New England Fishery Management Council
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Frank Blount, *Chairman* | Paul J. Howard, *Executive Director*

Habitat Area of Particular Concern Candidate Proposal Submission Form

Name of Proposal Developer(s):

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Title of HAPC Proposal: The New England Seamounts HAPC

Abstract / Brief Statement of Proposal:

An HAPC designation is proposed for Bear, Physalia, Retriever, and Mytilus seamounts, and the minor topographic rises surrounding them, that are within the U.S. EEZ off the southern edge of Georges Bank. The HAPC is proposed to elevate conservation measures for the protection of deepwater corals and co-occurring species (e.g., sponges) that are abundant within seamount landscapes. Corals are extremely sensitive to disturbance by fishing gear (mobile and fixed gear) and, with low recruitment and growth rates, require extremely long periods of time to recover from such damage. While no fishery for benthic or demersal species is currently operating at the New England Seamounts within the U.S. EEZ, actions after any such fishery commences may be too late to conserve coral habitats due to the very limited area of seamounts. This proposal is an opportunity to conserve sensitive coral communities with no impact to current economic investments by the fishing industry.

Coordinates of Candidate HAPC (Please provide in latitude and longitude to the scale of degree/minutes/seconds or decimal degrees):

The proposed boundary for this HAPC is as follows: northwest corner at 40.16^{o} N, 68.00^{o} W; southwest corner at 39.16^{o} N, 68.00^{o} W; northeast corner at 40.16^{o} N, 65.86^{o} W (longitude of the EEZ boundary); southeast corner at 39.16^{o} N, 66.63^{o} W (longitude of the EEZ boundary).

Signature of Primary Proposer or Representative: _______ *Peter Auster* ____________

Date: 18 March 2005

Proposal Title: The New England Seamounts HAPC

Submitted by:

Peter Auster, National Undersea Research Center and Department of Marine Sciences, University of Connecticut at Avery Point, Groton, CT 06340
and
Les Watling, Darling Marine Center, University of Maine, Walpole, ME 04573

Candidate HAPC: An HAPC designation is proposed for Bear, Physalia, Retriever, and Mytilus seamounts, and the minor topographic rises surrounding them, that are within the U.S. EEZ off the southern edge of Georges Bank.

Objectives: An HAPC designation for Bear, Physalia, Retriever, and Mytilus seamounts (hereinafter referred to as the New England Seamounts) is proposed to elevate conservation measures for the protection of deepwater corals and co-occurring species (e.g., sponges) that are abundant within seamount landscapes. Corals are extremely sensitive to disturbance by fishing gear (mobile and fixed gear) and, with low recruitment and growth rates, require extremely long periods of time to recover from such damage. While no fishery for benthic or demersal species is currently operating at the New England Seamounts within the U.S. EEZ, actions after any such fishery commences may be too late to conserve coral habitats due to the very limited area of seamounts. This proposal is an opportunity to conserve sensitive coral communities with no impact to current economic investments by the fishing industry.

Justification for Council Action: An HAPC or similar designation will preclude impacts of fishing activities due to the sensitivity of coral habitat to "human-induced environmental degradation" (HAPC criteria 2) as well as the rarity of seamounts and associated seamount communities within the Atlantic U.S. EEZ (HAPC criteria 4). The four major seamounts that are the subject of this proposal are the western end of a chain of more than 20 seamounts that stretch towards the Mid-Atlantic Ridge in international waters.

HAPC Boundary:

The proposed boundary for this HAPC is as follows: northwest corner at 40.16^{o} N, 68.00^{o} W; southwest corner at 39.16^{o} N, 68.00^{o} W; northeast corner at 40.16^{o} N, 65.86^{o} W (longitude of the EEZ boundary); southeast corner at 39.16^{o} N, 66.63^{o} W (longitude of the EEZ boundary). Figure 1 is a map of the proposed HAPC.

Supportive Information:

Seamounts have steep and complex topography, impinging currents with topographically induced upwellings, wide depth ranges, are dominated by hard substrates, are geographically isolated from continental platforms, and are dominated by invertebrate suspension feeders. Seamount faunas generally exhibit a high degree of endemism, owing to their isolation as well as the high degree of landscape variation at small and large spatial scales. The New England Seamount chain is a line of extinct volcanoes running from the southern side of Georges Bank to a point midway across the western Atlantic. The New England Seamount Chain, the Corner Rise Seamounts, the mid-Atlantic Ridge, and the deep sides of the Azores constitute a nearly continuous series of hard substrate "islands" in a sea of abyssal mud extending across the North Atlantic Ocean. These islands are therefore rare habitats within the context of the whole North Atlantic basin. The most westerly seamounts (i.e., Bear, Physalia, Retriever, and Mytilus) are within the boundary of the United States Exclusive Economic Zone. Several of the seamounts were visited by geologists in 1974, but there has been little biological exploration of the area. Our group (the Mountains-in-the-Sea Research Group) has conducted some of the first ecological studies along the New England Seamount Chain.

We know, from preliminary work conducted along the western side of the North Atlantic, and by German scientists in the eastern Atlantic, that some species of deep-sea octocorals and fish can be found in both areas. Our collections also indicate that there is a biogeographic separation of the eastern and western basins faunas, each with their own endemic species. This suggests that individual seamounts, or small groups of seamounts, may also harbor endemic species. In 2003 we collected 63 coral specimens at Bear, Kelvin, and Manning seamounts using the submersible *Alvin*. This collection contained 15 octocoral genera, 6 antipatharian genera, and some unknown number of zoanthid genera. With an increased number of dives in 2004 using the ROV *Hercules*, we collected 135 corals at Bear, Retriever, Balanus, Kelvin, and Manning seamounts. These specimens represent 23 octocoral genera, 7 antipatharian genera, and an unknown number of zoanthid genera. In all, 14 genera were added in 2004, including at those seamounts visited in 2003. From the videotapes we have also noted other octocoral colonies that so far remain uncollected. There are a series of taxonomic problems in several of the genera we are dealing with, so no estimate of species can be made at this time. However, our initial inspection of the material collected suggests we have about 15 new species, most in the families Plexauridae, Chrysogorgiidae, and Primnoidae. Taxonomic, genetic, and reproductive studies are ongoing. However, given the greater degree of investigation of corals in the east Atlantic, the presence of these undescribed species also suggests that they have very limited distributions.

We have also used video transects to census deep sea fishes and characterize the landscape in which they operate. To date, we have observed 36 fish taxa from 24 families based on *Alvin*, *Hercules* and *ABE* imagery. Moore et al. (2003a) listed 591 species of deepwater fishes in the northwest Atlantic Ocean that occur at depths greater than 200 m. However, the zoogeography of this region as whole has not been resolved to the level that can predict patterns of distribution and diversity at medium to small spatial scales (i.e., the spatial scale within and between seamounts across the region). Based on observations of variations in habitat features within seamount landscapes, and general patterns in the associations of fishes with such features, we developed a hierarchical landscape classification scheme to classify patterns of habitat use in deepwater fishes (Auster et al. 2005). The classification scheme includes geological and biological features as well as the local flow regime as habitat attributes. Preliminary analysis suggests that seamount fishes can be divided into four groups. The members of the first group are generalists and occur in all habitat types. These include halosaurids (i.e. *Aldrovandia* spp.), macrourids (i.e., *Caelorinchus* spp., *Nezumia* spp.), and *Synaphobranchus kaupi*. The second group, which occurs primarily in basalt habitats, includes an oreosomatid (*Neocyttus helgae*) that appears to have an association with both corals and depressions within basalt pavements. Taxa that make up the third group occur in fine-grained sediment habitats, including macrourids (*Coryphaenoides* spp.), chimaerids (*Hydrolagus* spp.), rajids, alepocephalids, ipnopids (*Bathypterois* spp.), and synodontids (*Bathysaurus* spp.). One final group appears to be specialized in living along the ecotone of ledges and sediment and includes morids (*Antimora rostrata* and *Laemonema* spp.), ophidiid cusk-eels and other synaphobranchids besides *S. kaupi*. Analysis of transect data is ongoing.

The observed size structures of coral colonies are intriguing. Prior anecdotal observations have indicated that stands of deep-water octocorals tend to be relatively uniform in size, and conspicuously lacking in small colonies. We are finding this general pattern in two species *Paragorgia* sp. and *Lepidisis* sp., but in *Paragorgia* we also have discovered what appear to be tiny recruits, consisting of just a few polyps. For this species, it may be that post-settlement mortality plays a role in the absence of small colonies. The size distributions of corals will become much more informative when we can convert them to age distributions. Studies to develop this size-age relationship are underway but regardless of the outcome, it appears that in general, coral communities are composed of cohorts from highly sporadic recruitment.

We are in the process of quantifying distributions of several species (*Paragorgia* sp. *Lepidisis* spp. *Metallogorgia* sp., *Paramuricea* spp., *Candidella* sp., *and Corallium* sp., as well as other scleractinians and antipatharians) using videotapes and digital still images. Preliminary quantitative analyses of coral species distributions indicate that community composition differs considerably between seamounts, even at comparable depths. These differences correspond to biogeographical boundaries, or they may be due to species' responses to local habitat conditions, such as substratum type or flow. We also find substantial variation in faunal composition between sites on a single seamount (Figure 2).

Merrett (1994) found that species richness of deepwater fishes in the North Atlantic, at depths greater than 250 m, was approximately 1094 species belonging to 143 families (589 pelagic and 505 demersal). That there are boundaries limiting the distribution of many species in this vagile fauna is evidenced by the reduced number of taxa (591) found in the northwest Atlantic alone (Moore et al. 2003a). Further, given that most ichthyofaunal surveys beyond continental shelf waters have been conducted using various types of towed nets over widely separated sampling stations, understanding the actual distribution of many deepwater taxa remains elusive. For example, trawl sampling by Moore et al. (2003b) at Bear Seamount revealed two species known previously only from the eastern Atlantic (i.e., *Hydrolagus pallida* and *Bathypterois dubius*). We observed *H. pallida* on Manning Seamount as well, using the *Hercules* ROV in 2004. Observations of false boarfish, *Neocyttus helgae*, nominally an eastern Atlantic species, were also made during video transects at multiple seamounts during both 2003 and 2004 expeditions (Moore et al in prep.). These observations suggest that seamount chains may provide "stepping stones" for dispersal and maintenance of populations of deepwater demersal fishes across ocean basins where their vertical distributions are restricted to slope depths (sensu Moore et al. 2003b). These observations are consistent with those of Kukuev (2002) who showed that there was little differentiation in the deepwater fishes (>500 m) of the Corner Rise Seamounts, mid-Atlantic Ridge, and east Atlantic seamounts. However, the shallow water ichthyofauna (from those peaks with depths <300m) east of the mid-Atlantic Ridge showed affinities for east Atlantic shelf faunas.

The available evidence we have from both octocorals and fish distributions suggests that the fauna of the New England Seamount chain is a part of a broad North Atlantic fauna with a regional endemism component (Watling and Auster, 2005). Since the chain of seamounts is nearly continuous from Bear Seamount to the Azores, a transition to an eastern Atlantic fauna must occur somewhere along the chain of seamounts, either at the Corner Rise seamounts or in the vicinity of the mid-Atlantic ridge. From Reid's (1994) analysis of flow at 2000 m, it would appear that the Corner Rise seamounts, and perhaps the easternmost New England chain seamounts such as Nashville, receive flow directly from the east and so should look more like the deep Azorean fauna than do the seamounts at the western end of the New England chain. Still, there are difficulties with this interpretation. Reid's (1994) flow analysis suggests a general east to west deep flow across the Atlantic south of 30° N with no northeastward flow south of the Gulf Stream. However, several of the octocorals that we have been able to identify so far were originally described from the deep Antilles and Florida Straits and others have been found on the Reykjanes Ridge (Keller and Pasternak 2001). These species have so far not been identified from the eastern Atlantic, suggesting that they are western Atlantic endemics with a larval connection between the New England seamounts and the deep Antilles. On the other hand, there seems to be a slight correspondence between the Antillean deep octocoral fauna and that from eastern mid-latitude seamounts, such as Great Meteor and the deep sides of the Azores (Grasshoff 1977, 1981). The results of our work to date suggest a degree of endemism in seamount fauna that warrants a risk-averse approach at the only seamounts in the Atlantic EEZ of the United States.

Potential and Existing Threats:

Fishing has had significant impacts on deep-water coral populations worldwide. Between 30-50 % of *Lophelia* reefs off Norway have been impacted or destroyed by trawling (Fosså et al. 2002). More than 90 % of *Oculina* habitat in a reserve off the east coast of Florida has been reduced to unconsolidated rubble (Koenig et al. in press). The authors present evidence of recent trawling activities as one likely and major cause of the damage but temperature extremes, excess nutrients, disease, strong currents, and other types of ship operations are also potential sources of historic mortalities. Comparisons of fished and unfished communities on seamounts off Tasmania showed that heavy trawling essentially removed the coral aggregate and significantly reduced the number of species and biomass (Koslow et al. 2001). There is a high degree of endemism of seamount fauna (de Forges et al. 2000) making these habitats particularly sensitive to fishing disturbances.

Observations of the impacts of a single trawl tow through *Primnoa* habitat in the Gulf of Alaska, where 1000 kg of coral were landed, showed seven years later that 7 of 31 colonies remaining in the trawl path were missing 80-99 % of their branches and boulders with corals attached were tipped and dragged (Krieger 2001). Damage was restricted to the net path. Approximately 50 colonies were observed within 10 m of the net (where bridles would have swept over the seafloor) and no damaged colonies or disturbed boulders were observed. Longline gear is also noted to tip and dislodge corals (Krieger 2001). Bycatch data from a longline survey in the Gulf of Alaska and Aleutian Islands showed *Primnoa* and other coral taxa were caught on 619 of 541,350 hooks fished at 150-900 m depths (Krieger 2001).

Corals are clearly sensitive to fishing gear impacts and recovery rates are extremely slow based on our knowledge of recruitment, growth rates, and age structure. The ability to age deep-water scleractinians and octocorals is relatively new and different methods are used in different studies. For *Primnoa resedaeformis*, a common outer shelf-upper slope species, Risk et al. (2002) estimates linear growth rates at the distal tips of the colonies at 1.5-2.5 mm yr-1 based on comparisons of live specimens with growth rates through the base of a sub-fossil specimen collected from the Northeast Channel at 450 m. Growth rates of this same species in the Gulf of Alaska are reported as 1.60-2.32 cm yr-1 , although these samples were collected at less than 200 m depth (Andrews et al. 2002). Age estimates for only a few specimens demonstrate this species lives for hundreds of years. The colony collected from the Northeast Channel (Risk et al. 2002) has an estimated age of >300 years, which is in accordance with age estimates of the same species collected in Alaska (>100 years; Andrews et al. 2002). *Desmophyllum cristagalli*, a deep-water scleractinian, grows at 0.5-1.0 mm yr-1 and lives >200 years, with this growth rate verified by a specimen collected from an aircraft sunk in Baltimore Canyon in 1944 (Lazier et al. 1999; Risk et al. 2002). A 1.5 m high colony of the deep-water scleractinian coral *Lophelia pertusa* may be up to 366 years of age (Breeze et al. 1997). Deep-water reefs of *Oculina varicosa* form pinnacles and ridges 3-35 m in height off the east coast of Florida and have an average growth rate of 16.1 mm yr-1 (Reed 2002). Based simply on age and growth information, recovery of impacted colonies and thickets may take hundreds of years.

Data on recruitment patterns are even more limited. A single series of observations in the Gulf of Alaska suggest that recruitment of *Primnoa* sp. is patchy and aperiodic (Krieger 2001). No recruitment of new colonies was observed in an area where *Primnoa* was removed by trawling after seven years. However, six new colonies were observed at a second site one year after trawling. Four of these colonies were attached to the bases of colonies removed by trawling. Recruits of *Primnoa* were also observed on two 7 cm diameter cables (>15 colonies each). Limited observations of corals in the Gulf of Maine and in submarine canyons have not revealed widespread coral recruits (Watling, Auster, and France, unpublished observations).

While there are no current commercial fishing activities occurring at the New England Seamounts, any future activities that contact the seafloor can have significant deleterious impacts that are neither minimal nor temporary. The proposed HAPC should be considered as a precautionary management measure to preclude impacts to a highly sensitive fauna (Auster 2001).

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Figure 1. Location map of the proposed New England Seamounts HAPC. The map is based on NOAA Bathymetric maps NOS NJ 19-3 (Bear Seamount) and NOS NK 19-12 (Lydonia Canyon).

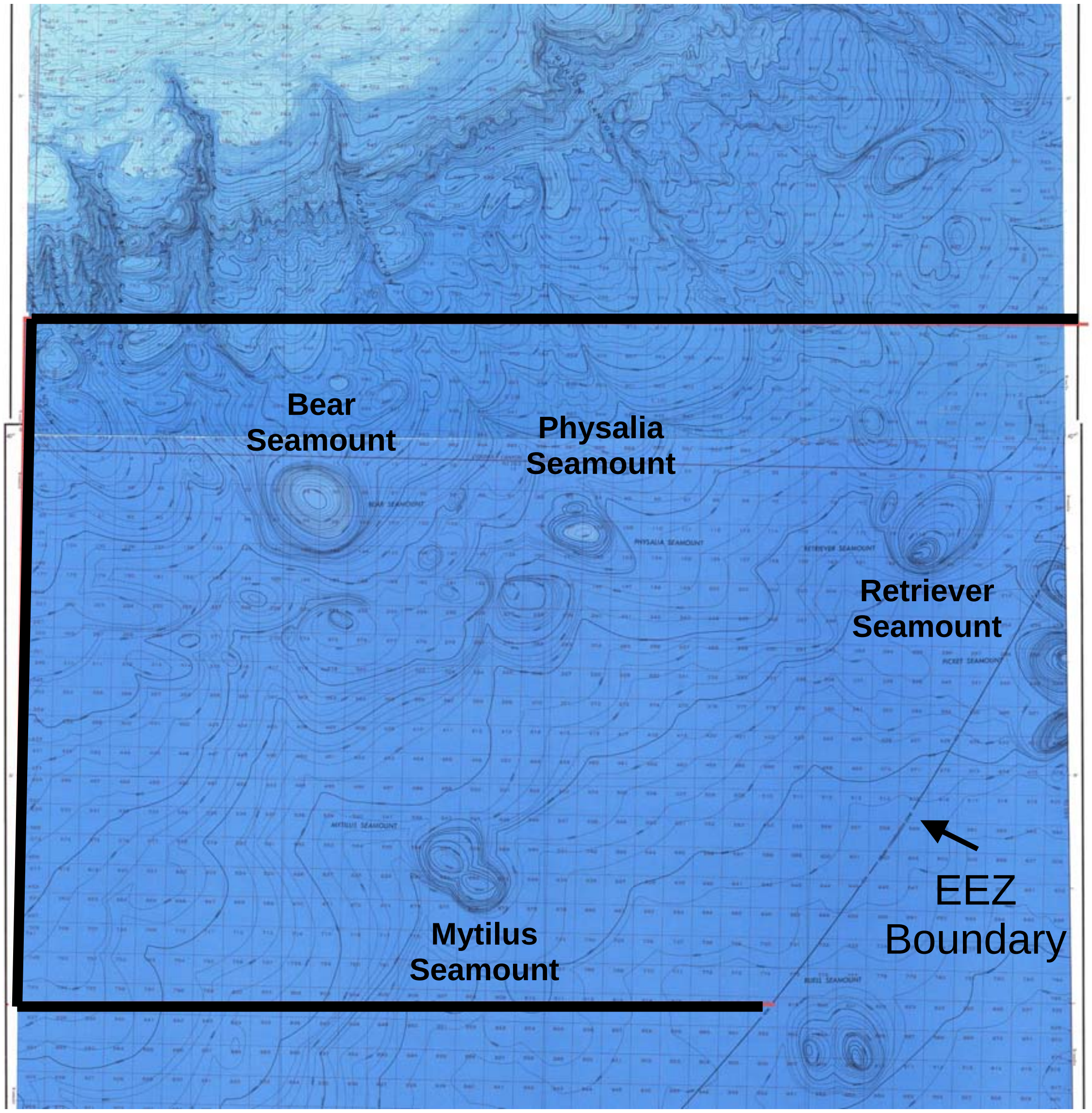
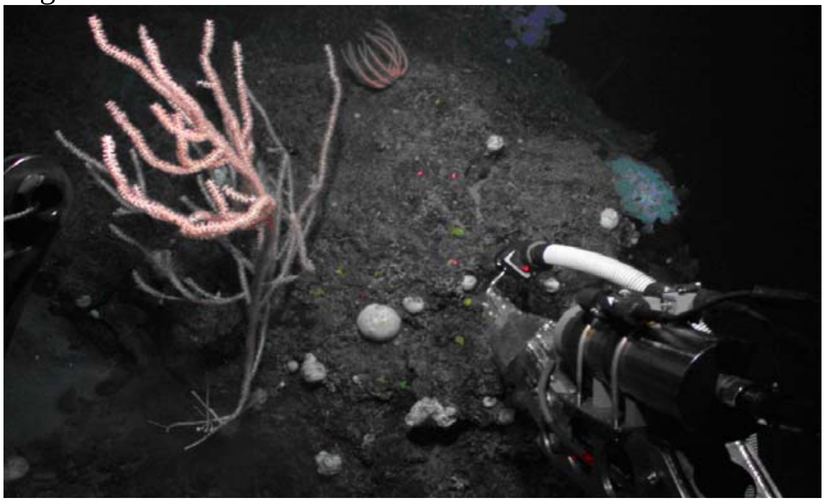
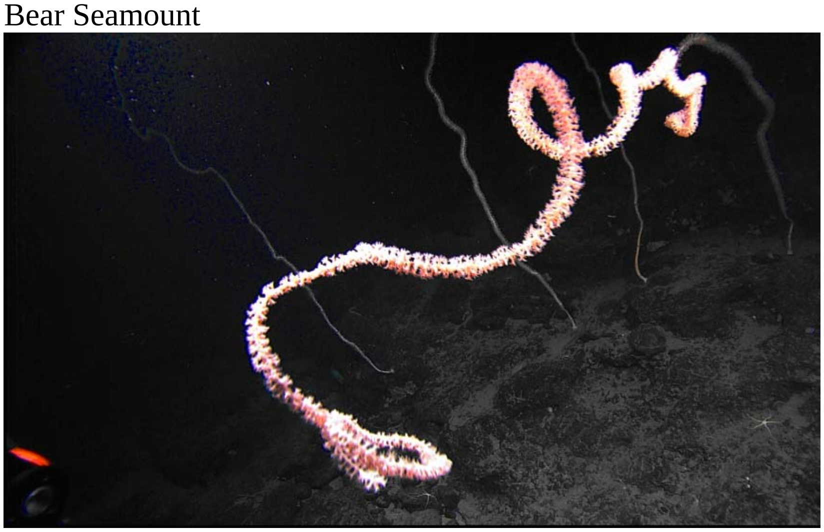


Figure 2. Photographic examples of variations in coral communities from two New England Seamounts.



Bear Seamount

Bear Seamount



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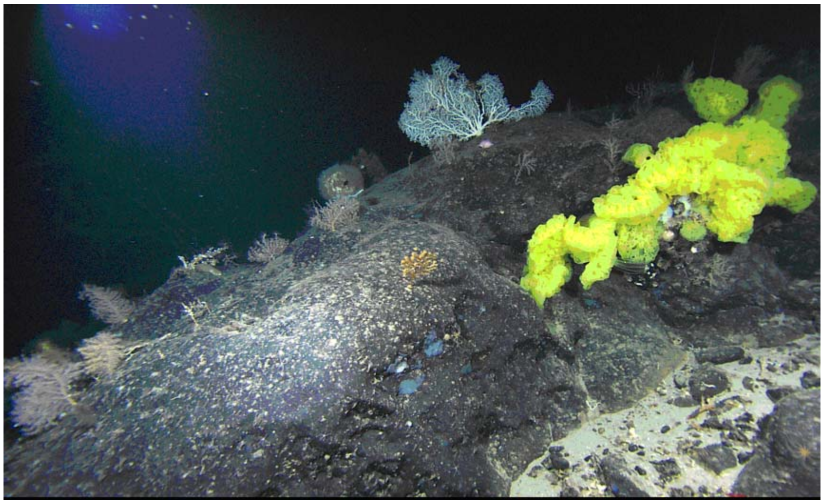
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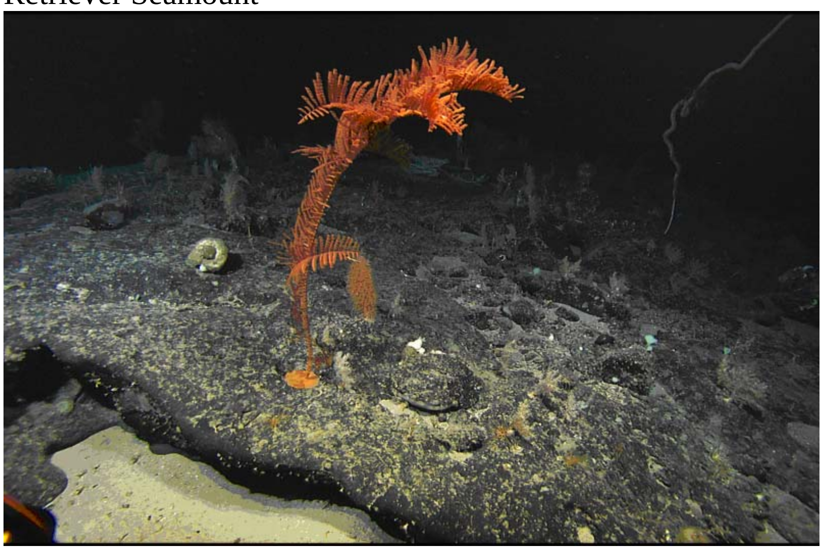
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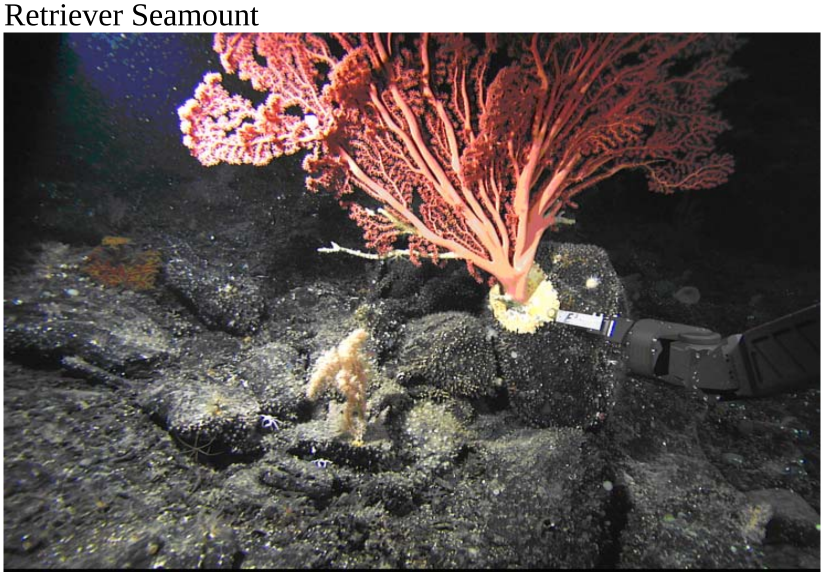
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