



February 22, 2023

Mr. Marc Gorelnik, Chair
Pacific Fisheries Management Council
7700 Ambassador Place, Suite 101
Portland, OR 97220

RE: Agenda item F.4 Non-Trawl Area Management – Final Preferred Alternative

Dear Mr. Gorelnik:

Thank you for the opportunity for Greater Farallones and Monterey Bay national marine sanctuaries (GFNMS, MBNMS, or sanctuary) to submit this informational report regarding the Non-Trawl Area Management Measures action. The purpose of this letter is to share with the Pacific Fishery Management Council (PFMC) a [Draft Restoration Plan and NEPA Evaluation for the YFD-70 Dry Dock](#) (Restoration Plan) authored by Office of National Marine Sanctuaries (ONMS) to restore resources, habitat, and biota, and to discuss the potential overlap between the Restoration Plan and the PFMC's Non-Trawl Area Management Measures action. ONMS would also like to discuss future opportunities to consult with the PFMC on the best pathway forward for protecting the proposed coral restoration sites from groundfish fishing impacts.

One of the purposes and policies of the National Marine Sanctuaries Act (NMSA) is to “restore and enhance natural habitats, populations, and ecological processes” (16 U.S.C. § 1431). The NMSA authorizes the recovery of response costs and damages associated with the destruction, loss, or injury to sanctuary resources, and requires ONMS to use funds recovered to restore sanctuary resources (16 U.S.C. § 1443). To that end, ONMS must compensate, to the extent possible, for losses of sanctuary resources and ecosystem services resulting from the massive, sunken drydock, YFD-70, at Pioneer Canyon in MBNMS. ONMS released the draft Restoration Plan, which proposes two feasible projects in the preferred alternative that restore sanctuary resources and ecosystem services consistent with the requirements of the NMSA:

1. Project 1 would remove targets¹ from MBNMS and GFNMS, ranging in locations from Point Arena to Point Sur, from the shoreline to seafloor depths no greater than 150 feet. ONMS would remove these targets from multiple habitat types including rocky reefs, sandy beaches, eelgrass beds, and hard, mixed, and soft sediments from the seafloor.
2. Project 2 would outplant up to 300 corals in two to five locations² within MBNMS and GFNMS that are currently protected from drilling, dredging, and benthic fishing in order to immediately serve as habitat and to provide regional propagules to grow additional corals. This project is the focus of our comment letter and why we would like to bring this Restoration Plan to the PFMC's attention at this time. The PFMC action could affect the scope and scale of the preferred alternative in the draft Restoration Plan.

¹ Targets include objects/vessels/vehicles of all sizes that can be derelict, abandoned, grounded, or sunken and discarded large objects such as shipping containers or fishing gear.

² For the purposes of this letter, an “area” is a general geographic area and a “location” is a more precise place within that area.

Appendix A provides data collected in several locations within the identified areas, which has occurred subsequent to the data collection period from 2009–2015 for the previous Essential Fish Habitat (EFH) review process, and therefore has not been holistically shared with the PFMC. These data show: the intrinsic value of these areas; their unique confluence of rocky reefs (groundfish EFH Habitat Areas of Particular Concern), biogenic habitat, and groundfish species of interests; and how locations within these areas would be suitable for coral restoration for the existing proposed Project 2 in the draft Restoration Plan and for potential future opportunities for coral outplanting.

Restoration Plan and NEPA Evaluation for the YFD-70 Dry Dock

On October 26, 2016, the YFD-70, under tow by TUG OCEAN RANGER, sank and was deposited in Pioneer Canyon, a deep canyon on the continental shelf within the boundary of MBNMS, and administratively managed by GFNMS. ONMS subsequently conducted a natural resource damage assessment, which led to a consent decree for this incident where NOAA settled claims under the NMSA (16 U.S.C. §§ 1431, *et seq.*) against certain responsible parties arising from the sinking of the YFD-70. Pursuant to the settlement, NOAA recovered approximately \$8,700,000 for restoration actions. The draft Restoration Plan was released on December 6, 2022.

Primary restoration actions in this case (e.g. removal of the YFD-70) are not feasible due to the significant technical challenges posed by deep-water salvage of a vessel of that size, safety concerns, and funding constraints. The sinking of the YFD-70 resulted in substantial, persistent, and ongoing impacts to seafloor and biota, including deep-sea corals. The presence of the YFD-70 has resulted in the permanent loss of habitat and ecosystem functions within the injury footprint. Therefore, ONMS has focused on identifying compensatory restoration projects to be undertaken within the regional ecosystem of the impacted area as the preferred restoration alternative.

The proposed projects are designed to restore resources similar to those injured by the impact and long-term presence of the YFD-70 and to compensate, to the extent possible, for losses of sanctuary resources and ecosystem services resulting from the sinking of the YFD-70. These proposed projects are appropriate, feasible, have a high likelihood of success, and, collectively, would provide restoration, to the extent possible, for the types of benthic habitats within the sanctuary that were injured or lost as a result of the sinking of the YFD-70 drydock.

ONMS is extending the public comment period for the draft Restoration Plan due to a technical error during the first comment period. The public has until March 15, 2023 to provide input. Comments must be submitted via email to gfnms.restoration@noaa.gov.

Area Selection Criteria for Coral Outplanting

The goal of the proposed coral outplanting project in the draft Restoration Plan is to create healthy coral communities in two to five locations in areas of MBNMS and GFNMS where coral is currently depauperate (lacking in numbers or variety of species). Both the areas generally and specific restoration locations within the areas identified by ONMS for coral outplanting efforts are considered suitable based on an initial set of criteria applied during the restoration planning process, including identifying: (1) areas with suitable depth; (2) areas with known hard substrate;

(3) areas where corals are known to historically or currently occur; and (4) locations that are protected from external harm via the NMSA and sanctuary regulations (e.g., drilling, dredging, or alteration of the submerged lands), and via the Magnuson-Stevens Act and implementing regulations (e.g., groundfish trawling or fixed gear). At the time of planning, ONMS assumed that the Non-Trawl Rockfish Conservation Area (NT-RCA) was a permanent fishery closure, which is why the NT-RCA was included in the criteria as it provided more areas available for potential coral outplanting. ONMS is concerned that any investment and progress in restoring coral colonies could be harmed by external activities including bottom-contact fishing gear that targets hard and mixed habitats.

Therefore, we are providing this correspondence to inform the PFMC of the overlap between areas anticipated to be opened to groundfish bottom contact fishing gear and ONMS's proposed coral restoration sites. We encourage the PFMC to consider pathways to protect coral restoration sites from groundfish bottom contact fishing gear in the future. Once the PFMC's Non-Trawl Area Management Measures action is final and ONMS has completed a final Restoration Plan for deep-sea corals, ONMS and NMFS staff will meet to determine what, if any, course of action might be needed to achieve the coral restoration outcomes including subsequent actions that may involve the PFMC.

We look forward to opportunities to share the information presented in *Appendix A* and plan to have staff available at the March PFMC meeting to answer questions as needed. We hope this information aids the PFMC process and look forward to working with PFMC staff and advisory committees.

Thank you for considering this information shared regarding these areas and the requirement of ONMS to restore sanctuary resources under the NMSA. If you have any questions, please contact Karen Reyna at 415-970-5247 or karen.reyna@noaa.gov.

Sincerely,



Maria Brown, Superintendent
Greater Farallones and Cordell Bank
National Marine Sanctuaries



Lisa Wooninck, Ph.D., Superintendent
Monterey Bay National Marine Sanctuary

cc:

Greater Farallones National Marine Sanctuary Advisory Council
Monterey Bay National Marine Sanctuary Advisory Council

Enclosure: Appendix A - Additional Details on Coral Restoration Areas & Nexus to NT-RCA

APPENDIX A

Additional Details on Coral Restoration Areas

A.1 - Additional Considerations Regarding Coral Outplanting and Restoration

Services Corals Provide to GFNMS/MBNMS

Corals and sponges of the deep sea (> 50 m) provide habitat and food for many species of fish and invertebrates throughout the continental shelf, slope, and canyons of Greater Farallones and Monterey Bay national marine sanctuaries (Roletto et al., 2017 and King et al., 2021). Deep sea corals and sponges provide shelter for larval and adult fish and invertebrates, and areas for breeding and brooding (Stone et al., 2005 and Taylor et al. 2014). These structure forming invertebrates create habitat complexity for other organisms to shelter in and position themselves higher into the water column for suspension feeding (Stone et al., 2005; Hixon and Tissot 2007; and Taylor et al., 2014). Many invertebrates, including brittle stars, basket stars, crinoids, polychaetes, crustaceans, and gastropods live on coral and sponges. Small crustaceans that live among the corals in this seascape are prey for fish (Rooper et al., 2007). Because many deep-sea corals are long-lived and record past environmental conditions in their skeletal structures, they provide another service by providing a living record, helping scientists understand how these communities may have been affected by past climate fluctuations and other events (Hill et al., 2011 and Roark et al., 2005).

Coral Outplanting and Restoration

Outplanting is a process that takes coral “branches” from healthy colonies and transplants them to a new location. Successful coral outplanting is based on established methodologies (Boch et al., 2020) within larger areas that have known coral habitats, which are approximately 360–4,400 feet below sea level. The outplanted corals would immediately serve as habitat, are expected to colonize and grow, and provide regional propagules to grow additional corals within the sanctuaries. Efforts to outplant/translocate healthy or rehabilitated corals may accelerate the recovery of local diversity and ecosystem function in coral and sponge communities that have been disturbed or destroyed by human activity (Boch et al., 2019). Long-term establishment of outplanted corals is not documented in scientific literature. However, conservative estimates of potential recruitment rates, in addition to known survivorship rates from outplanted corals (Boch et al., 2019), indicate that coral outplanting should result in an increase in the total number of corals restored through passive restoration over time if human-caused disturbances to the restoration areas, such as benthic fishing, do not occur.

Deep sea coral restoration within protected seafloor areas would benefit not only long-lived corals, but the many species that use the coral structure for living space, associated food sources, or nursery areas, including: fishes (e.g., thornyhead rockfishes, Dover sole, deep-sea sole, sablefish, grenadiers, snailfishes, eelpouts, sculpin, cuskeel, codling, hagfish, catshark, skates); crabs; shrimps; squat lobsters; molluscs (e.g., nudibranchs, octopus); sea stars; basket stars; brittle stars; crinoids; anemones; amphipods; and polychaetes. These species feed and live among the small and large corals at sites within GFNMS and MBNMS (e.g., Burton et al., 2017; Etnoyer et al., 2014; Graiff et al., 2016; Graiff et al., 2021).

A.2 - Detail on Proposed Coral Restoration Sites

Overview

Data collected at multiple locations within all five of the identified areas show the intrinsic value of these areas not only for their potential to site locations for coral restoration, but also for their biogenic habitat value, ecosystem services, and potential to provide high-relief rocky habitat for groundfish, including groundfish species of interest such as yelloweye and cowcod. These areas may all provide future opportunities for coral outplanting at specific locations to enhance the intrinsic value of these areas. In this section we share information about the habitats (both predicted from multibeam surveys and visually verified) and species in areas that have been explored by using camera sleds, submersibles, ROVs and/or AUVs. Below is more information about each of the areas:

1. Point Arena South
2. The Football
3. Cochrane Bank
4. Ascension Canyonhead
5. Sur Ridge

Point Arena South

A characterization of deep-sea coral and sponge communities at Point Arena South (PAS) Groundfish EFH Conservation Area (EFHCA) and surrounding locations occurred during a multi-day ROV cruise conducted in October 2019 on board E/V *Nautilus* (Graiff et al., 2021). Dive planning targeted habitats and biological communities of corals, sponges, and fishes in relation to the new, 2020 configuration of PAS EFH, which included areas once closed to commercial bottom trawling and now opened to bottom trawling, once opened to bottom trawling and now closed, or that remain closed to commercial bottom trawling. Particular interest was given to enumerating deep-sea corals and sponges (DSCS) in these areas. Fish species were also enumerated. These data provide the most recent assessment and characterization for a

portion of these areas before the final ruling on Amendment 28 went into effect on January 1, 2020 (50 C.F.R. part 660). One of the objectives of the cruise was to conduct visual transects using ROV *Hercules* to confirm substrate types modeled from multibeam and backscatter data collected by E/V *Nautilus* in 2016 and 2017 (methods from Cochrane, 2008) and classify habitats, and identify corals, sponges, and fish throughout the PAS and adjacent areas (Graiff et al., 2021).

As shown in **Figure 1a**, the characterization of PAS, which incorporates visual observation data, denotes an area of interest overlapping with the proposed NT-RCA Alternative 2. Note that the area of interest is not intended to show exact locations for proposed coral outplanting, but is intended to show the general area where one or more locations are suitable and therefore viable options for coral restoration based on criteria and established methodologies.

Corals: The hard-flat and hard-rugose substrates observed on transects located inside PAS areas closed to commercial trawling provide habitat for corals and sponges (Graiff et al., 2021). The total count of corals is low given the large amount of area surveyed but hotspots were identified (**Figure 1b**). *Swiftia sp.*, a gorgonian with a red-branched morphology was observed, and is a candidate for outplanting (**Image 1**). Other *Swiftia* species have been successfully outplanted on Sur Ridge.

Substrate: Hard-flat and hard-rugose substrates were observed, located inside PAS areas closed to commercial trawling. In areas currently closed by the NT-RCA, consolidated flat-rock with cobbles and boulders and some high-relief rock ridge habitats were observed (**Figure 1c**). These substrates provide habitat for corals and sponges.

Note substrate types modeled from multibeam and backscatter data and subsequent habitat characterization based on visual surveys were not included in the “Non-Trawl Area Management Measures Map Viewer” available to the PFMC. Those data show all substrates in this area as soft. However, the “Non-Trawl Area Management Measures Map Viewer” also rates the data quality in this area a 1 out of 10.

Groundfish/fish species of interest: Flatfish and rockfish species managed by the Groundfish Fishery Management Plan were observed. Notably, very large cowcod (**Figure 1d**) and yelloweye rockfish were (*S. ruberrimus*; **Figure 1e**) observed both on and off transects (Graiff et al., 2021). Per a request from NMFS, cowcod and yelloweye rockfish were counted and georeferenced, but counts were not included in the densities calculated from quantifiable transects reported (Graiff et al., 2021).

Image 1 - *Swiftia simplex* collected for species identification at Point Arena South during a 2019 expedition.



Figure 1a - Potential Coral Restoration Area at Point Arena South. “Area of Interest” are areas that may include one to multiple locations suitable for coral restoration. Explored transects are areas where surveys using camera sleds, submersibles, ROVs, and/or AUVs have made visual observations of the habitat and associated species. The Groundfish EFHCA and NT-RCA Modification Alternative 2 were provided by the Non-Trawl Area Management Measures Map Viewer.

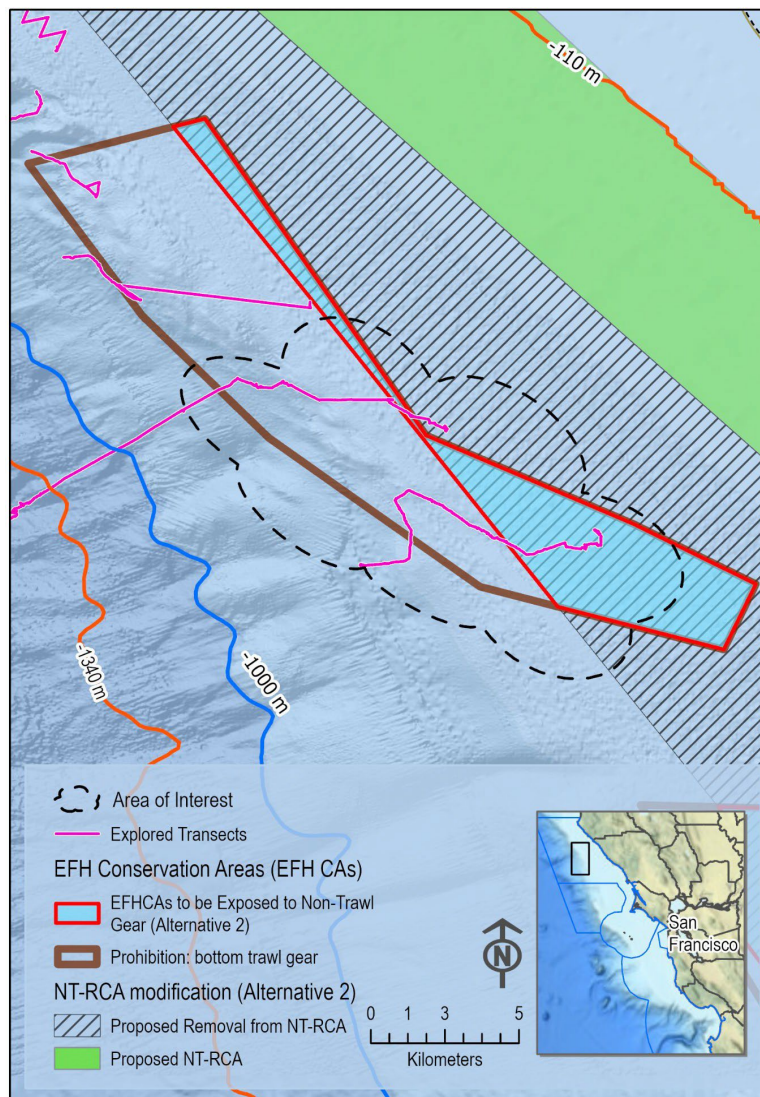


Figure 1b - Point Arena South geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and relevant biogenic species.

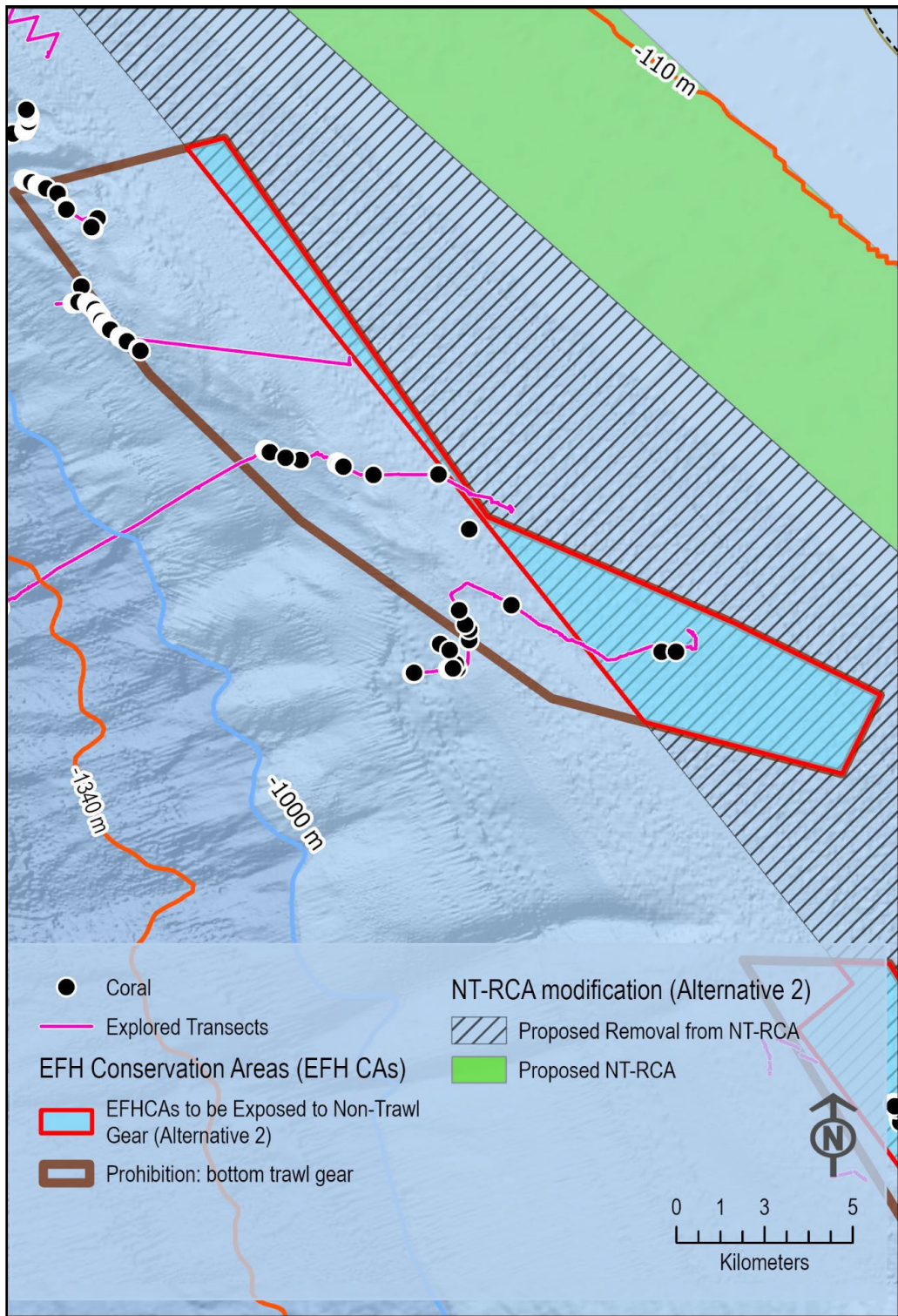
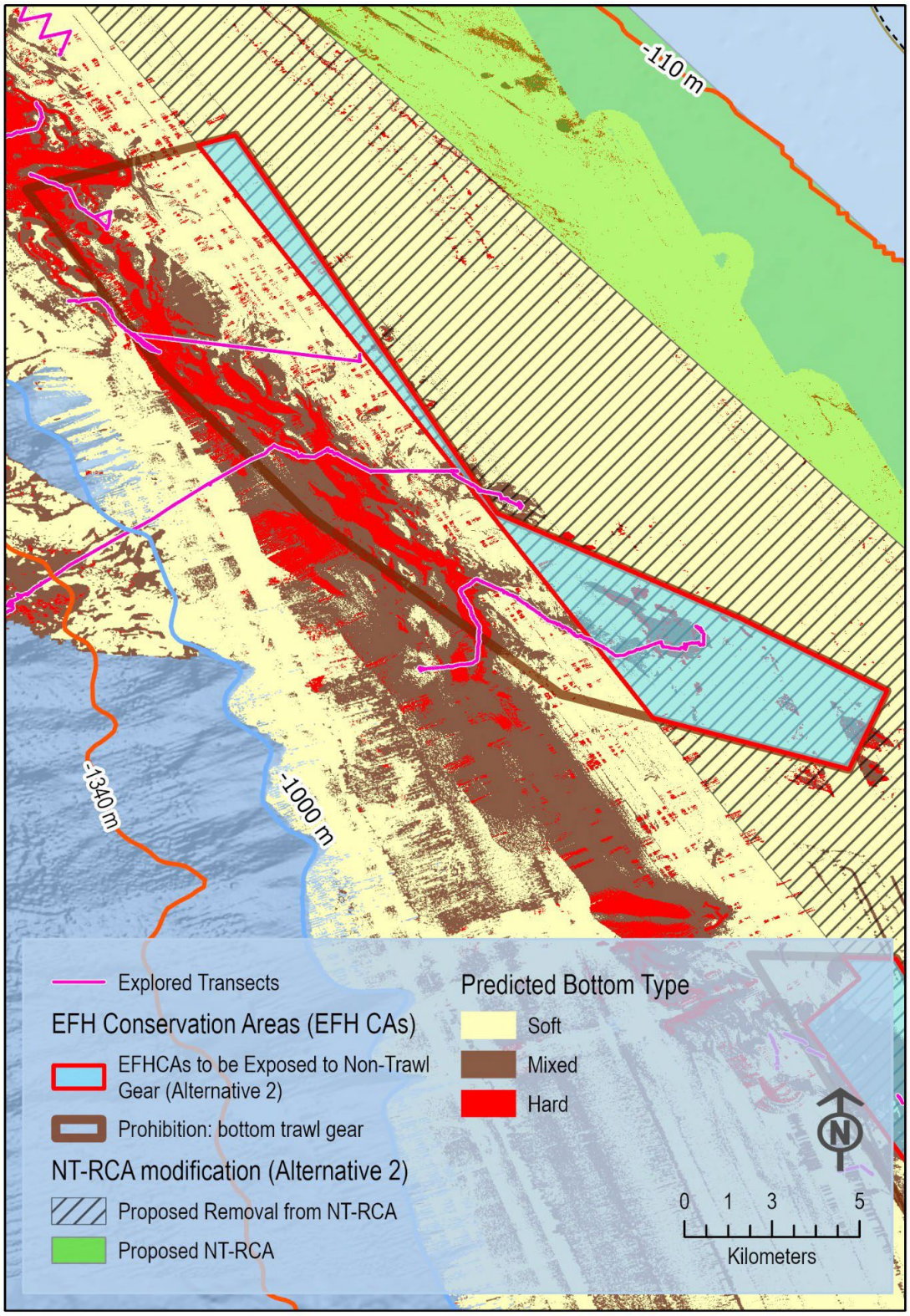


Figure 1c - Point Arena South geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and substrate.



Figures 1d and 1e - Point Arena South geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and relevant fish species.

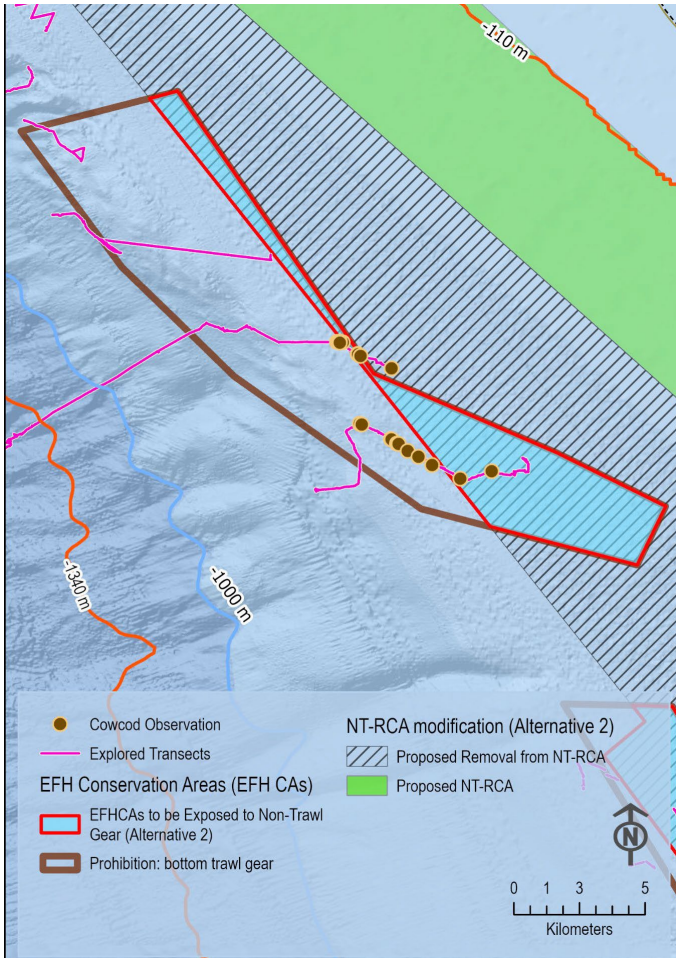


Figure 1d

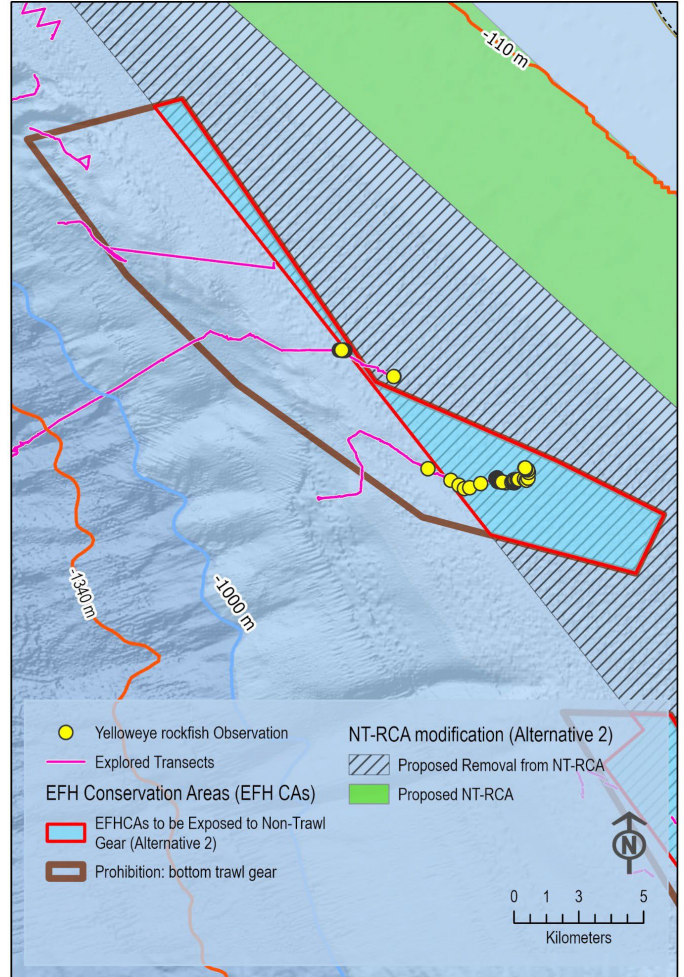


Figure 1e

The Football

A multi-day ROV cruise was conducted in 2014 to survey and characterize a rocky feature and surrounding habitat informally named "The Football". Using results from this survey, a site characterization report of The Football was published in 2016. The goals of the ROV surveys were to characterize deep-water benthic habitats, ground truth predicted habitat classifications, ground truth predictive habitat suitability models for coral and fish occurrence, and contribute to education and outreach about deep-water habitats (Graiff et al., 2016).

As shown in **Figure 2a**, the characterization of The Football area, which incorporates visual observation data, denotes an area of interest overlapping with the proposed NT-RCA Alternative 2. Note that the area of interest is not intended to show exact locations for proposed coral outplanting, but is intended to show the general area where one or more locations are suitable and therefore viable options for coral restoration based on criteria and established methodologies.

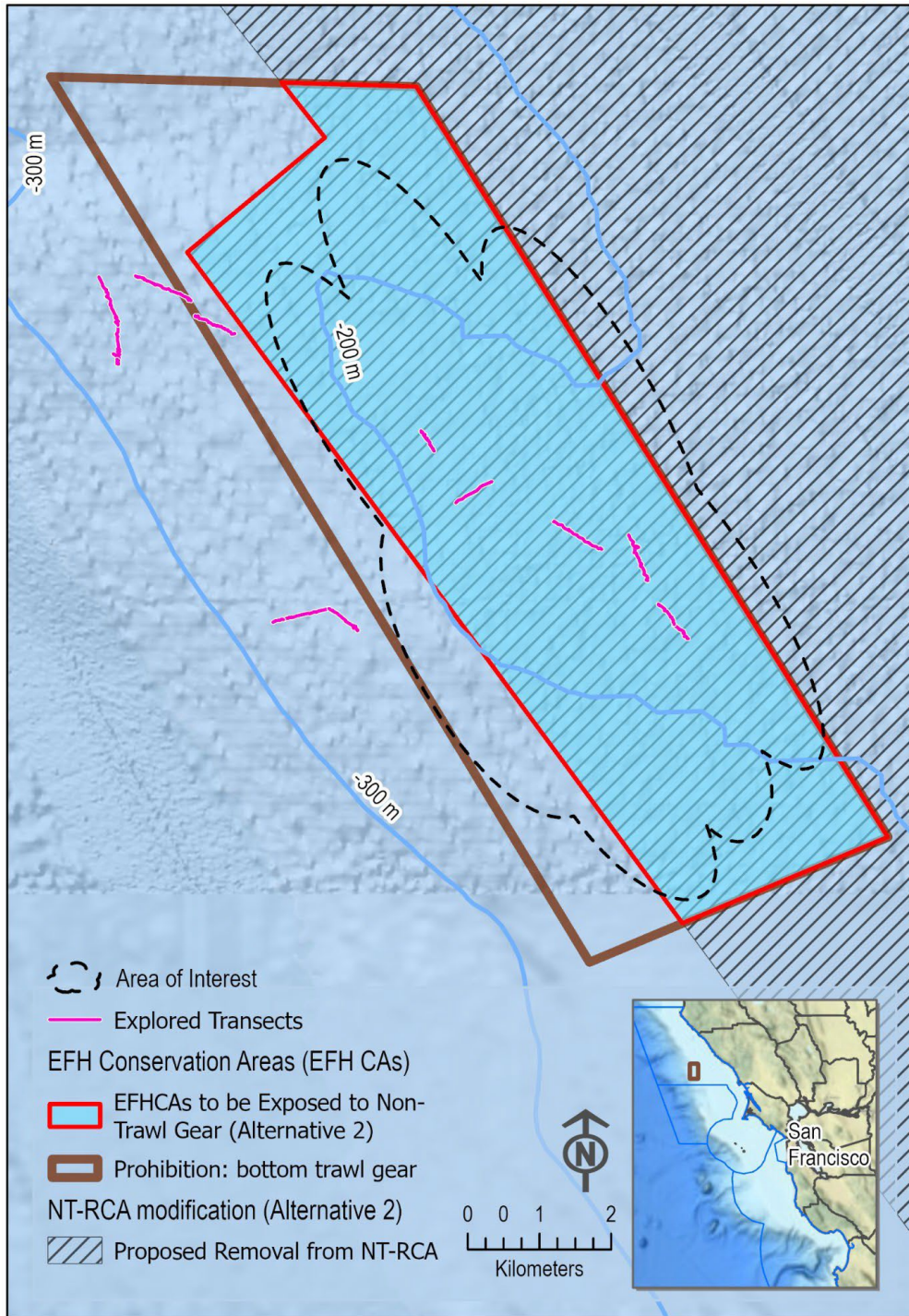
Corals: Corals from 4 taxa were enumerated from the eleven 15-minute quantitative segments conducted on The Football. Corals from three taxa were enumerated from transects that were not considered part of the 15-minute quantitative segments (**Figure 2b**). A new coral species, *Swiftia farallonesica*, was identified and accounted for nearly half of the coral and sponge observations (48% of total species composition; **Figure 2c**). *Swiftia sp.* have been successfully outplanted at Sur Ridge.

Substrate: The Football contains hard substrate features that are ideal for coral outplanting such as large boulder-like strata and rocky outcrops that form ledges and overhangs, which are used by invertebrates and hundreds of rockfish (Graiff et al., 2016). Stierhoff et al. (2011) also observed this outcrop slope in their ROV survey transect at The Football in 2011. Substrate included hard-flat (25% of the total area surveyed), comprised of sand mixed with cobbles, boulders or rocks, or a mix of cobbles, boulders, and rocks; and (3) hard-rugose (35% of the total area surveyed), primarily composed of a mix of larger rocky substrata like boulders, rock, and cobbles (**Figure 2d**).

Note substrate types modeled from multibeam and backscatter data and subsequent habitat characterization based on visual surveys were not included in the "Non-Trawl Area Management Measures Map Viewer" available to the PFMC. Those data show all substrates in this area as soft. However, the "Non-Trawl Area Management Measures Map Viewer" also rates the data quality in this area a 1 out of 10.

Groundfish/fish species of interest: Flatfish and rockfish species managed by the Groundfish Fishery Management Plan were observed. Rockfishes (at least 16 *Sebastes* species and at least 1 *Sebastolobus* species) comprised 83% of total fish density. Numerous yelloweye rockfish (*S. ruberrimus*) were observed on transects (**Figure 2x**). Many of the fishes taking refuge within the rock layers were so well-hidden they could not be identified to species. For additional information and images visit: <https://farallones.noaa.gov/science/football.html>

Figure 2a: Potential Coral Restoration Area at “The Football”. “Area of Interest” are areas that may include one to multiple locations suitable for coral restoration. Explored transects are areas where surveys using camera sleds, submersibles, ROVs, and/or AUVs have made visual observations of the habitat and associated species. The Groundfish EFHCA and NT-RCA Modification Alternative 2 were provided by the Non-Trawl Area Management Measures Map Viewer.



Figures 2b - 2c: Point Arena South geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and relevant biogenic species.

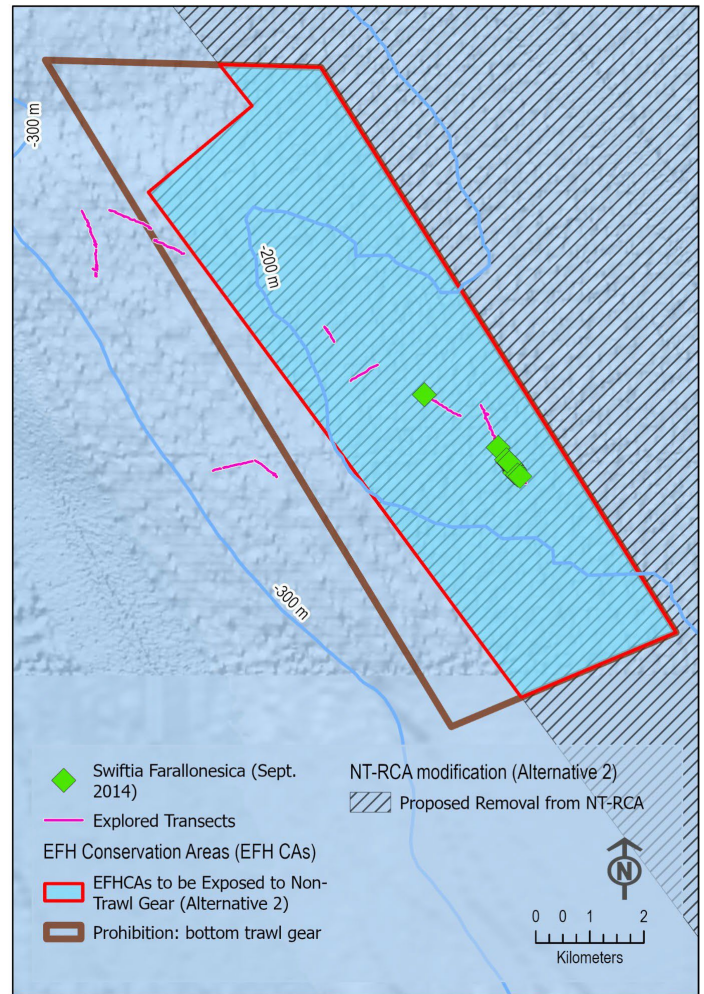
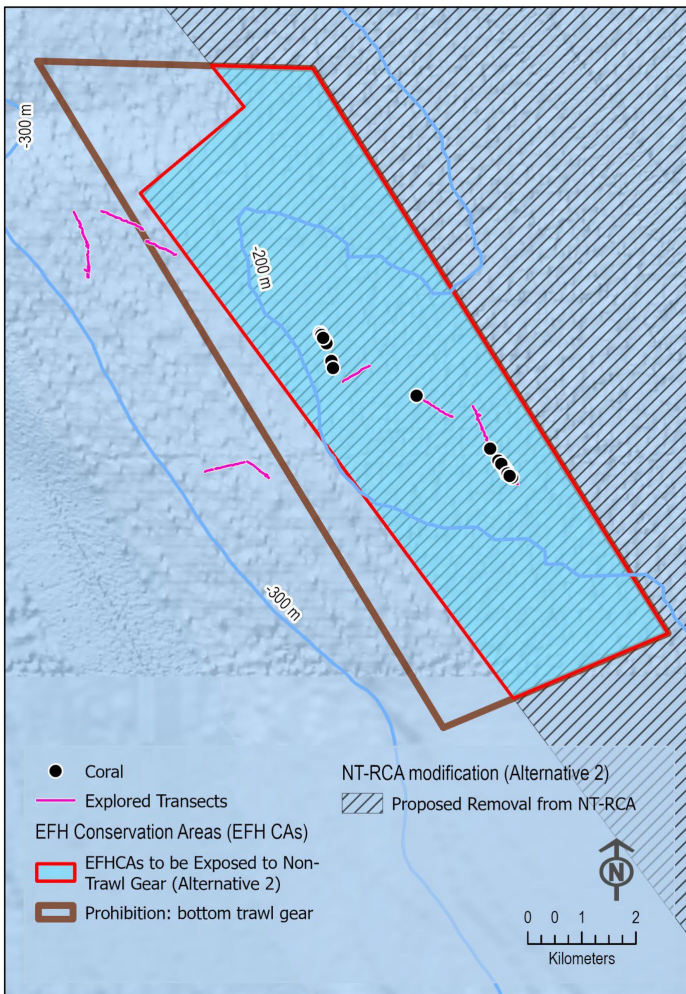


Figure 2d: The Football geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and substrate.

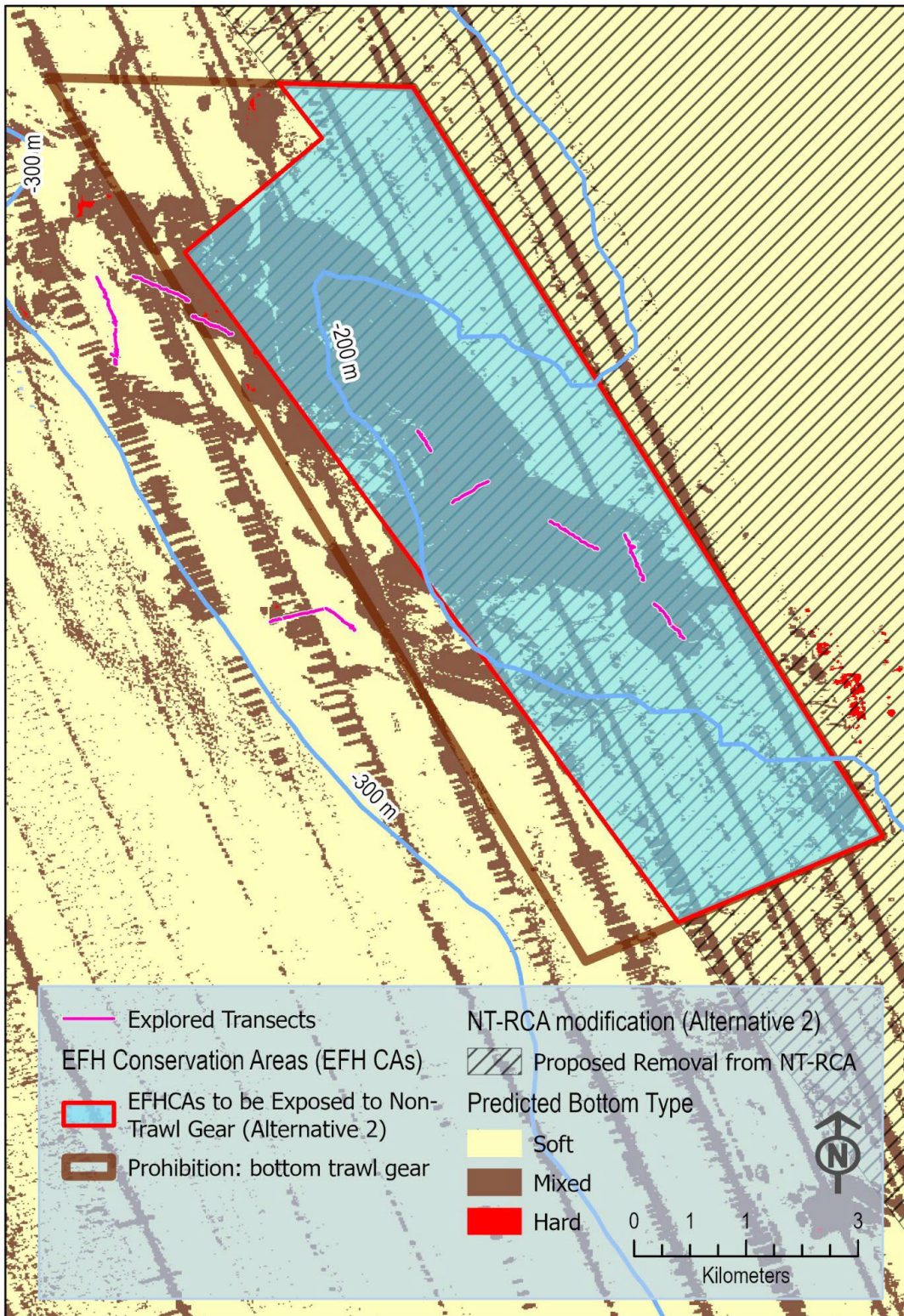
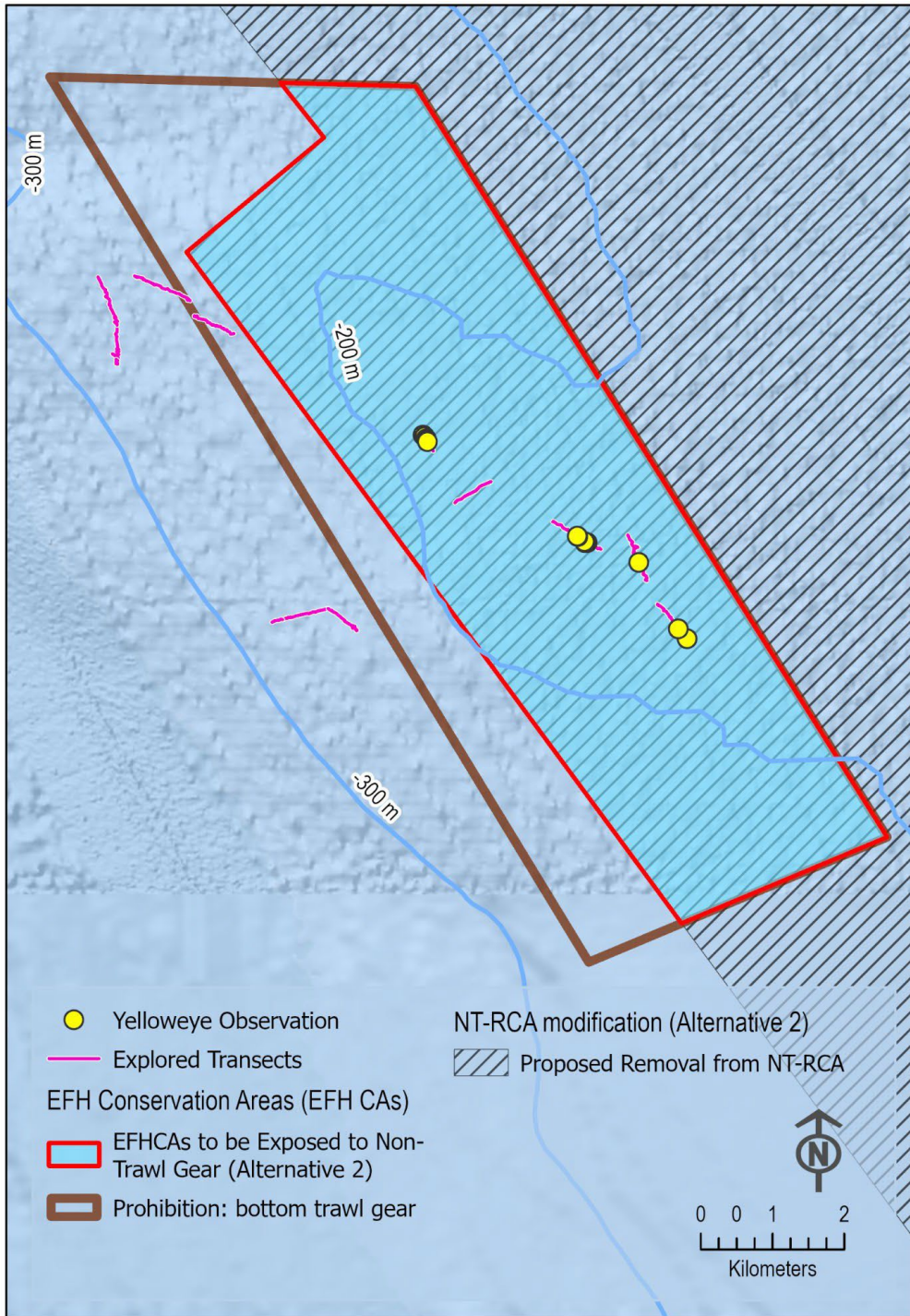


Figure 2e: The Football geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and relevant fish. Note, the black “dot” is a result of multiple sitings of yelloweye at one location.



Cochrane Bank

In October 2012, ONMS explored and mapped Cochrane Bank. Cochrane Bank is a rocky feature near the continental shelf break, located four kilometers northwest of Fanny Shoal. The purpose of the surveys was to ground truth mapping data collected in 2011, and to characterize the seafloor biota, particularly corals and sponges, in order to support EFH designations and other conservation and management goals under the NMSA (Etnoyer et. al., 2014).

As shown in **Figure 3a**, the characterization of Cochrane Bank, which incorporates visual observation data, denotes an area of interest overlapping with the proposed NT-RCA Alternative 2. Note that the area of interest is not intended to show exact locations for proposed coral outplanting, but is intended to show the general area where one or more locations are suitable and therefore viable options for coral restoration based on criteria and established methodologies.

Corals: Three taxa of coral were enumerated from visual surveys in 2012 and the survey team estimated an average density of 30 corals per 1000 square meters of sea floor (**Figure 3b**). A large black coral *Antipathes dendrochristos* was collected during the 2012 surveys. Experts determined that this specimen represents the northernmost occurrence of *Antipathes dendrochristos* to date (**Image 2**).

Groundfish/fish species of interest: Flatfish and rockfish managed by the Groundfish Fishery Management Plan were observed during the 2012 survey. The majority of fish observed (89%) were rockfish from at least 14 species. Yelloweye rockfish (*S. ruberrimus*) were observed. (**Figure 3c**).

Substrate: The high-relief rock present on Cochrane Bank is predominantly consolidated bedrock (Etnoyer et al., 2014). Approximately 0.28% of Cochrane Bank was surveyed. Habitat types on transect were primarily classified as: (1) high-relief hard bottom (15.2%), including boulders, cobbles, and rock; and (2) mixed low-relief hard bottom (75.7%), including a combination of mud and sand with boulder, cobbles, or rock (Etnoyer et. al., 2014). The multibeam bathymetry, acoustic backscatter, and seafloor character data are publicly available online through the United States Geological Survey (USGS) website, and described in detail in Dartnell et al. 2014. The data was included in the Non-Trawl Area Management Measures Map Viewer (**Figure 3d**).

Image 2 - Christmas tree black coral (*Antipathes dendrochristos*) with a rosy rockfish (*Sebastes rosaceus*), and many crabs and juvenile fish living in it. It is called a black coral because the stems/skeletal tissues are black, the living tissue is usually orange or yellow or greenish. This coral is two meters across and is at least 100 years old. Photo courtesy: NOAA.

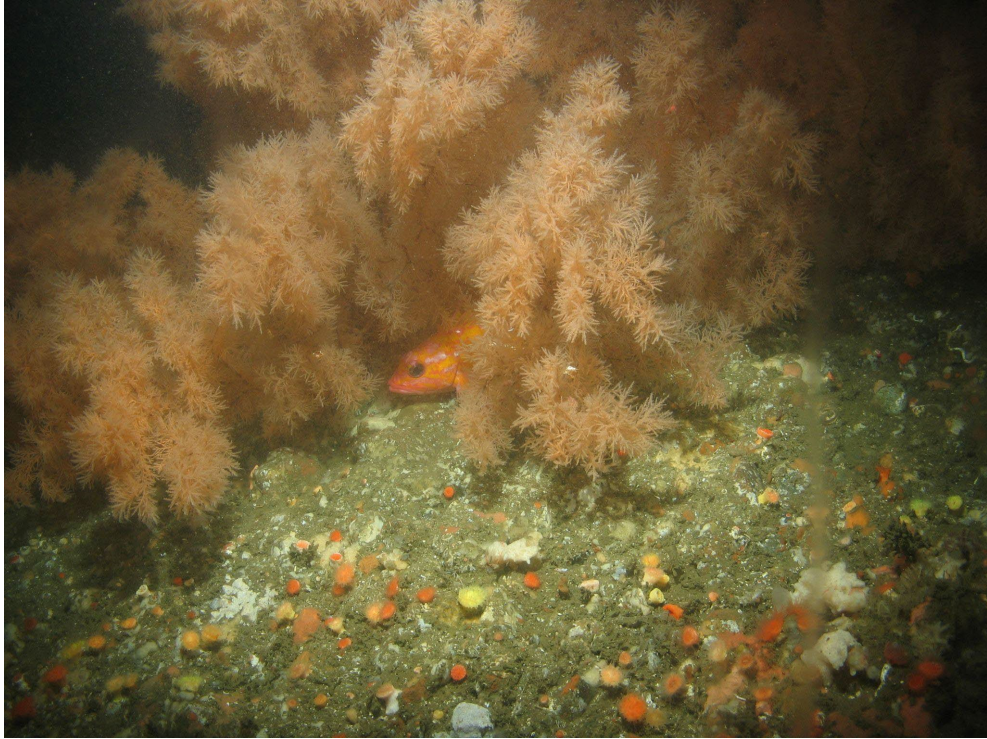


Figure 3a: Potential Coral Restoration Area at Cochrane Bank. “Area of Interest” are areas that may include one to multiple locations suitable for coral restoration. Explored transects are areas where surveys using camera sleds, submersibles, ROVs, and/or AUVs have made visual observations of the habitat and associated species. The EFHCA and NT-RCA Modification Alternative 2 were provided by the Non-Trawl Area Management Measures Map Viewer.

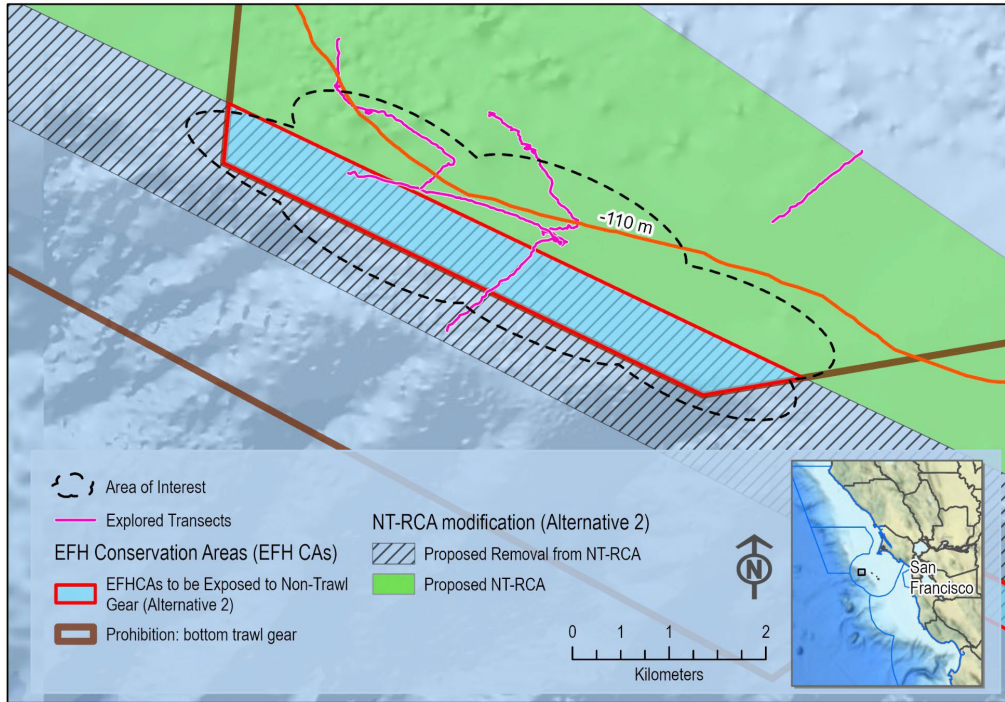


Figure 3b - Cochrane Bank geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and relevant biogenic species.

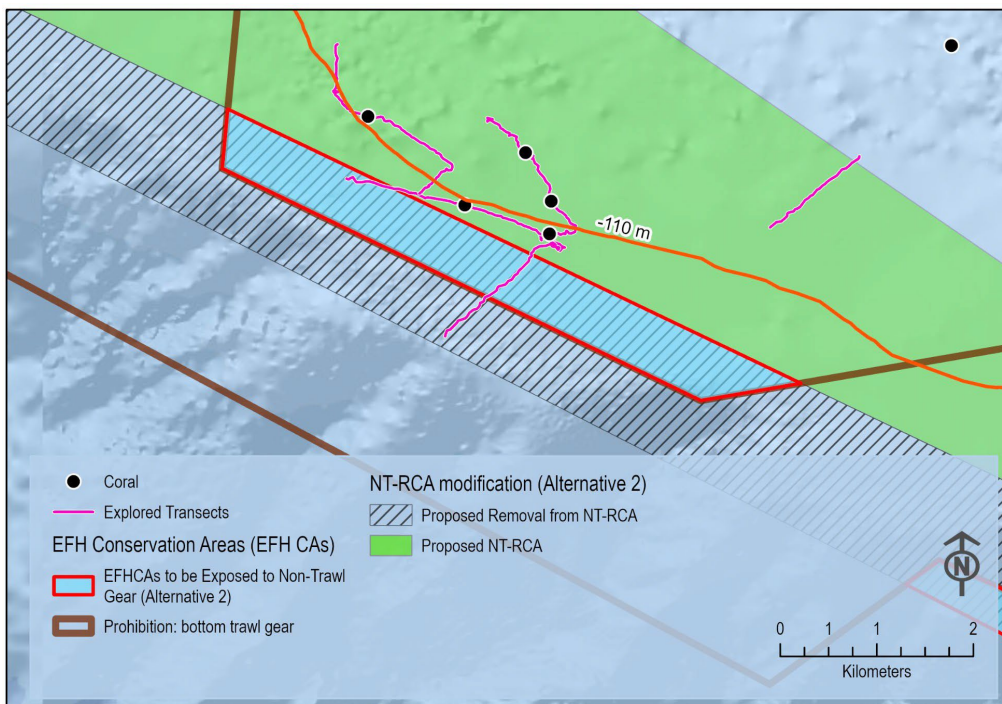


Figure 3c - Cochrane Bank geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and relevant fish.

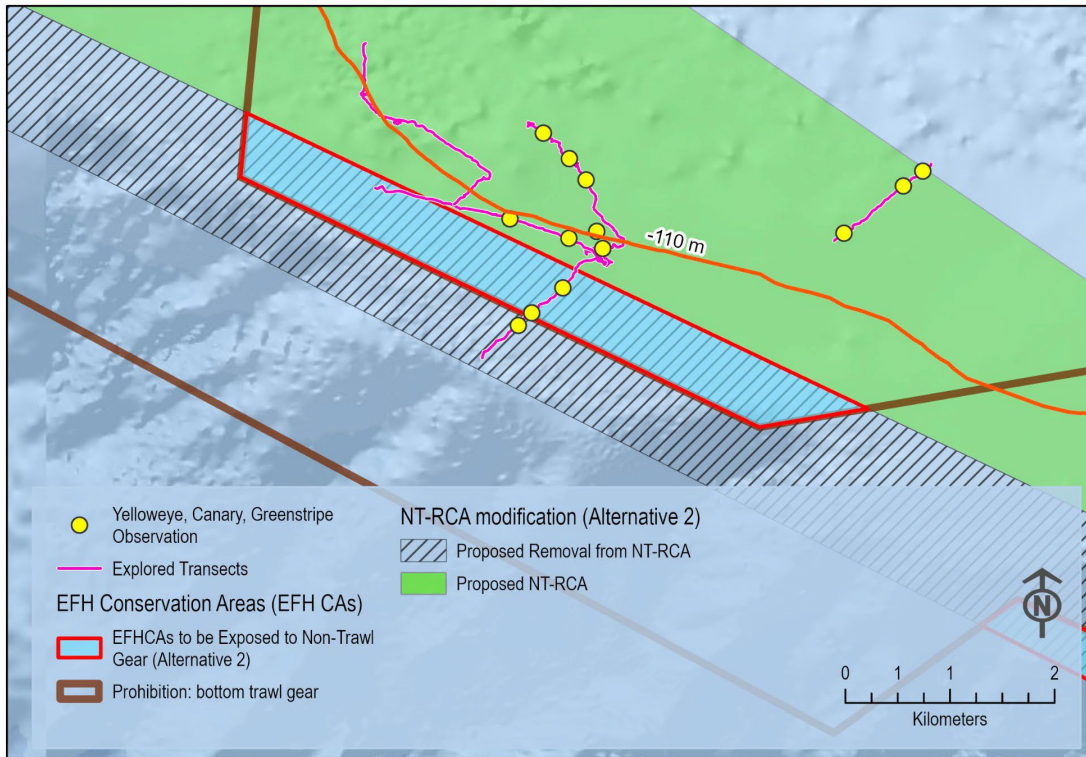
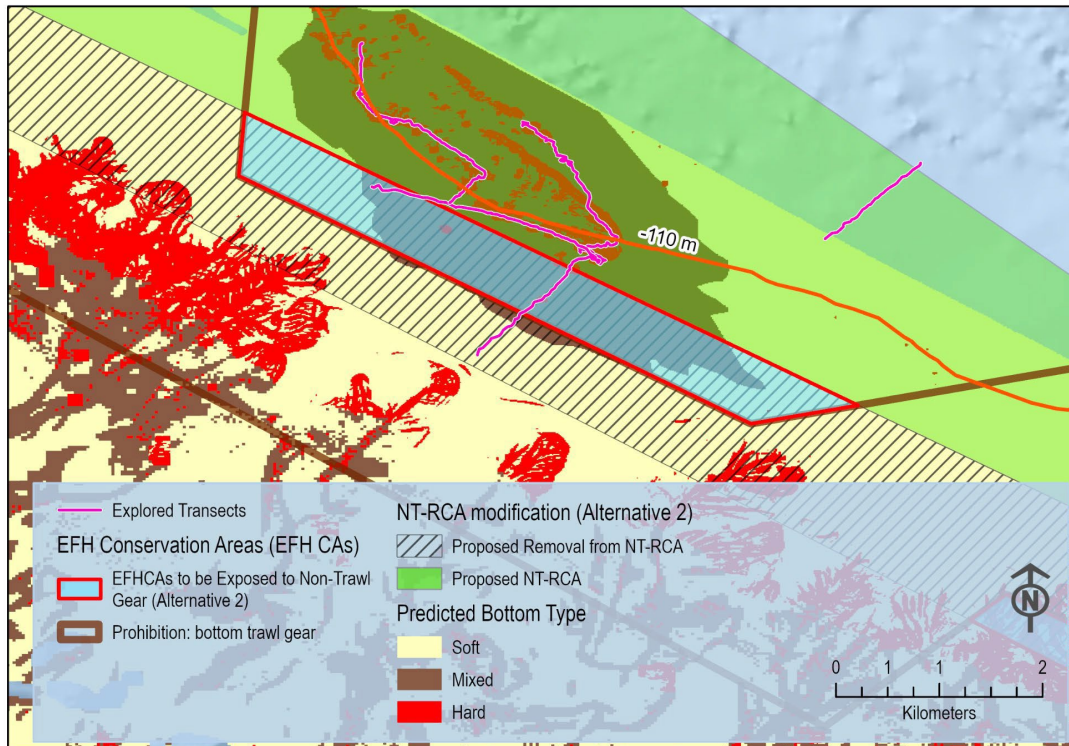


Figure 3d - Cochrane Bank geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and substrate.



Ascension Canyonhead

Ascension Canyonhead is a Sanctuary Ecologically Significant Areas (SESA; Area 4) of MBNMS. It covers a wide range of benthic habitats and features including the convergence of the canyon axes (at approximately 2,200 meters). This SESA has the highest habitat richness (12 habitats) and third highest habitat diversity of all the SESAs. Patches of hard bottom (8% of the SESA) are found mostly along the canyon walls. Surveys at Ascension Canyon have occurred and those data are provided below.

As shown in **Figure 4a**, the characterization of Ascension Canyonhead, which incorporates visual observation data, denotes an area of interest overlapping with the proposed NT-RCA Alternative 2. Note that the area of interest is not intended to show exact locations for proposed coral outplanting, but is intended to show the general area where one or more locations are suitable and is therefore a viable option for coral restoration based on criteria and established methodologies.

Corals: Surveys provide hundreds of records of structure-forming invertebrates, such as soft corals (e.g. gorgonians), crinoids, brachiopods, black corals, sponges, and a chemosynthetic community (**Figure 4b**). *Isididae sp.* have been observed, which has been successfully outplanted at Sur Ridge.

Substrate: Habitat data were provided by the Non-Trawl Area Management Measures Map Viewer. Known hard substrate occurs where patches of hard bottom are found, mostly along the canyon walls (**Figure 4c**).

Figure 4a: Potential Coral Restoration Areas at Ascension Canyonhead. “Area of Interest” is an area that may include one to multiple locations suitable for coral restoration. Explored transects are areas where surveys using camera sleds, submersibles, ROVs, and/or AUVs have made visual observations of the habitat and associated species. The EFHCA and NT-RCA Modification Alternative 2 were provided by the Non-Trawl Area Management Measures Map Viewer.

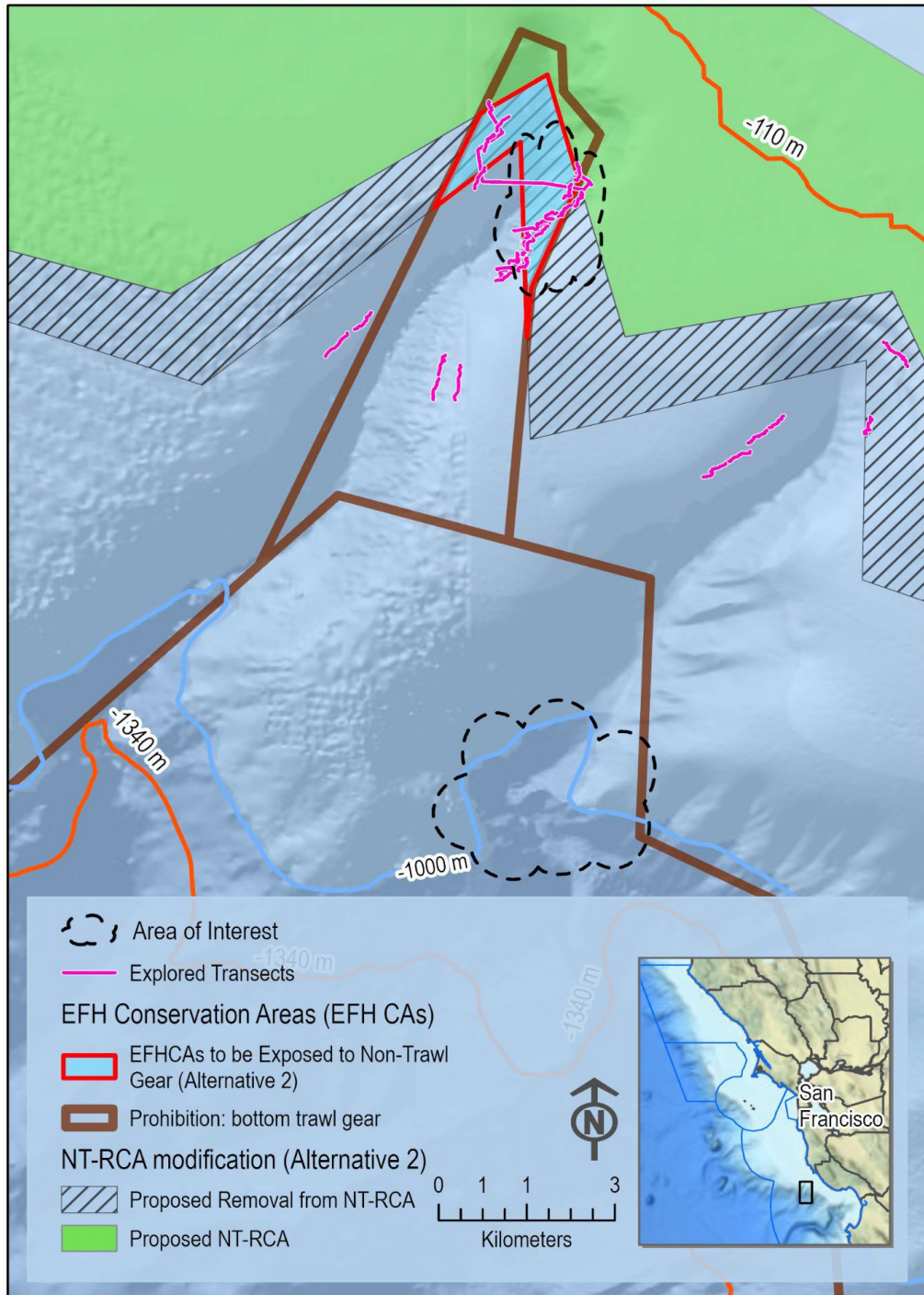


Figure 4b: Ascension Canyonhead geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and relevant biogenic species.

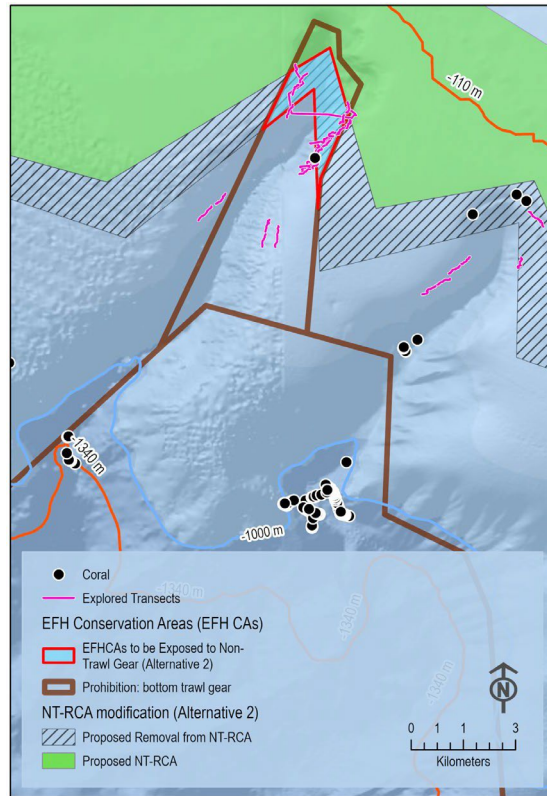
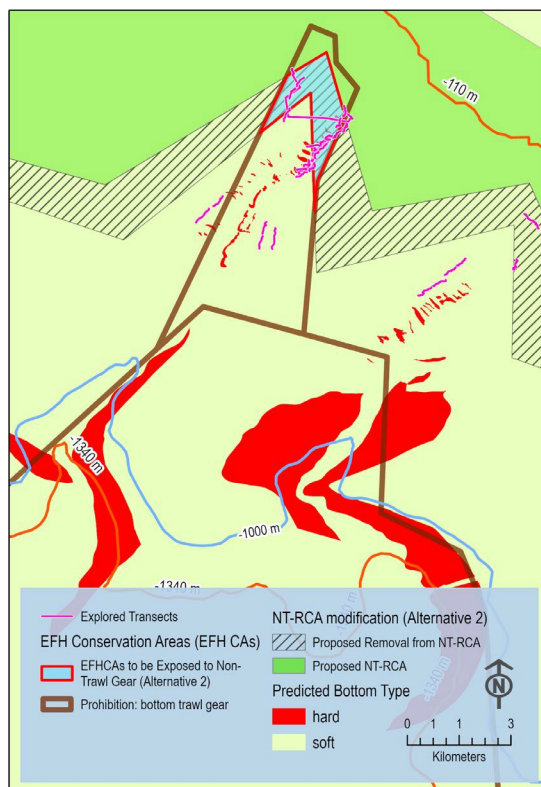


Figure 4c: Ascension Canyonhead geospatial data showing areas under consideration for the NT-RCA Alternative 2, locations explored, and substrate.



Sur Ridge

Sur Ridge is a large rocky feature that has been surveyed using a ROV. Scientists from the Monterey Bay Aquarium Research Institute (MBARI) and MBNMS conducted ROV surveys at the Sur Ridge seafloor (29 dives; 2013–2017) with several goals: 1) to explore and characterize Sur Ridge; 2) to conduct sea star feeding experiments; and 3) to develop methods to transplant deep-sea corals. ROV surveys were conducted from 0–1572 meters, with a focus on the seafloor from 785–1572 meters (Burton et al., 2017). The area is recognized as a SESA of MBNMS (Area 11). Sur Ridge is also considered a deep-sea coral observatory and has been populated with instruments such as: a hydrophone; a camera that takes pictures of a coral community every hour; particle traps to assess carbon and coral food flux; current meters to correlate with coral and sponge feeding activities; an eDNA sampler for biodiversity studies; a benthic respirometer to test organisms responses to different oxygen levels; and a CTD profiler to assess physical parameters above the ridge.

Corals: Corals have been observed at Sur Ridge including *Sibogorgia* species, *Clavularia* species, *Acanthogorgia* species, *Parastenella* species, *Heteropolypus* species, *Gersemia* species, *Desmophylum* species, three species of bamboo coral, bubblegum coral, three pieces of black coral, *Swiftia* species, and precious coral, the latter five all of which have been outplanted at Sur Ridge. Several coral species have been outplanted at Sur Ridge such as bubblegum coral, *Isidella tentaculum* (**Image 3**), *Corallium* sp., *Swiftia kofoidi*, *Lillipathes* sp., and *Keratoisis* sp.

Substrate: Sur Ridge is a deep-sea rocky outcrop that rises 500 meters (1,640 feet) above the seafloor. Subsea surveys to characterize benthic habitats and communities have occurred in numerous locations.

Figures 5a, 5b and **5c**, which incorporate visual observation data in characterizing Sur Ridge, denotes the area of interest. This area does not overlap with the proposed NT-RCA Alternative 2.

For additional information and images visit:

<https://sanctuaries.noaa.gov/science/conservation/sur-ridge-field-guide-monterey-bay-national-mairne-sanctuary.html>

Image 3: This bamboo coral (*Isididae*) located at Sur Ridge is an upright branching soft coral that acts as a foundation species for other benthic megafauna. Credit: MBARI.

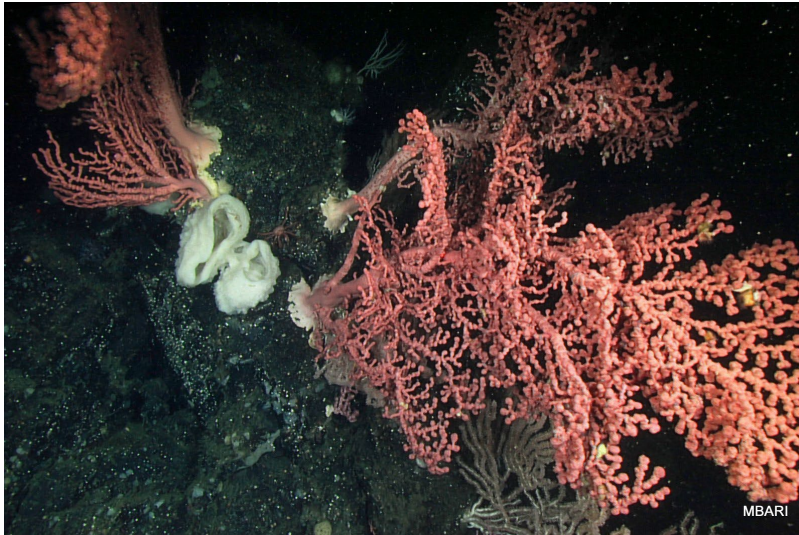


Figure 5a: Potential Coral Restoration Area at Sur Ridge. “Area of Interest” are areas that may include one to multiple locations suitable for coral restoration. Explored transects are areas where surveys using camera sleds, submersibles, ROVs, and/or AUVs have made visual observations of the habitat and associated species. The Groundfish EFHCA was provided by the Non-Trawl Area Management Measures Map Viewer.

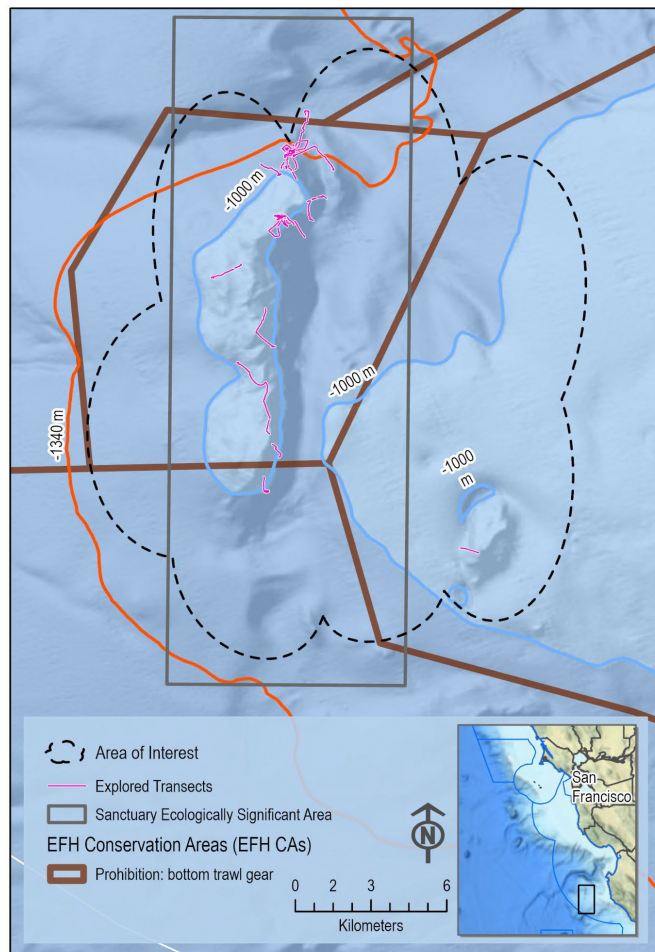


Figure 5b: Sur Ridge geospatial data showing relevant biogenic species.

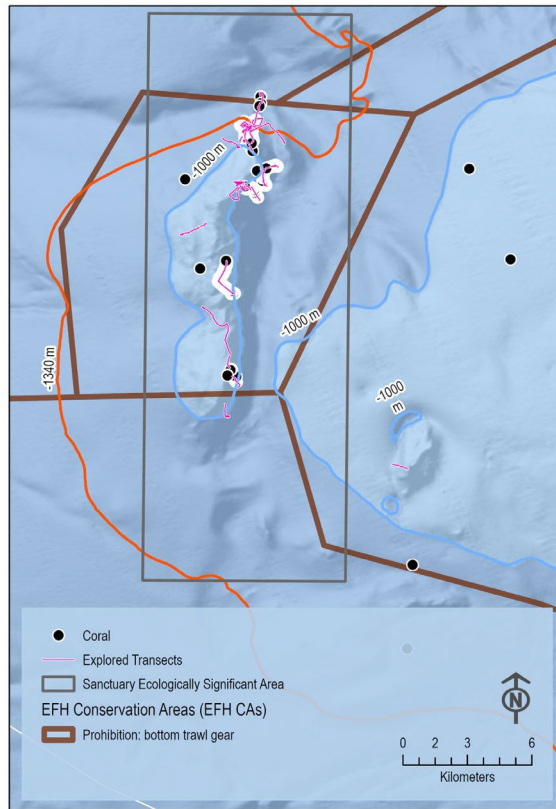
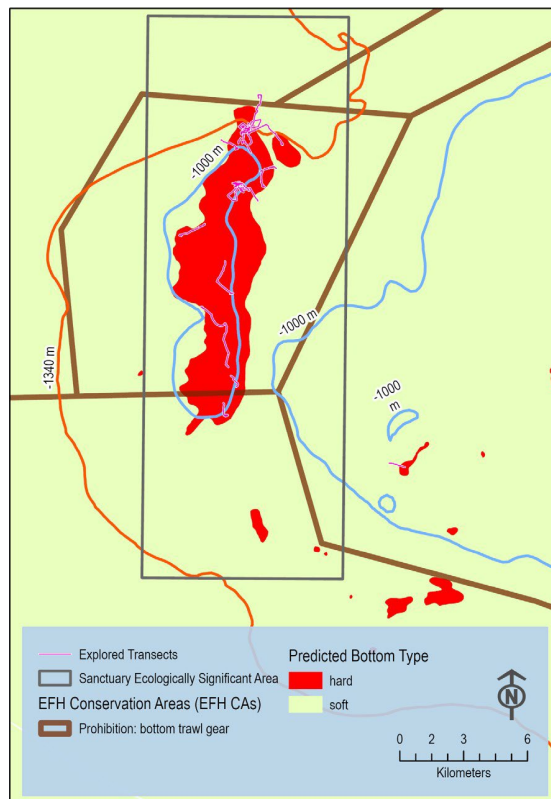


Figure 5c - Sur Ridge geospatial data showing substrate.



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