OCEANA

GULF OF ALASKA SEAFLOOR HABITAT PROTECTION PROPOSAL

DISCUSSION DRAFT

JUNE 2, 2023

I. PROPOSAL SUMMARY

Protecting ocean habitats is an integral part of responsible fishery management for ensuring long-term sustainable and productive fisheries, vibrant coastal communities, and healthy marine ecosystems. Recognizing this, the North Pacific Fishery Management Council (NPFMC) has been at the forefront of seafloor habitat protections nationally and internationally with implementation of the Aleutian Islands Habitat Conservation Area, Northern Bering Sea Research Area, and the forward-thinking Fishery Management Plan for the Arctic Management Area. With these and other actions combined, 64% of U.S. ocean waters offshore Alaska are protected from groundfish bottom trawling.[1] But in the central and western Gulf of Alaska, from Yakutat (140° W) to the Islands of Four Mountains in the eastern Aleutians (170° W), only 9% of the ocean area is protected year-round from groundfish bottom trawls. In fact, this region of the Gulf of Alaska is the last and largest remaining area from Southern California to the U.S. Arctic where the overall footprint of bottom trawling is not limited, leaving extensive oceans areas and important habitat features at risk.

In this discussion draft, we propose to advance the goal of protecting seafloor habitats and biodiversity while maintaining sustainable Gulf of Alaska fishing opportunities by:

1) designating 16 groundfish bottom trawl "open areas" in the central and western Gulf of Alaska; and

2) requiring that pelagic and semi-pelagic groundfish trawls in the Gulf of Alaska Fishery Management Plan area are fished entirely above the seafloor with no bottom contact when operating in any existing or proposed conservation area closed to bottom trawls.

This proposal demonstrates a comprehensive and practical approach that will significantly advance seafloor habitat conservation in the Alaska

Proposal Objectives

1. Protect areas containing known deep-sea coral and sponge communities from bottom trawl impacts.
2. Protect areas that may support deep-sea coral and sponge communities where bottom trawling has not been used recently, as a precautionary measure.
3. Protect essential fish habitats for managed groundfish species, and habitat for non-groundfish species including Gulf of Alaska crab, halibut, and lingcod.
4. Protect habitat conservation areas from pelagic and semi-pelagic trawls that contact the seafloor.
5. Maintain a productive groundfish fishery and minimize bottom trawl displacement.

[1] NOAA Fisheries 2021. Deep sea coral research and technology program 2020 Report to Congress. Appendix 4. Available: https://www.fisheries.noaa.gov/resource/document/deep-sea-coral-research-and-technology-program-2020-report-congress

region, reduce coral and sponge bycatch, and maintain substantial areas open important to the trawl fleet to be able to fish safely, efficiently, and profitably inside the identified open areas. In summary, this proposal would:

- Designate 16 groundfish bottom trawl open areas in Gulf of Alaska statistical/ reporting areas 610 to 640 (140° to 170° W longitude) totaling 101,735 km^2; with minimal displacement of recent catch (2015 – 2019) and fishing area.
- Protect 90% of the central and western Gulf of Alaska (areas 610 to 640) from groundfish bottom trawling (871,556 km^2), including 71% of the continental shelf (shore to 200 meters), 44% of the upper slope (200 – 1,000 meters) and 100% of the lower slope (>1,000 meters) depth zones.
- Protect 55% of known coral observations (n = 1,703) and 50% of sponge observations (n = 5,291).
- Protect all known seamounts in the Gulf of Alaska proposal area (n = 71) and 98% of the area containing rocky substrates (cobble/ boulder habitat area, 55,165 km^2).

II. BACKGROUND

The Magnuson Stevens Fishery Conservation and Management Act (MSA) provides clear and broad legal authority for habitat conservation.

The MSA provides broad authority to manage and conserve marine habitats. Recognizing that habitat loss is one of the greatest long-term threats to fisheries, Congress emphasized that "[h]abitat considerations should receive increased attention for the conservation and management of fishery resources of the United States." 16 U.S.C. § 1801(a)(9). As such, multiple MSA provisions give regional fishery management councils and the National Marine Fisheries Service (NMFS) authority to conserve and manage marine habitats by prohibiting certain types of fishing or gear.

The MSA, 16 U.S.C. § 1801 *et seq.*, requires NMFS and the councils to "describe and identify essential fish habitat" and "minimize to the extent practicable adverse effects on such habitat caused by fishing," while also identifying "other actions to encourage the conservation and enhancement of such habitat." 16 U.S.C. § 1853(a)(7). In addition, MSA section 303(b) provides that councils may include discretionary provisions in any fishery management plan (FMP) prepared for any fishery. 16 U.S.C. § 1853(b). Plainly read, this section of the statute authorizes councils to undertake certain types of measures – many of which are expressly oriented toward conserving the marine environment – and include them in their FMPs.

Specifically, section 303(b)(2)(A) allows councils to designate zones where, and time periods when, fishing will be limited or prohibited, or only specified types of gear will be permitted. 16 U.S.C. § 1853(b)(2)(A). Section 303(b)(2)(B) of the MSA allows for gear restriction zones to *protect deep sea corals*. 16 U.S.C. § 1853(b)(2)(B). And section 303(b)(12) is similarly broad, allowing councils to "include management measures in the plan to *conserve target and non-target species and habitats*, considering the variety of ecological factors affecting fishery populations." 16 U.S.C. § 1853(b)(12).

Bottom trawls impact marine habitats and deep-sea coral and sponge ecosystems are especially vulnerable.

Bottom trawling causes reductions in habitat complexity, changes in species composition, and reductions in biodiversity.[2] In fact, bottom trawling is the most widespread cause of reduced habitat complexity along the North American continental shelf and slope.[3] The adverse impacts of bottom trawling on deep-sea coral and sponge ecosystems and hard bottom habitats are well documented by both fishery observer data and *in situ* studies.[4] Deep-sea corals and sponges epitomize some of the most sensitive biogenic habitats in that they are long-lived,[5] typically live in low-disturbance habitat, and are therefore not resilient to anthropogenic disturbance.

Management actions to protect seafloor habitats from bottom trawling.

A comprehensive approach to managing bottom trawl impacts includes freezing the bottom trawl footprint to defined open areas and protecting important ecological areas within the trawl footprint. This must be done while also carefully managing the groundfish trawl fishery with annual catch limits, bycatch controls, and gear modifications. These actions are among the best practices for achieving seafloor habitat conservation and sustainable fishing objectives.

Habitat protection tools generally fall into the categories of gear modifications or gear type requirements, reductions in fishing effort, closed areas, and bycatch limits (e.g. coral bycatch caps).[6,7] Given the diversity of Gulf of Alaska habitats and important social and economic considerations, none of these alone will address all management challenges. For example, gear modifications already implemented in the Gulf of Alaska like raised footropes or semi-pelagic trawls that may reduce the overall intensity of seafloor habitat impacts, but they do not eliminate

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[2] E.g. Engel, J. and R. Kvitek. 1998. Effects of Otter Trawling on a Benthic Community in Monterey Bay National Marine Sanctuary. Conserv. Biol. 12: 1204–1214.; National Research Council (NRC). 2002. Effects of Trawling and Dredging on Seafloor Habitat. National Academy of Sciences. Washington, D.C. 126 p.; Chuenpagdee, R., L. E. Morgan, S. Maxwell, E. A. Norse, and D. Pauly. 2003. Shifting gears: Assessing collateral impacts of fishing methods in the U.S. waters. Front. Ecol. Env. 1: 517–524.

[3] Id. NRC 2002

[4] E.g. Krieger, K. J. 2001. Coral (*Primnoa*) impacted by fishing gear in the Gulf of Alaska. Pages 106–117 *in* J. Willison, J. Hall, S. Gass, E. Kenchington, M. Butler, and P. Doherty, eds. Proc. First Int. Symp. on Deep-sea Corals. Ecology Action Centre and Nova Scotia Museum, Halifax, Nova Scotia.; Thrush, S. and P. K. Dayton. 2002. Disturbance to marine benthic habitats by trawling and dredging: Implications for marine biodiversity. Annu. Rev. Ecol. Syst. 33: 449–473.

[5] Risk, M. H., J. M. Heikoop, M. G. Snow, and R. Beukens. 2002. Lifespans and growth patterns of two deep-sea corals: *Primnoa resedaeformis* and *Desmophyllum cristagalli*. Hydrobiologia 471: 125–131; Roark, E. B., T. P. Guilderson, S. Flood-Page, R. B. Dunbar, B. L. Ingram, S. J. Fallon, and M. McCulloch. 2005. Radiocarbon-based ages and growth rates of bamboo corals from the Gulf of Alaska, Geophys. Res. Lett. 32: 5.

[6] National Research Council (NRC). 2002. Effects of Trawling and Dredging on Seafloor Habitat. National Academy of Sciences. Washington, D.C. 126 p

[7] McConnaughey, R.A. Hiddink, J.G., Jennignts, S., et al. 2019. Choosing best practices for managing impacts of trawl fishing on seabed habitats and biota. Fish and Fisheries V21(2) https://doi.org/10.1111/faf.12431

those impacts. And closed areas, if not designed correctly, can shift effort into new areas causing an increase in habitat damage. A precautionary and comprehensive approach is paramount.

Importantly, in its Strategic Plan for Deep-Sea Coral and Sponge Ecosystems, NOAA describes conservation and management objectives to protect areas known to contain deep-sea coral and sponge communities, and a precautionary freeze the footprint approach to protect areas that 'may' support deep-sea coral and sponge communities.[8] Such a comprehensive approach has already been implemented in the Aleutian Islands FMP area, where 96% of this area is protected from groundfish bottom trawls (958,367 km^2 protected in statistical areas 541, 542 and 543). In the adjacent central and western Gulf of Alaska, however, only 9% of the region is protected year-round from all bottom trawling, the last and largest gap in seafloor habitat conservation from Southern California to the U.S. Arctic Ocean.

III. PROPOSED ACTIONS AND APPROACH

A. Groundfish Bottom Trawl 'Open Areas': A comprehensive approach to seafloor habitat conservation.

This discussion draft focuses on the Gulf of Alaska region between Yakutat, Alaska (140° W) and the Islands of Four Mountains in the eastern Aleutians (170°W), spanning over 1,900 kilometers in distance and 973,000 square kilometers in area. Specifically, this Gulf of Alaska proposal area spans NMFS federal statistical areas 610, 620, 630 and 640 and includes protections inside Alaska state waters (0 – 3 nautical miles) and federal waters (3 to 200 nautical miles).

Our proposal includes the designation of 16 groundfish bottom trawl open areas along the Gulf of Alaska (GOA) continental shelf and upper slope and a GOA Habitat Conservation Area, closed year-round to groundfish bottom trawling. Once specific areas open to bottom trawling are designated, fishery managers should still implement conservation and management measures within these areas, for example, annual catch limits and measures to minimize and avoid bycatch and/or interactions with other fisheries. We do not propose changes to existing habitat conservation areas or to Steller Sea Lion protection areas.

The GOA Habitat Conservation Area (figure 1) would protect areas known to contain high concentrations of deep-sea corals and sponges and which are currently vulnerable to bottom trawling, as well as other priority habitat features like seamounts, rocky reefs, and submarine canyons described below. As a precautionary approach, this proposal would freeze the footprint of groundfish bottom trawl gear to protect areas likely to support deep-sea coral or sponge ecosystems and other sensitive deep-sea communities. Doing so would prevent the expansion of bottom trawl gear into new areas to prevent damage to potentially undocumented and relatively pristine habitats on the continental shelf and the deep-sea.

[8] National Oceanic and Atmospheric Administration, Coral Reef Conservation Program. 2010. NOAA Strategic Plan for Deep-Sea Coral and Sponge Ecosystems: Research, Management, and International Cooperation. Silver Spring, MD: NOAA Coral Reef Conservation Program. NOAA Technical Memorandum CRCP 11. 67 pp.

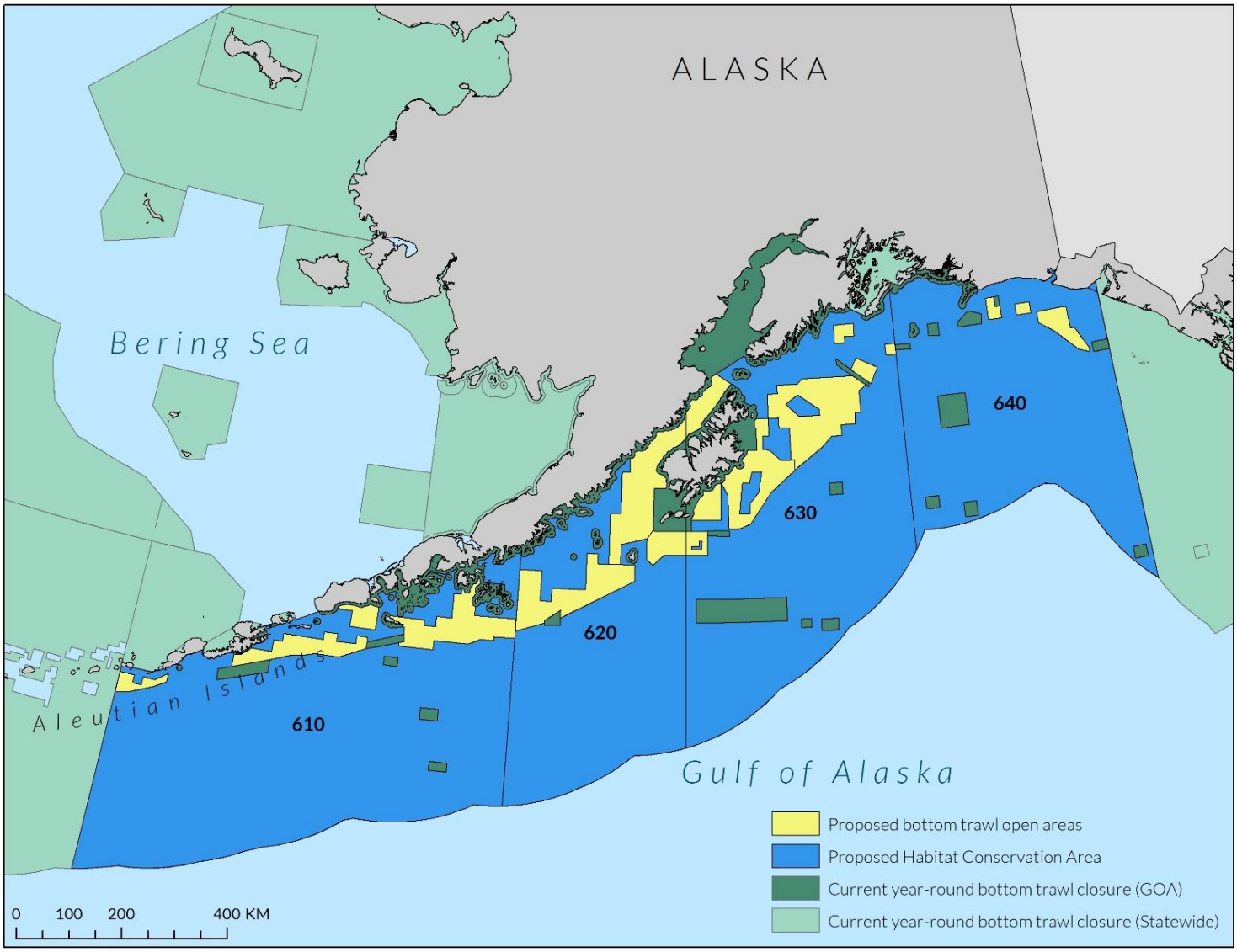


Figure 1. *Proposed Gulf of Alaska Habitat Conservation Area (blue) and proposed bottom trawl open areas (yellow) with existing bottom trawl closures (green).*

This proposal was designed using publicly available spatial data to identify and protect sensitive habitat features and areas at risk from expanded or exploratory bottom trawling. With Geographic Information System (GIS) data and analysis, we identified areas known to contain priority habitat features sensitive to bottom trawl impacts, including hard substrate (cobble/ boulder), biogenic habitat (corals, sponges, sea pens and sea whips), submarine canyons, and seamounts. We also analyzed publicly available bottom trawl fishing effort data to avoid closing areas having high trawl effort and to assess potential economic costs in terms of estimated catch and area displacement.

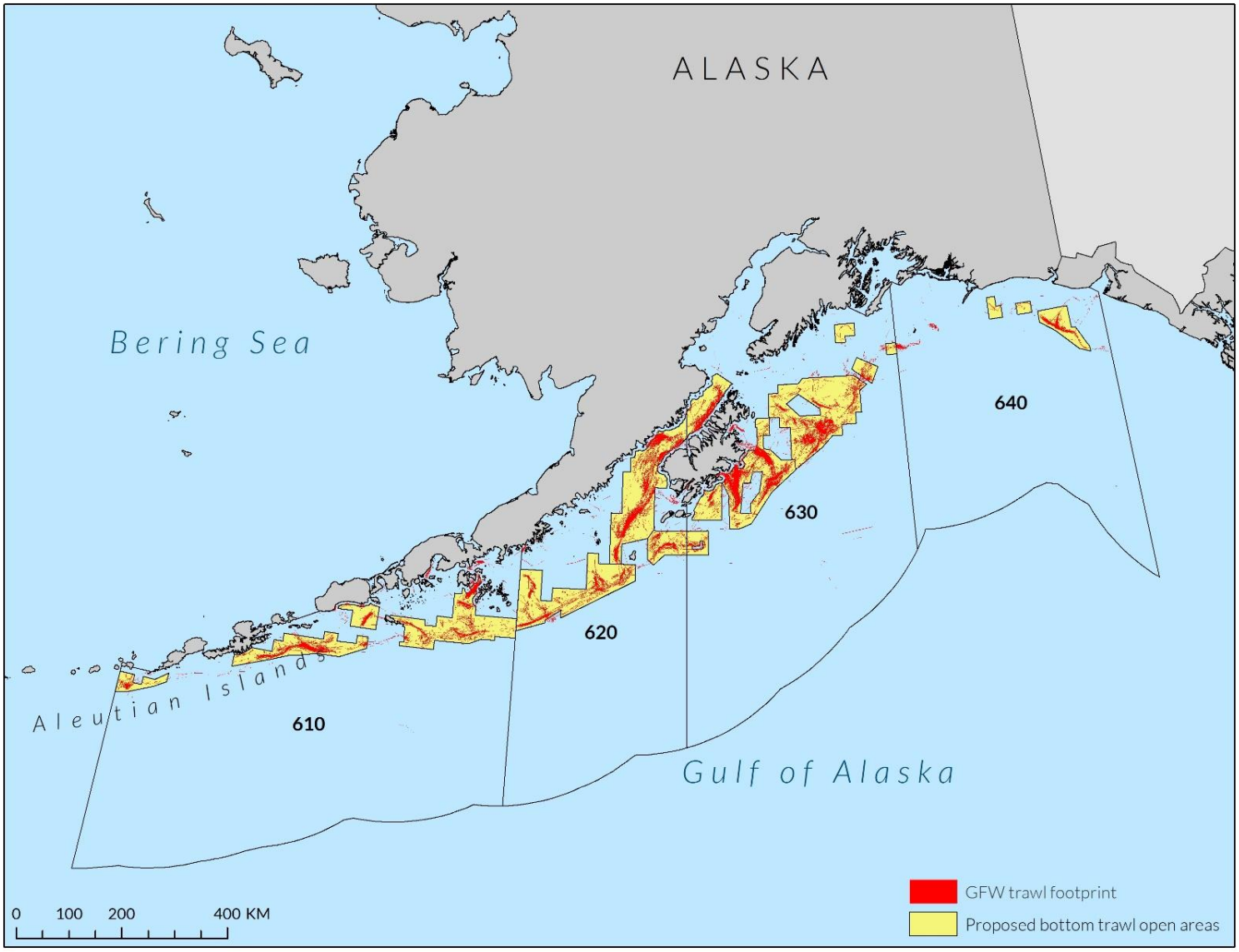


Figure 2. *Proposed Gulf of Alaska groundfish bottom trawl open areas (yellow) and trawl footprint (red) identified using AIS trawl track data (2015-2019) from Global Fishing Watch.*

We used AIS vessel track data from 2015 to 2019 available from Global Fishing Watch[9] to propose areas open to bottom trawling. Bottom trawl open areas were designed to identify high effort groundfish bottom trawl fishing grounds and avoid significant displacement of fishing effort while also protecting priority habitat features. Like the approach implemented in the Aleutian Islands, we began with the premise that everything is closed to bottom trawling except for areas where bottom trawling will have higher catch per unit effort of target species and lower expected

[9] https://globalfishingwatch.org/

damage to living seafloor structure.[10] We designed the open areas to have straight lines and with a minimum number of waypoints for ease of enforcement whenever possible.

B. Protecting seafloor habitats from pelagic and semi-pelagic trawling.

Pelagic trawls differ from groundfish bottom trawls primarily in that the trawl doors that keep the net open are designed to 'fly' above the seafloor instead of drag along the seafloor. The footrope at the mouth of the net and codend, however, can and does contact the seafloor when trawls are targeting fish schooling on or near the bottom. This means that sensitive habitat features are still at risk of being toppled by pelagic or semi-pelagic trawls when the gear is fished on the bottom.

The Gulf of Alaska Fishery Management Plan acknowledges the impacts of pelagic trawls, stating:

> *Sessile organisms that create structural habitat may be uprooted or pass under pelagic trawl footropes, while those that are more mobile or attached to light substrates may pass over the footrope, with less resulting damage. Non-living structures may be more affected by pelagic trawl footropes than by bottom trawl footropes because of the continuous contact and smaller, more concentrated, surfaces over which weight and towing force are applied…pelagic trawls have an almost entirely smoothing effect [on the seafloor].*[11]

Gulf of Alaska pelagic trawls have a width of 50 to 100 meters and NMFS estimates that the proportion of the area swept by pelagic trawls in contact with the seafloor ranges from zero, when truly fished off the bottom, to up to 100% of the area swept being in contact with the seafloor.[12]

To maintain the integrity and intent of existing and proposed habitat conservation areas closed to bottom trawl gear, we propose that pelagic and semi-pelagic trawls be prohibited from contacting the seafloor when fishing inside these conservation areas, including the proposed Gulf of Alaska Habitat Conservation Area. These trawls would be required to have bottom contact sensors on the footrope, net, and doors, which can inform a skipper exactly how high off the seabed the gear is. Gear sensors and requirements to keep the nets and doors off bottom would be a condition of fishing inside any existing or proposed groundfish bottom trawl closed area.

[10] Shester and Warrenchuk. 2007. U.S. Pacific Coast experiences in achieving deep-sea coral conservation and marine habitat protection. Bulletin of Marine Science, Volume 81, Supplement 1, November 2007, pp. 169-184(16)
[11] Appendix F, FMP for Groundfish of the GOA Management Area. GOAfmpAppendix.pdf (npfmc.org)
[12] Zaleski, M., T.S. Smeltz, S. Rheinsmith, J.L Pirtle, and G.A. Harrington. 2022 Evaluation of Fishing Effects on Essential Fish Habitat January 2023. NPFMC C4 EFH Component 2. Fishing Effects Evaluation (February 2023).

IV. PROPOSAL ANALYSIS

Gulf of Alaska Proposal Area: NMFS stat areas 610, 620, 630 and 640.

Baseline (Status Quo): Gulf of Alaska Slope and Seamount EFH Conservation Areas + state waters that are closed to bottom trawling + Kodiak Type 1 Red King Crab Closures + Cook Inlet trawl closure + Marmot Bay closure + 3 nautical mile Steller Sea Lion closures.

Proposed: Baseline + proposed GOA Habitat Conservation Area (all areas outside the 16 proposed groundfish bottom trawl open areas).

To understand the benefits and impacts of this proposal, we analyzed the percentage of each feature (e.g., total area, cobble/ boulder, biogenic habitat) protected from bottom trawling under two scenarios; 1) status quo management (baseline) and, 2) implementation of the proposed GOA Habitat Conservation Area. The baseline includes all current year-round non-pelagic (bottom) trawl closures: Gulf of Alaska slope habitat conservation areas, seamount habitat conservation areas, state waters closed to groundfish bottom trawling, Type 1 red king crab conservation areas off Kodiak, and the federal bottom trawl closure in Cook Inlet and Marmot Bay (off Kodiak). We also included the three nautical mile no groundfish fishing areas that are closed to protect Steller sea lions from disturbance in the baseline set of closures. However, we did not include other Steller sea lion area closures that apply to the Atka mackerel, Pacific cod and pollock trawl fisheries because these areas are not closed year-round to all groundfish bottom trawl gear.

We mapped and analyzed our proposal on a region-wide scale within NMFS statistical areas 610-640 and from shore to the 200 nautical mile EEZ boundary. We also analyzed our proposal across three depth zones: 1) the continental shelf (0 to 200 meters (m), 2) the upper continental slope (200 m to 1,000 m), and 3) the lower slope (>1,000 m). We analyzed and compared our proposal to the 'baseline' or status quo set of state and federal habitat conservation areas closed year-round to all groundfish non-pelagic bottom trawl gears. To ensure consistent results, all GIS analyses were done using the NAD83 2011 Alaska Albers projected coordinate system.

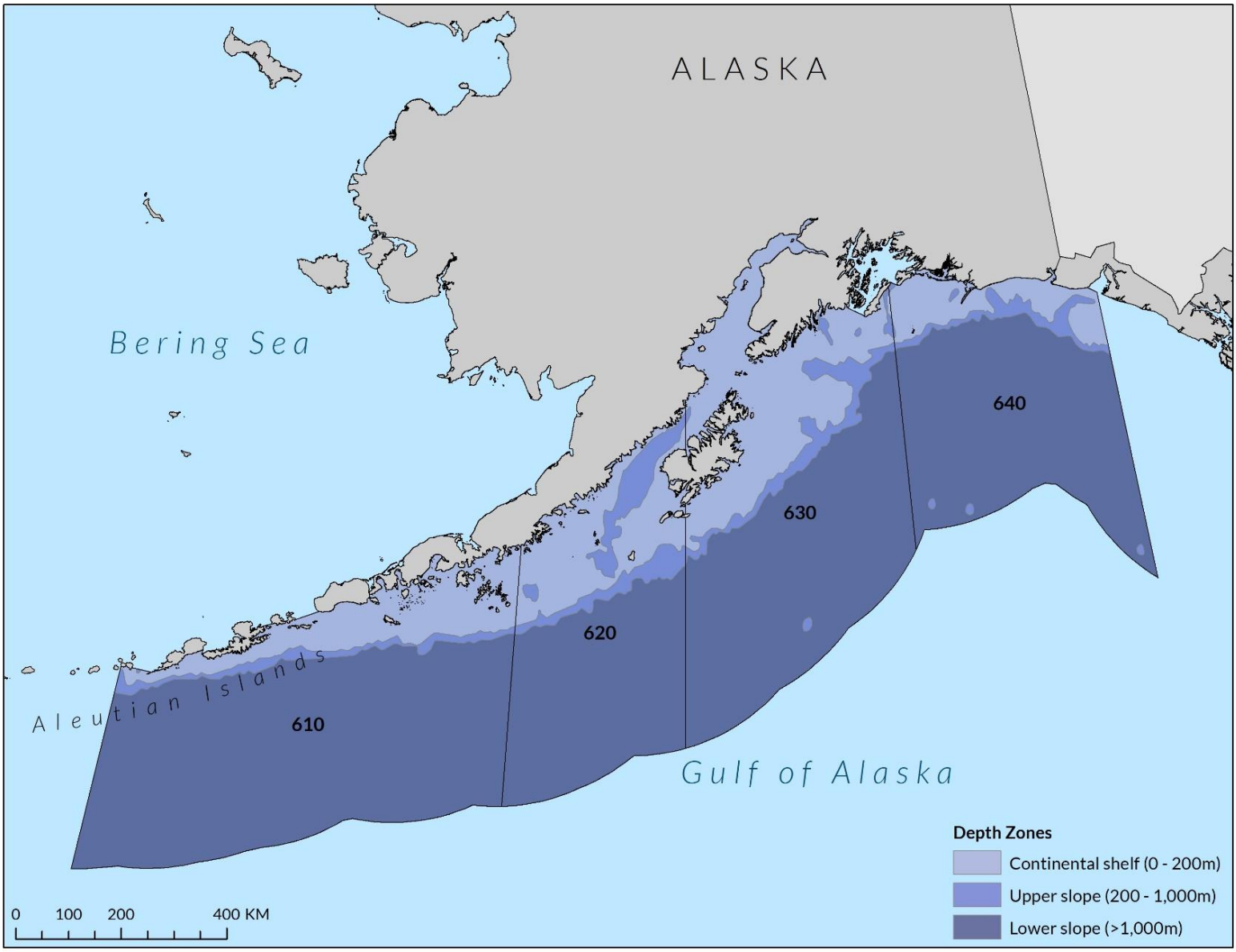


Figure 3. *Gulf of Alaska Proposal Area, which includes NMFS stat areas 610 to 640 from shore to the 200 nautical mile Exclusive Economic Zone (EEZ) boundary. Depth zones analyzed are the continental shelf (0-200 m), upper slope (200–1,000 m) and lower slope (>1,000 m).*

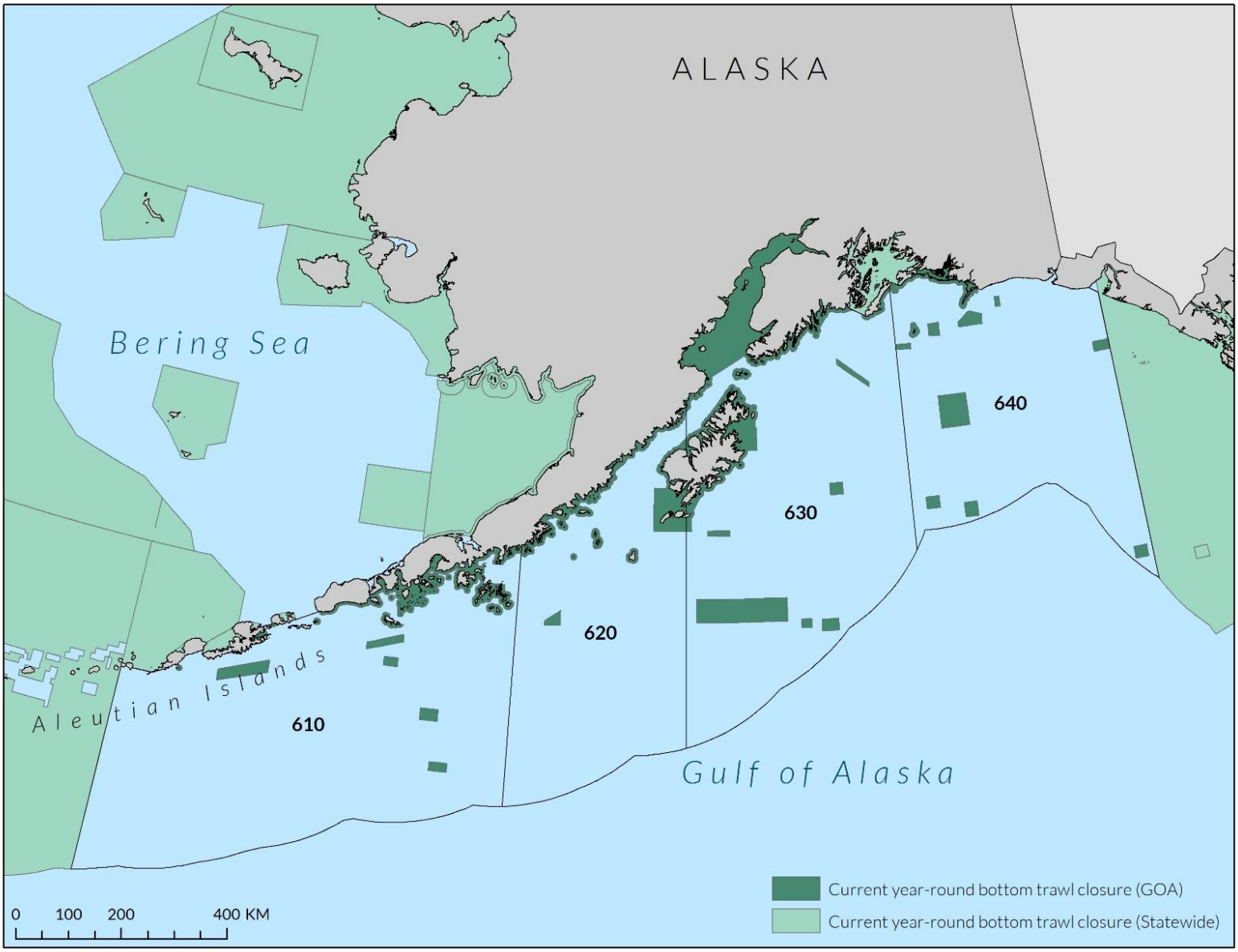


Figure 4. *The baseline or status quo set of year-round bottom trawl closures in the Gulf of Alaska proposal area (dark green) and bottom trawl closures outside of the proposal area (light green).*

V. RESULTS

Below we provide the results of our analysis in terms of area protected, priority habitats protected, and fishery effort potentially displaced.

A. Area Protected

Our analysis of the Gulf of Alaska proposal area finds that 9% of the region is currently closed year-round to bottom trawling (83,714 km^2). This includes 27% of the continental shelf (60,800

km^2), 10% of the upper slope (6,301 km^2) and 2% of the lower slope >1,000 meters (16,602 km^2) (Figure 5). In contrast, with this proposal 90% of the Gulf of Alaska proposal area would be protected year-round from groundfish bottom trawling, totaling 871,556 km^2. Combined with existing closures, this proposal would protect 71% of the continental shelf, 44% of the upper slope and 100% of the lower slope depth zones.

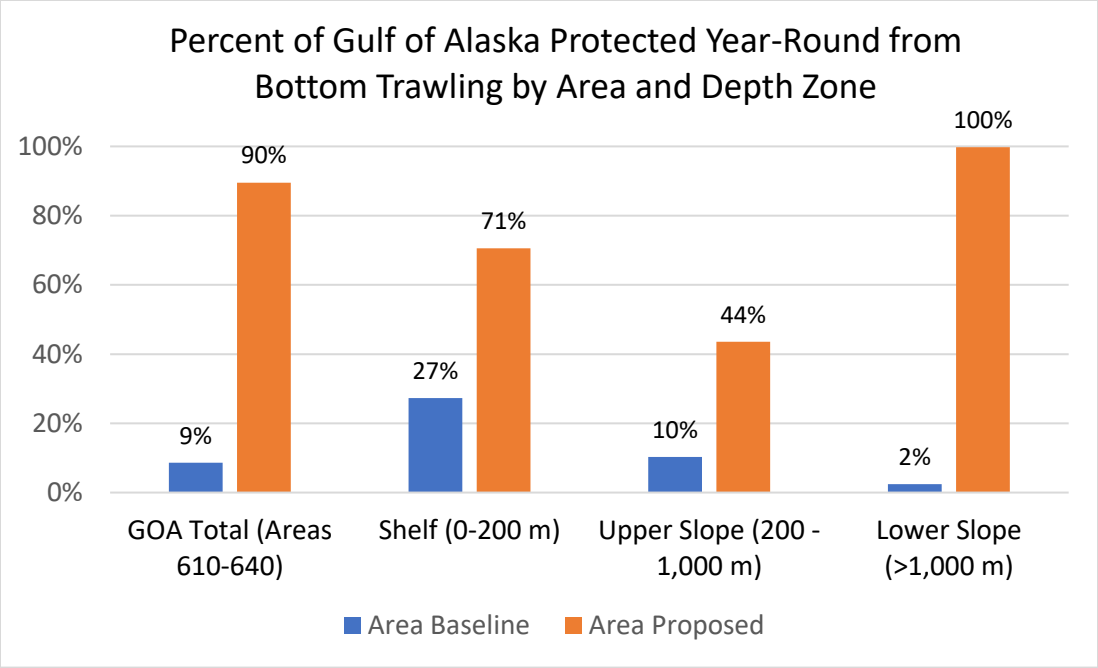


Figure 5. *Percent of Gulf of Alaska proposal area and depth zones protected year-round from groundfish bottom trawling under the baseline (status quo) and the proposed area protections.*

We analyzed this proposal at the region-wide level but also within the four NMFS statistical areas that collectively make up this region. This proposal, for example, would protect 95% of statistical area 610 (304,910 km^2) in the far western GOA where currently only 5% of this statistical area is protected (17,185 km^2) (Figure 6). It would also increase the percent of the continental shelf protected in area 640 (west of Yakutat) from 12% closed to bottom trawling (3,413 km^2) to 97% closed to bottom trawling (27,393 km^2).

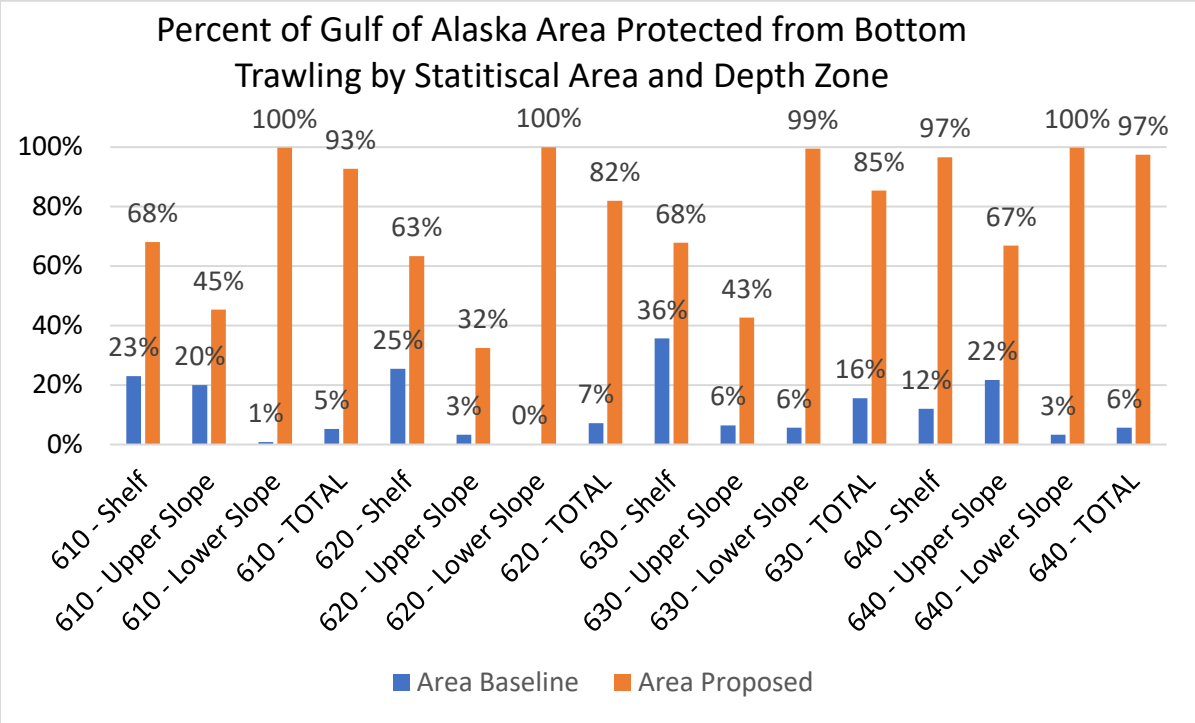


Figure 6. *The percentage of NMFS statistical areas 610 – 640 protected year-round from groundfish bottom trawling under the baseline and with this proposal. Also included is the percent of each depth zone within each statistical area that is protected now under the baseline and with the proposed area protections.*

B. Priority Habitat Features and Areas of Interest Protected.

i. <u>Rocky Reefs</u>

Rocky reefs are a priority habitat feature because of their relative rarity and high ecological importance. They take a variety of forms from nearshore reefs that support kelp forests and act as nursery grounds for juvenile groundfish, to offshore reefs that support deep-sea coral and sponge ecosystems, a diversity of North Pacific rockfishes and other groundfish, plus invertebrates that use these habitats for shelter and feeding.

A notable example in the Gulf of Alaska region is Wessels Reef located on Tar Bank south of Prince William Sound and North of Middleton Island. There are also extensive nearshore rocky reef systems along the Alaska Peninsula, off Kodiak Island, and on the continental shelf surrounding the Shumigan Islands. To evaluate the presence of rocky habitat in the Gulf of Alaska Region we used GIS data for "cobble and boulder" habitat provided by NOAA Fisheries which estimates the proportion of seafloor habitat within a 5km x 5km grid that is cobble or boulder, and we considered all areas where the proportion of cobble or boulder habitat was greater than zero.

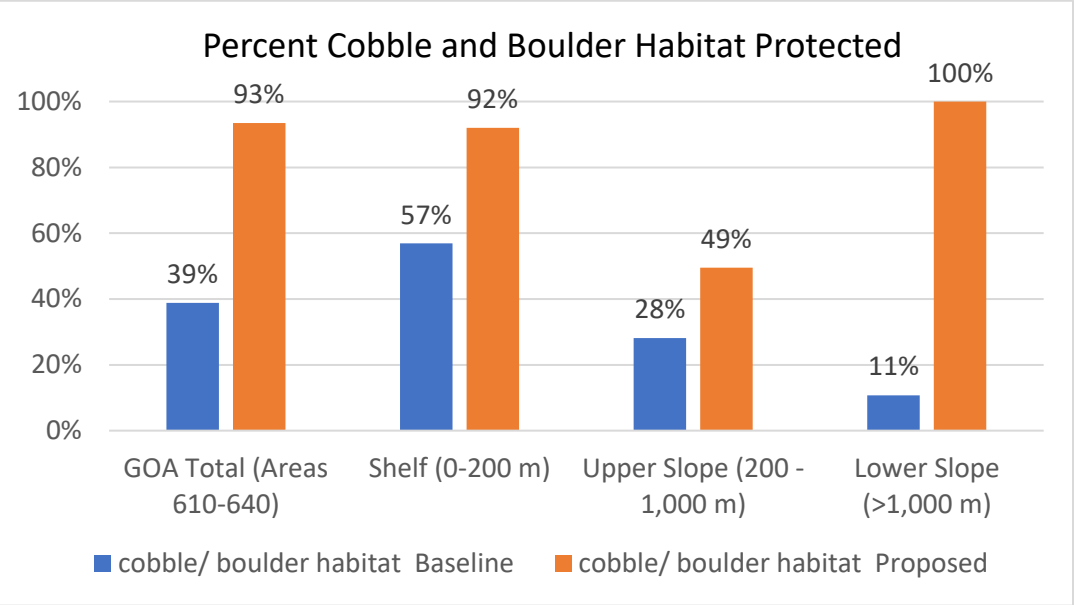


Figure 7. *Percent cobble and boulder habitat protected year-round from bottom trawling in the baseline (status quo) set of conservation areas compared with the protections under this proposal.*

This proposal results in a 141% increase in the amount of cobble and boulder area protected in the Gulf of Alaska region. Overall, 93% (55,165 km^2) of the GOA area containing this habitat feature would be protected from bottom trawling under this proposal including 92% of the cobble/boulder habitat on the continental shelf, 49% on the upper slope, and 100% of cobble/boulder habitat within the lower slope (figure 7).

ii. Coral and Sponge Ecosystems

In this proposal we designed bottom trawl open areas to avoid high density coral gardens documented in the western Gulf of Alaska south of Samalga Pass,[13] a coral garden identified by Oceana at the Snakehead on the southwest end of Albatross Bank,[14] plus areas with high coral and sponge observations as recorded in the NOAA Deep Sea Coral and Sponge (DSCS) Database. We analyzed this proposal in relation to coral, sponge and pennatulid records in the NOAA DSCS database and in relation to NOAA habitat suitability models that predict probability of coral and sponge presence. With this proposal, 55% of corals (1,703), 50% of sponges (5,291) and 59% of the sea whips and sea pens (908) identified in the GOA proposal area would be protected from bottom trawling.[15]

[13] Data provided by Tom Hourigan, NOAA Deep-sea Coral Research and Technology Program, personal communication, April 7, 2023
[14] Oceana (June 1, 2022) Available: https://usa.oceana.org/press-releases/oceanas-gulf-of-alaska-expedition-finds-ocean-teeming-with-life/
[15] NOAA DSCS Database, GOA Areas 610-640

Corals are living animals, some of which can survive for thousands of years. An astounding 70 species of cold-water corals have been documented throughout the Gulf of Alaska.[16] Unlike their tropical reef-forming counterparts, these corals inhabit cold waters ranging from as shallow as six meters in nearshore bays to depths greater than 4,500 meters on the slopes of offshore seamounts. Gorgonians and black corals are most common in the Gulf of Alaska, but there are many more, including stony corals, hydrocorals and true soft corals.

Deep sea corals grow incredibly slowly, but over time they create highly complex habitats commonly referred to as coral gardens. These coral gardens are home to a variety of marine life, from seafloor creatures like basket stars, anemones or sea stars, to shellfish like shrimp or crab, as well as many commercial fish species like rockfishes, cod and flatfishes. Fish and crab use deep-sea coral habitat for shelter and feeding sites where there is often increased prey abundance. Some rockfishes use the shelter of coral gardens as spawning and breeding habitat.[17]

Corals and large sponges in the Gulf of Alaska are Essential Fish Habitat (EFH) for juvenile and adult yelloweye rockfish.[18]

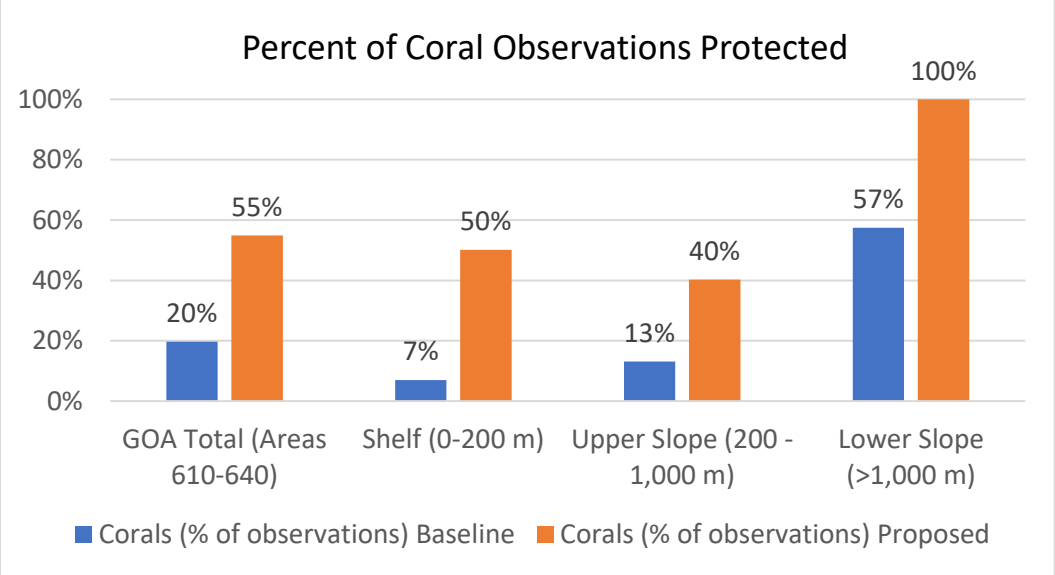


Figure 8. *Percent coral observations protected year-round from bottom trawling in the baseline (status quo) set of conservation areas compared with the protections under this proposal.*

[16] Stone RP and Cairns SD. 2020. Deep-Sea Coral Taxa in the Alaska Region: Depth and Geographical Distribution (v. 2020). Available: https:// deepseacoraldata.noaa.gov/library/2020-regional-deep-sea-coral-specieslist

[17] Stone RP and Shotwell SK. 2007. State of Deep Coral Ecosystems in the Alaska Region: Gulf of Alaska, Bering Sea and the Aleutian Islands. pp. 65-108. In: Lumsden SE, Hourigan TF, Bruckner AW and Dorr G (eds.) The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3. Silver Spring MD 365p.

[18] North Pacific Fishery Management Council (NPFMC). 2020. Fishery Management Plan for Groundfish of the Gulf of Alaska. November 2020. Anchorage, Alaska.

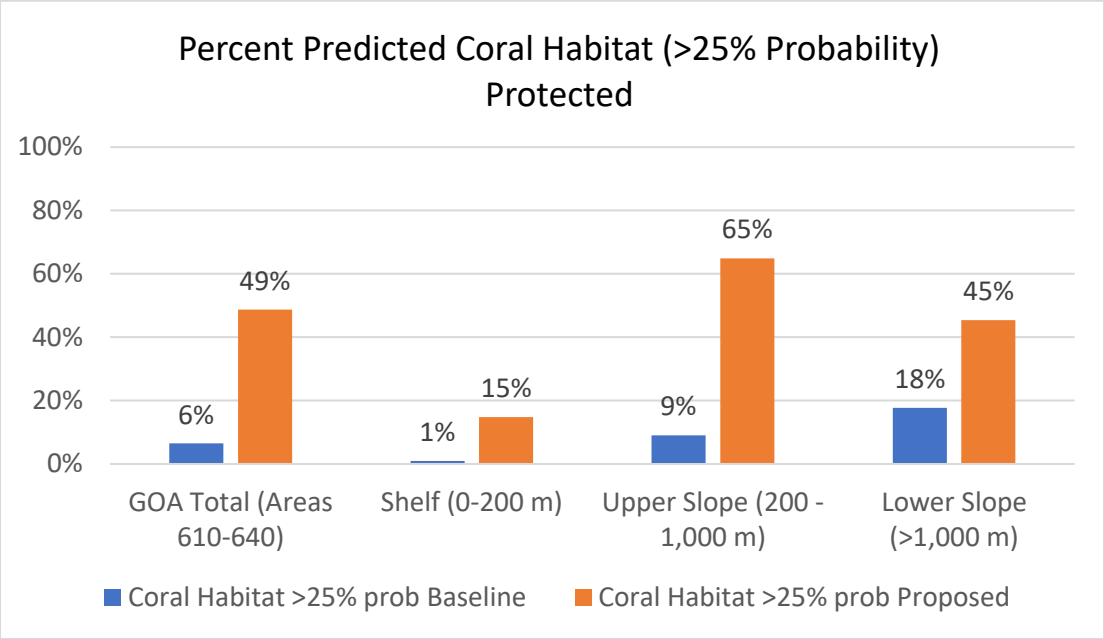


Figure 9. *Percent of coral habitat protected from bottom trawling in the baseline (status quo) set of conservation areas compared with the protections under this proposal, based on GOA coral habitat suitability models predicting greater than 25% probability of coral habitat presence.*[19]

Sea whips and sea pens (Pennatulids) found in the Gulf of Alaska are a type of habitat-forming cold-water coral. They grow in soft sediments along the continental shelf and can create vertical habitat almost a meter in height in what would otherwise be a flat featureless plain. Sea whip groves provide cover from predators and enhance the abundance and availability of prey species. For example, Pacific ocean perch have been observed using sea whip groves as shelter at night after feeding on krill above the groves during the day.[20]

[19] Rooper CN, M Zimmermann, and MM Prescott. 2017. Comparison of modeling methods to predict the spatial distribution of deep-sea coral and sponge in the Gulf of Alaska. Deep-Sea Research Part I 126(148-161) http://dx.doi.org/10.1016/j.dsr.2017.07.002

[20] Brodeur RD. 2001. Habitat-specific distribution of Pacific ocean perch (*Sebastes alutus*) in Pribilof Canyon, Bering Sea. Cont Shelf Res 21:207–224

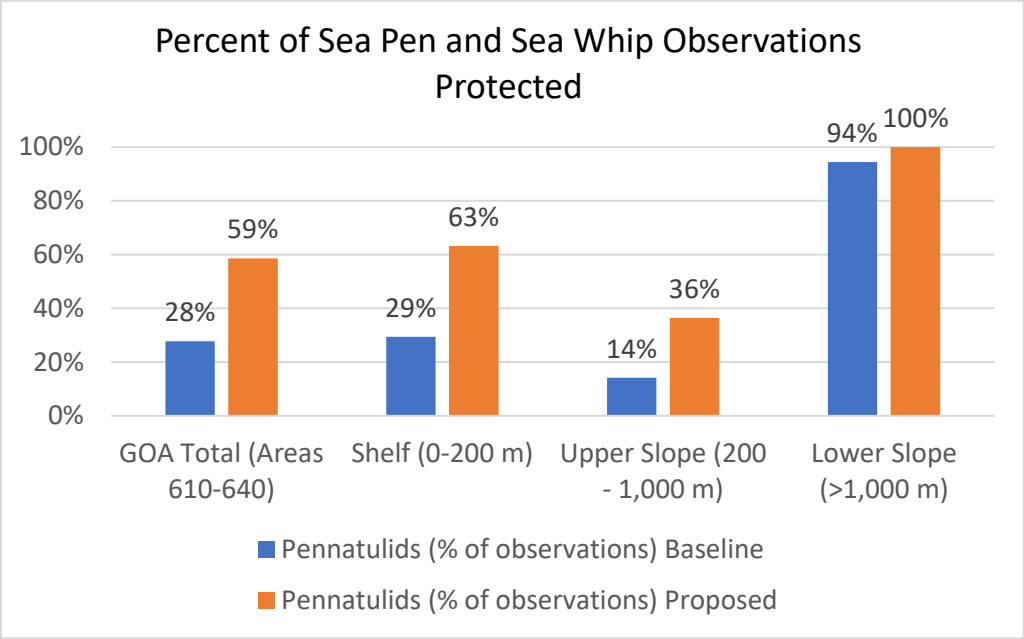


Figure 10. *Percent sea pen and sea whip (Pennatulid) observations protected year-round from bottom trawling in the baseline (status quo) set of conservation areas compared with the protections under this proposal.*

Sponges are living animals that filter water through their porous bodies to feed. There are 50 confirmed sponge species in the Gulf of Alaska, but scientists suspect there may be as many as 80 or more.[21] Like corals, sponges are a major component of the Gulf of Alaska's living marine habitat and an integral part of the region's seafloor ecosystems. Gardens of large sponges, often found with corals, are used by fish and other invertebrates for shelter, breeding and feeding, which in turn supports food webs and helps to maintain the Gulf's deep-sea biodiversity.

[21] Hoff GR, Malecha PW, Rooper CN, et al. 2021. Science Plan for the Alaska Deep-Sea Coral and Sponge Initiative (AKCSI): 2020-2023. AFSC Processed Rep. 2021- 01, 45 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115

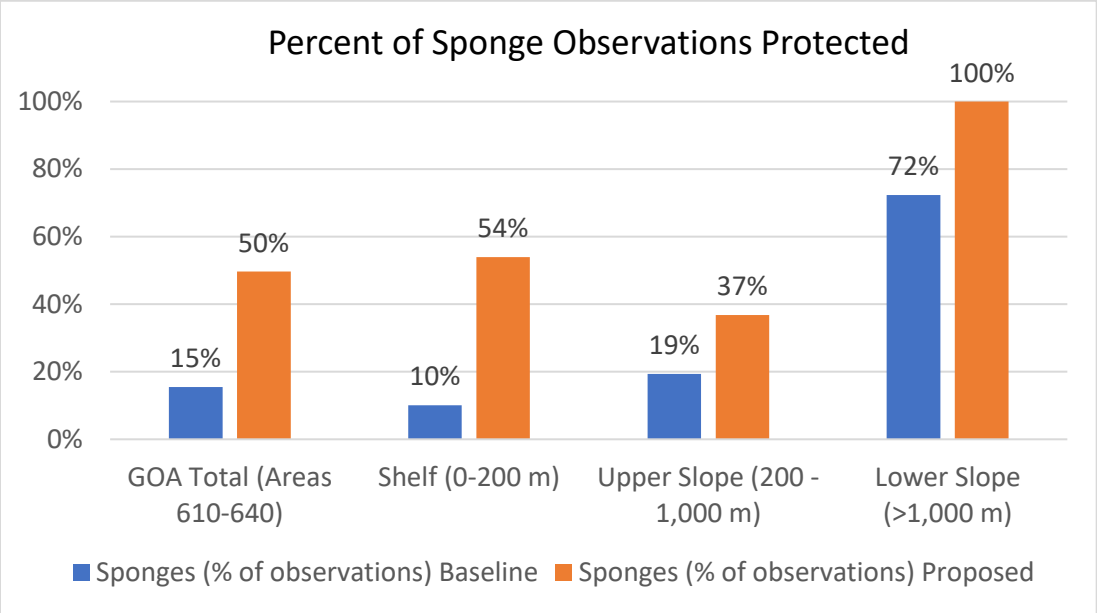


Figure 11. *Percent sponge observations protected year-round from bottom trawling in the baseline (status quo) set of conservation areas compared with the protections under this proposal.*

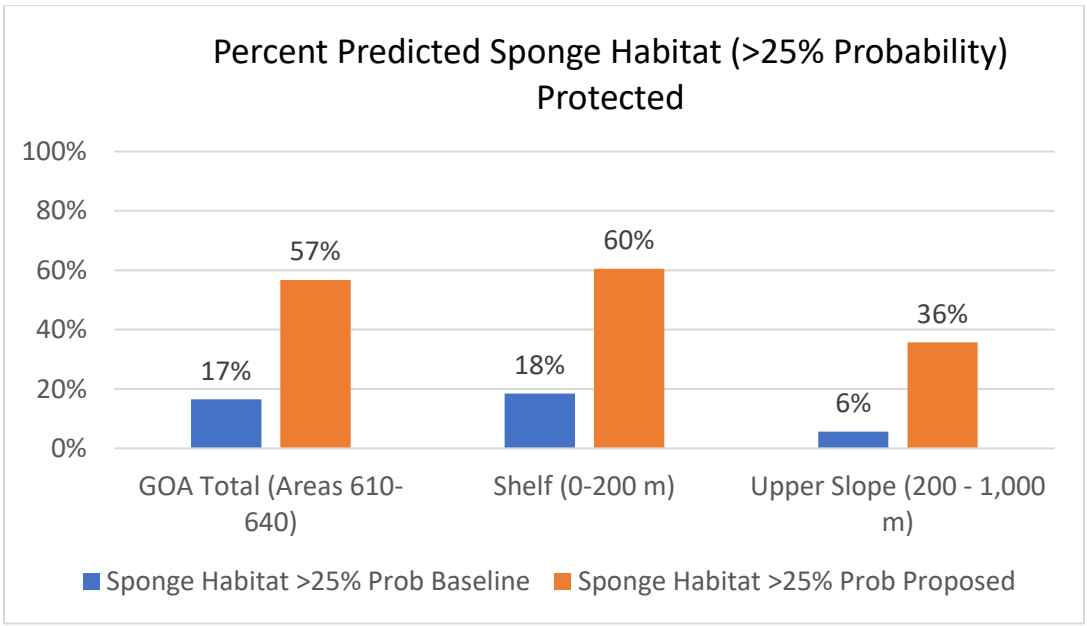


Figure 12. *Percent of sponge habitat protected year-round from bottom trawling in the baseline (status quo) set of conservation areas compared with the protections under this proposal, based on GOA sponge habitat suitability models predicting greater than 25% probability of sponge habitat presence.*[22]

[22] Rooper et al. 2017. *supra note* 19.

iii. Seamounts

From microscopic plankton to the largest whales, seamounts provide an essential foundation for life in the Gulf of Alaska. These underwater mountains forged by volcanic activity are biological hotspots that rise above the surrounding basin floor. Deep underwater currents climb along the base of seamounts toward the ocean surface, mixing with nutrients and light and sparking oases of life. These deep mountain chains support unique ecosystems distinct from the surrounding area, with diverse communities of deep-sea corals, sponges, octopi, and fish.

The Gulf of Alaska Large Marine Ecosystem contains over 100 seamounts that rise over 1,000 meters and most remain unnamed, let alone explored.[23] Their remoteness, over a hundred miles from land, means many have never been fished and are likely pristine. In 2006, the National Marine Fisheries Service designated 14 seamount protected areas in the Gulf of Alaska covering 37 seamounts where all bottom contact fishing gears are prohibited in recognition of their vulnerability to fishing impacts. By freezing the bottom trawl footprint, this proposal will protect an additional 34 seamounts from trawling impacts including Ely Seamount, Wyer Seamount, Smook Seamount, Putnam Seamount, and Hecht Seamount named on NOAA nautical charts,[24] plus others that are unnamed.[25] With this proposal, 100% of Gulf of Alaska Seamounts inside the U.S. EEZ will be protected from bottom trawling.

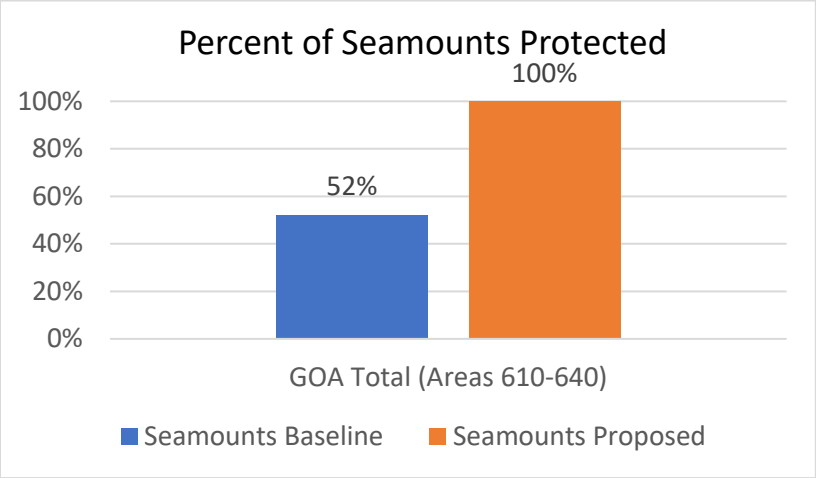


Figure 13. *Percent of seamounts protected year-round from bottom trawling in the baseline (status quo) set of conservation areas (n = 37) compared with the protections under this proposal (n =71).*

[23] Chaytor JD, Keller RA, Duncan RA and Dziak RP. 2007. Seamount morphology in the Bowie and Cobb hot spot trails, Gulf of Alaska. Geochem. Geophy. Geosy. 8(9) doi:10.1029/2007GC001712. Includes seamounts inside and outside the U.S. EEZ.
[24] NOAA Nautical Chart 500, Dixon Entrance to Unimak Pass, Available: https://www.charts.noaa.gov/OnLineViewer/500.shtml
[25] Yesson C, Clark MR, Taylor M, Rogers AD. 2011. The global distribution of seamounts based on 30-second bathymetry data. Deep Sea Research Part I: Oceanographic Research Papers 58: 442-453. DOI: http://dx.doi.org/10.1016/j.dsr.2011.02.004

iv. Submarine Canyons

Submarine canyons are distinct ocean features resembling deep narrow channels, meandering valleys and U-shaped troughs crossing the continental slope and shelf. They play a key role in connecting the coastal zone to the deep-sea through the transport of heat, salt and nutrients. They are known to be areas of enhanced productivity due to locally driven upwelling[26] and for this reason they often contain relatively high concentrations and abundances of marine life including corals, sponges, tunicates, and bryozoans which contribute to the structural complexity of the seafloor.

Carved by ancient geological processes, there are numerous deep-sea canyons and valleys cutting the slope and shelf of the central and western Gulf of Alaska. This proposal protects part of the Yakutat Valley as it cuts into the continental shelf toward Yakutat Bay, Kayak Trough (near Kayak Island), and Smith and Wildcat Canyons located along the lower slope south of Middleton Island. Other submarine canyons and troughs that are heavily trawled may need mitigation for crab habitat concerns like Chiniak and Barnabas troughs offshore of Kodiak Island. Because GIS data for all GOA submarine canyons is not available, we are unable to analyze the proportion of canyon features protected.

C. Estimating Fishing Effort Displacement.

In analyzing available data, we conclude that the maximum displacement of trawling with implementation of the GOA habitat conservation area and bottom trawl open areas is no more than five percent of displaced bottom trawl area (Figure 14) and four percent of bottom trawl catch (Figure 15).

i. Trawl Area: Global Fishing Watch AIS Trawl Track Analysis

To evaluate the potential for economic impacts and the practicability of the proposal, the current and proposed configuration of protected areas were overlaid with AIS trawl track data from Gulf of Alaska fishing vessels holding nonpelagic trawl groundfish permits from 2015 to 2019. Global Fishing Watch uses an algorithm to distinguish different types of fishing behavior from other vessel behavior like transiting or drifting. AIS fishing data collected by Global Fishing Watch (GFW) is free and publicly available.

We estimate the potential displacement of bottom trawl fishing area as the difference between AIS trawl track area inside the current suite of trawl closures (baseline) and with adoption of the proposed GOA Habitat Conservation Area. Nine percent of GFW trawl track area in the GOA project area occurs inside existing bottom trawl closures (Figure 14). Under the proposed set of conservation areas, 14% of recent GFW trawl track area would be included in bottom trawl closed areas. The difference between current and proposed closures – 5% – is our estimate of total potential displacement of trawl area.

[26] Freeland, H. and K. Denman. 1982. A topographically controlled upwelling center off Southern Vancouver Island. Journal of Marine Research 40: 1069-1093

Most of these habitat conservation areas, however, allow pelagic trawling and trawl track data inside habitat conservation areas could be from vessels that also have pelagic trawl permits and may be using this gear to target pollock or midwater rockfish. This needs further investigation. Because available data only show area and do not clearly distinguish between pelagic trawl and bottom trawl effort, this is likely an overestimate of the total potential bottom trawl displacement. Ultimately, NMFS should provide more detailed maps of the bottom trawl footprint based on confidential vessel monitoring system (VMS) data which could then be used to refine the proposed open areas and enhance the ability to reduce displacement and any potential economic impacts.

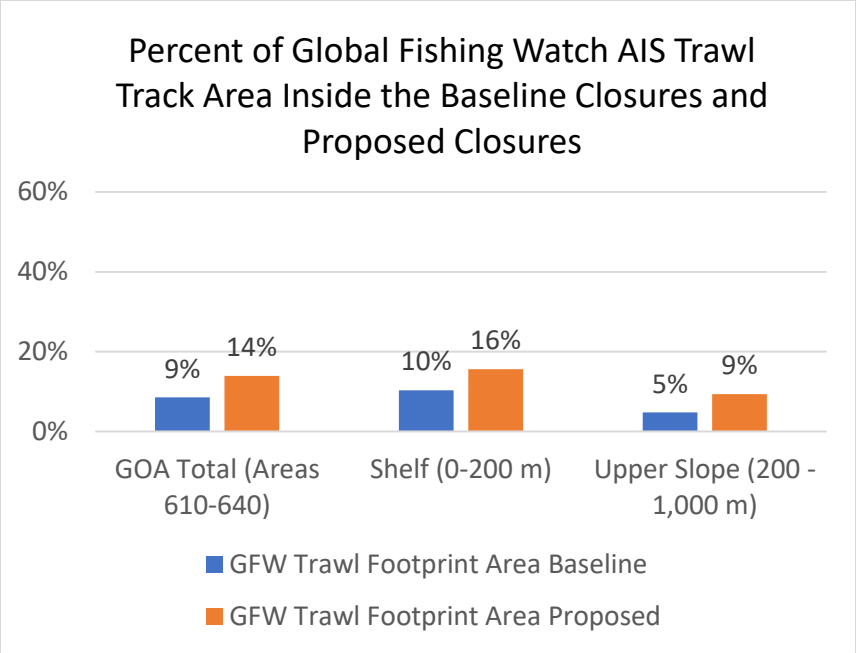


Figure 14. *Percent of GFW AIS trawl track data (2015 to 2019) inside the baseline set of closures and proposed closures across the GOA proposal area and shelf and upper slope depth zones. Based on the difference of trawl tracks in the baseline closures and proposed closures, we estimate that the proposal would displace no more than 5% of recent trawl area.*

ii. Analysis of Bottom Trawl Catch by Area

We used NMFS's observed catch data[27] to estimate the amount of groundfish bottom trawl catch and bycatch in the baseline, in the proposed habitat conservation area, and in the proposed open areas. NMFS estimates total fisheries catch and discards of marine species through observer sampling on vessels, dealer landing reports ("fish tickets"), and at-sea production reports. Catch and discards from observed trips are extrapolated to unobserved trips to estimate total catches for the fishery. NMFS provides the public with catch estimates aggregated by 400 square kilometer grid cells. Without knowing exactly where within each 400 km^2 grid cell catch occurred, we summed catch within polygons (areas open or closed to trawling) and catch was counted in an area if the centroid of the catch grid fell within the polygon. Our baseline estimates of bottom

[27] Observer data map (noaa.gov) AFSC/FMA: Web Map Observer Groundfish Data, Alaska, 1993-2022

trawl catch occurring within current bottom trawl closures (Figure 15) may be due to the spatial uncertainty due to aggregated catches in grid cells overlapping closure boundaries.

We used 2015-2019 catches to represent recent fishery behavior in a period prior to the COVID pandemic and 1993-2021 catches to represent both historical and present fishery behavior.

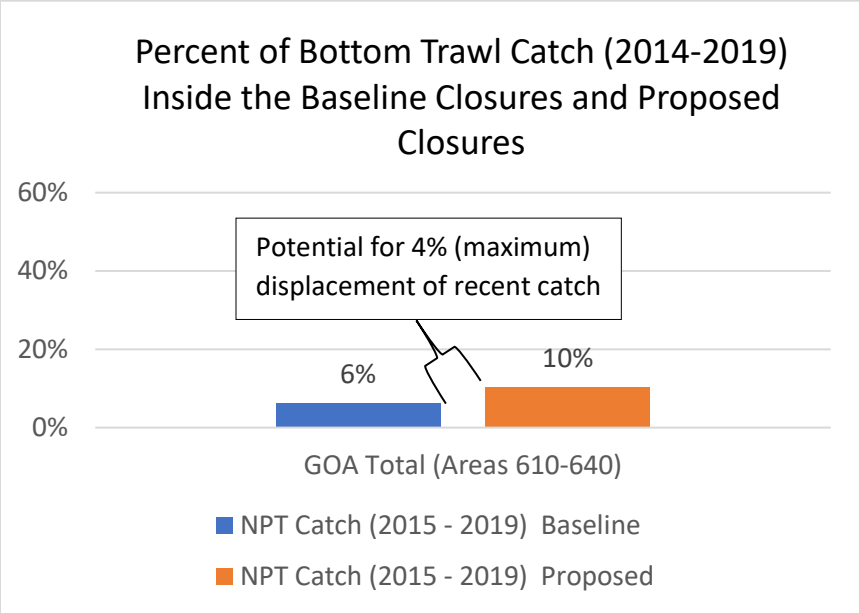


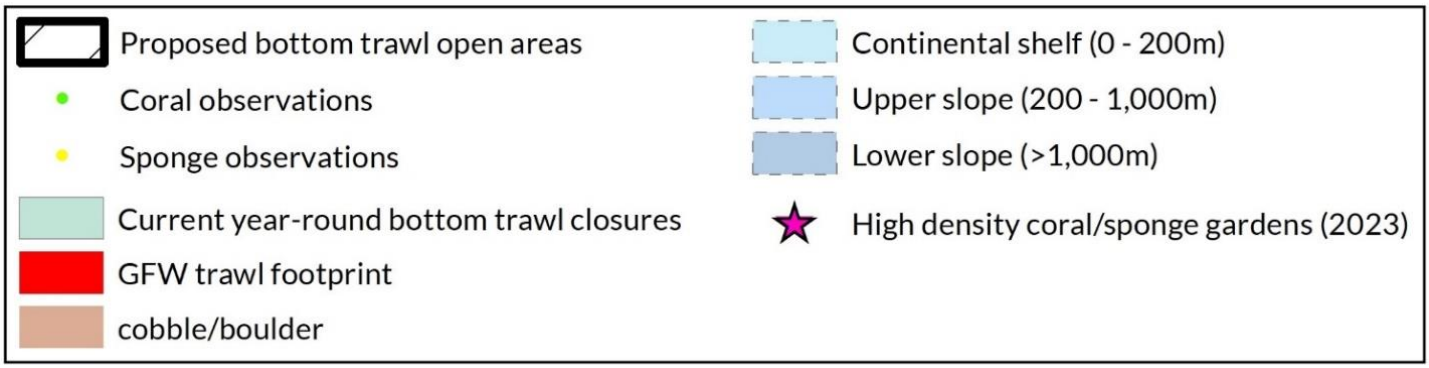
Figure 15. *Percent of bottom trawl (non-pelagic trawl ("NPT")) catch inside the baseline set of closures and proposed closure areas. Based on the difference of observed catch in the baseline closures and proposed closures, we estimate that the proposal would displace no more than 4% of recent groundfish bottom trawl catch.*

VI. Conclusion

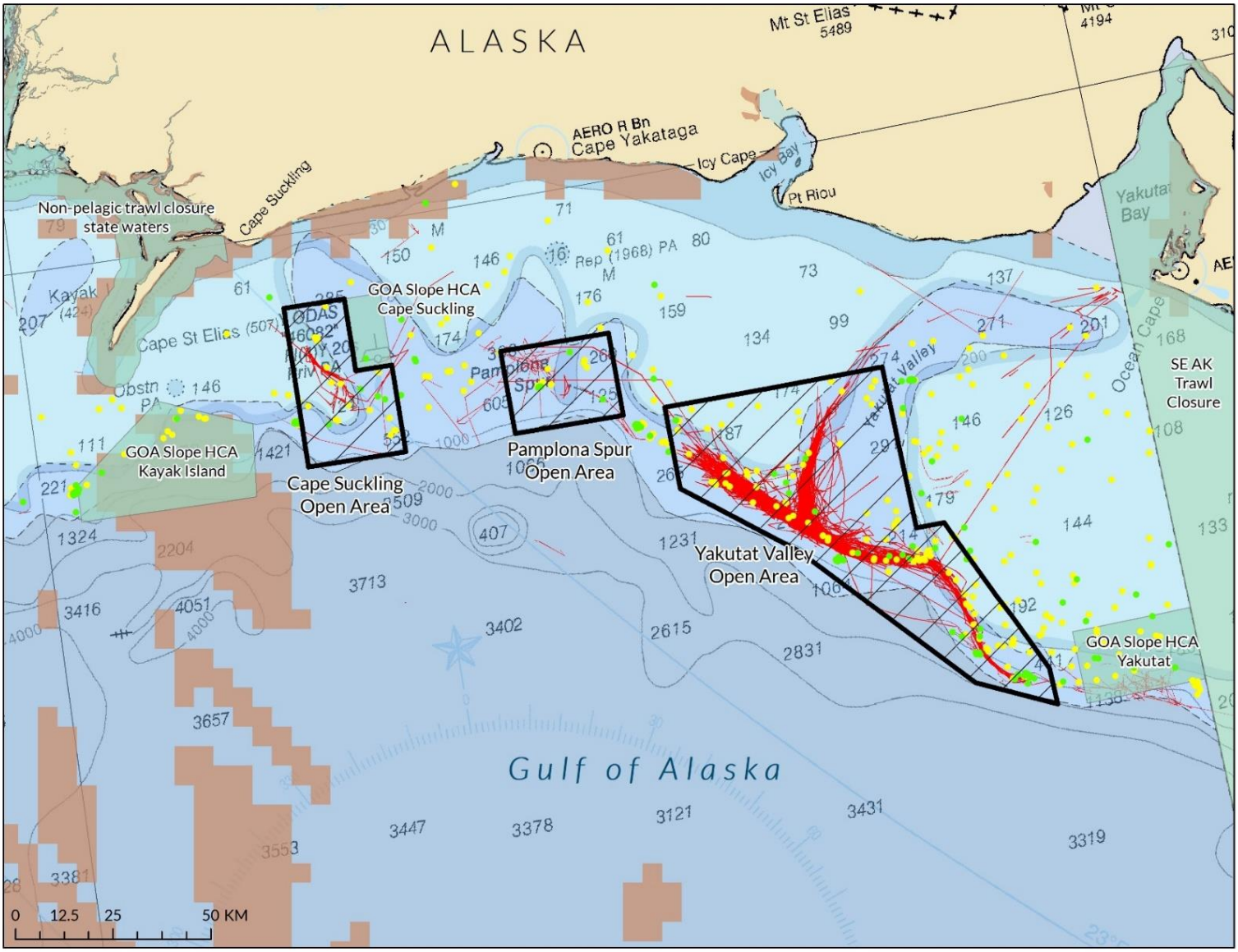
The conservation of seafloor habitat is necessary for the maintenance of sustainable fisheries and the long-term health of the marine ecosystem and is a core objective of the MSA. Federal groundfish trawl fisheries cause damage to seafloor habitats. Restricting the groundfish bottom trawl footprint to the most heavily trawled areas will limit habitat damage to areas where it has already occurred. Preventing expansion of trawling into un-trawled or sparsely trawled areas will allow habitats to recover or remain undisturbed from trawling. And preventing pelagic and semi-pelagic trawls from contacting the seafloor in habitat conservation areas will help meet conservation objectives in those areas. Implementation of the above outlined conservation proposal can provide lasting protection for seafloor habitats that are a critical component of ecosystem-based fisheries management.

VII. AREA MAPS

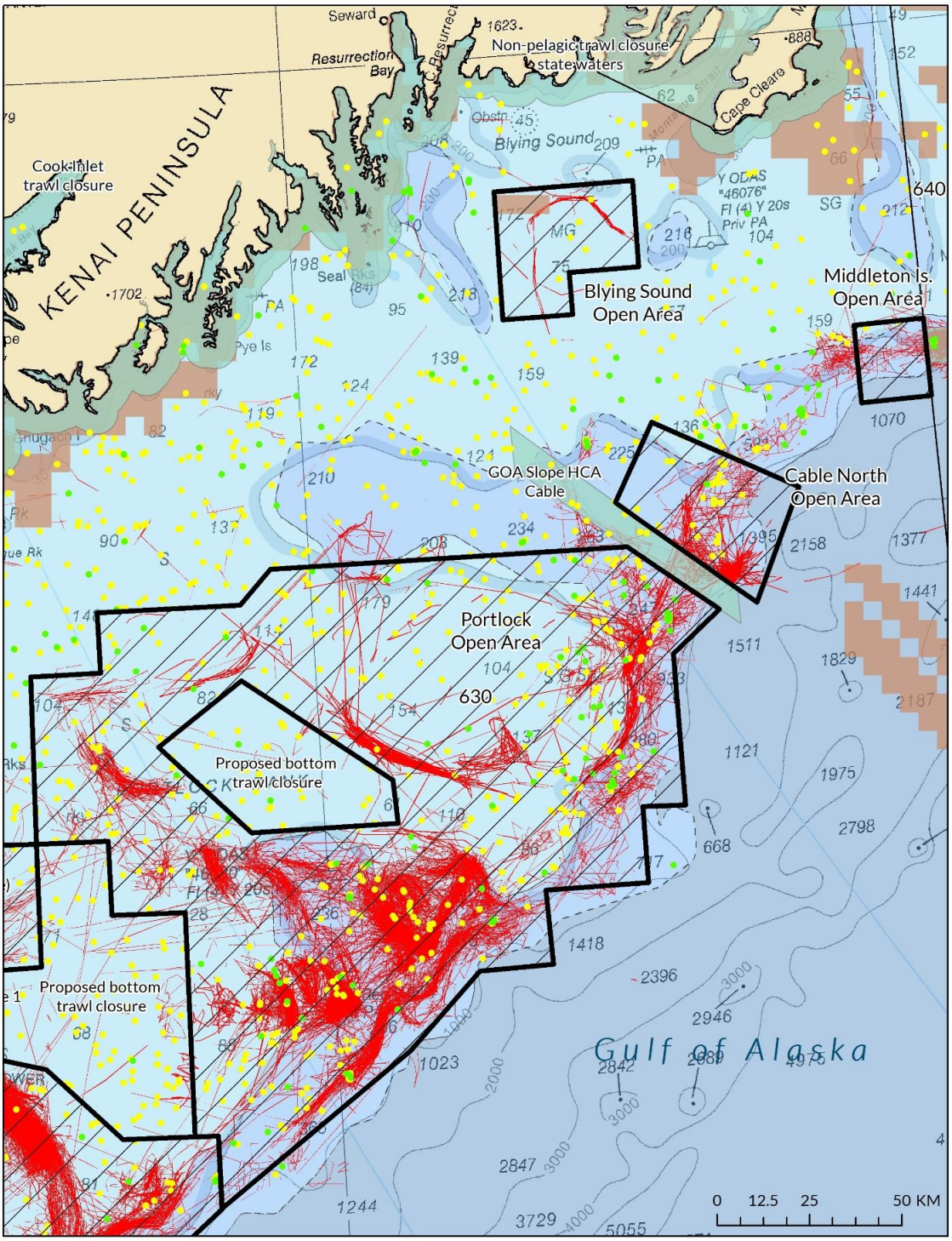
Master Legend: This legend applies to symbology for maps 1 – 8.



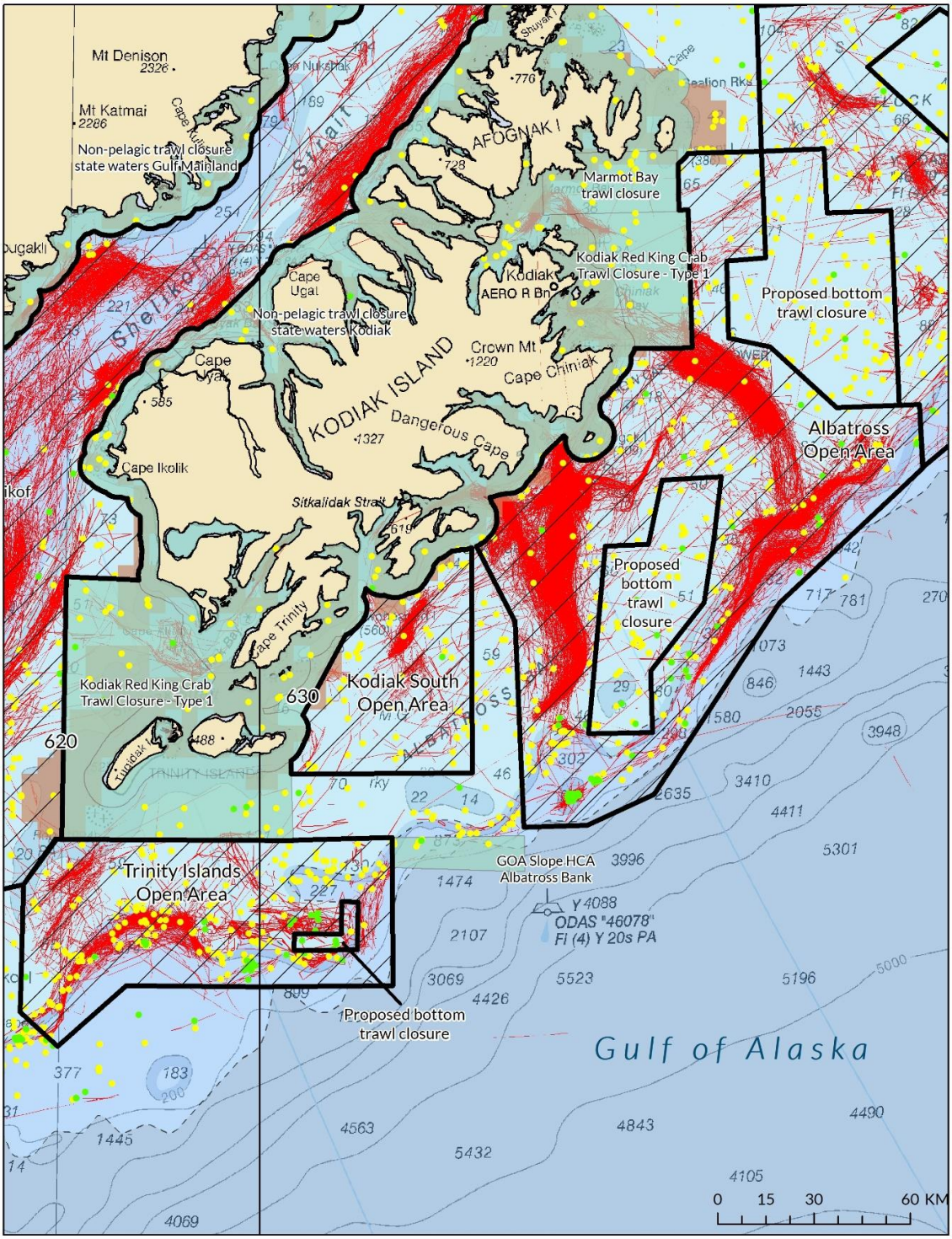
1. Central/ Northeastern Gulf of Alaska, Yakutat Bay (140°W) to Cape Suckling (Area 640). For all maps, the areas outside of the proposed open areas would be closed to groundfish bottom trawling.



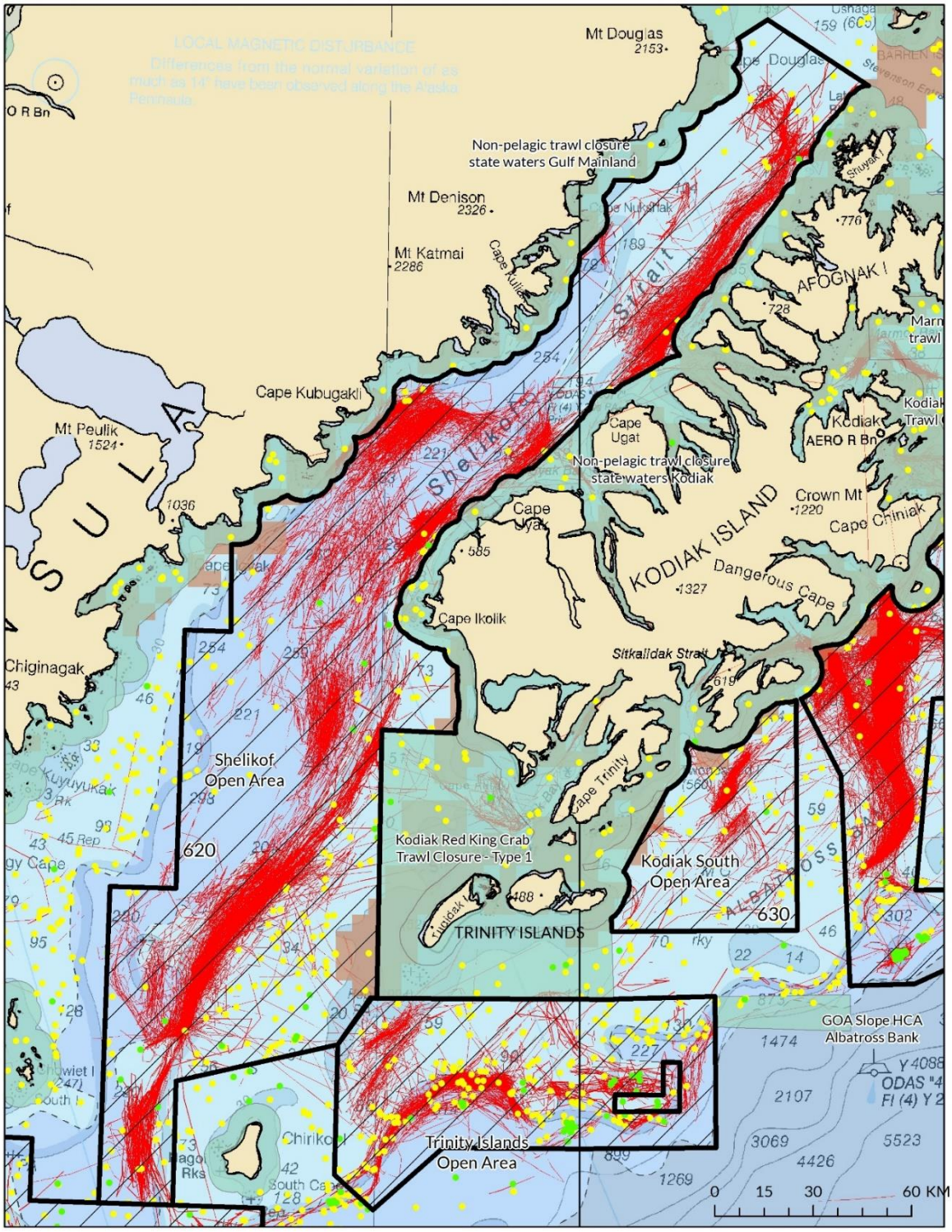
2. Central Gulf of Alaska, Middleton Island to Portlock Bank (Area 630). Note that the proposed Portlock Bank open area includes a bottom trawl closure at the center of Portlock Bank.



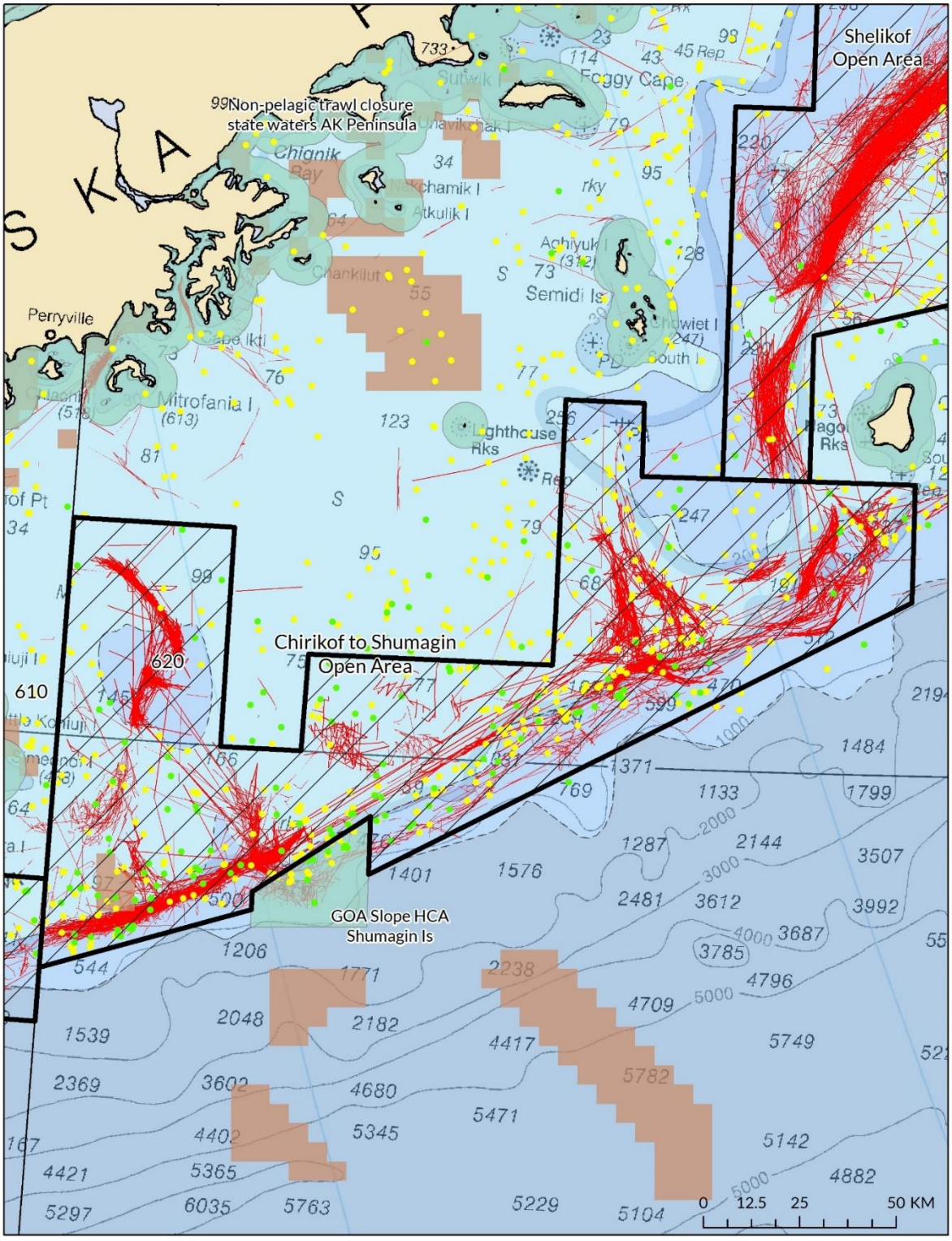
3. Central Gulf of Alaska: Kodiak Island, Albatross Bank, Trinity Islands (Areas 630 and 620). Note that there are proposed bottom trawl closed areas within the Trinity Islands open area at the Snakehead, within the Albatross Bank open area, and east of Marmot Bay, Kodiak.



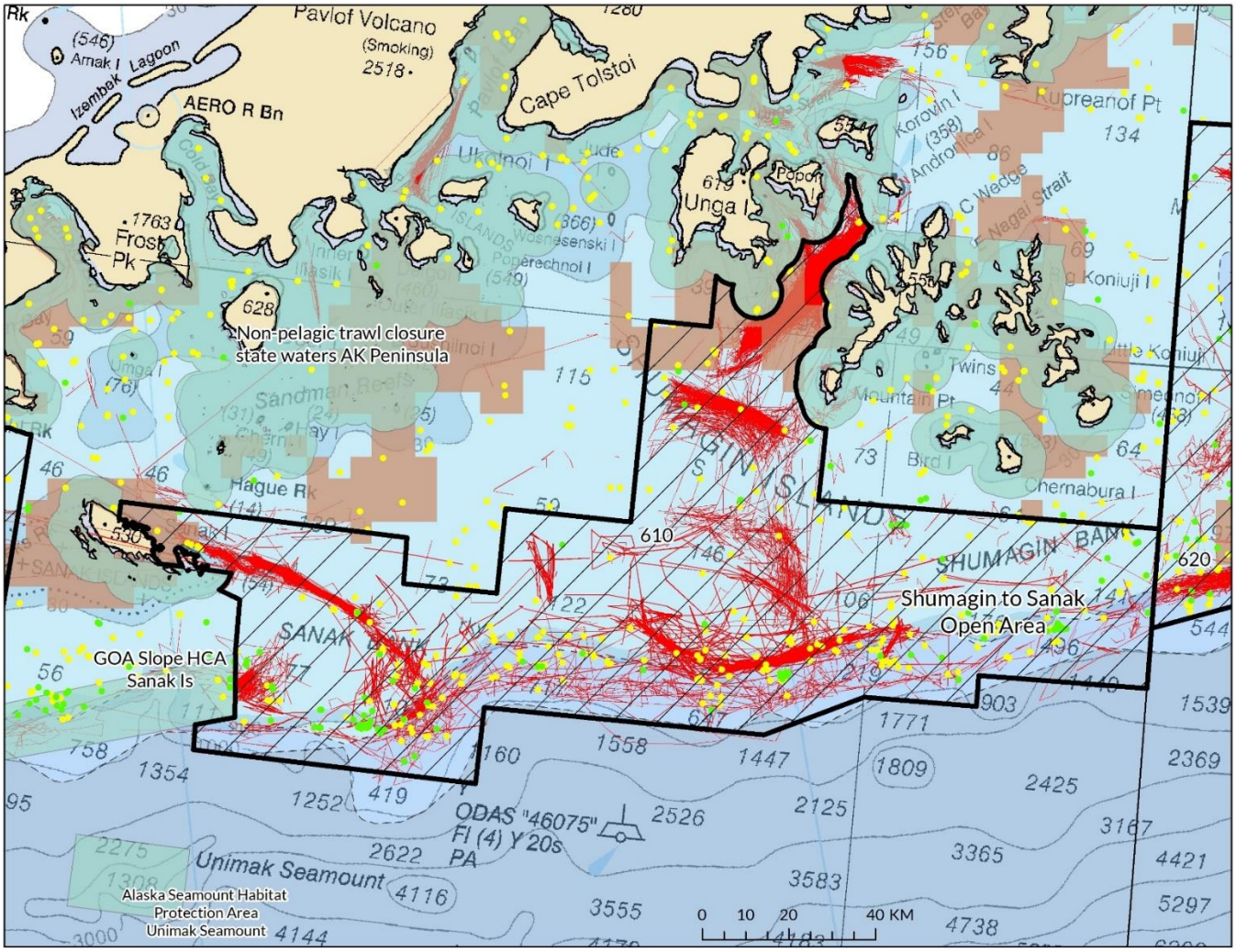
4. Central Gulf of Alaska: Shelikof Strait, Kodiak and Trinity Islands (Areas 630 and 620)



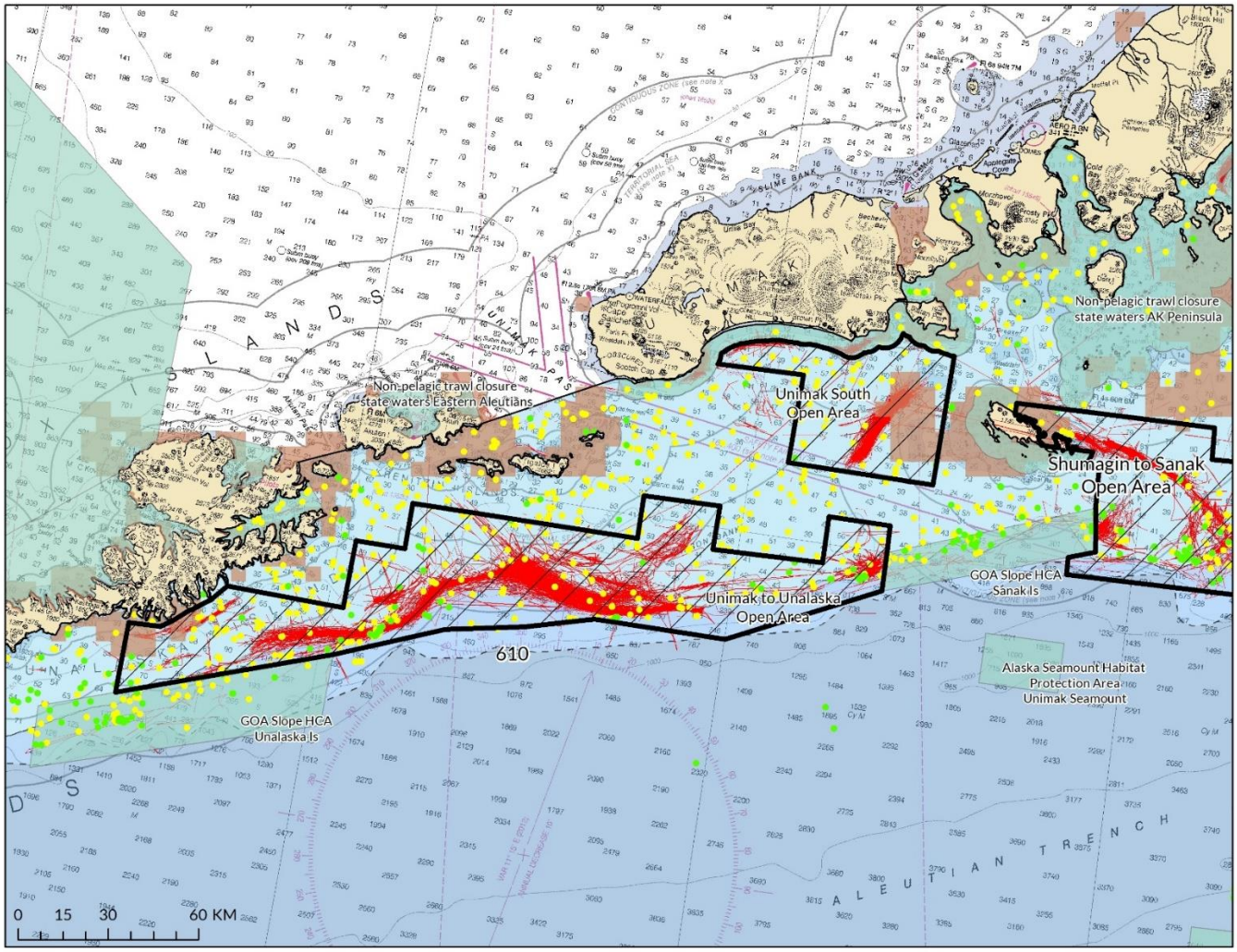
5. Central Gulf of Alaska: Chirikof Island to the Shumagins (Area 620)



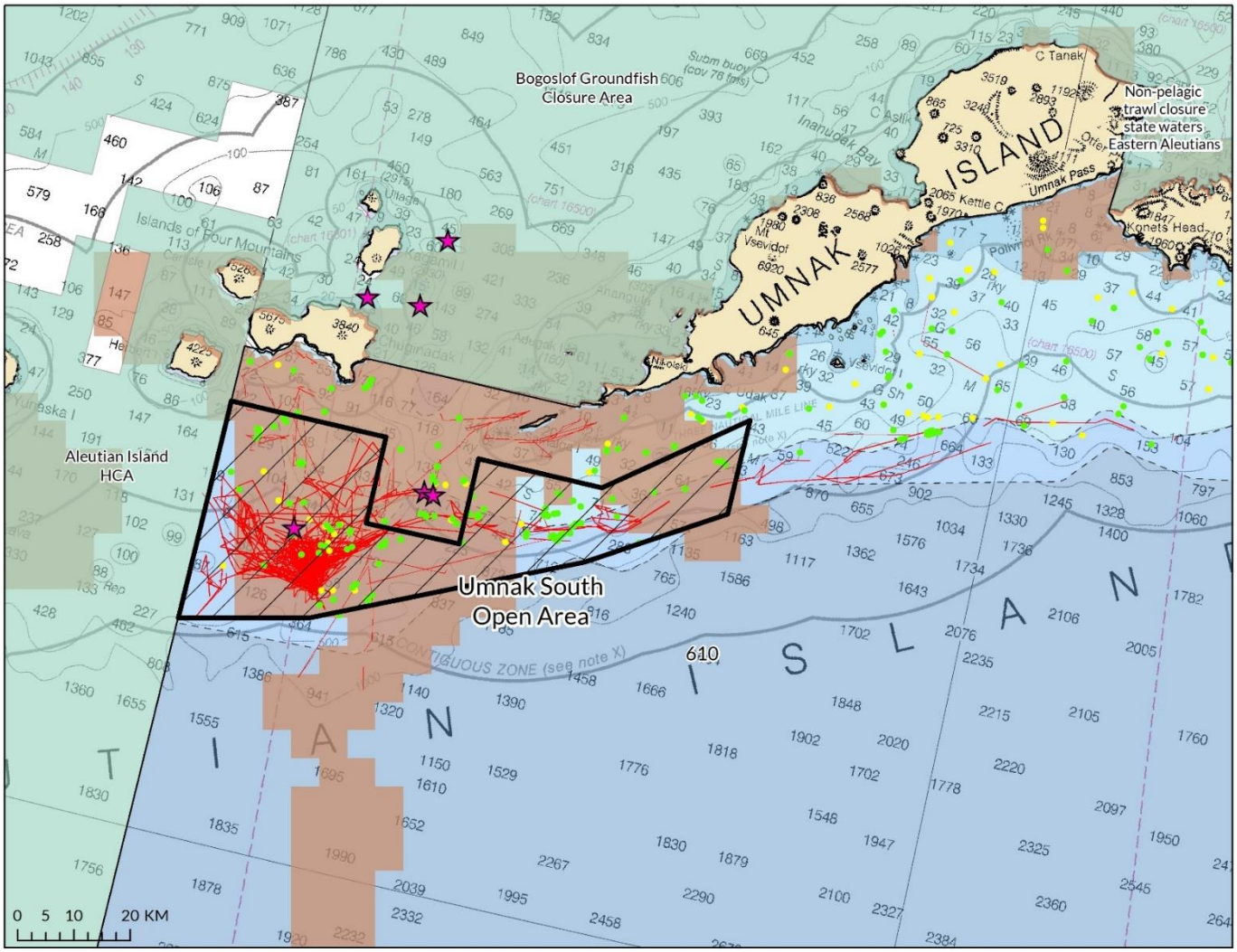
6. Western Gulf of Alaska: Shumagin to Sanak (Area 610)



7. Western Gulf of Alaska: Sanak to Unalaska (Area 610)

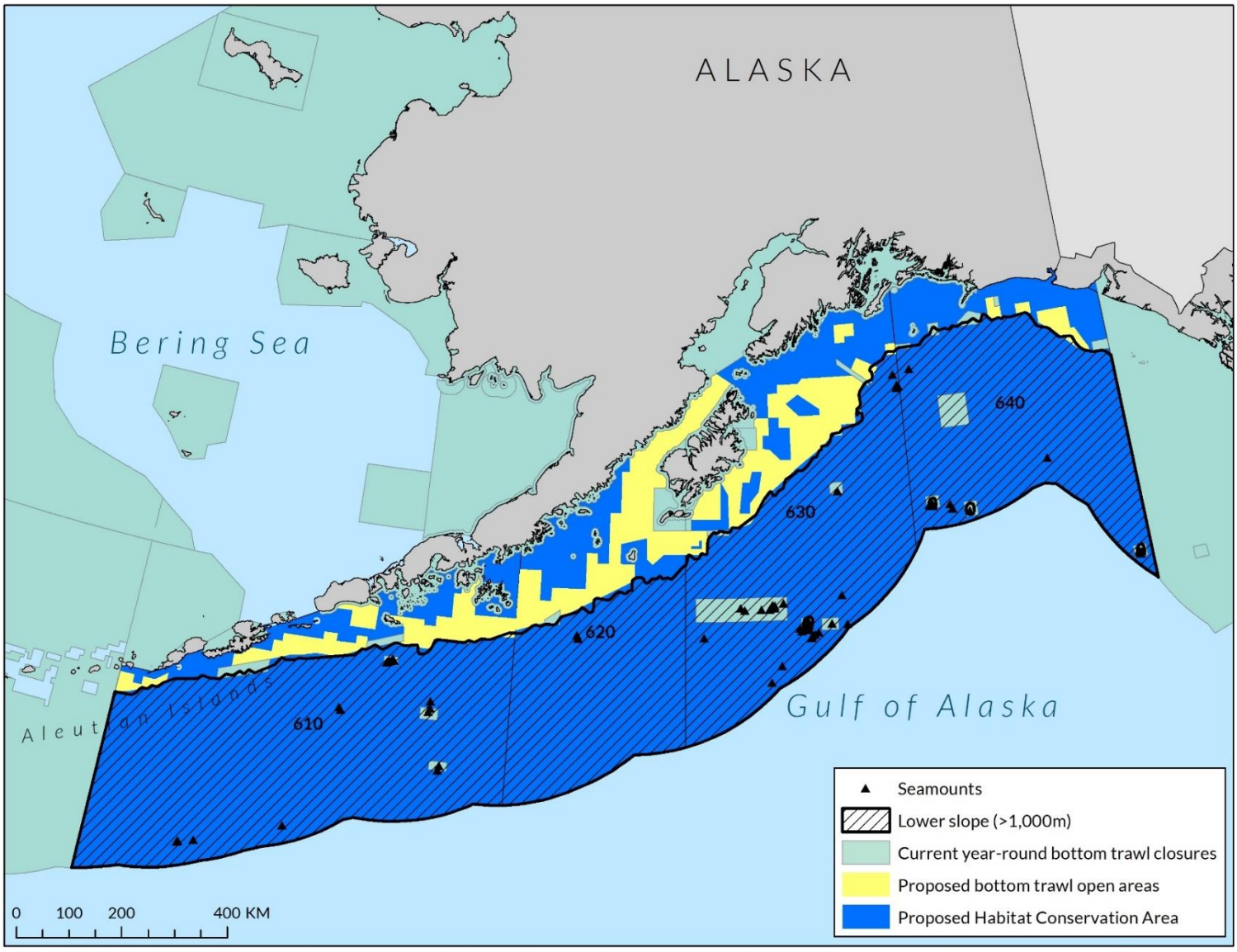


8. Western Gulf of Alaska, Umnak Island to the Islands of Four Mountains/ 170° West (Area 610) with location of NOAA identified high-density coral gardens noted by pink stars. This proposal would protect two coral gardens with very high coral density to the south of Samalga Pass. A third coral garden is in the proposed open area close to a high-density trawl area.[28]



[28] Aleutian High Density Coral Gardens: (Tom Hourigan, NOAA Deep-sea Coral Research and Technology Program, personal communication, April 7, 2023). The two coral gardens in the proposed GOA Habitat Conservation Area south of Samalga Pass were identified by NOAA using drop cameras and found to have "very high" coral density (>5 coral colonies/ m^2).

9. The Deep Sea – lower slope (>1,000 m) and seamounts



VIII. GIS DATA SOURCES

Cobble and boulder habitat:

Citation: NOAA substrate data provided by John Olson, NMFS personal communication, August 26, 2021.

Description: This dataset includes the proportion of substrate type within each 5km grid cell categorized as mud, sand, gravel/pebble, cobble and boulder. For our analysis, we selected grid cells with a proportion of either cobble or boulder greater than zero. This does not mean that the entire grid cell is exclusively cobble or boulder.

Coral, Sponge and Pennatulid observations:

Citation: NOAA Deep Sea Coral Research and Technology Program. (2023). *National Deep-Sea Coral and Sponge Database.* Accessed February 2023. Available: https://www.ncei.noaa.gov/maps/deep-sea-corals/mapSites.htm

Description: For our analysis, the entire NOAA deep sea coral database was used (records up to February 2023). We separated the database into categories of corals, sponges and pennatulids and used only records that fell within our study area.

NOAA coral and sponge habitat suitability models:

Citation: NOAA Deep Sea Coral Research and Technology Program. (2023). *Habitat Suitability Models.* Accessed February 2023. Available: https://www.ncei.noaa.gov/maps/deep-sea-corals/mapSites.htm AND, Rooper CN, M Zimmermann, and MM Prescott (2017) Comparison of modeling methods to predict the spatial distribution of deep-sea coral and sponge in the Gulf of Alaska. Deep-Sea Research Part I 126(148-161) http://dx.doi.org/10.1016/j.dsr.2017.07.002

Description: NOAA Gulf of Alaska coral and sponge habitat suitability models - probability of presence/absence - where taxonomic groupings of sponges/corals depict predictions of presence/absence for the Gulf of Alaska. Rasters are 100m x 100m grids with a probability ranging from 0-1 for each cell. We took these rasters and converted them to polygons to be able to calculate the amount of area (km^2) where corals or sponges were predicted between 25-50% probability, > 25% probability, and > 50% probability.

Aleutian Islands High Density Coral Gardens:

Citation: Aleutian High Density Coral Gardens: Data provided by Tom Hourigan, NOAA Deep-sea Coral Research and Technology Program, personal communication, April 7, 2023.

Seamounts:

Citation: Yesson C, Clark MR, Taylor M, Rogers AD (2011). The global distribution of seamounts based on 30-second bathymetry data. Deep Sea Research Part I: Oceanographic Research Papers

58: 442-453. DOI: http://dx.doi.org/10.1016/j.dsr.2011.02.004. Data DOI: http://doi.pangaea.de/10.1594/PANGAEA.757564

Trawl footprint:

Citation: Global Fishing Watch (2022). *Bottom trawl footprint, based on AIS data from 2015-2019. GFW | Map (globalfishingwatch.org)*

Description: The trawl footprint was created using Global Fishing Watch (GFW) publicly available AIS data from 2015 – 2019. Track data for 81 vessels was created based on the GFW algorithm that detects different types of fishing activity. Tracks were separated into catcher vessels (CAT) and catcher processors (CPR) where CAT tracks were buffered by 50 meters and CPR tracks were buffered by 100m to encompass the average width of their respective tow paths. All tracks were then merged together to create the trawl footprint.

Observed catch data:

Citation: Alaska Fisheries Science Center, Fisheries Monitoring and Analysis Division (2022) AFSC/FMA: Web Map Observer Groundfish Data, Alaska, 1993-2021, Available: https://apps-afsc.fisheries.noaa.gov/ords/r/fma_ols/fma-map/home?session=14935482097745

Description: Publicly available NOAA Alaska Fisheries Science Center Alaska groundfish observer data where observer data is aggregated by 400 km square cells. Not all fishing vessels have an observer on board. Not all hauls/sets on observed vessels are sampled. Cells representing less than three vessels in a particular year and gear are not included due to confidentiality constraints.

For our analysis we filtered the data as follows to analyze both the full dataset (1993-2021) and a recent time series (2015-2019):

- NPT catch: all non-pelagic trawl (NPT) catch records.
- PT catch: all pelagic trawl (PT) catch records.
- Halibut bycatch: all Pacific halibut records, filtered by NPT.
- Crab bycatch: all of the following crab species, filtered by NPT.
    - Angulatus tanner
    - Arctic lyre crab (rounded spine)
    - Bairdi tanner crab
    - Blue king crab
    - Box crab
    - Brown king crab
    - Couesi king crab
    - Crab unidentified
    - Decorator crab
    - Dungeness crab
    - Fuzzy crab
    - Hermit crab unidentified
    - Hybrid tanner crab
    - King crab unidentified
    - Korean horsehair crab
    - Lyre crab (sharp spined)

    - Lyre crab unidentified
    - Opilio tanner crab
    - Pygmy crock crab
    - Red king crab
    - Rhinoceros crab
    - Scaled crab
    - Tanner crab unidentified
    - Telmessus crab
    - Tanneri tanner
- Invertebrate bycatch: all of the following habitat forming invertebrate species, filtered by NPT.
    - Black coral
    - Brittle starfish unidentified
    - Bryozoans corals unidentified
    - Gorgonian
    - Hydrocoral
    - Invertebrate unidentified
    - Red tree coral
    - Sea anemone unidentified
    - Sea pen-sea whip unidentified
    - Soft coral
    - Stony coral
- LGL+Pot catch: all longline (LGL) and pot (POT) catch records.
- Chinook bycatch: all Chinook salmon catch records, filtered by NPT.

Other data considered in the design of this proposal:

Catch in areas database of fisheries catches: Catch-In-Areas Main | InPort (noaa.gov)

Recent (2018-2023) non-confidential catch estimates from NMFS Catch-In-Areas database.

Fleet characteristics: Groundfish permit holders Federal Fishing Permits and Licenses Issued in Alaska | NOAA Fisheries

Table 1. Geographic area analysis with results by statistical area and depth zone.

	Area (km^2)		cobble/ boulder habitat area (km^2)		Corals (*# of observations*)		Sponges (*# of observations*)	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
610 - Shelf	55,773	55,773	12,213	12,213	645	645	2,877	2,877
Inside Closure	12,820	37,991	4,682	10,332	48	350	254	1,541
Outside Closure	42,953	17,782	7,531	1,881	597	295	2,623	1,336
610 - Upper Slope	10,769	10,769	1,266	1,266	505	505	1,486	1,486
Inside Closure	2,152	4,891	0	304	46	121	185	317
Outside Closure	8,617	5,878	1,266	962	459	384	1,301	1,169
610 - Lower Slope	262,434	262,434	1,201	1,201	40	40	0	0
Inside Closure	2,214	262,028	0	1,196	4	40	0	0
Outside Closure	260,220	406	1,201	4	36	0	0	0
610 - TOTAL	328,975	328,975	14,679	14,679	1,190	1,190	4,363	4,363
Inside Closure	17,185	304,910	4,682	11,832	98	511	439	1,858
Outside Closure	311,790	24,066	9,997	2,848	1,092	679	3,924	2,505
620 - Shelf	48,761	48,761	5,648	5,648	147	147	1,535	1,535
Inside Closure	12,409	30,897	3,592	5,086	6	37	143	662
Outside Closure	36,352	17,864	2,056	562	141	110	1,392	873
620 - Upper Slope	22,327	22,327	138	138	335	335	730	730
Inside Closure	730	7,250	57	57	13	90	47	181
Outside Closure	21,596	15,077	81	81	322	245	683	549
620 - Lower Slope	111,741	111,741	2,200	2,200	0	0	0	0
Inside Closure	75	111,711	0	2,200	0	0	0	0
Outside Closure	111,666	30	2,200	0	0	0	0	0
620 - TOTAL	182,829	182,829	7,986	7,986	482	482	2,265	2,265
Inside Closure	13,214	149,859	3,649	7,343	19	127	190	843
Outside Closure	169,615	32,970	4,337	643	463	355	2,075	1,422
630 - Shelf	90,223	90,223	12,454	12,454	150	150	1,918	1,918
Inside Closure	32,170	61,226	10,011	12,092	11	72	256	1,153
Outside Closure	58,053	28,997	2,443	362	139	78	1,662	765
630 - Upper Slope	17,695	17,695	110	110	395	395	755	755
Inside Closure	1,146	7,555	57	108	36	211	52	317
Outside Closure	16,549	10,140	53	2	359	184	703	438
630 - Lower Slope	165,320	165,320	790	790	206	206	94	94
Inside Closure	9,322	164,468	0	790	192	206	94	94
Outside Closure	155,998	853	790	0	14	0	0	0
630 - TOTAL	273,238	273,238	13,354	13,354	751	751	2,767	2,767
Inside Closure	42,637	233,248	10,068	12,990	239	489	402	1,564
Outside Closure	230,601	39,990	3,286	364	512	262	2,365	1,203
640 - Shelf	28,352	28,352	4,807	4,807	33	33	266	266
Inside Closure	3,413	27,393	1,693	4,806	3	30	12	205
Outside Closure	24,939	959	3,114	1	30	3	254	61
640 - Upper Slope	10,453	10,453	556	556	292	292	713	713
Inside Closure	2,273	6,990	468	556	105	193	429	539
Outside Closure	8,180	3,464	88	0	187	99	284	174
640 - Lower Slope	149,443	149,443	17,638	17,638	353	353	282	282
Inside Closure	4,991	149,157	2,343	17,638	148	353	178	282
Outside Closure	144,452	286	15,295	0	205	0	104	0
640 - TOTAL	188,249	188,249	23,001	23,001	678	678	1,261	1,261
Inside Closure	10,678	183,539	4,505	23,000	256	576	619	1,026
Outside Closure	177,571	4,709	18,497	1	422	102	642	235

'Inside closure' = area/ feature within the stat area/ depth zone inside a year-round bottom trawl closure under the 'baseline' (status quo) set of bottom trawl closures or 'proposed' bottom trawl closures (baseline + proposed GOA habitat conservation area).

'Outside closure' is the inverse - the area open to groundfish bottom trawl gear under the baseline or proposed set of habitat conservation areas.

Table 1 continued

	Pennatulids *(# of observations)*		Coral Habitat Model 25-50% prob (area km2)		Coral Habitat Model >50% prob (area km2)		Coral Habitat > 25% sum	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
610 - Shelf	346	346	339.7	339.7	0.1	0.1	339.8	339.8
Inside Closure	108	211	4.4	5.3	0.0	0.0	4.4	5.3
Outside Closure	238	135	335.3	334.5	0.1	0.1	335.4	334.5
610 - Upper Slope	66	66	638.6	638.6	55.8	55.8	694.4	694.4
Inside Closure	23	23	43.6	90.7	0.0	7.1	43.6	97.8
Outside Closure	43	43	595.0	547.9	55.8	48.7	650.8	596.6
610 - Lower Slope	2	2	13.3	13.3	1.8	1.8	15.1	15.1
Inside Closure	0	2	0.0	2.1	0.0	1.2	0.0	3.3
Outside Closure	2	0	13.3	11.3	1.8	0.5	15.1	11.8
610 - TOTAL	414	414	991.7	991.7	57.7	57.7	1,049.3	1,049.3
Inside Closure	131	236	48.1	98.0	0.0	8.3	48.1	106.4
Outside Closure	283	178	943.6	893.7	57.7	49.3	1,001.3	943.0
620 - Shelf	205	205	1,343.7	1,343.7	0.0	0.0	1,343.7	1,343.7
Inside Closure	82	134	0.1	233.8	0.0	0.0	0.1	233.8
Outside Closure	123	71	1,343.6	1,109.9	0.0	0.0	1,343.6	1,109.9
620 - Upper Slope	120	120	2,501.2	2,501.2	135.6	135.6	2,636.8	2,636.8
Inside Closure	14	40	187.9	1,959.5	30.9	133.5	218.9	2,093.0
Outside Closure	106	80	2,313.3	541.7	104.7	2.2	2,418.0	543.9
620 - Lower Slope	0	0	1.4	1.4	1.3	1.3	2.7	2.7
Inside Closure	0	0	0.0	1.4	0.0	1.3	0.0	2.7
Outside Closure	0	0	1.4	0.0	1.3	0.0	2.7	0.0
620 - TOTAL	325	325	3,846.3	3,846.3	136.9	136.9	3,983.2	3,983.2
Inside Closure	96	174	188.0	2,194.7	30.9	134.8	218.9	2,329.5
Outside Closure	229	151	3,658.3	1,651.6	106.0	2.2	3,764.3	1,653.7
630 - Shelf	511	511	0.1	0.1	0.0	0.0	0.1	0.1
Inside Closure	153	284	0.0	0.0	0.0	0.0	0.0	0.0
Outside Closure	358	227	0.1	0.1	0.0	0.0	0.1	0.1
630 - Upper Slope	78	78	92.2	92.2	0.0	0.0	92.2	92.2
Inside Closure	0	24	0.8	24.6	0.0	0.0	0.8	24.6
Outside Closure	78	54	91.4	67.6	0.0	0.0	91.4	67.6
630 - Lower Slope	34	34	0.1	0.1	0.0	0.0	0.1	0.1
Inside Closure	34	34	0.1	0.1	0.0	0.0	0.1	0.1
Outside Closure	0	0	0.0	0.0	0.0	0.0	0.0	0.0
630 - TOTAL	623	623	92.3	92.3	0.0	0.0	92.3	92.3
Inside Closure	187	342	0.9	24.7	0.0	0.0	0.9	24.7
Outside Closure	436	281	91.4	67.7	0.0	0.0	91.4	67.7
640 - Shelf	133	133	13.0	13.0	0.0	0.0	13.0	13.0
Inside Closure	8	127	11.5	12.3	0.0	0.0	11.5	12.3
Outside Closure	125	6	1.6	0.8	0.0	0.0	1.6	0.8
640 - Upper Slope	54	54	124.5	124.5	0.0	0.0	124.5	124.5
Inside Closure	8	29	57.4	87.6	0.0	0.0	57.4	87.6
Outside Closure	46	25	67.1	36.9	0.0	0.0	67.1	36.9
640 - Lower Slope	0	0	3.8	3.8	0.0	0.0	3.8	3.8
Inside Closure	0	0	3.8	3.8	0.0	0.0	3.8	3.8
Outside Closure	0	0	0.0	0.0	0.0	0.0	0.0	0.0
640 - TOTAL	187	187	141.3	141.3	0.0	0.0	141.3	141.3
Inside Closure	16	156	72.7	103.6	0.0	0.0	72.7	103.6
Outside Closure	171	31	68.7	37.7	0.0	0.0	68.7	37.7

Table 1 continued

	Sponge Habitat Model 25-50% prob (area km2)		Sponge Habitat Model >50% prob (area km2)		Sponge Habitat > 25% sum		Seamounts	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
610 - Shelf	19,499.0	19,499.0	17,634.7	17,634.7	37,133.7	37,133.7	0	0
Inside Closure	5,253.0	13,308.5	3,486.3	10,115.5	8,739.3	23,424.0	0	0
Outside Closure	14,246.0	6,190.5	14,148.4	7,519.2	28,394.4	13,709.7	0	0
610 - Upper Slope	141.5	141.5	2,215.2	2,215.2	2,356.7	2,356.7	0	0
Inside Closure	1.4	26.6	193.1	254.9	194.5	281.5	0	0
Outside Closure	140.2	114.9	2,022.0	1,960.3	2,162.2	2,075.2	0	0
610 - Lower Slope	0.0	0.0	0.0	0.0	0.0	0.0	18	18
Inside Closure	0.0	0.0	0.0	0.0	0.0	0.0	10	18
Outside Closure	0.0	0.0	0.0	0.0	0.0	0.0	8	0
610 - TOTAL	19,640.5	19,640.5	19,849.9	19,849.9	39,490.4	39,490.4	18	18
Inside Closure	5,254.3	13,335.1	3,679.5	10,370.4	8,933.8	23,705.5	10	18
Outside Closure	14,386.2	6,305.4	16,170.4	9,479.5	30,556.6	15,784.9	8	0
620 - Shelf	21,367.1	21,367.1	18,595.7	18,595.7	39,962.8	39,962.8	0	0
Inside Closure	4,582.6	14,458.8	2,459.3	9,733.0	7,042.0	24,191.8	0	0
Outside Closure	16,784.5	6,908.3	16,136.4	8,862.7	32,920.8	15,771.0	0	0
620 - Upper Slope	6,115.4	6,115.4	2,815.8	2,815.8	8,931.2	8,931.2	0	0
Inside Closure	55.4	2,292.6	208.9	454.0	264.4	2,746.6	0	0
Outside Closure	6,060.0	3,822.8	2,606.9	2,361.8	8,666.9	6,184.7	0	0
620 - Lower Slope	0.0	0.0	0.0	0.0	0.0	0.0	2	2
Inside Closure	0.0	0.0	0.0	0.0	0.0	0.0	0	2
Outside Closure	0.0	0.0	0.0	0.0	0.0	0.0	2	0
620 - TOTAL	27,482.5	27,482.5	21,411.5	21,411.5	48,894.0	48,894.0	2	2
Inside Closure	4,638.1	16,751.4	2,668.3	10,187.0	7,306.3	26,938.4	0	2
Outside Closure	22,844.5	10,731.1	18,743.2	11,224.5	41,587.7	21,955.7	2	0
630 - Shelf	26,699.0	26,699.0	30,266.9	30,266.9	56,965.9	56,965.9	0	0
Inside Closure	4,766.8	10,424.8	4,341.9	22,852.3	9,108.7	33,277.0	0	0
Outside Closure	21,932.2	16,274.2	25,924.9	7,414.6	47,857.1	23,688.8	0	0
630 - Upper Slope	6,524.2	6,524.2	3,938.8	3,938.8	10,463.1	10,463.1	10	10
Inside Closure	202.1	2,690.7	387.0	1,782.8	589.0	4,473.5	6	10
Outside Closure	6,322.1	3,833.5	3,551.9	2,156.1	9,874.0	5,989.6	4	0
630 - Lower Slope	0.0	0.0	0.0	0.0	0.0	0.0	27	27
Inside Closure	0.0	0.0	0.0	0.0	0.0	0.0	11	27
Outside Closure	0.0	0.0	0.0	0.0	0.0	0.0	16	0
630 - TOTAL	33,223.2	33,223.2	34,205.7	34,205.7	67,428.9	67,428.9	37	37
Inside Closure	4,968.9	13,115.5	4,728.9	24,635.0	9,697.8	37,750.5	17	37
Outside Closure	28,254.3	20,107.7	29,476.8	9,570.7	57,731.2	29,678.4	20	0
640 - Shelf	346.4	346.4	1,172.8	1,172.8	1,519.2	1,519.2	0	0
Inside Closure	6.7	279.5	137.1	854.2	143.8	1,133.7	0	0
Outside Closure	339.7	66.9	1,035.7	318.6	1,375.4	385.5	0	0
640 - Upper Slope	1,055.1	1,055.1	1,261.4	1,261.4	2,316.5	2,316.5	10	10
Inside Closure	53.3	358.9	256.0	728.1	309.3	1,087.0	10	10
Outside Closure	1,001.8	696.2	1,005.4	533.3	2,007.2	1,229.5	0	0
640 - Lower Slope	0.0	0.0	0.0	0.0	0.0	0.0	4	4
Inside Closure	0.0	0.0	0.0	0.0	0.0	0.0	0	4
Outside Closure	0.0	0.0	0.0	0.0	0.0	0.0	4	0
640 - TOTAL	1,401.5	1,401.5	2,434.2	2,434.2	3,835.7	3,835.7	14	14
Inside Closure	60.0	638.4	393.1	1,582.3	453.1	2,220.7	10	14
Outside Closure	1,341.5	763.1	2,041.1	851.9	3,382.6	1,615.0	4	0

Table 1 continued

	GFW Trawl Footprint Area (km2)		NPT Catch (1993 - 2021) Sum kg		NPT Catch (2015 - 2019) Sum kg	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
610 - Shelf	3,952	3,952	82,957,527	82,957,527	8,423,185	8,423,185
Inside Closure	459	715	1,510,017	10,489,618	366,079	582,592
Outside Closure	3,493	3,236	81,447,511	72,467,909	8,057,106	7,840,593
610 - Upper Slope	1,124	1,124	33,665,589	33,665,589	11,184,804	11,184,804
Inside Closure	65	108	1,726,182	12,035,844	0	2,031,230
Outside Closure	1,059	1,016	31,939,408	21,629,746	11,184,804	9,153,574
610 - Lower Slope	22	22	0	0	0	0
Inside Closure	1	17	0	0	0	0
Outside Closure	21	5	0	0	0	0
610 - TOTAL	5,097	5,097	116,623,117	116,623,117	19,607,989	19,607,989
Inside Closure	526	840	3,236,199	22,525,462	366,079	2,613,821
Outside Closure	4,572	4,257	113,386,918	94,097,655	19,241,910	16,994,168
620 - Shelf	4,035	4,035	131,668,256	131,668,256	30,598,617	30,598,617
Inside Closure	430	545	7,197,653	9,410,928	786,118	786,118
Outside Closure	3,605	3,491	124,470,603	122,257,327	29,812,499	29,812,499
620 - Upper Slope	3,442	3,442	70,171,010	70,171,010	21,018,921	21,018,921
Inside Closure	93	153	342,380	3,428,092	114,820	509,595
Outside Closure	3,349	3,289	69,828,629	66,742,918	20,904,101	20,509,326
620 - Lower Slope	1	1	0	0	0	0
Inside Closure	0	1	0	0	0	0
Outside Closure	1	0	0	0	0	0
620 - TOTAL	7,479	7,479	201,839,265	201,839,265	51,617,538	51,617,538
Inside Closure	523	699	7,540,033	12,839,020	900,938	1,295,713
Outside Closure	6,955	6,780	194,299,232	189,000,245	50,716,600	50,321,825
630 - Shelf	7,339	7,339	287,081,399	287,081,399	51,951,140	51,951,140
Inside Closure	703	1,067	35,511,790	52,485,888	8,976,315	10,095,145
Outside Closure	6,636	6,272	251,569,609	234,595,511	42,974,825	41,855,995
630 - Upper Slope	3,128	3,128	147,977,474	147,977,474	36,539,247	36,539,247
Inside Closure	79	275	183,099	4,898,700	11,984	556,151
Outside Closure	3,048	2,852	147,794,375	143,078,774	36,527,263	35,983,096
630 - Lower Slope	63	63	3,762,399	3,762,399	2,775,344	2,775,344
Inside Closure	3	53	0	2,822,511	0	2,226,722
Outside Closure	60	10	3,762,399	939,888	2,775,344	548,621
630 - TOTAL	10,530	10,530	438,821,271	438,821,271	91,265,730	91,265,730
Inside Closure	785	1,396	35,694,889	60,207,099	8,988,299	12,878,018
Outside Closure	9,745	9,134	403,126,383	378,614,173	82,277,431	78,387,712
640 - Shelf	136	136	441,347	441,347	0	0
Inside Closure	2	79	84,959	267,824	0	0
Outside Closure	134	57	356,388	173,524	0	0
640 - Upper Slope	900	900	4,759,260	4,759,260	0	0
Inside Closure	175	269	173,120	824,103	0	0
Outside Closure	726	632	4,586,140	3,935,157	0	0
640 - Lower Slope	89	89	0	0	0	0
Inside Closure	59	84	0	0	0	0
Outside Closure	30	5	0	0	0	0
640 - TOTAL	1,125	1,125	5,200,607	5,200,607	0	0
Inside Closure	236	431	258,079	1,091,926	0	0
Outside Closure	890	694	4,942,527	4,108,681	0	0

GFW = Global Fishing Watch, NPT = Non Pelagic Trawl

Table 1 continued

	PT Catch (1993 - 2021) *Sum kg*		PT Catch (2015 - 2019) *Sum kg*		Halibut NPT Bycatch (1993 - 2021) *Sum kg*		Halibut NPT Bycatch (2015 - 2019) *Sum kg*	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
610 - Shelf	101,126,649	101,126,649	28,744,320	28,744,320	1,448,618	1,448,618	64,052	64,052
Inside Closure	32,819,835	55,073,019	13,319,010	15,913,157	21,796	130,085	5,468	5,927
Outside Closure	68,306,814	46,053,629	15,425,310	12,831,163	1,426,821	1,318,533	58,584	58,125
610 - Upper Slope	7,760,185	7,760,185	5,152,278	5,152,278	163,631	163,631	38,891	38,891
Inside Closure	0	1,978,859	0	1,020,622	6,265	54,409	0	11,072
Outside Closure	7,760,185	5,781,326	5,152,278	4,131,656	157,366	109,222	38,891	27,819
610 - Lower Slope	0	0	0	0	0	0	0	0
Inside Closure	0	0	0	0	0	0	0	0
Outside Closure	0	0	0	0	0	0	0	0
610 - TOTAL	108,886,834	108,886,834	33,896,598	33,896,598	1,612,249	1,612,249	102,943	102,943
Inside Closure	32,819,835	57,051,879	13,319,010	16,933,779	28,061	184,494	5,468	16,998
Outside Closure	76,066,999	51,834,955	20,577,588	16,962,819	1,584,188	1,427,755	97,475	85,945
620 - Shelf	71,203,460	71,203,460	14,886,763	14,886,763	3,195,303	3,195,303	463,533	463,533
Inside Closure	39,859,892	40,633,810	3,057,695	3,057,695	174,649	243,047	13,953	13,953
Outside Closure	31,343,568	30,569,651	11,829,068	11,829,068	3,020,654	2,952,256	449,580	449,580
620 - Upper Slope	142,752,526	142,752,526	47,017,306	47,017,306	1,372,001	1,372,001	375,354	375,354
Inside Closure	0	1,143,880	0	0	1,587	30,280	547	643
Outside Closure	142,752,526	141,608,646	47,017,306	47,017,306	1,370,414	1,341,721	374,807	374,711
620 - Lower Slope	0	0	0	0	0	0	0	0
Inside Closure	0	0	0	0	0	0	0	0
Outside Closure	0	0	0	0	0	0	0	0
620 - TOTAL	213,955,986	213,955,986	61,904,069	61,904,069	4,567,304	4,567,304	838,887	838,887
Inside Closure	39,859,892	41,777,690	3,057,695	3,057,695	176,236	273,327	14,501	14,597
Outside Closure	174,096,094	172,178,296	58,846,374	58,846,374	4,391,068	4,293,977	824,387	824,291
630 - Shelf	207,676,655	207,676,655	59,473,723	59,473,723	9,658,528	9,658,528	1,068,082	1,068,082
Inside Closure	90,563,298	90,828,948	15,894,475	15,894,475	1,256,049	1,678,214	194,098	214,802
Outside Closure	117,113,358	116,847,707	43,579,248	43,579,248	8,402,479	7,980,313	873,984	853,279
630 - Upper Slope	42,955,235	42,955,235	12,992,555	12,992,555	2,021,825	2,021,825	213,194	213,194
Inside Closure	0	636,441	0	0	4,369	63,911	210	4,037
Outside Closure	42,955,235	42,318,794	12,992,555	12,992,555	2,017,456	1,957,914	212,984	209,157
630 - Lower Slope	272,395	272,395	0	0	23,051	23,051	8,573	8,573
Inside Closure	0	272,395	0	0	0	8,457	0	4,295
Outside Closure	272,395	0	0	0	23,051	14,594	8,573	4,277
630 - TOTAL	250,904,285	250,904,285	72,466,278	72,466,278	11,703,404	11,703,404	1,289,848	1,289,848
Inside Closure	90,563,298	91,737,783	15,894,475	15,894,475	1,260,418	1,750,582	194,308	223,135
Outside Closure	160,340,987	159,166,502	56,571,802	56,571,802	10,442,986	9,952,821	1,095,540	1,066,714
640 - Shelf	3,020,580	3,020,580	0	0	18,103	18,103	0	0
Inside Closure	0	3,020,580	0	0	2,213	8,328	0	0
Outside Closure	3,020,580	0	0	0	15,890	9,775	0	0
640 - Upper Slope	591,890	591,890	0	0	138,703	138,703	0	0
Inside Closure	0	0	0	0	9,545	23,260	0	0
Outside Closure	591,890	591,890	0	0	129,158	115,443	0	0
640 - Lower Slope	6,597,309	6,597,309	965,325	965,325	0	0	0	0
Inside Closure	6,597,309	6,597,309	965,325	965,325	0	0	0	0
Outside Closure	0	0	0	0	0	0	0	0
640 - TOTAL	10,209,779	10,209,779	965,325	965,325	156,806	156,806	0	0
Inside Closure	6,597,309	9,617,889	965,325	965,325	11,758	31,588	0	0
Outside Closure	3,612,470	591,890	0	0	145,048	125,218	0	0

PT = Pelagic Trawl

Table 1 continued

	Crab NPT Bycatch (1993 - 2021) *Sum kg*		Crab NPT Bycatch (2015 - 2019) *Sum kg*		Invertebrate NPT Bycatch (1993 - 2021) *Sum kg*		Invertebrate NPT Bycatch (2015 - 2019) *Sum kg*	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
610 - Shelf	5,658	5,658	146	146	21,579	21,579	1,216	1,216
Inside Closure	334	980	0	12	365	3,028	47	391
Outside Closure	5,323	4,677	146	135	21,214	18,551	1,169	825
610 - Upper Slope	4,604	4,604	1,722	1,722	21,336	21,336	1,673	1,673
Inside Closure	14	1,609	0	645	263	2,892	0	729
Outside Closure	4,591	2,996	1,722	1,078	21,073	18,444	1,673	943
610 - Lower Slope	0	0	0	0	0	0	0	0
Inside Closure	0	0	0	0	0	0	0	0
Outside Closure	0	0	0	0	0	0	0	0
610 - TOTAL	10,262	10,262	1,868	1,868	42,915	42,915	2,889	2,889
Inside Closure	348	2,589	0	656	628	5,920	47	1,120
Outside Closure	9,914	7,673	1,868	1,212	42,287	36,995	2,842	1,769
620 - Shelf	12,409	12,409	3,035	3,035	13,733	13,733	1,497	1,497
Inside Closure	2,844	3,201	35	35	397	539	13	13
Outside Closure	9,565	9,208	3,000	3,000	13,336	13,193	1,485	1,485
620 - Upper Slope	7,538	7,538	3,032	3,032	4,478	4,478	1,282	1,282
Inside Closure	0	1,145	0	33	0	117	0	18
Outside Closure	7,538	6,393	3,032	2,999	4,478	4,361	1,282	1,265
620 - Lower Slope	0	0	0	0	0	0	0	0
Inside Closure	0	0	0	0	0	0	0	0
Outside Closure	0	0	0	0	0	0	0	0
620 - TOTAL	19,946	19,946	6,067	6,067	18,211	18,211	2,780	2,780
Inside Closure	2,844	4,346	35	68	397	656	13	30
Outside Closure	17,102	15,601	6,032	5,999	17,814	17,555	2,767	2,749
630 - Shelf	228,454	228,454	38,452	38,452	82,985	82,985	6,619	6,619
Inside Closure	46,755	52,964	12,299	12,323	18,574	28,791	1,385	1,421
Outside Closure	181,699	175,490	26,153	26,129	64,411	54,194	5,235	5,199
630 - Upper Slope	12,514	12,514	4,933	4,933	18,676	18,676	4,451	4,451
Inside Closure	206	810	8	100	720	2,268	0	110
Outside Closure	12,309	11,704	4,926	4,834	17,956	16,407	4,451	4,341
630 - Lower Slope	435	435	403	403	1,609	1,609	796	796
Inside Closure	0	68	0	62	0	127	0	97
Outside Closure	435	367	403	341	1,609	1,483	796	699
630 - TOTAL	241,403	241,403	43,788	43,788	103,269	103,269	11,866	11,866
Inside Closure	46,961	53,843	12,307	12,486	19,293	31,186	1,385	1,628
Outside Closure	194,443	187,561	31,481	31,303	83,976	72,083	10,482	10,239
640 - Shelf	17	17	0	0	48	48	0	0
Inside Closure	1	12	0	0	0	48	0	0
Outside Closure	16	5	0	0	48	0	0	0
640 - Upper Slope	212	212	0	0	1,752	1,752	0	0
Inside Closure	0	14	0	0	8	44	0	0
Outside Closure	212	198	0	0	1,743	1,707	0	0
640 - Lower Slope	0	0	0	0	0	0	0	0
Inside Closure	0	0	0	0	0	0	0	0
Outside Closure	0	0	0	0	0	0	0	0
640 - TOTAL	228	228	0	0	1,800	1,800	0	0
Inside Closure	1	26	0	0	8	93	0	0
Outside Closure	227	202	0	0	1,792	1,707	0	0

Table 1 continued

	LGL + POT (1993 - 2021) *Sum kg*		LGL + POT (2015 - 2019) *Sum kg*		Chinook NPT Bycatch (1993 - 2021) *Sum kg*		Chinook NPT Bycatch (2015 - 2019) *Sum kg*	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
610 - Shelf	23,994,580	23,994,580	6,127,841	6,127,841	13,819	13,819	695	695
Inside Closure	2,483,646	9,885,005	976,520	2,807,999	658	1,076	190	190
Outside Closure	21,510,934	14,109,575	5,151,321	3,319,842	13,161	12,743	505	505
610 - Upper Slope	23,472,664	23,472,664	2,146,120	2,146,120	1,757	1,757	167	167
Inside Closure	3,230,655	7,174,992	495,158	841,543	190	613	0	0
Outside Closure	20,242,009	16,297,672	1,650,962	1,304,577	1,566	1,144	167	167
610 - Lower Slope	2,621,710	2,621,710	106,049	106,049	0	0	0	0
Inside Closure	0	2,621,710	0	106,049	0	0	0	0
Outside Closure	2,621,710	0	106,049	0	0	0	0	0
610 - TOTAL	50,088,953	50,088,953	8,380,011	8,380,011	15,575	15,575	861	861
Inside Closure	5,714,301	19,681,707	1,471,678	3,755,592	848	1,689	190	190
Outside Closure	44,374,652	30,407,247	6,908,333	4,624,419	14,727	13,887	672	672
620 - Shelf	5,974,811	5,974,811	1,743,928	1,743,928	25,444	25,444	1,969	1,969
Inside Closure	1,328,262	1,495,266	493,281	555,289	2,656	3,409	0	0
Outside Closure	4,646,549	4,479,545	1,250,647	1,188,639	22,789	22,035	1,969	1,969
620 - Upper Slope	5,618,131	5,618,131	576,453	576,453	10,502	10,502	930	930
Inside Closure	622,052	1,830,159	40,773	165,129	0	0	0	0
Outside Closure	4,996,079	3,787,972	535,680	411,324	10,502	10,502	930	930
620 - Lower Slope	281,120	281,120	30,682	30,682	0	0	0	0
Inside Closure	0	281,120	0	30,682	0	0	0	0
Outside Closure	281,120	0	30,682	0	0	0	0	0
620 - TOTAL	11,874,061	11,874,061	2,351,063	2,351,063	35,947	35,947	2,898	2,898
Inside Closure	1,950,314	3,606,545	534,054	751,100	2,656	3,409	0	0
Outside Closure	9,923,748	8,267,517	1,817,009	1,599,964	33,291	32,537	2,898	2,898
630 - Shelf	6,710,588	6,710,588	1,766,178	1,766,178	59,550	59,550	2,938	2,938
Inside Closure	1,679,844	3,352,965	980,880	1,169,230	3,439	4,941	329	550
Outside Closure	5,030,744	3,357,623	785,298	596,948	56,111	54,609	2,609	2,388
630 - Upper Slope	26,306,073	26,306,073	4,565,770	4,565,770	41,249	41,249	2,197	2,197
Inside Closure	239,467	6,998,696	82,155	1,103,495	0	41	0	0
Outside Closure	26,066,606	19,307,376	4,483,616	3,462,276	41,249	41,208	2,197	2,197
630 - Lower Slope	2,061,795	2,061,795	382,798	382,798	0	0	0	0
Inside Closure	0	1,665,322	0	304,458	0	0	0	0
Outside Closure	2,061,795	396,473	382,798	78,340	0	0	0	0
630 - TOTAL	35,078,456	35,078,456	6,714,746	6,714,746	100,799	100,799	5,135	5,135
Inside Closure	1,919,311	12,016,983	1,063,035	2,577,183	3,439	4,982	329	550
Outside Closure	33,159,145	23,061,473	5,651,711	4,137,564	97,360	95,817	4,806	4,585
640 - Shelf	1,849,372	1,849,372	240,032	240,032	6	6	0	0
Inside Closure	303,561	1,722,327	91,965	211,805	0	0	0	0
Outside Closure	1,545,810	127,045	148,067	28,227	6	6	0	0
640 - Upper Slope	10,517,979	10,517,979	1,596,366	1,596,366	3,002	3,002	0	0
Inside Closure	1,460,697	6,098,266	383,126	875,424	0	1	0	0
Outside Closure	9,057,282	4,419,712	1,213,240	720,942	3,002	3,001	0	0
640 - Lower Slope	2,601,707	2,601,707	227,630	227,630	0	0	0	0
Inside Closure	1,786,709	2,601,707	104,597	227,630	0	0	0	0
Outside Closure	814,999	0	123,032	0	0	0	0	0
640 - TOTAL	14,969,058	14,969,058	2,064,028	2,064,028	3,009	3,009	0	0
Inside Closure	3,550,967	10,422,300	579,689	1,314,859	0	1	0	0
Outside Closure	11,418,091	4,546,757	1,484,339	749,169	3,009	3,008	0	0

LGL = longline

Table 2. Geographic area analysis for the GOA proposal area (stat areas 610-640 combined)

	Area (km^2)		cobble/ boulder habitat area (km^2)		Corals (*# of observations*)		Sponges *(# of observations)*	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
GOA TOTAL (610-640)	973,292	973,292	59,021	59,021	3,101	3,101	10,656	10,656
Inside Closure	83,714	871,556	22,904	55,165	612	1,703	1,650	5,291
Outside Closure	889,577	101,735	36,117	3,857	2,489	1,398	9,006	5,365
Shelf TOTAL	223,109	223,109	35,122	35,122	975	975	6,596	6,596
Inside Closure	60,811	157,507	19,979	32,316	68	489	665	3,561
Outside Closure	162,298	65,602	15,144	2,807	907	486	5,931	3,035
Upper Slope TOTAL	61,244	61,244	2,070	2,070	1,527	1,527	3,684	3,684
Inside Closure	6,301	26,686	582	1,024	200	615	713	1,354
Outside Closure	54,943	34,558	1,488	1,046	1,327	912	2,971	2,330
Lower Slope TOTAL	688,939	688,939	21,829	21,829	599	599	376	376
Inside Closure	16,602	687,363	2,343	21,825	344	599	272	376
Outside Closure	672,337	1,575	19,486	4	255	0	104	0

	Pennatulids *(# of observations)*		Coral Habitat Model 25-50% prob (area km2)		Coral Habitat Model >50% prob (area km2)		Coral Habitat > 25% sum	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
GOA TOTAL (610-640)	1,549	1,549	5,072	5,072	195	195	5,266	5,266
Inside Closure	430	908	310	2,421	31	143	341	2,564
Outside Closure	1,119	641	4,762	2,651	164	51	4,926	2,702
Shelf TOTAL	1,195	1,195	1,697	1,697	0	0	1,697	1,697
Inside Closure	351	756	16	251	0	0	16	251
Outside Closure	844	439	1,681	1,445	0	0	1,681	1,445
Upper Slope TOTAL	318	318	3,356	3,356	191	191	3,548	3,548
Inside Closure	45	116	290	2,162	31	141	321	2,303
Outside Closure	273	202	3,067	1,194	161	51	3,227	1,245
Lower Slope TOTAL	36	36	19	19	3	3	22	22
Inside Closure	34	36	4	7	0	3	4	10
Outside Closure	2	0	15	11	3	1	18	12

Table 2 continued

	Sponge Habitat Model 25-50% prob (area km2)		Sponge Habitat Model >50% prob (area km2)		Sponge Habitat > 25% sum		Seamounts	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
GOA TOTAL (610-640)	81,748	81,748	77,901	77,901	159,649	159,649	71	71
Inside Closure	14,921	43,840	11,470	46,775	26,391	90,615	37	71
Outside Closure	66,827	37,907	66,432	31,127	133,258	69,034	34	0
Shelf TOTAL	67,911	67,911	67,670	67,670	135,582	135,582	0	0
Inside Closure	14,609	38,472	10,425	43,555	25,034	82,027	0	0
Outside Closure	53,302	29,440	57,245	24,115	110,548	53,555	0	0
Upper Slope TOTAL	13,836	13,836	10,231	10,231	24,067	24,067	20	20
Inside Closure	312	5,369	1,045	3,220	1,357	8,589	16	20
Outside Closure	13,524	8,468	9,186	7,011	22,710	15,479	4	0
Lower Slope TOTAL	0	0	0	0	0	0	51	51
Inside Closure	0	0	0	0	0	0	21	51
Outside Closure	0	0	0	0	0	0	30	0

	GFW Trawl Footprint Area (km2)		NPT Catch (1993 - 2021) Sum kg		NPT Catch (2015 - 2019) Sum kg		PT Catch (1993 - 2021) *Sum kg*	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
GOA TOTAL (610-640)	24,231	24,231	762,484,261	762,484,261	162,491,257	162,491,257	583,956,884	583,956,884
Inside Closure	2,069	3,365	46,729,200	96,663,507	10,255,316	16,787,552	169,840,333	200,185,241
Outside Closure	22,162	20,866	715,755,061	665,820,753	152,235,941	145,703,705	414,116,550	383,771,643
Shelf TOTAL	15,462	15,462	502,148,529	502,148,529	90,972,941	90,972,941	383,027,344	383,027,344
Inside Closure	1,593	2,406	44,304,419	72,654,258	10,128,512	11,463,854	163,243,024	189,556,357
Outside Closure	13,868	13,056	457,844,111	429,494,271	80,844,430	79,509,087	219,784,320	193,470,987
Upper Slope TOTAL	8,594	8,594	256,573,333	256,573,333	68,742,973	68,742,973	194,059,836	194,059,836
Inside Closure	412	805	2,424,781	21,186,738	126,805	3,096,976	0	3,759,180
Outside Closure	8,181	7,789	254,148,551	235,386,595	68,616,168	65,645,996	194,059,836	190,300,656
Lower Slope TOTAL	175	175	3,762,399	3,762,399	2,775,344	2,775,344	6,869,704	6,869,704
Inside Closure	63	155	0	2,822,511	0	2,226,722	6,597,309	6,869,704
Outside Closure	112	20	3,762,399	939,888	2,775,344	548,621	272,395	0

Table 2 continued

	PT Catch (2015 - 2019) *Sum kg*		Halibut NPT Bycatch (1993 - 2021) *Sum kg*		Halibut NPT Bycatch (2015 - 2019) *Sum kg*		Crab NPT Bycatch (1993 - 2021) *Sum kg*	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
GOA TOTAL (610-640)	169,232,269	169,232,269	18,039,762	18,039,762	2,231,679	2,231,679	271,840	271,840
Inside Closure	33,236,505	36,851,274	1,476,473	2,239,991	214,276	254,729	50,154	60,804
Outside Closure	135,995,764	132,380,995	16,563,289	15,799,771	2,017,402	1,976,949	221,687	211,037
Shelf TOTAL	103,104,805	103,104,805	14,320,551	14,320,551	1,595,667	1,595,667	246,537	246,537
Inside Closure	32,271,180	34,865,327	1,454,707	2,059,674	213,519	234,682	49,935	57,157
Outside Closure	70,833,625	68,239,478	12,865,844	12,260,878	1,382,148	1,360,985	196,602	189,380
Upper Slope TOTAL	65,162,139	65,162,139	3,696,160	3,696,160	627,440	627,440	24,868	24,868
Inside Closure	0	1,020,622	21,765	171,860	758	15,752	219	3,578
Outside Closure	65,162,139	64,141,517	3,674,395	3,524,300	626,682	611,687	24,649	21,290
Lower Slope TOTAL	965,325	965,325	23,051	23,051	8,573	8,573	435	435
Inside Closure	965,325	965,325	0	8,457	0	4,295	0	68
Outside Closure	0	0	23,051	14,594	8,573	4,277	435	367

	Crab NPT Bycatch (2015 - 2019) *Sum kg*		Invertebrate NPT Bycatch (1993 - 2021) *Sum kg*		Invertebrate NPT Bycatch (2015 - 2019) *Sum kg*		LGL + POT (1993 - 2021) *Sum kg*	
Area	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
GOA TOTAL (610-640)	51,724	51,724	166,195	166,195	17,535	17,535	112,010,528	112,010,528
Inside Closure	12,342	13,210	20,326	37,855	1,444	2,778	13,134,893	45,727,535
Outside Closure	39,382	38,514	145,869	128,340	16,091	14,757	98,875,635	66,282,993
Shelf TOTAL	41,633	41,633	118,345	118,345	9,333	9,333	38,529,351	38,529,351
Inside Closure	12,334	12,370	19,335	32,407	1,444	1,824	5,795,314	16,455,563
Outside Closure	29,299	29,264	99,009	85,938	7,888	7,509	32,734,037	22,073,788
Upper Slope TOTAL	9,687	9,687	46,241	46,241	7,406	7,406	65,914,846	65,914,846
Inside Closure	8	778	991	5,322	0	857	5,552,870	22,102,114
Outside Closure	9,680	8,910	45,250	40,920	7,406	6,549	60,361,975	43,812,732
Lower Slope TOTAL	403	403	1,609	1,609	796	796	7,566,332	7,566,332
Inside Closure	0	62	0	127	0	97	1,786,709	7,169,859
Outside Closure	403	341	1,609	1,483	796	699	5,779,623	396,473

Table 2 continued

	LGL + POT (2015 - 2019) *Sum kg*		Chinook NPT Bycatch (1993 - 2021) *Sum kg*		Chinook NPT Bycatch (2015 - 2019) *Sum kg*	
Area	**Baseline**	**Proposed**	**Baseline**	**Proposed**	**Baseline**	**Proposed**
GOA TOTAL (610-640)	19,509,848	19,509,848	155,329	155,329	8,895	8,895
Inside Closure	3,648,455	8,398,732	6,943	10,080	518	739
Outside Closure	15,861,392	11,111,115	148,386	145,249	8,376	8,155
Shelf TOTAL	9,877,980	9,877,980	98,819	98,819	5,601	5,601
Inside Closure	2,542,646	4,744,324	6,753	9,425	518	739
Outside Closure	7,335,334	5,133,656	92,066	89,394	5,083	4,862
Upper Slope TOTAL	8,884,710	8,884,710	56,510	56,510	3,294	3,294
Inside Closure	1,001,212	2,985,591	190	655	0	0
Outside Closure	7,883,498	5,899,119	56,320	55,855	3,294	3,294
Lower Slope TOTAL	747,158	747,158	0	0	0	0
Inside Closure	104,597	668,818	0	0	0	0
Outside Closure	642,561	78,340	0	0	0	0