

## AN ABSTRACT OF THE THESIS OF

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Title: A Policy Perspective on the Emergence and Fate of U.S. West Coast Rockfish Conservation Areas.

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Michael Harte

### Abstract

Rockfish Conservation Areas (RCAs) are large areas closed to fishing in federal waters off the Washington, Oregon and California coasts. The Pacific Fisheries Management Council (PFMC) was responsible for the creation and regulation of the RCAs. The RCA boundaries were defined in 2002 to rebuild rockfish species declared as overfished in 2000. In 2006, the National Marine Fisheries Service (NMFS) designated approximately 12,620 square miles of the preexisting RCAs as groundfish Essential Fish Habitat Conservation Areas (EFHCAs). The addition of the EFHCAs was met with criticism from some frustrated stakeholders, who already saw the RCAs as an imposition on commercial fishing opportunities. This research explores deliberations leading up to the implementation of the RCAs and the establishment of groundfish EFHCAs and elicits stakeholder opinions about whether these management measures were beneficial to the fisheries and fishery management. The study also focuses on a recent trawl RCA, groundfish EFHCA designations, and decisions made by the Pacific Fisheries Management Council called Amendment 28; and the final action vote which was voted on in April 2018. Key findings from a content analysis of written documents and interviews with stakeholders suggest that unlike the 2002 RCA and 2006 EFH decisions, Amendment 28 was an effective stakeholder-driven process deemed successful by most participants. The general view of stakeholders is that the original RCA (2002) in combination with other management measures including groundfish EFHCAs (2006) and a subsequent Catch Share Program for the groundfish trawl sector (2011) helped rebuild overfished rockfish species. In Amendment 28, the PFMC took final action to reopen approximately 3,000 square miles to groundfish bottom trawling by eliminating the trawl RCA off of California and Oregon (though retained off

Washington), close approximately 13,000 square miles designated as EFH, and close approximately 123,000 square miles to all bottom contact groundfish gear, in waters deeper than 3,500 meters. An analysis of the Amendment, stakeholder submissions and comments suggest that the Pacific Fishery Management Council is increasingly adopting regulations consistent with ecosystem, rather than single species, based fisheries management.

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A Policy Perspective on the Emergence and Fate of U.S. West Coast Rockfish Conservation Areas

by  
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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Alexandra Spahr, Author

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## LIST OF ACRONYMS

1. BAC- Block Area Closure
2. CBNMS- Cordell Bank National Marine Sanctuary
3. CBTA- Coos Bay Trawlers Association
4. CCF- Capital Construction Fund
5. DAC- Discrete Area Closure
6. EBFM- Ecosystem Based Fisheries Management
7. EDF- Environmental Defense Fund
8. EEZ- Exclusive Economic Zone
9. EFH- Essential Fish Habitat
10. EFHCA- Essential Fish Habitat Conservation Areas
11. EIS- Environmental Impact Statement
12. EPAP- Ecosystem Principles Advisory Panel
13. FMA- Fishermen's Marketing Association
14. FMC- Fishery Management Council
15. FMP- Fishery Management Plan
16. FVOG- Fishing Vessel Obligation Guarantee
17. GFNMS- Greater Farallones National Marine Sanctuary
18. HAPC- Habitat Areas of Particular Concern
19. IFQ Program- Individual Fishing Quota Program
20. MBNMS- Monterey Bay National Marine Sanctuary
21. MSA- The Magnuson- Stevens Fishery Conservation and Management Act
22. MSY- Maximum Sustainable Yield
23. MTC- Midwater Trawlers Cooperative
24. NEPA- National Environmental Policy Act
25. NMFS- National Marine Fisheries Service
26. NOAA- National Oceanic and Atmospheric Administration
27. NRDC- Natural Resource Defense Council
28. OTC- Oregon Trawl Commission

## LIST OF ACRONYMS (Continued)

- 29. OY- Optimum Yield
- 30. PCA- Production Credit Associations
- 31. PFMC- Pacific Fisheries Management Council
- 32. POP- Pacific Ocean Perch
- 33. RCA- Rockfish Conservation Areas
- 34. SFA- The Sustainable Fisheries Act
- 35. TNC- The Nature Conservancy

## 1. Introduction

Historically, the oceans were governed by the concept of freedom of the seas, or “mare liberum” (Grotius, 1609; Baur et al., 2015, p. 2). The vastness of the ocean and relative lack of regulations led to the over exploitation of many fishery resources (Harden, 1968; Berkes et al., 1989). A “tragedy of the commons” scenario occurs when natural resources lack clear property rights (Gordon 1954; Hardin, 1968; Mansfield, 2001). In the modern era, this scenario characterized the United States Pacific Groundfish Trawl Sector fishing off the coast of California, Oregon and Washington. Until the last decade of the 20<sup>th</sup> century it lacked comprehensive management measures and operated under a “prevailing open-access regime; where anyone could fish” (Mansfield, 2001, p. 386; PFMC 1992). This open-access regime led fishers to race to catch as many fish at once as they could; which led to “overcapitalization and overfishing of fish stocks” consistent with a tragedy of the commons (Hannesson, 1991; Gordon, 1954; Hardin, 1968). By 2001, despite efforts to address challenges, overfishing of rockfish and other groundfish species within the Pacific Groundfish Trawl Sector led to the Pacific Fisheries Management Council (PFMC) implementing regulatory measures that impacted fishermen, processors and members of local communities and the fish stocks they depended on. These changes included the creation of Rockfish Conservation Areas (RCAs) in 2002 and groundfish Essential Fish Habitat (EFH) in 2006, which led to large areas closed to trawling in federal waters (3 nm to 200 nm) off the Washington, Oregon and California coasts.

### 1.1 Study context: Essential Fish Habitats, Rockfish Conservation Areas, and Amendment 28

Although EFH and RCAs are both spatial management measures they have different statutory

purposes that are not necessarily obvious to stakeholders in the PFMC process (61 FR 34572, July 2, 1996). The stated legislative goal of the RCAs is to rebuild overfished rockfish species, while Amendment 19 (2006) established groundfish EFH to mitigate the impacts from groundfish fishing activities such as bottom trawling and additionally help rebuild overfished stocks (Pettinger et al., 2013; 50 CFR 660.70 (r ); FMP: Amendment 19, 2017).

By 2014, with overfished rockfish stocks rebuilt or rebuilding, the PFMC asked the National Marine Fisheries Service (NMFS) to consider adjusting the trawl RCA to benefit fishermen (Table 1). NMFS expressed concern for the potential negative impacts that reducing the trawl RCA could have on the groundfish EFHs. The agency then conducted a legally required NEPA analysis and developed an Environmental Impact Statement (EIS) to determine what habitat impacts could result from reducing the trawl RCA.

Table 1-Dates of rockfish species declared overfished and rebuilt (Monterey Bay Fisheries Trust, 2017).

West Coast Rockfish Species	Declared Overfished	Declared Recovered
Bocaccio	1999	2017
Canary	2000	2015
Cowcod	1999	Still being rebuilt
Darkblotched	2000	2017
POP	1999	2017
Widow	2001	2012
Yelloweye	2002	Still being rebuilt

As a result of the NEPA evaluation and EIS, NMFS recommended that the PFMC combine the modifications to the trawl RCA with the upcoming EFH Five Year Review (2014) in order to analyze the impacts to groundfish EFH when considering any RCA changes. The merging of the groundfish EFH review with consideration of potential changes to the trawl RCA were done because of the spatial nature of the two management mechanisms. However, the

merger also increased the complexity of the amendment, which was intended to be an update to the groundfish EFH but instead turned into a long process to determine the fate of the trawl RCA.

The PFMC completed a Congressionally mandated periodic review of the groundfish EFH in 2014, and determined that new data, which showed the initial (2006) EFH designation process had designated some areas as EFH that were not EFH. These data showed that the changes were warranted to the groundfish Essential Fish Habitat Conservation Areas (EFHCAs) component elements of the Groundfish Fishery Management Plan (GFMP). The EFHCAs are a classification within the broader groundfish EFH in which there are areas closed to specified types of fishing (Region N.F.W.C; Table 2). The EFHCAs are areas closed to bottom-contact gear to “minimize the adverse effects of the groundfish fishery on EFH” (Federal Register, 2016, 5104). New data on the EFHCAs and trawl RCA prompted the PFMC to begin the process of accepting alternative proposals for these designations; which became known as Amendment 28 to the GFMP (PFMC, 2018; Groundfish EFH, 2016; Figure 1). It is Amendment 28, and the process that led to it, that is the focus of this research.

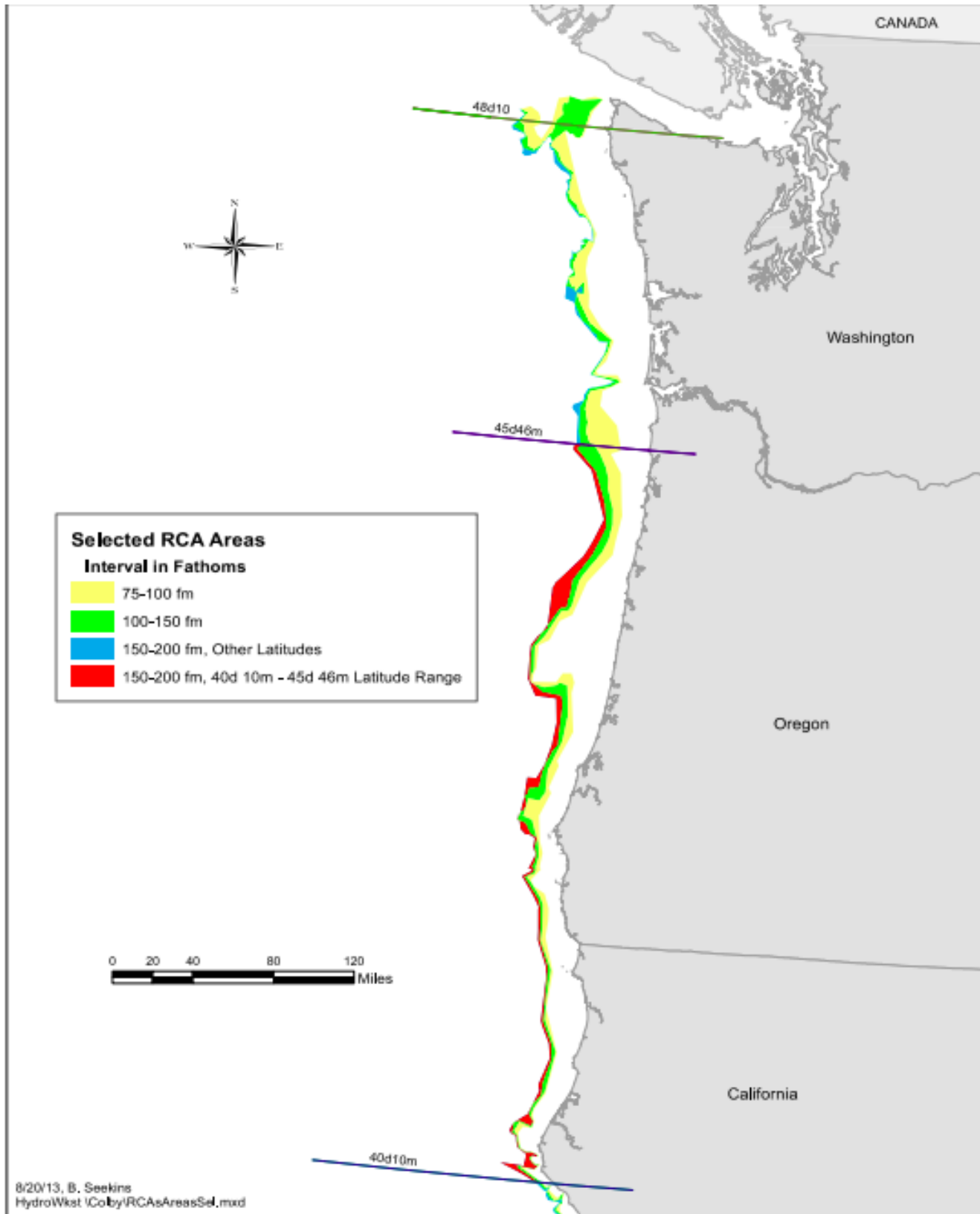


Figure 1-West Coast Rockfish Conservation Area. Highlighting the proposed action areas for Amendment 28 vote, based on latitude and fathom (Trawl RCA, 2014).



## 1.2 Ecosystem-based Fishery Management

In 1999 the NMFS Ecosystem Principles Advisory Panel (EPAP) recommended basic principles for implementing ecosystem-based fishery management (EBFM) to Congress (Ecosystem Principles Advisory Panel, 1999). EPAP recommended two key recommendations: “Proactively evaluate the effects of potential new fisheries in advance and apply the precautionary approach”. EBFM conceives that management measures should incorporate a holistic approach to fisheries management, starting with managing the ecosystem rather than the target species and “strives to balance diverse societal objectives” (Pikitch et al., 2004; Wesley and Link, 2015, p. 75). EBFM is increasingly a major management focus for FMCs in the U.S. and served as a prominent argument throughout the Amendment 28 process as to why new and modified EFHCAs were warranted, as well as was instrumental in the concept of “freezing the trawl footprint”, which is discussed later in the Amendment 28 process.

## 1.3 Research Questions

The goal of this research is to explore the views of different stakeholders involved in the process of creating various alternatives to be considered for Amendment 28. This paper attempts to gauge the following:

- Perceptions of the past effectiveness of the RCA and EFH designations, and their role in stock rebuilding relative to other management measures;
- Perception of the role the RCAs played during the Amendment 28 decision in the management of the Pacific groundfish fishery directly and in the combination with other groundfish management measures.

- The future role of the RCAs or similar spatial management measures in groundfish management directly and in the combination of with other groundfish management measures.

Another product of this research is a visual representation of the past and present critical policies and decisions that led the West Coast RCAs and groundfish EFH. This was done by using ArcGIS to create a Story Map to show the history of these designations and the Pacific groundfish trawl sector. (Appendix E for full timeline; Story Map Link:

<https://www.arcgis.com/apps/Cascade/index.html?appid=66a18016db2e429f954c77b2db24ab6a>)

## 2. Background to the Pacific Groundfish Fishery and Trawl Sector

Following evolving international law under the United Nations Convention of the Law of the Sea in which the U.S. participated, President Ronald Reagan established the United States' Exclusive Economic Zone proclaiming "sovereign rights and control over the living and non-living natural resources of the seabed, subsoil and superjacent waters beyond the territorial sea but within the 200 nautical miles of the United States Coast" (Reagan Proclamation 5030, March 10, 1983). The Magnuson Stevens Fishery Conservation and Management Act of 1976 (MSA) established eight regional Fishery Management Councils (FMC) (16 USC 1801 et seq.). The PFMC has jurisdiction over 317,690 square miles of EEZ from Washington, Oregon, and California and is made up of 14 voting representatives from these states and Idaho. The Council members are representatives from the state, tribal, industry, and environmental sectors. The PFMC manages 119 different marine species, including: salmon, groundfish, coastal pelagic species, and highly migratory species (Highly Migratory Species, 2014). They also participate in the international fishery management organizations for species that migrate through the PFMC region. These organizations include the Pacific Halibut Commission, the Western and Central Pacific Fisheries Commission, and Inter-American Tropical Tuna Commission (PFMC, 2018). To enact new policies concerning these species, the PFMC recommends the policies to the Secretary of Commerce through the National Marine Fisheries Service (NMFS). If accepted, the policies are implemented by the NMFS West Coast Regional offices and enforced by The National Oceanic and Atmospheric Administration (NOAA), the Coast Guard and local enforcement agencies (PFMC, 2018).

Prior to the MSFCMA and the establishment of regional FMCs, people had fished rockfish and other groundfish for thousands of years on the West Coast (Love et al. 2002). The first mention of a commercial rockfish fishery was during the California Gold Rush (1848-1855) (Love et al., 2002, 72). Rockfish became a staple of marine fisheries in the U.S, due to increase in demand for seafood and advancement of technology during the second World War (Love et al. 2002).

In the 1960s the Russians began using a factory trawler in their fishing industry, including off the US West Coast. The factory trawler, a massive ship designed to roll over large patches of rocky seafloor, allowed the Russians to conduct at-sea fish processing. This technique resulted in increased yields because the vessels were able to process the fish at sea, rather than in ports. This allowed the Russians to fish more desirable stocks like Pacific Ocean Perch (POP). Soon the Japanese also began using factory trawlers to catch POP.

In the late 1970s and early 1980s U.S. federal, state and regional governments began passing regulations to restrict foreign fishing fleet access to the U.S. fisheries. Foreign fishers had already begun moving to other fishing ventures, due to the depletion of rockfish stocks, like the POP (Love et al. 2002). U.S. domestic fleets continued fishing this stock and further depleting their numbers.

During the 1970s, NMFS (NOAA Fisheries) and PFMC crafted policies to create and establish the West Coast groundfish fishery as a valuable economic resource for the U.S. Through the 1976 MSA, the U.S. Congress developed a national fisheries program to benefit the nation and provide economic opportunities for the coastal communities of the Pacific Northwest (Healy, 1984; Patrick, 2015).

Two significant changes led to the growth of the West Coast Groundfish Trawl Sector. First, the U.S. began a program providing fishers with low-interest loans for fishing equipment and vessels. The average costs of new fishing vessels ranged from \$1 to 3 million, while factory trawlers cost around \$18 to 22 million. Loans were provided for larger, stronger nets, new fishing gear, sonar and net recorders (WCFDF, 1982; PFMC, 1993; Fishermen's News, 1978). Both national and regional programs helped finance these new vessels, encouraging the growth of the Groundfish Trawl Sector. Fishers had access to government-backed credit and financing through Production Credit Associations (PCAs), which provided direct loans for fishing vessels (OCZMA, 1985b; Mansfield, 2001). NOAA created two programs for financial assistance; the Fishing Vessel Obligation Guarantee (FVOG) and the Capital Construction Fund (CCF); both programs intended to encourage new construction of groundfish vessels and to ultimately expand West Coast Fisheries (Mansfield, 2001). Research grants were also created promoting the development of the Groundfish Sector through the Saltonstall-Kennedy grants program. Most of the new Pacific groundfish vessels in the late 1970s were funded through these federal programs (House, 1980a).

In passing the 1976 Magnuson Stevens Fishery Conservation and Management Act (MSA), Congress specifically recognized the factor represented by overharvest by foreign fishing fleets (16 USC 1801(3), Findings):

*(3) Commercial and recreational fishing constitutes a major source of employment and contributes significantly to the economy of the Nation. Many coastal areas are dependent upon fishing and related activities, and their economies have been badly damaged by the overfishing of fishery resources at an ever-increasing rate over the past decade. The activities of massive foreign fishing fleets in waters adjacent to such coastal areas have contributed to such damage, interfered with domestic fishing efforts, and caused destruction of the fishing gear of United States fishermen (16 USC 1801 (3)).*

A second large impact on the Groundfish Trawl Sector was an influx of immigrants in the 1970s, primarily from southeast Asian countries such as Vietnam (Love et al., 2002, p. 75). The new entrants into the fishery quickly realized the potential market back home, as well as domestically for rockfish and began a fishing industry using gillnets. Gillnets and their unregulated use eventually led to the decline of blackgill and bank rockfish stock by the 1990s (Love et al., 2002, p. 75). Domestic and foreign fishing coupled with misunderstanding of rockfish habitat, biology and reproduction led to the rockfish to quickly decline in the Pacific Groundfish Trawl Sector.

The MSA also set out guiding principles for fisheries management including the concept of Optimum Yield (OY) (Healy, 1984). The MSA defines OY (16 USC 1802(33)) as:

*The term "optimum", with respect to the yield from a fishery, means the amount of fish which—*

*(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;*

*(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and*

*(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.*

The use of OY is distinct from a previous MSA concept of Maximum Sustainable Yield (MSY) (Healy, 1984; Patrick, 2015). The difference between OY and MSY is that OY is not set as a specific number. By not specifying strict parameters of OY, the eight national FMCs could manage the growth of regional domestic fisheries (PFMC, 1982; Mansfield, 2001). Some observers find that a drawback of OY lies in this flexibility of catch numbers, if “OYs were assigned to local groups of species, then fishermen could try to harvest the maximum yield from the group, even though one species in the group might be fished slightly higher than the OY or

another slightly lower” (PFMC, 1982; Mansfield, 2001, p. 309). Although foreign fishing involvement in the Pacific Groundfish Trawl Sector decreased, exploitation rates of various rockfish and groundfish remained high into the 1980s due to the policy aimed at increasing exploitation.

In 1991, the PFMC adopted a limited entry program, changing the fishery from open access fishery to a fishery where the number of vessels was capped. Unfortunately, these changes were insufficient to reverse overfishing of many groundfish stocks. Stock assessments from 1999 to 2001 (Figure 2) indicated that the biomass of at least seven of the major commercial rockfish species – bocaccio (*Sebastes paucispinis*), canary rockfish (*Sebastes pinniger*), cowcod (*Sebastes levis*), darkblotched rockfish (*Sebastes cramer*), POP (*Sebastes alutus*), widow (*Sebastes entomelas*), and yelloweye (*Sebastes ruberrimus*) - were at or below the 25% of the biomass limit reference point (Love et al. 2002).

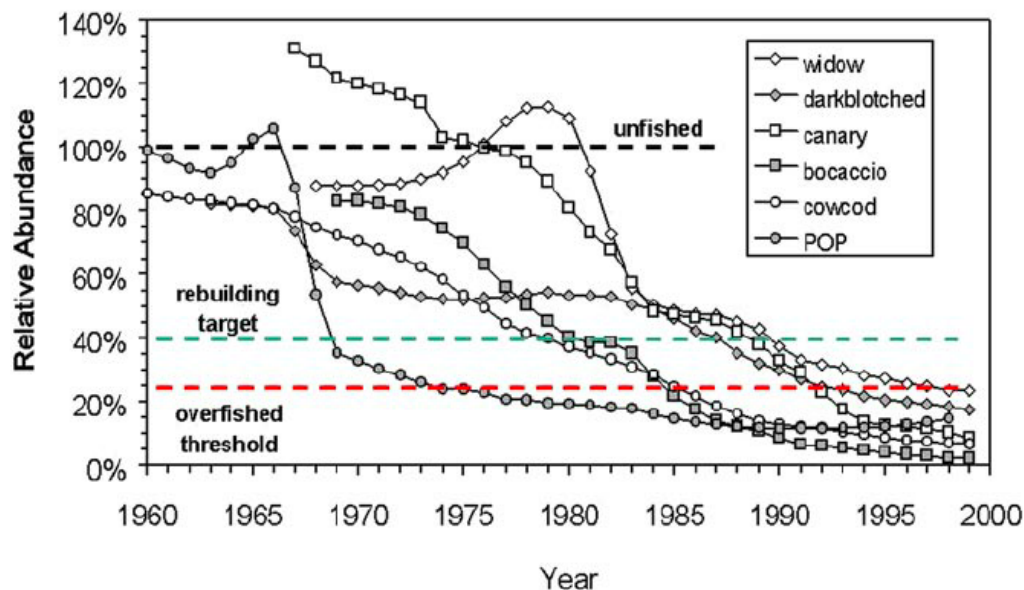


Figure 2-Decline of six major rockfish species (S. Ralston pers. comm., NOAA Fisheries, based on stock assessments of NOAA Fisheries; Morgan et al. 1998).

In response to these assessments, in the late 1990s the PFMC reduced the “allowable catch” of overfished rockfish species by 50-80% depending on species. Regulations included the implementation of various closure measures; including gear and depth restrictions, as well as species rebuilding plans as part of the attempt to mitigate the decreasing rockfish and groundfish populations (PFMC 1998, 1999a, 1999b). These measures failed to account for the impacts posed by different types fishing gear used for harvesting, in particular, the impacts of heavy bottom trawl gear. The National Academy of Science considers bottom trawling the most “destructive form of fishing on living seafloor habitats,” and served as the rationale behind NMFS and the PFMCs creation of the West Coast Rockfish Conservation Areas (RCAs) (Pusceddu, 2014, p. 8861; Rex, 2010).

In January 2000, the U.S. Department of Commerce officially declared the Pacific Groundfish Fishery to be in a state of disaster (NOAA, 2000). The PFMC was directed to implement the management measures required to stop the decline in rockfish biomass and to rebuild biomass to levels considered sustainable under the MSA. One management action was the creation of large area closures in the form of RCAs to allow the rebuilding of the overfish rockfish stocks.

## 2.2 Rockfish and the Rockfish Conservation Areas (RCAs)

There are 102 species of rockfish globally, most of them residing in the Pacific and Gulf of California (Love et al. 2002). The northern Pacific has been described as the “distribution” center for rockfish, with over 50 species living from California to British Columbia (Eschmeyer and Herald, 1983). Rockfish are in the genus *Sebastes*, their characteristics are a suborbital stay, spines along the head, spine and throughout the body, and at least rudimentary venomous glands



at the base of some or all the fin spines (Love et al. 2002). Rockfish are ovoviviparous fishes, and most rockfish females release a single brood annually, although some species produce multiple broods (MacGregor, 1970). Rockfishes are slow-growing, late maturing species and due to their life history traits, characterized as a K-selected group (Adams, 1980). Rockfish live in various habitats, found from intertidal zones to deep water around 1,000 meters (Haldorson, 1991). Rockfish are generally found in high-reef rocky substrates, but some species can be found in semi-pelagic schools or over muddy bottoms (Haldorson, 1991).

When the U.S. Department of Commerce declared the Pacific Groundfish fishery to be in a state of disaster in 2002, they estimated lost revenue to fishers to be \$11 million (PFMC, 2017). This declaration enabled the fishery to receive \$5 million in disaster relief funds, which were allocated to each West Coast state depending on the impacts from the fishery disaster. The disaster money went to creating relief programs for the fishers on the West Coast (Shaw and Conway, 2007; PFMC, 2017). The PFMC had to implement new and drastic policies to begin the rebuilding of the rockfish and other groundfish species that were declared overfished.

In 2002, the PFMC recommended the NMFS set aside 135,000 square miles along the U.S. West Coast for the RCAs with the goal of protecting the fish stocks from destructive bottom trawling (50 CFR 660.391-394) (Figure 1). RCAs are large-area closures that encompass varying area, depth and gear restrictions depending on which species is protected within the RCA. Their shape, latitude and longitude coordinates are defined in 50 CFR 660.71-74. The boundaries may change seasonally or be altered by in-season adjustments voted on at PFMC meetings. RCA boundaries are primarily set in areas where rockfish co-occur with other healthier stocks, to reduce bycatch of overfished rockfish species. The first RCA was created for darkblotched rockfish. In 2003 the PFMC recommended to NMFS that they create other RCAs, starting with

the implementation of a trawl RCA to protect the overfished rockfish species within the Groundfish Trawl Sector: Canary, widow, yelloweye and POP (PFMC, 2003). Later bocaccio and cowcod were added to the list of overfished rockfish protected within the RCAs.

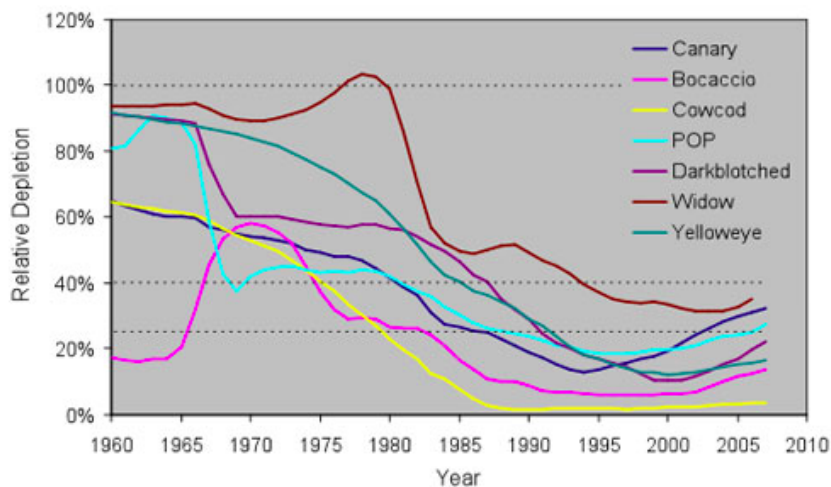


Figure 3- Depletion and rebuilding data of overfished Pacific rockfish species (S. Ralston, NOAA NMFS-SWFSC, unpubl. data; Sanctuaries Web Team, 2017).

The RCAs extend along most of the West Coast of the continental United States, including California, Oregon, and Washington. Of the six originally designated overfished rockfish populations: yelloweye rockfish, cowcod, canary rockfish, bocaccio, POP, and darkblotched rockfish, presently, only cowcod and yelloweye rockfish remain overfished in 2017. Yelloweye and cowcod have long-life spans, meaning their rebuilding status is slower than the original designated rockfish (Hillborn et al. 2010; Gertseva, 2017). Cowcod and yelloweye have their own RCAs along the west coast of the U.S.

### 2.3 Essential Fish Habitats

A major amendment to the MSA was the passage of the Sustainable Fisheries Act (SFA) in 1996. The SFA's fundamental goals were to "prevent overfishing, rebuild overfished stocks,

protect essential fish habitats, minimize bycatch, enhance research and improve monitoring” (Sustainable Fisheries Act, 1996; NMFS, 2003). The SFA requires all FMCs to identify essential fish habitats (EFHs) within their region and take practical steps to reduce impacts to these habitats.

The SFA defines EFHs as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (16 U.S.C. 1802(10); Sustainable Fisheries Act, 1996). EFHs are areas closed to the use of specific gear types, with the intent to decrease to the extent “practicable” the effects from groundfish fishing (Region N.F.W.C.). There are three classifications of EFH: EFH, Habitat Areas of Particular Concern (HAPC) and Essential Fish Habitat Conservation Area (EFHCA).

Table 2- Classifications of EFHs: EFH, EFHCA, HAPC (16 U.S.C. 1802(10); Sustainable Fisheries Act, 1996; Region N.F.W.C.; NOAA Habitat; Pettinger et al., 2014.

Classifications of EFH	Definition	Restrictions
Essential Fish Habitat (EFH)	“Those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (16 U.S.C. 1802(10); Sustainable Fisheries Act, 1996).	-Can be closed to specific gear types -Decrease, to the extent “practicable” the effects from groundfish fishing (Region N.F.W.C.)
Essential Fish Habitat Conservation Areas (EFHCA)	“Designated to minimize to the extent practicable adverse effects to EFH caused by fishing” (16 U.S.C. 1853 section 303(a)(7)).	-Closed to specified types of fishing (Region N.F.W.C.)
Habitat Areas of Particular Concern (HAPC)	“High priority areas for conservation, management or research due to their rare, sensitive, stressed by development or important ecosystem function” (NOAA Habitat)	Four types of HAPC for Groundfish EFH: -Estuaries -Canopy kelp -Seagrass -Rocky reef

The MSA requires EFH to be reviewed every five years by the FMCs, NOAA and NMFS, to ensure the EFH continue to meet their purpose based on new information. Following the review, the Council may choose to amend or revise parts or all the EFH (50 CFR 60.815(a) (10)).

The Pacific Coast Groundfish EFH was established following adoption of Amendment 19 of the Groundfish Fishery Management Plan (FMP) of 2006, by which NMFS designated approximately 12,620 square miles of the preexisting RCAs as groundfish EFHCA on the West Coast (Figure 4). For the Pacific Coast, the groundfish EFHs includes all the waters and substrate within areas with a “depth less than or equal to 3,500 m (1,914 fm) shoreward to the mean high water level” (FMP Amendment 19, 2006, p. 62). Amendment 19 encompasses various management measures consistent with the MSA to reduce adverse effects to EFH from fishing activities. The three types of closed areas are bottom trawl closed areas, bottom contact closed areas and bottom trawl footprint closure; examples include regulations specifying “fishing gear restrictions and prohibitions, [with] areas that are closed to bottom trawling and areas that are closed to all fishing that contacts the bottom” as well as prohibition of bottom trawling in areas identified as sensitive habitat (FMP Amendment 19, 2006, p. 62). Sensitive habitat is defined as habitat with hard substrate, biogenic habitats (corals and sponges), submarine canyons, seamounts, and ridges (FMP Amendment 19, 2006).

NMFS disapproved a section of Amendment 19 in which the PFMC tried to close waters deeper than 3,500 meters to bottom trawling, in the attempts to “minimize the effects to the groundfish FMP” (Federal Register, 2016). This section was left out because the groundfish EFH does not extend beyond 3,500 meters and the only fishing allowed at these depths need an exempted fishing permit. Also, due to the technical challenges, this area is not economically

viable for fishing. Nonetheless, environmental groups feel the prohibition of bottom-contact gear in waters deeper than 3,500 meters is important for protecting pristine habitat from fishing effects. The PFMC has the discretionary authorities given to them in the MSA to close waters, regardless of their designations as EFH (MSA sections 303(b)(2)(A), 303(b)(2)(B), 303(b)(12); Federal Register, 2016). The discretionary authorities of the PFMC made up the third and final subject area within Amendment 28.

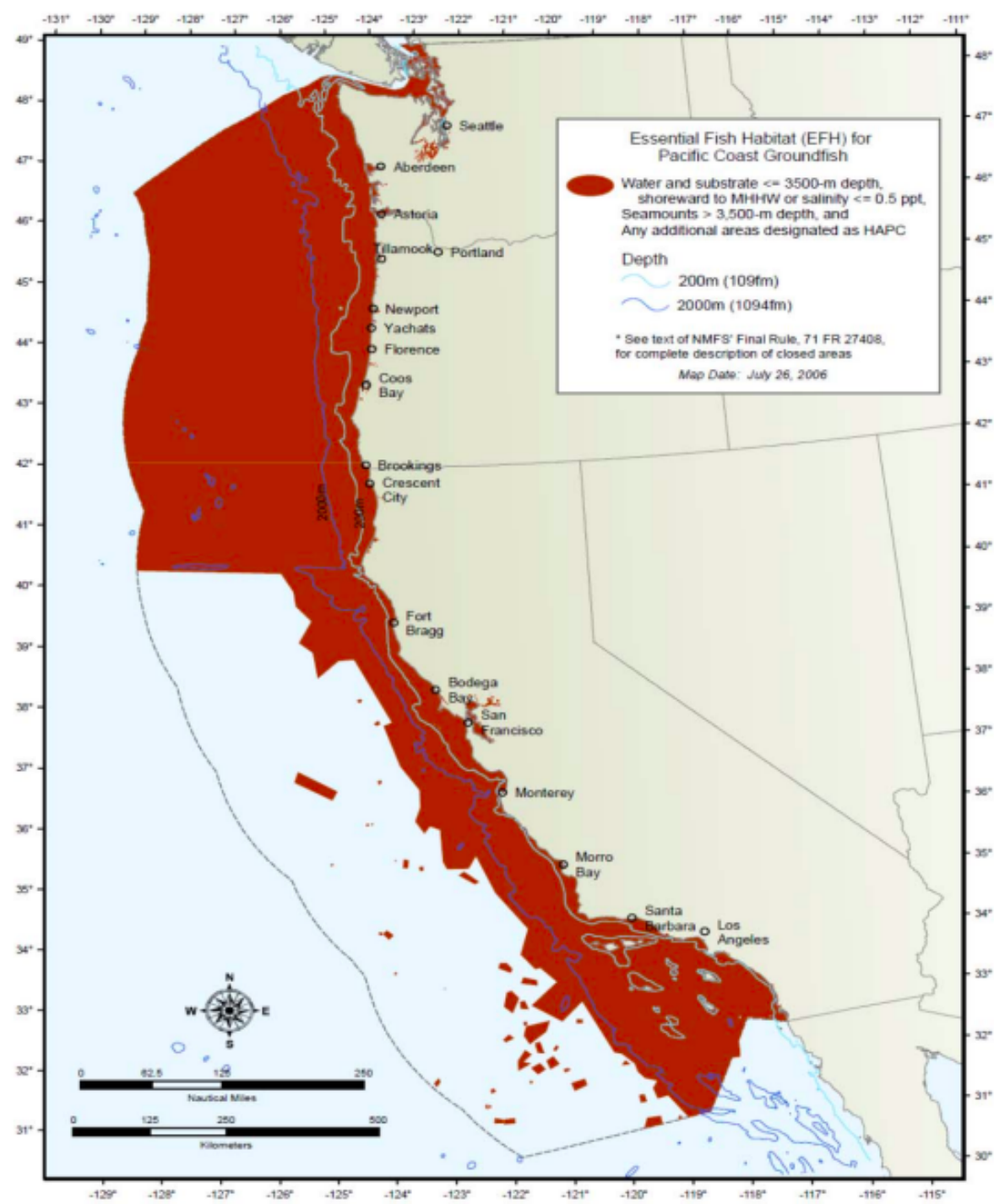


Figure 4- Map of West Coast EFH boundaries (AM 19 EFH EIS 2005, NMFS 2005).

## 2.4 Amendment 28

Amendment 28 encompassed three subject areas: (1) The nature and extent of the groundfish EFHCAs, (2) the future of the trawl RCA and (3) the discretionary authority granted to FMC by the MSA with respect to the areas deeper than 3,500 meters opened to bottom trawling.

The EFHCA changes are the most complicated portion of Amendment 28 (Table 3). The proposals to change EFH must include recommendations for the FMPs based on ten components (Table 4).

Table 3- Subject one of Amendment 28; Alternative 1.a, 1.b, and 1.c are the three final preferred alternatives for Amendment 28 (PFMC 2018).

### Subject area one of Amendment 28; EFHCAs changes (re-openings and closures)

- No action alternative, keep the EFHCAs the same
- Alternative 1.a: Collaborative Alternative
- Alternative 1.b: Oceana et al. Alternative
- Alternative 1.c: Midwater Trawlers Cooperative (MTC) Alternative
- Alternative 1.d: Garibaldi Reef South Alternative
- Alternative 1.e: Rittenburg Bank Alternative
- Alternative 1.f: Potato Bank Correction Alternative
- Alternative 1.g: New EFHCAs in Washington

Table 4- FMP recommendations to change EFH. These ten components must be addressed in any new proposal pertaining to changes to EFH. (Federal Register, 2016; 50 CRF 600.815.

FMP recommendations to change EFH; ten components
1. A description and identification of EFH, including habitat information for each managed species and life stage
2. A description of the MSA fishing activities that may adversely affect EFH and management measures to minimize those effects to the extent practicable
3. A description of the non-MSA fishing activities that may adversely affect EFH, for example, those managed by state agencies
4. A description of the non-fishing activities that may adversely affect
5. And analysis, if feasible, of how the cumulative effects of fishing and nonfishing activities affect the function of EFH on an ecosystem or watershed scale
6. A description of conservation and enhancement measures that encourage the conservation of EFH, including recommended options to avoid, minimize, or compensate for the adverse effects of fishing and non-fishing activities
7. Identification of the major prey species of each species
8. Identification of habitat areas of particular concern (HAPCs)
9. Identification of research and information needs that the Council and NMFS view as necessary to improve upon the description and identification of EFH, the identification of threats to EFH from fishing and other activities, and the development of conservation and enhancement measures for EFH
10. A procedure for reviewing and revising, if warranted, the EFH components of the FMP.

All the proposals for Amendment 28 for EFH addressed these ten components, listed in Table 4. The PFMC found that these five main components were the most important for Amendment 28: “the EFH descriptions for each species and life stages; the description of the adverse effects of fishing on groundfish EFH and management measures to minimize those effects (i.e. the EFHCAs); the description of non-fishing activities that may adversely affect EFH, conservation and enhancement measures that encourage the conservation of the EFH; the



research and information needs and the procedure to review and revise the groundfish EFH components” (Federal Register, 2016, 5104). NEPA requires FMCs evaluate a range of reasonable alternatives when choosing their final preferred alternative to recommend to NMFS. Table 3 shows the range of reasonable alternatives that the PFMC evaluated and eventually narrowed down to the three final preferred alternatives: The Collaborative alternative, the Oceana et al. alternative and the Midwater Trawlers alternative (Appendix A.1, A.2, A.3). Each proposal evaluated the groundfish EFH and made recommendations to modify either existing EFHCAs or create new EFHCAs based on the ten components required by regulation (Table 4).

Table 5- Subject two of Amendment 28, PFMC 2018.

Subject area two of Amendment 28; adjustments to the Trawl RCA. There are four alternatives for this subject.

- No action alternative, keep the trawl RCA the same
- Alternative 2.a: Remove the trawl RCA (for Oregon and California)
- Alternative 2.b: Remove the trawl RCA and in, Washington, implement discrete area closures (DACs)
- Alternative 2.c: Remove the trawl RCA and implement block area closures (BACs) (for Oregon and California)

Subject area two; or the adjustments to the trawl RCA is more straight forward than subject area one. The organizations that submitted proposals pertaining to the changes in the groundfish EFH and EFHCAs, also made recommendations on the trawl RCA. Subject area two of Amendment 28 had four alternatives: (1) a no action alternative, (2) the removal of the trawl RCA in Oregon and California, (3) the removal of the trawl RCA on the west coast but in Washington, implementation of discrete area closures (DAC), or (4) the removal the trawl RCA and implementation block area closures (BACs) in Oregon and California (Table 5: Appendix A.4, A.5). BAC and DACs differ in

their implementation; BACs are used for species conservation, while DACs are used to protect habitat. BACs act as a precautionary approach to lifting the trawl RCA because they can be re-implemented and act like an RCA at any time. BACs also give the PFMC the ability to more strategically close areas that put species conservation at risk.

Alternative 2.b, removes the trawl RCA outside of Tribal usual and accustomed fishing grounds (U&As) along the West Coast but in Washington the PFMC would implement DACs. DACs which could be implemented for pre-season or in-season adjustments. The Washington state DACs are fixed polygons based on habitat data, implemented to protect the habitat in five polygons the PFMCs identified to have a high probability, 25% or more of occurrence of “suitable habitat” for one or more of these species: Darkblotched rockfish, yelloweye rockfish and POP (Project Team Report 1, 2018, p. 48). Although used for habitat protection, the main purpose of DACs are to “reduce bycatch of overfished species by prohibiting fishing in one or more of the five fixed polygons by vessels using groundfish bottom trawl gear” (Project Team Report 1, 2018, p. 48). To incorporate DACs the PFMC must meet the procedural criteria laid out in the Groundfish FMP, Section 6.2. The FMP give the PFMC the ability to establish and adjust management measures for the Pacific Coast groundfish fishery with three framework procedures: The points of concern framework, the socioeconomic framework, and the habitat conservation framework. The points of concern framework allows the PFMC to “develop management measures that respond to resource conservation issues” (Pacific Coast Groundfish FMP, 2016, p. 52). The socioeconomic framework allows the PFMC to “develop management measures in response to social, economic and ecological issues that affect fishing communities” (Pacific Coast Groundfish FMP, 2016, p. 52). The habitat conservation framework allows the PFMC to “modify the number, extent and location of areas closed to bottom trawling in order to protect EFH” (Pacific Coast Groundfish FMP, 2016, p. 52). NMFS can initiate automatic

management actions without public notice under Section 6.2.A of the FMP. The action must be “nondiscretionary and the impacts must be reasonably accountable, based on previous application of the action or past analysis” (Pacific Coast Groundfish FMP, 2016, p. 53).

Alternative 2.c would remove the trawl RCA in California and Oregon and implement BACs outside of U&As in Federal waters. Here the BACs would be used as a “harvest management tool to prohibit fishing by vessels using groundfish bottom trawl gear at a certain depth and latitude” (Project Team Report 1, 2018, p. 50). BACs are an in-season management tool for “controlling harvest of target or non-target species, but they are not intended to be used for habitat protection” (Project Team Report 1, 2018, p. 50). BACs also give the PFMC the option to use them to reinstate the trawl RCA. Alternative 2.c allows for twenty BACs which can be closed in combinations or individually to create a more localized response to bycatch at certain latitudes (Project Team Report 1, 2018; Appendix A.5).

Table 6- Subject three of Amendment 28, PFMC 2018.

Subject area three of Amendment 28; the use of MSA section 303(b) discretionary authorities. There are only two alternatives for this subject.

- No action alternative, continue to allow use of bottom contact gear in waters deeper than 3,500 m
- Alternative 3.a: use MSA sec. 303(b)(A), 303(b)(2)(B) or 303(b) (12) to close waters deeper than 3,500 m to bottom contact gear, consistent with September 2015 Agenda Item H.8.a

The final subject area of Amendment 28 pertained to the discretionary authority given the FMCs by MSA (Table 6, Appendix A.6). Here the proposals evaluated the benefits of closing

areas to bottom contact gear deeper than 3,500 meters, even if the areas are not currently heavily utilized by fishers.

The final action vote for Amendment 28 was at the April 2018 Council meeting in Portland Oregon. The final preferred alternative was sent to NMFS for approval and recommendations. For subject area one, the groundfish EFHCAs, the PFMC decided to combine the three final preferred alternatives: The Collaborative Group, Oceana et al. and the Midwater Trawlers. For subject area two, the PFMC chose Alternative 2.c: Remove the trawl RCA in Oregon and California and implement BACs. For subject area three, the council voted on alternative 3.a: the use of MSA discretionary authorities to close areas to bottom contact gear in waters deeper than 3,500 meters in California. The PFMC also voted to create a new EFHCA in the Southern California Bight to prohibit groundfish bottom trawling.

The net change in EFHCAs has not been published on the PFMC website. NMFS has not made a final rule on Amendment 28. If accepted by the NMFS, Amendment 28's final action vote will re-open 3,000 square miles to groundfish bottom trawlers. The action will also close 13,000 square miles to bottom trawling as EFHCAs, and close 123,000 square miles to all bottom contact gear along the West Coast (PFMC, 2018).

## 2.5 Amendment 28 Stakeholders

Amendment 28 was a stakeholder-driven process and encompassed various participants throughout the process but the main participants came from the federal and state agencies, fishing industry members, environmental groups and the tribal nations. With all natural resource policy decisions, there are “winners” and “losers,” and the contention surrounding Amendment 28 arose from proposals reopen all or parts of the trawl RCA to fishing and to expand or reduce

EFH designation as EFHCAs. The groundfish trawl sector is a mixed fishery, so implementing large closures, as well as restricting the fishing of some species, negatively impacts the ability of fishers to spatially manage their activities adding to the necessity of a collaborative stakeholder-driven process to create area closures that was acceptable to the fishery stakeholders (Mansfield, 2001; Figure 4).

### **2.5.1 Industry Members**

Stakeholders asking for the reopening of the trawl RCA included the Oregon Trawl Commission (OTC), the Fishermen’s Marketing Association (FMA), the Coos Bay Trawlers Association (CBTA), Midwater Trawlers Cooperative (MTC), and the West Coast Seafood Processors Association (WCSPA), as well as various independent fishers. The OTC, FMA, CBTA, and MTC represent most trawl fishermen participating in the West Coast trawl catch share fishery. They argued the RCA should be re-opened because most rockfish species have been rebuilt, and thus has accomplished the goal for which it was created. Their inability to access the healthy target groundfish stocks hurts them economically, and they claimed that “current management measures are not allowing Optimum Yield to be achieved as required by National Standard 1 of the Magnuson Stevens Fishery and Conservation Act” (Pettinger et al., 2013, p. 18).

National Standard 1 of the MSA states that “conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry” (16 U.S.C. 1851, Sec. 201). Fishers believe that, as most of the rockfish species have been rebuilt, the RCAs are negatively impacting their ability to achieve optimum yield, and thus violate the Groundfish FMP. The overarching goals of the

Groundfish FMP are that the proposed actions should: “minimize bycatch, improve safety at sea, reduce regulatory complexity, and increase access to target stocks while meeting other regulatory requirements” (Trawl RCA Environmental Assessment, 2014, p. 167). Industry stakeholders have stated that “others purposefully confused the issue contending that the RCAs should be transformed into EFHCAs and that the area should continue to be closed to the fleet”; they argue that this “purposely molests the original intent of the RCA” by decreasing the fishable areas with the resulting negative economic impact on the trawl fishers aimed to hurt the trawl fishers (Pettinger et al., 2013, p. 3). They argue the success of “individual accountability afforded by the trawl IFQ program has proven that fishing behavior can and does change when harvesters are held personally responsible for their catch” and has resulted in reduced bycatch of rockfish species, in some cases by almost 70% (Pettinger et al., 2013, p. 20; Table 7).

Table 7- Annual catch of overfished rockfish species decreased from 2011-2012 in the Shorebased IFQ Program compared to the 2009-2010 levels (WCGOP Groundfish Mortality Report 2009-2010 and the Shorebased IFQ Program, Vessel Accounts System 2011-2012).

#### Shorebased IFQ Program decrease in catch rates of overfished rockfish in 2011-2012

60% decrease for yelloweye rockfish bycatch

89.6% decrease for cowcod rockfish bycatch (South of 40°10' N. latitude)

37.8% decreases for canary rockfish bycatch

56.7% decrease for bocaccio rockfish bycatch (South of 40°10' N)

68.1% decrease for POP bycatch (North of 40°10' N)

68% decrease for darkblotched rockfish bycatch

32.8% decrease for Petrale sole bycatch

### 2.5.2 Environmental Groups

An argument voiced by some environmental groups is that more, rather than fewer EFHCAs should be designated. Groups like Oceana, NRDC and Ocean Conservancy combined proposals called for an addition of 1,650 square miles to EFHCAs affording additional protection for mixed, hard and soft substrate. They also proposed thousands of more square miles be protected from bottom trawling (Proposal to PFMC, 2013). The Oceana et al. proposal contained “68 polygons: 61 closures and 7 reopenings,” along with changes to EFHCAs boundaries (Project Team Report 1, 2018, p. 37). Thirty-three new and modified EFHCAs overlapped with the trawl RCA, meaning large chunks of the trawl RCA would have been closed to bottom trawling even if it was lifted (Enticknap et al., 2016). Environmental groups wish to see the protection of benthic habitats from bottom trawling, especially in those pristine areas that have not been impacted by trawling. Along with implementing new EFHCAs, environmental groups called for the use of the MSA section 303(b) discretionary authority, which allows the “Council to implement management measures to conserve target and non-target species and habitats, after considering the variety of ecological factors affecting fishery populations” (MSA 303(b)(2)(A)). Using this discretionary authority, environmental groups, specifically Oceana hoped to see the PFMC “freeze the trawl footprint” and protect pristine habitat from destructive fishing practices.

### 2.5.3 Washington Tribes and Tribal U&A Harvest Areas

In 1854 and 1855 the federal government and the western Washington Tribes signed several treaties, collectively known as the Stevens Treaties which reserved the right for Tribes to fish in their “usual and accustomed places and stations” (50 C.F.R.). In 1998, courts ruled that the tribes reserved fishing rights to “fifty percent of the salmon and other free-swimming fish in

the wasters controlled by Washington State” (U.S. v. Washington, 1998; Midwater Trawlers Co-op, 2002). This decision was met with backlash from non-native fishers, who did not want to acknowledge tribal fishing rights. In 1974, the Boldt Decision reaffirmed the western Treaty Tribes rights to fish in their usual and accustomed places (U&A’s). (U.S. v. Washington, 1974). To uphold this decision, NMFS identified areas extending forty miles off the coast as usual and accustomed fishing areas for Pacific West Coast tribes in 1996 (Parravano v. Babbitt, 1995; Midwater Trawlers Co-op, 2002). Along with this regulation they set aside certain species harvest levels for the tribes. In September 2015, the U.S. District Court set the boundaries for U&As for both the Quileute Indian Tribe and Quinault Indian Nation off the coast of Washington (U.S. v. Washington, 2015).

The Hoh, Makah, Quileute and Quinault Tribes participate in the PFMC; the Boldt Decision not only re-affirmed the Tribes right to fish in their U&As but affirmed their right to harvest salmon and co-manage the Washington fisheries with the federal government. In 2006, when the PFMC and NMFS designated parts of the RCA as EFHCA, the western Washington Tribes (the Treaty Tribes) were not consulted in the designation of EFHCAs. Some early EFHCAs were in Tribal U&As, which was of concern for the Treaty Tribes. Eventually the PFMC and NMFS dropped areas from Amendment 19 that overlapped the Tribal U&As. After the implication for tribal fishing rights, the Treaty Tribes created a government to government consultation process with the U.S. through NOAA in terms of EFH designations in their U&As. Other concerns from the initial designation process over the closure of tribal U&As due to EFH, were the effects of reducing collection of commercial catch per unit effort (CPUE) data which is used to determine treaty rights in their areas (Pettinger et al., 2014). “Regulations created regarding tribal fisheries within U&A harvest areas, must consult with potentially affected



tribes” meaning the Treaty Tribes are prominent members of the Amendment 28 process (50 CFR 660.324 (d)). Treaty Tribes have had more input into the recent EFH designation process yet remain concerned about how the potential restrictions on areas outside tribal U&As may impact treaty rights by “displacing fishing pressure into U&As” (Pettinger et al., 2014, p. 14).

#### 2.5.4 The Collaborative Group

Table 8- Organizations involved in the Collaborative Group.

Industry Members/ Organizations	Environmental Organizations
-Northern port members: Eureka, Brookings, Coos Bay, Newport, and Astoria	- Environmental Defense Fund (EDF)
-Central port members: Fort Bragg, Half Moon Bay, Monterey, and Morro Bay	-The Natural Resource Defense Council (NRDC) -The Nature Conservancy (TNC)

The Collaborative Group is a coalition of fishing industry and environmental organizations that came together in 2014 to discuss and develop alternatives to the trawl RCA and groundfish EFH. The Collaborative Group is split up into two different collaborative working groups: The northern group and the central group. The northern collaborative working group focused on the region north of 40° 10’ ending at the Canadian border, and the central group focused on the area south of 40°10’ ending at Point Conception, CA. The Collaborative Group did not create another working group from Point Conception to the Mexico border because of the lack of active groundfish trawlers in the area (Final Collaborative Package, 2016). The two collaborate working groups used a “port to port” to approach to work with local fishermen in order to exchange knowledge and scientific data with the hopes of creating a proposal that would be a

consensus between many environmental groups and much of the trawl sector for Amendment 28 (Final Collaborative Package, 2016; Table 8).

The northern collaborative working group held port meetings in Eureka, Brookings, Coos Bay, Newport and Astoria (Final Collaborative Package, 2016). The stated goal for their proposal was to create a “robust fishing industry and a resilient benthic ecosystem [to serve] as a guidepost for considering possible openings and closures” (Final Collaborative Package, 2016, p. 2). They held discussions with skippers, permit holders, members from the Environmental Defense Fund (EDF) and the Natural Resource Defense Council (NRDC) from Washington, Oregon, and California.

The central collaborative working group held port meetings in Fort Bragg, Half Moon Bay, Monterey and Morro Bay. The goal for the central collaborative working groups proposal was to “improve habitat protection, as well as increase fishing opportunity” (Final Collaborative Package, 2016, p. 49). They worked with industry members, TNC, EDF, and NRDC. This region also encompasses three National Marine Sanctuaries; the Greater Farallones National Marine Sanctuary (GFNMS), Cordell Bank National Marine Sanctuary (CBNMS) and Monterey Bay National Marine Sanctuary (MBNMS). The final Collaborative Proposal incorporated representatives from these sanctuaries and the MBNMS 2013 proposal for the EFHCAs (Final Collaborative Package, 2016).

The Final 2016 Collaborative Package is a combination of both collaborative working groups proposals for each region. Their final report contained “59 polygons: 43 closures and 16 reopening’s”, along with multiple adjustments to EFHCAs (Project Team Report 1, 2018, p. 37). The only port that did not reach a consensus was Newport Oregon, which was defined in the Collaborative Proposal as the areas between 43°57’ and 45°46’ North latitude (Final

Collaborative Package, 2016). The fishers in this region submitted their own proposal with the Midwater Trawlers Cooperative, which is separate from the Collaborative's recommendation.

#### 2.5.5 Midwater Trawlers Cooperative

The Midwater Trawlers Cooperative (MTC) is a non-profit fishery industry trade association that represents industry members from the whiting and groundfish fisheries on the U.S West Coast, along with Pollock, cod and groundfish in the Bering Sea and Gulf of Alaska. The MTC participated in much of the Collaborative Group's proposal but the two groups could not meet a consensus with the fishers in central Oregon. The main area of contention between the two groups was the Heceta Bank area. MTC aligned fishers saw the Collaborative Group's proposal as a "whittled down version" of the original Oceana proposal, which the fishers considered to be too expansive and encroaching on their fishing capabilities in the very productive area of Heceta Bank (Midwater Trawlers, 2016, p. 2). MTC created their own proposal for this region that had "wide support" from fishers in the area (Midwater Trawlers, 2016, 2). The Midwater Trawlers proposal became the third final preferred alternative proposal for Amendment 28 and contained "13 polygons: 9 closures and 4 reopening's", along with boundary adjustments to EFHCAs (Project Team Report 1, 2018, p. 37).

### 3. Methods and Materials

To explore the decisions and policies leading to the proposed alternatives and final action vote on Amendment 28, this project uses a mixed methods approach to data collection and data analyses. Mixed methods “combine the qualitative and quantitative approaches into the research methodology of a single study” (Tashakkori and Teddlie, 1998, p. 17-18). Specifically, this study used both content analysis and semi-structured interviews.

Mixed methods research is beneficial because it combines the strengths from both qualitative and quantitative methods to try to better understand phenomena (Tashakkori and Teddlie, 2008, p. 353). Mixed methods should be used in a way that “has complementary strengths and non-overlapping weakness” (Brewer and Hunter 1998; Tashakkori and Teddlie, 2008, p. 353). This research used exploratory design which starts with “qualitative data to explore phenomenon and then builds to a second quantitative phase” (Creswell, Plano Clark, et al., 2003, p. 77). The variant used in this exploratory design was the instrument development model, this model and research design were used in both the content analysis portion and interviews of this research (Creswell, Plano Clark, 2003; Creswell, Plano Clark, 2006, p. 77). This design method begins with qualitatively exploring the research topic to find and develop items for quantitative instrument (Creswell, Plano Clark, 2006, p. 76). Next an instrument was created to evaluate the quantitative data collected from the previous qualitative results. The interpretation and results of this design method are shown through qualitative findings which leads to quantitative results. After deciding the variant to use, the next step is deciding the timing, weight and mixing of qualitative and quantitative procedures. Exploratory design states that the timing of qualitative and quantitative studies, should be sequential (Greene et al., 1989; Morse, 1991; Creswell, Plano Clark, 2006, p. 81). In this research, qualitative data was weighed heavier than quantitative data (Morgan et al., 1998). Finally, the mixing of the

data was connected between the two phases, meaning the qualitative data led to a collection and analysis of quantitative data (Creswell, Plano Clark, 2006, p. 84). The rationale for using this design was that the qualitative data explores the documents and stakeholders results more in depth than initial quantitative data. The quantitative results refine and support the conclusions from the qualitative results. Strengths to using exploratory design was that the separate phases make the research easily applicable to multiphase research, and allows for an easier integration of quantitative approaches to a design which tends to emphasize qualitative results (Creswell, Plano Clark, 2003). Some weaknesses to this approach were that it takes a substantial amount of time to implement and can be difficult to specify quantitative procedures that were valid and reliable (Creswell, Plano Clark, 2006, p. 79).

Mixed method approaches to data collection and analysis were beneficial because they are not dictated by specific theories but come from the studies purpose (Ridenour and Newman, 2008). Mixed method approaches also utilizes the strengths of both qualitative and quantitative research to analyze a broader range of research questions. Disadvantages of mixed methods happens when the researcher “quantifies qualitative data, [causing] it to lose its flexibility and depth” (Bazeley, 2004). The structure given to qualitative codes when incorporating quantitative techniques can be positive but the researcher must be aware of the possibility of quantifying qualitative codes and the losing some of fluidity within the codes. This occurs from another disadvantage of mixed methods research, when the researcher does not understand how to appropriately mix qualitative and quantitative methods. A main disadvantage of mixed methods research is that there is not a set formula for the mixing of qualitative and quantitative methods (Creswell, Plano Clark, 2006).

The content analysis of written documents from the PFMC was made up of three separate sections: (1) Public records, (2) submitted proposals for Amendment 28, and (3) final preferred

alternatives for Amendment 28. As discussed earlier in this exploratory design the timing was sequential, meaning qualitative data were collected and analyzed first. Here themes were identified using an inductive approach and open-ended coding analysis to establish indicators used in subsequent coding of the PFMC public records about Amendment 28. The key themes and subcodes were chosen because they tried to answer the research questions of the past, present and future roles along with the effectiveness of the groundfish EFHCA and trawl RCA. These codes were tested on the documents used in the content analysis of written documents. Themes and codes deemed unfit or weak were deleted or merged into other subcodes. In the end, five themes and seventeen subcodes were identified for the content analysis of written documents. These codes were used in the qualitative analysis of this research. Next the quantitative data was analyzed through descriptor statistics showing the frequency of codes used throughout the written documents pertaining to Amendment 28.

Following this content analysis, a series of nine open-ended questions (Table 9) were created and used in semi-structured interviews conducted leading up to and at the PFMC meeting (Creswell, 2007).

Table 9- Interview questions.

### Open-ended interview questions

1. Looking back, how successful does your organization consider the RCAs to have been in the rebuilding overfished groundfish stocks on the West Coast?
2. *If not explicitly mentioned in the response to the first questions:* As of today, have the RCAs accomplished their original goal of rebuilding overfished west coast groundfish stocks?
3. Looking back over the history of the RCAs; were there other management approaches the Council could have implemented or implemented earlier that could have better promoted rebuilding of overfished groundfish stocks?
4. Does your organization believe the addition of essential fish habitat (EFH) designations added to the effectiveness of the RCAs in rebuilding overfished groundfish stocks? (Amendment 19)
5. Which Alternative would your organization like to see implemented in the 2018 Final Action vote on Amendment 28?
6. *If needed for clarification:* What is this your organization's preferred alternative?
7. Does your organization believe the RCAs and/or EFH designations had any unintended negative or positive benefits? What were these?
8. What role does your organization feel RCA designation play in the future of federally managed west coast fisheries?
  - a. How about EFH designations?
9. Is there anything else you would like to share about the use of RCAs and EFH designations that would help me to understand their past, present and future role in the federal management of west coast fisheries?

Stakeholders were determined by using the publicly submitted proposals as a guide to identify the key players. A similar process was utilized to create the codes for the content analysis of the interviews. The same five themes were used in the content analysis of interviews to show

consistency. While a benefit of mixed methods research comes from the flexibility of the data or codes, this analysis showed that the same five themes were prevalent throughout the written documents and interviews. This is common in a stakeholder driven process, where the main themes were utilized throughout the process. This consistency shows the progression of themes or how they stayed consistent over the amendment process but the qualitative approach also allows for the subcodes to change and be more fluid in the analysis process.

The subcodes were identified through open-ended coded analysis; this resulted in sixteen subcodes for the interview analysis. The exploratory design and instrument design model were again utilized with sequential timing, starting with qualitative analysis and ending in quantitative analysis. Qualitative results were weighed more heavily than quantitative and the data was mixed between the two phases. Descriptor statistics were used again in the quantitative data analysis.

No identifiable or personal information was gathered from the participants. The participants were asked about their organization's stance on the policies leading up to and currently about to the groundfish EFH, EFHCAs, trawl RCA and Amendment 28. With participant permission, the interviews were audio recorded, transcribed verbatim and analyzed using the coding software, Dedoose (McLellan, MacQueen & Neidig, 2003). The transcribed data is kept in a secure location at Oregon State University to ensure the confidentiality of the participants.

Throughout the content analysis and interviews, a timeline of key events was created of the US West Coast groundfish fishery and the management measures that led to the West Coast RCAs, groundfish EFH and EFHCAs. The timeline included policy and regulations from mainly the PFMC but also included key policy decisions from federal agencies. Within the timeline, key court cases were used to show their effects on the Pacific Groundfish fishery. Records of the rockfish species overexploitation and rebuilding plans were utilized to show the policies impacts on the



species. Using the GIS software ArcMap, a Story Map was created to show a visual representation of the timeline of key policy decisions. The timeline included key policy and management decisions that led to the creation of the West Coast RCAs, groundfish EFH and EFHCAs. Story Map is an important tool in enhancing scientific communication. The platform allows users to incorporate images, dates and URLs to tell a story in images. Showing political history in an interactive platform can better inform others about research; while also, reaching a broader audience. Incorporating scientific communication tools into research is key to fostering learning with new audiences.

To ensure the ethical integrity of this study, the researcher has completed the Oregon State IRB training. The proposal went through the Oregon State IRB. Oregon State University's IRB committee found that the research had no human subjects, thus did not require additional IRB review into the study (Appendix D). Before any interviews were conducted, all participants gave consent to participate in the study. All interviewees were made aware that their participation was voluntary and could discontinue their participation in the study at any time.

## 4. Results

### 4.1 Amendment 28 Content Analysis

The content analysis of written documents was divided into three subsections: (1) The public records section, (2) the submitted proposals for Amendment 28 and (3) three final preferred alternative proposals for Amendment 28. The five themes for the content analysis were scientific, biological, economic, social impacts and management measures (Table 10; Appendix B.1 for full code book). The scientific theme related to the use of science, including methods and principles. Within this code the two subcodes used were best available science and scientific research. The biological theme related to biology or living organisms. The subcodes within this theme were: habitats, damage to organisms, sensitive habitats, groundfish and bycatch. Economic themes related to economics, or monetary concerns and the subcodes were: Commercial importance to the fishery, economically beneficial, and economically detrimental. The social impacts theme related to the community or broader individual, non-monetary factors, the subcodes were: Community impacts, collaboration among fishery participants, and discussion of welfare. The final theme was management measures, or measures implemented from the PFMC, federal/state agencies pertaining to the fishery, subcodes included: Council management measures, modifications to EFH, modifications to RCA, Council responsibilities, and enforcement.

Table 10- Five main themes identified for the content analysis and the codes used in each category. (Full code book is found in Appendix C.1).

Scientific	Biological	Economic	Social impacts	Management Measures
<p><b>-Best Available Science-</b> “The proposed habitat conservation areas would additionally benefit and progress the best available science available to managers for future decisions as they can serve as research and management controls” (PFMC, 2018; GreenPeace_EFH Proposal).</p> <p><b>-Scientific Research</b> “Through scientific research expeditions with remotely operated vehicles, documenting new areas with sensitive habitats” (PFMC, 2015; H8b_SupPublicComment)</p>	<p><b>-Habitats-</b> the natural home or environment of an animal, plant or organism</p> <p><b>-Damage to organisms-</b> physical harm caused to something in such a way to impair its value or make it useless Example: “authors conclude that removal of these slow-growing corals could cause long-term changes in associated megafauna” (Final Oceana Proposal)</p> <p><b>-Overfished Rockfish-</b> Depletion of a stock of fish by too much overfishing</p> <p><b>-Sensitive Habitats-</b> Quick to detect or respond to slight changes, signals or influences. As described in the Groundfish FMP: hard substrate, biogenic habitats (corals and sponges), submarine canyons, seamounts, and ridges (FMP Amendment 19, 2006). Example: “Adding the proposed areas of sensitive habitat as designated EFH and taking steps to protect those areas is consistent” (Final Oceana Proposal).</p> <p><b>-Groundfish-</b> fish that live on, in or near the bottom of the body of water they inhabit. Species include cod, flounder, halibut and sole</p> <p><b>-Bycatch-</b> Unwanted fish or other marine species caught during commercial fishing for other marine species</p>	<p><b>-Commercial importance to the fishery-</b> “Including a number of species of rockfish and other fishes of commercial importance” (PFMC, 2018; F3c_Public Comment).</p> <p><b>-Economically beneficial-</b> relating to a growth in monetary value Example: “will shorten the distance vessels must travel to harvest underutilized slope species such as Dover sole, slope rockfish, and other flatfish species and should also have beneficial economic effects” (G8b. Supplemental NMFS, 2013, 2969-3404)</p> <p><b>-Economically detrimental-</b> relating to a decline in monetary value example: “The Mendocino Ridge Expansion in 1b would displace a significant portion of revenue from the Eureka port area compared to the 1a Mendocino Ridge Modification #1” (F3b. Supplemental. GMT. 2018. 1566-1825).</p>	<p><b>-Community impacts-</b> relating to or concerned with the interactions of the fishery on communities, society, and non-monetary factors Example: “Monterey’s reputation as a fishing community is a key characteristic of its cultural identity, which draws tourists (DeSanto 2013; Rees et al. 2013: Galligan, MBMNS).</p> <p><b>-Collaboration among fishery participants -</b> Discussions, meetings between different stakeholder groups, positive compromises being made</p> <p><b>-Discussion of welfare-</b> in terms of caring or concern for impacts to stakeholders</p>	<p><b>-Council management measures-</b> “The management measures are necessary and appropriate to minimize these potential adverse impacts” (PFMC, 2013; Final Oceana, 2013).</p> <p><b>-Modify EFH-</b> “Thus, modifying current EFH Conservation Areas to include additional deep-sea coral and sponge habitat is clearly consistent with the responsibilities and authorities” (Final Oceana Proposal).</p> <p><b>-Modify RCA-</b> “would add a portion of the Trawl RCA into the new EFHCA” (Final Oceana, 2013)</p> <p><b>-Council Responsibilities-</b> “Thus, modifying current EFHCA to include additional deep-sea coral sponge habitat is clearly consistent with the Council’s responsibilities and authorities” (Final Oceana, 2013).</p> <p><b>-Enforcement-</b> The act of compelling observance of or compliance with law, rule or obligation Example: “EFH Conservation Areas are protected from midwater trawl gear through improved enforcement of bottom contact” (Final Oceana Proposal)</p>

#### 4.2 Public records for Amendment 28

In 2013 the PFMC began accepting public proposals for modifications to the trawl RCA and the groundfish EFHCAs, which later became Amendment 28. Materials submitted to the PFMC were uploaded and archived to the PFMC website, becoming public record. These public

records from the archived meetings of the PFMC from 2013 to 2018 and used in the content analysis of written documents.

Table 11- Organizations that submitted public records to the PFMC about modifications to EFHCAs and the Trawl RCA.

Public Records organizations- Stakeholders
Collaborative Group
Industry, Fishermen
Central Collaborative Group
Academic
Scientist
Audubon Society
Oceana
California Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
Washington Department of Fish and Wildlife
Congress
California Lt. Governor
PRMC Project Team
Citizen
EFH/RCA Project Team
Enforcement Consultants (EC)
Groundfish Advisory Subpanel (GAP)
Groundfish Management Team (GMT)
Habitat Committee (HC)
Science and Statistical Committee (SSC)
Coastal Treaty Tribes
National Marine Fisheries Science Center (NMFSC)
Pacific Fisheries Management Council (PFMC)
Northern Collaborative Group

Twenty-four organizations submitted seventy-one written documents to the PFMC concerning the proposed changes to the trawl RCA and EFHCAs, ranging from one to six hundred pages (Table 11; Appendix B.1).

The content analysis for the public records contained six main stakeholder groups: Industry, federal/state, environmental non-profit, tribal, citizen and the Collaborative Group. The Collaborative Group was a hybrid containing both industry members and environmental non-profits, which is why it was given its separate grouping.

The most numerous submissions of public records were from the federal/state agencies and related committees. The PFMC and NMFS employ a strict process before changing regulations. The federal/state stakeholder group submitted 48 of the 71 public records, or 67.6% of the total documents analyzed. Most of the submitted materials were from the PFMC committees, which included: The Groundfish Management Team, Habitat Committee, Science and Statistical Committee, Groundfish Advisory Subpanel, Enforcement Committee and the EFH/RCA Project Team. Most of these records were formal briefs used for reporting during the Council meetings. These documents are short and contain limited thematic information for the content analysis, this stakeholder section will be omitted from this analysis.

The second highest number of submitted files were public records from citizen stakeholders. Many of the documents from this group contained signatures supporting the various environmental non-profit groups stances on Amendment 28. Other citizen submissions ranged in content, including opinions by individuals on how the PFMC should implement the proposed changes to the trawl RCA and EFHCAs. These submissions included members with a very broad range of qualifications, ranging from elementary students to members of Congress and were the least consistent in expressed views. The citizen stakeholder group was only found in the public records section and will be cut from the rest of the content analysis.

The citizen participants are not considered further in the content analysis because they are not a group that created a cohesive proposal that addressed the ten components needed to change

the groundfish EFHs, nor did they explain or agree on the fate of the trawl RCA and EFHCAs. The majority of these documents contained mainly signatures from citizens in support of one of the environmental groups proposals. Excluding this group from the analysis does not bias or degrade the analysis because the submissions lacked thematic relevance. Also, after this initial call for proposals and comments, the rest of the Amendment 28 process was a closed process for proposals, meaning the PFMC read and listened to public comments but only proposals deemed appropriate to move on to the next stage in the amendment process were used in this content analysis.

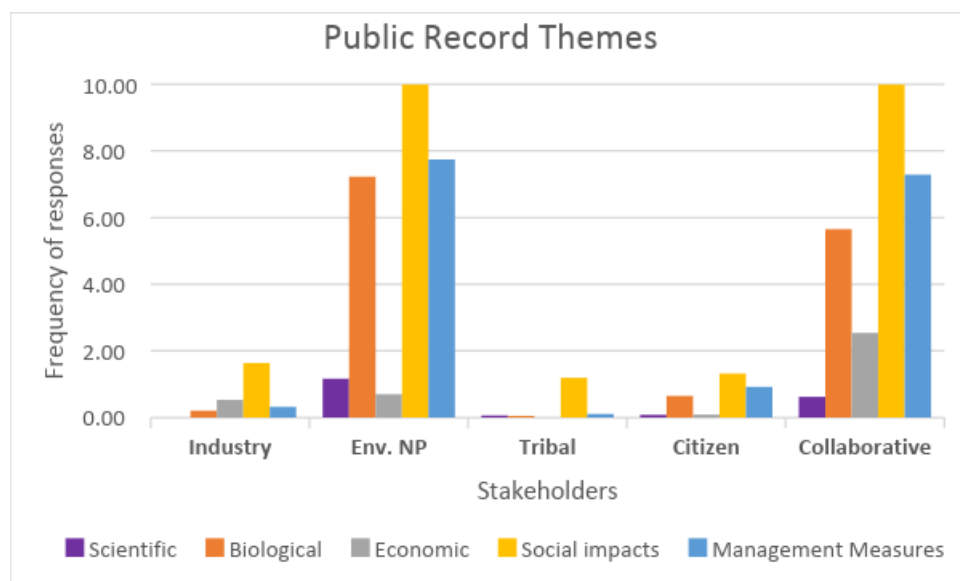


Figure 5- Bar Chart of the frequency of themes in responses as a function of stakeholders. Public record themes from the content analysis. All stakeholders top theme in the content analysis of public records was social impacts.

Table 12- Results from the content analysis of public records. Table of stakeholders with their document submissions and top three themes found throughout their documents. All stakeholders top theme was social impacts.

Stakeholders	Number of Submissions	Top Three Themes
<b>Industry</b>	3 out of 71 documents= 4.2%	1. Social impacts 2. Economics 3. Management measures
<b>Environmental Non-Profit</b>	5 out of 71 documents = 7%	1. Social impacts 2. Management measures 3. Biological
<b>Tribal</b>	5 out of 71 documents = 7%	1. Social impacts 2. Management measures 3. Scientific
<b>Citizen</b>	8 out of 71 documents= 11.3%	1. Social impacts 2. Management measures 3. Biological
<b>Collaborative</b>	2 out of 71 documents = 2.8%	1. Social impacts 2. Management measures 3. Biological

Social impact was the most common theme expressed across all stakeholder groups (Figure 5; Table 12). Further analysis showed within the theme of social impacts in the public records, the most used subcode was discussion of welfare. This subcode was used the most within the industry, environmental non-profits, tribal and citizen groups. Tribal records discussed the welfare of industry members the most frequently (0.966 relative frequency within the subcode). Citizen groups discussed the welfare of industry members most frequently (0.057 relative frequency within the subcode). The Collaborative groups most frequent subcode was not the discussion of welfare but collaboration among fishery participants (0.801 relative frequency within the subcode). In the content analysis of public records, scientific was the least mentioned theme across all stakeholders, and best available science was the least mentioned subcode. The Industry public records mentioned best available science the least (0.0 relative frequency within the subcode of this stakeholder).

### 4.3 Proposals for Amendment 28

The content analysis of proposals for Amendment 28 used documents submitted to the PFMC from 2013-2016. Twenty-three documents were submitted by the thirteen organizations, with the documents ranging from three to two hundred pages in length (Table, 13; Appendix B.2 and B.3).

Table 13- Organizations that submitted proposals for Amendment 28.

Organization submissions of proposals for Amendment 28
Marine Conservation Institute (MCI)
Greenpeace
Gulf of Farallones National Marine Sanctuary
Fishermen's Marketing Association
Environmental Defense Fund (EDF)
Monterey Bay National Marine Sanctuary
Oceana
Ocean Conservancy
CBNMS
Collaborative Group
PEW
Olympic Coast National Marine Sanctuary

The organizations were divided into three stakeholder groups; industry, environmental non-profit, and the Collaborative Group. As mentioned earlier the citizen group was removed from the content analysis due to its lack of cohesiveness and stated purpose. The federal and state agencies are a major player in the Amendment 28 process but cannot create their own proposal for Amendment 28. They were also removed from the rest of the content analysis of written documents. Tribal nations have a government to government agreement with the U.S. federal government concerning groundfish EFH. As a result of this agreement, the tribal groups did not submit proposals for Amendment 28, though they were considered a significant participant in the Amendment 28 process.



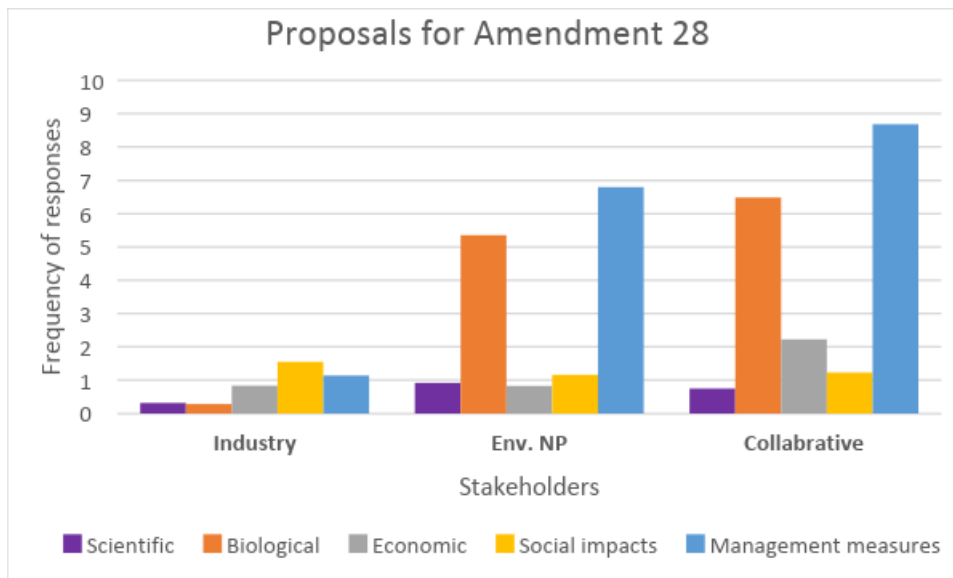


Figure 6- Bar Chart of the frequency of themes in responses as a function of stakeholders. Themes from the content analysis of the proposals for Amendment 28 divided by stakeholders. The Industry groups top theme was social impacts. While environmental non-profit and the Collaborative groups top theme was management measures.

Table 14- Results from the content analysis of the proposals for Amendment 28. Table of stakeholders with their document submissions and top three themes found throughout their documents.

Stakeholders	Number of Submissions	Top Three Themes
<b>Industry</b>	3 out of 23 documents= 13%	1. Social impacts 2. Management measures 3. Economics
<b>Environmental Non-profit</b>	18 out of the 23 documents= 78.3%	1. Management measures 2. Biological 3. Social impacts
<b>Collaborative</b>	1 out of the 23 documents= 4.3%	1. Management measures 2. Biological 3. Economics

The largest theme found in the content analysis of proposals for Amendment 28 was management measures, which was the top themes for both the environmental non-profits and Collaborative group (Figure 6; Table 14). Environmental non-profits largest subcode within management measures was Council responsibilities, where they discussed EBFM (1.00 relative frequency within the subcode). The Collaborative groups largest subcode was modifications to EFH, specifically about boundary changes (0.935 relative frequency within the subcode). The industry proposals highest overall theme was social impacts, with their largest subcode being

discussion of welfare pertaining to citizens (0.692 relative frequency within the subcode). In this section of the content analysis of proposals for Amendment 28, scientific was the again the lowest theme and scientific research was the least mentioned subcode. Scientific research was mentioned the least by the industry group (0.003 relative frequency within the subcode).

#### 4.4 Final preferred alternative proposals

In 2016 the PFMC narrowed down the proposals from eight documents that were submitted to be considered as the final proposals, to three final preferred alternatives: The Collaborative Group, Midwater Trawlers Cooperative and Oceana et al. During their meeting held in April 2018, the PFMC voted on their final preferred alternative that was a combination of all three final preferred alternatives. The final preferred alternative was sent to NMFS and the PFMC is awaiting their approval of Amendment 28.

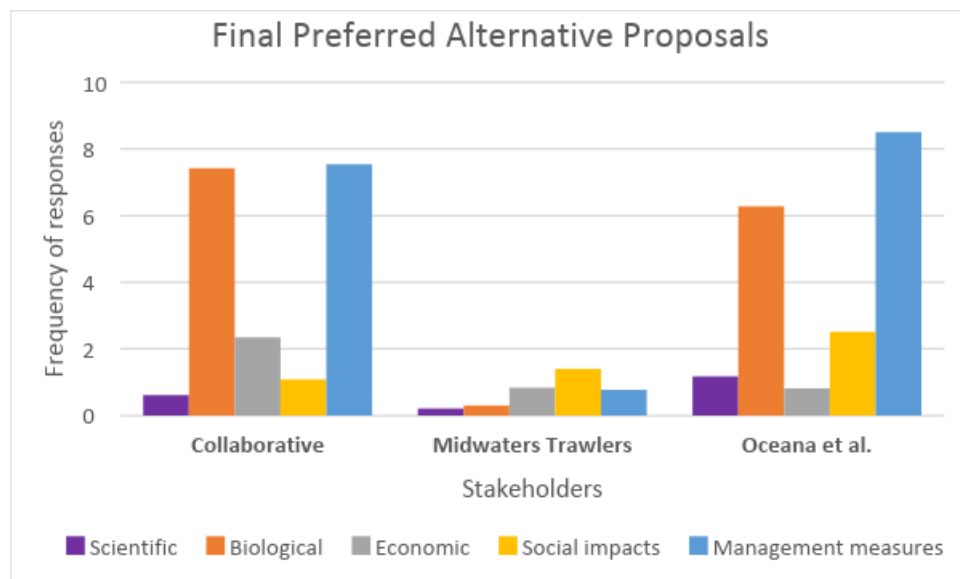


Figure 7- Bar chart of the frequency of themes in responses as a function of stakeholders. Themes from the content analysis of the final alternative proposals. The Collaborative Groups proposal and Oceana et al. highest theme was management measures. The highest theme in the Midwater Trawlers proposal, was social impacts.

Table 15- Results from the content analysis of the final preferred alternative proposals for Amendment 28. Table of stakeholders with their document submissions and top three themes found throughout their documents.

Stakeholders	Number of Submissions	Top Three Themes
<b>Collaborative</b>	1 out of 8 documents= 12.5%	1. Management measures 2. Biological 3. Economics
<b>Midwater Trawlers</b>	2 out of 8 documents= 25%	1. Social impacts 2. Economics 3. Management measures
<b>Oceana et al.</b>	5 out of 8 documents= 62.5%	1. Management measures 2. Biological 3. Social impacts

The most cited theme in the final preferred alternatives for Amendment 28 was management measures (Figure 7; Table 15). Within this theme the Collaborative groups most frequent subcode was modifications to EFH, specifically about boundary changes (0.873 relative frequency within the subcode). Midwater trawlers highest subcode in management measures was Council Responsibilities, specifically their legal obligation (0.135 relative frequency within the subcode). Oceana et al. highest theme was management measures and the most frequently used subcode was about the Councils responsibilities, pertaining to EBFM (1.00 relative frequency within the subcode). The Midwater trawlers highest overall theme was social impacts, not management measures. Within the theme of social impacts, their highest subcode was discussion of welfare about citizens (0.484 relative frequency within the subcode). The least cited theme in the final preferred alternative proposals was scientific with scientific research mentioned the least frequently. The proposal which mentioned scientific research the least was the Midwater Trawlers (0.004 relative frequency within the subcode).

The progression of this content analysis went from broader to more detailed. Each document phase in the content analysis showed how the PFMC narrowed down their choice for the final preferred alternative. The first phase in the content analysis, the public records, had the most stakeholders but all the documents shared the same main theme, social impacts. Within this

theme, the discussion of welfare was the most cited subcode within this theme. The second highest theme found in the content analysis of public records was management measures. As the documents were analyzed through the PFMC process, management measures became the top theme throughout the more refined grouping of the second phase, Amendment 28 proposals. The second largest theme throughout the stakeholders in the proposals was social impacts, followed by biological. This combination of themes, management measures as the number one theme, social impacts and then biological was also seen in the final preferred alternatives or the final phase of the content analysis. The Collaborative group kept the same three themes across the content analysis, only changing the final order for their proposals and final preferred alternative to: Management measures, biological and economics. Environmental non-profit groups and the final Oceana et al. proposal used the same three themes across the content analysis of their documents: Social impacts, management measures and biological. The Oceana et al. initial and final proposal for Amendment 28 kept the same ordering of these themes: Management measures, biological and social impacts.

Industry documents, proposals and the final Midwater trawlers preferred alternative all had the themes: Social impacts, economics and management measures. These themes changed throughout the analysis, starting with: social impacts, economics and management measures in the public records, changing to social impact, management measures and economics in their proposals and finally back to social impacts, economics and management measures in the Midwater Trawler proposal. Throughout the content analysis, scientific was the least mentioned theme throughout all the themes but especially in the Industry written documents, proposals and the Midwater Trawlers proposal. These documents had the least mentioned relative frequency of the subcodes within the theme of scientific when compared to the other stakeholder groups.

## 4.5 Interviews

The author conducted fifteen semi-structured interviews between April to May 2018 with individual representing the commercial fishing industry, tribal groups, environmental non-profits and the Collaborative Group (Appendix B.5). Participants were selected based on their involvement in the Amendment 28 process, either through proposals, documents or publicly stated positions held. After the initial candidates were selected, the other interviewees were recruited by a snowballing or chain referral sampling (Neuendorf, 2017, p. 89). Interviews were conducted in both person and by phone, averaging 32.29 minutes in length, with a range of ten minutes to fifty-five minutes. The interviews themselves were audio-recorded, transcribed verbatim and analyzed using the coding software, Dedoose (McLellan, MacQueen & Neidig, 2003).

Table 16- -Interviewees organizational affiliation.

Interviewees Organization Affiliation
Environmental Defense Fund (EDF)
Pacific Fisheries Management Council Staff
National Marine Fisheries Service (NMFS)/ National Oceanic and Atmospheric Agency (NOAA)
Environmental non-profit/ NGO
Oceana
Fishermen's Marketing Association
Natural Resources Defense Council (NRDC)
Tribal
Independent fisherman (I.F.) Fixed Gear
Independent fisherman (I.F.) Oregon Trawl Commission
Independent fisherman (I.F.) Shellfish Co.
Oregon Seafood Processors Association

Table 17- Interviews ordered with their affiliated stakeholder groups.

Interviews and stakeholder group
<b>Interview 1:</b> Industry
<b>Interview 2:</b> Collaborative Group
<b>Interview 3:</b> Treaty Tribes
<b>Interview 4:</b> Treaty Tribes
<b>Interview 5:</b> Federal/ State
<b>Interview 6:</b> Collaborative
<b>Interview 7:</b> Federal/ State
<b>Interview 8:</b> Collaborative
<b>Interview 9:</b> Environmental Non-profit
<b>Interview 10:</b> Collaborative
<b>Interview 11:</b> Environmental Non-profit
<b>Interview 12:</b> Industry
<b>Interview 13:</b> Federal/State
<b>Interview 14:</b> Federal/State
<b>Interview 15:</b> Industry

The interviews were analyzed using the same five overarching themes as those in the written document content analysis, with some additional subcodes added to better reflect the content of the transcribed interviews. The five themes for the content analysis were scientific, biological, economic, social impacts and management measures (Table 15; Table 16, Appendix C.2 for full code book). The research found that the added themes did not add to the richness of the thematic analysis. Keeping the themes consistent throughout the content analysis of written documents and interviews allowed for patterns to be showcased. Keeping rigor in mixed method analysis is important to for accountability within the analysis (Johnson and Onwuegbuzie, 2004; Tashakkori and Teddlie, 2008, p. 354).

The theme of scientific related to the use of science, including methods and principles. Within this code the two subcodes used were scientific research and area of scientific needs. The biological themes related to biology or living organisms. The subcodes within this theme were: sensitive habitats, bycatch and overfished groundfish. The economic theme related to economics, or monetary concerns and the subcodes were: Revenue displacement, and fishery decline. The social impacts theme related to the community or broader individual, non-monetary factors, the

subcodes were: impacts to participants, collaboration among fishery participants and trust building. The final theme was management measures, or measures implemented from the PFMC, federal/state agencies pertaining to the fishery, subcodes included: Council management measures, EFH effectiveness, RCA effectiveness, IFQ program, RCA effectiveness, BAC and DAC.

Table 18-Themes and codes used for the content analysis of the interviews with stakeholders. Full code book Appendix C.2.

Scientific	Biological	Economic	Social Impacts	Management Measures
<p><b>-Scientific Research</b> “Through scientific research expeditions with remotely operated vehicles, documenting new areas with sensitive habitats” (PFMC, 2015; H8b_SupPublicComment)</p> <p><b>-Area of scientific needs-</b> discussion of areas lacking scientific research or data. Example: “I think there's still a lot of research that needs to be done. You know, it's, it's the whole concept of do protected areas work” (Interview 5).</p>	<p><b>- Sensitive Habitats-</b> Quick to detect or respond to slight changes, signals or influences. As described in the Groundfish FMP: hard substrate, biogenic habitats (corals and sponges), submarine canyons, seamounts, and ridges (FMP Amendment 19, 2006). Example: “Adding the proposed areas of sensitive habitat as designated EFH and taking steps to protect those areas is consistent” (Final Oceana Proposal).</p> <p><b>- Bycatch-</b> Unwanted fish or other marine species caught during commercial fishing for other marine species</p> <p><b>-Overfished groundfish-</b> Depletion of a stock of groundfish overfishing</p>	<p><b>-Revenue displacement-</b> displaced revenue from a loss of access to economically viable stocks Example: “Things like displaced revenue, how much revenue annually came from an area that would now become closed, what happened when they would foreseeably be caught elsewhere” (Interview 9)</p> <p><b>-Fishery decline-</b> economic loss, stock decline</p>	<p><b>-Impacts to participants-</b> in terms of caring or concern for impacts to stakeholders</p> <p><b>-Collaboration among fishery participants-</b> Discussions, meetings between different stakeholder groups, positive compromises being made</p> <p><b>-Trust building-</b> building of trust between fishery participants Example: “so there was a fair amount of trust-building, you know, our entire meeting or two rarely basically was devoted to that, which is a fair number of hours” (Interview 2).</p>	<p><b>-Council management measures-</b> “The management measures are necessary and appropriate to minimize these potential adverse impacts” (PFMC, 2013; Final Oceana, 2013). Positive- “I think it was critical, the ultimate pairing of the RCA with the EFH resulted in far more EFH protected” (Interview 9, Environmental NP). Neutral- “for the most part, EFH attributed very little to increased spawning habitat or anything like that” (Interview 15, Industry). Negative- “No. The essential fish habitat and the RCA were put in place for entirely different reasons. The essential fish habitat conservation zones weren't a rebuilding tool” (Interview 3, Table A.).</p> <p><b>-EFH effectiveness-</b> Positive- “EFH added more diverse habitat, rough pinnacles, some canyons, a more diverse set of habitat. Coupled with the RCAs probably better protected all life history characteristic and probably more life states. So, it was probably additive to the RCA” (Interview 11, Environmental NP). Neutral- “it's hard to have a causal relationship there [EFH effectiveness]. I mean habitats important for rockfish productivity but protecting EFH, particular habitat areas of concern, it's hard to say just how, how much that contributed to the rebuilding” (Interview 14, Federal/State).</p> <p><b>-IFQ program-</b> Individual Fishing Quota Program -Positive- “So I think the industry deserves a lot of credit because of the success that they've seen in the conservation</p>



				<p>success is because of the Trawl IFQ” (Interview 5, Federal/state).</p> <p><b>-RCA effectiveness-</b></p> <p>Positive- “had seen recovery with the species the RCAs were intended to benefit. So definitely from that perspective, it has been successful” (Interview 9, Environmental NP).</p> <p>Neutral- “There’s a question of how much area closures, for some protection is important for rebuilding. I think there’s no doubt that some mortality reductions were very important. I think there’s fair, good reasons to believe they were important” (Interview 2, Collaborative).</p> <p>Negative- “I don’t think that if they had been implemented on their own, as the only measure indented to rebuild those stocks that they would have been successful” (Interview 1, Industry).</p> <p><b>-BAC- Block area closures</b></p> <p><b>-DAC- Discrete area closures</b></p>
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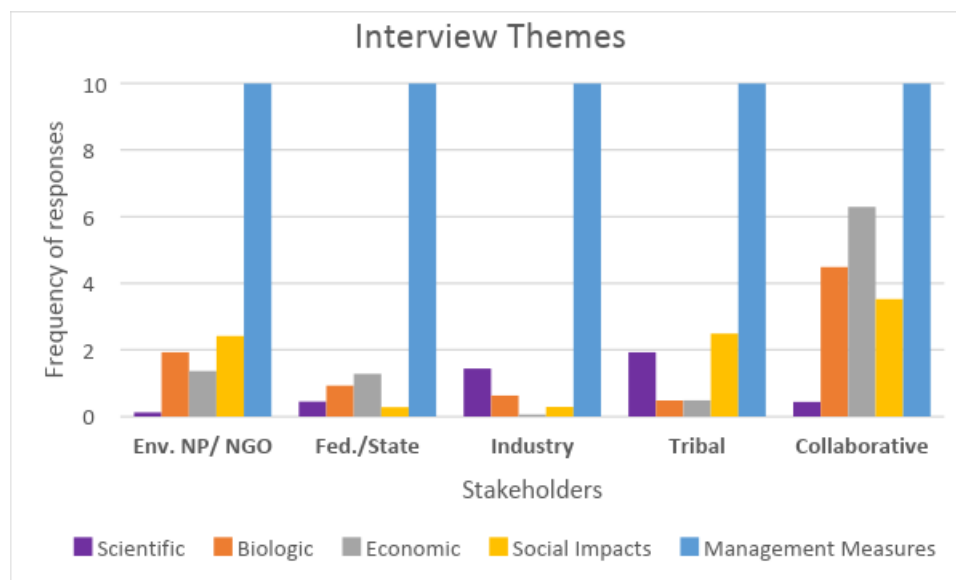


Figure 8- Bar chart of the frequency of themes in responses as a function of stakeholder. Themes from the content analysis of the interviews of key stakeholders from the Amendment 28 process. Management measures was the top theme seen throughout the interviews.

Table 19- Results from the content analysis of the interviews with their three key themes and proportion of stakeholder groups.

Stakeholders	Proportion of stakeholders interviewed	Top Three Themes
<b>Environmental non-profit</b>	2 out of 15 interviewed= 13.3%	1. Management measures 2. Social concerns 3. Biological
<b>Federal/ State</b>	4 out of 15 interviewed= 26.7%	1. Management measures 2. Economics 3. Biological
<b>Industry</b>	3 out of 15 interviewed= 20%	1. Management measures 2. Scientific 3. Biological
<b>Tribal</b>	2 out of 15 interviewed= 13.3%	1. Management measures 2. Social impacts 3. Scientific
<b>Collaborative</b>	4 out of 15 interviewed= 26.7%	1. Management measures 2. Economics 3. Biological

The most used theme within the interviews with stakeholders referred to management measures (Figure 8; Table 19). Within the environmental non-profit interviews the most common subcode within this theme was RCA effectiveness, in which they described it as positive (0.857 relative frequency within the subcode). The Federal/ State stakeholders top subcode was about EFH effectiveness in which they spoke positively about it (1.00 relative frequency within the subcode). Industry and tribal stakeholders top subcode was about the effectiveness of the joint EFH/RCA in which they spoke negatively about the management measure (1.00 relative frequency within the subcode). The most used subcode within the Collaborative groups interviews was EFH effectiveness, in which they spoke positively (1.00 relative frequency within the subcode). During the interviews, scientific was the least mentioned theme, with the subcode of scientific needs mentioned the least.

## 4.6 Research Questions

The questions for the interview guide were created to foster conversation with the interviewees and centered around the three central research questions. The following section lays out the interviewee's answers concerning these primary research questions (Table 20).

Table 20- Research Questions.

Research Questions
<ul style="list-style-type: none"> <li>• Perceptions of the past effectiveness of the RCA and EFH designations, and their role in stock rebuilding relative to other management measures;</li> <li>• Perception of the role the RCAs played during the Amendment 28 decision in the management of the Pacific groundfish fishery directly and in the combination with other groundfish management measures.</li> <li>• The future role of the RCAs or similar spatial management measures in groundfish management directly and in the combination of with other groundfish management measures.</li> </ul>

## 4.7 Past effectiveness of RCA and EFH

The first question attempts to gauge the effectiveness of the RCA, groundfish EFH and EFHCAs in the rebuilding process of overfished stocks from a management setting. Proving causal relationships between management measures and rebuilding stocks is difficult, even with stock assessments and data on specific species.

Table 21- Results from interviewees on their responses to the effectiveness of the RCAs.

Stakeholders	Top Response	Proportion of interview responses
Environmental non-profits	Positive	2 out of 2= positive
Federal/ state	Positive	4 out of 4= positive
Industry	Negative	1 out of 3= positive 2 out of 3= negative
Tribal	Positive	2 out of 2 = positive
Collaborative	Positive	4 out of 4= positive

When questioned concerning the past effectiveness of the RCAs, with the exception of the industry stakeholders, all found the RCAs to be effective (Table 21). Stakeholders from the industry expressed the view that the RCAs served not as a tool for rebuilding stocks but rather to further reduce the fishing effort targeting these species even though fishing was allowed to continue with much reduced total allowable catches. They noted that some of the data regarding early stock assessments of rockfish, stating that some rockfish species were overfished, were later found to be incorrect, with the result that some industry members were wary of the effectiveness of the RCAs. This wariness is why the industry members did not believe the RCAs to be effective.

Table 22- Results from the interviews on the effectiveness of the EFH and EFHCAs.

Stakeholders	Top Response	Proportion of Interview Responses
<b>Environmental non-profit</b>	Positive	2 out of 2= positive
<b>Federal/ state</b>	Positive	3 out of 4= positive 1 out of 4= neutral
<b>Industry</b>	Positive	2 out of 3= positive 1 out of 3= neutral
<b>Tribal</b>	Neutral	2 out of 2= neutral
<b>Collaborative</b>	Positive/ neutral	2 out of 4= positive 2 out of 4= neutral

Interviewees were asked about the effectiveness of the EFHCAs established in 2006. The environmental non-profit, federal/state and industry stakeholders all found the EFHCAs to be effective (Table 22). In contrast, only half the Collaborative members felt the EHFCA had been

effective, with the other half neutral on the subject. The Tribal stakeholders were neutral about the EFHCAs effectiveness.

Table 23- Results of interviews responses to the effectiveness of policy to designate part of the RCAs as EFHCAs.

Stakeholders	Top Response	Proportion of Interview Responses
<b>Environmental non-profit</b>	Positive	2 out of 2 = positive
<b>Federal/State</b>	Positive	2 out of 3= positive 1 out of 3= neutral
<b>Industry</b>	Negative	1 out of 3= neutral 2 out of 3= negative
<b>Tribal</b>	Negative	2 out of 2= negative
<b>Collaborative</b>	Positive/ Negative	2 out of 2= positive 2 out of 2= negative

Both the environmental non-profits as well as the federal stakeholders found the joint EFH/RCA to be positive and added to the effectiveness of the rebuilding process (Table 23). The industry as well as tribal stakeholders felt the joint EFH and RCA process were not effective to the rebuilding process, while the Collaborative stakeholders were split with their responses about the effectiveness of the joint RCA and EFH. This divide in responses represents the differing perspectives of the combined stakeholders in the proposals from the Collaborative Group; the two Collaborative members who answered negatively were members from industry and the two that answered positively were members from environmental organizations. These differing stances illustrate that major differences can exist between members of the same coalition supporting a set of policy actions.

## 4.8 Question two and three; current and future roles

### 4.8.1 RCA Current and Future Role

Table 24- Responses from the interviews on the future role of the Trawl RCA.

Stakeholders	Top Response
Environmental non-profit	Re-open
Federal/State	Re-open
Industry	Re-open
Tribal	Re-open
Collaborative	Re-open

All the stakeholders agreed that the trawl RCA is no longer needed and should be re-opened (Table 24). The stakeholders represented by environmental non-profits stated that they feel comfortable opening the trawl RCA due to the new and modified EFHCAs that the PFMC voted on at the April 2018 meeting. Without the EFHCAs they would not want to see the trawl RCA opened to bottom trawling. Most of the stakeholders, except for the ones from the industry, found the RCA to be effective. All agreed that the trawl RCA is no longer needed. This suggests that they believe the trawl RCA had either accomplished its goal of rebuilding overfished rockfish or the stocks has rebuilt irrespective of the RCAs effectiveness and hence was no longer needed.

### 4.8.2 EFH Future and Current

When asked about current EFHCAs, some stakeholders were unhappy with the designation process of EFH in 2006, as illustrated by the negative responses to the questions regarding the joint EFHCAs and RCA effectiveness from the industry and tribal groups (Table 20). This was likely influenced by new data shared during initial Amendment 28, which showed that some of the areas designated as EFHCAs in 2006 were incorrect and not essential habitat. Contrary to the unhappiness with the 2006 designation process, most of stakeholder's responses

about the future of EFHCAs were positive about the future of EFHCAs after Amendment 28 outcome and new EFHCAs take effect.

Table 25- Results on the EFHCAs future in the groundfish fishery.

Stakeholders	Top Response
Environmental non-profit	Permanent
Federal/ State	Long-term sustainability
Industry	Permanent
Tribal	Protect habitat
Collaborative	Protect habitat

The environmental non-profits number one response was that they see the biggest benefit of EFHCAs to be permanent (Table 25). To open or modify EFH, it must be shown with new data that the area designated was in fact not essential habitat, and requires compelling evidence that prior designations was incorrect. As illustrated in the previous section, environmental non-profits find the EFHs to be essential to groundfish management (Table 25) and stated that EFHs will become more important following the removal of the trawl RCA.

The federal/state stakeholders thought the EFHCAs will be important for long-term sustainability and will increase in importance with the re-opening of the trawl RCA, as was mirrored in their previous responses that the EFHs were effective in the rebuilding of the groundfish (Table 21). The federal/state stakeholders have continually found both the RCAs and EFHs as fundamental to the groundfish trawl stocks health; as illustrated throughout the content analysis.

The view of the industry stakeholders is that the EFHs will be a permanent fixture in the Groundfish Fishery, and this will be beneficial, which was expressed in their previous response (Table 25). Industry stakeholders state they have found the EFHs to be an effective policy in general (Table 22), despite the joint RCA and EFHCAs being perceived as negative for the

rebuilding process (Table 23). The former is critical in order to realize industry stakeholders second theme which was that they viewed the EFHs as important for long-term sustainability.

Both the tribal and Collaborative stakeholders found the EFHCAs to be crucial for protecting habitats, the difference being that the tribal stakeholders preferred their use for scientific research to better understand groundfish habitat. This contrasts with their previous conclusion that the EFHCAs had a negative effect on the effort to rebuild groundfish stocks (Table 22). The tribal stakeholders emphasized that they interpreted the goals of the RCA and EFHs based on the specific definitions given them and felt merging the two to be ineffective. Additionally, the tribal stakeholders found the RCAs to be positive in the effort to rebuild rockfish, as they were created for this purpose (Table 21). The tribal stakeholders were neutral on their stance of EFH's effectiveness in rebuilding overfished groundfish. They are not against protecting essential fish habitats, but believe the EFHCAs designations should have stricter metrics for designation.

The scientific theme was the least considered theme found across all sections in the content analysis of written documents. Although scientific evidence was discussed as a strong rationale for establishing the RCA and EFH as spatial management measures within these documents, the actual scientific evidence for or against RCAs and EFH as spatial management measures was somewhat lacking in the actual documentation reviewed. The conclusion of both the content analysis of the documents as well as interviews suggests that management measures, along with social impacts were the most important issues in the Amendment 28 process.

Overall, the main themes of management measures and social impacts were consistently mentioned throughout the content analysis of both the documents and interviews. The themes stayed consistent within the stakeholder groups, and their proposed final preferred alternative.



This consistency throughout the content analysis within stakeholder groups is somewhat predictable because Amendment 28 was a stakeholder driven process and the PFMC appears to have focused on producing a final preferred alternative acceptable to all stakeholders.

## 5. Discussion

The history of the Pacific Groundfish fishery leading up to the overexploitation of some stocks creates the context for the successful passage of Amendment 28. The fishery, like many others, was built on exploitation and exclusion of different groups. The historic theme of individuality that occurred in the Pacific Groundfish fishery helped lead to the overexploitation of the rockfish assemblages. In a short period of time, management of this fishery has transformed from an individualistic free-for-all to one of the networked relationships and a more collaborative one. This is revealed through an examination of the codes used in this project that focus on social impacts, like collaboration among participants and discussion of welfare of the fishery participants. Also, the biological concerns displayed by all stakeholders shows a growing awareness and coming together in the way stakeholders view the fishery. Concerns over sensitive habitat and bycatch are seen in both environmental and industry proposals.

Only a longer time period for observation will allow us to definitely identify if the policy was instrumental in the rebuilding, but many can agree that the fishery “has seen recovery with the species the RCAs were intended to benefit. So definitely from that perspective it has been quite successful” (Interview 9, Environmental non-profit). Others may view the policy as having little to do with the overall rebuilding of the overfished stocks on its own but effective because the policy was paired with other management measures that were successful. “I don’t think that if they had been implemented on their own, as the only measure intended to rebuild those stocks that they would have been successful” (Interview 1, Industry). The more holistic management approach did add to the protections of essential habitat, may have helped the rockfish rebuild faster than was expected. “EFH added more diverse habitat, rough pinnacles, some canyons, a more diverse set of habitat.

Coupled with the RCAs probably better protected all life history characteristic and probably more life stages. So, it was probably additive to the RCA” (Interview 11, Environmental non-profit).

Although this research focuses on the implementation of the trawl RCA and groundfish EFHs, the IFQ Program was cited as another important management measure that contributed to rebuilding success. “I feel very strongly that when the council implemented the catch share program and turned this into an IFQ fishery with the entire intent of an IFQ program to eliminate all of the input controls and restrictions on where, when, and how to fish and the allowed vessels. They allowed the fishers to make those choices for themselves to prevent overfishing.” (Interview 1, Industry). This view was shared among many of the fishers and echoed in some environmental stakeholders as well. This combination of management efforts prompted by different participants within the fishery added to the effectiveness of the PFMC management practices for rebuilding the groundfish sector. The various participants led to a successful stakeholder driven process, in which many of the stakeholders were broadly happy with the outcome of Amendment 28.

### 5.1 Content analysis of the written documents and interviews

The content analysis of the written documents and interviews showed the subcode progression and consistency through both data analysis phases. The interviewees from the environmental non-profits had the same three themes: Management measures, social concerns and biological. These same themes were also seen in the content analysis of written documents within the environmental non-profit records, proposals and the Oceana et al. final preferred alternative. The tribal interview themes: Management measures, social impacts and scientific were the same three themes seen in the tribal public record documents.

The industry interviewees highlighted management measures, scientific and biological themes throughout their interviews. But this differs from the content analysis of the written documents in which the industry and Midwater Trawler documents discussed social impacts, economics and management measures. The stakeholders interviewed from the Collaborative group mentioned management measures, economics and biological during their interviews. This was not seen in their initial public record documents which cited social impacts, management measures and biological. But the Collaborative groups proposal and final preferred alternative matched the three themes mentioned above in their interviews (Table 22).

The federal/state interviewees discussed management measure, economics and biological during their interviews but they were not included in the content analysis of written documents, so there are no data to compare.

## 5.2 Intended benefits, unexpected consequences

An advantage to mixed methods research is the ability for subthemes and codes to surface throughout the content analysis. Although not a theme throughout the content analysis of interviews, the interview questions did ask about the intended benefits or unexpected consequences of the RCAs, groundfish EFH, EFHCAs and Amendment 28. This theme had considerable overlap with the five main themes to be used in the content analysis so was not considered as a discrete theme but the interview responses are an illuminating part of this research.

The interviewees were asked about the intended benefits or unexpected consequences from the creation of RCAs, Amendment 19 and the EFHCAs. An amendment to the Groundfish FMP, is long, complex and fully consultative process. Committees were created by the PFMC to explore the benefits and consequences prior to the final action vote of these policies. As a result of this, many of

the interviewees found the many benefits to be expected. Potential unexpected consequences from Amendment 28 were more varied, ranging from environmental uncertainties, economic impacts, loss of scientific data, displacement of fishing effort, increased pressure as well as potential false expectations for the actual management outcomes arising from Amendment 28.

Interviewees acknowledged that some impacts were impossible to account for since “only a small portion of the ocean floor are fully mapped or explored relative to the oceanography” (Interview 5, federal/state). During of the Amendment 28 process, stakeholders utilized the most current science in their proposals, and additionally, collaborated with fishers regarding their historic knowledge of the areas, reducing the likelihood of unexpected consequences. Many felt that the modified and new EFHCAs voted on in Amendment 28, addressed problems with the 2006 EFH designations. “The EFHs, the modifications that we have in place those areas, that shouldn't have been closed but were, and the reopening will be nice. There's not a whole bunch but there were some pretty good areas that were closed off. But I think we did a pretty good job of addressing those and so we're looking forward to having access to those spots again” (Interview 8, Collaborative). For most stakeholders, the Amendment 28 process alleviated many of the uncertainties and consequences from the prior EFH 2006 designation.

Another theme that the interviewees identified as unpredictable were some of the economic impacts on fishers. “Some of the unintended things might be how different closures either existing or new affect the fishing communities given that groundfish gained importance to some of those communities because of other factors that, we're not really possible to predict” (Interview 5, federal/state). Re-opening, the RCAs will assist many fishers to gain access to profitable rockfish stocks. However, the growth and reestablishment of this fishery is going require time. “When you no longer have access to those fish, and the supply of fish declines you begin to lose a place in the

market, that is readily filled by somebody else around the world.” (Interview 15, industry). The independent fishers interviewed spoke of other fishers who had dropped out of the Groundfish Trawl Fishery following the past management measures of the early 2000s. Factors cited for the exit of these fishers included an increase in expenses, which coupled with new management protocols as well as decreased areas to fish. Although the IFQ program with a 100% observer coverage is a costly program to participate in, many fishers interviewed actually felt that it had been beneficial for the fishers and fishery. To many interviewees, the results of the IFQ program demonstrated conclusively that fishers have the ability to change their attitudes towards stock conservation if given personal accountability for their fishing endeavors. Additionally, fishers believe the IFQ Program has allowed them the freedom to fish “when, where and how they want” (Interview 15; Interview 1, industry).

Area closures can lead to a displacement of fishing effort, as well as potential income, and may increase pressure on the areas open to fishing. “There’s a lot of focus fishing in one place again and again and isn’t probably our best behavior as harvesters, but the lines encourage that, so you push a lot of activity to certain places.” (Interview 12, industry). Preventing fishers from fishing in previously untrawled areas was the reason environmental groups, spearheaded by Oceana, moved to create Subject Area Three of Amendment 28, the use of MSA section 303(b) discretionary authorities. This section aimed to “freeze the trawl footprint” to protect those pristine fishing grounds at depths greater than 3,500 meters. “One possible thing that can happen is that if you close an area; you may actually displace effort, it may cause fishermen to explore new places that haven’t been fished before, cause new exploration, which may actually cause more damage to pristine habitat, then if you would have not closed any areas” (Interview 9, environmental non-profit). This displacement of fishing efforts and pressure make it imperative that the areas designated for closures to be EFH, despite the fact that closures themselves have benefit.

The 2006 EFHCA designation process left many stakeholders unhappy with the outcome. The process itself was done quickly, and included little input from stakeholders. As a consequence of not having collaboration between various stakeholder groups, the result may be a “zero sum gain”. Only one side wins in the designation process; either industry or environmental groups. “I think one of the earlier round of EFH was done a little more bluntly, more hastily and done with a little less input. It clearly did close some grounds that weren't necessarily sensitive habitats, and that were also were pretty productive fishing grounds. I think it also creates a dynamic where closed areas become a zero-sum gain; either conservation wins, or industry is prevented from going in. I think that's a pretty significant unexpected consequence” (Interview 10, Collaborative). Amendment 28 stakeholders benefited from the observation that the contentious 2006 designation process that left many unhappy. In the Amendment 28 process, the Collaborative Group, Oceana et al. and the Midwater Trawlers made efforts to attempt to cooperate in order to craft something that everyone “could live with” (Interview 2, Interview 6, Collaborative and Interview 9, environmental non-profit).

### 5.3 The Washington Trawl RCA

An unexpected consequence from the Amendment 28 process were unmet expectations for some participating in the proposal process, in particular, commercial fishing interests from Washington State. For the trawl RCA, the PFMC chose alternative 2.c for California and Oregon, which opened the trawl RCA off their coasts, but chose alternative 2.a or the no action alternative for Washington, “the result is that they closed new areas, but they did not open old areas” (Interview 13, Federal/state). Unmet expectations were a potential consequence for any fisher that participated in the Amendment 28 process because it was impossible to foresee which alternative the PFMC would vote on. Washington states trawl RCA will remain closed reflecting

a more precautionary stance on stock rebuilding that in Oregon or California. Other stakeholders believe that there may have been other factors involved including “lobbying from recreational fishermen that were concerned about potential gear conflicts” due to the opening (Interview 11, environmental non-profit). A positive aspect of Washington’s trawl RCA remaining closed is that it can serve as a control group for the rest of the trawl RCA. Some interviewees expressed hope that if all goes well, the rest of the trawl RCA will be opened. This decision may arise from broader state versus federal and tribal politics, which is outside the focus of this research.

#### 5.4 EBFM, the Pacific Groundfish Fishery and the implementation of Block Area Closures

This research shows the participants in the Pacific Groundfish trawl sector are open to moving into a more ecosystem based approach, with their overall positive outlook on groundfish EFH and its future in the fishery (Table 23). The PFMC decision to implement Block Area Closures (BACs) as a precautionary measure, instead of the Discrete Area Closures (DACs), is interesting. Participants in the fishery may differ on the benefits of the RCAs but they generally agree that the RCAs plus a host of management measures including the groundfish EFH and IFQ program led to the rebuilding of overfished groundfish species. While some might not agree on the benefits of Amendment 19, where parts of the RCA were designated as EFHCA, they agree that the groundfish EFH has been useful to protect groundfish essential habitats. It is curious that the PFMC chose implementing BACs when the groundfish species are not being overfished due to the IFQ Program, together with other controls in place to ensure stock rebuilding.

Implementation of DACs to protect habitats rather than the precautionary BACs, which could be used to reestablish the trawl RCA, seemingly contradicts the discussions and written content analysis of Amendment 28. DACs are used to protect habitat, while BACs are used to protect



species. This research shows the fishery participants respect a more hands-off management approaches that call for the protection of essential habitats, so that the stocks can reproduce and rebuild without impacts from harmful fishing gears. The IFQ Program allows for the fishers to create a system that allows them to fish when, where and how they want. Implementing DACs, rather than BACS would have signaled for a spatial management approach more aligned with an ecosystem based approach to managing the Pacific Groundfish trawl sector. In practice, there is little difference between DACs and BACs. Although EBFM may suggest DACs are preferred to BACs where fish stocks are healthy, FMCs are still coming to terms with the regulatory complexity of giving effect to EBFM. The choice of BAC designation over DAC likely reflects that they are more closely aligned with the RCAs they are replacing rather than any resistance to EBFM as a concept.

### 5.5 Limitations and potential bias

Potential limitations of this study arise from the sample size and the use of mixed methods qualitative approach. In qualitative research, a smaller sample sizes may make it difficult to draw conclusions from the data, while a very large sample size may be too cumbersome for the researcher to devote the proper amount of time to do fine-scale analysis. Determining the correct sample size for qualitative research is based primarily on the researcher's best judgement and understanding of research capabilities (Huberman and Miles, 1994). The number of interviews for this study, totaling fifteen, was not a limitation in terms of getting a substantial sample size, although the range of interview candidates may be seen as a limitation. Most of the interview candidates were involved in the Amendment 28 process, such that the population interviewed was defined by the research question. Additionally, many of the

interviewees were willing to discuss the Amendment 28 process because they had a positive or primarily positive experience with the process. This does not mean they were happy with the entire process, but rather that they may have been satisfied with the outcomes from Amendment 28 compared to either the status quo or one of the competing proposals.

Another issue is the use of only one coder for the content analysis and interview transcripts. In qualitative research using two coders is preferred to ensure consistency with the codes. Unfortunately, for this research there was only time and resources for one coder. Adding a second coder would have allowed for more consistency in the coding and potentially more subcodes or themes to emerge.

The researcher may have some potential bias secondary to her focus in graduate school as a graduate student in Environmental Sciences. Environmental scientists tend to favor policies they deem environmentally friendly or supportive of conservation policies involving natural resources. Although the researcher attempted to exclude prior existing opinions, and bias out of the analysis and writing of this paper, the potential for inherent bias may be present. However, prior to undertaking the research, this researcher had little knowledge or opinions about RCAs, or the subject of Amendment 28, which should lead to both a less predetermined conclusions of the subject, as well as allowing the research able to stay neutral during the writing of this paper. But the lack of training and experience with fisheries management may impact how the researcher interprets the codes and themes throughout the analysis. The researchers background is not in qualitative or mixed methods researcher and the methods chosen could be a limitation to the design of this study. The researcher may be biased in her methods, which could have caused quantifying of the qualitative codes.

## 6. Future areas of research

The scientific theme was mentioned the least throughout the content analysis of documents but was continually mentioned throughout the interviews as a mechanism to improve management of the groundfish fishery. “Management measures would have reacted to better science had it been available but it was not.” (Interview 4, tribal). Recommendations for future research should view the re-openings of the trawl RCA and EFHCAs as an opportunity as an area to study in both how these policies contributed to not only the species, but additionally to better understand the function and role of the EFHCAs as a fisheries management tool. The remaining closure areas in Washington create a control setting for the trawl RCA to gather baseline information to demonstrate any differences between the two regions once fishers can return.

## 7. Conclusion

Although it is difficult to demonstrate that the RCAs alone were the key to the rebuilding of rockfish stocks, it was one of a suite of management measures, which also included the EFHCA's and the Catch Share Program, that contributed to its success. "My sense is that the [trawl] RCA is a dinosaur, it's a really outdated tool. It made a ton of sense under the prior management regime. However, we don't need a blunt instrument like that as a mortality closure anymore, with the individual quota coupled with either electronic monitoring or observers" (Interview 11, environmental non-profit). The successful rebuilding of overfished rockfish is evidenced by the decision of the PFMC to open the trawl RCA, which most stakeholders believed was no longer needed.

The trawl RCA will be re-opened off the coasts of California and Oregon. In all, the PFMC took final action to reopen approximately 3,000 square miles to groundfish bottom trawling, to close approximately 13,000 square miles and to close approximately 123,000 square miles to all bottom contact groundfish gear, in waters deeper than 3,500 meters.

Amendment 28 was a combined effort between environmental groups, industry groups, tribal representatives and federal/ state stakeholders, and the PFMC final action appears to have widespread support. Ironically, what started as a contentious policy between stakeholders became an opportunity for collaboration and trust building between groups that have been at odds for years. The environmental groups feel comfortable with opening the trawl RCA as a result of the new and enhanced EFHCAs areas which will continue to protect essential habitat and species without the protections of the trawl RCA. Fishermen are satisfied that management measures that are no longer needed have been eliminated in California and Oregon. As the trawl

RCA is lifted in California and Oregon, stakeholders are optimistic about opportunities for collaborative research in areas opened to them by Amendment 28.

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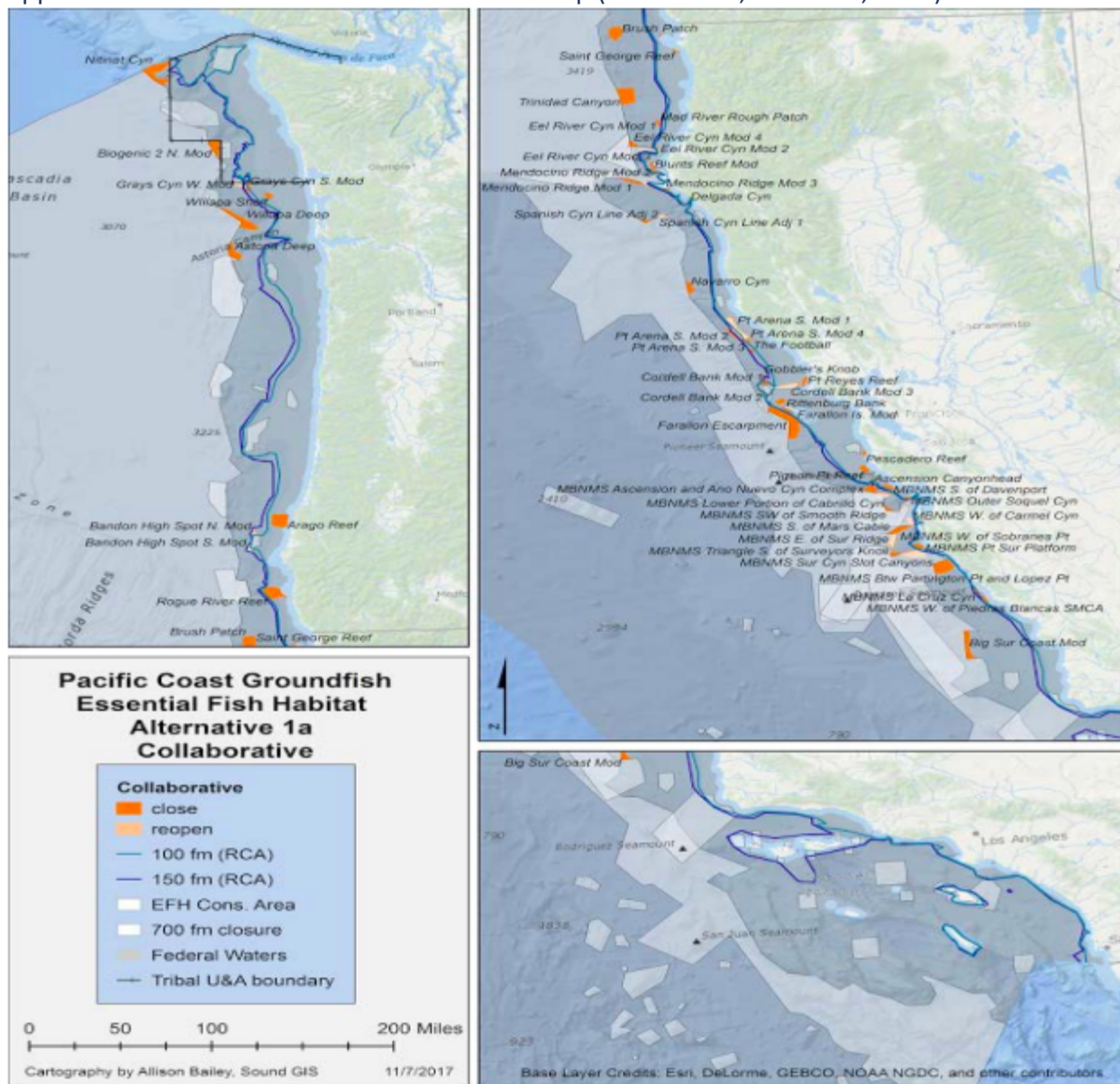
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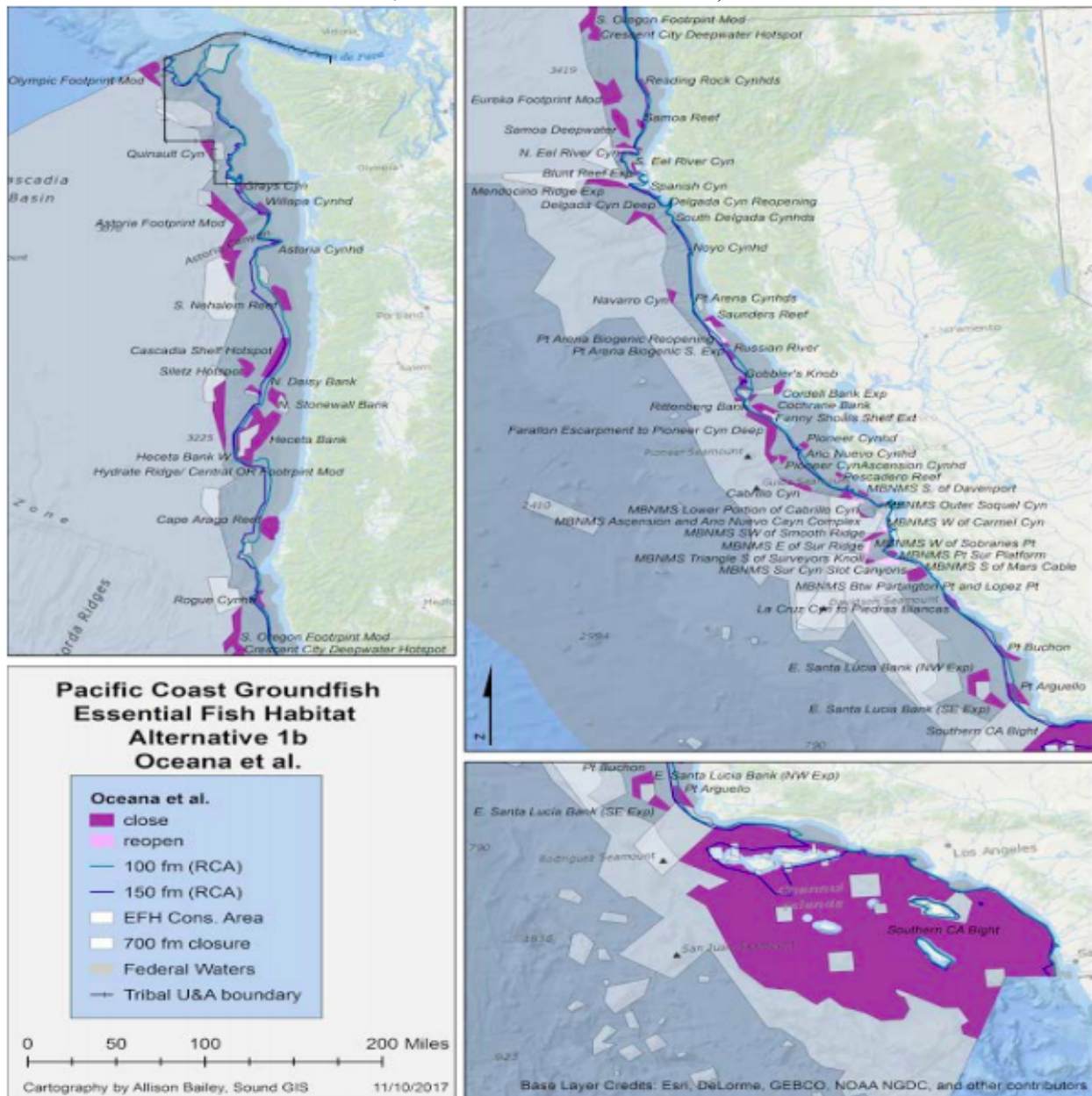
Wesley, P. & Link, J. (2015). Hidden in plain sight: Using optimum yield as a policy framework to operationalize ecosystem-based fisheries management. Marine Policy. 6, 74-81.

## Appendix A: Amendment 28 Maps

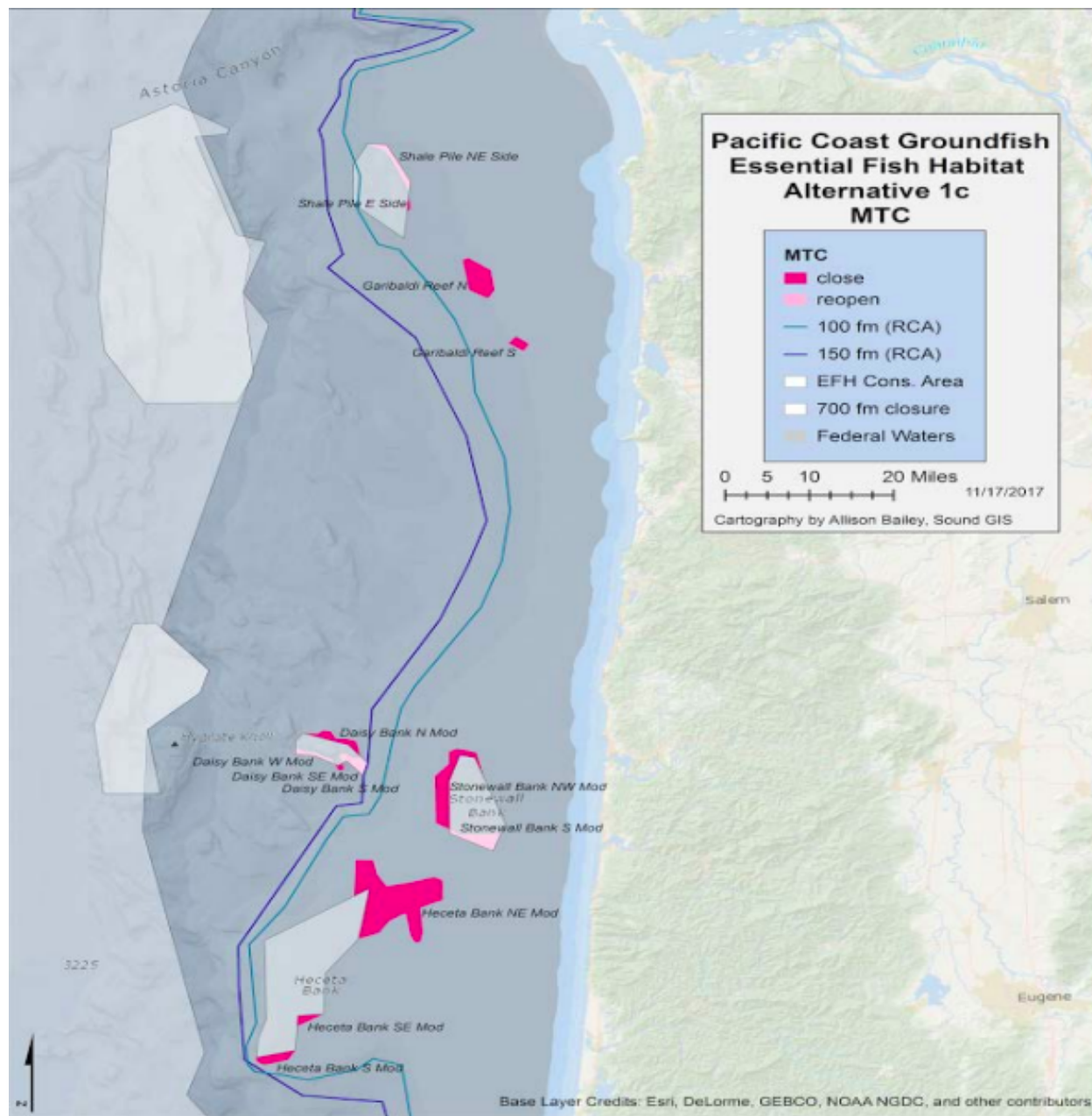
Appendix A.1- Alternative 1.a Collaborative Group (PFMC 2018; Hanshew, 2018).



A.2- Alternative 1.b Oceana et al. (PFMC 2018; Hanshew, 2018).

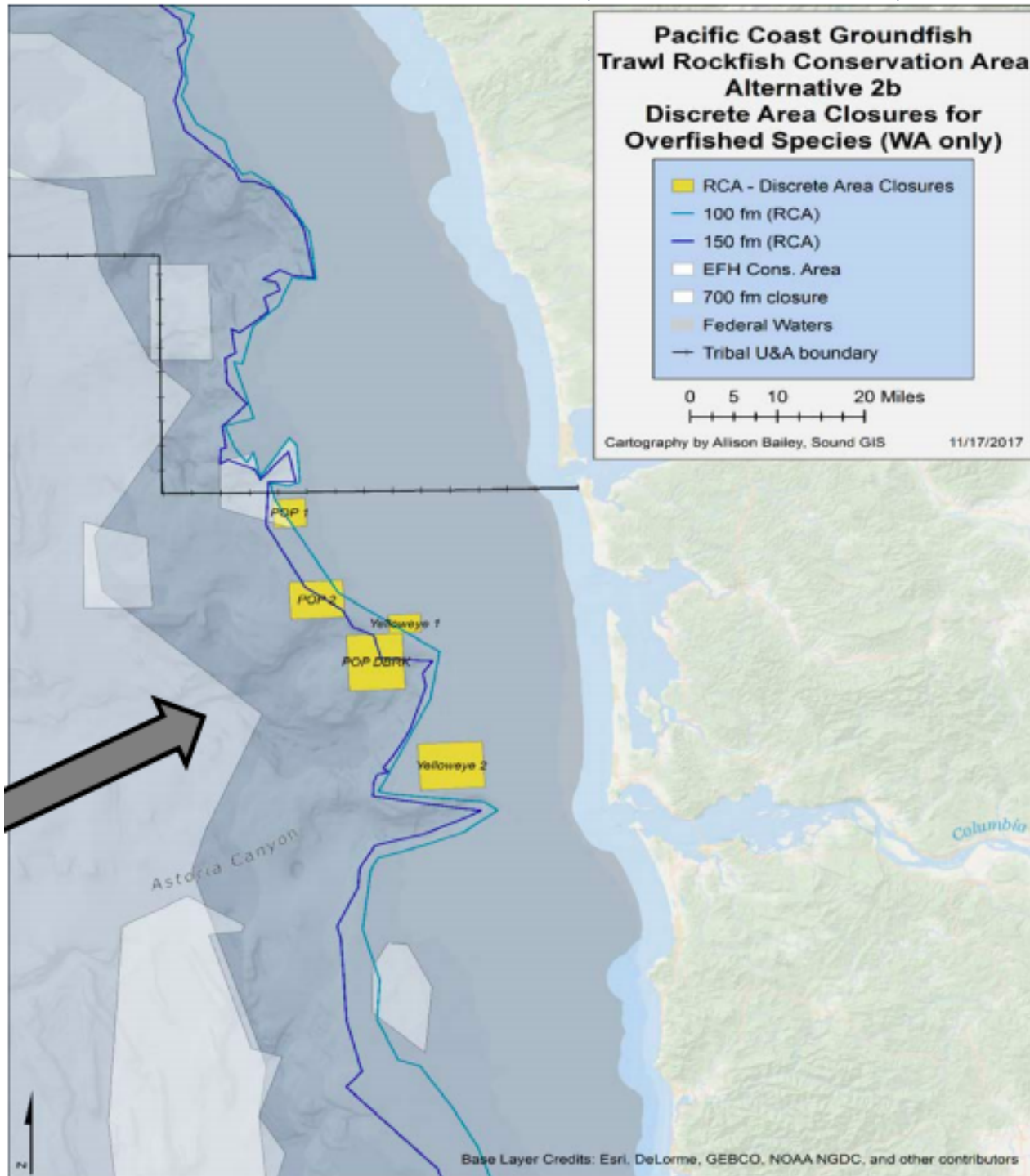


A.3- Alternative 1.c Midwater Trawlers Cooperative (PFMC 2018; Hanshew, 2018).

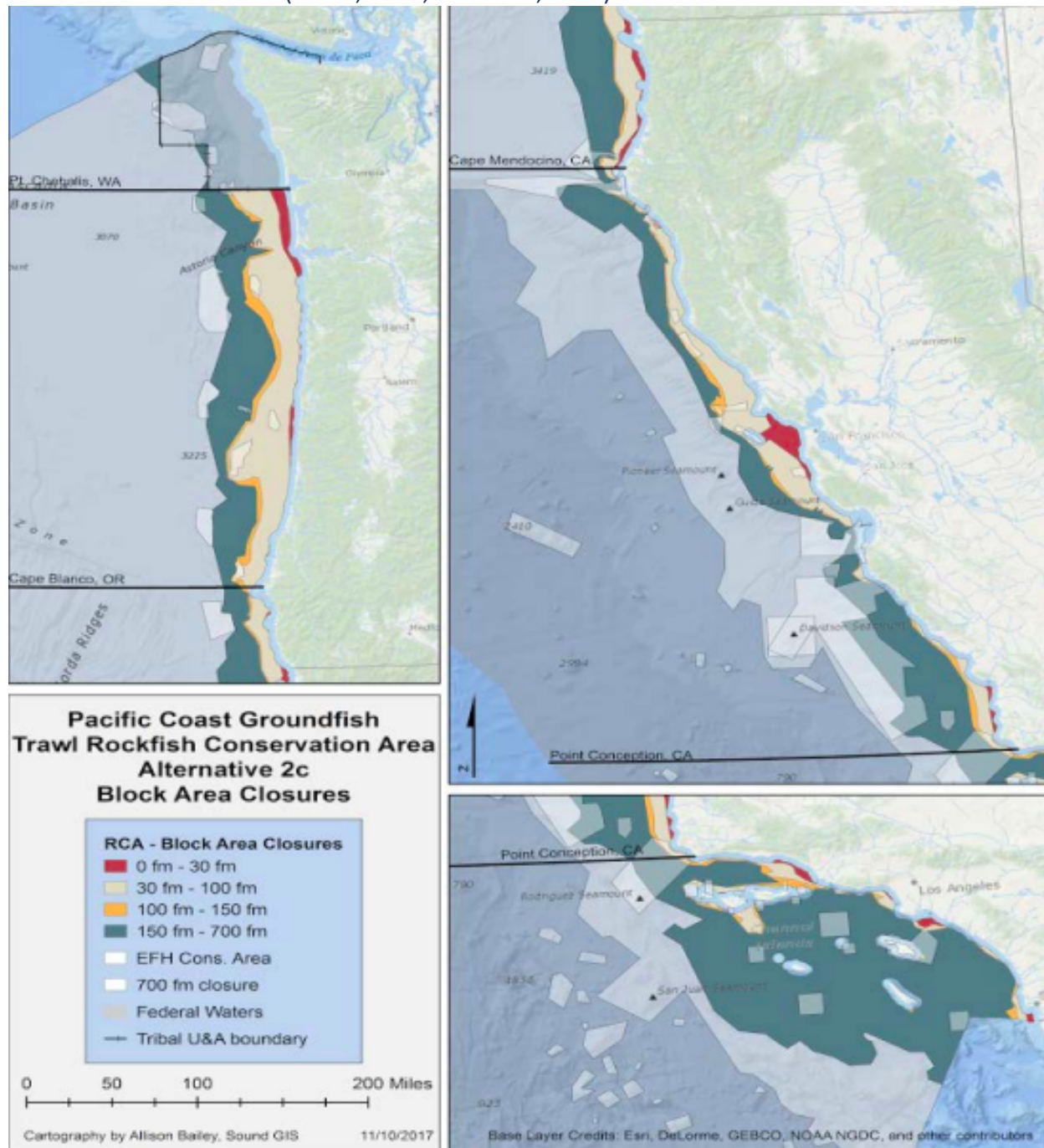




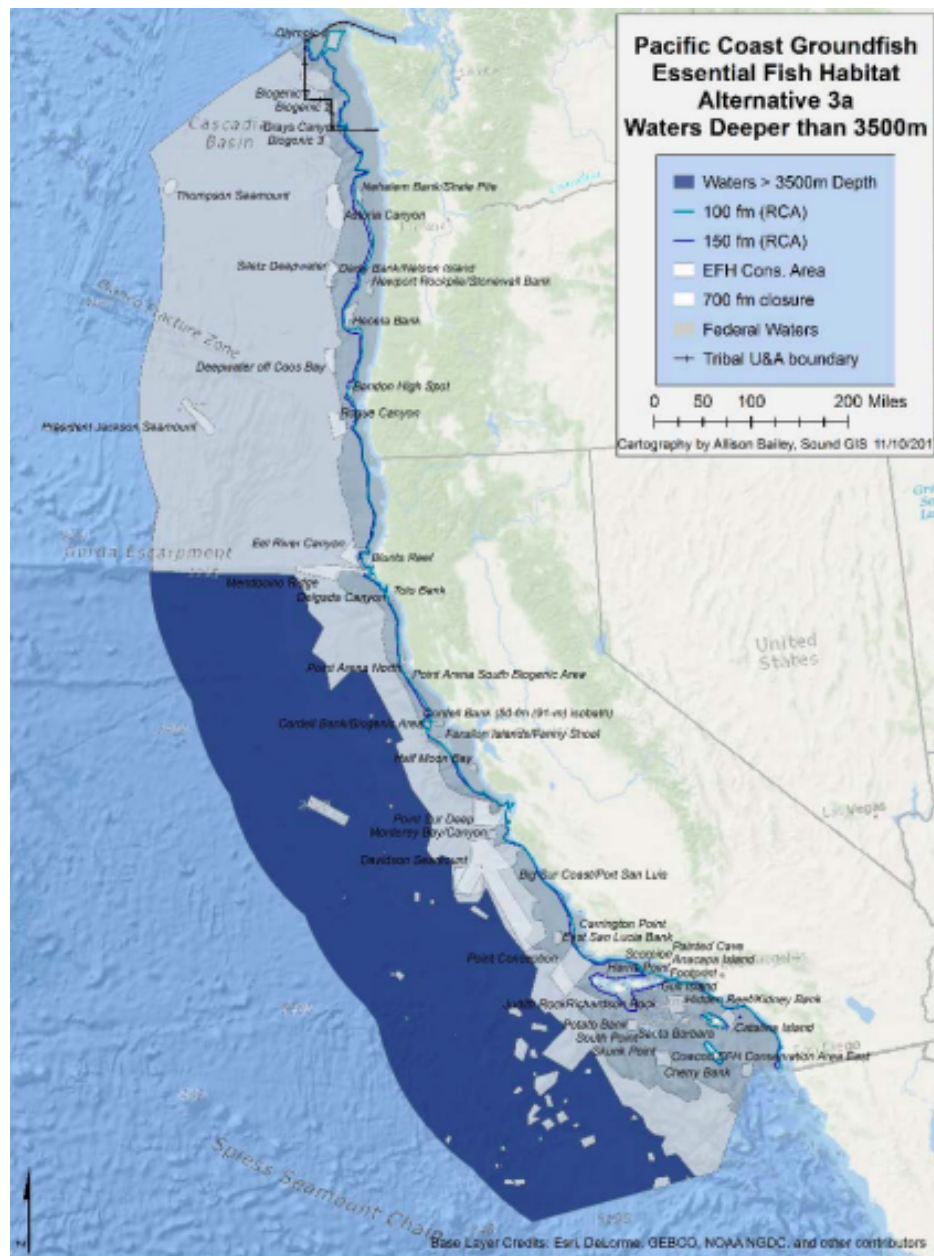
A.4- Alternative 2.a remove RCA, Alternative 2.b DACs (PFMC, 2018; Hanshew, 2018).



A.5- Alternative 2.c BACs (PFMC, 2018; Hanshew, 2018).

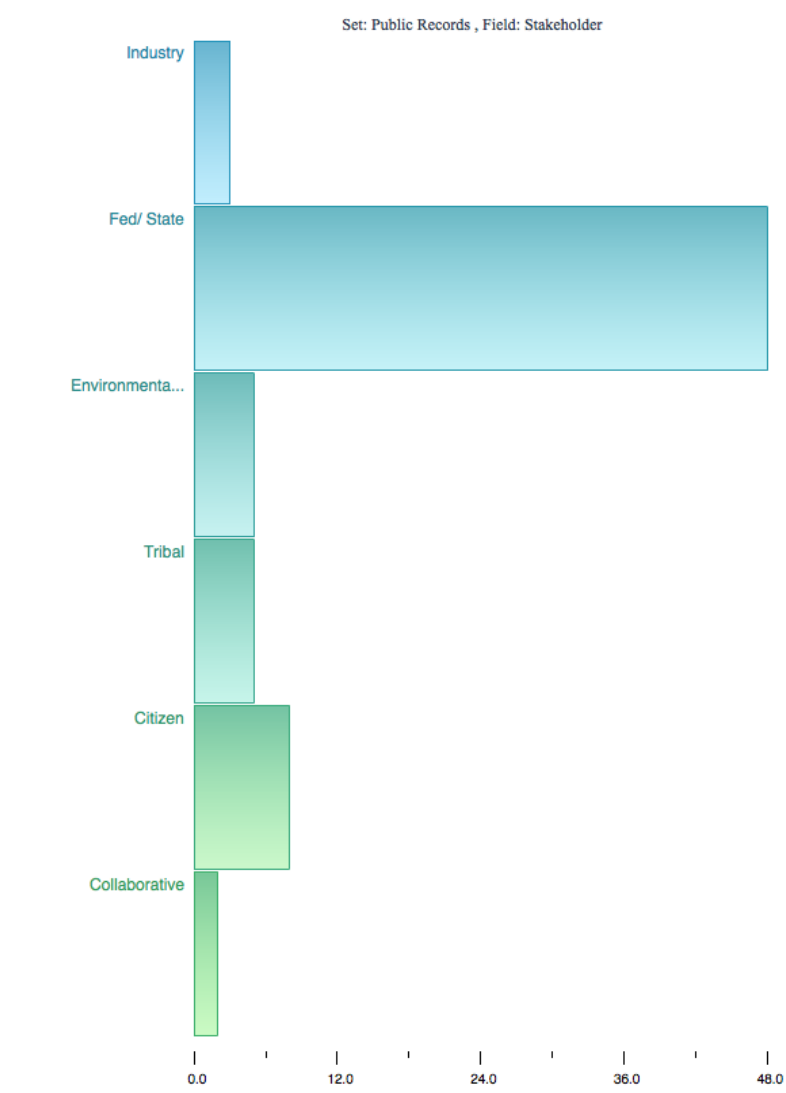


A.6- Alternative 3.a bottom contact closure in waters deeper than 3500 meters (PFMC 2018; Hanshew, 2018).

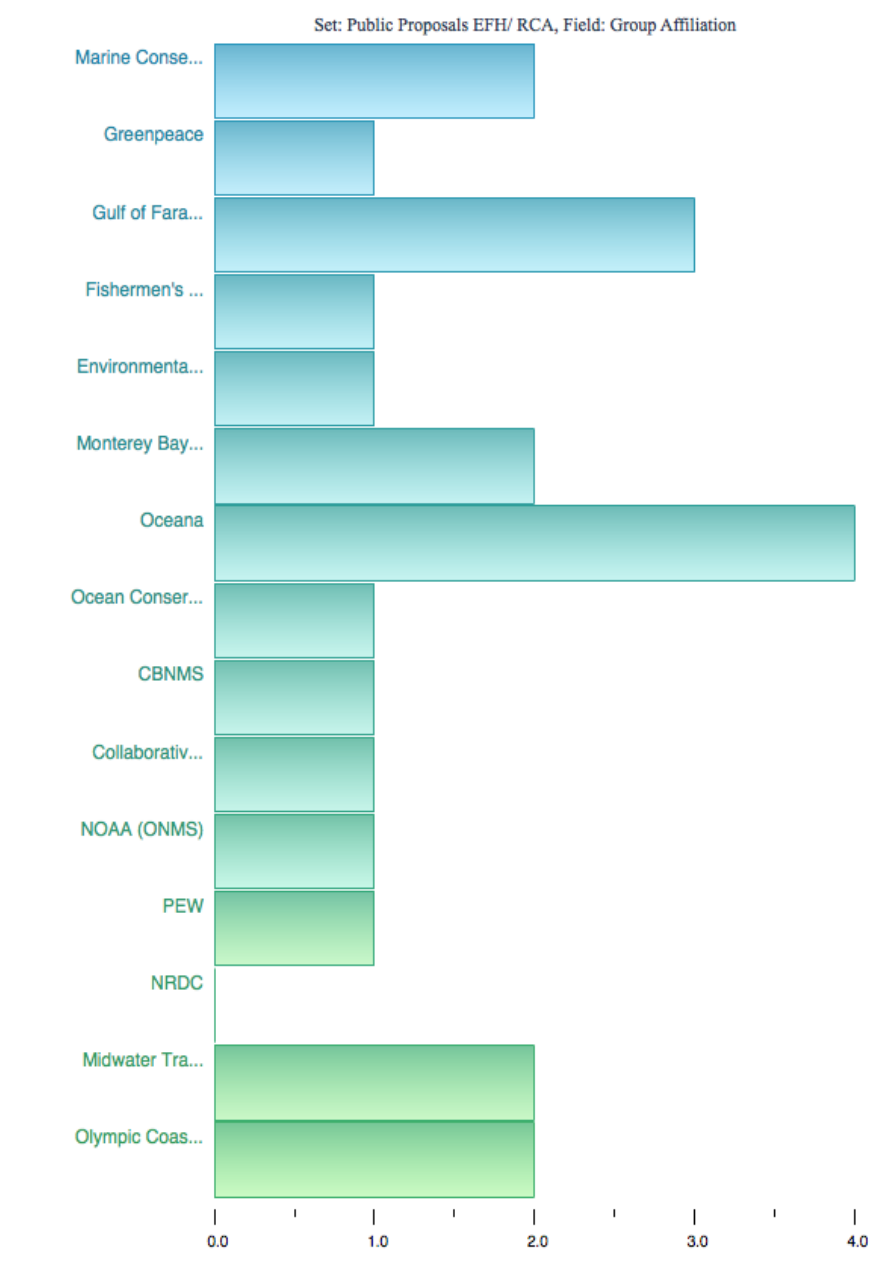


## Appendix B: Content analysis documents

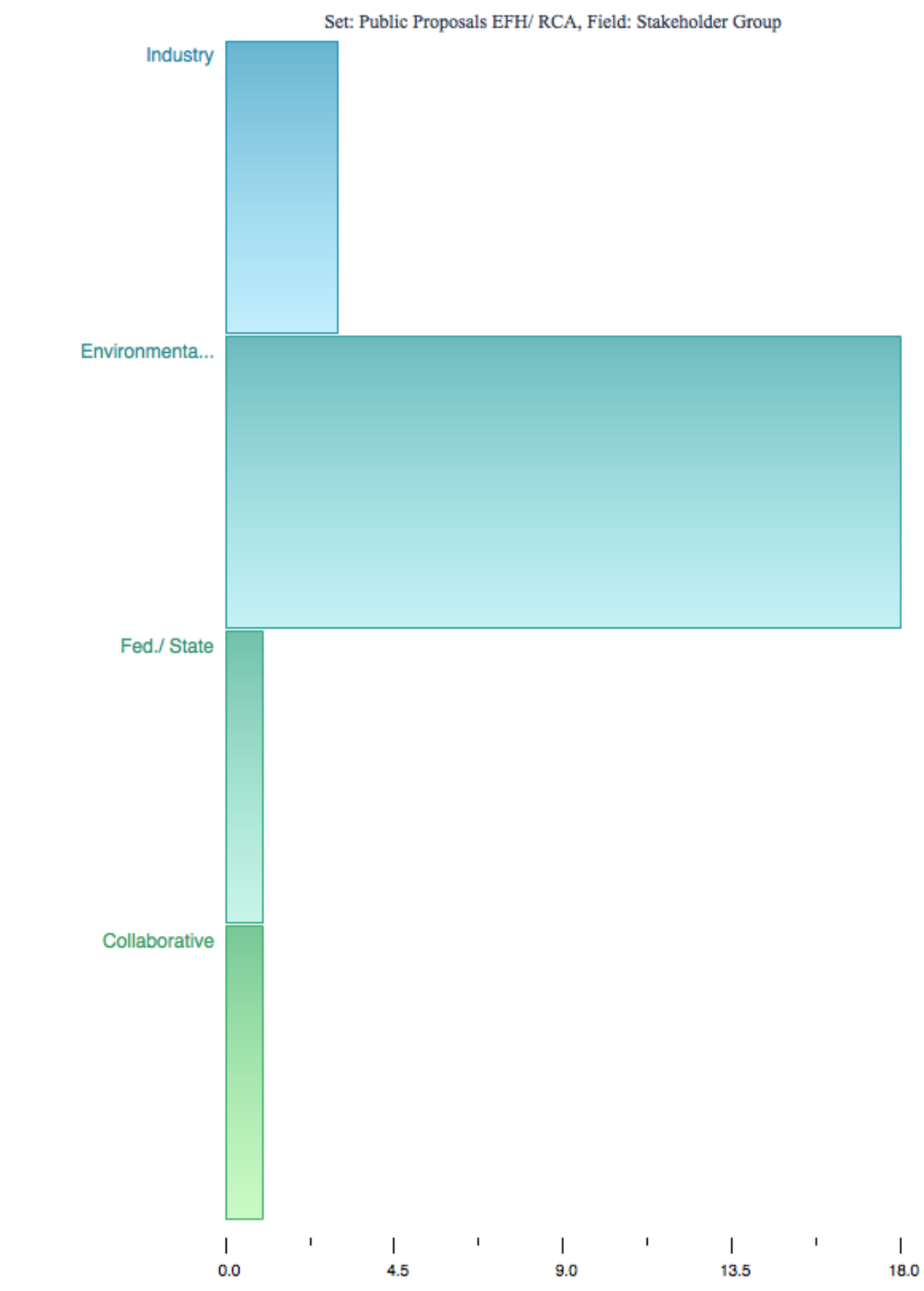
### Appendix B.1: Public record documents used in the content analysis.



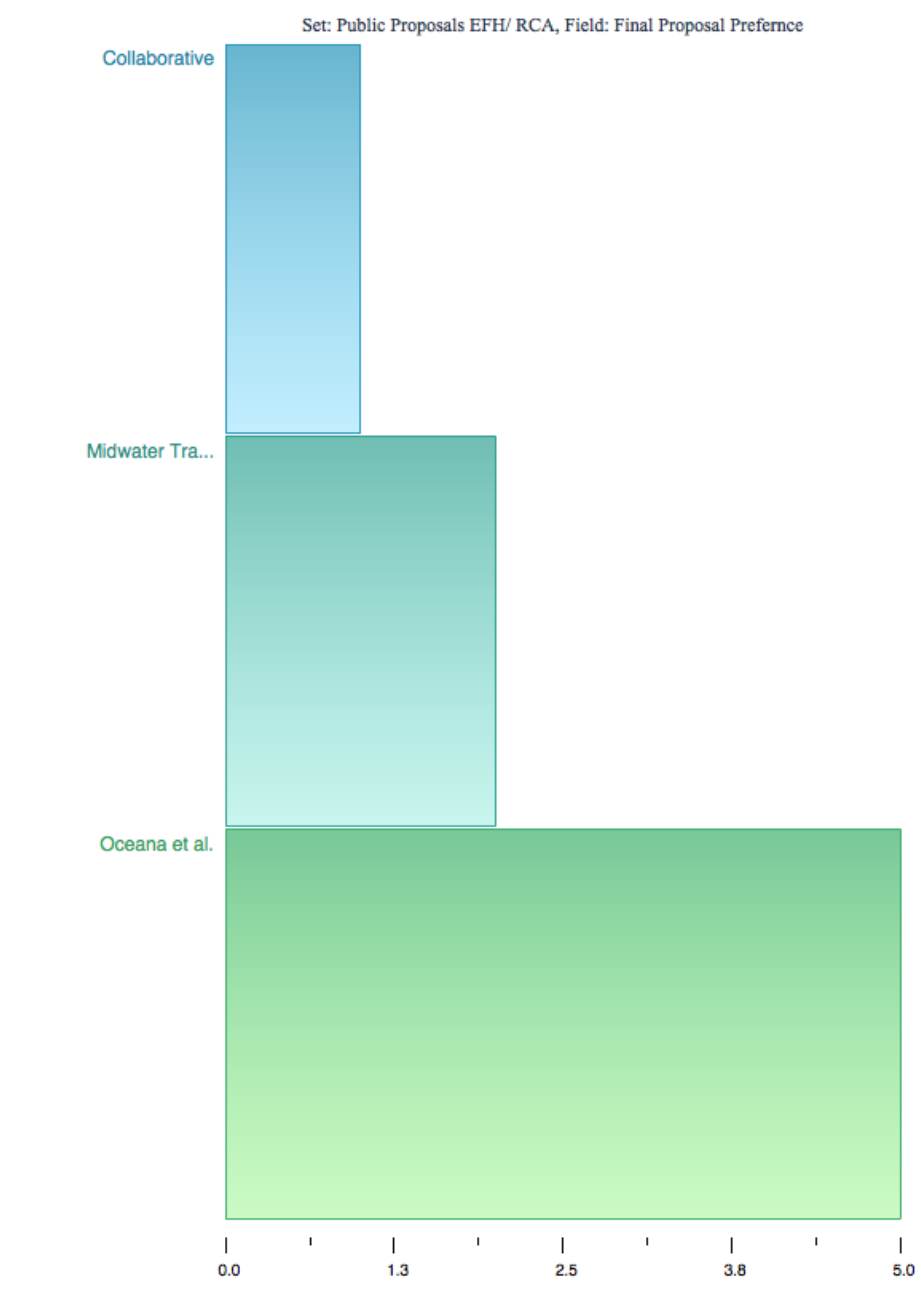
Appendix B.2: Proportions of organizations that submitted proposals for Amendment 28.



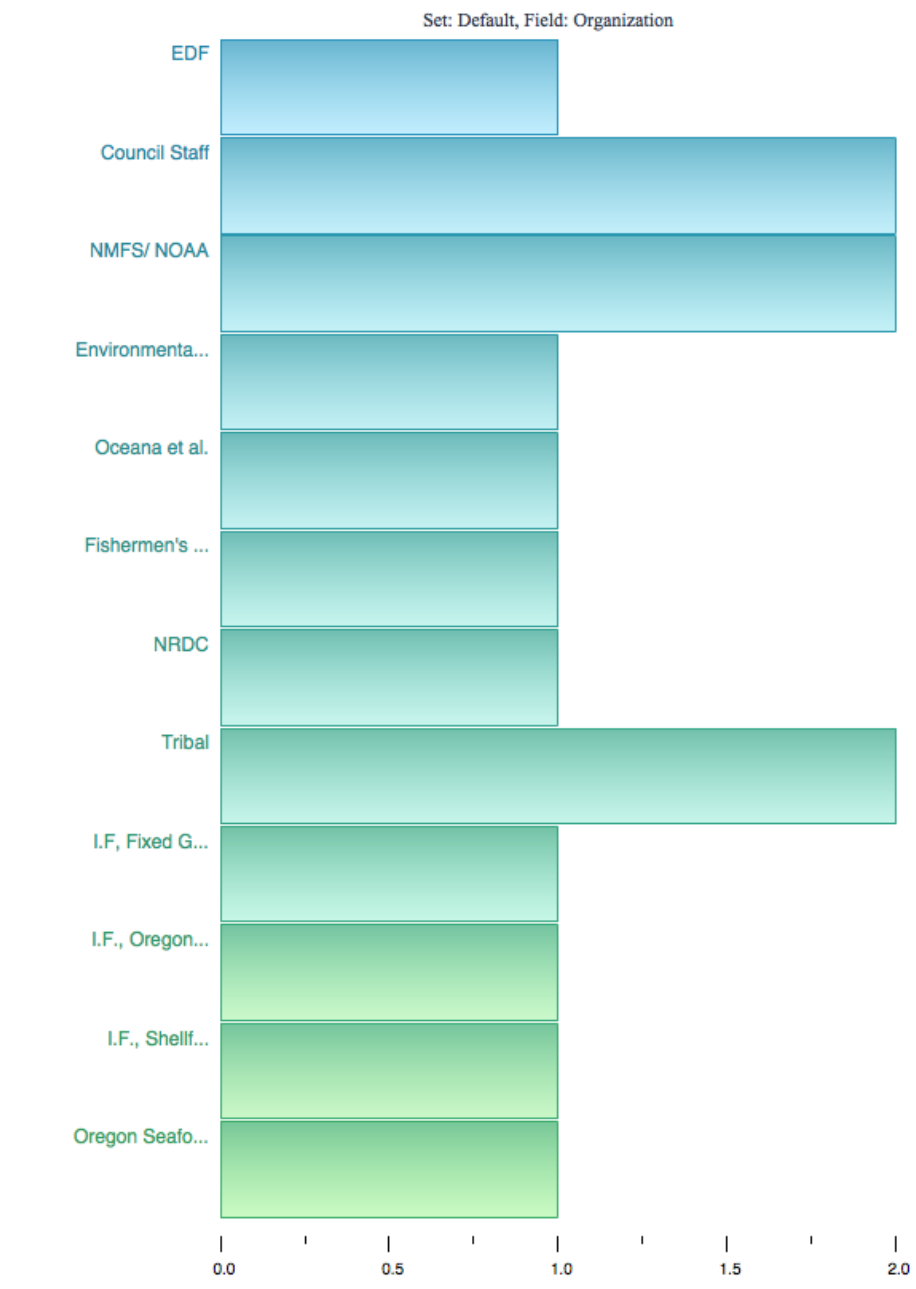
Appendix B.3: Proposal stakeholder affiliation.



Appendix B.4: Proportion of documents submitted for the final alternative proposals of Amendment 28. The three proposals for Amendment 28 were the Collaborative Groups, Midwater Trawlers, and Oceana et al.

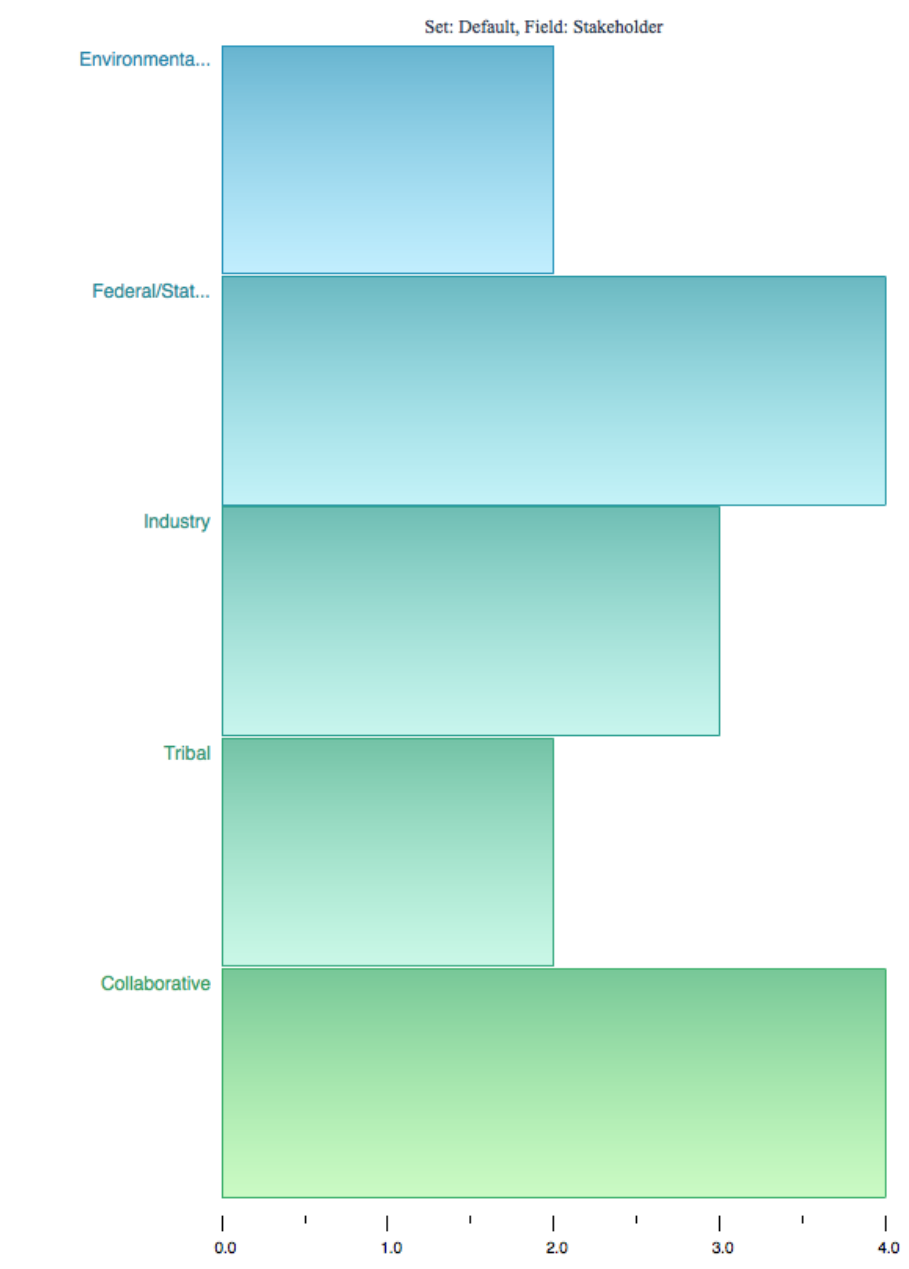


Appendix B.5: Interviewees organizational affiliation and proportion from the group.





Appendix B.6: Interviews combined into stakeholder groups.



## Appendix C: Code book from the content analysis

Appendix C.1: Code book from content analysis from written documents: public records, Amendment 28 Proposals and Final Preferred Alternative Proposals.

Scientific	Biological	Economic	Social Impacts	Management Measures
-Best Available Science -Scientific Research	-Habitats -Damage to organisms -Sensitive Habitats -Groundfish -Bycatch	-Commercial Importance to the fishery -Economically beneficial -Economically detrimental	-Collaboration among fishery participants -Discussion of welfare	-Council management measures -Modify EFH -Modify RCA -Council Responsibilities -Enforcement

### 1. Scientific

- a. Scientific Research- “Through scientific research expeditions with remotely operated vehicles, documenting new areas with sensitive habitats” (PFMC, 2015; H8b\_SupPublicComment)
- b. Best Available Science- “The proposed habitat conservation areas would additionally benefit and progress the best available science available to managers for future decisions as they can serve as research and management controls” (PFMC, 2018; GreenPeace\_EFH Proposal).

### 2. Biological

- a. Habitats- the natural home or environment of an animal, plant or organism
- b. Damage to organisms- physical harm caused to something in such a way to impair its value or make it useless
  - i. Example: “authors conclude that removal of these slow-growing corals could cause long-term changes in associated megafauna” (Final Oceana Proposal)

- c. Sensitive Habitats- Quick to detect or respond to slight changes, signals or influences. As described in the Groundfish FMP: hard substrate, biogenic habitats (corals and sponges), submarine canyons, seamounts, and ridges (FMP Amendment 19, 2006).
    - i. “Adding the proposed areas of sensitive habitat as designated EFH and taking steps to protect those areas is consistent” (Final Oceana Proposal).
  - d. Groundfish- fish that live on, in or near the bottom of the body of water they inhabit. Species include cod, flounder, halibut and sole.
  - e. Bycatch- Unwanted fish or other marine species caught during commercial fishing for other marine species
3. Economics
- a. Commercial importance to the fishery- “Including a number of species of rockfish and other fishes of commercial importance” (PFMC, 2018; F3c\_Public Comment).
  - b. Economically beneficial- relating to a growth in monetary value
    - i. Example: “will shorten the distance vessels must travel to harvest underutilized slope species such as Dover sole, slope rockfish, and other flatfish species and should also have beneficial economic effects” (G8b. Supplemental NMFS, 2013, 2969-3404)
  - c. Economically detrimental- relating to a decline in monetary value
    - a. Example: “The Mendocino Ridge Expansion in 1b would displace a significant portion of revenue from the Eureka port area compared to the 1a Mendocino Ridge Modification #1” (F3b. Supplemental. GMT. 2018. 1566-1825).
4. Social impacts
- a. Collaboration among fishery participants - Discussions, meetings between different stakeholder groups, positive compromises being made
  - b. Discussion of welfare- in terms of caring or concern for impacts to stakeholders
  - c. Community impacts- relating to or concerned with the interactions of the fishery on communities, society, and non-monetary factors

- i. Example: “Monterey’s reputation as a fishing community is a key characteristic of its cultural identity, which draws tourists (DeSanto 2013; Rees et al. 2013; Galligan, MBMNS).

## 5. Council Management Measures

- a. Council Management Measures- “The management measures are necessary and appropriate to minimize these potential adverse impacts” (PFMC, 2013; Final Oceana, 2013).
- b. Modify EFH- “Thus, modifying current EFH Conservation Areas to include additional deep-sea coral and sponge habitat is clearly consistent with the responsibilities and authorities” (Final Oceana Proposal).
- c. Modify RCA- “would add a portion of the Trawl RCA into the new EFHCA” (Final Oceana, 2013)
- d. Council Responsibilities- “Thus, modifying current EFHCA to include additional deep-sea coral sponge habitat is clearly consistent with the Council’s responsibilities and authorities” (Final Oceana, 2013).
- e. Enforcement- The act of compelling observance of or compliance with law, rule or obligation
- a. Example: “EFH Conservation Areas are protected from midwater trawl gear through improved enforcement of bottom contact” (Final Oceana Proposal

Appendix C.2: Code book from the content analysis from the interviews with stakeholders.

Scientific	Biological	Economic	Social Impacts	Management Measures
-Scientific research -Areas of scientific needs	- Sensitive habitats -Bycatch -Groundfish	-Revenue displacement -Fishery decline	- Impacts to participants -Collaboration among fishery participants -Trust building	-Council Management Measures -EFH effectiveness -IFQ program -RCA effectiveness -BAC -DAC

1. Scientific
  - a. Scientific Research- “Through scientific research expeditions with remotely operated vehicles, documenting new areas with sensitive habitats” (PFMC, 2015; H8b\_SupPublicComment)
  - b. Areas of scientific needs- discussion of areas lacking scientific research or data.
    - a. Example: “I think there's still a lot of research that needs to be done. You know, it's, it's the whole concept of do protected areas” (Interview 5).
2. Biological
  - a. Sensitive Habitats- Quick to detect or respond to slight changes, signals or influences. As described in the Groundfish FMP: hard substrate, biogenic habitats (corals and sponges), submarine canyons, seamounts, and ridges (FMP Amendment 19, 2006).
    - i. “Adding the proposed areas of sensitive habitat as designated EFH and taking steps to protect those areas is consistent” (Final Oceana Proposal).
  - b. Groundfish- fish that live on, in or near the bottom of the body of water they inhabit. Species include cod, flounder, halibut and sole.
  - c. Bycatch- Unwanted fish or other marine species caught during commercial fishing for other marine species
3. Economics
  - a. Fishery Decline- economic loss, stock decline
  - b. Revenue displacement- displaced revenue from a loss of access to economically viable stocks
    - a. Example: “Things like displaced revenue, how much revenue annually came from an area that would now become closed, what happened when they would foreseeably be caught elsewhere” (Interview 9)
4. Social impacts
  - a. Impacts to participants- in terms of caring or concern for impacts to stakeholders
  - b. Collaboration among fishery participants- Discussions, meetings between different stakeholder groups, positive compromises being made
  - c. Trust building- building of trust between fishery participants

- i. Example: “so there was a fair amount of trust-building, you know, our entire meeting or two rarely basically was devoted to that, which is a fair amount of hours” (Interview 2).

## 5. Management measures

- f. Council management measures- “The management measures are necessary and appropriate to minimize these potential adverse impacts” (PFMC, 2013; Final Oceana, 2013).
  - i. Positive- “I think it was critical, the ultimate pairing of the RCA with the EFH resulted in far more EFH protected” (Interview 9, Environmental NP).
  - ii. Neutral- “for the most part, EFH attributed very little to increased spawning habitat or anything like that” (Interview 15, Industry).
  - iii. Negative- “No. The essential fish habitat and the RCA were put in place for entirely different reasons. The essential fish habitat conservation zones weren’t a rebuilding tool” (Interview 3, Table A.).
- b. EFH effectiveness
  - i. Positive- “EFH added more diverse habitat, rough pinnacles, some canyons, a more diverse set of habitat. Coupled with the RCAs probably better protected all life history characteristic and probably more life states. So, it was probably additive to the RCA” (Interview 11, Environmental NP).
  - ii. Neutral- “it’s hard to have a causal relationship there [EFH effectiveness]. I mean habitats important for rockfish productivity but protecting EFH, particular habitat areas of concern, it’s hard to say just how, how much that contributed to the rebuilding” (Interview 14, Federal/State).
- c. IFQ program- Individual Fishing Quota Program
  - i. Positive- “So I think the industry deserves a lot of credit because of the success that they’ve seen in the conservation success is because of the Trawl IFQ” (Interview 5, Federal/state).
- d. RCA effectiveness

- i. Positive- “had seen recovery with the species the RCAs were intended to benefit. So definitely from that perspective, it has been successful” (Interview 9, Environmental NP).
- ii. Neutral- “There’s a question of how much area closures, for some protection is important for rebuilding. I think there's no doubt that some mortality reductions were very important. I think there's fair, good reasons to believe they were important” (Interview 2, Collaborative).
- iii. Negative- “I don’t think that if they had been implemented on their own, as the only measure indented to rebuild those stocks that they would have been successful” (Interview 1, Industry).
- iv. BAC- block area closures
- v. DAC- discrete area closures

## Appendix D: Quotes from Interviews

### RCA Effectiveness:

1. “It's been repeatedly raised as a problem in this process, we don't have good baseline information. We don't have good causality...it's hard to collect the data. It's expensive. It often requires forgone fishing opportunities and funding research, whether it's ROV cruises or other types of baseline monitoring. It's challenging. It's hard enough to get funding for stock assessment, which are a core piece of the management protocol, much less what's viewed as kind of extra research on” (Interview 2, Collaborative).
2. “Had seen recovery with the species the RCAs were intended to benefit. So definitely from that perspective, it has been successful” (Interview 9, Environmental NP).
3. “It was considered at the time the best way we could reduce fishing mortality to the prescribed low limits in a rebuilding plan without absolutely killing the fisheries” (Interview 14, Federal/state)
4. “I don't think that if they had been implemented on their own, as the only measure indented to rebuild those stocks that they would have been successful” (Interview 1, Industry).
5. “These stocks are very dependent upon the environment. If the ocean conditions are appropriate and good, you got huge classes. If ocean conditions are poor, you can have years of poor recruitment classes, and the populations fluctuate. It depends on what's going on in the environment.” (Interview 15, Industry).
6. “Quite successful actually. They rebuilt much faster than was anticipated per the actual stock assessment information that was done earlier.” (Interview 4, Tribal).
7. “The goal of the RCA was reduced catch rates. Particularly canary and yelloweye and then later that got expanded to other rockfish, but the goal was to reduce down rates so that you could stay within the harvest level that would lead to rebuilding. Yes, it was successful in reducing the harvest rate. When used in combination with many other things to achieve those rebuilding's” (Interview 3, Tribal).



8. “It was the only tool that was available to try to reduce those rates, those and latitudinal management” (Interview 3, Tribal)
9. “There’s a question of how much area closures, for some protection is important for rebuilding. I think there's no doubt that some mortality reductions were very important. I think there's fair, good reasons to believe they were important” (Interview 2, Collaborative).
10. “A lot of the policy-making in general with fisheries is shooting in the dark, or at least it’s on best guesses.” (Interview 2, Collaborative).

#### EFH Effectiveness:

1. “EFH added more diverse habitat, rough pinnacles, some canyons, a more diverse set of habitat. Coupled with the RCAs probably better protected all life history characteristic and probably more life states. So, it was probably additive to the RCA” (Interview 11, Environmental NP).
2. “I think theoretically, yeah to protect the areas while you’re rebuilding. That is going to be crucial to rebuilding those species” (Interview 7, Federal/state).
3. “It’s hard to have a causal relationship there [EFH effectiveness]. I mean habitats important for rockfish productivity but protecting EFH, particular habitat areas of concern, it’s hard to say just how, how much that contributed to the rebuilding” (Interview 14, Federal/State).
4. “So EFH as a whole is fine, but I think it’s changed, it’s been modified to protect biogenic habitat that isn’t necessarily the best habitat for rockfish” (Interview 4, Tribal).
5. “Heartburn with marine protected areas and now the use of essential fish habitat closures” this is because treaty rights are placed based (Interview 3, Tribal).
6. The “disparate treatment with treaty rights that are also in common with citizens of the United States” (Interview 3, tribal).
7. “That's the concern with putting [EFH] in place without some specific metrics and criteria and what you want to accomplish.” (Interview 3, tribal).
8. “Different ways to understand habitat, to manage and protect essential habitats while also respecting treaty rights within the government to government relationship of the

individual tribes with the federal government through NOAA fisheries.” (Interview 3, Tribal).

9. “Much more than a substrate project. [They] want to look at water columns, [they] want to be able to overlay the seasonal water column variations, any number of attributes associated with the different life states of animals” (Interview 4, Tribal)
10. “I mean holistically, yes. I think the idea is with area closures is by protecting habitat you are, at the very least sort of preserving the productivity of the stock; if not increasing it. You’re at the very least not degrading it further; in that sense, I think they did contribute to the rebuilding” (Interview 2, Collaborative)

#### Joint EFH/RCA Policy:

1. “I think it was critical, the ultimate pairing of the RCA with the EFH resulted in far more EFH protected” (Interview 9, Environmental NP).
2. “For the most part, EFH attributed very little to increased spawning habitat or anything like that” (Interview 15, Industry).
3. “No. The essential fish habitat and the RCA were put in place for entirely different reasons. The essential fish habitat conservation zones weren’t a rebuilding tool” (Interview 3, Tribal).
4. “I don’t think so. The EFH requirements were something that came into being after the RCAs were put in place and were in fact totally separate from the RCAs” (Interview 6, Collaborative)

#### Current and Future of the RCA:

1. “My sense is that the [trawl] RCA is a dinosaur, it’s a really outdated tool. It made a ton of sense under the prior management regime. However, we don’t need a blunt instrument like that as a mortality closure anymore, with the individual quota coupled with either electronic monitoring or observers” (Interview 11, Environmental non-profit).
2. “The council chose not to remove the trawl RCA off the Washington coast. So at least for the immediate future the existing regulations and use of the trawl RCA are going to stay in place for Washington” (Interview 5, Federal/state).

3. “So, I see the future being, you know, that the council process in season will be burdened at least at the start with looking at fishery information and making sure that we're evaluating if there is a need to implement a block area closure or more of one or more block area closures off the coast.” (Interview 5, Federal/state).
4. “In terms of the RCA, our organization and myself, I feel very strongly that when the council implemented the catch share program and turned this into an IFQ fishery for groundfish and brought 30 plus species into the ICU program, the entire intent of an IFC program is to eliminate all of the input controls and restrictions on where, when, and how they fished and allowed vessels to make those choices for themselves to prevent overfishing. So, in that context, I don't see a role for the RCA.” (Interview 1, industry).
5. “Well it's designated for rockfish, but it has had other effects...they believe it has been effective for deferring chinook by-catch, and another salmon bycatch. So, that fathom, RCA area is extremely productive for several species. That's excellent habitat for species beyond just the rockfish species of concern; it's good for many spaces. So, it might be a valuable instrument in maintaining ecosystems out here, especially at the coast, for shelf and slope break habitat species.” (Interview 4, tribal).
6. “Well, they're going away, so I don't know that they'll have much of a role anymore, at least for the trawl perspective. Their perspective is that they were put in place to help to cover depleted populations, the depleted populations are rebuilding, and they don't need them anymore especially with individual fishing quotas and a hundred percent observer coverage, as long as they stay within their quota” (Interview 10, Environmental non-profit).

#### EFH Current and Future:

1. “We envision that they continue to have a role. I think they play a more important role with the RCAs going away. The intent of them is to be permanent” (Interview 9, Environmental Non-profit)
2. “I guess the idea is that requiring changes in the gear type used, for example, I think a lot of benefits to fixed gears as an alternative to bottom trawls. They don't catch a lot of the bycatch that trawls do. Obviously, in some cases, they do, so you can still have a substantial catch. The council probably should have done more both from a habitat

- and rebuilding perspective. They should have done more regarding focusing on promoting a transition to more fixed instead of bottom trawl” (Interview 9, Environmental NP).
3. “Well, I think the general recognition is that it serves as a refuge and a buffer against fishing mortality, and a bit of a buffer against uncertainty” (Interview 7, Federal/state).
  4. “EFH plays a role in the long-term sustainable management of all fisheries. Also, it's not something that we're ever going to get away from, and I think in terms of overall sustainable management, there is an important role for EFH, you know, particularly in terms of collecting real special and unique and critical habitat and in terms of identifying important data research needs. Moreover, so I think there will always be a role for EFH.” (Interview 1, industry)
  5. “I think they did an effective job at reducing the [trawl] footprint. I would like to see the federal government pivot to now better understanding the habitat needs of groundfish. Right now, there is a focus on adult life stages of a few commercially important species” (Interview 3, Tribal).
  6. “I think that some EFH will probably be added to the Washington coast, once the government and treaty tribes resolve the disputes... I believe we have the EFHs that needed to be identified and protected under the proposals that were adopted at this meeting, so that it should not be an issue in the future. I can see them used if all of a sudden some additional research or mapping located areas in this big ocean that were obviously missed and should be protected” (Interview 6, Collaborative)

## Appendix E: IRB Decision

IRB determination found this study is research but does not involve human subjects. Due to this determination, no further review was required for this study.



**Oregon State University**  
Research Office

Human Research Protection Program  
& Institutional Review Board  
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Date of Notification	03/20/2018	Study Number	8501
Notification Type	Oversight Determination		
Principal Investigator	Michael Harte		
Study Team Members	None		
Study Title	A Policy Perspective on the Emergence and Fate of the Rockfish Conservation Area		
Funding Source	None	Cayuse Number	N/A

### **DETERMINATION: RESEARCH, BUT NO HUMAN SUBJECTS**

It has been determined that your project, as submitted, does meet the definition of research but **does not** involve human subjects under the regulations set forth by the Department of Health and Human Services 45 CFR 46.

**Additional review is not required for this study.**

Please do not include HRPP contact information on any of your study materials.

**Note that amendments to this project may impact this determination.**

The federal definitions and guidance used to make this determination may be found at the following link: [Human Subject](#)

## Appendix F: Timeline of key events

Year	Event
1848	-
1855	California Gold Rush and the first mention of a commercial rockfish fishery
1854 - 1855	The U.S. federal government signed the Stevens Treaties with the western Washington Tribes establishing their fishing rights, which reserved the tribes the right to fish in their “usual and accustomed stations” (50 C.F.R.).
1939 - 1945	Rockfish becomes a staple of marine fisheries in U.S. due to an increase in demand for seafood and advancement of technology during the Second World War (Love et al., 2002)
1960	The Russians begin using a large trawler for their fishing industry called the factory trawler
1974	The Boldt Decision, reaffirmed the western Treaty Tribes rights to fish in their usual and accustomed places. (U.S. v. Washington, 1974).
1976	The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA)- established eight regional Fishery Management Councils (FMC)
1982	Secretary of Commerce approved the first Pacific Coast Groundfish Fishery Management Plan (PCGFMP)
1983	President Ronald Reagan signed Presidential Proclamation 5030, which created the Exclusive Economic Zone (EEZ) for the United States; giving the U.S. sovereign rights over and control over the living and non-living natural resources of the seabed, subsoil and superjacent waters beyond the territorial sea but within 200 nm of the U.S. coast (Proclamation of the EEZ)
1994	Limited entry permits issued (Preliminary Draft EIS)
1996	Revision of the Magnuson Stevens Act, also included a moratorium on the adoption of any new IFQ programs (Brinson,2016)
1996	NMFS identified specific areas extending forty miles off the coast as usual and accustomed fishing areas for the specific Pacific coast tribes
1996	Passed the Sustainable Fisheries Act
1997	Large roller gears were allowed; provided better access to rocky areas) (Preliminary Draft EIS)
1998	The American Fisheries Act, enacted in 1999 (Public Law 105-277)
1999	Bocaccio, lingcod and Pacific Ocean perch declared overfished (Preliminary Draft EIS)
1999	Washington vs. Daley, objection to the non-treaty allocations under the Pacific whiting fishery management plan (173 F.3d 1158 (9th Cir. 1999)

1999	Midwater Trawlers Co-operative v. Department of Commerce, dispute over the NMFS regulation that allocated 32,500 metric tons of Pacific whiting to the Makah tribe (282 F.3d 710 (9th Cir. 2003))
2000	Amendment 12, PFMC proposed it as a framework amendment for developing rebuilding plans for overfished stocks (Pac. Fishery Mgmt. 2000)
2000	U.S. Department of Commerce declared Pacific Groundfish Fishery in a state of disaster
2000	Regulations defining small and large footrope implemented, prohibited large roller gears (>19 inches) (Preliminary Draft EIS)
2000	Trip limits became gear specific (Preliminary Draft EIS)
2000	Darkblotched rockfish declared overfished
2000	IFQ moratorium expired and then extended through a Congressional appropriations bill to 2002, except for the Pacific Sablefish Permit Stacking Program (Brinson, 2016)
2000	Amendment 13, incorporates Magnuson-Stevens Act provisions for bycatch
2002	January, NMFS rule that established guidelines to assist the Councils in the description and identification of EFH in fishery management plans and identification of adverse effects to EFH and the identification of actions required to conserve and enhance EFH
2002	Implementation of RCAs along the West Coast of the United States
2002	RCA (Preliminary Draft EIS) Trip limits became area specific; shoreward RCA and seaward
2002	Natural Resources Defense Council v. Evans, court held that the NMFS violated the SFA by authorizing rebuilding plans with inadequate protections for overfished species, also found that NMFS had failed to undertake required notice and comment period (168 F. Supp. 2d 1149, 1153 (N.D. Cal. 2001))
2002	Large footrope prohibited shoreward of the RCA
2002	IFQ moratorium lifted
2002	West Coast Groundfish Observer Program (WCGOP) implemented in trawl fishery (Preliminary Draft EIS)
2002	Pacific Marine Conservation Council, Inc. v. Evans, the U.S. District Court for the Northern District of California remanded Amendment 13 because it failed to meet SFA requirements for preventing bycatch and mortality (Iudicello and Lueders) (200 F. Supp. 2d 1194 (N.D. Cal. 2002))
2003	Designation of a C-shaped yelloweye RCA off the coast of Washington (YRCA), closed to commercial fixed gear fishers (Region, N.F.W.C.)
2003	Implemented Amendment 17, creates a framework for a multiyear management process
2003	U.S. District Court for the Northern District of California ordered NMFS to submit reports every six months showing that the agency is making process to bring the FMP into compliance with the SFA (Nat. Res. Def.

	Council v. Evans, 243 F. Supp. 2d 1046, 1059 (N.D.Cal. 2003). The court's order contained sharp criticism of NMFS for failing to meet its statutory obligations under the SFA and frustration with the lack of scientific data available about the species at issue. Id. at 1159
2003	Trawl buyback program implemented, fleet reduces by 1/3 (Preliminary Draft EIS)
2004	Amendment 16-1 establishes procedures for adopting and reviewing rebuilding plans for overfished stocks; addresses National Standard 1 of the MSA (FMP Amendment 16.1)
2004	Amendment 16-2, implemented rebuilding plans for overfished species: darkblotched rockfish, pacific ocean perch, canary rockfish and lingcod
2004	Amendment 16-3, established rebuilding plans for bocaccio, cowcod, widow rockfish and yelloweye rockfish
2004	Vessel Monitoring System implemented (VMS)
2004	Closure of whiting fishery, due to canary bycatch--> idk if important
2005	Selective flatfish trawl gear required shoreward of the RCA, north of 40°10 N. Lat (Preliminary Draft EIS)
2005	Council approved FMP Amendment 19, and submitted it for NMFS approval
2006	Revised the Magnuson Stevens Act, enacted additional safeguards to prevent "overfishing and ensure future sustainability for future fisheries stocks". The MSA was renamed the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA). It also established new science-based management measures: annual catch limits (ACLs) and Accountability Measures (AMs) (The Magnuson Stevens Act)
2006	Amendment 18 implemented: Bycatch Mitigation Program (FMP: Amendment 18)
2006	NMFS partially approved; disapproved the designation of specified oil rigs in HAPCs and the prohibition of bottom trawling in areas not designated as EFH; waters deeper than 3,500 m (FMP: Amendment 19)
2006	Amendment 19 implemented, EFHCA established
2006	Adopted two new darkblotched RCAs in California
2006	Adopted four new yelloweye RCAs off Oregon and Washington
2006	Introduced, reauthorization of MSA- Required NOAA to establish Deep Sea Coral Research and Technology Program and provided new discretionary authorities to protect deep-sea coral and sponge areas from damaging fishing gear (H.R. 5946, MSA 2006).
2007	Passed reauthorization of MSA 2006
2007	Amendment 16-4, re-evaluates and revises adopted rebuilding plans for depleted and overfished species: bocaccio, canary, cowcod, darkblotched rockfish, pacific ocean perch, widow rockfish, and yelloweye rockfish



2007	Recreational YRCA	Washington YRCA named changed to the North Coast
2007	Closed to commercial fixed gear; limited entry and open access fixed gear	North Coast Commercial YRCA, off northern Washington.
2007	troll gear	The Salmon Troll YRCA, northern Washington. Closed to salmon
2007	commercial fixed gear fishers	The South Coast Recreational YRCA, southern Washington. Closed to recreational fishing for groundfish and halibut; voluntary closure by
2007		Westcoast Offshore Recreational YRCA
2007		Stonewall Bank YRCA
2007		Point St. George YRCA
2007		South Reef YRCA
2007		Reading Rock YRCA
2007		Point Delgada YRCA
2008	boundaries to include the Davidson Seamount	Monterey Bay National Marine Sanctuary expanded
2009		Council adopted Alternative 2 in the draft Environmental Assessment. Amendment 22 which was a registration program for fishermen intended to land groundfish in the Open Access Fishery (Amendment 22)
2009	register their vessels with the NMFS	Amendment 22 passed, requiring open access fishing vessels to
2010	Ecosystems	NOAA adopted Strategic Plan for Deep-Sea Coral and Sponge
2010	Intersector Allocation Trailing Actions	Final regulation approval to implement Amendment 20, the Trawl Rationalization Program, harvester co-ops and Amendment 21, the
2010		Petrale sole declared overfished
2010		U.S. District Court for the Northern District of California issued a summary judgement, stating that the 2009-2010 harvest specification of darkblotched, cowcod and yelloweye rockfish violated the MSA by not rebuilding the species in the shortest amount of time possible (Iudicello and Bosse)
2011	Pacific coast groundfish trawl fleet (75 FR 78344; Dec.15, 2010)	NMFS implemented the trawl rationalization program for the
2011	F. Supp. 2d 1203 (N.D.Cal. 2011).	Natural Resource Defense Council v. Locke, U.S. District Court of California found that the 2009-2010 harvest levels for darkblotched, cowcod and yelloweye rockfish violated the MSA (NRDC v. Locke, 771 F. Supp. 2d at 1207) (771
2011	of initial biomass	Widow rockfish stock assessment shows the stock has been successfully rebuilt, with the spawning biomass depletion above the target of 40%
2012		Amendment 16-5, established new overfished species

	rebuilding plan for petrale sole, revises rebuilding plans for overfished species, revised proxies used to estimate the overfished threshold and rebuilding threshold for flatfish, adds a new default harvest control rule (also called the Secretarial Amendment 1)
2012	Pacific Coast Federation of Fishermen's Ass'n v. Blank, the fishermen argued that Amendment 20 and 21 violated the MSA by failing to protect and promote the interests of fishing communities when the agency declined to develop procedures allowing fishing communities to receive an initial allocation of fishing privileges, failed to restrict recipients of catch shares to those who "substantially participate" in the fishery and failed to comply with national standard eight, which requires FMPs to foster community participation in the fishery (Verbatim from Iudicello text) (Id. at 1092–94.) (693 F.3d 1084 (9th Cir. 2012))
2013	Adopted depth-based mortality rates in association with use of descending devices; cowcod, yelloweye and canary
2013	Council began accepting public proposals for the potential changes to EFH and trawl RCA
2013	Pacific Dawn v. Bryson (Pacific Dawn I) (No. C10-4829, 2011 WL 6748501, at *1 (N.D. Cal, Dec. 22, 2011))
2014	Completion of the periodic review of EFH, the Council and PFMC decided changes were warranted due to the Groundfish EFH
2014	Council recommended shrinking the trawl RCA. NMFS decided to combine both new EFH designations and trawl RCA decision into Amendment 28
2015	PFMC established a range of alternatives (ROA) for the groundfish EFH and trawl RCA
2015	U.S. v. Washington; U.S. District court set boundaries for the Quileute Indian Tribe and the Quinault Indian Nation U&A's off the coast of Washington State
2016	PFMC voted on final preferred alternatives on modifications to EFH and RCA
2016	EFH/RCA project team presented to PFMC methodology to develop discrete area closures (DAC) to aid in the Amendment 28 process; PFMC rejected DAC off Oregon and California but allowed for further analysis of the coast of Washington outside of the Tribal U & A areas. These DAC were only discussed for darkblotched, pacific ocean perch, bocaccio, cowcod and yelloweye rockfish (Preliminary Draft EIS)
2018	Final Action vote on Amendment 28

