NON-COMMERCIAL FISHING DEFINITIONS WITHIN UNITED STATES FISHERY MANAGEMENT POLICY

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We certify that we have read this thesis and that, in our opinion, it is satisfactory in scope and quality as a thesis for the degree of Bachelor of Science in Global Environmental Science.

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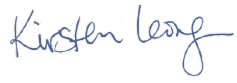

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For my grandfather who taught me how to love fish. His stories about salmon fishing in Alaska and his passionate work ethic have inspired me year after year to always do the best that I can.

I would also like to dedicate this project to my two younger sisters and all young girls that are growing up inspired by science. I hope more women continue to pave the way towards inclusivity and representation within any field of science, and that the youth of today are inspired to do even more.

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Finally, my patient and understanding parents for being a sounding board of inspiration for this project as well as for being my greatest supporters.

ABSTRACT

Social science has played a limited role in policy making regarding fisheries management in the United States for years, which is ultimately limiting the scope and understanding of the importance of fish throughout the country. Fisheries in the United States are managed by regional policy, as well as federal regulations, both of which are important for regulating how fish are distributed and consumed. Non-commercial fishing is principle when understanding the cultural significance of fish, however it is defined differently throughout the US. I was curious if there are patterns or differences in where non-commercial fishing is defined, and why those differences may occur. To investigate this, I examined all the policy documents in three of the National Oceanic and Atmospheric Administration's five management regions by using a deductive code system to attach common words or phrases that came up in any policy text about non-commercial fishing. I looked for patterns and differences between the codes and found that the top used codes throughout each region were subsistence fishing, recreational fishing, and traditional fishing. Each region, the Pacific Islands, Alaska, and the West Coast, brought up one type of fishing more than the others, and there can be conclusions made about why those differences are there. The Pacific Islands Region has a large diversity of terms, Alaska policy focuses on detailed definitions of subsistence fishing, and the West Coast has a limited discussion on all of the studied fishing types. In summary, these differences highlight opportunities for policy refinement and a better understanding of regional perspectives that could inspire law makers to apply these changes to ultimately make fishery management policy more inclusive.

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ABBREVIATIONS

AK ..... Alaska

ANILCA ..... Alaska National Interest Lands Conservation Act

CAQDA ..... Computer Assisted Qualitative Data Analysis

MSA ..... Magnuson-Stevens Act

NMFS ..... National Marine Fisheries Service

NOAA ..... National Oceanic and Atmospheric Administration

PIR ..... Pacific Islands Region

PNW ..... Pacific Northwest

US ..... United States

WC ..... West Coast

1.0 INTRODUCTION

1.1 BACKGROUND

Social science examines the relationships that humans have with each other and the environment around them (Abbott-Jamieson and Clay, 2010), as well as how interdisciplinary studies display social systems within the environment (Bennett, 2019). Whether anthropology or sociology comes to mind, there are dozens of focus areas that all provide unique research perspectives within science. Incorporating social science into any physical science research or management organization provides a multifaceted understanding while also creating a space for diversity and a comprehensive perception of socio-ecological relationships (Guerrero, *et al*. 2018). Socio-ecological relationships, such as those found in fishing communities, are a great example of opportunities to implement social science practices, which in this case can maximize productivity and sustainability within fishing communities (Hilmi, *et al.*, 2018).

Scientific analysis and education have traditionally been dominated by fields such as biology, chemistry, and physics as primary methods to observe and document the natural world. However, social science is a crucial field that provides accurate evaluation of different perspectives that can be extremely useful in understanding any natural systems that involve humans. Multidisciplinary science, including the social sciences, is essential for moving towards more inclusivity within interdisciplinary resource and management studies.

1.2 MINDSET OF SOCIAL SCIENCE

There is both quantitative and qualitative data within science, but social science often focuses on qualitative methologies such as interviews with Indigenous elders and surveys. These qualitative data collection methods are key for social scientists and they are not as commonly found within chemistry or physics for example. However, data from social science observations and experiments can be analyzed just as intricately as any numbers collected in a lab (Moon and Blackman, 2014).

Social scientists working in fishery management attempt to gather data and understand the human experience with respect to fisheries (Decker, *et al.* 2012). There are hundreds of fishing communities all over the world, all of which rely on fishery management policy (Bennett, 2019). The people in fishing communities are impacted by the policies and regulations put in place, and they must be included and considered in decision making that directly affects their lives, income, ecosystems, and families (Biggs, *et al,* 2021). Alaskan fishers and Hawaiian fishers, for example, should not be treated the same because their geographical location and cultural understanding of fishing are very different. For instance, salmon in Alaska are a huge part of the history of the land and are seen as incredibly influential and historically relevant (Blume, 2012 and Holmes, 2020), while salmon do not hold the same significance in Hawai‘i.

The deeply rooted cultural significance of the ocean and fish in many communities is why understanding fishing from a social science perspective is so important. In many of the Indigenous populations of the world, the sea and marine life are involved with creation stories and belief systems that link to religion, the cosmos, and their ancestors (Hau‘ofa, 1993). Polynesians have co-existed with fish as a primary food

source from their earliest history and have observed patterns and understand the ocean in ways that are of tremendous value scientifically. In the Indigenous Native American tribal folkloric traditions of the Pacific Northwest, salmon is a direct link to health and survival, and it is a symbol of perseverance, self-sacrifice, regeneration, and prosperity (Breslow, 2014). The sooner the importance and cultural relevance of fish are understood and explained in policy on a large scale, the sooner there will be genuine understanding of the social component of fisheries policy.

Social science plays an intrinsic role in ocean science and sustainability (Charnley, *et al.* 2017). According to Nathan Bennett, chairman of the People and the Oceans Specialist Group at the International Union for the Conservation of Nature, environmental social scientist, and human-environment geographer (Bennett, 2020), "we will be missing the boat if the marine social sciences do not form an integral and substantial part of the mandate and investments of this global ocean science for sustainability initiative" (Bennett, 2019). Both Bennett and Angela Guerrero, a sustainability scientist at Queensland University of Technology (Guerrero, n.d.) are examples of people who emphasize the importance of social science and the ways in which it can be implemented across scientific fields. Guerrero discusses, in one of her published reports, the concept of social-ecological integration and how by using predetermined criteria to establish social approaches to topics, a greater and more well-rounded understanding of the issue can be determined (Guerrero, *et al.* 2018). The real necessity of integration of social science ideology into policy is a rather new development, but with a union between policy and social science (Charnley, *et al.* 2017), there can be a more comprehensive set of standards for fisheries in the US.

1.3 NEGLECT OF SOCIAL SCIENCE

Many scientists and authors agree that there is a neglect of social science within the greater physical science community (Bennet, *et al*, 2017, Clay and Colburn, 2020). The United States has a long history of being inconsistent when it comes to including elements of sociocultural analysis in government funded agencies. The National Marine Fisheries Service (NMFS), a line office of the National Oceanic and Atmospheric Administration (NOAA), is part of the Department of Commerce, which has hed to viewing United States fisheries largely in terms of economic value. In as early as the 1880s there was evidence of social science data collection in fishery related studies, however, government organizations such as NMFS did not consider social scientists important or necessary until the mid 1970s (Abbott-Jamieson and Clay, 2010).

Although economics, smilar to other aspects of conventional fishery science, is quantitative and uses similar modeling techniques to study fish, it still falls within the realm of social science. When compared to other types of social science, its quantitative methodology makes economics easier to integrate into bio-ecological research and policy (Abbott-Jamieson and Clay, 2010). However, by focusing solely on economics within fisheries policy, this specific field will unintentionally tend to monetize the human experience, while also excluding other perspectives. The integration of social science into fishery managment is still being developed, as many organizations do not clearly see how social science can be applied to create more effective policy documents (Bennet, *et al*, 2017).

1.4 HISTORY AND APPLICATION OF SOCIAL SCIENCE AT NMFS

Because of its placement as an agency within the Department of Commerce, the first social scientists hired into NOAA were economists who worked largely on job outreach and budgeting (Abbott-Jamieson and Clay, 2010). Due to the diverse interdisciplinary nature of social science, there were initial disputes involving scientists that wanted to work for NMFS (Abbott-Jamieson and Clay, 2010). Research teams would commonly disagree on places where a social science perspective could be included and if it should be included at all (Abbott-Jamieson and Clay, 2010). This back and forth for recognition at NOAA continued through the years and continues today because there are still limited opportunities for social scientists within fishery policy writing (Abbott-Jamieson and Clay, 2010).

The Magnuson-Stevens Act (MSA) has been the guiding governing document for fisheries management in the United States since it was first written in 1976. It sets the legal guidelines for the data needed to sustainably manage and conserve United States fisheries resources (Magnuson-Stevens Act, 1976). The MSA highlights and defines ideas such as what a fishing community is or what an optimal yield is (National Standard 1-10, 1976), but those definitions are currently vague and unspecific. This is in part so that local differences can be accounted for by regional decision makers. However, social science perspectives still tend not to be included in these definitions (Abbott-Jamieson and Clay, 2010).

Now is the time to clearly identify where social science can be used in fisheries management policy. On July 26, 2021, Congressman Jeff Huffman introduced the *Sustaining America's Fisheries for the Future Act* (H.R. 4690), which is essentially the

reauthorization of the MSA (Huffman, 2021). Any changes included if this law passes will guide federal fishery managment until the law is changed again. The last MSA reauthorization took place in 2006. Currently, the MSA only defines recreational fishing and commercial fishing, however, there are a multitude of types of fishing that do not fall into the narrow definitions of either recreational or commercial fishing. Thus, there is a need to highlight places where there is a lack of representation of regional variations in human fisheries perspectives. The update proposal suggests adding the term "subsistence fishing" to the MSA (H.R. 4690), but previous social scientist work suggests that even addition of this new definition may still miss types of fishing that are crucial to fishing communities (Leong, *et al.* 2020).

1.5 REGIONAL VARIATION IN NON-COMMERCIAL FISHING

As previously stated, within fishery management there are multiple inconsistencies in policy documents about how fishing is defined. However, one example of particular importance is the term non-commercial fishing. The MSA defines recreational fishing as "fishing for sport or pleasure" and commercial fishing is defined as "fishing in which the fish harvested, either in whole or in part, are intended to enter commerce or enter commerce through sale, barter or trade" (Magnuson-Stevens Act, 2007). In the Pacific Islands Region, there has been dissatisfaction with the term recreational fishing as the only alternative to commercial fishing, which resulted in a definition for non-commercial fishing becoming codified for fisheries in the Western Pacific (Leong, *et al.* 2020). Non-commercial fishing is now defined as "fishing that does not meet the definition of commercial fishing in the Magnuson-Stevens Fishery

Conservation and Management Act, and includes, but is not limited to, sustenance, subsistence, traditional indigenous, and recreational fishing" (50 CFR § 665.12).

Initial work with other regions indicated that non-commercial fishing is an important umbrella concept for many fishing related activies that are practiced throughout the country, including subsistence fishing (Iwane, *et al.*, 2021 and Leong, *et al.*, 2020); anything from fishing on a family boat to performing traditional cultural fishing rituals may be included. This large variation is why attention is being drawn to the term non-commercial and how it is defined. With current innovations taking place regarding inclusivity and shifting how data is collected and analyzed, there is now space for a better understanding of types of non-commercial fishing that might require additional definitions. Importantly, different regions and fishing communities across the US may view non-commercial fishing differently as it is such a broadly encompassing term.

Fisheries are managed regionally across the US and each region has its own communities, cultural relationships to fish, management structures, and policy documents beyond federal regulation. Within NOAA fishery management, there are policy documents that regulate the specifics of fishing within each of the administration's 5 management regions. Each region describes fishing differently and there are different amounts of documents within each region as well as different definitions within each of those documents (Appendix A). Thus, there is a need to understand the complex dimensions of non-commercial fishing as explained in regional United States policy documents in order to make any necessary adjustments to the MSA and to ensure that regional perspectives are included. It is crucial to clarify how these regionally specific

definitions affect the public. By closely analyzing how non-commercial fishing is defined, the capacity for clarity and inclusivity on fishing populations nationwide expands. Highlighting the differences between cultures and environment, with respect to fish, will help to develop a deeper understanding of why those regional differences are there. This will also highlight what can be done to shift regulation to support the regional conditions to be the most inclusive and supportive.

1.6 PROJECT GOALS

Through a close analysis of non-commercial fishing definitions in three of NOAA's management regions, the variations between how non-commercial fishing is presented and viewed around the country will be explained. Due to the constraints of this project, only three of NOAA's five managment reigons will be analyzed. The regions of study are the Pacific Islands, Alaska, and the West Coast. Since the MSA is up for reauthorization there is a real potential for change. The biggest potential during the MSA reauthorization is adding a concrete definition of subsistence fishing to the policy, as well as updating the current definition of recreational fishing and potentially adding other types of fishing into the policy as well.

The intention with this project is to find places of explanation in policy throughout the country that discuss different types of non-commercial fishing and to identify patterns and expose the differences and their significance for the regions. Federal regulation and the current standing of fisheries management in the United States are also examined (Magnuson-Stevens Act, 2007). By looking at the differences between each region I can draw conclusions about why there are differences and if those differences are

of benefit to the region and its people. The goal is a concrete understanding of regional variation and the impact that has on defining fishing. Researching the geopolitical status of each region will help to develop an understanding of why policy vocabulary and phrasing in each region is the way that it is.

1.7 REGIONAL EXPECTATIONS

Although there are large physical differences between the studied regions in this project, there are both similarities and expected differences in the way that the regions discuss non-commercial fishing. In general, it is expected that each region will discuss fishing in a slightly different way from each other, but for the most part the policy will follow the federal regulations set in standards by the MSA. I expect the Pacific Islands Region to have a wide diversity of terms, largely because of its unique geographic location and diversity of islands and cultures across the Pacific. I expect the West Coast to have a less diverse discussion on non-commercial fishing because of the high populations of the states, diverse economy, and less focus on fishing practices than the other regions. Although fishing is a common activity in all the regions, it could be argued as more important in regions such as the Pacific Islands and Alaska. Alaska has a huge commercial fishing industry and residents of the state heavily rely on food that is caught in the wild, also called subsistence, so that will likely impact policy as well. Overall, I expect that Alaska fishing policy will frequently mention subsistence fishing, the Pacific Islands will discuss many types of fishing, and the West Coast will not talk about non-commercial fishing in great detail at all.

2.0 METHODS

In this project I used deductive coding of relevant NOAA policy documents to explore how non-commercial fisheries are categorized and defined. This thesis is a small part of a larger project being conducted at NOAA by a team of cross regional social scientists that are looking to further understand the dimensions of non-commercial fishing in the United States (Leong, *et al.,* 2020). The larger project explores the difference between the definitions of non-commercial fishing in policy and academic peer reviewed literature. Whereas this project understands how different types of non-commercial fishing have been acknowledged and defined in policy in the past in different regions. It identifies any inconsistencies that should be addressed as well as any other insights that would improve future definitions.

2.1 INITIAL REVIEW

In order to gain a complete understanding of the current status of social science within fishery management policy, I conducted a detailed review of the Magnuson-Stevens Act (MSA). The MSA is made up of 10 national standards (Appendix D), all of which describe some aspect of fishery management (Magnuson-Stevens Act, 2007, National Standard 1-10, 1976). While closely reading the national standards I generated questions and highlighted sections of text in each standard that were vague or inconclusive. Specific phrasing of certain concepts, such as “best scientific information” or “greatest benefit to the nation”, were not properly clarified or described (Magnuson-Stevens Act, 2007). Terms such as “best scientific information” are commonly referenced throughout federal policy (National Resource Council, 2004), so specifying those

definitions is essential. By asking questions such as “Who is a part of deciding what is the greatest benefit to the nation?” or “What does it mean by ‘best scientific information’?” I was able to emphasize places where a social science perspective could be better represented.

Highlighting vague phrasing helped to concretely recognize the current status of social science within United States policy. Anytime that a type of fishing or word was written and not defined, I noted it, as well as any places that did not explain the specifics of the concept being discussed in enough detail. For example, in the 8th national standard, which deals the most heavily with social science, it discusses fishing communities, but nowhere in the standard does it precisely lay out who is considered a member of a fishing community, or who is involved in deciding what makes a fishing community a fishing community (Magnuson-Stevens Act, 2007, National Standard 8, 1976). This technique of close reading is what I applied to the coding analysis portion of this project as well.

2.2 DOCUMENT SELECTION

All the documents included in this study relate to fisheries management in the United States and are currently used by NOAA to regulate fishing (Appendix A). The relevant policy documents were selected by federal social scientists from each region with national and regional knowledge of US fishery policies (Kirsten Leong, personal communication, Jan. 2022). The documents were considered relevant if they brought up non-commercial fishing somewhere in the policy. The documents included national policy such as pages from the Code of Federal Regulation, MSA, and Fishery Ecosystem

Plans, as well as regionally specific plans from each of NOAA's three western management regions: Alaska, West Coast, and Pacific Islands (Appendix A).

In each region, law and policy documents that included any terminology related to aspects of non-commercial fishing were collected and reviewed following the method established in the Pacific Islands Region in Leong et al. (2020). These included definitions at the national, regional, and local level. The regional social scientists worked closely with the regional office managers and the Office of Marine Sanctuaries teams to identify relevant documents (Leong *et al.,* 2020). Due to the time constraints of this project, I limited my analysis from all the management regions to only National Plans (n=7), and policy specific to the western US including the Pacific Ocean regions of Alaska (n=5), the Pacific Islands (n=14), and the West Coast (n=3; Table 2). This focus on the western United States was decided because not only do all the regions border the Pacific Ocean, but Alaska, the Pacific Islands, and West Coast are bound to have the biggest differences between them because they are such different environments.

2.3 CODING

For this project I utilized deductive coding using a code system developed by a cross regional team of NMFS social scientists. Together they first developed a list of 19 terms used to describe US fisheries (e.g., subsistence, personal use, etc.) (Appendix B). These social scientists then employed inductive coding of peer reviewed literature pertaining to US fisheries to categorize how these 19 different fisheries terms were being defined and described (see Appendix C for the original code book) (K. Leong, personal communication, Feb. 2022).

I used the technique of qualitative data analysis, or CAQDA (computer-assisted quantitative descriptive analysis) (Saldana, 2022) to conduct this work. Specifically, I used MaxQDA, a program focused on qualitative and mixed method data collection and analysis (MaxQDA, 2022), to code the documents as well as for visualization and analysis. I organized the parent code categories by color, depending on the topic of the code. There are 12 parent code categories, all of which have subcategories, also called child codes, within them (Table 1).

Table 1. This table shows the top used parent codes with a brief description of what each parent code is looking for, or who is involved with each category.

Code Category	Meaning
Fisheries Terms (Term Used)	These are the words used to describe US fisheries. This is how the different types of fishing are discussed and how the document is labeling the type of fishing.
Activity/Benefits/Motivations	This code category deals with any social, cultural, or other motivations that involve the fish or fishers. This category deals with where the fish goes and why it is being fished.
WHO: Scale/Relationships of Beneficiaries of Fish/Fish Flow	This category discusses the scale for which people benefit from the fish flow.
WHO: Characteristics of Community/Beneficiaries	These are the characteristics of people who benefit from fishing.
WHO: Characteristics of Fishers	This code category is the characteristics of the people who are fishing.
WHERE: Geographic Location	This is geographically where in the world that is being discussed in the document, in this case which region.
WHERE: Spatial Extent	This code category is the whether the fishing activity took place nearshore or offshore.
Characteristics of Fishery	This code categorizes the type of vessels and gear that are being used at the fishery, as well as any constraints or activities that occur there.

There were a few code categories that were provided in the original codebook that were not relevant to these types of policy documents. For example, there were minimal instances where any management or economic conditions came up, so those codes were

not represented as much as the "Activity/Benefits/Motivation" category or some other categories such as "Term Used" or "Characteristics of Fishers" (Appendix B and C).

For coding the documents in each region, I made sure to find segments of text where the phrasing in the code aligned with what was written in the document. For example, as stated in section 1.5, in the Code of Federal Regulations - Fisheries in the Western Pacific document, non-commercial fishing is defined as "fishing that does not meet the definition of commercial fishing in the Magnuson-Stevens Fishery Conservation and Management Act, and includes, but is not limited to, sustenance, subsistence, traditional indigenous, and recreational fishing." (50 CFR § 665.12). While coding this segment the codes that were attached to this text were: definition, fishing, blurred commercial/non-commercial, traditional fishing/fishers/fishery, recreational fishing/fishers/fishery, subsistence fishing/fishers/fishery, Indigenous characteristics of fishers, Indigenous characteristics of community/beneficiaries, recreational/leisure, survival/food/nutrition, food/consumption, NOT commercial, traditional/customary practices, and culture. The selected codes were attached because they all matched words that were written in the text. There could be other codes added, however, to stay consistent throughout all the regions, only words that were both in the text as well as in the codebook were used.

There were multiple codes that were similar, but placed in different categories within the codebook, so it was important to read context around the word or phrase in the document to make sure that the right code was being attached. In certain sections, I had to infer context about what some of the social or cultural implications were for the code systems. For example, if a document discussed cultural practice or traditional gatherings,

I had to make the decision to include the codes that mentioned, “social cohesion”, “cultural events”, “cultural identity”, etc., even if those phrases were not written directly in the text. Those decisions were based solely off context and background understanding of management policy.

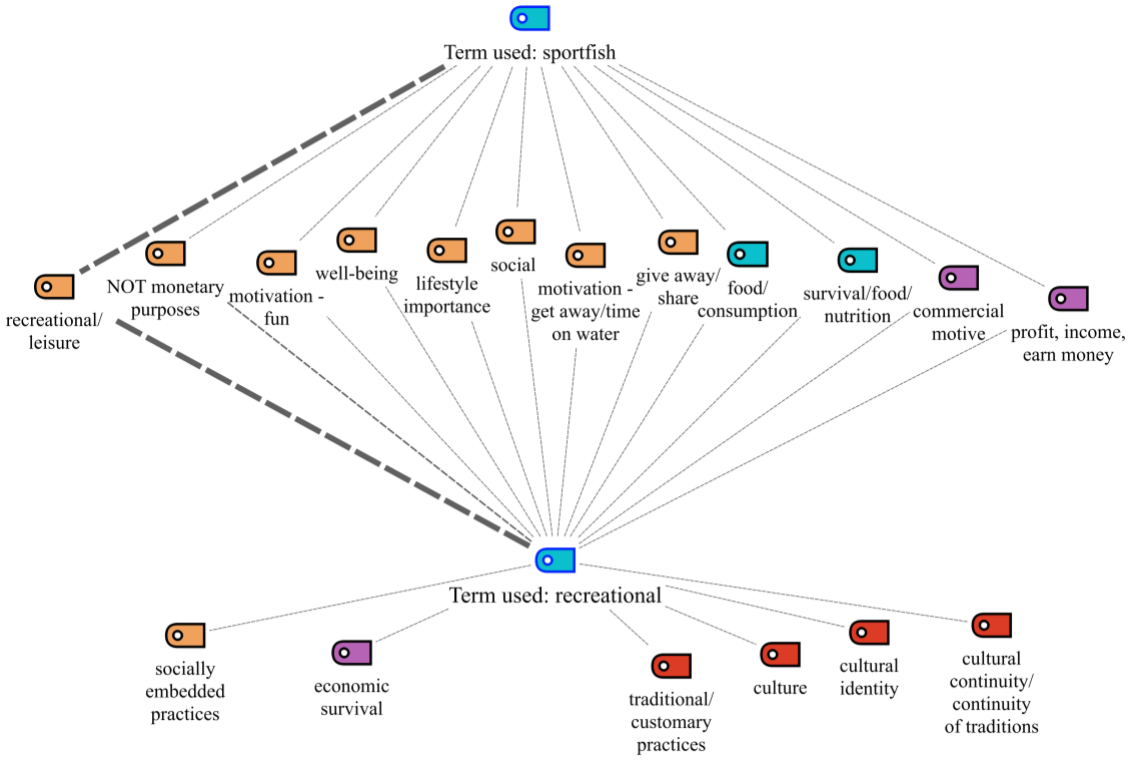

Figure 1. An example of consolidating two codes together due to similarity in usage. Shown are recreational fishing and sportfish fishing and all the codes that they co-occur with. The colors in the figure represent the “Activity/Benefits/Motivation” categories that were coded with either recreational or sportfish fishing. Orange codes fall under the Social category, blue under Food Security, purple are Economics, and red are Cultural Practices/Knowledge. The thickness of the dotted lines in the figure represents how many times those codes co-occurred together, the thickest lines being the highest frequency, and the thinnest line being the least.

Recreational and Sportfish fishing were commonly coded together, which is why they were consolidated into one code. Figure 1 shows how the consolidation process worked. Recreational fishing and sportfish fishing were consolidated into one term

because they were coded together 12/18 times. Since this percentage is more than 50%, they were combined into one code, which is now called recreational fishing (Appendix B). This figure also shows that there are some codes, such as all the Cultural Practices/Knowledge codes, that only come up with recreational fishing. Although this is an issue for combining them, it is an exception because the other commonalities make recreational and sportfish fishing similar enough to combine. This is one example of two common codes that were consolidated, subsistence and food fishing as well as traditional and customary fishing were also combined using the same method as in Figure 1.

2.4 ANALYSIS

The number of policy documents and their length varied greatly between the regions (Table 2, Appendix A). This created high variability between the number of codes assigned to each document or region, making statistical analysis, and standardizing necessary. Further, documents varied greatly in length at anywhere from 1 to 400 pages. Therefore, to compare term use between the regions, I divided the frequency of used terms by the number of pages in each region to normalize the data.

I also looked for co-occurrence between codes within different parent code categories. By studying co-occurrences of different codes, I can study the patterns that are coming up, so if certain codes are always coming up together, I can infer about how those terms are defined. In addition, I can also better understand the context of the term or idea and see if the definitions are consistent with the terms that are commonly discussed near them.

Finally, consolidating certain codes together based on the number of times that they co-occurred (Figure 1) allowed me to have larger numbers to analyze. Any codes

that related to culture, social life, or food security were lumped into corresponding codes titled “Cultural Practices/Knowledge”, “Social”, and “Food Security”.

“Activity/Benefits/Motivation” and “Term Used” codes are the focus in this study, but other child codes were organized by the number of times they came up and if some co-occurred, they were also consolidated.

3.0 RESULTS

3.1 REGIONAL DOCUMENT CHARACTERISTICS

All of the four regions have high variability in the number of policy documents and number of pages in each document (Table 2). Anything from a one-page Code of Federal Regulations monument declaration to a 400-page fishery ecosystem management plan were studied. In total, 29 documents and 3,249 pages were examined. Of the four regions discussed in this project, the Pacific Islands Region (PIR) has the greatest number of documents (14) and the highest number of pages (1969). Five out of the 14 documents in the PIR were under 10 pages. The National Region has the second largest number of documents (7), but still only half as many as PIR, with 4/7 documents being under 10 pages. Nationally there are 286 pages of policy, which is similar to the West Coast region that has 282 pages, but the West Coast has less than half the number of documents as National. The West Coast only has 3 documents, which is the least out of all the regions and all of them are over 10 pages. Alaska has the third highest number of documents (5) and the second highest number of pages (712), with only one document being less than 10 pages.

Table 2. This table shows all the regions and the number of documents found in each region. The third column has the total page numbers of all the documents in each region.

Region	Number of Documents	Number of Pages
PIR	14	1969
Alaska	5	712
West Coast	3	282
National	7	286

3.2 FISHING TERM DIVERSITY

The Pacific Island Regional policy documents discuss more than double the number of fishing types (Table 1, Appendix A) than any other region (Table 3). Alaska, the West Coast, and National regions have 5 to 7 terms used, but PIR documents included 17. There are 8 types of fishing that were only brought up in PIR. Regardless of region, subsistence, recreational, and traditional were the most frequently used fishing terms throughout (Table 3). The table includes consolidated codes (Appendix B), so subsistence, recreational, and traditional fishing include food fishing, sportfish fishing, and customary fishing in their count totals.

Table 3. Frequency of different terms that were used to describe different types of fishing. These terms were attached to segments of text that mentioned types of fishing that can all be found in Appendix B. The numbers next to each word are the number of times that each type of fishing was coded throughout that region.

PIR	**ALASKA**	**WEST COAST**	**NATIONAL**
Subsistence (18)	Subsistence (16)	Subsistence (2)	Subsistence (2)
Recreational (26)	Recreational (10)	Recreational (10)	Recreational (11)
Traditional (13)	Traditional (7)	Traditional (3)	Traditional (3)
Non-commercial (7)	Non-commercial (2)	Non-commercial (1)	Non-commercial (1)
Commercial (2)	Fishing (2)	Commercial (1)	Commercial (2)
Cultural (4)	Cultural (1)	Artisanal (1)	
Fishing (7)		Community-based (1)	
Artisanal (8)			
Community-based (2)			
Blurred non-commercial/commercial (2)			
Pelagic (5)			
Bottom-fish (10)			
Small-Scale (5)			
Small Boat (1)			
Smaller Fisheries (1)			
Nearshore (2)			
Coral Reef (1)			

3.3 FREQUENCY OF MOST COMMON TERM USED

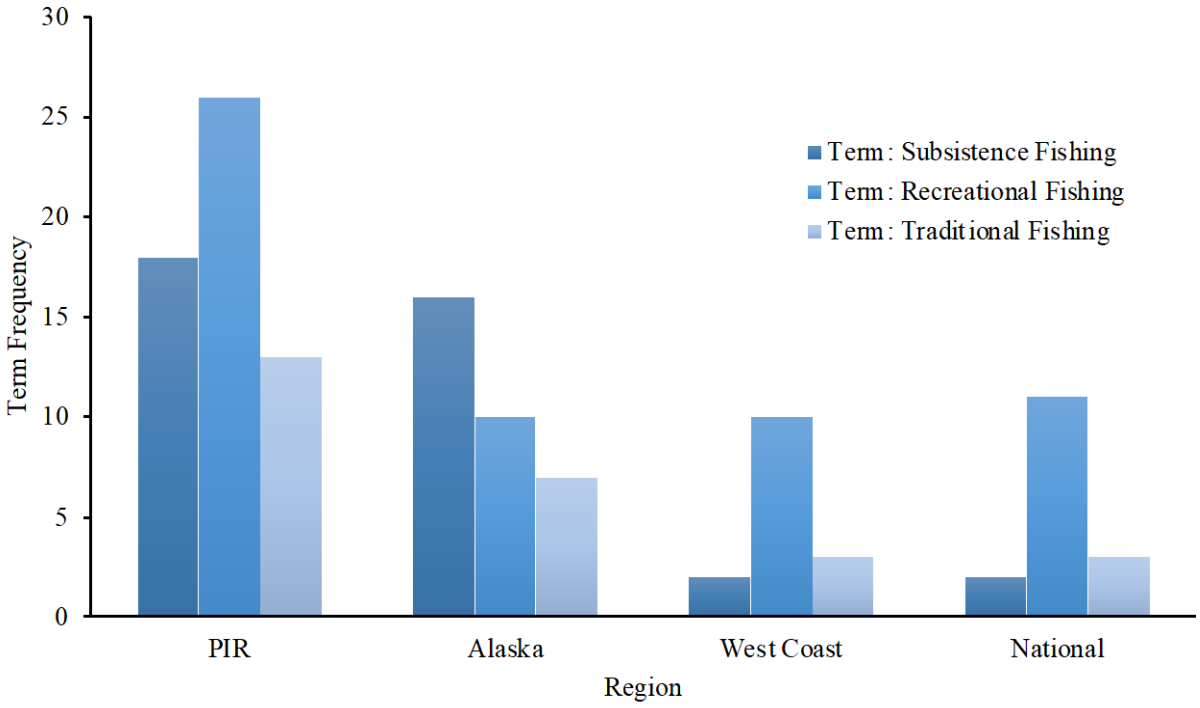

Figure 2. The total count of each of the three most popular fishing terms: subsistence, recreational, and traditional, in each of the regions and all the documents. The frequencies are the actual number of times these terms came up in each region, so no standardization for variation in pages of policy documents is included.

The PIR has the highest number of instances of the top used non-commercial fishing terms compared to the other three regions (Figure 3). The PIR has the highest frequency of all types of fishing, but out of the three fishing terms, recreational fishing is the most common. In Alaska, subsistence fishing is the most common term used, and in the West Coast and National regions recreational fishing was most common. Both the West Coast and National regions have similar relative distributions of the terms, with minimal use of subsistence and traditional fishing and a high frequency of recreational. Alaska, the West Coast, and National regions all have roughly the same number of instances of recreational fishing. Alaska and the PIR have very similar frequencies for the use of the term subsistence fishing.

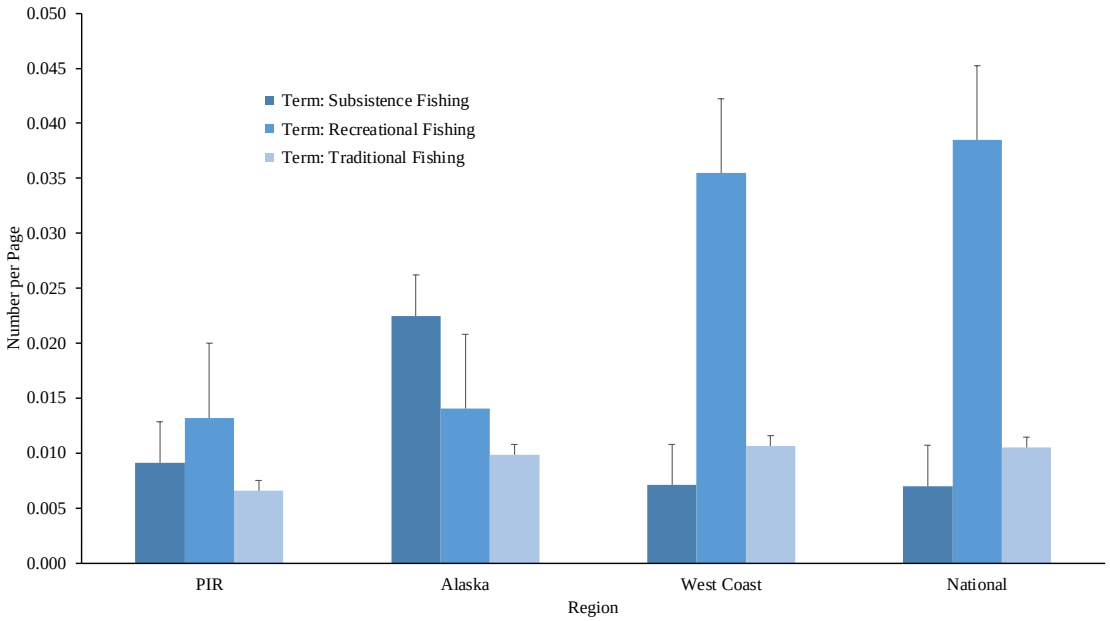

Figure 3. Usage (number per page, mean and standard deviation) of the top three most frequently used fishing terms across the three fishery management regions and nationally.

After standardizing the data by page number, the PIR no longer has the highest occurrence of any of the fishing terms (Figure 4). The ranked values of these terms within each region remained unchanged, but after standardizing by page number, the distributions between regions changed significantly. Recreational fishing is still the most commonly coded type of fishing in the PIR, followed by subsistence and then traditional. However, now in Alaska, subsistence has the highest frequency per page number, nearly double that found in any other region. Recreational fishing is the most common fishing term used in the West Coast and nationally, and those two regions have a much higher use of recreational fishing than either subsistence or traditional fishing. Now standardized, Alaska and the PIR have similar recreational fishing values. The West Coast and National regions mimic each other regarding the rank and distribution of the top three fishing terms.

3.4 FREQUENCY OF MOST COMMON ACTIVITIES

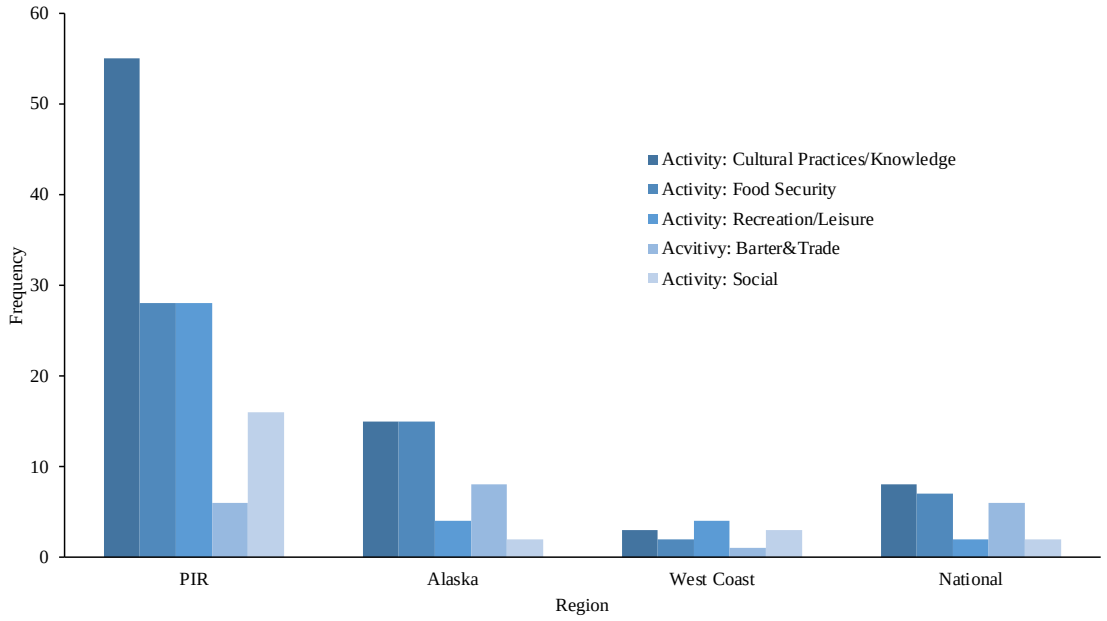

Figure 4. The frequency (total counts) of the most frequently used activities in all the documents in all the studied regions.

The PIR has a higher frequency than all the other regions of nearly every "Activity/Benefits/Motivation" code (Figure 5). The PIR has the highest frequency of Cultural Practices/Knowledge, Recreation/Leisure, Social, and Food Security, but a very low frequency of Barter and Trade. Cultural Practices/Knowledge was the most common code category used in Alaska, followed closely by Food Security. Social and Recreation/Leisure were the least common code categories used in Alaska, whereas Recreation/Leisure was the most used code category in the West Coast with 4 occurrences. The West Coast has the lowest code frequencies of each region and the opposite rank distribution compared to Alaska and National. Alaska and National have a similar distribution of the code categories, but Alaska has higher frequencies.

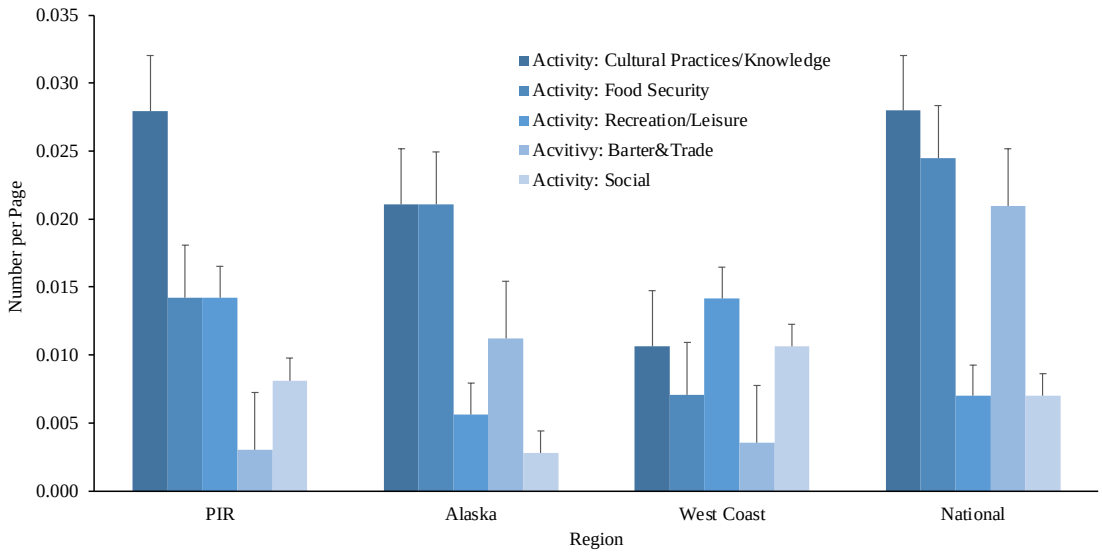

Figure 5. The most frequently referenced activity categories in all the regions and all the documents. Standard errors are included for the average frequency which was calculated by dividing the number of terms by the number of pages in each region.

After standardizing by number of pages, activity terms used across all the regions became more evenly distributed (Figure 6). Out of all the regions, Food Security was used the most in policy documents nationally. The use of Cultural Practices/Knowledge is very high and nearly identical between the PIR and National. Alaska has higher total counts of activity terms than National (Figure 5), but after standardizing by page numbers (Figure 6), they switched and National now has higher values. Alaska and National still have similar rank distributions to one another that are very different from PIR and the West Coast. The West Coast has a high frequency of Recreation/Leisure. Barter and Trade is low in the PIR and the West Coast, but high in Alaska and National. Essentially in Figure 6 all the regions are talking about activities related to fishing in different ways.

3.5 TERM CO-OCCURRENCE

Co-occurrence of terms is another interesting way to look at this data, which is illustrated below in Table 4. Each top used fishing term has an "Activity/Benefits/Motivation" code that occurs more frequently with it than the other activity codes (Table 4). The fishing terms and activity codes that co-occurred the most together were Food Security and subsistence fishing (19), Recreation/Leisure and recreational fishing (17), and traditional fishing and Cultural Practices/Knowledge (12). In addition, Cultural Practices/Knowledge was close behind Food Security in the subsistence fishing category at 17 occurrences. Aside from this, the values for other activities under each fishing type are much smaller than the most common co-occurrence in each category. Recreational fishing was coded 2nd highest with Food Security than it was for any of the other "Activity/Benefits/Motivation" codes but still a distant second to Recreation/Leisure. Traditional fishing had low frequencies for Recreation/Leisure, Barter and Trade, and Social, but Food Security co-occurred 2nd most frequently after Cultural Practices/Knowledge.

Table 4. The co-occurrence between the top used fishing terms and top "Activity/Benefits/Motivation" codes across all regions and documents. The most frequent co-occurrence is highlighted in blue.

Code System	Subsistence Fishing	Recreational Fishing	Traditional Fishing
Cultural Practices/Knowledge	17	4	12
Food Security	19	5	6
Recreation/Leisure	7	17	4
Barter and Trade	8	1	4
Social	2	4	3

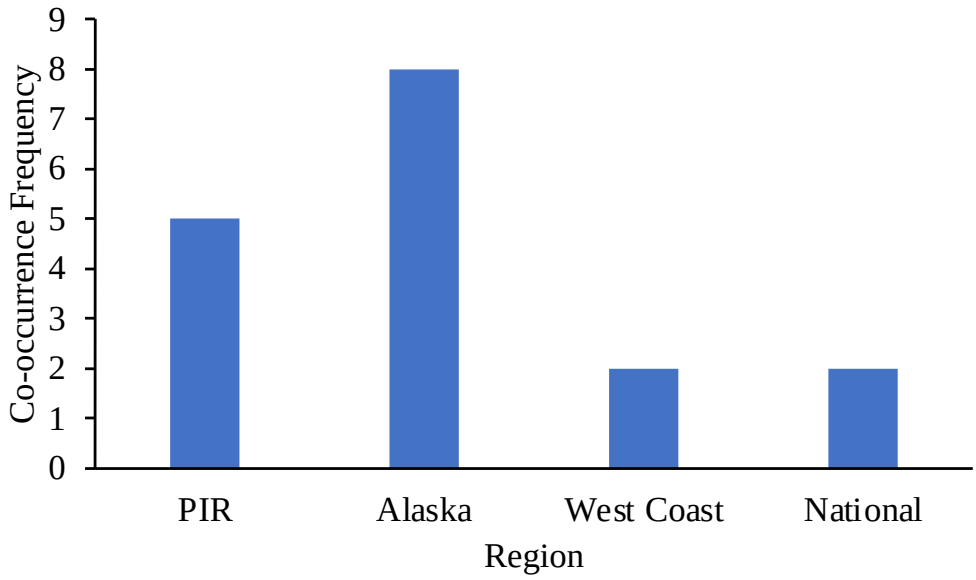

Figure 6. The distribution between regions of the co-occurrence of the term subsistence fishing with the Cultural Activity/Knowledge activity codes shown in Table 4. The total frequency between all regions totals 17, the co-occurrence total from Table 4.

This figure shows the relationship between cultural practices and subsistence fishing. Alaska has the highest frequency of co-occurrences between subsistence fishing and cultural activities. Alaska has 8 of the 17 total co-occurences, followed by PIR which has 5/17. National has the second highest frequency of co-occurrence between subsistence and cultural knowledge. Nationally there were 2 co-occurrences between the codes and in the West Coast there were also 2 co-occurrences, which are the same as the number of times subsistence is brought up in each of those regions. This same value means that 100% of the time that subsistence fishing is coded in National and West Coast documents, Cultural Practices/Knowledge is also coded. In the PIR Cultural Practices/Knowledges is coded 5/18 times that subsistence is coded in the region and in Alaska it is coded 8/16 times in the region.

3.6 DEFINITION FREQUENCY AND MOST COMMON CODES

Aside from frequencies, there are other codes such as “definition” that help to point out the context in which each fishing term is brought up. Subsistence fishing was defined 11 times in all the regions, recreational fishing was defined 18 times, and traditional fishing was defined 8 times. These together with the term fishing, which was defined 6 times, were the most frequently defined terms. The term non-commercial fishing was defined only three times throughout all the documents and all the regions.

There is high variability in the size of the data set throughout the regions, so the number of high frequency codes are very different for each region. The top used codes, or highest frequency codes were considered if they were used more than four times. In Alaska, Culture, Recreation/Leisure, Food Security, and Barter and Trade categories from “Activity/Benefits/Motivation” and subsistence from the “Term Used” category were the most frequent. Alaska also had four occurrences of both personal use beneficiaries and vulnerable populations from the “Characteristics” category (Appendix B). In the West Coast the codes that were used more than four times were recreational fishing and Recreation/Leisure.

The top used codes in the PIR were Culture, Social, Food Security, and Barter and Trade from the “Activities/Benefits/Motivation” category. Subsistence, recreational, traditional, non-commercial, bottomfish fishing, fishing, small scale fishing, and cultural fishing all from the “Term Used” category were also coded more than four times in the PIR. In the “Beneficiaries” category of the codebook, communities, personal use, friends and family, local economies, and household were all coded more than 4 times, and in the “Characteristics of the Community” category, local communities with long fishing

traditions, Indigenous, and cultural minorities were coded the most. In the "Characteristics of Fishers" category, local communities with long fishing traditions, and Indigenous were coded more frequently. Finally, charter boat fishing, local scale, and conventional management were all coded more than four times in PIR as well.

In the national region the codes that occurred more than four times were the Cultural Practices/Knowledge, Social, Food Security, and Barter and Trade all from the "Activity/Benefits/Motivations" category. Recreational fishing was also used more than four times in national policy documents.

4.0 DISCUSSION

After a close analysis of the differences between each of the four studied fishing regions, conclusions as to why those differences occur can now be understood. As humans move into an era in which environmental impacts such as climate change, pollution, and increased human population strongly affect fisheries, it is clear that this is the perfect time for management to be reevaluated and updated. The data suggests that the geopolitical status of each region, size of each region, as well as who lives in each region, could all potentially impact how fisheries are managed. Any cultural practices or deeply embedded social expectations could play a role, as well as historical treaties and government decisions that have only slightly varied over the years.

There can be many reasons as to why different parts of the United States discuss fishing so differently, but understanding some possibilities is important if there is going to be inclusivity between people and communities that heavily rely on fish. This study discovered that the Pacific Islands Region has the most diverse and involved set of policy documents, when compared to the other regions (Table 3, Figure 4 and 6). The West Coast region on the other hand has very low frequencies, and the pattern of distribution between National and West Coast is nearly identical in Figures 2 and 3. Alaska has detailed definitions of subsistence fishing, but in general the data shows that all the regions could benefit from a policy update.

4.1 REGIONAL CHARACTERISTICS

Due to the multitude of cultures and islands that make up the PIR, the wide variety of terms seen in Table 3 is understandable (Table 3). Multiple islands and cultures

can also explain why there are so many more documents and pages in the PIR than compared to any other region (Table 2). What makes the PIR unique is that it has only one state, Hawai‘i, but it also has multiple territories, which are the United States territories of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands (NOAA, n.d.). All these islands have different cultures and fishing practices, which are represented in the policy (Table 3). Although there are multiple islands in the region, the PIR has a small coastline and population of just under 2 million people (US Census, 2021). However, the region also has the majority of the Pacific Ocean to manage, making it the largest management region overall at 1.7 million square miles (US Census, 2010). The small populations of the islands emphasize how closely culturally connected the people are, and the reality that fish play an important role in many island communities. These elements of closeness, but also variety can be seen in the diversity of terms in Table 3, but also in the high frequencies of Cultural Practices/Knowledge in Figures 4 and 5.

Although the ocean is not dividing cultures in Alaska, there are many differing viewpoints within the region’s 1.5 million square miles (US Census, 2010), yet, there is not a large variety in use of different fishing terms (Table 3). Aside from subsistence law (Figures 2 and 3), Alaska is limited in inclusion and representation of different types of fishing (Table 3). Alaska’s small population of 732,000 people (US Census, 2021) includes 229 federally recognized tribes (Saenz, 2022), which play a significant role in lawmaking in the state. Since there are so many recognized tribes, much of the population fall under sovereign nations that are governed by native peoples. The power that these sovereign nations have limits the US government’s access to the land but also forces the

federal government to make agreements with native groups so that regulations can work with native treaties and policy. One example of these agreements is the "Cooperative Agreement Between the National Oceanic and Atmospheric Administration and the Alaska Eskimo Whaling Commission" (Appendix A). This document was analyzed in this study and it highlighted the constant discussion between tribes and the government which consequently limits Alaska's policy inclusivity (Table 3). If federal, state, and tribal regulations were more in tune, there could likely be a better working relationship between the three groups, which would not only create cohesive fishing policy, but also a deeper understanding of the cultural elements on both sides.

The similar distribution between national policy and the regional policy documents in the West Coast region (Table 3, Figure 2 and 3) is likely because of the relationship that the region has with the federal government. The West Coast has the highest population out of the three regions at nearly 50.5 million people (US Census, 2021), but only 149 federally recognized tribes (Saenz, 2022). Unlike the other regions, there are multiple states that make up the West Coast management region, those are: Oregon, Washington, and California (NOAA). A wide variety of terms is expected with such a high population and multiple states, however that is not reflected in the data (Table 3, Figures 2 and 3).

Aside from geographic and physical characteristics of the regions, there are other factors that could differ the regions as well. Offices and science center headquarters are one factor that could possibly change how fish are discussed because place-based work could potentially be more effective than working remotely. By looking at the data, there may be a possible connection between where the headquarter offices are and the

involvement of social science within policy management. If there are histories with connection of the science centers in each region, it is likely that those regions have a more involved social science team making sure that cultural practices and understandings are implemented in the fishery management policy of that region. If scientists and policy makers are headquartered in the environment in which they are regulating and writing policy for, it makes sense that those regions have more accurate and descriptive policy.

The Pacific Islands were originally managed from an office in San Diego until officially moving to Honolulu in 2003 (Seki, 2016). Before moving to Honolulu, the Southwest and Pacific Islands were both managed from San Diego, but now just the Southwest Science Center headquarters remain in La Jolla (NOAA, 2022). After the move to Honolulu, fishing policy became more inclusive because policymakers and scientists were able to interact with the environment and experience the diverse reality of fishing in the Pacific Islands (Seki, 2016). This may be what allowed the fishery policy to become so inclusive (Table 3).

The collaborative nature between the Northwest and Southwest Fisheries Science Centers could be what is limiting the term diversity (Table 3) because the two subregions are not familiar with the physical conditions in each other region, yet they are responsible for writing policy for the entire West Coast. A similar issue may be happening in Alaska with the region's headquarters being in Seattle (NOAA, 2022). Alaska is the only region that is not managed from within the regional boundaries at all.

4.2 HISTORICAL REGIONAL IMPORTANCE

The PIR has been driving the inclusivity of the term non-commercial fishing in management policy in the United States (K. Leong, personal communication, Feb. 2022) and that is reflected in the data (Table 3, Figures 2, 3, 4, and 5). Having this push to move away from the national definitions of fishing types, which are only recreational and commercial (Figure 4, Magnuson-Stevens Act, 2007), is what allows the PIR to be the expansive example of what inclusivity of fishing terms could look like.

Compared to the three other regions, the PIR is far more comprehensive (Table 3, Figures 2 and 3). This could have to do with the work in the Pacific Islands to be more inclusive, but also could have to do with the strong cultural connection to fish and the ocean that is found throughout Polynesia. Traditional fishing practices have been in place for generations in the PIR (Kleiber and Leong, 2018), whether it be a father teaching his son fishing methods passed down by his father or wayfinders working as "custodians of the sea" (Fache *et al.*, 2018, Hauʻofa, 1993). Although the region is made up of small islands, for many Pacific Islanders there is nothing small about it (Hauʻofa, 1993), and life in the ocean is just as important as life out of the sea.

Although the ocean is important to any fishing community, the ocean holds a huge cultural significance in the PIR simply because most of the region is the ocean. Instead of calling this region the Pacific Islands, Oceania is actually considered a better term with a more accurate connotation because it implies that the ocean is as equally important as the land (Hauʻofa, 1993). Oceania is filled with large ocean states, rather than small islands (Hauʻofa, 1993, D. Kleiber, personal communication, Mar. 2022). Recognizing that the regional management documents should encompass the ocean

surrounding the islands, as well as the fish in the sea helps to explain why non-commercial fishing is discussed more comprehensively in the PIR than other regions (Table 3, Figure 3, Figure 5). There are far more practices related to fishing than just recreation or commercial motives, and the PIR regional policy reflects that.

Hawai‘i and the Pacific Islands require vastly different management from other mainland regions simply because of their location. Unlike the West Coast, where there are many resources and exports for food and trade, in the PIR, fish is one of the main exports, meaning thousands of people heavily rely on it for jobs and sustenance (Hilmi *et al.*, 2018). All communities in the Pacific Island are defined as fishing communities (Kleiber and Leong, 2018). Fishing is deeply imbedded in Polynesian culture (Poepoe *et al.*, 2003) and because of these differences and distinctions between PIR and other regions, the diversity of fishing terms and more elaborate discussion of fishing activities is understandable (Table 3).

The cultural significance of fish may be the reason for PIR diversity, but the terms used in the West Coast region are likely affected by the history of the Pacific Northwest (PNW) and its native people's relationship with the federal government. This reality is reflected in multiple figures where the West Coast and National regions have very similar distributions (Figures 2 and 3). In the United States there is a complicated history with Indigenous people being moved onto reservations where there are limited opportunities (TED, 2010). In the 1800s there were multiple treaties signed between the federal government and Native Americans living in the PNW (Schmidhauser, 1976), that essentially permitted access for native people to certain types of fish throughout the region. Some of the hunting and fishing regulations put in place throughout the West

Coast provided protections and organization within fishing communities, however many of these regulations have been ignored or less prioritized over the years, especially for native communities (Ristroph, 2014).

The vocabulary in the West Coast management regions, as seen most with the term recreational fishing, mimics the vocabulary found in the national documents (Table 3, Figures 2 and 3). Indigenous rights and practices have rarely been included in policy since early colonization of the United States. In places like the West Coast, or other regions of the continental United States, where native populations are not often brought up in discussions about inclusivity, it is common to find little variation between regional and federal policy simply because Indigenous perspectives have not been considered before as relevant (Leong, personal communication, 2022). In Alaska and the Pacific Islands Region on the other hand, Indigenous populations are more prevalent and involved in lawmaking and regulating policy because of their populations and involvement, hence why their regional use of terms is more diverse than the West Coast (Figures 2 and 3).

Subsistence fishing is an important term in both PIR and Alaskan policy documents, however its critical significance in Alaska is represented the best in the regional policy (Figures 2 and 3). The term subsistence fishing in Alaska has the highest frequency by nearly double per page of document (Figure 3). Subsistence is defined in the Bering Sea Fishery Ecosystem Plan as “fishing for personal, family, and community consumption or sharing” (Appendix A). There is no other state in the country that relies so heavily on food that is caught in the wild (Blandford, *et al.*, 2012, Knutsen, 1987). According to the Department of the Interior, up to 18,000 tons of food are harvested by

rural residents of Alaska each year. Federal subsistence law was put into place to protect these people's rights to wild caught food (US Department of the Interior), and that is reflected in the policy (Figures 2 and 3). The Federal Subsistence Management Program manages subsistence in Alaska. It is responsible for making sure that rural Alaskans are given protections to hunt and eat food that is caught in the wild (US Department of the Interior).

The first subsistence law passed in the state of Alaska in 1978 did not actually do anything to explicitly protect native people's rights, it instead simply stated that subsistence uses of resources had priority over sport and commercial use of those same resources (Thornton, 1998, Subsistence Management Regulations for Public Land in Alaska, 2002). It was not until 1980 when the Alaska National Interest Lands Conservation Act (ANILCA) was passed that protections were put into place and fishing rights were properly specified (ANILCA, 1980).

In the Code of Federal Regulation, the definition of subsistence refers to the ANICLA definition. ANICLA defines subsistence as:

> The customary and traditional uses by rural Alaska residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade. (ANICLA, 1980)

Subsistence law discusses cultural aspects of fishing in Alaska as well as where people can have access to fish (Norris, 2002). As previously mentioned, there are hundreds of

federally recognized tribes in Alaska, according to the US Department of the Interior, many of whom play a role in defining what subsistence is and making sure that it stays federally recognized (Ristroph, 2014, Raymond-Yakoubian, 2012). Many places where native people can fish in Alaska is not their tribal land, but the US government's, so they rely on subsistence law to make sure they will continue to have access to the same resources (Ristroph, 2014).

Aside from subsistence law, the significant presence of the fishing industry in Alaska can help explain why Alaska so closely parallels the national "Activity/Benefits/Motivation" distribution in Figures 4 and 5. There is less of a discussion of recreation and social activities in Alaska and national documents, however the Barter and Trade category is quite high in both regions (Figure 4 and 5). The fishing industry in Alaska is its largest industry, and although this study is looking at non-commercial fishing, the reality is that fishing is a prolific resource for the region, and it holds a significant monetary value. As proven by NOAA's placement in the Department of Commerce, the economy and trade is important to the federal government as well. Both commercial and small-scale trade is a part of national and Alaskan policy and that is reflected in their similar distributions in Figures 4 and 5.

4.3 IMPORTANCE OF INCLUSIVITY

Although subsistence is mentioned so frequently in Alaska, there are still other types of fishing that take place such as recreational or commercial that significantly affect the population of the state. In Alaska, subsistence fishing is clearly defined, however it cannot be the only type of fishing that is defined in great detail. Regions like the Pacific

Islands currently describe cultural, pelagic, and artisanal fishing, for example, as a more detailed assessment of the activities involved in fishing (Table 3). This detail is needed in all the regions. By having a larger diversity of fishing types there can be more precise laws and regulations written to make sure that everyone affected by the type of fishing is considered.

Fishing rights and corresponding activities are a sensitive subject for many people, not just Indigenous communities (Figures 4 and 5), so written complete inclusivity is important. Data shows that fishing activities can involve many different people and can hold vastly different levels of significance (Figure 4 and 5). One example of how fishing can impact everyone is the Boldt Decision which was made in 1974 that granted tribes 50% of the annual fish catch throughout the lands surrounding the Puget Sound (Knutsen, 1987). This decision is one example of fishing rights being given to Indigenous communities instead of being taken away. Many non-native people were enraged when the case was decided because they thought their rights were being taken away. That rage showed the government that fishing rights and fish in general impact not only Indigenous communities, but everyone, making it important to ensure that management policy includes everyone.

4.4 WHAT CO-OCCURRENCE CAN REVEAL

Co-occurrence can be an interesting way to look at the terms and frequency of term use in each of the regions. By looking at how terms come up together it can solidify the definitions and the context in which terms are commonly found. The data found in the co-occurrence table (Table 4), is for the most part expected. Since Alaska has such

detailed subsistence laws (Ristroph, 2014), the federal laws reflect the regional need for subsistence regulation because of the reliance on fish within the state (ANICLA, 1980). It is expected that Alaska frequently mentions subsistence fishing in conjunction with food related activity codes (Table 4) because of the definition of subsistence.

The predicted pairings of activities are reflected in the data (Table 4), however slightly unexpected, subsistence fishing and Cultural Practices/Knowledge also co-occurred to a great extent, almost nearly as much as subsistence fishing and Food Security (Table 4). As it turns out, the majority of the occurrences of Cultural Practices/Knowledge and subsistence fishing exist within Alaska (Figure 6). This co-occurrence shows that there is a strong cultural element to subsistence fishing within Alaska because within the context of subsistence fishing the language that comes up in the policy surrounding the term heavily discusses cultural practices.

Recreational fishing on the other hand, is one example of fishing that is defined almost the exact same way in all the regions because of the national definition, yet contextually it is discussed less uniformly (Figures 2 and 3). As previously mentioned, the Magnuson-Stevens Act currently defines recreational fishing as “fishing for sport or pleasure” (Magnuson-Stevens Act, 1976). This definition remains vaguely consistent throughout all the regions; however, the activity data shows that recreational fishing is much more than just fishing for sport or pleasure (Figure 1, 4, and 5). There are terms that come up with recreational fishing that fall into a variety of categories under the “Activity/Benefits/Motivation” category (Figure 1). Terms such as “economic survival”, “cultural identity”, “food/consumption”, and “socially embedded practices” (Figure 1) were all coded alongside recreational fishing. This co-occurrence shows that terms other

than “sport” or “pleasure” are discussed within the context recreational fishing. This data can be used as a tool to show where updates should take place and how language and activities can be added to the updated definitions throughout each region.

Figure 1 shows the consolidation of the terms sportfish and recreational fishing based entirely on frequency of co-occurrence. However, the figure illustrates that culturally related activities are only discussed under the term recreational, showing that there are in fact different definitions for the two types of fishing. Although they have varying definitions, they were consolidated into one code because of the federal definition of recreational fishing and co-occurrence being higher than 50 percent (Magnuson-Stevens Act, 1976 and Table 1). Recreational fishing is in fact an umbrella term that can now be refined because of the examination of co-occurrence and consolidation. There are specifics within cultural significance or leisure activities that could be more inclusive if, for example, the definition of recreational fishing was updated and expanded.

4.5 MOVING FORWARD

The code framework used (Appendix C) was useful because it was extensive enough to include terms and phrasing that helped to paint an accurate picture of how fishing is defined in policy throughout the United States. There are many next steps that can be involved with this project. First, exploring all the remaining management regions in the country, including the Northeast and Southeast regions. There is likely significant use of the term recreational fishing in the Southern and Eastern regions of the United States (K. Leong, personal communication, Feb 2022) because of the need to follow

national standards and national terminology, similar to the West Coast region and parts of Alaska (Figures 2, 3, 4, and 5). Since the MSA is a federal document, evaluating all the regions will be helpful if a complete reauthorization is to take place. Secondly, completing the thorough policy investigation along with the peer reviewed literature that NOAA is currently analyzing (Leong, *et al.,* 2020) will help to inform policy makers considering the reauthorization of the MSA and the updating of any other fishery policy throughout the country. This work will likely bring a more comprehensive set of guidelines to the forefront of policy and management.

5.0 CONCLUSION

The data shows that there are differences in non-commercial fishing terms and how terms are emphasized in fisheries policy documents throughout the United States. It shows that the PIR is the most inclusive when it comes to fishery policy (Table 3, Figures 3 and 5) because it has been working the most extensively to include fishing diversity within the region. Other regions, with the exception of Alaskan subsistence laws, reference federal national management regulations such as the MSA as their baseline (Figures 2, 3, 4, and 5), rather than individual regional policy that can be specified to the geopolitical status of different populations around the country. This is especially true for the West Coast where term distribution is nearly identical to national policy (Figure 2 and 3). National policy does not define a large variety of types of fishing (Table 3), so the term recreational fishing is commonly used to encapsulate multiple definitions. Since recreational fishing is the only type of fishing that is federally defined, it has a much higher frequency in policy than most other types of fishing (Figure 2 and 3).

Overall, there could be more detailed definitions, wider variety term use, and more cohesive discussions on the role that fishing plays in different cultures around the country. The Pacific Islands Region is currently setting a new standard for cultural inclusivity, but hopefully the other regions are not too far behind. By reauthorizing the MSA and other national regulations, it will allow all regions to properly understand the cultural importance and diversity of fish throughout the country. This understanding will ultimately create better management and protection of fishing communities and cultures, while also properly representing all people who are affected by fishery policy and the ocean.

APPENDIX A

ALL DOCUMENTS

Document group	Document name
Northwest Region	International Pacific Halibut Commission Terms and Abbreviation
Northwest Region	Pacific Coast Groundfish FMP
Northwest Region	Pacific Fishery Management Council, Draft Fishery Ecosystem Plan
Alaska	Bering Sea Fishery Ecosystem Plan
Alaska	Bering Sea Aleutian Islands King and Tanner Crabs FMP
Alaska	CFR 50 Part 300
Alaska	Cooperative agreement by NOAA and Alaska Eskimo
Alaska	FMP for Fish Resources of the Arctic Management Area
National	CFR National Marine Sanctuary Program regulations
National	Magnusun Stevens Act Title 50
National	Magnusun Stevens Act_ Title 16
National	Modernizing Recreational Fisheries Management Act
National	Executive order 12962- Recreational Fisheries
National	National Marine Sanctuaries Act
National	National Saltwater Recreational Fisheries Policy
Pacific Region	CFR 665.905 Fishing Procedures and Criteria
Pacific Region	CFR- Fisheries in the Western Pacific
Pacific Region	CFR Papahānaumokuākea MNM
Pacific Region	Fagatele Bay NMS MP and EIS
Pacific Region	Fishery Ecosystem Plan for the American Samoa Archipelago
Pacific Region	Fishery Ecosystem Plan for the Pacific Remote Islands Areas
Pacific Region	Papahānaumokuākea MNM FMP
Pacific Region	Proclamation 8031
Pacific Region	Proclamation 8336
Pacific Region	Proclamation 8337
Pacific Region	Proclamation 9478
Pacific Region	Proclamation 8335
Pacific Region	Fishery Ecosystem Plan for the Mariana Archipelago
Pacific Region	Fishery Ecosystem Plan for the Hawai‘i Archipelago

APPENDIX B

MAXQDA CODE SYSTEM

Code System	Frequency
Code System	797
Category	0
Search item	0
good quote	1
definition	36
Activity/benefits/motivation	0
LUMP: Cultural Practices/Knowledge	81
culture	4
cultural practice	5
Cultural events/social gatherings, pāʻina	4
religious purposes, ceremonies	3
pre-colonial, pre-contact	1
cultural identity	15
cultural continuity/continuity of traditions	11
heritage and identity	7
spirituality	1
traditional/customary practices	23
fishing knowledge/TEK	7
LUMP: Food Security	49
survival/food/nutrition	13
survival	4
food/consumption	18
diet composition/health/nutrition	3
food security	9
material needs met	6
LUMP: Recreation/Leisure	40
recreational/leisure	19
motivation - fun	5

motivation - get away/time on water	5
NOT monetary purposes	8
NOT food	3
LUMP: Barter & Trade	0
give away/share	8
barter	7
trade	6
LUMP: Social	23
LUMP: Motive	0
motive - social, spend time with friend and family	3
socially embedded practices	7
lifestyle importance	3
sense of place	2
social cohesion/strengthen social networks	2
community resilience	2
well-being	1
social obligation	2
LUMP: Economic/Money Significance	11
economic	0
commercial motive	3
economic survival	4
sell fish	1
profit, income, earn money	3
NOT commercial	8
non-consumptive/NOT extractive	4
LUMP: Unused Code System	0
livelihood	0
sell surplus	0
export	0
cover expenses	0
secondary income	0
primary income	0

aquaculture	0
harvesting/harvest fishing	0
economic value of meals	0
social capital	0
psychological needs met	0
cultural obligations	0
reciprocity	0
Term used	173
LUMP: Subsistence and Food Fishing (+)	37
LUMP: Recreational and Sportfish (+)	45
LUMP: Traditional and Customary (+)	21
Term used: non-commercial fishing/fishers/fishery	11
Term used: bottomfish fishing/fishers/fishery	10
Term used: fishing	10
Term used: artisanal fishing/fishers/fishery	9
LUMP: Small-Scale, Small-Boat, and Smaller Fisheries	7
Term used: smaller fisheries fishing/fishers	1
Term used: small-boat fishing/fishers/fishery	1
Term used: small-scale fishing/fishers/fishery	5
Term used: commercial fishing/fishers/fishery	5
Term used: pelagic fishing/fishers/fishery	5
Term used: cultural fishing/fishers/fishery	5
Term used: community-based fishing/fishers/fishery	3
blurred commercial/non-commercial	2
Term used: coastal/nearshore fishing/fishers/fishery	2
Term used: coral reef fishing/fishers/fishery	1
LUMP: Unused Term Used	0
Term used: NOT …	0
Term used: wild-capture fishing/fishers/fishery	0
Term used: tropical fishing/fishers/fishery	0
Term used: trophy fishing/fishers/fishery	0
Term used: part-time commercial fishing/fishers/fishery	0

Term used: local fishing/fishers/fishery	0
Term used: Kaukau fishing/fishers/fishery	0
Term used: Holoholo fishing/fishers/fishery	0
Term used: expense fishing/fishers/fishery	0
Term used: aquaculture	0
fishery sector typology	0
WHERE: geographic location	77
PIR Lump	55
Pacific Islands Region	13
CNMI	9
Guam	4
Hawaii	14
American Samoa	15
Alaska	22
LUMP: Unused Codes	0
New Zealand	0
Florida Keys	0
tropical countries	0
Asia-Pacific Region	0
Mexico	0
WHO: Scale/relationships of Beneficiaries of fish/Fish flow	75
communities	19
personal use	15
friends and family	14
local economies	11
household	10
Residents/Villagers	6
NOT outsiders	1
LUMP: Unused Codes	0
small firms	0
NOT larger corporate entities	0
WHO: Characteristics of community/beneficiaries	47

Local communities with long fishing traditions	21
Indigenous	11
cultural minorities	4
rural	4
resource-dependent	3
Western/global North/developed	1
developing economy/Third World/undeveloped/global South	1
Gender	1
poor	1
LUMP: Unused Codes	0
immigrant communities	0
vulnerable populations	0
Characteristics of fishery	43
charter boat fishing	14
Traditional gear	7
Vessels	7
limited vessel size	3
limited vessel range	1
limited vessel power	1
Target pelagics	5
limited gear	4
fishing tournaments	2
use multiple methods/gear types	2
financial constraints	1
Target reef fish	1
LUMP: Unused Codes	0
Gear	0
flexible fishing techniques	0
Target species	0
Target specific species	0
Target multiple species	0
unreported commercial catch	0

limited investment/capital	0
data poor	0
WHO: Characteristics of fishers	41
Local communities with long fishing traditions	15
Indigenous	11
vulnerable populations	9
rural	4
resource-dependent	3
poor	1
Western/global North/developed	2
cultural minorities	2
developing economy/Third World/undeveloped/global South	1
Gender	1
LUMP: Unused codes	0
immigrant communities	0
WHERE: spatial extent	39
LUMP: Unused Codes	0
jurisdiction	0
outside urban areas/village	0
nearshore/coastal	11
local scale	8
state waters	7
reef areas	6
federal waters	5
remote/isolated	2
Management regime	15
conventional management	6
monitoring and compliance	2
license requirement	1
community-based management	4
HOW: control access	1
HOW: limit harvest quantity	1

no monitoring and compliance	1
gaps in management/low governance capacity	1
alternative management	1
LUMP: Unused Codes	0
management suggestions	0
traditional/customary management	0
no exclusive property right (quota)	0
no license requirement	0
customary management	0
NOT amenable to conventional management approaches	0
common property regimes/common pool resource governance	0
hybrid management	0
comanagement	0
exclusive property rights (quotas)	0
perception of governance	0
negative perceptions	0
limited representation	0
positive perceptions/support for regulations	0
Economic model	9
outside formal market economy/non-market/gift economy	7
community tenure	1
subsistence economy	1
fishing economy	2
pre-capitalist	0
gift economy	0
cultural/customary exchange	3
self-sufficient economy	0
independence from wage labor	0
no cash cost	0
market economy/commodity economy/capitalism	1
partial commodity economy	1
informal economy	1

Ocean/ecosystem condition	4
habitat degradation	2
loss of abundance	2
LUMP: Unused Codes	0
loss of larger fish	0

APPENDIX C

PROVIDED CODE SYSTEM

Code System	
definition	
Term used	
	fishery sector typology
	blurred commercial/non-commercial
	Term used: aquaculture
	Term used: artisanal fishing/fishers/fishery
	Term used: bottomfish fishing/fishers/fishery
	Term used: community-based fishing/fishers/fishery
	Term used: coastal/nearshore fishing/fishers/fishery
	Term used: commercial fishing/fishers/fishery
	Term used: coral reef fishing/fishers/fishery
	Term used: cultural fishing/fishers/fishery
	Term used: customary fishing/fishers/fishery
	Term used: expense fishing/fishers/fishery
	Term used: fishing
	Term used: food fishing/fishers/fishery
	Term used: Holoholo fishing/fishers/fishery
	Term used: Kaukau fishing/fishers/fishery
	Term used: local fishing/fishers/fishery
	Term used: non-commercial fishing/fishers/fishery
	Term used: part-time commercial fishing/fishers/fishery
	Term used: pelagic fishing/fishers/fishery
	Term used: recreational fishing/fishers/fishery
	Term used: sportfish fishing/fishers/fishery
	Term used: small-scale fishing/fishers/fishery
	Term used: small-boat fishing/fishers/fishery
	Term used: smaller fisheries fishing/fishers

	Term used: subsistence fishing/fishers/fishery	
	Term used: traditional fishing/fishers/fishery	
	Term used: trophy fishing/fishers/fishery	
	Term used: tropical fishing/fishers/fishery	
	Term used: wild-capture fishing/fishers/fishery	
	… (add any new terms already captured)	
	Term used: NOT …	
WHERE: geographic location		
	New Zealand	
	Mexico	
	Alaska	
	Florida Keys	
	American Samoa	
	CNMI	
	Guam	
	Hawaii	
	Pacific Islands Region	
	Asia-Pacific Region	
	tropical countries	
WHERE: spatial extent		
	jurisdiction	
		federal waters
		state waters
	remote/isolated	
	outside urban areas/village	
	reef areas	
	nearshore/coastal	
	local scale	
Ocean/ecosystem condition		
	habitat degradation	
	loss of abundance	
	loss of larger fish	
WHO: Characteristics of fishers		
	Western/global North/developed	
	developing economy/Third World/undeveloped/global South	
	vulnerable populations	
		resource-dependent
		rural
		poor
	indigenous	
	cultural minorities	
	immigrant communities	

	Local communities with long fishi	
	Gender	
WHO: Characteristics of community/beneficiaries		
	Western/global North/developed	
	developing economy/Third World/undeveloped/global South	
	vulnerable populations	
		resource-dependent
		rural
		poor
	indigenous	
	cultural minorities	
	immigrant communities	
	Local communities with long fishi	
	Gender	
WHO: Scale/relationships of Beneficiaries of fish/Fish flow		
	personal use	
	household	
	friends and family	
	Residents/Villagers	
		NOT outsiders
	small firms	
		NOT larger corporate entities
	communities	
	local economies	
Characteristics of fishery		
	data poor	
	limited investment/capital	
	financial constraints	
	Gear	
		limited gear
		use multiple methods/gear types
		Traditional gear
		flexible fishing techniques
	Target species	
		fishing tournaments
		unreported commercial catch
		Target specific species
		Target pelagics
		Target reef fish
		Target multiple species
	Vessels	

			charter boat fishing
			limited vessel range
			limited vessel power
			limited vessel size
Management regime			
	perception of governance		
		negative perceptions	
			limited representation
		Positive perceptions/ support for regulations	
	gaps in management/low governance capacity		
	management suggestions		
	conventional management		
			monitoring and compliance
			exclusive property rights (quotas)
			license requirement
	hybrid management		
			comanagement
	community-based management		
	common property regimes/comm governance		
	alternative management		
	traditional/customary management		
			no monitoring and compliance
			no exclusive property right (quota)
			no license requirement
			HOW: control access
			HOW: limit harvest quantity
			customary management
			NOT amenable to conventional management approaches
Economic model			
	market economy/commodity economy/capitalism		
	partial commodity economy		
			informal economy
	outside formal market economy/non-market/gift economy		
			community tenure
			subsistence economy
			fishing economy
			pre-capitalist
			gift economy

		cultural/customary exchange	
		self-sufficient economy	
		independence from wage labor	
		no cash cost	
Activity/benefits/motivation			
	aquaculture		
	non-consumptive/NOT extractive		
	harvesting/harvest fishing		
	economic		
		commercial motive	
		sell fish	
			profit, income, earn money
			primary income
			secondary income
			cover expenses
			sell surplus
			export
	livelihood		
		economic survival	
	trade		
	barter		
	NOT commercial		
	recreational/leisure		
		motivation - fun	
		motivation - get away/time on water	
		NOT monetary purposes	
		NOT food	
	subsistence		
		survival	
		material needs met	
		food/consumption	
			food security
			diet composition/ health/nutrition
			economic value of meals
	give away/share		
	social		
		sense of place	
		lifestyle importance	
		motive - social, spend time with friend and family	
		social cohesion/strengthen social	

		networks	
		social capital	
		social obligation	
		socially embedded practices	
		community resilience	
		well-being	
		psychological needs met	
	cultural		
		cultural practice	
			pre-colonial, pre-contact
			traditional/ customary practices
			Cultural events/ social gatherings, pāʻina
			religious purposes, ceremonies
		cultural obligations	
		cultural continuity/continuity of traditions	
		spirituality	
		heritage and identity	
		cultural identity	
		fishing knowledge/TEK	
		reciprocity	

APPENDIX D

MAGNUSON-STEVENS ACT NATIONAL STANDARDS

National Standards	Standard
1 - Optimum Yield	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.
2 - Scientific Information	Conservation and management measures shall be based upon the best scientific information available.
3 - Management Units	To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

4 - Allocations	Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (a) fair and equitable to all such fishermen; (b) reasonably calculated to promote conservation; and (c) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privilege.
5 - Efficiency	Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.
6 - Variations and Contingencies	Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
7 - Costs and Benefits	Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.
8 - Communities	Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirement of paragraph (2) [i.e., National Standard 2], in order to (a) provide for the sustained participation of such communities, and (b) to the extent practicable, minimize adverse economic impacts on such communities.
9 - Bycatch	Conservation and management measures shall, to the extent practicable, (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.
10 - Safety of Life at Ocean	Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

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National Standard 6 – Variations and Contingencies 50 C.F.R. § 600.335 (1976)

National Standard 7 – Costs and Benefits 50 C.F.R. § 600.340 (1976)

National Standard 8 – Communities 50 C.F.R. § 600.345 (1976)

National Standard 9 – Bycatch 50 C.F.R. § 600.350 (1976)

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