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Ada Dovell April 3, 2018

Capture of the United States Regional Fishery Management Councils: An Analysis of Special Interest Influence on the Determination of Catch Limits

by

Ada Dovell

Alexander Bolton
Adviser

Political Science

Alexander Bolton

Adviser

Tracy Yandle

Committee Member

Zachary Peskowitz

Committee Member

2018

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Ada Dovell

Alexander Bolton

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Abstract

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In the United States, governance of fishery resources is delegated to eight regional councils that are charged with managing overfished fish populations. These councils are composed of different interest groups–commercial fishers, recreational fishers, and scientific and government representatives–who are responsible for developing fisheries policy (Cufone 2004). However, since the establishment of the councils in 1976, commercial and recreational interests have seemingly come to dominate the councils, a trend often cited when explaining the general failure of the councils to successfully manage their fish stocks (Cochran 2000; Okey 2003; Thomas et al. 2010). One area where the influence of commercial and recreational interests is likely to exert the most influence is the development of catch limits, which determine the total amount of a particular fish species that can be withdrawn every year (Eagle et al. 2003). From 1976 until 2010, councils retained the right to set catch limits; however, after 2010, the ability to determine catch limits was effectively delegated to the Scientific and Statistical Committees, scientific advisory bodies to the councils (Crosson 2012). This paper will attempt to understand–through the lens of catch limits–what effect overrepresentation of commercial and recreational interests has had on fisheries regulation and policy development. Expressly, this research will test the following hypotheses: (1) The regional councils were captured by special interests prior to 2010 and (2) After 2010, as a result of the SSCs gaining the ability to set catch limits, special interests will not significantly influence council policy. In contrast to the aforementioned hypotheses, this study found that the regional fishery councils were not, in fact, captured by special interests prior to 2010, special interests exerting no significant influence on the determination of catch limits. Further, it was shown that special interests, specifically recreational users, had a meaningful impact on the catch limits after 2010. Though these findings do not support the initial hypotheses, they nevertheless constitute valuable contributions to existing scholarship on fisheries management, providing both a credible assessment of capture and assessing the relevance of scientific advisory bodies–such as the SSCs–for effective fisheries management.

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Introduction & Background

The question of how to best manage common pool resources has confronted resource users, policy makers, and scientists for decades and, to date, no consensus has been developed regarding the most efficient institutional design by which to manage resources that risk being overexploited. A one-size-fits-all formula for resource governance does not exist; each resource presents a unique set of challenges and circumstances that require individual consideration (Ostrom 2008). While cases of successful resource governance may serve as reference points, the nuances of resources systems must be acknowledged, particularly the characteristics of the resource users themselves which, I would argue, are more influential than the type of resource. The features of resource users, this paper will contend, have direct consequences on the expression of resource governance, revealing deficiencies in resource management design and potential areas for governance improvement. One case in which the complexities of resource governance have become very apparent is within United States fisheries. The oceans' resources present some of the largest common pool resources in existence and have proved exceedingly difficult to manage (Ostrom 2008).

However, before exploring the case of U.S. fisheries and their obstacles to management, it is important to review what is meant by the term "common pool resources." Common pool resources, also known as open-access resources, are those that are both non-excludable and extractable, meaning that it is extremely difficult to prevent individuals from utilizing the resource, and one person's use of a resource limits another individual's ability to utilize that same resource (Gardner et al. 1990). Given this definition, it is easy to discern why managing these resources would be so challenging; there is an extremely high incentive for people to "defect," exploiting the resource for personal gain as opposed to managing it for long-term

sustainability. The inherent dilemmas surrounding common pool resources have been extremely prevalent in U.S. fisheries, where many populations have been dangerously overfished (Rosenberg 2006). In an attempt to rectify the status of their fisheries and to protect them from foreign fishing interests, the U.S. government enacted the 1976 Magnuson-Stevens Act, which separated management of fisheries into eight regional councils. The eight councils are the New England, Mid-Atlantic, South Atlantic, Caribbean, Gulf of Mexico, Pacific, Western Pacific, and North Pacific, each of which are accountable for the fishing grounds from 3 to 200 miles offshore (Cufone 2004). These councils are responsible for governing fishing practices in their respective regions, the goal being recovery of at-risk populations and long-term sustainable management. Anyone who is considered to have sufficient knowledge about fisheries can be nominated by a member of the general public to become a council representative. Once nominated, the nominees complete applications containing background information concerning their involvement in fisheries, which are then brought before the governors of each state within a regional council. Governors make their own nominations, based on the ones previously presented, the Secretary of Commerce making the final decision on council appointment (Cufone 2004). Council members serve three year terms at which point they can be re-appointed.[1] While these details may seem inconsequential, they are central to understanding how or if the institutional dynamics of the regional councils have contributed to fisheries management deterioration, providing pertinent background knowledge for later sections of the paper.

While the Magnuson-Stevens Act of 1976 has been amended over time, the ultimate objective of this Act was to establish a participatory governance structure, allowing people invested in fisheries to have a voice, ultimately increasing the legitimacy of governance and

[1] The maximum time a council member may serve is nine consecutive years, however they can run again after taking one term off (Cufone 2004).

adherence to fisheries law (Office of Sustainable Fisheries 2012). The councils are supposed to primarily serve as advising bodies to the National Marine Fisheries Service (NMFS), an office within the Department of Commerce charged with conserving and sustainably maintaining ocean resources and habitats.[2] Chiefly, the regional councils are responsible for informing the NMFS of regional issues, providing more localized knowledge, and developing comprehensive policy (Cufone 2004). While U.S. fisheries have been operating under the jurisdiction of the Magnuson-Stevens Act for over 40 years, many fish stocks have yet to recover and some continue to be overfished (NOAA 2016; Ostrom 2008; Rosenberg 2006). Thus, the question of how to best manage the common pool resource of fisheries remains uncertain.

Despite immense research surrounding fisheries management policy, there remains no conclusive answer as to why the regional councils have been ineffective at sustainably managing their fish stocks. However, several theories exist, the most prevalent being that the overrepresentation of special interests (commercial companies and recreational fishers) on the councils has led to the development of poor policies (Cochrane 2000; Eagle et al. 2003; Okey 2003; Thomas et al. 2010).[3] The councils have historically served as the primary body charged with developing fisheries policy: they establish catch limits, determine quotas, and set fishing seasons.[4] [5] Each of these powers has the ability to significantly impact the status of fish stocks; larger quotas and catch limits as well as longer fishing seasons increase the amount of fish that can be caught, potentially leading to increased exploitation of certain stocks (Eagle et al. 2003). Studies exploring regional fisheries management have asserted that commercial representatives

[2] http://www.nmfs.noaa.gov/aboutus/aboutus.html Accessed 11/17/17
[3] This paper will provide and explanation for grouping commercial and recreational users under the title "special interests" in the theory section of the paper.
[4] http://www.fisherycouncils.org/ Accessed 11/17/17
[5] Catch limits refer to the total amount of a certain fish species that can be withdrawn, while quotas refer to the amount of fish allocated to individuals or companies that they are allowed to catch.

pursue more exploitative practices for economic gain, thus their historic overrepresentation on the councils can help to explain the endemically poor status of many fish stocks (Cochrane 2000; Okey 2003). Further, emerging literature has demonstrated that recreational fishing has grown dramatically over the past 20 years, rivaling commercial landings in many stocks and thus also posing a significant threat to sustainable fisheries management (Coleman 2004; Ihde et al. 2011).

In response to the continued overfishing of many stocks, the Magnuson-Stevens Reauthorization Act (MSRA) was introduced in 2006 to strengthen sustainable fisheries management. Among other provisions, this Act established that the final catch limits set by the councils cannot exceed the catch limits recommended by the Scientific and Statistical Committees (SSCs), advisory bodies charged with providing scientific advice from which the councils can base their final policy decisions (Crosson 2012). While the SSCs existed prior to 2006, providing councils with scientific advice for policy development, their advice had no authority and could effectively be ignored (Crosson 2012). The new authority given to the SSCs to recommend catch limits that the councils must adhere to represents a fundamental change in the power dynamics within the councils, providing the ideal setting in which to explore not only the effect of special interest representation (commercial and recreational users) on fisheries management, but also the impact of scientific bodies (such as the SSCs) on the behavior of regulatory agencies and policies subsequently produced.

At this point, it is relevant to review certain fisheries terminology that will be used throughout the remainder of the paper in reference to the main variables at play. Acceptable biological catch (ABC) refers to the total amount of a particular fish species that can be withdrawn annually; this catch level is recommended by the SSCs and is the number on which the councils then base their final catch limit decisions. Annual catch limits (ACL) refer to the

councils' final catch limits for each species every year. These terms, however, were only utilized in all councils beginning in 2010. In accordance with the 2006 Magnuson-Stevens Reauthorization Act, officially implemented in 2010, the councils' ACL cannot exceed the ABC specifications articulated by the SSCs. Before 2010, however, terminology for catch limits varied greatly depending on the council, as did the role of the SSCs. While SSCs existed prior to 2010, they served different functions depending on the regional council. Their primary purpose was to serve as an advising body to the council, and though some gave specific catch limit recommendations to the councils prior to 2010, others simply provided scientific knowledge or broad management advice. Nevertheless, prior to 2010, many councils had scientific advisory panels or monitoring committees dedicated to providing policy recommendations, particularly with respect to catch limits, from which the councils could base their final policy decisions (Eagle et al. 2003). Again, the recommendations from the scientific body (SSC, monitoring committee, advisory panel etc.) and the councils' final decisions regarding catch limits took different names in different councils prior to 2010.

For the sake of consistency throughout the paper, the different acronyms used for catch limits and the names for the various scientific advisory bodies (SSC, monitoring committee, advisory panels etc.) will not be used. Instead, the paper will simply refer to scientific-recommended catch limits (those recommended by whichever scientific body the council utilized prior to 2010) and council-set catch limits (those catch limits the council implements after the recommendation from the scientific body is given). Fundamentally, prior to 2010, a scientific body (whether it be the SSC or not) made catch limit recommendations to the councils for many fish stocks, levels from which the councils could then base their final catch limit decisions, but

were not required to adhere to. After 2010, and mandatory for all councils, the SSCs made catch limit recommendations that the councils' final catch limit decisions could not exceed. [6]

Research Questions & Relevance

With the background of regional fisheries management in mind, the research questions this paper will explore are as follows (1) Why have the regional fishery councils in the U.S. been generally unsuccessful at sustainably managing their fisheries? (2) Were the U.S. regional fishery management councils "captured" by special interests prior to 2010 (e.g. commercial and recreational interests)? (3) What was the impact of the Magnuson-Stevens Reauthorization Act and how have the changes articulated in this piece of legislature impacted special interest influence and council behavior? The broader significance of these questions is threefold: these questions could develop further knowledge of government management of natural resources, they inform a broader literature on the capture of regulatory agencies and, finally, they provide insight into the relevance of scientific regulatory bodies (particularly the SSCs) for regional fisheries management, which remains an underexplored subject.

The question of how to best structure the management of common pool resources has been a topic of much debate among scientists and policy makers, particularly with respect to how and if the government should be involved in management processes. Some scholars contend that localized management institutions must develop from the bottom up, building on networks of trust and reciprocity to construct regulation strategies that fit both the resource and those using it (Ostrom 1990). This model of management asserts that little government intervention is necessary and, if the government is to be involved, it should only be after nested management

[6] Catch limits are enforced in a variety of different ways. Most simply, given the total catch limit for a managed species, fishing rights and quotas are distributed by the councils to the stakeholders. Landings are then monitored to ensure that the quotas are not exceeded (NOAA. "Electronic Monitoring.")

institutions have developed (Ostrom 1990). On the other hand, some scholars claim that resource users are not capable of managing open-access resources for the long run, requiring outside intervention often in the form of government engagement (Hardin 1968). The case of fisheries management in the U.S.–and this study in particular– directly informs this topic. Prior to the establishment of the Magnuson-Stevens Act, fisheries in the United States were left to fisheries users to manage. However, when it was evident that fish stocks were being severely depleted by both U.S. and foreign industries, the government intervened and established the regional councils under the original Magnuson-Stevens Act in 1976 (Cloutier 1996). These councils have largely been considered ineffective considering that many fish species continue to be overfished (NOAA 2016; Ostrom 2008; Rosenberg 2006). So, is government the answer to fisheries management? This paper, by examining what the effect of special interest inclusion has been on governance outcomes, can distinguish if the source of management failure is a product of government misstep, or instead lies with special interest influence.

Regional fisheries management also provides an excellent opportunity to explore the concept of "capture." Capture, in its most basic essence, refers to when special interests come to dominate a regulatory body such that policy developed is reflective of these special interests as opposed to the interests of the general public (Carpenter and Moss 2014). The regional fishery councils are the primary regulatory body charged with managing U.S. fisheries. In establishing the regional councils, the federal government attempted to construct a democratic, participatory governance structure where users of the resource had a voice in management (Cufone 2004). But, many authors cite this participatory feature as the downfall of fisheries regulation, asserting that special interests have come to monopolize the regional councils. As a consequence of this overrepresentation, councils have come to enact policy that is merely reflective of these special

interests, overlooking the broader concerns of U.S. fisheries (Cochrane 2000; Eagle et al. 2003; Okey 2003; Thomas et al. 2010). This distorted policy, some contend, undermines public interests, which are the sustainable use and management of fisheries resources (Okey 2003). Applying the concept of capture to the regional councils provides insight into what the effect of special interest inclusion has been on the regional councils and on the realization of public interests as a whole. Through such analyses, we can better understand if the regional councils were captured by special interests prior to 2010 and what the potential consequences of capture might have been for fisheries policy.[7]

Though the capture model has been applied to regional fisheries councils, many empirical shortcomings exist (which will be further explored in the literature review and theory sections) that limit the applicability and validity of the findings. By determining if regional councils have, in fact, been captured, this paper could contribute to a larger explanation for why fisheries management has historically been ineffective. Further, applying the capture analyses to the example of regional fishery councils contributes to research on what the ramifications of capture are with respect to public interest realization and policy development, posing implications beyond environmental regulation. Finally, these questions address what the impact of scientific advisory and regulatory bodies (such as the SSCs) has been on fisheries management, specifically in response to the changes dictated in the MSRA regarding catch limits. The expanded power of the SSCs after 2010 demonstrates a fundamental shift in power dynamics, a topic that has received limited attention in both the environmental and political science fields.[8] Though technically overseen by the NMFS, the regional councils have acted as independent

[7] An explanation for why capture can only be tested before 2010 will be provided in the testing section of the paper.
[8] To date, I have only been able to find one article that discusses the role of the SSCs (Crosson, 2012). This article will be reviewed later in the paper.

bodies for decades, with few restraints on their administrative abilities (Cufone 2004). Now, the councils have concrete limits on their capacity to determine fisheries management policy, and this restructuring of power uncovers new opportunities for fisheries management research. What potential impacts will the extended ability of the SSCs have on the manifestation of special interests, and what are the long-term implications for future fisheries management? This paper will attempt to understand if special interest representation influenced council decisions after the implementation of the MSRA, and if this change has altered the dynamics of fisheries management for the better. Addressing these questions helps to articulate what potential effects a scientific advisory body, such as the SSC, has on the management dynamics of a larger regulatory agency, generating new and relevant theory on the future prospects of U.S. fisheries management. More fundamentally, such an analysis will reveal how incorporating scientific authority into a resource governance body influences the effectiveness of management, an understanding that can be applied not only to fisheries, but to a broad range of environmental resources.

Literature Review

Fisheries management in the U.S has been the subject of much study in past decades primarily because, despite being under the same management regime for over 40 years, the regional councils are still considered largely ineffective. Many managed fish stocks are still not rebuilt after years of unregulated fishing, and overfishing and exploitation of endangered stocks continues to be a pervasive issue (NOAA 2016; Beddington et al. 2007; Rosenberg 2006). There are numerous theoretical explanations as to why the regional councils have been unable to successfully regulate their fisheries, the first of which argues that the regional councils have exercised too much power over the NMFS, ignoring the advice they put forth and acting

according to their own prerogatives (Cufone 2004). While the NMFS is supposed to serve as the overarching regulatory body, its role has been undercut by the actions of the regional councils. When the councils develop their policies, they must present them to the NMFS for review; if the NMFS find encounter any points of issue, they can instruct the councils to redesign their management plans. However, the councils have found loopholes in this rule. Often, councils will defer restructuring the policy indefinitely or resubmit the same policy plan, effectively forcing the fisheries to operate "temporarily," under their original management strategy (Cufone 2004).

The second class of theoretical explanations for chronically poor fisheries management are those that cite issues of coordination within the management design. One perspective asserts that stakeholders (those who have a vested interest in the fishery, e.g. fishers and fishing businesses) are not included early enough in governance processes (Linke et al. 2011). This delayed inclusion leads to an absence of trust between the stakeholders and the scientists providing fisheries information, undermining the legitimacy of the management system.[9] Further, Allen (2005) argues that the interests of the general public are not integrated with the interest groups who utilize the fisheries. This failure to incorporate the public alongside other interest groups, he contends, has produced policy that does not align the incentive structures of the general public with those of the fisheries users, ultimately resulting in unsustainable and exploitative practices. Expanding on this concept, Naves et al. (2015), in a case study of salmon fisheries in Alaska, demonstrate that the level of within-group and between-group agreement with respect to fishery knowledge and policy depends greatly on the type of user. The authors break down type of user into the native populations, commercial fishers, and fisheries managers

[9] This study used the case of the European Union which has an extremely similar institutional design. The theoretical basis of the paper is very applicable to the case of the U.S.

and biologists, contending that differences in agreement level on fishery knowledge and policy between these stakeholders is explained by the absence of mechanisms by which these interest groups can easily share information. This limited information sharing has resulted not only in poor relationships between the different types of fishery users, but also selective and incomplete policy (Naves et al. 2015).

While the aforementioned literature explaining the general failure of fisheries management provides a valuable analysis of the nuances of fisheries management dynamics–factors which undoubtedly play a role in regulatory trends–I would argue that these theories comprise components of a larger phenomenon in fisheries management research. Cufone (2004) explains that the regional councils have exercised too much power over the NMFS, acting as independent bodies. But, what is the problem with councils acting autonomous bodies? If they were acting appropriately and in the best interests of the fisheries, their abilities would not be in question. Thus, the issue lies not as much with the councils' power, but more with what influences how that power is manifested (i.e. what interests are driving the councils' decisions). Further, Allen (2005), Linke (2011), and Naves et al. (2015) broadly suggest that the lack of coordination, cohesion, and information-sharing mechanisms between groups involved or invested in fisheries management has led to the development of incomplete policy. A lack of mechanisms for information sharing between groups, I would argue, does not fully explain historically poor fisheries management. According to the Magnuson-Stevens Act, the councils are supposed to be composed of a variety of balanced interests–including those with scientific and conservation backgrounds–to promote sustainable fisheries management.[10] If the councils were intended to represent a variety of balanced interests and serve as the primary body for

[10] 16 U.S. Code Chapter 38. Dec. 8 2017.

policy development, the councils themselves would theoretically serve as the best mechanism for information sharing between stakeholder groups, particularly because these groups are forced to interact to create management plans. Thus, perhaps information sharing and deliberation has failed to occur, not for a lack of mechanisms, but because certain groups have been excluded from those mechanisms to begin with. Overall, I am not suggesting that any of these theories are incorrect, more that they indicate the presence of a larger trend: the overrepresentation of special interest groups and the policies pursued by the councils as a consequence. Further, of the literature reviewed thus far, only Naves et al. (2015) actually utilize scientific testing, making the claims of the aforementioned studies somewhat bounded.

The third branch of theoretical explanations for inefficient fisheries management–and the type explored in this paper–analyzes the composition of the regional councils themselves, determining if overrepresentation of certain stakeholder groups has undermined successful fisheries management. Extensive scholarship exists that attempts to explain the impact of stakeholder inclusion on management success, most authors agreeing that special interests–whether they be commercial or recreational–have been systematically overrepresented on the regional councils, producing adverse management outcomes (Cochrane 2000; Coleman et al. 2004; Ihde et al. 2011; Okey 2003; Thomas et al. 2010). While many authors agree that the dominance of special interests on the regional councils has been detrimental to sustainability, the causal link and mechanisms explaining this relationship remain obscure. Okey (2003) contends that commercial interests are capitalistic and short term, leading to weak policy and exploitative practices. There is a need to include the general public in fisheries management, whose interests, according to Okey, primarily align with the goals of sustainability. An alternate perspective asserts that global social and economic priorities are one of the central reasons for fishery

management failure. Fisheries employ millions of people globally and constitute a huge source of revenue, thus a hierarchy has developed in which larger economic interests are given priority by the government, sustainable interests becoming marginalized (Cochrane 2000). This marginalization of sustainable interests and prioritizing of capitalistic demands has resulted in distorted policy outcomes.

Finally, Thomas et al. (2010) argue that state agencies, specifically the regional councils, have been captured by special interests. Performing a 10-year analysis of voting patterns in the regional councils, this study determined that state and federal agency representatives tend to vote in line with the special interests (commercial and recreational) of their state, illustrating the capture theory. It is relevant to note that, of the literature I have reviewed, only Thomas et al. (2010) test the capture theory with respect to regional fishery councils. Both Okey (2003) and Cochran (2000) offer insights into the over-representation of large commercial interests, but do not explicitly test capture. Applying the capture theory allows for the empirical testing of the effect imbalanced stakeholder inclusion on the regional councils, demonstrating not only the fact that special interests have been overrepresented, but also disentangling the mechanisms by which special interest representation influences management dynamics. Nevertheless, recognizing the overrepresentation of special interests on the regional councils and describing the potential consequences for fisheries management constructs the base from which the capture theory can be applied, making this area of scholarship an extremely pertinent starting point.

While Thomas et al. (2010) utilize the capture theory, their use of voting patterns to demonstrate capture, I would contend, limits the significance and applicability of their findings. Only four of the eight regional councils record individual voting records, thus the data from this paper is limited by a relatively small sample size. This limited dataset inhibits the

generalizability of their findings to the rest of the councils, let alone the theoretical applications outside fisheries management. More importantly for this study, Thomas (2010) was primarily examining if state and federal agency representatives on the councils are captured, using the mechanism of voting patterns to illustrate capture. Specifically, Thomas et al. examined if state and federal agency representatives vote in line with special interests (commercial and recreational interests) of their state. However, state and federal agency representatives compose a very small portion of the regional councils. Thus, even if they vote in accordance with the commercial and recreational interests of their states, their interests are not the only determinant of the policy ultimately adopted by the councils. Put more simply, while voting patterns are undoubtedly an interesting phenomenon to study, they do not always illustrate what policies the councils eventually pursue because state and federal representatives do not compose a majority of the councils. Since policy is what drives the management of fisheries, I would argue that to test capture it is more relevant to understand what (or who) influences final policy outcomes, as opposed the voting patterns of a subgroup within the councils. Given the aforementioned literature, a robust test of capture utilizing catch limits as the primary mechanism through which special interests are expressed would likely yield more substantive results.

Additionally, there is relatively little research performed on the impact of the MSRA, which established that final catch limits cannot exceed the scientific recommendation provided by the SSC. To my knowledge, only one paper has explicitly explored the impacts of the MSRA and specifically the modification to how catch limits are specified. Using the principal-agent theory, Crosson (2012) examined the interactions within the regional councils after the policy change regarding catch limits. Crosson determined that this policy revision resulted in an increased dialogue between the SSCs and the members of the regional councils, though not

completely reversing the principal agent structure (the council being the principal and the SSCs being the agent). This paper aligned more closely with the ideas put forth by Allen (2005), Linke (2011), and Naves et al. (2015) regarding coordination of interests and information sharing mechanisms, not fully touching upon the influence special interest representation on the councils. Moreover, the author does not thoroughly explore what the implications of this change are for the future success or failure of fisheries management.

Although Crosson does not discuss the broader implications of his study with respect to future fisheries management prospects, other papers have analyzed the implications of incorporating scientific advice into fisheries management, suggesting–but not empirically demonstrating–that further scientific involvement would improve fisheries management (Linke 2011; Prager and Rosenberg 2008). Prager and Rosenberg (2008) contend that an independent review process for management, whose purpose is to determine if current management structures are in the best scientific interests of the fishery, would promote the development of more sustainable policy and management success as a whole. Further, Linke et al. (2011) assert that stakeholders and scientists must cooperate at an earlier stage in management. Doing so would not only promote trust between the groups, but also increase the legitimacy of existing government. Given the positive perspective on the potential for scientific input to improve fisheries management, the study of the MSRA and its impact on the manifestation of special interests, particularly with respect to catch limits, seems an extremely pertinent point of study. The change in legislation, making the scientific-recommended catch limits a binding maximum, could perhaps serve to counteract special interest influence on the regional councils after 2010, mitigating any force that special interests may have exerted on catch limits prior to that time.

Given the existing scholarship discussing fisheries management reviewed in this section, this paper will attempt to analyze how imbalanced special interest representation on the councils has influenced the development of fisheries policy, specifically catch limits. Expressly, this paper will test if the councils were captured by special interests prior to 2010, with policies produced by the councils representing the interests of commercial and recreational users as opposed to the interests of the general public. This research will also address what the effect of the MSRA, specifically the change in process for determining catch limits, has been on the propensity for special interests to impact catch limits produced by the councils after 2010. Not only will this research provide a valuable empirical contribution to fisheries management research–extending upon existing theories regarding the consequences of special interest representation for policy development–but it also comments on the effect of the MSRA. Specifically, the paper will address how this legislation change has impacted the capacity of special interests to influence the development of catch limits, speaking to a broader literature on the significance of scientific input for environmental resource management.

Theory

It is well established that special interests have been systematically overrepresented on the regional fishery councils (Cochrane 2010; Eagle et al. 2003; Okey 2003). Annually, the National Marine Fisheries Service provides reports to Congress that publicize information on council members; significantly, these reports include a breakdown of council members by their financial interest group (stakeholder type), categorizing them as either commercial, recreational, or other. Utilizing this data, studies comparing the proportion of stakeholder types represented on the councils have found that commercial interests historically tend to hold the most seats on the councils; moreover, in recent years, recreational interests have gained increasing representation

on the councils (Cufone 2004). As of 2016, commercial and recreational interests jointly comprised a majority of the councils in all regions (U.S. Department of Commerce 2016).

Despite scholarship demonstrating the imbalanced representation of special interests on the councils, the causal pathway linking special interest dominance to ineffective fisheries management remains murky (Holahan 2012). The accounts explored thus far affirm that the overrepresentation of special interests has been the downfall of fisheries management, but fail to explain exactly how dominance of special interests has undermined successful fisheries regulation. This paper will first attempt to clarify the link between imbalanced stakeholder inclusion (stakeholders as defined by the NMFS as commercial, recreational, and other) and inefficient fisheries management by utilizing the "capture" theory. As explained previously, the capture theory is defined as when regulation is intentionally aimed away from the public's interests, instead favoring the interests of the regulated industry itself (Carpenter and Moss 2014). This is highly applicable to the case of regional fisheries, where special interests have seemingly monopolized the agencies charged with sustainably managing fish populations.

Before exploring the theoretical application of capture, it is relevant to first lay out what the interests of the different stakeholder groups are (commercial, recreational, and other) and what this implies for fisheries management and the use of the capture model. As articulated in the literature review, commercial interests are understood to be capitalistic, seeking to exploit fisheries for short-term economic gain (Okey 2003). Similarly, recreational fishing has come to be an extremely economically-valued enterprise. The value of recreational fishing, however, is not derived from the profits of the actual catch, but rather stems from the leisure and tourism industries. In 2014, revenue from fishing trips (that people pay to partake in) and equipment accounted for 60.6 billion dollars in annual revenue and supplied 439,000 jobs (Fisheries

Economies of the United States, 2014). The drastic growth of the recreational fishing industry has caused recreational harvests to increase in comparison to commercial harvests, even rivaling withdrawals of certain stocks (Coleman et al. 2004; Ihde et al. 2011). Thus, given their strong economic stake in fisheries, it is reasonable to assume that recreational interests are capitalistic as well, utilizing fisheries for short-term economic benefit. Considering the comparable interests of commercial and recreational users, they will be referred to jointly as "special interests" throughout the remainder of the paper. Though there is no precise definition of special interest groups in political science literature, the broad understanding is that special interest groups are groups with similar interests that attempt to exert political influence to have those interests realized (Grossman & Helpman 2001). In the case of regional fisheries management, commercial and recreational groups each have capitalistic interests, seeking to utilize the fishery for economic gain, constituting a special interest group.

The "other" group in fisheries management contains the governors of each state within the regional council as well as scientific experts. According to the Magnuson-Stevens Act, the councils are mandated to include the regional director of the NMFS and at least one other individual who is knowledgeable in conservation and fisheries management.[11] Given that the scientists involved must have expertise in conservation, it is reasonable to conclude that their interests are not exploitative, serving instead to counterbalance recreational and commercial interests. However, it is relevant to note that those are–at minimum–the only two "other" members who have voting privileges. All other required members of the "other" category are

[11] In the Thomas et al. 2010 paper, he refers to the "other" members as state and federal agency representatives. Primarily he refers to the regional director of the NMFS and the heads of state agencies who are responsible for marine fisheries (i.e. regional Director of Fish and Wildlife Service, district Commander of the Coast Guard, etc.). Councils are required to have "at minimum" two scientific voting experts. Historically, the number of scientific experts or members of the "other" category has varied.

non-voting members and thus do not have a substantial impact on council decisions. This has direct consequences for fisheries management, especially given that sustainable interests (i.e. the interests of the NMFS representative and any other scientific appointments) are assumed to represent the public's interests (Levine & Forrence 1990; Okey 2003). If the councils are only required to include a minimum of two voting members whose interests align with sustainable management, public interests are essentially excluded from the direct regulatory processes within the councils, particularly considering that special interests tend to compose a majority of the councils and all have voting privileges.

The effective exclusion of scientific interests from all regional councils prior to 2010 seemingly indicates that there was no true representation of public interests, making a test of capture somewhat problematic (Cloutier 1996). To determine if an agency has been captured, the counterfactual of public interests must be present to establish if regulation has, in fact, shifted away from public's interests and towards the industry's preferences (Carpenter and Moss, 2014). This is the field where current literature on fisheries management capture has fallen short, which is again evident in Thomas et al. (2010). While this is an interesting study, it did not best utilize the concept of capture. Thomas et al. (2010) states that public interests are underrepresented on the councils, but fails to explain who represents public interests, how they are represented at all, or what the importance of including public interests in the councils might be for fisheries management. Given the integral role of public interests in the capture model, I would argue that a complete analysis of capture requires a more complete assessment of public interest representation.

Broadly speaking, when it comes to fisheries, the public's interests are presumed to be the sustainable management of fishery resources (Okey 2003). While it is unlikely that every

individual is as invested in sustainable fisheries management as they might be in clean air, given that clean air has more direct and observable consequences for the larger public, there still exist significant public concerns when it come to fisheries management. Adequate fisheries management has direct implications for the overall health of the environment, fish prices and availability, as well as local and national economies (Department of Commerce 2017). Given that the scientific bodies (SSCs, monitoring committees, advisory panels, etc.) are responsible for providing scientific advice that promotes long term sustainability–addressing the aforementioned effects of fisheries management–I would argue that they can be understood as representing and serving the interests of the general public. Further, scholars and experts, such as the members of the SSCs, are expected to have the public interests in mind, their presence in agencies mitigating the potential for capture (Levine & Forrence 1990). In this light, it is logical to conclude that such scientific bodies serve to act in the public's interests, their policy recommendations thus providing the appropriate counterfactual with which to test the capture theory.

Utilizing the capture model, this paper proposes that the systematic overrepresentation of special interests led the regional councils to be captured before the implementation of the MSRA in 2010. When special interest groups become dominant, as in the regional fishery councils, policymakers are often forced to choose inefficient legislation (Dur and De Bievre 2007). In the case of regional fisheries, commercial and recreational interests–which tend to be intensely capitalistic–dominated the councils, producing inefficient and exploitative fisheries policy (Coleman et al. 2004; Okey 2003). The policy that this paper concerns itself with, as mentioned in the literature review, is catch limits, which refer to the maximum amount of a particular fish species that can be withdrawn annually to maintain the health of the stock (NOAA 2013). Due to the value of the fishing industry and its size, the councils face immense pressure from the

commercial and recreational fishing communities; everyone wants a piece of the pie. The simplest way for the councils to accommodate this pressure is to allocate more fishing rights to more users, which is most easily achieved by increasing catch limits (Eagle et al. 2003).[12] Increasing catch limits, however, has direct ramifications on the sustainability of the fishery, making catch limits an appropriate measure with which to test the capture theory. Recognizing the capitalistic character of recreational and commercial interests, we would expect that as the proportion of special interests represented on the councils increases, the catch limits will become less conservative (larger) in comparison to those recommended by the scientific body, demonstrating capture. Again, as a reminder, capture occurs when special interests push legislation away from the public's interests. In this case, the public's interests are synonymous with scientific interests. Thus, the council-set catch limit exceeding the recommendation of the scientific body would indicate capture. To clarify, capture can only be tested on data prior to 2010 because the MSRA established that the council-set catch limit cannot exceed that recommended by the SSC. Given that scientific interests are understood to represent the public's interests, this legislation essentially made it impossible for the councils to surpass the public's interests, making a test of capture after 2010 ineffectual.

The mechanism by which increased special interest representation leads the council-set catch limits to exceed those recommended by the scientific body (i.e. capture of the regional councils) can be explained by the median voter theorem (MVT). The MVT is, most generally, the theory that a majority rule voting system will select the outcome most preferred by the median voter (Congleton 2004). With respect to fisheries management this would signify that, as special interests have come to dominate the regional councils, the median preference has shifted

[12] This paper will not use the allocation of catch rights to test the capture theory because the SSCs do not have a say in the distribution of catch rights. Thus, there is no counterfactual by which to test the capture theory

to a more extreme position. Due to shifting council composition and the resultant more extreme median preference, the policies produced by the councils are consequently more extreme. In the case of regional fishery councils, this would have direct impacts on catch limits, the policy most likely influenced by special interests (Eagle et al. 2003). Again, acknowledging the capitalistic character of commercial and recreational interests, we would expect that as the number of special interests represented on the councils increases, thus shifting the median preference, catch limits would become less conservative in comparison to those initially recommended by the scientific body, whose interests serve as the public's interests.

Still unanswered is the question of how implementation of the MSRA in 2010 influences the manifestation of special interests and development of catch limits. In establishing that final catch limits set by the councils cannot exceed the scientific recommendation of the SSC, the federal government removed one of the fundamental areas in which special interests influence is directly manifested (Eagle et al. 2003). Since the regional councils no longer had full autonomy to develop catch limits after 2010, some might argue that this change in legislation alone is enough to mitigate the special interest pressure exerted by commercial and recreational stakeholders, particularly since members of SSCs are conservation and fisheries management experts (Crosson 2012). However, it is important to acknowledge a potential counter-argument to this theory. While SSCs can effectively determine catch limits, council members themselves are responsible for choosing the members of the SSCs. Some might contend that the capacity of councils to choose the SSC members might influence the decisions of the SSCs or indicate that the SSCs themselves are captured by special interests. However, the incentives to act as a member of an SSC are extremely specific. SSC members are paid very little, and the primary motivations to serve on an SSC are academic reputation and professional gain (Crosson 2012).

This limits the potential members of the SSCs to a very small pool from which the councils can choose, composed of individuals whose fundamental interests in serving on the SSC are rooted in professional prestige. Accordingly, it is unlikely that the SSC members are motivated to hold the position as a consequence of special interest pressure.

Though these explanations might be considered sufficient to explain why the SSCs and the policies they develop would not be subject to special interest influence, this paper will put forth another theory to explain why the SSCs are not likely to be impacted by special interests, also explaining why we would not expect special interests to exert influence on catch limits after 2010. This theory is the rule of unanimity. The rule of unanimity is a voting rule in which decisions are made by consensus (Buchanan & Tullock 1965). Unanimity voting often poses problems in larger institutions with diverse interests but in the case of SSCs, which are relatively small institutions with generally homogenous interests, I would argue that it serves as a block to special interest pressure that is prominent under majority rule voting systems (as explained previously by the MVT), counteracting the influence of special interests on the regional councils. Because almost all of the SSCs use the consensus model when developing policy–and the stances of individual members are not made publicly available–special interest pressure is apt to exert minimal influence (Coen & Richardson 2011; Crosson 2013). Council members cannot target individual SSC members whose positions on particular points of policy do not align with their interests as they have no way of knowing the opinions individual members. Thus, I would argue that after 2010 (when the MSRA was implemented) an impact of special interest representation on catch limits would not be evident.

To summarize, this paper can help to determine if the regional councils were captured by special interests prior to 2010, and if special interests influenced catch limits even after the

implementation of the MSRA in 2010. Such analyses provide a more accurate depiction of the impacts of special interest representation on management dynamics and policy outcomes, an understanding that has remained unclear in current literature on regional fisheries management. Further, this research will develop broader knowledge on the relevance of the MSRA, particularly if capping catch limits at the SSC's recommended limit has undermined the influence of special interests on council decisions with respect to catch limits. Currently, there is only one paper (to my knowledge) that discusses the implications of the MSRA, making this change worthy of further exploration (Crosson 2012). Results from these tests are directly relevant to analyzing if, as indicted by the literature, councils historically failed to incorporate public interests in their management decisions, instead allowing special interests to drive policy. Because the regional councils are a government agency and fisheries are a public resource, knowledge of whether or not councils have been acting in the interests of the general public–as they should be–are imperative for current and future evaluations of, and potential changes to, fisheries management. Moreover, assessing how and if special interests continue to influence council decisions after the implementation of the MSRA, though they cannot technically capture the councils, provides pertinent knowledge of how the behavior or preferences special interest groups may or may not have changed after 2010. Such information can not only help to clarify what the interests of the stakeholder groups are, but also how the inclusion of a scientific regulatory body may have influenced the expression of those interests.

Hypotheses

After considering the existing literature on special interest representation within the regional fisheries management councils and the relevance of the Magnuson Stevens Reauthorization Act for fisheries management, the hypotheses I will test are as follows:

1. Overrepresentation of special interests led to the capture of the regional fishery councils prior to the implementation of the MSRA in 2010.

    1(a) As the number of special interests represented on councils has increased, the catch limits proposed by the councils will be less conservative (the amount you can withdraw increases).

    1(b) Scientific-recommended catch limits will be more conservative (the amount you can withdraw is smaller) than those set by the councils.

2. After the implementation of the MSRA in 2010, special interests will not demonstrate a significant impact on the catch limits set by the councils.

Analyses & Variables

This paper will make use of a two-part analysis of regional fisheries management. The first part of the analysis will test if the regional councils were captured by special interests prior to 2010. To do this, the paper will examine council composition (proportions of the type of stakeholder) from 1998-2009. This will then be compared to the scientific-recommended catch limits and those actually set by the councils.[13] In this analysis, the dependent variable is the difference between the scientific recommendation and the council-set catch limit, and the independent variable is council composition (proportion of representation of interest groups). In

[13] It is important to remember that catch limits were recommended by scientific bodies prior to 2010, but the councils could override the scientific advice and set their own catch limits (Crosson, 2013).

comparing the scientific-recommended catch limit against what the councils ultimately established–before the implementation of the MSRA–it is evident how much policy actually swayed from the public interest (again, assuming that the scientific recommendation is representative of public interests). Moreover, because the comparison of set catch limits will be contrasted against change in council composition over time, the effects of stakeholder representation can better be deduced. In short, the first part of the analysis will attempt to establish if there is a causal relationship between the percent difference between the scientific-recommended catch limit and the council-set catch limits, and the proportion of special interests represented on the councils, determining if the councils were captured.[14]

The second part of the analysis will attempt to discern if special interest representation influenced the catch limits set by the councils after the implementation of the MSRA in 2010. To conduct this test, the percent difference between the SSC-recommended catch limit and the catch limit set by the council will be contrasted against the proportion of special interest representation on the councils from 2010-2018. As a reminder, the MSRA established that the council-set catch limits cannot exceed the recommendations of the SSCs, thus special interests cannot actually capture the councils after 2010 (with respect to catch limits) because the councils cannot exceed the SSCs recommendation, which represents public interests. However, this test will discern if and how special interest representation pushes the council to set the final catch limit closer to or further from the maximum recommended by the SSC. Such information reveals what the preferences of the special interest groups are, and if they have changed in response to the implementation of the MSRA.

[14] This part of the analysis will make use of data from 1976 until 2006, when the SSCs were given the responsibility of setting catch limits.

The unit of analysis that both tests will make use of is fish species per year per council. The regional councils are responsible for managing fish species in their region that are at risk for or are currently being overfished. Generally, each council is responsible for 4-7 fisheries, some of which contain over 20 species.[15] Thus, there will be observations for multiple fish species within each council every year. Because there are eight councils which have been established since 1976, this paper is maximizing the number of observations that can be utilized to test the hypotheses, making any results yielded from empirical testing more robust.

Additionally, the independent variable both analyses will utilize is the proportion of interest types represented on the councils. This paper will make use of the measurement strategies employed by the National Marine Fisheries Service on council member representation, which categorize interest type as either commercial, recreational, or other (scientists and politicians). The grouping of interests into these categories by the NMFS has also been utilized by a majority of literature concerning fisheries management. Since categorizing representation into the aforementioned groups is a well-established practice in literature on fisheries management and is determined by the regulatory body that oversees the regional councils, it serves as the best measure to utilize in my own research, allowing for accurate comparisons between my findings and those of others, also ensuring credibility within the broader academic community. A brief reminder that this study is interested in examining the effect of special interests–commercial and recreational fisheries users–on fisheries management and policy development. Special interest groups are understood as groups with similar interests that attempt to exert political influence to have those interests realized (Grossman & Helpman 2001). Given

[15] Current information on the number of species managed is available on the website of every regional council.

the similar interests of commercial and recreational users (economically driven), this paper identifies them as a joint special interest group.

The dependent variable for both analyses will be the percent difference between the scientific-recommended catch limits and those set by the councils. In utilizing catch limits as the dependent variable, this study is attempting to discern what the effect of special interest representation has been on fisheries policy. Because a scientific body (either the SSC, a monitoring committee, or an advisory panel depending on the council) gave catch limit recommendations before 2010 and the SSCs gave recommendations for all councils after 2010, we can glean a more accurate measure of whether overrepresentation of special interests on the councils led to less rigorous catch limits prior to 2010 (i.e. capture), and if special interests continue to influence the development of catch limits after 2010. However, there is a risk that catch limits do not form a comprehensive representation of policy outcomes, especially since fisheries management involves a wide range of complex and varied legislation. While a future study could make use of other policies to analyze the impact of special interest representation on council decisions, catch limits provided the best measure given the scope and time frame of this paper. To my knowledge, catch limits is the only measure that provides records of both a scientific recommendation (representative of the public's interests) and a final council decision. Accordingly, it constitutes the most valid measure with which to test not only if councils were captured prior to 2010, but also if special interests influenced council-set catch limits even after the implementation of the MSRA.

To test these pathways and establish if there is a causal effect of council composition on catch limits, this study will make use of a multiple regression analysis. Specifically, this study will employ both a series ordinary least squares regressions (OLS) and a series of logistic

regressions to test the relationship between special interest representation and capture. A further description of the 28 different models that were constructed will be developed in the "Testing" portion of the paper. This study will also make use of a fixed effects model to account for unobserved heterogeneity in council, year, and species. Using fixed effects helps to control for any broad factors in the year or council that impact council behavior, altering the relationship between council composition and catch limits. Finally, all regressions will be performed clustering for council and year. Clustering for council and year accounts for variability that occurs only within these sub-populations. Said differently, clustering at council and year helps to mitigate any correlation that may have been recorded between observations in these subgroups as a result of a factor which only exerted influence at the group level (Abadie et al. 2017). This increases the confidence intervals, resulting in more rigorous testing and substantive results.

To temper the effect of confounding variables and endogeneity, this study will employ several control variables in addition to the fixed effects. The nature of the regional councils and how they are organized ensures that they are nearly identical in their institutional design. Any legislation that is applied to the councils is uniformly applied, which makes controlling for potential institutional confounding variables– such as the standards for council membership, the type of council members, and the abilities of the councils–relatively straightforward.[16] However, one institutional factor that might be necessary to control for is the window of implementation. Though federal policy changes are enacted universally across all councils, there is a window of time for implementation; thus some councils may implement the policy change faster than others. In the case of the MSRA, the time window for implementation was four years. The MSRA was enacted in 2006 and all councils were required to have the policies fully

[16] All the requirements and capacities of the councils are explicitly articulated in the Magnuson-Stevens Act and are applicable to all councils.

implemented by 2010. After researching the different councils, it became evident that none of the councils implemented the MSRA until 2010, primarily due to the immensity of the changes contained in the Act. Consequently, controlling for the window of implementation was not necessary.

Additionally, this paper will control for the political party of the governors in the states represented within each regional council. Because governors select the council nominees that will be presented to the Secretary of Commerce, it is possible that their political affiliations could influence which nominees they select, especially given the somewhat polar stances taken by the Republican and Democratic parties with respect to environmental issues. While there is no precedent for this in scholarship on fisheries management, there is extensive scholarship on the differences between Republicans and Democrats with respect to environmental issues, indicating that Democrats and liberals take much stronger pro-environmental stances than their Republican and conservative counterparts (Dunlap 1975; Dunlap et al. 2001; McCright & Dunlap 2011). Given these findings, it seems relevant to control for political party considering that fisheries management is primarily driven by conservationist and environmental concerns (Cufone 2004). Further, determining if political party is significantly related to the establishment of catch limits also speaks to the claims made by Cochrane (2000), who stated that larger economic interests are given priority by the government, resulting in less sustainable policy. Analyzing if political ideology may be related to trends in catch limits could expand upon and inform Cochran's claims with respect to how the government potentially influences fisheries policy outcomes. Finally, I will also control for any environmental disasters, such as hurricanes or oil spills, that could have direct consequences for specific fish populations, and thus fisheries policy, in certain regions (McLaughlin 2008).

Data Collection & Construction

In order to operationalize the concept of capture, I needed a measure of public interests as well as the divergence from it. To review, the public's interests can be understood as synonymous with scientific interests, generally being the long-term sustainable management of U.S. fisheries. On the other hand, special interests, as represented by the commercial and recreational stakeholders, seek the short-term exploitation of the fishery for economic gain (Coleman et al. 2004; Ihde et al. 2011; Okey 2003). As explained previously, one of the primary policy areas where these interests would likely manifest themselves is in the development of catch limits (Eagle et al. 2003). Thus, to obtain a measure of public interests and the divergence from it, data on the scientific-recommended catch limit (the public's interests) and the council-set catch limit was required. The difference between the scientific recommendation and the council's final decision illustrates how far fisheries policy strayed from the public's interests, operationalizing the concept of capture and forming the key dependent variable. To my knowledge, no dataset existed that contained records of council-set catch limits or the scientific recommendations that coincided with the final decisions. For that reason, it was necessary that I develop my own dataset, containing both the recommended and set catch limits, to test the hypotheses.

Data collection for catch limits was a somewhat convoluted process and varied greatly depending on which council was being examined. Each of the regional councils manage several fisheries which include a multitude of different species. Certain fisheries had more complete data records than others, and documentation was often inconsistent. Consequently, this analysis concentrated on species with the longest and most complete histories of management (this was

necessary because catch limits prior to 2010 were needed to test capture).[17] Further, given the time frame for data collection, this paper chose to gather data for fish species, not crab, squid, or other marine life. The central justification for excluding other forms of marine life was not only that fish species tended to have the longest histories of management, but also that fish species overlapped the most between councils, providing an interesting comparison in how different councils regulated the same species. From 2010-2018, the final catch limits dictated by the council and the catch limits recommended by the scientific and statistical committees (SSCs) were found either in fishery management plan amendments, available on the council websites, or on the National Marine Fisheries Service website, which contains council-specific information. Some information was also found in fisheries bulletins, which the councils distribute to their stakeholders, as well as in the annual Code of Federal Regulations.

Prior to 2010, data collection was far more complex. While some councils recorded catch limits that were readily available on their websites, other councils listed past catch limits in their online archives of meeting minutes and briefing books. If a council did not maintain thorough archives, past catch limits could also be found in the Code of Federal Regulations and public bulletins available through the National Oceanic and Atmospheric Administration's website. Further, some information was obtained by contacting the councils themselves if the data was only available in paper archives. After combing through regional council archives, meeting minutes, briefing books, the Code of Federal Regulations, fishery management plans, and annual reports to Congress, data on council catch limits was recorded for six of the regional councils (for more information on the location of council specific data, see Appendix B). The Western Pacific Fishery Management Council and the Caribbean Fishery Management Council did not

[17] To see a list of species and the years of data collected, see Appendix A.

have complete archives and I was unable to find data dating back prior to 2010 in any of the aforementioned locations for these two councils.

To review, the premise of this paper is to examine how far the councils' final catch limit decisions strayed from the scientific recommendations. After 2010, all scientific recommendations came from the councils' SSC. Prior to 2010, the SSCs only obligation was to act as an advisory body to the council; they could make recommendations on catch limits, but were not required to. However, many councils had established monitoring or advisory committees for the different fisheries that, like the SSCs currently, were responsible for providing scientific-based recommendations to the councils regarding catch limits. Often, these monitoring or advisory bodies worked in direct coordination with the SSCs; however, they made the final recommendations on catch limits to the councils. Hence, depending on the council in question, catch limit recommendations prior to 2010 either came from a monitoring and advisory body or the SSCs themselves. This difference does not hugely impact the broader goal of the paper. While the SSCs did not always make catch limit recommendations prior to 2010, a scientific advisory body existed for each of the councils included in this study that made recommendations to the council which could either be adhered to or ignored (Eagle et al. 2003). Thus, a test of capture can be performed because, for the six councils recorded, there was a scientific-recommended catch level and a council-chosen catch level prior to 2010, making it possible to determine if councils strayed from the public's interests. Additional council-specific data for catch limits prior to 2010 can be found in Appendix B.

After collecting data on the recommended and set catch limits, several steps were taken to clean the data. First, for certain councils, the SSC or alternative advisory body would elect to recommend a range for the catch limit. Because a range could not be run through the statistical

models, the least conservative (highest) recommendation was chosen, making the study more robust. Additionally, for some councils, the scientific-recommended catch limit and the council-set catch limit were given in different units, and for certain species and years, only part of an observation was present (i.e. only the final council decision or the scientific recommendation was available). Consequently, observations that were incomplete or in different units were removed so that the regression analyses could be performed.

The key independent variables were operationalizations of the relative number of different interest groups represented on the councils. The data for such variables was collected from the Annual Financial Disclosure Reports that the National Marine Fisheries Service and the National Oceanic and Atmospheric Administration supply to Congress. These reports contain annual council membership broken down by financial interest group: commercial, recreational, or other. Reports were available online from 1998 until present, thus 1998-2018 became the working time frame of this research paper. The data concerning financial interest groups was then recoded so that for every year, each type of council member group was represented as a proportion of the total council membership. This allowed me to evaluate the effect of special interest representation over time, and how the proportional representation of special interest groups could impact the determination of catch limits.

I also chose to control for the political party of the governors of the states represented on the councils. To recap, the primary reason to control for the political party of the governors is that the governors of the states represented on the regional councils make recommendations for council membership to the Secretary of Commerce. Given the somewhat polarized stances of the Republican and Democratic parties with respect to environmental issues, and more specifically sustainability and conservation issues, it seemed pertinent to control for such a variable (Dunlap

1975; Dunlap et al. 2001; McCright & Dunlap 2011). The data for governors was obtained from Carl Klarner's Governors data set.[18] This data, which contained numerous variables including the political party of the governor, was then cleaned to contain only the states represented on the regional councils.[19] Klarner's data set, however, only extended until 2010. Accordingly, I updated the data set using the records from the National Governors Association to reflect governors until the present time; the updated data was coded in the same manner as the original data set (e.g. o=Republican, 1=Democrat, .5=Independent) and was then constructed such that there was one observation per council per year.[20] This observation was in the form of a mean. Said more simply, the mean of all of the governors of states represented in a particular council for one year was taken so that there was one observation for governors for each year and council.[21] Constructing the data in this manner removed the variable of state, which was not relevant for the purposes of this study.

Also necessary was controlling for any natural disasters that may have impacted U.S. fisheries. Such events have direct repercussions for the environment, fish stocks, the ability to fish, and the economy as a whole, thus potentially influencing council decisions regarding catch limits (McLaughlin, 2008). The data for natural disasters was obtained from the Federal Emergency Management Agency's (FEMA) disaster declarations summary, which contains a record of all federally declared disasters in the U.S.[22] Like the governors data set, this data was cleaned to contain only information on natural disasters that occurred in states represented on the regional councils. The set was also cleaned to exclude any repetitions of event declarations

[18] https://dataverse.harvard.edu/dataset.xhtml?persistentId=hdl:1902.1/20408
[19] A breakdown of the states included on the councils can be found on the regional fishery management council's website (http://www.fisherycouncils.org/).
[20] https://www.nga.org/cms/FormerGovBios
[21] The mean was derived from the coding of political party as o=Republican, 1=Democrat, .5=Independent.
[22] https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1

within a state. Disasters are declared in every county; thus, you could have multiple records of the same storm in the same state. Because this study was not interested in county level disaster declarations, I removed all repetitions of the same event within the same state. Like the governors dataset, state was variable included in the original natural disasters dataset, but was not relevant for this research. To remove the variable of state, a count was performed. I recoded the data such that there was a count of the number of natural disasters for each year in the councils being examined.

From this full data set–which included recommended and set catch limits, council membership, party mean, and natural disasters-subsets were created for observations before 2010 and after 2010. Creating the subsets of data allowed me to test both if the councils were captured before 2010 and the impact of the Magnuson-Stevens Reauthorization Act (MSRA) implementation in 2010. After the full data set and subsets were created, several variables were constructed allowing for different regression tests to be performed. First, a variable was developed for the percent difference between the scientific-recommended catch limit and the council-set catch limit per species, council, and year. This difference was the primary dependent variable used to test if the councils were captured by special interests prior to 2010, revealing how much (if) the council decision strayed from the recommended level. Regressing this difference by the proportional representation of different interest groups demonstrated to what degree such representation influenced the difference between the recommended and set catch limit. Finally, variables were constructed for whether or not commercial or recreational interests composed a majority of the council. If a particular interest group did compose a majority of the council, the data entry was coded as "1" and if they did not, the entry was coded as "0." The fundamental logic for including this variable was that the impact of holding a certain percentage

of representation (for example, going from 35%-40% representation on the council) might be marginal. However, going from simply holding a portion of council representation to holding a majority might have a significant impact on ability of interest groups to influence catch limits. Further explanations for the importance of these variables for this research are provided in the testing portion of the paper.

Testing

To test the relationship between council composition and the percent difference between the scientific-recommended catch limit and the council-set catch limit, a series of simple linear regressions was first performed (Models 1-3). In these regressions, the percent difference between the scientific-recommended catch limit and the council-set catch limit was the dependent variable and the combined proportion of commercial and recreational interests served as the independent variable. Model 1 simply tested the relationship between the two aforementioned variables, Model 2 incorporated the control variables (the number of natural disasters and the party mean of the governors), and Model 3 (the full model) included both the controls and the fixed effects for council, year, and species. As a reminder, using fixed effects helps to control for any broad factors in the year or council that impact council behavior, influencing the relationship between council composition and catch limits. Performing these preliminary tests allowed me to determine if council composition exerted any influence on the difference between the scientific-recommended and council-set catch limits over the entire time frame being examined (1998-2018). The progressive nature of these tests also provided initial insights into how the inclusion of control variables and then fixed effects influenced the regression outcomes, serving as a valuable starting point from which to develop and test other models.

Next, a series of linear regressions was conducted, again testing the relationship between the proportion of combined recreational and commercial interests and the percent difference between the scientific-recommended catch limit and the council-set catch limit. However, in these Models (4-5), the data frame was limited to after 2010. Model 4 examined the relationship including the control variables, and Model 5 then integrated the fixed effects. Performing these linear regressions revealed any effect that recreational and commercial interests may have had on the difference between the scientific-recommended catch limit and the council-set catch limit after 2010. This is relevant to the study because 2010 was the year in which the 2006 Magnuson-Stevens Reauthorization Act (MSRA) was required to be implemented. As a reminder, the 2006 Magnuson-Stevens Reauthorization Act mandated that the final catch limits implemented by the councils cannot exceed the initial recommendation of the SSC. Testing the impact of special interest representation (commercial and recreational interests) helps to establish if the proportional representation of such interests exerted influence on the difference between the recommended and set catch limits even after the authority to determine catch limits was effectively delegated to the SSCs.

A relevant clarification point is that after 2010, the councils could not exceed the catch limits recommended by the SSCs. Some might question what the relevance of performing the regression after 2010 might be since the councils' behavior is actively constrained to respect the interests of the public (i.e. the scientific recommendation), making capture theoretically impossible. Though these regressions do not, and cannot, test if the councils were captured by special interests after 2010, they can illustrate if the proportional representation of special interests influenced councils' decisions to set catch limits closer to or further from the absolute maximum recommended by the SSC. Such an analysis provides valuable information on special

interest behavior after 2010, demonstrating if stakeholder preferences changed as a consequence of the MSRA, which capped catch limits at the recommendation of the SSC.

Models 6-7 perform the same regression analysis, but for the data frame before 2010. These tests are relevant in establishing if there is an impact of commercial and recreational representation on the percent difference between the scientific-recommended catch limit and the council-set catch limit prior to 2010. Said differently, these analyses will help us to understand if the councils were captured by special interests prior to 2010. Further, conducting the analyses separately on data prior to 2010 and then after 2010 provides a relative gauge of how the legislation change may have influenced council behavior and decisions. Specifically, isolating the effect of the MSRA is relevant to understanding how allocating decision-making power to a scientific body potentially altered council dynamics, revealing the significance of scientific input for the manifestation of special interests. For Models 4-5 and 6-7, I chose not to run a test that contained neither controls nor fixed effects as results of such tests would not be robust and would likely not yield results that were significant to the overall goals of the research.

While Models 1-7 help to illustrate the impact of commercial and recreational interests combined, it is pertinent to test the effect of commercial and recreational representation separately. Analyzing the effects off commercial and recreation representation respectively allows me to determine if one interest group drives the relationship between interest group representation and the difference between the scientific-recommended catch limit and council-set catch limit. Subsequently, Models 8-10 test the individual relationships between commercial and recreational representation on the percent difference between the scientific-recommended catch limit and the council-set limit. Like Models 1-3, these regressions first tested just the individual effects of commercial and recreational representation (Model 8), then adding controls (Model 9),

and finally including both controls and fixed effects (Model 10). Overall, performing these tests allowed me to determine how commercial and recreational interests individually influence the difference between the recommended and set catch limits over the entire time frame being examined, demonstrating the strength of these relationships and in what direction they flow (i.e. if commercial or recreational interests have a stronger influence, and if they make the difference between the recommended and set catch limit smaller or larger). Such information is imperative for evaluating if commercial and recreational users do, in fact, have the congruent interests and if one group's preferences are stronger than the other's.

Models 11-13 test the same relationships as Models 8-10; however, these tests are limited to the data after 2010. These regressions help to test if recreational or commercial interests individually influence the difference between the scientific-recommended catch limit and the council-set catch limit after the implementation of the MSRA in 2010. As in Models 4 and 5, the councils cannot exceed the catch limit recommended by the SSC, thus the importance of running these tests is to illustrate if the representation of individual interest groups results in the councils setting catch limits closer to or further from the maximum recommended by the SSC. Model 11 simply examined the relationship, Model 12 added control variables, and Model 13 incorporated fixed effects. Models 14-16 test the impact of commercial and recreational representation on the percent difference between recommended and set catch limits before 2010. Again, Model 14 simply tested the relationship, Model 15 added control variables, and Model 16 integrated fixed effects. Like Models 11-13, these regressions demonstrate if one interest group drives the relationship between catch limit differences and special interest representation, the strength of such relationships, and in what direction they flow. This will help to illustrate if the councils were captured by a particular interest group prior to 2010.

I next conducted a series of linear regressions (Models 17-19) in which the independent variable was whether or not the commercial or recreational interests composed a majority of the council (the data was reformatted such that proportional and recreational interests were coded as "1" or "0" if they did or did not compose a majority of a particular council in a given year). Model 17 examined the relationship between an interest group holding the majority and the difference between the scientific catch limit recommendation and the council-set catch limit, Model 18 added control variables, and Model 19 added fixed effects. The primary purpose of these analyses was to determine if composing a majority of the council significantly influences the difference between the recommended and set catch limits, illustrating what the effect of simply holding a proportion, as opposed to a majority, may be for commercial or recreational representatives. It is possible that holding a majority significantly influences a stakeholder's effect on the difference between the scientific recommendation and the council decision with respect to catch limits. The effect of going from, for instance, 30%-40% representation may be marginal. However, holding a majority of council membership could result in a significant change in the impact of special interests on the difference between the recommended and set catch limits. If holding a majority shows to be significantly related to the difference between the recommended catch limit and the council catch limit, an interesting policy question then becomes whether any interest group should be allowed to hold a majority of the council (also informing broader literature on governance structures that incorporate the participation of stakeholder groups). Further, these regressions mitigate the inherent negative correlation that exists between the proportion of commercial and proportion of recreational representatives (as one increases in proportion, the potential impact of the other decreases).

Models 1-19 were each useful in determining the impact of special interest representation on the difference between the scientific-recommended catch limit and the council-set catch limit. However, another significant test would be to examine the impact of special interest representation on the likelihood for a council to exceed the scientific catch limit recommendation prior to 2010 (council cannot exceed the recommendation starting in 2010 as a result of the MSRA). Such a test is directly relevant to the question of whether special interests (commercial and recreational users) captured the councils, leading them to pursue policy that undermines the public's interests. In this case, exceeding the scientific recommendation (assuming that scientific interests represent the public interests), would illustrate capture. If the proportion of recreational or commercial interests made it more or less likely that a council exceeds that catch limit, we can glean a better understanding of what the interests of the different user groups are, and if capture of the councils was probable prior to 2010.

In order to test the impact of commercial and recreational representation on the likelihood of a council to exceed the scientific catch limit recommendation, I first recoded the data from before 2010 to "yes" or "no" (did the council exceed the scientific recommendation or not), making it a binary variable. Next, a series of logistic regressions (Models 20-22) was conducted to test the relationship between the combined proportion of commercial and recreational representation and the likelihood that a council exceeds the scientific catch limit recommendation. Model 20 tested this relationship, Model 21 incorporated the controls, and Model 22 utilized both controls and fixed effects. Broadly, these models help to estimate whether the proportion of special interests made it more or less likely for a council to exceed the recommended catch limit, demonstrating the preferences of the stakeholder groups and if such

interests made it more or less likely that the councils enact policy that was averse to the interests of the general public, further contributing to the capture analysis.

Models 23-25 conducted the same logistic regressions as Models 20-22; however, the proportion of commercial and recreational interests were separated into distinct variables. Model 23 simply tested the relationship, Model 24 incorporated the controls, and Model 25 utilized both controls and fixed effects. These models allowed me to test if commercial or recreational interests individually made it more or less likely for the councils to set catch limits that exceeded the scientific recommendation, also demonstrating if one interest group captured the councils prior to 2010. As in the linear regressions, separating the interest groups made it possible to test if one group drives the potential relationship between proportion of representation and likelihood of exceeding the scientific catch limit recommendation. Again, such a relationship would not be revealed if regressions were only performed on the total proportion of commercial and recreational representation.

The final series of logistic regressions (Models 26-28) helped to estimate the impact of commercial or recreational interests holding a majority of the council on the likelihood that a council exceeds the scientific catch limit recommendation prior to 2010. Model 26 tested this relationship, Model 27 included controls, and Model 28 made use of both controls and fixed effects. The primary benefit of including such tests, as reviewed previously, is that they demonstrate if having a majority, as opposed to just a percentage of representation, makes it more or less likely that the councils exceed the catch limits recommended by the scientific body. This again begs the question, should interests groups be allowed to hold a majority of representation on the councils? Further, these models evaluate if having a majority of a certain interest group makes it more or less likely that the councils were captured before 2010.

Results

While there are 28 different models being tested in this paper, the tested and substantive significance will chiefly be derived from the full models (those which include both the controls and fixed effects). The results from the other models will be reviewed, but not extensively. The primary justification for such an analysis is that the inclusion of both controls and fixed effects yields the most robust test and thus the results that will be most important for the purposes of this research.[23] Below are regression results tables that illustrate the products of the 28 different analyses. Figure 1 shows the results of the linear regressions in which the dependent variable was the difference between the recommended and set catch limits for the entire time frame (1998-2018). Figure 2 illustrates the results of the linear regressions in which the dependent variable was the difference between the recommended and set catch limits after 2010. Figure 3 shows the linear regressions results where the dependent variable was the difference between the recommended and set catch limits before 2010. Finally, Figure 4 demonstrates the results of the logistic regressions in which the dependent variable was the likelihood that the council-set catch limits exceed the scientific recommendation prior to 2010.

[23] The full models will be indicated in the explanation of the results.

Figure 1.

Percent Difference Between Recommended and Set Catch Limits: Entire Time Frame

Variables	Model 1	Model 2	Model 3	Model 8	Model 9	Model 10	Model 17	Model 18	Model 19
Proportion of Commercial and Recreational	-0.056345	-0.1502209	0.4349016*						
	(-0.172089)	(-0.173229)	(-0.183194)						
Natural Disasters		-0.0003264	-0.0021821		-0.0046031*	-0.0026585		-0.0046619	-0.0021393
		(-0.001742)	(-0.001887)		(-0.001965)	(0.001920)		(0.001913)	(0.001917)
Party Mean		-0.138226*	-0.0989335		-0.0041573	-0.1376579		-0.0727352	-0.167061
		(-0.054353)	(-0.087285)		(-0.061664)	(0.084052)		(0.059229)	(0.090075)
Proportion of Commercial				0.0556306	0.0249383	0.1996571			
				(-0.164174)	(-0.166123)	(0.180084)			
Proportion of Recreational				0.5024824	0.617748**	0.9681527**			
				(-0.187166)	(-0.208645)	(0.282731)			
Majority Commercial							-0.0556288	-0.0843284*	-0.033701
							(0.0393641)	(0.0399051)	(0.0488066)
Majority Recreational							0.129725**	0.174074***	0.1732696*
							(0.0480519)	(0.0449321)	(0.0668098)
Fixed Effect Council			✓			✓			✓
Fixed Effect Year			✓			✓			✓
Fixed Effect Species			✓			✓			✓
N	1125	1125	1125	1125	1125	1125	1125	1125	1125

P-Values: *.01-.05, **.001-.01, ***<.001
All models run with robust standard errors clustering for council and year.

Figure 2.

Percent Difference Between Recommended and Set Catch Limits: After 2010

Variables	Model 4	Model 5	Model 11	Model 12	Model 13
Proportion of Commercial and Recreational	0.0771039	0.4526541*			
	(0.1851624)	(0.1981907)			
Natural Disasters	-0.0042729*	-0.0007532		-0.0056873*	0.0002166
	(0.0018338)	(0.0020797)		(0.0026292)	(0.0018805)
Party Mean	-0.1509125	-0.1971247		-0.0499392	-0.1770062
	(0.0876637)	(0.1899612)		(0.1293927)	(0.1692714)
Proportion Commercial			0.2512414	0.1801007	0.0720063
			(0.2003359)	(0.2077355)	(0.2216082)
Proportion Recreational			0.5525734	0.5649079	1.118366*
			(0.3348803)	(0.3896948)	(0.516906)
Fixed Effect Council		✓			✓
Fixed Effect Year		✓			✓
Fixed Effect Species		✓			✓
N	518	518	518	518	518

P-Values: *.01-.05, **.001-.01, ***<.001
All models run with robust standard errors clustering for council and year.

Figure 3.

Percent Difference Between Recommended and Set Catch Limits: Before 2010

Variables	Model 6	Model 7	Model 14	Model 15	Model 16
Proportion of Recreational and Commercial	-0.6301661*	-0.1429518			
	(0.2700501)	(0.167055)			
Natural Disasters	0.0030777	-0.0039255		-0.0017014	-0.0047801*
	(0.0022153)	(0.0020991)		(0.0025576)	(0.0023409)
Party Mean	-0.1590595	-0.1596324		-0.0966149	-0.2321295
	(0.0904628)	(0.1492007)		(0.0716202)	(0.1510189)
Proportion Commercial			-0.3329528	-0.460253*	-0.233418
			(0.2127768)	(0.2288918)	(0.1713623)
Proportion Recreational			0.0721418	-0.0402762	0.0269469
			(0.255357)	(0.2406402)	(0.2532321)
Fixed Effect Council		✓			✓
Fixed Effect Year		✓			✓
Fixed Effect Species		✓			✓
N	607	607	607	607	607

P-Values: *.01-.05, **.001-.01, ***<.001
All models run with robust standard errors clustering for council and year.

Figure 4.

Likelihood that Council Catch Limits Exceed the Scientific Recommendation Before 2010

Variables	Model 20	Model 21	Model 22	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28
Proportion Commercial and Recreational	-3.840656*	-6.990761**	-6.711819						
	(1.913332)	(2.54702)	(6.68715)						
Natural Disasters		0.0177854	-0.1009763		-0.0119401	-0.0944641		-0.0067504	-0.0885762
		(0.0253059)	(0.0528827)		(0.0260588)	(0.0699971)		(0.0253533)	(0.0661737)
Party Mean		-3.508797***	-9.267652**		-3.616397	-9.402503*		-2.758717**	-8.363594**
		(0.8782677)	(3.349534)		(0.9119612)	(3.764618)		(0.9587536)	(3.220632)
Proportion Commercial				-3.433797	-7.257556**	-1.134004			
				(2.34375)	(2.720388)	(7.85025)			
Proportion Recreational				0.616646	-3.738572	-26.24958*			
				(2.641319)	(2.63768)	(12.88515)			
Majority Commercial							-2.362994**	-2.416675**	-2.500189
							(0.7566595)	(0.7283183)	(1.707591)
Majority Recreational							-0.4984416	-0.4107857	-1.708083
							(0.4519885)	(0.4673481)	(2.740461)
Fixed Effect Council			✓			✓			✓
Fixed Effect Year			✓			✓			✓
Fixed Effect Species			✓			✓			✓
N	607	607	199	607	607	199	607	607	199

P-Values: *.01-.05, **.001-.01, ***<.001

All models run with robust standard errors clustering for council and year.

In addition to the regression tables, there are several other figures that are relevant to review before delving into an interpretation of the results. Figure 5 illustrates the average percent difference between the scientific-recommended catch limit and the council-set catch limits over the whole time frame of the study (1998-2018). The vertical line represents the implementation of the Magnuson-Stevens Reauthorization Act in 2010, which established the regulation that the council-set catch limit cannot surpass the SSC's recommendation. This graph allows us to visualize trends over time in the percent difference between the recommended and set catch limits and will be relevant to reference when examining the results of the regression analyses and how the MSRA may have influenced special interest preferences and council behavior. Particularly relevant from this graph is the observation that catch limits set by the councils only exceed the recommendation of the scientific body 5% of the time. Not exceeding the recommended catch limit, which is taken to represent public interests, is evidence alone that capture did not occur. This is in direct contrast the original hypothesis which contended that councils were captured by special interests prior to 2010. Figure 6 demonstrates average council composition over time: the proportion of commercial, recreational and other interests present on the council every year. This figure shows average council composition trends over time, which will also be relevant to understanding how and why certain interest groups might have exerted more or less influence than others. Additionally, it depicts the extremely low representation of "other" interests in comparison to recreational and commercial interests. As a reminder, the other category is that which includes scientific and government representatives whom are understood to act in the public's interests.

Figure 5.

Average Percent Difference Between Recommended and Set Catch Limits

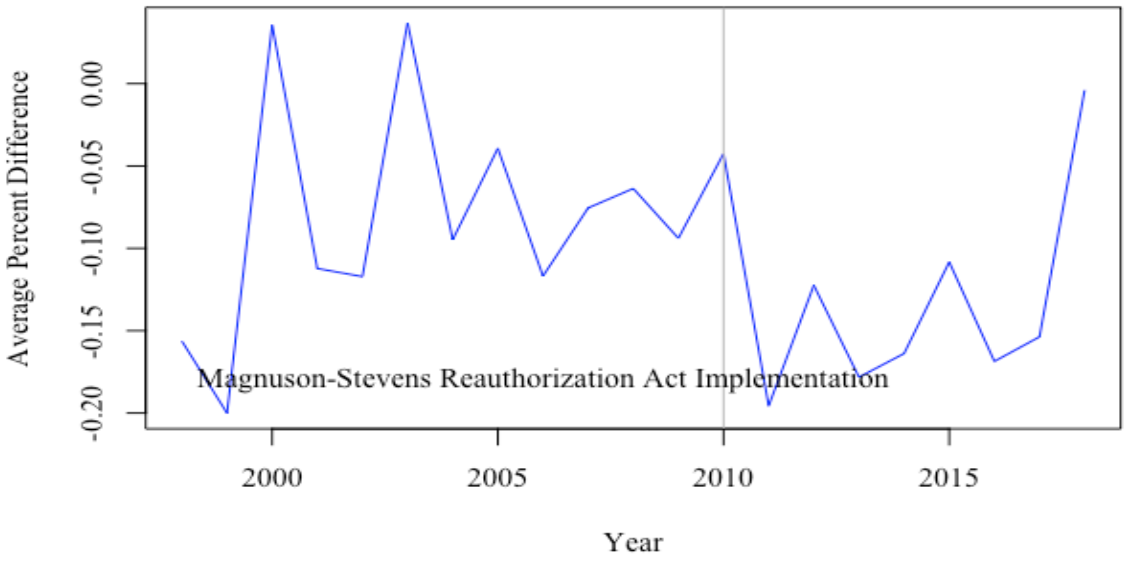
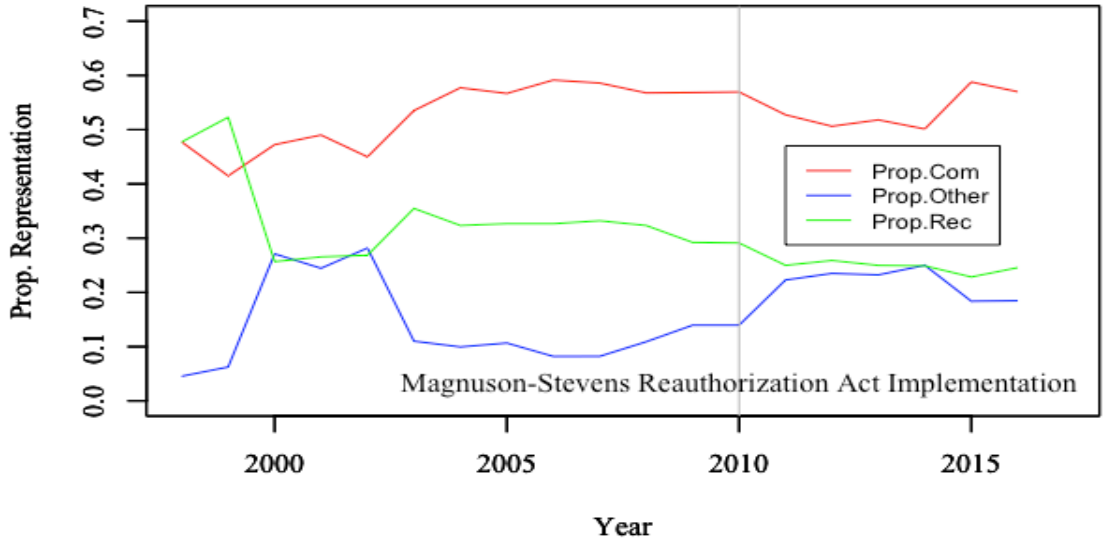


Figure 6.

Average Council Composition Over Time

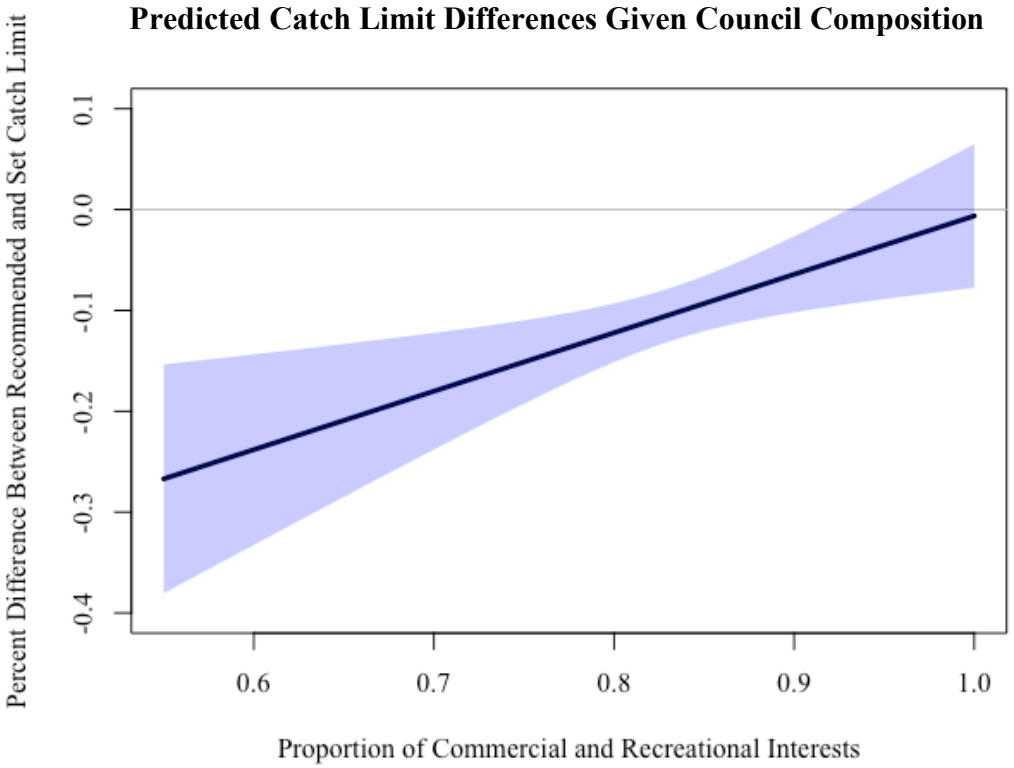


Keeping in mind the figures above, the results of Models 1-28 will now be discussed. To review, Models 1-3 examined the effect of the combined proportion of commercial and recreational representation on the difference between the recommended and set catch limits for the whole time frame in question (1998-2018). The central reason to conduct these regressions was to establish a baseline understanding of whether such interests had any influence on the difference between recommended and set catch limits. In Model 1, the proportion of commercial and recreational interests was statistically insignificant and negative. In Model 2, party mean was statistically significant (p-value .012) and negative. Proportion of commercial and recreational interests and number of natural disasters were both insignificant and negative. Model 3 (full model) indicated that the proportion of commercial and recreational interests was statistically significant (p-value .019) and positive. This indicates that going from 0-100 % representation for commercial and recreational users would result in a 43.49 percentage point increase in the difference between the scientific-recommended catch limit and the council-set catch limit. However, since there was no scenario in which commercial and recreational interests combined did not have representation on the council, it is important to review the substantive effect of their representation on the councils. The minimum representation for proportion of commercial and recreational users was .56 and the maximum was 1 (difference of .44), thus the substantive effect of commercial and recreational representation (.44 x 43.49) is 19.14 percentage points. Hence, commercial and recreational interests transitioning from 0-100% representation would result in a 19.14 percentage point increase in the difference between catch limits. The number of natural disasters and party mean were both insignificant and negative.

The main significance demonstrated through Models 1-3 is the importance of including the fixed effects. Models 1 and 2 showed that the proportion of commercial and recreational

representation had no significant impact on the difference between the recommended and set catch limits. However, after including the fixed effects, commercial and recreational representation was shown to have a significant impact. This finding indicates that broad factors in council, year, and species do influence the relationship between catch limits and council composition and will thus be important to account for in further testing. While Model 3 does show a significant impact of commercial and recreational representation on the difference between the recommended and set catch limit, this testing is too preliminary to conclusively determine the relevance of commercial and recreational representation with respect to capture. Model 3 examines the entire time frame of data (from 1998-2018), and does not divide the data into before and after the implementation of the Magnuson-Stevens Reauthorization Act, which required that the council-set catch limit not exceed the scientific recommendation. Testing for capture can only be performed on data from before 2010 (such tests are performed later in the analyses), thus Model 3 cannot speak directly to the capture analyses. Nevertheless, Model 3 still reveals valuable information on what the preferences of the commercial and recreational users are, which are demonstrated in Figure 7 below. As the proportion of recreational and commercial representatives increases, the difference between the recommended and set catch limit increases, approaching the limit (represented by the horizontal line at zero). Remember that the limit is also representative of the public's interests. Said more simply, as the representation of special interests increases, councils will set catch limits closer to the scientific-recommended maximum.

Figure 7.



Models 4 and 5 tested the impact of commercial and recreational representation on the difference between the scientific-recommended catch limit and the council-set limit for the subset of data after 2010. The purpose of running these regressions on this subset of data was to help isolate the effect of the Magnuson-Steven Reauthorization Act implementation in 2010, determining if perhaps special interest preferences changed as a consequence of the legislation. In Model 4, commercial and recreational representation was insignificant and positive, and party mean was insignificant and negative. Number of natural disasters was significant (p-value .025) and negative. In Model 5 (full model) commercial and recreational representation was statistically significant (p-value .028) and positive. This indicates that going from 0-100 % representation for commercial and recreational interests would result in a 45.27 percentage point

increase in the difference between the recommended and set catch limits after 2010, approaching the limit recommended by the SSC. Since there is no year in which commercial and recreational interests combined did not have representation on the council, it is relevant to review the substantive effect. The minimum representation for commercial and recreational interests after 2010 is .56 and the maximum is 1 (difference of .44), thus the substantive effect of commercial and recreational users (.44 x 45.27) is 19.92 percentage points after 2010. Thus, commercial and recreational representation going from 0-100% would result in a 19.92 percentage point increase in the difference between catch limits. The number of natural disasters and party mean were both negative and insignificant. Again, it is important to remember that after 2010, the council-set catch limit could not exceed the scientific recommendation, thus these findings illustrate whether the council set the limit closer to or further from the maximum recommended by the SSC. As follows, Model 5 shows that an increase in the proportion of commercial and recreational representatives would result in the councils setting catch limits that are closer the the maximum specified by the SSC after 2010.

Models 6 and 7 tested the impact of commercial and recreational representation on the difference between the scientific-recommended catch limit and the council set limit for the subset of data before 2010. Like Models 4 and 5, these regressions also help to isolate the effect of the MSRA, revealing the dynamics of special interest influence prior to 2010. Further, these models will help to address if the councils were captured by special interests prior to 2010. In Model 6, commercial and recreational representation was statistically significant (.023) and negative, party mean was insignificant and positive, and the number of natural disasters was insignificant and negative. In Model 7 (full model) none of the variables were statistically significant–an interesting change since Model 6 indicated that commercial and recreational

representation was significant–and all were negative. Model 7 yielded no statistically significant results, however it again demonstrated the relevance of including fixed effects; with only controls, commercial and recreational representation was significant, however with fixed effects it was no longer shown to be relevant. Overall, these results illustrate that prior to 2010, composition of councils (proportion of commercial and recreational interests) had no meaningful impact on the difference between the recommended and set catch limits, showing that the councils were likely not captured by special interests prior to 2010.

Ultimately, Models 5 and 7 (the full models of after and before 2010 respectively) illustrate the importance of sub-setting the data into distinct time frames–based on the MSRA–and running regressions on these subsets. If only Model 3 had been performed, the trends in the individual time frames would not have been detected and the results would not be fully indicative of actual fisheries management dynamics. These tests demonstrated that the effect of commercial and recreational representation was primarily felt after 2010, and that increasing the proportion of commercial and recreational representatives predicted the councils setting the catch limits closer to the maximum specified by the SSC. Further, Model 7 showed that commercial and recreational representation had no significant effect on the difference between the recommended and set catch limits prior to 2010, indicating that the councils were not captured by special interests. To summarize, these models show that councils were likely not captured by special interests prior to 2010, and that special interest influence was primarily felt after the implementation of the MSRA. These findings directly contradict the original hypotheses that councils were captured by special interests before 2010 and that special interest representation would not exert influence on catch limits after 2010.

Models 8-10 tested the impact of recreational and commercial representation individually for the entire time frame. As mentioned in the "Testing" portion of the paper, the primary reason for separating out the interest groups is that commercial and recreational users might influence the councils in different ways; they might have different preferences than initially expected and one interest group might individually drive the relationship between representation and catch limits. While literature on the interests of commercial users is well developed, scholarship on recreational users is far more recent and less established, thus it is possible that recreational interests are not equivalent to commercial interests as initially anticipated. In Model 8, recreational interests were statistically significant (p-value .008) and positive, and commercial interests were insignificant and positive. In Model 9, recreational representation was statistically significant (p-value .004) and positive, and the number of natural disasters was also statistically significant (p-value .021) but negative. Commercial representation was insignificant and positive, and party mean was insignificant and negative. Model 10 (full model) showed that recreational representation was statistically significant (p-value .001) and positive. This indicates that going from 0-100% representation for recreational interests would result in a 96.82 percentage point increase in the difference between the scientific-recommended catch limit and the council-set catch limit. However, since there was not a scenario in which recreational interests had no representation or had total control of the council, it is important to review the substantive effect of recreational representation. The minimum representation for recreational interests is .08 and the maximum is .64 (difference of .56), thus the substantive effect of recreational interests on the difference between recommended and set catch limits is 54.22 percentage points (.56 x 96.82). This indicates that increasing recreational representation would result in a 54.22 increase in the difference between recommended and set catch limits.

Commercial representation was not statistically significant and positive. Number of natural disasters and party mean were insignificant and negative. The important implication of Models 8-10 is that recreational interests were statistically significant throughout all three models, suggesting that recreational interests drive the relationship between council composition and the difference between the recommended and set catch limits. This is in contrast to what a majority of the literature indicated: that commercial interests are the principal force shaping council decisions. Further, the coefficient for recreational representation was positive, indicating that as recreational representation increases, the council-set catch limit is driven closer to the maximum scientific recommendation, approaching the public interest limit.

Models 11-13 tested the impact of commercial and recreational interests individually for the data subset after 2010. To review, the significance in testing these models was that they determined if commercial or recreational groups had different effects on the difference between recommended and set catch limits after 2010. Such information is helpful in determining not only if one interest group drives the relationship between representation and catch limits, but also how the relationship between recreational and commercial representation and catch limits may have changed after the implementation of MSRA in 2010. In Model 11, both commercial and recreational interests were statistically insignificant and positive. Model 12 found that neither commercial nor recreational representation were statistically significant, however both were positive. Number of natural disasters was statistically significant (p-value .036) and positive. Party mean was not statistically significant and negative. In Model 13 (full model) recreational representation was statistically significant and positive (p-value .036). This indicates that going from 0-100% representation for recreational interests would result in a 111.84 percentage point increase in the difference between the scientific-recommended catch limit and the council-set

catch limit. Again, since there was not a scenario in which recreational interests had no representation or had total control of a council after 2010, it is important to review the substantive effect of recreational interests in this analysis. The minimum representation for recreational interests after 2010 is .083 and the maximum is .50 (difference is .417), thus the substantive effect of recreational representation on the difference between recommended and set catch limits is 46.63 (.417 x 111.84) percentage points. Overall, Model 13 demonstrates that after 2010, an increase in recreational representation would result in an increased difference between catch limits. Specifically, as the representation of recreational users increased, the catch limits set by the council approach the limit specified by the SSC. This confirms (and defines) the findings of Model 5, that the impact of special interest representation is felt only after 2010, disproving the initial hypothesis. Further, this model shows that commercial representation had no significant effect on the difference between the recommended and set catch limits after 2010, again showing that recreational interests are driving the relationship between catch limits and representation, an unexpected finding given the plethora of literature discussing the strong influence of commercial interests on the regional councils.

Model 14-16 tested the impact of commercial and recreational interests individually for the data subset before 2010. Like Models 11-13, these tests were helpful in determining if one interest group was driving a relationship between representation and catch limits. Importantly, these models illustrate whether such interest groups captured the councils prior to 2010. Model 14 showed no significant impact of commercial or recreational representation; commercial representation was negative and recreational representation was positive. In Model 15, commercial representation was statistically significant (p-value .049) and negative. Recreational interests, number of natural disasters, and party mean were all insignificant and negative. Finally,

Model 16 (full model) showed that the number of natural disasters was significant (p-value .046) and negative. Proportion of commercial interests was not significant and negative, and recreational representation was not significant and positive. Party mean was not significant and negative. Overall, these findings suggest that neither commercial nor recreational interests had a significant impact on the difference between the recommended and set catch levels before 2010, indicating that the councils were not captured by special interests prior to 2010, and affirming the findings of Model 7.

To review, Models 11-16 represent finer-grained analyses of Models 4-7, splitting the tests into the time frames before and after 2010 and then further separating the tests into commercial and recreational interests individually. Model 16 (full model) confirms the same results found in Model 7: that special interests did not capture the councils prior to 2010 (neither combined commercial and recreational representation nor recreational and commercial interests individually were shown to have any significant impact of catch limits before 2010), disproving the original hypothesis. Further, Model 13 (full model) confirms similar results to Model 10 (full model): of the special interests represented on the councils, recreational representation demonstrates a significant impact on catch limit differences, though as Model 13 (full model) shows, only after 2010. According to these models, as recreational representation increases, the councils set the catch limits closer to the maximum specified by the SSC. The fact that special interests do not exhibit a significant impact on the difference between recommended and set catch limits until after 2010 also does not support the hypothesis that there would be no effect of special interest representation on catch limits after 2010. Finally, these models confirm that commercial representation appears to have no significant influence on the difference between recommended and set catch limits.

Models 17-19 examine the impact of commercial or recreational interests holding a majority of the council on the difference between the recommended and set catch limits. As explained in the testing portion of this paper, the principal justification for performing these models is that commanding a majority, as opposed to holding a portion, of a council might have a significant impact on the influence of a particular interest group on catch limits. In Model 17, a recreational majority was statistically significant (p-value .008) and positive. A majority of commercial interests was not statistically significant and negative. Model 18 shows that a majority of recreational interests was statistically significant (p-value .000) and positive, and a majority of commercial interests was also statistically significant (p-value .037) but negative. Number of natural disasters was also significant (p-value .017) and negative. Party mean was not significant and also negative. In Model 19 (full model), a majority of recreational interests was statistically significant (P-value .011) and positive. This indicates that when the majority is recreational, there is a 17.46 percentage point increase in the difference between the scientific-recommended catch limit and the council-set catch limit, pushing catch limits closer to the scientific-recommended maximum. A majority of commercial interests, number of natural disasters, and party mean were all insignificant and negative. Overall, Models 17-19 show that the impact of holding a majority on the difference between recommended and set catch limits is primarily felt for recreational interests. Significantly, a majority being recreational interests was statistically meaningful and positive throughout all three Models, indicating that when recreational interests command a majority, councils set catch limits closer to the scientific-recommended maximum. Like previous tests Model 19 confirms both the importance of including fixed effects and that recreational interests appear to drive the relationship between representation and catch limit differences.

Models 20-22 perform logistic regressions on the relationship between the proportion of recreational and commercial interests combined and the likelihood that the council exceeds the scientific catch limit recommendation prior to 2010 (these logistic regressions–and regressions 23-28–are only performed on the subset of data before 2010 because after 2010, the council set limit could not exceed the scientific-recommended limit). Given that the scientific interests are taken to be representative of the public's interests, these models are relevant in assessing if the councils were captured by special interests prior to 2010: exceeding the scientific recommendation indicates exceeding the public's interests. Model 20 found that the combined commercial and recreational representation was statistically significant (p-value .045) and negative. In Model 22 both commercial and recreational interests and party mean were statistically significant (p-values .006 and .000 respectively) and negative. Number of natural disaster was insignificant and positive. Finally, Model 22 (full model) showed that only party mean was significant (p-value .006) and negative. This indicates that when the party mean is 0 (all Republican governors in the states that the council covers) the likelihood of exceeding the recommended catch limit is 82.6% and when party mean is 1 (all Democratic governors in the states that the council covers) the likelihood of exceeding the recommended catch limit is 1.5%. Both commercial and recreational representation and number of natural disasters were insignificant and negative. The significance of Model 22 (full model) was that party mean of the governors seems to be a strong predictor of the likelihood that a council exceeds the recommended catch limit. The more Republican the mean becomes (closer to 0), the more likely it is that a council exceeds the scientific catch limit recommendation. This indicates political ideology may influence council behavior more than industry preferences (commercial, recreational, or other). Further, commercial and recreational representation did not have a

significant effect on the likelihood that a council exceeded the scientific recommendation, again indicating that the councils were not captured prior to 2010.

Models 23-25 performed logistic regressions on the relationship between commercial and recreational interests individually and the likelihood that a council exceed the scientific-recommended catch limit prior to 2010. As in Models 20-22, these regressions illustrate if the councils were captured by special interests before 2010, however they narrow the results to indicate if one interest group in particular is driving the relationship between representation and the likelihood that a council exceeds the recommended catch limit. In Model 23, commercial representation was negative and statistically insignificant, and recreational representation was insignificant and positive. Model 24 showed that commercial representation was statistically significant (p-value .008) and negative. Party mean was also statistically significant (p-value .000) and negative. Both recreational representation and number of natural disasters were negative and statistically insignificant. Finally, in Model 25 (full model), recreational representation was statistically significant (p-value .042) and negative, meaning that at the minimum representation of recreational interests, the likelihood of the council exceeding the catch limit is 68.7% and at the maximum it is 0.7%. This is intriguing particularly given that in all other full models in which proportion of recreational interests was statistically significant (Models 10, 13, and 19), proportion of recreational interests had a positive coefficient, signifying broadly that as the proportion of recreational interests increased, the councils were setting the catch limit closer to the recommended maximum. A negative coefficient indicates that as the proportion of recreational interests increases, the councils are setting the catch limit further from the maximum, or in this case, making it less likely that a council exceed the recommendation prior to 2010. This is the opposite of what was seen in models 10, 13, and 19, and perhaps

indicates that prior to 2010, recreational users were responsive to the recommendations of the scientific body; while their presence may have influenced the council to set catch limits closer to the maximum (as seen through models 10, 13, and 19), their interests were never to exceed the limit.

In Model 25 (full model), party mean was also significant (p-value .013) and negative. This indicates that at a party mean of 0 (all Republican governors in the states that the council covers) the probability that councils exceed the limit is 75.9% and at a party mean of 1 (all Democratic governors in the states that the council covers) the probability is 1.5%. Commercial representation and natural disasters were both insignificant and negative. The significance of these findings is that, as in Model 22 (full model), party mean seems to be a strong predictor of the likelihood that a council exceeds the recommended catch limit; the more Republican the party mean is, the more likely it is that the council exceed the limit and vice versa. Again, this indicates political ideology may influence council behavior more than industry preferences (commercial, recreational, or other). These models also demonstrate the value of incorporating fixed effects. When the regression was completed with only controls, commercial representation was found to be statistically significant, but when both control variables and fixed effects were implemented, recreational representation was shown to be statistically significant.

Models 26-28 completed logistic regressions on whether or not an interest group holding a majority influences the likelihood that the council exceed the recommended catch limit. Like Models 20-25, these tests help to establish whether or not the regional councils were captured by special interests prior to 2010. Moreover, they determine if an interest group commanding a majority, as opposed to holding a proportion, of a regional council has a significant impact on the likelihood that a council exceeds the recommended catch limit. In Model 26, a majority being

commercial was statistically significant (p-value .002) and negative and a majority being recreational was insignificant and negative. Model 27 showed that both a majority being commercial and party mean were statistically significant (p-values .001 and .004 respectively) and negative. A majority being recreational and natural disasters were statistically insignificant and negative. Lastly, Model 28 (full model) demonstrated that party mean was significant (p-value .009) and negative. This indicates that when party mean is at 0 (all Republican), the probability of councils exceeding the recommended catch limit is 76.9% and when the party mean is at 1 (all Democratic) the probability was 1.7%. A majority being commercial, a majority being recreational, and number of natural disasters were all insignificant and negative. The significance of Model 28, like models 26-27, is the political party appears to be very strongly connected with the likelihood that a council exceeds the recommended catch limits prior to 2010 (political party was significant throughout full Models 22, 25, and 28). Additionally, it confirmed the finding of previous models that special interest representation, whether it be commercial or recreational, did not capture the councils prior to 2010.

Ultimately, in reviewing the results explained in the preceding paragraphs, several intriguing findings become apparent. It was found through several different models that special interests, whether they be commercial and recreational representation combined or commercial and recreational representation individually, did not capture the councils prior to 2010, disproving the original hypothesis. This is primarily established through Models 7, 16, 22, and 28. Model 7 showed that recreational and commercial interests combined were not significantly related to a difference in the recommended and set catch limits prior to 2010. Model 16 found that commercial and recreational interests separately were also not significantly related to a difference in the recommended and set catch limits prior to 2010. Model 22 showed that

commercial and recreational representation did not have a significant impact on the likelihood that a council exceeds the recommended catch limit. Finally, Model 28 found that neither commercial nor recreational interests holding a majority influenced the likelihood that a council exceed the recommended catch limit. Each of these tests signify that the regional councils were not captured prior to 2010 as special interests, neither combined nor separately, significantly influenced catch limits. This again confirms what was discovered in Model 3, that council catch limits only exceeded the scientific recommendation 5% of the time. Since the scientific recommendation is indicative of public interests, the councils did not appear to be captured.

Interestingly, while special interests did not appear to capture the regional councils prior to 2010, several models indicated that special interests, particularly recreational users, impacted the difference between recommended and set catch limits after 2010. Model 5 demonstrated that the combined proportion of commercial and recreational representation had a significant and positive impact on the difference between recommended and set catch limits, pushing the set catch limit closer to the recommendation (i.e. the allowable maximum). Model 13 narrowed the results, showing that the proportion of recreational interests had a significant and positive impact on the difference between the recommended and set catch limits, pushing the final limits closer to the maximum recommended. This finding does not support the hypothesis that, because the MSRA essentially delegated the ability to set catch limits to the SSCs, special interests would not exert a significant influence on catch limits after 2010. Although the councils cannot set a catch limit that exceeds the scientific recommendation after 2010, it is interesting that special interests, particularly recreational users, only began to exert an influence on catch limits–driving them closer to the maximum–after 2010 (whereas they feasibly had the ability to push catch limits above the recommendation before 2010). This brings into question what the impact of the MSRA

was on council behavior because, according to these analyses, it appears that recreational preferences became stronger after 2010. The potential reasons for these apparently shifting preferences will be reviewed to a greater extent in the discussion section.

Further, in contrast to a majority of the literature regarding special interest influence on regional fisheries management, recreational interests seemed to have far greater impact on council behavior than commercial interests when tested separately. Models 10, 13, 19, and 25 all demonstrated significant impacts of recreational representation where commercial interests did not. Model 10 showed that recreational interests had a significant and positive impact on catch limit differences over the entire period of time, Model 13 demonstrated that recreational interests had a significant and positive impact on catch limit differences after 2010, and Model 19 found that a council being composed of a majority of recreational interests had a significant and positive impact on catch limit differences. As a reminder, a positive coefficient indicates the council approaching the maximum recommended catch limit. Although Model 25 showed recreational interests having a negative impact on the likelihood that the council exceed the recommended catch limit prior to 2010, recreational interests still had a significant impact while commercial interests did not.

Finally, the logistic models demonstrated that political party was a strong predictor of the probability that a council exceed the scientific catch limit recommendation, not the proportion of different interest groups represented on the councils. Models 22, 25 and 28 each showed that party mean (the mean of the governors from states represented on a council) was a stronger predictor of the likelihood that a council will exceed the catch limit prior to 2010 than commercial and recreational interests combined or commercial and recreational interests separately. Model 22 found that only party mean was statistically significant in relation to the

likelihood that councils exceed the recommended catch limit, not the combined proportion of recreational and commercial representation. In Model 25, both the proportion of recreational stakeholders individually and the party mean were significantly related to the likelihood that a council surpasses the recommended catch level; however, the p-value for party mean was smaller than the p-value of recreational interests, indicating a higher level of statistical significance. Further, the coefficient for recreational representation was negative, indicating that as the proportion of recreational stakeholder on a council increased, the less likely it was that the councils exceed the recommended catch limit. Finally, Model 28 showed that only party mean was significantly related to the likelihood that a council exceed the recommended catch limit, not the majority of the council being commercial or recreational interests. Again, the implications and significance of these findings will be further elaborated upon in the discussion section.

Discussion

In contrast to the original hypothesis, empirical testing showed that the regional councils did not appear to be captured by special interests prior to 2010. Not only did the different regression analyses demonstrate that special interest representation on the councils not have a significant impact on the difference between the recommended and set catch limits or the likelihood that a council exceed the suggested limit, but also–throughout the entire time frame being examined–councils only exceeded the scientific recommendation in 5% of the observations. Given that the scientific bodies are understood to represent the public's interest, the catch limit recommendation given to the councils can also be viewed as the publics' interest. Thus, not exceeding the recommended catch limit is, in itself, evidence that capture did not occur prior to 2010.

There are several interesting implications of the finding that the councils were not captured by special interests prior to 2010. Chiefly, such a result signifies that the management institutions were, in fact, acting with the public's interests in mind, producing policy that was not simply reflective of stakeholder preferences. Thus, an explanation for why certain fisheries remain overfished does not lie with the inclusion of interest groups in the management process. This finding has implications beyond the management of fisheries in the United States. As explained in the literature review, the question of how to best manage common pool resources has been a subject of immense controversy for decades, some arguing that the government must regulate the resource and others contending that those with a vested interest and knowledge of the resource should hold responsibility for management. The regional fishery councils are an excellent example of integrating both interest groups and government in the management process. Given that interest groups do not appear to push regulation away from the interests of the general public, according to this analysis, the United States Regional Fishery Councils appear to serve as a positive model for how to structure the management of a vast common pool resource with strongly vested user groups. However, the finding that the regional councils were not captured by special interests also implies that other explanations for the continued overfishing of certain stocks in the United States exist. For that reason, it is essential that subsequent fisheries governance research continue to explore the potential sources of mismanagement.

In view of the discovery that the regional fishery councils do not appear to be captured by special interests and are generally functioning along the lines of public interests, some might argue that fisheries should be completely deregulated, removing the government from the process entirely. However, removing the government from the fisheries management process, I

would argue, would completely undermine successful and sustainable management. The regional councils were a government initiative that was developed because the United States fisheries were being heavily depleted by both foreign fishing industries and United States fishing interests and enterprises (Cloutier 1996). Government involvement in the management process ensures a certain degree of transparency, accountability, and consistency (though it is by no means a perfect system) that might not be established on a more localized level. Further, the massive scale of United States fisheries requires, I would argue, that some federal regulation take place. Without such involvement, the communication, information, and coordination problems between different management institutions would be immense, and wide-scale overfishing would likely take place, particularly since fish are extremely mobile resources and because different councils manage the same species.

The fact that the councils were not captured by special interests prior to 2010, and apparently adhered to the scientific recommendations, leads this paper to further discussion of the importance of scientific advisory bodies. While the councils had no legal obligation to obey the catch limit recommendations put forth by the scientific advisory bodies prior to 2010, they only exceeded the recommendations in 5% of the observations. This finding, I would contend, expresses the positive effect that scientific input, even when not binding, can have on fisheries management. This both speaks to the relevance of such an advisory body in fisheries management and more broadly to the importance of third party "experts" (Levine & Forrence 1990). The scientific bodies included in the councils were expected to have extensive scientific knowledge of the specific fisheries being managed (i.e. experts) in order that they could provide founded and comprehensive guidance to the councils.[24] Perhaps, simply the presence of this third

[24] Magnuson Stevens Fishery Conservation and Management Act (1976). Print.

party expert group was enough to mitigate the capitalistic interests of commercial and recreational representatives, tempering the relationship between special interest representation and catch limits. If this is the case, such a finding would be valuable in analyzing the best methods by which to structure participatory management institutions with highly vested user groups. It is possible that, a third party expert is one avenue by which to balance the interests of the public and the interests of the user groups, resulting in more optimal policy outcomes.

While special interests did not capture the councils prior to 2010, special interests, particularly recreational users, did have a significant and positive impact on the difference between the recommended and set catch limits after 2010, pushing catch limits closer to the maximum recommended. This finding does not support the hypothesis that special interests did not influence council decisions with respect to catch limits after 2010, calling into question the impacts of the MSRA. Though the councils' catch limits could not exceed that which was recommended by the SSC after 2010, the fact that special interests did not significantly impact catch limits prior to 2010 (when they technically had the ability exceed the recommended limit) is very intriguing. Perhaps the strength in preferences of recreational users can be explained by the increased profitability of the fishing industry since 2000. While the number of recreational fishers has remained relatively stable since 2000, decreasing slightly in the last few years, the net revenue from recreational fishing has steadily increased, the cost of fishing permits consistently rising.[25] Thus, it is feasible that the economic interests of the recreational fishing industry can help to explain the impact of recreational representation on catch limits after 2010. The MSRA clearly places a priority on the scientific recommendation of the SSC, which is undoubtedly a positive step for fisheries management given the interests of the SSC, however it is unclear from

[25] https://www.statista.com/topics/1163/recreational-fishing/

this analysis whether the strengthening of recreational preferences to set catch limits closer to the maximum after 2010 is a product of the MSRA, or is a consequence of external factors such as the profitability of the recreational fishing industry. Further testing would need to be conducted to clarify this relationship and would likely prove an interesting and fruitful area of research.

Another interesting finding of this research was that the preferences of the different user groups were not aligned with what was assumed under existing literature. Past scholarship indicated that highly capitalistic commercial fishing interests would push the council to enact inefficient policy that was not aligned with the interests of the general public (i.e. the sustainable management of fisheries) (Okey 2003). There was far less literature on the interests of recreational users and what their inclusion on the councils might mean for management outcomes, however it was indicated that recreational interests were likely to be capitalistic as well (Coleman et al. 2004; Ihde et al. 2011). My research found that the proportion of commercial users represented on the councils did not have a significant effect on the difference between the recommended and set catch limit or the likelihood that the council exceed the recommended catch limit before or after 2010. Thus, the interests of the commercial users were far weaker than anticipated. On the other hand, the proportion of recreational users on a council did appear to have an impact on the difference between the recommended catch limit and the set catch limits after 2010, illustrating that the preferences of the recreational interest group are stronger than those of the commercial interest group.

These findings are extremely relevant given the emphasis placed on the impact of commercial interests on fisheries management within existing scholarship. Perhaps because the profits from recreational fishing are primarily derived from the sale of fishing licenses, supplies, and boating trips, the interests of this user group are far more short term and exploitative than

originally understood. Commercial fishers rely on the presence of fish for their livelihood and revenue, thus their interests might be more closely aligned with the long-term sustainable management of the fishery than previously thought. On the other hand, as explained before, profits from recreational fishing do not come from the fish themselves. The sustainable management of the fisheries, therefore, may not be as great a concern for recreational users. Given this interpretation, it is relevant for subsequent research to further analyze recreational fishing and the implications of such interests for future fisheries governance both with respect to catch limits and other areas of policy.

Finally, one of the most intriguing findings of this research is the observation that party mean appears to be a strong predictor of the likelihood that a council will exceed the scientific catch limit recommendation. The more Republican the party mean is (closer to 0) the more likely it is that a council would exceed the scientific recommendation, and the more Democratic (closer to 1) the less likely. Not only does this confirm the justification for including party mean as a control variable–considering that political parties in the United States are often tied to certain stances on the environment and sustainability–but it also opens up discussion on the importance of political ideology in fisheries management (Dunlap 1975; Dunlap et al. 2001; McCright & Dunlap 2011). Perhaps the trends observed in this paper are not as much evidence (or not) of capture, but are instead indicative of the political preferences of higher governing officials. Thus, councils may not be as responsive to special interests as they are to the political concerns of the governors who play a key role in determining council membership. This interaction between political preferences and interest group representation is an extremely interesting avenue of research. Understanding how and if government preferences supersede the interests of the user groups who are more directly connected to fisheries management could help to explain broader

trends in fisheries management. Specifically, this finding relates back to the question of if the continued overfishing and apparent mismanagement of U.S. fisheries is a product of government misstep (as special interests were shown not to have captured the councils). This study helps to provide a starting point from which to begin such research and would be an excellent avenue for this paper to pursue given more time.

Examining the relationship between political preferences of governors (and higher political bodies) and the concerns of interest groups managing the fisheries could also be relevant to the study of government supervised self-regulating industries. Separately, self-regulation refers to when an industry is responsible for managing and monitoring its own rules and conduct (Gupta & Lad 1983). One of the primary issues of self-regulatory industries is conflict of interest: will the industries actually regulate themselves if it is in their best interests (economically, legally, etc.) not to do so (Wotruba 1997). On the other hand, government regulation refers to when the government independently regulates the rules and conduct standards of a certain industry (Pegrum 1939). Critics of government regulation cite issues of inefficiency as well as conflict of interest, questioning the motivations of regulations that appear to be in the political or economical interests of the party in power (Koehn 2004). Given the aforementioned definitions, it follows that government supervised self-regulating industries refer to when the federal government is broadly responsible for regulating an industry but delegates management responsibilities to smaller, sometimes private, regulatory bodies (Smythe 1984). In these types of regulatory institutions, the government and private agencies interact to regulate particular industries. Hence, examining the ways in which the government and private agencies interact informs an understanding of how policy outcomes are developed, and what interests influence their construction.

An example of a government supervised self-regulating industry is the Financial Industry Regulatory Authority (FINRA). FINRA is a private firm that is responsible for regulating brokerage firms and different markets in the United States. Though this non-governmental organization is private, it operates under the authority of the Securities and Exchange Commission, a government agency.[26] While it is undoubtedly necessary to regulate brokerage firms and markets, FINRA has come under a certain amount of criticism. They have a great deal of autonomy with regard to the regulations they establish and they are not directly accountable to the public, whose lives they directly impact, despite the fact that they are under the purview of a government agency (Cole 2007). Though not identical, FINRA serves as a useful parallel to the regional fishery councils and is a good example through which to see why studying how special interests and political preferences interact within a regulatory body could have valuable applications outside environmental management.

Before concluding this paper, it is important to review the limitations of this research. The primary limitation that confronts this study is the sample size of available data. Only six of the eight councils maintained online archives prior to 2010 that contained information regarding scientific catch limit recommendations and final council decisions. Because not all of the councils are represented in the data set, the generalizability of the findings to all of the councils, and fisheries management in the United States as a whole, is somewhat limited. Further, the degree to which different councils record such information varied greatly even within the councils included. For instance, the NPFMC had extremely thorough archives for most of its fisheries, resulting in over 400 observations for this particular council. On the other hand, the MAFMC only had archives of a few select species prior to 2010, resulting in a data set that

[26] http://www.finra.org/about

contained only 70 observations. The difference in sample size between councils makes the findings more robust in some councils than in others (however, it is important to note that to control for this effect, the regression analyses included fixed effects for councils). Though all of the councils were required to establish some form of catch limit with the advice of a scientific body prior to 2010, the records of such information are simply not available online for many of the councils. Given more time, I would argue that it would be interesting and worthwhile to conduct additional research, personally visiting the councils whose online archives were constrained, and examining any paper archives they may maintain. Moreover, visiting the different councils would allow for observations of how each council operates, if their management and regulation processes are similar, if the councils interact, or if they function as individual entities. Such information would be relevant to determining if some councils have been more successful than others at managing their fisheries and why.

Though this paper was not able to include data from all of the councils, one of the primary contributions of the research was the data set itself. Prior to conducting this study, no dataset existed (to my knowledge) that contained information on the council-set catch limits over time, let alone one which incorporated the scientific-based recommendations that coincided with the councils' decisions. Given that fisheries are one of the prime examples of tragedy of the commons and are a site of continuous debate regarding management strategies, a dataset containing information on policy produced by the councils and the recommendations of a scientific body would be extremely valuable in further evaluating if the councils are acting in the best interests of the fisheries they manage (i.e. sustainably managing them). Further, since the councils are the primary body charged with managing the United States' marine resources, it seems pertinent to develop a history of the councils' decisions. A dataset containing such

information would allow subsequent research to evaluate council, or even species-specific, management trends over time, providing further insight into fisheries management dynamics and contributing to the broader political discussion of how best to structure the management of common pool resources.

Conclusion

Broadly, the goal of this research paper was to establish why many fish stocks in the United States continue to be exploited, despite being managed by regional fishery councils since 1976. In reviewing literature on fisheries management, one of the most common explanations for the continued mismanagement of the nation's fish stocks was the imbalanced representation of stakeholder interest groups (those with a vested interest in fishing) on the regional councils, specifically commercial and recreational users (Cochran 2000; Okey 2003; Thomas et al. 2010). Given the existing scholarship on the imbalanced representation of these special interests, this paper set out to determine if special interest representation on the councils resulted in their capture prior to 2010, policy produced by the councils straying from the public's interests. The policy that this paper concerned itself with was catch limits, or the total amount of a particular fish species that could be withdrawn in a given year. Given that catch limits have the power to drastically impact the health of a fish stock, allowing more or less of a certain species to be withdrawn, it seemed an appropriate and important mechanism through which to test capture (Eagle et al. 2003). While councils set the final catch limits, they are given a scientific recommendation from which they can base their ultimate decisions. Because scientific interests are based in the sustainable and long-term management of the fishery, these recommendations were taken to be indicative of the public's interest (Magnuson Stevens Fishery Conservation and Management Act 1976). Before 2010, the scientific recommendations had no authority over the

councils' final decisions; however, the Magnuson Stevens Reauthorization Act (MSRA) of 2006 established that final catch limits could not exceed the scientific recommendation. Thus, an important contribution of this paper is examining not only if councils were captured by special interests before 2010, but also testing how the change in legislation may have impacted special interest preferences, an area of research that has received extremely limited attention and one that could have significant implications for future changes to fishery management design.

Taking into account existing literature on fisheries management and scholarship examining special interest capture of regulatory agencies, the following hypotheses were posited: (H1) Before 2010, overrepresentation of special interests on the regional councils led the councils to be captured (H1a) As the number of special interests represented on the councils increased, the catch limits set by the councils will be less conservative (larger)(H1b) The catch limits set by the council would be less conservative than those recommended by the scientific body (H2) After 2010, the proportion of special interest representation will no longer influence the establishment of catch limits. Using 28 different statistical models, it was found that special interests, whether they be commercial and recreational interests combined or commercial and recreational interests individually, did not capture the councils prior to 2010, disproving the original hypothesis. Further, recreational interests seemed to have a far greater impact on council behavior than commercial interests, but only after 2010, a finding that seems in contrast with much of the existing literature on special interests and fisheries management. The fact that recreational interests influenced catch limits after 2010 also does not support the hypothesis that catch limits would not be influenced by special interests after 2010 as a result of the MSRA. Finally, the logistic models demonstrated that before 2010, political ideology was a strong

predictor of the probability that a council exceed the scientific catch limit recommendation, not the proportion of different interest groups represented on the councils.

Though the original hypotheses were not proven correct, this paper still provides a valuable contribution to literature assessing fisheries management. Not only did this paper generate a completely new data set on catch limits, which can be expanded upon and used in future research on fisheries management and policy, but it also showed that the regional councils were not captured by special interests prior to 2010. The influence of special interests has historically been one of the main explanations for the perpetual mismanagement of fisheries resources. Demonstrating that councils were not captured reveals that the inclusion of special interests has not led councils to disregard public interests. In fact, the councils appear to have consistently been functioning along the lines of public interest, only exceeding the scientific catch limit recommendations 5% of the time before 2010. Thus, it is imperative for future scholarship on fisheries management to further explore how public interests might manifest themselves, what drives the public interest, and what other sources of mismanagement might exist that could explain the continued overfishing of many U.S. stocks. Further, most literature has focused on the impact of commercial interests on fisheries management, assuming their interests to be capitalistic and exploitative, thus undermining sustainable fisheries management. However, this research showed that the primary interest group driving the relationship between catch limits and representation after 2010 was the proportion of recreational users. This finding can help direct future research to expand their focus to recreational fisheries users, particularly considering their prevalence on the councils and apparent influence on catch limits. Finally, this research reveals a strong relationship between the party mean of the governors in the states represented on the regional councils, and the likelihood that the council exceeded the

recommended catch limit prior to 2010. It was found that the more Democratic the mean is, the less likely the council was to exceed the limit, and the more Republican, the more likely. This finding suggests that trends in council decisions (i.e. catch limits) are more influenced by the political ideology of higher governing actors than by the special interests represented on the councils. This opens up a new and interesting area of study examining the relationship between political preferences and special interest representation, which could also help to explain trends in fisheries management and policy. Ultimately, though these findings did not confirm the initial hypotheses, this research, the data set, and the conclusions all constitute valuable contributions to existing literature on fisheries management, informing not only questions of why fisheries management has historically been unsuccessful, but also opening areas for further research on recreational fishing interests and the impact of political ideology on management dynamics.

Appendix A

Council	Years	Species
NPFMC	2000-2017	arrowtooth flounder
NPFMC	2000-2017	atka mackerel
NPFMC	2009-2017	blackspotted/rougheye rockfish
NPFMC	2001-2008	demersal shelf rockfish
NPFMC	2000-2017	flathead sole
NPFMC	2000-2017	greenland turbot
NPFMC	2000-2017	northern rock sole
NPFMC	2000-2017	pacific cod
NPFMC	2000-2017	pacific ocean perch
NPFMC	2001-2008	pelagic shelf rockfish
NPFMC	2000-2017	pollock
NPFMC	2000-2017	rex sole
NPFMC	2000-2004	rock sole
NPFMC	2000-2017	sablefish
NPFMC	2007-2017	shortraker rockfish
NPFMC	2003-2005	shortspine thornyhead
NPFMC	2006-2008	thornyhead rockfish
NPFMC	2000-2017	yellowfin sole
PFMC	2000-2017	arrowtooth flounder
PFMC	2000-2017	bocaccio
PFMC	2000-2017	canary
PFMC	2000-2017	chilipepper
PFMC	2000-2017	cowcod
PFMC	2000-2017	dover sole
PFMC	2000-2017	english sole
PFMC	2000-2017	lingcod
PFMC	2000-2017	longspine thornyhead
PFMC	2000-2017	pacific cod
PFMC	2000-2017	pacific ocean perch
PFMC	2000-2017	petrale sole
PFMC	2000-2017	sablefish
PFMC	2000-2017	shortbelly
PFMC	2000-2017	shortspine thornyhead
PFMC	2000-2017	splitnose
PFMC	2000, 2001, 2003, 2005, 2006	whiting
PFMC	2000-2017	widow

PFMC	2000-2017	yellowtail
NEFMC	2004-2017	american plaice
NEFMC	2010-2017	atlantic halibut
NEFMC	2000-2017	atlantic herring
NEFMC	2010-2017	atlantic wolf fish
NEFMC	2004-2017	cc/gom yellowtail flounder
NEFMC	2000-2017	gb cod
NEFMC	2000-2017	gb haddock
NEFMC	2004-2017	gb winter flounder
NEFMC	2000-2017	gb yellowtail flounder
NEFMC	2000-2017	gom cod
NEFMC	2004-2017	gom haddock
NEFMC	2004-2017	gom winter flounder
NEFMC	2004-2017	n. windowpane flounder
NEFMC	2004-2017	ocean pout
NEFMC	2004-2017	pollock
NEFMC	2004-2017	redfish
NEFMC	2004-2017	s. windowpane flounder
NEFMC	2004-2017	sne/ma winter flounder
NEFMC	2000, 2001, 2004-2017	sne/ma yellowtail flounder
NEFMC	2004-2017	white hake
NEFMC	2004-2017	witch flounder
MAFMC	2003-2018	black sea bass
MAFMC	2003-2018	bluefish
MAFMC	2003-2018	scup
MAFMC	2003-2009, 2012-2018	spiny dogfish
MAFMC	2003-2018	summer flounder
GMFMC	2008-2017	greater amberjack
GMFMC	1998-2010, 2013-2017	king mackerel
GMFMC	2004-2017	red grouper
GMFMC	2001-2017	red snapper
GMFMC	2004-2016	vermillion snapper
SAFMC	2013-2018	black sea bass
SAFMC	1998-2010, 2012-2017	king mackerel
SAFMC	2007-2018	red porgy
SAFMC	2007-2018	snowy grouper
SAFMC	2000-2017	spanish mackerel

Appendix B

The main function of this appendix will be to specify where the data on catch limits (both the recommended and set) was broadly found for each of the councils that were included in the study. For any values that were not found in the following places, data was either gathered from contacting the regional councils or by reviewing council meeting minutes and briefing books that are available on the councils' websites and archives.

North Pacific Fishery Management Council (NPFMC)

For the North Pacific councils, data for both the recommended and set catch limits from 2000-2017 was available in the stock assessment and fishery evaluation reports (SAFE) found in the publications section of the council's website.

Pacific Fishery Management Council (PFMC)

The Pacific council's data was in several different locations. From 2000-2004, the council-set catch limit can be found in the Winter Meeting Minutes. From 2005 onwards, the council-set catch limit can be found in the final impact statements available on their website. Data for the scientific recommendations for the Pacific council were found in the SAFE reports available on their website.

Mid-Atlantic Fishery Management Council (MAFMC)

For the Mid-Atlantic council, data on the council-set catch limits was found in council summary documents in the resources portion of the website. Data on the scientific-recommended catch

limit was found (for 2009-2017) in the SSC meeting reports available on the council's website. Before 2009, data on the scientific-recommended catch limit was found in the Federal Registrar.

New England Fishery Management Council (NEFMC)

For the councils' set catch limits, data was found in the plan amendments and framework specifications available on the council website as well as in the Federal Registrar. Scientific-recommended catch limits prior to 2010 were also found in the plan amendments, framework specifications, and in the Federal Registrar. Prior to 2010, scientific recommendations were found in the council meeting briefing books as well as on the website of the Atlantic States Marine Fisheries Commission.

Gulf of Mexico Fishery Management Council (GMFMC)

Council-set catch limits from 2010 until present were collected from the Southeast Regional Fisheries Office website in the ACL monitoring section. Prior to 2010, council-set catch limits were found in framework amendments on the council's website as well as in fishery bulletins on the Southeast Regional Fisheries Office website. Prior to 2010, scientific catch limit recommendations were found in the SouthEast Data Assesment and Review (SEDAR) stock assessments as well as in framework actions available on the council's website. After 2010, scientific catch limits were found in framework amendments available on both the council's website and the online Federal Registrar.

South Atlantic Fishery Management Council (SAFMC)

Council-set catch limits from 2010 until present were collected from the Southeast Regional Fisheries Office website in the ACL monitoring section. Prior to 2010, council-set catch limits were found in framework amendments on the council's website as well as in fishery bulletins on the Southeast Regional Fisheries Office website. Scientific recommendations prior to 2010 were available in the SEDAR reports and the Atlantic States Marine Fisheries Commission.

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