MORAL FOUNDATIONS AS TOOLS TO AFFECT SUSTAINABLE BEHAVIOR IN A
COMMON POOL FISHERY SIMULATION

by

Ross Bair
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Committee:

_____ Dr. Dann Sklarew, Committee Chair

_____ Dr. Agnieszka Paczynska, Committee Member

_____ Dr. Chris Kennedy, Committee Member

_____ Dr. Edward Maibach, Committee Member

_____ Dr. A. Alonso Aguirre, Department Chairperson

_____ Dr. Donna M. Fox, Associate Dean, Office of
Student Affairs & Special Programs, College of
Science

_____ Dr. Fernando Miralles-Wilhelm, Dean, College of
Science

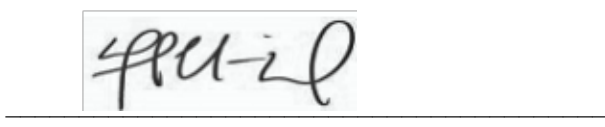Date: _12/2/2021_____ Fall Semester 2021
George Mason University Fairfax, VA

Moral Foundations as Tools to Affect Sustainable Behavior in a Common Pool Fishery
Simulation

A Dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy at George Mason University

by

Ross Bair
Master of Science
George Mason University, 2013
Master of Science
McDaniel College, 2005

Director: Dann Sklarew, Professor
Department of Environmental Science and Public Policy

Fall Semester 2021
George Mason University
Fairfax, VA

DEDICATION

This dissertation is dedicated to my wife Julia and children Elizabeth and Nathaniel for their understanding and patience through this process and for their inspiration to continue this good work in pursuance of a sustainable future.

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Many thanks to my advisor Dr. Dann Sklarew and the other members of my committee and lab group who were invaluably helpful in mentoring me through this process. Thanks also to my students who have been an endless source of inspiration and hope for the future.

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ABSTRACT

MORAL FOUNDATIONS AS TOOLS TO AFFECT SUSTAINABLE BEHAVIOR IN
A COMMON POOL FISHERY SIMULATION

Ross Bair, Ph.D

George Mason University, 2021

Dissertation Director: Dr. Dann Sklarew

The decline of global fisheries is a pending catastrophe. Healthy, well-managed

fisheries provide employment, economic and social benefits to many nations across the

globe (FAO, 2015). Because of their scope and common pool status, fisheries in the open

ocean are difficult to manage. International law has failed to be effective in this task.

Moral Foundation Theory suggests approaches to persuasive appeals that may be useful

in encouraging sustainable resource use. Moral foundations (MFs) are universal,

evolution-based justifications we use to create explanations for our moral reasoning.

Conservative and liberal political ideologies are guided differently by moral foundations

(Graham et al., 2009). .

This dissertation analyzes two studies that explore these ideas. The first uses

tailored MF appeals (Binding/ conservatives, Individualizing/ liberals) to attempt to

encourage sustainable action in an intergenerational, nonexcludable, common pool

fishing simulation. No detectable effect of these appeals was found on sustainable fishing behavior. In the second part of that study, some participants fished with an unsustainable fisher to see the effect of that interaction. There was no measurable effect of this fisher's presence in the simulation on participant fishing (Chapter 4).Characterizations by fishers of an unsustainable fisher activated participants' MFs and showed predictable choice of terms by liberals (binding, plus authority) and conservatives (no preference). Liberals were more likely to use any of the MF terms to describe unsustainable fishers (Chapter 4).

The results from study one are inconsistent with observations found in previous studies (Kidwell et al., 2013; Wolsko et al., 2016) that used MFT to create appeals to increase sustainable action. Despite these finding, MFs were not effective as a tool to encourage sustainable fisheries harvesting, these results provide confirmation that environmental resource issues are viewed through much the same lens as other moral issues.

Observations from these experiments potentially limit the value of MF appeals to influence sustainable behavior and support other observations of the lack of differences between conservatives and liberals when it comes to MFs (Frimer, 2020).

CHAPTER 1: INTRODUCTION

The Hook of Ocean Sustainability

Global fisheries are a common pool resource (CPR). The fish in the ocean can be accessed by all and can be exploited by any who have the means. Fisheries represent fourteen percent of global protein intake and 54% of total fishery exports now come from developing countries (*FAO - News Article*, 2014). These developing nations need this important source of inexpensive protein to provide adequate nourishment for their people. Healthy, well managed fisheries also provide more employment and social benefits in addition to economic benefits to these and many other nations (FAO, 2015).

Demand for fish has grown (Ritchie & Roser, 2021) due to rising world incomes, technological developments and an increase in the awareness of the health benefits of fish. Take from global capture fisheries has increased by 14% from 1990 to 2018, and total fish captures have reached production of 96.4 million tons, an increase of 5.4% over the previous 3-year average. Climate change has complicated our efforts to manage fisheries. Increased pressure on fish populations due to warmer and more acidic waters has challenged fish populations (Cigliano et al., 2010; Mallard et al., 2013) meanwhile, nutrient pollution has created a complex set of trophic cascades which threaten to decimate populations and leave fewer desirable fish for consumption (Myers & Worm, 2003).

The global community needs better long-term management of common pool fisheries to enable them to continue to be a healthy resource available for use. Insights into CPR management and the intersection of political ideology and moral psychology have provided some potential answers on how to go about doing this.

The introduction which follows will reinforce the importance of ocean fisheries specifically and CPRs generally. It will summarize the plight of ocean fisheries and provide context to inform current management regimes. It will then begin to justify a theory by comparing three methods of fisheries governance: privatization, in which fisheries are delineated for individual owners; a leviathan, an ultimate power and enforcer; and small-scale management tools described by Elinore Ostrom in which small group determination has found success through sustainable, mutually agreed upon solutions. Next, this introduction will describe Moral Foundation Theory (MFT) and justify the reasons why arguments based in MFT show promise in encouraging sustainable behavior. Finally, the potential of using MFT designed appeals which speak to the moral foundations of political ideologies and encourage sustainable behavior will be analyzed. In subsequent chapters, a set of questions based on the theory will investigate the utility of this theory and build on previous research by providing insights about potential mechanisms to effectively managing CPR. A discussion of the usefulness of these ideas considering these observations will follow.

To investigate the utility of the theory described above, Chapter 2 will provide general methods and procedures used to investigate the effectiveness of MF appeals on the behavior of individuals in a CPR fishing simulation. Chapter 3 will describe in detail

the specific procedures, results and analysis of the study which assessed the impact of tailored MF appeals on the fishing of individuals in the simulation and which added an unsustainable fisher (taker) to observe potential impacts in behavior that result. Chapter 4 will look for patterns in the MF terms participants used to describe unsustainable fishers from the experiment in Chapter 3. Finally, Chapter 5 will look at what can be learned from this investigation and what needs yet to be clarified in our understanding of the use of MFs in CPR communication.

There are several potential outcomes of the studies of this exploration. If a robust effect of MF appeals can be observed (Chapter 3), it will support the theory that appeals from a leviathan, a powerful enforcer, that include MFs might be enough to improve sustainable behavior without face-to-face interactions. If, however, the effect is only observable when an unsustainable fisher behavior is engaged it may support the need for engagement of the moral emotions to make such appeals effective (Chapter 3). If no effect of MF appeals is observable, it would support a growing number of researchers who have found MFT insightful but difficult to apply in any real-world operationalizable context (Frimer et al., 2013; Frimer, 2020) despite some previous successes (Ertör-Akyazi & Akçay, 2021; Kidwell et al., 2013). Finally, if participants are willing to use MF terms to describe unsustainable actors it will confirm engagement of MFs in their analysis of the simulation tasks.

The Nature of Common Pool Ocean Resources

      The organized study of CPR began in the 1950s. Public goods are nonexcludable, open to all, and non-rivalrous, i.e., more than one person can consume the resource at the same time (Samuelson, 1954). Private goods are excludable and rivalrous. Club goods, those that are excludable but non-rivalrous (Buchanan, 1965), and common pool goods are rivalrous and nonexcludable (E. Ostrom, 2006) (Table 1). The characteristics of each resource determine avenues available to manage and govern these resources sustainably. While the definitions of "good" and "resource" are different, resources are the materials needed to make goods, the nature of that difference does not impact the applications of types here. The remainder of this paper will refer to resources exclusively. Similarly, "commons" will also be used to refer to common pool of resources.

Table 1: Types of Goods.

Type of Good	Exclusivity	Rivalry	Example
Club Goods	Excludable	Non-rivalrous	Country Club, The Movie Theater, Pay television
Public Goods	Non-excludable	Non-rivalrous	Air, National Defense,
Common Pool Goods	Non-excludable	Rivalrous	Fisheries, National Parks Without Entry Fees, Large Groundwater Aquifers

A CPR is owned by many and thereby can be exploited by any members of the group of owners. While use of the commons often imparts benefit to the user, the cost of that use either excludes the use by another or degrades the quality of the commons in some way, the cost of which is shared by all. The sea is a classic example of a commons as described by Garrett Hardin in 1968. It has no easily defined lines of ownership and as such is owned by all. Due to its CPR status, the sea is vulnerable to a plight that Hardin calls the Tragedy of the Commons (TOC). In his essay Hardin uses the example of herdsmen to exemplify the circumstances that lead to a TOC (Hardin, 1968). First, the resource is owned by all. Second, individuals have access to and can benefit from the use of the resource. Third, the costs of use are distributed among the owners and are thereby less than the benefit of the use of the commons by the individual. Exploitation of the resource often results because the cost to the individual of additional use of the resource is less than the potential benefit to the individual.

Hardin (1968) suggests that there are no technical solutions to the problem of the TOC. He also asserts that absolute freedom within a CPR cannot be allowed if the system is to continue to be sustainable over the long term. Hardin sees two viable solutions to the commons (CPR) dilemma: The first is a strong governing body that can control the usage of the commons through "mutual coercion" (1968). This is first described by Thomas Hobbes (1651) as "The Leviathan." Private ownership is Hardin's other option. Privatization places control of the resource in the hands of individuals excluding all others. Since Hardin's work, there has been valuable criticism of his claim that such

commons are ungovernable by any other methods (E. Ostrom, 2009). Might persuasion that stops short of coercion be effective in the ocean commons?

The Ocean Commons

Characteristics of the ocean determine how it can be managed. Our ocean circulates and interconnects through currents which circulate the waters of the ocean. Established currents create a global conveyor, which when viewed in three dimensions from the vantage of the Antarctic, looks more like the circulation of arms and legs than disconnected oceanic subunits. One hundred fifty-one of the 195 countries of the world have direct access to this one sea. While countries have been allocated the waters surrounding their shores, outside of their exclusive economic zones (EEZs) little stands in the way of fishers to take without limit. Coercion, even mutually agreed upon as Hardin advocates, is not saving our fisheries.

Privatization, a potential solution given by Hardin to the TOC, has potential as a tool when paired with a leviathan capable of apportioning the resource. Individual Transferrable Quotas are one example that has been effective for managing fisheries and increasing the efficiency of the fishing industry, however they can only work in EEZ's where leviathans are present to create and manage these complex programs (Sumaila, 2010). This idea on a global fisheries scale would require a leviathan far more powerful, far-reaching and effective than current fisheries agreements.

Complex Solutions Have Emerged for Complex Problems

Because of the size, scope and common pool status of the ocean, managing marine conservation is a complicated task. While smaller-scale local laws and agreements

previously existed, it was not until 1982 with the United Nations Convention on the Law

of the Sea (UNCLOS) that these internationally recognized lines of control were drawn

(*UNCLOS and Agreement on Part XI - Preamble and Frame Index*, 1982). Up until 1982

domestic and international laws were challenged by questions of jurisdiction.

Furthermore, until the development of proper treaty organizations that dealt with the

marine environment, there was no forum to which one country could take shared issues

that impacted marine conservation. UNCLOS amounted to a leviathan with extremely

limited power. By itself UNCLOS has been largely unsuccessful due to non-compliance

(Churchill, 2012). UNCLOS has little enforcement capacity and since fish do not stay in

one place, using this agreement to govern the whole ocean is difficult. The European

Union (EU) and the Organization for Economic Cooperation and Development (OECD)

have also stepped into these roles for member countries having influence on the resource

decisions of these countries through their fisheries policies. Similarly, however, their

power to directly regulate is limited to member country EEZs and much of this is directed

by power of the member countries.

Large treaty organizations ignore the local knowledge and relationships which

create the on-the-ground system of checks and balances on fishing take. Checks and

balances, local knowledge and on the ground, interactions are difficult for any leviathan.

International government organizations and non-governmental organizations have

emerged with similar power and a platform to create messages advocating for fisheries

sustainability. Elenore Ostrom (1990) has since made the case that a leviathan is not the

best way to manage fisheries but that proper management can be achieved at the right

scale and using the right tools to build relationships through good communication.

Critique of the Leviathan

Ostrom (1990) acknowledges the point made by Olson (1965) in his book, "The

Logic of Collective Action," that "[i]t is logically presumed that work on behalf of the

common good will flow from the benefit provided to the individual from the common

reward received (Olson, 1965). Building from this point she also acknowledges that

"unless the number of individuals is quite small, or unless there is coercion or some other

special device to make individuals act in their common interest, *rational, self-interested*

individuals will not act to achieve their common or *group interests (Olson, 1965)*. What

special devices might help individuals govern the commons if rational self-interested

individuals cannot be depended upon to act on behalf of the commons? What might

nudge these interests to create more sustainable behavior? In part, carrying on from the

logic of Olson, Ostrom designates eight characteristics of effective CPR management that

she sees as essential.

Table 2: Elenore Ostrom's Eight Characteristics of Functional Commons Governance

1. Clearly defined boundaries.

2. Rules regarding the appropriation that are adapted to local conditions.

3. Collective-choice arrangements allow most resource appropriators to participate in the decision-making process.

4. Effective monitoring by those who are part of or accountable to the appropriators.

5. Graduated sanctions for resource appropriators who violate community rules.

6. Mechanisms of conflict resolution that are cheap and easy to access.

7. Community self-determination recognized by higher-level authorities.

8. Organization of large common pool resources in the form of multiple layers of nested enterprises, with small local CPR at the base level. (Ostrom, 1990).

The Importance of Communication to Ostrom's Model

Found within the characteristics of Ostrom's functional commons management systems are a series of hints which describe the value of communication to these functional local commons: Defining boundaries (Table 2 Number1), learning about local conditions (2), creating collective choice agreements, sanctions (3), conflict resolution mechanisms and organizational processes (6). Ostrom goes further in her Nobel speech which summarizes her career.

Ostrom's studies verified significant levels of cooperation when individuals know each other; communicate effectively; and can develop shared agreements, norms, and

sanctions (Ostrom et al., 1994). Ostrom hints that the agreements, norms and subsequent sanctions are developed through this important communication. She makes the case that repeated face-to-face communication is very successful in increasing returns and are helpful in solving a variety of social dilemma problems (Balliet, 2010; Orbell et al., 1988; E. Ostrom et al., 1994; Sally, 1995). She also shows that subjects who decided on their own system of sanctions through communication achieved returns of 90 percent of optimal (Ostrom et al., 1992). Ostrom's criteria depend upon close relationships which while ideal, are nearly impossible to foster in fisheries despite their appeal. Important to that communication are facial expressions, physical actions and "the way words are expressed to judge trustworthiness of others." (Poteete et al., 2010)

Placing all fishers around a table to meet, share stories and build consensus toward management clearly seems to be an effective step, but this is impractical. Could a middle ground be found? Could a leviathan be upgraded by improving communication in a way that help signal membership of a common group and thereby the trustworthiness (Poteete et al., 2010) necessary to create sustainable behavioral change? Could the right words expressed by an authoritative appeal, by a trust-signaling leviathan, be enough to create trust in a leviathan and encourage reduced resource exploitation in a common pool resource as seen in similar situations (Ertör-Akyazi & Akçay, 2021; Kidwell et al., 2013)?

The Future of Marine Policy? (A Leviathan That Connects)

It is highly unlikely that an international leviathan with enough power to successfully govern the marine environment will appear soon. Perhaps the best example

today of leviathan-like entities not represented by international law are NGOs and international agencies, like The Organization for Economic Cooperation and Development (OEDC) and the European Union (EU), both of with have fishery policies. The idea, however, has many appealing aspects. Governing from a position of granted authority would allow a leviathan the ability to govern one ocean. Because of the nature of the ocean commons this would be ideal. The idea of fairly apportioning the ocean would likely necessitate a body with the global power of a leviathan to implement. It would also allow for the creation of a monitoring body that might streamline enforcement and ensure that all aspects of dispute are taken up by a common court that is established in conjunction with this body. All these ideas are important aspects of Ostrom's ideals.

The difficulty of the leviathan model is that it does not very well allow for several of the other characteristics outlined by Ostrom, like face-to-face communication and conflict resolution. The ability of an international body to adapt its provisions to local conditions is encumbered by the size and scope of a leviathan like this. Especially in larger countries, an individual or small community with concerns about regulation would have a reduced voice in forming the regulations. Their ability to participate in debate would also be limited in this arena for the same reasons. The recognition of community self-determination for the reasons cited above would again be limited. To quote Ostrom "Further, the application of empirical studies to the policy world leads one to stress the importance of fitting institutional rules to a specific social-ecological setting. 'One-size-fits-all' policies are not effective." (Ostrom, 2009) With the scope of an organization

necessary to govern the oceans it seems likely without careful thought one-size-fits-all may be the default result.

The case for a leviathan is not a perfect one. Ostrom supports this point in her criticism of Hardin discussed above but also includes in her eighth characteristics of proper CPR management a link. Ostrom says that "Organization of large common pool resources in the form of multiple layers of nested enterprises, with small local CPR at the base level." (Ostrom, 1990) This nesting is what takes the parts of her model that make a leviathan seem appealing. Finally, a leviathan like this would still be unable to manage fisheries in EEZs leaving countries with weak governance like Indonesia ("Fisheries Country Profile," 2018) as opportunities for exploitation beyond a leviathan's reach. Sixty-four percent of the area of the ocean and 90% of its volume is not covered by the requirements of UNCLOS (Vanaik, 2020).

Thomas Hobbes' (1651) idea of the Leviathan depends on the hypothetical social contract. Today, the European Union (EU) has been able to put pressures on member countries for a wide variety of environmental standards, as has the Organization for Economic Cooperation and Development (OECD). These organizations are manifestations of the social contract (Palmer, 2001). The EU, OECD and agreements like the South Pacific Tuna Treaty (Fisheries, 2021) have helped to persuade countries to become more sustainable (Duit et al., 2016). In many ways the EU and OECD have stepped into the role of the environmental leviathan. Their regulations and subsequent communications surrounding these regulations have caused more uniform responses to environmental problems (Busch & Jörgens, 2005).

The question remains, how can the benefits of a leviathan be merged with the needs of small local communities to be heard and to govern themselves? Creating a set of bottom-up, nested communication networks that make sure that the needs of small communities are being considered at the international level, has not occurred. Communication about the best science and knowledge about management is essential to provide to all levels of Ostrom's nested hierarchy. How might that be best delivered so that the information is heeded? How might messages from a leviathan be tailored to those using a CPR? A leviathan by itself shows little hope of working. Indeed, in the past due to lack of compliance it has not worked. Might tactics of moral persuasion be more effective to engender sustainable action?

The Environmental Moral Domain

The moral domain includes "prescriptive judgments of justice, rights, and welfare pertaining to how people ought to relate to each other"(Turiel, 1983). Environmental questions, regarding fisheries as an example, speak to all these issues. Taking fish from a CPR that could be the only available food for others may deplete the resource and cause food scarcity, thus notions of justice are relevant. Waiting for fish to cross from the EEZ to international waters, while legal, is ethically questionable. Healthy diet is important to economic development and personal welfare. It is then necessarily the case that all judgements which happen among questions of the environment all living things share, are inherently moral judgements. What tools are available for making judgments and influencing the judgements of others in the moral domain? The following section will outline the nature of the constructs humans use to make moral judgements using MFT.

Moral Foundation Theory

Cognitive Revolution

Long before the enlightenment, Plato in his dialogue with Phaedrus acknowledged that the person was like a charioteer who was guided by two horses, one that represented rational thinking and the other that represented the soul's irrational passions (370 C.E.). As explained by Jonathan Haidt (Haidt, 2001), up until the late 19th century moral reasoning was thought to be derived from the rational mind, using an evidence-based model to solve problems. Thinkers of the enlightenment elevated the use of the rational mind. Immanuel Kant did likewise but thought there were limits to the value of reason to guide our decisions. David Hume (Hume, 1739) asserted that "Reason is, and ought to only be the slave of the passions and can never pretend to any other office than to serve and obey them." (*A Treatise of Human Nature*) The cognitive revolution, of the 1950's, embodied the realization that humans are more than a blank slate on which ideas take hold and upon which humans base our rational decisions (Pinker, 2002).

If rationally considering evidence is not the most influential method of problem solving and decision-making, then it is necessary to understand what other heuristics humans use to understand the world and make decisions. The cognitive revolution sought to explain with greater fidelity the behaviors of individuals in the world. The implications of both moral psychology and behavioral economics, also with roots in psychology, make clear that environmental advocates cannot begin to encourage environmental actions and choices without also examining how humans cognitively process these decisions.

Behavioral Economics

One of the most valuable explorations about how environmental actions and decisions are processed has come through the field of behavioral economics. Prior to 1970, most economists presumed that all individuals operated in a rational way while being confronted with instances in which individuals made decisions that were not in their own economic interest.

Methods of valuing the environment and ecosystem services developed during this time, and included, stated preferences, revealed preferences, hedonic pricing, self-reported willingness to act, willingness to pay, and direct observation of individuals in the real world. The work in these areas exposed many examples of irrational decision-making made by humans in these experiments.

The work of Herbert Simon's bounded rationality model (1972) sought to develop understanding of this irrationality and was further developed into the study of heuristics and biases by Daniel Kahneman and Amos Tversky. In their paper "Judgment Under Uncertainty Heuristics and Biases" (1974). They described what they later called System 1, which relies on heuristics or shortcuts used to answer questions that save time and mental effort. It also outlined the biases in judgment that these heuristics establish. Their research went on to describe System 2, or the rational mind, that relies on more mentally demanding analytical consideration of all factors in the decision-making processes. Neither System 1 nor System 2 is functional for all situations, but both are engaged in moral decision making.

Moral Psychology

Research in moral psychology is seeking to discover evolutionarily justifiable and culturally universal moral foundations upon which humans construct justifications for making decisions (Haidt, 2013a). Moral psychology investigates reasons why people, presented with the same supporting data, can disagree about issues. This work seeks to uncover the fundamental moral foundations that all humans share regardless of their culture. These MFs comprise the tools that individuals use to make decisions. The social intuitionist model is based on the idea that it is these moral foundations that create the automatic decision-making tools that all people use to make decisions without conscious reasoning. Jonathan Haidt (Haidt, 2001) gives several examples of observations that are better understood as described by the social intuitionist model of moral judgment (Figure 1) including the irrational behaviors observed by early behavioral economists.
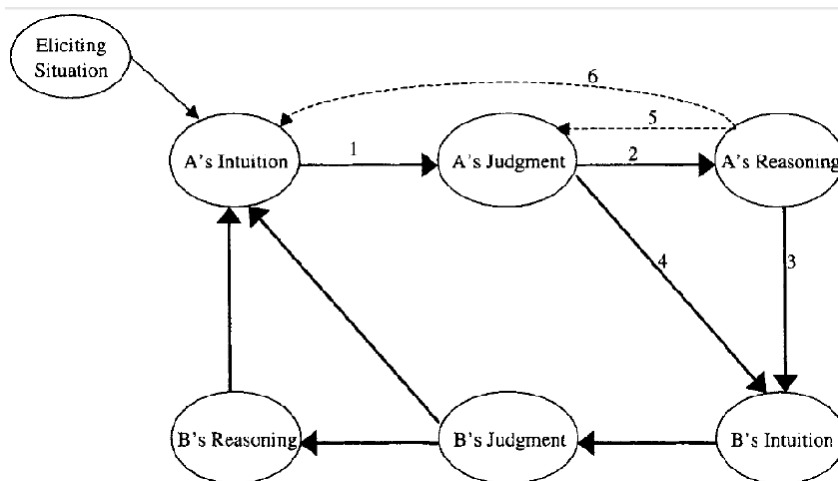
Figure 1: The Social Intuitionist Model of Moral Judgment (Haidt, 2013a)

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Dual Processing

   Haidt describes two systems involved in the social intuitionist model he

developed (Haidt, 2001, 2007, 2013a, 2013b; Haidt et al., 2007). He describes first the

intuitive system or moral intuition, much like Daniel Kahneman's System 1, as fast and

effortless, unintentional and automatic, inaccessible, not demanding attention, developed

through parallel processing, pattern matching, metaphorical, holistic, common to all

mammals, context dependent and dependent on the brain and body that houses it. Moral

intuition is also greatly influenced by moral emotion. Moral emotions are emotions that

respond to violations of morality, or that motivate moral behavior (Haidt, 2003;

Kahneman, 2003, 2011). While a complete list of emotions that respond when violations

of morality occur is yet debatable, moral emotions include emotions like disgust, shame,

anger, contempt, embarrassment, empathy/ sympathy, and guilt (Haidt, 2003). The

reasoning system or moral reasoning, like Kahneman's System 2, is slow and effortful,

intentional and controllable, consciously accessible, demands attention, is serially

processed, symbolically manipulated, unique to humans, context independent and usable

by any rule-following human or machine (Haidt, 2001; Kahneman, 2003). Haidt has

compared the intuitive system to an elephant that overwhelmingly influences the

direction in which the individual riding the elephant is going. The rider in Haidt's

analogy is rational thought, it has little influence on the elephant and generally is not used

to create rational conclusions to questions. Instead, the rider makes *post hoc* fabrications

to justify the movement of the elephant who already arrived at the solution to a particular question by use of intuition and moral emotion.

The Moral Foundations

Researchers have supported the existence of a core set of six moral foundations (MFs) which all humans, regardless of culture, use to make moral decisions. They include care-harm, fairness-cheating, loyalty-betrayal, authority-subversion, sanctity-degradation and liberty-oppression(Graham et al., 2009; Haidt, 2001, 2013a, 2013b; Kidwell et al., 2013). This work continued but a debate continues as to the foundations which should remain in the pantheon. Haidt never considered the list of MF to be finished, instead he acknowledged that the process of investigation the MFs would continue to identify MFs.

Post Hoc Problem

When faced with moral decisions, moral foundations theory indicates that "intuitions come first and facts second."(Haidt, 2013a) Using the social intuitionist model Haidt describes a model that relies primarily on the intuitive judgment of a situation (Figure 1; Link 1) and *post hoc* reasoning (Figure 1, Link 2). An individual's *post hoc* reasoning can influence the intuitions of others by way of reasoned persuasion (link 3) just as an individual's judgment can influence another's intuitions (links 4). Less common are reasoned judgment, where logical consideration overrides the influence of intuition (link 5), and private reflection in which, after reasoned consideration, an individual arrives at a new intuition (link 6). Efforts to influence the actions of others rely on direct appeal. These, according to the social intuitionist model, do not work well. How

might this system be used to reach people whom the Social Intuitionist Model Predicts are less suggestable?

Moral Action Problem

Research suggests that knowledge is not the key to unlock sustainable behavior. Moral action co-varies with moral emotions more than moral reasoning. Social scientists still have not reached consensus about why there is a disconnect between knowledge and sustainable behavior, nor what motivates people to take environmental action (Kollmuss & Agyeman, 2002; Owens, 2000) It has been recommended that the combination of many already independently complex models might be the solution (Kollmuss & Agyeman, 2002).

One possible reason why the knowledge-action link continued to elude researchers is that studies relied on both direct and indirect measurements of action. Actions on behalf of the environment or environmentally responsible behaviors that are either planned (Stapp & Ohio State Univ., 1978) or self-reported are different from real actions (Hines et al., 1987). Self-reporting bias makes self-reporting unreliable. Tools or factors that influence action – like knowledge of action strategies, attitudes or affect (Cheng & Monroe, 2012; DeChano, 2006; Kasapoğlu & Turan, 2008; Kraus, 1995, Leeming 2005,) – are also difficult to measure and difficult to standardize. Using indirectly measured substitutes for action are easier but are not in fact measuring real-life actions and choices. Measuring environmentally sustainable action is difficult to do in real to life situations. While improvements in methodologies to collect data about

environmentally responsible behavior have been made, the direct connection between knowledge action continues to be elusive.

A lack of a clear connection between the knowledge of environmental problems and environmentally responsible actions led to a line of reasonable explanations, including empathy, reflexive distress, sadness, guilt and shame (Cialdini, 1991) some of the same moral transgressions identified by Haidt as those triggered by moral transgressions. Haidt (2001) makes the case that moral emotions, our emotional responses evoked by questions of morality, are causes of our action and only later justified by moral reasoning. Moral reasoning is the face of moral judgment, it just happens not to be the cause. This helps explain the observations made by Kahan and colleagues as to why more knowledge does not necessarily correlate with belief in climate change (Kahan et al., 2012). Rather, more knowledge may be necessary to create post-hoc explanations and eliminate challenges to intuition-driven conclusions.

The Promise of Motivated Reasoning

As Haidt points out, humans by default, tend to be more like lawyers defending a client than like judges looking for facts or scientists looking for answers (Haidt, 2013a). To explain he points to two different sets of evidence, relatedness motives and coherence motives. In the first case people are more likely to accept conclusions that are in line with their social goals. In the second, individuals are more likely to accept conclusions that are in line with what they already believe (Haidt, 2001).

Haidt identified 5 moral foundations as part of his core list. Care/Harm and Fairness/Cheating are considered ''individualizing'' foundations because they are related

to ''individual-focused contractual approaches to society'' and Loyalty/ Betrayal, Sanctity/ Degradation and Authority/ Subversion are considered binding foundations because they serve in ''binding people together into larger groups and institutions." (Graham et al., 2011) Can communications from a leviathan like the EU or the OEDC that use moral foundations to make their appeal be used to more effectively persuade individuals to act more sustainably? Both institutions have interests in sustainable fishing, as described by their fishing policies (*Common Fisheries Policy (CFP)*, 2019.; *OECD Review of Fisheries*, 2020) Using MFs has the advantage of signaling group membership and if targeted appropriately, appeals may make messages with which individuals have fluency.

Table 3: Moral Foundations Grouped as Binding and Individualizing Foundations

Binding Moral Foundation	Individualizing Moral Foundations
Loyalty/ Betrayal	Care/ Harm
Sanctity/ Degradation	Fairness/ Cheating
Authority/ Subversion	

Moral Foundation Appeals As a Useful Theory to Create Sustainability Appeals
Political Ideology and Moral Choice

Political ideologies vary across cultures and are closely tied to moral reasoning (Frimer et al., 2013; Rempala et al., 2016). Different ideas unite different political

ideologies and work has been done to quantify the connection between MFs and ideologies inside and outside the US (Graham et al., 2009; H. Hsu et al., 2019). Despite these differences, political ideologies are well understood by the public in countries where they exist. They create groups with common moral justifications (Rempala et al., 2016). In the United States (U.S.) considerable change has occurred which has increasingly polarized the electorate (Groenendyk, 2018). There are many continuums which describe political ideologies each with their advantages and disadvantages (Feldman, 2013). The liberal and conservative continuum is the most used in research about U.S. politics and for that reason will be used in this study. Liberals and conservatives have been shown to justify their political ideologies using morality-based explanations (Graham et al., 2009; Rempala et al., 2016). Work by Graham to determine how liberals and conservatives use MFs differently in their moral justifications determined that while conservatives tend to use all five MFs evenly (binding and individualizing), liberals rely on care and fairness (individualizing) for theirs. Building on these observations, dictionaries of MF terms used by conservatives and liberals that reference these MFs were created, revised and improved (J. Frimer, 2019; Graham et al., 2009; Hopp et al., 2021).

A Model to Operationalize the Theory

Using Haidt's rider and elephant metaphor, where the elephant is our moral intuitions and the rider is reason, strong connections can be made to the duel cognitive model important to processing choices made by individuals in behavioral economics (System 1 and 2 (Kahneman, 2011)). Our possession of this duel cognitive system can be

a significant impediments to changing behavior about climate change (Gifford, 2011), but also about fisheries decision making.

Heuristics and biases identified in behavioral economics have been used to more appropriately construct policies that consider the way information is processed to create a greater good. Cass Sunstein and Andrew Thaler (2009) have developed a set of best practices which can be implemented as policies that encourage individuals to make better decisions despite our lack of economic rationality. These ideas, collectively called nudges, seek to use "libertarian paternalism," to allow individuals to preserve their freedom of choice while encouraging better choices through use of better-designed choice architecture.

The aim of libertarian paternalism is to help individuals to make the decision that they themselves would prefer but are unlikely to make. To do this, small changes are made to the way in which choices are presented and defaults are chosen to encourage choices that the chooser, upon reflection, would agree are in their best interest while still allowing a full range of options. Choice architects sometimes require individuals to make a choice and in other instances require more thoughtful default options to help nudge people to make choices that the chooser themselves deem better. (Thaler & Sunstein, 2009)

If a consideration of psychological biases can be used to determine when our rational minds (cost benefit analysis) could more effectively be relied upon, and when it is more useful to rely on a well-supported irrational mind (nudges), then perhaps a better way can be found to integrate moral foundations into policy communications as well.

Sunstein and Kahneman wrote a paper together in which they made the case that Moral foundations are likely just another manifestation of System 1 (2006). Can tools be used to help influence moral choices about sustainability which engage MFs System 1?

Not everyone agrees that applications of behavioral public policy are the best way forward from our understanding of nudges and cognitive biases. Policy rationale and justifications for choices need to be explored in combination with a list of options and potential outcomes from the implementation of a behavioral public policy plan (Ewert, 2020).

Application of MFT in Other Situations

Moral Foundation Theory has shown promise as a method to approach a variety of problems in an array of different fields; In bioethics to develop a more pluralistic approach to addressing complex policy questions while understanding that multiple religious and cultural traditions impact such decisions; to analyze ethically sensitive questions like euthanasia and abortion (Tilburt et al., 2013). In the health field it has also been used to describe the willingness of doctors to use cost controlling as a reason to deny care to patents (Antiel et al., 2013). MFT has been used as a framework for moral (Graham et al., 2008) and genetics education (Zande et al., 2009) and public policy process (Lewis, 2013). Despite all this work, few studies (Ertör-Akyazi & Akçay, 2021; Kidwell et al., 2013) have attempted to influence the actions of others based on moral foundational appeals and even fewer have used these appeals in an environmental resource use context.

Research Questions and Hypotheses

This dissertation sets to understand better the potential for a leviathan like the EU or OECD to use tailored appeals to promote? the sustainable fishing of both liberal and conservative fishers. This investigation will contain two experimental parts: Chapter 3 will include the description of attempts to use Moral Foundation (MF)-based appeals to encourage sustainability in the actions of participants in a virtual fishing simulation under two conditions, while fishing with sustainable (steward) fishers and while fishing along-side 2 stewards and one unsustainable fisher (taker). Chapter 4 will investigate effect of political ideology on likelihood of identifying distinct moral foundations to describe unsustainable fishers (takers) in that same virtual fishing simulation. Identifying the effectiveness of appeals in encouraging sustainability would enable us to use these MF appeals to encourage sustainability in a wide range of applications. This study will consider four questions with accompanying hypotheses across 3 chapters. They are as follows:

Q1.1: What are the effects of congruent and incongruent MF appeals on the sustainable fishing choices of people in a fishing simulation?

H1.1: Fishers exposed to congruent appeals will show a higher individual efficiency than those shown incongruent appeals.

Q1.2: How do the moral foundations differ among people who choose to take all the fish, some of the fish, and none of the fish?

H1.2: Those that took all fish and those that took no fish would have higher measures for Loyalty and Authority MF than those that took some but not all.

Q1.3: Does the presence of a fisher engaging in unsustainable fishing influence the effect of targeted MF appeals to promote sustainable fishing behavior?

H1.3: Participants will show a lower individual efficiency when fishing alongside a taker fisher.

Q2.1: What is the effect of political ideology on likelihood of identifying distinct moral foundations to describe unsustainable fishers (takers)?

H2.1: When describing the attributes of a "taker" fisher, liberals will use negative care and fairness terms more frequently and other MF terms less frequently than will conservatives.

Rationale for hypotheses 1.1, 1.2, 1.3 and 2.1 is presented below (pages 55, pgs. 55-56, 57 and 99, respectively). Asking these questions in the context of a real CPR fishery is nearly impossible and impractical for the same reasons that enforcement of fisheries governance is so difficult. The ocean is large and communication across it is difficult. Simulations act as good tools to fill this gap. Using a simulation, Chapter 3 (Question 1.1) will tackle the effect of MF appeals tailored to conservative and Liberal political ideologies. It will also look at characteristics of those that took all and no fish to see if similar patterns about the MFs of these individuals are seen here (Questions 1.2) as in past studies (Ertör-Akyazi & Akçay, 2021). Question 1.3 will attempt to trigger moral sensitivities by adding an unsustainable fisher to see if MF appeals have an increased effect in these instances. Chapter 4 will seek to understand how conservatives and liberals use terms to describe the actions of taker fishers (Question 2.1).

Your Friend the Leviathan

There is potential that moral foundation-based appeals targeted specifically at liberals and conservatives may have a positive effect on improving sustainable action in a common pool resource fishing simulation. If this is so, it is conceivable that the in-group signaling in the form of a MF prime may be enough to overpower the lack of interpersonal connection that Ostrom requires. This idea is supported by Self-affirmation theory (Hurst & Stern, 2020) which suggests that intervention can be used to increase collaboration by reducing threats and defensiveness, an idea which has been implicated in the value of MFs success in framing environmental issues as moral issues. Engendering trust along with appeal repetition and clarity has shown positive effects in messages designed to encourage behavior change (Maibach, 2019). This idea has included applications of MFT as the tool to reduce defensiveness and increase acceptance (Hurst et al., 2020). This would also explain observations of increased sustainable behavior in the Kidwell recycling study (2013).

CHAPTER 2: METHODS AND DESCRIPTIVE STATS

Introduction

Part I of this investigation aims to use Moral Foundation (MF)-based appeals to encourage sustainability in the actions of participants in a virtual fishing simulation under two scenarios: while fishing with sustainable (steward) fishers and while fishing along-side 2 stewards and one unsustainable fisher (taker). Part II of the investigation (Chapter 3) will question effect of political ideology on the likelihood of identifying distinct moral foundations to describe takers in that same virtual fishing simulation

There are a multitude of technologies that exist today, including online simulations and sampling tools, that allow researchers to ask questions in ways that increase the sample representativeness and our ability to get a large sample size, that didn't exist even 5 years ago. This study utilizes those tools in a way designed to determine the effects of moral foundation-based appeals on the behavior of conservatives and liberals in a commons pool resource fishing simulation. Amazon Mechanical Turk was used to recruit both liberal and conservative participants (n=509). Appeals designed to use the moral foundation-based terms which are congruent with terms used by liberals (individualizing) and those that are congruent with terms used by conservatives but not liberals (binding) were designed, read and shown to groups of participants. Simulated fishing behavior was analyzed to see what effect, if any these appeals had on in a fishing simulation called Fish 4.0 (Gifford & Aranda, 2013). The number of fish a participant took as a proportion of the entire population was collected, along with dominant moral foundations.

Sample Selection and Collection

To test the effectiveness of different appeals on the behavior of conservative and liberal participants in a simulation, 509 respondents were recruited using the crowd-sourcing website Amazon's Mechanical Turk (AMT). Amazon Mechanical Turk (AMT) is a crowd sourcing site which offers short "Human Intelligence Tasks" (HITs) in which participants can engage for compensation (Stewart et al., 2015). Participants are provided a short description of the HIT which tells respondents how much they can be paid for their participation. They can also see an estimate of time it should take to complete the HIT and how long they are allowed to complete it. For this research all respondents who completed all parts of the task were given $2.00 which was paid to them via a check or Amazon.com credit (Appendix A).

To determine an adequate sample size, an analysis of potential effect size was performed (Wilson Van Voorhis & Morgan, 2007). To properly measure the interaction of variables in hypotheses 1 and 2, an ANCOVA tests was used as the model. For an ANCOVA increasing the power of the model necessitated efforts to ensure a minimum sample. In a three-way ANCOVA with three independent variables (Political Ideology, Moral Foundation Appeal, Fisher Sustainability), each with two categories, it is recommended that each cell of the ANCOVA have at least 30 individuals in order to achieve a power of 80% (Wilson Van Voorhis & Morgan, 2007). Therefore, it is necessary to survey at least 240 individuals (8 combinations of the variables) to ensure 80% power. This is dependent on the variability of the data, however. Because AMT was used to select respondents specific to variables and avoiding others (those neither

conservative nor liberal) no other adjustments were necessary to samples to ensure adequate samples. Samples of sufficient size were gathered for all analyses to ensure an 80% power meaning that there is a very good chance of seeing a significant result if one in fact exists in the experiment.

This experiment sought individuals who fall on the conservative and liberal ends of the political spectrum. Amazon Mechanical Turk supplied only respondents who answered a question in a prior survey when recruited to AMT that they considered themselves to be liberal or conservative. This research does not seek to be representative of the population of the United States. Rather it seeks to be representative of political and moral viewpoints within self-identified conservative and liberal groups. Respondents were supplied in groups of self-identified liberals and conservatives by AMT. The sample identified as 36.8% female, 62.1% male, 0.4% other and 0% preferred not to identify a sex. Participants were required to be over the age of 18 and ranged between 18 and 72 years of age with a median age of 36.6 years old.

Of those completing at least the survey portion of the test, 51.8% came from cohorts identified by AMT as conservative and 48.2% identified as liberal. As a check of the ideology identified in the samples of respondents supplied by AMT, and to gain a more detailed picture of the participants, each participant was asked to place themselves on a 7-point political scale from "very conservative" to "very liberal." When the group was surveyed on this scale, 35.6% identified as conservative, 57.5% as liberal and 6.6% as neither liberal nor conservative. Those identifying as "conservative" or "very

conservative" accounted for 27.8% of the sample while those identifying as "liberal" or "very liberal" accounted for 43.2% of the sample.

Once respondents decided to accept the HIT, they were given a hyperlink which connected them directly to the Qualtrics-hosted online survey. To complete the HIT participants are required to supply a confirmation number given at the end of the survey to complete the task. The confirmation number is supplied by them to the AMT site for payment. This confirmation procedure is consistent for all HITs in this study.

Several previous studies have used AMT derived samples of liberals and conservatives and have supported this as a valid method. In one such study as recently as 2015 the authors reported that "liberals and conservatives in [the AMT] sample closely mirror the psychological divisions of liberals and conservatives in the mass public." They go on to state that AMT liberals "hold more characteristically liberal values and attitudes than liberals from representative samples" (Clifford, Jewell, et al., 2015) indicating that using AMT liberals and conservatives for psychological studies which seek to better understand these groups is a valid approach. Even during the COVID19 pandemic which occurred concurrently with this study, it was noted that the population of those who participate by doing HITs on AMT has remained stable (Moss et al., 2020). Finally, similar studies about the moral judgement of social/environmental issues and their relation to behavior have been done using AMT in the past (Zaikauskaite et al., 2020) undergirding this method which will allow comparisons between a group of previous and potentially future studies.

Moral Foundation Appeals

All appeals and instructions for completing the parts of this study were given in a video embedded in the survey. To create the MF-based appeals, an appeal was written by the researcher. Part one of the appeal was general in nature and identical for each participant. It informed them that the fish could be managed sustainably or overexploited. The appeal reminded participants that they received the fishery from other previous participants and that it would be passed forward to new groups. Participants were reminded that the experiment was interested in how they, and their fellow fishers managed the fishery (Appendix C).

In part two of the appeal, a general statement (Figure 4) was constructed. To this MFs terms were added to complete the appeal. The first appeal used a binding appeal (loyalty, authority, sanctity) and the second used an individualizing appeal (care, fairness) (Appendix D). The appeals balanced the use of words from each of the MFs to create an individualizing and a binding appeal. Each participant saw one of the two appeals during their experiment with one message condition tested on each respondent.

Table 4: The MF Appeal Framework and MF Appeals. This framework was used as a structure for the moral foundation appeal. Two versions of the appeal were created. The first used binding MF terms and the second used individualizing terms.

General Appeal

"As you think about how you will go about fishing, it is important to be _____ and_____ as you_____ the value of this resource that is important to providing the balance necessary for future prosperity. It is important that you _____ the_____ guidance on overfishing, and that you are reasonable in your fishing actions._____ of these resources is_____. Taking more than can be sustained is_____ to others who depend on that resource. Already caught, unused fish would be dumped into the ocean_____ the local waters. We must work_____ to prevent _____ _____ to these renewable resources."

The Binding Appeal	The Individualizing Appeal
"As you think about how you will go about fishing, it is important that you consider our patriotic tradition of valuing our natural resources' positive impact on our nation's future prosperity. It is important that you lawfully obey the guidance on overfishing, and that you abstain from overfishing. Waste of communal resources is disgusting. Taking more than can be sustained is a betrayal of innocent people who depend on that resource. Already caught, unused fish would be dumped into the ocean, dirtying the local waters. We must work together to respect the purity of these renewable resources."	"As you think about how you will go about fishing, it is important to be sympathetic and equitable as you preserve the value of this resource that is important to providing the balance necessary for future prosperity. It is important that you not abandon the just guidance on overfishing, and that you are reasonable in your fishing actions. Destruction of these resources is unfair. Taking more than can be sustained is detrimental to others who depend on that resource. Already caught, unused fish would be dumped into the ocean impairing the local waters. We must work compassionately to prevent unjust harm to these renewable resources."
Pink- Loyalty **Grey- Authority** Burgundy**- Sanctity**	**Yellow- Care** **Red- Fairness**

Experimental Design

Survey Design

The survey was created to combine four major parts, Mechanical Turk Login and Consent (Appendices A and B), Survey Part I (Appendix C), Fish 4.0 simulation (Appendix C), Survey Part II (Appendix E and F). The "Tailored Design Method" was used to create a survey to minimize coverage and sampling error (Dillman et al., 2008). The survey aspects described below were chosen to implement the idea of social exchange to the survey design. Each of the aspects of the survey experience is detailed in Table 5. The task in total required respondents to navigate between sections of the task (AMT, Survey and Fishing Simulation, Survey). Ensuring a high completion rate was important to reduce sampling error.

Table 5: Summary of the Experimental Process for This Study

Study Stages	Steps	Purpose of and Details Regarding Step
1. Recruitment Amazon Mechanical Turk	Respondents are Recruited (Appendix A)	- Participant Recruitment and Record Keeping - Respondents Read Description of Survey and - Link for participation is provided.
2. Survey Part 1	Read Informed Consent and Agree	-Ensures Participants are engaging in an informed way. (Informed Consent found in Appendix B)
	Watch Video Tutorial on Game which includes MF Appeal (Appendix)	-Video Explains the simulation (Text of the video can be found in Appendix C)
	Survey continues and Guides Respondents to the Finishing Simulation	Delivers MFT and General Appeal For Fishing Sustainability (Appendix D)
	Question Comprehension Quiz	-Check for and ensure understanding of the process
	Fishing Simulation (Gifford & Aranda, 2013; Sussman et al., 2016)	-Collects Data on Simulated Resource Use (Fish Capture (Appendix G: The simulation can be found at: http://www.fishsim.org:8080/ (Code TCUVEU)). -Measures Dependent Variable for Chapter 3
3. Fish 4.0	Fishing simulation	- Gathers Continuous Data for Dependent Variable in Chapter 3
4. Survey Part II	Impressions of Taker Questions	- Asks those fishing with unsustainable fishers, how likely they would be to use MF terms to describe those fishers. (Only asked of those participating with taker fishers) - Measures Dependent Variable for Chapter 4
	Moral Foundation 30 (MF30) Questionnaire (Graham et al., 2011)	-Identifies strength of moral foundations for each participant in making moral decisions.
	Demographics Questions	-Used to determine potential sampling errors
	Political Ideology Question	-Used to determine accuracy of AMT Ideology Predeterminations and to gain higher resolution on ideological groups.

The survey started with informed consent and a tutorial video. Each participant was presented with a random appeal (Table 4) which used terms that either appealed to the foundations most congruent to liberals (care, fairness- individualizing appeal), or a

prompt that appealed to the other 3 foundations , (loyalty, authority and sanctity- binding appeal). Following the video, participants were required to complete a five-question quiz to test their comprehension of the video but also to correct misconceptions about the most important aspects of the game.

Next the respondents were asked to participate in a common pool fishing simulation. In the simulation, fishers participated with three steward fishers or two stewards and one taker.

Following the simulation, respondents were guided back to the Qualtrics survey. Those fishing alongside unsustainable fishers (takers) (Chapter 4) were asked about which moral-foundation-linked terms were appropriate to describe their taker partners in the simulation. These terms were selected from a list of terms which conveyed each of the moral foundations (Graham et al., 2009). All respondents then completed a moral foundation 30 question survey and demographic questions including those about political ideology, age and sex (Appendix C). To assess political ideology and verify ideologies supplied by AMT, a single self-identification tool was used. Each end of the 7-point scale was anchored by strongly liberal and strongly conservative respectively with "neither liberal nor conservative" at the midpoint. An overall experimental design, with eight total groups was created by from the variables (Figure 2).
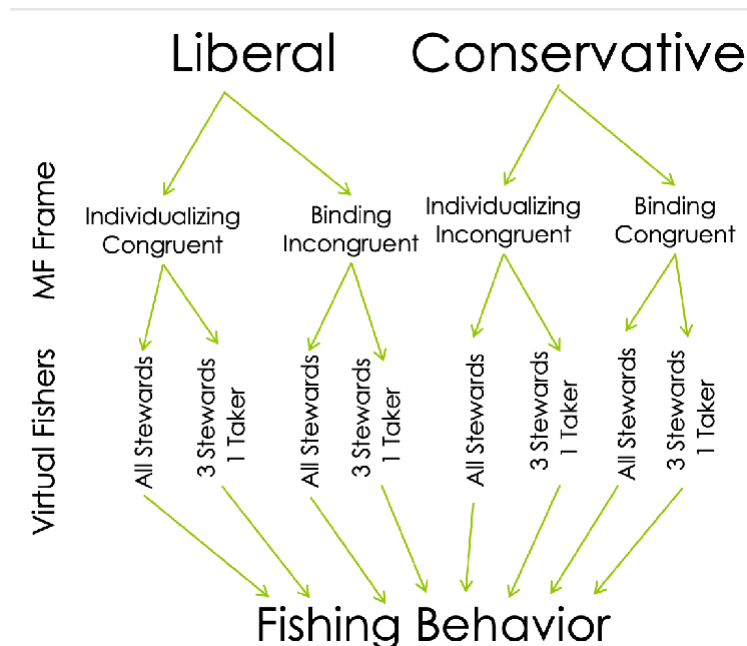
Figure 2: Experimental Design Tree Showing the Eight Experimental Groups From Which Data About Fishing Behavior Will Be Gathered.

Fish 4.0

Simulations have been used in resource use experiments for decades (Castillo & Saysel, 2005; Deadman et al., 2000; Fennewald & Kievit-Kylar, 2013; Hine & Gifford, 1996; Kramer & Brewer, 1984; Ostrom et al., 1994; Ostrom, 2006; Sussman et al., 2016) These experiments have provided insights into the interaction of individuals as well as the decision-making processes that people go through when deciding to use, or not use, a resource. This experiment uses an online fishing simulation like these resource-use experiments to mimic what have become tools common in the field.

In these experiments, fishers were given 150 seconds maximum to decide on how many fish they would take, and to collect those fish using the simulation. Fishing necessitated "leaving port" by clicking a button, and fishing by clicking the "Attempt to

Fish" button. At this point they could return to port and return to fish as they wished and were paid $5 for each fish. Fishers could pause the simulation at any point. Once all the fishers returned to port the season ended. The maximum capacity of the ocean was 100 fish and the ocean always started with 100 fish. There was no cost, virtual or real, to fishing for participants. All fishers participated in only one season but were told that the population of fish left at the end of the round would double before the start of the next season.
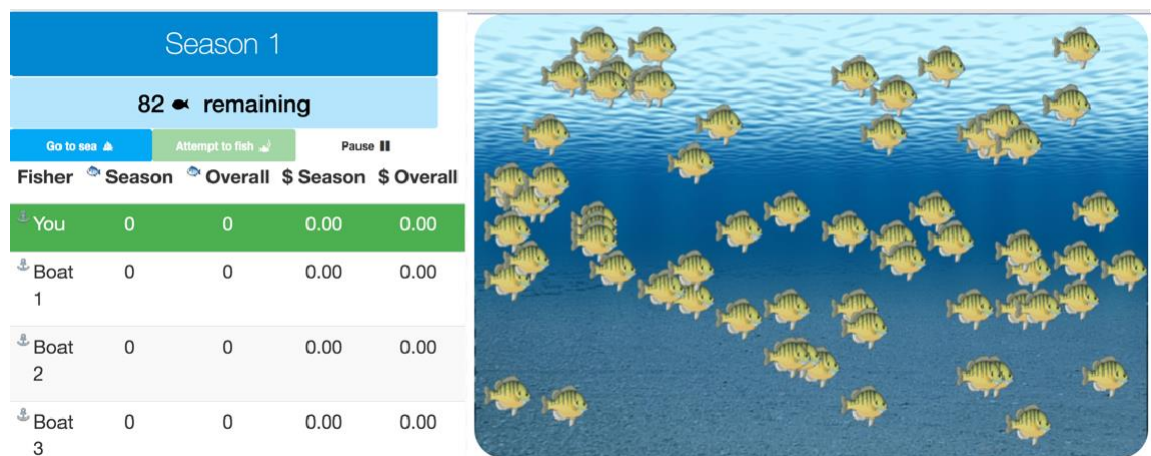
Figure 3: View of the participants while engaged in Fish 4.0: Feedback from actions taken is shown to the left along with "Go to Sea", "Attempt to Fish" and "Pause" buttons. A real-time fish population showing virtual fish is displayed on the right.

Data was collected on the fishing patterns of the participants using the fishing simulation. Data collected included the total number of fish taken in the round, and individual efficiency (IE). Individual efficiency was calculated using reproductive rate R_0 (the rate of reproduction between rounds), the number of fish harvested (N), and

Sustainable Take (The maximum number that all fishers could take and still ensure replacement of the fish before the next round started. Individual Efficiency is the difference of the sustainable take (S), and the number of fish harvested (N), divided by the sustainable take (S), times the rate of reproduction (R_0) (Sussman et al., 2016). For this game $R_0 = 2$ and N=12.5. This means that the population would double every season and each fisher could take 12.5 fish and ensure the fish population would come back the next season.

$$IE = R_! \frac{(\#)\%(\&)}{\#}$$

There are many different features of Fish 4.0 that can be set and tested. Most features were kept at default levels. The number of fish at the beginning of the season was set at 100. The participants took part in only one fishing season.

The fishing game contained several elements of deception. All respondents were told they were fishing with three others and that the fish currently in the fishery were those that were left after the previous group had finished with the game. After their participation they were told that the other fishers were computer-generated fishers or bots. In addition, the rate of fishing for the three other fishers was manipulated and the number of fish to start the simulation was always 100.

The bots were preprogrammed to a particular level of fish harvest. One half of the participants (Group A) participated with three other fishers who fished in a sustainable manner (Stewards). These fishers were programmed with a "greed" value of 39, 40 and 41. This, on average, created a scenario where the three bots fishing collectively took 40% the fish population. This level of fishing would be sustainable over infinite generations of all participants fish in this way. The second half of participants (Group B) fished alongside fishers who were programmed with a value of 1.00, 0.39. and 0.41 respectively. One bot was programmed to take more than the sustainable rate (1.00 takers). Together all the bots in Group B would collectively take 45% of the fish while the stewards matched the average of the stewards in the other group. A value of 1.0 programs a fisher who, alongside fishers fishing in the same way, take the entire population of fish (Table 6).

Table 6: Levels of Sustainability For Bot Fishers.

	Group A	**Group B**
Fish Sustainability	Three Steward Bots	2 Steward and 1 Taker Bot
Percentage of Fish Taken by Bots	40%	45%

Fishing Behavior

Individual efficiency was calculated for each fisher from the simulation data. Individual efficiency (IE) ranges from 0, a value achieved if the fisher took ¼ of the fish in the fishery, to 1, if the fisher took the exact sustainable yield based on population and replacement rate and above 1 and below 0 if fishers took very few or very many fish. In other words, if the fisher took ¼ of the fish and all the bots acted in the same way, then all the fish in the pool would have been taken. In this case, as each season started with 100 fish, a fisher taking 25 fish would have an IE value of 0 and a fisher taking 50 fish would have an IE value of -1 (Gifford & Aranda, 2013). Individual efficiency had an average of -0.167 for all respondents, range of 2.96 standard deviation of 2.77, minimum of -4.96 and maximum of 2.00.

Participants (n=509) were recruited from Amazon Mechanical Turk (AMT) between October 25 and January 27 2020-21 Of that group 60% (306) completed the entire survey and the fishing activity.

The sample of Americans identified as 37.1% female, 62.5% male, 0.4% other and 0% preferred not to identify a sex. Participants were required to be over the age of 18 and ranged between 18 and 99 years of age with a median age of 36.6 years old. Average age of AMT identified Liberals was 36.5 years and conservatives 36.6 years. The sample of AMT liberals was 64% male, 36% female and less than 1% who identified as other or who preferred not to identify a sex. The sample of AMT conservatives identified as 62% male and 38% female and 0% preferred not to identify a sex.

CHAPTER 3: EFFECT OF TAILORED MORAL FOUNDATION-BASED APPEALS ON SUSTAINABLE CHOICE IN A SIMULATED OPEN ACCESS FISHERY

Abstract

Compelling evidence as to the impending decline of global fisheries has continued to mount. Fisheries successes are affected by decisions that fishers make every day. Moral Foundation Theory (MFT) posits that the decisions humans make are largely determined by their alignment with the groups with which they identify, and defended by moral foundations, a palate of justifications used to justify their positions (Haidt, 2013a). Support for the idea that morally framed arguments may be effective methods to encourage sustainable action has continued to build (Ertör-Akyazi & Akçay, 2021; Kidwell et al., 2013; Wolsko et al., 2016). This study is in two parts. In part one, moral foundation-based appeals were designed to appeal to US conservatives and liberals to see if it might encourage them to fish more sustainably in a simulated, competitive, common resource game. The second experiment sought to determine if adding an unsustainable fisher (taker) among the group of sustainable fishers (stewards) might influence the effects of the Moral Foundation-based (MF) appeal. The fishing behavior of participants was observed and compared to observe differences in fish caught.

In study one, neither the use of congruent nor incongruent moral foundation-based appeals had any effect on the fishing behavior of participants. However, when fishers that took all fish, those that took some but not all and those that took no fish, were compared, differences in the moral foundations most likely used by these groups to describe the takers were observed. Both individuals who took no fish and those who took all fish

tested higher for ratings of loyalty, authority and sanctity but showed no difference for other foundations.

Similarly in study two, there was no effect when comparing the average of any of the experimental groups, an observation which does not support previous theory or Moral Foundation Theory as an actionable tool for direct resource use appeals.

Introduction

A Moral Justification For Better Environmental Communication

Threats to long-term human existence with regards to important planetary boundaries, including nitrogen pollution, biodiversity and climate change (Rockström et al., 2009; Steffen et al., 2015), place humanity in a dire situation to fix these problems. More recent and more detailed analyses continue to support the Earth's limited capacity to tolerate the our effects of our environmental harms on these systems (Lade et al., 2020). The ability to create compelling appeals to increase sustainable choice has only become more important as these interrelated global catastrophes loom.

A collapse of global fisheries represents one of these impeding catastrophes. Healthy fisheries are a renewable source of protein for the world if managed well, however, fisheries are threatened by excess nitrogen, and phosphorous, climate change, and ocean acidification. Additionally, the loss of species as a result of these factors has led to functional and genetic biodiversity loss (Steffen et al., 2015). These accumulated changes have further led to potential unforeseen effects (Worm et al., 2006). While

enduring threats from non-point source impacts, marine fisheries have also endured

increasing threats from human fishing (Worm et al., 2006).

As a common pool resource, from which no one can be excluded and anyone can

take resources, fisheries are vulnerable to exploitation. All the while, pressure on this

common pool resource from fish harvesting is growing at an ever-increasing rate (*FAO -*

News Article, 2014). Thirty years ago, Daniel Pauly chronicled the impending collision

between human population and ocean fisheries (Pauly, 1990). Human population

continues to grow and, while the rate of growth is slowing, estimates predict that

population will peak at 11 billion by 2100 (Population, 2019). The pressure on fish

consumption will not soon go away.

Fish consumption is related to socioeconomic level, with higher socioeconomic

groups eating more fish (Akbaraly & Brunner, 2008). Global development is creating

continued population and economic growth and proportional increases in demand for

fish. The Food and Agriculture Organization estimates that between 1990 and 2017 fish

stocks within biologically sustainable levels fell from 90% to 66% (*The State of World*

Fisheries and Aquaculture, 2020). Median fisheries are in poor condition. While a

business as usual scenario predicts collapse, with appropriate reforms the median fishery

can recover within ten years (Costello et al., 2016). Indeed, to meet our Sustainable

Development targets for "Life Below Water" and "Zero Hunger" (*THE 17 GOALS |*

Sustainable Development, 2015), current agreements will need to be strengthened

(Graziano da Silva, 2016). While technology has expanded food availability from

agriculture, it has only made fisheries struggle all the more (Pauly, 1990).

Global advocates and policymakers have struggled in their attempts to increase sustainability of individuals' resource use. They have found it difficult to determine what factors are most important to producing sustainable mindsets and choices by individuals. In searching for motivations which generate environmental behavior, researchers have identified knowledge (DeChano, 2006; Latif et al., 2013; Leeming & Dwyer, 1995; O'Brien, 2013; Pothitou et al., 2016; Sargisson & McLean, 2015; Shi et al., 2016), environmental literacy (Bair, 2014; Coyle & National Environmental Education and Training Foundation, 2005; S.-J. Hsu, 2004; Roth, 1992), and intrinsic motivations (van der Werff et al., 2013). Quality communication has also shown to be an effective tool in encouraging sustainable behaviors (Cox, 2007; Killingsworth, 2007; Schwarze, 2007).

Like fisheries management, climate change is a complex issue that, is also impacted by resource use decisions, and has a significant communications research history. Leombruni (2015) observed that climate communication that emphasizes proximity and potential risk, facilitates engaging experiences, activates social group norms, frames solutions in terms of gains, and appeals to long-term gains, can be effective at engaging individuals in policymaking. Properly designed communication which appeals to the most important motivations in sustainable choice cannot be engaged unless these elements can be identified and used to better communicate across the political spectrum. Audience segmentation has been implemented as an effective tool along with microtargeting to more effectively address issues like health (Noar et al., 2009) and climate change (Linden et al., 2015; Maibach et al., 2011). Efforts to address issues in ways that are conscious of different perspectives while engaging language

appropriate to the audience, are would more effectively advocate for environmentally

sustainable action.

Questions about policy that involve environmental sustainability have been

historically justified on an economic basis. Even amid these economic justifications, Kish

and Farley have called for an increased acknowledgement of the impact of "culture and

society" and an exploration which couples economics with a sense of "methodological

and intellectual pluralism" (2021). It has been suggested that the tools of economics fall

short at valuing nature at anything more than its utility to human kind (Light, 2011;

Naess, 1973; Routley, 1973) and that the global interconnected nature of ecological

systems determines that "lifestyle practices are a matter of morality not just

environmental sustainability."(Bandura, 2007) Financial valuation is not enough to fully

consider the value of the environment because "nature has non-anthropocentric intrinsic

(or inherent) value," and that this value should be "respected in a moral sense" (Light,

2011). For example, in Nicholas Stern's analysis of the economics of climate change, he

justifies his discount rate based on risk assessment couched in moral language. He makes

the case that valuing the benefits that occur to different groups of people at different

times creates "unavoidable ethical issues." (Stern, 2008) Justifications for action on

climate, water (Schultze, 1975), and air quality (Wolozin, 1968) have been consistently

defined on economic terms and justified by economic value. Meanwhile, other economic

perspectives look at all of the financial and moral incentives as economic incentives that

can be captured quite well with proper economic analysis (Frey, 1997). In one study on

the effectiveness of appeals to check tire pressure, direct appeals to finances elicited

fewer free tire pressure checks than appeals to environmental values and neutral appeals (Bolderdijk et al., 2013). There are a wide array of motivations for behavior including social pressure (Leslie et al., 2021), altruism, and reputation protection (Leão, 2020) in addition to economics. As the tire pressure appeal illustrates, there is also an underused moral argument that has the potential to be effectively used to encourage environmental sustainability.

Morality has been shown to influence the behavior of individuals in an environmental context (Currie & Choma, 2018; Dickinson et al., 2016; Feinberg & Willer, 2013). Questions of morality engage social norms and values which are used to create a set of societal rules of engagement based on those norms and values (Adger et al., 2017; Bolderdijk et al., 2013; E. M. Markowitz & Shariff, 2012; Sagi et al., 2015; Zaikauskaite et al., 2020).Despite this, morality has been undervalued as an approach to encouraging sustainable choice.

Solutions to these complex, morally charged environmental issues might be best addressed through communication which appeals to not only economic but moral sensitivities. The field of environmental communication has been called a crisis discipline that has an ethical responsibility to do its part in encouraging sustainability (Cox, 2007; Heath et al., 2007; Schwarze, 2007).

Better understanding the morality-based tools to encourage sustainability could lead to more effective fisheries stewardship. The United Nations Food and Agriculture Organization recognizes that the ethical management of fisheries must work to fix policies developed by dominant economic analyses (Food and Agriculture Organization

of the United Nations, 2005). They go on to state that economic development through fisheries policy should rely upon the capability approach. The most important aspects of this approach include broader objectives, effective communication, equity, freedom and an emphasis on human and ecosystem wellbeing (Food and Agriculture Organization of the United Nations, 2005). These appeals for equity, freedom and wellbeing are questions of morality, of right and wrong. The United Nations Declaration on Human Rights (Nations, 1948) supports them as such and recently declared a healthy environment a human right (*Access to a Healthy Environment, Declared a Human Right by UN Rights Council*, 2021). This further supports the justification of these issues as deserving of moral analysis.

It is through this broader lens of morals and ethics that environmental challenges and marine fisheries management should be explored. To do so, an exploration of similar environmental issues which have been explored in this way is fruitful.

Much has been written about the moral imperative to stop the impacts of climate change (Gardiner, 2006; E. Markowitz, 2012; E. M. Markowitz & Shariff, 2012; Sacchi et al., 2014). It has been suggested that climate change, for example, represents the "Perfect Moral Storm" because it is a global phenomenon, that has intergenerational effects, and has underdeveloped tools for management (Gardiner, 2006).

Much like the atmosphere, marine fisheries face the same structural problems. Marine fisheries are a nearly global common pool resource with interconnected exchanges which cannot exclude or limit users (Ostrom et al., 1994). Costello et al. calculated that 68% of these fisheries are not in good biological condition (2016). Like

climate change, ocean fisheries are subject to an, at best, regional scale, fraught with competing goals and incentives, with intergenerational effects.

These features of marine fisheries make setting benchmarks for success difficult, due to the complexity and opaque nature of fisheries and an underdeveloped set of tools for management and repair. Yet, Costello et al. (2016) go on to show that even complex fisheries have hope. With the current economic tools, they estimate that the average fishery could be rehabilitated in ten years or less. If we add to that the potential of social and political tools potentially even more progress can be shown (Foale & Manele, 2004). With the possibility to recover such an important resource, and the potential to harness a justified moral argument to do so, all the pieces to effectively create tailored moral arguments and improve a critical global sustainability problem are present.

Moral Drivers of Optimal Stewardship Behavior

The search for and identification of moral drivers has recently been given new tools and perspectives to tailor effective moral appeals to encourage fisheries stewardship. Jonathan Haidt and his team sought to determine the underlying moral palette with which humans paint our justifications for actions. To be included in their list, these moral foundations needed to be found empirically, be innate human traits, found in multiple cultures, and there must be a Darwinian evolutionary explanation for why humans would have developed this moral foundation (MF) (Haidt, 2001, 2003, 2013a).

Using surveys of individuals who justified their moral positions in morally ambiguous situations, Haidt and colleagues distilled their palette down to five moral

foundations including two individualizing foundations, care and fairness, and three binding foundations: loyalty, authority and sanctity.

More recent studies have looked at the tendency of conservatives and liberals in the United States to utilize each of these moral tools to justify moral decisions (Frimer, 2020; Graham et al., 2009; Rempala et al., 2016). Surveys used to identify the strength with which individuals rely on these respective foundations were developed to determine patterns amid the foundations and other identifiable categories. Graham used the foundations to determine the justifications used most often by conservatives and liberals, in a U.S. context, binding (conservatives) and individualizing (liberals). These are subsequently the words with which those that utilize those particular moral foundations use to justify their moral positions (Graham et al., 2009). While conservatives tend to use all these MFs with relatively even alacrity liberals rely heavily on care and fairness. Others have clarified the justification of liberal and conservative ideology using morally based language (Rempala et al., 2016).

These moral foundations are used by individuals to justify moral positions after the fact, as *post hoc* rationalizations of the positions of their respective moral tribe (Haidt, 2013a). Haidt makes the case in the social intuitionist model, upon which moral foundation theory relies, that intuitions lead to judgement and judgement leads to reasoning. (Figure 4) As extremely social organisms however, moral intuitions can be influenced by the intuitions of others thereby shaping the experience of the eliciting situation (Figure 4).

Figure 4: A Portion of the Social Intuitionist Model of Moral Judgment Edited From (Haidt, 2001).

Previous studies have sought to observe the way in which people with differing political ideologies rely on different MFs and the level at which these same individuals respond to appeals based on MFs that are congruent and incongruent with their political ideology (Graham et al., 2009). Dawson and Tyson (2012).found that MFs were a mediating force that influenced attitudes about climate change in conjunction with political ideology As many of the attributes of the climate crisis are like those of fisheries decline, these lessons seem to provide evidence that targeted tools designed for encouraging sustainable fishing may work to influence the intuitions of fishers. Assessing behavior is the next important step in determining how these MF tools might be used to encourage sustainable action.

Assessing Sustainable Behavior

Measuring real sustainable action is a difficult task. Experiments which measure actual participant behavior are less common because of the difficulty of measuring real behavior, and self-reported behavior is often subject to reporter bias (Barker et al., 1994). The measurement of sustainable actions has taken the lead from economists who consistently use direct measurement of behavior or outcomes where possible. Interpreting

the sustainability of behavior of individuals in complex real-world situations is difficult without direct measurement but that measurement is exceedingly difficult.

Economists have a long history of measuring choice and preference in a variety of ways, including using experiments. Public goods games have been used to create a multitude of choice tasks in research. The potential problems raised in Garett Hardin's *Tragedy of the Commons* have been the subject of a variety of variations of these social dilemma games with a wide range of settings and environmental contexts (Cubitt et al., 2011; Du et al., 2015; Ertör-Akyazi & Akçay, 2021; Faysse, 2005; Wen-ying & Dun, 1998).

Moral Foundations and Behavior

Others have done similar research on the effects of moral foundations on the behavior of individuals in environmental resource related tasks. Moral Foundations Theory also has been applied, in a limited way, to describe sustainable behavior. In one study, experimenters had participants read appeals to recycle that were either congruent or incongruent with their political ideology, then give their intentions to participate in recycling in the future. The congruent appeals induced greater intentions to recycle (Kidwell et al., 2013) .

The same researchers in another component of their study exposed residents in Kentucky to similar appeals to engage in recycling that were either congruent or incongruent with their political ideology and then measured actual recycling behavior. Liberal households which heard MF appeals congruent with their ideology recycled 144% more than liberal houses that received incongruent appeals. Similarly, conservative

households that received appeals congruent with their ideology recycled 102% more than those that received incongruent appeals. Additionally, households that received incongruent appeals recycled less than the control group by 27.1% for liberals, and by 8.9% for conservatives (Kidwell et al., 2013). Based on this study, it seems as though these appeals resonate differently with different groups and thus are distinctly influential in inducing measurable, environmental behavior in ideologically distinct groups.

Researchers have successfully determined a set of MFs that appeal to individuals of different political ideologies (Graham et al., 2009). These appeals have been targeted to influence the behavior of individuals in these groups to behave more sustainably in simulated and real recycling.

Other environmental resource fields with dynamics like common pool fisheries have successfully operationalized MFT. This is exemplified by work about climate change norms (Jansson & Dorrepaal, 2015) and climate resource use. In a public goods game experiment, Ertör-Akyazi & Akçay (2021) had groups of participants decide on how much of a mineral resource to extract (between 0 and 20 units) knowing that the extraction of resources had an individual benefit to the participants and a negative collective externality on each member of the group by accelerating climate change. After ten rounds of the game the 20-item MF questionnaire (*Questionnaires | Moralfoundations.Org*, 2013) was used to assess the MFs of each participant. They found that extraction in the first round was positively correlated to authority and loyalty. They also found that over ten rounds of extraction, that extraction was positively related to loyalty and negatively correlated with the care MF. Scores for authority and loyalty of

those who took all the available resource and from those that took none were higher than for those that took some but not all.

While the basic observations of MFT are robust. Our ability to turn those observations into tools which can be used to influence persuade or create a bigger tent to rally efforts to improve the management of common pool resources like fisheries needs further investigation. Past efforts to change technology requirements in an attempt to manage fishers only led to more effort for the same number of fish and populations equally likely to collapse (Wilen, 2000).

Efforts need instead to help facilitate coordination using a common moral language among fishers about how best to manage these resources. In so much as communication in the open ocean outside of exclusive economic zones is difficult, a leviathan, an all-powerful enforcer (Hobbes, 1651), may also be necessary to help coordinate and deliver these messages, as discussed below.

Little work has been done to look at the effectiveness of MFs in encouraging sustainability in an intergenerational common pool resource. This research aims to do so.

Questions and Hypotheses

Q1: What are the effects of congruent and incongruent MF appeals on the sustainable fishing choices of people in a fishing simulation?

H1: Fishers exposed to congruent appeals will show a higher individual fishing efficiency (fewer fish taken relative to the sustainable take) than those shown incongruent appeals.

Q2: How do the moral foundations differ among people who choose to take all the fish, some of the fish, and none of the fish?

H2: Those that took all fish and those that took no fish will have higher measures for loyalty and authority MF than those that took some but not all.

Q3: Does the presence of a fisher engaging in unsustainable fishing (taker) influence the effect of targeted MF appeals to promote sustainable fishing behavior?

H3: Participants will show a decrease in individual efficiency when fishing alongside a taker fisher; this inefficiency is exacerbated by the effect of a properly targeted MF appeal.

Answering question 1.1 will help us understand the value of targeted appeals for encouraging sustainable action by influencing the intuition of participants in an intergenerational resource scenario. Increasing the fluency of individuals by tailoring the appeal is hypothesized here as having an impact in increasing individual fishing efficiency. This is supported by previous observations (Kidwell et al., 2013). Finding evidence that does not support the alternate hypothesis would challenge existing theory that congruent MF appeals lead to sustainable fishing behavior as a result of this increase in fluency (Ertör-Akyazi & Akçay, 2021; Kidwell et al., 2013).

In similar experiments, comparing those participants that at the end of the experiment took all a resource and those that took none, to those that took some but not all, has yielded observations that these two groups (all and none) are more likely to use authority and loyalty moral foundations when making moral justifications. Answering question 1.2 will add new context within which similar behaviors, taking all or none of a

resource, and associated MF affinity have been seen in resource experiments. The hypothesis here expects higher authority and loyalty scores for those that took all and for those that took none when each group is compared individually to the group of fishers that took some. Such differences between these groups were seen in the climate resource study by Ertör-Akyazi and Akçay (2021). If the observations found by Ertör-Akyazi and Akçay apply to this fishing simulation, this will help expand the conditions under which these observations about fishers that took all, or none are observed and support the idea that these observations are robust across a wider range of resource scenarios. If rejected, these observations would support the idea that these behaviors do not necessarily stem from differences in MFs.

Table 7: Experimental Design Table for Study 1.

	Independent Variables		Dependent Variable
Question 1.1	Appeal Congruence		Individual Efficiency
Question 1.2	Took **Some** But Not All Took **All** Fish or Took **None** of the Fish		
Question 1.3	Appeal Congruence	Sustainability of Fellow Fishers	

To explore question 1.3, both appeal congruence and the sustainability of co-fishers will be changed. This experiment will explore how the presence of a taker fisher among the other fishers will affect the fishing of participants and how a MF appeal may affect the size of that change. The hypothesis supports that adding a taker fisher will decrease participant IE, but the MF appeal will have a moderating effect on the change.

The value of fluency in the congruent appeal is explored in question 1.2 and justifies the moderating effect, but why would fishing alongside takers decrease IE?

There is consistent evidence that those engaged in economics experiments alongside what economists call shirkers (takers) – individuals engaged in resource take beyond their proportional allotment – are punished quickly by others operating alongside them. This occurs even at a cost to the non-shirker in order to maintain the public good (Bowles & Gintis, 2002). Despite this, free riding, taking more resources without penalty due to a failure in the market to correctly address this issue, tends to increase the likelihood of participants acting as free riders (Albanese & Van Fleet, 1985). Moral disengagement (Bandura, 2007) is an impediment to positive environmental change and speaks to some of this shirker behavior. This theory describes the mechanisms that individuals use when deciding not to act environmentally. These include social justification, exonerative comparisons, displacement of responsibility, minimizing detrimental effects, and dehumanization of others who feel the consequences of environmental harms. All of these bolster the ability of the fishers to justify taking more fish without cognitive dissonance (Bandura, 2007). Moral disengagement calls upon the same tools of righteousness as MFT. While these experiments are unable to identify the feelings of participants are toward shirkers or if their actions are as punishment of shirking, Chapter 4 will explore the ways in which participants are willing to describe the actions of shirkers using MF terminology.

The hypothesis for question 1.3 predicts that adding a taker fisher will result in more take from participants, but that it may be moderated by the MF appeal. Fluency

gains thanks to MF (Ertör-Akyazi & Akçay, 2021) may help reduce the infective nature of this taking behavior but it is predicted that takers should encourage more taking.

Materials and Methods

Participants

Participants (n=306) were recruited from Amazon Mechanical Turk (AMT) an online tool which allows users to enlist the participation of willing respondents who choose to be part of the study based on a short description of the task. Amazon Mechanical Turk participants generally show similar psychological characteristics which motivate their ideological (conservative/ liberal) distinctions. Conservatives sampled by AMT are largely identical to conservatives sampled from the general US population when considering personality traits and values. Similarly, liberals sampled using AMT are also very similar to liberals from the US population but for slightly increased extraversion and holding characteristically political attitudes and liberal values (Clifford, Jewell, et al., 2015).

The study took place between October 25, 2020, and January 27, 2021. Participants were required to be over the age of 18. The entire survey experience took on average 28 minutes to complete. The study was approved by George Mason Universities Office of Research Integrity and Assurance (Appendix I). Consent was gained from each participant prior to participation (Appendix B).

Efforts were made in the following descriptive metrics to compare the sample of this study to the US adult population. The total sample of respondents identified as consisting of nearly twice as many males as females (Figure 5). Estimates of sex

distribution in 2019 in the US were 50.5 Female and 49.5 Male with less than 1% in other

sex categories (*World Bank Group - International Development, Poverty, &*

Sustainability, 2020). The average age of AMT identified liberals and conservatives was

nearly identical, 37 years old (Figure 6) and younger than the median age of Americans

18 years and older, 50 years (Gramlich, 2020).
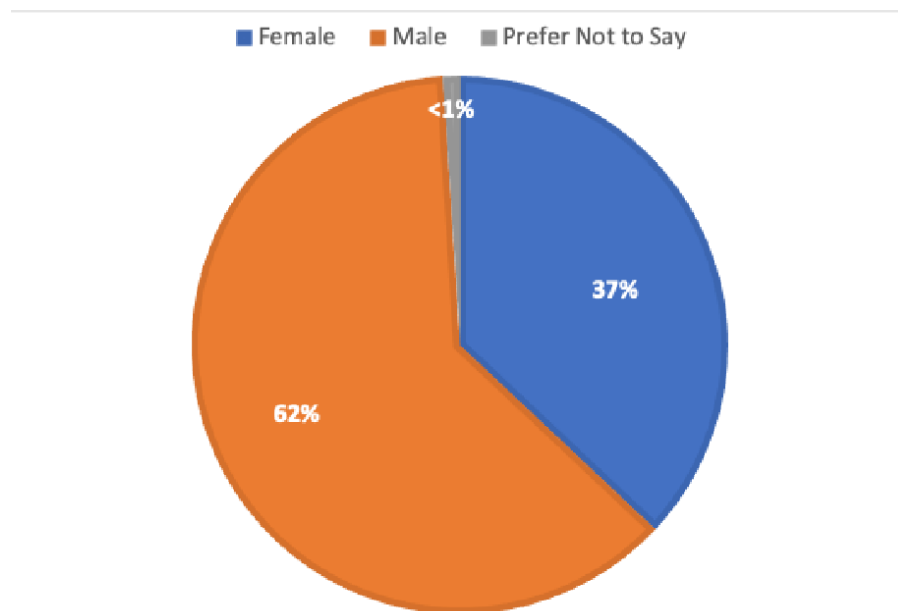
Figure 5: The percentages of respondents as they self-identified their sex.
US estimates of sex distribution are 50.5 female and 49.5% male.
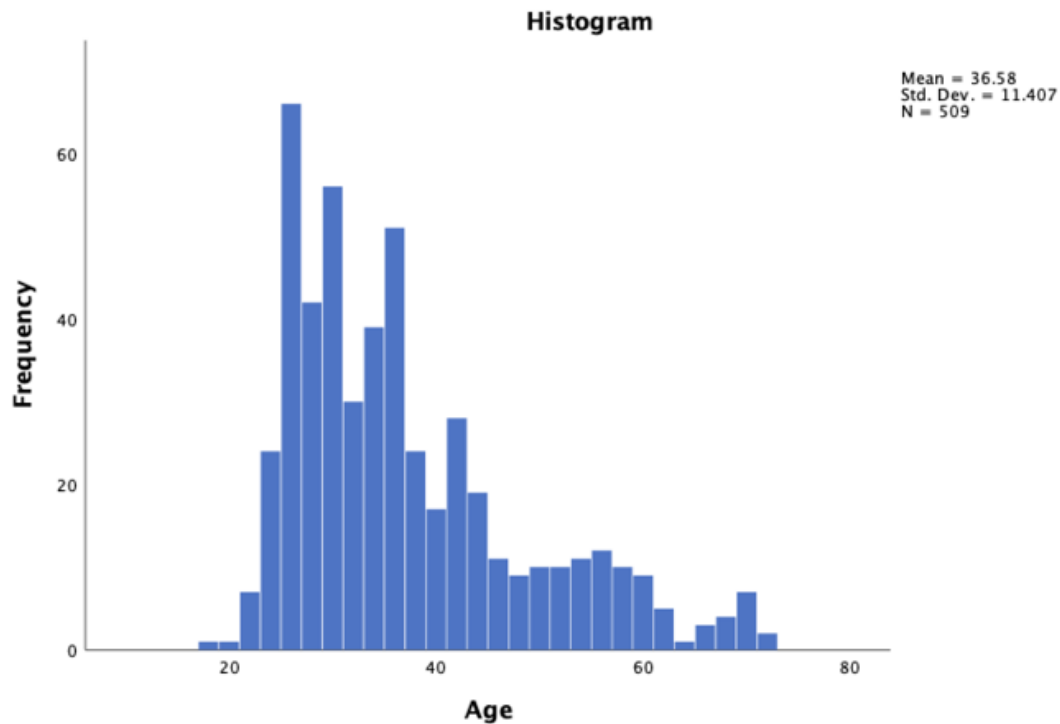
Figure 6: The Distribution of Ages of Participants in the Survey

Generally, the sample reflected the political make-up of the country. Liberals accounted for two percentage points more and conservatives two percentage points less than the nation when compared to recent surveys of US population by Gallop which place the number of conservatives at 41% and liberals at 59% excluding other ideologies (Saad, 2021). As a check of the ideology identified in the samples of respondents supplied by AMT, and to gain a more granular picture of the participants, each participant was asked to place themselves on a 7-point political scale from "very conservative" to "very liberal" (Figure 7). Omitting those not identifying as liberal or conservative, as they were not the subject of the questions in this study, the overall distribution of liberals and conservatives

in this study were 61% and 39% respectively which also matches well with previous estimate.
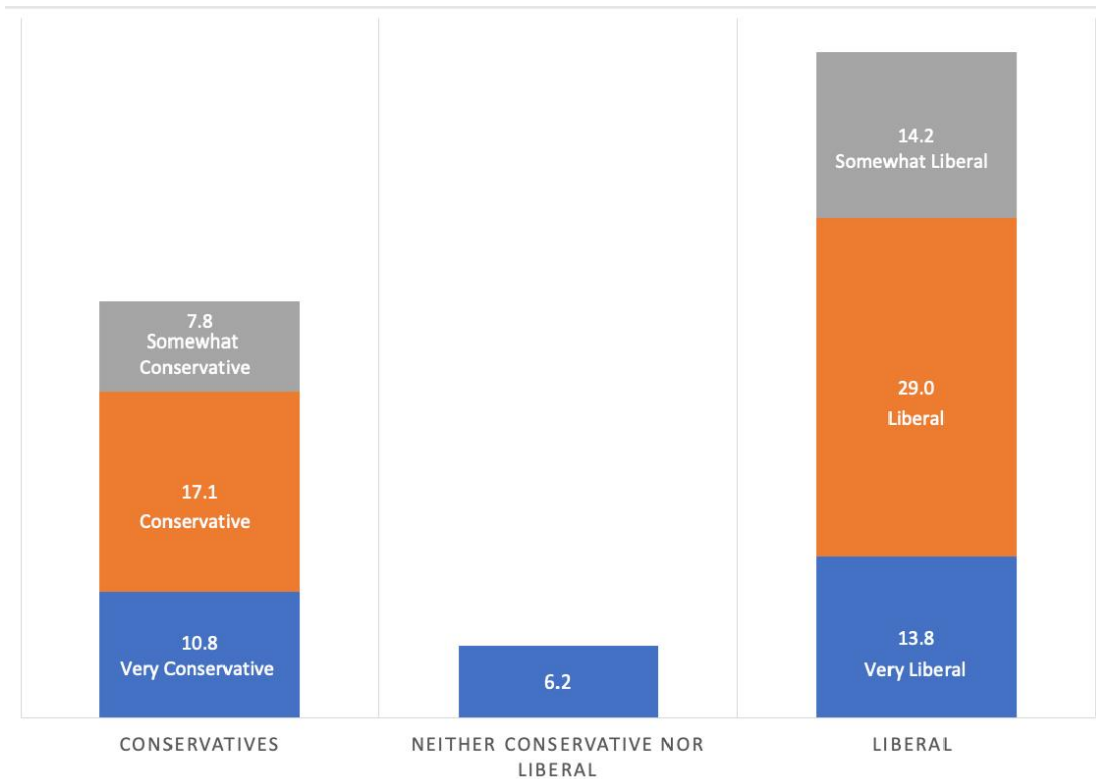
Figure 7: Percentages of Respondents As They Self-identified Across 3 Levels of Conservative, Liberal or Neither Conservative nor Liberal. A Gallop poll places estimates of conservatives at 41% and liberals at 59% of those that identify as conservative or liberal (Saad, 2021).

In summary, the sample in this study is younger than the electorate, by 13 years, and 13 percentage points more male than the electorate, however, the political ideologies, excluding those that don't self-describe as liberals or conservatives, is consistent with the US population.

Experimental Design and Procedures Questions 1.1 and 1.2

Participation in this experiment involved a survey experience and computer-based fishing simulation (Table 5). Participants watched a short video explaining how the game functions and what they should expect when they begin. Some of the details provided to participants include the fact that the fish were left to them by a previous group of fishers, that they will participate in 1-10 seasons, and that the fish population will double at the conclusion of each season. Additionally, participants were reminded that "overfishing occurs when more fish are taken than can be created by fish reproduction causing the fish population to shrink over time. This fishery can be harvested at a sustainable level, but it is known that this fishery is vulnerable to overfishing." (Appendix C) Before the video ended, participants experienced a MF appeal. The appeal was displayed on the screen and participants were read the appeal aloud by the video narrator to help them consider the number of fish they wished to take. Appeals were created by writing a generalized appeal which made it clear that the fishery could be overfished causing decline in the fishery (Appendix C) which were supplemented with a MF terms which use words that appeal to care and fairness (individualizing) or loyalty, authority, and sanctity (binding) (Wolsko et al., 2016) (Table 8). Separate groups of predetermined conservatives and liberals were shown these nearly identical appeals. This part of the experiment is a 2 x 2 design where political ideology is an observed variable, and the MF appeal is controlled in this experiment (Figure 8).

Table 8: Moral Foundation Appeals for Binding and Individualizing Appeal. Each appeal was created by using the MFs of the appropriate group as determined by Graham (2009) and by avoiding the MFs of the alternate appeal. Appeal A contains MF terms congruent with conservatives while appeal b is congruent with liberals.

Appeal A:

The Binding Appeal

"As you think about how you will go about fishing, it is important that you consider our patriotic tradition of valuing our natural resources' positive impact on our nation's future prosperity. It is important that you lawfully obey the guidance on overfishing, and that you abstain from overfishing. Waste of communal resources is disgusting. Taking more than can be sustained is a betrayal of innocent people who depend on that resource. Already caught, unused fish would be dumped into the ocean, dirtying the local waters. We must work together to respect the purity of these renewable resources."

Pink- Loyalty
Grey- Authority
Burgundy- Sanctity

Appeal B:

The Individualizing Appeal

"As you think about how you will go about fishing, it is important to be sympathetic and equitable as you preserve the value of this resource that is important to providing the balance necessary for future prosperity. It is important that you not abandon the just guidance on overfishing, and that you are reasonable in your fishing actions. Destruction of these resources is unfair. Taking more than can be sustained is detrimental to others who depend on that resource. Already caught, unused fish would be dumped into the ocean impairing the local waters. We must work compassionately to prevent unjust harm to these renewable resources."

Yellow- Care
Red- Fairness

Figure 8: Experimental Design Diagram for Question One.

The common pool resource game created a scenario in which the participant was made to think they were participating with 3 other fishermen when in fact they were fishing with 3 computer simulated fishers (bots) (Appendix C). The game was designed by Robert Gifford and programed by Jorge Aranda (Appendix G) (2013). All fishers were told they were fishing with three others and that the fish in the fishery now are those that were left after the previous group was finished with the game. The other fishers were all computer-generated bots and the number of fish to start the simulation is always 100. The bots were programmed to fish at a sustainable level taking fish such that if all bots and participants fished the same way they would take 40% of the fish on average.

After participating in the game, participants answered a series of 30 questions which determined the moral foundations upon which they rely when forming moral justifications (Questionnaires | Moralfoundations.Org, 2013) as well as demographic questions and one question confirming their political ideology.

Data collected included the total number of fish taken in the round, and individual efficiency (IE) or the number of fish taken relative to the sustainable take. Data was collected on the fishing patterns of the participants as they used the fishing simulation.

$$IE = R_! \frac{(\#)\%(\&)}{\#}$$

Individual efficiency was calculated using reproductive rate R_0 (the rate of fish harvested, (N), and sustainable take (the maximum number that all fishers could take and

still ensure replacement of the fish before the next round started. Individual Efficiency is calculated as the difference of the sustainable take (S), and the number of fish harvested (N), divided by the sustainable take (S=12.5), times the rate of reproduction (R_0=2) (Sussman et al., 2016)

A one-way ANOVA on rankings of data, also called a Kruskal–Wallis test, was done to determine if there is any difference in the distribution of ranks of IE for each of the groups of participants in each of the 4 combinations of ideology and MF appeal. The null hypothesis is that there are no difference in the distributions of the data while the alternate hypothesis is that the distributions of the data are different.

Experimental Design and Procedures Question 1.2

Question 1.2 involves an analysis of data from the participants in the same experiment. After data on IE and MFs had been gathered, an analysis was done using a non-parametric independent samples T-test to see if there is a statistically significant difference in the distribution of MF scores for individuals who took all the fish as compared to those that took some but not all. Also, the group that took no fish was also compared to those that took some but not all.

An independent samples T-test was used again to determine if there were statistically significantly difference between the comprehension quiz scores of individuals who took all the fish as compared to those that took some but not all. Finally, an independent samples T-test was used to compare the MFs of fishers who took all, none or some of the fish and a *post hoc* Tukey HSD test was be used to confirm which, if any, of the MFs are stronger among those that took all or none of the fish. The null hypothesis

of the t-test is that there is no difference between the MFs of these groups and the

alternate hypothesis is that there is a difference with confirmation using the Tukey HSD

as to where the difference exists and in which direction.

Experimental Design and Procedures Question 1.3

To determine the effect of an unsustainable fisher on the ability of the same MF

appeal from Chapter 3 to influence the fishing of participants, one half of participants

fished alongside one unsustainable (taker) fisher and two sustainable fishers (stewards).

The other half of participants participated alongside only stewards (Figure 9, Table 7).

Each of the computer-controlled fishers (bots) were preprogrammed to a

particular level of fish harvest. This setting represents the percentage of fish that fishers

as a group, acting in the same way, would take on average. In the group of fishers who

acted in a sustainable manner (stewards) fishers were programmed to take on average

40% of the fish. The other half of participants fished alongside one unsustainable fisher

(taker) who was programmed to take more than can be sustained over multiple seasons

indefinitely and who on would, if fishing alongside three likeminded fishers, take 100%

of the fish in one season. In addition to the taker, these participants fished with two others

that are on average the same as the bots in in the sustainable simulation (39 and 41%)

(stewards). These values were selected for steward fishers so that each of the bots fished

in a unique way and the same on average to the three stewards in group one.

Data analysis for this study began with an independent samples Kolmogorov-

Smirnov test with alpha of 0.05 and *post hoc* Tukey HSD test. Observations from this test

were then confirmed by using a Quade's ANCOVA (*Laerd Statistics Premium*

Homepage, 2021).. Both the Kolmogorov-Smirnov test and Quade's ANCOVA are used with non-parametric data that is not normally distributed, like the IE values in this experiment. The Quade's ANCOVA utilized the three factors of MF appeal, ideology and the sustainability of co-fishers to determine if any of these in any combination, had a statistically significant impact on the mean IE of participants.
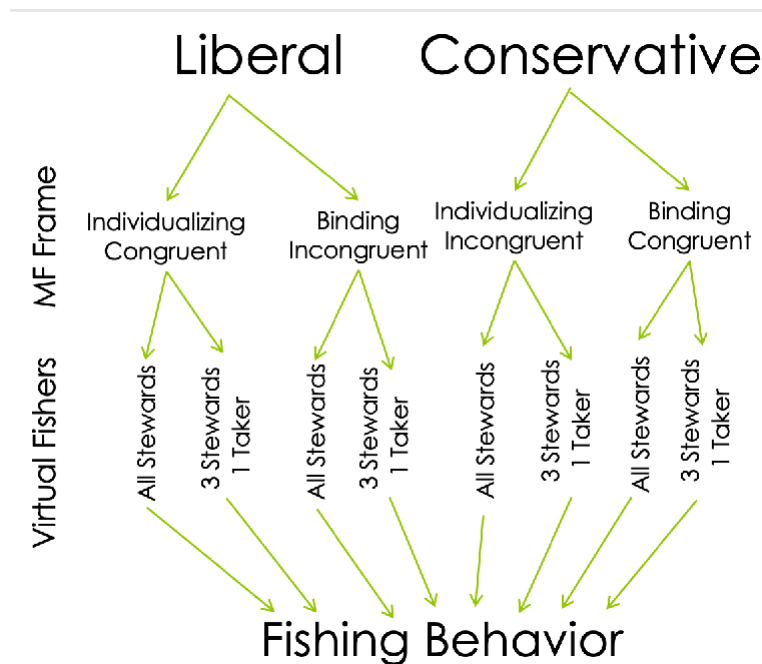
Figure 9: Experimental design Diagram For Effect of MF Frame (Binding/ Individualizing) and Fisher Sustainability (Steward/ Taker) on Fishing Behavior

Results

Fishing Behavior

The average number of fish taken during the simulation by all human fishers was 27 out of 100 catchable fish in the simulated ocean. Participants, who in combination with bots, extracted all the fish (all), and participants that took no fish (none) represented

21% and 10% of the participants, respectively. Due to the tendency of these participants

to take all or no fish, the number of fish taken, and subsequent individual efficiency,

showed a non-normal, bimodal distribution (Figure 10).
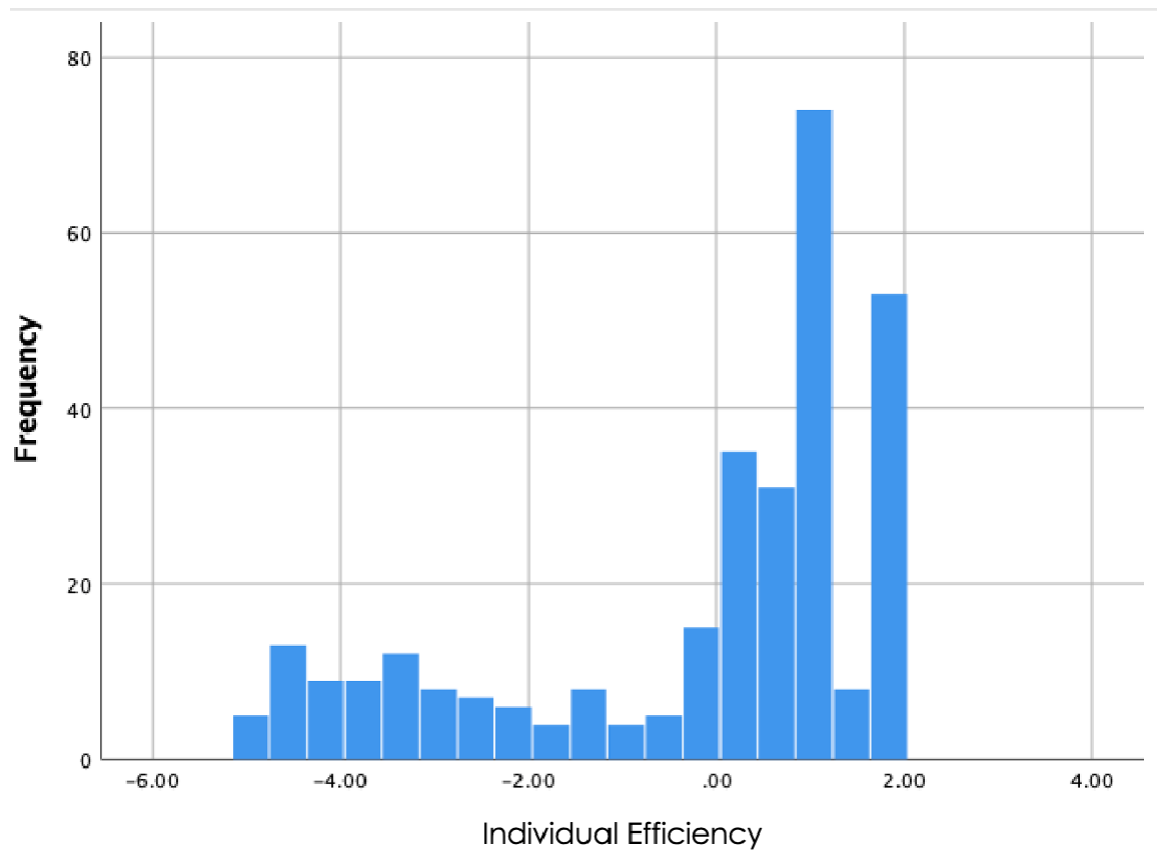
Figure 10: Histogram of Individual Efficiency of Fish Harvests of the 306 Participants

What are the effects of congruent and incongruent MF appeals on the sustainable

fishing choices of people in a fishing simulation?

Results of the 30-question Moral Foundation Survey (MF30) (Graham et al.,

2011) give a score from 1 to 6 (from very unlikely to very likely) for each of the indicator

questions. Six questions were used for each of the five MFs and total scores were

tabulated. Table 9 presents the average for each of the MFs, along with the averages for

each of the MFs as measured by Graham et al. (2011) for comparison. For example, totals

for each study are given in column 3 "Study Total" while totals for liberals and

conservatives for each study are found in columns 4 and 5.

Table 9: MF Scores for Graham et al. (2011) and This Study, Study Totals, Liberals, and Conservatives, (Graham- Gray Rows, Column 3, n=34,476) (This Study-White Rows Columns 3, n=514). Data Shows Averages of Liberals and Conservatives For Each MF from Graham et al. for Liberals and Conservatives (Gray Rows, Column 3, 4, n=21,933 and 41,28) and For All Liberals and Conservative Participants From This Study (White Rows, Columns 4, 5, n=244, n=266) Numbers After Values For Columns 3-5 Indicate Rankings Among Their Respective Study From High to Low. Note: Range For All Items and Subscales Is 0-5. *Significant at p<0.05, ***Significant at p<0.0001. Alpha Values for Graham et al. Are Not Available for Liberal and Conservative Models However, a Model Which Included Moderates and Libertarians Provided Alpha Values For Each MF Ranging From 0.65 and 0.84.

Foundation	Source	Study Total	Liberals	Conservatives	Difference Between Liberals and Conservatives
Sanctity	Graham et al.	1.56 – 5	1.27 – 5	2.89 – 5	
	This Study	2.99 – 5	2.58 – 5	3.36 – 4	-0.78***
Loyalty	Graham et al.	2.26 – 4	2.07 – 3	3.08 – 2	
	This Study	3.09 – 4	2.75 – 4	3.41 – 4	-0.66***
Authority	Graham et al.	2.27 – 3	2.06 – 4	3.28 –1	
	This Study	3.17 – 3	2.83 – 3	3.48 – 3	-0.65***
Care	Graham et al.	3.42 – 2	3.62 – 2	2.98 – 4	
	This Study	3.69 – 2/1	3.78 – 2	3.61 – 1	0.17*
Fairness	Graham et al.	3.55 – 1	3.74 – 1	3.02 – 3	
	This Study	3.69 – 2/1	3.82 – 1	3.58 – 2	0.24***

The data in this study were generally consistent with Graham (2011). Liberals

showed a greater reliance on fairness and care when compared with the other three

foundations and with a smaller difference between liberal and conservatives for the other

three (Table 9). Additionally, the ranking of MFs among liberals and study totals are nearly identical. In both the Graham study and this one, sanctity was the least commonly used MF, loyalty second least, and authority third. The data gathered in this study do not, however, exactly mimic the trends shows in Graham.

When conservatives and liberals were exposed to appeals designed to appeal to the individualizing moral foundations of liberals or of the binding moral foundations that appeal to conservatives, but not liberals, (Question 1.1) there was no significant difference between the IE of participants. Furthermore, there was no difference in the mean for IE among any of the groups compared (Table 10, Figure 11).

Table 10: Results of Kruskal Wallis Test Comparing Fishing of Liberals and Conservatives Exposed to Congruent and Incongruent Appeals – No Significant Difference Between Measures of IE Among Any Combinations of Appeal, Ideology nor Bot Sustainability (Significant at p<0.05) – Last Two Columns Show p-values, For Each Combination

Ideology Appeal/ Congruency	Ideology Appeal/ Congruency	Sustainability of Bots	AMT Ideology Sig.	Survey Ideology Sig.
Conservative Binding/ Congruent	Conservative Individualizing/ Incongruent	Stewards	0.204	0.904
Liberal Individualizing/ Congruent	Liberal Binding/ Incongruent	Stewards	0.320	0.786
Liberal Individualizing/ Congruent	Conservative Binding/ Congruent	Stewards	0.791	0.261
Conservative Individualizing/ Incongruent	Liberal Binding/ Incongruent	Stewards	0.631	0.211
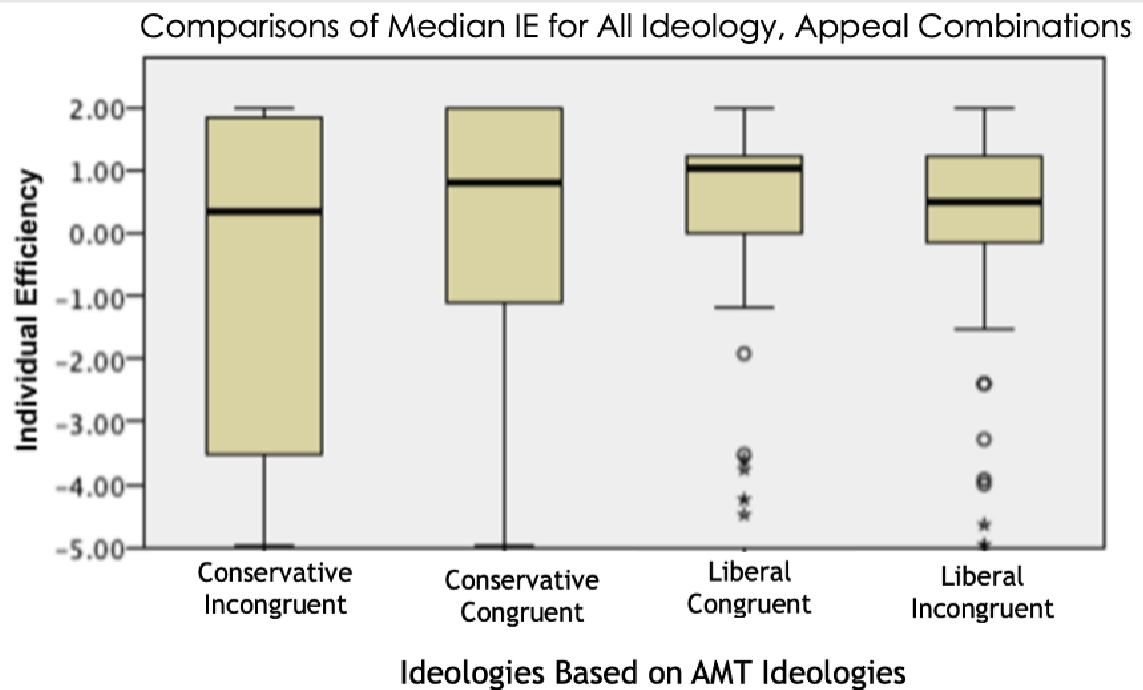
Figure 11: Box and whisker plot for the 4 experimental groups.

When comparing all combinations of ideology and appeal, there was no significant difference in the median individual efficiency shown by fishers. This was true when grouping participants using either the ideologies supplied by AMT, or the ideologies supplied by participants during the surveys (Figure 11). While not different in mean, it is worth note that the distributions are significantly different with a wider range of efficiency in both conservative groups. There was wider range of IE among conservatives than among liberals receiving either appeal. The significance of the difference in the distributions of the ranges between liberals and conservatives was confirmed by the independent samples Kolmogorov-Smirnov test (p=0.033).

In summary, binding and individualizing appeals show no significant effectiveness in changing the fishing behavior of participants in the simulation, regardless

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of the respondent's dominant political ideology. Still, the distribution of the IE for conservatives was significantly wider than that for liberal respondents.

How do the moral foundations differ among people who choose to take all the fish, some of the fish, and none of the fish?

Conservatives were nearly four times as likely to end their fishing with an empty pond. Similarly, they were three times as likely to have taken no fish at all (Figure 11). Despite this, the average number of fish taken by conservatives was not significantly different from the number taken by liberals when considering AMT supplied ideologies, survey ideologies (conservative vs. liberal) or ideologies established by groupings of only the most liberal ("very liberal" and "liberal") and most conservative ("very conservative" and "conservative") as determined by survey responses.
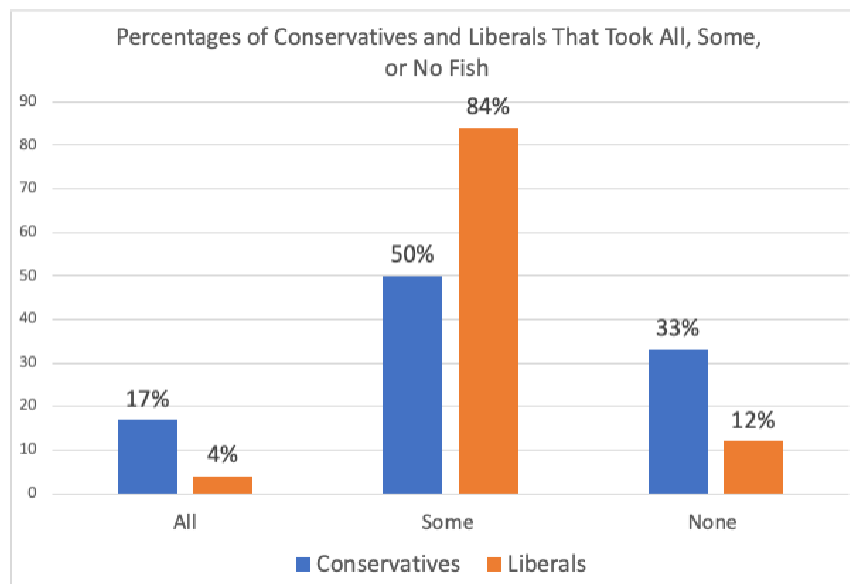
Figure 12: Frequency With Which Conservatives/ Liberals Took All of the Fish, Some of the Fish and None of the Fish

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Of the 306 participants, 8% were conservative and took no fish. Three times that number were conservatives and took some but not all, while 15% took none. Of that same group of fishers, 2% were liberals that took none, 44% were liberals that took some but not all, and 6% were liberals that took none. Prior to exploring the effect of the MF appeal, an exploration of engagement by way of exploring participant comprehension of the task revealed: Nearly 31% of fishers took all or no fish. Among these groups (some, all, none) there was also a difference in understanding the task. Five comprehension questions were asked of all respondents. The correct answers to the questions were provided to the participants afterwards to help clarify any misconceptions and reinforce understanding. Comprehension comparisons of those that took all fish and those that took no fish showed no significant difference. Both were significantly lower than those that took some when compared (Table 11). There were no comprehension differences observed between conservatives and liberals despite the outsized number of conservatives that took all or none of the fish.

Table 11: Independent Samples T-test Comparing Comprehension Quiz Scores (0-5) of "Some", "None" and "All" Fishers -Test Shows Significantly Lower Comprehension Scores For Fishers Taking All or None of the Fish When Compared to the Group That Took Some But Not All (**Significant at p<0.01)

Comprehension Quiz Score	Mean Difference vs. Took Some
Took None	-0.80**
Took All	-0.36**

Moral Foundation Strengths of Participants

Given the context above, the following analysis provides insights as to the differences between the MFs of those that took all, some and none. The analysis of moral foundations and fishing behavior was conducted to see if the moral foundation scores of participants differed in relation to the way participants fished.

Table 12: Results of the Tukey HSD Test Shows Significantly Higher Values in Scores For 3 of the MFs When Those That Took All fish, and Those Taking No Fish Compared To Those That Took Some But Not All. (**Significant at p< 0.001) For Loyalty, Authority and Sanctity.

Moral Foundation	Groups compared to those that took **some**	Mean Difference	F-Stat
Loyalty	None	6.41**	25.583
	All	6.12**	
Authority	None	5.19**	16.054
	All	4.90**	
Sanctity	None	7.93**	24.524
	All	7.17**	

An independent samples T-test was used to compare the MFs of fishers who took all, none or some of the fish. A *post hoc* Tukey HSD test confirmed that those that took all and those that took none had a significantly higher score for loyalty, authority and sanctity than those that took some fish but not all (Table 12). This finding is consistent with findings of Ertör-Akyazi & Akçay (2021) who found that loyalty and authority were higher among these groups. This study adds sanctity to that finding.

Does the presence of a fisher engaging in unsustainable fishing (taker) influence the effect of targeted MF appeals to promote sustainable fishing behavior?

Samples sizes for each of the combinations of survey ideology, MF appeal and bot sustainability ranged from 36-84 for each of the eight treatment groups (Figure 9). Comparing all eight combinations of ideology, appeal and bot sustainability showed no changes in effect, in terms of IE, just as in the study where all bot fishers were sustainable (Question 1.1). In each case, no difference was seen between any combination of ideology, fish sustainability and appeal (Table 9, Figure 13). Using the ideologies supplied by Mechanical Turk and the ideologies supplied by the respondents in the survey did not make a difference to the outcome in either direction.

Based on confirmation from a Quade's non-parametric ANCOVA no significant differences in fishing behavior were observed when considering all variables, (appeal, ideology and co-fisher sustainability) in concert with one another (Figure 13).

Comparisons of Median IE for All Ideology, Appeal Fisher Sustainability Combinations
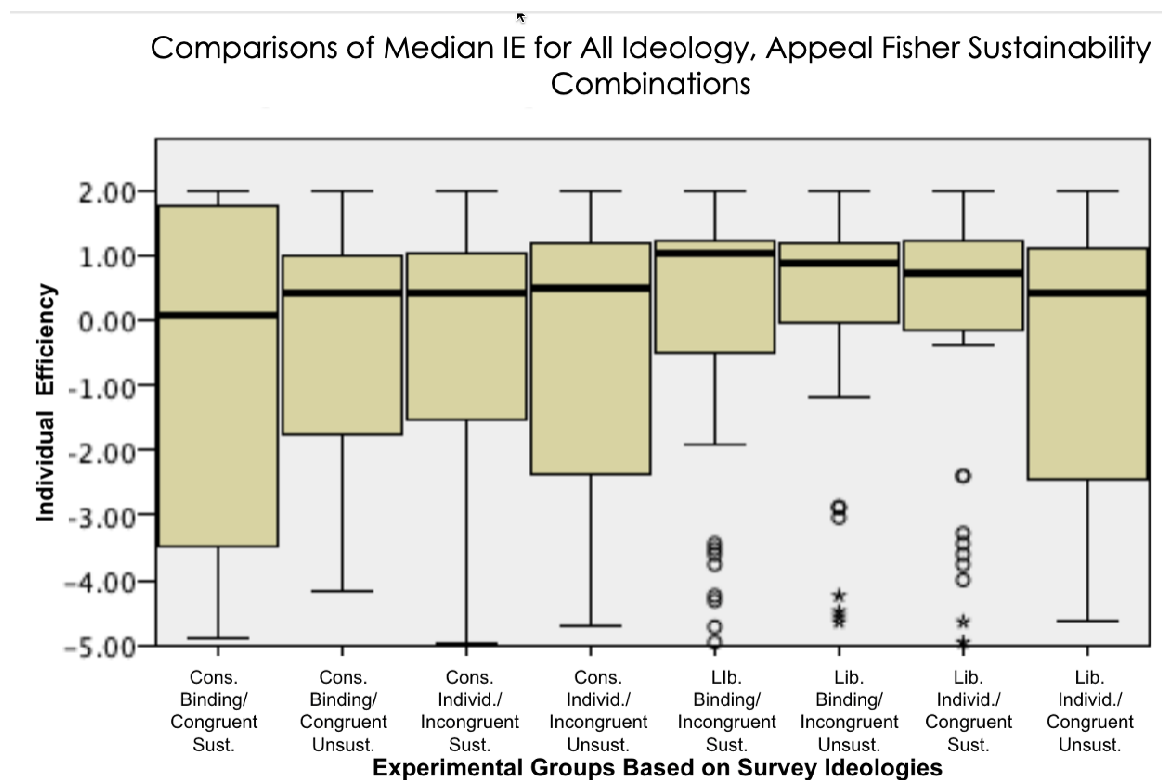
Figure 13: Box and Whisker Plots of individual Efficiency for Each Experimental Group Based on Survey Ideologies.

Discussion

General Discussion

There are several potential reasons why other studies may have been able to successfully use MF to encourage sustainable resource use whereas this study did not. These fall into three main categories: methodological, theoretical and phenomenological. Methodological reasons include weak appeals, and inappropriate methods of fish accounting, frequency of and clarity of appeal messages; while theoretical reasons include trust of the message provided. Finally, the phenomenological reasons surround

the presence of the difference between liberals and conservatives in the first place. Each of these will be considered in turn, below.

Methodological Improvements

Appeal Strength: Jonathan Haidt (Haidt, 2013a) speaks of the automatic moral processes that humans engage in as their moral psychological elephant. The elephant (moral intuition) is difficult to convince to go in another direction. The rider (moral justifications made through reason) is not a guide for the elephant but rather explains where the elephant went and why it went there. While it is not impossible for outside influences to affect the elephant's direction, the rider has little say in these decisions (Haidt, 2006). Using appeals to convince others to make more environmental choices is an attempt to use outside influences, to move the elephant.

It is possible that the MF appeals were not differently motivating for conservatives and liberals because they were not strong enough to influence moral intuitions of either group. In their study, Clifford and colleagues used different strengths of moral foundation-based appeals (Clifford, Iyengar, et al., 2015) and found positively correlated effects when words with greater scores were used. Subsequent efforts have been made by researchers to improve upon the moral foundation dictionary but even those that developed these tools admit that, in terms of effect size, the improved versions are "measurably better but by no means knocking it out of the park." (Frimer, 2019). The relatively small effect size of each MF term makes the impact of appeals of this type potentially marginal.

A catalog of the strength of each term's impact on those who identify with each MF might also be helpful. It would help to better tailor not only stronger but more effective, clearer messaging. Better MF dictionaries can be helpful in writing appeals. Efforts to expand the dictionary have shown little improvement of average psychometric scoring for terms. Dictionary expansion efforts have increased the variety of terms associated with each MF, which may make for more flexibility in writing appeals (Frimer, 2019). Using these tools to build stronger appeals based on scored appeals may help improve the response of the appeals in this study.

Method of Accounting For Fishing: Individual efficiency was used throughout the experiment to record fishing behavior but perhaps this is not how individuals think about resource use. The cognitive bias of loss aversion (Kahneman, 2011) might help to explain this tendency. We tend not to worry about what we have acquired but focus instead on the lost opportunity of getting more. Escapement, or the number of fish that avoid capture, was not used in this study, but it seems possible that participants watched the number of fish remaining in the ocean more closely than the number of fish they or the other fishers took. Escapement might be a better indication of the effect of appeals than individual efficiency. This could be calculated easily from the data and used for comparison.

Refinements of Effective Communication: Observations in the communications literature consistently point to the importance of the frequency of a message, clarity of that message, and trust of that message (Maibach, 2019). The criticisms which follow come from an understanding of that theory.

Research Questions 1 and 3, which compare the experimental groups across this study, showed no significant differences (Figure15). The appeal was not repeated, relatively brief, and without clear examples of what sustainable fishing looked like, may have been unclear and finally may not have been thought trustworthy. What follows will discuss criticism and potential solutions to each of the insights.

Appeal Frequency: Ertör-Akyazi, and Akçay (2021) did a similar experiment to the ones in this study. They simulated natural resource extraction in a 10-round public goods game framed as extraction of a non-renewable mineral with negative effects on climate change. Their observation of a bimodal distribution in the first round is consistent with first round extraction results observed in this study (Figure 9) as was the impact of authority and loyalty on lower initial extraction. The bimodal distribution of take in this experiment may in fact be protest bids which have been seen in willingness to pay experiments where the participant refuses to pay or pays far more for a good for ethical or other reasons (Halstead et al., 1992).What was not supported was the effect Ertör-Akyazi, and Akçay saw of the tailored MF appeals. The protest bids were not found in subsequent seasons and the effects of the MF appeals became clear.

Improvements made to increase the number of times participants saw the appeal or number of rounds, each with its new appeal would help to increase the participants exposure to the appeals. Additionally, as respondents may have been quickly catching fish to end the simulation, making it clear how many seasons of fishing would occur and exactly how long each would take may prevent this behavior.

Appeal Clarity: There are indications within the data of a lack of clarity of some participants of the task. Evidence of this includes the rate at which participants correctly answered the questions confirming understanding of the activity (Table 11). While there was no difference in score for those that took all and none of the fish, when these groups were compared to those that took some, but not all significantly different and lower scores were seen on comprehension scores. This points to the idea that their behavior may have been more influenced by a misunderstanding of the task than a true consideration of the factors involved.

Related to the issue of clarity is salience of the message. Saliency of the activity may also be low, causing a lack of engagement in the task. Often one measure of saliency is response rate which can indicates saliency at a task or question level ("Saliency," 2008). Indications in this experiment point to the fact that the survey seemed to have good salience. A 61% response rate and MF30 scores consistent with previous studies, support that these parts of the survey were taken seriously. Perhaps though the fishing simulation did not command the same level of engagement, as evidenced by all or nothing fishing behavior.

Increasing the salience of the activity by engaging real fishers in real fishing activities would also improve the salience of the activity which will potentially reduce the taking of all or no fish and increase response rates ("Saliency," 2008).

Adding a mechanism that would increase the investment of participants would also improve participation and may decrease high and low protest bids. One method to do this may be to include incentives for sustainable behavior. There were no incentives to

act sustainably in this experiment aside from a desire to do what had been advocated for in the appeal (Tan & Bolle, 2007). It is quite possible that an appeal once read is simply not a strong enough intervention to induce sustainable action. It is also possible that perhaps these incentives were enough for some but not most participants. One way to improve this would be to donate a small amount of money for each fish left in the population at the end of the game and inform participants that this would occur. This may provide increased incentive for participants to engage more fully. That said, the application to real world fisheries is more difficult as it necessitates the proper incentive, social norms, or economic in the proper context to be successful (Lubchenco et al., 2016).

Theoretical Improvements

Trust, an important component to effective communication as discussed above,

Appeal **Trust:** Research has shown that trust in communication can be engendered when individuals are seen as knowledgeable about the message they are giving, competent to deliver the message and motivated to help the listener (Pearce, 1974). To improve trust in future experiments, special efforts in the appeal can be made to show that the appeal is coming from a knowledgeable, competent person perhaps by signaling training in fisheries of the person delivering the message. Strength of the MF appeal as described above or an automatic small reward may create a sense that the person delivering the message is there to help and engender trust.

Phenomenological Observations

Another possible methodological reason there was no significant difference observed is that there was not one and that despite an effective appeal, there truly is no difference in the behavior.

Conclusion

Fisheries collapse is a morally significant problem as fish represents an important source of protein for so many and disproportionately so in the global south (*FAO - News Article*, 2014). Political ideology plays a large role in political negotiations and is understood as a social and political construct. This exploration attempted to determine the utility of ideology in combination with moral foundations as ideas to create more effective sustainability appeals. This study differed significantly from most previous studies because of the action necessitated in this experiment was not a measure of attitudes, planned action, or of donations to a cause. This study looked at actual behavior in a fisheries simulation.

Observations about liberals and conservatives and their respective MFs followed expected measures. Those that took all or none of the fish made up a relatively large segment of both liberals and conservatives. One likely explanation for this is moral disengagement, the tendency for individuals to abdicate personal responsibility to "self-sanction" and make "exonerative comparisons that render the practices righteous" (Bandura, 2007). From the perspective of the fishing game, one could explain taking all fish as an abdication of responsibility to act sustainably and continue the existence of the resource for themselves or for future fishers in the simulation. But it could also be seen as

taking fish to continue one's hypothetical family is an acceptance of responsibility. The moral priming established one story, but it is not the only moral conclusion that one might arrive at making the rationale of participants' decisions less clear. Fishers may have been confused as well (Table 11). Finally, rationales are further muddied as these are choices in a simulation not a real fishery.

An answer to the primary question investigating about the effect of tailored moral foundational appeals was ambiguous. There were several potential methodological and theoretical reasons discussed above that may help to explain a lack of clear observations and that deserve further exploration in further research. First, further study could look at the impact on repeated MF appeals. Second, steps can be made to insure the participant clarity of the task. Third, appeals which focus on the most effective MF terms might also help to show positive effects on IE by engendering trust in participants. All these steps would be necessary to further support the idea that the effects of these appeals are small.

While the observations of MFT and its connections to political ideology are robust, the usefulness of these observations as appeals which change the behavior of others seems ineffective. Observations of individuals driven to take all or none of a resource in this experiment necessitate an additional exploration of engagement, saliency and appeal strength which in ways addressed above.

Successful management of fisheries necessitates effective communication. Moral foundation appeals alone were not enough to cause significant change in this study; results were inconclusive . The social intuitionist model explains that morality "binds and blinds." MFT expects that more than a one-time verbal or written stimulus might be

necessary for MF appeals to be effective. Stronger, more repetitive and trusted appeals may be necessary to create this effect.

In this investigation of the use of MF appeals to influence the simulated fishing take of participants showed no effect. These observations are not in keeping with previous observations of similar common pool resource experiments. The difference in the MFs of liberals and conservatives were evident in this study but are relatively small. To use these differences to appeal for sustainability a full exploration of future potential studies will be necessary to enhance the signal which was not evident in chapter 4 these experiments. While liberals and conservatives are different in the MFs that they used to make moral justifications, they are all capable of responding to terms from all moral foundations and, though not confirmed here, still show some hope for these as useful tools.

CHAPTER 4: CHARACTERIZATION OF UNSUSTAINABLE FISHERS IN COMMON POOL FISHING SIMULATION

Abstract

Stewardship of our collective resources is a moral responsibility. Effective common pool resource (CPR) management requires effective communications which establish the ground rules for effective conflict resolution, individual participation, collective decision making, and sanction creation and delivery (Ostrom, 1990). In a CPR fishing simulation participants fished alongside two sustainable and one taker fisher. After completion of the simulation, survey participants were asked how likely they were to use words from a list of terms linked to each of the MFs. This was to see if conservatives and liberals would be equally likely to use the terms associated with each MF or if they would favor some MF terms similar to previous observations (Graham et al., 2011). While difference did exist and mostly followed predictions, the differences were small, and observations were not practical to use to create an improved communications strategy.

Introduction

Successful Common Pool Resource Management

In 1977, following the work of Garrett Hardin, Ostrom and her husband defined a CPR as any in which exclusion is "infeasible" but that the use of the resource bears a cost on the collective users in that some fixed portion of the good by the users (V. Ostrom & E. Ostrom, 1977). Ostrom realized that the current models of understanding assumed a rational actor which was not in fact the case (Ostrom, 2009). Ostrom worked at the

problem looking for guidance in the examples of where CPRs have been well managed.

E. Ostrom's task was finding out why some commons emerged to govern themselves in a sustainable way. She was able to find examples of where CPR were managed effectively and organized the ideas that made them effective. Ostrom distilled a series of characteristics consistent with a well-managed common pool resource including communication mechanisms for conflict resolution (Table 14). Part of the solution consistently found among successfully managed CPR is communication. Cheap talk, communication even when it does not bear directly on the task at hand, improves cooperation in the common pool task (Chakraborty & Harbaugh, 2010). Not so cheap talk, talk that creates cohesiveness, has been shown to create a greater sense of solidarity and have a positive effect on sustainability (Lopez & Villamayor-Tomas, 2017). The effect of CPR resource use without communication results in outcomes predicted by non-cooperative game theory, but given the chance, groups will collectively create rules and impose sanctions. These observations provide opportunity and underscore what Ostrom calls the "critical importance of communication and endogenous rule formation" (Ostrom, 2006). Carefully constructed dialogue which includes the appropriate stakeholders is essential to supplying the necessary components of adaptive governance necessary to manage commons resources (Dietz et al., 2003).

Table 13: Aspects of Ostrom's Eight Characteristics of Successful CPR Management (Ostrom, 1990)

1. Congruence between appropriation and provision rules and local conditions should exist.

2. Collective-choice arrangements allow participation by all affected individuals in deciding on the appropriation and provision rules.

3. Sanctions should be graduated to reflect the severity, frequency, and context of the violation.

4. Low-cost and readily available conflict-resolution mechanisms must exist to mediate conflicts among appropriators and between appropriators and officials.

To successfully manage a common pool resource, users must be able to clearly communicate. Despite the importance of expressing one's political opinions in the democratic process (Mutz & Martin, 2001), liberals and conservatives, the dominant political ideologies in the United States, do not have a history of communicating well with each other despite the importance of expressing one's political opinions in the democratic process (Mutz & Martin, 2001). Stereotypes of stakeholders created by their resource use and based in moral foundations are important to understanding how people are understood. It stands to reason that these differences might also give understanding as to why environmental issues are not equally moral issues for all (Zaikauskaite et al., 2020). For example, individuals who see the act of conservation of a resource as loyalty to the group may speak about successes differently and pursue different protective tools

or punitive actions than those who see conservation as an act of care or fairness. As MFs (Chapter 3) are based on group think and represent post-hoc rationalizations of the positions held by the group, and as so many of Ostrom's best CPR management practices necessitate clear communication, could patterns in the way resource users talk about fellow resource users, help to understand or improve the workings of the relationships in functioning CPR scenarios?

Attempts to influence the actions of individuals in the CPR fishing simulation were not successful (Chapter 3). The words used to characterize resource users, and the implications of those characterizations may potentially have impacts on policy development and future cooperation. In the words of Jonathan Haidt, "morality binds and blinds." (Haidt, 2013b) This is to say that morality is the glue that knits groups together but simultaneously gives individuals in those groups tunnel vision with regards to moral justifications outside of those which our group adopts. This is the value of moral exemplification. Amid environmental issues which have been shown to be morally charged, potential biases that can exist amid our interactions should be considered. But is this true among environmental resource-based actions and if so, how strong are the effects of this exemplification? Could these observations help researchers to interpret the perceptions of others in negotiation and resource management?

The Tragedy of the Commons

In 1968 Garrett Hardin wrote a pivotal paper in which he defined the "Tragedy of the Commons." In his essay Hardin acknowledges what Ostrom later confirmed (2006), that communication was essential to any plan to avoid the overexploitation of commonly

held resources. Hardin describes the problem of populations as a commons dilemma and asserts that a technical solution to population growth and all other commons dilemmas does not exist. This subset of problems he, and those he references, define as those without solution in the natural sciences (Wiesner & York, 1964). A technical solution to the problem of population, he says, would forego the necessary discussion of how to solve the commons problem, yet the commons problem cannot be solved in such a way. Instead, he calls for an "extension in morality." Amid today's political landscape how can the solutions that Hardin describes as "mutual coercion," "mutually agreed upon" be created without bidirectional communication which is mutually understood? What is the recipe for what Hardin sees as the tool for our moral extension? Liberals and conservatives are more polarized than ever before (Heltzel & Laurin, 2020). How does a politically toxic environment influence our approach? The first step is to better understand how ideologues view other's actions in a CPR problem, and how our political ideology might be an indicator of how those questions are managed.

Political Ideology and Collective Acrimony

It has long been thought that conservatives and liberals were cast from different moral forms. Conservatives have been characterized as more intuitive (Hannikainen et al., 2017) while liberals have been shown to be more analytical (Talhelm et al., 2015). Increasingly there is a lack of understanding between individuals of these ideologies. In part this lack of understanding might be a result of an active avoidance of the cognitive dissonance that can be created by hearing the opinions of others from ideologies that diverge from one's own (Frimer et al., 2017).

More muddled are descriptions of characteristics lobbed as accusations from both sides like intolerance, which has been shown to be no less owned by one ideology than another, though the victims of that intolerance shifts (Brandt et al., 2014). Fear, or the feelings of vulnerability brought by an instability, have been shown to be linked to increase support conservative positions like capital punishment and abortion and decrease support for individuals who are homosexual in liberals (Nail et al., 2009). Whether they talk to each other or not, and regardless of the source of their ideologies, conservatives and liberals seem to have a set of tools for moral understanding that while not identical, are certainly related. The strength of those differences will indicate how useful this understanding is to how the motivations of individuals are attributed to their actions.

The Platonic Ideal and Exemplification

Regardless of the actual differences and similarities of liberals and conservatives, there seems little debate that how people view each other and attribute traits to individuals in different groups may not be based on all the traits of those individuals. Exemplification theory was well described by Dolf Zillmann (1999). Exemplification has far-reaching implications for communication but with little systematic exploration until Zillmann's efforts. Similar to the idea of the Platonic Ideal (Murray, 1954), exemplification is a process used to attribute characteristics and motivations to a group based on the exemplar or model. As a result, individuals use the exemplar to characterize the group even if the group is clearly different regarding other features.

Exemplification allows individuals to collect observations and attribute traits to a group based on their possession of a particular subset of traits. A New Yorker, Zillmann

writes, is ascribed a whole group of traits due to that one piece of their identity,

regardless of the truth of those ascribed traits. This happens in fisheries management too.

In his social exploration of lobster fishing in the mid 1980's James Acheson chronicles

the complex social systems involved in the management of the communal fisheries

resources in Maine. In his account he explains the risk and uncertainty under which

fishermen were obligated to operate and the elements of simultaneous distrust and

comradery that this could elicit. Biologists charged with creating the regulatory regime of

the fisheries while having little information about the fishery or the long-term effects of

their determinations are stereotyped by fishermen just as fishermen do the same of

biologists. Acheson writes, that folks from the neighboring town were described by one

towns fishermen as "a little weird" and "backward" stating that they "have feuds over

nothing" and "keep to themselves" calling them "outlaws" and giving examples of

violent acts attributable to the people of that town. (Acheson, 1988) Clearly all the people

of the neighboring town were not fishermen nor do the stories of the neighboring town

correctly exemplify the others from the town. Despite this the willingness of persons to

use those isolated stories and attribute traits to others is an important example of how this

can be significant part of the story of fisheries regulation.

What is more insidious is that the use of the traits of the exemplar in place of

observable traits of the individual often "elude[s] direct perceptual control."(Zillmann,

1999) Events, too, Zillmann goes on, are subject to this process as are the perceived

motivations of individuals involved in those events. People carrying out actions,

including those judged as moral actions, are likely to be described using assumptions

made through generalizations about the exemplar, a lens through which the viewer interprets them.

The nature and cause of this phenomenon has been attributed to the potential effects of several well-described factors (Table 10).

Table 14:Cognitive Heuristics Linked to the Exemplification Phenomenon (Zillmann, 1999)

Heuristic	Description of Heuristic	Connected Ideas
Availability Heuristic	Delivering words, ideas or other stimuli to individuals can make them far more likely to think certain thoughts or about certain ideas connected with those stimuli.	Recency Bias Priming Effect
Representative Heuristic	Rule of thumb that uses the characteristics of the group that one belongs to as the characteristics of the individual despite other characteristics that change the likelihood of that being true.	Base Rate Neglect (Kahneman, 2011)

These heuristics take shape in creating the assumptions about the attributes, actions and motivations of the actions of individuals based solely on one or a few associations. A greater understanding of how these exemplifications are created and the degree to which they are predictable would increase the usefulness of these observations.

Moral Drivers of Exemplar Choice

Moral psychology has changed the way social scientists view our interactions with the moral world. Philosophers and researchers have realized for years that reason plays a supplemental and inferior role in the determination of individual moral positions (Haidt, 2001; Plato, 370 C.E.). Rather moral foundations (MFs) are used to justify the moral positions of our group and then choose facts as *post hoc* rationalizations of those

positions. Each moral foundation identified by Jonathan Haidt was chosen because it has an evolutionary basis for its use by humans, was found in multiple cultures, was measurable, and was innate in humans. Haidt determined a set of universal human tools which are implemented across cultures to justify our moral positions (Haidt, 2013a).

The MFs were collected by Haidt by recording observations of responses by individuals who were morally dumbfounded. Haidt devised hypothetical stories in which no one was harmed but that crossed lines which evoked moral norms, which could be only justified by evoking moral justifications (Haidt, 2001, 2003, 2013a). The list of five foundations was never considered finished but includes two individualizing foundations, care and fairness; and three binding foundations, loyalty, authority and sanctity (Graham et al., 2009).

Further work to determine useful categorizations of the foundations determined that U.S. conservatives tend to rely equally on all five moral foundations including binding and individualizing MFs while liberals rely on the individualizing foundations of care and fairness and to a lesser degree, loyalty, authority and sanctity. Graham used the foundations to determine the more common justifications used by conservatives and liberals, in a U.S. context (binding/ conservatives, and individualizing/ liberals) and subsequently the words which individuals that utilize those particular moral foundations use to justify their moral positions (2009). While conservatives tend to use all these words with relatively even ease, liberals rely more on care and fairness. Others have clarified that political ideologies like liberal and conservative tend to be justify justified using morally based language (Rempala et al., 2016).

The social intuitionist model, upon which MFT is based, posits that MFs are used to justify our moral intuitions after our moral judgements have been made. As eusocial organisms, humans can influence the intuitions of others by shaping the experience of the eliciting situation for individuals. This link is likely week and may be impractical for use in swaying individuals toward more sustainable action. (Chapters 3 and 4)
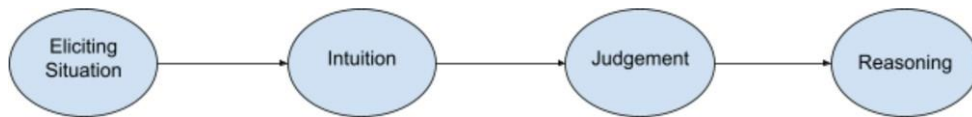
Figure 14: A portion of the Social Intuitionist Model of Moral Judgment edited from (Haidt, 2001).

The Work of Moral Environmental Action

The success of fisheries and many similar common pool resources are dependent on the willingness of actors to behave in a cooperative self-restrained way which uses resources sustainably. Society governs such complex systems using international, national and local agreements which are negotiated by the appropriate stakeholders. Understanding and acknowledging the underlying biases involved in this process is important to successful outcomes. Francesca Gino et al. in their paper about the impact of irrelevant factors in passing judgement, makes the case that John Rawls' (Rawls, 1971) assertion that fairness necessitates blind justice implemented by use of a "veil of ignorance" leads to bad outcomes (2010). Not only **do** individuals judge others in such interactions, but they need to do so to be effective communicators.

Yet, environmental issues are complex issues which make them harder to understand and make choices about. What's more, environmental issues like climate change don't elicit strong moral responses because of their complexity (E. M. Markowitz & Shariff, 2012). It stands to reason that these differences might also give understanding as to why environmental issues are not equally moral issues for all (Zaikauskaite et al., 2020). Stripping an environmental issue like fisheries of its complexity by using a simulation may be an effective case for observing responses to MF appeals.

Characterizing the Actions of Others

Scott Clifford combines the ideas of exemplification and MFs in the paper which introduces the idea of moral exemplification. In it he argues that MFs not only help humans to form our moral positions but also provide the character traits others attribute to the motivations behind behaviors (2014). Character traits represent moral dispositions, but behaviors of the individuals are interpreted by consumers in a way that answers the question "does this [person] share my moral beliefs?" (Clifford, 2014) In turn the observers make attributions which place their moral framework on the moral decisions of politicians, businesses, businesspeople, and colleagues. These results could have far-reaching impacts on the impressions which polluting businesses, unsustainable products, politicians, and friends leave with their respective constituencies. These are the actors in Ostrom's well managed CPR's.

Liberals and conservatives are known to use different language when justifying their position on moral questions (Frimer, 2020). Better understanding MF impressions, and how these connect to political ideology, would improve communication tools in an

increasingly politically divisive environment. *Post hoc* moral rationalizations are an important part of how moral foundations work. MFs are used to justify the positions of groups with which individuals identify and have already accepted as morally correct. It stands to reason that the moral foundations used by self-identified liberals and conservatives to characterize unsustainable fishers would be influenced by their ideology. There is disagreement about which moral foundations individuals characterizing others would use. While liberals rely on care and fairness more than conservatives who tend to rely on all MFs equally, recent evidence has downplayed the differences between liberals and conservatives (Frimer et al., 2013). Determining the similarities and differences between how conservatives and liberals view the actions of those acting poorly in a commons experiment is important. If it is indeed the case that conservatives and liberals are using their own moral framework to interpret these actions, it will provide insights as to how small and mid-scale regulatory fishing regimes can be better negotiated. If these are not the tools used by conservatives and liberals to exemplify the actions and motivations of others, it will undermine the usefulness of MFT as a tool to increase understanding in resource use scenarios.

Question and Hypothesis

Q2.1: What is the effect of political ideology on the likelihood of identifying distinct moral foundations to describe unsustainable fishers (takers)?

H2.1: When describing the attributes of a "taker" fisher, liberals will use negative care and fairness terms more frequently and other MF terms less frequently than will conservatives.

Materials and Methods

Participants

Participants were recruited from Amazon Mechanical Turk (AMT), an online tool which allows users to enlist the participation of willing individuals who choose to be part of the study based on a short description of the task. The study was conducted between October 25, 2020, and January 27, 2021. Participants were recruited in cohorts of self-identified conservatives and liberals supplied by AMT. The sample identified as 37.1% female, 62.5% male, 0.4% other, and 0% preferred not to identify a sex. Participants were required to be over the age of 18 and ranged between 18 and 99 years of age with a median age of 36.6 years old.

Experimental Design

Participation in this experiment involved a 28-minute survey experience and computer-based fishing simulation. Participants watched a short video explaining how the game functions and what they should expect when they begin. Participants also

listened to and were show an appeal to consider the number of fish they wished to take

(Appendix D). Two versions of the appeal were created and displayed as part of a related

study question, but they were shown to have had no effect on resource use across groups

(Chapter 3 and 4).

Table 15: Display of Independent and Dependent Variables for the Research Question

Independent Variables	*Dependent Variable*
Self-identified Political Ideology of Participant	*Self-reported Likelihood of Using a Variety of MF terms to Describe Takers*

The common pool resource fishing game (Gifford & Aranda, 2013) created a

scenario in which the participant was made to think they were participating with three

other fishers when in fact they were fishing with three computer generated fishers (bots)

(Appendix C). All fishers were told they were fishing with three others and that the fish

in the fishery now are those that were left after the previous group was finished with the

game. The other fishers were all computer-generated bots and the number of fish to start

the simulation is always 100. Two of the three bots were programmed to fish at a

sustainable level taking fish such that if all bots and participants fished the same way,

they would take 40% of the fish on average (stewards). The last bot was programed to

fish unsustainably (taker). If all bots and participants fished identically to this one

unsustainable bot, the group would take all the fish on average.

After participating in the game, participants answered a series of 30 questions which determined the moral foundations upon which they rely when forming moral justifications (Questionnaires | Moralfoundations.Org, 2013) as well as demographic questions and one question confirming their political ideology. Finally, respondents who fished with a taker fisher, were asked to think about the fishing of the takers whom they fished alongside, and characterize the behavior of the bot.

"One of the fishers you were fishing with did not fish sustainably. How likely would you be to use the following words to describe their behavior?"

The respondents were given ten words. Each word was identified from a list of words prototypical of each MFs, developed by Graham and colleagues (2009). Two words were chosen which aligned with each of the MFs (Table 13). Respondents were asked to place their likelihood score on a six-point scale from very likely to very unlikely. Likely responses indicated that those individuals would use those terms to describe unsustainable fishers. This can be compared across ideologies using a one-way analysis of variance (ANOVA) to see if there are significant difference is the likelihoods of liberals and conservatives to use each term and terms in sets of MF pairs as they use these terms to exemplify the actions of others. The hypothesis for this question is that liberals will use care, fairness terms and conservatives use terms more evenly across the MFs. This is supported by studies that have shown the increased use of care and fairness in liberals when making moral justifications and an even reliance of conservatives across the MFs (Graham et al., 2009).

Table 16: Terms and Corresponding Moral Foundations Participants Used to Characterize the Behavior of Unsustainable Fishers

Moral Foundation	Terms
Care	Lacking Empathy, Uncaring
Fairness	Unfair, Unjust
Loyalty	Unpatriotic, Disloyal
Authority	Dishonorable, Disrespectful
Sanctity	Sinful, Sick

General Descriptive Statistics

Using Amazon Mechanical Turk, 509 participants recruited and pre-identified as liberal or conservative. Surveys were collected and answered at least in part by each of these 509 participants. Data analyzing only moral foundations questions for this paper used all respondents. Of those surveys 278 participants completed the entire survey and participated alongside an unsustainable fisher.

Respondent Demographics

As a check of the political ideology identified in the samples of respondents supplied by AMT, and to gain a more detailed picture of the participants, each participant was asked to place themselves on a 7-point political scale from "very conservative" to "very liberal" (Figure 16). Omitting those not identifying as liberal or conservative as they were not the subject of the questions in this study, the overall distribution of liberals and conservatives in this study were 59% and 41% respectively. This matches well distributions seen in recent surveys of US population by Gallop which place number of

conservatives at 41% and liberals at 59% excluding other moderate ideologies (Saad,

2021).
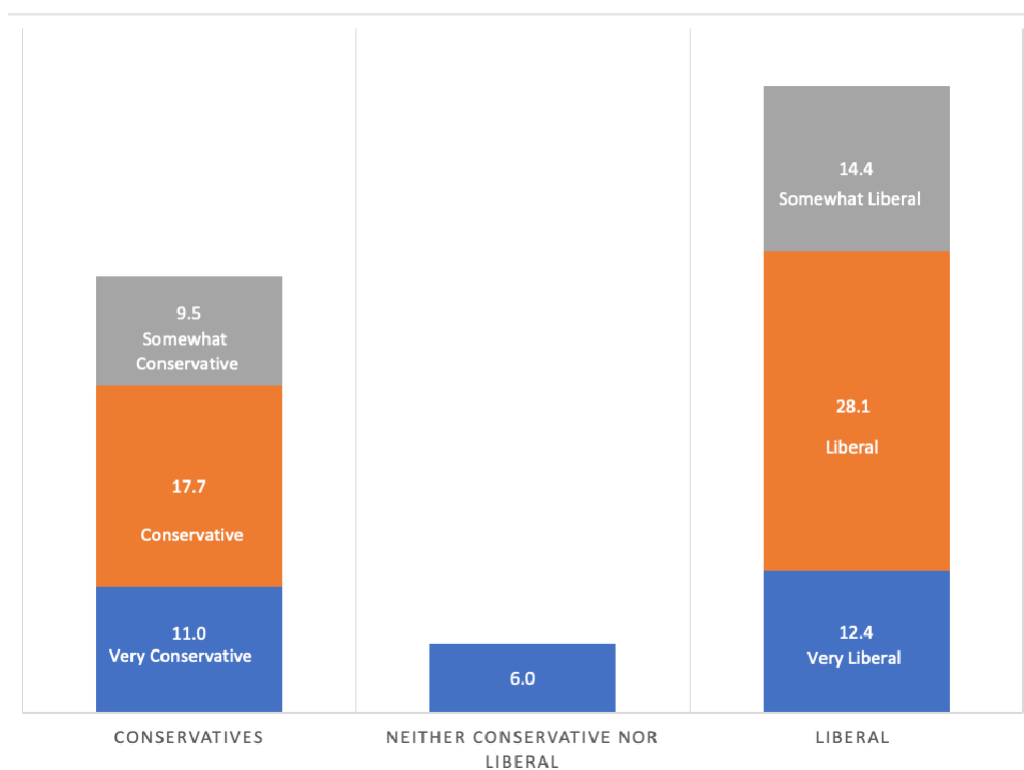
Figure 15: This graph displays the percentages of respondents as they self-identified across 3 levels of conservative, 3 levels of liberal or neither conservative nor liberal.

The total sample identified as consisting of nearly twice as many males as females (Figure 15). The average age of AMT-identified liberals and conservatives was nearly identical at liberals 38 years old and conservatives 36 years old. The median age of Americans 18 years and older, by contrast, is 50 years old (Gramlich, 2020). The sample of AMT liberals was 69% male, 30% female, 0.8% who identified as other and 0% preferred not to identify a sex. The sample of AMT conservatives identified as 61% male and 39% female. Estimates of sex distribution in 2019 in the US were 50.5% female and

49.5% Male with less than 1% in other categories (*World Bank Group - International Development, Poverty, & Sustainability*, 2020).
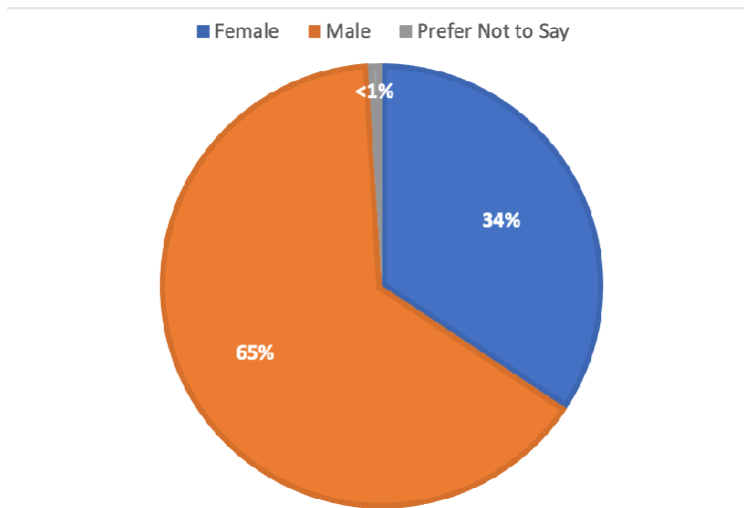
**Figure 16: Graph Displays Percentages of Self-identified Respondent Sex
US estimates of sex distribution are 50.5 female and 49.5% male.**
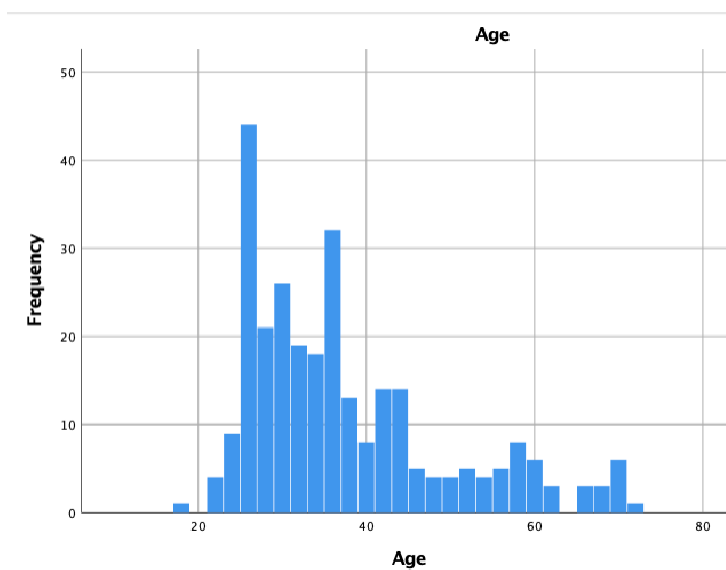
Figure 17: Distribution of Participant Ages n=279

Participants in this group ranged between 18 and 71 years of age with a median age of 37.0 years. Overall, the sample in this study is younger than the electorate, those 18 or older, by 13 years and 13 percentage points more male. However, the political ideologies, excluding those that did not self-describe as liberals or conservatives was consistent with the US population. The sample from MT was consistent with expectations of samples gathered in this way. Previous studies have shown that MT respondents are consistent with other representative sampling methods when measured for extraversion, agreeableness, conscientiousness, emotional stability and openness (Clifford, Jewell, et al., 2015).

Results

Comparing the Likelihood of Liberals and Conservatives to use MF Terms to Describe Unsustainable Fishers

Liberals (n=126) were significantly more likely than conservatives (n=153) to describe the player who engaged in unsustainable fishing practices as having a range of negative moral qualities. When the two most liberal (n = 113) and most conservative (n=81) groups were combined and conservatives and liberals were compared, the trend was still true. (Somewhat liberal and Somewhat conservative were excluded in these cases) (Table 18 column 3).

Table 17: Differences in the Likelihood of Participants to Use Different Terms Associated With the Five Moral Foundations – Differences Expressed in Likelihood of Use and Confirmed with One-Way ANOVA – Responses were given on a scale including "Ver Likely", "Likely", "Somewhat Likely", "Neither Likely nor Unlikely", "Somewhat Unlikely", "Unlikely," and "Very Unlikely"— For example, a difference of 1 means that respondents liberals are one Likert category more likely to use the term than the conservative groups. Significance is shown in with bolded cells. ***p>0.001,**p>0.01, *p>0.05

Moral Foundation	Moral Foundation Terms	Average of Likelihood of Liberals and Conservatives to use Individual MF Words and Word Pairs — Individual Words	Word Pair	Comparison Between Liberals' and Conservatives' Likelihoods of Word Usage — Individual Words	Word Pair	Average of Likelihood of Liberal/ Very Liberal and Conservative/ Very Conservative Participants to Use Individual MF Words and Word Pairs — Individual Words	Word Pair	Comparison between Liberal and Very Liberal and Conservative and Very Conservative — Individual Words	Word Pair
Care	Lacking Empathy	Cons. = 3.84 Lib. = 4.44	Cons. = 3.88 Lib. = 4.48	**0.607 p = 0.001*****	**0.601 p = 0.001*****	V.Cons. = 3.79 V.Lib. =4.47	V. Cons. = 3.86 V. Lib. =4.46	**0.679 p = 0.004****	**0.587 p = 0.008****
Care	Uncaring	Cons. = 3.91 Lib. = 4.52		**0.607 p = 0.001*****		V.Cons. = 3.93 V.Lib. = 4.44		**0.517 p = 0.031***	
Fairness	Unfair	Cons. = 3.85 Lib. = 4.48	Cons. = 3.86 Lib. = 4.37	**0.626 p = 0.001*****	**0.505 p = 0.005****	V.Cons. = 3.88 V.Lib. = 4.43	V. Cons. =3.84 V. Lib. = 4.36	**0.557 p = 0.022***	**0.519 p = 0.019***
Fairness	Unjust	Cons. = 3.87 Lib. = 4.25		**0.384 p = 0.034***		V.Cons. = 3.80 V.Lib. = 4.28		**0.481 p = 0.030***	
Loyalty	Unpatriotic	Cons. = 3.68 Lib. = 3.47	Cons. = 3.71 Lib. =3.63	No Difference p = 0.259	No Difference p = 0.672	V.Cons. = 3.57 V.Lib. = 3.62	V. Cons. = 3.60 V. Lib. =3.77	No Difference p = 0.691	No Difference p = 0.359
Loyalty	Disloyal	Cons. = 3.73 Lib. = 3.79		No Difference p = 0.726		V.Cons. = 3.62 V.Lib. = 3.92		No Difference p = 0.193	
Authority	Disrespectful	Cons. = 3.90 Lib. = 4.51	Cons. = 3.88 Lib. = 4.45	**0.612 p = 0.001*****	**0.571 p = 0.001*****	V.Cons. = 3.85 V.Lib. = 4.47	V. Cons. = 3.89 V. Lib. = 4.31	**0.617 p = 0.011***	**0.496 p = 0.021***
Authority	Dishonorable	Cons. = 3.86 Lib. = 4.39		**0.532 p = 0.003****		V.Cons. = 3.93 V.Lib. =4.14		No Difference p = 0.087	
Sanctity	Sinful	Cons. = 3.60 Lib. = 3.33	Cons. = 3.57 Lib. =3.32	No Difference p = 0.170	No Difference p = 0.145	V.Cons. = 3.36 V.Lib. =3.40	V. Cons. = 3.40 V. Lib. =3.42	No Difference p = 0.334	No Difference p = 0.609
Sanctity	Sick	Cons. = 3.55 Lib. = 3.31		No Difference p = 0.192		V.Cons. = 3.43 V.Lib. = 3.44		No Difference p = 0.963	
All	All Terms	Cons. = 3.78 Lib. = 4.05		No Difference p = 0.083		V.Cons. = 3.74 V.Lib. = 3.94		No Difference p = 0.077	
Care, Fairness,	Individualizing	Cons. = 3.86 Lib. = 4.42		**0.558 p = 0.001*****		V.Cons. = 3.84 V.Lib. = 4.41		**0.563 p = 0.008****	
Authority, Sanctity, Loyalty	Binding	Cons. = 3.72 Lib. = 3.80		No Difference p =0.590		V.Cons. = 3.67 V.Lib. = 3.87		No Difference p = 0.316	

Similarities and Difference in MF Term Use Between Conservatives and Liberals

Generally, both liberals and conservatives described the sustainability transgressor as having negative moral qualities. When averaging across the full range of five MF dimensions, liberals and conservatives held negative views of the transgressor. On three of the five specific MF dimensions (care, fairness, and authority) —and on one of the two general MF dimensions (individualizing foundations)—liberals viewed the transgressors as having significantly more negative moral qualities. The term dishonorable in the authority MF was the only term among these three MFs (care, fairness, authority) that did not show a significant difference and then only in the comparison between the most liberal and conservative groups.

Discussion

Since moral emotions are emotions that respond to violations of morality and motivate moral behavior (Haidt, 2003; Kahneman, 2003, 2011), it seemed that understanding the reaction of participants to taker fishers should activate their moral mind. The goal of this study was to measure the hypothesized existence of differences in how liberals and conservatives use moral exemplification to view takers as reflected by the words they use to describe others, and the extent of those differences to determine the utility of these observations to influence sustainable resource use. Measuring the differences in the tendency of liberals and conservatives to morally exemplify would further support the existence of this phenomenon and the extent to which individuals across ideologies use MF terms associated with their ideologies to describe the actions of others. Doing so would support the creation of more effective MF appeals that

acknowledge ideological differences and MF differences. It would also provide

understanding about how actions are judged and potentially create tools to utilize this

understanding to encourage sustainability in common pool resource scenarios. This

discussion of utility necessitates an exploration of the strength of those differences and

how they might be operationalized in creating more effective communication across

ideological groups.

Understanding Our Words

Several of the observations from this study support the current understanding of

the relationship between liberal and conservative ideologies and the association with, and

use of, moral foundations. When surveyed, conservatives tended to rely on the moral

foundations in a balanced way when making moral justifications during the Moral

Foundation Survey 30 Question Version, while liberals tended to rely more on the care

and fairness MFs. This observation was first made by Graham and was robustly

demonstrated in the observations in this dissertation (Chapter 3) (2009). Improving the

effectiveness of MF words by expanding the list and determining words with stronger

MF ties would make the list easier to use and potentially more effective. Work has

continued to develop and extend and vet the usefulness of dictionaries of terms which are

relevant to individuals who use each of the MFs (Frimer, 2019; Frimer, 2020; Hopp et al.,

2021) though efforts to extend the dictionary using more terms are making the tool

"measurably better but by no means knocking it out of the park."(J. Frimer, 2019)

Clearer connections between moral foundations and ideologies might further

support the justification of MF appeals tailored to specific ideologies to influence action.

These connections might enable the creation of more tailored appeals and greater understanding of how moral action is justified and judged.

Moral exemplification seems to provide some degree of explanation of the likeliness of individuals to use terms to describe moral transgressors. In this study, as in others (Frimer, 2020), some existing inconsistencies are difficult to explain. Why for example would liberals be more likely than conservatives to use authority words to describe the taker fishers as having negative moral qualities associated with authority. Perhaps the task is partially to blame. By asking respondents to declare judgement on their fellow fishers, respondents are being asked to use their authority, perhaps brining those words to mind. Liberals rely strongly on care and fairness to make decisions in morally ambiguous situations and as is observed in this study, to use terms consistent with those MFs to describe moral transgressors. But like in Graham's usage of the original MF dictionary to classify the sermons of liberal and conservative pastors the results are less clear with the other MFs. In that study, Graham found that liberals were more likely to use loyalty than conservatives in their sermons and in this study, liberals were more likely to use authority than conservatives. There was, in addition to a willingness to use care and fairness, a significant difference in liberals' use of authority to describe the takers.

Indeed Graham, Nosek and Haidt confirm a trap that they themselves fall into. They confirm that while liberals and conservatives can correctly identify the direction of differences in MFs between themselves and individuals typical of the alternate ideology, they exaggerated the size of that difference. Here this error is less important in the

identification than in its usefulness of these observations as group. One characteristic

shared by both liberals and conservatives is bias (Ditto et al., 2019).

Limitations and Future Research

While the study sample was consistent with previous descriptions of MT samples,

and that sample does have psychosocial characteristics consistent with the ideologies of

the greater population, this sample, like others, is more politically liberal and younger.

Though it was not measured in this study, the sample derived from AMT is also likely

less religious and less racially diverse than the actual US population (Huff & Tingley,

2015).

Repeated explorations of MF dictionaries have not created much improvement

from the original list of terms created (Graham et al., 2009). Attempts to update and

extend the dictionaries have born little tangible improvement. Even the creators of the

moral foundation dictionary 2.0 determined that despite a somewhat more comprehensive

method of its development it was only more useful in that it more fully captured each of

the foundations (J. Frimer, 2019). This is no small contribution as it increases the ability

to create appeals with greater flexibility. It does not however increase its ability to create

more effective appeals. Words which have been identified as being indicative of each

moral foundation are not created equal. Continued efforts to psychometrically score

appeals and more carefully weigh terms against each other may improve an appeal's

effectiveness yet it seems unlikely that it would improve its practical usefulness.

In replications of six previous MF studies, including Graham's study linking

political ideology to specific MFs (2009), Frimer was only able to replicate two and then

with effect sizes 38 times smaller than those of the original studies (Frimer, 2020). The lack of repeatability in these studies adds to the growing list of questions regarding the explanatory power and potential usefulness of MFT.

Conclusion

The goal of this research was to make observations that were capable of being operationalized into a tool which might help in the process of understanding each other as sustainability is pursued. The effect of an appeal alone showed no effect on the fishing of participants. If instances when these tools were more effective, they could be used to influence fish take however this too was not effective. Perhaps then moral foundations are not even being activated by the actions of fishers in the simulation.

This study asked those that participated alongside taker fishers to describe the actions of the taker fishers. In so doing, greater understanding could be brought about by the process of moral exemplification. An attempt to activate moral foundations through participation with a taker, however, was not successful. While the specifics of moral exemplification are to an extent supported by this study, the level to which they are supported falls short of useful. The small differences between liberals and conservatives in this case likely means that strategies developed to improve communications between liberals and conservatives in common pool resource dilemmas do not need significantly different strategies. It is also an indication that liberals and conservatives perhaps are not as far apart from each other in how they morally exemplify the unsustainable behaviors and of others. All of this further supports the idea that despite the differences between political ideologies, it might be more accurate to describe the language used by liberals

and conservatives as more similar than different (Frimer, 2020). On average, liberals and conservatives were both more likely than not to use any terms from any of the MFs. Perhaps despite the political divides liberals and conservatives are still more alike than different.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

An Impending Crisis

Human population continues to grow and will add another 3 billion people over the next 80 years (*Population*, 2019). Feeding these extra humans will continue to put pressure on renewable food resources like marine fisheries which provide an ever-increasing amount of protein to the economically transitioning nations (Akbaraly & Brunner, 2008)

This dissertation highlights the challenges to the implementation of MF appeals to encourage sustainable behavior in a common pool fishing simulation. It also analyzes the judgements participants make of unsustainable fishers to verify the nature of moral engagement of participants in this type of activity showing that both liberals and conservatives do engage in this type of activity with morality engaged though to different degrees. This dissertation gives support to the idea that without repeated messaging, MFs may not be useful in the development of robust operationalizable communications tools for sustainability communication.

Research into common pool resources supports the creation of organizations that create locally derived rules, collective agreements, collective choice arrangements, graduated sanctions and readily available conflict-resolution mechanisms (Ostrom, 2009). None of these can be developed without communications between appropriators and officials. Communication is paramount in determining solutions in common pool resource dilemmas like fisheries management, and Moral Foundation Theory (MFT)

seems to provide theoretical understandings which may be useful. In developing tools that would help sustainability advocates more effectively communicate across political lines. This may help in the development of communications solutions by engaging the more rational and more deliberate System II described by Kahneman and Tversky (Tversky & Kahneman, 1974). Graham and Haidt too, had high hopes of the operationalizability of MFT and Moral pragmatism.

In their paper "Moral Foundations Theory: The Pragmatic Validity of Moral Pragmatism" (Graham et al., 2012) Graham, Haidt and colleagues predicted the potential future of Moral Foundation Theory (MFT) in its applications and the potential insights which may be gained by its use. They questioned what the practical applications this new theory might have and made predictions which included the potential for the theory to bridge the gap between moral judgement and moral behavior. Work on this problem has come to fruition at least to a degree and has been extended to the realm of environmental morality. The studies of the preceding chapters follow the findings of several other studies which have observed positive changes in intended behavior (Dickinson et al., 2016; Kidwell et al., 2013; Watkins et al., 2016; Wolsko et al., 2016), and support for climate change policies (Dawson & Tyson, 2012; Koleva et al., 2012; Wolsko et al., 2016). Moral foundations (MFs) have also been used to create targeted appeals that also encourage recycling behavior (Kidwell et al., 2013). In this study, there was no effect of MF appeals designed to influence sustainable fishing of participants in a fishing simulation (Chapter 3) even when unsustainable (taker) fishers were participating along-

side participants (Chapter 4). There are several observations which are well supported in this study.

Findings Summary

Moral foundations are real, identifiable, measurable, and relied upon differently by individuals with different ideologies and used to justify a rationalization of a position held by that individual's group. This study supports moral exemplification theory that MFs are engaged when thinking about the actions of others. However, this study has also produced evidence that does not fit with previous theory regarding the utility of MF appeals for sustainable action. It is likely that in impassioned speeches for environmental change and more sustainable management of resources liberals will use a few more care and fairness terms, and conservatives will rely more evenly across all the MFs. The results from study one do not support the theory that MFs are effective in changing our action toward sustainability regardless of what terms are used. Also, the small effect size of these observations adds to recent assertions that, while humans judge each other using our MFs, liberals and conservatives are just not all that different in their MFs (Frimer et al., 2013).

Analysis of this set of studies can be divided into theoretical, methodological and practical observations. What follows will consider each of these areas followed by several different practical prescriptions for the observations of the last four chapters.

Uncertainty in the Effect of Moral Foundation-Based Appeals

Before declaring that MFs are not an effective tool for encouraging sustainable behavior, consideration will be given to several questions and criticisms of the underlying

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theory, methods, and practicality as communications tools. Finally, studies that found that such appeals were effective will be considered.

Theoretical: Evidence of Environmental Morality

For MFs to be effective morality must be engaged in participants such that they are primed to use their MFs for the purposes of making moral justifications. There is the possibility that fishing choices in the simulation were not seen as moral choices by the participants. This might be because fishing and environmental resource problems are not seen as such or because the simulation did not adequately simulate a situation realistic enough for participants to engage with the problem in a moral way. This does not seem to be so. In Chapter 5, participants were very willing to use moral language to describe the actions of the taker fishers and did so in a way which slightly favored the MFs predicted by the affinities of each ideology (equally likely to use all terms/ conservatives, individualizing/ liberals). The willingness of liberals to use MFs of their ideological group to engage in the moral exemplification of those individuals and the willingness of participants in general to do so seems to indicate that the simulation was in fact seen as a moral problem by most respondents in this study and in others (Ertör-Akyazi & Akçay, 2021). This is consistent with studies that have taught morality using moral simulations (Sherer, 1995). Additionally, the participants who participated alongside taker fishers activated moral foundationally significant terms which mostly aligned along ideologically drawn moral foundation lines (Chapter 5). This seems unlikely to occur if the fishers didn't engage with the transgression of these fishers by using their moral compass.

Theoretical: Challenges of Effective Appeals

It is possible that appeals generally, like those used in this study, are simply not effective. Other studies have seen minimal effects from written targeted appeals (Clayton et al., 2013) In some instances frames can tend to backfire in really polarizing issues causing skepticism and ambivalence rather than understanding especially in partisans who "seem impervious to disconfirming information" (Zhou, 2016). This seems possible and supports Haidt's elephant and rider analogy. Use of the psychometrically strongest terms from the MF dictionary (e.g.: wicked vs. unwholesome, obedient vs. respectful, traitorous vs. disloyal, bigoted vs. unfair, Kill vs Harm) might have had an increased effect, but likely would have made the appeal more difficult to write in an authentic way. Attempts to expand the MF dictionary have shown little improvement in developing a list of words that is more effective at activating MFs (Frimer, 2019; Frimer, 2020). If MF terms are less effective than thought, it does not explain why other instances of MF appeals have shown effectiveness (Kidwell et al., 2013). Finally, bad news is tough. Feinberg and Willer in a series of experiments showed that dire messages about climate change can cause skepticism in climate science (Feinberg & Willer, 2011). This criticism cannot be completely dispelled. More effective methods to deliver the appeal and efforts to make the appeals stronger may have a net effect though it does make creation of natural sounding appeals that are practical to use more difficult.

Methodological: Tools and Sample

There are several metrics from this study which point to the robust nature of the tools and techniques used to gather fishing, and fisher moral foundations data. First, the sample was significantly large. Participants were recruited from Amazon Mechanical Turk (AMT) and encompassed between 236 and 509 surveys depending on the question asked. The size of this study and the representative nature of its participants give a sample which is more representative than several other studies which rely on convenience samples which tend to be easier to get but also less representative. Because of this, the responses of the participants are likely more representative of the U.S. population. The sample of participants in the studies described in this dissertation possess MF characteristics predicted in the original MF studies. This supports the appropriateness of the methods of collection. The sample mimics well the results seen in those studies by Graham, Haidt and Nosek which reaffirms the validity of the experimental sample. Despite this, using the MFs to persuade individuals to behave sustainably did not work as it had in other studies.

Methodological: Task Realism

It is also possible that the act of online fishing is too different from the real, non-excludable, common pool resource to evoke the same moral emotions and intuitions that one associates with moral foundation activation. This seems unlikely. Those engaged with taker fishers described the takers using MFs consistent with the ideological scaffolding that previous research predicts (Graham et al., 2009). If participants are willing to use MF frames to describe fishing transgressions, it seems reasonable to

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conclude that the participants were viewing the task through a moral lens. Despite this, they were still not swayed to behave more sustainably by the appeal. Similar fishing experiments have been used for decades to model these types of economic choice experiments with results that transfer to real life and have been useful in observing a myriad of economic behaviors (Castillo & Saysel, 2005; Deadman et al., 2000; Ertör-Akyazi & Akçay, 2021; Fennewald & Kievit-Kylar, 2013; Kramer & Brewer, 1984, 1984). In an experiment which used MF frames to encourage behavior that reduced impacts on climate change, Ertör-Akyazi and Akçay observed that multiple generations of the experiment helped to create clearer behaviors. They showed that as the experiment continued, individuals were less likely to take all or none of the resource as observed in season one of this study and theirs.

Practicality of Moral Foundation Appeals

It is also possible that the strength of the difference between groups who experienced different appeals was too little to detect between the groups sampled. If that were so it would not be large enough to be an effective tool in an operationalizable way. To operationalize the effects psychosocial observations like this the effect needs to be detectable in instances that don't require the control of all variables so that they can be used in real life applications. For example, utilization of a targeted campaign necessitates targeted appeals. Hitting the target of appeals in a negotiation between small groups may be easy but doing so in a social media advertising campaign is much more complex (Key & Czaplewski, 2017) and if not done carefully, may be far less effective. For the efforts

of tailoring messages to have a positive effect, an effect must be robust enough to overcome any inefficiencies in targeted campaign.

The potential of MFT to provide insights into the moral justifications of individuals is clear. Reflected in this and other studies, MFT has shown clear associations with ideology that are repeatable and robust. Participants, saw the taking of fish as a moral act and justified the actions as evidenced by the rate at which they were willing to use MF terms to describe the actions of the takers/ transgressors, (Chapter 5) but the possibility of using this to improve resource use are discouraging.

Disparate Results

Why then have some studies shown success in using these appeals to encourage sustainability? First, many of the studies linked to sustainability were not measuring sustainable actions. Experiments measuring support for environmental policy (Dawson & Tyson, 2012), recycling intent (Kidwell et al., 2013), sustainable consumption (Watkins et al., 2016), willingness to act or support stronger policy on climate change (Wolsko et al., 2016) or intent to donate money or even donations of money, measure types of sustainable behavior but not real action. Improving the simulation by working with fishers or other common pool resource users would be an important extension to this study. Secondly, many of the studies which investigated similar questions surveyed a non-U.S. population (Jansson & Dorrepaal, 2015) and are difficult to compare to the ideological frameworks of this study. These differences are important, and it seems here significant. Future studies might look at intents and actions to verify parallel choices and increase the utility of analyses which look at intents and those that look at actions.

Kidwell did a comparison like this but recycling is not a common pool resource which limits its ability to speak to the questions of this study (2013).

What Would Haidt Think?

Appeals in this study were an attempt to modify the eliciting situation of the fishers to get them to fish more sustainably; this was not effective. The social intuitionist model, upon which MFT is based, describes humans as black holes for engagement. Because of the nature of the social intuitionist model, appeals have only the slightest capacity to influence the perception of any eliciting situations that do not support the conclusions already drawn. This is supported too by the seeming lack of engagement by the large number of participants who took either all or none of the fish, an observation seen also by Ertör-Akyazi and Akçay (2021). The idea of selective moral disengagement which has been previously implicated in the eschewing of any personal responsibility to "self-sanction" while making "exonerative comparisons that render the practices righteous" (Bandura, 2007) may also be in play here. These are tall hills to climb. This experiment has provided two examples of results that do not fit with previous theory. While the null hypothesis was not rejected, it seems that moral foundations – which scholars have hoped could be useful tools to engage moral sensitivities and reduce resource use – may not be as helpful as previously thought.

Real, but Possibly Un-useful

It is true that some attempts to use the differences in MF affinity of liberals and conservatives to appeal to sustainable behavior show some effectiveness (Ertör-Akyazi &

Akçay, 2021; Kidwell et al., 2013). Still, the practical use and applications of MF appeals in environmental communications are stymied by several important considerations.

While the hopes of tailoring communications to all individuals have exciting potential and the effectiveness of tailored communication is generally good, there is still work to be done to see if behavioral experiments consistently show a similar response to MF appeals (Skinner et al., 1999). Second, Moral Foundation Theory as supported by the social intuitionist model posits that MFs are the arguments that are created to justify positions that have already been identified as right. MFs justify righteous positions already settled upon and are used to describe those positions. Haidt describes our moral intuitions as the elephant which goes where it wants, being ineffectively nudged by the rider (reason). He attributes little capacity to the rider to pull the elephant in another direction and one would assume any person yelling at the rider a similarly small capacity. The difficulty of tailoring and effectively delivering these communications in addition to the, at best, weak effect size of these appeals makes this a nearly impossible tool to use in this way at this point.

Other Applications

If the effect of MF appeals is small but real and not seen for other reasons in this study, perhaps a more polarized issue might engender stronger moral emotions and have an observable effect. There is no other issue which is as far-reaching, impactful and in need of efforts to persuade change as climate change. Hardin calls pollution, like the CO_2 and other climate change gasses we put into the atmosphere that cause warming a negative TOC because material is being added to the environment instead of removed.

The capacity of the earth to remove pollution which causes climate change is the result of an intergenerational, renewable, common pool resource which has been exploited and needs badly, changes that can bring about long-term commitments and action around this problem. Climate change was not selected for this study because the author thought it too politically charged in a U.S. context for MF appeals to have an effect, but perhaps a hyper politicized issue like climate change may have been a more appropriate testing ground. Perhaps the increased politization is a prime target to get a response from MF appeal.

Even since the start of this study the ideological divisions regarding climate change among the public have reduced. For example, 66% of Americans think the United States should reduce their climate emissions regardless of what the rest of the world does, which is an increase of 5 percentage points in the last seven months. While arguments do still often differ as to why climate action is a good idea, a growing consensus across ideological lines is building among the public is building ("Politics & Global Warming, September 2021," 2021).

There is little debate that politics in the US are about as polarized as they have ever been (Dimock & Wike, 2020). This has implications for the ability of the MF to speak to the changing landscape of modern ideologies as these groups change. In the same way that other cultures have shown similar but different MFs in the context of their country's political parties (H. Hsu et al., 2019) so too temporal shifts could be similar to cultural shifts in MF affinity for groups. Further study of the level of politicization of an issue and the effectiveness of MF appeals may warranted.

Further Study

There are several potential follow up studies which would help to understand the nature of the observations in this study as it relates to others. Using this simulation across multiple seasons as in Ertör-Akyazi & Akçay (2021) would allow a better comparison to this climate-based study and expand the repetitions of the MF message. As mentioned above, research in communications consistently identifies three factors that have consistently been shown to increase the effectiveness of messages: trust in the source, ease of understanding and repetition (Maibach, 2019). While the message that respondents engaged with was shown visually and read orally, future studies which increase the repetition of the message may find greater success. This may have been why Ertör-Akyazi and Akçay may have gotten their results over several generations. Simplifying the message with examples of the impacts of their choices on the potential sustainability impacts of fish takes above and below the sustainable level may help with understanding of the task. Using fully scored appeals that balance the MF impact of each term may also increase the control of appeals while adding strength to the appeals. By understanding the potential MF effect of each word balance could be provided so that weaker and stronger appeals of each type might be used.

There is evidence from the comprehension quiz that some of the participants may have not been engaged fully in the activity. Additionally, salience of the experiment may be improved. While the survey seems to have been engaged with in an authentic way, the fishing simulation engendered many all or nothing behaviors that indicate reduced salience. Perhaps because decisions were being made in a simulation and not real

resource use scenarios. Future studies may increase this engagement through financial or reputational incentives that increase their willingness to engage authentically in the simulation. This may be done by direct payment of small amounts or by promised donations on behalf of the participants based on their actions. Too tracking escapement instead of efficiency may be truer to how the fishers engage with the task. Finally, as this experiment deals with proxies for fishers and a proxy for fishing, the study could be improved by using real fishers, real fishing or both. This would enable direct applications of the results to fishing actions in the real world while improving salience and authenticity. In the end choices in a simulation are just that and are not fishing.

Implications For Common Pool Resource Policy

While people tend to use MFs to judge the actions of individuals who act unsustainably they are not swayed by use of the same MFs to change their own behavior. This is counterintuitive yet fits well with Haidt's ideas on MFs. Morality, he says, "binds and blinds." (Haidt, 2013a) By this he means that morality and our justifications of moral positions are the framework of our social connections. Individuals identify as belonging to our group through the moral positions taken. It also, makes group members blind to rational arguments and evidence from others that contradict their intuitions. This is important to policy because it reduces the opportunities to change minds and decreases the potential for political compromise.

Andrew Light (2011)has called for environmental pragmatism that sets aside theoretical debates and focuses on pluralistic ideas that don't rely on the intrinsic value of nature. Callicott too has called for a Pragmatic Environmental Ethics (2002) as have

Graham and Haidt (2012). But how does MFT fit into the practical mix? While individuals are not swayed by MFs they will still use them to make judgements about others and their actions. This seems generalizable and is likely a finding that is not only specific to CPR, but further research would be necessary to bear this out. This is a seeming paradox. In the end, with such small differences in the MFs of conservatives and liberals perhaps this is not a paradox at all. Perhaps moral issues are approached by both groups with much the same sets of tools.

APPENDICIES

Appendix A Recruitment

Amazon Mechanical Turk is a crowd sourcing site which offers tasks for participants to take part in for compensation. Often these are surveys or other short "Human Intelligence Tasks" (HITs). Respondents are not recruited specifically for this research but have been recruited already to the Mechanical Turk site linked. Once respondents have registered on the website, they can log into the survey portal and choose from a list of surveys which tell respondents how much they can be paid for the HIT. They can then click on the HIT to see about how long the HIT should take the complete and how much time they are given to complete it.

All respondents volunteer to do these HITs and often take part in several HITs while members of the portal.

Informed Consent:
A waver for a signature for informed consent was granted by the institutional review board. Participants clicked that they accept the terms of the consent by scrolling to the bottom of the form and clicking I agree.

Moral Foundation Theory as Explanation for Natural Resource Use in a Commons Dilemma

INFORMED CONSENT
Please carefully read the consent form below. If you chose to participate, please click I agree below.

Study Title: Moral Foundation Theory as Explanation for Natural Resource Use in a Commons Dilemma

RESEARCH PROCEDURES
This research is being conducted to test how people use resources in a fishery like the ocean. If you agree to participate, you will be asked to watch a short video, answer a few questions take part in a virtual fishing activity and answer some final questions. The entire task will take approximately 15 minutes.
RISKS
There are no foreseeable risks for participating in this research.
BENEFITS
There are no direct benefits to participating other than to assist with the research about common use dilemmas.
CONFIDENTIALITY
The data in this study will be confidential. At no point will your name or other identifiers be associated with your responses. A code will be generated for you to get credit for participating at the end of the survey and it will be your job to share that survey completion code with Mechanical Turk for payment. **While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission.**
PARTICIPATION
Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party. For completing this activity, you will be given $2.00. Amazon Mechanical Turk will automatically display your earnings on your dashboard and earnings pages when researchers have confirmed full completion of and attention to all parts of the

survey within 10 days of participation. All payments will be in US Dollars or Amazon.com gift cards.

CONTACT

This research is being conducted by doctoral candidate Ross Bair at George Mason University. He may be reached at 540-421-8008 for questions or to report a research-related problem. His advisor is Dann Sklarew, and he can be reached at 703-993-2012. You may contact the George Mason University Institutional Review Board office at 703-993-4121 (IRB#1234869-1) if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

By clicking "I agree" below I acknowledge that I have read the above information and I agree to participate in this study.

Appendix C Video Script

All participants will watch a tutorial close captioned video with the following narration which will explain the activity in which they will participate.
Link to Tutorial Videos:
Binding appeal: https://www.youtube.com/watch?v=AbtQBTUTlio&ab
Individualizing appeal: https://www.youtube.com/watch?v=U6WjjKdQZJc&ab
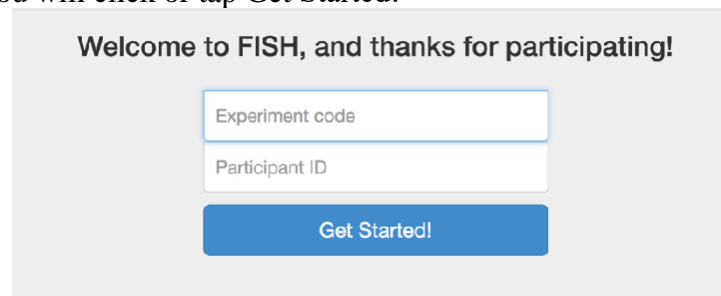
"Ahoy and welcome to the ocean. Thanks for helping by participating in this activity. As a new crewmember of this vessel, you will be asked to make decisions about fish harvesting in this section of the ocean. Please pay careful attention to the following instructions so that you can learn how the simulation works. When you are finished, I will ask a few questions to check your understanding. I can see three other vessels in the water and expect they'll be taking some fish today too so let's get started."

"When you are directed to do so you will log into the simulation by copying the experiment code and using the last 4 digits of your phone number or another memorable 4-digit number. This number will be your participant identification number for this activity. Next you will click or tap Get Started!"

Welcome to FISH, and thanks for participating!

Experiment code

Participant ID

Get Started!

"When the system had acquired enough participants, a message will display, and you should click Go fishing!"

Thanks for fishing.
We have acquired enough fishers to get started.
Click below to begin season 1.

Go fishing!

"Once the application has loaded the first season will begin. An information panel will be displayed alongside a picture of the fish in the ocean. In the information panel you will see the number of fish remaining in the sea, and the number of fish that you and the other 3 fishermen have taken this season. You will also see the total fish taken through all

4

seasons along with how much money you have made this season, and during all seasons. All participants see the same information you see."
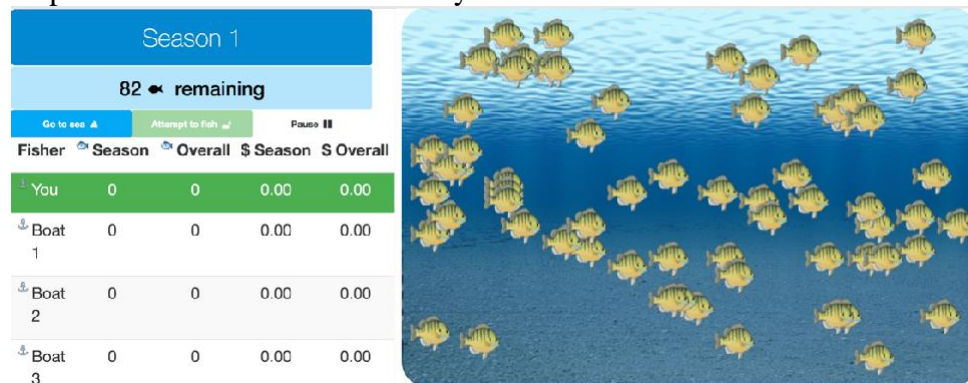
"You will see the fish swimming in the ocean. When a fish is taken a fish will be removed from the screen and recorded. All the fishers see the same information you do."

"To take fish you first need to click or tap the blue "Go to Sea" button. Once your boat is at sea, you can click or tap on the green "Attempt to Fish" button. This will allow you to catch your first fish. Click or tap once for each fish you'd like to take. Only return to port when you are finished."

"If at any point you wish to pause the fishing you can. By pressing the white pause button."

"You may catch as few or as many fish as you'd like until the season is over, or the number of fish has reached 0."

"The number of fish remaining will double before each new season."

"However, because the ocean can support only so many fish, the total number of fish will never exceed 100 fish."

"Fishing can go on this way for many seasons, but fishing stops any time that all fish are caught."

"You and your crew will be fishing for at least 1 and no more than 10 seasons but you will not be warned before the fishing is complete. There will be three other fishers in the water taking fish too."

"You can make "play money" fishing. You will be paid $5 for every fish you catch. While this is "play" money, please treat it as if it were real money."

"The fish in this ocean were left to you by previous fishers to reproduce and provide the population that you now have for your simulation."

"This research is designed to see how you and your fellow fishers deal with managing this resource. Just as it was for you the fish you leave will start the fishing for the next group."

"Your job is to consider all these factors, and the other fishers, and make your own decisions about how to fish. Fish however you wish".

"Before you begin it is important to know that just like in the real ocean, overfishing occurs when more fish are taken than can be created by fish reproduction causing the fish population to shrink over time. This fishery can be harvested at a sustainable level, but it is known that this fishery is vulnerable to overfishing."

The two treatments below differ in the words chosen to appeal to the participants. See (Appendix D) The colors indicate the different moral foundations which are triggered by each word.

All treatments will hear these final words.
"While all this is true, it is equally important that you harvest enough fish for your family of 4 to survive."

"Now that you have completed this tutorial, please return to the survey where I will ask a few questions about your understanding of the simulation. To do so, please minimize this video if necessary, and click or tap on the green continue button below."

This concludes the video narration.
Once participants have concluded the video, they will be able to click next which will take them to questions about how the simulation works.

Appendix D: Moral Foundation Terms and Survey Appeals

The following list of terms were determined to be morally salient with regards to each respective moral foundation by Graham et al. (2009). These terms were used in this study (Chapter 3 and 4) to construct the appeals given to fishers in the simulation. Words from care, and fairness were used to create the individualizing appeal, while words from the loyalty, authority, and sanctity were used to create the binding appeal. They were also used as options for terms that respondents fishing with unsustainable fishers would choose from as options to describe unsustainable fishers (Chapter 5).

Harm, safe, peace, compassion, empath, sympath, care, caring, protect, shield, shelter, amity, secur, benefit, defen, guard, preserve, harm, suffer, war, wars, warl, warring, fight, violen, hurt, kill, kills, killer, killed, killing, endanger, cruel, brutal, abuse, damag, ruin, ravage, detriment, crush, attack, annihilate, destroy, stomp, abandon, spurn, impair, exploit, exploits, exploited, exploiting, wound

Fairness, fair, fairly, fairness, fair, fairmind, fairplay, equal, justice, justness, justifi, reciproc, impartial, egalitar, rights, equity, evenness, equivalent, unbias, tolerant, equable, balance, homologous, unprejudice, reasonable, constant, honest, unfair, unequal, bias, unjust, injust, bigot, discriminat, disproportion, inequitable, prejud, dishonest, unscrupulous, dissociate, preference, favoritism, segregat, exclusion, exclud,

Ingroup (Loyalty), together, nation, homeland, family, families, familial, group, loyal, patriot, communal, commune, communit, communis, comrad, cadre, collectiv, joint, unison, unite, fellow, guild, solidarity, devot, member, cliqu, cohort, ally, insider, foreign, enem, betray, treason, traitor, treacher, disloyal, individual, apostasy, apostate, deserted, deserter, deserting, deceiv, jilt, imposter, miscreant, spy, sequester, renegade, terroris, immigra,

Authority, obey, obedien, duty, law, lawful, legal, duti, honor, respect, respectful, respected, respects, order, father, mother, motherl, mothering, mothers, tradition, hierarch, authorit, permit, permission, statu, rank, leader, class, bourgeoisie, caste, position, complian, command, supremacy,control, submi, allegian, serve, abide, defere, defer, revere, venerat, comply, defian, rebel, dissent, subver, disrespect, disobe, sediti, agitat, insubordinat, illegal, lawless, insurgent, mutinous, defy, dissident, unfaithful, alienate, defector, heretic, nonconformist, oppose, protest, refuse, denounce, remonstrate, riot, obstruct,

Sanctity/ Purity, piety, pious, purity**,** pure, clean, steril, sacred, chast, holy, holiness, saint, wholesome, celiba, abstention, virgin, virgins, virginity**,** virginal, austerity,

integrity, modesty, abstinen, abstemiousness, upright, limpid, unadulterated, maiden, virtuous, refined, intemperate, decen, immaculate, innocent, pristine, humble, disgust, deprav, disease, unclean, contagio, indecen, sin, sinful, sinner, sins, sinned, sinning, slut, whore, dirt, impiety, impious, profan, gross, repuls, sick, promiscu, lewd, adulter, debauche, defile, tramp, prostitut, unchaste, wanton, profligate, filth, trashy, obscen, lax, taint, stain, tarnish, debase, desecrat, wicked, blemish, exploitat, pervert, wretched

Moral Foundation Appeals
Appeal A – The Binding Appeal

"As you think about how you will go about fishing, it is important that you consider our patriotic tradition of valuing our natural resources' positive impact on our nation's future prosperity. It is important that you lawfully obey the guidance on overfishing, and that you abstain from overfishing. Waste of communal resources is disgusting. Taking more than can be sustained is a betrayal of innocent people who depend on that resource. Already caught, unused fish would be dumped into the ocean, dirtying the local waters. We must work together to respect the purity of these renewable resources."

Pink- Loyalty
Grey - Authority
Burgundy- Sanctity

Appeal B – The Individualizing Appeal

"As you think about how you will go about fishing, it is important to be sympathetic and equitable as you preserve the value of this resource that is important to providing the balance necessary for future prosperity. It is important that you not abandon the just guidance on overfishing, and that you are reasonable in your fishing actions. Destruction of these resources is unfair. Taking more than can be sustained is detrimental to others who depend on that resource. Already caught, unused fish would be dumped into the ocean impairing the local waters. We must work compassionately to prevent unjust harm to these renewable resources."

Yellow- Care
Red- Fairness

Appendix E: Moral Foundations Questionnaire (30 Questions)

The survey below was created to quantify the moral foundations that individuals used when making moral decisions. (Graham et al., 2011)

Part 1. When you decide whether something is right or wrong, to what extent are the following considerations relevant to your thinking? Please rate each statement using this scale:

Not at all Relevant	*Not Very Relevant*	Slightly Relevant	Somewhat Relevant	Very Relevant	Extremely Relevant

_____1. Whether or not someone suffered emotionally

_____2. Whether or not some people were treated differently than others

_____3. Whether or not someone's action showed love for his or her country

_____4. Whether or not someone showed a lack of respect for authority

_____5. Whether or not someone violated standards of purity and decency

_____6. Whether or not someone was good at math

_____7. Whether or not someone cared for someone weak or vulnerable

_____8. Whether or not someone acted unfairly

_____9. Whether or not someone did something to betray his or her group

_____10. Whether or not someone conformed to the traditions of society

_____11. Whether or not someone did something disgusting

_____12. Whether or not someone was cruel

_____13. Whether or not someone was denied his or her rights

_____14. Whether or not someone showed a lack of loyalty

_____15. Whether or not an action caused chaos or disorder

_____16. Whether or not someone acted in a way that God would approve of

Part 2. Please read the following sentences and indicate your agreement or disagreement:

Strongly Disagree	*Moderately Disagree*	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

_____17. Compassion for those who are suffering is the most crucial virtue.

_____18. When the government makes laws, the number one principle should be ensuring that everyone is treated fairly.

_____19. I am proud of my country's history.

_____20. Respect for authority is something all children need to learn.

_____21. People should not do things that are disgusting, even if no one is harmed.

_____22. It is better to do good than to do bad.

_____23. One of the worst things a person could do is hurt a defenseless animal.

_____24. Justice is the most important requirement for a society.

_____25. People should be loyal to their family members, even when they have done something wrong.

_____26. Men and women each have different roles to play in society.

_____27. I would call some acts wrong on the grounds that they are unnatural.

_____28. It can never be right to kill a human being.

_____29. I think it's morally wrong that rich children inherit a lot of money while poor children inherit nothing.

_____30. It is more important to be a team player than to express oneself.

_____31. If I were a soldier and disagreed with my commanding officer's orders, I would obey anyway because that is my duty.

_____32. Chastity is an important and valuable virtue.

To score the MFQ yourself, you can copy your answers into the grid below. Then add up the 6 numbers in each of the five columns and write each total in the box at the bottom of the column. The box then shows your score on each of 5 psychological "foundations" of morality. Scores run from 0-30 for each foundation. (Questions 6 and 22 are just used to catch people who are not paying attention. They don't count toward your scores).

"The average politically moderate American's scores are: 20.2, 20.5, 16.0, 16.5 and 12.6. Liberals generally score a bit higher than that on Harm/care and Fairness/reciprocity, and much lower than that on the other three foundations. Conservatives generally show the opposite pattern."

Appendix F: Post Video Statements and Questions

Once participants have concluded the video, they will be able to click next which will take them to questions about how the simulation works.

- **Debrief Questions**

Question: Including you, how many fishers will there be?
- 1
- 2
- 3
- 4

Answer: The answer is 3.
There will be 3 other fishers in the ocean fishing alongside you.

Question: You will participate in how many seasons of fishing?
- 1
- 3
- 5
- 1-10

Answer: The answer is 1-10.
You will be fishing for at least 1 but no more than 10 seasons.

Question: The number of fish at the beginning of the simulation is equal to which of the following?
- 1-10
- One half the number left by the previous group.
- The number left by the previous group
- Two times the number left by the previous group

Answer: The correct answer is, two times the number left by the previous group.

Question: Every time you want to catch a fish you need to hit which button?
- "Go to Sea"
- "Attempt to Fish"
- "Start Simulation"

Answer: You will need to hit the "Attempt to Fish" button to catch fish.

Question: **The number of fish left by the group will…**
- be cut in half and given to the next group of participants
- be doubled and given to the next group of participants
- be given directly to the next group of participants

Answer: The number of fish left by your group will be doubled and given to the next group of participants.

Please create a memorable 4-digit number. This will be your Participant ID for the fishing game and part of your task 8-digit (HIT) completion code. (Number between 0 and 9999)

   Next each participant will be sent to one of two groups. Each group will have the same link to click (http://www.fishim.org:8080/)

Group 1: Take a moment to think about how you'd like to fish. Now copy the experiment code below, and then click on the fish to get started.
BK3A2J (One Non-Sustainable fishers)

Group 2: Take a moment to think about how you'd like to fish. Now copy the experiment code below, and then click on the fish to get started.
88YR5L (All Sustainable fishers)

After finishing, only the group that had one unsustainable fisher will answer the questions grid below.
After finishing, only the group that had one unsustainable fisher will answer the questions grid below.

Question: "One of the fishers you were fishing with did not fish sustainably. How likely would you be to use the following words to describe their behavior?"

	Very Likely	Likely	Somewhat Likely	Somewhat Unlikely	Unlikely	Very Unlikely
Unpatriotic						
Dishonorable						
Sinful						
Uncaring						
Lacking Empathy						
Unfair						
Sick						
Unjust						
Disrespectful						
Disloyal						

Next all respondents will take "The Moral Foundation Questionnaire" 30 question version. (Appendix E)

All respondents answer the following question.

Question: Place yourself on the political ideology scale below

- Very Conservative
- Conservative
- Somewhat Conservative
- Neither Liberal nor Conservative
- Somewhat Liberal
- Liberal
- Very Liberal

Question: What is your current age in years?

Numeric Input 0-105

Question: What is your gender

- Male
- Female
- Transgender
- Other
- Prefer not to say

Debriefing Statements:

We want to let you know…

The study which you just completed contained an element of deception. You were, in fact, the first to interact with this resource and you were actually fishing with pre-programmed computer fishers, not other people participating in the study.

Conclusion Statement

Read this before closing your browser!

Thanks for participating in our fishing expedition, and for completing this survey. It is our hope that your simulation experience can help us learn how to more successfully encourage groups to behave in a more sustainable way.

Please carefully copy the 8 digit "Survey Code" number below.

To receive your compensation for this HIT, paste this 8-digit completion code in the appropriate location on the Mechanical Turk site.

Verification of both the survey and the game will earn you payment within 3 days' time.

Completed on (Date) at (Time)
Survey Code (8 digit HIT Code)
Study Title: Moral Foundation Theory as Explanation for Natural Resource Use in a
Commons Dilemma
Researcher: Ross Bair- rbair@gmu.edu

Appendix G: Parameters of Fish 4.0 Defined (Gifford & Aranda, 2013)

General Settings	
Number of Oceans	The number of simulations that exist with the same simulation name and settings. If 10 people are participating individually with the same simulation settings, 10 oceans are required.
Fishers per Ocean	The number of human and computer fishers in each ocean.
Human Fishers per Ocean	The number of human fishers per ocean; human fishers will be distributed evenly across oceans.
Number of Seasons	The number of seasons fishing will last for before the simulation ends, provided that all fish are not harvested first.
Initial Delay	The number of seconds to pause while supposedly waiting for other fishers. Adds realism.
Season Delay	The number of seconds between seasons. Time for the participants to reflect on the state of the fishery.
Economics	
Fish Value	The amount each fish that is caught is worth to the fisher.
Currency Symbol	The default is in dollars but can changed to any currency symbol.
Fish Stocking and Fishing	
Certain Fish	The number of fish that will definitely be available in the first season of fishing.
Potential Mystery Fish	How many mystery fish the participants are told there could be
Available Mystery Fish	How many mystery fish actually exist in the simulation

Spawn Factor	The multiplier by which the remaining fish in each season will generate or spawn new fish. A spawn factor of 3 means the remaining fish will triple for the next season.
Chance of Catch	A decimal number between 0 and 1, where 1 means all casts are successful, and 0 means that each cast is never successful; 0.5 indicates that half are successful on a random basis.
Bots (Computer Fishers)	
Greediness	Value from 0 to 1; 0 causes bots to take no fish, 0.5 causes them to fish at an exactly sustainable rate, and 1 causes them to take all fish possible
"Should Bots be Erratic"	If yes, bots behave non-deterministically. They may or may not act at any given moment of the simulation. Adds to realism.
Hesitation Factor	Determines the likelihood that the bots will act; a higher hesitation factor value makes it more likely that the bot will act.

Appendix H: Extended Descriptive Stats

Total Score Across the Ideological Spectrum for For Each Moral Foundation

● Care ● Fair ● Loyalty ● Authority ● Purity
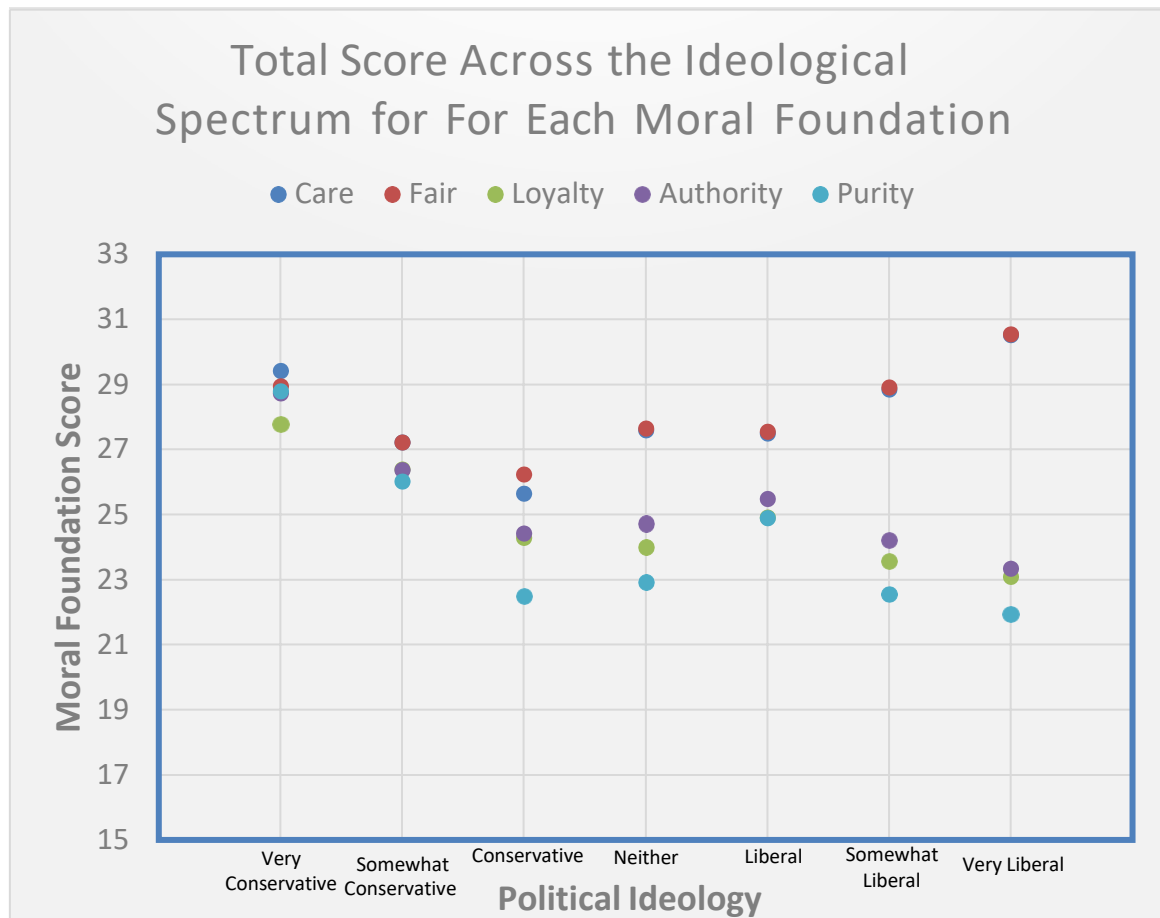
Total score for each of the moral foundations for each level of the political ideology scale. This pattern of values with those on the care and fairness being higher for the more liberal groups is similar to that observed by Graham but on average higher values for very conservative groups for all foundations is not consistent with Graham's observations (2009).

Appendix I: Institutional Review Board Human Subjects Research Determination

Form

The study was approved by George Mason Universities Office of Research Integrity and Assurance.

GEORGE MASON UNIVERSITY | **Office of Research Integrity and Assurance**

Research Hall, 4400 University Drive, MS 6D5, Fairfax, Virginia 22030
Phone: 703-993-5445; Fax: 703-993-9590

DATE: July 20, 2020

TO: Dann Sklarew, PhD.
FROM: George Mason University IRB

Project Title: [1234869-4] Moral Foundation Theory as Explanation for Natural Resource
                   Use in a Commons Dilemma

SUBMISSION TYPE: Continuing Review/Progress Report and Amendment

ACTION: APPROVED
APPROVAL DATE: July 20, 2020
EXPIRATION DATE: July 19, 2021
REVIEW TYPE: Expedited Review

REVIEW TYPE: Expedited review category #7

Thank you for your submission of Continuing Review/Progress Report materials and Amendment materials for this project. The George Mason University IRB has APPROVED your submission. This submission has received Expedited Review based on applicable federal regulations.

You are required to follow the George Mason University Covid-19 research continuity of operations guidance. You may not begin or resume any face-to-face interactions with human subjects until (i) Mason has generally authorized the types of activities you will conduct, or (ii) you have received advance written authorization to do so from Mason's Research Review Committee. In all cases, all safeguards for face-to-face contact that are required by Mason's COVID policies and procedures must be followed.

Please remember that all research must be conducted as described in the submitted materials.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form unless the IRB has waived the requirement for a signature on the consent form or has waived the requirement for a consent process. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by the IRB prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to the IRB office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed (if applicable).

- 1 -   Generated on IRBNet

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the IRB.

The anniversary date of this study is July 19, 2021. This project requires continuing review by this committee on an annual basis. You may not collect data beyond this date without prior IRB approval. A continuing review form must be completed and submitted to the IRB at least 30 days prior to the anniversary date or upon completion of this project. Prior to the anniversary date, IRBNet will send you a reminder regarding continuing review procedures.

Please note that all research records must be retained for a minimum of five years, or as described in your submission, after the completion of the project.

Please note that department or other approvals may be required to conduct your research in addition to IRB approval.

If you have any questions, please contact Katie Brooks at (703) 993-4121 or kbrook14@gmu.edu. Please include your project title and reference number in all correspondence with this committee.

GMU IRB Standard Operating Procedures can be found here: https://oria.gmu.edu/topics-of-interest/human-subjects/

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within George Mason University IRB's records.

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BIOGRAPHY

Ross Bair was born in Carroll County Maryland in 1980. He spent his formative years with his siblings who were all involved in 4-H with interests in goats, plants and horticulture. He attended Bridgewater College in Virginia where his focus was split between studying biology, government and the social sciences. During summers he spent time outdoors working at a summer camp and running. He graduated Magna Cum Laude from Bridgewater College in 2002 with a bachelor's in biology.

He began teaching biology, chemistry and ecology at his alma mater Westminster High School and continued to Harrisonburg High School in 2004 where he taught Biology, Ecology, Horticulture and AP Environmental Science. Ross earned a master's degree in Secondary Science Education from McDaniel College in 2005. It was during this time that Ross began reading extensively in the field of environmental science in support of improving his instruction. This, and the work he did with his students spurred his desire to continue academic research in Environmental Science.

In 2010 Ross moved with his wife and two-year-old twins to Manassas, Virginia where he enrolled at George Mason University. He also began working at Battlefield High school where he taught Biology, AP Biology and started the Environmental Science program. He became Science Head of Department at the school and led county-wide professional development for other AP Environmental teachers. He was also employed as a grader for AP Environmental Science tests for College Board.

He earned a master's in Environmental Science and Policy from George Mason University in 2013, studying the effect of Virginia State Science Standards of Learning on environmental literacy of students. He began work towards a PhD in the following year.

After finishing his coursework in 2017 he and his wife took positions teaching at Kaohsiung American School in Kaohsiung, Taiwan where Ross taught International Baccalaureate (IB) Diploma Program (DP), Middle Years Program (MYP) and Advanced Placement Biology and MYP Environmental Science. In 2019 Ross moved to Dakar Senegal to take a position at The International School of Dakar where he has taught IB DP Biology, MYP Biology, Theory of Knowledge and DP Environmental Systems and Societies. Ross became the Science Head of Department at the school in 2020 and a member of the Board of Trustees in 2021.