

Fishing for the Truth: Achieving the “Best Available Science” by Forging a Middle Ground Between Mainstream Scientists and Fishermen

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I. INTRODUCTION

Incorporating knowledge from commercial and recreational fishermen¹ into scientific research can be a daunting task given the complex legal and regulatory environments that govern fisheries in the United States. Facilitating greater cooperation between scientists and fisheries stakeholders can improve the quality and efficiency of data collection. However, uniting fishermen's knowledge and mainstream science into a cooperative research effort may pose a significant legal hurdle – information collected via cooperative research can be challenged for failing to meet the statutorily required “best available science” standard of the Magnuson-Stevens Fishery Conservation and Management Act.²

The quality of the information used in fish stock³ assessments has been the frequent target of legal actions. These assessments form the basis for establishing fishing limits, and in turn affect the allocation of fish among various user groups. If scientific information indicates that a stock is overfished, the Magnuson-Stevens Act requires restraints on fishing in order to allow the stock to recover.⁴ Thus, to challenge severe reductions in allowable catch, the fishing industry often claims that scientific information underlying these conclusions is inadequate or inaccurate.⁵ Environmental groups then counter by challenging reductions that are merely moderate or conservative. In light of increasing litigation in United States fisheries management and the emerging cooperative effort for data collection between fishermen and scientists, we may see a greater number of challenges that the data fails to meet the “best scientific information available” standard.

While cooperative research appears to benefit both scientists and fishermen,

¹ While the practice of using the word “fisherman” to describe all individuals who fish has fallen from favor by some, the traditional use of “fisherman,” rather than “fisher,” to describe both men and women who fish is used in this Article.

² 16 U.S.C. § 1851 (2006). After reauthorizations since 1976, the original Fishery Conservation and Management Act is now named the Magnuson-Stevens Fishery Conservation and Management Act and hereinafter will be referred to as the Magnuson-Stevens Act or MSA. In 1996, Congress amended the Magnuson-Stevens Act with the Sustainable Fisheries Act (SFA). Pub. L. No. 104-297. The SFA added significant conservation requirements to address overfishing, bycatch, and fish habitat protection. *Id.*

³ A stock of fish is defined under the Magnuson-Stevens Act as a species, subspecies, geographical grouping, or other category of fish capable of management as a unit. 16 U.S.C. § 1802(42) (2007).

⁴ 16 U.S.C. § 1851 (2007).

⁵ See, e.g., *Little Bay Lobster Co. v. Evans*, 2002 DNH 96 (D.N.H. 2002) (decision was based on best science available); see also *A.M.L. Int'l, Inc. v. Daley*, 107 F. Supp. 2d 90 (Mass. Dist. Ct. 2000) (decision was based on best science available). *But see* *Natural Res. Def. Council, Inc. v. Daley*, 209 F.3d 747 (D.C. Cir. 2000) (decision was not based on best science available); See also *Fishermen's Dock Coop. Inc. v. Brown*, 75 F.3d 164 (4th Cir. 1996) (decision was not based on best science available).

implementation of such a scheme may create significant legal challenges. Consider two hypothetical species of fish – Occamus and Tolemus. Suppose that, together, fishermen and scientists conduct cooperative research on both species and gather data concerning bycatch rates in a specified area in the Northern Atlantic. Suppose further that the National Marine Fisheries Service (“NMFS”) is willing to use the data gathered on Occamus to determine fishing limits. NMFS, however, declines to use the Tolemus cooperative research data, based on its determination that research methodologies did not comply with the “best available science” mandate of the Magnuson-Stevens Act. In the latter example, the fishing community may challenge NMFS’s decision to *reject* the cooperative data about the Tolemus; cooperative research provides the fishing community with an opportunity to provide its knowledge and experience, and to play a role in protecting the resource. Simultaneously, an environmental group may challenge NMFS’s decision to *employ* the cooperative data to regulate Occamus. Environmentalists may not want NMFS to use cooperative research when determining how to limit bycatch out of fear that cooperative data does not follow scientific protocols, and hence may inaccurately allow overfishing.

This Article demonstrates that the “best available science” mandate of the Magnuson-Stevens Act provides an effective mechanism for employing scientific data and fisheries observations that should conserve fisheries resources. Traditionally, fisheries research is conducted by scientists. The growing trend, however, is to utilize cooperative research schemes and incorporate data collected by fishermen with traditional science. Through this method parties can achieve similar, and perhaps better, results. Part II of this Article provides background on the history and structure of federal fisheries management and legal decisions that have applied the “best available science” requirement of the Magnuson-Stevens Act. Part III describes how cooperative research acts as an effective tool for gathering scientific information, and reveals the growing prevalence and value of cooperative research in the fisheries industry. Part IV demonstrates that cooperative research can meet the scrutiny required under the “best available science” standard. Part V concludes by suggesting that even if a court finds that cooperative research does not strictly meet the “best available science” mandate, NMFS may be entitled to deference in its use of this method.

II. FISHERIES MANAGEMENT AND THE "BEST AVAILABLE SCIENCE" MANDATE

A. *United States Fisheries Management & Overfishing Under the Magnuson-Stevens Act*

Upon instituting the Magnuson-Stevens Act, Congress found that maintaining sustainable sources of fish and shellfish is critical to contributing to the Nation's food supply, economy, and health, as well as providing recreational opportunities for citizens.⁶ Over the past thirty years, United States fisheries⁷ have come under increasing pressure due to overexploited fish stocks and degraded habitat. This misuse has already resulted in negative consequences for ecosystems and fishing communities and domestic commercial and recreational fishing industries are capable of complete degradation of our fisheries.⁸ NMFS (also known as NOAA Fisheries) is the federal agency responsible for stewardship of the Nation's living marine resources and their habitats.⁹ In 2004, NMFS reviewed 236 stocks of fish and identified 44 stocks that were being overexploited.¹⁰ In addition, it examined 200 stocks of fish and identified 53 stocks as overfished;¹¹ the status of 113 stocks was unknown.¹²

Until the end of the Twentieth Century, the federal government did not

⁶ 16 U.S.C. §1801(a)(1) (2007).

⁷ A fishery, as defined by the Magnuson-Stevens Act, is (A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economical characteristics and (B) any fishing for such stocks. 16 U.S.C. § 1802(13) (2006).

⁸ 16 U.S.C. § 1801(a)(2) (2007); Pub. L. No. 94-265.

As a consequence of increased fishing pressure and because of the inadequacy of fishery conservation and management practices and controls (A) certain stocks of fish declined to the point where their survival is threatened, and other stocks of fish have been so substantially reduced in number that they could become similarly threatened. *Id.*

"Fishery resources are finite but renewable. If placed under sound management before overfishing has caused irreversible effects, the fisheries can be conserved and maintained so as to provide optimum yields on a continuing basis." *Id.* at 1801(a)(5).

⁹ See generally 16 U.S.C. sec. 1801 et seq.

¹⁰ The terms "overfishing" and "overfished," are both defined by the Magnuson-Stevens Act as a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis. 16 U.S.C. § 1802(34) (2007). A stock of fish that is *experiencing overfishing* means that the stock is being harvested at a rate above a prescribed fishing mortality threshold. See NAT'L MARINE FISHERIES SERVICE, REPORT ON THE STATUS OF THE U.S. FISHERIES (2005).

¹¹ *Overfished* means the size of fish stock is below a prescribed biomass threshold. See NAT'L MARINE FISHERIES SERVICE, REPORT ON THE STATUS OF THE U.S. FISHERIES (2004).

¹² NAT'L MARINE FISHERIES SERVICE, REPORT TO CONGRESS: STATUS OF FISHERIES OF THE UNITED STATES I (2004).

impose any limits on United States fisheries beyond requiring a fishing permit and mandatory fishing gear.¹³ Without regulations, both domestic and foreign fishermen had a strong incentive to race against their competitors and catch as many fish as possible.¹⁴ This unmanaged competitive harvesting led to exploitation and degradation of the fisheries.¹⁵ In order to address the long-term sustainability of fisheries, the government had to improve fishery management.¹⁶

In 1976, Congress enacted the Fishery Conservation and Management Act (now known as the Magnuson-Stevens Act) to manage and control declining United States fishery resources within two hundred miles of its coast (the exclusive economic zone or EEZ).¹⁷ Congress passed this Act to prevent overfishing, rebuild overfished stocks, and ultimately ensure conservation and management of fishery resources.¹⁸ To achieve these goals, the Magnuson-Stevens Act created eight Regional Fishery Management Councils¹⁹ (hereinafter, "Councils"), which are responsible for preparing, monitoring, and revising fishery management plans.²⁰

NMFS works with the Councils, under the supervision of the Secretary of Commerce, to end overfishing, reduce bycatch,²¹ conserve essential fish habitat, and rebuild depleted stocks through the development of Fishery Management

¹³ See *An Ocean Blueprint for the 21st Century: Final Report of the U.S. Ocean Commission on Ocean Policy 231-32 (2004)* (unpublished manuscript, available at http://www.oceancommission.gov/documents/prepub_report/welcome.html) [hereinafter *Ocean Commission Report*].

¹⁴ OTTO GABRIEL, KLAUS LANGE, ERDMANN DAHM, & THOMAS WENDT, *FISH CATCHING METHODS OF THE WORLD* 502 (Blackwell Publishing Ltd.) (4th ed. 2005) [hereinafter *Fish Catching Methods*]. See also Sharon R. Siegel, Comment, *Applying the Habitat Conservation Model to Fisheries Management: A Proposal for a Modified Fisheries Planning Requirement*, 25 COLUM. J. ENVTL. L. 141, 144 (2000). The competition for fish is based on the theory of common property. Fish are viewed as common property and by their nature are available to everyone. The only limitation is a dwindling or depleted supply. *Id.*

¹⁵ DAVID HUNTER, JAMES SALZMAN, & DURWOOD ZAELEKE, *INTERNATIONAL ENVIRONMENTAL LAW AND POLICY* 757 (Foundation Press 2007) ("Unregulated fisheries is a classic case of the tragedy of the commons.").

¹⁶ See NAT'L ACADEMY OF PUBLIC ADMIN., COURTS, CONGRESS, AND CONSTITUENCIES: *MANAGING FISHERIES BY DEFAULT* (July, 2002) (study concluded that the United States fishery management system was in disarray and pointed out the need for major changes in the fishery management systems).

¹⁷ 16 U.S.C. § 1802(11) (2007).

¹⁸ *A.M.L. Int'l*, 107 F. Supp. 2d at 93.

¹⁹ The eight councils include the New England Council, Mid-Atlantic Council, South Atlantic Council, Caribbean Council, Gulf Council, Pacific Council, North Pacific Council, and Western Pacific Council. 16 U.S.C. § 1852 (a)(1)(A)-(H) (2007).

²⁰ *Id.* § 1852(a).

²¹ Bycatch is defined by the Magnuson-Stevens Act as fish which are harvested in a fishery but which are not sold or kept for personal use. This includes economic discards and regulatory discards, but does not include fish released alive under a recreational catch and release fishery management program. 16 U.S.C. § 1802 (2007).

Plans (FMPs).²² The Magnuson-Stevens Act requires FMPs to be consistent with ten National Standards, including prevention of overfishing, use of "best available science," and ensuring that conservation and management measures account for the importance of the fishery resource to fishing communities.²³ FMPs must also consider social, economic, biological, and environmental factors.²⁴

The first National Standard serves as the basis for all FMPs and mandates that "[c]onservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield for each fishery for the United States fishing industry."²⁵ Optimum yield is the maximum amount of fish that can be harvested safely (maximum sustainable yield), reduced by economic, social, and ecological factors.²⁶ The first National Standard has

²² *Id.* § 1853.

²³ *Id.* § 1851.

²⁴ *Id.* § 1851(a). The Magnuson Act proscribes ten standards for fishery conservation and management: (1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry; (2) Conservation and management measures shall be based upon the best scientific information available; (3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination; (4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges; (5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose; (6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches; (7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication; (8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities; (9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch; (10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea. *Id.*

²⁵ 16 U.S.C. § 1851(a)(1) (2007). The terms "overfishing" and "overfished" mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis. *Id.* § 1802(34).

²⁶ See RICHARD K. WALLACE & KRISTEN M. FLETCHER, UNDERSTANDING FISHERIES MANAGEMENT 22 (2d ed. 2001). The term "optimum," with respect to the yield from a fishery, means the amount of fish which (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (B) is prescribed on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant social, economic, or ecological factor; and (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery. 16 USC § 1802(33c) (2007).

priority, and therefore must be met before the other nine National Standards.²⁷ Once conservation efforts have been met, the second National Standard, the focal point of this article, requires that “[c]onservation and management measures shall be based upon the best scientific information available.”²⁸

B. “Best Available Science”

High quality fisheries management requires accurate information. The Magnuson-Stevens Act specifically mandates that Councils base FMPs on the best scientific information available.²⁹ To comply with this requirement, fishery managers must determine what constitutes the “best available science”

1. Origins of the “Best Available Science” Mandate

The Marine Mammal Protection Act of 1972 (“MMPA”) was the first congressional act to include a “best available science” mandate.³⁰ Though MMPA established a broad prohibition against the “taking”³¹ of marine mammals, it provided one important exception. Under this law, wildlife agencies may grant exceptions to the takings prohibition provided they determine, using the best available scientific evidence, that such a taking would have only a negligible impact on marine mammal populations or stocks.³²

Subsequently, the Endangered Species Act (“ESA”) incorporated the “best available science” mandate in 1973.³³ ESA requires the Secretary of Commerce to list a species as endangered or threatened “solely on the basis of the best

²⁷ *Natural Res. Def. Council Inc. v. Daley*, 209 F.3d 747, 753 (D.C. Cir. 2000).

As an initial matter, we reject the District Court's suggestion that there is a conflict between the Fishery Act's expressed commitments to conservation and to mitigating adverse economic impacts. The Government concedes, and we agree, that, under the Fishery Act, the Service must give priority to conservation measures. It is only when two different plans achieve similar conservation measures that the Service takes into consideration adverse economic consequences. This is confirmed both by the statute's plain language and the regulations issued pursuant to the statute. *Id.*

See 16 U.S.C. § 1851(a)(2) (2007) (requiring fishery management plans to contain “[c]onservation and management measures...based upon the best scientific information available”; 50 C.F.R. § 600.345(b)(1) (2007) (“Where two alternatives achieve similar conservation goals, the alternative that ... minimizes the adverse impacts on [fishing] communities would be the preferred alternative.”).

²⁸ 16 U.S.C. § 1851(a)(2) (2007). See also *id.* § 1801(a)(8) (“The collection of reliable data is essential to the effective conservation, management, and scientific understanding of the fishery resources of the United States.”).

²⁹ *Id.* § 1851(a)(2).

³⁰ See *id.* § 1361 *et seq.*

³¹ The term “take” means “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” 16 U.S.C. § 1362(13) (2007).

³² *Id.* § 1371.

³³ See *id.* § 1533 (b)(1)(A).

scientific and commercial data available.”³⁴ In order to determine what conservation efforts are in order under the ESA, the information leading to this determination must be complete and of high quality.³⁵ As such, the decision to list a species must be based on data that is “verifiable, accountable, responsible, and available.”³⁶ The legislative history of the ESA, however, does not clarify what Congress meant by the term “best available science,” nor what satisfies this requirement.³⁷

Several rationales support ESA’s “best available science” mandate. “Best available science” promotes more accurate decisions by the Secretary.³⁸ Utilizing the “best available science” increases public trust and political credibility, because the agency’s judgments appear objective.³⁹ Additionally, courts will more likely defer to an agency during judicial review of a challenged decision if the agency shows its determination was based upon the *best* information available.⁴⁰

Following Congress’s implementation of the ESA, Congress incorporated the “best available science” requirement into the Magnuson-Stevens Act.⁴¹ Both the ESA and the Magnuson-Stevens Act share one central goal – conservation of a finite natural resource. Science, however, is inherently uncertain, and this

³⁴ *Id.* § 1533(b)(1)(A). This section provides in full that:

The Secretary shall make the determinations required by subsection (a)(1) solely on the basis of the best scientific and commercial data available to him after conducting a review of the status of the species and after taking into account those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species, whether by predator control, protection of habitat and food supply, or other conservation practices, within any area under its jurisdiction; or on the high seas. *Id.*

16 U.S.C. § 1533(a)(1) provides that the “best...available” data is applied to the following factors to determine the status of the species proposed for listing: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

³⁵ Laurence Michael Bogart, *That’s My Story and I’m Stickin’ to it: Is the “Best Available Science” Any Science Available Under the Endangered Species Act?*, 31 IDAHO L. REV. 85, 144-5 (1994).

³⁶ *Id.* at 145.

³⁷ *Id.* at 122.

³⁸ Holly Doremus, *The Purposes, Effects, and Future of the Endangered Species Act’s Best Available Science Mandate*, 34 ENVTL. L. 397, 418 (2004).

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ NAT’L RESEARCH COUNCIL, IMPROVING THE USE OF THE “BEST SCIENTIFIC INFORMATION AVAILABLE” STANDARD IN FISHERIES MANAGEMENT 17 (National Academies Press 2004) (2004) [hereinafter *Best Scientific Information Available*]. A major reason for implementing the “best available science” standard was to allow for future improvement in scientific technology over the years. *Id.* at 19. See Senate Committee, *Fishery Conservation and Management Act*, 94.

uncertainty is especially significant when a natural resource is involved.⁴² The ambiguity of data often is directly linked to the availability of funding.⁴³ Furthermore, scientists must spend more time conducting research when the subject is an unpredictable natural resource.⁴⁴ Due to the unique character and common interest behind these statutes, Congress evidently sought a *compromise* between requiring a strict scientific basis to support implementation of conservation and management efforts, and allowing conservation without any foundation, and at any cost.⁴⁵ Thus, Congress' intent behind including the "best available science" requirement is to better facilitate management and conservation of a natural resource in light of these limitations on data collection.⁴⁶ Without this requirement, conservation and management groups would face a recurrent dilemma: had Congress required precise scientific data as a prerequisite to taking action, conservation efforts would likely come too late to have any real impact on a resource.⁴⁷

2. "Best Available Science" in Fisheries Management Plans

National Standard Two of the Magnuson-Stevens Act mandates that upon promulgating a FMP, "conservation and management measures shall be based upon the best scientific information available."⁴⁸ In general, the term "best scientific information available" refers to use of scientific information when science is unsettled or incomplete, when no better information is available, and when the decision by the Council furthers conservation of the fishery resource.⁴⁹ "Scientific information" includes, but is not limited to, biological, ecological, economic, or social information.⁵⁰ To ensure the success of a FMP, the data must undergo a thorough analysis and must be of high quality.⁵¹ Thus, while National Standard Two does not propose specific analytical tools or methodologies for information gathering, it has one restriction: that agencies use the "best available science" in their decision-making.⁵²

⁴² *Id.* at 19.

⁴³ *Id.*

⁴⁴ *Id.*

⁴⁵ *Best Scientific Information Available*, *supra* note 42, at 18-20.

⁴⁶ *Id.* at 18.

⁴⁷ *Id.*

⁴⁸ 16 U.S.C. § 1851(a)(2) (2007).

⁴⁹ Alan D. Copey, *Revisiting the Growth Management Act: Including Best Available Science in the Designation and Protection of Critical Areas Under the Growth Management Act*, 23 SEATTLE U. L. REV. 97, 115 (1999).

⁵⁰ 50 C.F.R. § 600.315(b)(1).

⁵¹ *Id.*

⁵² This mandate prohibits an agency from simply creating a rule based on mere political compromise rather than verifiable data. *See Hadaja, Inc. v. Evans*, 263 F. Supp. 2d 346, 353 (R.I. Dist. Ct. 2003) (The agency created a rule based on a political compromise rather than using the best

The Councils offer a different interpretation of “best available science,” placing greater emphasis on the word “best.” The Councils view “best available science” as referring to the most recent and relevant information available at the time an FMP is devised.⁵³ This interpretation logically follows from the ordinary meaning of the word “best” – the most relevant and contemporary information is seen as the best information.⁵⁴

Of further importance, the Magnuson-Stevens Act requires the best scientific information *available*.⁵⁵ National Standard Two does not, however, call for the best scientific data *possible*.⁵⁶ Inherent in both the statutory language, as well as the spirit of the Magnuson-Stevens Act, is the notion that scientific information may be incomplete; it need not be exact or absolutely comprehensive.⁵⁷ Furthermore, there may be differences among the relevant information available to a Council. If so, the Secretary may exercise discretion and choose among the various findings, so long as the choice is justified.⁵⁸ Likewise, if there is no other proposed scientific information, then what is available is therefore “best.”⁵⁹ As such, the Magnuson-Stevens Act does not force the Secretary of Commerce or the Councils to “sit idly by” and watch the deterioration of a

scientific information available. The court ruled that this did not constitute best scientific information available.)

⁵³ *Best Scientific Information Available*, *supra* note 42, at 26.

⁵⁴ Best is commonly defined as “the supreme effort one can make.” See <http://www.wordreference.com> (last visited on August 18, 2006).

⁵⁵ 16 U.S.C. § 1851(a)(2) (2007).

⁵⁶ *Oceana, Inc. v. Evans*, 384 F. Supp. 2d 203, 218-9 (D.D.C. 2005).

⁵⁷ 50 C.F.R. § 600.315(b) (2007); *A.M.L. Int'l*, 107 F. Supp. 2d at 101; *Parravano v. Babbitt*, 837 F. Supp. 1034, 1046 (N.D. Cal. 1993); *Nat'l Fisheries Inst. v. Mosbacher*, 732 F. Supp 210, 220 (D.D.C. 1990).

⁵⁸ 50 C.F.R. § 602.12(b)(1) (2007). See *J.H. Miles & Co., Inc. v. Brown*, 910 F. Supp. 1138, 1149-52 (E.D. Va. 1995). (Reasonable people can disagree about the merits of a research study and whether it should be accepted or rejected. Because one reasonable interpretation of the study is that it is an accurate representation of the number and location of clams, the decision to use this data is not arbitrary and capricious and shall not be set aside). See also *The Ocean Conservancy v. Evans*, 260 F. Supp. 2d 1162, 1178-9 (M.D. Fla. 2003) (While Ocean Conservancy disagreed with the Secretary’s chosen quota, there was a rational, scientific basis for the quota and as such, the quota must stand). *But see* *Natural Res. Def. Council v. Daley*, 209 F.3d 747, 754 (D.C. Cir. 2000) (Despite the overfished condition, NOAA Fisheries recommended a quota for summer flounder in 1999 that afforded only an 18 percent likelihood of achieving the target fishing mortality rate. The National Resource Defense Council challenged NOAA Fisheries’ quota on the grounds that it did not provide sufficient assurance that it would meet the conservation goals of the Magnuson-Stevens Act. The court decided that the 1999 quota was unreasonable because the proposed plan had at least an 82 percent chance of resulting in a mortality rate higher than the target rate. The court suggested that the management plan should have at least a 50 percent chance of achieving the target mortality rate, observing that “only in Superman Comics’ Bizarro world, where reality is turned upside down, could [NOAA Fisheries] reasonably conclude that a measure that is at least four times as likely to fail as to succeed offers a ‘fairly high level of confidence.’”)

⁵⁹ *Commonwealth of Massachusetts by its Div. of Marine Fisheries v. Daley*, 170 F.3d 23, 30 (1st Cir. 1999).

fishery resource merely because the data is incomplete or the accuracy is somewhat uncertain.⁶⁰ The statutory language of the Magnuson-Stevens Act thereby opens the door for cooperative fisheries research.

III. COOPERATIVE FISHERIES RESEARCH

Fisheries research becomes cooperative when scientists and fishermen work together to conduct research.⁶¹ For example, scientists may charter fishing vessels, or fishermen may participate aboard scientific research vessels. Including both scientists and fishermen in the research process creates a richer data-set: through the scientific method, scientists contribute precision, statistical verification, and hypothesis generation. Fishermen, on the other hand, contribute long-term experience and regular observations of fish and their practices. Both perspectives provide invaluable components when generating hypotheses and conducting fisheries research.

Notably, cooperative research in this field is far from a novel concept. Fishermen have been working with scientists to improve their understanding of fisheries resources and ecosystems since the 1800s.⁶² However, following the Magnuson-Stevens Act and its mandate that fisheries management be based on "best available science," there has been a growing emphasis on both timely and accurate data collection. In order to acquire the best scientific information available in an accurate and timely manner, it is essential that scientists and fisherman continue to work closely together.⁶³

A. *History of Cooperative Research in the Fishing Industry*

For as long as history indicates, humans have used fish as a source of food.⁶⁴ There is proof that even the earliest fishermen understood fish distributions, factors that influence fish migration, and diets of varying species of fish.⁶⁵ More recently, fishermen have come to understand that while there once appeared to be an endless abundance of fish, the fish population varies according to environmental conditions as well as human-related incidents, such as oil spills.⁶⁶ Thus, based on their nearly innate familiarity with fish, fish habitats, and behavioral patterns, these fishermen also became the first fishery scientists.

⁶⁰ *Id.*

⁶¹ NAT'L RESEARCH COUNCIL, COOPERATIVE RESEARCH IN THE NATIONAL MARINE FISHERIES SERVICE 7 (National Academies Press 2004) (2004) [hereinafter *Cooperative Research*].

⁶² *Id.* at 13.

⁶³ See *infra* Section III, subsections A-C of this Article.

⁶⁴ *Fish Catching Methods*, *supra* note 14, at 1.

⁶⁵ *On Fisheries Cooperative Research: Hearing Before the H. Comm. on Resources Subcomm. On Fisheries Conservation, Wildlife and Oceans*, 106th Cong. 1 (2001) (statement of Dr. Michael Sissenwine, Director of Northeast Fishery Science Center) [hereinafter *Hearing*].

⁶⁶ *Id.*

The methodology used in some of the first fisheries research provides an illustration of the necessary role fishermen have played in fisheries management. For example, in 1882, Spencer F. Baird and the Commission of Fish and Fisheries acquired a government fishing vessel that was used strictly for fisheries research.⁶⁷ Significantly, Baird and the Commission utilized data collected not only by the vessel's scientists, but by local fishermen.⁶⁸ Further, since the early 1900s, scientists in Woods Hole, Massachusetts have used information provided by fishing vessel operators' observations.⁶⁹ Together, these scientists and fishermen have established a "study fleet" of vessels, comprised of select fishermen who agreed to work with scientists.⁷⁰ Fishermen arranged to record catch rates and any related observations, so that scientists could monitor this information over time.⁷¹

According to Dr. Michael Sissenwine, Director of Northeast Fishery Science Center, these early fishermen were fully aware of the value of cooperative research.⁷² In 1925, Henry Bigelow and William Schroeder published *Fishes of the Gulf of Maine*, now one of the most well-known scientific works about fisheries.⁷³ This book was one of the first scientific compositions that recognized the value of observations by fishermen. In fact, the authors formally expressed their thanks to the fishermen who aided in the book's compilation, and acknowledged that the fishermen supplied them with "a vast amount of first-hand information on the habits, distribution, and abundance of the commercial and game fishes, which would be had from no other source."⁷⁴

As the field of fisheries research expanded in the first half of the twentieth century, government-appointed scientists continued to work with fishermen throughout the United States.⁷⁵ Fisheries science developed into a profession in the early 1900s.⁷⁶ As fisheries research improved, the Bureau of Commercial Fisheries continued to maintain relationships with local fishermen across the country, utilizing their knowledge, data-sets, and fishing vessels in joint research efforts.⁷⁷

⁶⁷ *Cooperative Research*, *supra* note 61, at 13.

⁶⁸ *Id.*

⁶⁹ *Hearing*, *supra* note 65, at 2.

⁷⁰ *Id.*

⁷¹ *See id.* ("In fact, the fishermen were quite enthused by this cooperative effort, that the Captain of one such vessel wrote '...let us know if you would like any further information, and if our present data is proving any interest. It certainly takes up some of my dead time, which is a great help to me.'"). *Id.* at 2-3.

⁷² *Id.* at 2.

⁷³ *Id.*

⁷⁴ *Id.*

⁷⁵ *Cooperative Research*, *supra* note 61, at 14.

⁷⁶ *Id.* at 13-14.

⁷⁷ *Id.* at 14.

B. Traditional Fisheries Research

Traditionally, the United States has funded and staffed research programs in order to obtain essential information about the Nation's fisheries.⁷⁸ More recently, these research programs have served as the *prevailing* procedure for fisheries research. But while data collected from government programs is greatly valuable, this research is costly and fails to utilize other important and less expensive resources; namely the experience and knowledge of fishermen already heavily engaged in the fishing industry.⁷⁹

1. Fishery Research Vessels

Surveying conducted by NOAA fishery research vessels provides the majority of the information used to evaluate fisheries issues,⁸⁰ including changes that occur in fish stocks over time.⁸¹ NOAA then uses these stock assessments to determine the population of a particular species of fish.⁸² From there, NOAA establishes fishing seasons and sets limits on the total amount of allowable catch.⁸³

Fishery research vessels conduct resource assessment surveys and other related fisheries biology research.⁸⁴ NOAA research vessels and chartered fishing vessels obtain data through routine surveys, as well as through scientific research conducted by federal, state, and university scientists.⁸⁵ These surveys sample an area of more than 200,000 square miles,⁸⁶ and as a result, the vessels test hundreds of species simultaneously.⁸⁷ Given the large span of area covered by the survey, researchers sometimes must sacrifice the precision of the information in order to foster a more comprehensive survey.⁸⁸

2. Observer Program

The NMFS Observer Program first began on the East Coast in 1977, as an

⁷⁸ *Id.* at 7.

⁷⁹ *Id.*

⁸⁰ *Hearing, supra* note 65, at 3.

⁸¹ *Id.*

⁸² Denise Lach & Shayla B. Sharp, *Integrating Social Values into Fisheries Management: A Pacific Northwest Study*, FISHERIES MAGAZINE, Apr. 2003, at 10.

⁸³ *Id.*

⁸⁴ NOAA Fishery Research Vessels, <http://www.moc.noaa.gov/> (last visited March 10, 2007). (Fishery resource assessment surveys require the use of commercial-sized bottom and midwater trawls, dredges, longlines, traps, a variety of fixed-frame juvenile fish and plankton sampling gears, remote sensing technologies, benthos samplers, bottom grabs, and environmental instrumentation).

⁸⁵ *Id.*

⁸⁶ *Hearing, supra* note 65, at 3.

⁸⁷ *Id.* at 3-4.

⁸⁸ *Id.*

effort to monitor foreign fishing vessels permitted to fish off the United States coast.⁸⁹ It was not until 1988 that NOAA implemented a domestic fisheries observer program, through which the agency assigns fisheries observers to particular fishing vessels in order to collect firsthand data.⁹⁰ The agency then uses the data to assess fish stocks, assess species, and appraise the economic impact of the fishing industry in a particular region.⁹¹ The presence of an observer on a fishing vessel does not release the operator from his or her obligation to report takes of protected species.⁹² Fishermen must follow the same reporting procedure whether or not there is an observer on board.⁹³

This Article examines the observer program in the Northeast, as representative of nationwide observer programs and the trend toward increasing observer coverage.⁹⁴ At the inception of the observer program in the Northeast, NOAA mandated observer coverage on five percent of all fishing vessels.⁹⁵ Since 2004, observer coverage has doubled, with an observer present on about ten percent of all fishing vessels in the Northeast.⁹⁶ Increased observer coverage is not particular to the Northeast. While only about three percent of all longline vessels nationwide had an observer present in 1988, between 1992 and 1998, longline vessels experienced an increase in observer coverage amounting to between four and five percent of longline coverage nationwide.⁹⁷ Despite this increase, however, only a small percentage of commercial fishing boats actually

⁸⁹ Margaret Petruny-Parker, Kathleen Castro, Malia Schwartz, Laura Skrobe, & Barbara Somers, *Proceedings of the New England Bycatch Workshop*, Rhode Island Sea Grant, Narragansett, R.I., 6 (2003) [hereinafter *Proceedings*].

⁹⁰ *Cooperative Research*, *supra* note 61, at 71. Mandatory observer programs have been utilized to jointly provide data collection and enforcement aspects. Voluntary observer programs have been designed more to collect fishery information and data. Nonetheless, any observer program produces information on fisheries that is useful for conservation and management efforts. *Id.* at 6.

⁹¹ *Proceedings*, *supra* note 89, at 6-7.

⁹² The presence of these reporting requirements indicates that fishermen routinely report and assess fish stocks and species as part of their daily routine.

⁹³ See NOAA FISHERIES, THE NORTHEAST FISHERIES OBSERVER PROGRAM, AN INTRODUCTION 4 (2004) [hereinafter NOAA FISHERIES] (This handbook was created by NOAA and is distributed to fishing vessels that carry fisheries observers on board. The handbook lays out the laws governing the fisheries observer program and explains what an observer does while onboard a fishing vessel. The brochure also explains the responsibilities of a vessel owner/operator and describes how fishermen benefit by working with the Fisheries Observer Program.).

⁹⁴ NOAA has six regional programs: Alaska, Northeast, Northwest, Pacific Islands, Southeast, and Southwest. See NOAA Fisheries, <http://www.nmfs.noaa.gov/regional.htm>.

⁹⁵ *Id.*

⁹⁶ NOAA FISHERIES, *supra* note 93, at 2. The number of sea days observed per year varies between 1500 days and 10,000 days, depending on funding and data collection requirements in the Northeast. *Id.* at 5.

⁹⁷ *National Coalition for Marine Conservation v. Evans*, 231 F. Supp. 2d 119, 139 (D.D.C. 2002).

have observers on board.⁹⁸ An unfortunate result is that this limited amount of information can serve only as a representative sample for all other commercial fishing boats.

Notably, scientific observers are not always warmly accepted on board fishing vessels. This rancor perhaps stems in part from the fact that fishermen do not have the opportunity to participate in the data collection process. In anticipation of any ill will, the Magnuson-Stevens Act directly requires that the Secretary publish regulations for vessels that carry observers.⁹⁹ This helps to ensure the safety of the observers and to guarantee that the fishing vessel's crew will comply with requests from on-board observers.¹⁰⁰ NOAA also provides brochures for fishing vessel users suggesting that fishermen must foster an accommodating environment for observers.¹⁰¹ For example, one such brochure says, "two-way communication between fishermen and fishery scientists is encouraged. The observer program is an important link between scientists and fishermen."¹⁰² Implementation of a *cooperative*, rather than an observing, program would help to alleviate this animosity.

C. *Incorporating Fishermen's Knowledge and the Value of Cooperative Research*

The role of fishermen is vital to effective scientific research. Fishermen bring field experience, practical knowledge, and a mode for data collection to fisheries research. Admittedly, fishing vessels may not be equipped as well as research vessels for long-term surveys.¹⁰³ And indeed there are substantial differences between mainstream scientists and fishermen. For example, scientists are strictly guided by the standardized rules of the scientific method.¹⁰⁴ They observe and gather data, make observations, and publish results for others to

⁹⁸ *Id.*

⁹⁹ 50 C.F.R. § 648.11 (2006).

¹⁰⁰ *Id.*

¹⁰¹ See, e.g., NOAA FISHERIES, *supra* note 93 (using the regional Northeast NOAA observer program as a representative of observer programs nationwide). During their training sessions, observers are informed that it is imperative for fishermen and scientists to work together as a team and maintain a peaceable rapport. *Id.*

¹⁰² NOAA FISHERIES, *supra* note 93.

It is in the best interest of both fishermen and fisheries managers to have an accurate set of data from which to determine sustainable levels of fish and shellfish harvests. Observers' efforts aboard fishing vessels are a vital part of process, and one that depends on close cooperation with commercial fishermen. *Id.* at 12.

"Ideas, complaints, and information communicated between observers, captain, and crew are a valuable source of information for all parties." *Id.* at 9.

¹⁰³ *Hearing, supra* note 65, at 3.

¹⁰⁴ See *Cooperative Research, supra* note 61, at 80-81.

evaluate and build upon.¹⁰⁵ Scientists use statistical and mathematical models upon which to conduct analyses of their carefully collected information.¹⁰⁶ Fishermen, on the other hand, employ a variation of the scientific method, with less emphasis on formal methodology.¹⁰⁷ A fisherman's primary purpose when gathering information about a fishery is to maximize his or her allowable fishing time and quantity of catch.¹⁰⁸

However, employing fishermen and utilizing fishery vessels when conducting research provides numerous advantages. Fishing vessels increase the scope of sea that can be observed and fishermen can provide supplemental information unavailable to scientists on research vessels. Further, scientists can utilize fishermen's experience to design and implement research strategies, and cooperation creates a mutual understanding and respect among both scientists and fishermen.¹⁰⁹

1. Scientific Benefits

Both the fishing industry and the scientific community will benefit from employing fishermen and utilizing fishing vessels to obtain scientific information. On the most basic level, including additional participants (fishermen) and additional vessels (fishing vessels) in the research process provides an opportunity to gather a greater quantity of data.¹¹⁰ In addition, cooperative efforts will help scientists collect and create better quality data.

One of the major benefits of cooperation between fishermen and scientists is an increase in both the scope and precision of research.¹¹¹ Resource surveys conducted on NOAA research vessels cover almost the entire continental shelf, from a depth of fifteen meters to two hundred meters.¹¹² Because the objective of these studies is comprehensive research, the precision of the information gathered is deficient.¹¹³ Despite the great area of sea that these research vessels cover, researchers must sacrifice quality for quantity.¹¹⁴ Information gathered through cooperative research can help to fill in these gaps. For example, because fishing vessels can enter geographical locations where NOAA research vessels cannot, such vessels can collect previously unattainable data, thereby

¹⁰⁵ *Id.*

¹⁰⁶ *Id.*

¹⁰⁷ *Id.* at 72-73.

¹⁰⁸ *Id.* at 83.

¹⁰⁹ *Hearing, supra* note 65, at 3.

¹¹⁰ *Cooperative research, supra* note 61, at 84.

¹¹¹ *Hearing, supra* note 65, at 3.

¹¹² *Id.*

¹¹³ *Id.*

¹¹⁴ *Id.*

expanding the scope of the research.¹¹⁵ For instance, fishing vessels gather data on inshore fishery resources, a geographical area where traditional research vessels cannot survey.¹¹⁶ Additionally, due to a recent downward sprawl of fisheries, traditional research vessels have not been able to reach depths low enough to gather data from these areas. Because fishing vessels can reach these lower depths, they can provide more information about these fisheries.¹¹⁷

Moreover, a long-established practice on fishing boats is to maintain a logbook containing information about each fishing expedition.¹¹⁸ Logbook data includes the location fished, gear and equipment employed, the variety of fish caught, and any other fishing observations made during the trip.¹¹⁹ Logbooks contain daily data sheets precisely geared toward observations made on board the fishing boat.¹²⁰ Information recorded in these logbooks is quite valuable.

The D.C. Circuit Court considered vessel logbooks in *National Coalition for Marine Conservation*.¹²¹ The court noted that logbooks are comprehensive with respect to documenting the full spatial and temporal range of fishing activity.¹²² Thus, the court found that logbooks amply determine the catch and bycatch trends both in a given area and across time.¹²³ The district court also highlighted that this recorded information, chronicled directly from fishermen, is more complete than information documented by scientific observers.¹²⁴ Finally, the court recognized that even when scientific observers assess fisheries from fishing vessels, there is virtually complete consistency between the scientist's recordings and those entered in the vessel's logbook.¹²⁵ Although logged information may contain potential inadequacies, the information is so precise and specific that it serves as an accurate reflection of day-to-day fishery resources. This legally recognized accuracy and importance of fishery logbooks confirms two important points. First, information collected by fishermen is likely as accurate, or perhaps more accurate, than the same information when recorded by scientists. Second, fishermen's vessels and knowledge are valuable tools for accurate fisheries research.

Cooperative research also provides scientists with access to the unique

¹¹⁵ *Id.* at 4.

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ *National Coalition for Marine Conservation v. Evans*, 231 F. Supp. 2d 119, 138 (D.D.C. 2002) (NMFS requires fishermen to self-report their bycatch in logbooks and submit logbooks to NMFS); *Hearing*, *supra* note 65, at 4.

¹¹⁹ *Hearing*, *supra* note 65, at 4.

¹²⁰ *Id.*

¹²¹ *National Coalition for Marine Conservation*, 231 F. Supp. 2d at 139.

¹²² *Id.*

¹²³ *Id.* at 129.

¹²⁴ *Id.*

¹²⁵ *Id.* at 139.

knowledge of fishermen. Fishermen are in an inimitable position; many have accumulated experience from years at sea and they have witnessed and scrutinized fisheries and their changes. They are experts on fishing grounds, and as such, they understand the realities of working at sea.

In addition to their expertise, fishermen can assist in reducing bycatch, which is a major factor in fishery depletion.¹²⁶ To lessen wasteful fish discards, and thus to minimize depletion, scientists have created fishing gear that catches only targeted species, and simultaneously keeps out unwanted fish. Utilizing valuable input from fishermen about what fishing gear best accomplishes bycatch reduction in this manner can inexorably result in better fisheries management and conservation.¹²⁷

Cooperative research among fishermen and scientists will also greatly improve fishery management. By taking advantage of the vital information that fishermen possess by virtue of their experience, fishery management will gain increased credibility and acceptance of its information throughout the fishing industry.¹²⁸ And most importantly, this data will facilitate more successful conservation efforts. Councils can create more effective FMPs by combining high quality data and scientific rigor with fishermen's observations and expertise. More accurate FMPs will thereby prevent overfishing in areas where fisheries have already been greatly depleted and allow fishing where the resource is more plentiful.

2. Social Benefits

The main benefits of cooperative fisheries research include the creation of richer and more accurate data and more effective conservation efforts by NMFS. There are, however, social benefits that follow from this type of research as well. Cooperative research schemes require interface between scientists and fishermen in both the work they conduct together and their personal contacts with one another.¹²⁹ Cooperative efforts necessitate increased interaction and rapport between fishermen and fishery scientists. Ultimately, this joint research can lead to a mutual understanding between the two groups, as all parties have the opportunity to experience the fishing industry from alternative perspectives.¹³⁰

Fishermen have many incentives for participating in cooperative research and often are quite willing to enter into cooperative research projects.¹³¹ Due to a

¹²⁶ *Hearing, supra* note 65, at 5.

¹²⁷ *Id.* See generally *Fish Catching Methods, supra* note 14, at 483-490 for a concise explanation of fishery and gear research.

¹²⁸ *Cooperative Research, supra* note 61, at 79.

¹²⁹ *Id.* at 75.

¹³⁰ *Hearing, supra* note 65, at 3.

¹³¹ *Cooperative Research, supra* note 61, at 79.

decline in fish populations, there are limits on both the number of catches a fisherman can make and the parameters that define fishing seasons.¹³² Because commercial fishermen rely on catching fish for their livelihood, and because depressed conditions damper their ability to catch enough fish, economic incentives encourage fishermen to engage in fisheries research projects.¹³³

Specifically, three economic incentives exist for fishermen. First, fishermen have a vested interest in increasing fish populations, because the more fish there are available to catch, the more fish there are available to sell. By participating in research, fishermen can maintain a voice in the future management of fisheries.¹³⁴ As such, fishermen will directly help conserve the resource they rely upon for their financial well-being.¹³⁵ Fishermen can directly contribute to management decisions by providing the most accurate information on fishery resources.¹³⁶ Second, researchers or grants usually compensate fishermen for their time and for the use of their fishing vessels, providing a supplemental source of income.¹³⁷ Third, by operating their fishing vessels on research expeditions with scientists, fishermen will have additional opportunities to fish.¹³⁸ As such, fishermen may generate even more supplementary income.¹³⁹

Many fishermen may be initially skeptical of scientific research and analysis used to support methods of fishery management. However, by participating in management and conservation efforts, fishermen can gain greater confidence in the data that is used to develop and implement the management plans.¹⁴⁰ This increased confidence, in turn, builds trust between fishermen and scientists. Finally, inviting fishermen into the research process increases their understanding of the scientific process.¹⁴¹ This greater understanding enables fishermen to conduct data collection and observation that meets the rigors of the scientific method.

3. Disincentives to Cooperative Research

Until the mid-1990s, traditional scientists viewed cooperative research as a stark change from the status quo.¹⁴² Upon the implementation of the Magnuson

¹³² *Id.* at 81.

¹³³ *Id.*

¹³⁴ Considerations in Chartering Fishing Vessels as Research Platforms, <http://www.fishresearch.org/advice.asp> (last visited August 18, 2006).

¹³⁵ *Cooperative Research, supra* note 61, at 81.

¹³⁶ *Id.* at 83.

¹³⁷ *Id.*

¹³⁸ Considerations in Chartering Fishing Vessels as Research Platforms, <http://www.fishresearch.org/advice.asp> (last visited August 18, 2006).

¹³⁹ *Cooperative Research, supra* note 61, at 83.

¹⁴⁰ *Id.* at 10.

¹⁴¹ *Id.*

¹⁴² *Id.* at 84.

Act, NMFS had almost complete control over the collection, analysis, and interpretation of fisheries data. Even today, scholars do not always view processes that incorporate fishermen into data collection and analysis as legitimate research.¹⁴³

Both fishermen and scientists will likely experience some burdens in engaging in cooperative research. For scientists, participation will necessarily require additional time and effort to cultivate true cooperation with fishermen.¹⁴⁴ There may also be a lower level of personal comfort for research scientists because commercial fishing boats are less accommodating than research vessels.¹⁴⁵ Similarly, fishermen may also encounter challenging aspects of participating in cooperative research. Fishermen will experience working with scientists as principal investigators, and as such, fishermen will necessarily be subordinate to the scientist's instructions throughout projects.¹⁴⁶ Also, fishermen must share their fishing vessels with scientists, which may lead to more crowded conditions aboard otherwise accommodating boats.¹⁴⁷

Despite the potential disadvantages that both parties face, there are substantial benefits that will inevitably result from cooperation between scientists and the fishing industry. Cooperative research efforts will improve fisheries management by providing information that more accurately reflects the current state of fisheries. This advantage far outweighs any minor inconveniences that the parties may endure during their cooperative venture.

D. Cooperative Research Today

In order to collect the most complete, unbiased, and relevant data possible, cooperative efforts must occur between fishery managers, the fishing industry, and scientists. The major advantages of cooperative research include an overall gain in scientific and management benefits, a reduction in research costs, and a general increase in data collection efficiency.¹⁴⁸ While there are potential disincentives, such as increased time investments by scientists, there is a movement in both the fishing and scientific communities to forge a unity between the two.¹⁴⁹

¹⁴³ *Id.* at 98.

¹⁴⁴ *Id.*

¹⁴⁵ Considerations in Chartering Fishing Vessels as Research Platforms, <http://www.fishresearch.org/scientistip.asp> (last visited August 18, 2006). Also, scientists conduct research based on the incentive that they will one day be published, however there may be a lessened opportunity for publication when they are involved in collaborative research. *Cooperative Research*, *supra* note 61, at 6.

¹⁴⁶ Considerations in Chartering Fishing Vessels as Research Platforms, <http://www.fishresearch.org/advice.asp> (last visited August 18, 2006).

¹⁴⁷ *Id.*

¹⁴⁸ See *Cooperative Research*, *supra* note 61, at 3.

¹⁴⁹ PLANNING LONG-TERM RESEARCH IN THE GULF OF ALASKA 61 (Nat'l Academy Press 2002)

Currently, the United States is involved in a movement toward cooperative research in the fisheries industry.¹⁵⁰ Throughout the nation, Councils have been creating Fishery Management Plans that encourage cooperative research. In 2002, NOAA issued its annual Fisheries Strategic Plan, which stated:

To the extent practicable, we (NOAA Fisheries) will charter fishing vessels to participate in research during resource surveys, encourage frequent contact and cooperation between scientists and constituents, and incorporate scientifically valid observations by fishers and others into fish stock assessments and other analyses related to living marine resources and their habitat.¹⁵¹

As a result, cooperative efforts are emerging throughout the United States.

In 2000, NMFS created the Cooperative Research Partners Program ("CRPP") to facilitate communication between marine scientists and the fisheries community.¹⁵² CRPP has received over nine million dollars in funding since its establishment.¹⁵³ This bursary has led to the implementation of fifty-two long- and short-term research projects.¹⁵⁴ The long-term projects focus primarily on data collection and tagging programs that study fish movements and patterns.¹⁵⁵ The short-term research projects concentrate on habitat studies and conservation investigations.¹⁵⁶

In addition, the Northeast Fisheries Science Center ("NFSC") established a program called the Cooperative Research Program. This program incorporates

(The Fishermen & Scientists Research Society was established in 1994, and is a non-profit organization representing a partnership between fishermen and scientists. The Society stresses the importance of effective communication between the two groups and urges corroborative research among fishermen and scientists in order to provide both industries with the most accurate information that will enable proper utilization of fishery resources while protecting fish stocks and the marine ecosystem. The current membership includes 227 fishermen and 92 scientists or other members.). See also <http://www.fsrns.ca/> (last visited January 10, 2006).

¹⁵⁰ See *Cooperative Research*, *supra* note 61, at 7-8.

¹⁵¹ U.S. Department of Commerce, Nat'l Oceanic and Atmospheric Admin., Nat'l Marine Fisheries Service Plan (2002). The 2007 Draft Strategic Plan for Fisheries Research makes several references to cooperative research efforts. Specifically, the 2007 Draft Plan calls for cooperative efforts between fishermen and scientists in order to assess fisheries habitat changes, develop gear for bycatch reduction, improve gear selectivity, and evaluate gear regulations. U.S. Department of Commerce, Nat'l Oceanic and Atmospheric Admin., Nat'l Fisheries Draft Service Plan 25, 26, 40 (2007).

¹⁵² Cooperative Research Partners Program, <http://www.nero.noaa.gov/StateFedOff/coopresearch/about.htm> (last visited August 18, 2006).

¹⁵³ *Id.*

¹⁵⁴ *Id.* (Eighteen of these research projects have been completed. Of these 18, 15 have submitted final reports that have been reviewed and approved. An additional 34 cooperative research projects are still ongoing.) (See website for list of all projects and a brief description of the same).

¹⁵⁵ *Id.*

¹⁵⁶ *Id.*

input from the fishing industry into mainstream marine research.¹⁵⁷ The mutual goal of this collaboration is to maximize the use of fisheries while maintaining a sustainable level of employment.¹⁵⁸ Many different programs initiated by NFSC provide critical data regarding the status of our nation's fisheries.¹⁵⁹

One cooperative effort, the Northeast Consortium, formed in 1999.¹⁶⁰ The Northeast Consortium incorporates fishermen's knowledge, experience, and expertise into fisheries research.¹⁶¹ The committee promotes partnerships among fishermen, scientists, and others who have a stake in the effectiveness of fisheries management. Through Congress, NOAA provides the Consortium with funding, which it uses for cooperative research concerning gear selectivity, fish habitat, stock assessments, and socioeconomics.¹⁶² Partnerships among scientists and fishermen compete for funding, and are eligible for financial support only as long as their project involves cooperation between commercial fishermen and scientists.¹⁶³ This increased implementation of cooperative fishery research programs facilitates inclusion of fishermen's knowledge in the attempt to gather the best scientific information available.

V. COOPERATIVE RESEARCH AND "BEST AVAILABLE SCIENCE"

A close cooperation between fishermen, fishery managers, and scientists will lead to healthier fish stocks, greater protection of endangered and threatened species of fish, and greater financial security for the fishing industry. Providing research platforms, logistical support, and at-sea collaboration may be the most effective means of achieving truly cooperative research. However, to comport with the Magnuson-Stevens Act's "best scientific information" mandate, "cooperative research must meet the same levels of scientific rigor and quality that is expected of any other scientific research endeavor."¹⁶⁴

¹⁵⁷ Northeast Fisheries Science Center (NEFSC), <http://www.nefsc.noaa.gov/> (last visited August 18, 2006).

¹⁵⁸ NEFSC Black Sea Bass tagging cooperative research, <http://www.nefsc.noaa.gov/> (last visited August 18, 2006).

¹⁵⁹ NEFSC, <http://www.nefsc.noaa.gov/read/popdy/blackseabass-tagging/coopProjects.htm> (last visited August 18, 2006) (Cooperative Black Sea Bass Tagging Project, Cooperative Monkfish Research Program, Cooperative Shark Tagging Program, Cooperative Tagging (Yellowtail Flounder), and Data Collection Feasibility Studies for Regional Management of Illex Squid).

¹⁶⁰ Northeast Consortium, <http://www.northeastconsortium.org/aboutus.shtml> (last visited August 18, 2006).

¹⁶¹ Northeast Consortium, <http://www.northeastconsortium.org/aboutobjectives.shtml> (last visited August 18, 2006).

¹⁶² *Cooperative Research*, *supra* note 61, at 63.

¹⁶³ *Id.*

¹⁶⁴ *Id.* at 72.

A. *Fishermen as Scientists and Experts*

Fishermen's primary purpose during commercial fishing trips is to catch fish.¹⁶⁵ They are, however, also responsible for recording data about the quantity of fish they catch, the type of fish, the size of the fish, and any bycatch resulting from the expedition.¹⁶⁶ Like mainstream scientists, who document and chronicle their observations, fishermen collect data in a systematic manner to most accurately reflect their time at sea.

A party disputing data collected by fishermen likely will contend that this data does not meet the legal standard of scientific information. Yet, most fishermen have substantial experience. From their day-to-day experiences with fishing, they are often very familiar with the sea and its marine life.¹⁶⁷ Fishermen can speak intelligently and accurately about fish habitats and patterns, and about changes that occur within fisheries resources.¹⁶⁸ Fishermen have personal knowledge about what fishing gear most advantageously reduces bycatch.¹⁶⁹ On the other hand, NMFS certifies many scientific observers after only a few weeks of training and commercial vessel training trips.¹⁷⁰ As such, fishermen are arguably more qualified than scientific observers for the task of documenting and submitting information to fishery management for analysis. Given these qualifications, they can and should be considered experts in this field.¹⁷¹

B. *Fishermen's Data as Science.*

In 1993, the United States Supreme Court decided *Daubert v. Merrell Dow Pharmaceuticals, Inc.* In *Daubert*, the Court analyzed and explored various research methodologies in order to further elucidate the requirement that information be "scientific".¹⁷² There is no hard and fast checklist of requirements that a particular methodology must meet in order to qualify as "science".¹⁷³ The Court in *Daubert*, however, developed a list of four guidelines

¹⁶⁵ *Hearings*, *supra* note 65, at 2.

¹⁶⁶ *Ocean Commission Report*, *supra* note 13, at 301.

¹⁶⁷ *Hearing*, *supra* note 65, at 2.

¹⁶⁸ *Id.*

¹⁶⁹ *Cooperative Research*, *supra* note 61, at 73.

¹⁷⁰ A.I.S. observer provider, <http://www.aisobservers.com/FOPoverview.htm> (last visited August 18, 2006) (observers are certified by NMFS after three weeks of training in Woods Hole, MA and after four commercial vessel training trips, trained on data collection skills and taken out on practice trips about commercial vessels).

¹⁷¹ Notably, in the federal courts, Federal Rule of Evidence 702 defines an "expert" as one with "knowledge, skill, experience, training, or education." See FED. R. EVID. 702. Fishermen certainly have all if not nearly all of these attributes, and quite unquestionably qualify as experts of fishing and fisheries.

¹⁷² *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

¹⁷³ Although the list promulgated by the Supreme Court is not exclusive, a court may consider falsifiability, peer review and publication, error rate, standards of operation, and general acceptance,

to follow in deciphering whether data will be considered “science”.¹⁷⁴ These four guidelines are: falsifiability, peer review, controlling standards, and general acceptance.¹⁷⁵

1. Falsifiability

According to the Supreme Court, cooperative research methodology must be testable and must survive attempts at replication.¹⁷⁶ Cooperative data collection can often easily meet this standard, in the same manner that purely scientific data is scrutinized. So long as the parties record their data collection process, similarly situated fisheries stakeholders can follow their procedure, and accordingly chronicle data and observations. Alternatively, a team of research scientists can fairly easily conduct a similar study and log their observations accordingly.

2. Controlling Standards

Scientists must follow established protocols in order to ensure uniformity and sound scientific methodology. Controlling standards consist of generally agreed upon protocols in a particular area of science.¹⁷⁷ The subsampling of fish species to determine the amount of catch provides an example of one area of fisheries science. Rather than examine the catch of an entire species in a given area, researchers will collect data from a predetermined number of fish to generate a representative sample.¹⁷⁸ They will then base their data and findings on this sample, and apply the information to the larger species.¹⁷⁹ Many cooperative research efforts that subsample fisheries follow specific scientific protocols for subsampling, as provided by the cooperating science center.¹⁸⁰

to determine the admissibility of scientific information.

¹⁷⁴ While the *Daubert* test is primarily employed in the courtroom, a *Daubert*-type analysis is useful here, because this multifactor test is designed to determine what scientific data is acceptable to the legal community.

¹⁷⁵ *Daubert*, 509 U.S. at 593-594.

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

¹⁷⁸ Telephone Interview with David Beutel, Research Scientist, University of Rhode Island Fisheries Department, in Kingston, R.I. (Dec. 15, 2005).

¹⁷⁹ *Id.*

¹⁸⁰ *Id.* These standards take the form of a pamphlet, which specifies different standards depending on the species of fish. For example, Mr. Beutel specified one subsampling technique. If the catch of a species is small, e.g. only one hundred fish, the fishermen will measure as many target species as possible in order to eliminate error. If the catch is much larger, the fishermen will subsample by weighing or measuring a predetermined amount of fish. Mr. Beutel highlighted that each species has a different predetermined protocol. For instance, when sampling haddock, none of the fish are measured, but instead all are weighed. However when sampling spiny dogfish, two baskets are weighed, then the rest of the fish are counted. If the catch contains both spiny dogfish and haddock, fishermen will mix both protocols. *Id.*

However, when fishermen are conducting gear research, for which there is no already-established scientific protocol, fishermen establish their own protocol.¹⁸¹ David Beutel, a Research Scientist at the University of Rhode Island Fisheries Department, indicated that his cooperative research team follows a paired comparison when conducting gear research.¹⁸² In a paired comparison, one boat tows a control group of gear, while another boat tows the experimental gear.¹⁸³ The boats tow side-by-side for the same amount of time in order to control for potential differences between varying areas of the sea.¹⁸⁴ To further control for these differences, the control gear and the experimental gear are switched every three tours.¹⁸⁵

If the data generated is not compatible with a format used by the science center, this presents a data quality issue. The science center spends time manipulating the data so that it fits within the form of one of their traditional protocol methods.¹⁸⁶ Science centers hire data managers and data quality control specialists for this task.¹⁸⁷

In a cooperative research effort, fishermen work directly with scientists or with the shared scientific standards that govern scientists' research. By working directly or indirectly with scientists, fishermen are provided with scientifically sound protocols of general applicability for much of their research. Where science has not already generated a procedure, fishermen have mirrored scientific methodology when providing their own protocols.

3. Peer Review

Peer review provides scientists with a platform for public dissemination of information, which in turn presents other scientists with the opportunity to replicate their studies.¹⁸⁸ Peer review can lead to either positive furtherance of a hypothesis or can unearth uncertainties that ultimately undermine a study. However, the role of peer review and publication is not dispositive. Thus far, there is no established method of peer review or publication for data collected solely by fishermen. Peer review of cooperative research, however, can be instituted in the same manner that peer review is conducted with mainstream scientific research.

¹⁸¹ *Id.*

¹⁸² *Id.*

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ *Id.*

¹⁸⁶ *Id.*

¹⁸⁷ *Id.*

¹⁸⁸ *Doremus, supra* note 38, at 410.

4. General Acceptance

Overall, the scientific community more freely accepts methods that are consistent with accepted scientific processes than those that are inconsistent.¹⁸⁹ With cooperative research, it is unlikely that data collection conducted by fishermen is the generally accepted method within the scientific community. Data collection conducted by fishermen in cooperation with research scientists or under the guidance of scientifically sound protocols is, however, more likely to be considered a generally accepted scientific method.

In light of these four guidelines, it appears that cooperative research fits within the spectrum of scientific methodologies accepted by the legal community. In fact, in *Little Bay Lobster Co. v. Evans*, the plaintiff lobster dealers and retailers claimed that a newly proposed lobster management boundary was not supported by scientific data or analysis.¹⁹⁰ The evidence in the case was provided directly by fishermen, and included findings from university-sponsored tagging studies.¹⁹¹ The cooperative studies demonstrated that a former lobster habitat boundary line posed a greater threat of lobster migration than a newly established boundary line.¹⁹² The court reviewed the scientific validity of the data provided directly from fishermen, and concluded that the data fell within "the ambit of scientific information".¹⁹³ Therefore, the court found that this information comported with the Magnuson-Stevens Act.¹⁹⁴ Thus, while there is no peer review of data collected exclusively by fishermen, this does not rule out cooperative research as a viable scientific effort. Fishermen's methods and their data can be tested and there are existing standards that control the process's operation. Further, these methods are generally accepted among the fishing community and are accepted among some scientists. Accordingly, cooperative research does constitute "science," as defined and accepted by the legal community.

B. Cooperative Research Comports with the "Best Available Science" Mandate

Because of their familiarity with fishing vessels and fishery resources, fishermen are experts on the feasibility of employing various data collection techniques.¹⁹⁵ Scientists, on the other hand, are experts on employing these

¹⁸⁹ Bert Black, *Science and the Law in the Wake of Daubert: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715, 784 (1994).

¹⁹⁰ *Little Bay Lobster Co.*, 2002 WL1005105 at 21.

¹⁹¹ *Id.* at 21.

¹⁹² *Id.*

¹⁹³ *Id.*

¹⁹⁴ *Id.*

¹⁹⁵ *Cooperative research*, *supra* note 61, at 73.

techniques in accordance with the rigidity of the scientific method.¹⁹⁶ Fishermen will need training to ensure that they fully understand the scientific code of behavior. At the same time, scientists will need to understand that compromise may be necessary in which traditional scientific techniques are replaced with less conventional fishery industry methods.

Fishermen's insights may be described as anecdotal, as opposed to the systematic data gathered through statistically valid and scientifically sound sampling techniques. However, fishermen's insights are not truly anecdotal, in that they are not simply uninformed and unreliable stories. Rather, the information conveyed is the result of observations that have been made within the context of long-term experience in authentic conditions. In fact, with vigilant collection techniques and thorough assessment, fishermen's knowledge may be as scrupulous and accurate as the stock assessment methods and other empirical data analysis conducted by scientists.¹⁹⁷

The mandate for the "best available science" does not actually require perfect science. Instead, the process must facilitate an accurate assessment of either fisheries populations, or the most appropriate fishing gear to prevent undue bycatch, in order to best conserve the natural resource. Accordingly, the method of research used must result in the collection of biological, ecological, economic, or social information about fisheries. Based on the data and analyses, the agency can then institute conservation efforts correspondingly.

Legal analysis shows that fishermen are experts and that their data constitutes "science" under the standards promulgated by the legal community. As such, the data collected through cooperative research also amounts to valid "science". While the data may not be perfect, and a cooperative effort may not be the only means of gathering this information, cooperative research is scientifically sound and properly-conducted methodology. Cooperative research is guided by the rigors of science and incorporates the authenticity of real fishing experience.

Furthermore, cooperative research data constitutes "best available science". Research that involves both fishermen and mainstream scientists goes beyond traditional fisheries research. Cooperative research provides data from geographical areas that are inaccessible to traditional scientists, and contributes valuable insight and experience from fishermen, which cannot be duplicated by traditional scientists. As such, the Secretary of Congress and NMFS may use discretion and reasonably and justifiably conclude that data generated by cooperative research is the best scientific information available.

¹⁹⁶ *Id.*

¹⁹⁷ Lach & Sharp, *supra* note 82, at 11.

VI. CONCLUSION

Data gathered through this cooperative endeavor ultimately provides fishery managers with the best possible understanding of a resource. Data collected through a cooperative research effort between fishermen and fishery management falls within the definition of “best available science”. A reviewing court may be inclined to conclude that cooperative research does not strictly meet the rigors of scientific scrutiny. In the alternative, the court may determine that the data does not amount to the best scientific information available. Nonetheless, NMFS, as a regulatory agency, will receive strong deference in its implementation of cooperative research as “best available science”.¹⁹⁸ Therefore, so long as the choice to use cooperative research is reasonable, the decision will likely be upheld by a reviewing court.

In the hypothetical situation discussed in the Introduction of this Article,¹⁹⁹ the decision by NMFS to use information about the Occamus species generated through cooperative research and the decision not to use the cooperative data concerning Tolemus should be upheld as long as NMFS’s decision was reasonable. If NMFS reasonably concluded that the Occamus data complied with the “best available science” standard, yet at the same time reasonably concluded that the Tolemus data did not comply, then a reviewing court must defer to NMFS’s decision. As such, neither the fishing community’s defense of cooperative research, nor the environmental group’s challenge to cooperative research would prevail. However, if a reviewing court finds no rational reason for NMFS’s decision, then the court must require that NMFS reasonably support its decision. Therefore, as long as the agency properly reviews cooperative research data within the framework of the “best available science” mandate and legally sound scientific information, a reviewing court should uphold a decision by NMFS to employ cooperative fisheries data.

¹⁹⁸ “[I]f the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency’s answer is based on a permissible construction of the statute.” *Chevron U.S.A. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 843 (1984). As long as the agency’s construction of the statutory requirement is rational, then the agency’s decision must be upheld. *Id.* at 844. “[C]ourts must respect the interpretation of the agency to which Congress has delegated the responsibility for administering the statutory program.” *Id.* at 843. “To satisfy this standard it is not necessary for a court to find that the agency’s construction was the only reasonable one or even the reading the court would have reached if the question initially had risen in a judicial proceeding.” *Fed. Election Comm. v. Democratic Senatorial Campaign Comm.*, 454 U.S. 27, 39 (1981).

¹⁹⁹ See *supra* Part I of this Article.

