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Dayton L. Alverson

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# THE ROLE OF CONSERVATION AND FISHERY SCIENCE UNDER THE FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976

Dayton L. Alverson\*

## I. INTRODUCTION

The enactment of the Fishery Conservation and Management Act of 1976,<sup>1</sup> which extends United States jurisdiction over fishery resources seaward to 200 nautical miles, constitutes a radical departure from the legal and philosophical foundations of past United States fishery management. The Act incorporates major changes in the distribution of authority to manage fishery resources seaward of the territorial sea<sup>2</sup> and broadens the goals of management to accommodate socioeconomic objectives. Furthermore, it explicitly mandates employment of the best scientific information available in the development of fishery management plans and seeks to establish a comprehensive program of fisheries research to carry out the purposes, policies, and provisions of the Act. It is the purpose of this article to examine and discuss those provisions of the Act which may have a profound impact on the future of fisheries science.

## II. CONTENTS OF THE ACT CONCERNED WITH FISHERY SCIENCE

### A. *Findings, Purposes, and Policies*

Several items in section two of the Act,<sup>3</sup> which deals with findings, purposes, and policies, will have a significant impact upon fishery sci-

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\* Director of National Marine Fisheries Service, Seattle, Washington. The author is indebted to Professors William Burke, Edward Miles, and Donald McKernan, University of Washington, for providing their critical comments on this article.

1. Pub. L. No. 94-265, 90 Stat. 331 (codified at 16 U.S.C.A. §§ 1801-1882 (West Supp. 1977)).

2. Management authority over the three-mile territorial sea remains with the coastal states. Fishery Conservation and Management Act (FCMA) § 306, 16 U.S.C.A. § 1856 (West Supp. 1977) [hereinafter cited as FCMA or the Act].

3. See generally *id.* § 2, 16 U.S.C.A. § 1801.

ence and conservation of living resources. The initial purpose noted<sup>4</sup> is to establish a jurisdictional zone within which the United States, through eight Regional Fishery Management Councils,<sup>5</sup> can institute appropriate management measures to conserve the fishery resources (including anadromous species but excluding tuna<sup>6</sup>) found off the coasts of the United States. Of key significance for such management programs is the explicit policy requirement in section 2(c)(3)<sup>7</sup> that future management programs utilize and be based on the best scientific information available. This section also requires that those responsible for developing fishery conservation programs draw upon extant federal and state conservation agencies and academia to provide scientific input into the development of management plans. The section is potent in terms of its legal intent—that conservation programs must have a solid scientific basis or at least must be directed by the best scientific information available at a Regional Council level. At a minimum, the section suggests that those responsible for developing management plans demonstrate that they have reviewed and analyzed the array of scientific information upon which decisions might be made.

A further statement of policy in the Act expresses the intent of Congress that active efforts be continued “to obtain an internationally acceptable treaty, at the Third United Nations Conference on the Law of the Sea [LOS III], which provides for effective conservation and management of fishery resources.”<sup>8</sup> The degree to which alterations of

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4. The first purpose set forth in the Act is

(1) to take immediate action to conserve and manage the fishery resources found off the coasts of the United States, and the anadromous species and Continental Shelf fishery resources of the United States, by establishing (A) a fishery conservation zone within which the United States will assume exclusive fishery management authority over all fish, except highly migratory species, and (B) exclusive fishery-management authority beyond such zone over such anadromous and Continental Shelf fishery resources.

*Id.* § 2(b)(1), 16 U.S.C.A. § 1801(b)(1).

5. For full discussion of the Regional Councils, see Part II—D *infra*.

6. The “highly migratory species” excluded are defined as species of tuna which “spawn and migrate over great distances in waters of the ocean.” FCMA § 3(6), (14); 16 U.S.C.A. § 1802(6), (14) (West Supp. 1977).

7. The subsection states that it is the policy of Congress to assure that the national fishery conservation and management program utilizes, and is based upon, the best scientific information available; involves, and is responsive to the needs of, interested and affected States and citizens; promotes efficiency; draws upon Federal, State, and academic capabilities in carrying out research, administration, management, and enforcement; and is workable and effective.

*Id.* § 2(c)(3), 16 U.S.C.A. § 1801(c)(3).

8. *Id.* § 2(c)(5), 16 U.S.C.A. § 1801(c)(5).

the Act made to conform with international norms might affect the work of scientists and the national approach to conservation is questionable inasmuch as major portions of the Act already appear to be in close conformance with drafts considered within LOS III.

There are, however, differences between the LOS III position on fisheries and the jurisdictional concept embodied in the Act. For example, the Act ignores or is purposely reticent on institutional arrangements for handling "transnational" stocks and on the collection, exchange, and analysis of scientific information for their management. The Revised Single Negotiating Text in LOS III appears to mandate some type of joint management formula.<sup>9</sup> Other differences also exist which, if ultimately adopted, could influence the mode of scientific input into Regional Fishery Management Councils as well as legal bases for decisions.<sup>10</sup>

## B. Definitions<sup>11</sup>

### 1. "Conservation and management"

The definition of "conservation and management" is the building block that must be considered when reading the remaining sections of the text and seeking the intent of the legislation. The definition goes far beyond common usage:

The term "conservation and management" refers to all of the rules, regulations, conditions, methods, and other measures (A) which are required to rebuild, restore, or maintain, and which are useful in rebuilding, restoring, or maintaining, any fishery resource and the marine environment; and (B) which are designed to assure that—

- (i) a supply of food and other products may be taken, and that recreational benefits may be obtained, on a continuing basis;
- (ii) irreversible or long-term adverse effects on fishery resources and the marine environment are avoided; and

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9. 5 Third United Nations Conference on the Law of the Sea 125-201, U.N. Docs. A/CONF.62/WP.8/Rev.1 & A/CONF.62/WP.9/REV.1, Part II, Art. 52 (1976).

10. Examples of these differences include the issues of consent to scientific research and the exchange of scientific data. For a more complete comparison of the Act and the LOS treaty text, see Jacobson & Cameron, *Potential Conflicts Between a Future Law of the Sea Treaty and the Fishery Conservation and Management Act of 1976*. 52 WASH. L. REV. 451 (1977).

11. See generally FCMA § 3, 16 U.S.C.A. § 1802 (West Supp. 1977).

(iii) there will be a multiplicity of options available with respect to future uses of these resources.<sup>12</sup>

A commitment to assure that "irreversible or long-term adverse effects on fishery resources and the marine environment are avoided" is more simply stated than achieved or, for that matter, measured and demonstrated. One could assume that as long as all elements of a biological community are maintained at levels which permit their rebuilding to the carrying capacity of the environment, and so long as the homeostasis (equilibrium seeking) mechanisms of the ecosystem remain intact, this condition will be met. Problems, however, will arise in attempts to demonstrate compliance with the objective. It is often difficult to measure quantitatively changes in the stock abundance of targeted species and to sort out causative factors. Addressing the problem of the long-term implications of fishing on the targeted species, on other elements of the biological community, and on the marine environment will require a much more holistic approach to fishery management. If done with any reasonable degree of confidence, the cost could be staggering. However, there are few instances which suggest that fishing has introduced irreversible or long-term effects on fishery resources. (An exception may exist for some of the herring-like species.) Fortunately, the Councils need not have all relevant facts at their disposal but can make decisions based on the best scientific data available.

The commitment to "a multiplicity of options" could be satisfied if the resources were maintained at reasonable sizes and if irreversible effects were avoided. That is, the multiplicity of future options can be retained by ensuring that human activity neither alters species complexes nor destroys the resilience of the ecosystems' populations. Nevertheless, nature itself may modify the system and foreclose certain options. As a result, one of the scientists' roles will be to differentiate between such natural effects and the effect of human activity.

A commitment to retain a multiplicity of options for the future is in some ways antagonistic to the concept of optimum yield.<sup>13</sup> It may, for example, be to "the greatest overall benefit to the Nation, with partic-

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12. *Id.* § 3(2), 16 U.S.C.A. § 1802(2).

13. "Optimum yield" is a management goal discussed at note 17 and accompanying text *infra*.

ular reference to food production”<sup>14</sup> to purposely overfish or, if possible, to eliminate a predator or scrap species, in order to increase the productivity of the system.<sup>15</sup> Under the terms of the Act, such practices would be precluded if they were determined by the courts to be irreversible or to foreclose “future options.”<sup>16</sup>

## 2. “Optimum” yield

Perhaps the most controversial of the Act’s definitions is that of “optimum,” which is used throughout the text as an adjective modifying “yield”:

The term “optimum,” with respect to the yield from a fishery, means the amount of fish—

(A) which will provide the greatest overall benefit to the Nation, with particular reference to food production and recreational opportunities; and

(B) which is prescribed as such on the basis of the maximum sustainable yield from such fishery, as modified by any relevant economic, social, or ecological factor.<sup>17</sup>

Inasmuch as optimum yield is established as a major goal of fishery management,<sup>18</sup> its definition has great importance in terms of the information that will be demanded from the scientific community. It is apparent from the definition that many social and economic factors will have to be considered in establishing management objectives. Those responsible for developing plans must integrate biological, sociological, and economic information in formulating a basis for optimum yield and subsequently provide quantitative data supporting any departure from the maximum sustainable yield. Furthermore, the shifting away from maximum sustainable yield for economic, social, or ecological reasons within any management plan must be substantiated by use of the best scientific information available.<sup>19</sup>

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14. This is an aspect of the definition of optimum yield. FCMA § 3(18), 16 U.S.C.A. § 1802(18) (West Supp. 1977).

15. For an example of such a circumstance, see Christy, *The Fishery Conservation and Management Act of 1976: Management Objectives and the Distribution of Benefits and Costs*, 52 WASH. L. REV. 657 (1977).

16. FCMA § 3(2), 16 U.S.C.A. § 1802(2) (West Supp. 1977).

17. *Id.* § 3(18), 16 U.S.C.A. § 1802(18).

18. *Id.* § 301(a)(i), 16 U.S.C.A. § 1851(a)(i). See notes 27–29 and accompanying text *infra*.

19. See Comment, *Judicial Review of Fishery Management Regulations Under*

The incorporation of optimum yield as the primary objective of fishery management and the mandate to document departures from potential biological yield will place considerable stress on the fishery institutions responsible for providing the Regional Councils with supporting scientific data. One commentator has stated that if the Councils are to work "there must be a shift in emphasis from biological to economic analyses."<sup>20</sup> This view reflects a simplistic interpretation of the information needed by the Councils and of the technical input explicitly required by the legislation.

While there certainly will be a need for much more economic analysis in developing management plans and evolving optimum yield concepts, the sociological aspects of fishery management must also be taken into account. To be effective, the Councils will need well-coordinated, multidiscipline inputs. The issue is not whether one discipline should be subordinate to another, but rather what is the proper blending of scientific talent. The appropriate scientific mix will vary, depending on the stage of fishery development and the biological and socioeconomic problems confronting the fishery. The information needed by Councils does not mandate a shift from biological to economic analysis, but rather a more broadly based examination of the influence of human and natural events on living marine resources, user groups, and the environment. It is true, however, that human resources available to undertake the required socioeconomic analysis are more limited than those available to undertake biological studies; hence, there is a need to build the socioeconomic documentation and analytical capacity which will lead to a more balanced treatment of management problems.

The definition of optimum yield is vague because it lacks criteria for judging what constitutes "the greatest overall benefit to the Nation."<sup>21</sup> As a result, the rather disparate views concerning optimum yield could form a battleground between and among user groups, scientists, the Councils, their advisory groups, and consumer advocates.<sup>22</sup> The only real clue to a scientific objective for optimum yield is

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*the Fishery Conservation and Management Act of 1976*, 52 WASH. L. REV. 599 (1977).

20. Bell, *World-Wide Economic Aspects of Extended Fishery Jurisdiction Management*, in *ECONOMIC IMPACTS OF EXTENDED FISHERIES JURISDICTION* 3, 25 (L. Anderson ed. 1977).

21. See also Christy, *supra* note 15.

22. One commentator asserts that optimum yield is "a recipe for achieving heaven or hell, and what is achieved will depend on how the definition is variously inter-

the stipulation in the national standards that conservation and management measures shall, "where practicable, promote efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose."<sup>23</sup> The ability of the scientific community to contribute relevant analyses for optimum yield will ultimately be contingent on the evolution of criteria allowing quantitative interpretation of the socioeconomic consequences of various management alternatives.

### 3. "Fishery" and "fishing"

The definition of the term "fishery" is of particular interest to conservationists because it differs from the conventional usage. Most fisheries operate on a variety of stocks and species which frequently cannot be managed or treated as a unit. The Act, however, defines a "fishery" to be: "(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 economic characteristics; and (B) any fishing for such stocks."<sup>24</sup> By this definition, salmon management might well be sliced into myriad fisheries related to concepts of functional management units. From a scientific standpoint, one could thus consider "optimum" as describing a particular attribute of a resource or population having economic potential or recreational value.

The meaning of "fishery," however, should be taken in context with the definition of the term "fishing."<sup>25</sup> This definition essentially incorporates the catching and harvesting activities which are normally associated with a fishery. The definition is of special interest to the re-

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puted." Larkin, *An Epitaph for the Concept of Maximum Sustainable Yield*, 106 TRANSACTIONS OF AM. FISHERIES SOC'Y 1, 9 (1977).

23. FCMA § 301(a)(5), 16 U.S.C.A. § 1851(a)(5) (West Supp. 1977).

24. *Id.* § 3(7), 16 U.S.C.A. § 1802(7).

25. "Fishing" is defined by the Act as follows:

- (A) the catching, taking, or harvesting of fish;
- (B) the attempted catching, taking, or harvesting of fish;
- (C) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish, or
- (D) any operations at sea in support of, or in preparation for, any activity described in subparagraphs (A) through (C).

Such term does not include any scientific research activity which is conducted by a scientific research vessel.

*Id.* § 3(10), 16 U.S.C.A. § 1802(10).



search community because it states that the "term does not include any scientific research activity which is conducted by a scientific research vessel." The definition has obviously been qualified to insure that freedom of scientific research is not inhibited and that the United States position within LOS III concerning freedom of research is not tainted.

### C. *National Standards*

Seven national standards are set forth in the Act.<sup>26</sup> The first standard requires that management measures be designed to prevent overfishing and achieve optimum yield on a continuing basis.<sup>27</sup> Significantly, the Act does not define overfishing; therefore, one must assume the term embraces the traditional view that a fishery is in an overfished state when the stock has been reduced below a level at which it can be expected to produce the maximum sustainable yield, or when the fishery is conducted in a manner that the yield per recruit is less than could be achieved with an alternative strategy.

With the increasing criticisms of maximum sustainable yield as a management objective,<sup>28</sup> it is surprising that the national standards are not more precise in terms of overfishing. Nevertheless, from the scientist's perspective, it does provide a mandate to develop information upon which to judge stock condition and, taken in connection with other national standards, the relationship between the stock and other biological elements of the ecosystem. Consideration of the intrinsic dynamics of most marine resources suggests that in order to comply with the first national standard, the management measures must be updated on a continuing basis to adjust for annual natural changes in resource productivity as well as changes in the socioeconomic structure dependent upon a fishery.

The impacts of natural factors influencing the productivity of targeted fishery resources have frequently been ignored by the fishery scientist or, at best, given token attention. Management strategies for fisheries have normally been based on quasi-static, density-dependent, or fixed-biological-parameter models.<sup>29</sup> Hence, we have not effectively

26. *Id.* § 301, 16 U.S.C.A. § 1851.

27. *Id.* § 301(a)(1), 16 U.S.C.A. § 1851(a)(1).

28. *See, e.g.*, Larkin, *supra* note 22.

29. *See* Alverson, *Management of the Ocean Living Resources: An Essay Review*, 3 OCEAN DEV. & INT'L L.J. 99 (1975).

resolved problems involving stochastic variations that result from large-scale recruitment or availability changes. The degree to which biological and socioeconomic theory can be applied to the day-to-day management needs of the Regional Councils will depend upon the capacity of fishery models to accommodate these dynamic processes.

The second national standard requires that conservation and management measures "be based upon the best scientific information available."<sup>30</sup> Unlike most pious statements of good intention, this standard may, in fact, be tremendously potent. It commits those responsible for plan development to a rigorous analysis of all scientific information on both the resource and the user groups to be managed.<sup>31</sup> Evidence that a Regional Council or the Secretary of Commerce has ignored or failed to take into account any important scientific information could lead to judicial rejection of the plan.<sup>32</sup> The real questions, of course, are (1) Who is to decide what is the best scientific information available? (2) What yardsticks will be used to measure how well such information is analyzed?

It is reasonable to assume that several interpretations of the status of a resource as well as different perspectives on the proper goals and objectives for optimum yield may reach a Council. Disparate interpretations and views may emanate from state or federal agencies, the academic community, environmental advocates, and user groups. The issue of the best scientific information may also form the basis of international disputes over maximum sustainable yield and calculated United States capacity. In a strictly quantitative sense, one could assume that, in judging between two properly documented sets of data, the information having the higher reliability in a mathematical sense should be the basis upon which a decision is made. The selection between sets of data is likely to be more intricate, however, as there does not seem to be any quantitative mechanism to evaluate methodology, underlying assumptions, and techniques behind such proffered information.

The third national standard is concerned with the geographic area within which a management plan is to be applied: "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

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30. FCMA § 301(a)(2), 16 U.S.C.A. § 1851(a)(2) (West Supp. 1977).

31. See, e.g., S. REP. No. 94-416, 94th Cong., 1st Sess. 30 (1975).

32. See Comment, *supra* note 19, at 637.

as a unit or in close coordination.”<sup>33</sup> This standard requires some understanding of genetic units of target species; the definition of “stock,”<sup>34</sup> however, permits a rather broad interpretation and, as previously stated, is not restricted to a strictly biological concept. Nevertheless, from a practical standpoint, stock management will have to be based on some understanding of population elements which are closely linked genetically.

The fifth national standard of interest to the scientific community provides: “Conservation and management measures shall, where practicable, promote efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.”<sup>35</sup> Like the definition of “optimum,” this standard needs further elaboration in order to provide the criteria upon which efficiency in the utilization of fishery resources can be based. The standard is annoying, at least to some economists, because the goal of economic efficiency is modified by the clause that “no such measure shall have economic allocation as its sole purpose.” Francis Christy states that if this means “the allocation of capital and labor—an interpretation likely to be adopted by economists—then it would clearly impede the imposition of limited access systems.”<sup>36</sup>

Christy and Scott have stated:

the goal of economic efficiency can be approached by preventing excessive entry into the industry, so that those who fish would be producing the maximum net economic revenue (to be shared by them, or appropriated by the public) and so that those who are prevented from participating will be able to produce other goods and services valued by the community.<sup>37</sup>

It would be erroneous, however, to assume that this view is endorsed or championed by economists as a whole. For example, Bromley and Bishop hypothesize “that the bulk of the present literature which attempts to apply economic concepts to the practical problems of fish-

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33. FCMA § 301(a)(3), 16 U.S.C.A. § 1851(a)(3) (West Supp. 1977).

34. The term “stock of fish” means “a species, subspecies, geographical grouping, or other category of fish capable of management as a unit.” *Id.* § 3(22), 16 U.S.C.A. § 1802(22).

35. *Id.* § 301(a)(5), 16 U.S.C.A. § 1851(a)(5).

36. Christy, *Limited Access Systems Under the Fishery Conservation and Management Act of 1976*, in *ECONOMIC IMPACTS OF EXTENDED FISHERIES JURISDICTION* 141, 143 (L. Anderson ed. 1977).

37. F. CHRISTY & A. SCOTT, *THE COMMON WEALTH IN OCEAN FISHERIES* 11 (1965).

eries management—and which will likely form the foundation for prescriptive advice on fisheries management in the proposed 200-mile economic zone—is subject to serious question on theoretical grounds.”<sup>38</sup> These economists and others question whether economic efficiency should be the guiding principle of optimum yield and believe that inefficient actions or situations may sometimes be socially desirable. In the end, these disparate views should not lead Councils to adopt one philosophy over another or to select exclusive alternatives. As Professor Crutchfield notes, for any given fishery “we normally face management situations in which *combinations* of measures are forced on us inevitably.”<sup>39</sup> The molding of optimum yield in terms of economic and sociological precepts is likely to lead to different management strategies for different fisheries or for a particular fishery during various developmental stages.

The sixth national standard<sup>40</sup> can be considered the insurance policy of the Act for two reasons. First, it allows the scientific community and the management entity to take into account natural variations which make status-of-stock forecasting extremely difficult. Second, it allows for the establishment of a conservative management regime when the quality of available data which must serve as the basis for management decisions is poor. An application of these principles can be noted in the National Marine Fisheries Service (NMFS) Preliminary Management Plans for trawl fisheries in the Gulf of Alaska and Bering Sea.<sup>41</sup> Both plans make estimates of stock conditions and show ranges for maximum sustainable yield estimates. In instances where the scientists felt the data base was poor and the estimates of stock sizes resulted in wide confidence intervals, the plans propose harvest at or below the lower limit of presumed yield ranges.

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38. Bromley & Bishop, *From Economic Theory to Fisheries Policy: Conceptual Problems and Management Prescriptions*, in *ECONOMIC IMPACTS OF EXTENDED FISHERIES JURISDICTION* 281, 281–82 (L. Anderson ed. 1977).

39. Crutchfield, *Evaluation of the Conference by an Economist*, in *ECONOMIC IMPACTS OF EXTENDED FISHERIES JURISDICTION* 381, 383 (L. Anderson ed. 1977) (emphasis in original).

40. This standard provides: “[c]onservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.” FCMA § 301(a)(6), 16 U.S.C.A. § 1851(a)(6) (West Supp. 1977).

41. Nat’l Marine Fisheries Service, Nat’l Oceanic and Atmospheric Adm’n, U.S. Dep’t of Commerce, Draft Environmental Impact Statement/Preliminary Fishery Management Plan, Trawl Fishery of the Bering Sea and Aleutian Islands (1976); Nat’l Marine Fisheries Service, Nat’l Oceanic and Atmospheric Adm’n, U.S. Dep’t

#### D. Regional Fishery Management Councils

Section 302 of the Act establishes eight Regional Fishery Management Councils which will play a fundamental role in the development of conservation and management plans.<sup>42</sup> It also mandates the creation of Scientific and Statistical Committees (SSC's) which are to provide technical assistance to the Councils.<sup>43</sup> An essential role for the SSC's is to insure that the management plans' technical input receives adequate scientific review and that the Councils are advised of the inputs' quality and adequacy. It is therefore important that scientists participating should be, as much as possible, free from direct involvement with the fisheries to be managed; they should respond as individual experts, not as advocates of an agency or institutional position. Furthermore, because the SSC's will have to consider physical, biological, and social sciences, their composition should be responsive to the multidisciplinary input requirements of the Act.<sup>44</sup> It is thus possible that the role of the SSC's could largely determine whether the Councils will merely reinstate the legacy of "political expedience" in fishery

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of Commerce, Draft Environmental Impact Statement/Preliminary Fishery Management Plan, Trawl Fishery of the Gulf of Alaska (1976).

42. FCMA § 302, 16 U.S.C.A. § 1852 (West Supp. 1977).

43. The Act provides that "[e]ach Council shall establish and maintain, and appoint the members of, a scientific and statistical committee to assist it in the development, collection, and evaluation of such statistical, biological, economic, social, and other scientific information as is relevant to such Council's development and amendment of any fishery management plan." *Id.* § 302(g)(1), 16 U.S.C.A. § 1852(g)(1).

44. For example, the Scientific and Statistical Committees for the Pacific and North Pacific Councils include eleven and ten members, respectively, from state and federal scientific bodies and from academia. The university community is represented by four members on each committee. Two scientists from the federal institutions are on the Pacific SSC and one on the North Pacific SSC; each has four scientists from state research bodies. The Pacific SSC is rounded out by one member from industry and the North Pacific SSC by one member from an international fisheries body.

The balance in these committees is tilted toward government scientists, but this is not unexpected inasmuch as government research entities (state and federal) have historically been closely linked with conservation of fishery resources and because government agencies hire the largest portion of scientists concerned with fishery management.

It is interesting to examine the educational background of the members of these two committees. On the Pacific Council SSC, one of the members has a legal background, one a background in economics, and nine have been trained in the biological sciences. On the North Pacific Council, two SSC members have training in the social sciences, one is a physical scientist, and the other seven are biologists. The predominance of biologists reflects the historical preoccupation of fishery science and management with resource (biological) problems. The Committees probably could function more effectively as multidisciplinary units if the social sciences were better represented.

management, giving lip service to the intent of the Act, or move forward to management processes based on scientific principles, recognizing the legislative objectives of the Act.<sup>45</sup>

*E. Contents of Fishery Management Plans*

Section 303<sup>46</sup> of the Act, delineating the expected contents of the management plans, will be of great importance to both the scientists involved in the management process and the courts involved in reviewing the results of that process. That section requires, *inter alia*, that each plan describe the status of the managed resource and establish the maximum sustainable yield (MSY) and optimum yield in question.<sup>47</sup> Each plan must also incorporate a summary of the information utilized in making such specifications.<sup>48</sup> Although not specifically required by the Act, the documentation would likely have to include a description of the methodology and rationale for selecting optimum yield values which depart from the MSY.

The concept of MSY, however, must be placed in the proper perspective, lest we fall into the trap of presuming it to be some magical number which allows us to establish annual harvest levels. This is the unfortunate position we have been in throughout the history of fishery management. MSY provides a long term guide as to the expected yield of a particular resource—the average yield that can be expected over time. Unfortunately, the value has little to do with the day-to-day management process—that is, what should the catch be this year, next year, or the following year? The allowable catch on an annual basis, as recognized by most population dynamicists, may be substantially higher or lower than the MSY value, depending on variations in recruitment or other vital biological rates which influence the dynamics and health of the resource. Hence, in the actual manage-

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45. It should be noted that each management plan will have to be accompanied by an Environmental Impact Statement (EIS) and such statements will have to meet the requirements of the National Environmental Policy Act, 42 U.S.C. §§ 4321–4347 (1970). Evaluating the technical content of and conclusions reached in such EIS's will be another important SSC role.

46. FCMA § 303, 16 U.S.C.A. § 1853 (West Supp. 1977).

47. Management plans must "assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specifications." *Id.* § 303(a)(3), 16 U.S.C.A. § 1853(a)(3).

48. *Id.*

ment process, one must start off with some allowable biological catch which may be higher or lower than the MSY for the year in question. This figure must subsequently be modified in terms of optimum yield, however that concept may ultimately be defined.<sup>49</sup>

The Act also requires that the domestic harvesting capacity be quantified.<sup>50</sup> This figure must be taken into account when establishing the surplus available to foreign fishermen—that is, the total allowable level of foreign fishing. For purposes of this determination, capacity may be defined in several ways, but the initial assessment must be on the basis of the physical capacity of the fishing fleet. This must then be gauged in terms of the processing capacity and subsequently interpreted in terms of available markets for the products being produced. Although the Act is not explicit regarding how the total allowable level of foreign fishing is ultimately to be determined, it is implicit that the first step is to identify the biological surplus for a particular year. The Council can subsequently modify the allowable biological catch with socioeconomic objectives to produce optimum yield value, provided supporting data and rationale are given. When this has been accomplished, the total allowable level of foreign fishing is determined by subtracting the United States capacity or expected harvest from the optimum yield; the remnant must be made available for foreign harvest.<sup>51</sup> The responsibilities of scientists—both social and natural—will be to provide the information base upon which these steps can be quantified.

Section 303 also establishes specific guidelines for the documentation process required for each management plan.<sup>52</sup> The degree to

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49. See notes 17–23 and accompanying text *supra*.

50. Management plans must assess and specify

(A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3), and

(B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing.

FCMA § 303(a)(4), 16 U.S.C.A. § 1853(a)(4) (West Supp. 1977).

51. Although the language of the Act does not explicitly require that the remaining yield be allocated to foreign fishermen, *see id.* § 201(d), 16 U.S.C.A. § 1821(d), both the better view and the intent of the Congress dictate such a result. *See Magnuson, The Fishery Conservation and Management Act of 1976: First Step Toward Improved Management of Marine Fisheries*, 52 WASH. L. REV. 427 (1977).

52. Management plans must

specify the pertinent data which shall be submitted to the Secretary with respect to the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight there-

which the process may be institutionalized may vary between Councils, but in the long run one can expect some sort of national format which will structure plans prepared by Councils. The North Pacific Fishery Management Council has already moved to establish a formal outline for its management plans. The outline, presented in Appendix I, demonstrates the diversity of expected information inputs.<sup>53</sup>

The documentation of data required by the Act<sup>54</sup> provides an excellent opportunity for the scientist to enhance the quality of information which historically has been retrieved on fishing operations. It also allows the Councils to require that various user groups submit pertinent data for their particular fishing activity. The information may be of a biological, sociological, or economic character. This procedure, obviously, is a powerful tool for improving the quality and quantity of information needed to manage marine fisheries effectively.

#### F. Action by the Secretary

One paragraph in section 304 is extremely important to the marine scientific community:

(e) Fisheries Research.—The Secretary [of Commerce] shall initiate and maintain a comprehensive program of fishery research to carry out and further the purposes, policy, and provisions of this Act. Such program shall be designed to acquire knowledge and information, including statistics, on fishery conservation and management, including, but not limited to, biological research concerning the interdependence of fisheries or stocks of fish, the impact of pollution on fish, the impact

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of, areas in which fishing was engaged in, time of fishing, and number of hauls. FCMA § 303(a)(5), 16 U.S.C.A. § 1853(a)(5) (West Supp. 1977).

53. In addition to the prescribed inputs, the Act also permits any fishery management plan presented by a Council to establish a system for limiting access to fisheries in order to achieve optimum yield. In the development of a limited entry system, additional documentation may be required, including information on:

1. present participation in the fishery;
2. historical fishing practices in, and dependence on, the fishery;
3. the economics of the fishery;
4. the capability of fishing vessels used in the fishery to engage in other fisheries;
5. the cultural and social framework relevant to the fishery; and
6. any other relevant considerations.

*Id.* § 303(b)(6), 16 U.S.C.A. § 1853(b)(6).

54. Beyond the requirements of § 303(a)(5), *see* note 52 *supra*, the Act also requires certain catch data from foreign vessels. FCMA § 201(g)(3), 16 U.S.C.A. § 1821(g)(3) (West Supp. 1977).



of wetland and estuarine degradation, and other matters bearing upon the abundance and availability of fish.<sup>55</sup>

This paragraph provides the Councils with the appropriate commitment on the part of the federal government to undertake and maintain an effective and comprehensive program of fisheries research. The legal implications of the paragraph may have considerable dimension. The paragraph goes far beyond the conventional collection of information for the management process and includes studies on matters such as the impact of pollution and environmental degradation, which may have an impact upon the living resources. If this mandate was not previously vested within the structure of the National Oceanic and Atmospheric Administration (NOAA), this paragraph now provides an adequate basis to assume a commitment to research in these areas.

### III. ASSESSMENT AND SUMMARY

One commentator has stated that the "exclusive fishery management authority in the 200-mile zone is not necessarily a bane nor a blessing."<sup>56</sup> I could not agree more. The Fishery Conservation and Management Act in a sense provides a new stage upon which the actors can act out their play. Most of the actors will be the same, except that economists and sociologists will now be assigned to the cast; the major difference lies in the new script. Thus, the real problem "is to determine the correct management objectives and regulations, especially in view of the widely differing biological, technological, economic, and social aspects of the different fisheries involved."<sup>57</sup>

Although the Act does not attempt to influence or direct the activities of fishery scientists, it is clear that fishery management, as practiced in this country, will be sharply altered and that therefore the character of research undertaken to support management activities also must change. The mandate to incorporate socioeconomic factors into the management process will necessitate both a much broader data base, and a more extensive interpretive capacity, and, hence, a multidisciplinary approach in development management concepts. In

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55. *Id.* § 304(e), 16 U.S.C.A. § 1854(e).

56. Anderson, *Editorial Introduction to ECONOMIC IMPACTS OF EXTENDED FISHERIES JURISDICTION* at vi (L. Anderson ed. 1977).

57. *Id.*

addition, the national standards, coupled with the definitions section of the Act, require interpretation of the status of resources, including not only an analysis of the impact of harvesting on target species, but also consideration of the interactions with other elements of the biological community.

The Act is designed to include scientific input both in management plan development and in the technical review process. The required ingredients of fishery management plans demand specific inputs, including biological and socioeconomic descriptions of the fisheries, a statement of the status of the stock and its maximum sustainable yield (however defined), and the proposed optimum yield. For both the status of stock and the optimum yield determinations, summaries of the information used to establish these parameters are required as part of the documentation process. In this regard the Scientific and Statistical Committee can serve as a focal point for organizing plan development and providing scientific commentary to the Council. The legislation also authorizes formation of advisory panels made up of user groups. Thus, the SSC and the advisory panel will have to work in close harmony if the Councils are to function smoothly.

Regardless of the quality of scientific advice given to the Councils and the care taken in the development of management plans, one may expect that many management plans will ultimately be contested in the courts. Because records of the SSC's actions and advice to the Councils will form a body of information the courts will certainly examine on review, the formal maintenance of records by this group, as well as the Council, will be absolutely necessary.<sup>58</sup>

In sum, the Act constitutes a radical departure from historical United States fishing policy. In addition to setting rigid biological requirements, the Act:

- (1) establishes a new jurisdictional base;
- (2) broadens the goals of management so that a variety of social and economic issues are considered in the formulation of management plans;
- (3) states its commitment to the maintenance of a healthy American fishing industry;
- (4) defines national standards against which management plans must be gauged;

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58. See Comment, *supra* note 19, at 623.

(5) reserves certain resources or portions of resources for exclusive use by domestic fishermen; and

(6) states the right of the United States to enforce measures promulgated within its fishery zone.

Although the legislation incorporates many factors which appear to enhance the development of fishery science and to insure better scientific input into management of our living resources, certain procedural difficulties exist which could inhibit the implementation of timely and effective management. First, all fishery management schemes are required by the National Environmental Policy Act to be accompanied by environmental assessments.<sup>59</sup> Second, the Act mandates a wide range of commitments which, if not meticulously followed, will provide a fertile field for legal intervention. Finally, there is the possibility that historical jealousies among state and federal agencies and academia will continue and that a consensus will seldom be reached among Council members—or for that matter, within the SSC—regarding the best scientific approach to and framework for the evolution of management plans. If these shortcomings become the *modus operandi*, then a ponderous bureaucracy may have been created which could impair rather than enhance the quality of fishery management. This, however, need not be the case. If industry, academia, and government agencies can work together to carry out the law, many of the Act's deficiencies can be overcome or minimized. Similarly, if federal and state agencies truly coordinate their efforts as partners, they can supply a great portion of the technical information needed to manage the 200-mile fishery zone.<sup>60</sup>

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59. See note 45 *supra*.

60. See Alverson, *Commercial Fishing in the United States*, in COUNCIL ON ENVIRONMENTAL QUALITY, WILDLIFE AND AMERICA (in press).

## APPENDIX I

### NORTH PACIFIC FISHERY MANAGEMENT COUNCIL OUTLINE FOR FISHERY MANAGEMENT PLANS<sup>61</sup>

A. *Cover sheet.*—Includes the title “Fishery Management Plan,” the fishery for which a plan has been developed, the responsible Council(s), the date of Council approval, and the signature(s) of the responsible Council official(s).

B. *Executive summary.*—A concise summary containing the following information: management objectives to be attained; the range for MSY, U.S. harvesting capacity, and the optimal level of catch for the fishery management unit; the surplus available for foreign fishing if any; a brief description of the ecological, economic, and social impacts (beneficial and adverse); a brief description of alternatives considered in the planning process, and the proposed conservation and management measures.

#### C. *Management Plan Content*

##### 1.0 Table of Contents

##### 2.0 Introduction

2.1 Goals and objectives for management plan

2.2 Operational definitions of terms used

##### 3.0 Description of Fishery

3.1 Areas and stocks involved

3.2 History of exploitation

3.2.1 Domestic fishery

3.2.1.1 Description of user groups

3.2.1.2 General description of fishing effort

3.2.1.3 Catch trends

3.2.1.4 Description of vessels and gear employed

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61. Scientific and Statistical Committee, North Pacific Regional Fishery Management Council, Outline for Fishery Management Plans (unpublished memorandum on file at *Washington Law Review*). This outline has been approved by the North Pacific Council as the format to be used for all Fishery Management Plans.

- 3.2.2 History of foreign exploitation
  - 3.2.2.1 Description of user groups
  - 3.2.2.2 General description of fishing effort
  - 3.2.2.3 Catch trends
  - 3.2.2.4 Descriptions of vessels and gear employed
- 3.3 History of management
  - 3.3.1 Management institutions, policies, jurisdictions
    - 3.3.1.1 Regulatory measures employed to regulate fishery
    - 3.3.1.2 Purpose of measures
  - 3.3.2 Foreign
    - 3.3.2.1 Regulatory measures employed to regulate fishery
    - 3.3.2.2 Purpose of measures
  - 3.3.3 Effectiveness of management measures (foreign and domestic)
- 3.4 History of research
  - 3.4.1 United States
  - 3.4.2 Foreign
- 3.5 Socioeconomic characteristics
  - 3.5.1 Output of subject domestic commercial fishery
    - 3.5.1.1 Value of catch (ex vessel)
    - 3.5.1.2 Description and value of product (wholesale)
    - 3.5.1.3 Markets, domestic and export
  - 3.5.2 Domestic commercial fleet (vessels and/or gear) characteristics
    - 3.5.2.1 Total gross income of fleet (from subject fishery)
    - 3.5.2.2 Investment in vessels and gear (total and average per fleet/gear unit)
    - 3.5.2.3 Annual participation in subject fishery (in vessel-days or other appropriate measure)
    - 3.5.2.4 Total manpower employed (man-days per season, average weekly employment, or other appropriate measure) and labor payments (shares and wages)
    - 3.5.2.5 Economic viability (net income and efficiency)
  - 3.5.3 Domestic commercial processing characteristics

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- 3.5.3.1 Total gross income of area processors (from subject and all other fisheries, and average per unit)
- 3.5.3.2 Investment in plant, equipment, etc. (total and average per operator)
- 3.5.3.3 Total employment and labor income
- 3.5.3.4 Economic viability (net income and efficiency)
- 3.5.4 Recreational fishing characteristics
- 3.5.5 Subsistence fishing characteristics
- 3.5.6 Indian Treaty fishing characteristics
- 3.5.7 Other activities directly related to fishing
- 3.5.8 Area community characteristics
  - 3.5.8.1 Total population (by relevant demographic characteristics)
  - 3.5.8.2 Total employment (from subject and all other area fisheries and related activities by number of workers at peak and annual monthly averages by Alaska resident and nonresident and native and non-native)
  - 3.5.8.3 Total work force (all industries including fisheries by industrial classification, number employed, unemployed, total payroll, and other labor income)
- 3.6 Interaction between and among user groups (impact of foreign fishery on domestic fishing activities and of domestic subject fishery on other fisheries, gear conflicts)
- 3.7 Federal and State revenues derived from fishery
- 4.0 Biological descriptors
  - 4.1 Life history features
  - 4.2 Stock units
  - 4.3 Catch effort data
  - 4.4 Survey and sampling data
  - 4.5 Other (including relevant data on habitat, habitat concerns, habitat protection programs)
  - 4.6 Quality of data
  - 4.7 Current status of stocks
    - 4.7.1 Maximum sustainable yield (MSY)

- 4.7.2 Equilibrium yield (EY)
- 4.7.3 Acceptable biological catch (ABC)
- 4.8 Estimate of future stock conditions
  
- 5.0 Catch and capacity descriptors
  - 5.1 Data and analytical approaches
    - 5.1.1 Domestic
    - 5.1.2 Foreign
  - 5.2 Domestic annual capacity (DAC)
  - 5.3 Expected domestic annual harvest (DAH)
  
- 6.0 Optimum yield concept
  - 6.1 Departure from MSY to ABC for biological reasons
  - 6.2 Departure from ABC for socioeconomic reasons
  - 6.3 Optimum yield (OY)
  
- 7.0 Total allowable level of foreign fishery (TAC)
  
- 8.0 Management regime
  - 8.1 Management objectives
  - 8.2 Areas, fisheries, and stocks involved
  - 8.3 Management measures and rationale
    - 8.3.1 Domestic
      - 8.3.1.1 Season, gear, and area restrictions
      - 8.3.1.2 Size and sex restrictions
      - 8.3.1.3 Quotas
      - 8.3.1.4 Other (limit entry)
    - 8.3.2 Foreign
      - 8.3.2.1 Season, gear, and area restrictions
      - 8.3.2.2. Size and sex restrictions
      - 8.3.2.3 Other (limit entry)
    - 8.3.3 Relationship of the recommended measures to existing applicable laws and policies
      - 8.3.3.1 Other fishery management plans prepared by a Council or the Secretary
      - 8.3.3.2 Federal laws and policies
      - 8.3.3.3 State laws and policies
      - 8.3.3.4 Other
  - 8.4 Enforcement requirements (inspection, surveillance)

## Conservation and Fishery Science

### 8.5 Reporting requirements (foreign, domestic, processors)

#### 8.5.1 Data standards

#### 8.5.2 Time and place of reporting

### 8.6 Cooperative research requirements

### 8.7 Permit requirements

### 8.8 Financing requirements

#### 8.8.1 Management and enforcement costs

#### 8.8.2 Expected state and federal revenues, taxes, fees

### 9.0 Statement of Council intentions to review the plan after approval by the Secretary

## 10.0 References

## 11.0 Appendices (data sources, public meetings, and comments)