

The NAFO Model of International Collaborative Research, Management and Cooperation

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Abstract

Following extension of fisheries jurisdiction to 200 nautical miles by Coastal States in the Northwest Atlantic in 1977, the Northwest Atlantic Fisheries Organization (NAFO) was established through a multilateral convention. NAFO differed substantially in form and modalities from its predecessor fisheries organization, International Commission for the Northwest Atlantic Fisheries (ICNAF), which had been responsible for international fisheries management in the Northwest Atlantic from 1949. The structure of NAFO was designed to reflect the circumstances of Coastal State jurisdiction over fisheries in much of the area, the existence of several self-contained stocks outside 200 miles on the Flemish Cap, and the existence of several stocks which straddle the boundary between the Coastal States jurisdiction and the waters outside the 200-mile zones of the Coastal States. NAFO functioned relatively smoothly during its first years (1979-85). From 1985 to the early-1990s, decisions by the Fisheries Commission of NAFO were ineffective because of extensive use of the "objection procedure" by one member of NAFO. During the past two years, this conflict has abated. Progress has been made in devising a more effective management and enforcement regime. Recent international legal developments, especially the 1985 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, will have significant implications for the functioning of NAFO. In particular, the implementation of a precautionary approach to management will pose significant challenges and opportunities for NAFO.

Key words: international organization, management, NAFO

Introduction

Following the extension in early-1977 of fisheries jurisdiction to 200 miles, by the Coastal States bordering the Northwest Atlantic, most but not all the fisheries being prosecuted in the area at that time were brought under national jurisdiction. There remained a number of harvested fish stocks that straddle, or occur outside, the 200-mile zones. Most of these stocks involve species that are normally thought of as coastal species such as cod and flatfish (Table 1). This situation is due to Canada's Continental Shelf extending beyond the 200-mile limit; there are fishing grounds over 300 miles offshore with waters of less than 200 m depth (Fig. 1). These more distant grounds form a distinct fishing bank, called the Flemish Cap, which lies entirely beyond 200 miles. Four important fish stocks occur there. The largest fishing area, the Grand Banks of Newfoundland, extends from the inshore out to, and in places beyond, 200 miles. Here there are six stocks, which occur both inside and outside national jurisdiction, the so-called "straddling stocks". The two fishing areas on the Grand Banks that extend beyond 200 miles are known as "the Nose" and "the Tail".

These features of geography and fish distribution dictate the need for an international organization to manage the stocks beyond 200 mile and those that straddle the 200-mile limit.

TABLE 1. Stocks in Subareas 2 and 3 showing management authority. Note: for cod in Div. 2J and 3KL when the stock recovers, Canada will set TAC and 5% of this will be allocated by NAFO.

Coastal State managed stocks	Straddling stocks managed by NAFO	Regulatory area discrete stocks
Cod Div. 2GH Cod Div. 2J and 3KL ¹		Div. Cod Div. 3M
	Cod Div. 3NO	
Cod Subdiv. 3Ps Haddock Div. 3LNO Haddock Subdiv. 3Ps Pollock Subdiv. 3Ps Redfish SA 2 and Div. 3K		
	Redfish Div. 3LN	Redfish Div. 3M
Redfish Div. 3O American plaice Div. 2 and 3K		
	American plaice Div. 3LNO	American plaice Div. 3M
American plaice Subdiv. 3Ps		
	Yellowtail Div. 3LNO	
Witch flounder Subdiv. 3Ps		
	Greenland halibut SA 2 and 3	
Atlantic halibut SA 3 Roundnose grenadier SA 2 and 3 Capelin SA 2 and Div. 3K Capelin Div. 3L		
	Capelin Div. 3NO	Shrimp Div. 3M
	Squid SA 3 and 4	
Several herring Capelin Shrimp Snow crab And scallop stocks Many salmon stocks Mackerel SA 3 and 4		

¹ See Legend.

The Northwest Atlantic Fisheries Organization (NAFO) is the international body that has the responsibility to manage these stocks of fish that are outside national jurisdiction or straddle national and international waters. Despite some very difficult periods, NAFO has provided a forum for significant cooperation and progress in fisheries science and management.

This paper will focus on the history and structure of NAFO, and show how the periods of difficulty in its operations have shaped the Organization and increased cooperation and collaboration between its members, often through compromise.

History

The NAFO of today has roots that go back to its predecessor the International Commission for the Northwest Atlantic Fisheries (ICNAF), but it is quite different in structure and functioning from ICNAF. ICNAF was established under the International Convention for the Northwest Atlantic Fisheries, which

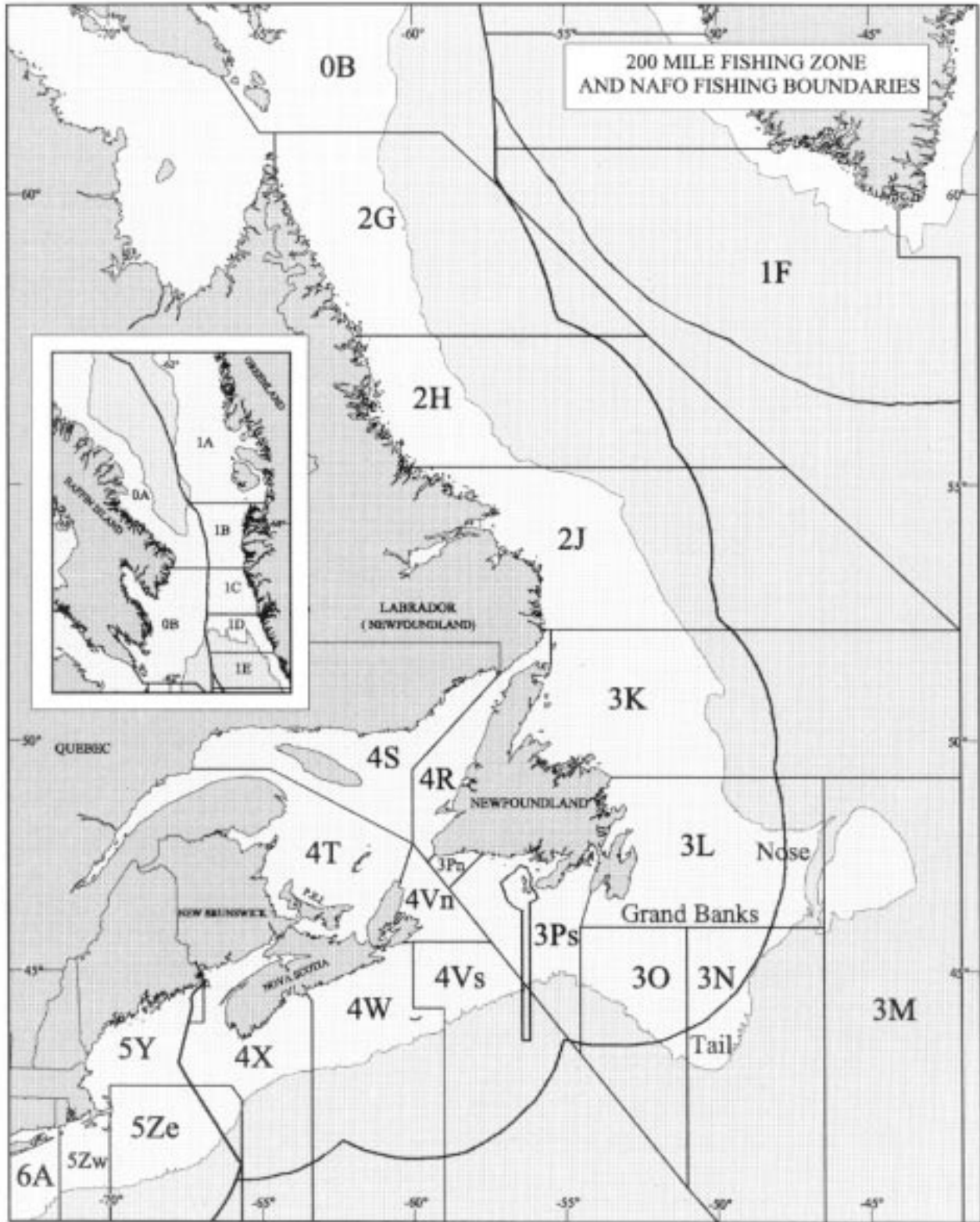


Fig. 1. The Canadian Fisheries Zone and the NAFO Convention Area, Subareas and Divisions (less Subarea 6 to the south). The ICNAF Convention Area consisted of Subareas 1 to 5 as shown, with slight differences in the western boundary of Subarea 1.

came into force in 1950. It was responsible for management of the fisheries of the Northwest Atlantic outside the territorial seas of the Coastal States, west of 42°W longitude, between 39°W and 78°10'N latitude, with some exceptions (Fig. 1).

ICNAF was charged originally with the "investigation, protection and conservation of the fisheries... in order to make possible the maintenance of the maximum sustained catch...". Proposals to do this were to be made on the basis of scientific investigations. This concept of maximum sustained catch was later modified to allow for "joint action...to achieve the optimum utilization", with proposals to achieve this made "on the basis of scientific investigations and economic and technical considerations" (ICNAF, 1974).

This change which came into effect at the end of 1971, in itself represented a very important recognition that the pursuit of the maximum sustained catch was not proving possible, and that not only was it necessary to recognize other considerations such as economic ones, but also that there were benefits to be gained from not harvesting to the maximum.

The ICNAF Convention area covered the main fishing banks between the Davis Strait, in the north, and Georges Bank in the south, and was divided into 5 Subareas. In later years, two more areas were added for purposes of compiling catch information: one to the north covering the Davis Strait, and one to the south, extending as far as Cape Hatteras. These additional areas were not subject to the full provisions of the Convention and were known as Statistical Areas. The Convention did not cover the Territorial Seas of the Coastal States, although catches in the Territorial Seas were included in the records of the Commission as if taken in the adjacent Subarea. The Convention referred to fish and fisheries, without specification as to species groups. This was later (1963) clarified to include molluscs. Harp and Hooded seals were added by a protocol in 1966 (ICNAF, 1974).

The structure of ICNAF involved the Commission itself, and five Panels with responsibility for considering conservation in the defined "Subareas" of the Convention Area, and for making recommendations for action by the Commission. A sixth Panel was added when harp and hood seals were brought under the Convention. In order to avoid confusion with the other Panels, which were numbered 1 to 5 to correspond to the Subareas, while the Statistical Areas, for which there were no corresponding panels, were designated as Statistical Areas 0 and 6, this new panel was called "Panel A". In any case, "Panel 6" had already been coined as a reference to a social event on the last evening of each meeting. The Convention did not make specific provisions for a scientific structure, but many provisions referred to the fundamental requirement for a scientific basis for action and one Article spelled out a wide range of scientific activities which the Commission could authorize, ranging from the collection of data to direct scientific investigation.

The early decisions of ICNAF concerned such measures as mesh size and minimum fish size, but it became apparent within a decade or two that excessive harvesting was underway. The first approach to controlling harvesting was to seek ways of limiting effort, but this floundered on the long-standing, and still current, problem, of how to equate the effort of one vessel size/fishing gear combination with that of a different combination. There was very extensive scientific study of the problem, but no satisfactory solution, although some years later, in 1975, a return to the concept resulted in a much simpler approach, in which the required reduction in effort was, in the first instance, to be implemented within each vessel size/gear type category.

The total catch increased dramatically during the 1960s, from about 1.8 million tons in 1954 to 4.6 million tons in 1968 (Fig. 2). The increase was seen in many stocks and was initially due to expansion of effort by the 13 countries already active, but a major change occurred with the arrival in the area of the fleets from Eastern Europe. Total catches were maintained above 4 million tons until 1974 but then dropped rapidly, to about 3 million tons at the end of that decade. This apparent stability in the late-1960s and early-1970s masked a series of stock declines because of the practice of "pulse" fishing, which means that once one stock was depleted, effort was directed at another. The groundfish stocks, particularly cod and haddock, were depleted early in the period and attention switched sequentially to such species as herring, mackerel and capelin.

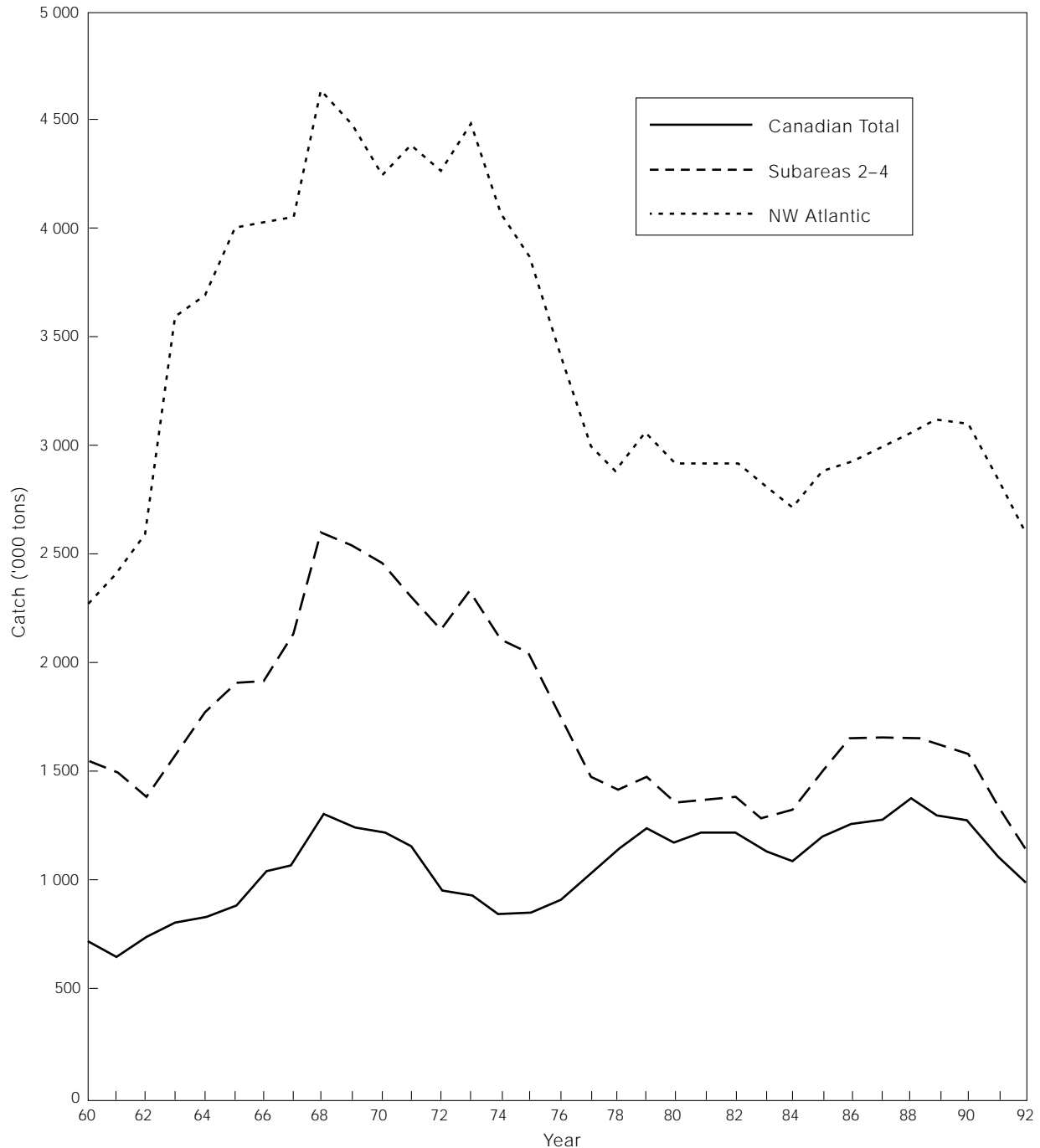


Fig. 2. Total catches in Northwest Atlantic, and Subareas 2 to 4 and by Canada, 1960–92.

In the area immediately adjacent to the Canadian coast i.e. Subareas 2 to 4, the peak catch was also in 1968 (Fig. 2) at about 2.7 million tons but the decline started immediately and the total catch was less than 1.5 million tons by 1977.

The excessive harvesting was continuing and consideration switched from controlling effort to direct limitation of the total catches. This was first discussed by Templeman and Gulland (1965). Despite the drawback that the Convention did not permit suballocation of any such limit between the Contracting Parties, overall total catch limits were introduced for the first time in 1969 for the 1970-fishing year. This

decision was accompanied by agreement in the Commission to a proposal to modify the Convention in a way that would permit national allocation, but such modification required ratification by all the Contracting Parties and did not come into effect until mid-December 1971. Within two years, agreement was reached on TACs and national allocations for 53 stocks.

There was by this time, some recognition of the need to consider inter-specific relationships and by-catch problems. Additional catch controls were established that placed limits on the total catch of species that were not subject to individual TACs, and, in the most southern Subarea, on the overall catch of all species under quota. These limits were less than the sum of all individual species quotas, and were intended, amongst other reasons, to control dumping of several species when the quotas for them were filled, but quotas for other species in the catch remained open. A second approach to by-catch problems was the introduction of time/area specific "windows" where fishing was permitted (the opposite to fisheries closures).

Throughout the ICNAF area, the catches declined in the 1970s while fishing effort by distant-water nations increased substantially.

Events such as these gave added thrust to the international movement towards extended fisheries jurisdiction, and when the Coastal States in the ICNAF area extended their jurisdiction at the beginning of 1977, the major fisheries became subject to substantially different management regimes within the 200-mile fisheries areas of the Coastal States. The Contracting Parties to ICNAF recognized this, and in their decisions on management measures for 1977 and subsequent years, did not address stocks now covered by Coastal State fisheries jurisdiction. There was early agreement as to which stocks were considered to be straddling stocks, based on whether significant fisheries occurred beyond 200 miles, and not simply on whether some specimens of the stock might be found beyond 200 miles. At this time, negotiations were begun to revamp ICNAF, both to recognize the new legal framework, and also to address some difficulties experienced with the ICNAF Convention. Beginning in 1977, a series of negotiations led to a new Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries. This was signed in 1978 and came into force at the beginning of 1979. The Convention established the Northwest Atlantic Fisheries Organization (NAFO) as the operative body. For 1979, ICNAF and NAFO operated in tandem, but the former was terminated at the end of the year.

The "NAFO" Convention

The new Convention Area (Fig. 1) was larger than that under ICNAF in that the Statistical Areas to the north and south were both incorporated as Subareas. The NAFO Convention applies to all waters of the Northwest Atlantic, including territorial waters. In addition to maintaining the geographical Subareas (1-5) that had been established by ICNAF, and adding the two Statistical Areas (0 and 6) as new Subareas, the Convention established a Regulatory Area in which the management and conservation measures decided within NAFO would apply. This Regulatory Area is that part of the Convention Area that lies beyond the areas in which Coastal States exercise fisheries jurisdiction. The objectives of the Convention were "to contribute through consultation and cooperation to the optimum utilization, rational management and conservation of the fisheries resources of the Convention Area" (NAFO, 1994).

There were a number of other fundamental changes in that the Convention created three distinct "bodies" within NAFO; the General Council, the Scientific Council and the Fisheries Commission. The fundamental effect was to make a much clearer distinction between the coordinating and administrative functions, the conservation and management activities and the scientific process. Furthermore the separation of the science and fisheries management functions was intended to facilitate the provisions in the Convention whereby Coastal States may request scientific advice, as this may be done without such matters being raised in the Fisheries Commission.

The Convention also included "consistency" provisions to address the relationship between the actions of the Fisheries Commission in the Regulatory Area and the management measures taken by Coastal

States. The Commission is required (Article XI, para. 3) to "seek to ensure consistency between" its measures for stocks occurring both in the Regulatory Area and coastal fishing zones, with measures taken by the Coastal States concerned. This applies both to the direct effects of management proposals and to indirect effects that would result from inter-species relationships and other linkages.

The membership of NAFO was initially 13. Neither Spain nor the United States joined at that time, and the European Union acceded on the part of France, UK, Germany and Italy. Denmark, on the other hand remained a member, initially on behalf of the Faroe Islands, and later also on behalf of Greenland. Subsequently membership has grown to 17, despite the reunification of Germany and the accession of Spain and Portugal to the European Union, as Russia, Estonia, Latvia and Lithuania became members following the dissolution of the USSR, and Korea, the United States and France, on behalf of Saint Pierre et Miquelon, have joined in recent years.

Scientific Cooperation

ICNAF

As noted earlier, the ICNAF Convention did not establish an organizational structure for scientific matters, although ICNAF was charged with being "responsible in the field of scientific investigation for obtaining and collating the information necessary for maintaining those stocks of fish that support international fisheries in the Convention Area". A series of Standing Committees was established (ICNAF Rules of Procedure, 1969) and the Standing Committee on Research and Statistics (STACRES) quickly became the focus for scientific endeavor.

Although the Convention provided for the direct involvement of ICNAF in undertaking research, there were no scientific investigations as such by members of the Secretariat staff. The research was undertaken by agencies of the Contracting Parties, with the scientists bringing the results of their research to meetings where they were reviewed by their colleagues. The peer review process became much more organized as mathematical procedures become more widely used to assess the status of fish stocks and the number of stocks being managed increased. An early, and continuing, function of STACRES addressed the fundamental question of fisheries and biological data. STACRES developed specifications for the nature of the data to be collected, how to store it and how to disseminate it.

As noted earlier, there was recognition that some fish stocks were under stress even as early as the 1950s. The types of measure envisaged in those days were largely with respect to mesh size, in order to avoid the unnecessary harvest of fish too small to be utilized and to increase the yield. ICNAF scientists, through STACRES, coordinated studies on the size selectivity of the various fishing gears and investigated the impacts of varying mesh size. By the 1960s, however, as fishing effort increased rapidly it became clear that measures to control minimum fish sizes and minimum mesh sizes were not sufficient and that fishing effort itself must be curtailed.

This led to the extensive work on equivalency of different harvesting methods. The difficulties in obtaining agreement on effort restriction in an international forum with different fleet and gear mixes, resulted in no direct action being taken on effort levels *per se*, but led instead to the implementation of overall catch controls or Total Allowable Catches (TACs). The scientific work on effort controls had been at least in part at the behest of the commissioners but the pressure for control on catches as an alternative was generated during the work of STACRES.

In 1965, Templeman and Gulland (1965) warned that "for many if not most of the stocks of major importance, the amount of fishing has now reached a level such that further increases in fishing will bring little or no increase in catch and may even reduce the catch.... There must therefore be some direct control of the amount of fishing. All methods of doing that raise difficulties, but that presenting least difficulties is by means of catch quotas. There must be separate quotas for each stock of fish and preferably allocated separately to each section of the industry."

Templeman and Gulland (1965) also laid the groundwork for the shift in management objective to $F_{0.1}$ which occurred a decade later. They observed that it made no sense to try for the last possible pound of catch when 90% of the maximum yield could be taken with perhaps 50% of the maximum effort (Parsons, 1993).

Once TAC management had become the general rule, the challenge for STACRES became the search for the appropriate catch level. In hindsight, this was an almost impossible task because the data were insufficient, the stocks were declining rapidly rendering out of date even the data that were available, the management decisions usually took the optimistic view of how much could be removed and the control measures were not well respected. It was only in 1975, with the adoption of measures to reduce effort levels by distant water fleets, and in 1976, when the first TACs were set at the estimated $F_{0.1}$ level, that a more conservative management philosophy emerged. The impact on the science community was a sense of both relief and of concern, the latter because of the even greater demands for advice; advice fine-tuned to the data available each year, despite the knowledge that there were very great variability in the data.

NAFO

In establishing a Scientific Council, the NAFO Convention specifies (Article VI) the functions as being to provide a forum for consultation and cooperation ... "with respect to the study, appraisal and exchange of scientific information and views relating to the fisheries in the Convention Area, including environmental and ecological factors affecting these fisheries, and to encourage and promote cooperation among the Contracting Parties in scientific research designed to fill gaps in knowledge pertaining to these matters".

The Scientific Council is charged also with maintaining and disseminating statistics and records and information, providing advice to the Fisheries Commission on request, or on its own initiative, and providing advice to Coastal States on request. Initially there were no such requests from the Fisheries Commission, and the Council provided advice on TAC levels against the $F_{0.1}$ yardstick used during the last years of ICNAF. This was encouraged by the practice of the Coastal States, mainly Canada, to submit written requests for advice, not only for certain stocks with the 200-mile limits, but also for the NAFO managed stocks and to specify the parameters of the advice being sought. It was not until 1985 that the Fisheries Commission generated its own request. The development of the request and subsequent requests gave rise to considerable controversy within the Fisheries Commission as to the nature of the advice to be sought ($F_{0.1}$, F_{current} or F_{max}) and even for which stocks advice would be sought.

The structure that has been set up by the Scientific Council illustrates well many of the Council's functions: the actual stock assessments are conducted in a Standing Committee on Fisheries Science (STACFIS); coordination of research and discussion of research priorities is undertaken in the Standing Committee on Research Coordination (STACREC); and, in recognition of its importance, consideration of environmental research has been conducted in a separate STACFIS Subcommittee which was upgraded recently to become the Standing Committee on Fisheries Environment (STACFEN). This increased focus on the environment reflects the much greater attention that is being paid to research into the role of the ocean environment in ecosystem dynamics. Publications, editorial policy, and promotional issues are the responsibility of the Standing Committee on Publications (STACPUB).

The Scientific Council has paid considerable attention to communicating the results of both its deliberations and the basic research. The report to the Fisheries Commission has evolved over time and is now in two parts, with a summary sheets for each stock, in the actual Scientific Council report, supported by a detailed reporting of the data, discussion and conclusions in the report of STACFIS. This format has been endorsed by the Fisheries Commission, and in fact is becoming fairly widespread in fisheries management fora. There are a number of other publications, including research papers, statistical information and biological information.

The Scientific Process

A feature of scientific debate within STACRES in ICNAF, that has been continued in the present day Scientific Council and is a very important and significant element, has been the exchange of views and the constructive criticism of findings. While at times there has been some national alignment of experts, there has also been considerable debate among scientists from the same country, particularly Canada, and not only between scientists from different countries.

There have been difficult periods during the work of the Scientific Council due to conflict within the Fisheries Commission as to which stock should be evaluated or which management criterion should be implemented when setting TACs. In part these difficulties were fostered by the provision in the Convention that the Scientific Council could "provide advice to the Fisheries Commission.....on its own initiative as required for the purposes of the Commission". This has generated debate as to whether the fact that the Fisheries Commission did not include, in its overall Request for Advice, a question concerning a certain stock or a range of management options, was a deliberate decision or was due to lack of foresight. Regrettably, this caused considerable disruption to the scientific process until negotiations within the Fisheries Commission, or bilaterally, removed the cause for the friction. During the late-1980s, the dissension in the Scientific Council was associated either with debating whether advice should be provided for one particular cod stock (the so called "2J3KL Stock") that occurred mostly within Canadian waters, or whether advice on whichever stock was being considered would address management options other than $F_{0.1}$. There were also difficulties, associated with formulating scientific advice in response to requests from Coastal States. The main problem was whether occurrence in the waters of another Coastal State meant a response could be given only with the concurrence of that other Coastal State.

This particular phase appears to have passed, and left everyone both wiser and determined to avoid a repetition. This resolve is tested sometimes by the requirement for consensus on scientific advice. There is no voting when it comes to advice; there is either agreement on the conclusions or there is not. The scientists recognize that the option that is described in the Convention of submitting a report which provides "all views advanced on the matter" without a conclusion, is not helpful to the Fisheries Commission or to the Coastal State which posed the original question. The scientists seek therefore to provide consensus advice. The actual wording of the advice can however, be debated as long and hard as the analyses on which it is based and at times a divergent view is expressed, such as for Div. 3LN redfish in 1997.

It is inevitable that the work of the scientists, which attracts most attention, is the scientific advice for the management of the fish stocks under international control. Unfortunately this masks the work on biology and environment, the coordination of research and the identification of research priorities that are essential to effective science. Nevertheless, some of the most innovative assessment work and debate has taken place in STACRES and the Scientific Council, and has been led by scientists who have achieved great recognition in much larger spheres.

An important part of the peer review process is the identification of what more needs to be done on the particular subject, be it the collection of data, further analysis or a different approach. The scientists have been quick to recognize what else needs to be done, and there is an impressive record of collaboration when the task requires it. The collaboration may take the form of organizing special scientific sessions to focus on a particular topic. This Symposium is the latest expression of this. The publications and reports of ICNAF/NAFO contain many examples of this cooperative collaboration, ranging from the Georges Bank Herring Investigation and the Flemish Cap Project, both multinational coordinated investigations, through special sessions on the Environment Impacts, to smaller scale cooperation through exchange of scientists on research vessels and joint analyses and publications.

There has been a considerable training component in the science activities over the years. The most obvious is the Workshop in Assessment Techniques at a recent Special Session at which those with the understanding of, and familiarity with, the utilization of the more modern assessment techniques, shared their expertise with scientists from many Contracting Parties. The training aspect, however, has been

much more fundamental, because the in-depth review and debate of research results and the techniques that were utilized, have provided great assistance to the young scientists as they develop their skills. It is no doubt very intimidating to arrive at a meeting of the Scientific Council with the results of many long weeks of analyses only to have them taken to pieces and debated and tested step by step, before being re-assembled, but that is what gives the conclusions of the scientific process their strength and provides enormous guidance to further research and analysis.

Management and Enforcement

The most obvious linkage is through the need for a thorough knowledge of catches, which implies either excellent reporting from the fishing operations, or effective monitoring to achieve this. Management and enforcement are the essential functions in maintaining resource levels, provided that the scientific information is adequate.

The basic elements of management and enforcement under both ICNAF and NAFO have been that decisions on management measures are taken by majority vote (two thirds) and that enforcement is the responsibility of the Flag State. There has been considerable evolution of both elements over time, although this has not been a particularly smooth process.

ICNAF

Management actions under the original ICNAF Convention were to be "designed to keep the stocks of these species of fish which support international fisheries in the Convention Area at a level permitting the maximum sustained catch by application of one or more of a series of management measures" (Article VIII). Recommendations for management measures for each Subarea were developed in the respective Panel, or combination of Panels if appropriate, and required two-thirds majority of all members of that Panel or Joint Panel. There was further discussion in the overall Commission, but the main debate was in the Panels. Management proposals were transmitted to Contracting Parties after the meeting for confirmation of acceptance. Notification of acceptance was required from Contracting Party members of the Panel making the original recommendation, as well as from members of any other Panel covering a Subarea where the proposed management measure would have an impact. The measure would only come into effect once all these Contracting Parties had confirmed acceptance, and then only after a further four month delay. This process was frustrating as it required positive action by all Contracting Parties and it was replaced in 1969 by a process in which the measure was assumed to be acceptable unless a state indicated non-acceptance (described as "lodging an objection") within 6 months of the official notification of the proposal. If there was no such objection, the measure would come into effect at that time. If there was an objection, the Contracting Parties doing so would be exempted from the proposal and implementation of the proposal for other Contracting Parties would be delayed for a further 60 days, during which time they also could object and opt out from the measure. This "objection procedure" had the advantage of no longer requiring confirmation of acceptance but it generated a new problem, that was to become a major issue twenty years after its original formulation in 1965 (it took 4 years to come into effect).

NAFO

The NAFO Convention (Article XI) provides for management and conservation of the fisheries resources "designed to achieve the optimum utilization of the fishery resources of the Regulatory Area", without specifying the types of measures. The Convention did not adopt the Panel structure of ICNAF and decisions are taken in the Fisheries Commission as a whole, still by two thirds majority, but now, of those Contracting Parties present and voting. Thus neither abstentions nor absentees are part of the equation as they were in ICNAF, but the decisions are still subject to the objection procedure.

There were changes in the details of the process to confirm the acceptance of management recommendations. In NAFO, the Executive Secretary, rather than the Depository Government, sends the notification of the proposals to the Contracting Parties, and these have sixty days, rather than six months, to object, otherwise the proposal becomes a binding measure for all Contracting Parties. In the event of an objec-

tion, implementation is delayed further forty days (rather than 60 days) unless (as in ICNAF) there has been a further objection, in which case there is another thirty-day delay to allow for further objections.

As noted, this "safety valve" for second thought, was not a problem for many years, and the objection procedure was seldom used. In the later 1980s, however, it became a major threat to the functioning and future of NAFO as will be discussed later.

Management Process

Typically, the annual management process starts with the deliberations of the Scientific Council in June of each year, although the Council may meet to discuss specific questions at other times. The conclusions of these deliberations, and the advice for management, are made available to the Contracting Parties by the end of June and they then have two months to prepare for the Fisheries Commission meetings at the beginning of September.

At the annual meetings, for many years, it has been the practice, of the Commission to first decide on TAC levels before considering allocation issues. Much of the debate has been as to which management criterion should be used. In general, this has been whether TACs should be set to maintain catches as high as possible, or to set the TAC at a more conservative level, usually that consistent with the $F_{0.1}$ level of fishing mortality. In practice, TACs, have been set at the more conservative level, although more recently some TACs for stocks in Div. 3M, i.e. those completely beyond Coastal State jurisdiction, have been set above this level.

After deciding on the TACs, albeit often on a provisional basis, the debate turns to the question of allocation. The general rule has been for a pro rata adjustment when TAC levels change, but this is challenged regularly by Contracting Parties who do not have specific allocations and wish to have them, particularly whenever there were increases in TACs, a rare occurrence in recent years. These requests are seldom accepted however, although adjustments have been made to the "Others" category. This is a collective allocation for Contracting Parties without specific allocations that allow for limited harvests when fishing associated species.

The conservation decisions adopted over the years have included most of the measures in the management arsenal: – minimum fish sizes, minimum mesh sizes, trawl rigging specifications, effort controls, and TACs and national allocations. Closed areas and closed seasons were used by ICNAF in areas that are now within Coastal State waters and have not been implemented as yet in the NAFO Regulatory Area. The major instrument in NAFO has been the TAC, and there has often been strenuous and protracted debate on the appropriate level. Indeed there have been instances of meetings ending without all TACs being decided, and special Fisheries Commission meetings being called to complete the Agenda.

The lengthy (1985–95) confrontation in NAFO between the European Union (EU) and other members, particularly Canada, is a case in point. Prior to the Annual Meeting of NAFO in 1985, the EU had concurred with the practice, carried over from the last year of ICNAF, of setting TACs at the $F_{0.1}$ level. In that year, coincidental with the need to find fishing opportunities for Spain and Portugal who would be joining the EU, the EU sought to set TACs at the F_{max} level, and when out-voted, subsequently lodged objections and set autonomous quotas for its fleets, many of which appeared unrealistic and in any event appeared to be ignored in practice (for more details, see Parsons, 1993).

In addition, the EU sought to bring under NAFO management the Labrador-Grand Bank (Div. 2J and 3KL) cod stock that had been managed by Canada since the extension of jurisdiction. This move followed the discovery that good catches from this stock could be made in the Regulatory Area in early spring, immediately adjacent to the Canadian fisheries zone, on the "Nose" of the Grand Banks. Although the Fisheries Commission voted to prohibit fishing for that stock in the Regulatory Area on the grounds that it was fully subscribed by Canada, the EU lodged an objection and set a high autonomous quota. This situation persisted for 8 years until 1992 when there was a sudden dramatic alarm issued by the scientists

about the status of the Div. 2J and 3KL cod stock. Canada imposed a moratorium on fishing this stock within its 200-mile zone, the EU announced subsequently a suspension of fishing for this stock.

With regard to the stocks under NAFO management, after 1985 the EU objected routinely to most of the TACs and set autonomous quotas for its fleets. The EU argued that, in addition to the implications of harvesting at $F_{0.1}$, advice on alternative management options should be provided by the Scientific Council and that the F_{max} level should be used by the Fisheries Commission when setting TACs. However, faced with the annually more dire assessments from the Scientific Council, and evidence of blatant disregard for the regulations by some of its own member states, the EU objected to fewer and fewer of the TACs, and in the autumn of 1992 accepted all the NAFO TAC decisions including the moratorium on fishing for Div. 2J and 3KL cod in the Regulatory Area. This was followed shortly by the acceptance of moratoria on directed fisheries for cod, American plaice, yellowtail flounder, and witch flounder in Div. 3LNO for the 1994 and subsequent years.

Enforcement

One of the most difficult tasks in fisheries management is achieving effective implementation of the regulations adopted. The history of ICNAF and NAFO provides many examples of often large-scale violation of the regulations. Compliance is the responsibility of the Flag State and yet in many cases there was little or no obvious enforcement. Indeed, the apparent violations were not only with respect to at-sea operations involving mesh size or small fish, but also involved reporting of catches to national authorities and by them to the statistical agencies.

Concerns about at sea compliance led early in ICNAF to the development of a Scheme of Joint International Enforcement, although this did not come into effect until 1971. Under the Scheme, Inspectors from one Contracting Party could undertake inspections of vessels from any other Contracting Party. The inspectors could examine the fishing gear, catches and documents, including logbooks, according to a detailed protocol. This scheme was "rolled over" into NAFO in 1981 with some rewording to reflect the changed circumstances and later was modified further and renamed the Scheme of Joint International Inspection. There has been continued development of the Scheme, both with respect to the modalities of the inspection procedure and to the requirements on the captain of the vessel being inspected. One element of the latter has addressed recently the issue of captains refusing to haul back their nets while an inspector was aboard, refusals that provided reason for speculation as to the motive. Under both the ICNAF and NAFO schemes, the Inspection Report was transmitted to flag state authorities for action, and it is in this regard that NAFO has made some very significant progress. Under the current version of the Scheme, inspectors finding specified apparent infringements may call upon an inspection vessel of the flag state of the vessel being inspected, if one is in the area. Under certain circumstances where an inspector "cites a vessel for having committed, to a serious extent, an apparent infringement" and if there is no inspection vessel of the flag state in the area the competent authorities of the flag state may require the vessel to proceed to a nearby port for a thorough inspection. Other improvements include a hail system for when vessels enter the Regulatory Area, change division, or leave the Regulatory Area. The hails include information on species sought, and on leaving the area, the catch by species. They are made by radio to the flag state authority, and to the NAFO Secretariat.

One long-standing but frustrating initiative has been the placement of observers on vessels. The Scientific Council has long advocated this for the collection of more detailed catch and biological information, including data on the discards of both species of direct commercial interest that might be too small or damaged, and species taken incidental to the fishing operations. During the early-1980s, it appeared as if a scientific observer scheme would be implemented, on the basis of bilateral arrangements between countries, but this did not develop beyond a few preliminary trials, partly because there were concerns that this was a form of management control, rather than a truly scientific initiative. In 1990, however, the Scientific Council produced evidence of massive over-fishing of cod on the Flemish Cap, which in part stimulated the adoption of more stringent measures under the Scheme of Joint International Inspection, but led also to the development of a pilot observer scheme. During the initial 6 month trial

period, Contracting Parties whose vessels in aggregate were expected to fish each year for 300 days or more in the Regulatory Area, were required to have observer coverage of 10% of their effort. The trial period was extended until the end of 1997 and the required level of coverage was increased to 100%. The observers monitor fishing operations, and the compilation of catch data, and collect biological information.

Associated with this most recent trial of an observer scheme, a pilot project on the use of satellite tracking was set up to allow comparison between these two means of monitoring fishing vessel operations. Implementation of this element has been slow because there have been delays in deploying the transponders for satellite tracking.

Overall, however, the pressure for effective recognition of the obligations when fishing on the high seas has increased greatly with the recognition of the consequences of inadequate control and the development of new international instruments.

Cooperation

One of the most pressing problems for resource conservation in the Regulatory Area has been fishing by entities beyond the control of NAFO, and, in particular, by vessels flying the flags of non-member countries. Some but not all of this effort has been by vessels that previously had fished as part of the fleets of member countries and had transferred the flag specifically to avoid the NAFO regulations. The NAFO response was concerted action by all Contracting Parties, through the General Council, to call upon the flag states to halt these fishing activities. In retrospect, this did not appear to have much effect, and the General Council authorized missions by representatives of some Contracting Parties to visit the countries on behalf of the Organization. At the same time, bilateral pressure was applied by a number of Contracting Parties to these non-member countries. The passage of legislation in Canada in 1995, with regard to action against vessels compromising international management in the Regulatory Area, provided added impetus. The level of non-member activity has dropped rapidly (Table 2).

Another type of cooperation is where bilateral problems are settled within the multilateral forum of NAFO, or where NAFO problems are resolved bilaterally.

The lengthy (1985–95) confrontation in NAFO between the EU and other members, particularly Canada, that has been noted already, was an example of how bilateral and multilateral interests intertwine. It was in part a reflection of Canada–EU bilateral frictions. The resolution in NAFO was achieved in part through

TABLE 2. The number of non-member flag states with vessels active in the NAFO Regulatory Area each year (1986–96), together with the total number of groundfish fishing vessels involved.

Year	No. of States	No. of Groundfish Vessels
1986	6	30
1987	5	29
1988	7	41
1989	7	47
1990	7	44
1991	8	35
1992	6	35
1993	7	31
1994	9	27
1995	4	13
1996	4	7

a recognition of the need to bring the fishing activities of some EU member states under control. This occurred at a time when non-NAFO member states were harvesting increasingly high proportions of the catches particularly on the Southern Grand Banks, while Contracting Parties were cutting back on their catches. A second major factor was the progress in negotiations between the EU and Canada over future fishing arrangements for EU vessels within the Canadian 200-mile fishing zone, including the question of port access which had been denied since the breakdown in Canada-EU fisheries relations. Negotiations between the two Parties led to agreement in December 1992 on an "Ad Referendum Memorandum of Understanding between the Government of Canada and the European Communities on Fisheries Relations and accompanying exchange of letters to put it into effect".

Several elements of the Canada-EU fisheries agreement addressed problems pertaining to NAFO, including agreement for EU support of management measures for straddling stocks consistent with decisions taken by the Coastal State for the same stocks within the 200-mile fisheries limit; controlling the catches of the fleets of EU member nations; coordination of inspection efforts; cooperation to address the non-member issues, and cooperation in the development of joint proposals to add a dispute settlement mechanism to the NAFO procedures as a way to prevent any future abuse of the objection procedure.

An element of the Canada-EU Agreement concerned the jurisdictional question of which stocks should be managed by NAFO, and in particular addressed the Div. 2J and 3KL cod situation.

When Canada extended its fisheries jurisdiction there was no fishery for Div. 2J and 3KL cod in the eastern part of Div. 3L beyond 200 miles, so it was only in 1985, when the captains of EU vessels that had been fishing the stock inside Canadian waters under allocations provided by Canada, found that they could make catches beyond the zone, that the question arose. The Scientific Council was requested in 1985 and each year subsequently, to estimate the percentage of the stock beyond the Canadian 200-mile zone and they reported it to be less than 10% in winter and less than 5% on average throughout the year (*NAFO Sci. Coun. Rep.*, 1986, see text on page 80).

The Canada-EU Agreement of 1992, recognized that the stock was primarily within Canadian waters and provided that Canada would set the TAC, and that the EU would support a proposal to NAFO that once the stock was sufficiently rebuilt for harvesting to be resumed, 5% of the TAC would be made available for distribution within NAFO. This has been adopted by NAFO.

Ironically, no sooner had this standoff on TACs been put to one side, pending the recovery of the cod stock within the 200-mile limit and beyond in the Regulatory Area, the same question arose over Greenland halibut. In 1986, the Scientific Council had reported very limited occurrence of this species in the Regulatory Area, but in 1990, substantial catches were made in the Regulatory Area, and these escalated to over 50 000 tons by 1993. It appeared that the stock distribution had shifted south and east and that the species was much less abundant in the more northern parts of the range than it had been in the past. There were a number of unknowns, in part due to the difficulty of assessing abundance at depths between 1 000 and 2 000 m, and including whether the change in distribution pattern was permanent, or whether the stock would at some time return to its more normal distribution. The debate within and outside NAFO was intense, initially over the harvest by the EU of a stock that Canada considered to be under Coastal State jurisdiction, and later over the level of the TAC and the allocation between Contracting Parties. In this latter respect the EU attempted to protect the proportionate share it had gained during the rapid escalation of the fishery while other Contracting Parties could not accept allocations based on a fishery that had such a short history and which had been undertaken outside the NAFO regulatory framework. The eventual solution, in a compromise that followed dramatic confrontations on the high seas and bilateral discussion and agreement between Canada and EU, was to set separate TACs for parts of the range.

Discussion

NAFO came into being in 1979, and inherited a working model from its predecessor ICNAF. The challenges NAFO has faced have, however, been enormous, particularly with a declining resource base

being exploited by increasing fishing power. Progress has been somewhat erratic, with periods of confrontation before compromise and cooperation were achieved and the organization adapted and moved on.

The Convention itself has proven adequate to handle the problems that NAFO has faced in all but two significant areas, while a third problem has been beyond the legal grasp of the Convention. These three deficiencies have been the objection procedure, the reliance on flag state enforcement and fishing in the Regulatory Area by non-members. Another issue is whether there are better ways of conducting the business of the organization such as the means of obtaining scientific advice.

Objection Procedure

The rationale for having an objection procedure is understandable, in that it provides the opportunity for State authorities to seek relief from a measure that although agreed to by the majority may be particularly and unreasonably onerous for that State. The keyword here is "unreasonably" because an onerous measure may be justified, if for example a particular conservation problem is being caused by that State. The objection procedure should not be open to States to use as a weapon to achieve their own ends against the wishes of the majority, and particularly if the result is to free the State from taking any real conservation action when all other States are implementing restrictive measures. One possible solution would be to eliminate the procedure, but this may create inequality in certain situations, and a more balanced approach may be to reduce the scope of the procedure and place some limitations on its use. One such option that is being explored is the addition of a dispute settlement mechanism, so that other members may challenge the objection. At present there is no opportunity within NAFO to dispute the lodging of an objection, other than to object also. Another option would be prescribe some restrictions on the use of the objection procedure as an amendment to the Convention.

NAFO has agreed to examine the question of dispute settlement in the context of the objection procedure, although there is considerable divergence of view. Canada is of the view, first tabled as a proposal in 1992 (NAFO, 1993), that excessive or inappropriate use of the objection procedure should be open to scrutiny and challenge. This would be facilitated by establishing clear guidelines for the use of the procedure, together with a mechanism for determining quickly whether the objection meets these criteria. The EU position is that disputes should be handled as envisaged in the 1982 UN Law of the Sea Convention (UN, 1982), although this would ignore the considerable clarification of the process contained in the 1995 UN Agreement on Straddling Stocks and Highly Migratory Stocks (UN, 1995). Even this later Agreement does not address fully the problem, because it does not cover stocks entirely beyond national jurisdiction but which are not highly migratory. Furthermore, it may be many years before it comes into effect. The US has suggested a dispute settlement mechanism that focuses on activities of fishing fleets that actually jeopardize conservation, rather than on the decisions by states which might lead to such a situation. The debate is ongoing, and included in the agenda of a meeting of a working group in April, 1997.

Science

The NAFO model with respect to Science is different from that in many international fisheries organizations. Some international organizations, e.g. the International Pacific Halibut Commission (IPHC), maintain their own scientific staff, and conduct the basic research in support of fisheries management. It is arguable that this avoids political pressure on the scientists so that the management advice is "pure" and the research is focused clearly on the problems. At the same time such arrangements tend to create "black boxes" with respect to the research results and analyses, so that only the conclusions are presented. Furthermore member states still need scientific expertise to interpret and advise on the conclusions presented to them, which in fact generates some duplication of scientific expertise. An intermediate model between this and the NAFO type of approach is that seen in, for example, the Northeast Atlantic, where several fisheries commissions and environmental organizations obtain their scientific support from a third party scientific body – the International Council for the Exploration of the Seas (ICES). Here, as in NAFO, scientists bring their analysis and data and there is intense debate, but the organization is funded independent of the management bodies.

The collegial scientific approach in NAFO has worked reasonably well. There is debate over the science, and all parties have access to the details of this debate. Research priorities are identified, and cooperative investigations and analyses have been planned and executed. However, given the global nature of many of the broader issues, e.g. climate change and fisheries applications of the precautionary approach, there is clearly scope for greater international collaboration. At the time the NAFO Convention was being negotiated consideration was given to having ICES provide the scientific input to NAFO. This was discounted at the time as being not the best option. Should this be revisited as NAFO approaches the 21st Century? Or is maintenance of the Scientific Council still the best alternative?

Whatever the structure for scientific research, including economic research and analysis, the most demanding priority has to be to increase the understanding of the ocean factors that influence resource abundance and productivity and the influences of human activities. This will be a major focus for future research because knowledge about the inter-linkages within ecosystems and between the physical and biological elements is not only a key to better management, but its acquisition is one of the obligations assumed when nations ratify the Convention on Biological Diversity (UNEP, 1994), as well as the other recent international instruments.

Management

The most obvious challenge for the future is to rebuild stock biomasses and to ensure that future harvesting is held to sustainable levels. This underlines the necessity for adequate control of fishing by vessels from Contracting Parties and fishing by non-members. The rebuilding of the stocks is clearly dependent on continued protection of the stocks and favorable recruitment, as even with very low removals in the last 2–3 years there is limited evidence of rebuilding for only two stocks as of 1997.

There are four elements to future improvements in the control of harvest levels:

- international legal developments,
- matching harvesting capacity to resource productivity,
- innovative means for monitoring and control, and
- education and understanding.

Internationally, the awareness of the need to act in a sustainable fashion has blossomed during the 1990s. The UN Conference on the Environment and Development and the resulting Agenda 21 and the Commission on Sustainable Development (UN, 1992), the UN Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea, of 10 December 1982 relating to the Conservation of Straddling Fish Stocks and Highly Migratory Fish Stocks (for simplicity "the UN Agreement on Straddling Stocks and Highly Migratory Stocks") (UN, 1995), the FAO Code of Conduct for Responsible Fisheries (FAO, 1995a), and the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (FAO, 1995b), have provided a promising basis for cooperation and collaboration in the future.

There remains, however, plenty of opportunity for controversy between States who wish to start new fisheries and the States already active in an area. It is simplistic to assume that the established States will make "quota" room for new entrants as this implies reductions in their own catch or to assume that the aspirants will cease fishing if no allocations are forthcoming. Nevertheless, the obligations for aspiring new entrants to cooperate with regional arrangements and to avoid compromising the biological resources are now much stronger than even two or three years ago.

The concept of cooperative enforcement on the High Seas has been given a great boost by the UN Agreement on Straddling Stocks and Highly Migratory Stocks. This global Agreement incorporates provisions with respect to action that International Inspectors can take when serious infringements of regulations are suspected and no action is being taken by the Flag State. In such specified situations, inspectors may remain on board to collect additional evidence and may require, where appropriate, the master to bring the vessel to the nearest port. This goes further than even the provisions that had been

negotiated in a very few regional arrangements such as within NAFO and the North Pacific Anadromous Fisheries Commission whereby flag state authorities might agree to order their vessels to the nearest port whether this be a port of the flag state or of another Contracting Party.

Many of the new agreements and treaties recognize that managers, harvesters, and all involved need an increased understanding of the oceans and their resources and of the impacts caused by exploitation. Without such understanding conservation measures are likely to be less effective and to be compromised severely in implementation. The goal has to be that all users accept the measures in place and support them. This acceptance will most likely never be achieved when there are too many people chasing too few fish because that creates incentives to compete and to maximize short-term gains. This can be resolved only by facing difficult decisions about harvesting capacity and ways of achieving capacity reduction.

There are many innovative techniques that are now being tried, or would seem likely to hold promise for the future in controlling and monitoring fishing activity, such as satellite-based locator systems coupled with remote entry of catch information for real time monitoring. Another option for monitoring fishing activity is to make greater use of sales information to confirm catch reporting. Even without resorting to these various new measures, States can reduce greatly the incentive for non-compliance by providing vessel operators with more assurance of viable operations. Measures such as matching fleet capacity to catch opportunity, setting the catch opportunities at sustainable levels, and involving all parties in decision making will reduce the pressure on fishers to ignore the regulations.

A major new element for fisheries conservation is the recognition in the BioDiversity Convention, the UN Agreement on Straddling Stocks and the FAO Code of Conduct, of the concept of caution in making decisions, particularly where there is uncertainty or risk. This "precautionary approach" will require considerable modification of existing approaches to managing the marine resources of the world. The approach means that the resource will receive the benefit of the doubt, not the fishing industry, when there is uncertainty about the impact. This uncertainty may be due to incomplete data, poor adherence to regulations, unpredictable biological effects/or unforeseen environmental effects. Science is making great advances in the analysis of risk, but nevertheless, as stated, decisions should now "err on the side of caution". The two new international fisheries instruments require another fundamental change in management practices as they make specific reference to determining biological thresholds, and to establishing, in advance, the management actions that will be taken if these thresholds are triggered.

NAFO in the 21st Century

NAFO is already grappling with the various elements of change, and has an excellent opportunity to be a leader amongst international fisheries organizations. Despite the problems experienced, the evolving mechanisms provide the foundation for future progress. The Fisheries Commission is experimenting with electronic tracking, enhanced inspection, and real time reporting, while the Scientific Council is identifying the research requirements, as well as formulating advice to the Fisheries Commission, on the practical aspects of the precautionary approach, and the definition of biological reference points.

Fisheries in the Regulatory Area will continue, using a mix of fishing gears, and involving most of the current Contracting Parties. The economic realities of distant water fisheries will mean that a number of Contracting Parties will operate fewer vessels. While there may well be some new members, closer attention to the fate of the catches, particularly with respect to eliminating preferential entry of product into the markets of Contracting Parties, could reduce the incentive for new entrants.

Cooperative enforcement with a number of collaborative elements will be the norm, and all vessels will be reporting daily on their operation. Summaries of this information will be shared widely, while still maintaining confidentiality of the details of commercial operations. There might even be joint funding of some enforcement and control activities. There will be gear and season and area restrictions, including "no-take" areas not only to improve the patterns of harvest of commercially exploited stocks, but also to avoid by-catches of threatened species and to avoid detrimental disturbance of sensitive habitats.

Scientific investigation will continue to be hampered by resource constraints, in part because the scope of necessary research is so enormous. Scientists will be addressing the identification and monitoring of safe biological limits, the nature and causes of environmental fluctuation and their impacts on biological parameters, the impact of harvesting on the ecosystems and habitat including gear specific considerations, and new ways of assessing all these elements. While doing this, scientists will be grappling with what else might be happening to the resources, ecosystems and habitat, so that they can address the full extent of the precautionary approach, and not focus only on the results of statistical analyses.

Fisheries management decisions will be taken after considering a much wider range of inputs, including analysis of the biological, economic and practical factors. This practical element has been too often ignored; can the measure be implemented effectively? Management decisions will continue to be based on a single species approach for many years, subject to risk analyses of options that take into account the uncertainty in the assessments and to being risk adverse consistent with the precautionary approach. Multi-species and ecosystem considerations will initially be addressed as an area of uncertainty, but will be factored in explicitly, as the information and understanding increases.

All of this will be in the context of a much more open world, with information more freely available and with cooperation between different agencies, not only within the organization but between organizations. There will be numerous collaborative efforts to investigate alternative techniques and mechanisms, and to improve them whether they are in the field of fisheries science, resource management or fisheries surveillance and control.

The status of very many of the world's fisheries at the present time is such that there is every reason to be concerned about future prospects. These prospects will remain bleak unless all fishing nations can apply a truly collaborative approach to research and management and cooperate fully with each other in developing in every respect sustainable approaches and practices.

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