History and Description of the International Commission for the Northwest Atlantic Fisheries

by

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SUMMARY

Increasing pressure on the world's fish resources from the late 1800s to the mid-1900s prompted not only the formation of national fishery management schemes in coastal waters but also regional management bodies in international waters. The International Commission for the Northwest Atlantic (ICNAF) was among the first regional fisheries management bodies to be established in the world (http://www.fao.org/fishery/rfb/en) and was considered to have played a leading role in the assessment and management of fish stocks outside of national jurisdictions.

Despite ICNAF's lead role and innovations in the formulation of fishery management techniques, an overwhelming expansion of long distance fleets in the 1950s and 1960s had a profound and lasting effect on the fishery resources in the northwest Atlantic. An extensive learning curve in understanding status and effects of exploitation on the fish populations, and limits on controls that could be imposed in international waters, diminished the effectiveness of ICNAF.

The following describes the establishment and evolution of ICNAF with some background on why it was created. The creation and evolution of the Convention, the Commission as governing body and it committees, the evolving participation (Contracting Parties), fisheries that occurred within its jurisdiction, innovations in fisheries statistics, science and management, publication history and achievements are described. From the first meeting in 1949 where the Convention was formulated to the final meeting in 1979 when ICNAF was dissolved, and significant events in between, constitutes the timeline.

Background – *a brief history of northwest Atlantic fisheries and early (pre-ICNAF) management*

Much of the following section is adapted from Anderson (1998) who provided a thorough description of the fisheries and (limited) management in the northwest Atlantic prior to the establishment of ICNAF. For details of the early fisheries of the northwest Atlantic and the establishment of fisheries management by the coastal states Greenland, Canada and the USA, refer also to Blake (1997), Candow and Corbin (1997), Galtsoff (1962), Grosslein (1969), Halliday and Koeller (1981), Halliday and Pinhorn (1985, 1990, 1996),

Hennemuth and Rockwell (1987), Horsted (2000), Innis (1978), Lear 1998, Parsons (1993) and Serchuk and Wigley (1993).

The first major fisheries of the east coast of North America predate the formation of ICNAF by 425 years. Starting in the late 1500s, France and Portugal, followed later by Spain and England developed the first long distant fleets fishing for cod on the Grand Banks off Newfoundland (Innis, 1978, Lear 1998). Much of that early effort was carried out by long lining; trawling came much later. To the south in USA waters, commercial long lining began primarily near shore soon after the first colonists arrived in New England in the early-1600s. Beginning in the mid-1700s, fishing expanded, reaching further offshore to the Georges Bank (Serchuk and Wigley 1993).

Even early on, there was a realization that the fishery resources were not finite and that increasing exploitation was having a negative effect on the stocks. Hennemuth and Rockwell (1987) reported that in the late-1860s, New England fishermen raised concerns about declines in the abundance of some of the near-shore species prompting the first attempt to understand the nature of the fish populations and effects of exploitation. The imposition of closures by the General Court of Massachusetts Bay on cod and mackerel fisheries during the spawning season was the earliest recorded attempt at management (http://www.nafo.int/about/frames/history.html).

In 1871, the US Congress created the Fish Commission and a temporary fishery research station was established in 1875 in Woods Hole Massachusetts, made permanent in 1885 (Galtsoff, 1962). In Canada, a Board of Management and the first marine biological research station were established in 1898, a permanent facility established in 1908 in St. Andrews, New Brunswick (Parsons, 1993, Trippel 2011). Both countries continued to develop national programs and departments for the purpose of managing fisheries in their territorial (coastal) waters. Off Greenland, cod had been fished since the 1800s, mainly by non-Greenland vessels prior to the 1900s (Horsted 2000). It was not until 1910 that fishery statistics were collected (and published by ICES). Management of the fisheries there started under ICNAF. Greenland, as an integrated part of Danish attended ICNAF as part of the Denmark delegation.

Initial attempts at fisheries management comprised the establishment of hatcheries designed to enhance commercially exploited stocks. In 1919, a minimum mesh size set for cod trap nets in Newfoundland constituted one of the earliest management measures there (Halliday and Pinhorn 1996). Closed areas were employed in Canada to minimize gear conflicts but the only action that effectively reduced exploitation was a limit placed on the number of trawlers (an emerging technology) in the 1920s and 1930s.

Concern about the effects of fishing on stocks was a primary motivation for establishing the International Council for the Exploration of the Sea (ICES) in 1902 (Went, 1972) but that organization dealt with research on the living resources and focused on the northeast Atlantic. There was no management mandate.

The first international fisheries body in the northwest Atlantic was the North American Council on Fishery Investigations (NACFI), established in 1921 by an agreement among

Canada, Newfoundland (not yet part of Canada), the USA and France. However, that organization, like ICES also focused on cooperative fisheries research rather than management. It did however, set a standard for the collection of fishery statistics among the participating countries and also established the first geographical divisions for reporting of statistics. NACFI however, was short-lived, discontinued in 1938 (Royce 1988).

With major advancements in gear technology, expansion of European based distant water fleets and the absence of any controls on their activities heightened concerns about over-exploitation of northwest Atlantic fish stocks. Increase in fishing effort in the 1920s resulted in a sharp drop in catch per unit effort of haddock in the 1930s (ICNAF 1952). Restrictions on the number of trawlers in Canada were relaxed and long distance fleets started to expand after the Second World War. Those and similar developments world wide prompted the formulation of several conventions in the 1940s with the objective of fishery management (Halliday and Pinhorn 1998). The USA took the lead in the initialization of many of those conventions globally and acted as the repository state (see Cushing 1977, Halliday and Pinhorn (1996) and Anderson 1998 for a description of the Atlantic Conventions and the FAO web site Regional Fisheries Bodies (RFBs) http://www.fao.org/fishery/rfb/en for a history and global description of fishery Conventions and Commissions).

Formation of ICNAF – *events leading up to the 1949 conference*

The first regulatory convention that pertained to the North Atlantic was the 1943 Draft Convention relating to the Policing of Fisheries and Measures for the Protection of Immature Fish (Halliday and Pinhorn 1996, Sen 1997). However, Canada and USA shared doubts that North American interests would be well served by a North Atlantic-wide organization dominated by European states. That convention never came into force in the northwest Atlantic.

Subsequent discussions that took place at ICES and at the Overfishing Convention of 1946 (the follow-up to the 1943 Convention) dealt only with the eastern Atlantic although problems of over-exploitation Atlantic wide were recognized. At the suggestion of the USA, a separate conference was convened in Washington, DC on Jan. 26-Feb. 8 1949. It was attended by eleven countries with interests in fisheries off the east coast of North America. Delegations comprising fishery administrators, scientists and industry representatives from Canada, Denmark, France, Iceland, Italy, Newfoundland, Norway, Portugal, Spain, the United Kingdom of Great Britain and Northern Ireland and the United States of America participated in the International Northwest Atlantic Fisheries Conference. The FAO (Food and Agriculture Organization of the United Nations) and ICES (International Council for the Exploration of the Sea) attended as observers.

It was well understood the difficulty of the task at hand when it was stated in the report of the conference that: "*The need for thorough consideration of the problems facing the Commission is paramount, and considerable time will be needed for assembling the material required for a determination of those problems*".

However, the primary purpose of that 1949 conference was to formulate a Convention (international treaty) pertaining to fisheries that occurred in areas of the north Atlantic west of 42^{o} Longitude and north of 39^{o} Latitude. The key outcome and the Final Act of the conference was the publication of a Fisheries Treaty known as the International Convention for the Northwest Atlantic Fisheries.

The Convention

The President of the United States ratified the Convention on September 1, 1949, with documents deposited on that same date. The Northwest Atlantic Fisheries Act of 1950 (16 USC 981-991; 64 Stat. 1067), as amended provided implementing authority.

The treaty, entered into force on July 3, 1950 with Canada (including Newfoundland, now a part of Canada), Iceland, the UK and the USA (the Depository Government) as the initial signatories. Its stated purpose was the "*investigation, protection and conservation of the fisheries of the northwest Atlantic Ocean, in order to make possible the maintenance of a maximum sustained catch from those fisheries*" (ICNAF 1951). Thus, the concept of sustainable use of fishery resources was introduced.

During the drafting of the Convention, several issues were raised. Notably, France and Spain requested that definition of coastal limits (for USA, Canada and Greenland) appear on the Convention but this was declared by the conference as out of its competence, avoiding the issue of defining territorial waters: Article I defined the bounds of the Convention area simply by indicating exclusion of territorial waters.

Also under Article I, the Convention Area was initially divided into five Subareas (1–5) (Fig. 1a) for the purpose of management. The area was extended southward in 1967 to include areas north of Lat. 35^{o} (Subarea 6). Statistical Area 0 was created in 1974 (ICNAF, 1974) off Baffin Island (Fig. 1b). However, Area 0 and 6 were not part of the Convention Area and thus ICNAF did not have regulatory authority there. Using best knowledge of the day and incorporating boundaries established by its predecessor NACFI, these divisions were designed to correspond to distribution of the important commercial species. Found (1933) stated that "*the limits have been designed to correspond as far as possible with natural divisions of the fish populations or with barriers to fish migrations*". A comprehensive review of the rationale, establishment and changes in delineation of the geographic areas for collecting fisheries statistics in the Northwest Atlantic, initially by NACFI and later by ICNAF (and NAFO), is provided by Halliday and Pinhorn (1990).

Article II defined the composition, roles and responsibilities of the Commission (now named the **International Commission of the Northwest Atlantic Fisheries**) as the body that would execute the Convention. Contracting governments (later to be referred as Contacting Parties) were directed to appoint up to three Commissioners, to meet annually and also when called by the Commission Chair. Each Contracting Party was allocated one vote and decisions of the Commission were taken by a two-thirds majority of the votes.

Article III described the supporting body for the Commission work, namely the Secretariat (refer to later sections for a description of this supporting body). The specific makeup of the Secretariat was developed during the first few years, the Executive Secretary filling positions in administrative support.

Article IV is perhaps the most important section of the Convention, stipulating the establishment of a Panel for each of the Subareas defined under Article I (Fig. 1). Each Panel responsible for keeping under review the fisheries of its Subarea and the associated scientific, statistical and other information and, on the basis of scientific investigations, making recommendations to the Commission for adoption (e.g. scientific studies, investigations and most importantly, regulatory measures). Panel membership by Contracting Parties was contingent upon having current substantial exploitation in the Subarea in question or having a coastline adjacent to the Subarea.

Article V allowed for the institution of advisory committees and public hearings. By this Article, over time, various committees were created to form a structure supporting the Commission. Subsequent sections describe this evolution.

Article VI laid out Commission responsibilities for scientific investigations, exploratory fishery investigations, obtaining the information necessary determining the status of stocks including biological and oceanographic information and fishery statistics. It also alludes to the need to study methodology for maintaining and increasing stocks that is stock assessment methods, an aspect that later, ICNAF took a lead role. Also adhering to the dictates of Article VI, ICNAF established a number of publication series for scientific and statistical information relating to the fisheries of the Northwest Atlantic. These communications are described in a later section.

Article VII specified how the Commission was to operate within the framework of the Panels, with the authority to make recommendations to the Commission on such matters as regulatory measures, studies and investigations and alterations of Subareas as deemed necessary.

Article VIII, key to the management of fisheries and aimed at maintaining fisheries at levels permitting maximum sustained catch, authorized the Commission to adopt regulatory measures including a) establishing open and closed seasons, b) closing particular areas because of spawning or small/immature fish, c) establishing size limits for fish, d) prohibiting particular fishing gear, and e) specifying an over-all catch limit for any species. Such measures became effective four months after notifications of acceptance by Contracting Parties were received by the Depository Government (USA) (Anderson 1998).

Article IX was an administrative statement that allowed the invitation of Contracting Governments to any matters that relate to the objectives and purposes of the Convention. That is, this Article allowed for countries to become involved in the business of ICNAF, by invitation. This was not invoked during the time of ICNAF but a similar Article was used later by NAFO when it dealt with provision of advice for stocks that straddled the 200 mile limit of Canada.

Article X sought to establish working arrangements with the FAO and ICES. In the case of ICES, it was briefly considered as the body to provide scientific advice. However, this did not come about as the Committee on Research and Statistics (STACRES) took on those duties. Nonetheless, both ICES and FAO played an important part in the early years of ICNAF, particularly with respect to Panel 1 (see the section on the Commission for a description of the Panels) that bordered the ICES jurisdiction. ICNAF also attended ICES and FAO meetings and interacted with other bodies such as the Permanent Commission (for the northeast Atlantic) that had been set up by the 1946 International Fisheries Convention. The Executive Secretary of ICNAF had a very busy schedule of travel not only attending those meetings but also traveling extensively in Europe meeting with the fishing industry and meeting Contracting Party scientists and managers at their institutions.

The remaining Articles XI through XVII dealt with administrative procedures including financial matters, how the work of the Commission, in particular the Secretariat budget was to be handled through payments from the Contracting Parties. How to deal with external matters, the ratification procedures for the Convention, specification of the deposition of the Convention with the USA and its registration with the UN was included. It also provided allowance for the withdrawal of any Contracting Party from the Convention.

Throughout the years, many amendments were made to the Convention and these are described in the Annual Reports of ICNAF.

The Commission – ***the decision making body and its committees***

The Commission as specified in the Convention was composed of up to three representatives of the Contracting Parties and was the body responsible for carrying out the tasks laid out in the Convention. The composition of Contracting Parties changed over time as countries became more or less involved in fisheries in the Convention area. The numbers increased from the initial five (Canada, Denmark, Iceland, UK and USA) in 1951 to a high of 18 by 1975 – Bulgaria, Canada, Cuba, Denmark, France, German Democratic Republic (GDR), Federal Republic of Germany (FRG), Iceland, Italy, Japan, Norway, Poland, Portugal, Romania, Spain, Union of Soviet Socialist Republics (USSR), United Kingdom (UK, including Ireland) and USA – before decreasing to only 12 - Bulgaria, Canada, Cuba, GDR, Iceland, Japan, Norway, Poland, Portugal, Romania, Spain and USSR by the time ICNAF officially dissolved on December 31, 1979 (Table 1, Anderson 1998, ICNAF 1951- 1979). This involvement mirrored the fleet activity and catch history (Fig. 2, upper panel) in the area. The European Economic Community started to attend as observers in 1971 and later under NAFO, member countries of the European Union (EU) attended as a single delegation. Invitations were forwarded to other countries that fished in the northeast Atlantic as observers, namely Belgium, Netherlands and Sweden but these countries never joined ICNAF.

The first meeting of the Commission in April 1951, hosted by the USA in Washington DC, was attended by the five signatory governments - Canada, Denmark, Iceland, UK and USA, five additional countries whose ratifications were pending France, Italy,

Norway, Portugal and Spain (Table 1) and the two observer organizations, FAO and ICES. Attendance of FAO and ICES (and ICNAF in reciprocation) continued throughout the ICNAF period in the spirit of cooperation and sharing of information. A host of other organizations also attended over the years including the Permanent Commission, the North Pacific Halibut Commission, the Pacific Salmon Commission, International Commission for the Conservation of Atlantic Tunas, among others. The Executive Secretary or the Commission Chair often reciprocated. The ad hoc Committee on Relations with Other International Organizations (Table 2) reported on those cooperative efforts regularly. The first Annual Report of ICNAF was a USA Department of State publication, once again emphasizing the central role of the USA in the creation of ICNAF.

At that inaugural meeting, the Commission recognized that "*During recent years certain fisheries of the area, particularly off the New England coast of the United States of America, have shown signs of depletion*" (see discussion of haddock below). Further, the international importance of the occasion was embodied in the following statement by the Undersecretary of the US Dept. of State "*I am told that this is the first instance wherein a group of nations have formally committed themselves to a program of scientific investigation and regulation, to the end that fish resources of a vast area of the high seas shall be conserved and utilized prudently*". While conservative and prudent management in the coming years was not always observed, on a global scale, the formation of ICNAF represented a major step in the attempt to manage high seas fisheries. It was the genesis of a group of organizations that was, years later, to be coined as Regional Fisheries Management Bodies (RFMOs), responsible for conserving living marine resources in international waters.

A number of important issues were addressed during that first meeting of the Commission. First, the draft Rules of Procedure (ICNAF 1951, Appendix VI and VII) were refined by the ad hoc Drafting Committee (Table 2) to finalize a framework for how the Convention was to be executed. The supporting body for the Commission and its committees was instituted in the form of a Secretariat and it was recommended that the Executive Secretary "*be a biologist, a man with great administrative and statistical ability*". Meeting support, compilation of reports and collation of statistics were the key functions of the Secretariat.

The main body of the work done by ICNAF initially took place within five committees known as Panels, their work corresponding to five statistical areas (Fig. 1).Throughout the life of ICNAF, the Panel system, adherent to Article IV of the Convention was employed to "*review the fisheries of its subarea and the associated scientific, statistical and other information and, on the basis of scientific investigations, making recommendations to the Commission for adoption (e.g. regulatory measures, scientific studies and investigations*." Thus at the start, the work of the Commission combined both scientific and regulatory aspects but separated the tasks into five geographical areas (Fig. 1).

Ad hoc committees (for example Credentials, Nominations, Biology, Relations, Headquarters Site: were set up under the Rules of Procedure to address administrative requirements such as choice of venue for the Secretariat – Canada or USA. By 1953, a

number of invitations to host the Secretariat were forthcoming from the United States (6 invitations including Harvard University) and Canada (4 invitations including Dalhousie University, Halifax, Nova Scotia and St. Johns in the province of Newfoundland). It was settled in the following year that the ICNAF Secretariat would be established in Canada, temporarily in St. Andrews New Brunswick (for 1952) then permanently in Halifax Nova Scotia (1953-1979) (Anon 1951). Staffing of a Secretariat to support the work of the Commission was discussed. The first addition to the staff of the Secretariat was a statistician, in recognition of the importance of fishery statistics in the conduct of managing the fisheries.

The Commission also established Standing Committees on Finance and Administration (STACFAD, 1951) and Research and Statistics (STACRES, 1951), with the latter to recommend the conduct and coordination of research programs in the various countries, advise the Commission on improvements deemed desirable in the collection of statistics and provide advice on possible regulatory measures (Table 2). Research and statistical programs were to be carried out by agencies of the various Contracting Parties thus constituting a loosely coordinated international effort. In later years, two other standing committees were formed, STACREM, 1967 and STACTIC, 1971, their regulatory functions described in later sections. Under the standing committees, numerous subcommittees were formed and dissipated to address issues of the day.

How the Commission was to function and how it was to be supported was established.

> **Science and Statistics** – *the development of fisheries, biological and hydrographic data collection, scientific research, assessment methods and provision of advice*

In 1951, recognizing the inadequate state of knowledge pertaining to fishing activity in the Convention Area, STACRES considered the following as basic data to support scientific evaluation of the effects of exploitation: *landed weights by year, area and species for at least five principal species; by commercial size categories; annual fishing effort; and estimates of discards, for the development of means for maintaining maximum sustained yield* (ICNAF 1951). Thus, the concept of MSY (maximum sustainable yield) was expressed early on within ICNAF as a management objective. This concept was broadened in 1971 by modifying the Convention to one of achieving optimal utilization of the stocks rather than MSY (Halliday and Pinhorn 1996). The idea of fishing at level less than MSY (as is the current practice at NAFO) to take into account uncertainty, to reduce the possibility of over-exploitation, was discussed and implemented during the ICNAF time as it became apparent that maximizing yield often resulted in over-exploitation.

Landings data, collected by area, country and time period, comprising total weights and fish sizes of the principal groundfish species represented part of the fisheries statistics deemed essential to the purposes of the Commission. On that basis, the ICNAF collection and reporting system led to the establishment of what Anderson (1998) referred to as one of the worlds best fisheries data bases of the time. Also in 1952, steps were taken to improve the collection and reporting through the production and distribution of fish identification pamphlets and in 1953, information on numbers and specification of

vessels fishing in the Convention was requested. In 1954, statistical Subareas were created by the Sub-Committee on Division of Commission Divisions within Subareas to accommodate stock partitioning of various species (Fig. 1b).

Initially, ICNAF focused on a single species, haddock (Subarea 5) and for this reason was informally referred as the "haddock Commission". Georges Bank haddock was known to have undergone substantial decline staring in the 1930s (Galtsoff, 1962) and this was the motivation to start with this species. Scientific discussions at the first ICNAF meeting focused on what information was required to determine a cod-end mesh size of trawls that would allow sufficient escapement of young haddock and thus increase yield potential. Panel 5 also indicated the need to estimate natural mortality, examine changes in age frequencies, estimate recruitment and adult population size, comparing the latter estimate with the total catch and with estimates of total mortality from catch data. This constituted the principle information needed to assess status of the stocks but formal stock assessments to advise on allowable catches were years away. Until the mid-1960s, age based trends in commercial landings and catch rates were primarily used as a proxy for population trends.

Coordination in conducting research and collecting statistics on fish populations and fisheries was established through STACRES. The statistical section of the 2nd annual Report brought together for the first time, data on landings of groundfish by all countries fishing in the Convention Area. The report listed: cod (*Gadus callarias*), haddock (*Melanograrnmus aeglefinus*), redfish (*Sebastes marinus*), Atlantic halibut (*Hippoglossus hippoglossus*), American plaice (*Hippoglossoides platessoides*), yellowtail flounder (*Limanda ferruginea*), witch flounder (*Glyptocephalus cynoglossus*), fluke (*Paralichthys dentatus*), lemon sole (*Pseudopleuronectes americanus)*, pollock (*Pollachius virens*), whiting (*Merluccius bilinearis*), white and red hake (*Urophycis tenuis and chuss*), cusk (*Brosme brosme*), wolffish (*Anarhichas sp.*) and Greenland halibut (*Reinhardtius hippoglossoides*) (Table 3). For 1951, 1.3 million metric tonnes (million t) of landed fish was reported (later amended to 2.3 million t, Fig. 2). This highlighted the fact that a wide array of species was already being heavily exploited in the Convention area.

In 1961, the Commission requested that harp and hood seals of the Northwest Atlantic be brought under the provisions of ICNAF and in 1966, Panel A was formed to deal with seal research, statistics, management and coordination with coastal State regulations. In 1963, herring (and other pelagic fish) were brought into the normal scope of STACRES. In 1965, the Convention was changed to include molluscs, primarily referring to scallops.

Various countries were also undertaking exploratory fishing to expand the scope of the fisheries, particularly north of the Grand Banks. Those explorations opened up new areas to the north and identified commercial potential for species not previously exploited. Exploratory trawling was carried on at depths never before fished in the world, initially at 600-800 m and later at up to 1500 m. This involved development of trawl gear that could function properly at those great depths. What they found at the greatest depths were dense concentrations of roundnose and roughead grenadier (*Coryphaenoides rupestris* and *Macrourus berglax*) mixed with Greenland halibut. Based on those explorations, the worlds first deep slope fisheries were developed in the late 1960s. The 1968 Annual

Report noted that "*the doubling of the catch of other groundfish species from 11,000 tons to 22,000 tons was due to a new fishery for roundnose grenadier, Macrourus rupestris, by the USSR*".

Salmon and large pelagic species (sharks and tunas) were briefly considered to become part of the Commissions management mandate but that was put aside. It was clear that the primary management mandate was groundfish. However, ICNAF participated in joint working groups with other organizations on species such as salmon (Parrish and Horsted 1980).

A research plan was formulated by STACRES in 1953 and program summaries were prepared annually thereafter. Most member countries were using research vessels to acquire fishery-independent data by the early-1950s and this was the source of much of the information that appeared in the STACRES reports. Studies initially dealt with stock structure, life history and size composition and in 1953-1955, haddock, redfish and Atlantic halibut were the primary focus (Subcommittee on Redfish-Halibut and Subcommittee on Cod-Haddock). In 1956, cod became the focus of research and a symposium on cod biology was held. Work on gear selectivity (to be used for mesh size regulation) continued as a focus under the Workshop on Population Dynamics and on the Selectivity of Fishing Units in 1957. From the mid-1950s to mid-1960s, a wide range of research was carried on the commercially important species with an emphasis on tagging (for the purpose of stock definition), on aging of fish using otoliths and age based catch rates in the fisheries. The latter was useful in building information on year class strength of cohorts to be used to be used in the assessment of status of species in the 1960s and 1970s. Plankton surveys were also reported as a means to examine recruitment (relative abundance of eggs and larvae in the water column) of the commercially important fish. Until the late 1960s, summary of research activities constituted the majority of the annual reports in most years illustrating the vast amount of research that was carried out in the early years.

The study of hydrographic conditions in the northwest Atlantic was also an ICNAF mandate. The Executive Secretary was "*requested to arrange during the 1953 meeting of the Committee a symposium on long-term changes in hydrographic conditions and corresponding changes in the abundance of fish stocks to guide us in planning hydrographic programs and to throw light on the effects of such natural factors on fisheries"* (ICNAF 1953) and a Sub-committee on Hydrography was formed in that year. In 1954, a comprehensive analysis of the conditions in the Convention area - The Waters of the ICNAF Convention Area (ICNAF 1954) was presented to the Commission. Hydrographic surveys were done regularly (Beaudouin 1968) and updates in hydrographic conditions were reported annually. Symposia were undertaken decadally, often coordinated with ICES (Mälkki 2012). Knowledge of the hydrography in the Convention area and its influences on the resources was greatly enhanced by this work. The Intergovernmental Oceanographic Commission of the UN (IOC) report on ICNAF in 1962 indicated that ICNAF had met the resolutions set forth by that organization. That report outlined an extensive program on the study of oceanographic influences and their effect on the living resources (Anon 1962).

The earliest indication that the scientific focus was shifting from fish size based management advice (mesh size to allow suitable escapement of small fish) to assessment of stock status (size of population and sustainable removals) was in 1960 when a Subcommittee on Fishery Assessment in Relation to Regulation Problems was formed, the purpose to initiate "*new lines of co-ordinated research*" (ICNAF 1963). The Assessment Subcommittee, concentrating on obtaining better understanding of the long term effects of fishing on ICNAF fish stocks, emphasized the need for development of new theoretical techniques and for a reappraisal of data requirements. The 1964 Annual report stated "*Of vital significance to the Commission and member countries was the scientific advice provided by the Assessment Subcommittee, at the request of the Commission (Agenda Item 18), on the problem of the adequacy of present ICNAF conservation measures in the face of recent increased fishing activity and its probable consequences*".

In 1964, the ICNAF Commission requested: "*that the Chairman of Research and Statistics and of the Assessment Subcommittee review in general terms the various kinds of action which might be taken by the Commission for the purpose of maintaining the stocks of fish in the ICNAF area at a level at which they can provide maximum sustained yields*". In response, Gulland and Templeman (1965) produced a paper on Review of Possible Conservation Actions for the ICNAF Area. That report stated that "*Any conservation or management measure consists of restricting present catching operations in some way in order to ensure better catches in the future*". It also cautioned that for most ICNAF stocks, further increase in fishing effort would not result in greater yield because catch per unit effort (and population abundance) was declining. The realization that limitations on catch (or fishing effort) were required in order to try to prevent or reduce declines in fish populations led to the development of analyses (fishery assessments) that determined the effect of removals of fish from the population. From there, the science of stock assessment started to evolve into a more analytical approach that attempted to determine numbers of fish in the population and how many could be removed through fishing to maintain MSY and thus to try to prevent declines.

In his address to the Commission at the 1966 meeting in Spain, the Minister of Commerce, EXCMO. Sr. D. Faustino Garcia Monco cautioned that "*Today any regulation intended to attain the maximum benefits in the exploitation of live resources must necessarily have a technical and scientific basis*" but also stressed the dependence of industry on the fisheries in ICNAF waters. In essence, this advice was followed by the Commission. Over the coming years, they developed the scientific techniques necessary to determine stock status and recommend catch levels that were intended to attain sustainability. However, many stocks were already in decline, effort, already excessive, continued to build as existing fleets expanded, fleets of new Contracting Parties (Table 1) joined the fishery and fishing by non-member countries increased. Management actions based on the scientific advice was slow to follow. For example in 1966 (and repeated regularly thereafter), STACREC noted increasing exploitation for many stocks, in particular cod and haddock; effort was "*approaching or may even be beyond the level giving the maximum sustained yield per recruit*". Catch limitations based on the scientific advice was still years away (see management section).

The first analytical assessments aimed at providing advice on maximum allowable catch were carried out in 1969 by the Assessment Committee largely based on emerging theory and methods found in Beverton and Holt (1957) and Schaefer (1957). The question of catch-quota regulations for Subarea 5 haddock and Subarea 1 cod was considered, deriving provisional estimates of the quotas to achieve specific reductions in fishing mortality. In fact in 1969, there was a recommendation that no fishing for haddock take place on Georges Bank/Gulf of Maine, in essence the provision of advice leading to the first complete closure of a fishery under ICNAF. Thus, by the early 1970s, a scientifically based and managed fishery was being implemented across the board, a first in the world in international waters (Gulland and Boerema 1973). However, at each annual meeting from the late 1960s to 1979, it was recognized that despite the restriction placed on catches, heavy exploitation over many years had for too long exceeded the point of sustained yield. The 1971 report concluded that "*the rate of increase of fishing intensity has far exceeded the rate of scientific studies to determine the effects of it*". There was always a lag in the scientific advice and regulatory implementation and as well, issues of non-compliance (fishing outside of the regulations) further exacerbated the situation.

The pros and cons of the ICNAF system were debated by Rozwadowski (2002). He noted that the ICNAF system of in-house advice (through STACREC and the Assessment Subcommittee), according to D. H. Cushing, allowed scientific experts to work on one advisory committee rather than spreading out the expertise over many working groups, as in the NEAFC-ICES arrangement. This had special advantages when dealing with mixed fisheries, as most demersal fisheries were. A significant disadvantage of the ICNAF system resided in countries' reticence to devote funds to international research, preferring to support national laboratories. The ICNAF system, some argued, gave scientists a greater degree of understanding of management needs and processes. Others countered that proximity to management decisions made ICNAF advice more prone to political influence than the ICES working group system. This claim, on the other hand, was denied by others who noted that national interest might be apparent in scientific discussions within ICNAF, but argued that scientific integrity rendered advice largely free of bias. One explanation of ICNAF's success on the scientific advisory front rested precisely in its marriage of science and management, namely that distant-water fishing nations had strong interests in sending their best scientists to the meetings.

Management – *regulation of the fisheries*

Five Panels corresponding to the five Convention Subareas (Fig. 1) and comprising Contracting Party members with interest in those area (see Article IV of the Convention) initially encompassed all aspects of ICNAF business, including regulatory tasks.. The species groups initially designated for management were cod or cod-like fish, flat-fishes, and redfish although the scope was extended to other species in subsequent years (described above under Science).

The Convention initially allowed for regulatory measures pertaining to: a) establishing open and closed seasons; b) closure to fishing of spawning areas or; c) areas populated by small or immature fish; d) establishing size limits for any species; e) prohibiting the use of certain fishing gear and appliances; f) prescribing an overall catch limit for any species

of fish. At the early stages, management actions in the form of regulations were limited pertaining to mesh size. The Convention was amended over time to be more comprehensive (described below).

Minimum mesh size regulations provided the basis for nearly all of the management measures during the first 15 years in ICNAF, with over 20 such measures adopted (Halliday and Pinhorn, 1985). At the first meeting of ICNAF, the sole management strategy comprised recommendation of a minimum 3 ¼ inch mesh for haddock "a level which would allow a maximum proportion of unmarketable-sized haddock to escape with minimal effect on the *catch of marketable-sized fish*". In 1952, the Commission approved a Canada/USA proposal for mandatory minimum mesh size of 4½ inches for haddock in Area 5 and specified how that regulation would be enforced. That constituted the first regulatory action by ICNAF. An ad hoc Committee on Trawl and Mesh Sizes was formed in 1954 and in 1958 a subcommittee for studying the technical and practical aspects of the mesh regulations.

Mesh regulations were extended to cod as well as haddock on the Scotian Shelf, Gulf of St. Lawrence and the Grand Banks (Areas 3 and 4) in 1956 and 1957 but it was not until 1968 that trawl regulations were extended north to Labrador (Area 2) where a variety of species, particularly flatfish and pollock were included. A mesh size of 130 mm (standard changed to metric) was established off west Greenland to match that established off east Greenland by NEAFC. In the early-1970s, the 130 mm standard was applied in all areas. In southern areas, where small mesh fisheries also occurred, by-catch allowances of mesh regulated species were generally 10% of the catch on board or 5 000 lb. A series of trawl regulations discussed throughout the 1960s and adopted by the Commission in 1965 were finally implemented in 1968 (ICNAF, 1968). Gear regulations were never adopted for pelagic species. Halliday and Pinhorn (1996, Appendix Table 7) provides a timeline of the mesh size regulations put in place by ICNAF.

Those gear regulations were monitored by at sea inspections starting in 1957. An ad hoc committee was set up to consider the information collected (Chairman's Report, Item 13, 1957 Ann. Meet.-Ann. Proc.). In 1968, ICNAF adopted the NEAFC inspection scheme thus harmonizing inspection processes in the north Atlantic. Nonetheless, inspections continued to pertain primarily to gear regulations since catch limitations were not in force at the time. That changed in 1971 when the Scheme for Joint International Enforcement of the Fishery Regulations became operative, providing for inspectors to examine catches and relevant documents as well as fishing gear to verify that the Commission's regulations were being observed. There were initial reservations by some countries to below-deck inspections (where fish product was stored) but these were largely removed by 1973, and the scheme was progressively strengthened (Halliday and Pinhorn 1996).

The Standing Committee on International Control (STACTIC) was established in 1971. Terms of reference (Commission Rule of Procedure 6.5) were adopted by the Commission in Plenary Session in 1972. That committee was tasked with all aspects under the Scheme for Joint International Enforcement of the Fishery Regulations.

Pinhorn and Halliday (1996) pointed out that the scope of fishery management is much broader than just conservation and includes, particularly, the economic performance of the industry and the distribution of benefits to meet the objectives of society. In addressing the Commission in 1954, seeking advice on the surveying of marine resources, Dr. G. L. Kesteven, of FAO expressed a point of view common to the time, the need to increase world production to feed a rapidly growing human population. Sustainability played no part in his address. He specified searching out new fishery resources and increasing harvest of existing resources. He stated that "*we know that the waters of the world must yield more food*". Economic benefit and not fishery conservation was the focus of the time.

However, that point of view, the need to "*yield more food*" changed as the consequences of unrestrained fishing became apparent. The 1963 annual report of ICNAF stated that "*To date, only minimum mesh-size regulations have been recommended and are in force*", thus during the 1950s and 1960s effort grew, unrestrained (Gezelius and Raakjær 2008). In 1968, catches in the Convention area peaked at 4.5 million tonnes then started to decline rapidly as catch rates dropped, the result of declining populations (Fig.2). The approach to feeding the world and where management measures consisted solely of gear regulation was clearly not sustainable.

In his opening address to the 1967 Annual Meeting, Stanley Cain, Assistant Secretary for Fish, Wildlife and Parks in the U.S. Department of the Interior stated: "The Commission is faced with a major problem; that is the tremendous increase in fishing effort during the last few years. The Commission's scientists have concluded that additional regulatory action *is necessary to supplement the minimum mesh size regulations when and if they enter into force. You are now giving urgent study to this very critical problem".* At the opening of the 1968 meeting, Mr Buchan, M.P., Joint Parliamentary Under Secretary of State for Scotland reiterated the view that "*The development of fishing power and intensity have already shown that the measures which the Commission may recommend under the Convention are not by themselves sufficient to secure the objectives of the Convention*.". STACRES (and ICES) scientists had raised warnings for years prior about the inability of the mesh size regulation regime to protect fish stocks from over-fishing (Rozwadowski 2002).

While FAO (1960) supported the concept of effort limitation as a way to reduce over-exploitation, ICNAF took a different approach. The consensus was that limiting catches was the most effective way to accomplish this (Gulland and Boerema. 1973, Gulland 1984, Halliday and Pinhorn 1996). Templeman and Gulland (1965) concluded that action had to be taken to reduce net fishing, through catch quotas. Their concerns and advice to the Commission were expressed as follows: "*For many if not most of the stocks of major importance the amount of fishing has now reached a level such that further increase 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 this raise difficulties, but that presenting least difficulties is by means of catch quotas. There must be separate quotas for each stock of fish, e.g. for cod at West Greenland, and preferably be allocated separately to each section of the industry*". Based on wide

recognition that current management measures were insufficient, the Commission asked STACRES to review various options for resource conservation.

The Commission reviewed the report of a Working Group established in 1966 with participation by FAO, NEAFC, and OECD, on Joint Biological and Economic Assessment of Possible Conservation Actions in the Convention Area (WGBEAC 1967) and in the following year, the Commission established a Standing Committee on Regulatory Measures (STACREM) to examine the economic, administrative and scientific aspects of proposed regulatory measures (ICNAF 1968). The committee was to consider how best to reduce fishing effort to achieve the maximum sustainable yield. The first step was to determine what research was required to establish appropriate quota levels.

Although there had been two prior examples of catch quotas, in the Pacific halibut fishery and the Antarctic whaling industry, it was discussions at ICNAF and later NEAFC in the 1960s that focused the attention of administrators and scientists on the need to restrict catches. The first measures to control catches, and hence the level of fishing mortality, were agreed to in 1969 for application in 1970 (Halliday and Pinhorn 1996). The Convention was amended in 1971 to be non-specific and therefore more comprehensive as to what the Commission could put into force. Halliday and Pinhorn (1985) indicated that primary significance of this was to allow for national allocation of overall (or global) catch quotas which paved the way for acceptance of a comprehensive catch quota control scheme. STACREM considered statements from the Assessment Subcommittee and proposals on catch-quota regulatory systems by USSR and USA and guidelines were proposed for the negotiation, enforcement and monitoring of catch limitations for the first time.

Haddock stocks off Nova Scotia and New England were the first to be placed under Total Allowable Catch (TAC) controls, once the Commission acquired the authority to propose national allocation of TACs in 1971. Catches from many other stocks were subsequently placed under quota; yellowtail flounder in 1971, herring and cod in 1972, silver hake, American plaice, pollock, mackerel and redfish in 1973 (Table 3). By 1974, virtually all stocks subjected to a significant directed fishery were under TAC control including the newly established deep water fisheries. Refer to Halliday and Pinhorn 1996, Appendix Table 8 for a complete list and time line of species placed under quota.

"Second tier" TACs were also established in 1974, in addition to single stock "first tier" TACs. This second tier TAC was set at a level below the sum of the first tier TACs to address mixed fishery and by-catch problems and to allow for species interactions (Halliday and Pinhorn. 1985, O'Boyle, 1985). In later years, when Gulland (1984) wrote about fishery control by catch limits, he had the ICNAF experience to draw on.

In 1971 as quotas were being introduced, the division of the quota among nations in the form of allocations moved to the centre stage (Anon 1971). The task of allocating the quota was done by STACREM. It was stated that "*the shares should be based mainly on historical performance but should also take account of other factors, such as provision for states with developing fisheries, coastal states, and states with fleets which are*

incapable of being diverted to other fisheries". The process was in the form of negotiations.

Other regulatory measures put in place by ICNAF included minimum fish size (kept), closed areas and seasons and fishing effort restrictions. For example, it was prohibited to keep herring less than 9 in., sardine fishery exempted. Minimum fish size regulations were considered to be more effective than mesh size regulations for reducing the catches of small fish in the case of pelagic species (Halliday and Pinhorn 1996). Closed seasons and areas were applied primarily to reduce bycatch and to protect spawning fish. Regulation of fishing effort was also implemented in 1976 for Subareas 2–4 groundfish fisheries of non-coastal states. However no other measures were as effective in reducing pressure on the stocks as quota regulation.

Also, in the 1960s, the Council of Europe called for a ban by both ICNAF and NEAFC on high-seas drift netting, such as used at Greenland, and also longlining, the method used in the Faroese fishery. ICNAF responded by recommending a ban in the northwest Atlantic, but this measure stalled when several countries registered formal objections. From 1970 ICNAF continued to pursue a ban until finally, in 1972, its members agreed to cease the fishery beyond 12 miles after 1976 (Rozwadowski 2002) thus shutting down a harmful fishery. Drift netting persisted long after in other parts of the world.

Although Contracting Parties were placed under catch regulation, another problem was emerging. In the 1967 Annual Report (reiterated in subsequent years), it was noted that "*two large Romanian stern trawlers have been carrying out exploratory fishing in the southern part of the Convention Area for the past 2 years. During the 1966 fishing season they took almost 3,500 tons of, mainly, herring in ICNAF Division 5Z"*. It was also noted that a report "*has been received in the Secretariat that the Japanese Fisheries Agency has issued a license to the Kaimon Mani (2,518 tons) of the Nippon Suisan Fishing Company to carry out experimental trawling operations in the Convention Area from 25 April to 24 July 1967*". As well, a small, but growing Cuban fleet was known to be fishing in the Convention Area. By 1976, vessels carrying the flag of Israel, the Republic of Korea, Greece, Ireland, and Nigeria were known to fish in the Convention Area (ICNAF 1977). Efforts were made (unsuccessfully) to obtain the cooperation of non-member countries in providing details of their fishing activities. Catches taken by such means were unrestricted and undocumented adding to the problem of trying to manage the fisheries at a sustainable level. This fishing by non-Contracting Parties continued to grow and in later years, was deemed illegal. The problem became global in later years and was referred to as IUU (Illegal, Unreported and Unregulated) fishing.

In terms of ICNAF as a fisheries regulatory instrument, Halliday and Pinhorn (1996) concluded that "*these actions put ICNAF at the forefront among international fisheries commissions worldwide as the first to establish control of overall level of exploitation, to adopt TAC regulations, national allocation of catch possibilities, and, in the case of second tier TACs, the first to attempt multispecies management"*. Unfortunately, for many stocks, catch controls came too late and in retrospect were not great enough. In addition, IUU fishing that was out of the control of ICNAF further increased the fishing mortality that eventually led to the collapse of many commercial stocks.

Publications –*reporting on ICNAF work and innovations*

Following its single publication of the Annual Meeting Report in 1951, ICNAF evolved a set of publications to report its work. That evolution, summarized below is based on a detailed accounting found in Hodder (1980) and is summarized as a timeline in Table 4.

In 1953, the Commission's annual publication was divided in two series: *Annual Proceedings* (Administrative Report, Report of the Annual Meeting, Research Summaries by member countries) and *Statistical Bulletin* (statistics of annual catch and effort for the fisheries in the ICNAF Area). This series continued until it was replaced in 1973 by the *Annual Report* series. In 1972, a new series of *Proceedings* of individual meetings was introduced.

Anderson (1998) in summarizing scientific publications of ICNAF stated that "*adhering to the dictates of its Convention (Article VI), ICNAF established a number of publication series for scientific and statistical information relating to the fisheries of the Northwest Atlantic. Research contributions from scientists and others engaged in the work of the Commission for use at ICNAF scientific meetings were papers issued as "Meeting Documents" until 1964 but subsequently all documents produced for consideration by Commissioners were designated "Commission Documents". During the period 1965–72, the research contributions were issued as "Research Documents". Beginning in 1973, a separate "Summary Document" series was initiated for national research reports, reports of committees, subcommittees and working groups, statistical tabulations, reports on status of fisheries and research carried out, and relevant reports or abstracts of activities of other international agencies*".

In 1958, ICNAF began publishing the reports and proceedings of STACRES in a red-covered publication which, beginning in 1962, was entitled *Redbook*. The *Special Publication* series was also initiated in 1958 for the purpose of publishing, at irregular intervals, the results of special ICNAF projects and contributions to Symposia and Special Meetings. The *Sampling Yearbook* series was also begun in 1958 as a means of providing scientists and others involved in the work of the Commission with an annual record of the sampling carried out each year by member countries to determine length and age compositions of commercial catches of principal species required for stock assessment purposes.

Beginning in 1964, ICNAF established a primary, peer-reviewed, scientific journal entitled *Research Bulletin* for publishing the results of individual research relevant to the ICNAF area. The 1963 Annual Report stated "*Another new project is the launching of the Commission's scientific publication, the Research Bulletin. Stimulating and informative talks were given at informal scientific sessions on 31 May by Dr. A. S. Bogdanov on Soviet research on redfish in the Convention area, by Mr. B. E. Skud on herring research in Subarea 5, by Dr. B. Rasmussen on the Norwegian porbeagle shark fishery in the Convention area and by Dr. R. Trites on current measurements in the Gulf of St. Lawrence".* In 1976, a secondary publication entitled *Selected Papers* was established by STACRES as a means to publish noteworthy research documents presented to ICNAF

scientific meetings which were not of the standard required for publication in the *Research Bulletin*.

ICNAF also produced miscellaneous publications at irregular intervals such as *List of Fishing Vessels* and *Index and List of Titles*. Lastly, as a vehicle for routine communication of requests for data, preliminary catch reporting, meeting notices and the like to scientists, commissioners and advisers, the ICNAF Secretariat employed "Circular Letters".

A common method at ICNAF for studying scientific issues on a wide variety of species and issues was joint Symposia with other fishery organizations. At the first meeting of ICNAF in 1951, several biological seminars were held during the evenings to determine "*what scientific knowledge is lacking in the NW Atlantic fisheries and how should it be acquired*" essentially the first ICNF symposia. Although not formally a part of the Commission work, those sessions provided an opportunity to discuss and clarify problems prior to their definitive consideration and execution by STACRES which did not start its work in earnest until 1953.

Symposia became the primary forum for exchange of ideas related to the science and management of fish in the Convention area and well reflect the innovations in fishery science attributable to the ICNAF scientific community (Table 5). Anderson (1998) noted that the leading scientists in the field of fishery research from both North America and Europe became involved in ICNAF making their work cutting edge. In fact, in later years, some perceived ICNAF and its publications as the principal forum for North Atlantic fisheries science (Rozwadowski 2002). The list of scientists and their work reported in the annual reports is indeed impressive. (Mälkki 2012) describes the decadal series of hydrographic symposia started by ICNAF in 1964.

The end of ICNAF – *effect of introduction of the 200 mile limit and transition of responsibilities to NAFO*

The most significant development in international fisheries occurred in the mid-1970s; extension of national jurisdictions to 200 miles. However, in the ICNAF Convention area, there existed a portion of the fishable continental shelf on the Grand Bank and Flemish Cap that extended beyond 200 miles. As such, it was recognized that ICNAF could no longer function in its current state but that an international fisheries management body was required to manage the resources that extended beyond the new 200 mile territories.

Anderson (1998) provided a summary of events that led up to the dissolution of ICNAF. At the 26th Annual Meeting of ICNAF in 1976, Canada and the USA announced their respective intents to extend their EEZs to 200 miles effective January 1, 1977 and March 1, 1977, respectively (ICNAF 1976). The USA formally withdrew from the Commission on December 31, 1976. Also effective January 1, 1977, Denmark similarly extended to 200 miles its jurisdiction around Greenland as did France around the islands of St. Pierre et Miquelon. In October 1976, ICNAF initiated discussions regarding future multilateral cooperation in fisheries in the Northwest Atlantic, and in December 1976 adopted amendments to the Convention to allow for the continued functioning of the Commission

until a final decision could be made regarding a future arrangement. Canada noted that new multilateral arrangements would be needed to bring ICNAF into line with the new jurisdictional realities. Discussions continued at several conferences convened by Canada in 1977 and 1978 until agreement was reached in 1978 on a new international organization to replace ICNAF, to function in the Convention area outside 200 miles.

From 1977 until ICNAF was formally dissolved at the end of 1979, the Commission continued to manage fisheries in a somewhat abbreviated fashion. STACRES continued to provide advice for a reduced number of stocks (about 25 compared to around 70 previously) in response to Canadian requests for advice on certain stocks located within or partly within its 200-mile zone, to Danish requests for advice on several stocks in Greenland waters, to joint Canadian–Danish requests for several stocks overlapping the Canadian and Danish zones in Statistical Area 0 and Subarea 1, and to Commission requests for advice on several stocks lying totally outside any national zones.

With the deposit of instruments of ratification by Canada, Cuba, the European Economic Community (EEC), the German Democratic Republic (GDR), Iceland, Norway, and the Union of Soviet Socialist Republics (USSR), the Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries, done at Ottawa, Canada, on 24 October 1978, came into force on 1 January 1979 and this provided for the orderly transition from ICNAF to the new multilateral organization, the Northwest Atlantic Fisheries Organization (NAFO). It was noted at the 10th Special Meeting of ICNAF that with the creation of NAFO on 1 January 1979, ICNAF and NAFO were operating in parallel. The Special Meeting adopted a resolution recommending that all Members of ICNAF withdraw from the Commission effective 31 December 1979, in accordance with Convention Article XVI, thereby terminating ICNAF.

The preface of the final report of ICNAF in 1979 read as follows: “This is the 29th and final annual report of the proceedings of the Commission and is an authoritative record of its activities from 1 July 1978 to the termination of operations of the Commission on 31 December 1979”. The opening remarks at that last meeting concluded that: ICNAF can proudly lay claim to a number of firsts among international fisheries *commissions: establishing control of the overall level of exploitation, adopting TAC regulations, adopting national allocations of TACs, and attempting multispecies management by means of "second-tier" TACs”.*

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Annexes

Stocks and Management Decisions (extract From Halliday and Pinhorm 1996)

Summary of Management Measures (extract From Halliday and Pinhorm 1996)

ICNAF Publications, a chronology

Relevant Web Links

- http://en.wikipedia.org/wiki/**ICNAF**
- www.nafo.int/about/history/early.html and www. nafo.int/about/history/intro.html
- www.cambridge.org/aus/catalogue/catalogue.asp?isbn=9780511248047&ss=fro
- www.mta.ca/about_canada/**fisheries**/index.htm
- www.all-science-fair projects.com/science_fair_projects_encyclopedia/**Northwest_Atlantic_Fisheries**_Organization
- www.coursehero.com/file/1753964/jinetalenvireconandmgemnt2002/
- onpedia.com/encyclopedia/**northwest-atlantic-fisheries**-organization
- http://books.google.ca/books?id=zpWoYogzGOIC&pg=PA214&dq=icnaf&hl=en&sa=X&ei=DfddT5OXEtKx0QGKxdmgDA&ved=0CDYQuwUwAA#v=onepage&q=icnaf&f=false

Figures

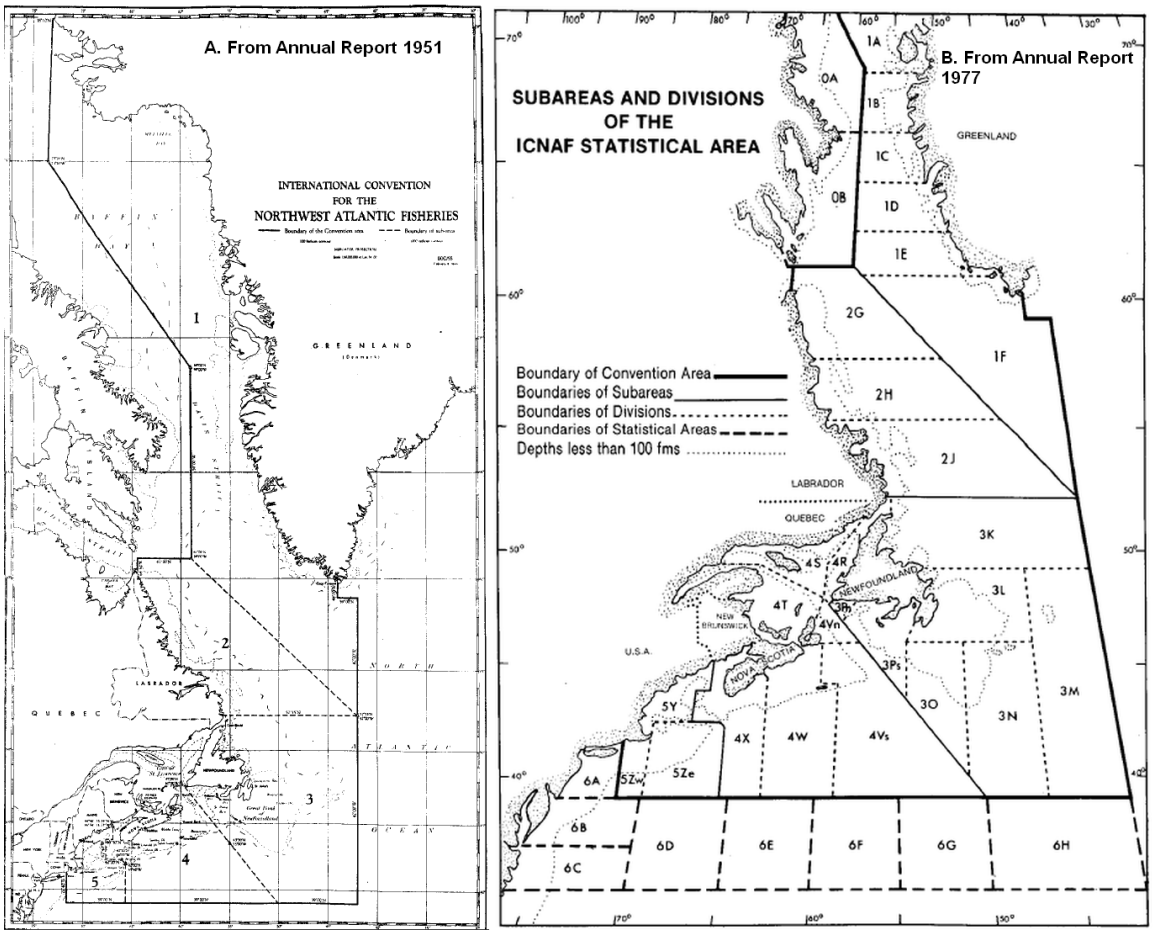

Figure 1. Maps of the Convention Are of ICNAF. Panel A shows the subareas without divisions from the 1951 Annual report. Panel B shows the map from 1977 with subdivisions.

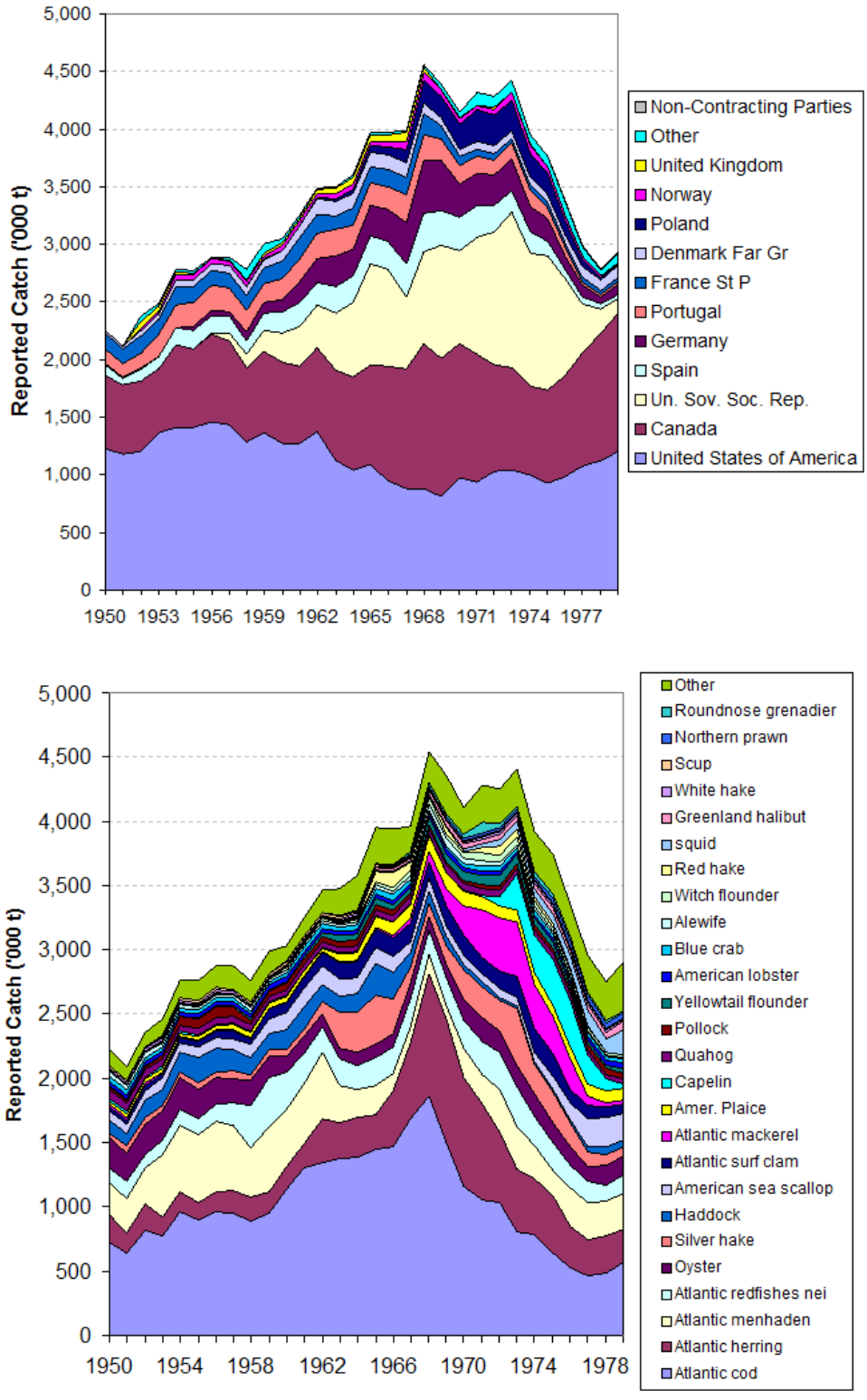

Figure 2. Catches in the ICNAF Convention area. Panel A shows catches by country. Panel B summarizes catches by species. Note: Nearly all menhaden, oyster, surf clam, quahog, blue crab and alewife were taken by the USA.

Tables

Table 1. Contracting Parties and observers of ICNAF. Light squares with o denote countries attending as an observer, dark squares as Contracting parties.

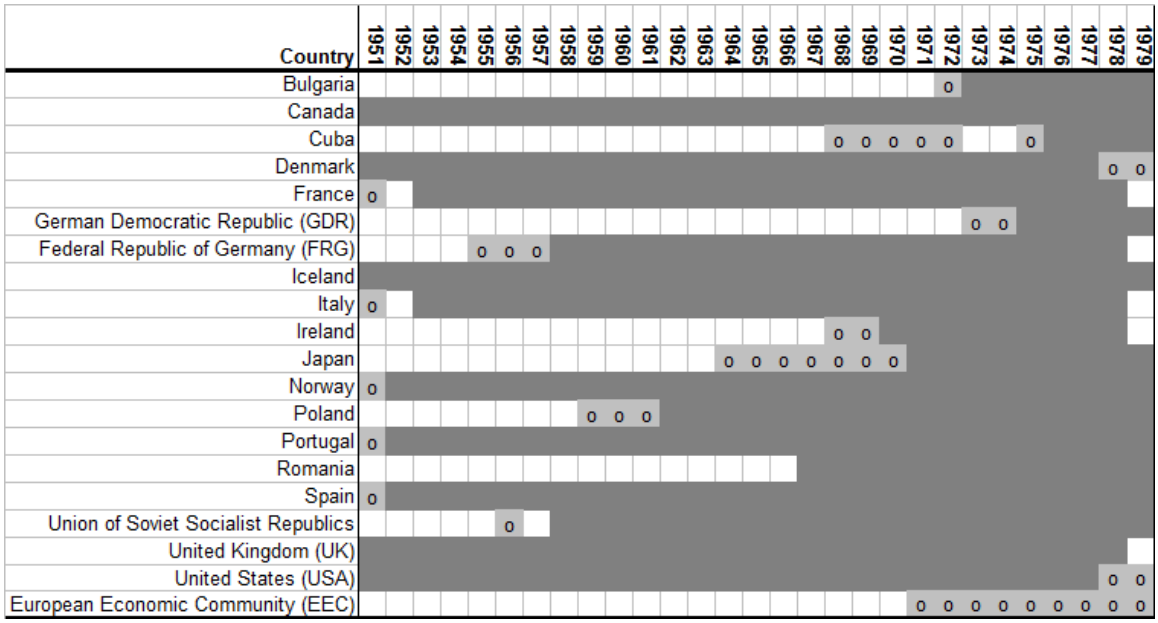

Table 2. Bodies and committees of ICNAF.

Bodies/Committees	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
(Fishery) Commission																													
Standing Committee on Finance and Administration (STACFAD)																													
Standing Committee on Research and Statistics (STACRES)																													
Standing Committee of Oceanographers																													
Standing Committee on Regulatory Measures (STACREM)																													
Standing Committee on Regulatory Measures (STACTIC)																													

Table 3. List of main Species managed by ICNAF. M denotes that a species was managed either by mesh or size regulation, q by quota. Note that some species were managed in some areas but not in others – m denotes regulation in at least one area. S denotes the taking of statistics, r that research was carried out on that species.

Species managed	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
haddock	r	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	q	q	q	q	q	q	q	q	q	q
Atlantic cod			sr	sr	sr	sr	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	q	q	q	q	q	q	q	q
pollock			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	m	m	m	q	q	q	q	q	q	q
White/red hake			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	q	q	q	q	q	q	q
cusk			r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	m	m	m	q	q	q	q	q	q
slver hake			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	q	q	q	q	q	q	q
argentine			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	q	q	q	q	q	q	q
whiting			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr
wolffish			s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
roundnose grenadier																sr	sr	sr	sr	sr	m	m	m	q	q	q	q	q	q
roughead grenadier																sr	sr	sr	sr	sr	m	m	m	q	q	q	q	q	q
Greenland halibut			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	m	m	m	m	q	q	q	q	q	q
witch flounder			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	m	m	m	m	q	q	q	q	q	q
American plaice			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	m	m	m	q	q	q	q	q	q	q
yellowtail flounder			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	m	q	q	q	q	q	q	q	q	q
Atlantic halibut			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	m	m	m	m	q	q	q	q	q	q
fluke			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	q	q	q	q	q	q
lemon sole			sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	m	q	q	q	q	q	q
redfish		r	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	m	q	q	q	q	q	q	q
seals			r	r	r	r	r	r	r	r	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	q	q	q	q	q	q
capelin			r	r	r	r	r	r	r	r	r	r	r	r	sr	sr	sr	sr	sr	sr	sr	sr	sr	q	q	q	q	q	q
herring			r	r	r	r	r	r	r	r	r	r	r	r	sr	sr	sr	sr	sr	sr	sr	q	q	q	q	q	q	q	q
mackerel			r	r	r	r	r	r	r	r	r	r	r	r	sr	sr	sr	sr	sr	sr	sr	sr	q	q	q	q	q	q	q
butterfish																											q	q	q
squid			r	r	r	r	r	r	r	r	r	r	r	r	sr	sr	sr	sr	sr	sr	sr	sr	sr	q	q	q	q	q	q
scallops															sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr	sr
shrimp																							r	r	r	r	q	q	q
lobster			r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r
salmon			r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r

Table 4. List of ICNAF publications. Special Publications were not published annually.

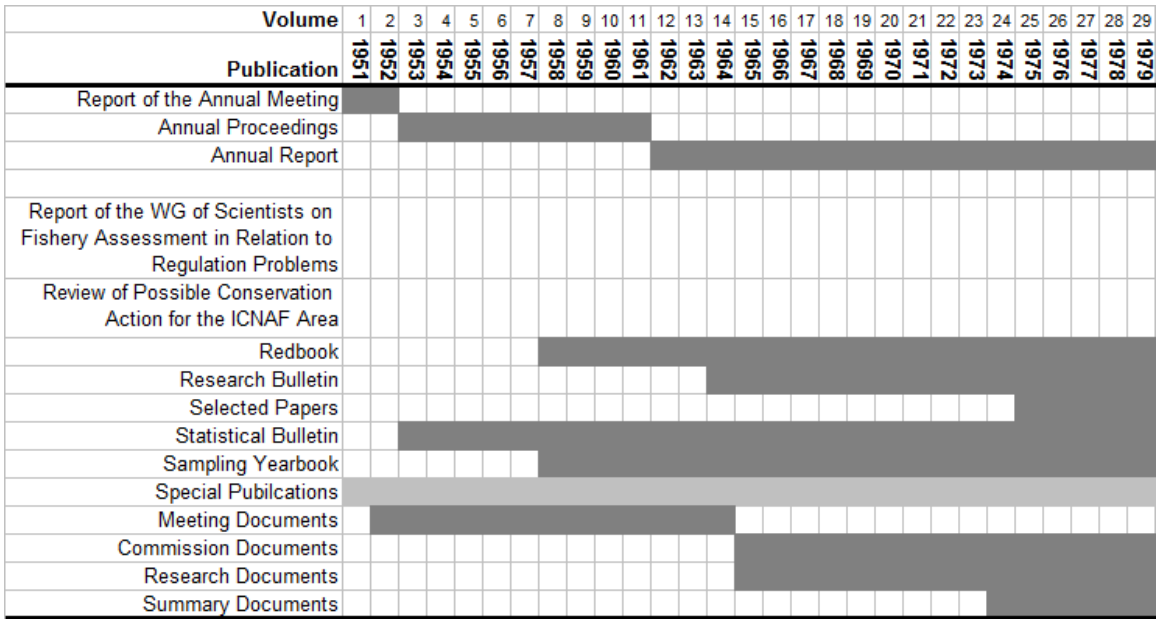

Table 5 List of ICNAF Symposia

ICES/FAO/ICNAF/IABO/SCOR Symposium on the Early Life History of Fish (Woods Hole, USA, 3 April 1979

ICES/FAO/ICNAF Symposium on the Biological Basis of Pelagic Fish Stock Management (Aberdeen, Scotland 3-7 July 1978)

A Special Session on the Theory and Application of Sampling Systems and Statistical Data Analysis in Fisheries Science will be held in conjunction with the October 1978 meeting of ICES and co-chaired by the Chairmen of the ICES Statistics Committee and of the ICNAF Standing Committee on Research and Statistics.

ICNAF Symposium on Environmental Conditions in the Newfoundland Grand Banks Area, 1972 and their Effects on Fishery Trends, held in May 1974

ICES/ICNAF/IBP Symposium on the Biology of the Seal, Guelph, August 1972
Symposium On the Biology of the Seal (14-17 August 1972, University of Guelph (with support from NRC, FAO, CNSS, FRB and WWF)

ICES/FAO/ICNAF Symposium on Acoustic Methods in Fisheries Research, Bergen, 19-22 June 1973,

Symposium on the Early Life History of Fish, Oban, Scotland, 1973 are being prepared jointly by IABO, FAO, ICES and ICNAF respectively.

Symposium on Environmental Conditions in the Northwest Atlantic, 1960-1969 (held in 18-19 May 1971) at BIO convened by Dr N. J. Campbell

Symposium on Fish Stocks and Recruitment, July 1970 (jointly convened by ICES, ICNAF and FAO) (7-10 July 1970, Aarhus, Denmark)

A Symposium on Physical Variability of the North Atlantic under the joint auspices of ICES/ICNAF/IAPSO/SCOR/IOC preceded the 57th Statutory Meeting of ICES, 25-27 September 1969, Dublin.

ICES/FAO/ICNAF/UNESCO/IBP Marine Food Chains Symposium (23-26 July 1968, Aarhus, Denmark)

ICNAF Environmental Symposium held at FAO, Rome, 27 January-1 February 1964. Chairmanship of Dr C. E. Lucas

Commission-sponsored North Atlantic Fish Marking Symposium held at Woods Hole, Mass., 24-27 May 1961, under the Chairmanship of Mr R. J. H. Beverton

ICES/ICNAF Redfish Symposium held at Charlottenlund, Denmark, 12-16 October, 1959

Joint ICNAF/ICES/FAO Special Scientific Meeting on Fishing Effort, the Effect of Fishing on Resources and the Selectivity of Fishing Gear, held in Lisbon, 1957

Workshop on Population Dynamics and on the Selectivity of Fishing Units in 1957

1956 Symposium on Cod Biology held during the meeting of the Statistics and Sampling Committee with Mr. Rollefsen, helped by the Secretariat, as convener.

Some Problems for Biological Fishery Survey and Techniques for their Solution. A Symposium held at Biarritz, France, March 1-10, 1956"

Committee on Research and Statistics organize a symposium on redfish biology at the Fifth Annual Meeting of the Commission.(1955)

A symposium was held on Long-Term Changes in Hydrographic Conditions and corresponding Changes in the Abundance of Fish Stocks in the Northwest Atlantic. (1953)