

North Atlantic Fishery Management Systems: A Comparison of Management Methods and Resource Trends

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Abstract

The administrative and regulatory frameworks used to control fishing in each North Atlantic management regime subsequent to declarations of 200 mile limits are documented, and compared to those of the previous international commissions. The apparent objectives underlying regulatory actions are examined, and trends in stocks of the most important finfish species before and after extensions of jurisdiction are described. The primary elements of these regulatory regimes are then compared. In general, management authorities did not develop coherent policies that reconciled conflicting social and economic aspirations and, as a result, in the 1980s most fleets were overcapitalized, exploitation rates were high for most of the important groundfish stocks, enforcement of regulations was difficult, and non-compliance was a serious problem in many regimes. Most regimes have adopted new regulatory approaches in the 1990s.

Key words: Groundfish, management, North Atlantic, stock

Introduction

Extensions of fisheries jurisdictions to 200 nautical miles in 1977, or about then, by most countries bordering the North Atlantic changed radically the political basis for control of exploitation of marine renewable resources. These jurisdictional extensions put most of the coastal fishing banks within national jurisdictions. Previously, the fish stocks on these banks were in international waters and thus were accessible to everyone. Fisheries were regulated through regional fisheries commissions established under international conventions fairly soon after the Second World War. These commissions, in revised forms, still serve as fora for international management issues, but the geographical area over which they have regulatory authority is much reduced.

The change from international to national management of fisheries provided the opportunity for divergent approaches to be adopted in the many new regulatory zones. The two major international fisheries commissions for the Northeast and Northwest Atlantic, which had many members in common, had developed a fairly standard approach to fishery regulation throughout the North Atlantic. At the time of extensions of jurisdiction coastal nations shared this common heritage. They also had as guidance the consensus developing at the Third United Nations Conference on the Law of the Sea on coastal state authorities and responsibilities with regard to fisheries. Despite this common basis there was, nonetheless, scope for adoption of substantially different objectives and management strategies and of different methods, or tactics, for implementing them.

This paper documents the administrative and regulatory frameworks used to control fishing in each North Atlantic management regime, examines the apparent underlying objectives, and describes concurrent resource trends. Descriptions of the work of the international fisheries commissions prior to extensions of national jurisdiction to 200 miles are followed by comparable descriptions of subsequent domestic management systems and of the new international commissions outside of extended fishing zones. The primary elements of these regulatory regimes are then compared.

The purposes of this review are, firstly, to bring together in a systematic fashion, information on management in all North Atlantic regimes which is often not readily accessible and, secondly, to provide comparisons among regimes of the basic elements of their regulatory systems and resource trends. The review was motivated by a perceived need to counteract ill-informed comparisons among

regimes which serve to confuse debate about the most appropriate techniques for regulating fisheries.

There has been a preoccupation in North Atlantic management regimes with what has come to be called conservation, i.e. fish stock management, but, of course, the scope of fishery management is much broader than this and includes, particularly, the economic performance of the industry and the distribution of benefits to meet the objectives of society. There are intimate linkages between conservation, economic and social objectives in that any action taken in the name of one category of objectives has significant implications to the prospects of attaining objectives in the others. Sometimes regulatory actions are taken with multiple purposes in mind, and it is thus not possible to deal exclusively with one aspect of fishery management. This paper is concerned primarily with the regulation of fishing in the context of the overall objectives, explicit or implicit, of management agencies. Its scope includes regulation of participation in the fishery as well as regulation of the amount of fishing and of how fishing is conducted. The actions described are those of fishery managers (administrators) who carry the legal authority and responsibility to regulate fisheries, of biologists who provide the scientific and technical information and advice on which regulatory decisions are largely based, and of enforcement officers who implement managerial decisions through surveillance and apprehension of regulatory offenders. Excluded from consideration, however, are: evaluations of the economic and social effects of management policies; actions taken by management agencies relating to the secondary, fish processing, sector such as product quality or market improvement programmes; and measures taken by government agencies, other than those directly responsible for fisheries management, relating to general economic development, or social support, which result in indirect subsidization of fishing activity.

The comparisons among regimes are limited to the management of finfish species and indeed to the six species which are of greatest overall importance to the finfish fisheries on both sides of the Atlantic; the groundfish, Atlantic cod, haddock and pollock (called saithe in Europe), and the pelagic fish, Atlantic herring, Atlantic mackerel and capelin. Each of these species has stocks in several management regimes and this allows comparisons of the effects of different regulations on stocks of the same species. These six species were at the centre of developments in the

international fisheries in the last 30 years and it was events in these fisheries that provided the primary incentive for extensions of jurisdiction. As a result of their importance, the effects of fishing on the major stocks of these species is relatively well described.

It was decided to restrict comparisons to stocks in the Atlantic proper. Baltic Sea fisheries are not examined although important stocks of cod and herring occur there. These stocks live in unique conditions, particularly of low salinity, and are managed through an international commission specifically for the Baltic Sea (International Baltic Sea Fishery Commission). Stocks in the Skagerrak and Kattegat are also excluded. These are managed under terms of an agreement between Norway, Sweden and the European Union (EU), and a separate account for this special area would introduce an unnecessary complexity.

Conventions and Methodology

References to management regimes and management agencies or authorities may seem clumsy but it is in recognition that not all the political systems of the regimes studied conform to the simple coastal state model. The EU provides a prime example where extensions of jurisdiction were national actions by member nations but where most of the authority to regulate fishing lies with the EU itself. Greenland and the Faroe Islands, however, have authority to regulate fishing in their own zones but responsibility for international relations resides with Denmark. Thus political situations can be complex, and referring to management authorities provides a useful simplification.

The term management institutions is used to describe the organizational framework within which the various players in the management process interrelate. The international commissions are legal institutions, established by treaty to perform prescribed functions in relation to fishery management in a particular geographical area. At a domestic level institutional frameworks can also be recognized that establish the authorities of various parties in the management process.

The conceptual framework for management is discussed in terms of objectives – the broadest statement of a management agency's policy, strategies – the methods used to obtain objectives, and tactics – the mechanisms used to implement strategies (Halliday and Pinhorn, 1985). For example an objective of obtaining optimum yield (OY) from the fishery could be pursued through a strategy of fishing at the biological reference point,

$F_{0.1}$, and the tactic used to effect this strategy could be the implementation of a system of catch quotas.

When authority over a maritime zone is extended, fisheries may be only one of the activities over which jurisdiction is claimed. Zones come with a variety of labels such as territorial seas, contiguous zones, exclusive economic zones and fishing zones. The baselines from which these zones are measured may be defined by various criteria. However, for present purposes there is no need to entertain these complications and all zones which confer jurisdiction over fisheries on the claimant are referred to here as "fishing zones".

Fishing limits, and all other distance measurements, are given in nautical miles. Thus, all references in the text to miles should be understood to be nautical miles. A nautical mile is equal to 1.15 statute miles and 1.85 kilometres.

Fish species are referred to by their common names and for the primary species Atlantic cod, Atlantic herring and Atlantic mackerel the "Atlantic" is dropped for the rest of the paper, so cod always means Atlantic cod and so on. A number of other species are also referred to and, to avoid confusion, a list is provided in Appendix Table 1 of common and scientific names for all species referenced.

Catches referred to in the paper are nominal catches. Nominal catch refers to that part of the fish catch removed from the sea which is kept for use either for human consumption or for fish meal. It does not include fish discarded at sea. Nominal catches are recorded as the weight of fish in the round fresh condition, i.e. the weight of the catch as it comes out of the sea before any processing. The weight unit used is metric tons, sometimes referred to as tonnes, and is equal to 1000 kilograms or 2204.6 lbs (avoirdupois). This unit is referred to throughout this paper as "tons" or using the abbreviation "t". The total quantities of fish killed by fishing should be taken into account in fishery management and this would include discards, as most of these are dead when returned to the water. However, this is not possible except in a few specific cases because data on discards are not generally collected.

For ease of reading, use of abbreviations is avoided where practical. Acronyms for international organizations are retained, as are country name abbreviations, those scientific notations which refer to exploitation levels (because there is no alternative), and a few others for which usage has become widespread at least in fisheries circles. A list of all abbreviations which are introduced in the text is provided for reference in Appendix Table 2.

The standard report series produced by management agencies, which contain much of the specific information on regulations, catch statistics, stock status reports, and the like are listed at the beginning of the Reference section by management agency. Citations in the main text of specific documents in these series are restricted to the special cases where a direct quotation is made. The usual citation procedure is used for scientific and other sources.

Information on management systems was obtained from literature sources and supplemented by personal interviews with senior scientists and (in most cases) administrators in each management regime. Draft accounts were then provided to these senior scientists for review, and correction of the facts, regarding their domestic management system.

Many of the stocks included in this account are shared between management zones but, for convenience, all are assigned to one zone or another based on which management regime appeared to have the predominant influence on stock management.

Catch and resource trends were obtained from stock assessment documents produced by international and domestic scientific advisory agencies (Appendix Table 3). Most of the stock assessments used were conducted in 1992 and thus the last year of data in these was 1991. The last year of data used in the actual comparisons in this review is 1988, thus making the comparisons insensitive to the input parameters used in sequential population analyses. Stock assessments were accepted as they stood, the only innovations introduced by the present authors being the joining up of data series from earlier reports with those of the most recent ones, when this was necessary to extend stock parameter estimates back to the 1960s.

The parameters used for each stock are for the fished population. The fished population is defined as those age groups making a significant contribution to the fishery. An age group was judged to be making a significant contribution if it was at least 10% recruited to the fishery. Thus, the estimates relate to that part of the stock that is available to the fishery. In most cases this equates to fish which are age 3 or age 4 and older. In the case of fishing mortality (F), this approach averages the F experienced by young fish which are only partially vulnerable to the gear with the F on older fish which are fully vulnerable, i.e. fully-recruited to the fishery. A weighted averaging method is used, i.e. the F at each age is multiplied by the numbers of fish at each age before summing over age groups and dividing by the total number of fish in the fished population. Thus, variation in the number of recruits

has an important influence on the weighted average F . Nonetheless, this is a good F to use for comparing trends over long time series of data or among stocks because it takes into account all the differences resulting from changes or differences in fishing gears or fishing behaviours.

The weighted F described above for illustrating trends is not comparable to the F s used as biological reference points for management such as F_{\max} (Beverton and Holt, 1957) and $F_{0.1}$ (Gulland and Boerema, 1973). The latter are usually the fully-recruited F (Northwest Atlantic) or are representative of the unweighted average F over some selected age range encompassing the last of the partially recruited age groups and the first of the fully recruited age groups (Northeast Atlantic). Thus, the way of calculating reference points varied among stocks and, indeed, sometimes for the same stock over time. Nonetheless, it was necessary to find a way to compare the fishing mortalities estimated to have occurred in the fishery against those targets to determine the effects of regulation. The first step was to decide upon what reference points to use and what the values of those were for each stock. The reference points F_{\max} and $F_{0.1}$ were chosen as these were the most widely used and the only ones for which estimates could be located for all stocks (except capelin for which these reference points are not relevant). The source documents for stock assessment data (Appendix Table 3) for the period 1979–88 were searched for estimates of the values of F_{\max} and $F_{0.1}$ and those were used for the comparisons. Sometimes several estimates were available for one stock but these were averaged to give a single value. The estimates of fishing mortality in the fishery were then recalculated to express the calculated F on the same basis as the reference F , i.e. averaged over similar age groups in the same way. Those estimates provided the basis for conclusions as to whether the estimated fishing mortalities in the fishery coincided with, or were above or below, the reference levels. This raised the additional complication of deciding what is the same and what is different, a problem that does not lend itself to statistical analysis. Thus, an arbitrary criterion was adopted that estimated values (averaged for 10 year study periods before and after jurisdiction) which lay within 15% of the reference level were considered to be at that level. The 10 year study periods chosen were 1967–76, representing the international commission years, and 1979–88, representing the post-extension of jurisdiction years. This allows a two year transition between the two periods, providing time for new measures, which may have been introduced on extension of jurisdiction, to come into effect. Although this whole procedure is quite crude and arbitrary, the fact of the matter is that most decisions were not difficult to make; mortalities in the fishery usually deviated widely from reference levels.

