Stocks and shares

Questions about fish stocks lie behind Europe's fishing limits debate. **D. H. Cushing** discusses the state of stocks in the North-East Atlantic

THE conservation of fish stocks in the North-East Atlantic (between Cape Farewell and Gibraltar) started with the Overfishing Convention of 1946 which prescribed minimum landing sizes for demersal fishes in the ports and minimum mesh size in the trawl cod ends at sea. The Convention was activated in the Permanent Commission in 1953 which itself was replaced by the North-East Atlantic Fisheries Commission (NEAFC) in 1964 in order to acquire the power to regulate herring stocks as well as demersal ones. Sixteen nations have adhered to it voluntarily to conserve fish stocks internationally. In the last three years the Third Law of the Sea Conference has established a quite different trend towards coastal state management.

The present object of conservation is the maximum sustained yield (MSY) in weight. Men dispute whether it is a proper objective and propose others of various forms. In the North-East Atlantic, however, most stocks are overexploited and fishing effort should be reduced to obtain the MSY. This means that fewer ships at less cost would gain a greater catch and the average catch of each vessel or catch per unit of effort would be considerably increased. In his book *The Fish Gate* (Faber, London; 1943), Michael Graham named this principle the Great Law of Fishing.

The major stocks taken by fishermen in the North-East Atlantic comprise the cod-like fishes (cod, haddock, whiting and saithe), the flatfish (plaice and sole) and the pelagic species (herring, sprat and mackerel). The stocks are estimated by natural regions such as the North Sea, Irish Sea, Barents Sea and so on, between which exchange of individuals is usually low. The state of the stocks by species is summarised in the accompanying table; they are given by region (such as the North Sea) and are classed in four groups according to the reduction in fishing effort needed to obtain the MSY.

There are three stocks at or approaching the MSY with present measures: North Sea plaice, North Sea whiting and the cod in the Barents Sea. A slight restraint is required in five stocks: West Scotland herring, Iceland saithe, Faroe haddock and West Scotland cod and haddock. Eight stocks would be brought to the MSY

with moderately reduced fishing effort: Faroe cod, saithe in the North Sea and in the North-East Arctic, and both flatfish species in the Irish Sea, Bristol Channel and the English Channel. Unfortunately, there are fourteen stocks in need of heavy reduction in fishing effort: cod in the North Sea, Irish Sea and Bristol Channel, haddock in the North-East Arctic, North Sea, Irish Sea and Bristol Channel, whiting in the Irish Sea and Bristol Channel, sole in the North Sea and Irish Sea and herring in the North Sea and Irish Sea. The state of sprat and mackerel stocks in the North Sea and of mackerel stocks in the Western Approaches is uncertain.

Three reasons

There are three reasons why, after twenty years, most fish stocks in the North-East Atlantic remain over-exploited. The first concerns a limit in mesh regulation. The impact of an increase in fishing effort on a single species can be lessened to some degree by enlarged meshes in the trawl cod ends, but in a mixed fishery the meshes are fitted to the smallest fish species and any increase in fishing effort on the larger animals cannot be accommodated in this way. In the North Sea, mesh regulation was designed mostly for soles and haddock but the benefit for larger species like cod and plaice was less. In the North Sea and elsewhere in the North Atlantic, minimum mesh sizes were agreed by the end of the

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Quota problems go deep in Denmark...

1950s. But during the 1960s a considerable increase in fishing effort occurred all throughout these regions. In the International Commission for North-West Atlantic Fisheries (ICNAF), quotas were introduced in 1970 and in NEAFC in 1974. From North-West Atlantic experience, quotas stabilise fishing and prevent further expansion.

The collapse of herring fisheries throughout the North-East Atlantic illustrates the second reason for over-exploitation. The Downs stock, exploited by the East Anglian fishery, failed in the late 1950s, followed by other stocks in the North Sea; when NEAFC took power to regulate herring fisheries it did not succeed in doing so. When the Norwegian fishery on the Atlanto-Scandian herring stock collapsed in 1967, no action was taken. A contributory but minor cause of failure was the mistaken belief that fishermen must take fewer herring than the whales.

State of the stocks in the North-East Atlantic: reduction in fishing needed to obtain MSY

	None	Slight	Moderate	Heavy
Cod	North-East Arctic ¹	W. Scotland	Faroe	North Sea Irish Sea Bristol Channel
Haddock		Faroe W. Scotland		North-East Arctic North Sea Irish Sea Bristol Channel
Whiting	North Sea			Irish Sea Bristol Channel
Saithe		Iceland	North-East Arctic North Sea	
Plaice	North Sea		Irish Sea Bristol Channel English Channel	
Sole			Britsol Channel English Channel	North Sea Irish Sea
Herring		W. Scotland		North Sea Irish Sea Celtic Sea

D. H. Cushing is Deputy Director of the Fisheries Laboratory, Lowestoft, UK.

¹At the present pattern of exploitation.

dogfish, cod and gannets that driftermen saw round their nets.

The major cause was the scientific dogma that fishing could never reduce the magnitude of the incoming year classes. Today we distinguish growth overfishing from recruitment overfishing. In growth overfishing the loss in numbers is greater than need be to give the maximum yield from the growth of individuals, and it is no accident that such individuals grow by an order of magnitude during their adult lives. In recruitment overfishing (often in herring-like fishes that grow little during their adult lives) the magnitude of the incoming year classes is reduced by fishing—an interference with breeding, as the fishermen used to say. The collapse of the herring stocks in the North-East Atlantic has been due to recruitment overfishing.

One of the difficulties was the high variability of recruitment; the dependence of recruitment on parent stock looked like a scatter diagram and sometimes the true relationships were masked. Indeed the belief that recruitment was independent of parent stock was mistakenly reinforced. The important conclusion, however, is that the overexploitation of the herring fisheries in the North-East Atlantic was less due to institutional failure than to the inability of scientists to understand the problems they faced. It remains true that the failure of NEAFC to take prompt and effective action was due in part to the difficulties of agreeing upon measures which would necessarily severely restrict the fisheries economies of some member states.

Considerable overexploitation

The development of industrial fisheries for fish meal in the North Sea has caused considerable overexploitation indirectly. During the 1960s herring were caught for fish meal on their spawning grounds and the trawlers were allowed to take 10% by-catch of those protected species which gathered to eat the herring spawn on the sea bed. Today more than two million tons of fish are taken from the North Sea for fish meal and the by-catches of protected species can be considerable. The sandeel fishery is "clean" and little else but sandeels is caught. In the fishery for Norway pout (which are very small gadoids) in the Northern North Sea, however, small haddock and whiting are caught in large numbers. In some years more than 100,000 tons of small haddock have been turned into fish meal, and in 1976 75,000 tons of small whiting were caught for the same purpose.

Norway pout are caught with small-meshed nets, legal under NEAFC rules, provided that the catch of under-sized protected species is less than 10%;

the total catch of Norway pout in 1975 exceeded 800,000 tons. The real difficulty is that fishermen exploiting adult gadoids for human consumption must not land fish below the minimum landing size and must discard them at sea, whereas fish meal fishermen can land large quantities of them; the large industrial fleets are seen everywhere in the North Sea and the traditional fishermen for human consumption see the small gadoids being taken which they themselves have to discard. Further, a rough calculation shows that 300,000 tons of Norway pout for fish meal are less valuable than 20,000 tons of haddock, had they been allowed to grow into the adult fishery.

After two decades of recruitment overfishing, the remaining herring stocks in the North Sea need drastic conservation measures. This need has at last been recognised by the industrial fishing nations who have agreed to a ban on all directed fishing for herring in the North Sea. But juvenile herring are caught in the industrial fishery for sprats; in 1975, about 600,000 tons of sprats were taken and the by-catch of small herring in the Danish catches was substantial. In other words, the industrial fishery for sprats not only prevents any chance of recovery of herring stocks, it also hastens the chance of extinction. A fair proportion of the world's catch of fish ends as fishmeal because of the high demand for it, and many industrial fisheries, like that for capelin in the Barents Sea or for anchoveta off Peru, exploit resources that cannot be used at all for human consumption. The problem peculiar to the North Sea is the conflict in use between fisheries for industrial purposes and those for protected species.

The three sources of overexploitation were recruitment overfishing, the conflict between fisheries for industrial species and those for protected species,

and the increase in fishing effort in ships, fishermen and gears. The herring and sole stocks in the North Sea are in danger from recruitment overfishing, but the problem has been recognised and steps are being taken in the scientific working groups to resolve it, even if the herring problem has not yet been solved in the Commission itself. The problems of the industrial fisheries are more difficult because of the large investment in ships and processing equipment in Denmark. Possible solutions include the diversion of such fleets on to stocks which would yield no by-catch of protected species, or to establish areas and seasons in the Norway pout and sprat fisheries when the by-catches of protected species are reduced to tolerable levels. The problem must be solved because it is hard to persuade the non-industrial fishermen to accept quotas or effort reduction when the industrial fleets are allowed to catch small gadoids and small herring.

The table shows that fishing effort should be extensively reduced throughout the North-East Atlantic. The introduction of quotas in 1975 has stabilised fishing effort; in ICNAF with a longer experience of quotas since 1970, an effort restraint was also introduced in 1976. The effort exerted on all the stocks on the right half of the table is much too great, which means that fleets in the North Atlantic will have to be reduced to some degree. There are few stocks left unexploited, but one is large, that of blue whiting off the west coast of the British Isles. Stocks are estimated at about 8–15 million tons and the potential catches could be large, but the exploitation has hardly started. Although some existing vessels could be used to catch the blue whiting, it remains the case that fishing on the great majority of other stocks in the North-East Atlantic must be reduced, in some cases drastically. □

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