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Status of the Herring Stocks Fished by the Federal Republic of Germany Fleet

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The findings presented in this paper are mostly derived from the results and conclusions drawn at: 1) A March 1977 meeting in Copenhagen, Denmark, by the International Council for the Exploration of the Sea's (ICES) Sea Herring Assessment Working Group for the North Sea, Celtic Sea, and Hebrides stocks in the area south of lat. 62°N; 2) an April 1977 meeting in Bergen, Norway, by ICES's Atlanto-Scandian Working Group for the Norwegian Sea stock; and 3) several 1976 meetings by an International Commission for the Northwest Atlantic Fisheries working group for the Georges Bank stock. Each of the five stocks mentioned above will be dealt with individually.

NORTH SEA

North Sea catches, including the Skagerrak and English Channel catches, are shown in Figure 1. The total catch amounted to 183,000 metric tons (t) for 1976 even though the Northeast Atlantic Fishery Commission (NEAFC) only had approved a 160,000-t quota for the total area. In particular, the following picture is shown: In the eastern part of the northern North Sea, catches decreased from 9,700 t in 1975 to 2,500 t in 1976, while in the western part of this area catches increased slightly from 96,000 t in 1975 to 108,000 t in 1976. In the central North Sea, catches declined from 182,000 t in 1975 to only 46,000 t in 1976, which is approximately a 75 percent decrease. With respect to the central North Sea catches, the fishery for herring for direct human consumption dropped from 91,000 t in 1975 to 39,000 t in 1976, while the young herring fishery (i.e., fishery for fish meal) decreased from 91,000 t in 1975 to less than 8,000 t in 1976. However, it must be stressed that in1976 it was forbidden to catch herring only for fish meal. In the southern part of the North Sea, including the English Channel, catches decreased from 26,000 t in 1975 to 12,000 t in 1976, thus by more than one-half. Out of these figures it is quite clear that with the exception of the western part of the northern North Sea, in all other areas there occurred a slightly more than drastic decrease of herring catches in 1976. These results, which cover the whole North Sea, show the lowest catches since herring fishery records were first kept with the exception of the war years of 1915-1917 and 1941-1942.

What are the reasons for this development? In the middle 1960's the high fishing effort led to high yields and, consequently, to the first serious reductions in stock abundance as shown by small numbers of larvae, high mortality rates, and low catch per unit of effort. These serious indications of stock depletion were recognized and subsequently fostered several different countermeasures: 1) Closure of spawning areas; 2) establishment of minimum sizes of 20-23 cm; 3) closure of specific areas or seasons; and 4) reduction of fishing effort or catch quotas. However, only starting in 1971 did the NEAFC agree upon a closure of the total North Sea area both in May and from 20 August to 30 September. Similar regulations were in force for 1972, 1973, and 1974. In the middle of 1974 a catch quota system for the different nations was established after the system of closed seasons had shown itself ineffective. This quota system is still in force.

Meanwhile, the herring catch in the North Sea has been totally prohibited by a decision of the Ministry Council of the European Economic Community (only the Netherlands was allowed to catch any fish (1,500 t) in June). Thus the questions are: What does the herring situation look like just now; what kind of biological facts caused the closure of the North Sea for all directed herring fisheries; and what does the picture look like for the near future?

First of all, the total catch in 1976 amounted to only a little bit more than one-half of the already low 1975 catch. Despite the recruitment of the relatively

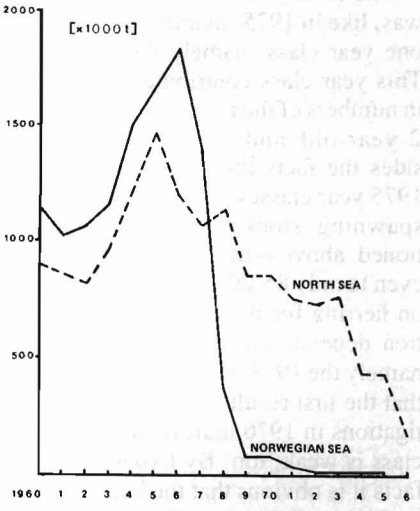

Figure 1.—International herring catches (× 1,000 t) in the North Sea and Norwegian Sea during 1960-1976 (1976 values are preliminary).

strong 1973 year class to the 1976 spawning population, this spawning population amounts to only 155,000 t after taking into consideration the 1976 catch results. By taking the results of the 1976 international research on the number of larvae into consideration, this would result in a size of the spawning population of only 85,000 t. These figures of 155,000 t and 85,000 t, respectively, probably do not mean too much to outsiders, but they become terrifically important when it is pointed out that years ago scientists of all North Sea herring fishing nations concluded that the spawning potential should amount to about 800,000 t to guarantee a sufficient number of recruits to the stock. This latter value represents about 30 percent of the spawning stock size at the end of the 1940's when the total stock was only slightly fished.

The picture of the North Sea herring stock becomes even dimmer when one looks at the strength of the 1974 and 1975 year classes which will recruit to the spawning stock in 1977 and 1978, respectively. All indications, including the catches of the mixed fisheries which operated with minimum mesh sizes (NEAFC's "Recommendation No. 2" on fisheries) and yielded only the extremely low level of 8,000 t in 1976, show that both year classes are extremely weak.

The fishery in 1976 on adult herring was, like in 1975, mainly dependent on one year class, namely the 1973 one. This year class contributed 74 percent in numbers of the total 1976 catch of the 2-year-old and older herring. Besides the facts that, 1) The 1974 and 1975 year classes are very weak; 2) the spawning stock amounts—as mentioned above—to only 155,000 t, or even to only 85,000 t; and 3) the fishery on herring for direct human consumption depends on only one year class, namely the 1973 one, it is now apparent that the first results of the larvae investigations in 1976 indicate that this year class is weak, too. By looking at these facts it is obvious that the herring stock in the North Sea is at this time in very bad shape. It is even worse than anticipated by experts the year before and will probably deteriorate in the near future or even no longer exist if decisive and drastic steps are not immediately taken. The Herring Assessment Working Group recommended, therefore, an instantaneous and total ban on all types of directed herring fisheries in the North Sea to avoid the threatening danger of a total and final breakdown. If this recommendation comes into force and the ban is continued for 1978 and 1979, then there is a good chance that the spawning stock will reach approximately one-half of the level of the desired size, i.e., 400,000 t, by 1979 if recruitment is average. Consequently, the herring stock will improve relatively fast, provided that a fishery management regime that is directed by logic becomes effective. The basic requirement for such an improvement, of course, is a continuous monitoring of the stock during coming years. At present, however, based on this very low stock level, it cannot be stressed strongly enough that a ban on herring fishing should be in force at least for all of 1978. On the other hand, it should also be emphasized that at this current very low stock level it is very difficult to predict the stock situation more than 3 years in advance because of the natural fluctuations of which recruitment plays a part.

There is still the question of whether or not the catch of certain quantities of herring could be allowed. This question was checked by the working group, too. Calculations were made on what would result from a catch of 75,000 t and 150,000 t, respectively, in 1977 and 1978. It resulted that if a catch of 75,000 t were taken each year, then the present very low level of the stock could not be increased until 1979, even if one assumes a very low fishing mortality rate of young fish. The catch of 150,000 t in 1977 would lead to a total breakdown of the stock in 1978.

CELTIC SEA

Catches in this area for the 1976-1977 season (which extended from 1 April to 31 March) were 7,000 t, the lowest on record since 1956 (Fig. 2). Normally in this area between 20,000 t and 50,000 t are caught per year. As for the 1974-1975 and 1975-1976 seasons, the quota set by the NEAFC for 1976-1977 of 16,800 t (which later was reduced to 10,800 t) was not reached; only 65 percent of the total allowable catch was taken. In connection with this, it must be emphasized that this low total catch is not due to a reduced fishing effort, and that the fishing mortality rate of this stock has remained at more or less the same level since the 1972-1973 season. Calculations of the working group show the size of the adult herring stock to be 10,000 t as of 1 April 1976, while in the late 1960's it was on a constant level of about 80,000-90,000 t. The present low level of stock abundance is a result of a steady decline since 1972 for which two reasons are responsible: 1) A very high fishing mortality since the 1971-1972 season; and 2) a low recruitment, observed for the first time in 1970, being revealed extremely strongly during the past 2 years. Furthermore, there are indications suggesting that since 1972, herring, especially 2-year-old fish, were fished heavily, but prior to that time were subjected to only a moderate fishing mortality rate. The reason for this is indicated by the experts by an

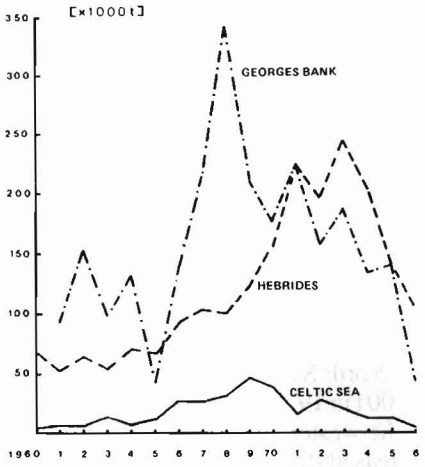

Figure 2.—International herring catches (× 1,000 t) in the Celtic Sea, Hebrides area, and on Georges Bank during 1960-1976 (1976 values are preliminary).

increase of the growth rate in connection with a lower age at sexual maturity.

The stock size of the Celtic Sea herring was estimated at 8,300 t on 1 April 1977. Thus, it follows that the quota of 6,500 t for the 1977-1978 season which was set as a precautionary measure by ICES is much too high. If this is the case, then the fishing mortality rate of all fully recruited age groups would be raised to the average level of the most recent years. This would result in a total stock size of about 11,000 t on 1 April 1978, even if recruitment is overestimated. Therefore, the working group strongly recommended a ban on the herring fishery for the whole 1977-1978 season. Even in this case, the stock on 1 April 1978 will be under the target level of 40,000 t which guarantees the survival of this stock. It also follows that a total ban for the herring fishery in this area must be enacted for the 1978-1979 season.

HEBRIDES

Another stock which is important for the FRG herring fishing fleets is the one off Scotland in the Hebrides area. International catches are shown in Figure 2. Preliminary results for 1976 show the catches at about 107,000 t, the lowest since 1969. Not even the total allowable catch agreed upon by the NEAFC (i.e., 136,000 t) was taken, but only 78 percent of the quota. This decline is mainly due to the fact that the Scottish government, following a recommendation of their own scientists, imposed catch restrictions in order to preserve the stock. These restrictions severely reduced the Scottish fishery, especially the coastal fishery of which about 30,000 t show up in the international catch statistics.

The working group checked the newest available data and determined that since 1971 the fishing mortality rate of this stock has been above the level of maximum sustainable yield and has continued to increase in the last 3 years. The adult stock reached its maximum size of 670,000 t in 1972, but decreased to less than one-half of this value by 1 January 1975.

A slight increase in stock abundance could have been obtained through the recruitment of the moderate 1973 year class in 1976, but this possible gain was mostly compensated by the heavy fishing since 1975 on the adult stock. Based on the assumption that the 1974 year class (which will recruit to the adult stock in 1977) is little above average in strength and that the aforementioned facts are correct, the strength of the total stock should be 206,000 t on 1 January 1977. This anticipated stock size would result in, not in a total catch of 83,000 t, as first proposed, but rather in one of only 48,000 t for 1977. The 1978 total allowable catch depends on that of 1977, of course. If the initially agreed upon maximum catch of 83,000 t is taken in 1977, then it would result in only 44,000 t being available in 1978. However, if the catch were restrained to 48,000 t in 1977 as proposed, then it would result in a total allowable catch of 53,000 t in 1978. By taking the latter course of action an increase of the strength of the spawning stock would be achieved, the working group concluded. Therefore, the working group recommended for the herring stock of the Hebrides area a total allowable catch in 1977 of 48,000 t, and in 1978 of 53,000 t.

NORWEGIAN SEA

Catches of the Atlanto-Scandian herring stock up to 1975 are shown in Figure 1. No figures are available for 1976, but catches will only amount to 1,000 t of mostly "small herring" and "fat herring" off the Norwegian coast. Besides other factors, the increase of catches up to 1966 was due to the occurrence of the strong 1959 year class. The sharp decline after 1966 was due both to the very high fishing effort—especially by the Norwegian purse-seiners — and to the almost complete failure of recruitment.

Steps to regulate the stock were taken by Norway and Iceland beginning in the late 1960's but it was already too late to save the stock as indicated by the catches in the following years. The spawning stock had declined to virtually nothing in 1970 and 1971; no larvae were even found on the spawning grounds. Since 1972 the spawning stock began to improve slightly, due in part to a very small segment of the 1969 year class surviving the "small herring" and "fat herring" fisheries and being able to spawn in 1973 as 4-year-old fish. In 1976 some of the 1973 year class fish recruited to the spawning stock. By 1977 all of the 1973 year class had fully recruited to the spawning stock. In addition, in 1977 some of the 3-year-old fish of the 1974 year class reached sexual maturity.

On the basis of these findings and of some tagging experiment results, the working group concluded that the spawning stock will have a size of about 200,000 t in 1977. Through investigations with hydroacoustic methods on the number of larvae present in 1975 and 1976, it was determined that both year classes were weak. It is assumed that those year classes will lead to a strong increase in stock abundance only if they are not fished. Assuming that: 1) There is no fishery on adults or juveniles; 2) the estimation of the 1975 and 1976 year class strengths is approximately correct, and; 3) these year classes fully recruit as 3- or 4-year-old fish to the stock, then the spawning stock will increase to 430,000 t in 1978 and 895,000 t in 1979. No agreement could be reached between the members of the working group on what steps should be taken to manage the stock on a seasonal basis. However, they explicitly pointed out that the spawning stock is currently at a low level.

GEORGES BANK

Finally, the herring situation in the Georges Bank area should be described. This stock was heavily fished by foreign fishing fleets, including the FRG stern trawler fleet, between 1967 and 1972 (when catch quotas were introduced). Catches since 1961, the first year for which official statistics were prepared, are shown in Figure 2. In reality, catches were supposedly higher by some 10,000 t from the mid-1960's until 1972, since data on discarded fish were only partially recorded, and the catches of nonmember countries of

ICNAF like the German Democratic Republic (GDR) did not appear in the international statistics or become incorporated in the stock assessments.

After the introduction of national quotas in 1972, catches declined in accordance with the declining total allowable catches, namely, 188,000 t, 137,000 t, and 141,000 t, respectively, in 1973, 1974, and 1975. During these years a total catch of 150,000 t was agreed upon by ICNAF. For 1976 a quota of 60,000 t was set, but according to preliminary statistics only about 43,000 t were taken. FRG catches reached their maximum of 82,000 t in 1970 and decreased in the following years corresponding to the decreased quotas. The resulting catch in 1976 was less than 9,000 t.

The last time the working group of ICNAF dealing with this stock met was more than a year ago. At the beginning of 1977, the United States was no longer an official member of ICNAF, but did participate as an observer at various ICNAF meetings. Because this herring stock is for the most part inside the U.S. 200-mile limit, the working group was dissolved for practical reasons. The last findings presented to ICNAF on the Georges Bank herring stock derived, therefore, from 1976. At that time it was decided to set the quota at 60,000 t or less per year to guarantee an adult stock size of 225,000 t. If this value of 60,000 t or less is adopted in successive years, then the adult stock should again reach a size of 500,000 t. If this stock size is achieved, then an allowable catch for foreign fleets could potentially be established again. Because there was no agreement on the stock size at the beginning of 1977, and because the 1971, 1972, and 1973 year classes were weak, the working group recommended a quota of 55,000 t for 1977. At the annual meeting, however, this recommendation was not agreed upon. At a special meeting in December 1976 the quota was finally set at 33,000 t. In addition, the United States specified a fishing season from 15 August to 30 September to be conducted in a special 950 km^2 area with only pelagic nets or purse seines. The FRG portion of this quota equaled 4.725 t, which is approximately 5 percent of the maximum FRG catch in 1970.

What about the development of this fishery during the coming years? The last strong year class was the 1970 one. The international herring fishery has depended on this year class exclusively since 1973. About 88 percent of the FRG-caught herring in 1973, and about 73 percent of the FRG-caught herring in 1976, belonged to the 1970 year class. All other year classes were of only minor importance as shown in results of other nations, too. There are indications that no strong year classes will contribute to the stock during the next 2-3 years. As shown by results of international larval surveys and juvenile surveys prior to 1976, both the 1975 and 1976 year classes are weak, and, what is more important, the number of larvae observed in 1976 was the lowest on record in the 6-year history of the annually conducted cruises.

Since there were no worthwhile concentrations of herring to be found in the 1977 special fishing area, or "window", the international herring fishery in 1977 failed completely, based on the information and data available to date. None of the nations fishing in this area have caught herring in significant numbers. Furthermore, all of the cruises conducted by different research vessels from the United States, Canada, USSR, Poland, and FRG in the Georges Bank-Gulf of Maine area in the course of summer-fall of 1977, showed the same result. For example, the FRG research vessel *Anton Dohrn* made 78 bottom-trawl hauls (each lasting 30 minutes) in October 1977 in the Georges Bank-Nantucket Shoals area and caught a total of only 94 specimens of herring. The extent to which a spawning occurred in 1977, if any, is unknown. However, on the basis of plankton catches with special nets, there are indications that in the Nantucket Shoals area and in a narrowly encircled area on Georges Bank some spawning must have taken place. Final results of these surveys will be available in a few weeks, but more detailed information on the situation of the Georges Bank herring stock will be obtained during the annually conducted spring juvenile herring surveys which will be continued during the next few years at least. To date it is obvious that in the near future an increase in the herring catch quota for this area cannot be expected, rather the contrary will be the case. It seems out of the question that in the next 2 or 3 years that this stock will again reach a size which will allow catches at the same level as those at the end of the 1960's or at the beginning of the 1970's, provided that there is no abnormally favorable larval development or environmental setting during the next 2 or 3 years.

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