

Observations on the Strong Fluctuations in the
Catches of Juvenile Herring in German Coastal Waters

By

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For more than 40 years a winter fishery for sprat and juvenile herring has existed on the coast of Niedersachsen (Tiews, 1961 a and b). As has recently been shown, the juvenile herring caught belong to a population mixture of Bank and Downs herring being in the beginning of their second year of life and measuring mainly from 9 cm to 16 cm (Tiews, 1961 b).

In former years the favourite fishing gear was the "stow" net, two of which were usually operated from an anchored vessel. For the past six years, however, the fishermen have mostly used trawl nets, both bottom and pelagic pair trawls as well as otter board trawl nets. In view of the unstable catch situation in the shrimp fishery (March/Oct.), which is the main fishery of these fishermen, the government is encouraging winter fishing on this coast in order to raise the socio-economic standard of the local fishing communities, which are largely dependent on the coastal fisheries due to the lack of other industries. Since then the number of boats participating has increased from 32 (1957-58) to 50 (1958-59), and then to 78 (1959-60).

The available catch statistics, started in 1921, show strong fluctuations in the size of the catch obtained. The largest annual yield of juvenile herring ever obtained, amounting to nearly 3,000 metric tons, was taken in 1926 (Table 1). In recent years the largest quantity, 2,771 tons, was caught in the 1951-52 season. Thereafter the catch decreased to 6 tons only in 1956-57 and increased again to 1,473 tons in 1959-60. This increase is coincident with the systematic introduction of trawl nets into the fishery. During the last season, 1960-61, despite numerous fishing trials, the catch was practically naught as juvenile herring were not present on the usual fishing grounds, and consequently the winter fishery became a complete failure (Tiews, 1961 c).

There are obviously strong year-to-year fluctuations in the availability of juvenile herring along the German coast during the winter months, but, unfortunately, little is known to explain these fluctuations and to predict the success of a forthcoming fishing season. It is the aim of this paper to disseminate some new knowledge on this question gained during recent years when scientific investigations were carried out by the Institut für Küsten- und Binnenfischerei, and which may deserve special attention with regard to an early recognition of fluctuations in the recruitment of the North Sea herring stock.

According to these investigations, a prediction of the winter catch of juvenile herring is possible shortly before the beginning of the season; it was namely found that poor or good catches during the winter coincide with those made by German shrimp fishermen in the same area during the preceding summer and autumn. This was concluded from research material collected by the Institut für Küsten- und Binnenfischerei on the catch composition of the German shrimp fishery since 1954 (Meyer-Waarden, 1959, 1960; Tiews, 1961 d). This research, originally initiated to assess the quantity of protected and unprotected fish in the German shrimp catch, has in the meanwhile led to new knowledge of considerable importance of the fluctuations in abundance of the first year-classes of many species of fish in the coastal waters of the German Bight. From 1954 to 1960, 3,953 random samples of unsorted shrimp catches of 5 kg each were investigated as to their species and length composition. Samples from known localities and total catch were taken once to thrice a week at 11-12 shore stations during the research period 1954 to 1956 and 5-7 stations since 1957. The shore stations were: Wyk/Föhr, Husum, Tönning, Bism, Friederichskoog, Cuxhaven, Fedderwardsiel, Varel, Wilhelmshaven, Neuharlinger-siel, Norddeich, and Groot-siel.

On the basis of these investigations and of the official catch statistics, it was possible to calculate the amount of fish caught by the shrimp fishery, separately for each fish species. As Figure 1 A shows, generally, there are always juvenile herring present in the coastal waters, but the fish appear in larger quantities on the shrimp fishing grounds at the beginning of August. The herring are then some 6-8 cm in length and were found to be much more abundant at the coast of Niedersachsen than at Schleswig-Holstein. Figure 1 shows also the yearly fluctuations in catch per unit effort (B) and the numbers of herring caught in both the major areas during the single years of the research period (C).

For comparison of summer and winter catches of juvenile herring (Table 2) the following sets of data are given: (1) total number of juvenile herring caught in the shrimp fishery at the coast of Niedersachsen, (2) number of juvenile herring caught in the shrimp fishery in terms of catch per net and 10 hrs, (3) total yield of the winter fishery for juvenile herring, and (4) catch per trip during the winter fishery.

According to these data, during the period 1957 to 1959, both summer and winter catches of juvenile herring were much higher than during the preceding years and the succeeding year of 1960. Catches were highest in 1959, when 5,566 herring were caught averagely in 10 hours with one shrimp net and the catch per trip amounted to 1,785 kg in the winter fishery. From 1959 to 1960, the figures show a sharp decline both of summer and winter catch. During the summer of 1960, 186 specimens only were caught and catches of the winter fishery were naught. Looking at the total yields of the winter fishery during the period 1957 to 1959, it must be kept in mind that the number of boats participating in the fishery has increased from 32 (1957-58) to 50 (1958-59), and then to 78 (1959-60) (Tiews, 1961b).

Apart from this interesting correlation between summer and winter catches of juvenile herring in German coastal waters, it seems likely that another correlation between the catch of herring larvae and that of juvenile herring exists. It is well known that under the supervision of Dr. Hempel, R.V. "Anton Dohrn" has, since 3 years, conducted survey work on the distribution and abundance of herring larvae in the Dogger Bank area in October every year, and in the southern North Sea and English Channel at the beginning of every year as part of the international cooperation in this field. According to these investigations, initiated in 1959, the catch of larvae was about ten times higher in 1959 than in 1960. From this finding it can be concluded that the numerical strength of the 1959 year-class of herring must be considered a very poor one, if compared with that of the 1958 year-class. Consequently, it is not surprising that the catch of juvenile herring was almost naught in the German coastal waters during the winter of 1960-61. On the other hand, the high catches of juvenile herring during the summer of 1959 and the winter of 1959-60 may allow the conclusion that the herring of the 1958 year-class must be of an exceptional huge numerical strength (Table 2).

According to German investigations on larvae it may be expected that herring of the 1960 year-class are again more numerous than the 1959 year-class. Preliminary compilation of the data, however, indicate that the 1960 year-class is much less abundant than the 1958 year-class, which was three times as abundant as the 1960 year-class.

References

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Table 1. Catches (in tons) of adult and juvenile herring and of sprat in Ostfriesland and Oldenburg in the years 1921-61 (Based on statistics of the "Staatliche Fischereiamt Bremerhaven")

Year	Adult herring	Juvenile herring	Sprat	Total
1921	121	521	-	642
2	151	1,238	-	1,389
3	68	585	-	653
4	48	649	-	697
5	30	1,009	-	1,039
6	170	2,631	-	2,801
7	326	2,920	-	3,246
8	184	2,615	-	2,799
9	69	449	-	518
1930	51	452	-	503
1	85	1,361	-	1,446
2	95	1,327	-	1,422
3	35	879	5	919
4	96	418	60	574
5	57	1,273	-	1,330
6	32	342	-	374
7	12	464	-	476
8	6	309	-	315
9	1	111	-	112
1940	1	248	-	249
1	0	1,649	-	1,649
2	0	1,258	-	1,258
3	-	1,550	-	1,550
4	-	885	-	885
5	-	606	-	606
6	-	3	-	3
7	-	710	223	933
8	-	1,694	717	2,411
9	-	1,473	75	1,548
1950	-	1,750	80	1,830
1950/51	-	1,449	22	1,471
1951/52	-	2,771	7	2,778
1952/53	-	1,105	-	1,105
1953/54	-	495	17	512
1954/55	1	119	108	228
1955/56	1	93	194	288
1956/57	-	6	76	82
1957/58	41	220	118	379
1958/59	21	632	100	753
1959/60	96	1,473	58	1,627
1960/61	13	5	11	29

Table 2. Comparison of catches of juvenile herring caught in the shrimp fishery and the winter fishery at the coast of Niedersachsen

	1954	1955	1956	1957	1958	1959	1960
Total no. of juvenile herring caught in the shrimp fishery (mill. fish)	6	11	17	141	144	206	13
Number per net and 10 hrs	120	207	345	3,120	3,156	5,566	186
Total yield of winter fishery for juvenile herring (tons)	119	93	6	220	632	1,473	5
Catch per trip (kg)	+) (1954/55)	+) (55/56)	+) (56/57)	634 (57/58)	988 (58/59)	1,785 (59/60)	0 (60/61)

+) Data are not available.

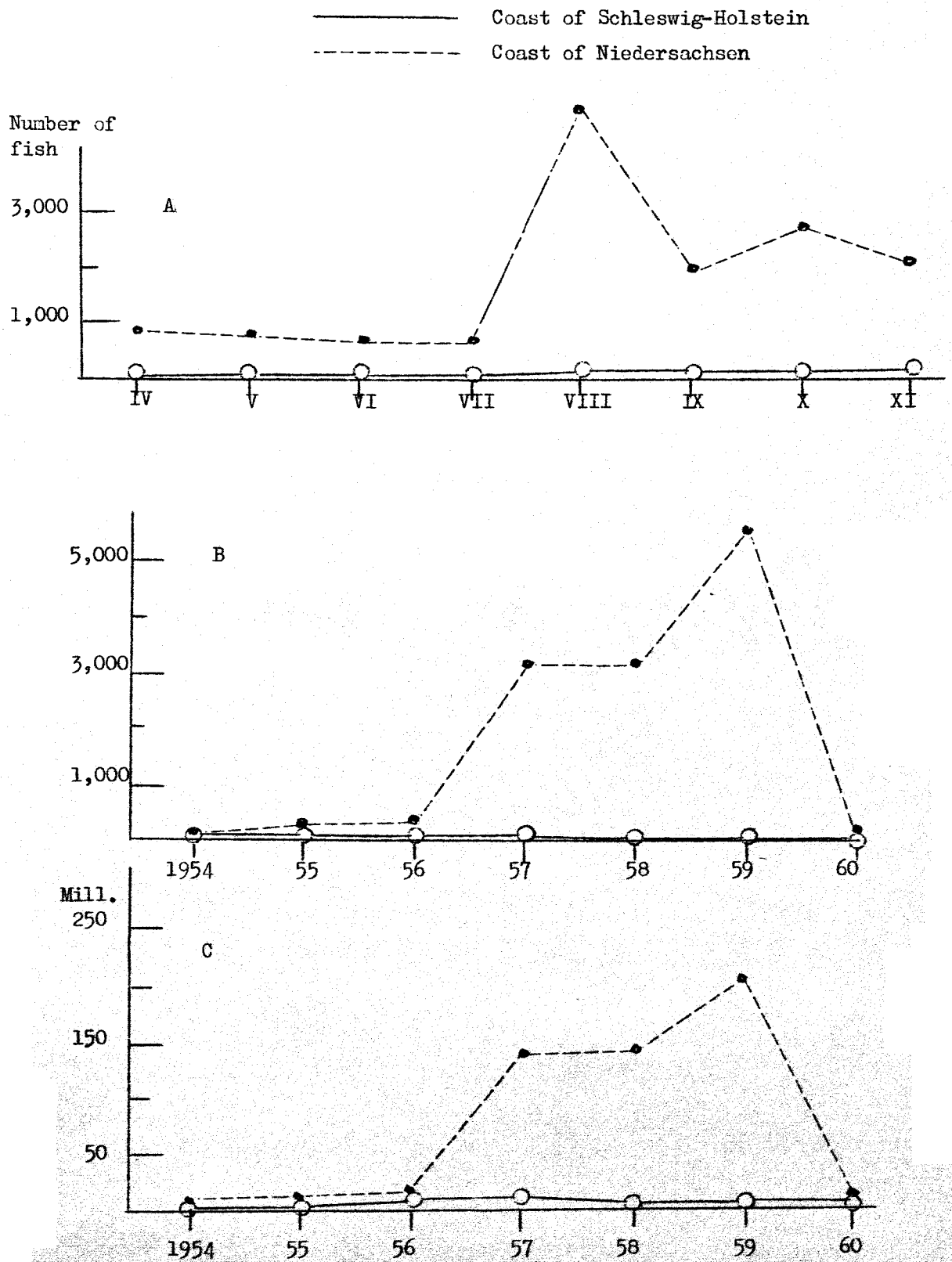


Figure 1. Fluctuations in herring abundance in German coastal waters as found in the shrimp fishery. A - Seasonal fluctuations averaged over the period 1954-60. B - Yearly fluctuations given both in terms of catch per net and 10 hours. C - Yearly fluctuations given in total numbers caught by the German shrimp fishery.