

**INTERNATIONAL COUNCIL FOR
THE EXPLORATION OF THE SEA**

C.M. 1989/M:18
Anadromous and Catadromous Fish Committee

**DECLINE OF THE CATCHES OF CORE-GONIDS AND MIGRATORY SMELT
IN THE LOWER RHINE, THE NETHERLANDS.**

by

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Abstract

Catch data of coregonids (*Coregonus albula*, *C. lavaretus*), notwithstanding the species were abundant for many hundred years, dates only from 1910. In 1918 the commercial fishery came to an end. The highest recorded catch 14,6 tons was in 1915.

Extensive restocking operations between 1907 -1938 were all failures. At present still a few specimens are yearly caught, from releases, re-stocking programmes - in West Germany (FRG)

Migratory (anadromous) smelt (*Osmerus eperlanus*) was once an important fishery in the Zuiderzee and Rhine-Scheldt estuary. The fishery in the Zuiderzee came to an end in 1932 when the enclosure dam was completed. The smeltfishery in the lower reaches of the Rhine came to an end in 1966 when the "Delta-works" were completed in Hollands Diep and Haringvliet.

Introduction

In the framework of the International "Ecological Rehabilitation of the Rhine" - programme, an initiative shared by France, German Federal Republic and the Netherlands, a desk study was undertaken to evaluate existing information on the decline of the coregonid fisheries and the smelt (*Osmerus eperlanus* (L.)) in the river Rhine. Also to indicate causes for the decline. Coregonids were commercially caught in the whole section of the Rhine flowing through the Netherlands, smelt (migratory form) only the lower reaches and estuary.

Coregonids

Depending what systematic division one likes to follow, two or three coregonid species inhabit(ed) the Rhine., *Coregonus lavaretus lavaretus* (L.) (white fish); *C. oxyrinchus* (L.) (Houting); *C. albula* (L.) (Vendace). It is better to see *C. oxyrinchus* (L.) as a subspecies of the white fish hence, *C. lavaretus oxyrinchus* L. (Redeke, 1934, 1941; Nijssen and de Groot, 1987).

The vendace has only been caught a few times (last 1927) but if it occurs is likely not recognized. The fisheries concentrated on whitefish/houting. Only migrating forms of the coregonids enter our waters, spawning has never been established in the past. At the turn of the last century whitefish was caught in all large rivers Rhine, IJssel, Meuse.

The fisheries concentrated in the months August-November. Catch data are difficult to trace before 1910 as the fish was sold directly by the fishermen themselves. It was possible to obtain data from 1910-1939. Table 1, figure 1, show the data. Remarkable, is the strong decline from 1916-1920. In 1917 catches were still about 5000 kg.

In 1921 1000 kg, in 1927 500 kg, in 1933 100 kg and in 1939 3 kg. The decline is far quicker than those observed in the salmon catches (de Groot, 1989 a). For the government the downfall, and nearly extinction of the species was reason for concern. Artificial rearing was tried (1907 first time) and restocking with eggs, 1-month or 1 year old whitefish (even from Russia, Peipus-Lake). In total nearly 119 million larval or juvenile whitefish were released between 1907 -1939 in our inland waters. This all without any noticeable result.

At present there is in Germany (GFR) a growing concern to preserve coregonids. The non-migratory forms in the German alpine lakes are threatened by pollution.

Hence large restocking operations are yearly carried out also in large lakes formed by barrages (Talsperre), coregonids are released in Nordrhein-Westfalen and Hessen. The present day increase of caught individuals in Rhine and IJssellake must originate from all these attempts. And there is no serious recovery of the coregonids in our waters. As migratory forms of coregonids reach the estuaries, the brackish zone and coastal waters only in the extreme, there will be no serious negative effects of the large construction works in the Rhine-Scheldt estuary (Delta works).

Pollution in the spawning areas must be seen as the major cause for the decline of coregonids. Release in the inland waters of coregonids is not a good proposition as is clearly demonstrated between 1907 -1939.

Smelt

Smelt is represented in the Dutch waters in its migratory (anadromous) as well as land locked (non-migratory) form. The migratory form is known from the estuaries ; Wadden Sea and lower reaches of the large rivers, the non-migratory form at present is found in large quantities in the IJssellake (at present 4000-5000 ton/yr), the Frisian Lakes and in the provinces North and South Holland.

Table 2 shows the catches and earnings for 1980-1988 of IJssellake smelt, Table 3 shows the catches of migratory smelt 1914-1919 for the Hollands Diep, Haringvliet area and figure 2 gives the catches for the same area from 1946 -1986. It can be seen that since 1966 no migratory smelt has been caught in the lower reaches, the freshwater and brackish tidal area of the Rhine. In 1970 the large construction works of the Delta works were completed and the area virtually closed off from the sea (only open 2.6% of the year). That not all migratory smelt vanished from our coastal waters is shown in figure 3 showing the catches from 1946-1988.

The migratory smelt obtains a length of up to 30 cm in its eight year (Mohr 1941). The non-migratory smelt in the freshwater lakes and large rivers has a length of 8-15 cm. But the non-migratory smelt of the IJssellake, a very large freshwater body, will even reach in its fourth year a length of 19 cm (first - 6 cm, second 12 cm, third 14 cm). The large non-migratory smelt is, however, not common. (Redeke 1907, 1914, 1922 and Havinga 1928, 1954). Redeke (1914) indicated that migratory smelt spawned in the lower reaches of the Rhine, in the freshwater tidal area of the Hollands Diep, between Moerdijk-bridges and Willemstad. In the upper reaches of the Rhine in the Netherlands, near Arnhem and Nijmegen the migratory smelt always was a rare fish (Van den Ende 1847).

The non-migratory smelt spawns in lakes and rivers. In both cases spawning takes place from February - April when temperatures are between 4-12 °C. Eggs are laid and stuck to stones, gravel, waterplants, but never on silt bottoms. The eggs are ellipsoid and on average a female carries 40.000 eggs. The average egg density is 6 eggs/cm², but sometimes eggs are found in layers. The larvae appears between 140-162 day degrees (20 -18°C).

The reason for the decline of the Rhine smelt is linked to the migratory and spawning habits. The lower reaches of the Rhine have stopped to be tidal and are unreachable for the migratory fish. The siltation of the river-bed has increased since the closure. In 1987 it has been estimated that about 70 million cubic meters of silt have been deposited in the lower reaches of the Rhine of which 50 million cubic meters have been deposited in Hollands Diep and Haringvliet. In the part of the river still directly open to the sea, the part flowing through Rotterdam about 5 million cubic meters of silt have been deposited. Also the silt content of the Scheldt-estuary increased (Anon., 1987). The silt covered, and heavily polluted bottom is unsuited for the survival of the eggs.

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Tabel 1: Dutch coregonid catches 1910-1939.

Year	Landings (kg)
1910	2.769 kg
1911	3.586 kg
1912	1.665 kg*
1913	1.241 kg*
1914	3.170 kg*
1915	14.682 kg*
1916	3.298 kg
1917	4.737 kg
1918	1.175 kg
1919	1.644 kg
1920	720 kg
1921	972 kg
1922	130 kg
1923	25 kg
1924	690 kg
1925	65 kg
1926	597 kg
1927	534 kg
1928	115 kg
1929	140 kg
1930	24 kg
1931	109 kg
1932	139 kg
1933	129 kg
1934	53 kg
1935	1 kg
1936	2 kg
1937	46 kg
1938	0 kg
1939	3 kg

*= underestimate

Table 2: IJssellake smelt catches 1980-1988.

	Landings (kg)
1980	157 000
1981	160 000
1982	2309 000
1983	1235 000
1984	1305 000
1985	1357 000
1986	1881 000
1987	2317 000
1988*	3319 000

Table 3: Smelt catches in Hollands Diep and Haringvliet 1914-1919.

Year	Total (kg)
1914	140771
1915	109366
1916	225955
1917	101097
1918	176055
1919	146275

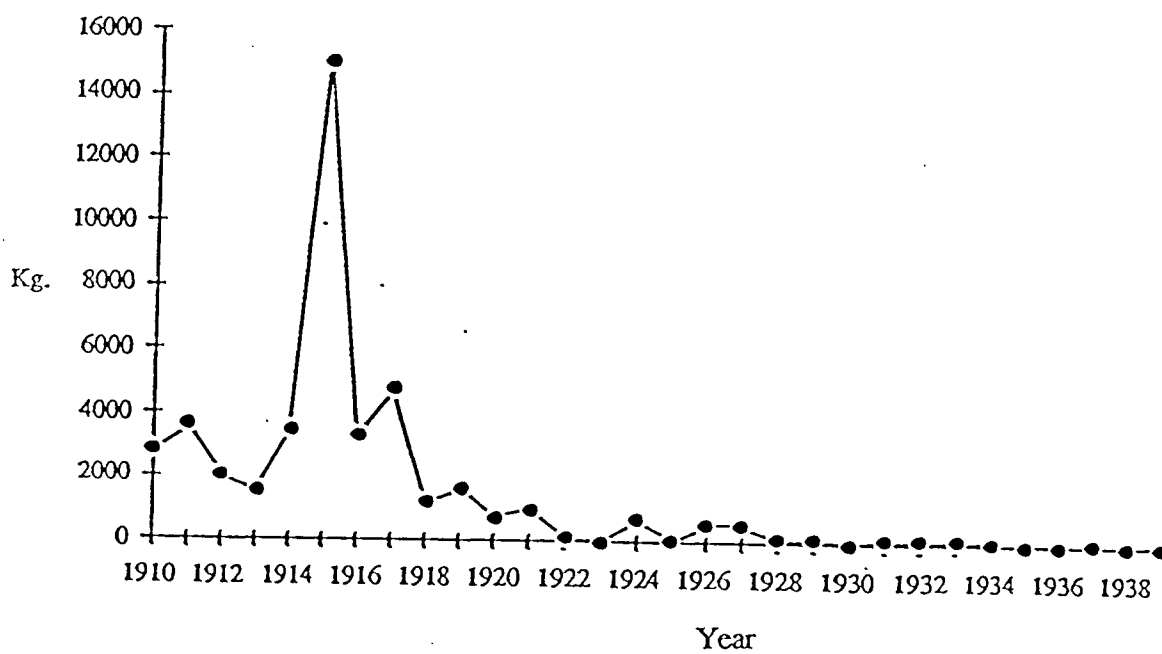


Fig. 1. Dutch coregonid catches 1910 - 1939.

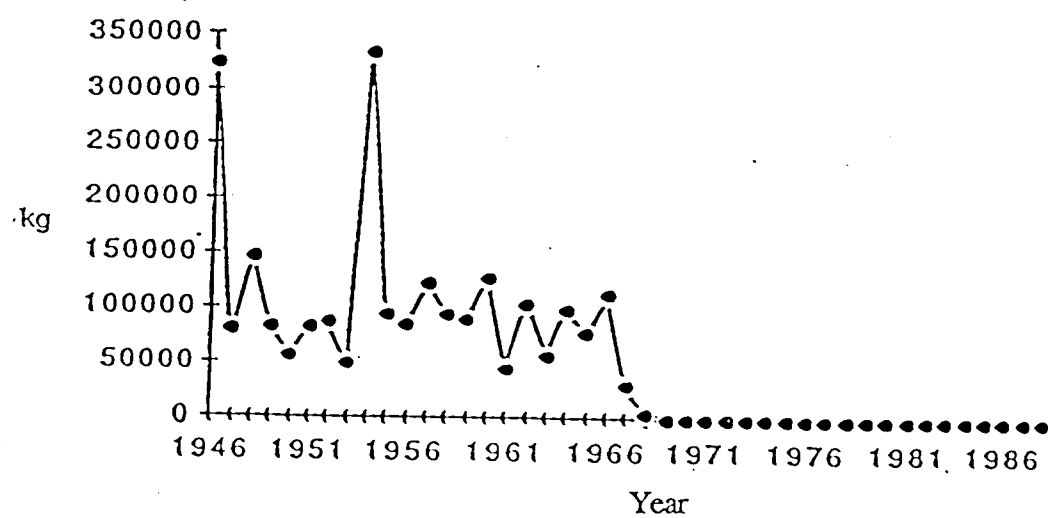


Fig. 2. Smelt catches in Hollands Diep and Haringvliet 1946 - 1988.

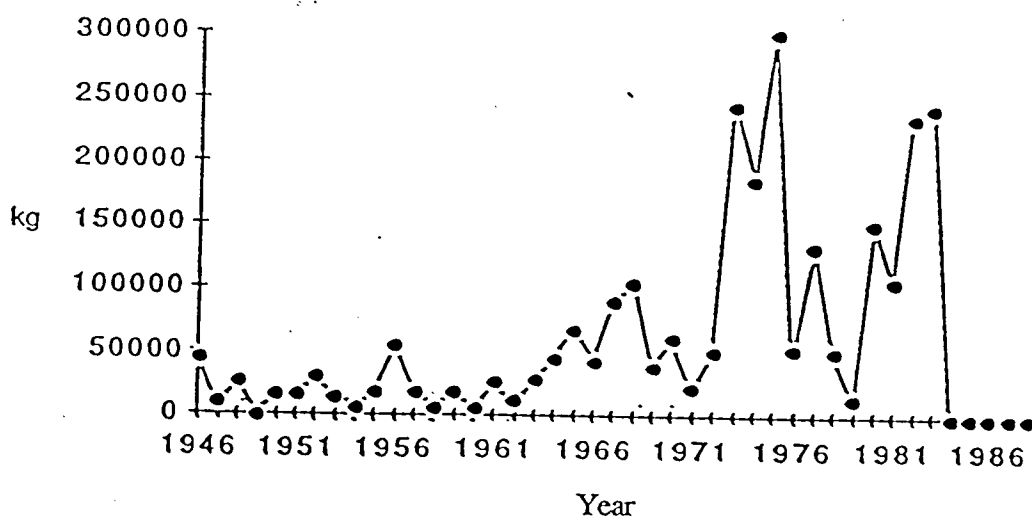


Fig. 3. Smelt catches in the Dutch Waddensea 1946 - 1988.

