

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

C.M. 1989/M:19  
Anadromous and Catadromous Fish Committee

**THE FORMER ALLIS AND TWAITE SHAD FISHERIES OF THE LOWER RHINE,  
THE NETHERLANDS.**

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## Abstract

The allis shad (*Alosa alosa*) and the twaite shad (*A. fallax*) were the subject of intensive fisheries during the months of April and May. Both fisheries came to an end.

At present the restocking, introduction, leading to recolonisation by these two species at the river Rhine is under review.

Data on the catches of allis shad could be traced for the period 1880-1932, and for the twaite shad for the period 1893-1970.

Fisheries for the first species came to an end in 1910 and for the second in 1966.

The decline and ultimate disappearance of the allis shad was caused by overfishing and destruction of the spawning areas, the twaite shad fishery after an steep increase in the end thirties beginning of the forties, went steep down in 1942, and the species was not able to reproduce anymore after changing the tidal regime of the Lower Rhine into a non-tidal river by constructing the Deltaworks in the Haringvliet and Hollands Diep.

## Introduction

In the framework of the International "Ecological Rehabilitation of the Rhine"-programme, a desk study was undertaken to evaluate existing information on the decline, and in some cases extinction, of several anadromous species, e.g. salmon and trout (de Groot, 1989 a), coregonids and migratory smelt (de Groot, 1989 b). The present paper deals with the allis shad (*Alosa alosa* (L)) and the twaite shad (*Alosa fallax* (Lac.)) Both fishes belonging to the riverine Clupeidae were the subject of fisheries. The fisheries on the allis shad was the more important one, and those on the twaite shad became only of some importance when the former species came to an end in 1910.

## Allis shad

The allis shad, and its relative the twaite shad, enters the river to spawn, when the water is above 11-12°C. They enter in small schools, the males a few weeks earlier in the season than the females. Allis shad was caught in the Rhine from March - June. The spawning period was May - June.

The actual spawning never took place in the Dutch waters, but in the higher reaches of the Rhine, e.g. near Koblenz as well in the rivers Mosel (near Trier) and Neckar (between Neckarsteinach and Hirschhorn). Spawning takes place, mainly during the night in the upper water levels, above a gravelly bottom.

During the spawning one can hear the fishes splashing through the surface waters. A noise already described by the late Roman Ausonius in his poem "Mosella". The best known description of the spawning is made by Vincent (1894).

The eggs are fertilized in mid-water and sink to the bottom, swelling in the mean time. They wedge themselves in the gravel on the bottom. A female produces about 50.000 eggs per kg bodyweight. Depending on the watertemperature larvae emerges within 8-4 days (22-24°C). The spawned fish leave the river. But the larvae and youngfish are transported down river into the freshwater tidal area, where by using a vertical diurnal-rhythm combined with the ebb and flood movement of the water they can maintain themselves in the estuary for over one year.

Adult fish were caught by the Dutch riverfisheries between the 3rd week of March - 1st week of June. In the good days the earnings were about 20% of the year income (80% salmon). The catches fluctuated in the same way as they fluctuated in the other rivers e.g. the Elbe-river (Germany). It was possible to give an overview of the Dutch allis shad catches between 1880-1934 (table 1; fig. 1). In addition the landings of allis shad at the most important fish market for riverfish, the Kralingseveer (Rotterdam) for the years 1869-1894 (table 2). The decline in catches over the years is striking. For the period 1881-1890 : 207 423 ; for 1891 - 1900 : 54 685 ; for 1901 - 1910 : 39 701 ; for 1911 - 1920 : 1 249 and for 1931 - 36 : 13. (Redeke, 1938).

Protective fishery measures were difficult to agree upon, national as well as international. The reason was simple, salmon could be caught on the river (except on Sunday) the whole year round. A measure to restrict the allis shad fisheries from March - June, would also have its repercussion on the salmon fisheries.

One opted for the last, the most important fisheries, and neglected to restrict the allis shad fisheries. Hence the main reason for the sharp decline of the stocks was caused by the fisheries themselves. However, riverimprovement (e.g. deepening, barrages etc.) also had its influence to a lesser degree. The last especially in the spawning area, where changes of the riverbed must have had its negative effects.

The quiet waters, bordering the main stream in this area were ideally suited for spawning. Notwithstanding Lelek (1987) states that "poor waterquality is probably chiefly responsible for the decline and extinction in many European rivers, this seems less true for the Rhine, where overfishing and destroying the spawning habitat are the main factors for the extinction of the species. But, pollution combined with the present day entry difficulties for anadromous fishspecies into the Rhine-Scheldt estuary will certainly be additional factors hampering reintroductions (if feasible) in the future.

The fact, however, that the nursery function of the lower reaches of the Rhine, with the freshwater tidal movement, are lost for ever by the large construction works (Delta-works) is of far more importance to make it impossible for the species to maintain itself as a spawningpopulation. The juvenile fish (of allis shad as well as twaite shad) who could stay for over one year in the lower reaches of the river, will now be washed out into the sea. The complex system of making use of a vertical migration pattern, combined with the tidal movement, to maintain both species doesn't exist anymore.

How true the theory is of Redeke (1938), based on earlier observations of Hoek (1894, 1899) that the hybridization of allis and twaite shad played an important role in its disappearance has still to be seen.

Even if it occurred it would have played an unimportant role as the spawning areas of both species were well separated.

### Twaite shad

Twaite shad, as said before, spawn under the same conditions as the allis shad. But as the allis shad moved up streams above the zone of the freshwatertidal movements, the twaite shad stayed in this zone. The species spawned mainly in the Dutch part of the Rhine. As the twaite shad had to move far less up the river, the entry period and stay of the adult fish was far shorter than for the allis shad.

April and May were months of entry and spawning. The actual spawning period was three weeks. Well known spawning areas were in the Merwede (near Woudrichem) and in the Bergse Maas (near Genderen), but the actual spawning sites were never localized. Also the noise produced by the spawning fishes during the night was well known to the fishermen.

After spawning the adult fish left the river, but the young fish stayed in the lower reaches of the river, together with the young allis shad. It took the fish 3 years to become mature. (Hoek, 1899)

As twaite shad were an inferior product in the days when allis shad were plenty, catch data were not kept. Only when the allis shad catches were declining a mild interest became noticeable for twaite shad. And in the end for a short period (1933-1944) there even was a fishery on twaite shad of some importance. It was possible to give the catch data of twaite shad for 1893-1950 (numbers) and for 1946-1970 (weight, kg) (Table 3, figs. 2, 3). In the beginning the presented data will be underestimates, but it is clear that the period 1934-1939 show top records (1938-1.117.137 fish caught). The wartime statistics (1940-1945) will show an underestimate, but the decline in catches is undeniable. In 1950 catches increased to some extent, but since 1966, when the Hollands Diep and Haringvliet were virtually cut off by the Delta-works, catches dropped to zero in the lower reaches of the Rhine.

As it takes 3-4 years for a twaite shad to return to the river and the closing off of the rivermouth took a couple of years, the final disappearance is difficult to date. But since 1950 the fishery was of no profit at all.

The decline of the twaite shad in the Rhine was caused by several factors, but was not caused by the fishery itself. Riverworks, e.g. deepening, with all its consequences have destroyed several spawning habitats, but also pollution, (higher silt contents, toxic substances?) may have played a role. But fatal again was the closing off of the river, changing a freshwater tidal system in the estuary into a one way flowing river.

Making it impossible for the estuary to act as an nursery and on-growing area. Even if today a twaite shad reaches the former spawning sites, the larvae will be waisted.

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year	number	year	number
1880	188 361	1908	39 562
1881	246 344	1909	49 819
1882	206 729	1910	35 210
1883	147 111	1911	5 481
1884	150 521	1912	1 257
1885	277 367	1913	1 274
1886	269 297	1914	1 678
1887	235 899	1915	7 321
1888	223 399	1916	9 555
1889	161 531	1917	3 676
1890	155 234	1918	651
1891	76 275	1919	192
1892	53 898	1920	134
1893	67 214	1921	1 816
1894	60 189	1922	670
1895	51 371	1923	528
1896	37 767	1924	184
1897	75 585	1925	624
1898	104 391	1926	1 349
1899	136 529	1927	1 019
1900	136 087	1928	369
1901	92 762	1929	141
1902	95 971	1930	105
1903	71 531	1931	59
1904	64 791	1932	17
1905	76 044	1933	-
1906	90 024	1934	-
1907	52 730		

Table 1. Allis shad landings in the Netherlands 1880-1934.

year	number	year	number
1869	42 217	1882	141 542
1870	79 184	1883	103 746
1871	94 786	1884	84 170
1872	79 322	1885	184 209
1873	69 851	1886	179 439
1874	116 033	1887	167 966
1875	85 181	1888	148 846
1876	71 431	1889	128 837
1877	67 495	1890	123 233
1878	91 998	1891	53 568
1879	91 232	1892	43 915
1880	65 707	1893	34 289
1881	122 398	1894	35 500

Table 2. Allis shad landings Kralingseveer (1869-1894)



Table 3. Twaite shad landings in the Netherlands 1893-1950.

year	number	year	number
1893	11278	1922	39210
1894	15684	1923	107724
1895	5706	1924	110967
1896	70701	1925	206246
1897	56280	1926	209666
1898	68643	1927	176786
1899	216918	1928	270561
1900	64743	1929	313894
1901	188993	1930	221342
1902	102993	1931	66298
1903	98549	1932	214244
1904	57501	1933	393618
1905	72631	1934	686642
1906	29660	1935	516387
1907	88776	1936	578358
1908	211474	1937	656726
1909	131585	1938	1174137
1910	25759	1939	723099
1911	39424	1940	344593
1912	142611	1941	303910
1913	56107	1942	49349
1914	261881	1943	28025
1915	168943	1944	1011
1916	68516	1945	-
1917	24587	1946	4451
1918	86924	1947	283
1919	29449	1948	9100
1920	49371	1949	4384
1921	47244	1950	33080

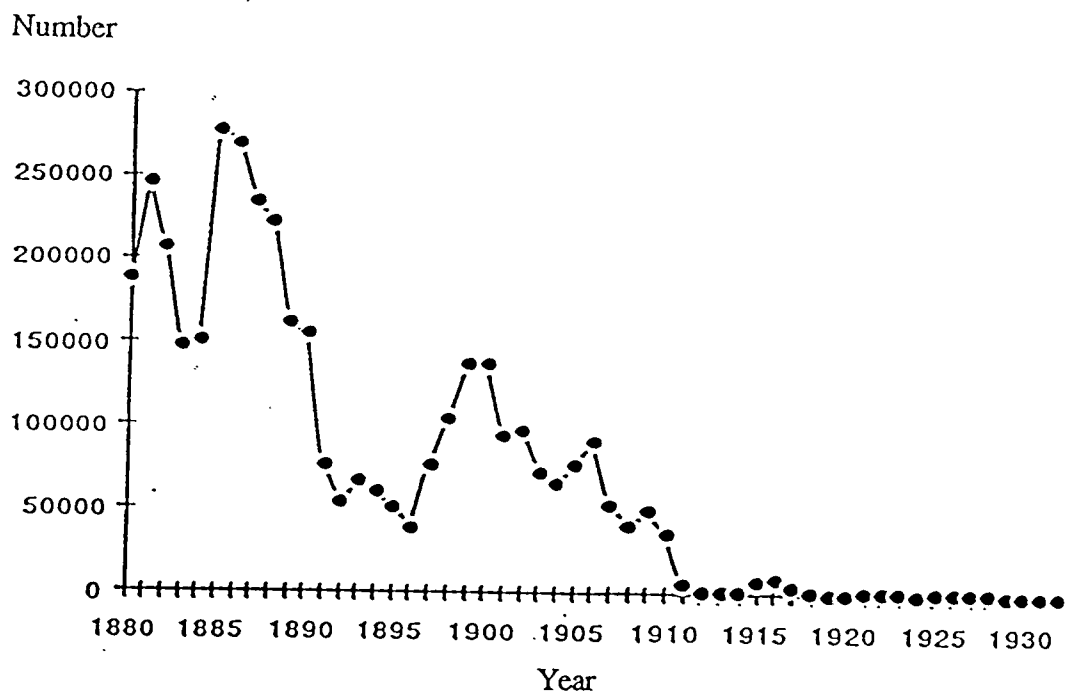


Fig.1. Allis shad landings 1880 - 1934.

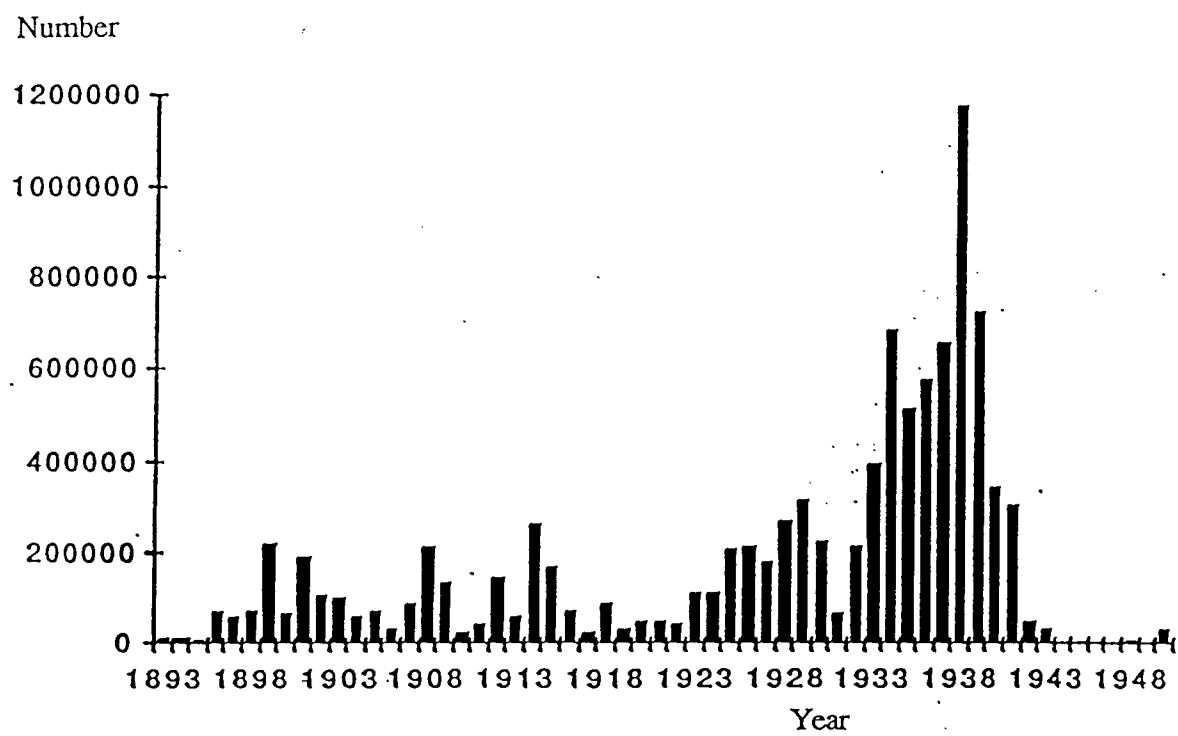


Fig. 2. Twaite shad landings 1893 - 1950.

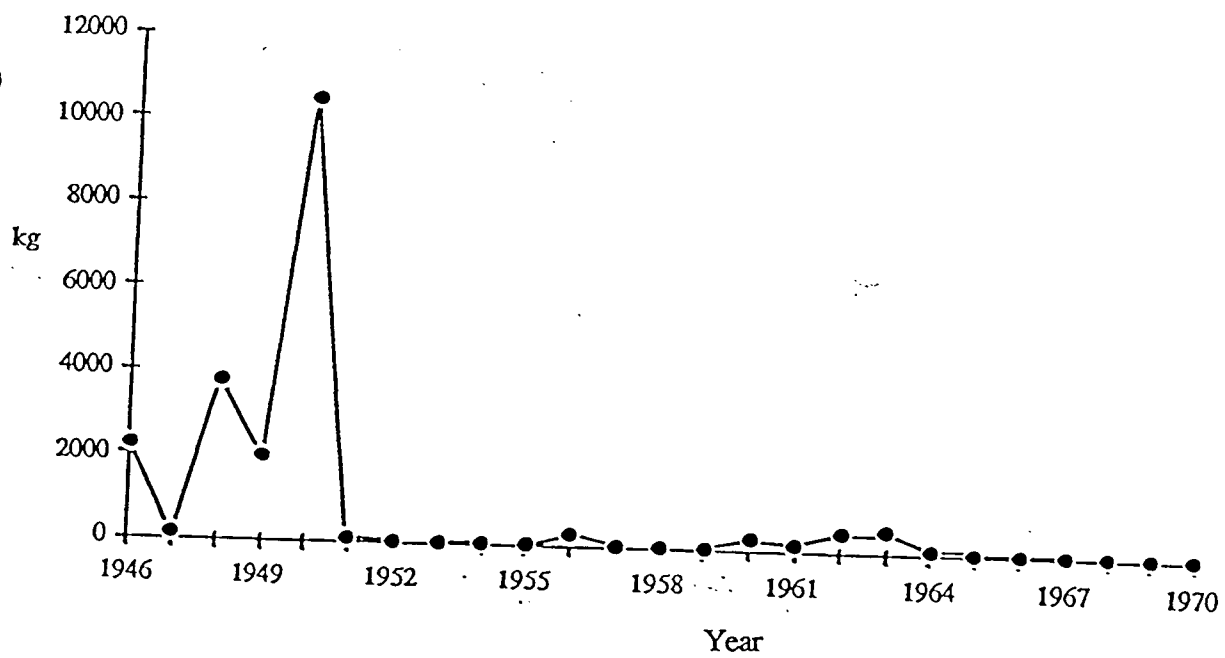


Fig. 3. Twaite shad landings (kg.) Hollands Diep and Haringvliet 1946 -1970.

