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Short communication

Fishery practice versus experimental design: Preliminary results of the introduction of protective sieves in the eel fyke-net fishery of the Vistula Lagoon, Poland

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Abstract

In response to the high by-catch of juvenile commercial fish species in fyke-nets used in targeted eel catches in the Vistula Lagoon, a regulation came into force requiring gear to be fitted with protective sieves with openings 20 mm × 65 mm in diameter. The protective sieves replace material with 16 mm mesh bar lengths in the codend. This paper presents the quantitative composition and length distribution of fish from commercial catches prior to and following the obligatory mounting of sieves in the gear (1999) as well as after they had come into widespread use (2004). The application of the sieves limited the retention of juvenile bream, perch, and roach. They also significantly limited the numbers of fish of the smallest length classes that were retained. The total number of pikeperch retained in the fyke-net was reduced, although the length distribution of this species did not vary as much as it did with other species. A difference in the protection effect was noted in the catches from the current study in comparison with experimental catches conducted in the same month in 1998–1999. Selectivity curves for pikeperch and bream were calculated based on samples collected with gear fitted with protective sieves accompanied by an additional net sewn to the outside of the sieve to retain all the fish that passed through the fyke-nets. L50% was 17.6 and 12.4 cm TL, respectively. In the commercial catches made in 2004, only a slight limitation in the retention of pikeperch of the 11–14 cm length class was noted, and bream specimens smaller than 17 cm TL were all but eliminated. The authors are of the opinion that behavior and factors that affect mortality following contact with the fishing gear are significant. The variability of bream regarding the dependence of body height on length might have influenced the results.

Keywords: Fyke-net fishery; Protective sieves; Pikeperch; Bream; Vistula Lagoon

1. Introduction

Fyke-net eel fishery is the most profitable fishery in the Vistula Lagoon, even if the eels (*Anguilla anguilla*) are smaller compared to those caught in lakes (Borowski and Dąbrowski, 1997; Świerzowski

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and Dembiński, 1978). The shape of eel permits it to slip through meshes more easily than other fish do. The legal minimum mesh size for fyke-net codends was 16 mm. In order to maximize their income, fishermen try to modify gear construction. This increases the quantity of the by-catch of undersized commercial fishes such as pikeperch (*Sander lucioperca*), bream (*Abramis brama*), and perch (*Perca fluviatilis*). In the August to October period, the fry of these fish enter fyke-nets in large numbers and are retained (some meshed) in the codends and then discarded. As young fish are sensitive to higher temperatures, low oxygen content, and manipulation during net lifting, many of them die before they are released (Borowski and Dąbrowski, 1996). This leads to the increased mortality of this fish group and reduces the number of survivors recruited to the populations that will support the fishery in the coming years.

Eel fishermen in the Vistula Lagoon began to reduce undesirable by-catch in 2003 by mounting perforated metal or aluminum sheets in cod-ends. In 2003, the Ministry of Agriculture and Rural Development declared it mandatory to mount sieves (see Fig. 1) with 20 mm × 65 mm openings in fyke-nets deployed in eel fishery in the Vistula Lagoon. The oval openings in the sheets should enable young fish to escape while simultaneously reducing the work required to clear the gear of retained juvenile fish. Sieves serve as a type of buffer for the steps taken by fishermen, who, facing declining eel stocks from overfishing and decreasing recruitment trends, try to compensate for smaller catches by improving gear construction to minimize the possibility of legal-sized fish escaping. This is accompanied by a rise in the by-catch of undersized fish that are released back into the water. Their chances of survival are not good (Cook, 2003). As anticipated, fishermen were not enthusiastic about the mandatory sieves. Their scepticism stemmed from the belief that a portion of the eel entering the gear would escape through the sieve openings and that the gear fitted with the sieves would be more difficult to manipulate.

The aim of the current study was to evaluate the differences of fish retention in the fishery practiced before and after the introduction of protective sieves in the Polish part of the Vistula Lagoon in comparison with the results of experimental catches conducted as a pilot study prior to sieve introduction.

2. Material and methods

2.1. Study area

The Vistula Lagoon is a brackish water basin in the southern Baltic Sea with an area of 838 km^2. The Polish part of the lagoon is 328 km^2 with a maximum depth of 4.4 m and an average depth of 2.6 m. The lagoon has a particular hydrologic system that is shaped by inputs of inland freshwaters and saline waters from the Gulf of Gdansk. The annual input of freshwater from the drainage area of 30,000 km^2 is 3 km^3; this results in the complete exchange of water over the course of 1 year (Żmudziński and Szarejko, 1954). Unlike freshwater inflows, saline water inflows through the Pilawa Straits are irregular and depend on meteorological and hydrographic factors. This phenomenon, combined with the shallow depths and extended length of the lagoon, continuously mix the water in the Vistula Lagoon from early spring until late fall. This mixing lifts the sediments from the bottom and reduces water transparency, but it also prevents oxygen deficiency which could be caused by large amounts of organic matter and thermal stratification (Łomniewski, 1958; Różańska, 1964).

2.2. Sampling

The results presented in this paper are based on the analysis of 22 samples collected in May 1999 and 12 samples collected while fishing in May 2004 in the same regions of Vistula Lagoon (Fig. 2). In 1999, the catches were made with standard fyke-nets deployed by fishermen in the Vistula Lagoon. The construction of them is described in detail in Grzywacz et al. (1982). The gear is manufactured with knotted polyamide netting. The material is attached to six hoops, and the diameters of the first and last are 1.55 and 1.05 m, respectively. The material attached to the first three hoops had a circumference of 200 meshes and that attached to the remaining hoops was 160 meshes. No selective sieve was fitted at the mouth of the codend. Selectivity was provided by the so-called third heart with a circumference of 160 meshes that was sewn in front of the fourth hoop. The last chamber in all of the fyke-nets deployed in the studies was 16 mm.

All of the fyke-nets studied in 2004 were fitted with selective sieves with openings of 20 mm × 65 mm as shown in Fig. 1.