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GRID-SORTING OF PENNED SAITHE

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ABSTRACT

Size selection of penned saithe was obtained by forcing the fish against an adjustable grid mounted in the end of net pens. The size selection was rather sharp, with a selection range of about 5 cm only. All fish forced against and passing through the grid survived the observation periods of 7-14 days, and there were no sign of external injuries caused by the selection process.

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INTRODUCTION

Along the coast of Norway, saithe (*Pollachius virens*) are fished by purse seines, either when occurring in schools or aggregated by use of artificial light (allowed south of 62° North only). The fishery is regulated by minimum fish size limits (varying with the region) and a total allowable catch quota. There is a certain need for size selection methods in this fishery, due to undersized fish in the catches and price differentiation according to size.

Based on a method for size selection of farmed salmon (*Salmo salar*) using an adjustable grid, trials for size selection of penned saithe were conducted. The behaviour of the fish during the selection process was recorded, and the selection properties of the grid were investigated. The survival of fish passing through the grid was recorded for periods of 7 to 14 days.

MATERIALS AND METHODS

The experiments were carried out in sheltered bays on the east side of Bømlo, southwestern Norway, in April 1992. Local fishermen caught the saithe at night-time with a small purse seine, using artificial surface light for attraction. The fish were transferred to storing pens (approx. 10x6x6 m), which were towed to nearby bays and moored.

In the first experiment, a group of around 100 kg of relative large fish (43-62 cm) of cod (*Gadus morhua*), lythe (*Pollachius pollachius*) and saithe, caught by traps and kept in a storing pen for about two months, was transferred to a storing pen containing about 1000 kg of saithe (29-40 cm). This group of saithe was caught by purse seine about 14 days before the experiment, and was towed for four hours at 1 m/s to the experimental site. The two groups were allowed to mingle for one hour before the experiment started.

In order to separate the fish according to size, an adjustable grid (produced by Moster Industrier A/S, N-5440 Mosterhamn) was mounted in the upper part of one end of an empty storing pen (Figure 1). The aluminium grid was 190 cm high, 170 cm wide (fully extended),

had bars of 40 mm thickness, and was painted black. The opening between the bars was adjusted to 55 mm. The grid with the empty pen attached was then mounted to one end of the pen containing the fish (Figure 1). An underwater video-camera with a controllable pitch was mounted in the empty pen and focused on the grid to observe fish passing through the grid.

The purpose of this experiment was to find out whether saithe would pass through the grid, either voluntarily or when forced towards the grid. After the mounting of the grid and the empty pen, the volume of the storing pen was reduced by drying up the net carefully until the fish occurred at the same depth level as the grid, and the pens were then left until next morning. Both pens were then inspected with the video-camera, and the rest of the fish in the storing pen were forced towards the grid by drying up the pen.

A similar protocol was followed in the succeeding experiments, in which the opening between the bars of the grid was 35 or 40 mm. The saithe used in the experiments were captured from two days to one week before the experiment started. Shortly after the grid with the empty pen was mounted to the storing pen, the experiments were carried out by forcing the fish towards the grid by drying up the storing pen for one to four hours, depending on the speed of the selection process.

After the forcing was terminated, the grid was removed and the pens were left separated for up to two weeks to record the survival of the fish after the selection process. Samples for measurement of length (down to the nearest cm) and maximum body width (taken by a slide caliper, down to the nearest mm) of the fish that remained or passed through the grid, were taken by a small net-bag operated by hand. In the first experiment the samples were taken one week after the selection trial, but in the other four cases the sampling was conducted immediately after the forcing towards the grid was terminated.

RESULTS

During the first six hours of the first experiment, approximately 25 saithe were observed to pass through the grid, and during the first 45 min of daylight the next morning, another 10 saithe swam through. The fish passed through slowly and tilted slowly downwards. The following UTV-inspection of the pen revealed that approximately 200 kg of saithe had passed through the grid during the night. When forcing the remaining fish towards the grid by drying up the storing pen rather hard, all the small saithe (approx. 800 kg) passed through the grid during 20 min, and only the group of larger fish was left. There was a difference of about 20 cm in average length and about 33 mm in average width between the fish that passed through the grid and the fish that remained in the storing pen in this experiment (Table 1).

In the next experiment, the fish (4000 kg) were forced towards the grid shortly after it was mounted. The fish had been caught just two days prior to the experiment and were somewhat resistant to swim through the grid. After two hours, only a small quantity of fish had passed through the grid (approx. 100 kg). The fish that had passed through were not significantly smaller (Table 1), but significantly thinner than the fish remaining in the storing pen. After four hours of forcing most of the fish had passed through the grid, and only a small quantity was left in the storing pen. The fish that had passed through were in average about 6 cm smaller and 6 mm thinner than the remaining fish.

In the next two experiments, the forcing towards the grid was not conducted for more than approximately one hour, and during this period most of the fish passed through the grid. The fish used in these experiments were caught 3-5 days prior to the experiments, and passed rather readily through the grid. The selection curves constructed for bar openings of 35 and 40 mm were rather steep and with a narrow selection interval of about 5 cm (Figure 2).

The fish passing through the grid in the final experiment were kept in the pen for 14 days, and no external injuries or mortality was recorded. The fish used in the other experiments were kept in the pen for one week, and no mortality was recorded. The fish used in the fourth trial were captured when swimming relatively deep (30-40 m), and about 20 fish were dead and floating at the surface with an expanded swim-bladder five days after capture. During the

experiment, about 50 fish floated to the surface with obvious buoyancy problems, and were removed.

DISCUSSION

These experiments showed that size selection of saithe kept in storing pens is possible by use of an adjustable grid. Moreover, the selection process is so rapid (up to 5 tons of fish were sorted within one hour) that this principle can be applied in the fishery. The selection properties of the grid were also favourable with nearly knife-edged selection curves that had a selection range of approximately 5 cm. In the fishery, the grid may therefore be used to sort out undersized fish from the catches and to sort the remaining catch in different size categories to obtain a better price. The grid has been successfully used for size sorting of salmon in sea pens for some years, and more than 300 units have been delivered.

There were certain indications that fish caught shortly (within 48 hours) before sorting were reluctant to swim through the grid (trial no. 2). Fish that had acclimatized in the storing pen for more than three days, however, passed through rather easily. It is therefore uncertain whether the grid principle can be applied for size selection directly in purse seines, where the fish are stressed from the capture process.

The saithe seemed to tolerate the selection process, and no mortality was recorded within a period of 14 days after the experiments. If this is the case for smaller fish that may occur in purse seine catches along the Norwegian coast, remains to be tested. Saithe, brought rapidly close to the surface for storing in pens, may have buoyancy problems, and the stress of the selection process seemed to somewhat increase such problems, even for fish that had acclimatized in the pen for five days. By mounting the grid deeper in the pen, such effects can probably be avoided.

Table 1. Results from selection trials on penned saithe.

Trial no.	Quantity (kg)	Grid opening (mm)	Length							Width							
			Through grid			Not through				Wilcoxon	Through grid			Not through			
			Average (cm)	SD (cm)	N	Average (cm)	SD (cm)	N	Average (mm)		SD (mm)	N	Average (mm)	SD (mm)	N	Wilcoxon	
1	1000	55	34.1	4.4	45	54.5	6.4	38	p<0.05	40.8	5.9	45	73.2	10.5	38	p<0.05	
2	4000	40*	33.9	2.7	41	35.1	3.4	41	p>0.05	38.3	3.9	41	40.7	4.8	41	p<0.05	
3	4000	40**	33.8	2.7	41	39.9	5.4	36	p<0.05	38.3	3.9	41	44.2	7.9	36	p<0.05	
4	4000	35	32.2	2.0	80	34.6	3.2	53	p<0.05	35.5	3.4	80	38.3	7.0	53	p<0.05	
5	5000	40	36.9	2.8	105	42.8	2.6	61	p<0.05	40.8	3.4	105	47.9	3.4	61	p<0.05	

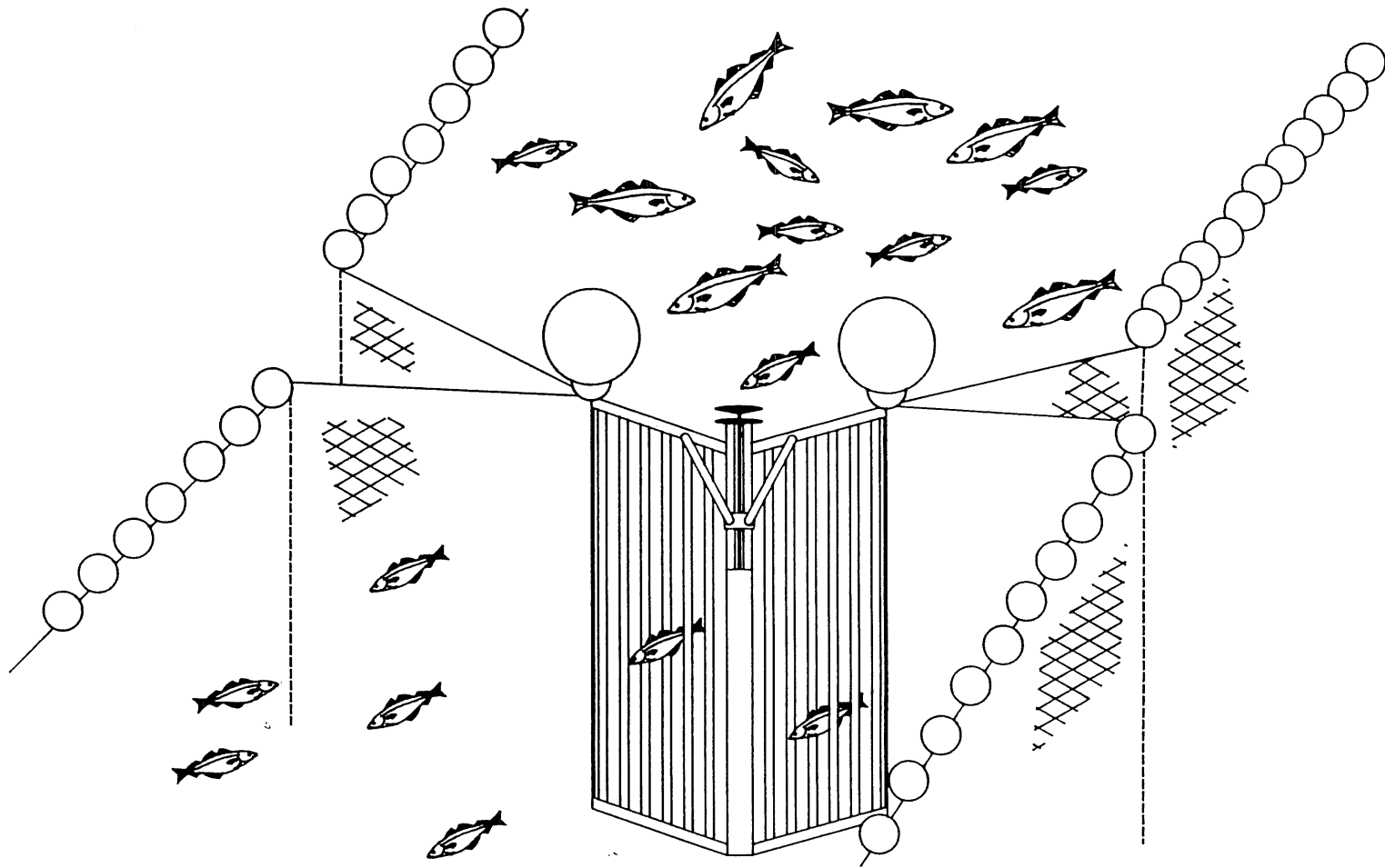


Figure 1. Mounting of the adjustable selection grid at one end of a storing pen with saithe, with an empty pen attached.

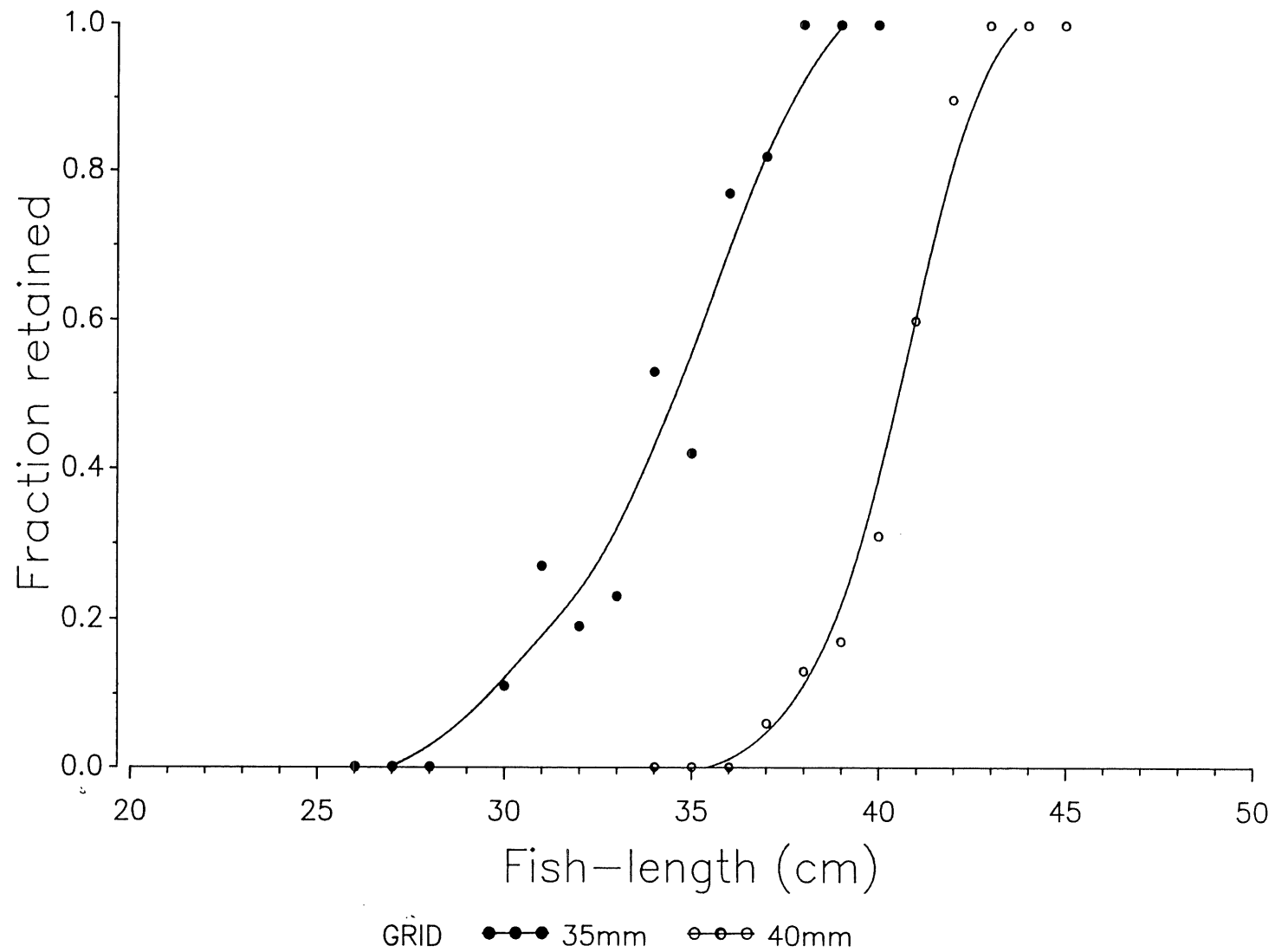


Figure 2. Selection curves for trial no. 3 and 4, with bar openings of 35 and 40 mm, respectively.