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SIMULATED NET INJURIES ON SAITHE

by

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SUMMARY

This report describes a small scale experiment with simulated net injuries on saithe. The aim was to test methods to detect effects of injuries in fish skin, and evaluate to what extent skin damage causes increased mortality in saithe. The fish were divided into 4 groups: 1. Control - no treatment. 2. Anaesthetized control - anaesthetized at day 0, no further treatment. 3. Net damaged - fish forced through the meshes of a trawl net. 4. Induced damage - scale and mucus removed from a pre-determined region of the posterior body. The fish were kept in small-meshed net pens for observation two weeks after treatment. The extent of skin injuries and mortality were recorded throughout the experiment period. Blood samples were taken to detect possible imbalance in osmoregulation due to scale removal and mucus damage.

No significant differences were found in measured blood parameters between the controls and treated groups. Thus, the skin injuries did not seem to cause any detectable disturbances in the ion balance of the fish. However, a majority of the fish in the induced damage group subsequently developed secondary infections in the damaged skin region some days after treatment. This group also showed a significantly higher total mortality than the other groups during the second half of the observation period. The exact causes of mortality are not known, but skin damages together with frequent handling stress probably made the fish more vulnerable to infections.

INTRODUCTION

For a long period mesh size regulations in trawl and seine fisheries have been an important tool in fisheries management. It has been assumed that most of the small fish filtered through the codend meshes survive until they reach legal size. However, recent investigations in the Soviet Union and Scotland (Treschev *et al.* 1975, Efanov and Istomin 1988, Main and Sangster 1988) have indicated that survivability of fish escaping through the meshes of a trawl codend may be significantly reduced. If further investigations confirm that this is an important problem, major changes in fisheries regulation methods have to be introduced.

This report describes the first in a series of controlled small scale experiments aimed at investigating the vulnerability of different fish species to gear damage and the effect of gear induced injuries on fish mortality. One of the main purposes of this first experiment was to establish suitable methods to simulate gear damage and to demonstrate its effect on fish physiology. The investigation was done on saithe (Pollachius virens L.).

MATERIALS AND METHODS

Approx. 350 saithe were captured in a net pen at the Institute of Marine Research Aquaculture Station in Austevoll, south-west of Bergen. Prior to the experiments the fish were accustomed to captivity for about one month. The fish size varied from 30 to 60 cm, the majority smaller than 40 cm. Except for single specimens with symptoms of bacterial infection (probably vibriosis), the condition of the fish were apparently good.

Samples of ten fish were killed prior to treatment. The skin and mucus layer were examined for injuries. Blood samples (heart puncture) were taken to establish normal values of the blood parameters measured throughout the experiment period. The fish were divided into 4 groups and transferred to small meshed (60 mm stretched meshes) net pens. The groups were treated the following ways:

Control (C, n=73)

No treatment

Net damaged (ND, n=119)

The fish were forced through the meshes of a piece of trawl net (mesh size 110 mm) to simulate escapement from a codend. However, most fish passed through the net meshes without any visible skin damage.

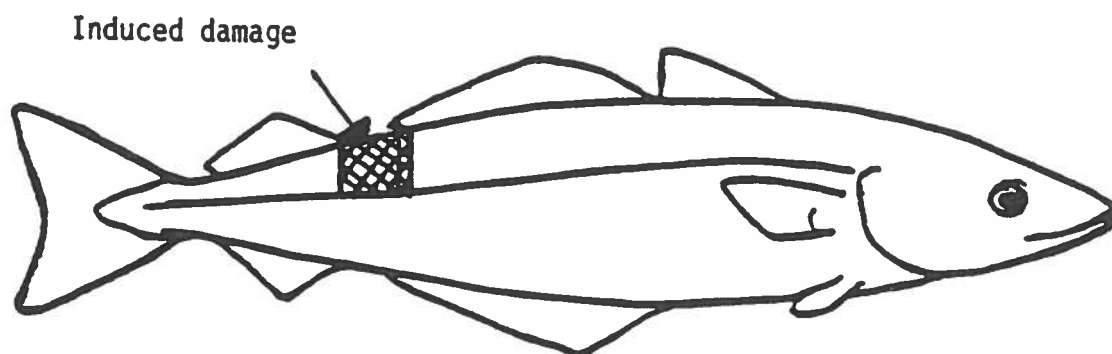


Figure 1. Wounded skin area of fish in the induced damage group. Scale and mucus were removed from the marked skin area by the reverse side of a scalpel.

Induced damage (ID, n=51)

The fish were anaesthetized with Metomidate. Thereafter, scale and mucus were removed from a pre-determined region of the posterior body (Fig. 1) with the reverse edge of a scalpell. The wounded area made up less than 5% of the body surface.

Anaesthetized control (AC, n=69)

The fish were anaesthetized as the induced damage group and transferred to the net pen without further treatment.

Samples of 4 fish were taken 2, 4, 12 and 24 hours, and thereafter 2, 3, 4, 6, 8 and 14 days after treatment. Visible skin lesions were noted and blood samples taken by heart puncture. Haematocrit was measured immediately. Blood plasma was centrifuged off and stored at -20°C . Plasma concentrations of Cl^{-} , K^{+} , and Mg^{2+} were later determined by atomabsorbtion spectrophotometry. Dead fish were removed from the net pens at each sample time and skin damage noted. The experiment was terminated after an observation period of 14 days.

RESULTS

During the first day of experiment no mortality was observed in any treatment group. The second day after treatment the wounded skin area of the induced damage group was covered by a dense mucus layer and hardly visible. After 4 to 5 days, however, blood effusions started to appear, and by the end of the observation period almost every fish in this group had developed secondary infections in the wounded area, particularly along the boundary line between damaged and normal skin.

Table 1. Estimated daily mortality rates in the different treatment groups. (C - control, ID - induced damage, AC - anaesthetized control, ND - net damage)

Day	C			ID			AC			ND		
	No. alive	No. dead	% daily mortality	No. alive	No. dead	% daily mortality	No. alive	No. dead	% daily mortality	No. alive	No. dead	% daily mortality
0	73			51			69			119		
1	61			39			57			116	1	1.0
2	57			35			53			102		
3	53			31			49			98		
4	49			27			45			93	1	1.0
6	42	3	3.3	22	1	2.1	41			90		
8	38			17	1	2.7	36	1	1.3	86		
14	34			8	5	6.4	29	3	1.6	82		

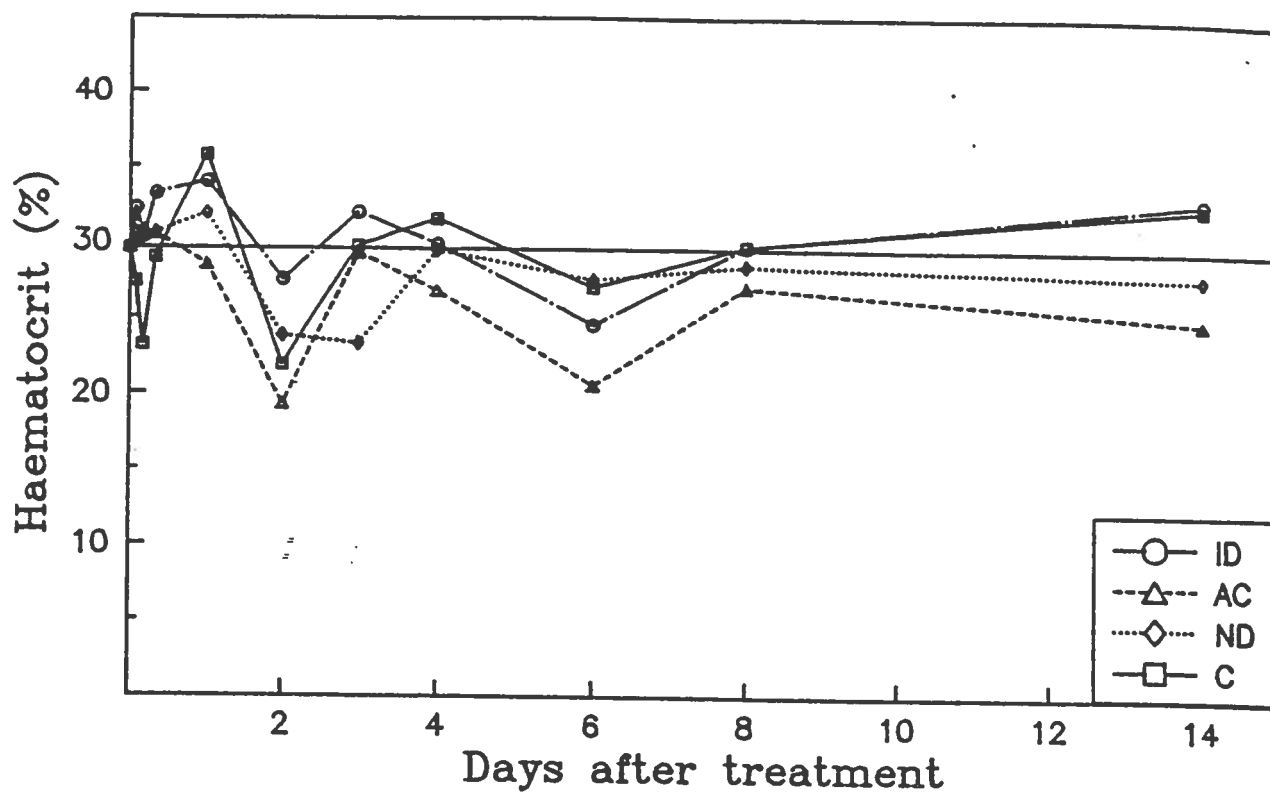


Figure 2. Average haematocrit values in blood from saithe the first 14 days after induced skin damage. ID - induced damage, AC - anaesthetized control, ND - net damage, C - control.

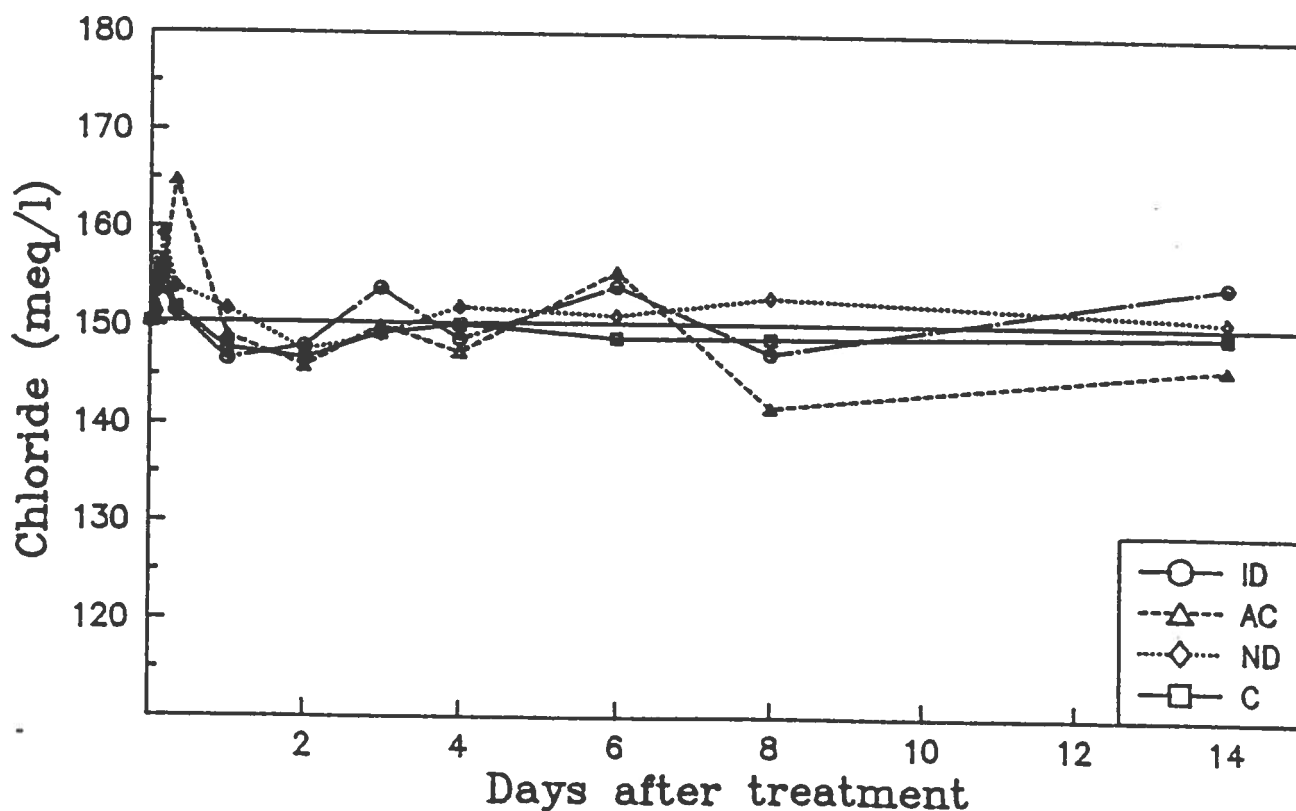


Figure 3. Average content of Cl^- in blood plasma from saithe the first 14 days after induced skin damage. ID - induced damage, AC - anaesthetized control, ND - net damage, C - control.

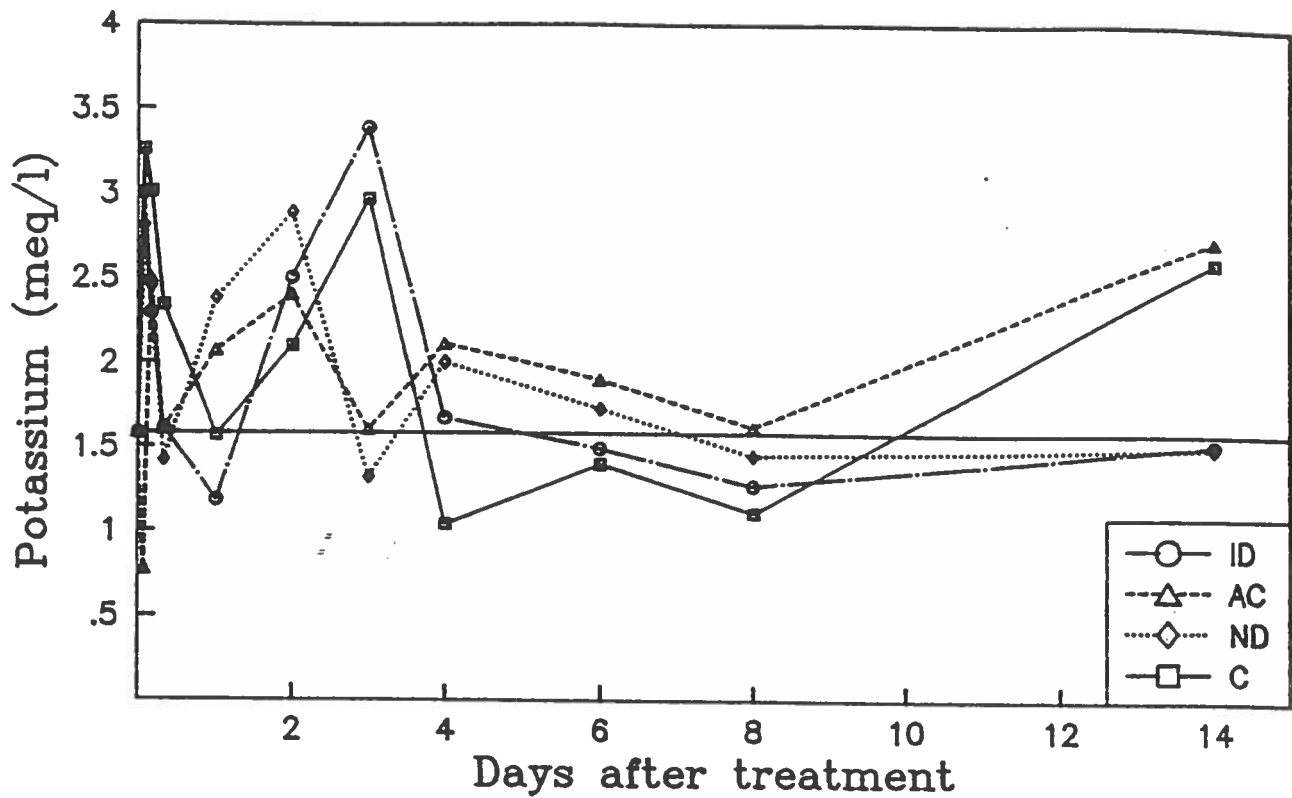


Figure 4. Average content of K^+ in blood plasma from saithe the first 14 days after induced skin damage. ID - induced damage, AC - anaesthetized control, ND - net damage, C - control.

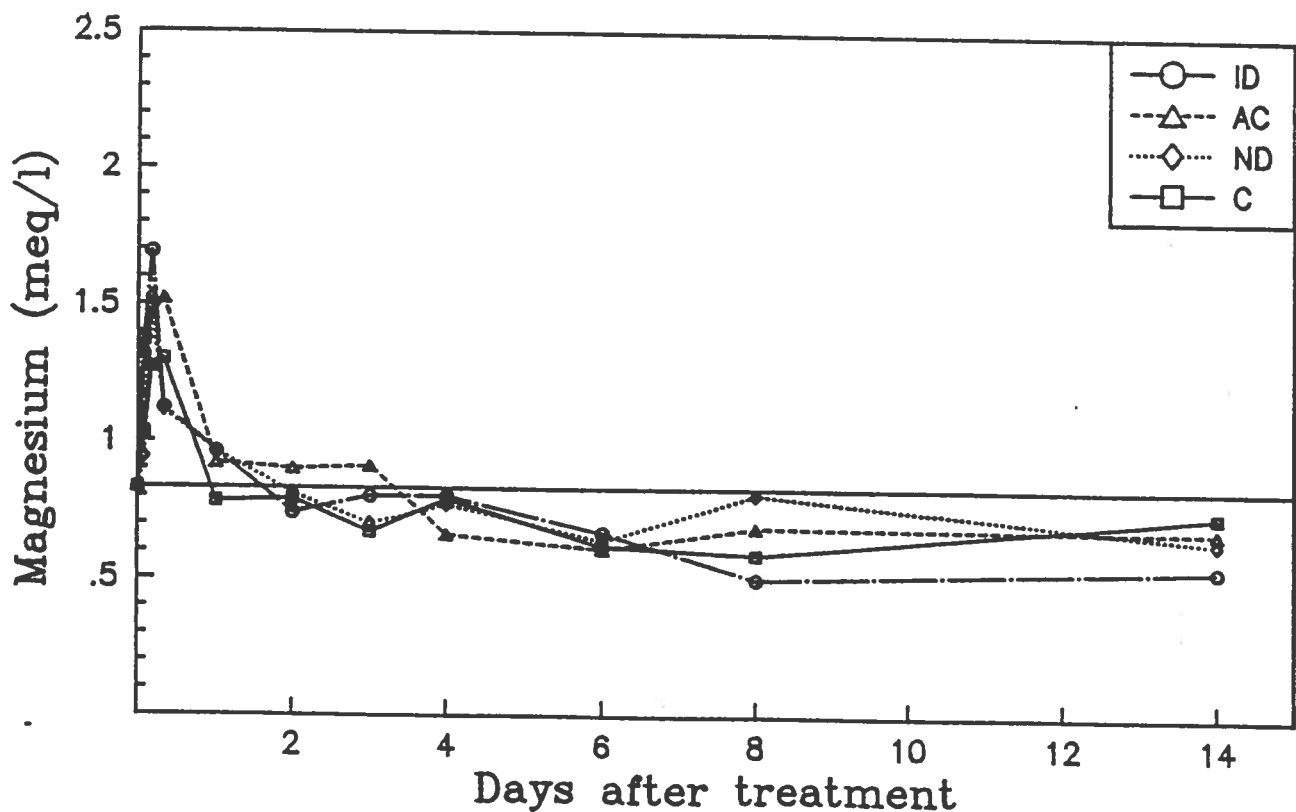


Figure 5. Average content of Mg^{2+} in blood plasma from saithe the first 14 days after induced skin damage. ID - induced skin damage, AC - anaesthetized control, ND - net damage, C - control.

lowed by an increase in mortality, which may have been caused by a defect protective scale and mucus layer.

Muscular fatigue and exhaustion may also play an important role in mortality related to catching processes. Beamish (1966) reported high mortality in haddock caught by trawl in shallow waters. Based on observed high lactic acid content in blood plasma, he assumed that exhaustion might be an important cause of mortality the first 12 hours after hauling. In our experiment it is not probable that exhaustion alone is the cause of mortality, but frequent handling stress may lead to a negative energy balance which makes fish more predisposed to infections. It is well known that fish is forced to high motoric activity during trawling and seining (e.g. Main and Sangster 1981), and the role of exhaustion in fish mortality after escapement from fishing gear should be studied in more detail in future experiments. This experiment will therefore be continued by another small scale experiment where the effects of muscular fatigue combined with net induced skin damage on cod and haddock will be investigated.

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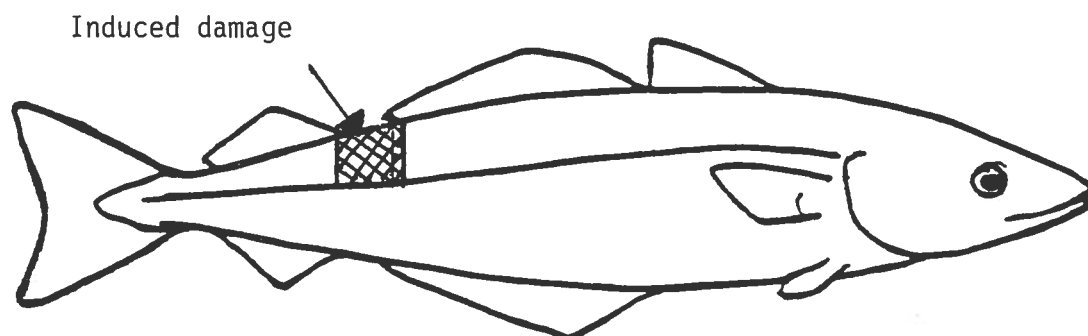


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