Title: Diurnal periodicity of winter activity in the perch, Perca fluviatilis L.

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Anglers have personal knowledge of the feeding and activity patterns in the perch, however this knowledge is rarely made public, and in any case it mostly applies only to specific cases. (Anderson etc.)

Since 1967 data have been collected on the distribution of fish caught in a 24 hour period during the winter angling season. The present study on activity periods is based on data from nearly 2000 perch collected between 1967 and 1971.

Methods and data

The study was carried out in the northern part of lake Paijanne for 36 days and at Haukanmaa lakes in the Toivakka area for 14 days. 50 study days in all. All catching was done by winter-angling (which means first drilling a hole in the ice and then using a short rod and line. Translator's note) All May results are from the Haukanmaa lakes.

Fishing began well before sunrise and continued until fish stopped biting (feeding) usually after sunset. The following table shows the number of study days per month and the number of hours when fish were caught. On a few days fishing was stopped at mid-day but this has been taken into account in calculations.
The number of study days in each year is as follows:
1967, 1; 1968, 5; 1969, 19; 1970, 12; and 1971, 13. Since, the fishing areas varied, weather conditions differed greatly from day to day, various baits were used and the fish caught were all sizes, the results can be considered very similar to the catches of an ordinary winter-angler.

The numbers of fish caught per day and per hour.

During the whole study period 1834 perch were caught. Their distribution is shown in the following table:

<table>
<thead>
<tr>
<th>Month</th>
<th>No. of days</th>
<th>No. of hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>December</td>
<td>7</td>
<td>16.0</td>
</tr>
<tr>
<td>January</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>February</td>
<td>12</td>
<td>61.5</td>
</tr>
<tr>
<td>March</td>
<td>11</td>
<td>59.5</td>
</tr>
<tr>
<td>April</td>
<td>13</td>
<td>82.5</td>
</tr>
<tr>
<td>May</td>
<td>5</td>
<td>32.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>256.0</strong></td>
</tr>
</tbody>
</table>

Average 36.7  7.2
From December to February the number of fish caught in a day was about 20 individuals. The average caught in a day in March rose to 37.4 and in May the numbers had risen to an average of 72 per day. Therefore the catch improved with the advance of spring.

Since the feeding period during these months increased from a few hours in a day to about 12 hours, it is necessary to examine the catches also in this respect. The average number of fish caught in an hour is 7.2 and both the February and May figures differ significantly from the mean (t= 3.57; p<0.01 and t= 4.49; p< 0.01) The other month's average catches do not differ noticeably.

The low hourly catches in February are due to the severity of the winter at that time. The catches did not increase in size until the snowcover got thinner and more light could penetrate through the ice.

Times of feeding during a 24 hour period.

As can be expected the feeding periods occurred at different times of the day during the different phases of the study period.

During December, fish were caught between 1000 and 1400 hours, i.e., during day-light. On two of the seven study days fish were only caught in the afternoon, but on the others, fish were taken in both morning and afternoon.

The results on January feeding activity are based on two day's catches; one in 1968 and one in 1970. Activity pattern did not seem to differ from that of December nor is there any significant difference in the length of the day light hours.

In February the feeding period is longer, fish were caught between 0600 and 1800, mostly at mid-day. Anderson et al got nearly identical results for the activity periods, from net-fishing in February. Since net-fishing results mainly show the extent of general activity and rod and line results show feeding activity, the two methods together give
complementary information on the activity of the perch.

In March the feeding period increased in the evening to 2000 hrs. On most days the most active feeding period occurred in the morning between 0800 - 1000, i.e. few hours earlier than in December - February. Mid-day was fairly quiet but in the afternoon another feeding period occurred, though slightly less pronounced than the morning period. Merivesi has shown that fish are caught between 0900 - 2000 hrs. in the winter with maximum numbers caught at 1600 hrs. This result would apply to the March activity pattern in this study.

The two peaked activity pattern, which began in March continued in April, and the most active feeding period occurred at 0800 - 1000 hrs in the morning and 1400 - 1600 hrs in the afternoon. At the same time the morning feeding period had shifted to an earlier time since on several days the greatest number of fish were caught before 0800 hrs.

At Paijanne the ice started to melt in May and therefore the conditions for winter angling were somewhat exceptional. The present study was carried out in early May in the years 1969 to 1971. The feeding period is long, from 0400 - 2200 hrs and clearly has 2 peaks, with maximum peaks occurring at 0600 - 0800 hrs and 1600 - 1800 hrs. At the same time the activity period was concentrated more and more in the evening just before sunset.

The distribution of number of fish caught during 24 hrs during December - May is given in the table below. Of the total, the most productive period was found to be between 0600 - 1600 hrs., with the peak period occurring between 0800 - 1000 hrs. This despite the fact that during December and January no fish were caught during this time (0800 - 1000). Therefore a greater number of perch must have been active during February - April.
Adaptation to daylight

It has been seen earlier that the perch is not active in light conditions less than the so called 'Bürgerliche Dämmerung' (Lind and Tenhunen 1970, 1971). This is probably due to the visual capacity of the species, this fact is confirmed further by experiments carried out by Boulet. According to these experiments the perch does not react to 'objects' less than 2mm in size but it did react to larger ones if the speed of movement is not greater than 3mm per sec.

Therefore it was to be expected that the visual capacity of the perch is an important factor in the winter, when the days are short and lakes are under an ice and snow cover. Thus the species would be day-active in the winter, a fact well known to winter anglers.

The present data together with the net-fishing results obtained by Anderson et al. show that during the darkest months of the year, the perch is only active in the mid-day period. Throughout the whole winter fishing season, activity only occurs during the time between sunrise and sunset. The two-peaked activity pattern which occurs from March onwards is due to increase in the number of day light hours. March is also the time when the shift to a greater evening activity beings.

<table>
<thead>
<tr>
<th>Hrs GMT</th>
<th>% of catch</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 - 06</td>
<td>0.8</td>
</tr>
<tr>
<td>06 - 08</td>
<td>14.7</td>
</tr>
<tr>
<td>08 - 10</td>
<td>26.9</td>
</tr>
<tr>
<td>10 - 12</td>
<td>18.7</td>
</tr>
<tr>
<td>12 - 14</td>
<td>14.7</td>
</tr>
<tr>
<td>14 - 16</td>
<td>16.9</td>
</tr>
<tr>
<td>16 - 18</td>
<td>3.2</td>
</tr>
<tr>
<td>18 - 20</td>
<td>4.1</td>
</tr>
</tbody>
</table>
REFERENCES

ANDERSON E., MOSSBERG P. & NYBERG P. 1972: Vinterdygnsaktiviteten hos abborre, gärs, mört och nors i sjön Erken. (Summary: Diel activity during the winter in perch, ruff, roach and smelt in lake Erken).


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The distribution of the diurnal periodicity of the fish caught in each study month in the Paijanne and Haukanmaa lakes. Vertical axis on the right hand side is the number of fish caught per 2 hour intervals expressed as a percentage of the total catch per month.
Notice

Please note that these translations were produced to assist the scientific staff of the FBA (Freshwater Biological Association) in their research. These translations were done by scientific staff with relevant language skills and not by professional translators.