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Title: Activity of perch, *Perca fluviatilis* L. in relation to water temperature.

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It is not difficult to catch perch during the spawning season. At this time up to two thirds of the fish in a small lake can be caught by using only cages.

In the summer the perch is generally found in the warm surface waters and only rarely does it go into the deeper levels. In other words the perch seeks the warm water. With this in mind one might expect the changes in temperature to be reflected in the patterns of activity.

Catchability and activity in relation to temperature.

Of all environmental factors, the perch as a poikilotherm, is probably most affected by the variation in temperature. Light, air pressure, wind, carbon dioxide and oxygen quantities also have an effect on the activity of perch.

Hergenrader & Hasler (1967) measured swimming speeds of the American yellow-perch in January - March and May - October periods. The water temperature varied from 1° - 22° C and swimming speeds from 12 to 28cm/sec. The swimming speed increased nearly evenly with rising temperature, with maybe the greatest increase in speeds at 10° and 20° C. Thus activity in regard to swimming was greatest at the highest temperatures.

Merivesi's (1969) results on perch catches in relation to temperature, show that the quantity of the catches increases with rising temperatures up to 15° C and after that starts to decrease. It is not so easy to catch a perch on a hot day. (sic!)

While working on the diurnal periodicity of activity of the perch,

quantities of catches were also studied. (Lind & Tenhunen). The number of fish caught and water temperature during the 3 summer months are shown in the following table:

month	the average number caught per day	water temperature °C
June	50	8 - 15
July	115	15 - 18
August	40	11 - 17

The catch in July (the warmest month) is over twice the size of that in June and nearly three times that in August. Therefore the size of catches increases with rising water temperature, but not directly since the August numbers are a little less than in June despite the higher water temperatures in August. Thus the numbers caught are not only determined by temperature. Very high temperatures were not recorded during the study period.

The number of fish caught and the number of hours of activity seem to be directly related, as shown in the table below. This shows the average number of hours when fish were active and the number of activity peaks, both per 24 hours.

month	the average number of activity hours/day	activity peaks/day
June	6.8	1
July	18.5	2-3
August	10.9	1-2

In July when the greatest numbers of fish were caught, the fish were active throughout the day and night. In June they were active for a few hours in the evening and night and in August activity occurred at sunset and sunrise. June and August activity periods were 2 and 3 times shorter

respectively than in July.

The numbers of hours of activity, i.e. the number of hours during which fish were caught is related to water temperature, as is shown in the figure. It also shows that there is not a linear relation, because activity increases almost evenly up to 15°C and at temperatures higher than 15°C there is a sudden rise in the number of hours of activity.

In this respect these results differ with Merivesi's as his results show an opposite trend at temperatures higher than 15°C. Otherwise these two studies give similar results, and both indicate slightly less activity at temperatures of 13° - 14°C than at temperatures a few degrees lower. This decrease is undoubtedly due to the fact that at these temperatures spawning has already ceased after which the activity of the perch might be slightly reduced.

A general feature was that both the catch size and hours of activity increased with rising temperature, therefore the perch must be more active in warm water rather than in cold. This is linked to the poikilothermic character of the perch, because with rising temperature the metabolic rate and feeding periods increase thus resulting in increased activity.

Growth in relation to the seasons of the year.

Parallel to the research on activity, large-scale marking was carried out to establish the periods of growth during the year. As the marking was done during all the summer months and as a control, also in winter, results on growth periods were soon obtained.

After spawning, which took place in the beginning of June in lake Kiutajarvi, the fish generally had lost weight by the end of the month, or the weight remained unchanged. Any signs of growth only started to appear during the last days of June and the main period of growth was July

and the beginning of August. The weight of fish marked in August, when caught at later dates (up to the following spring) was found to be the same or more often less than at the time of marking. In other words many perch had lost weight during the winter.

In Ylempi Kalliolampi lake, where the population of big fish is sparse (Lind & Turunen) the perch grew also between August and the following June. But the greatest period of growth was July. The weight of one-year-old perch increased during June and July from about 2g to 9g and the length from 7 to 9cm. In August weight decreased from 9g to 7g with length remaining the same. The population of fish in this size group was very dense.

Same pattern emerged with the examination of the regeneration of injuries caused during catching. Most injuries occurred on the fins. In the fish marked during August and September the fin injuries had generally not healed by the following winter and spring, whereas in the fish marked during June and July regeneration had occurred regularly.

In England in lake Windermere the growth of perch according to information on scales and operculum bones, starts in May - June and ends in September - October, greatest growth occurring during June - August. Hardly any growth occurs in water temperatures below 15°C. In England the growth period is considerably longer than in Finland.

Growth and Activity

The growth of perch is generally restricted to the warmest time of the summer, which in the north is July. There are some exceptions to this rule, such as in very sparse populations when growth might occur also at other times, mainly June, September and October.

Activity, outside the spawning season, follows similar patterns, catches being 2 or 3 times greater during the warm water period than at other times. This period usually also occurs in July. Behaviour at very high temperatures

still requires more research.

Also the activity pattern during a 24 hour period is related to temperature. With the rise in temperature, the hours of activity increase, and in an area such as Kuusamo, where there is sufficient light also through the night, this results in a non-synchronous activity pattern.

Thus the growth, catchability and activity of the perch form a consistent inter-related pattern, which is best demonstrated during the warm water period in July.

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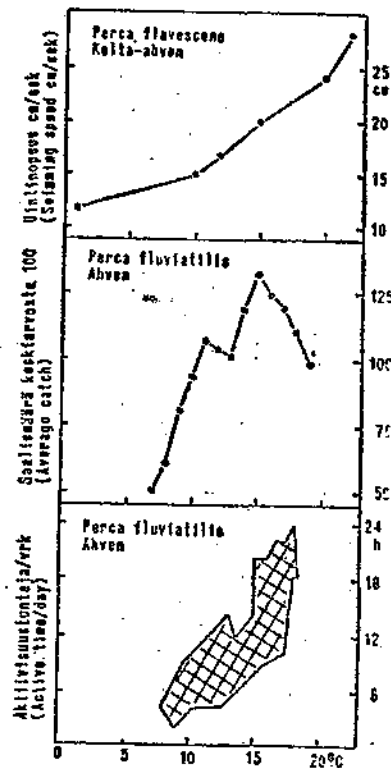
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Notice

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