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On the diel rhythm of motor activity in perch.

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The river perch (Perca fluviatilis L.), according to some evidence (5), is most active in the daytime hours, and displays seasonal changes of diel rhythm with a break of the rhythm in spring and autumn, according to others (3) two peaks of activity occur, at dawn and at dusk. B.P. Manteifel' and his co-authors (1) classify the perch with the crepuscular-daytime type of fish, in which the maximum activity appears with light intensity in a broad range (one - one hundred lux).

In the present work data were obtained on the motor activity of 3 perch measuring 18-20 cm, caught by net in the littoral of the reservoir and spawned under laboratory conditions.

On another day spawning they were placed in a modified apparatus of the construction of Müller & Schreiber (4), where their movements were recorded for eight days - from 28 April to 5th May 1974. The apparatus consisted of a ring-shaped aquarium with opaque walls (diameter of the outer wall, 90cm, of the inner, 50) and a recording system working on the principle of a photo-relay. The degree of intensity of movement of perch was judged by the number of crossings by the fish of a violet ray of light, transmitted through special apertures in the walls of the aquarium, per unit of time. Simultaneously the intensity of illumination at the surface of the water in the aquarium, the temperature of the water and the atmospheric pressure were recorded. During the experiment the fish were fed once in two days on a limited quantity of earthworms.

The alternating rise and fall in motor activity (number of crossings per hour) of the experimental fish takes place during different intervals of time (fig. 1a). By spectral analysis (2) it was revealed that the most reliable ( $P = 0.95$ ) oscillation of activity was with a period equal to 24 hours. The distribution of average hourly values of intensity of movement in the course of the 24 hour period has one maximum coming at 17 hours, and 2 minima, at 2 and 21 hours, and is very well correlated with the daily changes of light intensity ( $r = + 0.74$ ). According to the equation of regression, to each mean increase of light intensity 10 lux per hour corresponds an increase of motor activity of 4.5%, if one takes the number of crossings at night time as 100% (fig. 1b).

However, the mean diel values of activity have an inverse dependence on the diel level of light intensity ( $r = -0.67$ ), i.e. perch are more active on dull days than on sunny ones (fig. 2a, b). The temperature of the water also produces some influence ( $r = + 0.55$ ): the total increase of motor activity corresponded progressively to the temperature of water in the apparatus. Significant correlations between changes in intensity of swimming and atmospheric pressure, and likewise in the feeding regime, were not found.

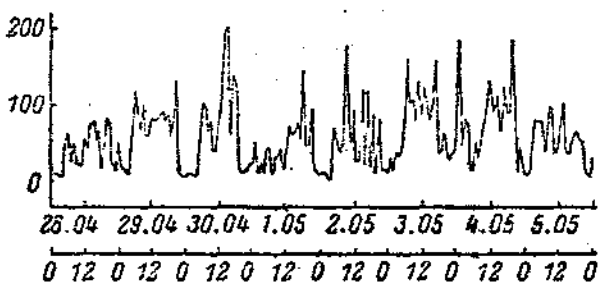
Thus, spawned perch in laboratory conditions and with a deficit of food have quite a definite diel rhythm of changes of swimming intensity, with a maximum in the light hours of the day. Between the daily distribution

of motor activity and the change of light intensity is observed a positive linear dependence, but very high level of light intensity in the middle of the day causes some lowering of activity. Temperature, evidently, does not bring changes in daily rhythm, but influences only the total of its level.

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a a)



б б)

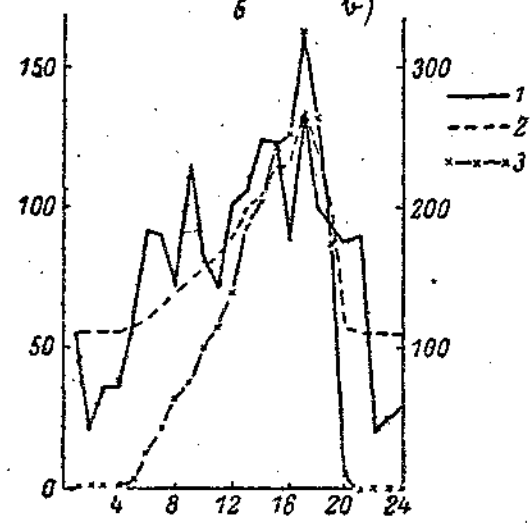


Рис. 1. Двигательная активность окуня.  
 а — абсолютное значение активности за период наблюдения. По оси ординат — количество пересечений в час; по оси абсцисс — дни (сверху), часы (снизу).  
 б — зависимость активности от суточного изменения освещенности. Кривые: 1 — эмпирическая, 2 — регрессионная, 3 — освещенности. По оси ординат — среднее количество пересечений в час (слева) и средняя освещенность, лк/час (справа); по оси абсцисс — часы.

Fig. 2.

Distribution of mean diel values of motor activity of perch, light intensity and temperature, in April - May. Broken line - mean increase in oscillation of values. Ordinate: a) - light intensity lux/hour; б) - no. of crossings by fish of the beam of light per hour; в) - temperature of water, °C/hour. Abscissa - days.

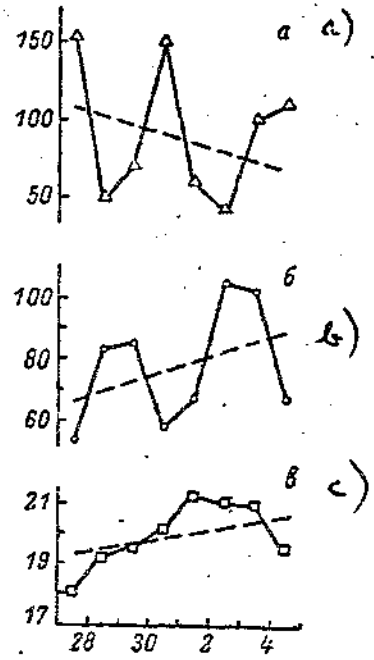


Рис. 2. Распределение среднесуточных величин двигательной активности окуня, освещенности и температуры в апреле-мае.

Пунктирная линия — средний уровень колебания показателей. По оси ординат: а — освещенность, лк/час, б — количество пересечений рыбей луча света за час, в — температура воды, °C/час; по оси абсцисс — дни.

9. 1. Motor activity of perch.

- a) Absolute significance of activity during the period of observation. Ordinate - number of crossings per hour. Abscissa - days (above), hours (below).
- b) Dependence of activity on diel changes of light intensity. Curves: 1 - empirical; 2 - regression; 3 - light intensity. Ordinate - mean number of crossings per hour (left), and mean light intensity, lux/hour (right). Abscissa - hours.

### **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.