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The Downstream Migration of the Young Salmon in the Arctic

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The peculiarities of light conditions in the Arctic effect greatly the life cycles of different animals including the young salmon during their downstream migration.

During the investigations of the biology of young chum and pink salmon in rivers of the Kola Peninsula in recent years, some significant fluctuations in the time of their downstream migration were recorded.

The downstream migration of the Pacific Ocean pink salmon and chum young begins and even takes place at night because then there is less possibility to get into contact with many predators. In the Kola Peninsula, however, the young have to migrate during the polar day. Under these conditions the predators not only feed on the young, but also restrain their downstream migration in the rivers as well as their movements in the inshore waters. Therefore, the pink salmon and chum young stay in the river for a much longer period and their downstream migration is slower.

This was observed both for the young grown at the rearing plants and for the wild salmon. Thus, for example, observations in 1962 showed that pink salmon downstream migrators reached a length of 5 - 5.6 cm on the spawning grounds of the small Sidorovka River (northern shore of the Kola Peninsula), some kilometers from the estuary. The rate of speed for the downstream migration of pink salmon young grown at the rearing plants is not a constant value, but depends on size and number of young released. When small sized young or larvae are released, they may stay in the river to the end of the summer. When the young are bigger, the duration of their downstream migration is shorter (see Figure I). It is also more intensive when they are released in greater number simultaneously from the rearing plant. Corresponding observations were made for chum young. Taking into account these peculiarities in the behaviour of pink salmon and chum young, studies of downstream migration of the Atlantic salmon (Salmo salar) young in the conditions of the polar day were of special interest for the authors.

Investigations of the downstream migration of Atlantic salmon young in relation to the light conditions were conducted in the Soyana river which runs into the Mizensky Gulf from the east in 1973.

The counting of young in that river was started in 1965, and the number of downstream migrators registered was 24 000 in 1973.

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During the downstream migration period, the amount of light in the underwater layers was determined with help of a selenic photo-cell installed at the level of the trap opening. The light elimination rate was recorded on the band of the registrar. The number of downstream migrators was registered six times daily, and water temperature and level were determined as well.

Data obtained show that the greatest number of youngs went downstream within the period from 13.00 to 19.00 hours. However, both the daily rhythm of downstream migration and the number of youngs going downstream depend greatly on the peculiarities of light conditions. In cloudy periods the number of youngs decreased sharply, whereas in sunny days downstream migration was more intense. Hours of sunshine, whether early at dawn or late at sunset, may shift correspondingly the intensity rate of the downstream migration for the youngs.

When the sun is shining, the patches of sunlight appearing on the water are registered on the band as vertical touches. It may be noted that the most intensive downstream migration was observed simultaneously with that line, in spite of the fact that the level of total light intensity may be relatively low. The width of the line characterizing the presence of patches of sunlight on the water surface shows that the rate of lighting fluctuates with high frequency within the range 125-500 lux, which may make up from 7 to 30% of the total submarine light. A speedy movement of the light belt in the water mass as a result of the patch of sunlight is a phenomenon of great importance. Under these conditions the contact between the Salmo salar youngs and the predators diminish greatly.

Sunlight effects not only the daily rhythmic of the downstream migration, but also its periodicity (Figure II), whereas no connection is observed between the temperature and the level of water. Comparison between the periodicity of young downstream migrators of Atlantic salmon and the number of sunny hours in a day, temperature and level of water, for the Soyana River throughout the period from 1965 to 1972, confirmed this regularity.

Evidently, the availability both of sunlight and of the patches of sunlight is an important environmental factor in relation to the Atlantic salmon youngs' downstream migration under the conditions of the polar day, favouring the greater speed for downstream migration and the survival of the individuals during that period, similar to the effect of darkness, water turbidity, high flood and other factors in other cases. It should be mentioned that the number and the size of downstream migrators also effect their movement rate.

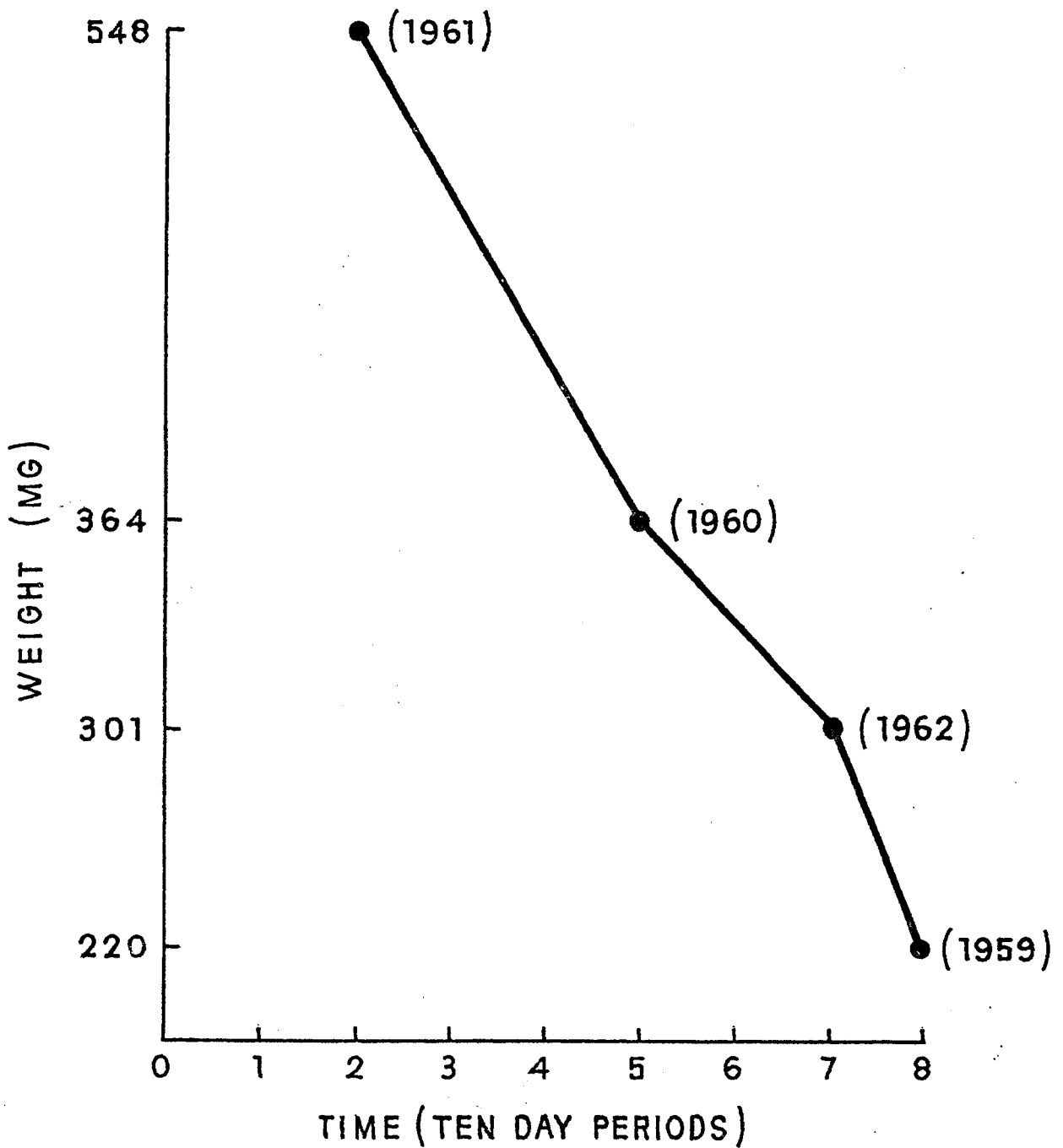


Figure I. Duration of the period of downstream migration of pink salmon youngs grown at the rearing plants in the Kola River (Kola Peninsula) in relation to their weight at release.

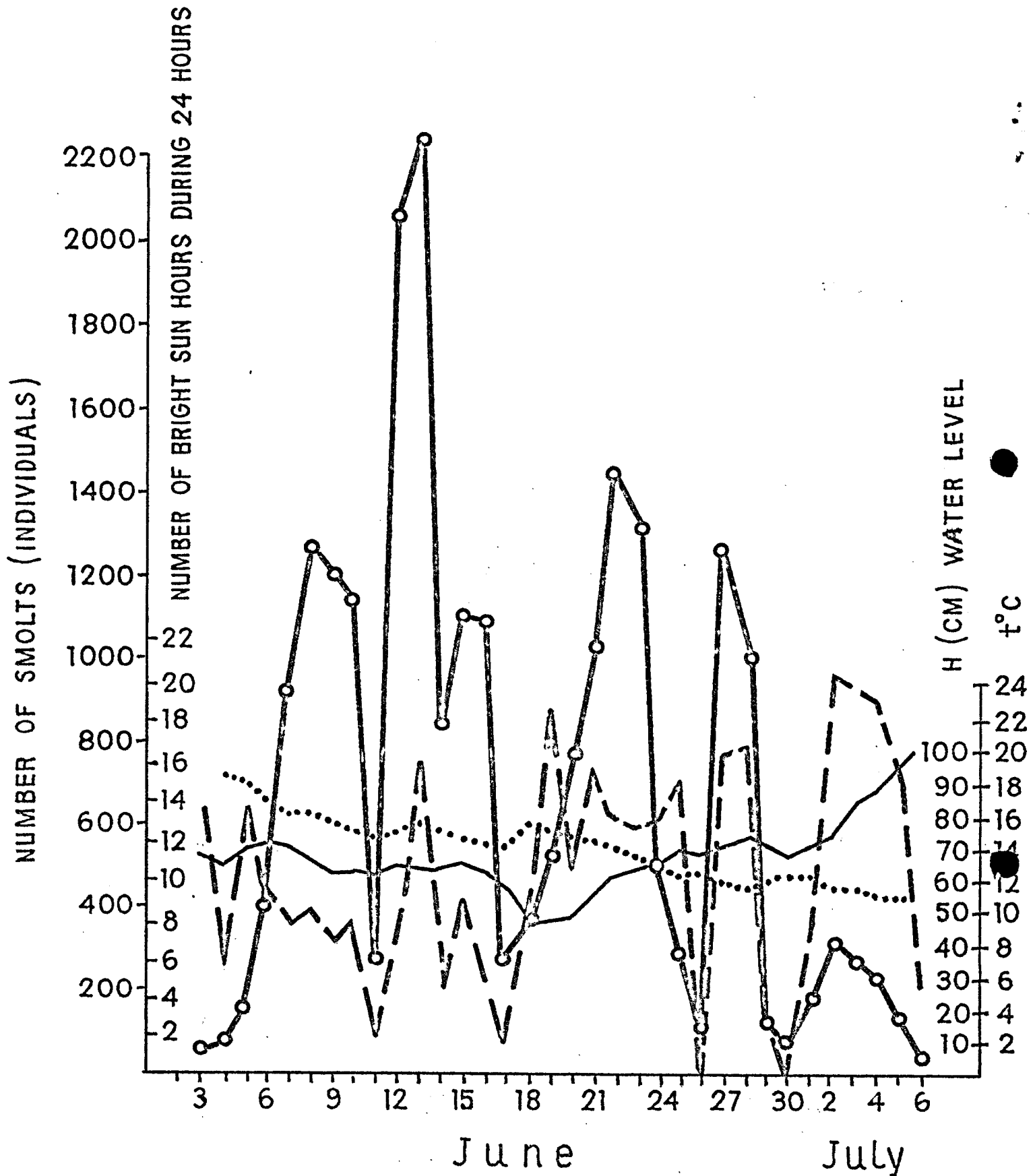


Figure II. Duration of the period of downstream migration of *Salmo salar* youngs in the Soyama River in 1973 (○—○); duration of the sunlight (number of sunlight hours during a day) (----); water temperature (—) and water level (.....).