

M^o 2572

Oxygen Consumption of Mayfly Nymphs in Relation to Available Oxygen

LITTLE is known of the reasons why freshwater animals are confined to certain habitats, or of the effects of their particular environments on the metabolism of the animals. The first steps in a study

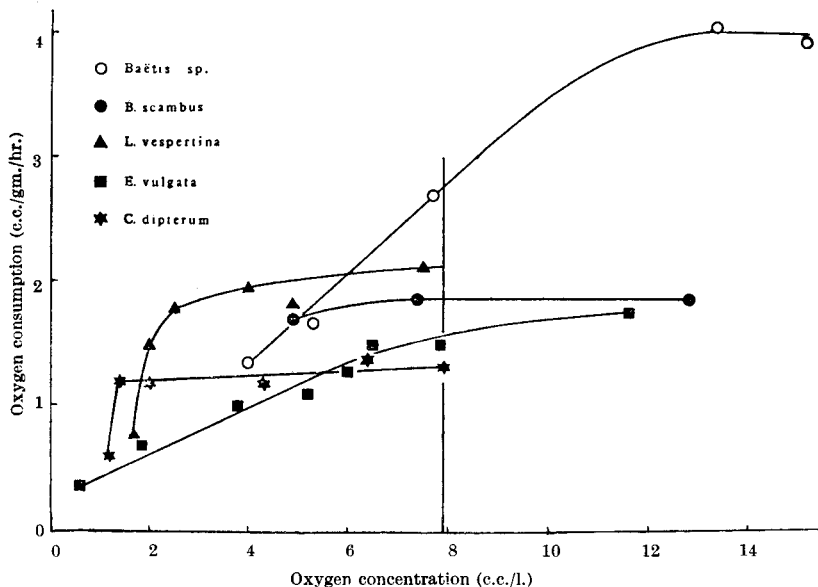


FIG. 1.

of these questions were reported in NATURE, 130, 277 (1932). It has been shown that certain animals living in swift streams have a higher oxygen consumption and rate of heart beat than nearly related animals living in still waters, and that they are less resistant to water lacking oxygen^{1, 2, 3}. The next step has been to study the oxygen consumption of such animals in terms of the available oxygen, and we have confined ourselves to mayfly nymphs. We have used *Baëtis scambus* and *Baëtis sp.* (the latter is one third the weight of the former) from a swift stream, *Leptophlebia vespertina* from Lake Windermere, *Cloëon dipterum* from a pond, and *Ephemera vulgata* living in mud in a pond. Our results are summarized in Fig. 1, in which the vertical line at an oxygen concentration of 7.9 c.c. per litre marks the oxygen content of water in equilibrium with the

atmosphere at the temperature of the experiments, namely, 10°.

It is clear that *Baëtis* sp. and *Cloëon dipterum* present extreme contrasts: as the available oxygen falls below air saturation, the oxygen consumption of *Baëtis* sp. falls off at once, while that of *Cloëon dipterum* does not decrease until the oxygen concentration is below one fifth air saturation. The oxygen consumption of *B. scambus*, which is much lower than that of *Baëtis* sp., decreases very little when the oxygen in the water diminishes. The oxygen consumption of *Ephemera vulgata* falls as soon as the oxygen in the water begins to decrease, but less rapidly than that of *Baëtis* sp. *Leptophlebia vespertina* recalls *Cloëon dipterum*: its oxygen intake falls slowly at first, and then, below one third air saturation, it drops suddenly.

As the oxygen in the water is raised above air saturation, *Baëtis* sp. increases its oxygen consumption until it has reached one and a half times its value in Nature, while, on the contrary, the oxygen intake of *Baëtis scambus* remains steady, and that of *Ephemera vulgata* scarcely rises.

It is evident that the species most dependent on the oxygen in its environment is *Baëtis* sp., and it lives in streams where oxygen is always abundant. *Cloëon dipterum*, the most independent form, was taken from a pond in which the oxygen falls low at night in summer. But if the behaviour of these species fits their environments, that of *Ephemera vulgata* apparently does not do so, for it was found buried in mud in a pond, yet its oxygen intake drops as soon as the oxygen in the water decreases. These results will be published in full in the *Journal of Experimental Biology*.

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¹ H. Munro Fox and B. G. Simmonds, *J. exp. Biol.*, **10**, 67 (1933).

² H. Munro Fox, B. G. Simmonds and R. Washbourn, *J. exp. Biol.*, **12**, 179 (1935).

³ R. Washbourn, *J. exp. Biol.*, **13**, 145 (1936).