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Function of the Gills of the Mayfly Nymph,
Cloeon dipterum

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It is generally supposed that the plate-like abdominal gills occurring in some ephemeropterid nymphs are respiratory organs, although little experimental evidence is available to support this view. Moreover, both Dewitz¹ and Cuénot² have shown that these gills are not essential to life. Recently, another function has been ascribed to these structures by Eastham³, who shows that in the nymph of the mayfly, *Ecdyonurus venosus*, they act as paddles which bathe with water the gill tufts attached to their bases.

In order to test whether or not these gill plates are truly respiratory in nature, the oxygen consumption of both the normal and gill-less nymphs of the mayfly, *Cloeon dipterum*, has been measured at 10° C. at various oxygen concentrations. The results are shown in Fig. 1, each point in which is the average of three to eight experiments. This figure may be compared with Fig. 1 of Fox, Wingfield and Simmonds⁴.

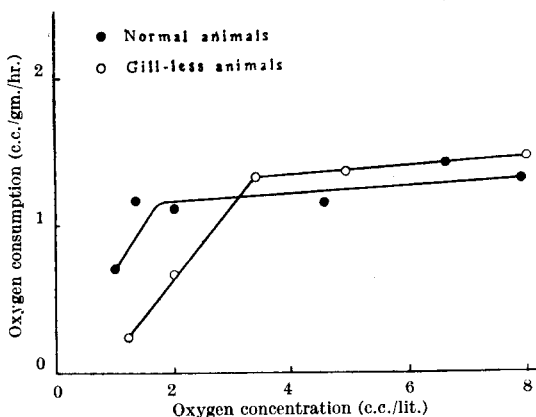


Fig. 1.

It will be seen that, as the oxygen content of the water is decreased, the oxygen consumption of both the normal and the gill-less nymphs remains nearly the same until a concentration of about 3 c.c./lit. is reached. Below this concentration the oxygen consumption of the gill-less nymphs falls off rapidly, but this marked decrease does not occur in the normal animals until the oxygen content of the water is reduced to about 1.5 c.c./lit. It is clear that the gills in this species of mayfly nymph only aid

the oxygen consumption in water of low oxygen concentration, that is, below 3 c.c./lit.

At high oxygen concentrations, the gills of *Cloeon dipterum* only beat intermittently, but as the oxygen content of the water falls the quiescent periods are much reduced, thus causing a greater volume of water to pass over the dorsal surface of the animal in a given time.

It is not yet clear whether at low oxygen concentrations the level of oxygen consumption in the normal animal is maintained by gaseous exchange taking place at the gill surface, or whether under these conditions the gills merely act as paddles which pass a greater volume of water over the respiratory surfaces of the animal. Either of these processes would enable the animal to maintain its normal level of oxygen consumption at low oxygen concentrations.

The results summarized above will be published in full elsewhere.

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¹ Dewitz, H., *Zool. Anz.*, **13**, 525 (1890).

² Cuénot, L., "L'Adaptation", Paris (1925).

³ Eastham, L., *J. Exp. Biol.*, **14**, 219 (1937).

⁴ Fox, H. Munro, Wingfield, C. A., and Simmonds, B. G., *J. Exp. Biol.*, **14**, 210 (1936).