OXYGEN CONSUMPTION OF *MUGIL MACROLEPIS* IN RELATION TO DIFFERENT SALINITIES

C. V. MATHEW
Calicut Research Centre of C.M.F.R. Institute, Calicut.

ABSTRACT

Laboratory experiments conducted on the oxygen consumption of *Mugil macrolepis* in relation to 3 different salinities show that a straight-line relationship can be derived by using the formula: $Q = aw^{b}$, the oxygen consumption being $0.756W^{0.832}$, $0.538W^{0.876}$, and $0.486W^{0.893}$, respectively at salinities 7‰, 20‰ and 30‰.

The rate of oxygen consumption is an index of the metabolic activities of the fish. Several earlier workers (Job 1969, Fry 1947, Kinne 1964, Rao 1965) have shown that in euryhaline species the environmental salinity to a certain extent influences respiration. The present study deals with the effect of salinity on the respiratory rate of the tropical euryhaline fish *Mugil macrolepis* (Smith), a species useful for aquaculture.

M. macrolepis were collected by using cast net, from Korapuzha estuary near Calicut. The fish were kept in fibreglass tanks of size, 75 cm x 45 cm x 45 cm, filled with water of known salinity. In view of their tolerance to a wide range of salinity, three far-different salinities were chosen, viz., 7‰, 20‰, and 33‰. For lowering the salinity, fresh water was mixed with sea water. The fish were acclimatised in these salinities for 24 h. Since the fish show reluctance to feed immediately after collection, and as the rate of respiration may decrease due to starvation, the experiments were started only after a time lapse of 3-4 days.

The respiratory chamber used for the experiment was of capacity 4.83 l, circular in shape, with an inlet and an outlet. The water used for each experiment was well-aerated and filtered. Before each experiment, the fish was kept in the respiratory chamber for 15-20 minutes. For each experiment a control was set up to determine the rate of respiration by bacteria and other organisms. Each experiment had a duration of 45-60 minutes.

Fish weighing 16.9 to 85.5 g were used for the experiments. The experiments were conducted at a water temperature of 28°C ($\pm$1) As the rate of oxygen consumption of *M. macrolepis* decreases when the dissolved oxygen falls below a certain level, this level was found out, which was 4.O mg/l. Care was therefore taken to restrict the experiments at oxygen levels higher than this.

The results are graphically illustrated in Fig. 1. The equation derived by using the formula $Q = aW^b$, denotes a straight-line relationship on plotting the logarithmic values between body weight and oxygen consumption. According to Winberg (1956) the b values for many fish species is in the region of 0.8. The b values in these experiments were 0.932 at salinity 7%, 0.876 at 20‰ and 0.893 at 33‰.

The a value, which is the intercept of Q, is 0.756 at 7 ‰, 0.583 at 20‰ and 0.486 at 33 ‰. The a value at 20 ‰ is only about 77% of a value at 7 ‰. The a value at 33 ‰ is only about 72% of the a value at

Kutty (1971) conducted experiments on the prawn, *Penaeus indicus* in 3 salinities, 7, 21 and 35. He points out that the lowest metabolic rate is at

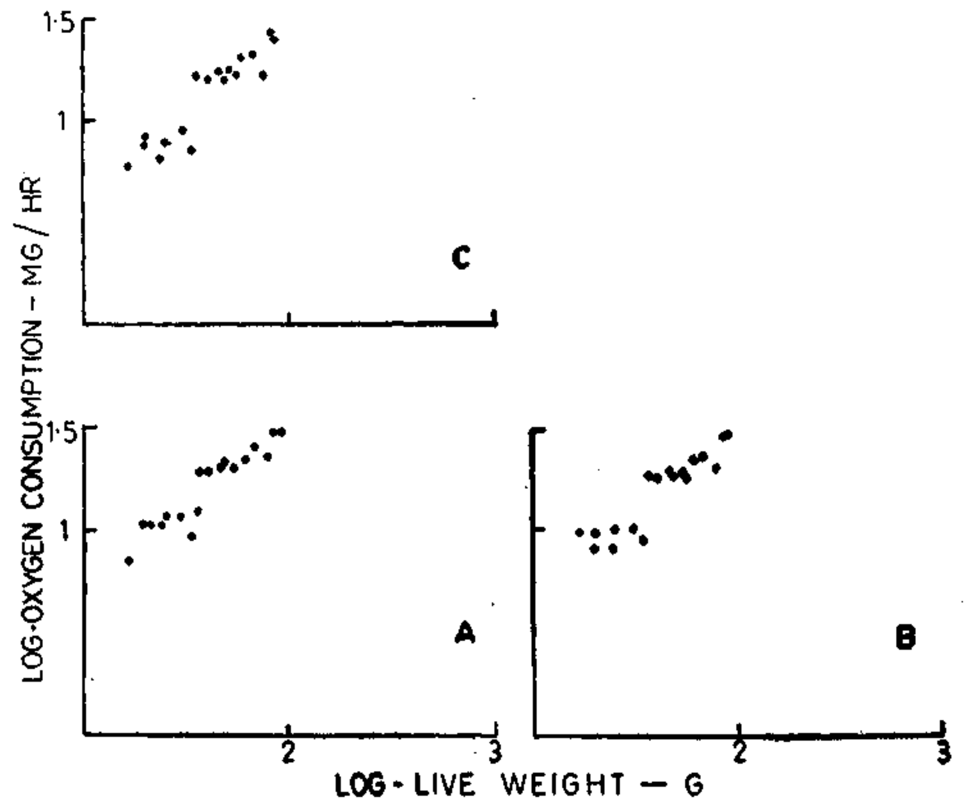

FIG. 1. Double logarithmic plot of oxygen consumption of *M. macrolepis* in relation to different salinities. A: 7%o. B: 20‰. C: 33‰.

the salinity range 10 to 20 outside which the standard metabolic rate tends to increase. Job (1969), who experimented on *Tilapia mossambica* in relation to 3 salinities, 0.4, 12.5 and 30.5, points out that the metabolic rate in relation to salinity is size-dependent. The present experiments show that there is a definite relationship between the salinity and rate of metabolism. It is also clear that this is size-dependant, though the metabolic rate decreases as the salinity increases.

I am grateful to Dr E. G. Silas, Director, for critically going through the manuscript and offering helpful suggestions. My thanks are due to Dr G. Seshappa, for giving constant encouragement throughout the experiments.

FRY, F. M. J. 1947. *Univ. Toronto Stud. biol.* Ser., 55: 1-62.

JOB, S. V. 1969. *Mar. biol.*, 2: 121-126.

KINNE, O. 1964. *Oceanogr. mar. biol. A. Rev.*, 2: 281-339.

KUTTY, M. N. 1971. *Mar. biol.*, 2: 125-131.

RAO, V. PARVATHESWARA. 1965. *Helgolander wiss. Meeresunters*, 12: 301-314.

WINBERG, G. G. 1956. Intensinest. Obmena ipisoch potribnosti xyb. Naunchyne. Trudy Belorussokovo Gosndarstvennovo Universitata Imeni. V. I. Lenia, Minik, 253 pp and *Fish. Res. Bd. Can., Ser.* 194, 202 pp.