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Seasonal Changes in Metabolism of Four South Temperate Marine Fishes

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Abstract

GENERALLY speaking, the fishes included in this study demonstrate a loss of sensitivity to temperature during the warm season, such sensitivity being measured in terms of metabolic rate in the upper range of temperature tolerance.

Forsterygion varium and *F. robustum* show a clear relationship between size and metabolic rate, following cold history. With warm history these species show no significant relationship between size and metabolic rate. Hence, in these two species the small animals can make a better adjustment to cold than can the large ones, but acclimation to heat is not size related.

In *Pseudolabrus celidotus* there is, in some seasons, an extreme inverse relationship between size and metabolic rate. It is indicated that this species develops unusual metabolic regulatory mechanisms. The metabolic-rate temperature curve becomes flattened during the warm season.

INTRODUCTION

THE metabolic rate of poikilothermic (i.e., "cold-blooded") animals depends upon the environmental temperature. Very approximately, it has been generally considered that an increase of 10° C. results in a doubling of the metabolic rate, over the normal range of temperature tolerated by a given species. The increase of metabolic rate with temperature rise is logarithmic. This relationship is commonly expressed as the temperature coefficient or Q_{10}, the factor by which metabolic rate increases with a 10° temperature rise. Measurements of metabolic rate at different temperatures demonstrate the degree of dependence of metabolism upon temperature and have been termed "acute" measurements by Bullock (1955) in his review of the subject.

The relationship between metabolic rate of poikilothermic animals and environmental temperature is complicated by the phenomenon of thermal acclimation. After transfer to a lower temperature, an animal usually shows the expected depression of metabolic rate, followed after several days or weeks by a return approximately to the original level. A similar compensation of metabolism, but

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