CHAPTER III

CHANGES IN THE PYRUVIC ACID LEVEL OF THE MUSCLE OF OPHICERHAL
PUNCTATUS BLOCH DURING STORAGE AT -4°C

INTRODUCTION

A survey of literature yields little information on the keto-acid composition of fish muscle, although these compounds are known to be important in the intermediary metabolism of tissue and organisms (Baldwin, 1952).

Pyruvic acid is the penultimate stage of muscle glycolysis. The latter phenomenon can lead to sequential rises and falls both in the pyruvic as well as in the lactic acid levels of the muscle and these, in turn, may affect the pH of the tissue. The pyruvic acid is considered likely to contribute to the flavour of fish meat (Jones, 1959). Thus, in addition to its purely biochemical importance, pyruvic acid can be of significance in the technology of fish as food.

Practically nothing has appeared on the pyruvic acid content and its variations in the muscle of the freshwater fishes during storage. The present chapter deals with the
Fig. 15. Changes in the muscle pyruvic acid content of
C. punctatus during storage at -4° C.
observations on the changes in the pyruvic acid content of the muscle of *Ophisthopus punctatus* flesh during storage at low temperature (-4°C).

**MATERIALS AND METHODS**

Details of the techniques of muscle sampling and storage were the same as described elsewhere (page 32), except that the fishes were stored at -4°C for a total period of 16 days. Estimations of pyruvic acid were made, after the interval of every four days, according to the method of Friedemann and Haugen (1943), details of which have been given under 'Procedure and Methodology'.

**RESULTS AND DISCUSSION**

The values of the pyruvic acid concentration in the muscle of *O. punctatus* during storage at -4°C have been given in Table 11 and shown graphically in Fig. 15.

From a value of 10.33 mg in the fresh muscle, the pyruvic acid concentration rose to 29.91 mg/100 g in the fishes stored for four days. This increase was found to be about 57%. Thereafter, the pyruvic acid level began to fall steadily. On the eighth, twelfth and sixteenth days of storage the values were found to be 21.33, 11.50 and 5.41 mg/
100 g, respectively. The decline in the pyruvic acid content between four to sixteen days of storage was about 81%.

The rise recorded in the level of pyruvic acid of the muscle of *G. puncticatus* during the first four days of storage at -4°C, appears primarily be due to the degradation of muscle glycogen. Presumably, the glycogen present in the muscle is broken down under the action of phosphorylase and amylase into glucose-1-phosphate, maltose and glucose, respectively, and eventually into pyruvic and lactic acids and other compounds, as has been pointed out by Ono et al. (1957), Andreiev (1958) and Manohar (1970).

The eventual fall in the level of pyruvic acid after four days of storage at -4°C might be expected in a system in which keto-acid is catabolised or, in which precursors are in limited supply as a consequence of the leaching action of ice-melt water.

The action of lactic dehydrogenase (L.D.H.) which is well known for its role in the conversion of pyruvic into lactic acid, can account for the decline in the pyruvic acid level. It is known that the activity of the lactic dehydrogenase is enhanced by the cold storage of the fish muscle (Tappel, 1956).
Similarly, in the later phase of storage, between four to sixteen days, a decline in the glycogen phosphor- rylase activity may lead to the slow production of pyruvic acid, as has been observed during the present study. Also, the microbial attack, utilizing the pyruvic acid and its precursors, may be an additional causative factor in depressing the muscle pyruvic acid level (Jones, 1959).

It seems probable that Embden-Meyerhof pathway of glycolysis, requiring A.T.P. supply for chemical reactivity, gets altered in the later phase of muscle postmortem due to a decline in the A.T.P. level. The slowing pace of glycolysis with the period of storage, consequently, limits the production of pyruvic acid precursors.

**SUMMARY**

The pyruvic acid content registered an increase in the muscle of *Q. punctatus* during the first four days of storing the fish at -4°C. The later period of storage, between four to sixteen days, was marked with a rapid fall in the muscle pyruvic acid level of the fish. The initial rise in the pyruvic acid concentration was attributed mainly to the enzymatic breakdown of muscle glycogen. The decline in the amount of pyruvic acid beyond four days of storage, on the other hand, was perhaps the result of its
conversion into lactic acid by the action of lactic dehydrogenase. It could also be the consequence of bacterial attack.