

# INFLUENCE OF ENVIRONMENTAL CHANGE OF TEMPERATURE ON ABALONE, *HALIOTIS DISCUS*, BEHAVIOR

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## ABSTRACT

Influence of environmental temperature change on abalone was measured as the functions of locomotion speed and respiration rate in the experimental tank. Oxygen consumption was increased linearly with temperature rise while maximum locomotion speed was found in 20 C.

*Keyword: abalone, oxygen consumption, locomotion length*

## INTRODUCTION

Abalones are used for luxury marine food items as well as important craftwork for ceremony in Japan. Annual catch of abalones in Japan increased gradually since 1960s and the maximum catch was recorded in 1970, 6466 tons. The amount of catch was quickly decreased for their over fishing from 1970 and in 1997, it was only 2218 ton. Artificial aquaculture of abalone has been tried since 1975 for stock recovery and young shells were released in the coastal areas. Aquaculture farm of abalone is successfully developed as well.

In Thailand, shrimp aquaculture is popular and important agricultural export industry. However many problems arise recently, such as shrimp disease and environmental problem. Abalone should be more expensive marine food items than shrimp and is expected hopeful. As the biological and environmental information are very few about abalones, we need to understand fundamental biological information on abalone to keep stable supply of the in the aquaculture.

We tried experimentally to understand the effect of water temperature on their behavior as the function of their locomotion speed and oxygen consumption.

## MATERIALS AND METHODS

To understand physiology of abalones we measured oxygen consumption. To understand behavior of abalones we measured locomotion length.

We used mature disc abalones, *Haliotis discus*. They were cultivated in a reserved tank under L12:D12 condition before experiments. Table 1 is shell length and wet weight of the abalones.

### Experimental 1: Oxygen consumption

Each abalone was released into the respiration chamber. It was left for 24 hours before experiments for acclimation. After 24 hours, the respiration chamber was placed in the temperature controlled water bath. The valves were closed and chamber was sealed. Dissolved oxygen concentration in the chamber was measured with DO meter every 1 minute. The rate of oxygen consumption was calculated. The water temperature in the chamber was changed in 4 cases in each experimental series, 10, 15, 20 and 25 ° C.

### Experimental 2: Locomotion length

Each abalone was attached with a light-emitting diode float and released into 500L tank calmly. It was left for 24 hours before experiments for acclimation. After 24 hours, a piece of kelp was put near water inflow, and the opposite side, the habitat was put near water outflow.

We started to monitor the locomotion of abalones for 24 hours with a CCD camera. The laboratory was in darkness, and the position of the abalone was measured using a light-emitting float. These data were continuously recorded on a personal computer connected with RS-232C. We could estimate their locomotion.

## RESULTS

### Experimental 1: Oxygen consumption

The correlation between oxygen consumption and water temperature is shown in Fig 1. The oxygen consumption increased with water temperature. Between 10 and 25 ° C, oxygen consumption has a linear relation to temperature.

## Experimental 2: Locomotion length

The correlation between oxygen consumption and water temperature is shown in Fig. 2. The abalones don't move actively in 10, 15, 25 ° C. Those locomotion lengths are from 4.8 to 17.1m/day. The locomotion length in 20 ° C is 26.9m/day. It is significantly higher than in other water temperature.

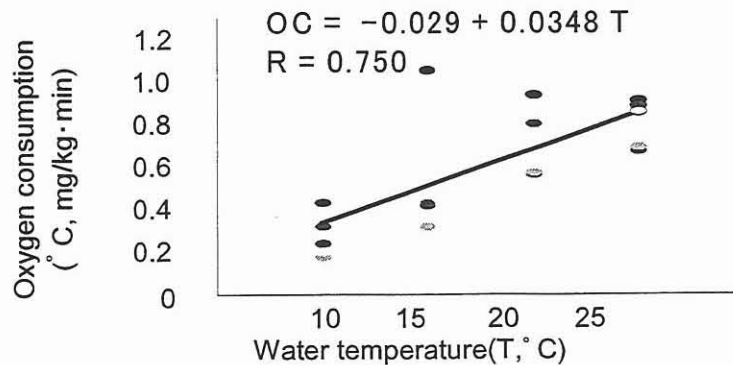


Figure 1. The relationship water temperature and oxygen consumption

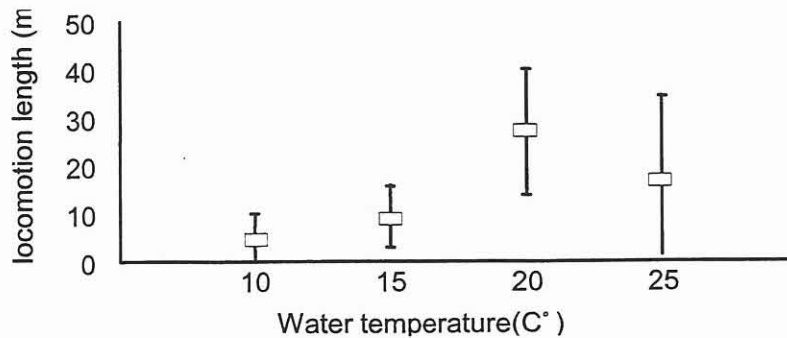


Figure 2. The relationship water temperature and locomotion length

## DISCUSSION

We overlapped Experimental 1 and 2 results. We can see the abalones consume less oxygen consumption and move longer distance in 20 ° C than in 25 ° C. The results indicated that abalone had lower metabolic rate and walked around more at 20 ° C condition than the one at under 25 ° C condition, It suggested that the condition in 20 ° C is more suitable condition for abalone than in 25 ° C.

We suggest that abalone's suitable environmental by combining abalone's physical and behavior information.

## CONCLUSION

The oxygen consumption increased with water temperature ranging from 10 to 25 ° C. The locomotion length of abalones under 20 ° C was 26.9m/day, significantly longer than those under 10, 15 ° C.