Short Paper

Changes in the Electrophoretic Pattern
of Mucous Solution Extracted from Gills
of the Yellowtail *Seriola*
quinqueradiata Affected
by the Red Tide

Hiroshi Kobayashi,*¹ Yukinori Takahashi*²
and Toshiaki Itami*²

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In exposure to the red tide, blooms of *Chattonella* sp., fish have been proved to suffer from obstructed oxygen uptake.^{1,2)} For branchial respiration, the role of a mucous substance on the gill surface has been noted.³⁾ Recently, changes were found in the electrophoretic patterns of glycoprotein from this gill mucus in the yellowtail *Seriola quinqueradiata* that had been exposed to the red tide, and the results are described below.

Twelve yellowtail, with an average body weight of 113 g, were used. The fish were divided into two groups, one being used to investigate effects of the red tide and the other as a control, and 6 fish were placed in each experimental basin (cubic contents: 20 l). In the red tide experiment, the fish were exposed to *Chattonella* sp. blooms of 6,200 cells/ml. *Chattonella* blooms were cultured in the medium of SWM-III under the controlled conditions. At time points of 10 min (Exp. I: fish swimming normally), 17~19 min (Exp. II: fish beginning to lie laterally) and 24~27 min (Exp. III: fish continuously lying laterally) after exposure, 2 fish were taken out, and their gills were excised. A piece of gill filaments (about 5 g/fish) was immersed in 20 ml of distilled water. After 1 hour of immersion, mucous solution was prepared by filtration. In the control experiment (Exp. IV), 6 fish were kept in natural sea water and treated in the same manner as those in the red tide experiment, although the sampling times of fish after exposure were 10, 20 and 30 min, respectively. The mucous solution obtained was dehydrated to a concentration of about four-fold by polyethylene glycol (M. W.: 1,000) through a cellophane tube. Then, the glycoproteins in the mucous solution were analyzed by polyacrylamide gel electrophoresis (PAGE). After electrophoresis, polysaccharide was stained with PAS and decolorized by a routine manual procedure. The composition of PAS fractions was measured by a densitometer at 750 nm.

Electrophoresis of the glycoprotein in the mucous solution revealed 11 bands, and this number was com-

Fig. 1. Relative change in composition of glycoprotein in gill mucus revealed by electrophoresis in the yellowtail. Exp. I, Exp. II and Exp. III, red tide experiments; Exp. IV, control experiment (see text for details).

mon in each experiment. Fig. 1 shows the relative compositional change of each glycoprotein fraction. According to the order of arrangement from the cathode side, the fractions were designated F1-F11.

Fractions that changed markedly due to the red tide were F1, F2, F4, F7, F8 and F9. In Exp. I, F1, with a relative mobility (R_m) of about 0.03, showed a conspicuous compositional change. F2 ($R_m \approx 0.04$) was increased in all three of Exp. I, II and III. F4 ($R_m \approx 0.09$) gradually increased in accordance with the time of exposure to the red tide. In contrast, F9 ($R_m \approx 0.45$) decreased upon exposure to the red tide and was particularly, decreased in Exp. II and III. In Exp. IV, fractions that obtained in three sampling times showed all the same feature.

The red tide was thus shown to cause a change in composition of the glycoprotein in the gill mucus. Therefore, this change is assumed to be related to the gas exchange on the surface of the gill epithelium. Further research on this aspect is expected.

References

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*¹ Faculty of Agriculture, Kinki University, Kowakae, Higashiosaka, Osaka 577, Japan (小林 博: 近畿大学農学部).

*² Shimonoseki University of Fisheries, Nagatahonmachi, Yoshimi, Shimonoseki 759-65, Japan (高橋幸則, 伊丹利明: 水産大学校).