CONTRIBUTION OF ENCLOSED COASTAL SEA TO TIDAL RIVER WITH DISSOLVED OXYGEN

KONDO MASAAKI
Faculty of Bioresources, Mie University, 1515 Kamihama, Tsu, Mie 5148507, Japan

Dissolved oxygen (DO) is one of the important water quality indexes. This paper explains low DO environment in tidal river affected by enclosed coastal sea and riverbed. The Iwata River in Mie Prefecture and Ise Bay in Japan are introduced. The Iwata River flows into Ise Bay. The riverbed consists of mud. In Ise Bay, which is a typical enclosed coastal sea, the depletion of DO is caused every summer. The oxygen-depleted water is distributed nearer coast of Mie Prefecture in Ise Bay.

Salt water intruded from Ise Bay provides the base of low DO condition in the Iwata River. Under the spring tide in summer, water quality in the Iwata River was observed during one tidal cycle. In the same season, the observation of water quality in Ise Bay was conducted. Dissolved oxygen concentration in the Iwata River agreed well with that in Ise Bay. It is found that the oxygen-depleted water in Ise Bay intruded into the Iwata River, and the DO concentration of the intruded salt water at high water was range of 4 to 5 mg/L. Dissolved oxygen concentration at low water was 2 mg/L.

Dissolved oxygen consumption by riverbed provides low DO condition in the Iwata River. Riverbed material and salt water were subjected to experiments. In consideration of water condition in summer and weak stagnation in the upper tidal reach, temperature of water and bed material was allowed to be about 28°C. Salinity was allowed to be 2.8%. Water mass in experimental tank was allowed to be still. Results show that the DO concentration decreased by 3 mg/L. The DO consumption of 3 mg/L subtracted from the intruded salt water of about 5 mg/L was equal to the value at low water of 2 mg/L. Riverbed decreased the DO concentration of the intruded salt water.

The combination of two factors forms the low DO environment in the Iwata River on summer. The oxygen-depleted water in Ise Bay intrudes and becomes the base of the low DO environment in Iwata River. Furthermore, dissolved oxygen concentration in the Iwata River become lower, because of the DO consumption by riverbed.