Flooding Impacts on DO Environments in a Large Tidal River

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1. Introduction

Eutrophication was generally observed in tidal urban rivers due to low flow rate and large residence time. Therefore these rivers have severe environmental problems like intrusion of blue tide and massive fish death which was mainly caused by formation of hypoxic water mass. However there was little information on DO environments in large tidal rivers. Furthermore, although massive fish death were frequently observed after flooding, environmental impacts from inland to tidal rivers during flooding are still unclear (*e.g.*, Eyre and Balls,1999; Tappin, 2002).

The most crucial points concerning the above-mentioned issues is to collect field data of the riverine loads during flooding and DO environments in tidal rivers. To investigate DO environments in tidal rivers and its relation to floodings which are closely related to CSO impacts, we conducted field measurements on hydrodynamics and water quality environments in the Sumidagawa and Kandagawa Rivers, Japan. We also collected data of massive fish death in tidal river in Tokyo.

2. Methods

Massive fish death from 1997 to 2007 observed by Tokyo Metropolitan Government are used in this study. Total number of massive fish death during 11 years was 181. 70 % of the massive fish death were caused by low DO conditions.
Field measurements of the pollutant loads under flood conditions were performed using automatic water samplers in Kandagawa River. DO and other water-quality environemnts in Sumidagawa and Kadagawa Rivers were measured using a CTD sensor (Datasonde5x, Environmental System Inc.) in 2009 and 2010.

3. Results and discussion

Figure 1 illustrates points and periods in which massive fish death appeared from 1997 to 2007, showing that massive fish death were concentrated in tidal reach of small urban rivers like Kandagawa, Shakujiigawa and Nomigawa Rivers. A large number of massive fish deaths were also found in a large tidal river (Sumidagawa River) which connects to Kandagawa and Shakujiigawa Rivers. It is noted that these events of massive fish death were occurred in summer seasons and furthermore just after flooding events.
Figure 2 shows the contour maps of salinity and DO in Sumidagawa River before and after flooding event (Sep. 8, 2010). The results reveal that DO on Sep. 9 were lower than 2 mg/ L in overall region of Sumidagawa River due to the flooding event. These facts indicate that

inflows of CSO due to flooding events have an important role on reduction of DO concentration in the Sumidagawa River.

4. References

Eyre, B. and Balls, P. (1999). A Comparative Study of Nutrient Behavior along the Salinity Gradient of Tropical and Temperate Estuaries, *Estuaries*, **22**(2A), 313-326.

Tappin A. D. (2002), An Examination of the Fluxes of Nitrogen and Phosphorus in Temperate and Tropical Eestuaries: Current Estimates and Uncertainties, *Estuarine, Coastal and Shelf Science*, **55**, 885-901, doi:10.1006/ecss.2002.1034.

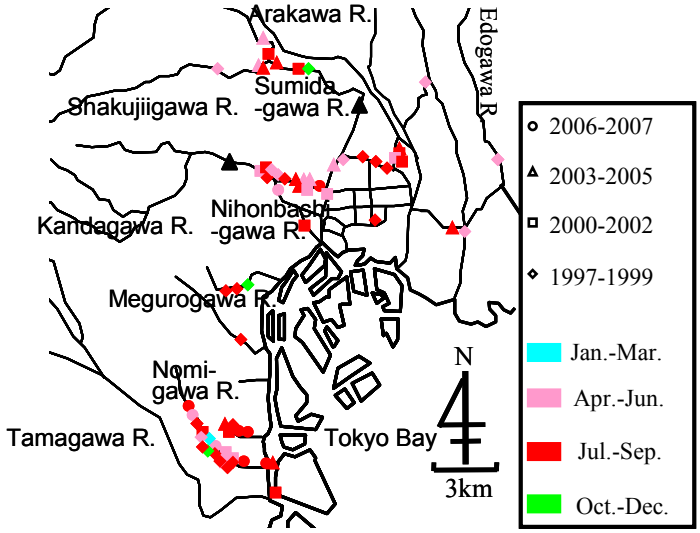

Figure 1 Points of massive fish death in Tokyo's 23 Wards.

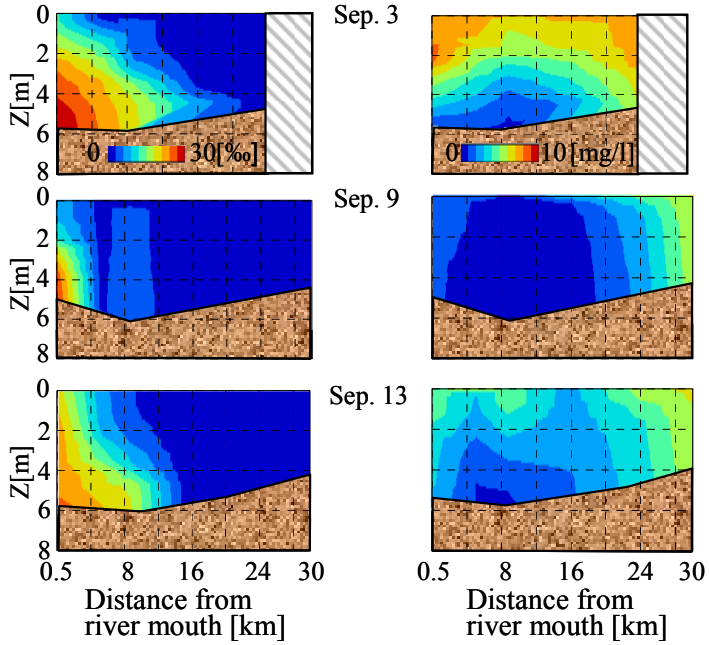

Figure 2 Contour of Salinity(left) and DO(right) in Sumidagawa River.