Coastal wetlands, dunes, estuaries, deltas and lagoons

Analysis Of Seawater Run Up In The Yodo River Estuary

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1. Background The estuary of the Yodo River in Japan has a fishery of natural freshwater clam. When a red tide of Alexandrium tamarense causes shellfish poisoning occurred in the estuary, the shipment of freshwater clams was halted due to government regulations. Red tides have occurred two times, in 2007 and 2011. A.tamarense is marine phytoplankton. Therefore A.tamarense is unable to propagate in freshwater. How then was the freshwater clam fishery affected? In order to clarify the factors of how seawater ran up the estuary, we have made close observation of the physical environment in the estuary. 2. Observation Red tides of A.tamarense occur from April to May in the estuary. So we observed before and during this period in the estuary 6 times; March 8(spring tide, one tidal period), April 2-3(neap tide, one tidal period), April 9(spring tide, ebb), April 23(spring tide, ebb), May 7(spring tide, ebb), May 21(spring tide, ebb). The area observed is between the river mouth to the Yodo river weir a distance of about 10km. We checked the vertical distribution of salinity and the water temperature at 5 stations in the area. At the same time water samples were taken from the surface and bottom-1m. From these samples the cell density of A.tamarense was counted, and Chl.a concentration and nutrients were analyzed. The vertical distribution of current along the traverse line of the river mouth was also measured. In addition, we obtained the amount of water discharge from Yodo river weir during February to May 2012. 3. Result The estuary circulation was found by observing the vertical distribution of salinity. We checked up the distance from the river mouth to the salt water wedge at ebb tides. When the run up of seawater was weak, the position of the salt water wedge was at about 5000m on March 8 and April 9. On the other hand, when the run up was strong, the position of wedge was about 9500m on April 23. And the estuary was filled with the seawater on May 21. In general, tidal currents are strong during spring tides, but the distances from the river mouth to the salt water wedge had variation. Therefore the range of the run up was linked with not only the tidal change but also another factors in this estuary. 4. Discussion In general, estuary circulation is linked with; (1)amount of river discharge. (2)difference of current speed

between the upper and the lower. (3)differences of salinity and temperature between the upper and the lower. Therefore we compared these conditions with the distance from the river mouth to the salt wedge. The river discharge in this study was defined by the amount of water discharge from Yodo river weir which is daily mean. And the differences were defined by subtractions of average values between the upper layer(0-0.5m) and the lower layer(1.5m-Bottom). From the results of them, when the strong seawater run ups were found on April 23 and May 21, they were attributed to the river discharge. When the weak run ups were found on March 8 and April 9, they were attributed to the river discharge attributed to the current speed. In addition, the middle seawater run ups were attributed to the current speed on April 2 and May 7. Therefore, the primary factors of seawater run up are the river discharge and the difference of current speed between the upper and the lower.