

The Runoff Characteristic of Nutrients from Kako River in Hyogo Prefecture, Japan

Yukio KOMAI, **Kazuo MURAMATSU** and Hiroki NANBA

Department of Environmental Engineering, Osaka Institute of Technology, Osaka City, Japan

The eutrophication in the Seto Inland Sea, which is the largest enclosed coastal sea in Japan, has been serious problem. To reduce the amount of loadings of nitrogen and phosphorus to the Seto Inland Sea, many measures have been taken for about forty years. As a result, the concentrations of nitrogen and phosphorus in the Seto Inland Sea have decreased. Then, a number of the red tide occurrence largely decreased than 1970's. On the other hand, seaweed culture, which is one of major fishery in the Seto Inland Sea, is getting worse. The similar serious problem happens in the Sea of Harima, where is located in the eastern part of the Seto Inland Sea. To solve the seemingly paradoxical problems, which are conservation of water environment and sustainment of fishery production including seaweed culture, it is necessary to seek new measures to manage the amount of nutrients flowing into the Sea of Harima. Therefore, we conducted an investigation at the downstream of the Kako river, which is the largest river in the watershed of the Sea of Harima, to get correct loadings of nutrients as possible.

Daily water sampling was conducted at the Ikejiri station in the downstream of the Kako River from April to December 2010. The total phosphorus (TP), total nitrogen (TN), and other parameters were measured. The flow rate was used data observed at the Kakogawa weir office of the Ministry of Land, Infrastructure and Transport.

The concentration of TP was 0.041-0.903mg/L (ave.:0.104mg/L), TN 0.67-4.77mg/L (ave.:1.08mg/L). The daily average flow rate fluctuated 2.59-2100m³/s (ave.:52m³/s) for nine months. The total amount of TP and TN are 340ton (1.22ton/day) and 2,100ton (7.80ton/day) from April to December. The loadings of TP and TN showed the largest value in May. Especially, the loadings of TP was 156ton on 24 May, in the case of runoff, and occupied about 47% to 340ton. The loadings of TP and TN were 300ton and 1,700ton within 10% in order with a lot of flow rate.

The L-Q equations of TP and TN were $L(TP)=0.065Q^{1.13}$ and $L(TN)=0.828Q^{1.08}$, respectively. The coefficients of equation for TP and TN were more than 1. These result indicated that the type of runoff of TP and TN was classified into "washout type" in which the concentration of TP and TN increased in proportion to an increasing of flow. The loadings of the TP and TN from Kako River largely fluctuated every month. These results show that investigations during many rain events are important to evaluate annual loadings of TP and TN in addition to a regular sampling.

Contact Information: Kazuo Muramatsu, Department of Environmental Engineering, Osaka Institute of Technology, 5-16-1 Omiya Asahi Osaka City Japan, 535-8585, Phone: 81-6-6954-4512, Email: d1d09f04@eng.oit.ac.jp