

water abstraction from the Changjiang River. And the water discharge of several branches is the important factor that impact the quantity of water drainage into the Changjiang River, such as Huaihe River, Guxi River, and Qingyijiang River. Water abstraction of sluices is regularly, which corresponds to the magnitude of tides. And the water discharge into the Changjiang River of some branches is also impacted by tides. In September and October 2006, the quantity of water abstraction is much more than water drainage. The net decreased water discharge reached more than 1400 m³/s, which will affect the water discharge into estuary of the Changjiang River, especially when the water discharge from the upper and middle basin is low.

Krka river estuary (Eastern Adriatic Coast) evaluation of natural and anthropogenic influences by multielemental analysis

N. MIKAC*, N. CUKROV & G. KNIEWALD

Division for Marine and Environmental Research, Rudjer Bošković Institute, 10000 Zagreb, Croatia
* E.mail: mikac@irb.hr

The Krka river estuary is located on the Eastern Adriatic coast and is a typical highly stratified karstic estuary with fresh/brackish surface water layer flowing seawards and bottom upstream counter-current seawater flow. The estuary has a total length of 22 km, its depth gradually increasing from 2-42 m. Input of terrestrial material into the Krka river estuary is relatively small and prevented by the number of calc tufa barriers at the river/estuary confluence. Due to the uniqueness of these tufa barriers and waterfalls, this area now is a National Park.

The town of Šibenik (40000 inhabitants) is located in the central part of the estuary. The main sources of anthropogenic pollution in this part of the estuary are phosphate-ore handling in the Šibenik port, the input of untreated wastewaters from the city of Šibenik and the now defunct factory of ferromanganese alloys. All these sources of pollution are now either inoperational or being remediated. Previous work established localized pollution with some elements (Hg, Mn, U, ref. 1, 2, 3), but assessment of the contamination of the entire area of the Krka river estuary with a variety of eco-toxic elements was never performed.

The aim of the work was to establish the degree of anthropogenic influences in the estuary by

multielemental analysis of sediment and water. Surface sediments and sediment cores as well as surface water were analyzed for trace element composition by means of the HR ICP-MS (High Resolution Inductively Coupled Plasma Mass Spectrometry).

Obtained results indicate a clear anthropogenic point-source influence on several locations within the Krka river estuary. The most severe impact was established for the Šibenik port - for elements Hg, Cd, Zn, Pb, As and Cu and must be understood in terms of a combined effect of contamination related to phosphate-ore unloading over many years and input of untreated municipal wastewaters.

Further contamination of the estuarine sediment column was established in front of the closed ferromanganese-alloy factory, where high concentrations of Mn, Pb and Ba were measured. However, in the largest part of the Krka river estuary the concentrations of measured elements were low and within expected ranges of natural (lithogenic and marine) variations. This indicates that the major part of the Krka river estuary is still unpolluted.

References

- Mikac N., Roje, V., Cukrov, N. and Foucher, D. (2006) Mercury in aquatic sediments and soils from Croatia. *Archives of Industrial Hygiene and Toxicology*. 57, 3, 325-332.
- Orešćanin, V., Barišić, D., Mikelić, L., Lovrenčić, I., Rubčić, M., Rozmarić-Mačefat, M. and Lulić, S. (2004) Environmental Contamination Assessment of the Surroundings of the ex-Šibenik's Ferro-manganese Smelter, Croatia. *Journal of Environmental Science and Health, Part A-Toxic/Hazardous Substances & Environmental Engineering*, A39, 9, 2493-2506
- Cuculić V, Cukrov N, Barišić D, Mlakar M. (2006) Uranium in sediments, mussels (*Mytilus* sp.) and seawater of the Krka river estuary. *J Environmental Radioactivity* 85, 59-70.

Increase in moon Jellyfish populations in Seto Inland Sea, Japan: possible effect on predator-prey interactions under summer hypoxia

Jun SHOJI^{1*} & Akihide KASAI²

¹ Takehara Fisheries Research Station, Hiroshima University, Minato-machi 5-8-1, Takehara, Hiroshima 725-0024, Japan

*E-mail: jshoji@hiroshima-u.ac.jp