

Uzorkovanje sedimenta autonomnim ronjenjem

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Industrijski, poljoprivredni i kućanski otpad se neprestano odbacuje u vodeni okoliš. Zagađivači iz tog otpada, posebno ekotoksični metali, mogu ugroziti ljudsko zdravlje postajući dio prehrambenog lanca.

Ekotoksični metali, za razliku od organskih zagađivala, nisu biorazgradivi, te jednom uneseni u okoliš postaju zauvijek njegov dio akumulirajući se posebno u sedimentu gdje s organskom tvari, formiraju različite komplekse. Vrlo je važno razlikovati ekotoksične metale antropogeno unesene od onih koji su prirodno prisutni.

U svim vodenim ekosustavima sediment je krajnje odlagalište svih zagađivala pa tako i ekotoksičnih metala, s mogućnošću da se promjenom fizičko-kemijskih uvjeta vrati otapanjem u vodeni stupac (Ouyang i sur., 2006). Tako sedimenti nisu samo rezervoar zagađivala, nego i stalan izvor toksikanata za vodene organizme, posebno bentičke (Long i sur., 1996; Fichet i sur., 1998).

Prema tome praćenje koncentracija ekotoksičnih metala u sedimentu je neophodno kako bi se utvrdilo trenutno stanje antropogenog opterećenja nekog područja, ali i provjerilo kako je to bilo u prošlosti. Naime, sediment posjeduje osobinu da „pamti“ događaje, te analizirajući sedimentne kolone tj. sedimentne slojeve možemo rekonstruirati događaje tijekom prošlosti. To zahtijeva prije svega pravilno uzorkovanje sedimenata i dopremanje neporemećenog do laboratorija.

Kod uzorkovanja sedimenta razlikujemo uzorkovanje recentnog tj. površinskog sedimenta i uzorkovanje povijesnog tj. uzorkovanje sedimentnih kolona. Oba tipa uzorkovanja sedimenta mogu se provoditi iz plovila mehaničkim napravama (gravitacijski korer, grabilo ... itd) ili autonomnim ronjenjem.

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godina, a korištene tehnike su opisane u znanstvenoj literaturi (Kniewald i sur., 1985; Martinčić i sur. 1986; Kniewald i sur., 1987).

Uzorkovanje se obavlja posebno konstruiranim prozirnim ručnim korerom od akril ili pleksiglasa. Ručni korer ronilac pažljivo utisne u sediment da se ne bi poremetili slojevi, te vadi iz dna poklopivši ga odozgo. Na površinu ga iznosi u uspravnom položaju. Korer se u tom položaju transportira do laboratorija gdje se prema svrsi istraživanja odvajaju sedimentni slojevi od 1 do 5 cm.

Prednosti uzorkovanja autonomnim ronjenjem su:

- Mogućnost da ronilac kritički evaluira postaju uzorkovanja te izabere najreprezentativniji dio dna za uzorkovanje sedimenta
- Uzorkovanje neporemećenog uzorka sedimentne kolone što se može odmah i provjeriti uslijed prozirnosti korera
- Uklanjanje vidljivih bentičkih organizama i drugih neželjenih objekata s površine sedimenta.
- Uzorkovanje željene dubine sedimenta

Uzorkovanja sedimenta iz plovila gravitacijskim korerima i grabilima je u prednosti kod uzorkovanja na većim dubinama, gdje je uzorkovanje autonomnim ronjenjem nemoguće ili povezano sa sigurnosnim problemima za ronioaca.

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Sediment sampling by scuba diving

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Industrial, agricultural and domestic wastes are continuously being discharged into water-bodies. Pollutants in these wastes, particularly ecotoxic metals, can endanger public health by becoming part of the food chain. Heavy metals are not biologically degradable like many organic pollutants, hence, they tend to accumulate, especially in sediments associated with organic and inorganic matter, and involve formation and adsorption of different complexes. It is important to distinguish between the introduction of trace metals by anthropogenic activities and through the natural weathering processes.

All aquatic ecosystem sediments are trace metals ultimate sinks, with possibility of their remobilization into the water column due to physico-chemical changes (Ouyang et al., 2006). Sediments are not only reservoirs for contaminants through adsorption and absorption processes, but also a source of toxicants for aquatic organisms through the water column which is in direct contact with precipitated layer on the bottom (Long et al., 1996; Fichet et al., 1998). Therefore, monitoring of trace metals in sediments is necessary to provide insight of recent as well as early pollution, which is directly connected with the pollution level in the water column above the sediments. Namely, sediment has an ability to "remember" history and by analyzing sediment layers we are able to reconstruct past events. However, to obtain this, sediment has to be properly sampled and undistributed transported to a laboratory.

We may sample recent surface sediment or historic sediment columns. Both ways of sediment sampling we may perform from a boat using mechanical devices (gravitational corers, dredger ... etc) or by scuba diving.

In the Ruđer Bošković Institute, Division for Marine and Environmental Research, sediment sampling by scuba diving has been performed for more than

twenty years and sampling techniques were described in literature (Kniewald i sur., 1985; Martinčić i sur. 1986; Kniewald i sur., 1987).

Sediment samples were retrieved by scuba divers using specially designed transparent plexiglas or acrylic corer. The corer is inserted into the sediment taking care not to disturb the unconsolidated sediment layers. The scuba diver covers the top of the corer and slowly removes it from bottom. The corer is brought to the surface in the vertical position and transported to laboratory in same position. In the laboratory, sediment layers of desired thickness are separated.

Primary advantages of the sampling technique described above are:

- The possibility of a critical evaluation of sampling site by a scuba diver and opportunity to choose most representative part of sediment for sampling
- Ability to collect undisturbed sediment samples and possibility to control this throughout transparent corer.
- Exclusion of visible macro benthic species and other unwished objects from a sediment surface.
- Sampling of desirable depth of sediment.

Sediment sampling from a boat using mechanical devices (gravitational corers, dredger ... etc) have advantages at greater depth where sampling by scuba diving is impossible or dangerous.

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