

LONG-TERM MONITORING OF PCBs AND DDTs IN FISH FROM THE EASTERN ADRIATIC SEA

Violeta Calić *, Mladen Picer and Nena Picer

Rudjer Boskovic Institute, Bijenicka 54, 10002 Zagreb, CROATIA - vcalic@irb.hr

Abstract

The muscle tissue of fish was analysed for PCBs and DDTs between 1972 and 2006. These organic pollutants were monitored to trace the levels and to ascertain whether the concentrations exceeded the maximal allowed quantities in fish fixed by the regulations. Quantitative determination of DDTs and PCBs in the samples examined has been carried out using GC-ECD.

Keywords : *Adriatic Sea, Ddt, Pcb, Monitoring.*

Chlorinated aromatic molecules are one of the most significant mutagens in a sea environment. Chlorinated insecticides (DDT) and polychlorinated biphenyls (PCB) present a group of synthetic organic compounds, greatly used in different fields of a human activity. Monitoring of marine ecosystems has been typically made using widely distributed coastal organisms, such as inshore bottom fish, as bioindicators [1].

The long-term monitoring of chlorinated hydrocarbons in several fish species from coastal waters of the east Adriatic is performed with the aim for locating and determining a critical sea pollution points, as well as for tracking of PCB and DDT levels [2]. Mostly benthic and epibenthic fish was analyzed with exception of a few pelagic fish caught in the north Adriatic. Contaminants in these fish do not depend much upon relatively small distances from a dotted source of contamination, thus providing better contamination status of a site.

In the period between 1972 and 2006 intensive samplings have been carried out at the number of station along the Croatian sea coast (Istria, Kvarner and islands, area of Zadar, Šibenik, Split and Dubrovnik). All analyses are performed by the same laboratory of Rudjer Boskovic Institute; with uniformed methodology. Fish fillets were extracted with n-hexane using a high revolution blender. The analytical method used for the extracts included filtration through a column of Na_2SO_4 anh., cleaning on an alumina column and the separation of the PCBs from organochlorine insecticides on a miniature silica gel column. After concentration down to 1 cm^3 , elutes were analyzed by EC gas chromatography [2].

The following ranges of levels of chlorinated hydrocarbons are determined in fish on the wet sample mass: PCB ranges from below the method sensitivity (0.1) to 2403 ng g^{-1} , respectively DDT ranges from 0.1 do 1575 ng g^{-1} .

PCB levels are higher compared to DDT, especially in last decade, and it could be said that they are comparable to the more contaminated areas of the Mediterranean, such as the coasts of Spain, France, Italy and Greece [3]. Although significant levels of PCBs and DDTs are observed in certain samples, it never exceeded the maximal allowed quantity for these substances in fish. The annual trends of PCB and DDT levels have been analyzed with a linear regression. The trend lines of the DDT and PCB levels, and of their ratio, as natural logarithmic values are presented in Fig. 1 and 2. Results of these trend analyses point to a significant decrease of DDT levels from 70's of last century to nowadays, while in the same period levels of PCBs increase in analyzed biota samples, but this increase is not statistically significant.

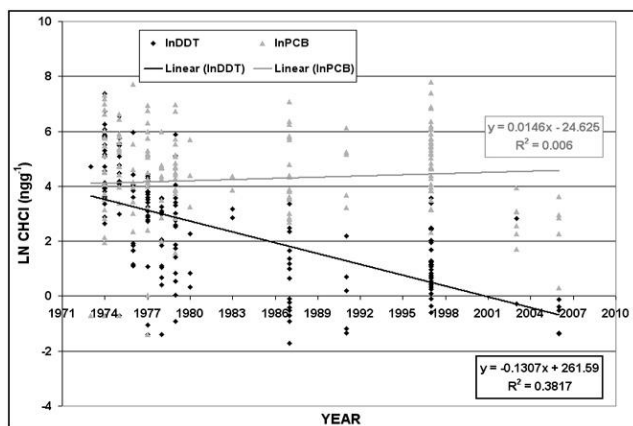


Fig. 1. Trend lines of DDT and PCB levels.

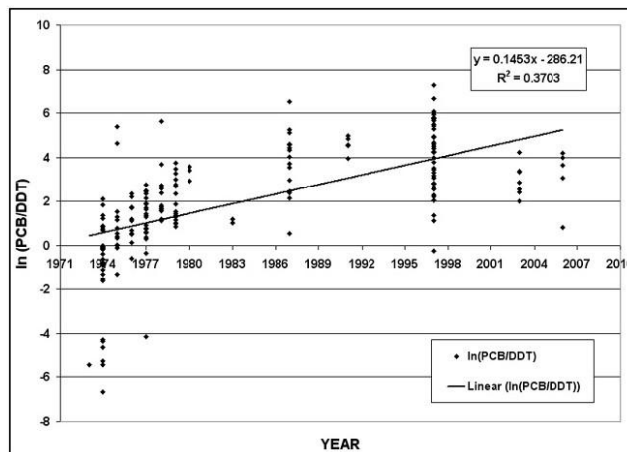


Fig. 2. Ratio of PCB/DDT as logarithmic natural values.

References

- 1 - Tanabe S., Kaunan N., Subramanian A., Watanabe S., Tatsukawa R., 1987. Highly toxic coplanar PCBs: Occurrence, source, persistency and toxic implications to wildlife and humans. *Environ. Pollut.*, 47(2): 147-163.
- 2 - Picer M., 2000. DDTs and PCBs in the Adriatic Sea. *Croat. Chem. Acta*, 73(1): 123-186.
- 3 - Picer M. and Picer N., 2003. Hazards posed by petroleum oil and some chlorinated hydrocarbons to aquatic ecosystem in Croatian karst during 1991-1995 war in Croatia. *Period. biol.*, 105(3): 345-354.