

Polychlorinated Hydrocarbons in Fish *Mugil cephalus* Collected from Cuddalore Coast, Bay of Bengal

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Abstract: The aim of the present study was to determine the presence of p,p'-DDT and its metabolites (p,p'-DDE and p,p'-DDD) and α -HCH and PCBs in the muscle of gray mullet, *Mugil cephalus* collected from Cuddalore coast of Bay of Bengal during the period from June 2009 to January 2010. Polychlorinated hydrocarbons are convenient indicators of environmental pollution. The analyses were carried out using the method of gas chromatography. The muscle of mullet demonstrated the highest content of DDT and PCBs. The present results will constitute a contribution to the knowledge on the presence of polychlorinated hydrocarbons in the marine environment.

Key words: Polychlorinated hydrocarbons • Mullet • *Mugil cephalus*

INTRODUCTION

With the growth of civilization, an increasing number of chemicals are being introduced to our environment. These chemicals are hazardous to living organisms, to humans and to our ecosystems. The aquatic environment is particularly sensitive to the toxic effects of contaminants since a considerable amount of the chemicals used in industry, urbanization and in agriculture enter marine and other aquatic environments. Organisms are often exposed to complex mixtures of pollutants, including polychlorinated biphenyls (PCBs) and metals. Pollutants that bioaccumulate in the organism first cause effects at the molecular and cellular levels. This may lead to adverse effects in the organism, which in turn may cause changes at the population and the community level during the coming years.

Polychlorinated hydrocarbons are characterized by their high toxicity for aquatic organisms and their high bioaccumulation. Their global production before 1980 has been estimated to range between 1.2 [1] and 2.0 [2] million tons. It is estimated that about 60% of that ended up in the seas and oceans. About 30% of the former amount is accumulated in the coastal bottom sediments [1]. The principal source of pollution of water bodies with pesticides has been the runoff from the agricultural land. Polychlorinated biphenyls (PCBs) reach the marine and inland waters in the form of industrial and communal sewage and solid industrial and municipal waste, stored

at landfills from where they get to soil and surface waters. Utilization of wastes containing PCBs is difficult, because they do not disintegrate, during their incineration in conventional furnaces, but they are carried up into the atmosphere. Under natural conditions, polychlorinated hydrocarbons as very stable compounds undergo biodegradation in a low extent in water bodies and accumulate mainly in living organisms [3-7]. Hence the present study had been initiated on the content of selected polychlorinated hydrocarbons in fish of the Cuddalore coast, Bay of Bengal. Concerning the suitability and selection of fish species, the mullet are found to be suitable for environmental monitoring. Mullet belongs to the family of Mugilidae of the class of osteichthyes. It is an economically important marine fish due to marketing of their meats and eggs, inhabiting usually in shores and estuaries along the Cuddalore coast of Bay of Bengal. Mullet provide advantages for environmental biomonitoring because they can be easily trapped because of their ability to withstand the conditions of highly polluted areas

MATERIALS AND METHODS

Live specimens of *Mugil cephalus* were collected from Cuddalore coast on 15th day of each month during June 2009 to January 2010. For the analysis, muscle from below the dorsal fin was dissected out from 10 specimens and were homogenized. 10g sub samples were taken,

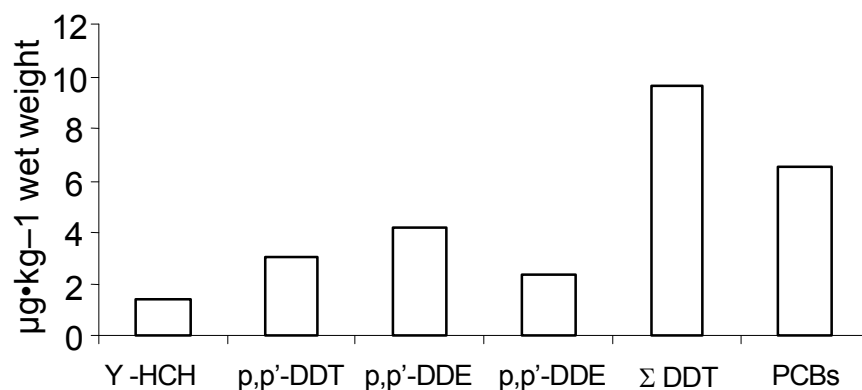


Fig. 1: Amount of selected polychlorinated hydrocarbons in the muscle of fish collected from the Cuddalore coast

grind with anhydrous Na_2SO_4 and transferred quantitatively to 250cm³ conical flasks. Amounts of 50 cm³ of n-hexane-ethyl ether mixture (2.5: 1) and again 50 cm³ of n-hexane-ethyl ether mixture (9: 1) were used for extraction. After filtration the merged extracts, placed in a 250-cm³ conical flask with glass stopper were condensed in a rotary vacuum evaporator down to the volume of 2.0 cm³ and they were transferred quantitatively to 10 cm³ calibrated conical test tubes with glass stoppers. The content of those tubes was condensed again in a hot air flow (50°C) to the volume of 1.0 cm³ and purified with 7% SO_3 in concentrated H_2SO_4 and subsequently in 5% KOH in 96% $\text{C}_2\text{H}_5\text{OH}$. The compounds studied were determined quantitatively and qualitatively with the method of gas chromatography, using Chromatron GCHF 18.3 with ECD trite detector, under the following conditions: 3m glass column, 3-mm diameter, filled with Chromosorb Q 100-120 mesh, with 3% V-101 liquid phase, carrier gas: nitrogen, 30 cm³·min⁻¹ flow, column and detector temperature: 200°C, feeder temperature: 240°C. The analyses were done in triplicate.

RESULTS AND DISCUSSION

Several industries are located at the Cuddalore coast. Domestic and industrial wastes, urban and agricultural run off, discharges from ships, sediments and contaminated waters of rivers have cumulatively had significant adverse effects on the water quality of the Bay. Industrial activities cover a large range of industries including food processing, paint, ceramic, chemical and textile factories, vegetable oil and soap production etc. Industrial and domestic wastes as well as contaminated waters heavily pollute the Bay. The presence of the compounds surveyed was detected in the samples of fish muscle (Fig. 1). The concentrations of the compounds in the muscle tissue of

fish were slightly high. It may be explained by the presence of lipid in the muscle. Polychlorinated hydrocarbons are characterized by their high chemical stability and resistance to atmospheric factors [8,9]. Those compounds practically do not dissolve in water, but they dissolve well in organic solvents, fats and natural oils. In bodies of water those compounds, as lipophilic, are quickly involved in the trophic circle and they are characterized by high bioaccumulation coefficients [10-12]. The present study clearly showed the presence of polychlorinated hydrocarbons in water, even at low concentrations, adversely affects the development of many aquatic organisms and may lead to unfavorable qualitative changes in their specific composition [9, 13-16].

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