

ORGANOCHLORINE LEVELS IN THE MUSCLE OF A DEEP SEA FLATFISH IN EASTERN MEDITERRANEAN WATERS

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Abstract

DDTs were the dominant contaminants in the flesh of four-spotted megrim in the Aegean Sea, their concentrations ranging in the various seasons between 12,5-32,3 ng/g, while those of PCBs between 4,5 and 12,1 ng/g. Variations in pollutant concentrations seemed to be related to variations in lipid content. PCBs 153 and 138 were the most prevalent congeners, while in relation to DDTs, p,p'-DDE dominated.

Keywords: PCBs, DDTs, lipids, flesh, four-spotted megrim, Aegean

Introduction

Persistent lipophilic organic pollutants, and among them PCBs and DDTs, are widely distributed in the marine environment, presenting a highly bioaccumulative nature in many life forms. Although monitoring programs of the aforementioned pollutants usually take place at coastal areas, which mainly receive urban, industrial and riverine inputs, open sea waters deserve also special consideration, since these compounds extend the boundaries of their distribution all over the marine ecosystem. Moreover, data on pollutant concentrations in edible fish are of great importance with respect to both human health and potential impacts on higher aquatic consumers. The present study provides data on the concentrations of PCBs and DDTs in the muscle of four-spotted megrim (*Lepidorhombus boscii*), in the Aegean Sea; the species is an edible flatfish dwelling on muddy bottoms, mainly between 200 and 450 m in the study area (1).

Material and methods

The sampling area was located off the Sporades Isles in the central Aegean at depths from 200 to 400 m. Samples were collected seasonally by a commercial trawler. Subsequent to their capture, fish were preserved in a freezer in glass jars. In the laboratory, the total length (TL) of each specimen was recorded, and then the muscle was removed, lyophilized, grounded, mixed and stored at 4°C, till used for further analysis. Samples were Soxhlet-extracted, and the solvent extract was evaporated to dryness and the residue was weighted for the determination of the lipid percentage. The organic extract was prepared according to Satsmadjis *et al.* (2). Gas chromatographic analysis was performed with a Varian 3700 GC equipped with a ⁶³Ni electron capture detector and a fused silica Megabore column DB-1, 30m x 0.53mm i.d. Quantification of PCBs was made using an external standard calibration mixture of selected congeners, the load of the muscle was estimated on the basis of seven PCB congeners (Nos. 101, 105, 118, 138, 153, 156, 180). DDTs were quantified as the sum of p,p'-DDT, o,p'-DDT, p,p'-DDD and p,p'-DDE. Concentrations of PCBs and DDTs are presented as ng/g on a dry weight basis.

Results and discussion

Mean total lengths, PCBs, DDTs concentrations and percentage of lipids in the flesh of the four-spotted megrim in each season are given in Table 1. DDTs were the dominant contaminants and their concentrations were in the range of 12,5-32,3 ng/g, while those of PCBs were 4,5-12,1 ng/g.

Table 1. Seasonal concentrations of PCBs and DDTs (ng/g dry weight) in the flesh of four-spotted megrim in the Aegean Sea.

Month	Mean TL (mm)	Lipids (%)	PCBs	DDTs
September	136,8±6,16	3,75±0,84	11,65±3,22	23,90±9,00
December	142,8±5,75	2,31±0,26	4,45±1,23	12,48±8,39
March	141,5±7,05	2,93±0,22	10,77±3,85	29,10±7,65
June	138,1±7,14	3,61±0,42	12,04±3,01	32,28±9,51

Among DDT metabolites, p,p'-DDE was dominant in the muscle with percentages ranging from 72,5% to 88,4%. The ratio of p,p'-DDE to total DDT is cited as an indicator of whether new sources of DDT are entering an ecosystem. It is suggested that a ratio greater than 0.6 reflects a relatively stable system with no new inputs (3).

In relation to PCBs, hexachlorobiphenyl congeners 153 and 138 were found in major amounts contributing respectively 29,17% and 29,68% to the total PCB concentrations in the muscle of the four-

spotted megrim. PCB 118 and 180 accounted respectively for the 14,2% and 13,6% of total PCBs. In western Mediterranean waters the most prevalent PCB congeners in the four-spotted megrim were also the highly chlorinated ones (4). The richness of a PCB isomer in a given organism is the result of the composition of PCBs present in the environment, modified by the decomposition processes that occur in organisms. PCB 153 is extremely persistent (5), while PCBs 118, 138 and 180 are considered as difficult to metabolize (6), the latter being related to the presence/absence of H-atoms in the molecule and their positions (5).

Both PCBs and DDTs values exhibited seasonal differences, and the trends were closely related to lipid contents of the muscle. In winter (December), when the species exhibited low feeding intensity (7), lipid content was significantly lower in relation to the other seasons. The latter appeared to have a direct impact on pollutant concentrations, which exhibited lowest levels during that season.

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