

LEVELS OF ORGANOCHLORINES IN RED MULLET FROM GREEK WATERS

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Organochlorine concentrations data in the tissues of red mullet (*Mullus barbatus*), a quite abundant and commercially important fish species, have been the subject of several studies during the last decade (RAVID *et al.*, 1985; SATSMADJIS *et al.*, 1988a; GEORGAKOPOULOS-GREGORIADES *et al.*, 1991; VASSILOPOULOU and GEORGAKOPOULOS-GREGORIADES, 1993). The aim of the present study is to report on the concentrations of organochlorines in red mullet caught at five sites of the Greek Seas, in spring and autumn from 1989 to 1991.

Sampling locations appear in Figure 1. In each specimen the fork length, weight, sex and state of maturity were recorded. Then, the flesh of the fish was removed, lyophilized, ground, mixed and stored in a refrigerator till used for further analysis. The organochlorine and lipid concentrations in the flesh of red mullet was determined according to the procedure proposed by SATSMADJIS and LATRIDES (1985) as modified by SATSMADJIS *et al.*, (1988b).



Figure 1. Location of sampling stations.

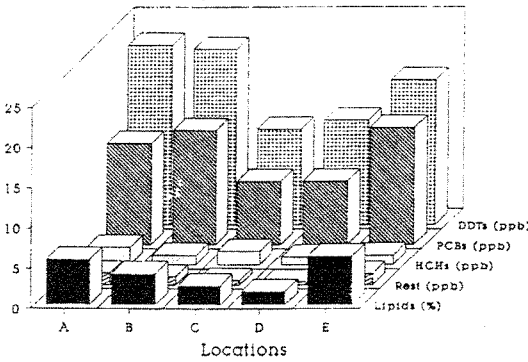


Figure 2. Mean total values of organochlorines and lipids.

Complementary clustering (group average strategy) using the Bray-Curtis similarity coefficient (BRAY and CURTIS, 1957) were performed on mean organochlorine data at the five sampling locations, using Primer algorithms (CLARKE and WARWICK, 1989). The mean total values of organochlorine concentrations (ppb wet weight) and the mean percentage of lipids in the red mullets were in all sites rather low (Fig. 2). Both parameters exhibited minimum values at sites C and D (located at the southern part the Greek Seas), which could be also influenced by the fact that specimens from sites C and D were of smaller size than those from the other three areas (t-test, $P > 0.05$). It is known that organochlorines are lipophilic pollutants, whose concentrations generally increase as fish grow (LARSSON *et al.*, 1991; VASSILOPOULOU and GEORGAKOPOULOS-GREGORIADES, 1993). The application of cluster analysis revealed that sites A, B (NE Greece) and site E (NW Greece) exhibiting higher organochlorine concentrations, clustered together (Fig. 3). Sites C and D formed a separate group. Hence, higher organochlorine concentrations, being consistent with lipid content and size of fish, appear in mullets from the northern part of Greece in relation to those from the southern part. The organochlorine concentration pattern reported for the same sites for the period 1986-88 (GEORGAKOPOULOS-GREGORIADES *et al.*, 1991) revealed an east-west decline in organochlorine levels. The difference between the two surveys seems to be created by changes in organochlorine levels arising from the different lipid content and size of fish rather than real changes in organochlorine levels in the sampling sites.

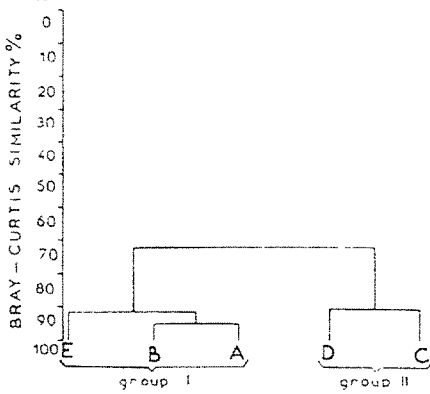


Fig. 3. Dendrogram for the mean concentrations of organochlorines in red mullet from 5 Greek locations

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