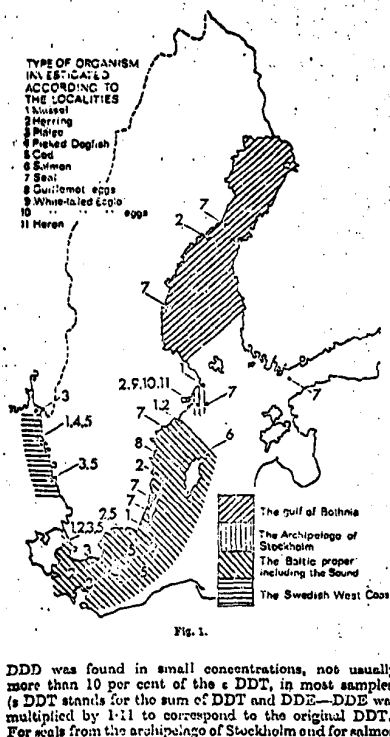

Fig. 1.

DDD was found in small concentrations, not usually more than 10 per cent of the ε DDT, in most samples. (ε DDT stands for the sum of DDT and DDE—DDE was multiplied by 1·11 to correspond to the original DDT.) For seals from the archipelago of Stockholm and for salmon from the Baltic proper which had relatively large amounts of DDD, ε DDT stands for the sum of DDT, DDE and DDD.

We analysed all the samples using gas chromatography and electron capture detection. Confirmations were carried out with double column systems combined with treatments with sulphuric acid and potassium hydroxide[7].

We found that the principal PCB components were PCB numbers 7–14 (low number is equal to a low chlorination degree), but the mussels also contained the lower numbers (the PCB composition being similar to clophen A 50). The PCB amounts given in Table 1 are, nevertheless, the sum of all PCB components found in the samples although the relative amounts of the different numbers vary. The results suggest that the low PCB numbers are metabolized or excreted faster than the higher numbers, so that there is an increase of the latter as it passes through a food chain.

An attempt to quantitate PCB has been made in Sweden[7], but because the method is still rather rough the values may be correct only within a factor of 2. The method is indirect because all the PCB components have not been isolated yet, and it is based on a combination of mass spectrometry, micro-colorimetric and electron capture detection. For each twenty samples a blank on the solvent and a residue-free plaice sample with added pesticides (lindane, aldrin, *pp'*DDE, dieldrin, *pp'*-DDD and *pp'*-DDT) were also analysed. Recovery was above 80 per cent, but as normal in residue analysis[7] we made no correction.

The mean figures in Table 1 are calculated from the average value of each locality within the four regions. The residue values are based both on fresh tissue and on hexane extractable fat. The figures for fresh tissue are comparable with reported values from other countries. We believe, however, that the fat values are of particular interest from an ecological point of view. Fat is important in the transport of energy and as a carrier of the residues between the species in the food chain. Furthermore, there is a great seasonal variation in fat content within the populations. The difference between the greatest and the smallest residue level in the extractable fat of individuals of one species at a given time, in a given place, is less than in fresh tissue. The fat content of herring muscle, for example, varied from about 1 per cent in the spring to about 10 per cent in the autumn. Our discussion will therefore be based largely on residue levels in extractable fat.

Mussels from the west coast of Sweden have lower average values of ε DDT and PCB than from the Baltic proper and the archipelago of Stockholm. The level of ε DDT in mussels from the Dutch, West German and British coasts[8,9] has an upper limit similar to that in mussels from the Baltic proper and the archipelago of Stockholm.

DDT contamination in individual plaice, cod and in fish oil is greater in the Baltic proper than off the west coast of Sweden, and there is little or no overlapping of the residue values. In the case of PCB, a plaice from the very polluted Idefjord in the west coast increases the average value for the west coast samples from 0·03 to 5 p.p.m. Other individual samples of fish from the west coast contain PCB residues of the same magnitude as residues in specimens from the Baltic. This may be the result of coastal contamination. The picked dogfish, which lives more in the open sea, seems to have the same amount of ε DDT, but a smaller amount of PCB than other fish from the west coast of Sweden.

The samples of herring from the Baltic proper, the archipelago of Stockholm and the Gulf of Bothnia had large residues of ε DDT. No herring from the west coast of Sweden has been studied. Recently we analysed eight herrings from the west coast. On fat basis the mean values were: ε DDT, 1·9; DDT, 0·86; and PCB, 0·75, in good agreement with the fish oil values (see Table 1). Juvenile herring from the Dutch Wadden Sea (coastal waters)[8,9] contained DDE residues in fresh tissue with an upper limit of the same magnitude as in herring from the Baltic area.

Residues of PCB and ε DDT in one sample of fish oil from the southern Baltic proper were about five to ten times greater than the three samples from the west coast of Sweden. The figures for the latter are similar. This is in accord with residues in fat in fish from the respective areas.

One herring from the Sound had a much larger content of PCB (23 p.p.m.) than the herring from the rest of the Baltic area. This increased the average value in this area from 4·6 to 6·8 p.p.m. Cod and plaice from the Sound also had a larger PCB content than specimens from the Baltic proper and off the west coast. This suggests that there is local contamination of PCB in the Sound. Furthermore, the mean levels of PCB noted in herring were smaller in the Gulf of Bothnia than in the rest of the Baltic.

The youngest Baltic salmon had about ten times more chlorinated hydrocarbons residue than a sample reported from Great Britain[3].

The seals from the Baltic proper, the archipelago of Stockholm and the Gulf of Bothnia contained large amounts of residues of both ε DDT and PCB, about ten times greater than amounts found in Great Britain[3], Canada[3] and the Netherlands[10]. One specimen from

MONS 029727