The Toxity of Polychlorinated Biphenyls (PCB) in Sea Water to *Grammarus Oceanicus*

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This work was undertaken to investigate some lethal and sublethal effects of PCB following direct uptake from sea water. The dosing system devised by Zitko (1) has been employed. One of the commercially available PCB preparations, Aroclor 1254, was tested on *Gammarus oceanicus*.

Methods and Materials

Stock solutions of Aroclor 1254 and Corexit 7664 in various weight ratios were made up in distilled water. Test solutions were then prepared by pipetting known volumes of the stock into glass beakers and making up to 2 litres with sea water. Control beakers contained Corexit 7664 in sea water and sea water alone.

Five *Gammarus* were added to each beaker which was maintained at 5 ± 0.5 C and the survival time (± 6 hours) of each animal recorded. Bioassays were continued for 30 days and solutions changed weekly.

Results and Discussion

Apart from some deaths caused by cannibalism, no mortality occurred in sea water alone or Corexit 7664 in sea water in concentrations up to 1.9 g/ℓ. Colloidal solutions of Aroclor 1254 solubilized in Corexit 7664 (1:19 W/W) or emulsions (1:10, 1:1, and 1:0.1 W/W) in sea water were lethal at concentrations as low as 0.01 mg/ℓ and 0.1 mg/ℓ respectively. Observations suggested that moulting or freshly moulted animals were particularly vulnerable. Plotting the survival time of *G. oceanicus* against concentration (Fig. 1) showed a "critical point" of response below which there was, and above which there was no time/concentration effect. The lethal threshold is between 0.001 and 0.01 mg/ℓ for colloidal solution and between 0.01 and 0.1 mg/ℓ for emulsions of Aroclor 1254 solubilized in Corexit 7664 in sea water. After exposure to Aroclor 1254 in sea water for periods greater than 150 hours some *Gammarus* which died were found to have severely necrosed branchiae. Necrosis was indicated by a

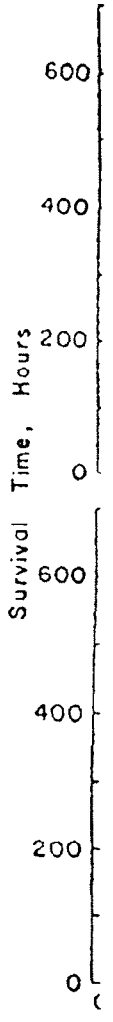

Figure 1

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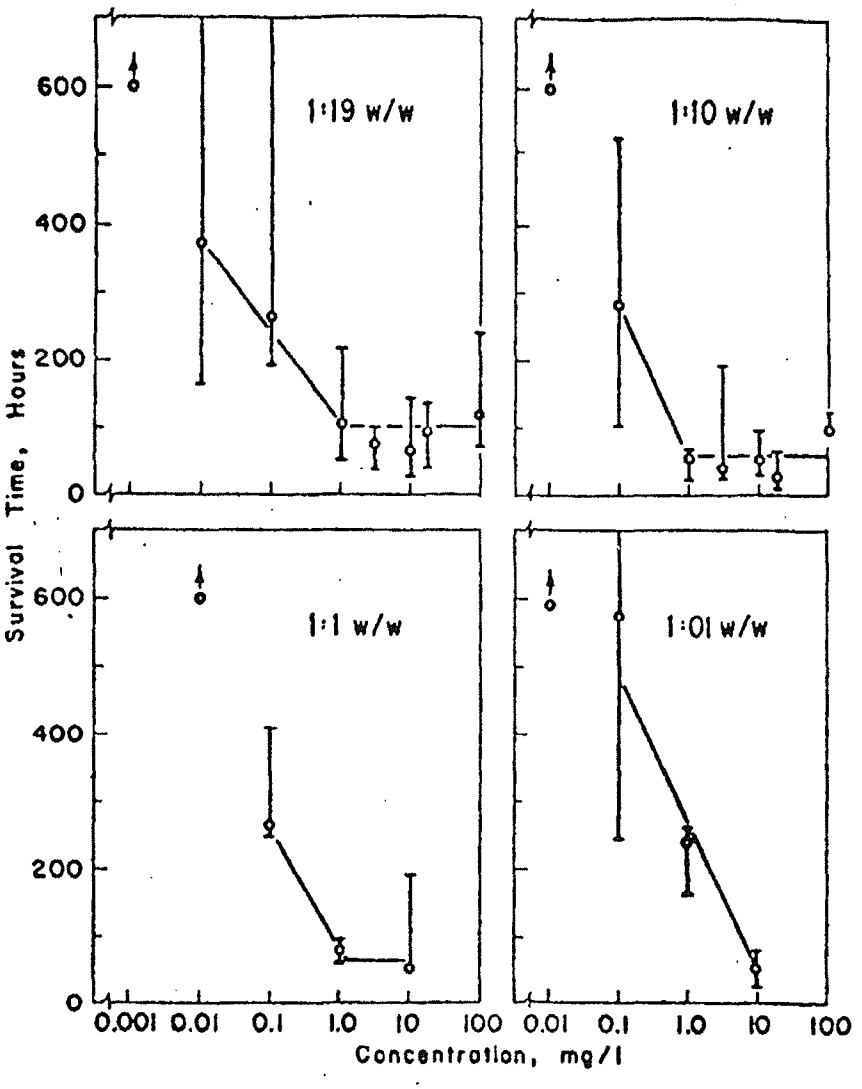

Figure 1. Median and range of survival time of *G. oceanicus* in Aroclor 1254:Corexit 7664 in sea water.

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chitinous wound callus which isolated the affected brownish tissue. A less extensive, sublethal necrosis was found in some animals down to 0.001 mg/ℓ of colloidal PCB in sea water. A sublethal branchial oedema was attributed to the effect of Corexit 7664 in sea water effective at a concentration down to 0.19 mg/ℓ.

Other data (2) show that the highest concentration of Corexit 7664 used (1.9 g/ℓ) to solubilize Aroclor 1254 is 15 times lower than the 48-hr LC50, and thus no mortality was caused directly by the emulsifier. Nevertheless it is possible that a synergistic effect occurred between the emulsifier and PCB.

References

1. ZITKO, V. Bull Environ. Contamination and Toxicol.

2. WILDISH, D. J. Fisheries Research Board of Canada, MS Report No. 1084. Polychlorinated biphenyls in sea water: bioassay of *Gammarus oceanious* (May 1970).

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