Fish Kill Caused by an Intermediate Oil from Coke Ovens

V. ZITKO and S. N. TIBBO
Fisheries Research Board of Canada
Biological Station
St. Andrews, New Brunswick, Canada

Thousands of dead herring (*Clupea harengus* L.) were observed in North Sydney Harbour, Nova Scotia, Canada, in April 1969 over a period of 4 to 5 days. Before death, the fish were seen swimming around with their mouths open, leaping out of the water, and then sinking to the bottom.

An intermediate oil from coke production was suspected to be the cause of the fish kill. This oil contains a large amount of aromatic hydrocarbons (IR bands at 3050-3075, 1600, 1515, 1500, and 690-800 cm^{-1}, UV bands at 320, 310, 285, 280, 275, 248, and 220 nm, $A^{1\%}_{1\,cm}$ = 12, 530, and 3650 at 310, 248, and 220 nm, respectively, fluorescence excitation maximum 280 nm, fluorescence emission maximum 310 nm). TLC of the oil on silica gel in heptane yielded two distinctly separated zones, the broader zone of lower mobility contained two narrow bands with blue fluorescence, separated by darker background.

Toxicity of the oil to herring was determined in static tests using 10 fish per 60 liters sea water (7-9°C) in polyethylene-lined fiberglass tanks. LT50* was 0.25, 0.87, 3.7, and 93 h at 100, 10, 8, and 6 ppm of oil, respectively. A mortality of 20% was observed at 4 ppm and no mortality up to 240 h occurred at 2 ppm.

Samples of skin, muscle, and intestines from 4 dead herring from North Sydney Harbour were combined and analyzed for the presence of oil as described previously (1), using the intermediate oil as the standard, and measuring the fluorescence emission intensity at 310 nm on excitation at 280 nm (a Perkin-Elmer MPF-2A Spectrofluorometer was used). The fluorescence emission spectra of all tissue samples were identical with that of the oil and only a weak background fluorescence was observed in extracts of control fish. Skin, muscle, and intestines contained 17.5, 5.2, and 9.2 µg/g of oil on wet weight basis. The extracts were combined after the analysis, concentrated to a small volume, and applied to a TLC plate. A zone corresponding to the lower-mobility

*Time to 50% mortality, hours

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zone of the original oil was observed.

The detection of the oil in dead herring and the high toxicity of the oil to herring under laboratory conditions indicate that this intermediate oil caused the fish kill. The distribution of the oil in the tissues shows that the oil was taken up primarily through the body surface.

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Literature Cited

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