

Mercury in fish from the Forth

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The Firth of Forth and adjacent North Sea receive inputs of a range of industrial and domestic wastes. In particular, an industrial discharge containing around 1 kg day^{-1} of mercury enters the estuary at Grangemouth, and sewage sludge containing approximately 0.1 kg of mercury is dumped daily near Bell Rock or St Abb's Head. In order to assess the effect that these discharges have on the mercury content of the flesh of commercial and other fish species, samples of fish have been taken at various locations close to the sources of mercury for comparison with fish from areas distant from mercury inputs. These "background" areas include the central North Sea, Ythan estuary and the West Coast (Minches).

The mercury concentration in fish flesh increases with age and therefore the mercury concentrations of fish from the Forth area were examined in relation to the fish length. The flounders caught in the inner Forth (west of Queensferry) have mercury concentrations ranging from $0.03\text{--}1.22 \mu\text{g g}^{-1}$ (mean $0.27 \mu\text{g g}^{-1}$), with the higher values occurring in the Alloa area, upstream of the industrial discharge. Flounders from the outer Forth (Cockenzie area) and the sludge grounds had significantly lower mercury concentrations, ($0.04\text{--}0.74$; mean $0.12 \mu\text{g g}^{-1}$) within the range of the background values, ($0.03\text{--}0.74 \mu\text{g g}^{-1}$). The concentrations in small plaice from the inner Forth ($0.01\text{--}0.57 \mu\text{g g}^{-1}$, mean $0.21 \mu\text{g g}^{-1}$) were in general lower than those in flounders, but significantly greater than those in plaice from the sludge grounds and outer Forth ($0.02\text{--}0.17$, mean $0.06 \mu\text{g g}^{-1}$), which were similar to the background fish. Elevated mercury concentrations were also found in young cod and whiting from the inner Forth, (cod $0.07\text{--}0.38 \mu\text{g g}^{-1}$, mean $0.20 \mu\text{g g}^{-1}$ and whiting $0.04\text{--}0.25 \mu\text{g g}^{-1}$, mean $0.10 \mu\text{g g}^{-1}$). The mercury concentrations in the older cod and whiting from the outer Forth and the sludge grounds were within the range of the background fish (i.e. cod $0.20\text{--}0.55 \mu\text{g g}^{-1}$ and whiting $0.01\text{--}0.25 \mu\text{g g}^{-1}$).

The Forth estuary does not support a significant commercial fishery for white fish, but the area is used by such species as cod, whiting and plaice at certain times of the year as a nursery ground. Only in the case of flounders can a direct comparison be made between areas for fish of the same size, but in all species the enhanced concentrations of mercury in fish caught west of Queensferry should be noted. By contrast, fish caught at the sludge disposal grounds contain concentrations of mercury similar to those in fish from distant areas. The industrial input in the estuary therefore appears to influence the mercury concentrations in fish to a greater degree than the sludge disposal operation. This difference may be related to the difference in magnitude of the inputs of mercury, the dispersive nature of the sewage disposal grounds, or the likely greater mobility of the adult stocks.