DDT residues in ducks

Use of D D T has declined greatly in recent years in Australia. However, it is a highly persistent pesticide, and its residues will remain in the environment for a long time to come even if its use stops completely.

In the United States, residue levels in waterfowl have been found to be sensitive indicators of general environmental contamination by D D T and other organochlorine pesticides. Recent work by Mrs Penny Olsen of the CSIRO Division of Wildlife Research and Mr Harry Settle and Mr Roland Swift, of the South Australian Regional Laboratory of the Australian Government Analytical Laboratories, indicates that a similar correlation exists in this country.

The scientists analysed wings from black ducks taken in March 1977 at ten locations scattered through New South Wales and Victoria (see the map). Smaller numbers of wings of other duck species were also analysed.

Figures for the use of D D T for crop production in each area were taken from a report compiled by the Australian Academy of Science in 1972. Although these are somewhat dated, they offer a guide to the extent to which the pesticide has been used in different areas since it made its debut in Australia in 1946.

At each location, wings from 25 black ducks were collected and pooled. Tests at the Analytical Laboratories determined their content of D D T and its breakdown products D D E and D D D.

In areas described by the Academy in 1972 as being exposed to medium use of D D T (1–4 pounds per acre per year), the average residue in wings was 11·2 parts per million (wet weight). The

Black duck

locations in this category were Barrenbox Swamp and Lake Tarrawong, N.S.W.

Six locations — Lake Cowal in New South Wales and Shepparton, Kerang, Lake Buloke, Sale, and Tower Hill in Victoria — were exposed to light or sporadic use of D D T (less than one pound per acre per year). Black duck wings from these areas gave concentrations of D D T and its breakdown products averaging 1·44 p.p.m.

For the other two locations, Coraki in northern New South Wales and the Monaro district in the south of the State, the Academy recorded no D D T use. The figure for wings collected in these areas was 0·22 p.p.m.

Concentrations in wings from the other species of ducks generally followed the same pattern — an association between residue levels and recorded D D T use.

Another 25 black ducks were collected in 1978 from Barrenbox Swamp, and eight of these, with wing concentrations of D D T residues ranging from 0·3 to as much as 221·2 p.p.m., were subjected to more detailed analysis. Levels in their fat, breast muscle, liver, and brain tissues were examined to see how they compared with the wing analysis figures.

In all cases, birds with high wing concentrations had high concentrations in other tissues. Similarly, a low wing figure indicated that the concentration elsewhere would be small.

Levels in livers were considerably higher than those in the breast muscle and brain. The scientists take this to indicate that the birds rapidly assimilate the residues they ingest into their tissues. The correlation found between concentrations in the ducks and D D T use is further evidence of this.

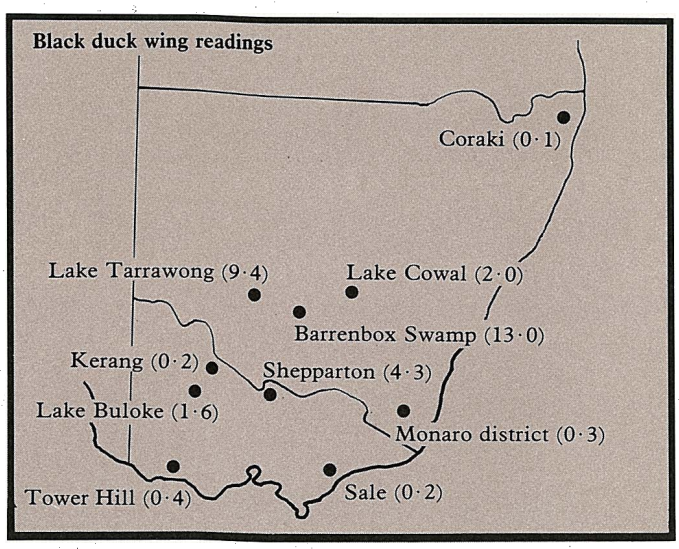
The black duck is a highly mobile creature, a fact reflected in the large residue-level variation among individual birds. However, the scientists conclude from their results that, by gathering average wing concentration figures for a substantial number of birds, it may be possible to generally define areas that have been exposed to differing quantities of D D T and other organochlorine pesticides.

They say samples from a greater number of areas and more precise figures on D D T use than those gathered by the Academy are needed to clarify the relation between residues in ducks and in the environment.

Residue levels in the fat of the eight ducks tested were nearly eight times greater than those in the wings. As the maximum D D T-residue level set by the National Health and Medical Research Council for the fat of poultry for human consumption is 7 p.p.m., it seems that a wing concentration of 1 p.p.m. shows that a duck is probably just over the limit.

The average concentration in wings for black ducks was greater than 1 p.p.m. in five of the ten locations sampled. At Barrenbox Swamp and Lake Tarrawong, it was greater than 7 p.p.m., which indicates that the level in the birds' fat must have been many times the limit. The average for grey teal wings was above 1 p.p.m. at two of the three sites where this species was sampled.

Black duck and grey teal together make up about 80% of



The figure for each location is the average content (p.p.m.) of DDT and its breakdown products DDE and DDD in wings from black ducks.

How concentrations varied at Barrenbox Swamp

Black duck categories	number of birds	residue concentration in wings (p.p.m.)	
		lowest	highest
adult male (non-moulting)	25	0·06	92·90
adult male (moulting)	25	0·31	316·10
adult female (non-moulting)	25	0·20	104·50
adult female (moulting)	25	0·38	117·40
juvenile male	14	0·03	6·00
juvenile female	11	0·03	2·70

These figures illustrate the great range of concentrations found among individual birds. The higher levels in adults are probably due to their longer exposure to residues, and mobilization of fat reserves during the moult may be one reason why moulting birds gave higher readings than non-moulting ones.

hunters' bags each duck-shooting season in south-eastern Australia. The scientists say their results suggest a need for caution in the consumption of these ducks. They also believe their results suggest a need for detailed study of potential harmful effects of the residues on species more sensitive to them than ducks.

Tests were also run for residues of the organophosphate pesticides diazinon, ethion, delnav, malathion, and trithion; none was detected in any of the ducks.

Apart from D D T residues, the only contaminants detected were low concentrations of P C B (polychlorinated biphenyl) and the organochlorine pesticide dieldrin, in just one duck each.

Organochlorine residues in wings of ducks in south-eastern Australia. P. Olsen, H. Settle, and R. Swift. *Australian Wildlife Research*, 1980, 7 (in press).