

Brief Communication

**RESIDUES OF POLYCHLORINATED BIPHENYLS (PCB)
AND ORGANOCHLORINE INSECTICIDES IN EGGS
FROM MUTE SWAN (CYGNUS OLOR)
AND POCHARD (AYTHYA FERINA)***

The swan was chosen for investigation as a species whose reproduction is not threatened; on the contrary, a recent investigation has shown that the swan population of Denmark has increased steadily since 1926 due to preservation regulations (Bloch 1971). As the swan is exclusively a herbivore, eggs of the pochard from one of the localities were examined for comparison, as the latter consumes animal food supplemented by plant material.

The eggs were collected from two localities in June 1970, the first (Nakskov Indrefjord) being an almost enclosed brackish water area which receives water from a 150 km² drainage area and which is separated from the town of Nakskov by a self-emptying sluice. The second locality, Suderø in Smålandshavet, is completely open and surrounded by sea which receives currents from the Baltic Sea. With the exception of two eggs from pochard (No. 3 and 4), eggs were collected from different nests.

Both localities have supported swan colonies for several years, the maximum being 100 pairs at Suderø and 50 pairs at Nakskov. The pochard population of Nakskov Indrefjord was previously the highest in Denmark at about 75 pairs, but it has been greatly reduced during the last six years together with the other duck populations.

Isolation and clean-up of the chlorinated compounds were performed as described by Jensen (1972). The qualitative and quantitative gas chromatography analyses were carried out according to Karlog *et al.* (1971).

The results of the chemical analysis are given in Table 1. Values are given as mg chlorinated compound/kg extractable fat to eliminate the differences in fat content, due to the occurrence of embryos of varying size in some of the eggs.

While p,p'-DDT, p,p'-DDE and PCB (recognized and estimated as Clophen A60) were found to occur in all the eggs from

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Table 1. PCB and organochlorine insecticides in eggs from mute swan and pochard.

| Species | No. | ppm fat weight | | |
|--|-----|--------------------------|------------------------|-----------------------|
| | | p,p'-DDE | p,p'-DDT | PCB |
| mute swan (<i>Cygnus olor</i>) Suderø | 1 | 0.169 | 0.056 | 0.78 |
| | 2 | 1.200 | 0.665 | 0.95 |
| | 3 | 0.159 | 0.098 | 0.82 |
| | 4 | 0.256 | 0.139 | 1.28 |
| | 5 | 0.242 | 0.112 | 0.69 |
| | 6 | 0.168 | 0.086 | 0.82 |
| | 7 | 0.312 | 0.148 | 0.99 |
| | 8 | 0.403 | 0.00 | 2.29 |
| | 9 | 0.235 | 0.091 | 0.77 |
| | 10 | 0.181 | 0.116 | 0.76 |
| mean values and ranges | | 0.333 (0.159 — 1.200) | 0.151 (0.0 — 0.665) | 1.02 (0.69 — 2.29) |
| mute swan (<i>Cygnus olor</i>) Nakskov Indrefjord | 1 | 0.356 | | 3.94 |
| | 2 | 0.268 | | 2.67 |
| | 3 | 0.361 | | 3.00 |
| | 4 | 0.119 | | 1.53 |
| | 5 | 0.275 | n.d. | 2.20 |
| | 6 | 0.185 | | 2.19 |
| | 7 | 0.228 | | 2.95 |
| | 8 | 0.582 | | 7.05 |
| | 9 | 0.620 | | 5.45 |
| | 10 | 0.360 | | 2.42 |
| mean values and ranges | | 0.335 (0.119 — 0.620) | | 3.34 (1.53 — 7.05) |
| pochard (<i>Aythya ferina</i>) Nakskov Indrefjord | 1 | 3.580 | | 55.7 |
| | 2 | 1.825 | | 50.5 |
| | 3 | 1.715 | n.d. | 47.3 |
| | 4 | 1.605 | | 43.4 |
| | 5 | 1.350 | | 6.4 |
| mean values and ranges | | 2.015 (1.350 — 3.580) | | 40.7 (6.4 — 55.7) |

n.d. = not detected.

Suderø, only p,p'-DDE and PCB were found in eggs from Nakskov Indrefjord. The occurrence of unaltered p,p'-DDT in eggs from Suderø indicates pollution of the Baltic Sea as also observed in Sweden (*Odsjö & Olsson 1971*). The high PCB content of eggs from Nakskov Indrefjord presumably reflects industrial pollution from the town of Nakskov.

It will be noticed that eggs from the swan, which is lower in the food-chain, contains considerably less DDE and PCB than pochard eggs. These compounds, however, are not presumed to have caused the decrease in the pochard population of the locality.

The thicknesses of the egg-shells are given in Table 2. Measurements were made with a micrometer at the equatorial plane of the dried shell, after removal of the membranes. For the swan eggs no significant difference was found between the two localities.

Table 2. Thickness of the egg-shell (in mm).

| Species | m. \pm s | n |
|--------------------|-----------------|------|
| mute swan, Suderø | 0.71 \pm 0.05 | (10) |
| mute swan, Nakskov | 0.70 \pm 0.05 | (10) |
| pochard, Nakskov | 0.36 \pm 0.02 | (5) |

n = number measured.

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REFERENCES

- Bloch, D.*: Ynglebestanden af Knopsvane (*Cygnus olor*) i Danmark i 1966. (The breeding population of the mute swan (*Cygnus olor*) in Denmark in 1966). *Danske Vildtundersøgelser* 1971, hefte 16, 43—44.
- Jensen, S.*: 1972. To be published.
- Karlog, O., I. Kraul & Sv. Dalgaard-Mikkelsen*: Residues of polychlorinated biphenyls (PCB) and organochlorine insecticides in liver tissue from terrestrial Danish predatory birds. *Acta vet. scand.* 1971, 12, 310—312.
- Odsjö, T. & M. Olsson*: Ekologisk miljögiftforskning. (Ecological research on environmental poisons). *Sveriges natur. Årsbok* 1971, 93—94.

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