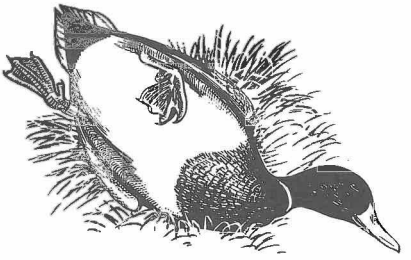
Pesticide poisoning of wildfowl in England and Wales.



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The use of pesticides carries a potential risk for wild and domestic animals. The Wildlife Incident Investigation Scheme examines cases where animals are suspected of being poisoned by pesticides in England and Wales. During the years 1982-1991, 85 incidents involving wildfowl deaths were reported through the Scheme. The cause of death was identified in 53% of these, with agricultural chemicals implicated in 33%.

Keywords: Mortality, Mallard, Swans, Geese, Organophosphates, Agricultural Chemicals

The Wildlife Incident Investigation Scheme (WIIS) operates in England and Wales as a method of assessing the effects of pesticides on wildlife after the pesticides have been registered for use. Data gathered may also be used to enforce relevant wildlife or pesticide legislation involving agricultural chemicals. The Scheme operates by a combination of methods, including field inquiries, to help identify the cause of an incident; a *post-mortem* examination may result in tests to ascertain whether disease contributed to the death, and laboratory analytical studies are carried out on tissues from the dead animal to determine the presence of a range of pesticide residues (Hardy *et al.* 1986, Fletcher *et al.* 1992).

Mortality is usually attributed to a pesticide if residues or derivatives are found above levels considered to represent lethal exposure. The cause of wildfowl poisoning by agricultural chemicals can be assigned to one of four categories (Greig-Smith 1988, Fletcher *et al.* 1992): 1) The **deliberate abuse** of one of these compounds, either as a result of an illegal control method to kill wildfowl suspected of causing damage, or where the birds have been poisoned as a result of eating bait illegally-placed for some other target species. 2) **Misuse** of chemicals arises when wildfowl are killed due to the careless, accidental or wilful failure to adhere to the correct practise of using the compound. This includes incidents where spilt dressed grain is not cleared adequately, or the chemical is poorly stored, thus allowing wildfowl access. 3) Wildfowl may be poisoned as a result of the **approved use** of a product that may have been applied as recommended. 4) Where there is no evidence to assign an incident of wildfowl poisoning to one of the other categories, then the cause is classed as **unspecified use**.

Results

From 1982 to 1991, a total of 85 incidents involving wildfowl was investigated. The cause of death was established in 45 of these, and poisoning by agricultural chemicals was confirmed in 28 (33%) (**Table 1**). The majority of these incidents arose from the deliberate abuse of agricultural chemicals or from their approved use.

Deliberate abuse

The nine incidents involving deliberate abuse resulted in the deaths of Mute Swans *Cygnus olor* (two incidents) and Mallard *Anas platyrhynchos* (seven incidents) and, in two incidents, of Moorhens *Gallinula chloropus*. The compounds involved included the narcotic alphachloralose (five incidents), the organophosphorus insecticides mevinphos (two incidents) and dimethoate (one incident), the organochlorine compound endrin (one incident). The baits used were either bread or grain. The numbers of birds found poisoned varied, from three Mute Swans poisoned in each of two incidents, to more than 100 mallard in one other case. Reasons for abuse included attempts to clear Mallard from a golf course, to kill Mallard perceived to be a problem at a trout farm, to control ducks at a public pond, and as a personal grudge against an individual who was encouraging duck for later shooting.

Table 1. Causes of death of wildfowl reported to the Wildlife Incident Investigation Scheme 1982-1991.

Cause of Death	Incidents *n*
Pesticide poisoning	
Deliberate abuse	9
Misuse	2
Approved use	12
Unspecified use	5
Infectious disease or trauma	9
Other poisoning	8
Unknown	40

Misuse

Cases of misuse usually arise from poor chemical storage, incorrect usage (after failure to follow instructions on labels) or inappropriate disposal. Only two incidents were reported in this category, both involving Mallard, in one case 17 birds and, in the other, 20. In the first incident the birds had access to an inadequately-stored split bag of wheat seed which had been treated with chlorfenvinphos. This is an organophosphorus insecticide used to reduce damage to growing wheat by Wheat Bulb Fly *Delia coarctata*. The second incident resulted from ducks being poisoned after having access to a farm store where they fed on grain treated with fonofos, another organophosphorus treatment used against wheat bulb fly.

Approved use

The 12 incidents in this category were found to have resulted from either insecticidal seed treatments, sprays or granular applications of insecticides. In all cases, there was sufficient evidence from the field inquiry to suggest that pesticides were being used according to the regulations.

Insecticidal seed treatments

Wildfowl frequently feed on seed available at the surface of fields, and much of the seed sown in the UK is treated with insecticides. There were five incidents involving these compounds. Carbophenothion is an organophosphorus insecticide which is applied to winter wheat seed to reduce damage by wheat bulb fly. During the years under review, four incidents involved this compound and the poisoning of wildfowl. In the past, large numbers of geese, in particular Pink-footed Geese *Anser brachyrhynchus*, have been found poisoned after feeding on grain treated with this compound which is particularly toxic to geese (Bailey *et al.* 1972, Hamilton & Stanley 1975, Hamilton *et al.* 1976, Stanley & St Joseph 1979).

After feeding on a winter wheat field drilled with treated seed in 1982, 85 Brent Geese *Branta b. bernicla*, 21 Canada Geese *B. canadensis*, and four Pink-footed Geese were found poisoned. The seed had been drilled two weeks earlier and had started to germinate. Recent rain had softened the ground and the geese had ingested the treated seed together with the seedlings. In another incident, also in 1982, residues of carbophenothion were found in 22 Bewick's Swans *Cygnus columbianus* and three Whooper Swans *C. cygnus*. In this case prolonged rain had made drilling difficult, resulting in grain being left on the surface. Compounding the problem, a nearby wildfowl refuge provided food in the form of grain to attract birds. In another incident in 1985, eight Bewick's Swans were poisoned by carbophenothion-treated grain which was poorly drilled due to prolonged rain. The previous crop in the field had been sugar beet, and the swans were attracted to this field by the remains of the beet tops lying on the surface. The final incident of wildfowl poisoning by carbophenothion involved the deaths of 30 to 60 Greylag Geese *Anser anser* in 1986. Again, a newly-drilled field was the source of the compound. Interestingly, Canada and Egyptian Geese *Alopochen aegyptiacus*, feeding on the same field were apparently unaffected. This illustrates the specific toxicity of these organophosphorus compounds (Stanley & Bunyan 1979).

The remaining incident reported which involved poisoning by seed treatments resulted from maize ingestion. Four Mallard died in 1990, after feeding on a field which

had been sown with maize treated with the carbamate compound, bendiocarb. This compound is used to control Frit Fly *Oscinella frit*, and to reduce damage by wireworms *Agriotes* spp..

Insecticidal sprays

The five incidents investigated all implicated the insecticidal spray, triazophos, and all occurred in February or March. In four cases triazophos was sprayed on winter wheat, probably to control Yellow Cereal Fly *Opomyza* sp., and the wildfowl were poisoned as a result of grazing on the wheat soon after it had been sprayed.

Brent Geese were poisoned in two incidents, with 50 to 60 birds dying in each. In one case, in 1984, small residues of dimethoate, as well as triazophos, resulting from a tank mix, were found in the tissues of the dead geese. At least one local field of winter wheat had been sprayed with these compounds. In the other, in 1987, the birds were found dead in a field where triazophos had been recently sprayed. A similar incident had occurred a few years earlier at this site which had resulted in the deaths of 80 Brent Geese. Seven Bewick's Swans were found dead in 1986 after feeding in a field which had been sprayed with a mix of triazophos and fonofos; only triazophos residues were detected. In 1982, 30 Greylag Geese were found dead on a wheat field after an application of triazophos. The geese had been seen feeding on the field prior to spraying. Mortality of wildfowl after mixtures of insecticides have been applied to fields in North America has been reported by Stone & Gradoni (1985b) and Blus *et al.* (1991). Triazophos residues were found in tissues of geese after a field of carrots had been sprayed in 1985. This compound is used to reduce the damage caused by late generation Carrot Flies *Psila rosa*. Twelve Canada and Greylag Geese and a Moorhen were found dead. *Post-mortem* examination revealed the presence of carrot foliage in the gizzards of the birds.

Insecticidal granules

There were two incidents implicating these compounds in wildfowl deaths. Granules containing disulfoton in a base of Fullers earth are applied to the soil at the time of drilling in order to control aphids in several vegetable crops. Disulfoton is an organophosphorus compound. In 1990, 16 dead Mallard were collected from a dyke and were later found to have ingested this compound, probably from a nearby, recently-treated field of brussels sprouts.

In 1984, 11 Shelduck *Tadorna tadorna* and two Mallard were found poisoned. A nearby field of sugar beet had been treated with the systemic carbamate insecticide, carbofuran, during a very dry spell in which a rain gun irrigator was used. This had malfunctioned, resulting in excess water being pumped onto the field. Large pools of water were formed which contained dissolved granules and attracted the ducks. Granular formulations of carbofuran have caused mortality of wildfowl in the United States, where its use is under review (Smith 1987).

Unspecified use

In five other incidents there was insufficient evidence to identify the origin of the poisoning. In 1983, 11 Teal *Anas crecca* and five Mallard were found dead in a drainage ditch. Significant residues of the organophosphorus compound, phorate, were detected in the tissues. Phorate has many uses as a systemic insecticide with vapour-phase activity but, in this incident, field investigations failed to find whether the compound had been used locally. There were two incidents in 1986 and 1989, involving Mallard killed by fonofos; as grain was found in the gizzards of the birds, they may have ingested treated grain, although the sources were not found.

In 1983, 60 to 70 domestic and wild Mallard died over a period of one week on a large pond; analysis of tissue samples revealed residues of the organophosphorus insecticide, diazinon. Although this compound has several agricultural uses, it is also a veterinary product, used for sheep dipping and other purposes. Possibly it had entered the pond after a sheep dip had been emptied nearby. Deaths of wildfowl in North America involving diazinon have been reported by Zinkl *et al.* 1978 and Stone & Gradoni 1985a. Finally, carbofuran residues were confirmed in tissues of two Mallard in 1987.

Other poisoning

Although the WIIS concentrates on the detection of pesticides in wildfowl, other poi-

soning cases are sometimes brought to light. Usually, cases of inorganic lead poisoning, found commonly in swans, are screened out prior to submission. However, in the early 1980s, five lead poisoning incidents all involved Mute Swans. Another incident where Mute Swans were found poisoned resulted from calcium carbide being fed maliciously to the birds in bait. In the presence of water, this compound produces acetylene. About 14 Mallard were found dead and dying on a quay. At *post-mortem* examination these birds had their crops bulging with grain, and the discolouration of the lungs and blood suggested nitrate poisoning. On analysis this was confirmed; the source of the nitrate was not found. Toxins, produced by blue-green algae, were considered to have poisoned Mallard on a lake in late summer, 1989.

Trauma and infectious disease

Of the wildfowl incidents investigated between 1981 and 1990, nine deaths were attributed to trauma or infectious disease. The two trauma incidents involved Mute Swans; one had flown into overhead wires, the other had swallowed fishing line and weights. Duck virus enteritis was found to be the cause of death of Mallard, Canada Geese and a Barnacle Goose *Branta leucopsis*. Botulism was identified in Mallards in an incident in 1990, and avian tuberculosis in two Shelducks. Peritonitis was considered the cause of death of Mute Swans and Mallard. Many deaths occur from trauma, disease and starvation but are not usually reported to the Scheme, or are rejected on submission as outside our remit. Our sample of wildfowl deaths, therefore, is not random.

Discussion

The deliberate abuse of pesticides can be combatted in several ways and, in Great Britain, an anti-abuse campaign was launched in 1991. Where perpetrators of illegal poisoning are identified and sufficient evidence is available, prosecutions are undertaken. If successful, fines are imposed and as much publicity is generated as possible. Action is being taken to increase awareness of the problems of abuse amongst users of the countryside. A publicity campaign has encouraged the public to help in identifying illegal uses, to preserve evidence, and to report incidents. They are being asked not to interfere with legal methods of control, such as traps, as this may lead to illegal methods, including poisoning, being used.

The hazard to wintering geese from the use of wheat seed treatment has been highlighted by Stanley & Bunyan (1979), and action taken to reduce the numbers of deaths, in particular by the use of carbophenothion. In areas where overwintering goose populations are thought to be at risk, alternatives which are much less toxic to geese are used. In other areas, if wildfowl are known to visit fields where carbophenothion-treated grain was used and incorporation had been poor, scaring is encouraged for the period when the birds are vulnerable. Thus no cases have been reported in recent years. The problem of triazophos and wildfowl deaths, identified by the Scheme, has led to new regulations restricting the use of the compound to winter cereals up to the end of December, thereby presenting less of a hazard to geese grazing on the crop.

Conclusion

In general, the Wildlife Incident Investigation Scheme has acted as a post-registration surveillance system, highlighting the problems provided by agricultural chemicals, and has proved invaluable in identifying potential and actual problems to wildfowl. As new pesticide compounds are introduced, the Scheme will ensure that problems can be identified at an early stage and action taken. The Scheme is a potent force in ensuring that the perpetrators of illegal poisoning will, wherever possible, be prosecuted, and should eliminate or reduce the indiscriminate killing of wildfowl and other wildlife.

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