

**PESTICIDE POISONING OF ANIMALS 2003**

**A REPORT OF INVESTIGATIONS IN SCOTLAND**

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## SUMMARY

The Wildlife Incident Investigation Scheme in Scotland investigates deaths of wildlife, including beneficial insects, pets and livestock, where there is strong evidence to indicate that pesticide poisoning may be involved.

The scheme, together with sister schemes throughout the United Kingdom, provides a means of post-registration surveillance of pesticide use, so that registration may be revised if necessary. These schemes also provide a measure of the success of the pesticide registration process, and help in the verification and improvement of the risk assessments made in the registration of compounds. Incidents of approved use and of misuse can highlight problems with the approval conditions or the label instructions for a pesticide, and can provide valuable feedback into the regulatory process.

The scheme in Scotland also furnishes evidence that can be used by SEERAD, or by the police, to enforce legislation on the use of pesticides, and in the protection of food, the environment, and animals.

There were 152 suspected incidents registered for investigation by the scheme in 2003. The causes were determined in 64 incidents, of which 37 (26% of those investigated) involved pesticide poisoning or exposure to pesticides. Only one incident was attributed to the approved use of a pesticide, this arose from an application of the molluscicide, metaldehyde, on winter wheat. Three incidents, involving bromadiolone, coumatetralyl, and metaldehyde, were each attributed to some form of misuse.

Deliberate abuse of pesticides was identified in 32 incidents in 2003 compared to 23 in 2002, and 25 in 2001. This represents 86% of pesticide incidents in 2003 compared to 58% in 2002, and 71% in 2001. Carbofuran formulations were the most actively abused pesticide products. In addition, there was a single incident that was thought to be a result of deliberate abuse of a pesticide formulated as a veterinary medicine.

Twelve agricultural chemicals were identified in the pesticide poisoning incidents, compared to nine in 2002.

## INTRODUCTION

1. In the United Kingdom the impact of all pesticide uses on wildlife and other animals, including beneficial insects such as honeybees, is assessed before approval is granted by the regulatory body. Where it is thought that an unacceptable risk would arise, restrictions on use may be imposed in the conditions of approval under the Control of Pesticides Regulations (COPR) 1986 (as amended) or the Plant Protection Products Regulations (1995), in order to protect wildlife and domestic animals.

2. The Scottish Wildlife Incident Investigation Scheme (WIIS) is one of four schemes, operating in the United Kingdom, which investigate possible pesticide poisoning of animals. The scheme in Scotland is operated by the Scottish Agricultural Science Agency (SASA) on behalf of the Environment and Rural Affairs Department of the Scottish Executive (SEERAD). The procedures for incident investigation are described in Appendix I.

3. Incidents confirmed as involving pesticides are assigned to one of four categories:

- **Approved use** of the product, according to the specified conditions of use;
- **Misuse** of a product, by careless, accidental or willful failure to adhere to the correct practice;
- **Abuse** of a pesticide, in the form of deliberate, illegal attempts to poison animals;
- **Unspecified use**, where the cause could not be assigned to one of the above categories.

There is also a category of Veterinary use, where subsequent investigation identifies the involvement of a pesticide formulated as a veterinary medicine. Such cases are investigated incidentally rather than deliberately, and may include abuse, misuse, approved use, or unspecified use of the relevant compounds. Incidents suspected of involving veterinary medicines should be reported to the Veterinary Medicines Directorate (Tel. 01923-338427).

4. The results of investigations are reported to the Environmental Panel of the Advisory Committee on Pesticides (ACP). The information provided may result in a re-evaluation of the approvals previously granted to products, or may affect the progress to full commercial use of products currently under provisional approval. Information from incidents assists in the validation and improvement of the risk assessment procedures used by the regulatory body for new and existing compounds.

5. The majority of this post-registration surveillance activity is funded jointly by the agricultural and non-agricultural sectors of the pesticide industry, under the Food and Environment Protection Act 1985 (FEPA). In cases where there is evidence to indicate misuse or deliberate abuse of a pesticide, the results of investigations may also result in legal enforcement. Under FEPA and COPR, all aspects of pesticide advertisement, sale, supply, storage and use are fully regulated. If investigations reveal contravention of this Act, or other legislation such as the Wildlife and Countryside Act

1981, then prosecution or other forms of enforcement may ensue. All activities carried out to enforce the legislation in Scotland are funded by SEERAD.

6. SEERAD is a partner in the Campaign against the Illegal Poisoning of Animals led by DEFRA. The freephone number (0800 321600) is routed to SASA and provides ready access for incident notification. To prevent large numbers of dead animals being submitted and analysed, with the consequential impact on resources and finances, strict criteria are applied to potential incidents prior to acceptance. Incidents are only accepted where the use of pesticides may be implicated. Incidents are rejected for further analysis where they obviously involve trauma or disease. Unless there are special circumstances, substantial delays in the notification of incidents or the unavailability of bodies or baits may also lead to rejection.

## INCIDENTS IN 2003

### NUMBER OF INCIDENTS IN 2003

7. A total of 152 suspected poisoning incidents were notified to SASA in 2003. A further 7 incidents had been eliminated on veterinary evidence prior to submission. Seven of the submitted incidents were rejected for investigation because the acceptance criteria were not met or because of post mortem evidence, leaving 145 incidents registered for onward investigation (158 in 2002).

8. The cause of death or illness (including pesticides and non-agricultural chemicals, disease, starvation and trauma) was established in 64 incidents (44% of those investigated). Pesticides were identified in 37 of these incidents (26% of those investigated). In other incidents, either no residues were detected, or investigations were terminated because of insufficient information or lack of suitable tissue samples.

**Table 1: Number of incidents investigated in 2003**

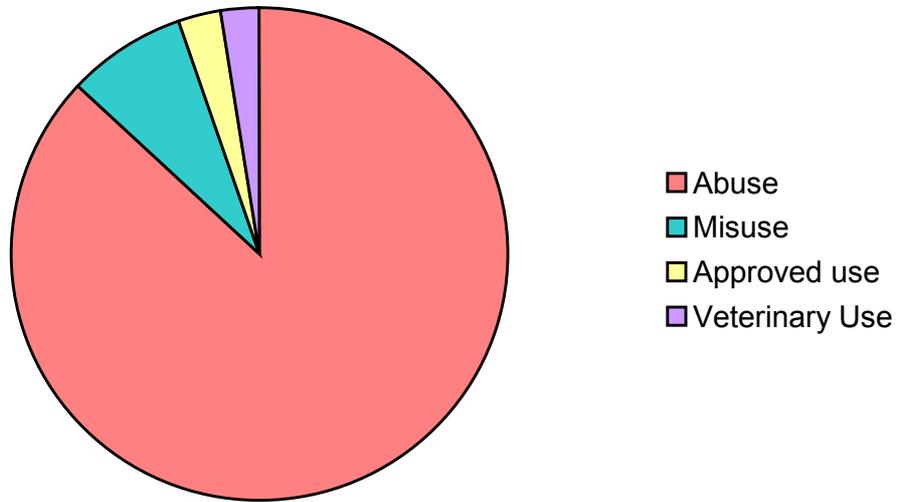
	Incidents Investigated	Pesticide poisoning incidents	Other cause of death found
Vertebrate wildlife	86 *	24 (28%)	26 (30%)
Livestock	4	0	0
Companion animals	41	10 (24%)	1 (2%)
Exotics	2	0	0
Beneficial insects	3	0	0
Suspected baits and suspicious substances	9	3 (33%)	not applicable
<b>TOTAL</b>	<b>145</b>	<b>37 (26%)</b>	<b>27 (19%)</b>

\* one incident involved a bird of prey and a mammal.

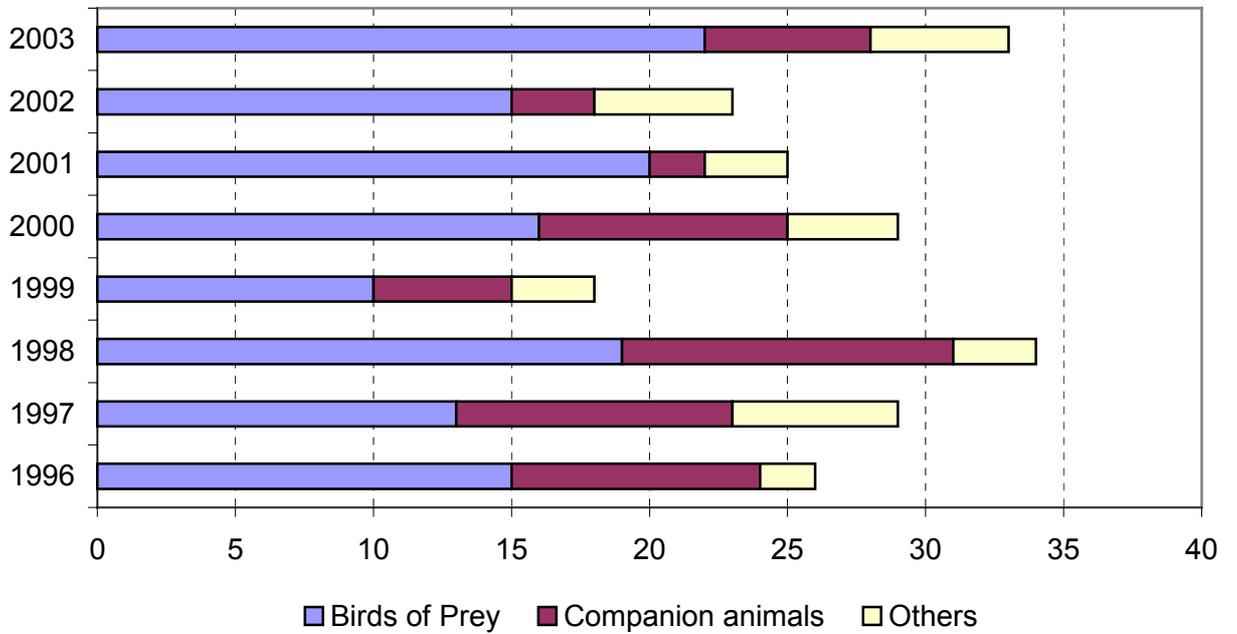
9. One incident (3% of poisonings) was attributed to the approved use of the pesticide involved, 3 incidents (8%) involved some element of misuse, 32 (86%) were associated with abuse, and one incident was associated with abuse of pesticides supplied for veterinary use. A breakdown of incidents by animal category is shown in Table 1. A list of the pesticides involved, and other causes of death, is presented in Table 2.

**Table 2: Number of incidents involving individual pesticides in 2003 and species and/or bait involved.**

<b>Carbamates</b>		
aldicarb	2	bait, cat
carbofuran	25	bait, buzzard, cat, dog, fox, magpie, peregrine falcon, raven, red kite, sea eagle, sparrowhawk
<b>Organophosphates</b>		
diazinon	1	red kite
mevinphos	3	chemical, pheasant, rook
propetamphos	1	red kite
<b>Rodenticides</b>		
bromadiolone	2	dog, formulation
coumatetralyl	1	dog
difenacoum	1	dog
<b>Other Compounds</b>		
chloralose	3	buzzard, chemical, red kite
metaldehyde	2	dog
sodium cyanide	1	chemical
strychnine	3	chemical, dog
<ul style="list-style-type: none"> <li>• one incident involved carbofuran and chloralose</li> <li>• one incident involved diazinon and propetamphos</li> <li>• one incident involved coumatetralyl and difenacoum</li> <li>• one incident involved, bromadiolone, carbofuran, chloralose, mevinphos, strychnine and sodium cyanide</li> </ul>		
<b>Cause of death other than pesticides</b>		
disease	2	
starvation	7	
trauma	17	
ethylene glycol	1	
unknown	74	
not applicable	7	



**Figure 1. Pesticide Incidents in Scotland 2003**



**Figure 2. Abuse of pesticides in Scotland (number of incidents)**

## VERTEBRATE WILDLIFE: MAMMALS

**10.** A total of 8 incidents involving wild mammals were investigated (Table 3). The cause of death was established in one incident. A fox submitted from the Borders was found to have been poisoned with carbofuran.

**Table 3: Number of incidents involving wild mammals in 2003**

	<i>Number of incidents investigated</i>	<i>Number (%) in which pesticide poisoning was identified</i>	<i>Number (%) in which another cause of death was identified</i>
Bat	2	0	0
Fox	2	1 (50%)	0
Mole	1	0	0
Rabbit	2	0	0
Squirrel	1	0	0
Vole	1	0	0
<b>TOTAL</b>	<b>8 *</b>	<b>1 (13%)</b>	<b>0</b>

\* One incident involved a mole and a vole

## VERTEBRATE WILDLIFE: BIRDS

### *Birds of Prey (including owls)*

**11.** A total of 71 incidents involving birds of prey were notified. The cause of death was established in 48 (68%) incidents; with pesticide poisoning accounting for 22 (31%) of these (Table 4).

### *Buzzards*

**12.** Common buzzards were involved in 40 incidents in 2003. The cause of death was established in 25 of these incidents, with 12 of them attributed to pesticide poisoning. The twelve incidents linked with pesticides were clearly associated with deliberate abuse, the chemicals involved being carbofuran (11) and chloralose (1). Other causes of death included trauma (7), disease (2), and starvation (4).

### *Eagles*

**13.** One golden eagle and 2 sea eagle deaths were notified in 2003. The analytical investigation revealed that a sea eagle from Highland died from carbofuran poisoning. The cause of death of the other two birds was not established.

**Table 4: Number of incidents involving wild birds in 2003**

	<i>Number of incidents investigated</i>	<i>Number (%) in which pesticide poisoning was identified</i>	<i>Number (%) in which another cause of death was identified</i>
Birds of prey including owls	71	22 (31%)	26 (37%)
Wildfowl and waterbirds	2	0	0
Gulls and waders	1	0	0
Gamebirds	2	1 (50%)	0
Corvids	9	3 (33%)	0
Other birds	1	0	0
<b>TOTAL</b>	<b>79 *</b>	<b>23** (29%)</b>	<b>26 (33%)</b>

\* **Six** incidents involved birds of prey and corvids and **one** incident involved corvids and a game bird.

\*\* **Two** incidents involved birds of prey and corvids and **one** incident involved corvids and a game bird.

### ***Red Kites***

14. Ten incidents involving red kites were reported during the year. The cause of death was identified in all of these, with 7 being associated with pesticide abuse. Carbofuran poisoning accounted for 5 of the incidents, 3 from Dumfries and Galloway, where a total of 5 birds died, and one each from Central and Strathclyde. A single incident of chloralose abuse occurred in Dumfries and Galloway in which 3 kites and 2 buzzards died. Residues of two veterinary medicines, diazinon and propetamphos, were identified in tissues from a red kite from Doune, Central. In the absence of reliable field information to the contrary, the incident was attributed to abuse. The causes of death in the remaining incidents were identified as starvation (2) and trauma (1).

### ***Other Raptor Species***

15. Peregrine falcons were the casualties in three incidents, 2 of which involved carbofuran abuse. In the first of these a single dead bird was found close to its nest site in Strathaven. In the other incident 2 birds were found dead on shoreline beneath cliffs at a locus in Grampian. There was a suspicion that someone had tried to dispose of the bodies by throwing them into the sea. Trauma was recorded as the cause of death for the third incident.

16. Only one incident involving sparrowhawks was reported. Two birds were recovered during a field search following the poisoning of red kites. Both

sparrowhawks were found to have been poisoned with carbofuran after feeding from wood pigeon baits in Dumfries and Galloway.

17. Seven barn owls and 2 tawny owls were received during the year. The cause of death was identified in 6 of the incidents but none involved pesticide poisoning. One barn owl died from starvation, 3 others and both tawny owls died from trauma.

18. No evidence of pesticide involvement was identified in four incidents where kestrels were submitted, but trauma was established as the cause of death in 2 of these incidents.

19. Two incidents involving hen harriers were investigated during 2003. Trauma was identified as the cause of death in one incident. No cause of death was determined in the other.

### ***Wildfowl and Waterbirds***

20. In 2003 there were two incidents involving wildfowl and waterbirds. Both incidents involved the death of swans at separate locations in Strathclyde. No cause of death was identified in either incident although there had been report of algal bloom on the pond where 7 swans died in one of the incidents.

### ***Gulls and Waders***

21. Only one incident was reported that involved the death of approximately 30 herring gulls. No pesticides were identified in the laboratory investigation.

### ***Gamebirds***

22. Two incidents involving pheasants were submitted in 2003. The abuse of mevinphos was responsible for the death of a pheasant and numerous rooks in a wood at Alness, Highland. No cause of death was established in the second incident.

### ***Corvids***

23. A total of 9 incidents involving crows (6), rooks (1), a magpie (1), and ravens (2) were notified in 2003. Pesticide poisoning was found to be the cause of death in 3 incidents. One incident, detailed above, involved the abuse of mevinphos which resulted in the death of approximately 30 rooks and a pheasant. The other incidents both involved the abuse of carbofuran. In one, a magpie, 2 buzzards and skeletal remains of a crow were submitted from a locus in Strathclyde. The magpie and buzzards died as result of poisoning, but no residue of carbofuran was detected in the sample analysed from the crow. Two ravens and 2 buzzards were poisoned in a single incident in the Stranraer area where a rabbit carcass had been adulterated with carbofuran and laid out allegedly with the intention of poisoning foxes. No cause of death was established for the remaining crows (5) and raven (1).

### *Other birds*

24. Two chaffinches were submitted as part of a single incident from Highland region. The analytical investigation failed to implicate pesticide poisoning and the cause of death was not established.

### **LIVESTOCK**

25. Four incidents involving livestock were notified in 2003 (Table 5). No evidence to implicate pesticide poisoning, or to indicate another cause of death, was found in any of the incidents.

**Table 5: Number of incidents involving livestock in 2003**

	<i>Number of incidents investigated</i>	<i>Number (%) in which pesticide poisoning was identified</i>	<i>Number (%) in which another cause of death was identified</i>
Cattle	2	0	0
Poultry	1	0	0
Sheep	1	0	0
<b>TOTAL</b>	<b>4</b>	<b>0</b>	<b>0</b>

### **COMPANION ANIMALS**

26. Forty-one of the incidents registered in 2003 involved companion animals (Table 6). The cause of death was established in 11 (27%) cases, with pesticide poisoning being responsible for 10 (24%) incidents and ethylene glycol poisoning being the cause of death in the remaining case.

**Table 6: Number of incidents involving companion animals in 2003**

	<i>Number of incidents investigated</i>	<i>Number (%) in which pesticide poisoning was identified</i>	<i>Number (%) in which another cause of death was identified</i>
Cats	18	3 (17%)	1 (6%)
Dogs	23	7 (30%)	0
<b>TOTAL</b>	<b>41</b>	<b>10 (24%)</b>	<b>1 (2%)</b>

### *Cats*

27. Poisoning was implicated in four of the 18 incidents involving cats in 2003. Three were associated with the abuse of carbamate insecticides and one resulted in the death

of 5 young cats following acute renal failure as a result of ingesting a product containing ethylene glycol. Aldicarb poisoning accounted for the death of a cat from Glenrothes. Another cat from the same household had died in similar circumstances 10 days earlier but no samples had been submitted for analysis. In an incident in Nairn, carbofuran poisoning is believed to be associated with the death of 3 cats from a single household, although only tissues from one cat were submitted. In a third incident a veterinary practitioner in Edinburgh suspected poisoning to be the cause of death of a cat that had been found dead in a garden, when blue pellets were found in the stomach content material. Analysis confirmed that the cat had died from carbofuran poisoning.

### ***Dogs***

**28.** Dogs featured in 23 incidents in 2003. The cause of death was established in 7 of the incidents, all of them being attributed to pesticide poisoning. Deliberate abuse of pesticides accounted for 3 of the incidents. The chemicals involved were carbofuran (1) and strychnine (2). A dog began vomiting and died apparently after eating something whilst being walked in woods near Fort William. Blue granules were evident in the vomitus and laboratory investigation confirmed the presence of carbofuran. Strychnine (1 µg/ml) was identified in the urine of a dog from Highland Region that had exhibited seizures. Subsequently in a further incident at this location, a second dog developed fits and strychnine (0.3 µg/ml) was again found to be present in a urine sample. Both dogs survived.

**29.** Two incidents involved exposure to metaldehyde. One appeared to be associated with the approved use of a metaldehyde formulation. A dog became ill following a walk on farmland in Lothian. The veterinary practitioner suspected metaldehyde poisoning and prompt treatment ensured that the dog survived. In the other incident, attributed to misuse, improper disposal of a formulation resulted in the death of a dog in the Borders.

**30.** Rodenticide poisoning was linked with the deaths of dogs in 2 incidents. One was attributed to the misuse of bromadiolone and the other to the misuse of coumatetralyl and difenacoum.

### **BENEFICIAL INSECTS**

**31.** Only three incidents of suspected honeybee poisoning were accepted into the Scheme in 2003 (Table 7). The analytical investigations failed to provide any evidence to implicate pesticide poisoning with any of the incidents.

**Table 7. Number of incidents involving beneficial insects during 2003**

<b>Number of incidents investigated:</b>	<b>3</b>
<b>Number of incidents attributed to pesticides:</b>	<b>0</b>

## **SUSPECTED POISONOUS BAIT**

32. Nine items were submitted for investigation as suspected poisonous baits or related materials during 2003 (Table 1). In each case there were no known animal casualties associated with the alleged bait. Pheasant carcasses from Kelso were found to be contaminated with carbofuran. Quantities of various pesticide formulations were seized during a subsequent search of premises and vehicles at the locus. The active ingredients identified included mevinphos, carbofuran, alphachloralose, bromadiolone, strychnine and sodium cyanide. In a separate incident from the Borders, a mevinphos formulation and a plastic syringe were found during a police search. The third incident involved the adulteration of a rabbit carcass in Dumfries and Galloway with an aldicarb formulation. In the 6 remaining cases the analytical investigations failed to reveal any evidence to substantiate the belief that the items had been prepared as potential poisonous baits.

## **INCIDENTS WHERE REGULATORY AND/OR ENFORCEMENT ACTION WAS CONSIDERED**

### **APPROVED USE INCIDENTS**

33. Information from incidents thought to have arisen from approved use is fed back into the pesticide regulatory process for evaluation<sup>1,2</sup>. If significant concerns are highlighted by post registration monitoring, thorough consideration is given to the need to adjust the approval status or conditions of use of the pesticide in question. If a specific product is identified in this way, then the approval holder is contacted and given the opportunity to comment and provide additional feedback from their experience with the product.

34. Only one incident investigated during 2003 was attributed to the approved use of the pesticide product involved, compared to 4 in the year 2002. It involved the poisoning of a dog by metaldehyde during the sowing of a wheat crop.

### **Incident Summary**

35. A dog developed seizures and a high temperature after being walked close to where a field of winter wheat had recently been sown on a farm near Kirkliston in October. It was noticed that the dog appeared to have a 'blue ball' in its mouth at one point. The dog started to become distressed when it arrived back at the farm a short while later, and received veterinary assistance. Analysis of a urine sample from the dog revealed the presence of metaldehyde (46 µg/ml). The residue was consistent with metaldehyde poisoning being the cause of the illness. Field information confirmed that a contractor had applied metaldehyde pellets when sowing winter wheat in a field that had previously been used to grow oil seed rape. There was no evidence of any spillages in the field nor in the area of the steading used for storing the molluscicide prior to application. It appears that an aggregated lump of fused pellets probably

formed and that this somehow became dislodged from the seeder, and fell to the ground. This is likely to have been the 'blue ball' observed in the dog's mouth during the walk.

## **MISUSE INCIDENTS**

**36.** A dog from Maybole in Ayrshire became ill in April, and died within several days. Laboratory investigation demonstrated the presence of a significant residue (1.5 mg/kg) of bromadiolone in a sample of liver tissue, which confirmed a veterinary diagnosis of anticoagulant poisoning being the cause of death. Field investigation revealed that the exposure to the the rodenticide probably occurred on an occasion when the dog had been kept in an animal transport container in the back of a friend's van. Apparently the dog managed to break free, and chewed on one or more containers holding rodenticide bait material. Both parties appeared to have taken reasonable precautions, however it would seem in hindsight that allowing the animal any access to the storage area was contrary to best practice.

**37.** The death of a farm dog from Dumfries & Galloway in May was diagnosed as being the result of exposure to an anticoagulant rodenticide. Analytical investigation demonstrated the presence of residues of coumatetralyl (1.2 mg/kg) and difenacoum (0.04 mg/kg) in liver tissue. A field investigation found that the farmer had been using a Racumin formulation to control rodents in a grain store on the farm. He was aware of the requirement to secure the store to prevent non-target animals gaining access to the bait material. It would seem probable that this was the source of exposure, however it is not clear how the dog gained access.

**38.** A farm dog in the Borders died after a short illness in December despite veterinary treatment. The veterinary practitioner suspected poisoning, and submitted tissue samples to the scheme. The gut content material was bright green/blue colour. Analysis identified a gross residue of metaldehyde (3,100 mg/kg) in this material. Further field investigation indicated that the farm had received an 'Allure' formulation of slug pellets intended for use on oil seed rape crops. This material had been placed in the chemical store. One of the bags became damp at a corner, and part of the material acquired a plasticine-like consistency, rendering it unfit for purpose. This portion was removed and sealed in another bag within the store. A young employee inadvertently included the bag when removing waste paper and cardboard for burning. It is thought that some of the metaldehyde material survived the fire because of its high water content, and that the dog subsequently gained access from the cold remains of the fire.

## **ABUSE INCIDENTS**

**39.** As in all previous years the illegal practice of deliberately abusing pesticide products to generate poisonous baits claimed numerous victims. Such acts remain the cause of the majority of pesticide related poisonings throughout the U.K. The indiscriminate nature of the process puts at risk any animal that finds the bait material attractive. In 2003, thirty two incidents (86% of pesticide incidents) were attributed to the abuse of agricultural pesticides in Scotland. In addition, a single incident involved

the abuse of pesticides formulated as a veterinary medicine. A high proportion of these incidents involved birds of prey and companion animals (Figure 2).

**40.** Seven pesticides were identified in abuse incidents in 2003, compared to six in 2002. The chemicals were aldicarb (2), carbofuran (24), chloralose (3), diazinon (1), propetamphos (1), and strychnine (2).

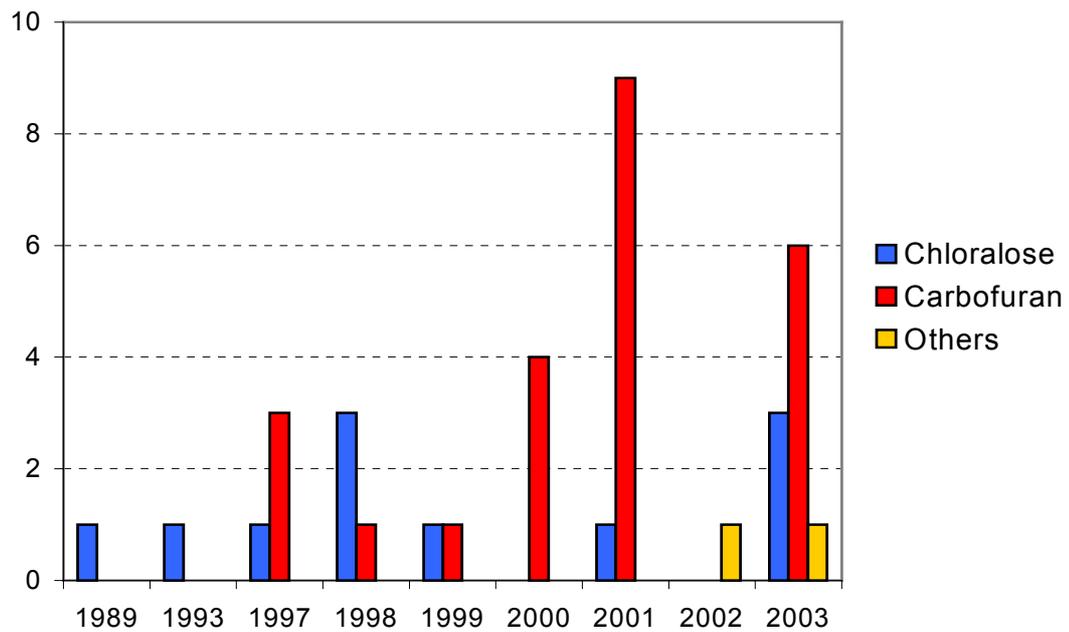
**41.** The red kite re-introduction programme was severely effected by illegal poisoning activities for the second time in the last 3 years (Figure 3). In early March a single bird was recovered from the Gargunnock area of Central Region and shown to have been poisoned with carbofuran. It had fed just prior to death, and had significant quantities of food in both the gullet and the stomach. Two incidents in Dumfries in March that may have been linked, saw 3 red kites poisoned with carbofuran. Only the head of a second bird from the first incident was recovered, but a residue of carbofuran was identified in a piece of animal tissue found in the beak. (Later in the same month and in the same area, 2 sparrowhawks were poisoned with carbofuran presented on pigeon carcasses). A red kite mortality in Central Region in August was attributed to propetamphos poisoning. Traces of a second organophosphorus insecticide diazinon were identified in food material recovered from the gullet. This combination of insecticides is considered to be a strong indicator that a veterinary medicine formulation (sheep dip) was the likely source of the pesticides. The post mortem evidence suggests that deliberate abuse was likely to have been the underlying cause of the mortality. The carcass of a young bird (4 months) was found in an autolysed condition in Ayrshire during September. It was possible to demonstrate that it had been poisoned with carbofuran. Three red kites and 2 buzzards were poisoned with chloralose in the Castle Douglas area in September. Evidence from post mortem examinations suggested that a rabbit (or rabbits) may have been used as the bait material. Finally a red kite was poisoned with carbofuran in Dumfries in December.

**42.** Buzzards were victims in 12 incidents throughout the country, with 11 resulting from carbofuran poisoning and 1 from chloralose poisoning. One incident in Fife resulted in the deaths of 6 birds, and several other incidents involved multiple casualties. A sea eagle died from carbofuran poisoning in February in the vicinity where another sea eagle had been poisoned in 2002. Three peregrine falcons were poisoned with carbofuran in Grampian during May.

**43.** A large number of rooks died from mevinphos poisoning in the Alness area during March. It is regrettable that a pesticide that has been withdrawn from approved use for twenty years is somehow still being used illegally to poison non-target animals. An aldicarb formulation was abused in an urban situation to poison cats in Glenrothes. The same pesticide was also abused to prepare a poisonous bait in Dumfries and Galloway.

## **UNSPECIFIED USE INCIDENTS**

**44.** Each year there always tend to be a few confirmed pesticide incidents where, despite detailed field investigations, the source of the compound cannot be definitely established. Animal bodies may be found in locations remote from the point of exposure in circumstances where the onset of toxic symptoms has been delayed.



**Figure 3. Number of red kites poisoned in Scotland**

Unusually in 2003 none of the incidents where pesticide poisoning was the direct cause of death fell into this category. In a single incident a sub-lethal residue (0.07 mg/kg of difenacoum) was identified in the liver tissue of a buzzard found in Central Region. *(Note: surveillance for this type of background rodenticide residue in birds of prey has not been completed for 2003 due to a temporary shortfall in staff resources).*

## **ENFORCEMENT ACTION**

**45.** Positive enforcement action continues to be a priority as a measure to counteract pesticide abuse. SEERAD officials frequently work in partnership with wildlife liaison officers from the various police forces in Scotland, as well as staff from other organisations. Where possible, cases are referred to the Procurator Fiscal Service for prosecution. In circumstances where there is insufficient evidence to support prosecution, the fact that an investigation has been seen to take place around the locus may act as a deterrent to re-offending. Where poisoning or the risk of poisoning arises from misuse, and enforcement action is not possible or appropriate, those involved receive advice on how to employ better practice.

**46.** Eight incidents were reported to the Procurator Fiscal Service for possible prosecution. In one, the defendant pleaded guilty at Arbroath Sheriff Court to charges relating to the possession and improper storage of an unapproved pesticide formulation (Control of Pesticides Regulations). At least one buzzard had been poisoned with carbofuran, and the defendant was admonished. In a second prosecution involving the poisoning of buzzards and ravens, and where the defendant claimed to have laid baits with the intention of killing foxes, the Sheriff ruled that there was no case to answer. The other cases have not been heard as yet. A prosecution arising from an incident in 2002 was heard in late 2003. The offender pleaded guilty to charges made under the Wildlife and Countryside Act 1981, which included possession of carbofuran in unlabelled containers, and was fined a total of £250. Another prosecution arising from two related incidents that occurred in 2002 is scheduled to be heard in April 2004.

**47.** SEERAD officials carried out 25 field investigations during 2002. Eighteen of these were joint operations with the police, and some also involved RSPB Investigation Officers. The police pursued 12 incident investigations independently.

## REFERENCES

1. K Hunter, 'The Poisoning of Non-target Animals', in *Pesticides-Developments, Impacts, and Controls*, p74-86, Eds. G A Best and A D Ruthven, *The Royal Society of Chemistry*, 1995
2. M R Fletcher and R C Grave, Post registration surveillance to detect wildlife problems arising from the approved pesticides. *Proceedings British Crop Protection Council – Pests and Diseases*, 2: 793-798, 1992
3. E A Sharp, S Le Bouhellec, L M Melton, M J Taylor, and K Hunter, Analytical diagnosis of chloralose poisoning in Scottish wildlife crime investigation. *Poster presentation at 'Emerging Analytical Science', The Royal Society of Chemistry, Glasgow, September 2001*
4. M J Taylor, E A Sharp, S Le Bouhellec, L M Melton, and K Hunter, The determination of chloralose residues in birds of prey by LCMSMS and LC-oaToFMS. *Poster presentation at the British Mass Spectrometry Society LCMS Symposium, Cambridge, December 2001*
5. K Hunter, M J Taylor, E A Sharp, L M Melton, and S Le Bouhellec, Determination of chloralose residues in animal tissues by liquid chromatography-electrospray ionisation tandem mass spectrometry. *Journal of Chromatography B*, in press

## **APPENDIX 1.**

### **INVESTIGATION PROCEDURES**

The investigation of suspected pesticide poisoning incidents relies on a scheme, which allows members of the public and interested organisations to submit carcasses, suspected baits or other samples for pesticide analysis. The Wildlife Incident Investigation Scheme is operated in Scotland by the Chemistry Section at SASA, on behalf of SEERAD. Agricultural Staff in the area offices of SEERAD located throughout Scotland, provide support when necessary for field investigations, and also act as an additional point for notification of incidents.

A number of environmental and animal welfare organisations, such as RSPB or SSPCA, play an active role in some incident investigations. These bodies act not only by assisting members of the public to notify incidents, but also by screening out inappropriate cases prior to notification.

The SAC Veterinary Investigation Service acts in partnership with the scheme, in forwarding relevant samples to SASA from potential incidents notified indirectly via its laboratories, and by screening out incidents that are unlikely to involve pesticides. The Lasswade Veterinary Laboratory (VLA) is used to provide specialist pathological support to SASA on wild animals, and also furnishes an additional route into the scheme. The post mortem examinations undertaken by these laboratories may identify disease, trauma, starvation or other causes of death, eliminating the need for expensive analytical investigation.

As well as investigating incidents involving wildlife, the scheme covers suspected poisoning of livestock, companion animals, and honeybees. Incidents may be rejected if they fall outwith the remit of the scheme, or if other acceptance criteria are not met.

SASA makes use of analytical techniques and equipment capable of identifying low levels of pesticides considered to present a possible hazard to vertebrates or beneficial insects. Two multi-residue methods are used for carbamate, organochlorine, organophosphorus, and pyrethroid compounds, and for anticoagulant rodenticides. These are supplemented by compound-specific analytical methods for chloralose, metaldehyde, paraquat, strychnine and other compounds. A simpler and more specific method<sup>3,4,5</sup> for the determination of chloralose in animal tissues based on liquid chromatography in tandem with mass spectrometric detection was introduced during 2001. Wherever possible residues are confirmed using an alternative analytical technique.

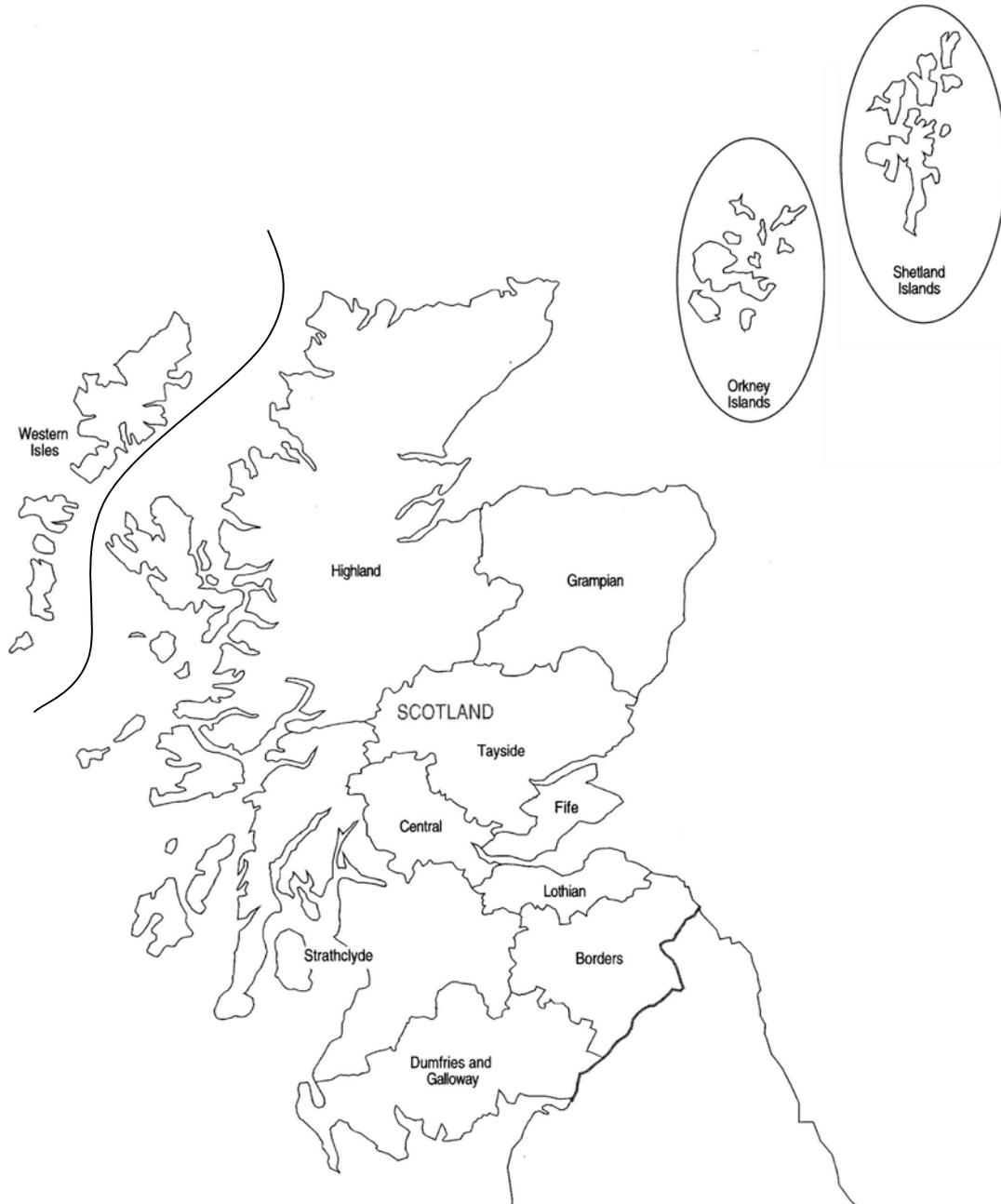
Field investigations are normally only triggered by SASA following the identification of a specific pesticide as the likely cause of poisoning. However field investigations may be initiated following either notification, or after post-mortem examination, if sufficient evidence of pesticide involvement is available.

Analytical results, post-mortem findings, and the field investigation report are collated and interpreted by SASA to assess the probable cause of the incident, and whether any residues detected contributed to the death or illness of the animal involved. Mortality is generally attributed to a pesticide if residues of a chemical or its derivatives are found

at levels considered to represent lethal exposure. In some cases, the presence of residues in association with typical post-mortem findings may be used to determine mortality.

The results of investigations are presented annually as part of an U.K. report published by the Environmental Panel of the Advisory Committee on Pesticides. The regulatory body, Pesticides Safety Directorate, is able to assess relevant incident information for any implications for the approval status of a particular pesticide or family of pesticides. Where legal proceedings are used as part of enforcement action, the evidence gathered by SASA, and by SEERAD Agricultural Staff, is presented in reports to the Procurator Fiscal Service. Police forces are active partners in countering pesticide abuse, and frequently take the lead in investigations and presentation of such cases to the Procurator Fiscal.

## APPENDIX 2. REGIONS IN SCOTLAND USED TO CLASSIFY INCIDENTS



**APPENDIX 3. PESTICIDE INCIDENTS OCCURRING IN 2003**

<b>Incident No.</b>	<b>Date</b>	<b>Location</b>	<b>Species</b>	<b>Pesticide</b>	<b>Conclusion</b>	<b>Enforcement Action</b>	<b>Comments</b>
03005	Jan	Rothsay, Isle of Bute, Strathclyde	Buzzard	Carbofuran	Abuse	SEERAD investigation	
03014	Feb	Morar/Bracara, Highland	Sea eagle & sheep bait	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	
03015	Mar	Heriot, Border	Buzzard	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	
03018	Mar	Invergordon, Kincaig, Highland	Dog (still alive)	Strychnine	Abuse	Police & SEERAD investigation	
03021	Dec '02	Tulliallan, Central	Buzzard	Difenacoum	Disease		Bumblefoot Sub-lethal residue of difenacoum
03024	Mar	Gargunnock, Central	Red kite	Carbofuran	Abuse	SEERAD investigation	
03025	Mar	Stranraer, Dumfries & Galloway	2 Buzzards, 2 ravens, a crow and 2 rabbit baits	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	Prosecution February 2004 Sheriff ruled no case to answer
03028	Mar	Arbroath, Tayside	3 Buzzards & sample of chemical	Carbofuran	Abuse	Police & SEERAD investigation	Prosecution Dec 2003 Offender found guilty. Admonished

03030	Mar	Laurieston, Dumfries & Galloway	2 Red kites	Carbofuran	Abuse	Police investigation	Referred for prosecution
03032	Mar	Alness, Highland	Approximately 30 rooks and a pheasant	Mevinphos	Abuse	Police & SEERAD investigation	
03036	Mar	Laurieston, Dumfries & Galloway	Red kite	Carbofuran	Abuse	Police investigation	Referred for prosecution
03037	Mar	Methven, Tayside	Buzzard	Carbofuran	Abuse	Police investigation	
03038	Mar	Heriot, Border	2 Buzzards & a suspected bait	Carbofuran	Abuse	Police investigation	May be related to incident 03015
03039	Mar	Laurieston, Dumfries & Galloway	2 Sparrowhawks & 2 pigeon baits	Carbofuran	Abuse	Police investigation	Referred for prosecution
03040	Apr	Annat, Corpach, Fort William, Highland	Dog	Carbofuran	Abuse	Police & SEERAD investigation	
03046	Apr	Ayr, Strathclyde	Dog	Bromadiolone	Misuse	SEERAD investigation	
03051	Apr	Strathaven, Strathclyde	1 Magpie, 2 buzzards, a crow & chemicals	Carbofuran & chloralose	Abuse	Police & SEERAD investigation	Referred for prosecution
03052	Apr	Glenrothes, Fife	2 Cats	Aldicarb	Abuse	Police & SEERAD investigation	
03053	Apr	Nairn, Highland	3 Cats	Carbofuran	Abuse	SEERAD investigation	
03055	Apr	Edinburgh, Lothian	Cat	Carbofuran	Abuse	Police & SEERAD investigation	

03056	Apr	Invergordon, Kincaig, Highland	Dog	Strychnine	Abuse	Police & SEERAD investigation	Animal from same location as that involved in incident 03018
03058	May	Dalwhinnie, Highland	2 Buzzards & 2 partridge baits	Carbofuran	Abuse	Police & SEERAD investigation Advisory letter to land owner	
03059	May	Conheath, Dumfries & Galloway	Dog	Coumatetralyl & Difenacoum	Misuse	SEERAD investigation	
03062	May	Strathaven, Strathclyde	Peregrine falcon	Carbofuran	Abuse	Police & RSPB investigation	Referred for prosecution
03074	May	Findochty, Grampian	2 Peregrine falcons	Carbofuran	Abuse	Police investigation	
03100	Aug	Upper Lanrick, Doune, Central	Red kite	Diazinon & Propetamphos	Veterinary use	Police, SEERAD & RSPB investigation	Probably abuse of a veterinary medicine
03103	Aug	Fairnington, Kelso, Border	Pheasant baits & chemicals	Carbofuran, mevinphos, bromadiolone, chloralose, Sodium cyanide	Abuse	Police, SEERAD investigation	Referred for prosecution
03107	Aug	Corsehope, Heriot, Border	Chemical only	Mevinphos	Abuse	Police investigation	
03115	Sep	Sanquhar, Dumfries & Galloway	Rabbit bait	Aldicarb	Abuse	Police investigation	

03116	Sep	Crofthead, Sorn, Strathclyde	Red kite	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	
03117	Sep	Castle Douglas, Dumfries & Galloway	3 Red kites & 2 buzzards	Chloralose	Abuse	Police investigation	
03124	Oct	Strichen, Grampian	Buzzard & duck bait	Carbofuran	Abuse	Police & SEERAD investigation	
03129	Oct	Humbie, Kirkliston, Lothian	Dog	Metaldehyde	Approved use	SEERAD investigation	Dog survived
03136	Nov	Anstruther, Fife	6 Buzzards	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	
03137	Nov	Corsehope, Heriot, Border	Buzzard	Carbofuran	Abuse	Police investigation	
03152	Dec	Lauder area, Border	Dog	Metaldehyde	Misuse	SEERAD investigation	Improper disposal
03156	Dec	Laurieston, Dumfries & Galloway	Red kite	Carbofuran	Abuse	Police & RSPB investigation	
03158	Dec	Kelso area, Border	Fox	Carbofuran	Abuse	Police investigation	