

PESTICIDE POISONING OF ANIMALS 2004

A REPORT OF INVESTIGATIONS IN SCOTLAND

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CONTENTS

	Paragraphs
SUMMARY	
INTRODUCTION	1 - 6
INCIDENTS IN 2004	
Number of incidents in 2004	7 - 9
Vertebrate wildlife: mammals	10
Vertebrate wildlife: birds	11 – 24
Livestock	25
Companion animals	26 – 29
Exotic animals	30
Beneficial insects	31
Suspected poisonous baits	32
INCIDENTS WHERE REGULATORY AND/OR ENFORCEMENT ACTION WAS CONSIDERED	
Misuse incidents	33
Abuse incidents	34 - 39
Unspecified use incidents	40 - 44
ENFORCEMENT ACTION	45 - 47
REFERENCES	
APPENDICES	
Appendix 1. Investigation procedures	
Appendix 2. Regions in Scotland used to classify incidents	
Appendix 3. Pesticide incidents occurring in 2004	

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 121 incidents of suspected poisoning registered for investigation by the scheme in 2004. The causes were determined in 46 incidents, of which 34 (28% of those investigated) involved pesticide poisoning or exposure to pesticides. No incidents were attributed to the approved use of a pesticide. One incident was attributed to misuse of difenacoum, and a single incident was associated with a veterinary use of diazinon.

Deliberate abuse of pesticides was identified in 23 incidents in 2004 compared to 32 in 2003, and 23 in 2002. This represents 68% of pesticide incidents in 2004 compared to 86% in 2003, and 58% in 2000. Carbofuran formulations were the most actively abused pesticide products.

A further 9 incidents were attributed to unspecified use of a pesticide; where there was insufficient information to positively identify the source of the poison. All of these incidents involved exposure to anticoagulant rodenticides.

Nine agricultural chemicals were identified in the pesticide poisoning incidents, compared with 12 in 2003.

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. In order to protect wildlife and domestic animals, restrictions on use may be imposed in the conditions of approval made under the Control of Pesticides Regulations (COPR) 1986 (as amended) or the Plant Protection Products Regulations (1995), where it is thought that an unacceptable risk would arise.

2. The Scottish Wildlife Incident Investigation Scheme (WIIS) is one of four schemes, operating in the United Kingdom, which investigates 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 free phone number (0800 321600) is routed to SASA and provides 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 analysis where they obviously involve trauma or disease. Substantial delays in the notification of incidents, or the unavailability of bodies or baits, may also lead to rejection.

INCIDENTS IN 2004

NUMBER OF INCIDENTS IN 2004

7. A total of 146 suspected poisoning incidents were notified in 2004. Of these, 25 incidents were eliminated on veterinary evidence prior to submission, leaving 121 incidents registered for onward investigation at SASA. Two of the incidents screened out involved wild mammals [disease (1), trauma (1)], one involved a dog (trauma), seven involved birds of prey [disease (1), starvation (3), trauma (2)], and fifteen involved other wild birds [disease (7), starvation (4), trauma (4)].

8. The cause of death or illness (including pesticides and non-agricultural chemicals, disease, starvation and trauma) was established in 46 incidents (38% of those investigated). Pesticides were identified in 34 of these incidents (28% 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 2004

	Incidents Investigated	Pesticide poisoning incidents	Other cause of death found
Vertebrate wildlife	80	28 (35%)	11 (14%)
Livestock	2	0	1(50%)
Companion animals	22	3 (14%)	0
Exotics	1	0	0
Beneficial insects	6	0	0
Suspected baits and suspicious substances	10	3 (30%)	not applicable
TOTAL	121	34 (28%)	12 (10%)

9. No incidents were attributed to the approved use of pesticides. One incident (3%) involved some element of misuse, 23 (68%) were associated with abuse, and one incident was associated with a pesticide supplied for veterinary use. In a further 9 incidents no specific source of the exposure was identified and the cause of each incident was categorized as unspecified 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 2004 and species and/or bait involved.

Carbamates		
carbofuran	15	bait, buzzard, chemical, crow, goshawk, peregrine falcon, red kite,
Organophosphates		
diazinon	1	red kite
Rodenticides		
brodifacoum	4	bait, buzzard, dog, tawny owl
bromadiolone	7	bait, barn owl, buzzard, dog
chlorophacinone	1	buzzard
difenacoum	6	buzzard, dog, sparrowhawk
Other Compounds		
chloralose	5	buzzard, chemical, crow, peregrine falcon, red kite
sodium cyanide	2	chemical
strychnine	1	fox
<ul style="list-style-type: none"> • <i>one incident involved brodifacoum, bromadiolone and difenacoum</i> • <i>one incident involved brodifacoum and bromadiolone</i> • <i>one incident involved bromadiolone, chlorophacinone and difenacoum</i> • <i>two incidents involved bromadiolone and difenacoum</i> • <i>one incident involved chloralose and sodium cyanide</i> 		
Cause of death other than pesticides		
disease	0	
starvation	4	
trauma	7	
o-cresol	1	
unknown	69	
not applicable	8	
<i>one incident involved multiple conclusions: abuse, starvation, unknown</i>		

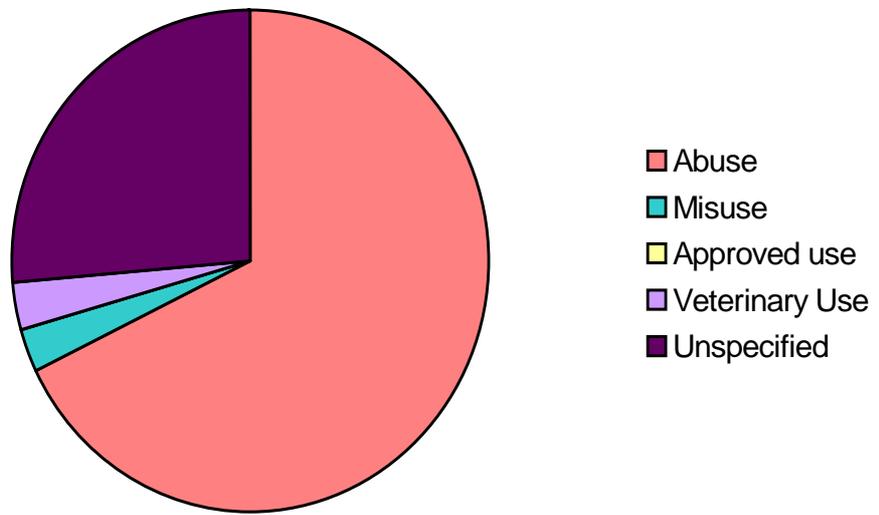


Figure 1. Pesticide Incidents in Scotland 2004

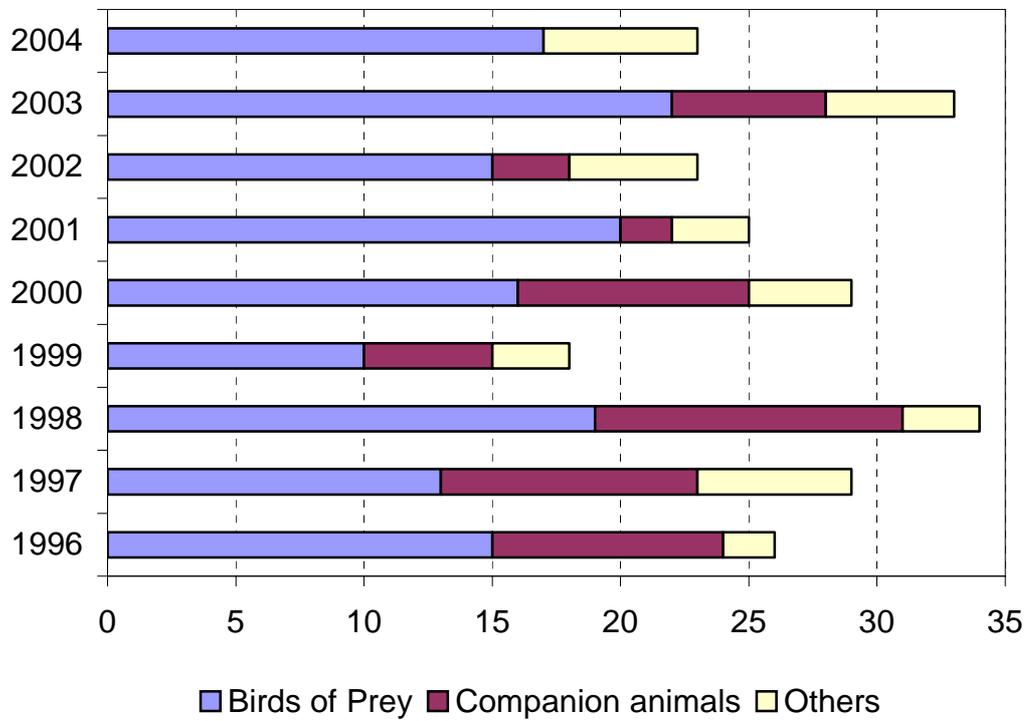


Figure 2. Abuse of pesticides in Scotland (number of incidents)

VERTEBRATE WILDLIFE: MAMMALS

10. A total of 13 incidents involving wild mammals were investigated (Table 3). The cause of death was established in one incident. Three foxes submitted from the Beaulieu area of Highland were found to have been poisoned with strychnine.

Table 3: Number of incidents involving wild mammals in 2004

	<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>
Badger	1	0	0
Bat	1	0	0
Fox	2	1 (50%)	0
Hare	1	0	0
Field Mouse	1	0	0
Mink	1	0	0
Otter	1	0	0
Seal	1	0	0
Stoat	1	0	0
Squirrel	3	0	0
TOTAL	13	1 (8%)	0

VERTEBRATE WILDLIFE: BIRDS

Birds of Prey (including owls)

11. A total of 58 incidents involving birds of prey were notified. The cause of death was established in 37 (64%) incidents; with pesticide poisoning accounting for 26 (45%) of these (Table 4).

Buzzards

12. Common buzzards were involved in 37 incidents in 2004. The cause of death was established in 21 of these incidents, with 18 of them attributed to pesticide poisoning. Fourteen incidents linked with pesticides were clearly associated with deliberate abuse; the chemicals involved being carbofuran (13) and chloralose (1). In the other 4 pesticide incidents, residues of anticoagulant rodenticides found in liver tissue were within the likely lethal range, although no specific evidence of haemorrhaging was identified at post mortem examination. In each case, at least two rodenticides were identified, with the major components being bromadiolone (2) and difenacoum (2). The

cause of death in each case was attributed to some form of unspecified use of rodenticides. Other causes of death included trauma (1), and starvation (2).

Eagles

13. Two golden eagle mortalities were notified in 2004. In one case, the cause of death was trauma, and in the other case death was attributed to starvation.

Table 4: Number of incidents involving wild birds in 2004

	<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	58	26 (45%)	11 (19%)
Wildfowl and waterbirds	4	0	0
Gulls and waders	4	0	0
Gamebirds	1	0	0
Corvids	6	5 (83%)	0
TOTAL	67 *	27** (40%)	11 (16%)

* *Five incidents involved birds of prey and corvids and one incident involved birds of prey and a wader*

** *Four incidents involved birds of prey and corvids*

Red Kites

14. Nine incidents involving red kites were reported during the year. The cause of death was identified in 7 of these, with 4 incidents being associated with pesticide poisoning. Carbofuran formulations were subject to abuse in two incidents, one of which also included a buzzard. Chloralose was abused in a single incident in Dumfries and Galloway in April. Residues of diazinon were identified in the stomach content material (119mg kg⁻¹) and liver tissue (0.35mg kg⁻¹) from a red kite found in the Doune area, Central. A field investigation revealed that a veterinary medicine formulation ('Golden Fleece') had been used on the estate to treat sheep for scab and blowfly. It appears that exposure arose from ingestion of lambs' tails that had fallen off after dipping. The cause of death in the remaining 3 incidents was identified as trauma.

Other Raptor Species

15. Peregrine falcons were the casualties in two incidents. Both of which were attributed to abuse of pesticides. In the first of these, two immature birds and a crow were poisoned with carbofuran in Grampian during July. In the other incident, a single bird was poisoned with chloralose in Border Region during November.

16. Two incidents involving sparrowhawks were reported during the year. In one, death was found to be a result of trauma; in the other case a liver residue of difenacoum was within the anticipated lethal range, however there was no evidence of haemorrhages in the carcass.

17. A goshawk found dead in the Tweed valley in March died from carbofuran poisoning in an abuse incident also involving numerous buzzards and a crow.

18. One incident involving a hen harrier was investigated during 2004. No cause of death was determined.

19. No evidence of pesticide involvement was identified in three incidents where kestrels were submitted. The cause of death in each case remains unknown.

20. Four incidents involving barn owls and two involving tawny owls were notified during 2004. Extensive areas of sub-cutaneous haemorrhaging were identified in the carcass of a barn owl recovered from a paddock near Maybole, Strathclyde. Subsequent analysis revealed the presence of residues of bromadiolone (0.28mg kg^{-1}) and difenacoum (0.02mg kg^{-1}) in liver tissue. No specific source of exposure was identified and this incident was categorized as arising from unspecified use. Other causes of death for barn owls were trauma (1) and starvation (1). Two dead tawny owls were found under overhead electricity cables near Port William, Dumfries & Galloway, in July. A residue (0.3mg kg^{-1}) of brodifacoum and a trace of chlorophacinone were present in the liver tissue of one of the birds. The residue of brodifacoum was well within the anticipated lethal range, however no specific indication of haemorrhaging was noted in the post mortem findings. No rodenticide residues above the reporting level (0.003mg kg^{-1}) were present in the liver of the second bird. No cause of death was established for the tawny owl in the second incident.

Wildfowl and Waterbirds

21. In 2004 four incidents involving wildfowl and waterbirds were investigated. All of the incidents occurred in Strathclyde and involved eider ducks and guillemots, swans (2) and a cormorant. No cause of death was identified in any of the incidents.

Gulls and Waders

22. Gulls and waders were involved in four incidents during 2004. The deaths of approximately 30 black-headed gulls were reported in two separate incidents in Barassie, Strathclyde. Two further incidents involving an oystercatcher and a lapwing, occurred in Tayside. The cause of death was not established in any of the incidents.

Gamebirds

23. No cause of death was established in an incident involving a single pheasant from Dumfries and Galloway.

Corvids

24. A total of 6 incidents involving crows were notified in 2004. Pesticide poisoning was found to be the cause of death in all but one of these. Four incidents involved the death of single crows from the abuse of carbofuran in Border, Tayside, Strathclyde and Grampian respectively. A goshawk, 2 peregrine falcons and numerous buzzards were also poisoned in these incidents. One incident in Central Region, which resulted in the death of 2 crows, was associated with the abuse of chloralose. No cause of death was established in a second incident from the same area of Central Region.

LIVESTOCK

25. Two incidents involving livestock were notified in 2004 (Table 5). There was no evidence to implicate pesticide poisoning in either of these incidents. However, residues of ortho-cresol were detected in the rumen content and gut content from two of the three animals that had died in one incident. Field information indicated that a neighbouring landowner had recently fixed new, treated, fence posts on the boundary. Cresols are components of tar oils and their presence in the animal digestive tract may indicate that exposure to some kind of timber treatment could have been responsible for this incident.

Table 5: Number of incidents involving livestock in 2004

	<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	1 (50%)
TOTAL	2	0	1 (50%)

COMPANION ANIMALS

26. Twenty-two of the incidents registered in 2004 involved companion animals (Table 6). The cause of death was established in 3 (14%) cases, with pesticide poisoning being responsible for all three incidents.

Cats

27. No cause of death was established in any of the 7 incidents involving cats.

Dogs

28. Dogs featured in 13 incidents in 2004. The cause of death was established in 3 of these incidents, all of them being attributed to pesticide poisoning. One of the incidents was attributed to misuse of a difenacoum formulation, and the other two incidents were associated with some form of unspecified use of brodifacoum, and brodifacoum and bromadiolone respectively.

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	7	0	0
Dogs	13	3 (23%)	0
Guinea pigs	1	0	0
Racing Pigeons	1	0	0
TOTAL	22	3 (14%)	0

Other animals

29. The remaining 2 incidents involved a guinea pig and racing pigeons respectively. No cause of death was identified in either of these incidents.

EXOTICS

30. No cause of death was established for an arctic fox submitted from a Wildlife Centre in Dundee.

BENEFICIAL INSECTS

31. Six incidents of suspected honeybee poisoning were accepted into the Scheme in 2004 (Table 7). 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 2004

Number of incidents investigated:	6
Number of incidents attributed to pesticides:	0

SUSPECTED POISONOUS BAITS

32. Ten items were submitted for investigation as suspected poisonous baits or related materials during 2004 (Table 1). In each case there were no known animal casualties associated with the alleged bait. Premises were searched in Tayside following the death of buzzards from carbofuran poisoning. Gamekeeping equipment and quantities of chloralose and sodium cyanide were recovered. A residue of chloralose was present in a gamebag recovered during the search. A quantity of carbofuran was found in a pill bottle, and sodium cyanide was present in a 'Talonex' (aluminum phosphide) container recovered from a field investigation in Border Region. Analysis of blue grain found in a cat owner's garden, in an incident in Lockerbie, was identified as an

anticoagulant rodenticide formulation containing bromadiolone. In the 7 remaining cases the analytical investigations failed to reveal any evidence to substantiate the belief that the items were pesticide formulations or had been prepared as potential poisonous baits.

INCIDENTS WHERE REGULATORY AND/OR ENFORCEMENT ACTION WAS CONSIDERED

MISUSE INCIDENTS

33. A Labrador dog from Brechin area of Tayside became ill during September, and died within 10 hours despite veterinary therapy for suspected rodenticide poisoning. Laboratory investigation confirmed the presence of a significant residue (1.9 mg kg^{-1}) of difenacoum in a sample of liver tissue, which corroborated a veterinary diagnosis of anticoagulant poisoning being the cause of death. Field investigation established that rodenticide baits had been laid in nearby farm buildings, on the same estate, by a professional pest control company. The dog owner provided photographic evidence showing that the door to one of the farm buildings (a wood shed) had been left open and that a tray of rodent bait was readily accessible. The estate management had called the pest control company back to clear up before the field investigation could commence. However, this incident prompted a SEERAD review of previous incidents in the area, and several seemed to have been associated with the activities of the same pest control company. SEERAD officials engaged the company in dialogue on these matters, and the company management agreed to brief their operatives on any shortfalls in procedures. In addition SEERAD inspected 4 farms where the company was carrying out rodent baiting. Although most of the outdoor baiting points were adequately protected, some were not.

ABUSE INCIDENTS

34. As in 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 2004, twenty three incidents (68% of pesticide incidents) were attributed to the abuse of agricultural pesticides in Scotland. A high proportion of these incidents involved birds of prey, but unusually none involved companion animals (Figure 2).

35. Seven pesticides were identified in abuse incidents in 2004, compared to seven in 2003. The chemicals were bromadiolone (1), carbofuran (16), chloralose (4), sodium cyanide (2), and strychnine (1).

36. Twenty of the 23 abuse incidents resulted in vertebrate casualties, eighteen of these involving birds of prey. The largest ever number of victims of a single incident was recorded on an estate in the Tweed valley near Peebles in March. Initial submissions included a goshawk, along with a pheasant bait and a rabbit bait. Carbofuran was identified in each item. An early field investigation led to the recovery of 15 buzzard carcasses, a crow carcass, 2 rabbit baits and 10 pheasant baits, as well as 2 coffee jars containing blue granules (carbofuran formulation). Buzzards were also

victims of carbofuran poisoning in incidents in Border (4), Grampian (1), Highland (3), Strathclyde (1), and Tayside (3). One buzzard was poisoned with chloralose in Grampian.

37. Three abuse incidents involved red kite victims. In January a single bird was recovered from the New Galloway area of Dumfries and Galloway. Although the carcass had been heavily predated, residues of carbofuran were identified in stomach content material (201 mg kg⁻¹), and liver tissue (42.9 mg kg⁻¹). In April, another single bird was recovered from the Corsock area of Dumfries and Galloway. On this occasion chloralose poisoning was identified as the cause of death. Finally a red kite and 2 buzzards were all poisoned with carbofuran in an incident near Grantown-on-Spey in November.

38. Peregrine falcons were victims of abuse in two incidents. One involved 2 immature birds, poisoned with carbofuran at a quarry in Grampian in July. Carbofuran was also identified in a pigeon bait and a crow found at the locus. A single bird was poisoned with chloralose at a locus near West Fishwick, Border in November.

39. In other incidents, 3 foxes were poisoned with strychnine at a locus near Beaully, Highland; a field investigation failed to reveal any relevant circumstantial information. A crow was the victim of chloralose poisoning in an incident near Doune, Central in March. In May, a quantity of a bromadiolone formulation was found in a cat owner's garden. It is thought that this was some kind of malicious act.

UNSPECIFIED USE INCIDENTS

40. 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.

41. In 2004 there were 9 incidents that fell into this category and all of them were associated with anticoagulant rodenticide poisoning. In January a dog on a country estate became ill, exhibiting symptoms of nervous signs, muscle twitching and temporary blindness, and it was suspected that it may have been poisoned. A quantity of a blue pellet material had been found in the owner's garden. Analytical investigation demonstrated that the blue material contained brodifacoum, however this substance was not identified in a sample of urine from the dog. A field investigation revealed that the local Environmental Health Department had been carrying out rodent baiting operations on the estate. Brodifacoum bait material had been laid within buildings on the estate; however the formulation in use was different in appearance to that found in the garden. All out door baiting points used bait with a different rodenticide active, and inspection of the baiting points indicated sealed purpose built boxes were in use. The dog made a full recovery and there was no evidence to specifically identify how the blue material had arrived in the garden.

42. In November a dog was ill on and off over a 5 day period before dying. The illness (vomiting) first became apparent after the dog returned from a wooded area. The animal appeared to recover but started vomiting again on the fifth day after again being out in the wooded area. Analysis of liver tissue showed the presence of

brodifacoum (0.16mg kg^{-1}) and bromadiolone (0.28 mg kg^{-1}). These residues are consistent with rodenticide poisoning being the likely cause of death.

43. Rodenticide residues in four buzzards, a sparrowhawk, a barn owl, and a tawny owl from different locations were within the anticipated lethal range (see paragraphs 12, 16 and 20). There was clear evidence of haemorrhaging in the case of the barn owl. There was no evidence to indicate the likely source of exposure in any of these incidents.

44. Surveillance for sub-lethal (background) residues of anticoagulant rodenticides in the liver tissue of birds of prey and wild mammals continued in 2004. A buzzard poisoned with carbofuran near Leadhills, Strathclyde, had residues of brodifacoum (0.003mg kg^{-1}), bromadiolone (0.005mg kg^{-1}), and difenacoum (0.11mg kg^{-1}). Residues in the range of $0.003 - 0.08\text{mg kg}^{-1}$ were identified in a number of species. The rodenticide actives making up the residues in all cases where rodenticides were detected are shown in Table 8.

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 crime 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. Three incidents were reported to the Procurator Fiscal Service for possible prosecution. In one, the defendant pleaded guilty to charges made under the Wildlife and Countryside Act (1981). He was fined £2500 for intentionally poisoning a goshawk and a number of buzzards, £2500 for placing poisonous baits containing carbofuran on an open hillside, and £500 for culpably and recklessly placing poison on an open hillside where the public and wildlife were endangered. He was admonished on a fourth charge of being in possession of carbofuran. In a second case, the defendant pleaded guilty to charges of unlawful storage of chloralose and 'cymag' and was fined £1200. The court accepted a not guilty plea to a charge made under the Wildlife and Countryside Act, of possession of chloralose capable of committing an offence. The third case, involving charges relating to contraventions of the Control of Pesticides Regulations, Wildlife and Countryside Act, and culpable and reckless conduct will be heard in the Jedburgh Sheriff Court in April 2005. Seven other incidents are subject to on-going police investigations, supported as necessary by SEERAD officials. A prosecution relating to the poisoning of birds in Strathclyde in 2003 was heard in 2005. The defendant was found guilty of charges including the improper storage of chloralose (Control of Pesticide Regulations, 1986) and admonished.

47. SEERAD officials undertook 20 field investigations during 2004. Fifteen of these were joint operations with the police, and some also involved RSPB Investigation Officers. The police pursued 7 incident investigations independently.

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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 out with 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^{3,4,5} for the determination of chloralose in animal tissues based on liquid chromatography in tandem with mass spectrometric detection (LCMS) was introduced during 2001, and a more sensitive and specific LCMS method for rodenticides was introduced in 2004. Wherever possible, residues are confirmed using an alternative analytical technique.

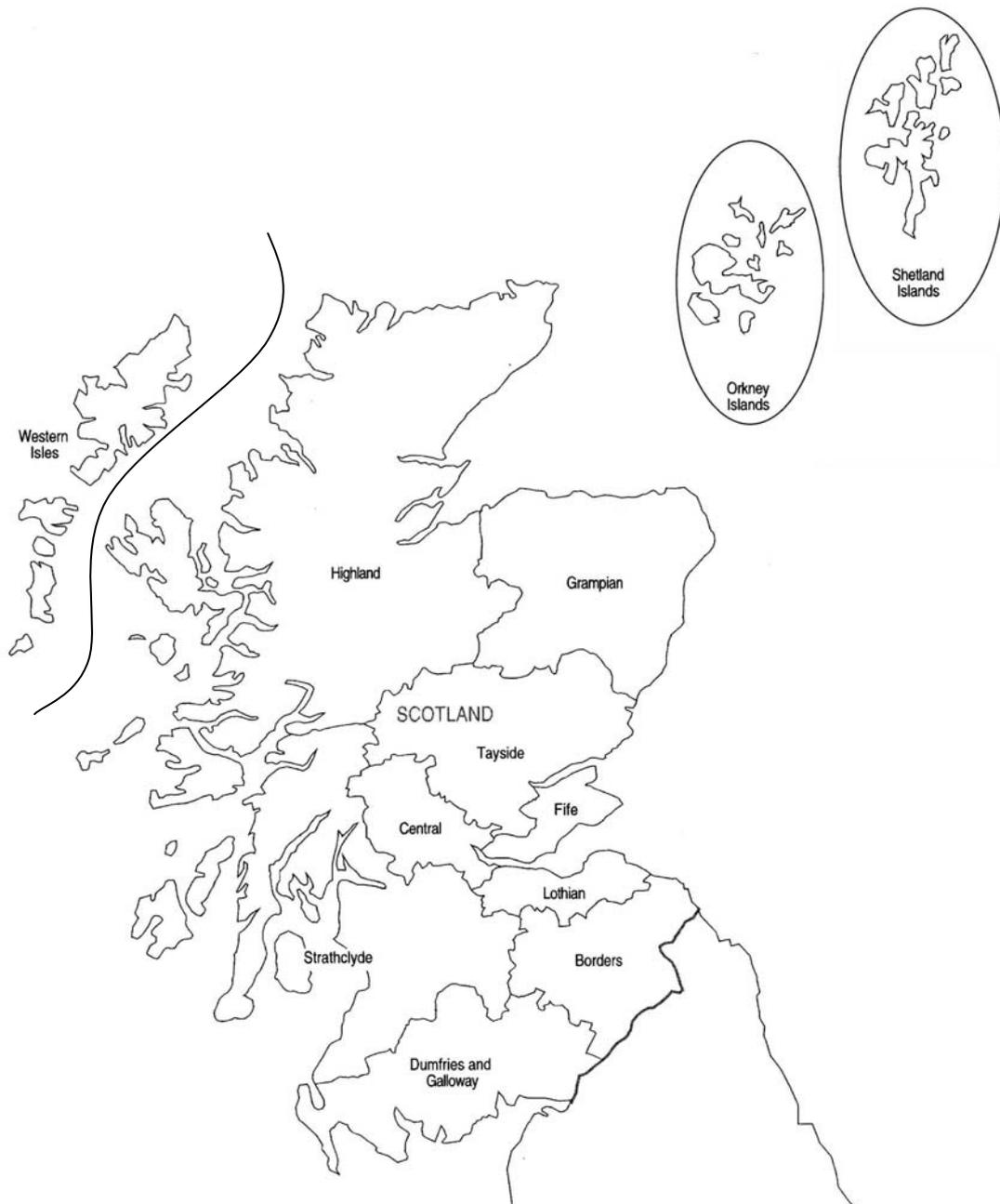
Field investigations are normally only triggered by SASA following the identification of a specific pesticide as the likely cause of poisoning. However field investigations may be initiated following either notification, or after post-mortem examination, if sufficient evidence of pesticide involvement 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 2004

Incident No.	Date	Location	Species	Pesticide	Conclusion	Enforcement Action	Comments
04006	Jan	South Queensferry, Lothian	Dog & bait	Brodifacoum	Unspecified use	SEERAD investigation	Dog made a full recovery
04009	Jan	New Galloway, Dumfries & Galloway	Red kite	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	Insufficient evidence to report to Procurator Fiscal
04015	Feb	Raeshaw, near Heriot, Border	Chemicals, (Mink and Rabbit Bait)	Cyanide & Carbofuran	Abuse	Police & SEERAD investigation	Insufficient evidence to report to Procurator Fiscal
04021	Feb	Compass Slack, Raeshaw, near Heriot, Border	2 Buzzards, (5 Barn owls, Kestrel & Tawny Owl)	Carbofuran	Abuse	Police & SEERAD investigation	Only buzzards were poisoned Insufficient evidence to report to Procurator Fiscal
04022	Feb	Tayside	Buzzard	Bromadiolone & Difenacoum	Unspecified use		
04023	Feb	Drumoak, Grampian	Buzzard	Bromadiolone & Difenacoum	Unspecified use		
04025	Mar	Mill of Argaty, Doune, Central	2 Crow, (Buzzard & Rabbit Bait)	Chloralose	Abuse	High profile Police & SEERAD investigation	Only one crow poisoned. Buzzard died from starvation.

04026	Feb	Cawdor, Nairn, Highland	Buzzard	Carbofuran	Abuse	SEERAD investigation	
04029	Mar	Dun Coillich, Glengoulandie, Tayside	2 Buzzards, 4 Rabbit Baits (& Mole)	Carbofuran	Abuse	Police & SEERAD investigation	Mole not analysed Incident reported in the press, no charges made to date
04031	Mar	Peebles, Border	Goshawk, 15 Buzzards, Crow, 3 Rabbit Baits & 11 Pheasant Baits & Chemicals	Carbofuran	Abuse	Police investigation	Guilty plea. Fined a total of £5500 for offences under the Wildlife & Countryside Act. Admonished on a charge of being in possession of carbofuran
04032	Mar	Kinnaird, Tayside	Buzzard & Rabbit Bait	Carbofuran	Abuse	Police & SEERAD investigation	Incident reported in the press, no charges made to date
04034	Mar	Kinnaird, Tayside	5 Buzzards, 2 Crows, 5 Rabbit Baits & (Gull)	Carbofuran	Abuse	Police & SEERAD investigation	No residues detected in gull Incident reported in the press, no charges made to date
04035	Mar	Tulliemet, Tayside	Chemicals, 2 Gamebags, Knife, & 2 Rabbit Baits	Chloralose & Cyanide	Abuse	Police investigation	Guilty pleas to unlawful storage of pesticides. Fined £1200.

04043	Apr	Beauly, Highland	3 Foxes	Strychnine	Abuse	SEERAD investigation	
04044	Apr	Corsock, Dumfries & Galloway	Red kite	Chloralose	Abuse	Police investigation	Insufficient evidence to report to Procurator Fiscal
04045	Apr	Kingsbarns, Fife	Buzzard	Brodifacoum, Bromadiolone, Difenacoum	Unspecified use		Immediate cause of death - trauma
04048	Apr	Oxnam, Jedburgh, Border	Buzzard	Carbofuran	Abuse	Police investigation	No charges made to date
04051	Apr	Fettercairn, Laurencekirk, Grampian	Buzzard	Chloralose	Abuse	Police investigation	
04061	Jun	Dalwhinnie, Highland	Buzzard	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	
04062	Jun	Leadhills, Strathclyde	3 Buzzard, Crow & 7 Rabbit Baits	Carbofuran	Abuse	Police, SEERAD & RSPB investigation	Ongoing investigation
04066	May	Lockerbie, Dumfries & Galloway	Grain Bait	Bromadiolone	Abuse	Police investigation	Insufficient evidence to report to Procurator Fiscal

04068	June	Carberry, Musselburgh, Lothian	Buzzard	Bromadiolone, Difenacoum , & Chlorophacinone	Unspecified Use		
04074	Jul	Longhaven Quarries, Grampian	2 Immature Peregrine Falcon, Crow & Pigeon Bait	Carbofuran	Abuse	Police & SEERAD investigation	Extensive TV, radio and press coverage
04079	Jul	Port William, Dumfries & Galloway	Tawny Owl	Brodifacoum	Unspecified use		
04082	Jul	Doone Lodge, Doone, Central	Red Kite	Diazinon	Veterinary Use	SEERAD investigation	
04105	Sep	Fairnington, Kelso, Border	Buzzard	Carbofuran	Abuse	Police & SEERAD investigation	Prosecution scheduled for April 2005
04111	Sep	Brechin, Tayside	Dog	Difenacoum	Misuse	SEERAD investigation	Warning letter issued to Pest Control Contractor
04117	Oct	Drumclog, Strathclyde	Buzzard & 2 Pigeon Baits	Carbofuran	Abuse	Police investigation	Insufficient evidence to report to Procurator Fiscal
04122	Oct	Raeshaw, Heriot, Border	Buzzard & Hare Bait	Carbofuran	Abuse	Police & SEERAD investigation	Ongoing police investigation
04127	Nov	West Fishwick, Border	Peregrine Falcon	Chloralose	Abuse	Police & SEERAD Investigation	Ongoing police investigation

04128	Nov	Maybole, Strathclyde	Barn Owl	Bromadiolone	Unspecified use		Extensive areas of sub-cutaneous haemorrhaging
04132	Nov	Rhynd, Tayside	Dog	Brodifacoum, Bromadiolone	Unspecified use	Police & SEERAD Investigation	
04133	Nov	Cromdale, Grantown-on-Spey, Highland	Red Kite, 2 Buzzards & 2 Pheasant Baits	Carbofuran	Abuse	Police, SEERAD & RSPB Investigation	No carbofuran detected in pheasants or one buzzard
04138	Dec	Keith, Grampian	Sparrowhawk	Difenacoum	Unspecified use		