

**PESTICIDE POISONING OF ANIMALS 2005**

**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 157 incidents of suspected poisoning registered for investigation by the scheme in 2005. The causes were determined in 71 incidents, of which 32 (20% of those investigated) involved pesticide poisoning or exposure to pesticides.

A single incident was attributed to the approved use of the rodenticide bromadiolone. This involved the death of a grey squirrel in a garden environment. A further two incidents, both involving rodenticides, resulted from misuse of rat baits. One involved pigeons in a derelict building, and the other involved a goose on a farm.

Deliberate abuse of pesticides was identified in 19 incidents in 2005 compared to 23 in 2004, and 32 in 2003. This represents 59% of pesticide incidents in 2005 compared to 68% in 2004. 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. Seven of these incidents involved exposure to anticoagulant rodenticides. Finally, two red kites were poisoned with propetamphos in a single incident where exposure resulted from use of the pesticide as a veterinary medicine.

Ten agricultural chemicals were identified in the pesticide poisoning incidents, compared to nine in 2004.

## 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 wilful 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, 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.

7. The report for 2005 is presented in a revised format partly to aid subsequent amalgamation into a U.K. report, but also to make data viewed electronically more useful to partner organisations and other interested parties.

## INCIDENTS IN 2005

### NUMBER OF INCIDENTS IN 2005

8. A total of 167 suspected poisoning incidents were notified in 2005. Of these, 7 incidents were eliminated on veterinary evidence prior to submission, 2 incidents occurred in England, and one submission of Cymag related to health & safety issues, leaving 157 incidents registered for onward investigation at SASA. All of the 7 incidents screened out on veterinary evidence involved wild birds [disease (2), starvation (4), and trauma (1)].

9. The cause of death or illness (including pesticides and non-agricultural chemicals, disease, starvation and trauma) was established in 71 incidents (45% of those investigated). Pesticides were identified in 32 of these incidents (20% 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.

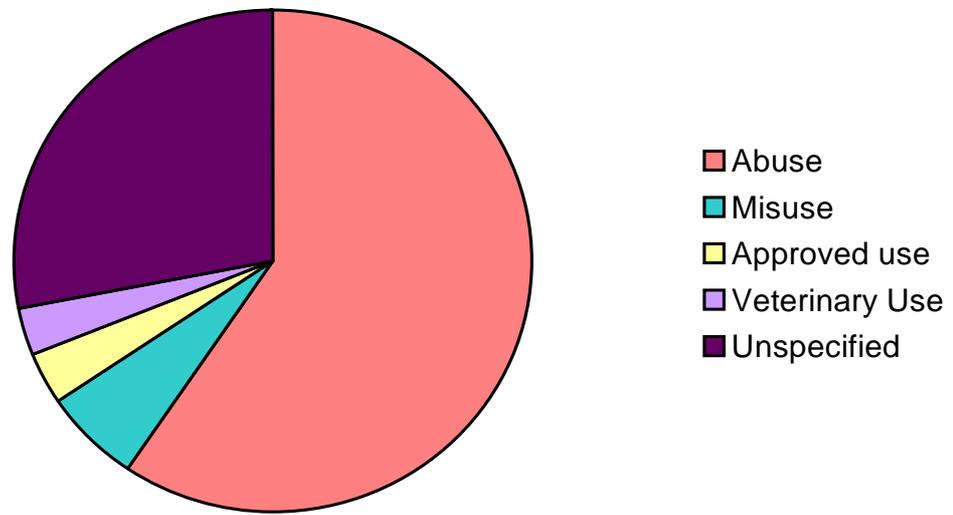
**Table 1: Number of incidents investigated in 2005**

	Incidents Investigated	Pesticide poisoning incidents	Other cause of death found
Vertebrate wildlife	107	22 (21%)	37 (35%)
Livestock	2	0	0
Companion animals	32	6 (19%)	2 (6%)
Beneficial insects	5	0	0
Suspected baits and suspicious substances	11	4 (36%)	not applicable
<b>TOTAL</b>	<b>157</b>	<b>32 (20%)</b>	<b>39 (25%)</b>

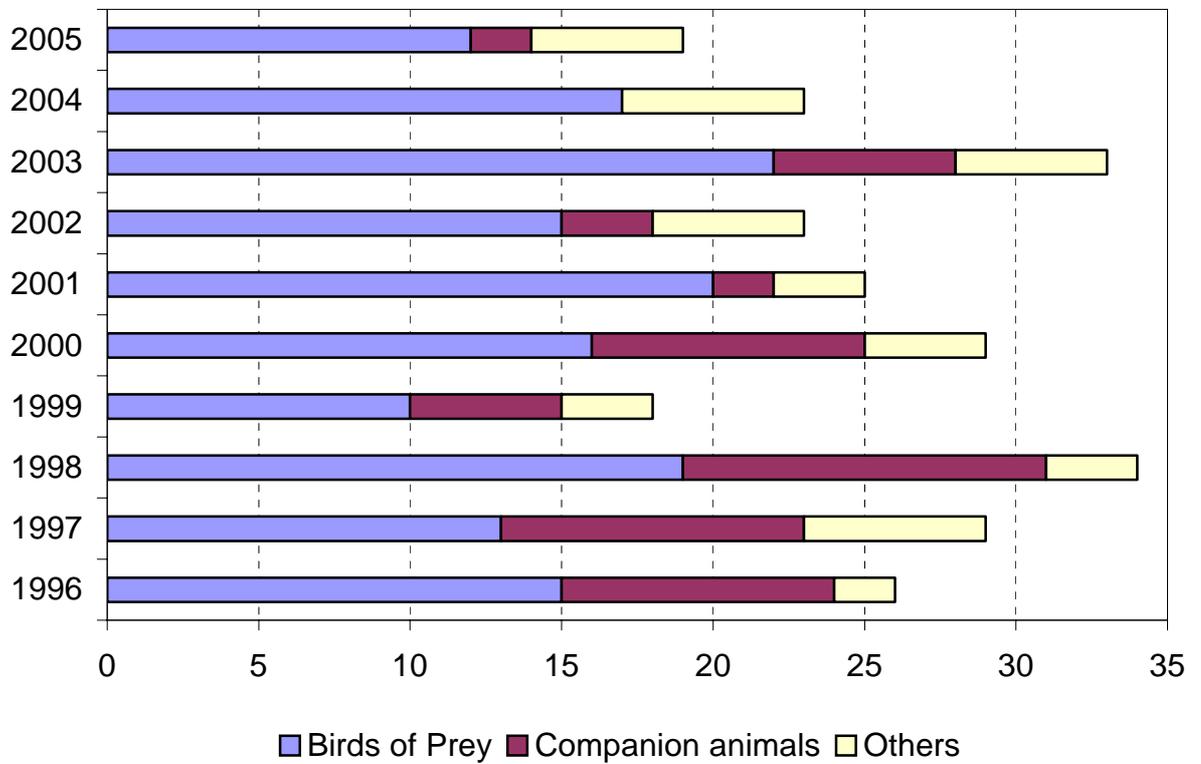
10. A single incident was attributed to the approved use of pesticides. Two incidents (6%) involved some element of misuse, 19 (59%) were associated with abuse, and one incident was associated with a pesticide supplied for veterinary use. In a further 9 incidents no specific source of the exposure was identified and the cause of each incident was categorised 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.**

<b>Carbamates</b>		
carbofuran	15	bait, buzzard, cat, chemical, crow, eagle, raven, red kite,
<b>Organophosphates</b>		
propramphos	1	red kite
<b>Rodenticides</b>		
brodifacoum	3	badger, goose, red kite
bromadiolone	9	badger, barn owl, chemical, dog, fox, grey squirrel, kestrel, otter, pigeon
chlorophacinone	1	cat
difenacoum	7	badger, cat, fox, goose, grey squirrel, kestrel, red kite
<b>Other Compounds</b>		
chloralose	4	bait, buzzard, chemical, red kite
metaldehyde	3	cat, chemical, dog
sodium cyanide	2	chemical
strychnine	1	chemical
<ul style="list-style-type: none"> <li>• <i>two incident involved brodifacoum and difenacoum</i></li> <li>• <i>one incident involved brodifacoum, bromadiolone and difenacoum</i></li> <li>• <i>three incident involved bromadiolone and difenacoum</i></li> <li>• <i>one incident involved chlorophacinone and difenacoum</i></li> <li>• <i>one incident involved carbofuran, bromadiolone, metaldehyde and sodium cyanide</i></li> <li>• <i>one incident involved carbofuran, chloralose, sodium cyanide, and strychnine</i></li> </ul>		
<b>Cause of death other than pesticides</b>		
disease	10	
starvation	4	
trauma	21	
o-cresol, ethylene glycol, lead, yew	4	
unknown	80	
not applicable	7	



**Figure 1. Pesticide Incidents in Scotland 2005**



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

**Table 3. Summary of species received**

	Incidents Investigated	Pesticide poisoning incidents	Other cause of death found
<b>Vertebrate Wildlife</b>			
<i>Mammals</i>			
badger	3	1 (33%)	1 (33%)
fox	4	1 (33%)	0
hedgehog	2	0	1 (50%)
otter	6	1 (17%)	2 (33%)
squirrel	2	1 (50%)	0
vole	1	0	0
<i>Birds</i>			
buzzard	38	9 (24%)	12 (32%)
eagle, golden	5	1 (20%)	1 (20%)
eagle, sea	1	0	0
hen harrier	2	0	1 (50%)
kestrel	3	1 (33%)	0
peregrine falcon	1	0	0
red kite	10	4 (40%)	2 (20%)
sparrowhawk	2	0	2 (100%)
barn owl	6	1 (17%)	4 (80%)
tawny owl	3	0	2 (67%)
owl	1	0	0
cormorant	1	0	0
moorhen	1	0	0
shelduck	1	0	0
swan, whopper	1	0	1 (100%)
gulls	3	0	1 (33%)
Pigeons and doves	9	1 (11%)	6 (67%)
pheasant	1	0	0
chough	1	0	0
crow	2	1 (50%)	0
raven	3	1 (33%)	0
rook	1	0	1 (100%)
<b>Companion Animals</b>			
cats	17	3 (18%)	1 (6%)
dogs	12	2 (17%)	0
goose	1	1 (100%)	0
horse	1	0	1 (100%)
peregrine falcon	1	0	0
<b>Livestock</b>			
cattle	1	0	0
sheep	1	0	0
<b>Beneficial Insects</b>			
honeybees	5	0	0

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

### **APPROVED USE INCIDENTS**

**11.** A grey squirrel was found in a domestic garden in Ayrshire during November. The carcass was autolysed, but a post mortem examination revealed a large blood clot in the thorax. Both the stomach and the intestines contained a pale blue/green coloured material. Analysis of liver tissue identified a residue ( $8.5\text{mgkg}^{-1}$ ) of bromadiolone well into the lethal range. A trace of a second rodenticide, difenacoum ( $0.01\text{mgkg}^{-1}$ ), was also identified. A field investigation revealed that a neighbour had complained to the local authority about a rat problem in the notifier's garden. The local authority had placed rat bait in the garden without the knowledge of the householder. There was no evidence to indicate improper use of the rat bait material.

### **MISUSE INCIDENTS**

**12.** Approximately 100 dead pigeons were found in a derelict cinema in January. The notifier believed that they had been poisoned after gaining access to rodenticide bait material laid in the open within the premises. Bromadiolone was confirmed as the active ingredient of bait material recovered from the site. Two pigeon carcasses were submitted. In one, there was evidence of some haemorrhaging under the skin and profuse haemorrhaging into the crop. The crop of both birds contained blue-tinged cereal seed. No residues of bromadiolone or any other anticoagulant rodenticide were detected in the liver tissues from the birds. The field investigation confirmed that some rat bait had been laid in open trays. The contractor involved indicated that the pigeons had been shot with air guns at the request of the local authority. Several other sites serviced by the contractor were inspected for compliance with the appropriate practice in laying baits.

**13.** A free ranging pet goose on a farm died within hours of becoming unwell. The post mortem examination identified quantities of clotted and unclotted blood in the body cavity and pulmonary haemorrhages. Analysis confirmed a significant residue ( $0.59\text{mgkg}^{-1}$ ) of difenacoum in liver tissue together with a trace of brodifacoum. A field investigation revealed that rat baits containing Sorex Plus had been used on the farm. A rat had been observed when a turkey shed was being cleaned out. A casual employee had laid the rat bait material within the building. The goose appears to have gained access to the bait when the doors to the shed were removed for cleaning purposes.

### **ABUSE INCIDENTS**

**14.** 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 2005, nineteen incidents (59% of pesticide incidents) were attributed to the abuse of

agricultural pesticides in Scotland. A high proportion of these incidents involved birds of prey (Figure 2).

**15.** Only three pesticides were identified in abuse incidents in 2005, compared to seven in incidents investigated in 2004. The chemicals were bromadiolone (1), carbofuran (15), and chloralose (3).

**16.** Fourteen of the 19 abuse incidents resulted in vertebrate casualties, twelve of these involved birds of prey, and two involved companion animals. Buzzards were the casualties in poisoning incidents in Border (3), Fife (1), Grampian (1), Highland (1), and Strathclyde (3). Red kites were victims in two separate incidents in Highland, and a golden eagle was poisoned in the Western Isles.

**17.** A dog that was submitted for veterinary treatment in March was thought to have been maliciously fed with food containing a rodenticide bait material. Bromadiolone was identified in vomitus, and in material recovered from the stomach. The animal recovered after veterinary treatment. It appears that the dog had probably been fed rodent bait in sandwiches. Police investigations failed to establish who had been responsible, however the issue was publicised in a press release, and a warning was issued to local householders. A cat died in a Lothian town after showing signs of twitching and frothing at the mouth. A high residue of carbofuran was identified in the stomach content material.

**18.** Three crows in Border Region were confirmed to have been poisoned with carbofuran in June. A buzzard had been poisoned in the same locality during 2004. In four cases, submitted material were confirmed to be poisonous baits in circumstances where there were no known animal casualties.

## **UNSPECIFIED USE INCIDENTS**

**19.** Each year there always tends 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.

**20.** In 2005 there were 9 incidents that fell into this category and 7 of them were associated with anticoagulant rodenticide poisoning. A residue ( $0.29\text{mgkg}^{-1}$ ) of bromadiolone was identified in liver tissue from a fox submitted from West Lothian in February, along with a trace of difenacoum. The animal had been found in the middle of a field, and no obvious cause of death had been identified. The bromadiolone residue is within the anticipated lethal range. Residues of difenacoum, bromadiolone and brodifacoum were present in liver tissue from a badger submitted in March. The animal had been found in a semi-urban area of West Lothian. The stomach was empty and there were no signs of injury. The difenacoum residue ( $1.6\text{mgkg}^{-1}$ ) and the bromadiolone residue ( $0.31\text{mgkg}^{-1}$ ) were both within the lethal range, indicating that rodenticide poisoning was the cause of death. A red kite, thought to be a possible road traffic accident victim on the Black Isle, was submitted in May. Laboratory investigation confirmed bruising on the lower part of the breast and disruption of the liver. In addition difenacoum and brodifacoum were detected in liver tissue. The difenacoum residue ( $0.3\text{mgkg}^{-1}$ ) was within the lethal range. In July a dead otter was

found on the premises of a tennis club. The carcase had been badly damaged after death, so a definite cause of death could not be established. A residue ( $0.18\text{mgkg}^{-1}$ ) of bromadiolone in liver tissue was at the lower end of the lethal range. A barn owl found on a golf course in the Borders was submitted as a possible victim of rodenticide poisoning after a post mortem examination revealed internal haemorrhages. A residue ( $0.053\text{mgkg}^{-1}$ ) of bromadiolone was identified in liver tissue. The magnitude of the residue is out with the anticipated lethal range, but it is possible that exposure to rodenticides contributed to the death of this bird. In October, a dead kestrel was found on top of a wood pile in a farm shed. Rodent baiting was being undertaken on the property and appeared to be being conducted in accordance with good practice. A bromadiolone residue ( $0.403\text{mgkg}^{-1}$ ) detected in liver tissue was well into the lethal range confirming rodenticide poisoning as the cause of death. A trace ( $0.021\text{mgkg}^{-1}$ ) of difenacoum was also identified in liver tissue. Finally a cat, thought to have been exposed to 'Drat' (chlorophacinone) by ingesting poisoned rodents, was found dead at a roadside. A post mortem examination revealed no evidence to suggest that trauma was the cause of death. A residue ( $0.048\text{mgkg}^{-1}$ ) confirmed exposure to chlorophacinone, however the magnitude of the residue was out with the range normally considered to reflect a lethal dose.

**21.** Two incidents involved exposure to metaldehyde slug baits. In one, two cats from the same household died 48 hours after the onset of symptoms. A slug bait material had been applied to fields in the vicinity. Residues of metaldehyde were detected in material from the stomach and in liver tissue. The field investigation did not identify the precise route of exposure. A dog died in October, 3 hours after starting to vomit blue/green coloured material. Although metaldehyde was identified in a sample of vomitus, the source of the molluscicide was not established.

**22.** Surveillance for sub-lethal (background) residues of anticoagulant rodenticides in the liver tissue of birds of prey and wild mammals continued in 2005. A buzzard that had been a victim of abuse in Fife was found to have a residue ( $0.164\text{mgkg}^{-1}$ ) of difenacoum in liver tissue. Residues in the range of  $0.003 - 0.09\text{mgkg}^{-1}$  were identified in a number of species. A number of liver tissues from buzzards and foxes were made available for rodenticide screening, out with the WIIS scheme, by the RSPB and SAC respectively. A bromadiolone residue ( $0.155\text{mgkg}^{-1}$ ) in a buzzard was close to the anticipated lethal range. Several foxes carried liver residues consistent with rodenticide poisoning being the cause of death (no history available). The rodenticide actives making up the residues in all cases where rodenticides were detected are shown in Table 4.



<b>ANIMAL</b>		brodifacoum		bromadiolone		coumatetralyl		difenacoum		Flocoumafen
buzzard*										
buzzard*										
kestrel				U				A		
red kite				A				A		
red kite										
red kite										
red kite										
red kite		U						U		
red kite										
sparrowhawk										
sparrowhawk										
barn owl				U						
barn owl										
barn owl										
tawny owl										
tawny owl										

\* Animals submitted out with the formal WIIS scheme

## **ENFORCEMENT ACTION**

**23.** 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 such as the RSPB and SSPCA. 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.

**24.** The Procurator Fiscal is proceeding with a prosecution at Jedburgh Sheriff Court following an incident where crows were poisoned with carbofuran. An earlier poisoning incident, that involved a buzzard at the same general location in 2004, triggered interest from the police and SEERAD officials.

**25.** A warning letter was issued to a pest control company about protecting rodent bait against access from non-target animals. This followed reports of pigeon deaths in a derelict building. It is understood that the police issued warning letters to local residents following two abuse incidents in semi-urban situations.

**26.** SEERAD officials carried out 23 field investigations during 2005. Fifteen of these were joint operations with the local police force, and some also involved RSPB Investigation Officers. The police pursued 6 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<sup>3,4,5</sup> 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.

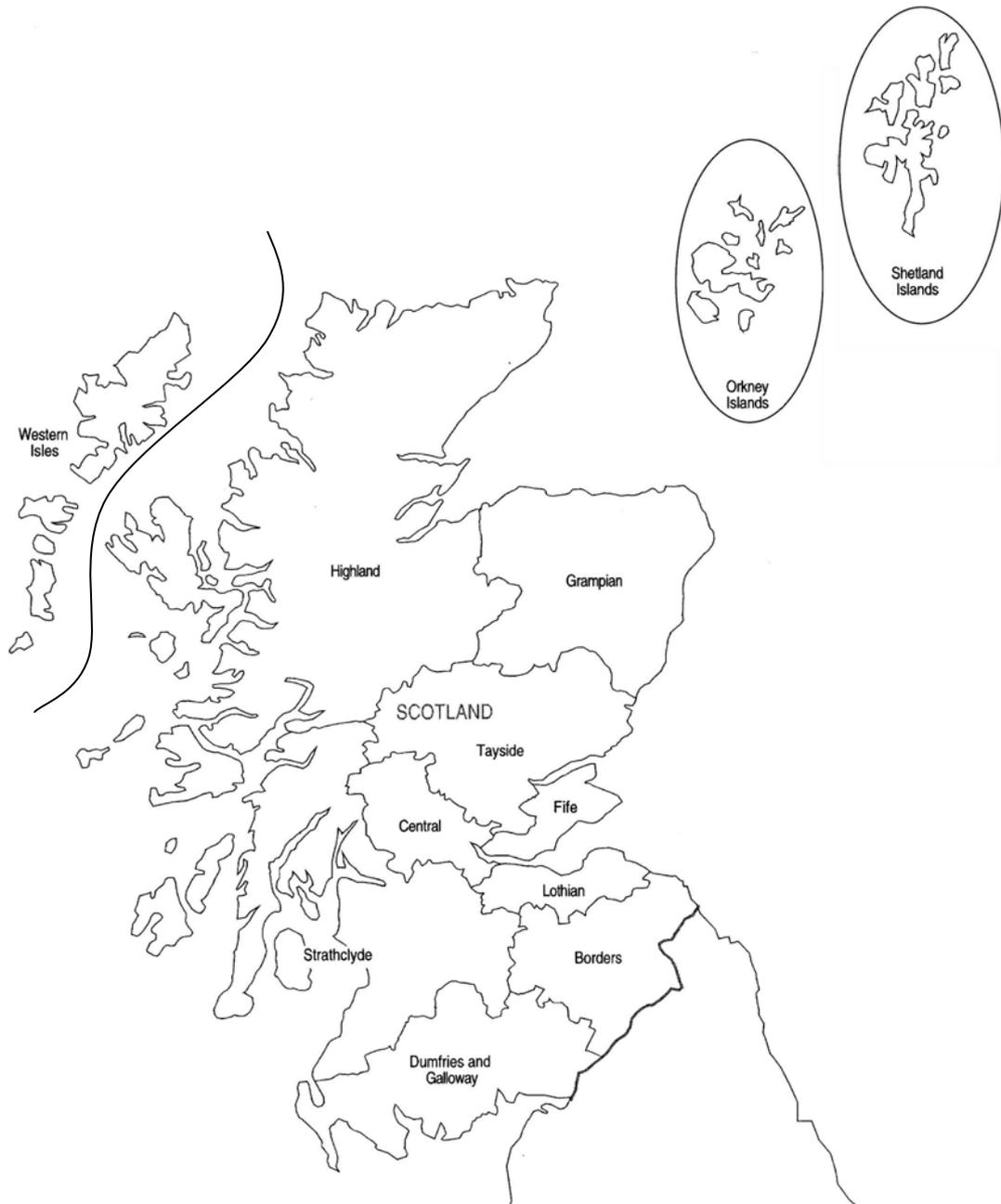
Field investigations are normally only triggered by SASA following the identification of a specific pesticide as the likely cause of poisoning. However field investigations may be initiated following either notification, or after post-mortem examination, if sufficient evidence of pesticide involvement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



Number	Chemical	Category	Species	Month	County	Comments
5149	Bromadiolone & Difenacoum	Approved	Grey Squirrel	November	Strathclyde	Dead animal found in garden. Rat bait had been used in the garden area by the local district council property after complaints about rats by a neighbour. <b>Bromadiolone</b> residue well within lethal range.
5005	Bromadiolone	Misuse	Pigeons (100)	January	Tayside	Rodent control operation in derelict old picture house building. Rat bait laid in open trays. Bromadiolone confirmed in bait material but not in pigeons(2). Warning letter issued to contractor, and other operational sites visited to check compliance with required practice.
5114	Difenacoum & Brodifacoum	Misuse	Goose	August	Grampian	Free range gander died on a farm where Sorex Plus was in use in a turkey shed. The doors had been removed from the shed for cleaning purposes allowing access for a period. Unclothed blood and pulmonary haemorrhage noted at PM. <b>Difenacoum</b> residue in liver tissue well within the lethal range.
5040	Bromadiolone	Abuse	Dog	March	Fife	Dog thought to have ingested rat bait that had allegedly been placed in sandwiches with malicious intent. Animal survived, but residues were identified in vomitus and stomach content material
5007	Carbofuran	Abuse	Red kite	January	Highland	Bird had been in good bodily condition prior to death. Off-white discoid granules observed in stomach & gullet content materials.
5016	Carbofuran	Abuse	Buzzards (2) & hare bait	February	Highland	Carbofuran not detected in hare. Very low sub-lethal residues of <b>bromadiolone</b> detected in liver of one buzzard.
5026	Carbofuran	Abuse	Buzzard & rabbit baits	February	Fife	Carcases found in area used for release of pheasants, rabbits approximately 3 weeks later than the buzzard. Significant residues of carbofuran present in rabbit carcasses. A residue of <b>bromadiolone</b> approaching the lethal range was detected in the liver of this bird.
5015	Carbofuran	Abuse	Rabbit bait	February	Strathclyde	As received, the bait consisted of the rear half of a rabbit with little of the viscera remaining. Blue granules evident near the backbone and on exposed tissue surfaces.

Number	Chemical	Category	Species		County	Comments
5038	Carbofuran	Abuse	Buzzards (3), Raven & Lamb bait	March	Grampian	
5052	Carbofuran	Abuse	Buzzard	April	Strathclyde	Bird found in lambing field by farmer. Bait material appears to have been of mammalian in nature
5072	Carbofuran	Abuse	Rabbit baits (2)	June	Strathclyde	Dessicated carcasses found near a stink pit
5089	Carbofuran (metaldehyde, Cymag, & bromadiolone bait)	Abuse	Crows (3), pigeon, partridge, chemicals	June	Border	Crows confirmed as being poisoned. Bait probably avian in nature. Syringes and an emty Phostoxin canister amongst items recovered in field investigation.
5119	Carbofuran	Abuse	Buzzards (2)	August	Border	Partly decomposed birds found close together in a wood.
5127	Carbofuran	Abuse	Golden eagle	September	Western Isles	Post mortem identified possible presence of granules in digestive tract material.
5142	Carbofuran (chloralose, cyanide & strychnine)	Abuse	Buzzard & rabbit bat	October	Border	A crow submitted in the same incident had not been poisoned.
5146	Carbofuran	Abuse	Buzzard	November	Strathclyde	Bird found on farmland. Blue coloured granules evident on mammalian tissues found in stomach and gullet.
5153	Carbofuran	Abuse	Chemical	November	Western Isles	Herb/spice jar containing free flowing blue granules seized by the police. Found in a gun cabinet in a domestic garage.
5154	Carbofuran	Abuse	Cat	November	Lothian	Sudden onset of twitching, oedema, and frothing at mouth followed by death.
5161	Carbofuran	Abuse	Buzzard & raven bait	December	Border	Buzzard found by walker, raven subsequently recovered in field investigation.
5020	Chloralose	Abuse	Buzzards (2)	February	Strathclyde	A live bird and a partly predated buzzard were found together. The live bird subsequently recovered and was released.
5057	Chloralose	Abuse	Pigeon bait	May	Fife	Carcase found in close proximity to a peregrine falcon nest site. High concentration of chloralose detected in cuttings from exposed tissue surfaces.

Number	Chemical	Category	Species		County	Comments
5069	Chloralose	Abuse	Red kite	May	Highland	Dead bird found lodged in a tree. Low sub-lethal residues of bromadiolone and difenacoum detected in liver tissue
5093	Bromadiolone	Unspecified use	Otter	July	Border	Dead animal found on tennis club premises. Carcase had been damaged after death. Bromadiolone at lower end of lethal range.
5123	Bromadiolone	Unspecified use	Barn owl	September	Border	Bird found on golf course. Internal haemorrhage noted at post mortem, rodenticide poisoning suspected. Liver residue confirms exposure, but magnitude outwith anticipated lethal range.
5017	Bromadiolone & Difenacoum	Unspecified use	Fox	February	Lothian	Bromadiolone residue within lethal range. Carcase damaged, limited post mortem only.
5143	Chlorophacinone & Difenacoum	Unspecified use	Cat	October	Grampian	Dead cat found at roadside, no evidence of trauma. May have been exposed to Drat via ingestion of poisoned rodents. Chlorophacinone residue confirms exposure but magnitude of residue outwith the normal lethal range.
5144	Bromadiolone & Difenacoum	Unspecified use	Kestrel	October	Strathclyde	Bird found on top of wood pile in a shed. It had been in relatively poor bodily condition prior to death, but no specific evidence of haemorrhaging was noted at post mortem. The bromadiolone residue was well within the lethal range. Rodent baiting undertaken on the property appeared to be being conducted in accordance with good practice.
5035	Difenacoum, Bromadiolone & Brodifacoum	Unspecified use	Badger	March	Lothian	Animal found in semi-urban area. Residues of difenacoum and bromadiolone in liver both well within the lethal range. Trace of brodifacoum also present.
5136	Difenacoum & Brodifacoum	Unspecified use	Red kite	May	Highland	Difenacoum residue within lethal range.
5091	Metalddehyde	Unspecified use	Cats (2)	July	Fife	The animals died within 48hours of the onset of symptoms. The precise route of exposure was not established.
5141	Metalddehyde	Unspecified use	Dog	October	Highland	Dog vomited blue/green granular material, and died approximately 3 hours later. Source of exposure not identified.
5117	Propetamphos	Veterinary use	Red kites (2)	September	Central	Birds found in close proximity. A rubber band used for sheeps tails was found close to one of the birds. A red kite died from propetamphos poisoning in the same area in 2003.

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5001	Difenacoum	Disease	Otter	Dec 2004	Fife	Animal found on the bank of the Eden east of Cupar. Very low sub-lethal residue. Death caused by pyothorax resulting from a Pasteurella infection.
5081	Bromadiolone & Difenacoum	Other poison	Red kite	April	Highland	Dead bird found on beach. GCMS examination indicates presence of cresol in material from stomach/gullet, and cresol poisoning was suspected to be the cause of death. Low sub-lethal residues of bromadiolone & difenacoum detected in liver tissue
5030	Bromadiolone	Starvation	Fox	March	Highland	Animal emaciated, carcass pale with petechial haemorrhages on lungs. Sub-lethal residue of bromadiolone present in liver
5098	Difenacoum	Starvation	Buzzard	July	Tayside	Immature bird. Very low sub-lethal residue present in liver tissue.
5077	Bromadiolone	Trauma	Buzzard	February	Lothian	Bird found under electricity pylon and thought to have been electrocuted. Very low sub-lethal residue present in liver tissue.
5080	Bromadiolone	Trauma	Buzzard	March	Fife	Bird found under electricity pylon. Haemorrhages noted in lungs. Residue of bromadiolone outwith the lethal range.
5156	Bromadiolone	Trauma	Tawny owl	October	Central	Road traffic accident casualty. Very low sub-lethal residue of bromadiolone detected in liver.
5073	Bromadiolone & Difenacoum	Trauma	Red kite	June	Highland	Bird died from dehydration after its legs became entangled in the radio transmitter harness. Combined rodenticide residue approaching the lower end of range where adverse effects may occur.
5075	Bromadiolone & Difenacoum	Trauma	Barn owl	May	Border	Owl believed to have been killed by a predator. It nested on arable land where there is a continuous rodent control programme. Low sub-lethal residues present in liver.
5097	Bromadiolone & Difenacoum	Trauma	Sparrowhawk	May	Lothian	Road traffic accident casualty. Very low sub-lethal residues detected in liver.
5103	Bromadiolone & Difenacoum	Trauma	Barn Owl	August	Grampian	Injury to breast with haemorrhaging under the skin. Very low sub-lethal residues of rodenticides present in liver tissue.
5104	Bromadiolone & Difenacoum	Trauma	Sparrowhawk	August	Lothian	Bird flew into a window. Very low sub-lethal residues of rodenticides present in liver tissue
5116	Difenacoum	Trauma	Hedgehogs (3)	August	Border	Animal found together on golf course. Very low sub-lethal residues of difenacoum identified in two hedgehogs

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5032	Difenacoum & Brodifacoum	Trauma	Tawny owl	March	Lothian	Probable road traffic accident casualty in urban area. Low sub-lethal residue of difenacoum & a trace of brodifacoum in liver
5044	Bromadiolone	Unknown	Otter	March	Highland	Low sub-lethal residue
5118	Bromadiolone	Unknown	Buzzard	August	Grampian	Dead bird found beside a pheasant feeder. It had been in poor bodily condition prior to death. Very low sub-lethal residue of bromadiolone present in liver tissue.
5006	Difenacoum	Unknown	Buzzard	January	Central	Low sub-lethal residue. Bird had been in relatively poor condition prior to death; when found, its legs were tied together with orange twine.
5028	Difenacoum	Unknown	Buzzard	January	Strathclyde	Very low sub-lethal residue. Bird had been found below a telegraph pole, but there were no signs of injuries.
5029	Difenacoum & Bromadiolone	Unknown	Red kite	February	Central	Sub-lethal residues present in liver tissue
5033	Difenacoum	Unknown	Buzzard & Kestrel	March	Highland	Both carcasses in poor condition. Low sub-lethal residue of difenacoum detected in liver of buzzard
5125	Difenacoum	Unknown	Buzzard	April	Highland	Bird found under an electricity pole near a small housing estate. Sub-lethal residue of difenacoum present in liver tissue
5100	Difenacoum	Unknown	Buzzard	August	Tayside	Bird in good bodily condition prior to death. Only a low sub-lethal residue of difenacoum detected.
5135	Difenacoum	Unknown	Red kite	September	Highland	Very low sub-lethal residue of difenacoum identified in liver.