

Pesticide Poisoning of Animals in 2011



A Report of Investigations in Scotland

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INVESTIGATIONS OF SUSPECTED INCIDENTS IN SCOTLAND

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A Division of the Scottish Government Agriculture, Food and Rural Communities Directorate

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SUMMARY

The Wildlife Incident Investigation Scheme (WIIS) operated in Scotland by Science and Advice for Scottish Agriculture (SASA) Pesticides & Wildlife Branch <http://www.sasa.gov.uk/wildlife-environment/wildlife-incident-investigation-scheme-wiis> investigates suspected poisoning of wildlife, beneficial insects, companion animals and livestock if there is evidence to indicate that pesticides or biocides¹ may be involved.

The scheme, together with similar schemes operating in England & Wales and Northern Ireland, provides a means of post-registration surveillance of pesticide use throughout the UK, 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 provides evidence that can be used by the Scottish Government or the police, to enforce legislation relating to the safe use of pesticides and the protection of food, the environment and animals.

In 2011, there were 237 incidents (which included 5 bee incidents) submitted to the WIIS Scotland. This represented a slight increase compared to the 233 received in 2010. Four incidents were excluded², leaving 233 incidents accepted for further investigation. The cause of death or illness was determined in 129 incidents. Ninety four incidents (40% of all incidents accepted into the WIIS Scotland) tested positive for pesticides and other chemicals³. Twenty-five of these incidents were attributed to pesticide poisoning.

Sixteen incidents were categorised as abuse, 5 incidents were attributed to unspecified use, one incident followed approved use and 3 incidents were categorised as misuse.

Eighteen different pesticides or chemicals were identified (see Table 2). The insecticide, carbofuran was detected in 9 out of 16 (56%) incidents categorised as abuse, even though UK approval for use of products containing this chemical expired in 2001.

Selected samples were also screened for evidence of exposure to anticoagulant rodenticides. Residues of various anticoagulant rodenticides were detected in 87 out of 210 incidents (i.e. 41% of those incidents selected for rodenticide screening). The second generation anticoagulant rodenticides, bromadiolone, brodifacoum and difenacoum were found to be the most prevalent active ingredients detected.

¹ In recent years, some non-agricultural pesticides have been classified as biocides e.g. anticoagulant rodenticides. However, throughout this report 'pesticide' or 'pesticides' will be used as the generic terminology.

² Excluded refers to incidents where the criteria for acceptance into the WIIS Scotland have not been met or where there is no suitable material for analysis.

³ Includes incidents that involved veterinary medicines and ethylene glycol.

INTRODUCTION

1. In the United Kingdom the impact of pesticide use on non-target vertebrate wildlife and other animals including honey bees, companion animals and livestock, is assessed before approval is granted by the regulatory body. In order to protect 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 (2011), where it is thought that an unacceptable risk would arise.
2. The WIIS Scotland is one of four schemes, operating in the United Kingdom, which investigates possible pesticide poisoning of animals. The WIIS Scotland is operated by SASA's Pesticides & Wildlife Branch on behalf of the Scottish Government Agriculture, Food and Rural Communities Directorate (AFRC). The procedures for incident investigation are described in Appendix I.
3. Incidents confirmed as involving pesticides that were considered to be responsible for the cause of death or illness of an animal or that contravene related legislation are assigned to one of the following 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.
 - **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.
4. The results of investigations are ultimately reported to the Environmental Panel of the UK Advisory Committee on Pesticides (ACP) <http://www.pesticides.gov.uk/guidance/industries/pesticides/advisorygroups/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 by the agricultural and non-agricultural sectors of the pesticide industry, under the Food

and Environment Protection Act 1985 (FEPA) and Control of Pesticides Regulations (COPR). In cases where there is evidence to indicate misuse or deliberate abuse of a pesticide, the results of investigations may also lead to legal enforcement. Under FEPA and COPR, all aspects of pesticide advertisement, sale, supply, storage and use are fully regulated. If investigations reveal contravention of FEPA, COPR, or other legislation such as the Wildlife and Countryside Act 1981 or Possession of Pesticides (Scotland) Order 2005, then prosecution or other forms of enforcement may ensue. All activities carried out to enforce the legislation in Scotland are funded by the Scottish Government.

6. The WIIS Hotline number (freephone: 0800 321600) is routed to SASA and provides access for incident notification. To prevent large numbers of dead animals being submitted and analysed, strict criteria are applied to potential incidents prior to acceptance.

Incidents are usually excluded from analysis when there is insufficient or unsuitable sample. However, details are recorded for reference purposes.

INCIDENTS IN 2011

NUMBER OF INCIDENTS IN 2011

7. A total of 237 suspected poisoning incidents were referred to the WIIS Scotland throughout 2011 (Figure 1). Four incidents were excluded leaving 233 incidents accepted for subsequent investigation.

Pesticides and other chemicals were detected in 94 separate incidents i.e. 40% of all incidents investigated (Appendix II).

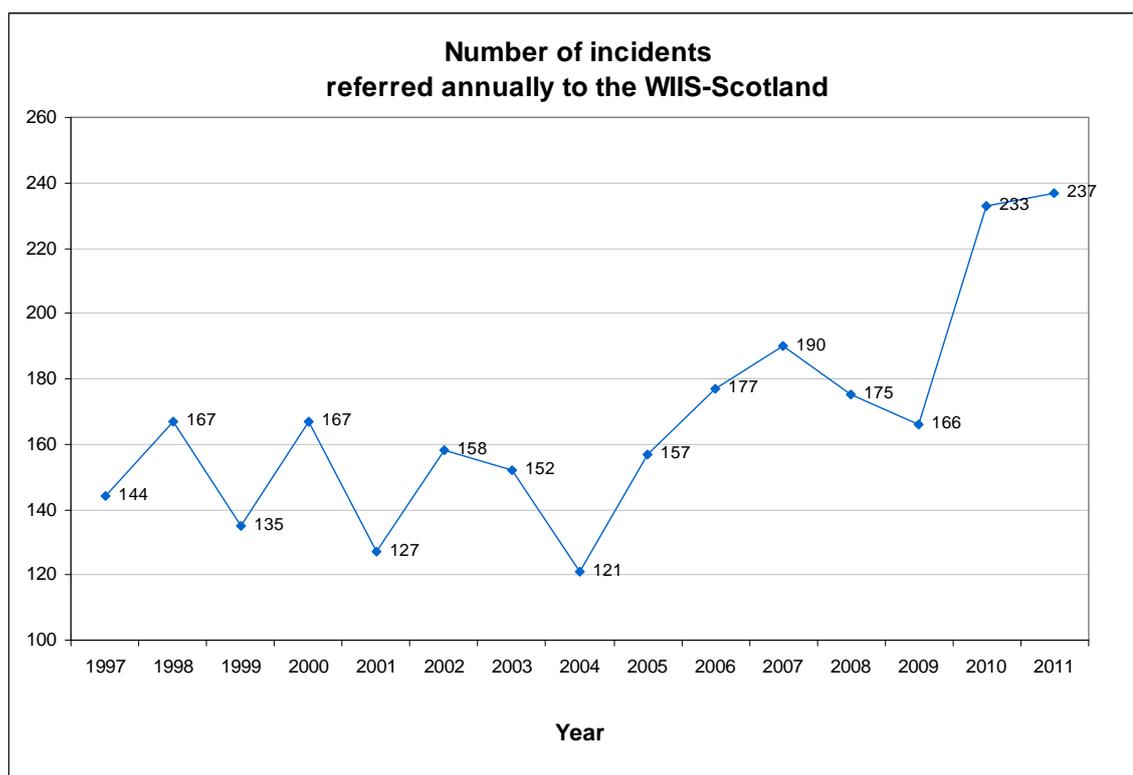


Figure 1. Number of incidents referred to the WIIS (Scotland) per annum (1997-2011).

8. The cause of death or illness was established in 129 incidents. 25 of these incidents involved pesticides and were assigned to an appropriate WIIS category. In the remaining 104 incidents, death of the animal was concluded to be due to starvation (28), disease (7), trauma (68) and ethylene glycol (1).
9. One incident was attributed to the *approved use* of pesticides. The details of the incident were forwarded to SASA by Chemicals Regulation Directorate (CRD) (<http://www.hse.gov.uk/index.htm>) after a veterinary surgeon reported treating a dog that had become ill after ingesting "Bio Slug Mini Pellets" containing metaldehyde. Three incidents were categorised as *misuse*. Two involved dogs and the other involved cattle. In a further 5 incidents, it was not possible to identify a specific source of the pesticide residues detected and the cause of each incident was categorised as *unspecified use*. Sixteen incidents were categorised as *abuse*. Further details of these poisoning incidents are provided in the Categorized Incidents section. A breakdown of all 233 incidents is presented in Tables 1-3.

Table 1: Number of incidents investigated in 2011

Sample classification ^a	Incidents Investigated	Incidents involving pesticides ^b	Categorised incidents ^c	Incidents with other known cause of death or illness
Vertebrate wildlife	177	84	17	100
Livestock	1	1	1	0
Companion animals	35	6	5	2
Honey bees	5	0	0	2
Bait, chemical or paraphernalia	15	3	2	Not applicable
TOTAL	233	94	25	104

^a Where single incidents involved submission of several sample types – the sample was simply classified by the first named specimen.

^b All incidents including those involving veterinary medicines and ethylene glycol.

^c Incidents involving ethylene glycol and veterinary drugs only were not assigned to a WIIS category.

A list of the pesticides and other chemicals detected during 2011 is presented in Table 2.

Table 2: Identity and frequency of pesticides detected in incidents and associated sample types

Chemical	Number of positive incidents	Sample type ^a
aldicarb	3	bait, buzzard, cat
aldicarb sulfoxide ^b	3	bait, buzzard, cat
bendiocarb	2	raven, red kite
brodifacoum	26	buzzard, dog, fox, red kite, sea eagle, sparrowhawk, tawny owl
bromadiolone	61	bait, barn owl, buzzard, dog, fox, golden eagle, kestrel, otter, peregrine falcon, rabbit, red kite, sparrowhawk, tawny owl
carbofuran	9	buzzard, chemical, golden eagle, raven, red kite, sparrowhawk
chloralose	2	bait, buzzard, crow, paraphernalia, red kite
coumatetralyl	4	fox, peregrine falcon, tawny owl
diazinon	1	chemical
difenacoum	34	buzzard, fox, red kite, sea eagle, sparrowhawk
dimetridazole	1	chemical
ethylene glycol	1	cat
metaldehyde	1	cattle

Chemical	Number of positive incidents	Sample type ^a
methiocarb	1	dog
novocaine	1	chemical
oxytetracycline	1	chemical
penicillin G	1	chemical
strychnine	1	bait, peregrine falcon

^a An individual incident may have involved submission of multiple sample types and/or detection of more than one pesticide.

^b Aldicarb sulfoxide is a metabolite of aldicarb

Table 3 contains details of the variety and number of specimens tested by SASA Pesticides & Wildlife Branch and the number where pesticide residues were detected. The presence of a pesticide residue does not imply pesticide poisoning was the cause of death.

Table 3: Species and number tested (including detected residues) in 2011

Species or sample type	Number tested (residue detected)
<i>Mammals - wildlife</i>	
Badger	2 (0)
Fox	46 (36)
Mole	1 (0)
Otter	1 (1)
Rabbit	1 (0)
Rat	1 (0)
Squirrel - red	2 (0)
<i>Birds</i>	
Buzzard	60 (26)
Eagle - golden	7 (1)
Eagle - sea	7 (3)
Goshawk	2 (0)
Kestrel	4 (1)
Merlin	1 (0)
Owl - barn	2 (1)
Owl – long-eared	1 (0)
Owl – short-eared	1 (0)
Owl - tawny	9 (4)
Peregrine falcon	4 (3)
Red kite	17 (11)
Sparrowhawk	15 (8)

Species or sample type	Number tested (residue detected)
Chaffinch	1 (0)
Greenfinch	3 (0)
Pigeon	2 (0)
Sparrow	1 (0)
Gannet	1 (0)
Gull	3 (0)
Oystercatcher	1 (0)
Swan	5 (0)
Capercaillie	1 (0)
Red-legged partridge	2 (0)
Crow	6 (2)
Jackdaw	1 (0)
Raven	4 (2)
Rook	5 (0)
<i>Companion Animals</i>	
Cat	15 (3)
Dog	14 (4)
Guineapig	1 (0)
<i>Livestock</i>	
Cattle	1 (1)
<i>Beneficial Insects</i>	
Honey bees	5 (0)
<i>Miscellaneous</i>	
Deer (suspected bait)	2 (0)
Eggs (suspected bait)	3 (0)
Dog food (suspected bait)	1 (0)
Grouse (suspected bait)	3 (1)
Hare (suspected bait)	3 (0)
Animal remains (suspected bait)	9 (0)
Paraphernalia (e.g. knives, game bags, gloves)	21 (0)
Pheasant (suspected bait)	4 (2)
Pigeon (suspected bait)	3 (1)
Rabbit (suspected bait)	9 (0)
Sausage/meat (suspected bait)	2 (0)
Suspicious chemicals and substances e.g. soil, debris	49 (26)
Total number of specimens tested	365 (137)

CATEGORISED INCIDENTS

APPROVED USE

10. A veterinary surgeon reported the details of this incident, which occurred in Lothian, to the CRD. A dog was treated for severe toxicity after ingesting a slug pellet formulation containing metaldehyde that had been applied to address a slug problem in the owner's garden. The owner was unaware of the potential toxicity to dogs, believing the product to be 'safe' from the labelling on the packaging. The wording on the labelling for metaldehyde and methiocarb slug pellet products has been reviewed over the last few years due to the large number of incidents reported to the National Poisons Information Service (NPIS) that involve garden pesticides and children. The phrase "since this product contains metaldehyde, which can kill if eaten, it must be kept away from children and pets" is now required on all slug pellet products containing these active ingredients. Some products also carried a phrase "this product contains an animal repellent to reduce attractiveness of pellets to domestic animals" and CRD now require this to be removed to avoid the possibility of undermining the general warning to keep the pellets away from pets. Other changes, such as new packaging design to restrict the flow of pellets from the container and a clear 'scatter diagram' or picture to illustrate the correct method of application have also been introduced to improve the safety of such products. However, it appears that the approval for the product that was used may have expired and consequently the packaging may not have borne the amended warning phrases or safety features that might have avoided this incident.

MISUSE

11. Three incidents in 2011 were attributed to misuse. The first, which occurred in February, resulted in the death of a working gun dog following massive pleural and abdominal haemorrhage. The analytical investigation identified a significant residue of brodifacoum in liver tissue from the dog confirming anticoagulant rodenticide poisoning was likely to be responsible for the dog's death. An investigation into the circumstances surrounding the incident confirmed that 'Jaguar', an anticoagulant rodenticide formulation containing brodifacoum, had been used to control a rat infestation in a recently emptied chicken house. Brodifacoum-based anticoagulant rodenticide products are only approved for use in indoor situations and the inspector was satisfied that the bait had been used appropriately. The chicken unit was situated behind two fences and the owner insisted that the gates and unit had been kept securely fastened whilst the rodenticide blocks were in use. The dog was allowed free unattended access to the area of the holding but never allowed into the area of the chicken house. However, although all the appropriate precautions appear to have been taken the dog died following accidental exposure to brodifacoum.

In June, a cocker spaniel became ill after being walked in a rural area of Perthshire. It was taken for veterinary treatment and the veterinary surgeon noticed a blue colouration was apparent in the vomit and faeces. It was suspected that the dog had ingested slug pellets and that metaldehyde poisoning

was the likely cause of the illness. The laboratory analysis revealed a residue of methiocarb, another active ingredient used in slug pellets, in a sample of faeces from the animal. A field investigation undertaken by Scottish Government Agricultural staff concluded that the dog had ingested the poison whilst rooting around in rubbish.

In the third misuse incident cattle died after ingesting a quantity of metaldehyde slug pellets. The affected cattle were part of a group of 18 animals that had been in a rented field since the end of April 2011. The first indication that a problem existed occurred in mid-August when two animals were found collapsed and trembling in respiratory distress and a third was unwell and twitching. The findings of the post mortem examination, carried out by SAC Veterinary Services in Penicuik, suggested that the animals had ingested a slug pellet formulation when small, blue pellets were found in the animal's intestines. The laboratory investigation confirmed that suspicion by identifying a residue of metaldehyde in a sample of rumen contents. The field investigation established that the field where the cattle were grazing, which is permanent pasture, has a disused quarry within it which is sometimes used by the landlord for burning waste paper. It was also established that the landlord has a large vegetable processing business and that metaldehyde slug pellets are used on these crops but were not used on the permanent grassland. A search of the field and disused quarry failed to uncover any evidence of metaldehyde and the source of the chemical remains uncertain. However, it may be that a container with some metaldehyde inadvertently ended up amongst rubbish waiting to be burnt and that allowed the stock to gain access to the poison.

ABUSE

12. In 2011, sixteen incidents were categorised as abuse compared to 32 incidents in this category in 2010. Analytical investigations included analysis of tissue samples, digestive tract material, various chemicals and poisoning paraphernalia (e.g. implements/tools, game bags and sweepings from vehicles). As in previous years, a high proportion (63%) of abuse incidents involved birds of prey (Figure 2).

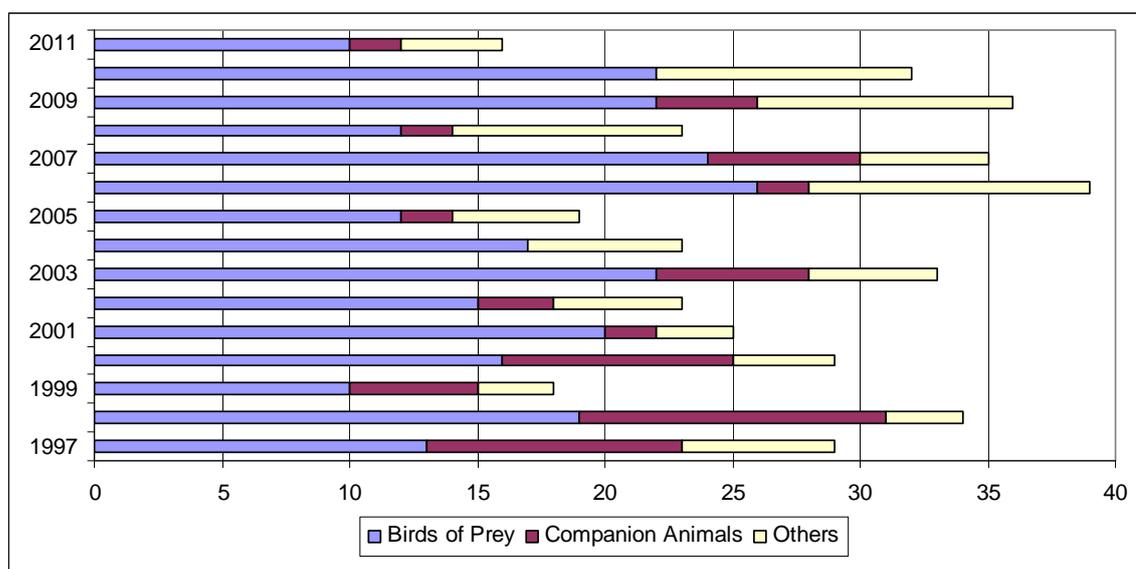


Figure 2. Abuse of pesticides in Scotland (number of incidents 1997 - 2011).

13. Ten abuse incidents involved birds of prey (Table 4). The 6 others included; cat (1), crow (1), dog (1), raven (1) and suspected baits (2).

Table 4: Number of birds of prey that were victims of pesticide abuse in 2011

Region ^a	Number of incidents	Buzzard	Red Kite	Peregrine Falcon	Sparrowhawk	Golden Eagle
Border	1	1	-	-	-	-
Dumfries & Galloway	1	-	1	-	-	-
Grampian	1	1	-	-	-	1
Highland	3	1	2	-	-	-
Lothian	1	2	-	-	2	-
Strathclyde	2	-	1	2	-	-
Tayside	1	2	-	-	-	-
TOTAL	10	7	4	2	2	1

^a See appendix III for regional classification in Scotland

14. Seven different pesticides and/or their metabolites were detected and identified in abuse incidents in 2011. The pesticides were aldicarb, aldicarb sulfoxide, bendiocarb, bromadiolone, carbofuran, chloralose, and strychnine.

UNSPECIFIED USE

15. Sometimes it is not possible to definitely establish the source of a pesticide which has been positively detected and is present at levels considered to pose a significant risk of mortality. Such cases are categorised as 'Unspecified Use'. In 2011 5 incidents, all involving anticoagulant rodenticides fell into this category. Animals and pesticides involved in these incidents are listed in Table 5.

Table 5: Unspecified Use incidents recorded in 2011

Region	Pesticides	Month	Species
Border	brodifacoum, bromadiolone, difenacoum	February	buzzard, tawny owl
Dumfries & Galloway	brodifacoum, bromadiolone, difenacoum	April	red kite
Lothian	bromadiolone, difenacoum	February	fox
Lothian	difenacoum	March	buzzard
Strathclyde	brodifacoum, bromadiolone	March	fox

ANTICOAGULANT RODENTICIDES

16. Non-target animals are occasionally casualties of poisoning caused by wilful or accidental non-compliance with good practice in rodenticide baiting. Indirect or secondary poisoning can also occur when predators, scavengers or curious animals ingest rodents killed or affected by rodenticides. The WIIS Scotland offers a unique opportunity to probe wider environmental contamination by looking for rodenticide residues present in non-target animals that otherwise would not be available. Routine monitoring of liver tissue from wild mammals, birds of prey and other animals is carried out in order to assess the magnitude and frequency of exposure to anticoagulant rodenticides. The results provide an effective indication of the non-target animals exposed to anticoagulant rodenticides.

In 2011, SASA Pesticides & Wildlife Branch tested 210 livers from a variety of animals for the presence of residues of anticoagulant rodenticides. Residues were detected and identified in the livers of 87 specimens i.e. 41% of the total number of livers tested (Table 6).

Table 6: Species tested throughout 2011 for the presence of residues of anticoagulant rodenticides^a

Species	Number tested	Number positive ^b
Buzzard	50	21
Eagle-golden	5	1
Eagle-sea	5	3
Goshawk	2	-
Kestrel	4	1
Merlin	1	-
Peregrine falcon	4	2
Red kite	14	9
Sparrowhawk	15	7
Barn Owl	2	1
Long-eared Owl	1	-
Short-eared Owl	1	-
Tawny owl	9	4
Crow	3	-
Jackdaw	1	-
Raven	4	-
Rook	5	-
Greenfinch	3	-
Pigeon	1	-
Chaffinch	1	-
Capercaillie	1	-

Species	Number tested	Number positive ^b
Gull	4	-
Partridge	2	-
Swan	5	-
Badger	2	-
Cat	3	-
Dog	10	1
Fox	46	36
Mole	1	-
Otter	1	1
Rabbit	1	-
Rat	1	-
Red Squirrel	2	-
TOTAL	210	87

^a Brodifacoum, bromadiolone, chlorophacinone, coumatetralyl, difenacoum, difethialone, diphacinone, flocoumafen & warfarin.

^b This is the total number of specimens that tested positive from 210 livers examined. An individual WIIS incident may involve >1 specimen.

*

INVESTIGATION PROCEDURES

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

A number of environmental and animal welfare organisations, such as the RSPB-Scotland and the Scottish Society for the Prevention of Cruelty to Animals, 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 Scottish Agricultural College (SAC) Veterinary 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 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 beneficial insects and investigates suspicious substances and suspected baits. 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 various analytical techniques, methods and instrumentation to detect, identify and quantify pesticide residues. Two multi-residue methods are currently used to determine and quantify:

- (1) Pesticides
- (2) Anticoagulant rodenticides.

These multi-residue methods are supplemented by compound-specific analytical methods developed for the determination of chloralose, metaldehyde, paraquat, strychnine and gassing compounds. Wherever possible, residues are confirmed using an alternative analytical technique or measurement parameter.

Field investigations are normally only triggered following the positive detection and identification of pesticide(s) in or on the test specimen. However, field investigations may also be initiated if sufficient evidence of pesticide involvement is available e.g. following direct notification or after post-mortem examination.

Analytical results, post-mortem findings and field investigation reports are collated and interpreted by Pesticides and Wildlife Branch specialists in order to categorise an incident and to determine whether residue levels detected contributed to the death or illness of the animal involved. In some cases, the presence of residues in association with typical post-mortem findings may be used to determine mortality.

The results of investigations in Scotland are presented annually in this report series and in reports published by the UK regulatory body, The Chemicals Regulation Directorate, who are 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 Pesticides & Wildlife Branch and SG Agricultural Staff, is presented in reports to the Procurator Fiscal Service. Police forces are active partners in countering pesticide abuse and take the lead in investigations and presentation of such cases to the Procurator Fiscal.

How to Report Incidents

SASA Website

<http://www.sasa.gov.uk/wildlife-environment/wildlife-incident-investigation-scheme-wiis>

PAW Scotland

<http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/paw-scotland/what-you-can-do>

SUMMARY OF INCIDENTS THAT TESTED POSITIVE FOR PESTICIDE RESIDUES – 2011¹

Ref.	Month	Region	Chemical	Category	Species	Comments
11001	January	Dumfries & Galloway	bromadiolone brodifacoum	trauma	red kite	This bird was found dead at the roadside with a dead pheasant lying nearby. There was concern that the kite might have been poisoned. However, the laboratory investigation only confirmed exposure to anticoagulant rodenticides.
11002	January	Border	brodifacoum	starvation	buzzard	Buzzard found dead by a walker. The concern that it may have been poisoned was not substantiated. A low residue of brodifacoum was confirmed in liver tissue from the bird.
11003	January	Central	bromadiolone	starvation	buzzard	This buzzard was found dead in a tree by a member of the public. The analytical investigation failed to provide any evidence to implicate pesticide poisoning but confirmed a low residue of bromadiolone in liver tissue.
11006	January	Border	carbofuran (bromadiolone)	abuse	buzzard	The buzzard was found dead in an area where there is a history of bird of prey persecution. Although the carcass was in an advanced state of autolysis residues of carbofuran were confirmed in liver tissue and the gizzard contents from the bird. However, no enforcement action has been taken due to a lack of evidence. A very low residue of bromadiolone was also detected in liver tissue from the bird.
11007	January	Fife	bromadiolone brodifacoum difenacoum	unknown	white tailed eagle	This bird was found dead behind a stock fence near to an area of forestry. The analytical investigation failed to provide any evidence to implicate pesticide poisoning but confirmed the presence of low residues of bromadiolone, brodifacoum and difenacoum in liver tissue.
11010	January	Strathclyde	brodifacoum	misuse	dog	This dog died following massive pleural and abdominal haemorrhage. The analytical investigation confirmed a residue of brodifacoum in liver tissue from the dog. A field investigation, undertaken by AFRC agricultural staff, established that 'Jaguar' rodenticide blocks containing brodifacoum were in use in a chicken house on the premises. Although all the appropriate precautions had been taken this dog appears to have died following accidental exposure to the rodenticide product.

Ref.	Month	Region	Chemical	Category	Species	Comments
11012	February	Dumfries & Galloway	bromadiolone difenacoum	trauma	red kite	This bird was found tangled in barbed wire on a pylon; low residues of anticoagulant rodenticide residues were detected in liver tissue.
11017	January	Lothian	bromadiolone difenacoum	unknown	fox	Fox found dead by a member of the public who was concerned that it may have been poisoned. The analytical investigation failed to provide any evidence of pesticide poisoning but revealed low residues of two anticoagulant rodenticides in the liver tissue.
11020	February	Highland	chloralose	abuse	red kite	The police were concerned that this bird may have been poisoned. The analytical investigation revealed a gross residue of chloralose in the crop material from the bird. Unfortunately no enforcement action has been pursued due to insufficient evidence.
11022	January	Strathclyde	difenacoum	trauma	sparrowhawk	This sparrowhawk was found dead with a fractured right clavicle. A very low residue of difenacoum was detected in the liver tissue submitted for anticoagulant rodenticide analysis.
11024	February	Strathclyde	strychnine (bromadiolone)	abuse	2 peregrine falcons and a suspected pigeon bait	These carcasses were submitted by Scottish SPCA inspectors. Residues of strychnine were detected in tissues from both peregrines and on the pigeon remains. This case has been closed due to a lack of evidence. A very low residue of bromadiolone was also confirmed in liver tissue from one of the peregrines.
11025	February	Grampian	brodifacoum difenacoum	starvation	buzzard	This buzzard was found on top of a granite pillar at the entrance to a private house. The post mortem examination findings indicated that starvation was the likely cause of death. The opportunity was taken to test liver tissue from the bird for evidence of exposure to anticoagulant rodenticides. The analysis confirmed the presence of very low residues of brodifacoum and difenacoum.
11026	February	Border	bromadiolone brodifacoum difenacoum	unspecified	tawny owl and buzzard	These birds were found dead at the same location within the space of one week. The post mortem examination findings raised the possibility of anticoagulant rodenticide poisoning being responsible for their deaths. The analysis confirmed that suspicion by revealing residues of rodenticides at levels that were considered to be within the anticipated lethal range.

Ref.	Month	Region	Chemical	Category	Species	Comments
11030	February	Lothian	bromadiolone	unknown	fox	This fox was found dead in an area where several other dead foxes had been reported. An extensive analytical investigation only revealed a low residue of bromadiolone in liver tissue from the animal.
11032	February	Lothian	bromadiolone difenacoum	unspecified	fox	This fox was found dead on the finder's lawn. The laboratory analysis identified residues of bromadiolone and difenacoum in liver tissue. The residues were at levels that would normally be considered to be within the anticipated lethal range. The source of the chemicals has not been established.
11040	March	Lothian	difenacoum	unspecified	buzzard	The residue of difenacoum detected in the liver tissue from this bird indicated that anticoagulant rodenticide poisoning probably contributed to the death. The source of the chemical is still uncertain.
11041	March	Tayside	chloralose (bromadiolone)	abuse	2 buzzards, two suspected pheasant baits and 2 crows	This incident is the subject of an ongoing police investigation. A low residue of bromadiolone was detected in liver tissue from one of the buzzards.
11045	March	Strathclyde	bromadiolone brodifacoum	unspecified	fox	This is one of several animals found dead in the same area. The laboratory tests have confirmed residues of bromadiolone and brodifacoum in liver tissue. The bromadiolone residue level was within the anticipated lethal range. However, the source of the chemical has not been established.
11046	March	Grampian	carbofuran (bromadiolone)	abuse	golden eagle and a buzzard	This satellite tagged eagle was found to have been poisoned with carbofuran. A buzzard carcase seized during the field search was also confirmed to have been poisoned. However, there was insufficient evidence to pursue any enforcement action and this case is now closed. A low residue of bromadiolone was also detected in the liver tissue from the eagle.
11048	March	Border	bromadiolone difenacoum	unknown	buzzard	Two buzzards found dead below power lines. The analytical investigation confirmed the presence of low residues of bromadiolone and difenacoum in liver tissue from one of the birds.

Ref.	Month	Region	Chemical	Category	Species	Comments
11052	March	Tayside	bromadiolone brodifacoum difenacoum	starvation	buzzard	Found dead in poor bodily condition. The laboratory investigation was restricted to screening for evidence of exposure to anticoagulant rodenticides. Low residues of bromadiolone, brodifacoum and difenacoum were confirmed in liver tissue.
11054	April	Highland	aldicarb carbofuran	abuse	buzzard	The laboratory investigation confirmed the presence of residues of the carbamate insecticides, aldicarb and carbofuran, in tissue samples analysed from this bird. However, no further police investigation has been undertaken due to a lack of evidence.
11056	April	Lothian	bromadiolone difenacoum	unknown	buzzard	Three buzzards were found dead together on the ground under an electricity pylon. The post mortem examination failed to establish the cause of death. The laboratory investigation confirmed the presence of low residues of the anticoagulant rodenticides bromadiolone and difenacoum in liver tissue from one of the birds.
11057	April	Dumfries & Galloway	bromadiolone difenacoum brodifacoum	unspecified	red kite	Low residues of three anticoagulant rodenticides were confirmed in liver tissue from this bird. The combined residue level indicates that anticoagulant rodenticide poisoning probably contributed to the death. The source of the chemicals has not been established.
11062	April	Strathclyde	difenacoum	starvation	sparrowhawk	Found dead in a garden. The post mortem examination findings suggested that starvation was the likely cause of death in this instance. A low residue of difenacoum was confirmed in liver tissue from the bird.
11064	April	Grampian	bromadiolone coumatetralyl	starvation	tawny owl	The post mortem examination identified starvation as the likely cause of this owl's death. Low residues of two anticoagulant rodenticides were found in liver tissue from the bird.
11066	April	Highland	difenacoum	disease	buzzard	Septicaemia was identified as the cause of this buzzard's demise. A low residue of difenacoum was detected in liver tissue.
11069	April	Highland	difenacoum brodifacoum	starvation	sparrowhawk	This bird was found dead in a garden and starvation was thought to be the possible cause of death. Very low residues of brodifacoum and difenacoum were confirmed in liver tissue.

Ref.	Month	Region	Chemical	Category	Species	Comments
11075	May	Lothian	aldicarb aldicarb sulfoxide	abuse	2 cats	Three cats from the same area were found dead and a fourth cat was euthanased. Tissues from 3 of the cats were submitted for analysis. Residues of aldicarb and its metabolite aldicarb sulfoxide were identified in tissues from 2 of the animals. The source of the aldicarb has not been established.
11079	May	Dumfries & Galloway	carbofuran	abuse	raven	The analytical investigation confirmed that this raven had died from carbofuran poisoning. No further action has been possible due to insufficient evidence.
11083	May	Highland	bendiocarb carbofuran	abuse	red kite	Following a report of a dead red kite the police carried out a ground search and collected the red kite and skeletal remains of another bird. The analytical investigation detected residues of bendiocarb and carbofuran in the samples from the red kite only. The case is now closed due to a lack of evidence.
11087	May	Strathclyde	bromadiolone	trauma	fox	A dead fox was found in a field in a country park. Foxes had been being fed by a member of the public and it was noted that 8 had stopped coming for food. The post mortem examination revealed that it had multiple skull fractures resulting from blunt trauma. A significant residue of bromadiolone was confirmed in liver tissue but a field investigation has failed to establish the source of the chemical.
11091	May	Tayside	methiocarb	misuse	dog	Dog became ill after rummaging in rubbish whilst being walked. It later recovered after receiving veterinary treatment. The analytical investigation confirmed that the dog had ingested a quantity of methiocarb slug pellets. The source of the methiocarb has not been established.
11093	June	Dumfries & Galloway	bromadiolone difenacoum	starvation	red kite	Low residues of two anticoagulant rodenticides were detected in liver from this red kite. The post mortem examination findings indicated that starvation was the likely cause of death.
11094	May	Highland	brodifacoum	trauma	buzzard	The residue of brodifacoum detected in this buzzard was approaching the level where adverse effects would be expected. However, in this case there was circumstantial and post mortem evidence to indicate that electrocution was the likely cause of death.

Ref.	Month	Region	Chemical	Category	Species	Comments
11097	June	Strathclyde	ethylene glycol	other	cat	There was concern that this cat had died as a result of pesticide poisoning. The analytical investigation failed to confirm that suspicion but kidney histopathology indicated that ethylene glycol poisoning was the cause of death.
11101	June	Dumfries & Galloway	bromadiolone	unknown	otter	This otter was found dead on a river bank. It was the second otter to have died in the area within a two week period. The post mortem examination and analytical investigation failed to establish the cause of death. A low, sub-lethal residue of bromadiolone was detected in liver tissue.
11103	May	Lothian	metalddehyde	approved	dog	Dog became ill after ingesting metalddehyde slug pellets applied to the garden by its owner. The dog recovered following veterinary treatment.
11105	June	Highland	difenacoum	trauma	buzzard	The post mortem examination findings indicated that trauma associated with a blow to the head was the likely cause of death in this incident. A very low residue of difenacoum was confirmed in liver tissue.
11109	June	Western Isles	difenacoum	unknown	white tailed eagle	This bird was found dead on a croft. The cause of death has not been established. A low residue of difenacoum was confirmed in liver tissue.
11113	July	Lothian	difenacoum	trauma	buzzard	This bird was found dead at the side of the A68. There are concerns that the local population of buzzards and sparrowhawks has declined recently. The analytical investigation confirmed the presence of a very low residue of difenacoum in liver tissue.
11115	July	Dumfries & Galloway	carbofuran (bromadiolone)	abuse	red kite	A gamekeeper reported finding a dead red kite to the police. Residues of carbofuran were confirmed in both the liver tissue and the stomach contents from the bird confirming carbofuran poisoning as the cause of the bird's demise. However, due to insufficient evidence no enforcement action has been taken. A low residue of bromadiolone was also confirmed in liver tissue.

Ref.	Month	Region	Chemical	Category	Species	Comments
11123	July	Lothian	novocaine penicillin G	other	chemical	A small bottle containing orange liquid and a cream coloured sediment was found on a tree stump. The analytical investigation confirmed that the bottle contained a mixture of novocaine (a chemical used as an anaesthetic) and penicillin G (an antibiotic). Police enquiries have failed to establish the source of this veterinary medicine.
11126	July	Grampian	difenacoum	unknown	red kite	Young bird found alive but unable to fly. The bird died despite receiving veterinary treatment. A low residue of difenacoum was confirmed in liver tissue from the bird
11128	August	Lothian	bromadiolone	trauma	sparrowhawk	Found dead under bushes in a garden. The post mortem examination findings indicated trauma was the likely cause of death. A low residue of bromadiolone was confirmed in liver tissue.
11129	August	Dumfries & Galloway	bromadiolone difenacoum	starvation	red kite	This bird was found alive but was subsequently euthanased. It was very thin with no fat reserves. Low residues of bromadiolone and difenacoum were found in liver tissue.
11133	August	Lothian	metaldehyde	misuse	cattle	Three animals, out of a group of 18 young cattle in a field, were found unwell. Two died. The post mortem examination of one of the animals revealed the presence of small blue pellets in the intestines. The analytical investigation confirmed a residue of metaldehyde in the sample. It is thought that improper disposal of the product packaging might be responsible for this incident.
11136	August	Grampian	coumatetralyl	trauma	peregrine falcon	This bird had been shot. The opportunity was taken to screen for evidence of exposure to anticoagulant rodenticides. This confirmed the presence of a low residue of coumatetralyl.
11139	August	Tayside	carbofuran	abuse	chemical	A small plastic tub containing a quantity of blue granules was found near an outhouse on an estate in Tayside. The analytical investigation confirmed the active ingredient on the granules to be carbofuran. No further action has been taken and the case is now closed.

Ref.	Month	Region	Chemical	Category	Species	Comments
11141	August	Strathclyde	bromadiolone brodifacoum	trauma	fox	This fox was thought to have been the victim of a road traffic accident. The opportunity was taken to screen for evidence of exposure to anticoagulant rodenticides. This confirmed the presence of low residues of bromadiolone and brodifacoum.
11142	August	Tayside	bromadiolone difenacoum	starvation	buzzard	There is a history of pesticide poisoning in the area where this bird was found dead. However, the analytical investigation has confirmed only low residues of bromadiolone and difenacoum. The post mortem examination suggested that starvation was the likely cause of death.
11146	August	Central	bromadiolone	abuse	dog and bread bait	Two dogs were being walked, off their leads. One of the dogs was seen eating bread that had been adulterated with blue grain. Analysis of the blue grains confirmed the presence of bromadiolone, an anticoagulant rodenticide. The dog survived. The case is now closed.
11147	September	Lothian	carbofuran	abuse	2 sparrowhawks and 2 buzzards	These carcasses were found in a lay-by on the A68. The analytical investigation confirmed that the birds had been poisoned with carbofuran. A police investigation has failed to produce any positive lines of enquiry and the case has been closed.
11152	September	Tayside	bromadiolone	trauma	fox	This fox had been shot. The opportunity was taken to screen for evidence of exposure to anticoagulant rodenticides. The analysis confirmed the presence of a residue of bromadiolone at a level that would normally be considered to be within the anticipated lethal range.
11153	September	Strathclyde	carbofuran (bromadiolone)	abuse	red kite	This tagged red kite was found in a wood. The post mortem examination findings were indicative of pesticide poisoning being responsible for the death of this bird. The analytical investigation confirmed that suspicion by revealing residues of carbofuran in the tissues tested. Despite an extensive search, no enforcement action has been pursued due to insufficient evidence and this case is now closed.

Ref.	Month	Region	Chemical	Category	Species	Comments
11154	September	Border	bendiocarb	abuse	raven	This raven was found 'laid out' with stones around it. The post mortem examination failed to establish a cause of death but the analytical investigation confirmed residues of bendiocarb, a carbamate insecticide, in tissues from the bird. The field investigation failed to establish the source of the poison and the case is now closed.
11155	September	Lothian	bromadiolone difenacoum brodifacoum	trauma	2 foxes	This incident involved 3 foxes that had been shot. Residues of anticoagulant rodenticides were found in two of the animals. In each case the bromadiolone residue was at a level that would normally be considered to be within the anticipated lethal range.
11156	September	Grampian	bromadiolone	starvation	sparrowhawk	Found dead on farmland and submitted for anticoagulant rodenticide analysis only. A low residue of bromadiolone was confirmed in liver tissue.
11158	September	Highland	aldicarb	abuse	grouse bait	This incident is the subject of an ongoing police investigation.
11164	September	Tayside	bromadiolone	unknown	barn owl	Found dead in a field close to a road. The analytical investigation confirmed the presence of a low residue of bromadiolone in liver tissue.
11165	September	Tayside	bromadiolone difenacoum	unknown	buzzard	Found dead. Low residues of bromadiolone and difenacoum were confirmed in liver tissue.
11167	September	Border	bromadiolone difenacoum	unknown	buzzard	Found dead. Low residues of bromadiolone and difenacoum were confirmed in liver tissue.
11169	September	Central	bromadiolone	trauma	fox	Two foxes that had been shot were submitted for anticoagulant rodenticide analysis. A residue of bromadiolone was confirmed in liver tissue from one of the animals.
11170	September	Tayside	bromadiolone brodifacoum	trauma	fox	Liver tissue from this shot fox was submitted for anticoagulant rodenticide analysis. Residues of bromadiolone and brodifacoum were detected. The bromadiolone residue was at a level normally considered to be within the anticipated lethal range.
11171	October	Central	bromadiolone brodifacoum	trauma	fox	This fox had been shot and liver tissue was submitted for anticoagulant rodenticide analysis. Residues of bromadiolone and brodifacoum were detected. The bromadiolone residue was at a level normally considered to be within the anticipated lethal range.

Ref.	Month	Region	Chemical	Category	Species	Comments
11173	October	Tayside	bromadiolone	unknown	white tailed eagle	There was concern that this bird may have been poisoned. However, only a very low residue of bromadiolone was confirmed in liver tissue.
11174	October	Fife	bromadiolone	unknown	buzzard	Two buzzards were found dead in the same area and there was a suspicion that they may have been poisoned. However, the analytical investigation only revealed a very low residue of bromadiolone in liver tissue from one of the birds.
11175	October	Highland	brodifacoum	starvation	sparrowhawk	This bird was found dead in a garden. The post mortem examination findings indicated that starvation was the likely cause of death. A very low residue of brodifacoum was confirmed in liver tissue.
11177	October	Fife	bromadiolone brodifacoum difenacoum	trauma	fox	Liver tissue from this shot fox was submitted for anticoagulant rodenticide analysis. Residues of bromadiolone, brodifacoum and difenacoum were detected. The bromadiolone residue was at a level normally considered to be within the anticipated lethal range.
11178	October	Central	difenacoum	trauma	fox	Liver tissue from this shot fox was submitted for anticoagulant rodenticide analysis. A low residue of difenacoum was confirmed.
11183	September	Tayside	brodifacoum	trauma	tawny owl	This bird was found dead in an area where there is a history of pesticide abuse. However, in this instance trauma was thought to be the cause of death and only a residue of brodifacoum was confirmed in the liver tissue.
11189	October	Fife	bromadiolone coumatetralyl	trauma	3 foxes	Residues of bromadiolone and coumatetralyl were detected in liver tissue from each of these shot foxes. The bromadiolone residues were found at levels normally considered to be within the anticipated lethal range.
11199	November	Fife	bromadiolone brodifacoum difenacoum	trauma	buzzard	This bird was found dead in an area where rat poison was reported to be in use. The analytical investigation revealed low residues of bromadiolone, brodifacoum and difenacoum in liver tissue. However, in this case the post mortem examination findings indicated that trauma was the likely cause of death.
11200	November	Tayside	bromadiolone	trauma	fox	The liver tissue from this shot fox was screened for residues of anticoagulant rodenticides. A residue of bromadiolone was confirmed.

Ref.	Month	Region	Chemical	Category	Species	Comments
11205	December	Dumfries & Galloway	bromadiolone	trauma	buzzard	The carcasses of a buzzard and a mole were found and submitted for analysis by a member of the public who was concerned about poisoning. The analytical investigation failed to provide any evidence of pesticide poisoning. A very low residue of bromadiolone was confirmed in liver tissue from the buzzard.
11206	November	Lothian	bromadiolone brodifacoum	trauma	fox	The opportunity was taken to screen liver tissue from this shot animal for evidence of exposure to anticoagulant rodenticides. The analysis confirmed residues of bromadiolone and brodifacoum. The bromadiolone residue was at a level normally considered to be within the anticipated lethal range.
11207	December	Tayside	bromadiolone	trauma	fox	Only a very low residue of bromadiolone was confirmed in liver tissue from this shot fox.
11209	December	Tayside	bromadiolone difenacoum	trauma	fox	Liver tissue from this shot fox was submitted for anticoagulant rodenticide analysis. Residues of bromadiolone and difenacoum were detected. The bromadiolone residue was at a level normally considered to be within the anticipated lethal range.
11212	December	Border	bromadiolone brodifacoum	trauma	tawny owl	This owl carcass was found in a wheelie bin. The post mortem examination findings suggested that trauma was the likely cause of death. The analytical investigation confirmed the presence of low residues of bromadiolone and brodifacoum in liver tissue.
11214	December	Tayside	bromadiolone	trauma	fox	The opportunity was taken to screen liver tissue from this shot animal for evidence of exposure to anticoagulant rodenticides. The analysis confirmed a residue of bromadiolone at a level normally considered to be within the anticipated lethal range.
11215	December	Central	bromadiolone	trauma	fox	This fox had been shot. A low residue of bromadiolone was confirmed in liver tissue from the animal.
11216	December	Tayside	bromadiolone difenacoum	trauma	fox	The opportunity was taken to screen liver tissue from this shot animal for evidence of exposure to anticoagulant rodenticides. The analysis confirmed residues of bromadiolone and difenacoum. The bromadiolone residue was at a level normally considered to be within the anticipated lethal range.

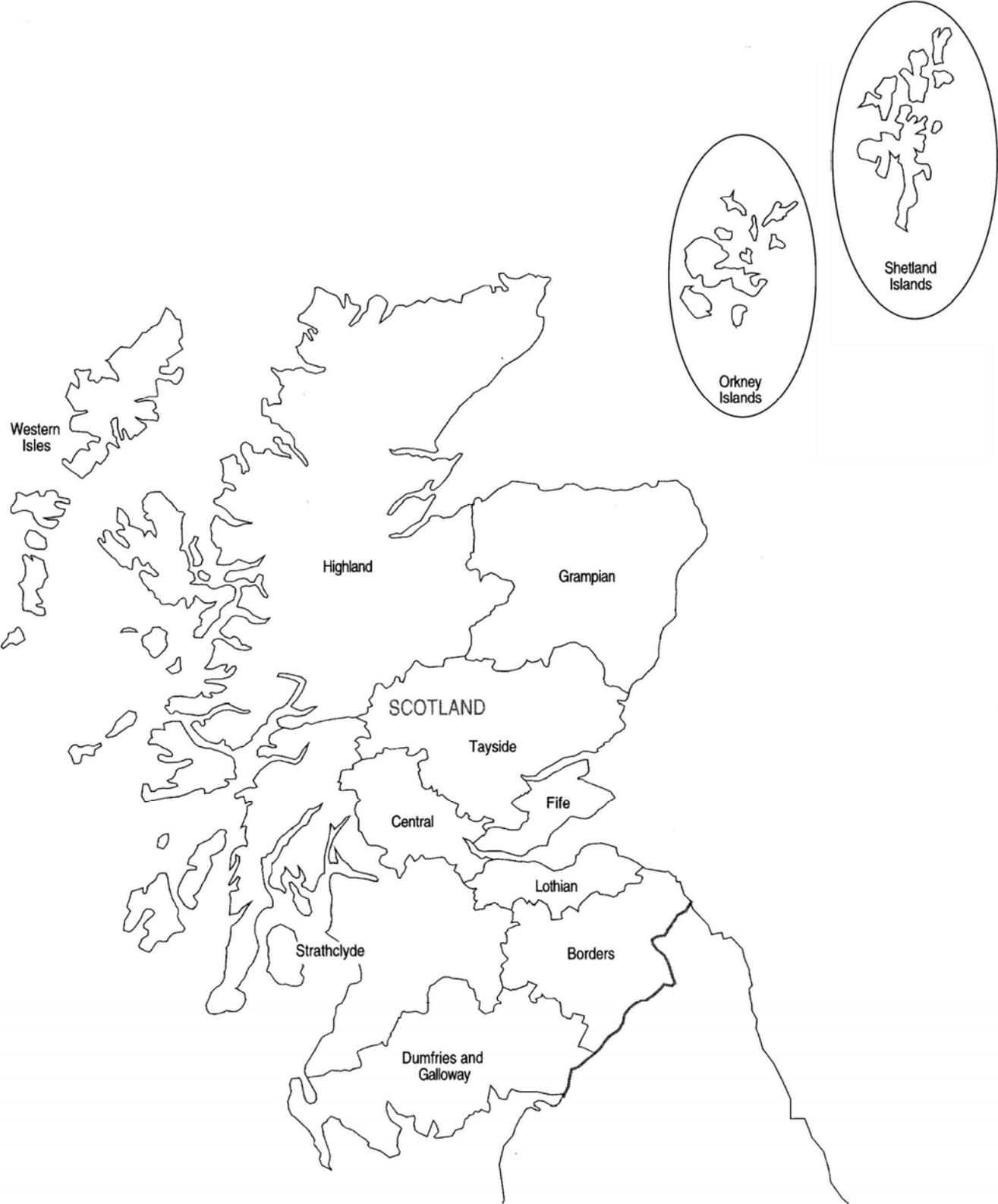
Ref.	Month	Region	Chemical	Category	Species	Comments
11218	December	Lothian	bromadiolone	trauma	fox	The liver tissue from this shot fox was screened for residues of anticoagulant rodenticides. A residue of bromadiolone was confirmed at a level normally considered to be within the anticipated lethal range.
11219	December	Lothian	bromadiolone	trauma	fox	Another shot fox with a residue of bromadiolone in liver. The residue was at a level normally considered to be within the anticipated lethal range.
11220	December	Strathclyde	bromadiolone	trauma	kestrel	The post mortem examination findings indicated that trauma associated with a broken neck was the likely cause of death in this incident. A low residue of bromadiolone was confirmed in liver tissue.
11221	September	Grampian	bromadiolone brodifacoum	trauma	fox	Liver tissue from this shot fox was submitted for anticoagulant rodenticide analysis. The analytical investigation revealed low residues of bromadiolone and brodifacoum.
11223	September	Grampian	bromadiolone brodifacoum	trauma	fox	Liver tissue from another shot fox was submitted for anticoagulant rodenticide analysis. Residues of bromadiolone and brodifacoum were detected. The bromadiolone residue was at a level normally considered to be within the anticipated lethal range.
11224	October	Central	bromadiolone	trauma	fox	This fox had been shot. The opportunity was taken to screen for evidence of exposure to anticoagulant rodenticides. The analysis confirmed the presence of a residue of bromadiolone at a level that would normally be considered to be within the anticipated lethal range.
11225	September	Grampian	bromadiolone coumatetralyl	trauma	fox	Liver tissue from this shot fox was submitted for anticoagulant rodenticide analysis. Low residues of bromadiolone and coumatetralyl were confirmed.
11226	September	Grampian	bromadiolone difenacoum	trauma	2 foxes	Liver tissue from these foxes was submitted for anticoagulant rodenticide analysis. The analysis confirmed the presence of a residue of bromadiolone in tissue from one fox and a low residue of difenacoum in the other. The bromadiolone residue was at a level that would normally be considered to be within the anticipated lethal range.

Ref.	Month	Region	Chemical	Category	Species	Comments
11227	September	Grampian	bromadiolone	trauma	3 foxes	Residues of bromadiolone were detected in all three of these foxes. The residues in 2 of the animals were at levels that would normally be considered to be within the anticipated lethal range.
11228	September	Grampian	bromadiolone brodifacoum	trauma	fox	The opportunity was taken to test liver tissue from two shot foxes for evidence of exposure to anticoagulant rodenticides. Residues of bromadiolone and brodifacoum were detected in only one fox. The bromadiolone residue was within the anticipated lethal range.
11229	January	Highland	brodifacoum difenacoum	starvation	buzzard	This bird was found dead under a hedgerow after a period of severe weather. A very low residue of difenacoum and a residue of brodifacoum, at a level that would normally be considered to be within the anticipated lethal range, were confirmed in liver tissue. However, starvation was thought to be the likely cause of death.
11232	July	Highland	brodifacoum difenacoum	trauma	red kite	This red kite was found dead below its nest. The post mortem examination findings indicated that trauma was the likely cause of death. A very low residue of difenacoum and a residue of brodifacoum, at a level that would normally be considered to be within the anticipated lethal range, were confirmed in liver tissue.

¹ As some incident investigations are ongoing at the time of publication of this report, only limited information has been provided. Incidents updates will be published on the SASA website (<http://www.sasa.gov.uk/animal-poisoning-reports>) as further information becomes available.

APPENDIX III

REGIONS IN SCOTLAND USED TO CLASSIFY INCIDENTS





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