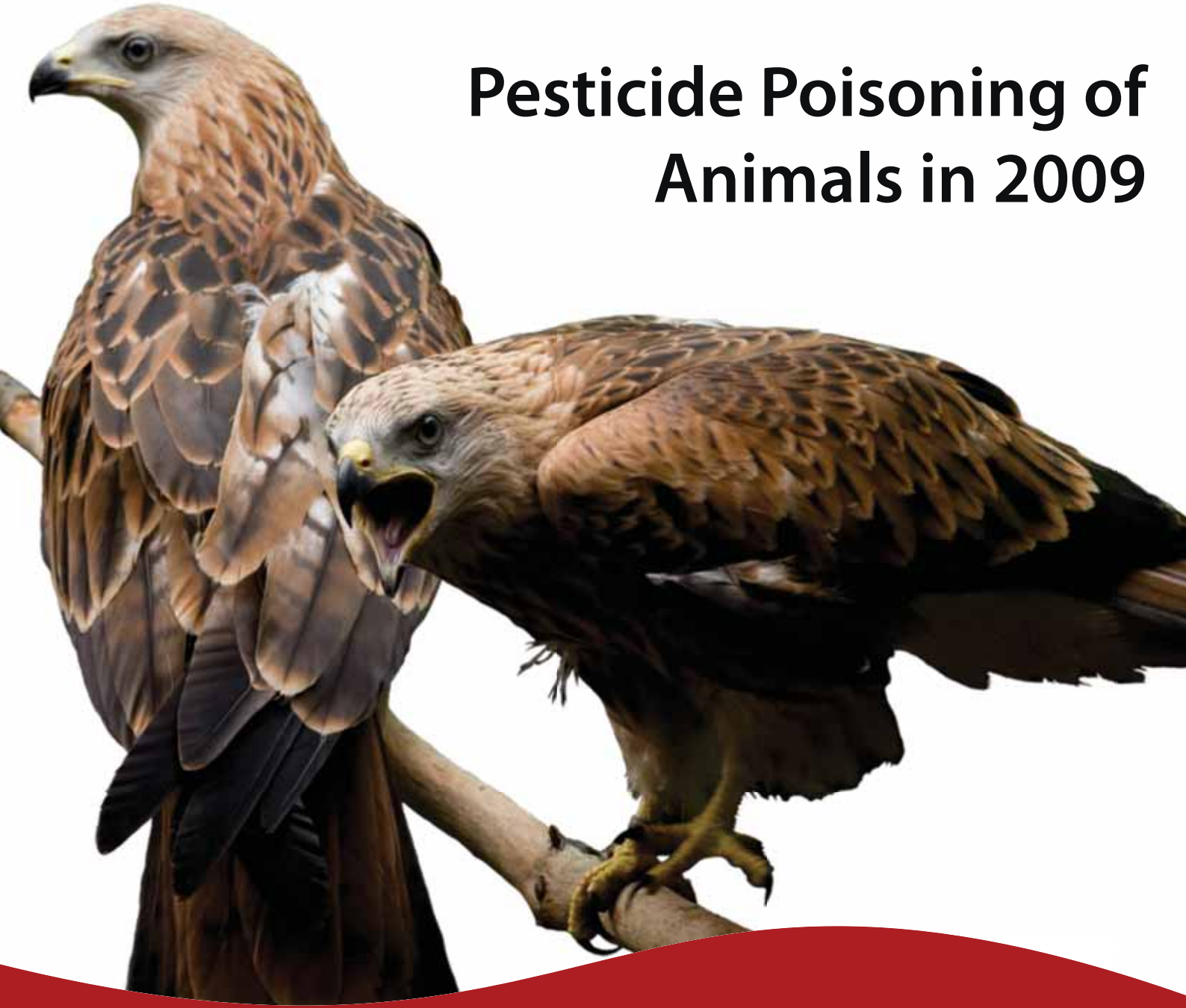
The Scottish Government

Pesticide Poisoning of Animals in 2009



A Report of Investigations in Scotland

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PESTICIDE POISONING OF ANIMALS IN 2009

INVESTIGATIONS OF SUSPECTED INCIDENTS IN SCOTLAND

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Front Cover: Red kites (Milvus milvus): Aberdeen Red Kite Release Project.

The Front Cover design and photograph were prepared by SASA Photography Unit.

Summary

The Wildlife Incident Investigation Scheme (WIIS) operated in Scotland by Science and Advice for Scottish Agriculture (SASA) Chemistry Branch investigates suspected poisoning of wildlife, beneficial insects, companion animals and livestock if there is evidence to indicate that pesticides or biocides[1] 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 2009, 166 incidents (which included 6 honeybee incidents) were referred to the WIIS Scotland. Seven incidents were excluded[2], leaving 159 incidents accepted for further investigation. The cause of death or illness was determined in 79 incidents and unknown in 80 incidents. Seventy four incidents (47% of all incidents accepted into the WIIS Scotland) tested positive for pesticide residues[3].

Thirty six incidents were categorised as abuse, 5 incidents were attributed to unspecified use, 1 incident was approved use, 2 incidents were categorised as misuse and 1 incident was veterinary use.

Nineteen different pesticides[3] were identified. The insecticide, carbofuran was again the most common pesticide detected, even though UK approval for use of products containing this chemical expired in 2001. Twenty two abuse incidents involved carbofuran.

Selected samples were also screened for evidence of exposure to anticoagulant rodenticides. Residues of various anticoagulant rodenticides were detected in 42 out of 110 incidents (i.e. 38% 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.

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[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 1 incident that involved ethylene glycol only.***

Introduction

1. In the United Kingdom the impact of pesticide use on wildlife and other animals including honeybees, 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 (1995), 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 Chemistry Branch on behalf of the Scottish Government's Rural Payments and Inspections Directorate (RPID). The procedures for incident investigation are described in Appendix I.

3. Incidents confirmed as involving pesticides 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). 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 2009

NUMBER OF INCIDENTS IN 2009

7. A total of 166 suspected poisoning incidents were referred to the WIIS Scotland throughout 2009. Seven incidents were excluded from the scheme leaving 159 incidents accepted for subsequent investigation by SASA Chemistry Branch (including screening of selected samples for residues of anticoagulant rodenticides). Figure 1 shows the number of incidents referred to the WIIS Scotland per annum since 1997. Pesticides were detected in 74 separate incidents i.e. 47% of all incidents investigated (Appendix II).

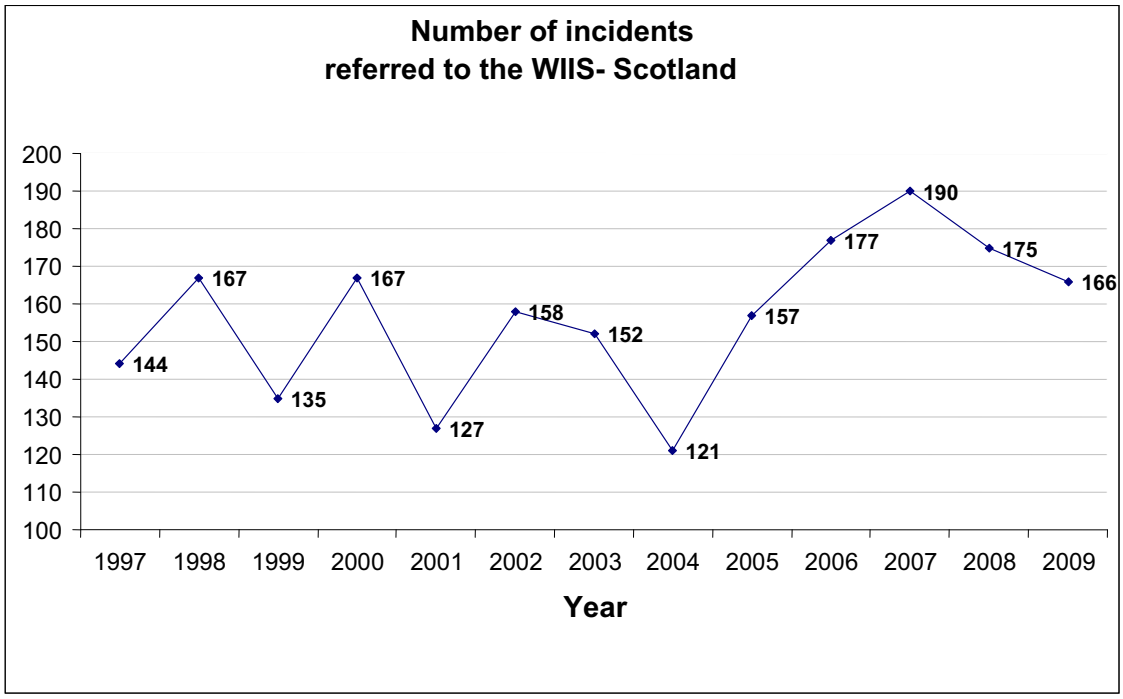


Figure 1. Number of incidents referred to the WIIS (Scotland) per annum (1997-2009).

8. The cause of death or illness was established in 79 incidents. Forty five of these incidents involved pesticides and were assigned to an appropriate WIIS category. In the remaining 34 incidents, death was concluded to be due to starvation (10), disease (6), trauma (17) or ethylene glycol (1).

9. One incident involving a buzzard was attributed to the *approved use* of pesticides. Two incidents involving chemicals only were categorised as *misuse*. One incident was attributed to *veterinary use*. In a further 5 incidents, no specific source of the exposure was identified and the cause of each incident was categorised as *unspecified use*. Thirty six incidents were categorised as *abuse*. A breakdown of incidents by sample classification is provided in Table 1.

Table 1: Number of incidents investigated in 2009

Sample classification[a]	Incidents Investigated	Incidents involving pesticides[b]	Categorised incidents[c]	Incidents with other known cause of death or illness
Vertebrate wildlife	99	53	30	28
Livestock	9	1	0	1
Companion animals	34	12	8	2
Honeybees	6	1	1	1
Baits, chemicals or paraphernalia	11	7	6	1
TOTAL	**159**	**74**	**45**	**33**

[a] **Where single incidents involved submission of several sample types – the sample was simply classified by 1st named specimen.**

[b] **All incidents including those involving anticoagulant rodenticides.**

[c] **An incident involving ethylene glycol only was not assigned to a WIIS category.**

A list of the pesticides encountered during 2009 is presented in Table 2.

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

Chemical	Number of incidents in which chemical was detected	Sample type[a]
aldicarb	1	cat
bendiocarb	2	cat, honeybees
brodifacoum	14	bait, buzzard, dog, otter, red kite, peregrine falcon, tawny owl
bromadiolone	26	badger, buzzard, cat, dog, magpie, peregrine falcon, red kite, sea eagle, tawny owl, wildcat
carbofuran	22	bait, buzzard, cat, golden eagle, magpie, paraphernalia, raven, red kite, sea eagle
chloralose	12	bait, buzzard, cat, chemical, crow, paraphernalia, red kite, tawny owl
coumatetralyl	3	bait, dog
cyanide	2	chemical
DDE[b] (dichlorodiphenyldichloroethylene)	1	golden eagle
difenacoum	13	bait, barn owl, buzzard, cattle, dog, otter, red kite
endrin	1	cat
ethylene glycol	1	bait
flocoumafen	1	bait
isoproturon	1	buzzard
methiocarb	2	buzzard, chemical, paraphernalia
mevinphos	1	bait, raven
phostoxin (phosphine)	1	chemical
strychnine	1	chemical
warfarin	1	cat

[a] **An individual incident may have involved submission of multiple and several sample types and detection of >1 pesticide.**

[b] **DDE is a break-down product (metabolite) of DDT.**

Table 3 contains details of the number and variety of species/samples tested by SASA Chemistry Branch.

Table 3: Species and number of samples tested in 2009.

Species or sample type	Number
Mammals - wildlife	
Badger	1
Fox	2
Hedgehog	1
Otter	2
Squirrel - red	1
Wildcat	1
Birds	
Buzzard	49
Eagle - golden	5
Eagle - sea	4
Owl - barn	9
Owl – short-eared	3
Owl - tawny	4
Peregrine falcon	3
Red kite	10
Sparrowhawk	1
Dove	1
Goose	1
Crow	3
Jackdaw	1
Magpie	4
Raven	8
Rook	3
Companion Animals	
Cats	19
Dogs	19
Livestock	
Cattle	9
Beneficial Insects	
Honeybees	6
Miscellaneous	
chicken (suspected bait)	3
eggs (suspected bait)	4
grouse (suspected bait)	1
meat and tuna (suspected bait)	1
paraphernalia (e.g. knives, game bags, gloves)	117
partridge (suspected bait)	1
pheasant (suspected bait)	4
pigeon (suspected bait)	4
rabbit and hare (suspected baits)	13
suspicious chemicals and substances e.g. soil, debris	24
Total number of specimens tested	**342**

Categorised Incidents

APPROVED USE

10. A buzzard was found dead on farmland in Fife. Analysis of the bird's stomach content revealed that the bird had been exposed to methiocarb, the active ingredient of products used to control e.g. slugs, snails and insects. The subsequent field investigations discovered that 'Decoy', which contains methiocarb, had been recently applied to a field on the farm.

MISUSE

11. Two incidents were categorised as 'Misuse'. The first incident was discovered in January 2009, when a crofter was seen sprinkling a substance onto the ground. Close inspection of the circumstance revealed that the crofter had sprinkled 'Townex' rat poison about the carcase of a partially buried sheep in order to alleviate a 'rat' problem.

The active ingredient of 'Townex' is coumatetralyl and this chemical was confirmed to be present in soil samples and the 'Townex' formulation.

The second incident in September 2009, involved the incorrect storage of 'Phostoxin' a gassing agent or fumigant for control of rodent or insect pests. The 'Phostoxin' was discovered during an investigation into suspicious activities around West Linton in the Scottish Borders.

ABUSE

12. In 2009, thirty six incidents were categorised as abuse. Analytical investigations included analysis of tissue samples, digestive tract material, various chemicals and poisoning paraphernalia (e.g. implements/tools, game bags, residues or sweepings from vehicles). As in previous years, a high proportion (61%) of abuse incidents involved birds of prey (Figure 2).

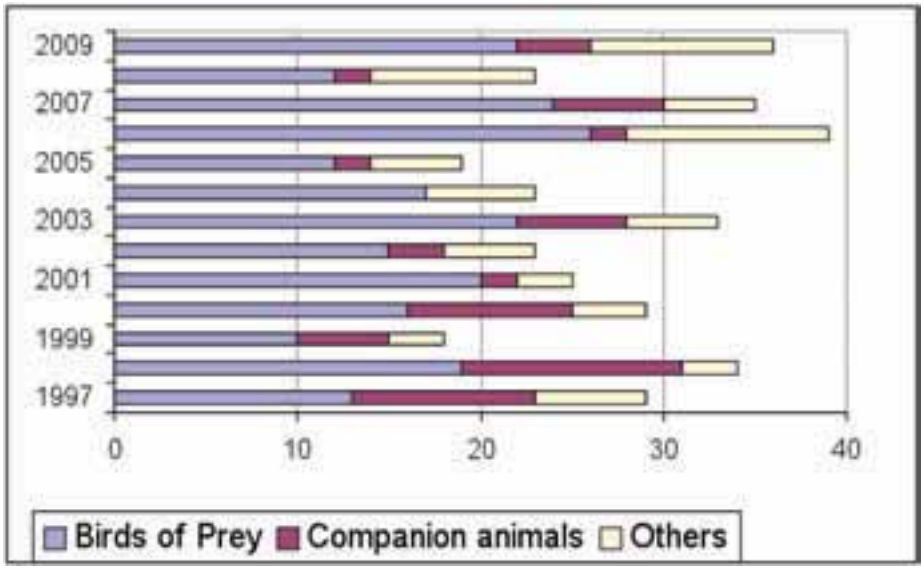


Figure 2. Abuse of pesticides in Scotland (number of incidents 1997 - 2009).

13. Twenty two abuse incidents involved birds of prey (Table 4). Four incidents involved companion animals (all cats) and the 10 others included; raven (4), magpie (1), crow (1) and suspected baits (4).

Table 4: Bird of prey species that were victims of pesticide abuse in 2009.

Region[a]	Incidents	Buzzard	Red Kite	Sea Eagle	Tawny Owl	Golden Eagle
Border	5	4	1	-	-	-
Dumfries & Galloway	1	2	-	-	-	-
Grampian	1	1	-	-	-	-
Highland	2	1	1	-	-	-
Strathclyde	3	5	-	-	-	1
Tayside	10	9	2	1	1	1
TOTAL	**22**	**22**	**4**	**1**	**1**	**2**

[a]**See appendix III for regional classification in Scotland.**

14. Eight different pesticides were detected and identified in abuse incidents in 2009. The pesticides were aldicarb, brodifacoum, carbofuran, chloralose, cyanide, methiocarb, mevinphos 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. Such cases are categorised as 'Unspecified Use' and in 2009, five incidents fell into this category. Animals and pesticides involved in these incidents are listed in Table 5.

Table 5: Unspecified Use incidents recorded in 2009.

Animal	Region	Pesticides	Month
Wildcat	Grampian	Bromadiolone	May
Dog	Strathclyde	Brodifacoum, bromadiolone, coumatetralyl, difenacoum,	July
Honeybees	Tayside	Bendiocarb	August
Dog	Strathclyde	Bromadiolone	September
Cat	Grampian	Endrin	December

VETERINARY USE

16. **A** cat was found dead in Irvine, Strathclyde. Residues of bendiocarb, an insecticide used to control pests that present a risk to human health e.g. ants, cockroaches or fleas, were detected in liver tissue from the cat. Subsequent investigations revealed that the owner had treated the cat with a flea treatment product that contained bendiocarb as the active ingredient.

Anticoagulant Rodenticides

17. 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 or scavengers 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 2009, SASA Chemistry Branch tested 118 livers from a variety of animals for the presence of residues of anticoagulant rodenticides. Residues were found in 41 specimens i.e. 35% of the total number of livers tested (Table 6).

Table 6: Species tested throughout 2009 for the presence of residues of anticoagulant rodenticides[a].

Buzzard	43	18
Eagle-Golden	4	-
Eagle-Sea	3	1
Peregrine falcon	3	1
Red kite	8	4
Sparrowhawk	1	-
Barn Owl	9	1
Short-eared Owl	3	-
Tawny owl	4	2
Unknown owl	1	-
Crow	1	-
Magpie	3	1
Rook	1	-
Dove	1	-
Goose	1	-
Badger	1	1
Cat	6	2
Dog	12	5
Fox	2	1
Hedgehog	1	-
Otter	2	2
Wildcat	1	1
Cattle	8	1
TOTAL	**118**	**41[b]**

[a] **Brodifacoum, bromadiolone, chlorophacinone, coumatetralyl, difenacoum, diphacinone, flocoumafen & warfarin.**

[b] **This is the total number of specimens that tested positive from 118 livers tested. An individual WIIS incident may involve >1 specimen.**

APPENDIX I

INVESTIGATION PROCEDURES

The investigation of suspected pesticide poisoning incidents relies on a scheme, which allows members of the public and interested organisations to submit carcases, suspected baits or other samples for pesticide analysis. The Wildlife Incident Investigation Scheme is operated in Scotland by the Chemistry 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 Lasswade Veterinary Laboratory is used to provide specialist pathological support to SASA on wild animals and also provides 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, suspicious materials and 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 identify and quantify single or multiple pesticide-residues. Two different multi-pesticide residue methods are currently used to determine and quantify:

(1) Organochlorine, organophosphorus, carbamate and pyrethroid compounds

(2) Anticoagulant rodenticides.

These multi-residue methods are supplemented by compound-specific (i.e. single-residue) analytical methods developed for the determination of chloralose, cyanide, metaldehyde, paraquat, phosphine and strychnine. 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 SASA Chemistry Branch 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 form part of the Advisory Committee on Pesticides - Environmental Panel report series published by Defra. The regulatory body, The Chemicals Regulation 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 Chemistry Branch and SG 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 II

SUMMARY OF POSITIVE INCIDENTS - 2009

REF	MONTH	REGION	PESTICIDE	CATEGORY	SPECIES	COMMENT
09002	January	Tayside	chloralose, bromadiolone	abuse	tawny owl	This incident is the subject of an ongoing police investigation. A low-level residue of bromadiolone was also detected in liver tissue.
09003	January	Highland	brodifacoum, bromadiolone	trauma	red kite	The post mortem examination findings were indicative of the bird having died as a result of a collision with a vehicle but the presence of a large amount of food in the stomach raised the possibility of poisoning. However the analytical investigation failed to provide any evidence to implicate pesticide poisoning. Low, level residues of brodifacoum and bromadiolone were confirmed in liver tissue from the bird.
09004	January	Strathclyde	carbofuran	abuse	cat	This cat was found dead in an area where there is a history of cats being poisoned with carbofuran. The source of the chemical is unknown.
09012	January	Fife	methiocarb	approved	buzzard	This buzzard was found dead on farmland. The post mortem examination findings showed the bird had died in poor bodily condition. There was mud in the talons and the stomach contained soil, grit and plant material. The analytical investigation confirmed the presence of a low residue of methiocarb in the stomach content material. A field investigation has confirmed that a methiocarb product had been applied to the crop in December 2008.
09013	January	Lothian	brodifacoum	unknown	buzzard	Bird found dead and reported to the police. The carcase was quite decomposed and had been scavenged by predators. The cause of death was not established at the post mortem examination. A low level residue of brodifacoum was confirmed in liver tissue.
09014	February	Highland	bromadiolone	starvation	buzzard	Bird found unwell; pesticide poisoning suspected. The bird was in poor condition. A large growth found in the bird's gullet may have hindered its ability to feed. A residue of bromadiolone was confirmed in liver tissue.

REF	MONTH	REGION	PESTICIDE	CATEGORY	SPECIES	COMMENT
09017	January	Tayside	bromadiolone	unknown	cat	This cat died suddenly just after it had been outside. This incident occurred in a rural location and the owner was concerned that it may have been poisoned. However, the analytical investigation did not confirm that suspicion. A very low, residue of bromadiolone was identified in liver tissue.
09018	January	Highland	coumatetralyl	misuse	chemical, soil, bone	This incident is the subject of an ongoing police investigation.
09019	February	Highland	brodifacoum	starvation	2 buzzards	These birds were found dead in the same area within a few days of each other. Starvation was identified as the cause of death and the opportunity was taken to test for evidence of exposure to anticoagulant rodenticides. Low level residues of brodifacoum were confirmed in liver tissue from each bird.
09021	February	Highland	carbofuran	abuse	raven	Raven found dead in a remote area. The analytical investigation established that carbofuran poisoning was responsible for the bird's death.
09022	February	Highland	brodifacoum, bromadiolone, difenacoum	trauma	red kite	This red kite was found dead on a rail track. Low level residues of brodifacoum, bromadiolone and difenacoum have been found in liver tissue from the bird.
09023	February	Border	difenacoum	unknown	otter	This otter was found dead next to a waterway with partly ingested food around its mouth. The analytical investigation failed to establish the cause of death. A low level residue of difenacoum was confirmed in liver tissue.
09025	February	Fife	ethylene glycol	other	bait material	This incident is the subject of an ongoing police investigation.
09026	March	Border	carbofuran, bromadiolone	abuse	buzzard	This incident is the subject of an ongoing police investigation. A low level residue of bromadiolone was also detected in liver tissue.
09032	March	Tayside	chloralose	abuse	2 buzzards	This incident is the subject of an ongoing police investigation.
09034	March	Strathclyde	difenacoum	starvation	buzzard	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 level residue of difenacoum was confirmed in liver tissue.
09035	March	Border	bromadiolone	trauma	buzzard	The post mortem examination findings were indicative of the bird having died as a result of trauma associated with a blow to the head. A low level residue of bromadiolone was confirmed in liver tissue.

REF	MONTH	REGION	PESTICIDE	CATEGORY	SPECIES	COMMENT
09036	March	Border	carbofuran, bromadiolone	abuse	buzzard	This incident is the subject of an ongoing police investigation. A low level residue of bromadiolone was also detected in liver tissue.
09037	March	Strathclyde	carbofuran	abuse	rabbit bait	This incident is the subject of an ongoing police investigation.
09038	March	Highland	chloralose	abuse	buzzard	This incident is the subject of an ongoing police investigation.
09040	March	Tayside	carbofuran, difenacoum	abuse	2 buzzards	This incident is the subject of an ongoing police investigation. A low level residue of difenacoum was also detected in liver tissue.
09044	March	Strathclyde	carbofuran	abuse	raven	This incident is the subject of an ongoing police investigation.
09045	March	Border	brodifacoum, bromadiolone, difenacoum	unknown	buzzard	This bird was found dead near woodland. The analytical investigation has failed to provide any evidence to implicate pesticide poisoning with the bird's death. Low level residues of brodifacoum, bromadiolone and difenacoum have been confirmed in liver tissue from the bird.
09046	April	Tayside	chloralose, bromadiolone	abuse	3 buzzards	This incident is the subject of an ongoing police investigation.
09049	April	Strathclyde	chloralose	abuse	crow	A member of the public reported finding 2 dead birds and a sick bird. One of the dead birds was collected for analysis. The source of the chemical is still under investigation.
09050	April	Border	brodifacoum	abuse	rodenticide bait	This incident is the subject of an ongoing police investigation.
09051	April	Strathclyde	carbofuran	abuse	magpie, rabbit bait	This incident is the subject of an ongoing investigation.
09054	April	Strathclyde	bromadiolone	disease	badger	Found dead; pesticide poisoning suspected. The post mortem examination findings revealed evidence of tumours in the carcase. The opportunity was taken to screen for evidence of exposure to anticoagulant rodenticides. The analysis confirmed the presence of a low level residue of bromadiolone.
09055	April	Strathclyde	carbofuran	abuse	raven	This incident is the subject of an ongoing police investigation.
09057	April	Strathclyde	difenacoum	unknown	cow	Sudden, unexplained death of farm animal. A low level residue of difenacoum has been confirmed in liver tissue.

REF	MONTH	REGION	PESTICIDE	CATEGORY	SPECIES	COMMENT
09059	April	Strathclyde	brodifacoum, bromadiolone, difenacoum, isoproturon	unknown	buzzard	Found dead; pesticide poisoning suspected. The post mortem examination findings showed no obvious abnormalities. The analytical investigation has confirmed the presence of low, sublethal residues of brodifacoum, bromadiolone and difenacoum in liver tissue. Low level residues of isoproturon have also been detected in liver tissue and crop content material from this buzzard.
09060	April	Tayside	chloralose, bromadiolone, difenacoum	abuse	buzzard	Found dead; pesticide poisoning suspected. The analytical investigation has confirmed the presence of chloralose and low level residues of bromadiolone and difenacoum in liver tissue.
09062	April	Strathclyde	carbofuran	abuse	buzzard, pigeon bait	This buzzard was found dead beside the remains of a pigeon. The source of the carbofuran is still under investigation.
09066	April	Highland	carbofuran	abuse	red kite	This incident is the subject of an ongoing police investigation.
09068	April	Grampian	bromadiolone	unspecified	wildcat	A dead wildcat was found in an old cattle court that is now used for horses. The post mortem examination findings indicated that anticoagulant rodenticide poisoning was the possible cause of death. A field investigation is underway to try to establish the source of the chemical.
09069	April	Border	brodifacoum	abuse	rodenticide bait	This incident is the subject of an ongoing police investigation.
09070	May	Border	aldicarb	abuse	cat	This incident is the subject of an ongoing Scottish SPCA investigation.
09071	May	Border	brodifacoum	unknown	otter	Found dead next to a river. The analytical investigation has identified a low level residue of brodifacoum in liver tissue from the otter.
09072	April	Highland	DDT	unknown	golden eagle	This bird was found dead. However, no evidence of pesticide poisoning was uncovered. A very low level residue of the persistent organochlorine DDE was confirmed.
09073	May	Lothian	bromadiolone	trauma	buzzard	There was concern that this bird might have been poisoned. However, the analytical investigation has only revealed the presence of a low level residue of bromadiolone in liver tissue.
09074	April	Tayside	bromadiolone	trauma	white-tailed sea eagle	This eagle was found dead near to a railway line. The analytical investigation has confirmed a low level residue of bromadiolone in liver tissue from the bird.
09075	May	Grampian	mevinphos	abuse	2 ravens	This incident is the subject of an ongoing police investigation.

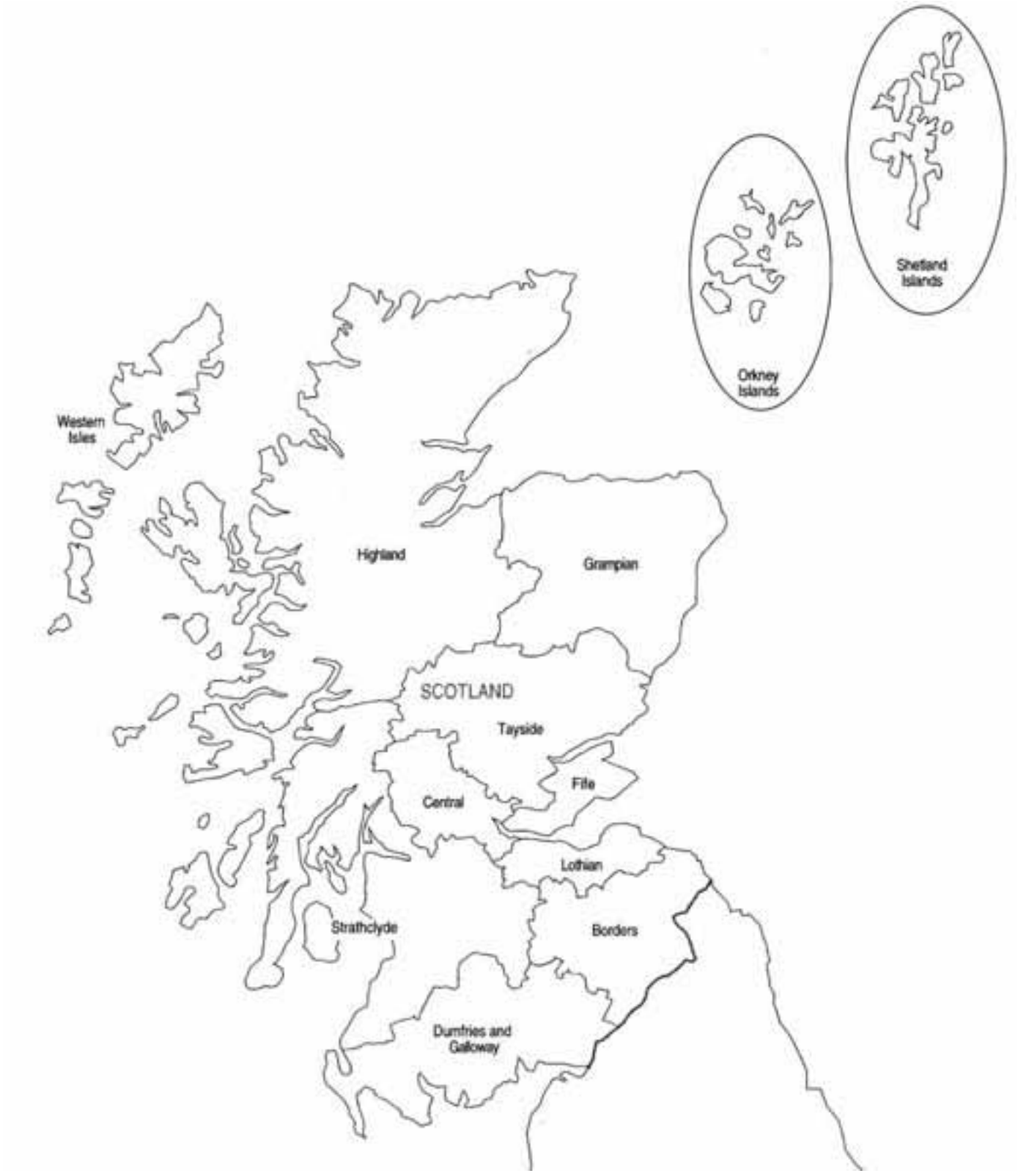
REF	MONTH	REGION	PESTICIDE	CATEGORY	SPECIES	COMMENT
09078	May	Strathclyde	brodifacoum, bromadiolone	unknown	dog	This dog was euthanased following the onset of acute haemorrhagic enteritis. Low level residues of brodifacoum and bromadiolone were confirmed in liver tissue from the animal.
09081	May	Border	carbofuran, bromadiolone	abuse	red kite	This incident is the subject of an ongoing police investigation. The analytical investigation has also confirmed the presence of a residue of bromadiolone in liver tissue from the bird.
09082	June	Tayside	chloralose	abuse	red kite	This incident is the subject of an ongoing police investigation.
09083	June	Strathclyde	carbofuran, methiocarb, strychnine, sodium cyanide	abuse	golden eagle	This incident is the subject of an ongoing police investigation.
09087	June	Grampian	carbofuran	abuse	buzzard	This incident is the subject of an ongoing police investigation.
09090	June	Border	carbofuran	abuse	buzzard	This incident is the subject of an ongoing police investigation.
09093	June	Dumfries & Galloway	brodifacoum	unknown	red kite	This was a young bird that was found dead in its nest. A low level residue of brodifacoum was confirmed in liver tissue.
09096	June	Dumfries & Galloway	difenacoum	unknown	barn owl	Three owl chicks found dead close to a nest. A low level residue of difenacoum was confirmed in liver tissue from one of the birds.
09098	June	Strathclyde	brodifacoum, bromadiolone, coumatetralyl, difenacoum	unspecified	dog	Farm dog stopped eating and became lethargic and dull prior to death. The post mortem findings were suggestive of possible anticoagulant rodenticide poisoning. The analytical investigation has confirmed the presence of four anticoagulant rodenticides. The source of the chemicals has not been established.
09100	July	Grampian	bromadiolone difenacoum	starvation	buzzard	The post mortem examination findings indicated that starvation was the likely cause of death in this incident. Low level residues of bromadiolone and difenacoum were confirmed in liver tissue.
09103	July	Tayside	carbofuran, chloralose, difenacoum	abuse	golden eagle	This incident is the subject of an ongoing police investigation.
09108	August	Highland	coumatetralyl	unknown	dog	This dog collapsed after a period of repeated vomiting. A very low level residue of coumatetralyl was confirmed in liver tissue from the dog. However, in the absence of any specific post mortem examination findings anticoagulant rodenticide poisoning was not thought to be the cause of death.

REF	MONTH	REGION	PESTICIDE	CATEGORY	SPECIES	COMMENT
09109	August	Tayside	bromadiolone, difenacoum	unknown	buzzard	This bird was thought to have died from pesticide poisoning. However, only low level residues of bromadiolone and difenacoum have been detected in liver tissue from the buzzard.
09110	August	Tayside	carbofuran	abuse	white-tailed sea eagle	This incident is the subject of an ongoing police investigation.
09113	August	Strathclyde	chloralose	abuse	cat	This incident is the subject of an ongoing police investigation.
09117	August	Tayside	carbofuran chloralose	abuse	buzzard	This incident is the subject of an ongoing police investigation.
09120	September	Border	carbofuran	abuse	buzzard	This incident is the subject of an ongoing police investigation.
09122	September	Lothian	brodifacoum, flocoumafen	unknown	tawny owl	There was concern that this bird had died form pesticide poisoning. However, only low level residues of brodifacoum and flocoumafen have been detected in liver tissue.
09123	September	Central	bromadiolone	unknown	3 magpies, rook	These birds were found in gardens, alive but looking concussed. There was concern that they may have been poisoned. The analytical investigation has confirmed the presence of a residue of bromadiolone in liver tissue from one of the magpies.
09124	September	Border	aluminium phosphide	misuse	chemical	This incident is the subject of an ongoing police and Scottish SPCA investigation.
09126	September	Strathclyde	carbofuran	abuse	2 cats	This incident is being investigated by the Scottish SPCA.
09127	September	Strathclyde	bromadiolone	unspecified	dog	Sudden, unexplained death of a dog. The analytical investigation has confirmed the presence of a low residue of bromadiolone. The presence of this residue and strong post mortem evidence suggest anticoagulant rodenticide poisoning as the cause of death.
09128	September	Strathclyde	bromadiolone	unknown	dog	This dog was seen eating something that had been thrown into the garden. The dog was ill for 2 days, then became comatose and died. Only a very low level residue of bromadiolone was confirmed in liver tissue.
09133	October	Grampian	chloralose	abuse	2 egg baits	This incident is the subject of an ongoing police investigation.
09138	October	Central	bromadiolone, brodifacoum	unknown	peregrine falcon	This peregrine falcon was found alive in a park but died overnight. There was concern that it may have been poisoned. However, the analytical investigation only revealed low level residues of bromadiolone and brodifacoum in liver tissues from the bird.
09142	October	Strathclyde	chloralose, sodium cyanide	abuse	buzzard, rabbit bait	This incident is being investigated by the Scottish SPCA.

REF	MONTH	REGION	PESTICIDE	CATEGORY	SPECIES	COMMENT
09143	October	Tayside	carbofuran	abuse	red kite	This incident is the subject of an ongoing police investigation.
09145	October	Strathclyde	bendiocarb	veterinary	cat	This cat was found dead and the owner, concerned that it may have been poisoned, contacted the Scottish SPCA. Analysis revealed a residue of bendiocarb in liver tissue from the cat. The Scottish SPCA indicated that the owner may have used a flea treatment containing bendiocarb. The identity of the product has still to be established.
09147	October	Dumfries & Galloway	carbofuran	abuse	2 buzzards	This incident is the subject of an ongoing police investigation.
09152	December	Grampian	endrin, warfarin	unspecified	cat	This farm cat was found dead. Another cat from the same farm had been found dead the previous day and the owner was concerned that they may have been poisoned. The analytical investigation has revealed residues of the organochlorine insecticide endrin in samples from the cat. A field investigation, undertaken by SGRPID staff, has failed to establish the source of the chemical. A very low level residue of the anticoagulant rodenticide warfarin has also been detected in liver tissue from this animal.
09153	December	Highland	bromadiolone	unknown	buzzard	This was a young buzzard that was observed staggering and being non-responsive to passing traffic prior to collapsing. The finder suspected that it may have been the victim of poisoning. However, the analytical investigation failed to provide any evidence to implicate pesticide poisoning. A low level residue of bromadiolone was confirmed in liver tissue from the buzzard.
B0609	August	Tayside	Bendiocarb	unspecified	honeybees	Dead and dying bees found on the landing board and on the ground in front of two hives. The analytical investigation has confirmed the presence of a residue of bendiocarb in the sample of bees tested. The source of the bendiocarb has not been established but exposure to this compound usually occurs through its use as a feral bee or wasp control treatment.

APPENDIX III

REGIONS IN SCOTLAND USED TO CLASSIFY INCIDENTS



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