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Pesticide poisoning of animals 2003:

Investigations of suspected incidents in the United Kingdom

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A Report of the Environmental Panel of the Advisory Committee on Pesticides 2004

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Published by the Department for Environment, Food and Rural Affairs.
Printed in the UK, December 2004, on recycled material containing 80% post-consumer waste and 20% totally chlorine free virgin pulp.

PB 10337

Preface

Pesticides can adversely affect organisms other than the pest species they are targeted against. These 'non-target' effects can be indirect, for example through insecticides directly affecting the insects eaten by birds, herbicides removing the food plants of butterflies, or herbicides removing plants that are eaten by mammals, either as green plants or as seeds. More obvious, direct effects are sometimes seen when animals die or suffer ill health through exposure to pesticides. The UK Wildlife Incident Investigations Scheme (WIIS) is the main tool used to monitor such problems when they arise from approved use, and to measure trends in misuse and deliberate abuse of pesticides.

The 2003 report shows that, compared with 2002, there were substantially fewer incidents reported, a small reduction in the number attributed to pesticide poisoning and a slightly smaller number and percentage (3%) of pesticide incidents related to approved use. Industry has taken effective voluntary action to reduce incidents of poisoning caused by approved use or by misuse of pesticides. For example, concern over some of the aldicarb incidents reported here led to the manufacturer taking up a suggestion from the Environmental Panel to alter the wording on the Environmental Information Sheet under the Voluntary Initiative. Industry is also taking steps to reduce the exposure of wildlife to rodenticides. The number of cases of careless misuse in 2003 is down to 17 incidents (13%). Unfortunately there has been an increase to 68% (85 incidents, up from 78 in 2002) of incidents of pesticide poisoning that represent deliberate abuse, and deliberate abuse is still the major cause for concern.

Finally, it is a pleasure once again to acknowledge the hard work of all those involved with the WIIS scheme. They keep me informed with regular updates and are always ready to provide additional information when needed.

Prof. Robert Smith

Chairman
Environmental Panel of the Advisory Committee on Pesticides

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Summary

In the UK the Wildlife Incident Investigation Scheme investigates deaths of wildlife, including beneficial insects, pets and some livestock, where there is strong evidence to suggest that pesticide poisoning may be involved.

The Scheme provides a unique means of post-registration surveillance of pesticide use, so that registrations can be revised if necessary. In addition, it provides a measure of the success of the pesticide registration process and helps in the verification and improvement of the risk assessments made in the registration of compounds. Evidence from the Scheme may also be used to enforce legislation on the use of pesticides and the protection of food, the environment and animals.

There were 397 suspected poisoning incidents registered by the Scheme in 2003. The causes were determined in 203 incidents, of which 126 (32% of those registered) were pesticide poisoning. In the remaining incidents, there was either insufficient information, lack of suitable tissues for analysis and/or failure to detect pesticide residues (see Table 1). In 2002, there were 450 suspected poisoning incidents registered by the Scheme and the causes were determined in 213 incidents, of which 131 (29%) were pesticide poisoning.

There were four incidents arising from the approved use of pesticides in 2003 (includes one bee incident). This compares with six in 2002 (includes one bee incident). Proportionately this is 3% of pesticide incidents reported in 2003 (see Figure 1), compared with 5% in 2002. This proportion of approved use incidents is similar to that seen in years prior to 2002 (see Table 23).

The number of misuse incidents, often the result of the careless use of pesticides, was 17 in 2003 (includes one bee incident). There were 20 incidents in 2002 (includes one bee incident). This represents 13% of confirmed poisoning incidents in 2003 (see Figure 1), compared with 15% in 2002.

Deliberate abuse of pesticides was identified in 85 incidents, compared with 78 incidents in 2002. This represents 68% of all pesticide incidents (see Figure 1) and is an increase on the 59% of all pesticide incidents that was seen in 2002.

There was insufficient information available to identify the source of the poisoning in a further 19 pesticide incidents (15%, see Figure 1) and these were attributed to unspecified use (includes six bee incidents). In 2002, there were 25 of these incidents (19%, includes three bee incidents).

For honeybees, there were 8 incidents attributed to pesticide poisoning, out of 24 incidents investigated (see Table 17). In 2002, there were 5 pesticide poisoning incidents confirmed out of 25 investigated.

There was one incident where veterinary products were thought to be involved (see Table 4, and Figure 1), compared to two in 2002.

As in previous years there were thorough investigations of all incidents where the approved use, or illegal use, of pesticides was implicated. Where appropriate and with sufficient evidence, prosecutions were undertaken by Defra and other agencies (see enforcement action) for the illegal use of pesticides. Incidents of misuse or approved use can highlight problems with the approval conditions, or the label instructions, for a pesticide and can provide valuable feedback into the regulatory process.

Summary

Of the 397 suspected poisoning incidents: vertebrates were involved in 342 incidents; bees in 24; suspected baits and suspicious samples, where no poisoned animals were found, in 31.

In England, 160 incidents were reported, of which 62 (39%) were found to be caused by pesticides; Scotland had 145 incidents registered, 37 (26%) were found to be caused by pesticides; Wales had 43 incidents registered, 10 (23%) were found to be caused by pesticides; and in Northern Ireland, 49 incidents registered, 17 (35%) were found to be caused by pesticides (see Table 2 and Figure 3).

Twenty-four pesticides were identified in these poisoning incidents (see Table 4); Twenty-six compounds were found in 2002.

Introduction

1. Before approval is granted for the use of pesticides, in the United Kingdom, the impact on wildlife, including beneficial insects, has to be assessed. If an unacceptable risk is identified, then restrictions on use, in order to protect wildlife, honeybees and domestic animals, may be imposed in the conditions of approval under the Control of Pesticides Regulations (COPR) 1986 (as amended) and the COPR (Northern Ireland) 1987 or Plant Protection Products Regulations 1995, as appropriate.

2. In the United Kingdom there are four schemes, which investigate possible pesticide poisoning, under the Wildlife Incident Investigations Scheme (WIIS). Fish are not usually covered by the Scheme.

   (1) The Department for Environment, Food and Rural Affairs (Defra) and the Welsh Assembly Government Environment, Planning and Countryside Department (EPC) examine cases of suspected poisoning by pesticides that involve vertebrate wildlife (chiefly birds and mammals) and companion animals in England and Wales. Over the years this scheme has widened its scope and now is able to detect most of the pesticides thought likely to cause animal deaths (Hardy et al. 1986).

   (2) Defra and EPC investigate mortality of beneficial insects, mainly honeybees reported by beekeepers, in England and Wales. This part of the WIIS has been in operation since 1981 (Fletcher et al. 1994b).

   (3) In Scotland, the Scottish Executive Environment and Rural Affairs Department (SEERAD) operates a scheme covering incidents in all categories.

   (4) In Northern Ireland, the Department of Agriculture, Food and Rural Development (DARD) operates a scheme in the same way as SEERAD. This scheme was introduced in 1992 in line with the existing schemes operating in Great Britain. Prior to that a scheme operated on an informal basis.

3. The post-registration surveillance on pesticides carried out by Government Departments is funded mainly by the agrochemical industry, under the Food and Environmental Protection Act 1985 (FEPA).

4. All pesticide incidents during the reported year, were assigned to one of four categories:

   Approved use of the product, according to the specified conditions for use;

   Misuse of a product, by careless, accidental or wilful failure to adhere to the correct practice;

   Abuse of a pesticide, in the form of deliberate, illegal attempts to poison animals;

   Unspecified use, where the cause could not be assigned to one of the above categories;

   There is also a category of Veterinary use, where there is known involvement of veterinary products in incidents. Veterinary incidents may include abuse, misuse, approved use or unspecified use of these compounds. These incidents are not by definition covered by the WIIS and where the involvement of a veterinary medicine is suspected it should be reported to the Veterinary Medicines Directorate (Tel. 01923-338427).

   There are some reported animal deaths that are subsequently found to be the result of other causes, which are unrelated to pesticide use eg. disease, starvation, trauma and other non-pesticide poisonings.

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

6. Where there is evidence to indicate misuse or deliberate abuse of a pesticide in an incident, then this may also result in legal enforcement. Under FEPA and COPR, all aspects of pesticide advertisement, sale, supply, storage and use are fully regulated. If incidents reveal contravention of this Act, or of other legislation such as the Wildlife and Countryside Act 1981, Wildlife (Northern Ireland) Order 1985, Protection of Animals Act 1911, and the Welfare of Animals Act (Northern Ireland) 1972, then prosecution, or other forms of enforcement, may ensue. Any investigations carried out to enforce the legislation are paid for by the Home Departments.

   The investigation procedures for WIIS are described in Appendix 1.

The Campaign Against the Illegal Poisoning of Animals

7. Interested Government Departments, led by Defra, continued the long-term Campaign Against the Illegal Poisoning of Animals. There has been much press and media coverage throughout the years and as a result the Scheme is now becoming much more widely known. The provision of a freephone number (0800 321600) has had a continuing good response, allowing ready access to the Scheme.

8. Strict criteria are applied to potential incidents prior to acceptance, to ensure the efficient use of available resources. This means that incidents are only accepted if they involve the illness or death of animals, or beneficial insects, where the use of pesticides is implicated. Incidents with only the presence of baits, intended or likely to cause deaths of animals, are also accepted. Incidents are rejected where they obviously involve trauma or disease and if these causes of death are confirmed after veterinary examination, then further investigation of the incident is not undertaken. Substantial delay in notification of an incident, or the unavailability of carcases, may also lead to rejection of an incident. Where there are special circumstances associated with an incident, which may provide valuable information to regulators, these rejection criteria may be ignored.

Part 1: Incidents in 2003

Number of incidents in 2003

9. All incidents that occurred during 2003 and were accepted into WIIS, are included in this report. There were 397 suspected poisoning incidents accepted by the Scheme in 2003. The cause of death or illness (including pesticides and other chemicals, trauma, starvation and disease) was determined in 203 incidents (51% of those accepted). Pesticide poisoning was identified in 126 of these incidents (32% of those accepted). In the remaining incidents, there was either insufficient information, lack of suitable tissues for analysis and/or failure to detect pesticide residues. Details of the animals and pesticides involved in all of the incidents accepted by WIIS are given in Part 3 of this report. For previous comparable data see Fletcher et al., 1995, 1996, 1997, 1998, 1999 and Barnett et al., 2000, 2002, 2002, (2001 data affected by FMD) & 2003.

10. There were 4 incidents of approved use, 17 of misuse, 85 of abuse, 19 of unspecified use and 1 incident, which involved pesticides formulated as veterinary products. Positive enforcement continued to be a priority in 2003, with prosecutions being taken against offenders following the investigation of incidents. These incidents, together with any regulatory and/or enforcement activities, are reported in Part 2 of this report.

Part 2: Incidents in 2003 where regulatory and/or enforcement action was considered

Approved use incidents

Introduction

11. Information from the WIIS on incidents suspected to have resulted from approved use is very important, and is fed into the pesticide regulatory process (see Fletcher and Grave 1992). Where significant concerns are highlighted, thorough consideration is given to the most appropriate action needed. If a suspected approved use incident arises, the approval holder is contacted as a matter of course, and is given the opportunity to comment. Useful feedback from the companies has been received. Farmers, growers and other members of the public are strongly encouraged to report any poisoning incident which may have resulted from the approved use of a pesticide to their local Defra Rural Development Service office, or freephone 0800 321600.

Incident summaries

12. A dead pheasant was found on a field that had been drilled with sugarbeet and Temik (aldicarb) earlier that day. The field was drilled, using the "Surefill" system, on 13 March from midday until 18:30. The weather was dry and the soil was very dry. No spills had been observed and the application equipment was reported to be well maintained (purchased 1996) and the operator had just been on a training course with British Sugar. Normally the drilling depth is about 1cm, but this year the drill had been deeper (1.5cm) because of the dry conditions. The farm manager also reported that he was not aware of any other incidents of wildlife deaths associated with Temik use on the farm. They use 1700 kilos of Temik each year. No spillages were seen during an inspection of the field. The bird had been found on the headland, where there was an infestation of rabbits, with droppings and scrapes noted in the seed bed. There was also a problem with mice digging up the seeds. The post-mortem found the bird to be in good condition and there were numerous black granules in the crop and green fibre. The analysis confirmed a residue of aldicarb in the gizzard contents of the bird and it is likely that this caused the death of the bird. It is possible that vertebrate pests in the area disturbed the seed bed and caused granules to be accessible to the pheasant.

13. A dying red kite was found on a farm, where drilling of sugar beet and Temik (aldicarb) had occurred the same morning. The operation had started at about 10:00, from the northern end of the field and was carried out from west to east. About 1km NW of this field and at 13:30, another farm worker found a red kite on the ground and in distress. The bird was picked up and wrapped in a coat, whilst the finder made some enquiries to see what could be done to treat it. However, the bird died soon after this and was placed in a cardboard box. The Temik application used the "Surefill" system and no spillages were reported. The machinery appeared to be well maintained and modern. Part of this very large field (12 ha) was searched and no spilt Temik was seen, but there were some exposed sugar beet seeds. The hedges were heavily rat infested and there were signs of a recent rodenticide treatment. There was also a noticeable rabbit infestation and a number of small rabbits were seen. On post-mortem the bird was in good condition and fur and a paw from a small mammal, probably rabbit, were noted in the crop. Analysis confirmed an aldicarb residue in the crop of the bird and a smaller residue in the gizzard and this is likely to have caused the birds death. It was suggested that the red kite had fed on a young rabbit killed

during the drilling process and contaminated with aldicarb. There were also tests completed for a range of anticoagulant rodenticides on this red kite and a residue of bromadiolone was confirmed in the liver. There was no haemorrhage reported on the post-mortem, but the amount found approached a level that may be regarded as significant and does confirm exposure to the compound.

[**NB** Early in 2003, the European Council adopted a decision under which authorisation for all uses of aldicarb in the EC will be withdrawn by 2007.]

14. A dog developed seizures and a high temperature after being walked close to where a field of winter wheat had recently been sown on a farm near Kirkliston in October. It was noticed that the dog appeared to have a 'blue ball' in it's mouth at one point. The dog started to become distressed when it arrived back at the farm a short while later, and received veterinary assistance. Analysis of a urine sample from the dog revealed the presence of metaldehyde and the residue was consistent with metaldehyde poisoning being the cause of the illness. Field information confirmed that a contractor had applied metaldehyde pellets when sowing winter wheat in a field that had previously been used to grow oilseed rape. There was no evidence of any spillages in the field nor in the area of the steading used for storing the molluscicide prior to application. It appears that an aggregated lump of fused pellets probably formed and that this somehow became dislodged from the seeder, and fell to the ground. This is likely to have been the 'blue ball' observed in the dog's mouth during the walk.

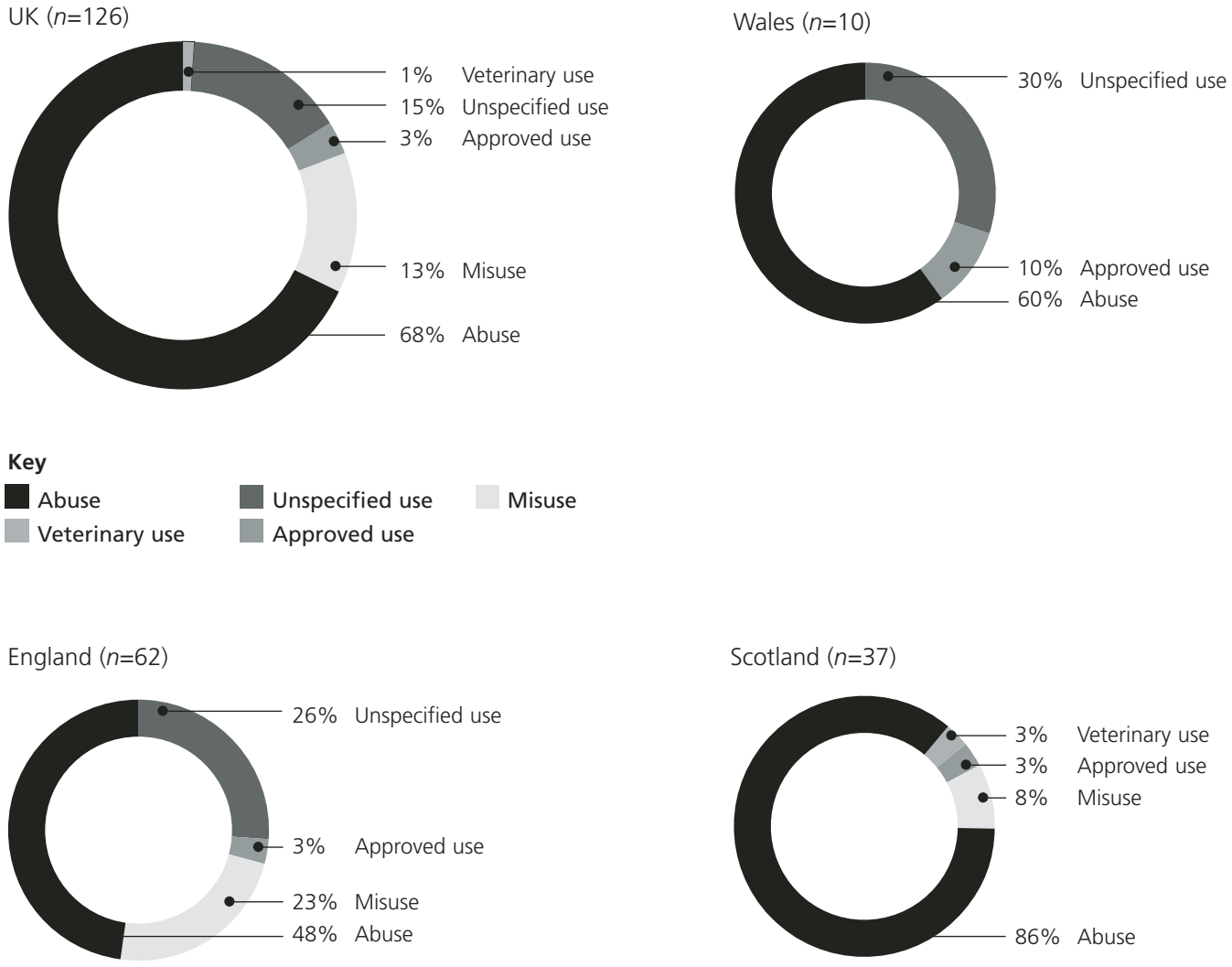
15. A carpet of dead bees was found outside two hives at an apiary. A spray poisoning incident was suspected, as the apiary site is close to oilseed rape fields. The bees were inspected in the morning and appeared to be fine and were working hard. However, by the evening the dead bees were found. The beekeeper knows one local farmer and he always informs him if he is going to spray, but there was another farmer growing spring oilseed rape nearby. The dead bees were analysed and a residue of alpha-cypermethrin was confirmed and this was considered to be the cause of death of the bees. Given this result, the other farmer was contacted and he confirmed that he had sprayed his crop on the advice of an agronomist. A mixture of Contrast (carbendazim and flusilazole), Caramba (metconazole) and Contest (alpha-cypermethrin) had been sprayed when the rape was in the green bud stage. Within this crop there was a patch of a different variety that had some plants in flower, but this product is approved for application during the flowering stages of oilseed rape. This application was likely to be the cause of the incident, as further analytical tests confirmed the presence of flusilazole in the honeybees (the other two fungicides were not screened for). These fungicide active substances are not themselves toxic to bees and their use in tank mix with alpha-cypermethrin is within the conditions of approval. A small number of incidents over the years has led to the suggestion that some fungicides in tank mix with pyrethroids might potentiate the activity of the latter against bees. A research and development project has been commissioned to look at possible synergism between pesticides and the Environmental Panel is giving this issue careful consideration.

Part 2: Incidents in 2003 where regulatory and/or enforcement action was considered

Misuse incidents

16. A number of incidents were reported where misuse of pesticides was identified (see Figure 1). These often result from poor storage, spillage, chemicals not being used in the approved manner (eg. rodenticide baits being left uncovered), or compounds being disposed of in an inappropriate way (Barnett and Fletcher, 1998). The chemicals found in this category tend to be predominantly rodenticides and molluscicides. In 2003, there were 17 (13%) misuse incidents (includes one honeybee incident) and 12 different compounds involved. There was one further misuse incident that has not been included in the number of poisoning incidents, as it was revealed during further investigation of an incident of mevinphos abuse. Rat carcases, which were found to contain brodifacoum, were not collected and disposed of and the rodent control treatment was with brodifacoum treated grain being used outside. In 2002, there were 20 (15%) misuse incidents (includes one honeybee incident) and 10 different compounds involved.

Figure 1: Proportion of all incidents by category of pesticide involvement in 2003 (All pesticide incidents in Northern Ireland were abuse).



Part 2: Incidents in 2003 where regulatory and/or enforcement action was considered

17. Three misuse incidents involved slug pellets and in two of these the active ingredient was, metaldehyde and the other involved methiocarb. It was reported that slug pellets, containing metaldehyde, had been applied to an arable field in the autumn and a spillage had been left there until February, when the incident occurred. The dog recovered after veterinary treatment. During the field investigation, there were some burnt packaging remains noted. In an incident in Scotland, a bag of metaldehyde slug pellets had become damp in the corner. The damp material acquired a plasticine-like consistency, so could not be used and was placed in another bag. This bag was inadvertently included with some material to be burnt. It is thought that some of the material remained after the fire, which the dog later had access to. The dog received veterinary treatment, but did not recover. Burning is not a recommended method for disposing of slug pellet residues, containing any of the approved active ingredients. There was an incident with methiocarb where the product had been used in a slug monitoring point. Fortunately, the dog received very prompt veterinary care and recovered. The use of slug pellets in slug monitoring points has caused many incidents of poisoning and is not an approved use of the products. There are alternative methods for assessing slug populations described in "Integrated control of slugs in arable farms – LK0925". Potentially wild animals, such as badgers and foxes, are likely to find the pellets palatable and are equally at risk when spillages are left uncleared. The fact that they are likely to skulk in cover once affected will mean that they are less likely, than are dogs, to be found and reported to the Scheme.

18. Uncovered bait, inadequately secured bait boxes, or storage in unlabelled containers, were found in the nine rodenticide misuse incidents. In five incidents, bromadiolone was involved, in three incidents, difenacoum (warfarin in one and coumatetralyl in another were also involved) and in one incident it was only warfarin. Dogs were involved in three incidents and there was an incident with a tawny owl and one with a badger. There were four incidents where only treated grain bait was involved. This had been inadequately protected in three incidents (two involved bromadiolone and one difenacoum) and in the fourth incident, a professional warfarin based rat control product had been supplied to a home owner for use against squirrels.

19. There were two incidents where samples were not forwarded for analyses, but pesticide misuse was suspected. Grain treated with the fungicides, bitertanol and fuberidazole, was not disposed of correctly in one incident. In the other incident, three dogs had access to a packet of Pathclear (paraquat) and remained well after they received prompt veterinary attention. The misuse of aluminium phosphide occurred in one incident, where setts were gassed during a rabbit control treatment. A dog was poisoned following exposure to a large spillage of Temik (aldicarb) that was left on a track. The product had been decanted into hoppers on the applicator and aldicarb had spilt during the journey to the fields. If the Sure Fill or Ultima packaging had been used, this incident may not have occurred. The honeybee misuse incident involved bendiocarb, where a feral bee control treatment had been undertaken close to the apiary site.

20. Further information about these incidents can be found in Appendix 2, or in later sections of this report.

Part 2: Incidents in 2003 where regulatory and/or enforcement action was considered

Abuse incidents

21. As in previous years, a large number of incidents involved the deliberate abuse of pesticides (see Figure 1, no incidents involved bees). During 2003, 85 incidents were attributed to abuse (68% of pesticide incidents); 78 were found in 2002, which represented 59% of pesticide incidents.

22. These abuse incidents involved 20 different compounds, compared with 15 in 2002. Nearly half of the abuse incidents involved carbamate compounds, either carbofuran or aldicarb. Alphachloralose also accounted for a large proportion of the abuse incidents. The number of incidents attributed to these compounds were: carbofuran, 32 (38%); alphachloralose, 12 (14%); and aldicarb, 8 (9%). Compounds found in abuse incidents in 2002 were: alphachloralose, 22 (28%); carbofuran, 21 (27%) and aldicarb, 10 (13%). Raptors were involved in a majority of the carbofuran incidents, although there were some incidents with corvids. Cats (two incidents), dogs (two incidents) and a fox were also attributed to carbofuran. There were two alphachloralose incidents that involved corvids and one a seized sample and the nine other incidents all involved raptors. Four of the aldicarb abuse incidents involved companion animals (three incidents, dogs and one, cats). The other four aldicarb abuse incidents involved: red kite (one incident); two peregrines (one incident); a rabbit bait (one incident); and contamination of a water supply for pheasant release pens. Ten of the abuse incidents involved more than one compound: carbofuran and alphachloralose; aldicarb and carbofuran; alphachloralose and bromadiolone; carbofuran, mevinphos, bromadiolone, alphachloralose and sodium cyanide; bromadiolone and warfarin; bromadiolone and coumatetralyl; brodifacoum and coumatetralyl; brodifacoum and bromadiolone; bromadiolone and difenacoum (two incidents).

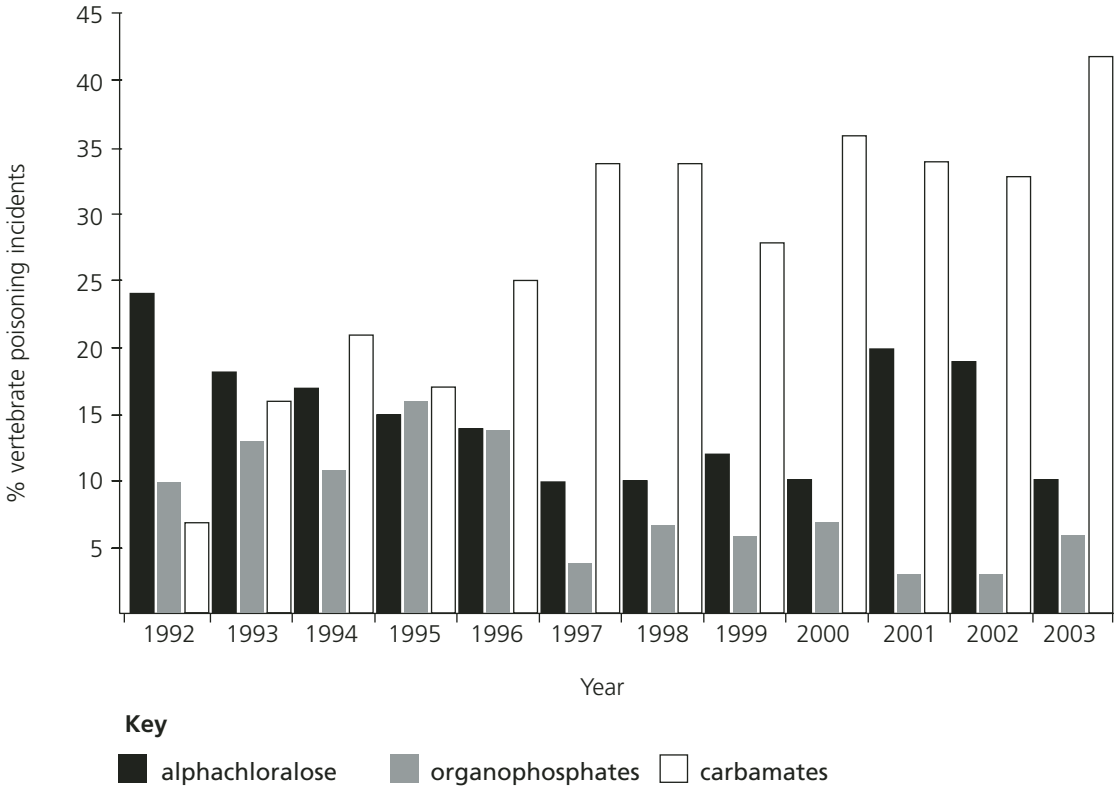
23. There were four (5%) incidents that involved the abuse of bendiocarb and apart from one incident with magpies, dogs (two incidents) and a cat were involved. There was an incident with another carbamate compound, thiodicarb, which had been left in a trail, possibly to poison gamebirds. An incident with methiocarb occurred when piles of pellets were left exposed, which may have been an action against badgers using the area. There were also five incidents with the metaldehyde slug pellet formulation. Metaldehyde abuse is often associated with companion animals and in 2003, there were three incidents with dogs, one incident with a fox and one where only a bait was submitted, but it had probably been intended for cats.

24. The anticoagulant rodenticides accounted for 13 (15%) abuse incidents: with 2 incidents attributed to brodifacoum; 6 incidents attributed to bromadiolone; 3 incidents attributed to coumatetralyl; 4 incidents attributed to difenacoum and 3 incidents attributed to warfarin (six of these incidents involved more than one compound, see paragraph above). The number of abuse incidents with anticoagulant rodenticides was seven (9%) during 2002. Eight of the incidents involved dogs and there were three incidents where only bait samples were involved. There were incidents where more than one compound was detected and one was an otter with brodifacoum and bromadiolone and another was a buzzard and crow with alphachloralose and bromadiolone. There was one incident not included in these statisitics, where the abuse of difenacoum and flocoumafen was discovered during further enquiries into an incident of carbofuran abuse.

Part 2: Incidents in 2003 where regulatory and/or enforcement action was considered

25. There were two abuse incidents with vertebrate gassing agents, which involved aluminium phosphide used to gas badger setts in one incident and a sample of sodium cyanide that was seized during the investigation of another incident. There were two sodium cyanide abuse incidents in 2002. The abuse of mevinphos occurred in three incidents (fox, red kites, pheasant and 30 rooks involved in these), compared to one incident in 2002 (see Figure 2). There was an incident of phorate abuse, which involved a buzzard, during 2003. Companion animals (four incidents with dogs and one with a cat) were involved in all five of the paraquat abuse incidents and there were also two incidents with dogs and strychnine abuse. There was another incident of strychnine abuse, where a buzzard was poisoned. There were two incidents of paraquat abuse and seven incidents of strychnine abuse, during 2002. Finally, there was an abuse incident where about 250 pheasants died when their water supply was contaminated with gamma-HCH.

Figure 2: Changing trends in the use of some pesticide classes in vertebrate incidents



Unspecified use incidents

26. There are always a number of incidents where the source of the compound is unknown, despite detailed field investigations. This may occur when animals travel some distance from where they were exposed to the pesticide, which is possible with anticoagulant rodenticide incidents and those where bendiocarb is involved. In 2003, 18 incidents of unspecified use (14% of pesticide poisoning incidents) were identified and six of these were bee incidents. There were 25 in 2002 (19%), with three bee incidents. There were 7 different compounds detected in these incidents, compared with 13 in 2002.

27. Badger faeces were confirmed as containing metaldehyde, but this was a rural area and the source of the pesticide was unknown. Dead plant material, which had residues of paraquat present, was submitted during an investigation of a neighbour dispute. A canary may have died following exposure to these contaminated plants. It was not possible to establish if the product had been applied according to the label instructions, so it has been classified to this category of use.

28. The compounds identified in the honeybee incidents were, bendiocarb (five incidents) and gamma-HCH (one incident). Feral bee treatments were the likely source of the bendiocarb, but none were known of in the area.

Anticoagulant rodenticide incidents

29. There is increasing concern over the number of incidents where anticoagulant rodenticides are implicated in the deaths of animals, particularly those where red kites are killed. Therefore, these unspecified use incidents are highlighted in this separate section. Given the species involved and the size of the residues present, it is likely that rodent control operations are the cause of these incidents. These compounds take some time to poison animals, as their mode of action is to delay the onset of symptoms so as to prevent target rodents from becoming bait shy. This, combined with a large hunting area, makes it difficult to trace all sources of rodenticide use in an area. Birds of prey are almost certainly being exposed through secondary poisoning only, which is by eating poisoned rodents, and this emphasises the need for thorough carcase searching during baiting operations. There have been some training initiatives undertaken by MAFF (now Defra) and advice leaflets produced by English Nature highlighting the risks to red kites within the release areas. There was a leaflet produced by English Nature and RSPB "Rat Poison and the Threat to Birds of Prey", which was issued in 2003. A leaflet has also been produced for Scotland by the RSPB, in partnership with Scottish Natural Heritage, Scottish Executive and Partnership for Action Against Wildlife Crime.

30. During 2003, there were eleven unspecified use incidents with these compounds and eight occurred in England (one incident involved a mixture of difenacoum and bromadiolone and another was difenacoum and brodifacoum) and three in Wales. In 2002, there were 17 incidents; ten incidents occurred in England, four in Scotland, one in Wales and two in Northern Ireland. Red kites were involved in nearly half of the incidents in this unspecified use category, with bromadiolone in four incidents (one incident also had a very small residue of difenacoum noted) and difenacoum in one incident. Five other poisoning incidents involved; cats (two incidents, one with coumatetralyl and one with difenacoum), a dog poisoned with bromadiolone, a fox with coumatetralyl (but some disease and a small residue of difenacoum noted) and feral pigeons poisoned with difenacoum and bromadiolone. Therefore, red kites were the only raptor involved in the five anticoagulant rodenticide incidents. In 2002, there were six of these incidents that involved red kites. Although rodent control operations were known of in the vicinities of many of these incidents, it was difficult to establish all sources of rodenticide use in each area.

31. One incident was assigned to this category, although the source of the rodenticide was known. Two carrion crows and a rabbit were found dead during a rat eradication programme, where great care had been taken to protect rodenticide baits from non-target species. One of the carrion crows had been found on the 17 March and the second crow and rabbit on the 30 April. This is part of a Seabird Recovery Project where difenacoum, in

the form of cereal bait blocks, had been used. The baits were placed at 50m intervals throughout the area and were housed in lengths of drainage pipes. These pipes had a piece of wire across the entrance way to restrict access and to discourage entry by birds and rabbits. The analyses undertaken confirmed significant residues of difenacoum in a liver sample from the crows and the rabbit and this was likely to be the cause of their death. There were also small residues of brodifacoum in their livers and in the crows, this was about half the size of the difenacoum residue and in the rabbit, it was about ten times smaller. This difference in residue size could be because the crows will eat other poisoned animals that may have accumulated more than one residue, whereas the rabbit will only eat rodenticide bait. This incident was considered to be an approved use, as all label instructions had been followed, but there was no reported use of brodifacoum on the Island. To try to determine how these animals had incurred residues of brodifacoum, a sample of bait blocks was submitted for analysis. These were found to contain difenacoum and a brodifacoum residue, that was approximately 100 times smaller than the difenacoum residue. Therefore, it appeared that bait blocks were contaminated with another rodenticide active ingredient during production, so additional samples of bait block were submitted for testing. Only difenacoum was confirmed in one sample, but the other had difenacoum and a small residue of flocoumafen. The users had taken appropriate precautions and thought that the products they had used contained only difenacoum, but analysis has proved that other active ingredients were also present. However, this is not strictly a misuse incident, as the user was not aware of the contamination issue, but it also cannot be approved use, as brodifacoum has no approval for use outdoors. Therefore, the incident has been categorised as unspecified use. Many hundreds of kilos of bait had been used on the Island and only a very small sample was submitted for testing. Therefore, it is difficult to assess the extent and impact of this suspected contamination of a rodenticide product during manufacture. The licence holder concerned has been informed and will be required to produce data to verify that their products are free from contamination with other active ingredients.

Anticoagulant rodenticide sub-lethal exposure

32. During 2003, only raptors from England and Wales were screened for anticoagulant rodenticides, even when death was from another cause. In 2003, there were eight incidents where sub-lethal exposure had occurred; five were from England and three were from Wales. In 2002, there were eighteen incidents where sub-lethal exposure had occurred; seven were from England, five were from Wales and six from Scotland. In England, there were three incidents where red kite deaths resulted from the use of other pesticides (two were abuse and one was approved use), but exposure to anticoagulant rodenticides had also occurred (In 2002, there were six such incidents, three red kites and three buzzards). The abuse incidents involved exposure to difenacoum and the approved use incident was exposure to bromadiolone. In the five other incidents, death was attributed to trauma in four incidents and starvation in one incident. Exposure to difenacoum had occurred in all of these incidents, but bromadiolone was also present in two incidents of trauma. The incidents where two compounds were present, occurred in England and involved a buzzard and an incident with three barn owls. The two other trauma incidents occurred in Wales and involved red kites. The remaining incident, which also occurred in Wales, involved a buzzard which died from starvation. There were two further incidents where background residues of anticoagulant rodenticides were determined in other species. Coumatetralyl was determined in a dog, but the cause of death was attributed to disease and a badger had been exposed to bromadiolone, but the cause of death was unknown.

Part 2: Incidents in 2003 where regulatory and/or enforcement action was considered

Enforcement action

33. Government Departments remain committed to use all available enforcement methods to help stamp out illegal poisoning. Where the information collected on an incident indicates that breaches of pesticides legislation may have occurred, a range of regulatory action is considered.

34. Where there appears to be sufficient evidence of illegal activity, cases are referred for formal investigation and ultimately court action may be taken. Any fines and costs subsequently imposed, together with the publicity such cases attract, are an incentive to use pesticides properly.

35. Even where a formal investigation or prosecution action is not warranted, other regulatory action, for example the issue of Enforcement Notices or warning letters, may be taken. Also, it may sometimes be appropriate to transfer a case to another regulatory authority, such as the police. In these circumstances, Defra will remain on hand to offer technical and legal assistance.

36. 157 cases were considered for possible enforcement action in 2003. Of these, 100 did not have sufficient evidence to take further action and were closed. In the remaining incidents, a variety of regulatory action was taken. Much of this involved helping the police force by producing witness statements, lists of non-approved products and sample charges for the Crown Prosecution Service to consider. Several incidents were referred to Investigations Branch. Seven cases were taken to court and six of these resulted in a guilty verdict. In total twenty three Enforcement Notices, advice letters or warning letters were issued and three cases were transferred to other enforcement authorities.

37. One case dealt with a pest controller who pleaded guilty to, and was convicted of failing to take all reasonable precautions to protect the health of human beings, creatures and plants when using strychnine hydrochloride. The defendant was fined £500 and ordered to pay £500 in costs. The prosecution arose after a fox was found dead on a homeowner's lawn, after the defendant was hired to treat a mole infestation. The treatment was correctly carried out by baiting the mole runs with strychnine loaded worms, but also some strychnine was placed in pots under bushes, and the next day the homeowner found the carcass of the fox on his lawn.

38. One of the Enforcement Notices was issued after a pest controller failed to keep a secure pesticide store. Damaged or unlabelled containers connected with Phostoxin were not kept in a proper, secure manner and waste strychnine bottles were kept on the premises and not disposed of safely. The Enforcement Notice required the farmer to provide a secure pesticide store and to dispose of all empty and/or damaged and/or unlabelled pesticide containers through a licensed/authorised specialist waste disposal operator.

39. No incidents from Wales were referred to Defra Investigations Branch during 2003. There was one incident, where further enquiries were made by the North Wales Police after alphachloralose was confirmed in a peregrine found near a tethered pigeon. The Police received some information as to the likely suspect, but further investigation found no evidence to support this.

Part 2: Incidents in 2003 where regulatory and/or enforcement action was considered

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

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

42. SEERAD officials carried out 25 field investigations during 2003. Eighteen of these were joint operations with the police, and some also involved RSPB Investigation Officers. The police pursued 12 incident investigations independently.

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Species/samples involved

43. A total of 397 incidents was investigated during 2003. The categories of animals (animals of more than one category may have been involved in a single incident) and suspected baits involved are listed in Table 1. 340 incidents involved vertebrates, 24 involved bees and 31 were suspected baits and/or seized samples. The cause of death or illness (including pesticides and other chemicals, trauma, starvation and disease) was established in 203 (51%) of all incidents. A further 17 (4%) were classed as 'not applicable', as they involved suspected baits where no dead animals were involved and analyses, or further information, failed to show the involvement of any pesticides. Pesticides were implicated in 126 (32%) of the incidents (compared with 131 (29%) in 2002); 63 (30%) incidents with vertebrate wildlife, 8 (33%) incidents with bees, 42 (32%) incidents with companion animals and 14 (45%) incidents with suspected baits only. A geographical breakdown of the data is shown in Table 2.

Table 1: Numbers of incidents investigated in 2003

	Incidents investigated	Pesticide poisoning	Other cause of death found
Vertebrate wildlife	208	63 (30%)	62 (30%)
Companion animals	130	42 (32%)	14 (11%)
Livestock	5	0	1 (20%)
Exotics	2	0	0
Bees	24	8 (33%)	0
Suspected baits and suspicious substances	31	14 (45%)	not applicable
TOTAL*	**397**	**126 (32%)**	**77 (19%)**

***Animals from more than one category may be involved in a single incident.**

Table 2: Incidents investigated by country in 2003 (% pesticide as cause)

	England	Wales	Scotland	N.Ireland
Vertebrate wildlife	64 (41%)	35 (23%)	86 (28%)	23 (22%)
Companion animals	60 (35%)	5 (20%)	41 (24%)	24 (42%)
Livestock	1 (0%)	0	4 (0%)	0
Exotics	0	0	2 (0%)	0
Bees	18 (39%)	3 (33%)	3 (0%)	0
Suspected baits and suspicious substances	19 (47%)	1 (0%)	9 (33%)	2 (100%)
TOTAL*	**160 (39%)**	**43 (23%)**	**145 (26%)**	**49 (35%)**

***Animals from more than one category may be involved in a single incident.**

Part 3: Incidents in 2003: Species/samples and the pesticides involved

44. A comparison of the number of poisoning incidents for each category of animal from 1994 to 2003 is shown in Table 3.

Table 3: Number of incidents in which pesticides were identified as a likely cause of poisoning 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Vertebrate wildlife	76	62	77	54	49	57	68	55	63	63
Livestock	3	2	2	1	4	2	0	0	1	0
Companion animals	101	91	97	86	90	48	58	34	45	42
Exotic species	0	0	0	0	2	0	0	0	0	0
Fish	0	0	2	0	0	0	0	0	0	0
Earthworms	0	0	0	0	1	1	0	0	0	0
Bees	20	33	8	15	12	9	13*	5	5	8
Suspected baits and suspicious substances	16	28	29	32	29	22	28	16	20	14
TOTAL**	**211**	**208**	**204**	**185**	**185**	**139**	**162**	**109**	**131**	**126**

***Four of these incidents are likely to be associated with one pesticide application.**

****Animals from more than one category may be involved in a single incident.**

45. A list of the pesticides detected (including bee incidents), is shown in Table 4, which also lists the species involved and the presence of compounds in seized samples. Residues of pesticides, mainly anticoagulant rodenticides (see earlier section), are sometimes detected at sub-lethal levels in the tissues of animals.

Table 4: Numbers of incidents* involving individual pesticides in 2003 and species and/or bait involved

Organochlorine compounds		
gamma-HCH	2	pheasant, honeybee, sample.
Organophosphorus compounds		
diazinon (veterinary product)	1	red kite.
mevinphos	4	pheasant, red kite, rook, fox, rat, cat, bait, sample.
phorate	1	buzzard.
propetamphos (veterinary product)	1	red kite.
Carbamate compounds		
aldicarb	11	blackbird, moorhen, peregrine, pheasant, red kite, squirrel, cat, dog, bait, sample.
bendiocarb	10	magpie, cat, dog, honeybee, bait.
carbofuran	32	blackbird, buzzard, crow, magpie, moorhen, peregrine, raven, red kite, rook, sea eagle, sparrowhawk, fox, cat, dog, bait, sample.
methiocarb	2	fox, field mouse, dog, pellets, sample.
thiodicarb	1	grain, pellets.

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Table 4: Numbers of incidents* involving individual pesticides in 2003 and species and/or bait involved (continued)

Rodenticides			
brodifacoum	4	crow, otter, rabbit, rat, dog, grain bait.	
bromadiolone	18	buzzard, crow, pigeon, red kite, otter, dog, bait, grain.	
coumatetralyl	6	fox, cat, dog, sample.	
difenacoum	11	crow, dove, red kite, badger, rabbit, cat, dog, bait, grain.	
flocoumafen	2	sample, bait.	
warfarin	4	dog, grain.	
In addition to the above, there were 10 incidents where residues of one or more of these compounds were detected and were considered to be at sub-lethal levels.			
Pyrethroid compounds			
alpha-cypermethrin	1	honeybee.	
In addition to the above small residues of fluvalinate were detected in 6 honeybee incidents. These were probably associated with varroa mite treatments. The fungicide, flusilazole, was also present in the alpha-cypermethrin incident.			
Herbicides			
paraquat	7	cat, dog, bait, plant, sample.	
Other compounds			
alphachloralose	12	buzzard, crow, peregrine, red kite, rook, bait, powder.	
bitertanol/fuberidazole	1	grain.	
cyanide	1	sample.	
metaldehyde	8	badger, fox, dog, bait, pellets.	
phosphine	2	badger sett.	
strychnine	4	buzzard, dog, bait, sample.	
Causes of death other than pesticides			
disease	16	ethylene glycol	1
starvation	17	naphthalene	1
trauma	42	not applicable	17
unknown	177		

***Some incidents will involve more than one pesticide, see later sections and Appendix 2.**

46. Appendix 2 lists all the incidents where pesticides were detected from throughout the United Kingdom during 2003.

Vertebrate wildlife: mammals

47. A total of 44 wild mammals incidents was investigated in 2003 and the cause of death was established in 16 of these incidents, with 10 confirmed as pesticide poisoning (see Table 5). Table 6 shows the number and percentage of pesticide poisonings for the past ten years.

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Table 5: Numbers of incidents involving wild mammals in 2003

		Number of incidents investigated*	Number (%) in which pesticide poisoning was identified	Number (%) in which another cause of death was identified
Badger	England	8	2 (25%)	2 (25%)
	Wales	2	0	1 (50%)
		10	**2 (20%)**	**3 (30%)**
Fox	England	8	4 (50%)	2 (25%)
	Wales	1	0	0
	Scotland	2	1 (50%)	0
		11	**5 (45%)**	**2 (18%)**
Rabbit	England	1	1 (100%)	0
	Scotland	2	0	0
		3	**1 (33%)**	**0**
Squirrel	England	2	0	0
	Scotland	1	0	0
	N. Ireland	2	0	0
		5	**0**	**0**
Bat	Scotland	**2**	**0**	**0**
Hare	N. Ireland	**3**	**0**	**0**
Mole	Scotland	**1**	**0**	**0**
Mouse	England	**1**	**1 (100%)**	**0**
Otter	N. Ireland	**2**	**1 (50%)**	**0**
Polecat	England	**1**	**0**	**1 (100%)**
Rat	England	**2**	**0**	**0**
Seal	N. Ireland	**2**	**0**	**0**
Shrew	N. Ireland	**2**	**0**	**0**
Vole	Scotland	1	0	0
TOTAL*	England	22	8 (36%)	5 (23%)
	Wales	3	0	1 (33%)
	Scotland	8	1 (13%)	0
	N. Ireland	11	1 (9%)	0
		44	**10 (23%)**	**6 (14%)**

***Mammals from more than one category may be involved in a single incident.**

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Table 6: Incidents involving wild mammals 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	156	104	77	85	68	54	56	30	52	44
Pesticide incidents	11%	13%	26%	19%	12%	31%	16%	23%	21%	23%

Badger

48. Ten incidents with badgers were submitted to the Scheme in 2003 and the cause of death was established in five of these, with two confirmed as pesticide poisoning. An incident of misuse of difenacoum and warfarin occurred when badgers were accessing bait that had been placed in rat burrows. In the other incident, the source of the metaldehyde could not be determined.

49. Badger setts were suspected to have been targeted in five incidents, but there were no residues determined in the samples submitted. However, there were two incidents that involved the illegal use of aluminium phosphide at badger setts. In one incident misuse had occurred, as the setts were gassed during a rabbit control treatment, but the other incident was an abuse of the compound.

Fox

50. As foxes are considered a pest species and are often the target for illegal poisoning, there are always a large number of incidents with this species reported to the Scheme. Table 7 shows the number and percentage of pesticide poisonings for the past ten years.

Table 7: Incidents involving foxes 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	57	54	41	33	27	24	28	9	24	11
Pesticide incidents	18%	17%	34%	33%	15%	42%	25%	33%	29%	45%

51. In 2003, 11 incidents with foxes were investigated. The cause of death was established in seven of these incidents, with five confirmed as pesticide poisoning. Four incidents occurred following the abuse of pesticides and two of these incidents were with carbofuran, one with metaldehyde and one with mevinphos. The anticoagulant rodenticide, coumatetralyl, was involved in an incident of unspecified use.

Other mammals

52. Twenty three incidents with other mammals were investigated in 2003 (see Table 5). The cause of death was established in four of these incidents, with three confirmed as pesticide poisoning. A rabbit was poisoned during the unspecified use of difenacoum (see earlier section), a field mouse was poisoned following the abuse of methiocarb and an otter was poisoned following the abuse of brodifacoum and bromadiolone.

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Vertebrate wildlife: birds

53. A total of 167 wild bird incidents were investigated in 2003 and the cause of death was established in 112 of these incidents, with 56 identified as pesticide poisoning (see Table 8). Table 9 shows the number and percentage of pesticide poisonings for the past ten years.

Table 8: Number of incidents involving wild birds in 2003

		Number of incidents investigated*	Number (%) in which pesticide poisoning was identified	Number (%) in which another cause of death was identified
Birds of prey including owls	England	32	13 (41%)	8 (25%)
	Wales	26	7 (27%)	14 (54%)
	Scotland	71	22 (31%)	26 (37%)
	N. Ireland	7	3 (43%)	0
		136	**45 (33%)**	**48 (35%)**
Corvids	England	7	3 (43%)	3 (43%)
	Wales	4	2 (50%)	1 (25%)
	Scotland	9	3 (33%)	0
	N. Ireland	2	2 (100%)	0
		22	**10 (45%)**	**4 (18%)**
Gamebirds	England	3	3 (100%)	0
	Scotland	2	1 (50%)	0
	N. Ireland	1	0	0
		6	**4 (67%)**	**0**
Gulls and waders	England	3	0	2 (67%)
	Wales	1	0	1 (100%)
	Scotland	1	0	0
	N. Ireland	1	0	1 (100%)
		6	**0**	**4 (67%)**
Pigeon and doves	England	**3**	**1 (33%)**	**1 (33%)**
Wildfowl and waterbirds	Wales	1	0	1 (100%)
	Scotland	2	0	0
	N. Ireland	2	0	2 (100%)
		5	**0**	**3 (60%)**
Other birds	England	5	0	0
	Scotland	1	0	0
		6	**0**	**0**
TOTAL*	England	45	21 (47%)	10 (22%)
	Wales	31	8 (26%)	17 (55%)
	Scotland	79	23 (29%)	26 (33%)
	N. Ireland	12	4 (33%)	3 (25%)
		167	**56 (33%)**	**56 (33%**

***Birds from more than one category may be involved in a single incident.**

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Table 9: Incidents involving wild birds 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	267	232	199	155	192	151	178	150	184	167
Pesticide incidents	24%	22%	30%	26%	22%	28%	33%	32%	30%	33%

Birds of prey (including owls)

54. There were 136 incidents with birds of prey (see Table 8 and 10) investigated in 2003. The cause of death was established in 93 of these incidents, with 45 identified as pesticide poisoning. Table 11 shows the number and percentage of pesticide poisonings for the past ten years.

Table 10: Number of incidents involving birds of prey (excluding owls) in 2003

		Number of incidents investigated	Number (%) in which pesticide poisoning was identified	Number (%) in which another cause of death was identified
Buzzard	England	13	4 (31%)	4 (31%)
	Wales	12	1 (8%)	7 (58%)
	Scotland	40	12 (30%)	13 (33%)
	N. Ireland	5	3 (60%)	0
		70	**20 (29%)**	**24 (34%)**
Eagle	Scotland	**3**	**1 (33%)**	**0**
Hen harrier	Scotland	**2**	**0**	**1 (50%)**
Kestrel	Scotland	4	0	2 (50%)
	N. Ireland	1	0	0
		5	**0**	**2 (40%)**
Peregrine	England	2	2 (100%)	0
	Wales	4	3 (75%)	0
	Scotland	3	2 (67%)	1 (33%)
		9	**7 (78%)**	**1 (11%)**
Red kite	England	7	7 (100%)	0
	Wales	9	3 (33%)	6 (67%)
	Scotland	10	7 (70%)	3 (30%)
		26	**17 (65%)**	**9 (35%)**
Sparrowhawk	England	2	0	1 (50%)
	Scotland	1	1 (100%)	0
		3	**1 (33%)**	**1 (33%)**
Harris Hawk	N. Ireland	**1**	**0**	**0**

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Table 11: Incidents involving birds of prey (including owls) 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	134	131	122	84	97	98	136	111	129	136
Pesticide incidents	28%	24%	34%	25%	30%	34%	38%	37%	31%	33%

Common buzzard

55. There were 70 reported incidents with common buzzards in 2003. In 44 of the incidents, the cause of death was established and 20 of these were attributed to pesticide poisoning.

56. Deliberate abuse of pesticides accounted for all of the incidents. Carbofuran abuse was involved in thirteen incidents and alphachloralose abuse was involved in five incidents (one incident also involved bromadiolone). There was also an incident that involved the abuse of phorate and one that involved the abuse of strychnine. There were two buzzard incidents, where anticoagulant rodenticide residues were confirmed as present, but were not considered to be the cause of death (see section on anticoagulant rodenticides and Appendix 2).

Red kite

57. There were 26 reported incidents with red kites in 2003, some of which were introduced birds. The cause of death was identified in all of the incidents, with 17 attributed to pesticide poisoning and in three of these incidents more than one bird was involved (two red kites in two incidents and three in another). Nearly half of these incidents were from the abuse of carbamate compounds, with carbofuran implicated in seven incidents and aldicarb in one incident. There was an abuse incident which was attributed to alphachloralose (an incident that involved three red kites and two buzzards) and another which was attributed to mevinphos (an incident that involved two red kites and a fox). The unspecified use of anticoagulant rodenticides was involved in five incidents and four of these involved bromadiolone and one involved difenacoum. There was one incident where the abuse of two veterinary compounds, diazinon and propetamphos, was suspected. Finally, there was one approved use incident, which involved aldicarb (see earlier section).

58. There were five red kite incidents where anticoagulant rodenticide residues were confirmed, but were not considered to be the cause of death (see section on anticoagulant rodenticides and Appendix 2). In three of these incidents, the cause of death was attributable to another pesticide.

Eagle

59. One golden eagle and two sea eagle incidents were submitted in 2003. The cause of death was established in one sea eagle incident, where the abuse of carbofuran had occurred.

Peregrine falcon

60. There were nine peregrine falcon incidents reported to the Scheme during 2003. The cause of death was established in eight incidents, with seven the result of pesticide abuse. There were three incidents with alphachloralose, three with carbofuran and one with aldicarb. No anticoagulant rodenticide residues were found in the peregrines submitted from England and Wales.

Other raptor species

61. Other species of raptor were submitted as possible pesticide poisoning victims. These included five kestrels, three sparrowhawks and two hen harriers. An incident with a Harris hawk (assumed to be a falconers bird) was also reported, but the cause of death was not established. The cause of death was determined in two of the kestrel incidents, two of the sparrowhawk incidents and one hen harrier incident. Only one incident was attributed to pesticide poisoning, from the abuse of carbofuran, and two sparrowhawks were involved in the incident. A sparrowhawk, from England, was screened for anticoagulant rodenticide residues, but none were found.

Owls

62. There were eighteen owl incidents notified in 2003, fourteen incidents involved barn owls and six involved tawny owls (two incidents involved both species). The cause of death of the birds was identified in nine of the incidents, but none were due to pesticide poisoning. There was an incident where barn owls had residues of anticoagulant rodenticides present (difenacoum and bromadiolone), but their cause of death was attributed to trauma.

Wildfowl and water birds

63. In 2003, there were five incidents investigated by the Scheme that involved wildfowl and water birds. The cause of death was identified in three of these incidents and none involved pesticide poisoning.

Gulls and waders

64. There were six incidents with gulls and waders in 2003 and the cause of death was established in four of these incidents, with none attributed to pesticide poisoning.

Pigeons and doves

65. Pigeons and doves were reported in three incidents in 2003 and the cause of death was determined in two of the incidents, with one attributed to pesticide poisoning. There was an incident where 22 feral pigeons died and residues of difenacoum and bromadiolone were found in some birds tested, but no source for these anticoagulant rodenticides was found.

Corvids

66. This group of birds is often the target of deliberate pesticide poisoning, as they are considered by some to be pests. In 2003, there were 22 incidents reported and the cause of death was found in 14 incidents, with 10 of them attributed to pesticide poisoning. Abuse of pesticides occurred in nine of these incidents and many involved other species, particularly raptors. There was one incident of unspecified use (see earlier section). Table 12 shows the number and percentage of pesticide poisonings for the past ten years.

Table 12: Incidents involving corvids 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	39	29	30	22	26	19	13	12	22	22
Pesticide incidents	33%	28%	57%	41%	15%	47%	31%	33%	36%	45%

67. Carbofuran was implicated in four of the incidents and in one of these alphachloralose was also involved. Alphachloralose was also involved in three other incidents with corvids (an incident with a buzzard and a crow, also involved the abuse of bromadiolone). Magpies, crows and rooks were among the corvid species involved in these incidents. A mevinphos incident involved a pheasant and 30 rooks and an incident with bendiocarb, involved three magpies. The unspecified use of difenacoum and brodifacoum occurred in an incident with two crows and a rabbit (see earlier section).

Gamebirds

68. There were six incidents notified in this category in 2003 and pesticide poisoning was determined in four, with three incidents of abuse and one incident of approved use. The mevinphos incident involved numerous rooks, as well as a pheasant. During 2003, about 500 pheasants were killed in two incidents, where a pesticide (gamma-HCH in one incident and aldicarb in the other) was intentionally introduced into the water supply for pheasant rearing pens. There was one approved use incident, which involved a pheasant poisoned with aldicarb (see earlier section).

Other birds

69. This category includes passerines (mainly garden birds) and other birds not dealt with in earlier sections. There were six incidents reported and the cause of death was not determined in any of these incidents.

Companion animals

70. There were 130 incidents with companion animals reported to the Scheme in 2003 (see Table 13). The cause of death was established in 56 incidents, with pesticides implicated in 42 of these.

Table 13: Number of incidents involving companion and other animals in 2003

		Number of incidents investigated*	Number (%) in which pesticide poisoning was identified	Number (%) in which another cause of death was identified
Cat	England	13	3 (23%)	3 (23%)
	Wales	2	0	0
	Scotland	18	3 (17%)	1 (6%)
	N. Ireland	2	1 (50%)	0
		35	**7 (20%)**	**4 (11%)**
Dog	England	43	17 (40%)	9 (21%)
	Wales	3	1 (33%)	0
	Scotland	23	7 (30%)	0
	N. Ireland	22	9 (41%)	1 (5%)
		91	**34 (37%)**	**10 (11%)**
Canary	England	**2**	**1 (50%)**	**0**
Ferret	Wales	**1**	**0**	**0**
Parrot	England	**1**	**0**	**0**
Pony	England	**1**	**0**	**0**

Part 3: Incidents in 2003: Species/samples and the pesticides involved

Table 13: Number of incidents involving companion and other animals in 2003 (continued)

		Number of incidents investigated*	Number (%) in which pesticide poisoning was identified	Number (%) in which another cause of death was identified
TOTAL*	England	60	21 (35%)	12 (20%)
	Wales	5	1 (20%)	0
	Scotland	41	10 (24%)	1 (2%)
	N. Ireland	24	10 (42%)	1 (4%)
		130	**42 (32%)**	**14 (11%)**
Frog	England	**1**	**0**	**0**
Cattle	Scotland	2	0	0
Poultry	England	1	0	1 (100%)
	Scotland	1	0	0
Sheep	Scotland	1	0	0
TOTAL		**5**	**0**	**1 (20%)**

***Animals from more than one category may be involved in a single incident.**

Table 14 shows the number and percentage of pesticide poisonings for the past ten years.

Table 14: Incidents involving companion animals 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	313	271	275	253	235	149	160	109	150	130
Pesticide incidents	49%	34%	35%	34%	38%	32%	36%	31%	30%	32%

Cat

71. There were 35 incidents with cats in 2003 and the cause of death was determined in 11. In the 7 pesticide incidents, about 11 individuals were poisoned. Table 15 shows the number and percentage of pesticide poisonings for the past ten years.

Table 15: Incidents involving cats 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	125	90	112	110	91	58	63	41	40	35
Pesticide incidents	41%	33%	38%	37%	38%	24%	30%	29%	30%	20%

72. Pesticide abuse accounted for five incidents: two incidents involved carbofuran; one aldicarb; one bendiocarb; and one paraquat. An incident with the unspecified use of coumatetralyl occurred. There was an incident with a feral cat that was attributed to difenacoum, but the animal also had residues of coumatetralyl, bromadiolone and brodifacoum present. The cat had been found dead with a rabbit carcase and it was probably scavenging on other small mammals.

73. Ethylene glycol (anti-freeze) poisoning was diagnosed in an incident where five young cats died from acute renal failure as a result of ingesting this product.

Dog

74. The Scheme registered 91 incidents with dogs in 2003. The cause of death was determined in 44 incidents. In the 34 pesticide incidents, about 40 dogs were poisoned. Table 16 shows the number and percentage of pesticide poisonings for the past ten years.

Table 16: Incidents involving dogs 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	183	170	163	138	149	89	98	63	104	91
Pesticide incidents	28%	39%	35%	33%	40%	38%	41%	33%	32%	37%

75. The abuse of pesticides was found in 24 incidents and involved a wide range of compounds. Vertebrate control products were abused in ten incidents. Eight of these incidents involved anticoagulant rodenticides: three incidents with coumatetralyl (one of these incidents also involved brodifacoum and another incident also involved bromadiolone); three incidents with warfarin (one of these incidents also involved bromadiolone); two incidents with difenacoum and two incidents with strychnine. Carbamate abuse was identified in six incidents: two with aldicarb; two with bendiocarb; and two with carbofuran (one of these incidents also involved aldicarb). There were four incidents with slug pellets and three of these involved metaldehyde and one methiocarb. Finally, there were four incidents that involved the abuse of paraquat.

76. The misuse of pesticides accounted for eight incidents and four of these involved spillages, improper disposal or excessive application rates. Two incidents involved metaldehyde, one methiocarb and another aldicarb. The aldicarb incident involved very extensive spillages on a farm track, where a dog died after being walked in the area. There were three incidents that involved anticoagulant rodenticides, with bromadiolone involved in two incidents and a mixture of coumatetralyl and difenacoum in the other incident. There was an incident with a package of paraquat, which had been left in an area that was accessible to three dogs. The package was torn apart and some contents were missing, assumed to have been eaten by the dogs. No samples were received for testing and the dogs received prompt treatment and recovered.

77. There was only one incident where the source of the pesticide was not known and this involved bromadiolone.

78. There was one approved use incident, which involved metaldehyde and is discussed in the approved use section of this report.

Other companion animals

79. There were five incidents with other companion animals (see Table 13 for species). There was one incident where the deaths of canaries may have been caused by feeding contaminated plant material (carcases were not available for analysis). The incident has been classified as unspecified use of paraquat, as it is not known if the product had been used in the correct manner and tests on a sample of vegetation confirmed that paraquat residues were present.

Other vertebrates

80. There was one incident that involved a frog, but no cause of death was determined.

Livestock

81. Livestock are not normally included in the Scheme, but they may be accepted if there are other environmental samples associated with the incident. There were no incidents attributed to pesticides, during 2003, which involved livestock.

Honeybees

82. There were 24 suspected honeybee poisoning incidents investigated during 2003 (see Table 17), with 18 incidents reported from England, 3 incidents reported from Wales and 3 incidents reported from Scotland. Pesticides were implicated in eight (33%) of these incidents; seven were from England and one from Wales. There were no pesticide incidents reported from Scotland.

Table 17: Number of incidents involving bees in the UK during 2003

Number of incidents investigated:	**24**	
Number of incidents attributed to pesticides:	**8**	
Pesticide detected*	**Number of incidents**	**Number of colonies affected**
Carbamate compounds bendiocarb	6	22
Organochlorine compounds gamma-HCH	1	1
Pyrethroid compounds alpha-cypermethrin	1	2
TOTAL	**8**	**25**

***There were six incidents where small residues of fluvalinate were detected, see Appendix 2 for further details. Flusilazole was also confirmed in honeybees with a residue of alpha-cypermethrin.**

Part 3: Incidents in 2003: Species/samples and the pesticides involved

83. There were diseased honeybees found in four incidents investigated, but this was not considered to be the likely explanation for the observed mortality. The cause of death in the remaining honeybee incidents could not be determined. There were six incidents where small residues, approximately 0.005 micrograms fluvalinate per bee, were noted in the bees examined. The presence of this pesticide is not thought to be the cause of death of the bees, but an indication of the use of the compound to control varroa mites. These residues have not been confirmed by an alternative method, but they are reported in Appendix 2 to show the frequency that residues of this compound are noted.

84. Three different compounds have been detected in the incidents attributed to pesticides (see Table 17). In the alpha-cypermethrin incident, the sample of bees also had a confirmed residue of the fungicide, flusilazole. For reviews and articles on bee poisoning incidents refer to: Fletcher, M. & Barnett, L. 2003; Barnett, Libby. 2002; Barnett, E.A. et al., 1997; Fletcher, M.R. et al., 1994; and Greig-Smith, P.W. et al., 1994. For the incidents investigated and the percentage of pesticide poisonings for the past ten years refer to Table 18, and for a summary of the 2003 incidents, where pesticides were involved, refer to Table 19.

Table 18: Incidents involving bees 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	45	56	40	40	43	28	48	23	25	24
Pesticide incidents	44%	59%	20%	40%	28%	32%	27%	22%	20%	33%

Table 19: Pesticides detected in honeybee incidents in the UK during 2003

Month	Location	Number of colonies in apiary	Number of colonies affected	Pesticide involved	Level detected (µg/bee)
May	Surrey	25	12	bendiocarb	0.093
June	South Glamorgan	6	2	alpha-cypermethrin flusilazole	0.018 0.14
July	Cambridgeshire	2	1	gamma-HCH	0.053
July	Surrey	25	3	bendiocarb	0.14
August	Berkshire	6	3	bendiocarb	0.031
August	Middlesex	4	2	bendiocarb	0.04
August	Surrey	4	1	bendiocarb	0.03
August	Surrey	2	1	bendiocarb	0.33

85. The incidents where pesticides were detected are also summarised in Appendix 2. There was one incident of approved use, in Wales, where alpha-cypermethrin residues were confirmed in the honeybees analysed (see earlier section). There was also an incident in North Yorkshire (see Appendix 2) where cypermethrin and fungicides (chlorothalonil and cyproconazole) had been applied to a bean crop. The sample of bees available was small and weathered and only a possible fluvalinate residue was noted. Pyrethroid insecticides, although very toxic to honeybees under laboratory conditions, are considered not to pose

an unacceptable risk to bees when applied to certain flowering crops in the field. However, the Scheme has reported incidents with these compounds and often they are associated with use in a mix with fungicides. The possibility that some pyrethroid/fungicide mixtures might pose a risk to bees is currently being investigated. An important source of data on this issue is WIIS, so beekeepers must continue to be vigilant and collect a sample of dead honeybees as soon as possible when they suspect a pesticide poisoning incident has occurred.

86. There was an incident that involved the misuse of bendiocarb, as a nearby feral bee control treatment had occurred and the treated area was not adequately protected. There were five other incidents that involved bendiocarb, but they were assigned to unspecified use. However, it is likely that all these incidents were due to honeybees robbing bendiocarb treated comb, which had not been sealed off or removed adequately, during a feral bee control treatment. Despite thorough field investigations, the source of the gamma-HCH in the remaining incident has not been established.

87. A beekeeper in Surrey, noticed up to 100 dead honeybees outside each affected hive. There are 25 colonies on the site and 12 of these were affected. The dead bees had their proboscis extended, so poisoning was suspected. The colonies had generally been in good condition, but European Foul Brood had been diagnosed in two colonies within the apiary. The weather had been cloudy and cool and the bees were likely to be foraging on garden flowers, shrubs and trees. The apiary had been inspected the day before, when no dead bees had been present. The laboratory tests confirmed a residue of 0.093 micrograms bendiocarb per bee, so it is likely that these bees died from pesticide poisoning. Further enquiries revealed that a Ficam-D (bendiocarb) treatment had been undertaken in a nearby residence. It is assumed that these honeybees robbed bendiocarb treated comb, which had not been removed or adequately sealed off. This beekeeper also reported two further suspected poisoning incidents, one that occurred in July and the other in August. The incident in July occurred at the same apiary site, but only three colonies were affected. The laboratory tests confirmed a residue of 0.14 micrograms bendiocarb per bee in this incident, so these bees have died from pesticide poisoning. In August, a few hundred dead bees were found outside one colony at another apiary site. The laboratory tests confirmed a residue of 0.33 micrograms bendiocarb per bee, so these bees have died from pesticide poisoning. There were no pesticide treatments known of in the area at this time.

88. In Berkshire, thousands of dead bees were found at three out of six colonies in an apiary. Most of the bees were already dead and in a putrefied state, but some were seen falling and staggering around. There had been slight chalk brood on two colonies, but apart from this they were fine when inspected a few weeks before the incident. The bees were probably foraging on heather, clover and various garden flowers, as there were no agricultural or horticultural crops within flying distance. The laboratory tests confirmed a residue of 0.031 micrograms bendiocarb per bee, so it is likely that these bees died from pesticide poisoning. In an incident in Surrey, bees were seen crawling and staggering around the entrance to a hive. The apiary has four colonies, which had been inspected a few days before the incident and had seemed fine. A few more days later there were hundreds of dead and dying bees outside the hive, so a sample was collected. The bees were thought to be foraging on garden flowers, trees and clover. The laboratory tests confirmed a residue of 0.03 micrograms bendiocarb per bee, so it is likely that these bees died from pesticide poisoning. A beekeeper in Middlesex found honeybees, dead or twitching, with their proboscis extended. There are four colonies at this site and the two affected colonies have

made a significant recovery following the incident. The apiary is in a garden and so the bees were foraging predominantly on flowers, shrubs and other plants in this urban area. The laboratory tests confirmed a residue of 0.04 micrograms bendiocarb per bee, so it is likely that these bees died from pesticide poisoning. No feral bee control treatments were known of in the area in all these incidents, but this is the likely source of the pesticide in this type of incident.

89. In Cambridgeshire, the entire colony of bees died over a period of several days. The colony was a new swarm and therefore had not yet been inspected. There was one other colony at the apiary, which had not been affected and the bees had probably been foraging in the surrounding gardens. Pesticides were not known to have been used nearby prior to the incident, as there were no flowering crops and no feral bees, or colonies, that may have been treated by a pest control contractor. The laboratory tests confirmed a residue of 0.053 micrograms gamma-HCH per bee, so it is possible that these bees died from pesticide poisoning. At present the source of the gamma-HCH remains uncertain.

90. An incident with alpha-cypermethrin has not been reported by WIIS since 1997, when two incidents were reported. In these incidents, the products used had also been tank mixed with fungicides and had been applied to flowering oilseed rape. Both incidents were categorised as approved use and one involved honeybees and the other was bumblebees. The 2003 incident is discussed in the approved use section of this report.

Suspected poisoned baits and suspicious samples

91. Each year a number of suspected baits and suspicious samples are submitted for pesticide residue investigation, even though no dead animals have been found nor poisoning known to have occurred. There were 31 such incidents notified to the Scheme in 2003 and pesticides were detected in 14 (45%) of these. Table 20 shows the number of possible baits and suspicious samples submitted and the percentage in which pesticides were detected for the past ten years. There were eight incidents of abuse and six incidents of misuse. Some of the baits were indiscriminate attempts at pest control, where no mortalities were found, but in two of the incidents gamebirds appeared to be the intended victims. There were also badger setts (see section on badgers) involved in two incidents, one of pesticide misuse and one of abuse.

Table 20: Incidents involving possible baits and suspicious samples 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Incidents investigated	57	72	63	66	62	67	64	35	47	31
Pesticide incidents	28%	39%	46%	48%	47%	33%	44%	46%	43%	45%

92. A range of compounds was found in the abuse incidents. There were two incidents where a mixture of bromadiolone and difenacoum were involved and in one incident the bait appeared to have been left for gamebirds. In another gamebird related incident, a trail of thiodicarb pellets was left in an area used by the birds. Bait laced with metaldehyde may have been intended for cats. A badger sett was intentionally gassed with aluminium

phosphide. There was an abuse incident where rabbit carcases were laced with aldicarb and another where a mevinphos formulation and a syringe were found during a search. Finally, pheasant carcases were found to be contaminated with carbofuran and during a subsequent search of vehicles and premises, various pesticides were found including: mevinphos; bromadiolone; alphachloralose; and sodium cyanide.

93. The six misuse incidents mainly involved vertebrate control products, particularly anticoagulant rodenticides. There were three incidents that involved exposed or inadequately protected bait points and two involved bromadiolone and one difenacoum. There was also an incident where a professional, warfarin based, rat control product was supplied to a home owner to deal with a squirrel problem. There was one incident with aluminium phosphide, which occurred at a badger sett. There was an incident where fungicide treated grain (bitertanol and fuberidazole) had not been disposed of correctly.

Pesticides

94. The chemicals found in the 118 vertebrate and bait incidents are listed in Table 4. Details of these incidents are also given in Appendix 2. Pesticides involved in bee incidents can also be found in Table 4 and Appendix 2 and above in the section for this category.

95. A total of 22 different compounds was implicated from all incidents (except bee incidents) submitted in 2003 (23 in 2002). There were 18 different chemicals from England (20 in 2002), 12 from Scotland (9 in 2002), 6 from Wales (6 in 2002) and 7 from Northern Ireland (5 in 2002). Table 21 shows the number of different pesticides implicated in all incidents (except bee incidents) for the past ten years.

Table 21: The number of different pesticides implicated in all incidents (excludes bees) 1994–2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Number of compounds	35	36	29	26	34	27	29	23	23	22

Other causes of death

96. There were 77 vertebrate incidents where the cause was determined as other than pesticide poisoning. This represents 23% of vertebrate incidents (excludes those incidents that involve baits only). This compares with 80 (21%) in 2002. It should be noted that disease, starvation or trauma victims are not usually sent for analyses, (see Appendix 1). However, it is possible that a sub-lethal exposure to a pesticide contributed to death, apparently by natural causes. Within the remit of the Scheme it is not possible to monitor sub-lethal effects, but if pesticides are strongly implicated in an incident, tissues may still be sent for analyses.

Part 4: Conclusions

Number of incidents

97. In 2003, of the 397 incidents registered, pesticide involvement was found in 126 (32%) and other causes of death (other chemicals, disease, starvation, etc.) were identified in 77 (19%) (see Table 1, Figure 3). In addition, there were 17 (4%) incidents reported that were classified as "not applicable" (alleged bait materials where no pesticides were identified and where no dead animals were found). Since 1999, the number of incidents reported each year has averaged 470 (not including data for 2001, due to FMD). However, prior to this there were about 620 incidents reported per year (see Table 22). Despite this difference in the number of incidents reported, the overall proportion of pesticide incidents has remained at around 30%. Therefore, people should be actively encouraged to report suspected incidents to the Scheme, as when more incidents are reported, there may be more pesticide incidents detected.

Table 22: Number of incidents reported to the Scheme 1996–2003 and number (%) pesticide incidents identified

Year	1996	1997	1998	1999	2000	2001	2002	2003
England								
Incidents reported	354	333	334	232	244	133	188	160
Pesticide incidents	128 (36%)	118 (35%)	108 (32%)	84 (36%)	83 (34%)	51 (38%)	80 (42%)	62 (39%)
Wales								
Incidents reported	58	51	32	41	42	34	50	43
Pesticide incidents	24 (41%)	13 (25%)	9 (28%)	9 (22%)	11 (26%)	6 (18%)	10 (20%)	10 (23%)
Scotland								
Incidents reported	160	144	167	135	167	127	156	145
Pesticide incidents	34 (21%)	36 (25%)	52 (31%)	40 (30%)	57 (34%)	35 (28%)	34 (22%)	37 (26%)
Northern Ireland								
Incidents reported	79	79	79	45	53	52	56	49
Pesticide incidents	18 (23%)	19 (24%)	16 (20%)	6 (13%)	11 (21%)	17 (33%)	7 (13%)	17 (35%)
TOTAL								
Incidents reported	**651**	**607**	**612**	**453**	**506**	**346**	**450**	**397**
Pesticide incidents	**204 (31%)**	**185 (30%)**	**185 (30%)**	**139 (31%)**	**162 (32%)**	**109 (32%)**	**131 (29%)**	**126 (32%)**

98. There are regional variations in the number of incidents, both those reported and pesticide incidents (see Table 22). In England, between 1996 and 1998, the average number of incidents reported was 340 (proportion of pesticide incidents 34%), but since 1999, this number is 220 (proportion of pesticide incidents 38%). This decrease in incidents reported, may in part account for the increase in the proportion of pesticide incidents, from 32% in 1998, to 39% in 2003. In Wales, the number of incidents reported peaked in 1996, at 58, then only 32 incidents were reported in 1998. Therefore, the number of incidents reported for 2003 is within the range seen in previous years and there has been a small increase in the proportion of pesticide incidents in 2003, compared to 2002. In Scotland, the number of incidents reported and the number and proportion of pesticide incidents is within the variation seen in previous years. In Northern Ireland, 1999 saw only 45 incidents reported, compared to 79 in previous years. For the last three years, there have been around 52 incidents reported. The proportion of pesticide incidents in 2003 is the highest recorded to date, at 35%.

Part 4: Conclusions

99. The percentages of poisoning incidents in the various categories of pesticide use are shown in Figure 1. In 2003, there were four incidents where the approved use of pesticides occurred, representing 3% of the pesticide incidents reported. In 2002, there were 6 (5%) approved use incidents. This number and proportion of incidents, is within the range seen for vertebrate incidents in years prior to this (see Table 23). This small proportion of approved use incidents indicates that when label instructions are followed, pesticides are apparently not causing major problems to wildlife and other animals. However, the Scheme relies on incidents being found and reported and some incidents, particularly those involving small vertebrates, are not reported. The Scheme only monitors acute, lethal effects. Sub-lethal or chronic effects may not be identified.

Table 23: Number of vertebrate pesticide poisoning incidents in each category of use 1995–2003

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Abuse	112	136	125	95	61	95	81	78	85
(%)	(64%)	(69%)	(74%)	(55%)	(47%)	(63%)	(78%)	(62%)	(71%)
Misuse	21	19	21	45	31	22	6	19	16
(%)	(12%)	(10%)	(12%)	(26%)	(24%)	(15%)	(6%)	(15%)	(14%)
Approved use	5	11	3	4	7	9	2	5	3
(%)	(3%)	(6%)	(2%)	(2%)	(5%)	(6%)	(2%)	(4%)	(3%)
Unspecified use	32	26	21	22	29	19	14	22	13
(%)	(18%)	(13%)	(12%)	(13%)	(22%)	(13%)	(13%)	(17%)	(11%)
Veterinary	5	4	0	7	2	4	1	2	1
(%)	(3%)	(2%)		(4%)	(2%)	(3%)	(1%)	(2%)	(1%)
TOTAL	**175**	**196**	**170**	**173**	**130**	**149**	**104**	**126**	**118**

100. There were 17 incidents arising from the misuse of pesticides (13% of pesticide poisoning incidents) in 2003. In 2002, there were 20 (15%) misuse incidents. This number and proportion of incidents, is within the range seen for vertebrate incidents in years prior to this (see Table 23). Misuse incidents are often associated with poor storage, unprotected rodenticide treated grain, or pellet spillages on fields.

101. As in previous years, deliberate abuse incidents account for the major proportion of those in which pesticides were implicated. In 2003, the number of abuse incidents was 85, which is more than the 78 incidents reported in 2002. The proportion of abuse incidents, at 68% (see Figure 1), is also higher than the 59% reported in 2002. However, the proportion of vertebrate abuse incidents has ranged from 47%, in 1999, to 74%, in 1997. Therefore, the 2003 abuse data is not exceptional when compared to previous years. Additionally, there were 19 (15%) incidents where the source of the pesticide could not be identified, or the incident could not be assigned to one of the other categories (there were 25 (19%) reported in 2002). This number and proportion is low, compared to previous years and may in part be due to there being no unspecified use incidents reported from Scotland during 2003. In 2003, there was one incident reported that involved the suspected abuse of two veterinary compounds. Details of all these poisoning incidents can be found in Appendix 2. Regulatory and/or enforcement action was taken as appropriate (see earlier sections).

Vertebrate incidents

102. Of the 373 vertebrate related incidents reported, 118 (32%) involved pesticides. There were 3 incidents (3%) arising from approved use (see Table 23). Incidents arising from misuse amounted to 16 (14%) and abuse of pesticides was 85 (71%) incidents. There were 13 (11%) unspecified use incidents. During 2003, there was one incident with pesticides formulated as a veterinary medicine product. These are identified, as the multi-residue methods employed will also detect various veterinary compounds.

103. Figure 2 shows the relative proportion of incidents with alphachloralose, carbamate and organophosphorus compounds over several years. Since 1994, carbamate compounds have consistently been involved in a larger percentage of vertebrate poisoning incidents than either organophosphates or alphachloralose and there is no sign of this trend changing. In fact, 2003 has seen the proportion of carbamate incidents at the highest to date, at 42%. Between 1997 and 2000, incidents with either an organophosphate or alphachloralose, have fluctuated around a proportion that is generally lower than that seen in years prior to 1997. However, in 2001 there was an increase in the proportion of alphachloralose incidents, to a level not observed for nearly ten years. This may in part have been due to FMD, although the proportion for 2002 is also high. However, during 2003 the proportion of alphachloralose incidents has returned to a proportion seen during 1997-2000. In 2002, the Environmental Panel of the Advisory Committee on Pesticides has considered the inclusion of alphachloralose in the Poison Rules 1982 and has recommended that it be classified under Part one. All of the alphachloralose incidents were attributable to abuse and most of the carbamate incidents also arose from abuse of these compounds.

104. For the animals involved in these incidents, birds of prey are the group with the highest number of pesticide poisoning incidents. Buzzards are the species most often associated with pesticide poisoning incidents and then red kites. In England, all seven of the red kite and both of the peregrine incidents investigated, were attributed to pesticide poisoning and in Scotland 70% of 10 red kite incidents investigated were attributed to pesticide poisoning. The peregrine, at 78%, had the highest, overall, proportion of pesticide poisoning.

Bee incidents

105. The number of bee incidents reported has been around 25 for the last three years, but it has ranged from 56 incidents in 1995, to 28 incidents in 1999. However, the proportion of poisoning incidents for 2003 is high, but it is within the range seen in previous years (see Table 18). There is an apparent reduction in incidents with fluvalinate residues reported in 2003 (there were 11 in 2002). However, when residues of bendiocarb are confirmed in bee samples, further analyses for pyrethroid compounds are not completed. In 2003, there has been a recurrence of incidents with bendiocarb and one incident was assigned to misuse and five other incidents assigned to unspecified use of the compound. However, it is likely that all the bendiocarb residues were acquired through honeybees robbing bendiocarb treated comb, which had not been sealed off or removed adequately, during a feral bee control treatment. The good summer, during 2003, may have created an increased need for the use of this pesticide to control nuisance/feral bees. Anyone, particularly professional users, should refer to the free HSE advice leaflet "Feral Honey Bees – points to consider when asked to treat a honey bee nest" (http://www.hsebooks.co.uk). In 1995, eleven bendiocarb incidents were reported and in 1994 and 1999, there were six bendiocarb

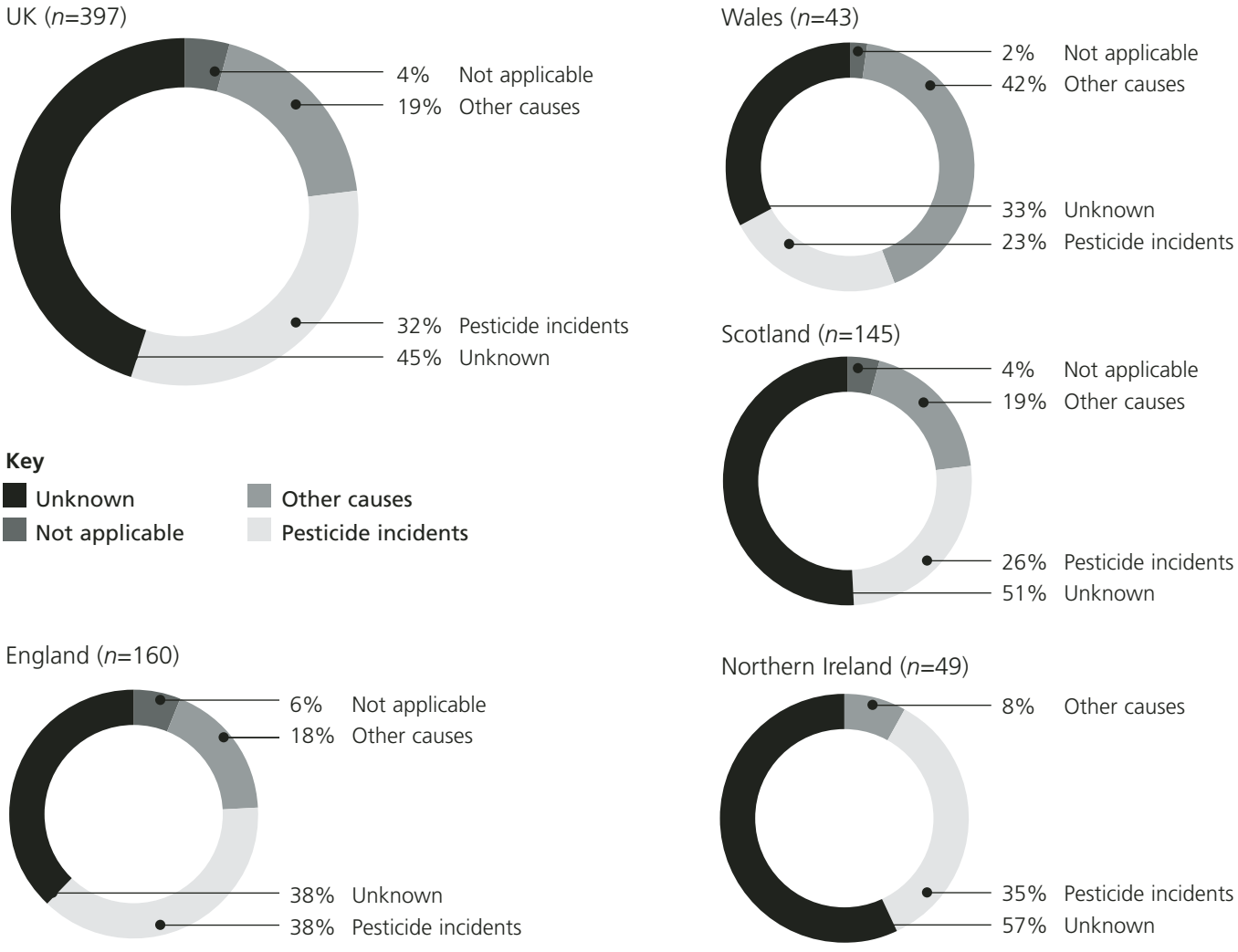
incidents. Therefore, the six incidents for 2003 are not exceptional, but a return to numbers seen in previous years. There has also been an approved use incident with a pyrethroid compound, tank mixed with fungicides and applied to oilseed rape (see earlier section).

Unknown causes of incidents

106. There are always a number of incidents reported where the cause remains unknown. This may be due to several factors, such as, insufficient or inappropriate tissues for analysis, an absence of disease diagnosis, poisoning by other chemicals, or no appropriate analytical method for a particular compound. In 177 (39%) incidents reported in 2003, the cause of death was not established (see Figure 3). This is a decrease in number and proportion, compared to 2002, when 210 (47%) incidents were unknown.

107. In addition, there were 17 incidents (4%) that were classified as not applicable (see Figure 3), which is a small decrease in number and proportion compared to 2002 (20 incidents, 6%). These are suspected baits or suspicious substances where there are no dead or poisoned animals found. Often these are just food placed for animals or birds, or discarded food items.

Figure 3: Proportion of reported incidents in 2003 by cause of incident.



Seasonal distribution

108. The seasonal distribution of incidents can be seen in Appendix 2. Incidents of abuse occur throughout the year, but March had the most incidents, with fifteen and December the least, with two incidents. February and April, both had ten incidents of abuse and were the months with the next highest level of abuse incidents. This springtime peak in abuse incidents is likely to reflect illegal pest control activities by some farmers, or gamekeepers. Most of the incidents in February and March involved raptors, whereas in April, it was mainly companion animals affected. Carbofuran was implicated in twelve of the incidents in March and only three of the incidents in February and four in April. There is another peak of abuse incidents in November when nine incidents were reported. There were buzzards poisoned in four of these incidents and two of these involved carbofuran and two, alphachloralose. Misuse incidents were more frequently recorded in February (five incidents) and October (three incidents). In February, two incidents involved dogs and granular applications and two were badgers and vertebrate control products. In October, two of the incidents were associated with rodenticide misuse, where there were no animal casualties. There were no unspecified use incidents in January to February and June, September and December. August was the month with most incidents assigned to this category (five incidents) and then November, which had four incidents. Four of the incidents in August involved honeybees poisoned with bendiocarb and in November, all incidents involved anticoagulant rodenticides (two incidents with cats and one with a fox and one with a red kite). The majority of approved use incidents occurred in March as they involved aldicarb applications (two incidents).

Regional distribution

109. Given the rural practices that predominate in some counties and regions of the UK, there is some bias towards certain categories of incidents in these areas. For example, the two approved use incidents with aldicarb that occurred in Norfolk. In Dyfed, there were three unspecified use incidents with anticoagulant rodenticides that all involved red kites. Surrey had four honeybee, bendiocarb, incidents and three were unspecified use and one misuse. The abuse incidents occurred in many counties, but Border and Dumfries and Galloway, both had five incidents with carbofuran. There were four incidents of carbofuran abuse in Highland and also four in Strathclyde. The only other notable trends were two incidents of bendiocarb abuse in Cheshire and two incidents of bromadiolone misuse in East Yorkshire.

Publications

Appendix 3 gives a list of publications that have arisen from work carried out by the Scheme and its findings. In addition to these, the results of the Scheme have been widely used in several publications.

Part 5: Acknowledgements

We should like to thank Frankie O'Brien of DARD for providing the results from Northern Ireland. Tricia Brobyn of PSD supplied details of the approved use incidents from England. Kathy Wood of PSD provided the information on enforcement action in England and Gary Spiller, that for Wales. For determination of the pesticide residues in this report, we should like to thank the analytical chemists, particularly Ainsley Jones, Andrew Charlton, Sheonaidh Charman and Vicki Jowett at Central Science Laboratory (CSL), and Laura Melton at Scottish Agricultural Science Agency (SASA). We are also grateful to colleagues in Defra, SEERAD, EPC, DARD, SASA and CSL, who have participated in incident investigations during 2003, and to all individuals and organisations who have supported the Wildlife Incident Investigation Scheme by submitting carcases, providing information or contributing in other ways.

Part 6: References

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Part 6: References

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Appendix 1: Investigation procedures

The investigation of potential wildlife poisoning incidents depends on a scheme, which allows members of the public and interested organisations, to submit carcases or suspected baits for pesticide analysis. In England and Wales, this is organised on a regional basis with the relevant Rural Development Service (RDS) or Environment, Planning and Countryside Department (EPC) wildlife officer deciding, in consultation with others if necessary, whether an investigation should be started. This permits the screening-out of incidents that may not involve pesticides.

In England and Wales, after acceptance of an incident, the carcases are taken to a local Veterinary Laboratories Agency where a post-mortem examination is undertaken. This may result in bacteriological or virological tests to determine whether disease contributed to the deaths.

A field visit may be made by an RDS or EPC wildlife officer to gather information to help in identifying the cause of the incident. A further visit may be required in non-abuse incidents in order to obtain more information, for example to interview relevant contacts not previously available or to follow up the results of analyses.

Incidents may be rejected if they are outside the remit of the Scheme, for example if poisoning is thought to have involved other chemicals or pollutants. If the field inquiry or the post-mortem identifies the cause of death as other than possible pesticide involvement, then tissues are not sent for analysis.

The field inquiry report, post-mortem findings and relevant tissues from casualties are forwarded to the Wildlife Incident Unit (WIU) at the Central Science Laboratory, Sand Hutton, York, where chemical and other analyses of the tissues are carried out.

The results are collated and interpreted by WIU to assess the probable cause of the incident and whether any residues detected contributed to the death or illness of the animal. Mortality is generally attributed to a pesticide if residues of a chemical or its derivatives are found above levels considered to represent lethal exposure. In some cases, the presence of residues in association with typical post-mortem findings may be used to determine mortality. Wherever possible, residues found are confirmed using an alternative analytical technique.

Honeybee deaths in England and Wales are investigated in a similar way. Samples of dead bees are passed by beekeepers to the National Bee Unit of the Central Science Laboratory at Sand Hutton, York to enable disease screening and other investigations to be carried out. Field visits are made by RDS or EPC wildlife officers to gather relevant information. Bee samples are forwarded for residue analysis to the WIU, where reports of the incidents are also collated. There are experimental data, resulting from laboratory dosing of honeybees with pesticides, which can be used to assist in assessing the significance of residues in the insects.

The Scottish scheme is similar to those in England and Wales and covers wildlife, companion animals, livestock and bees. Samples are sent to the Scottish Agricultural Science Agency (SASA) in Edinburgh for investigation. Veterinary support is provided by the Veterinary Investigation Laboratories of the Scottish Agricultural College and by Lasswade Veterinary Laboratory. Field investigations by Scottish Executive Environment and Rural Affairs Department (SEERAD) staff are normally only undertaken when pesticide poisoning has been confirmed unless there is clear evidence of deliberate abuse or misuse of a pesticide.

The Northern Ireland scheme is similar to the Scottish scheme. Samples are sent to specified analytical and veterinary laboratories in Northern Ireland. As with the Scottish scheme field investigations are normally only carried out when pesticide poisoning has been found.

Appendix 1: Investigation procedures

Investigations are usually carried out by the Health and Safety Executive Northern Ireland. The abuse and misuse of pesticides affecting wildlife may also contravene the provisions of the Wildlife (Northern Ireland) Order 1985, which is enforced by the PSNI supported by the Countryside and Wildlife Branch of the Department of the Environment (Northern Ireland).

Where an incident is to be investigated for use in legal proceedings, evidence is gathered by the Defra Investigations Branch, in collaboration with the Pesticides Safety Directorate, who relies on information collected by the RDS and EPC wildlife officers. SEERAD staff in Scotland and the PSNI, DARD staff and others in Northern Ireland carry out a similar role. Veterinary and analytical findings may also be used in evidence. The HSE and local authorities also have a regulatory role under FEPA and local liaison takes place between the departments to co-ordinate enforcement action. The police may also investigate cases.

All the schemes make use of analytical techniques and equipment capable of identifying low levels of residues of approved pesticides that are considered to present a possible hazard to vertebrates or bees. Multi-residue methods are used for the detection of organochlorine, organophosphate, some carbamate and pyrethroid compounds and for anticoagulant rodenticides. These are supplemented by specific analyses for strychnine, alphachloralose, metaldehyde, paraquat and some other compounds.

Appendix 2: Incidents where pesticides were detected in 2003

Month	County	Number and Species	Chemical	Cause	Comments
January	Gloucestershire	fox	metaldehyde	abuse	
January	Kent	grain	bromadiolone	misuse	*Exposed bait points, no bait boxes used.
January	Strathclyde	buzzard	carbofuran	abuse	SEERAD investigation.
January	Tyrone	dog	coumatetralyl/bromadiolone	abuse	Haemorrhaging into abdomen also haemorrhaging of muscles.
January	Tyrone	dog	warfarin	abuse	Enlarged spleen and consolidation of lungs.
February	Buckinghamshire	grain, bait, fox, 2 red kites	mevinphos	abuse	Gamebird shooting in the area. Pigeon carcases used as baits, but stuffed in badger setts.
February	Buckinghamshire	6 rats	brodifacoum	misuse	Brodifacoum misuse found during follow-up to previous incident.
February	Devon	2 dog, bait	coumatetralyl	abuse	Canned dog food appears to have been used as the bait.
February	East Yorkshire	red kite	aldicarb	abuse	Sub-lethal exposure to difenacoum also noted.
February	Isle of Wight	dog, grain, sample	difenacoum	abuse	
February	Kent	dog, sample	metaldehyde	misuse	Spillage of pellets may have been left on a field for some months.
February	Leicestershire	red kite	carbofuran	abuse	Sub-lethal exposure to difenacoum also noted.
February	Norfolk	badger sett	aluminium phosphide	misuse	Suspected treatment during rabbit control.
February	Norfolk	dog	aldicarb	misuse	Large spillage of aldicarb granules left on an unmetalled farm track.
February	Norfolk	grain	bitertanol/fuberidazole	misuse	*Treated grain not buried as per label instructions.
February	South Yorkshire	badger, grain	difenacoum/warfarin	misuse	Badgers accessed rat bait placed in rat burrows.
February	West Glamorgan	buzzard, magpie	carbofuran	abuse	Golf course nearby, source uncertain, but abuse suspected.
Febuary	Highland	sea eagle, bait	carbofuran	abuse	Police, SEERAD & RSPB investigation, sheep used as a bait.
February	Down	buzzard	alphachloralose	abuse	Found wandering in a quarry in a drunken state, died later.
February	Down	buzzard	alphachloralose	abuse	
March	Berkshire	grain	warfarin	misuse	A professional rat control product, supplied to a homeowner, for use against a squirrel problem.
March	Cheshire	red kite, bait	carbofuran	abuse	Moorland with sheep and grouse. Grouse used as a bait.

Month	County	Number and Species	Chemical	Cause	Comments
March	Cheshire	3 samples	difenacoum/flocoumafen	abuse	Rodenticide abuse discovered in follow-up to previous incident.
March	Cheshire	3 magpies	bendiocarb	abuse	The area has a history of bendiocarb abuse, but no bait found.
March	Cornwall	2 buzzards	carbofuran	abuse	No bait found, but likely to be a rabbit, as fur in the talons of one bird.
March	Devon	rabbit, 2 crows, 3 baits	difenacoum	unspecified	Seabird recovery project rat control programme, where great care had been taken to protect non-target species. Brodifacoum also found in animals and flocoumafen and brodifacoum found in bait samples.
March	East Yorkshire	dog, bait	carbofuran/aldicarb	abuse	Bread bait left in a lane, used by dog walkers, which has a history of abuse incidents. A blackbird (unknown) and moorhen (trauma) were also submitted.
March	Norfolk	pheasant	aldicarb	approved	Field drilled with sugarbeet, using "Surefill" system. Infestation of rabbits and mice which may have disturbed the seed bed.
March	Norfolk	red kite	aldicarb	approved	Field drilled with sugarbeet, using "Surefill" system, bromadiolone also found in the liver of this bird.
March	Norfolk	3 barn owls	bromadiolone/difenacoum	trauma	Two birds had residues of bromadiolone and one was close to significant levels, the other bird had a small difenacoum residue.
March	Powys	3 crows	alphachloralose	abuse	Source of alphachloralose uncertain, agricultural area with sheep and cattle and a cat was ill, with convulsions, some days prior to this incident.
March	West Glamorgan	red kite	difenacoum	trauma	Suspected sub-lethal exposure.
March	Border	buzzard	carbofuran	abuse	Police, SEERAD & RSPB investigation.
March	Border	2 buzzards, bait	carbofuran	abuse	Police investigation.
March	Central	red kite	carbofuran	abuse	SEERAD investigation.
March	Dumfries & Galloway	crow, 2 buzzards, 2 ravens, 2 baits	carbofuran	abuse	Police, SEERAD & RSPB investigation. Rabbits used as baits. Prosecution in February 2004 Sheriff ruled no case to answer.
March	Dumfries & Galloway	2 red kites	carbofuran	abuse	Police investigation referred for prosecution.
March	Dumfries & Galloway	red kite	carbofuran	abuse	Police investigation referred for prosecution.

Month	County	Number and Species	Chemical	Cause	Comments
March	Dumfries & Galloway	2 sparrowhawks, 2 baits	carbofuran	abuse	Police investigation, pigeons used as baits, referred for prosecution.
March	Highland	dog (still alive)	strychnine	abuse	Police & SEERAD investigation.
March	Highland	pheasant, 30 rooks	mevinphos	abuse	Police & SEERAD investigation.
March	Tayside	samples, 3 buzzards	carbofuran	abuse	Police & SEERAD investigation.
March	Tayside	buzzard	carbofuran	abuse	Police investigation.
April	Berkshire	red kite	bromadiolone	unspecified	Small residue of difenacoum also noted.
April	Devon	bait	metaldehyde	abuse	This is an urban residential area, bait may have been for cats.
April	Norfolk	22 feral pigeons	difenacoum/bromadiolone	unspecified	
April	Somerset	honeybee	fluvalinate**	unknown	
April	Suffolk	buzzard, granules	strychnine	abuse	Source of strychnine uncertain at present.
April	Dyfed	red kite	bromadiolone	unspecified	Source of rodenticide uncertain. Rural area with sheep farming.
April	Gwynedd	peregrine, 2 baits	alphachloralose	abuse	Remote, isolated area. Pigeon carcase used as a bait.
April	Fife	2 cats	aldicarb	abuse	Police & SEERAD investigation.
April	Highland	dog	carbofuran	abuse	Police & SEERAD investigation.
April	Highland	3 cats	carbofuran	abuse	SEERAD investigation.
April	Highland	dog	strychnine	abuse	Police & SEERAD investigation.
April	Lothian	cat	carbofuran	abuse	Police & SEERAD investigation.
April	Strathclyde	dog	bromadiolone	misuse	SEERAD investigation.
April	Strathclyde	magpie, crow, 2 buzzards, chemicals	carbofuran/alphachloralose	abuse	Police & SEERAD investigation, referred for prosecution.
April	Down	dog	paraquat	abuse	Sudden death.
May	Cambridgeshire	badger sett	aluminium phosphide	abuse	
May	Cumbria	peregrine, bait	carbofuran	abuse	This is a disused quarry, allegations of persecution by pigeon racers and a pigeon carcase was used as a bait.
May	Kent	plant, canary	paraquat	unspecified	Neighbour dispute, where paraquat was sprayed onto vegetation, without the owners knowledge and canaries died possibly after eating contaminated plants.

Month	County	Number and Species	Chemical	Cause	Comments
May	Nottinghamshire	dog	metaldehyde	abuse	This is a suburban housing area and several of the neighbours are pigeon fanciers. Source of the metaldehyde uncertain.
May	Surrey	honeybee	bendiocarb	misuse	Feral bee treatment undertaken close to the apiary site.
May	Anglesey	peregrine	alphachloralose	abuse	This is the outskirts of a small town, with sheep and cattle farming in the area.
May	Dumfries & Galloway	dog	coumatetralyl/difenacoum	misuse	SEERAD investigation.
May	Grampian	2 peregrines	carbofuran	abuse	Police investigation.
May	Highland	2 buzzards, 2 baits	carbofuran	abuse	Police & SEERAD investigation, advisory letter to land owner. Partridges used as baits.
May	Strathclyde	peregrine	carbofuran	abuse	Police & RSPB investigation, referred for prosecution.
June	Cheshire	dog	bendiocarb	abuse	Rural area with a shoot, abuse suspected, source uncertain.
June	Derbyshire	crow, rook, fox, 2 magpies	carbofuran	abuse	There are no game rearing interests reported from the area. Source of carbofuran uncertain.
June	Greater London	honeybee	fluvalinate**	unknown	
June	Lincolnshire	dog	paraquat	abuse	Source of paraquat uncertain, but abuse suspected.
June	North Yorkshire	honeybee	fluvalinate**	unknown	Cypermethrin poisoning suspected, but sample of bees was very weathered and not enough bees in first sample.
June	Dyfed	buzzard	difenacoum	starvation	Suspected sub-lethal exposure.
June	Dyfed	red kite	difenacoum	trauma	Suspected sub-lethal exposure.
June	Gwent	2 peregrines, 2 baits	aldicarb	abuse	This is an old quarry face in woodlands, with sheep rearing. Pigeon carcases used as poison baits.
June	Powys	dog, pellets	metaldehyde	abuse	
June	South Glamorgan	honeybee	fluvalinate**	unknown	
June	South Glamorgan	honeybee	alpha-cypermethrin/flusilazole	approved	Spray application to oilseed rape suspected.
June	Tyrone	dog	paraquat	abuse	Typical signs of paraquat poisoning reported.
June	Tyrone	dog	warfarin	abuse	Eight weeks weeks old - suspected poisoned.
July	Cambridgeshire	honeybee	gamma-HCH	unspecified	Source of gamma-HCH uncertain.
July	Devon	badger	metaldehyde	unspecified	The source of the metaldehyde in this rural area is uncertain.

Month	County	Number and Species	Chemical	Cause	Comments
July	Gloucestershire	honeybee	fluvalinate**	unknown	
July	Greater Manchester	cat	bendiocarb	abuse	Source of bendiocarb uncertain, urban area with a history of incidents.
July	Lancashire	buzzard	difenacoum/bromadiolone	trauma	Source of rodenticide uncertain, sub-lethal exposure to difenacoum and bromadiolone suspected.
July	Norfolk	tawny owl, bait	bromadiolone	misuse	Exposed rodenticide bait in a barn, cause of death of the tawny owl uncertain.
July	Northhamptonshire	dog	coumatetralyl	disease	Small residue, not responsible for symptoms shown.
July	Somerset	250 pheasant, sample	gamma-HCH	abuse	Pesticide intentionally applied to drinking water supply for pheasant rearing pens.
July	Staffordshire	honeybee	fluvalinate**	unknown	
July	Surrey	honeybee	bendiocarb	unspecified	Feral bee treatment suspected, but none identified in the area.
July	Fermanagh	dog	brodifacoum/coumatetralyl	abuse	Presented with acute onset fits/stares/shaking.
July	Tyrone	cat	paraquat	abuse	Respiratory distress, vomiting, diarrhoea, blood in faeces, blood in urine.
July	Tyrone	dog	warfarin/bromadiolone	abuse	Neighbour dispute.
August	Berkshire	honeybee	bendiocarb	unspecified	Feral bee treatment suspected, but none identified in the area.
August	Derbyshire	peregrine	alphachloralose	abuse	
August	Greater Manchester	dog, bait	bendiocarb	abuse	Dog biscuits laced with bendiocarb.
August	Middlesex	honeybee	bendiocarb	unspecified	Feral bee treatment suspected, but none identified in the area.
August	North Yorkshire	2 dogs	aldicarb	abuse	No bait found, but abuse suspected in this neighbour dispute.
August	Surrey	honeybee	bendiocarb	unspecified	Feral bee treatment suspected, but none identified in the area.
August	Surrey	honeybee	bendiocarb	unspecified	Feral bee treatment suspected, but none identified in the area.
August	Dyfed	red kite	bromadiolone	unspecified	
August	Border	pheasant baits, chemicals	carbofuran/mevinphos/ bromadiolone/alphachloralose/ sodium cyanide	abuse	Police, SEERAD investigation, referred for prosecution.

Month	County	Number and Species	Chemical	Cause	Comments
August	Border	chemical only	mevinphos	abuse	Police investigation.
August	Central	red kite	diazinon/propetamphos	veterinary	Police, SEERAD & RSPB investigation, probably abuse of a veterinary medicine.
September	Norfolk	250 pheasants, 2 samples	aldicarb	abuse	Intentional contamination of water supply in pheasant release pen.
September	Shropshire	field mouse, 2 dogs, baits	methiocarb	abuse	Mounds of pellets, probably left in an area to deter badgers.
September	Staffordshire	dog, bait	metaldehyde	abuse	Meat and pellets.
September	Dumfries & Galloway	rabbit bait	aldicarb	abuse	Police investigation.
September	Dumfries & Galloway	3 red kites, 2 buzzards	alphachloralose	abuse	Police investigation.
September	Strathclyde	red kite	carbofuran	abuse	Police, SEERAD & RSPB investigation.
September	Armagh	dog	paraquat	abuse	A greyhound – 11 months old found dead in the morning.
October	Berkshire	dog	bromadiolone	unspecified	Bromadiolone had been in use in the area, but no evidence that the dog could access the bait.
October	Buckinghamshire	red kite	bromadiolone	unspecified	Source of bromadiolone uncertain, no obvious haemorrhage on post-mortem.
October	Cambridgeshire	grain	difenacoum	misuse	Exposed rodenticide bait points.
October	East Yorkshire	bait	bromadiolone	misuse	Inadequate protection of bait points.
October	Greater London	3 dogs	paraquat	misuse	*Picture of child and a dog on the package, led the user to believe the product was safe to be left in the kitchen.
October	Leicestershire	buzzard	phorate	abuse	Source of phorate unknown, abuse suspected.
October	Lincolnshire	grain, pellets	thiodicarb	abuse	A trail of pellets may have been left for gamebirds.
October	Grampian	buzzard, bait	carbofuran	abuse	Police & SEERAD investigation, duck used as a bait.
October	Lothian	dog	metaldehyde	approved	SEERAD investigation.
October	Derry	otter	bromadiolone/brodifacoum	abuse	Found at the side of a road.
November	Buckinghamshire	2 cats	coumatetralyl	unspecified	Source of exposure uncertain.
November	East Yorkshire	dog	bromadiolone	misuse	Rodenticide allegedly supplied in an unlabelled container and left unprotected in a garden.

Month	County	Number and Species	Chemical	Cause	Comments
November	Somerset	cat	difenacoum	unspecified	Coumatetralyl, bromadiolone and brodifacoum also found, source of rodenticides uncertain, but this was a feral cat found with a rabbit carcase and possibly scavenging on other small mammals.
November	South Yorkshire	2 dogs	aldicarb	abuse	History of abuse incidents in the area.
November	Suffolk	dog, pellets	methiocarb	misuse	Use at a slug monitoring point, the dog recovered after prompt treatment.
November	Suffolk	fox	coumatetralyl	unspecified	Difenacoum also noted, very thin condition and signs of bacterial septicaemia.
November	Worcestershire	buzzard	alphachloralose	abuse	Source of alphachloralose uncertain, bird recovered after treatment.
November	Dyfed	red kite	difenacoum	unspecified	
November	Border	buzzard	carbofuran	abuse	Police investigation.
November	Fife	6 buzzards	carbofuran	abuse	Police, SEERAD & RSPB investigation.
November	Antrim	buzzard, crow	alphachloralose/bromadiolone	abuse	Found in a field.
November	Antrim	rook	alphachloralose	abuse	
November	Down	bait	bromadiolone/difenacoum	abuse	Blue green pellets present amongst the grain on gross examination.
November	Down	bait	bromadiolone/difenacoum	abuse	Found under pheasant feeders by gamekeeper alleged high loss of birds.
November	Down	dog	difenacoum	abuse	Violent vomiting, with mucus and blood, then moribund.
December	Lancashire	badger	bromadiolone	unknown	Suspected sub-lethal exposure.
December	Border	dog	metaldehyde	misuse	SEERAD investigation, improper disposal.
December	Border	fox	carbofuran	abuse	Police investigation.
December	Dumfries & Galloway	red kite	carbofuran	abuse	Police & RSPB investigation.

* Incidents where samples were not available for laboratory analysis, but analysis in the field, or information gathered during enquiries into the incident, implicate the pesticide.

** Residue not confirmed, but reported here to show the frequency that residues of this compound are noted.

Appendix 3: Major WIIS publications (in chronological order since 1976)

Hamilton, G.A., Hunter, K., Ritchie, A.S., Ruthven, A.D., Brown, P.M. and Stanley, P.I. (1976). Poisoning of wild geese by carbophenothion-treated winter wheat. *Pestic. Sci*. **7:** 175–183.

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Appendix 3: Major WIIS publications (in chronological order since 1976)

Greig-Smith, P.W. (1990). Investigations of honeybee poisoning by pesticides in the UK, 1981–1989. *Proceedings*, Fourth International Symposium on Harmonisation of Methods for Testing the Toxicity of Pesticides to Bees. Research Institute of Apiculture, Dol, Czechoslovakia 1990, pp 29-34.

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Appendix 3: Major WIIS publications (in chronological order since 1976)

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In addition to the above, the results of the Scheme have been widely used in several publications.

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