

Campaign for Responsible Rodenticide Use (CRRU) UK

The UK Rodenticide Stewardship Regime
2018 Annual Report

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Annual Report 2018

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Foreword

The year 2018 was, once again, one of significant effort and progress for the UK Rodenticide Stewardship Regime. Of particular importance was the report received early in the year from the Health and Safety Executive, and the other government departments that comprise the Government Oversight Group (GOG), that the regime implemented by CRRU UK in 2016/17 was fit for purpose. Consequently, HSE had authorised rodenticide products, under the rules of the European Commission's Biocidal Products Regulation, for a wide range of application scenarios so that they can be used by competent professionals for the protection of human and animal health and hygiene. That we have reached this important milestone is due to the enormous efforts of all in CRRU UK, in both manufacturer and stakeholder organisations. Our thanks should go to them all.

All the different component parts of the UK Rodenticide Stewardship regime worked together for the first time in 2018. This involved initiatives developed in 2016 and 2017 and three significant new elements that are described in more detail in this report.

While the stewardship regime was underway in the UK, in Europe the landscape for the regulation and use of rodenticides was again radically changing as a result of the Commission's authorisation renewal programme, with important implications for all UK manufacturers, retailers and users.

Firstly, the long-established practices of permanent baiting, application of baits directly to rodent burrows and use of covered and protected bait placements (instead of proprietary tamper-resistant bait boxes) came under scrutiny. CRRU UK provided justifications for these practices, together with essential and detailed risk mitigation measures that will allow them to be used while minimising risks to non-target animals and the wider environment. These practices are now available with some professional rodenticide products authorised in the UK by HSE.

Although we know that some UK wildlife species are exposed to rodenticides, and the objective of the regime is to minimise such exposure to reduce residues of anticoagulants in non-target animals, we are less sure about how this exposure occurs. It seems likely, however, that permanent baiting, that is the application of rodenticides to protect sites and to monitor for the ingress of rodents in the absence of an extant infestation, plays a significant role. Therefore, new rules on permanent baiting were introduced by the Commission and implemented in UK by HSE. These rules have significant impacts on decisions about whether or not sites can be baited in the first place, what products can be used and how permanent baiting is justified, conducted and monitored. CRRU UK has issued new guidance on the increasingly complex operation of permanent baiting which, if stewardship is to achieve its objectives to reduce exposure and residue levels, must be put into practice by all competent professionals.

Lastly, a ruling by the Committee for Risk Assessment (RAC) of the European Chemicals Agency (ECHA) has resulted in the classification and labelling of all anticoagulant products that contain 30 parts per million (ppm) of the active ingredient or more, as 'toxic to reproduction'. To provide alternatives that do not require such labelling, manufacturers have brought to the market a range of products carrying lower amounts of active ingredient than previously (mostly 20-30 ppm instead of 50 ppm). These provide the opportunity to those who use them to reduce anticoagulant residues released into the environment by a factor of up to 50%. It remains to be seen whether these lowered strength products can provide effective control of the UK's widespread resistant rat and mouse infestations, but this is another development that may contribute towards the regime's goal of reducing residues in wildlife.

With the stewardship regime now in full operation, and with significant changes to rodenticide labels and consequent use practices in place, the task of monitoring the hopefully beneficial impacts of the regime will continue. This report provides information on the breeding performance of a representative sample of UK barn owls, our growing understanding of the spread and practical consequences of anticoagulant resistance among UK rats and mice and the latest information on the level of exposure of UK barn owls to second-generation anticoagulants. The latter is a key indicator, set by HSE/GOG, for the performance of the stewardship regime. Again these data are provided by an independent organisation, the Centre for Ecology & Hydrology (CEH). Although some anticoagulant residue levels found in barn owls by CEH scientists during 2017 appear to be declining in comparison with the baseline years of 2007-2012, observed reductions are not large enough to meet scientific requirements for statistical significance. We must hope therefore that, with another year of responsible rodenticide use across the UK in 2018, these reductions will continue and significantly increase.

Finally, many aspects of the stewardship regime are focussed on the conventional use of rodenticides and their possible impacts on terrestrial ecosystems. However, a scientific report from Germany has detected anticoagulants in aquatic systems; considered mainly to be the result of sewer baiting. There is no indication that the very low levels detected are problematic at this stage, but it may be that in the UK we should consider sewer baiting practices and see what can reasonably be done to reduce the release of anticoagulants into the aquatic environment.



Dr Alan Buckle
Chairman CRRU UK,
University of Reading

2. Summary

The government requirements for stewardship schemes which would permit authorisation of anticoagulant rodenticide products for use outdoors were set out as the “High-Level Principles” (GOG, 2018; and see Annex 1). The Government Oversight Group, chaired by HSE, has determined that these principles are met by the CRRU Rodenticide Stewardship Regime and the regime is fit for purpose to deliver the anticipated key benefits (GOG, 2018).

During 2018, the regime, based on a structure of six work groups, maintained and extended those components of the regime that had been previously introduced. These include the offering of training and certification for all professional rodenticide user groups, competence checks at point-of-sale for all authorised professional rodenticide products, development and dissemination of best practice guidance for responsible rodent pest management in the UK, communication with all rodenticide users concerning the requirements of the regime and assessment of progress through a suite of monitoring studies conducted in collaboration with independent scientific agencies.

Three additional elements were added to the regime in 2018; a process whereby the systems for point-of-sale competence checks were audited at all outlets selling professional rodenticide products to ensure compliance with stewardship requirements, the implementation of CRRU UK-approved farm standards, and consequent auditing to those new standards, of all registered members of 15 major farm assurance schemes and the initiation of a scheme providing materials to support voluntary continuous professional development (CPD) for all rodenticide user sectors.

The CRRU UK monitoring programme has confirmed that there were neither significant increases nor decreases in the exposure of barn owls to anticoagulants during 2017, that barn owl breeding in the same year was at a level similar too, or slightly higher, than the average for the period 2011 to 2017 and that new foci of anticoagulant resistance continue to be discovered across the UK using DNA tests, both in Norway rats and house mice, particularly in the south and east of England.

In 2018, for the first time, all important elements of the UK Rodenticide Stewardship Regime were in operation to deliver governance of the supply chain for rodenticide products and a competent workforce among pest management professionals, in both public and private sectors, in all sectors of the farming and animal husbandry industry and in gamekeeping. The regime also operated a programme to monitor the delivery of the key benefits of stewardship. Work will continue in 2019 in all CRRU UK work groups to maintain and intensify all aspects of rodenticide stewardship.

3. Introduction

When it published its review of the progress of the UK Rodenticide Stewardship Regime at the beginning of 2018 (GOG, 2018), the Government Oversight Group (GOG) stated that there was evidence that the industry had put in place what it had said it would; namely a simple, robust and workable scheme for the stewardship of professional rodenticide products. However, the report drew attention to three additional elements of the regime that were to be developed and introduced during the forthcoming year.

The first of these involved supply chain governance and the requirement for an independent audit to assess the extent of compliance with proof of competence checks at point-of-sale. The second was the implementation of audits on the premises of all members of CRRU-approved farm assurance schemes, following the embedding of CRRU UK stewardship requirements within the new, published standards of each scheme. Finally, a focus was required on continuing professional development (CPD) and the development by CRRU of materials to ensure that knowledge of competent individuals is maintained and enhanced. All of these requirements are now in place and this has resulted, for the first time during 2018, in all essential elements of the UK Rodenticide Stewardship Regime being in operation together.

Another essential component of the regime is monitoring and evaluation. The GOG has set out monitoring requirements to be delivered by CRRU, as well as by other involved agencies and government departments (GOG, 2018; see Annex 2). Thus, CRRU contracts independent expert groups to monitor on an annual basis: 1) the distribution and concentrations of anticoagulant residues in a sample of UK barn owls (the Centre for Ecology & Hydrology), 2) the extent and severity of anticoagulant resistance among UK rat and mouse populations (the Vertebrate Pests Unit, the University of Reading) and 3) the breeding performance of a sample of barn owl nests (the Wildlife Conservation Partnership). The results of these monitoring programmes are provided and discussed in subsequent sections of this report.

CRRU will continue to report progress to the GOG on an annual basis. This document is the third such report, and a full appraisal of the regime and its outputs will be made by government no later than 2020. The focus in this document will be those additional elements that CRRU has put in place during 2018 and the monitoring programmes conducted during the year.

4. REPORTS FROM THE CRRU UK WORK GROUPS ON PROGRESS DURING 2018

4.1. General

The structure of the regime, involving six Work Groups, has shown itself to be both efficient, in terms of the use of resources, and appropriate to the requirements of operating rodenticide stewardship across the UK among three quite different user groups, i.e. professional pest control technicians in the public and private sectors, farmers and growers, and those involved in game-rearing and game-management. All work delivered by these work groups is done by those who volunteer from companies and organisations within the CRRU UK Task Force and contribute their expertise and efforts, while holding challenging jobs within the organisations that they represent. This ongoing voluntary commitment to allocate scarce resources towards the development and delivery of the regime is an exemplary instance of collaboration between industry and stakeholder organisations. Those who benefit from this effort are the general public, whose living and working environments are kept free, as far as possible, from rodent infestation and whose foodstuffs are protected from the wide range of rodent-borne diseases and pathogens.

4.2. Best Practice Work Group (Leader, Dee Ward Thompson, BPCA)

The work of the Best Practice Work Group is to provide guidance and promote the responsible use of rodenticides to ensure a “competent workforce” among all professional user groups.

On 1st January 2018, the new CRRU-approved farm assurance scheme (FAS) standards came into force. From that date onwards the membership of 15 different schemes, totalling more than 95,000 members, are to be audited regularly according to the requirements of schemes’ standards that comply with the CRRU Code of Best Practice. Table 1 shows the schemes involved, their membership numbers in 2018 and the frequency of audits conducted.

The work group has been active in other areas of the regime. Its members collaborated with the Regulatory Work Group to create justifications, with essential required mitigation measures, for three ‘non-standard’ rodenticide application methods (see section 4.4). The WG was also the principle

source of materials for the Continuing Professional Development (CPD) CRRU on-line platform and provided three of the four modules currently available (see section 4.3).

Rodenticide use practice has changed substantially during the last 12 months with product labels, after renewal, reflecting the requirements of the new ECHA Summary of Product Specification (SPC) documents for the first time. The work group continuously monitors these changes to decide whether existing CRRU best practice guidance documents need to be updated. Changes to the rules about permanent baiting were important enough to require the 2016 CRRU document to be substantially revised and reissued (CRRU UK, 2018a). Further consideration of the foundation document, the CRRU Code of Best Practice (CRRU UK, 2015), is currently ongoing with the possibility of revision in 2019.

4.3. Training and Certification Work Group (Leader, Matthew Davies, Killgerm Chemicals Ltd.)

All aspects of the work of the Training and Certification Work Group are intended to support the development and maintenance of a “competent workforce” and to disseminate the fundamental requirements of the responsible use of rodenticides across the three user sectors.

The major deliverable of the work group continues to be the provision of CRRU-approved training through a total of 181 training providers serving four awarding organisations (BASIS Registration Ltd., RSPH City & Guilds, - NPTC and LANTRA). In the period August 2017 to July 2018, nine different CRRU-approved courses were offered and examined. There was a total of 5,498 certificates awarded to training participants during the period, bringing to 18,827 the total number of certificates awarded for CRRU-approved courses during the three years of the regime (Table 2). This is a very substantial contribution to the maintenance of a competent workforce. A report containing more details of the courses provided and certificates awarded has been provided in confidence to HSE and the GOG.

Table 1. The CRRU-approved farm assurance schemes, their membership numbers and the frequency of audits conducted in 2018. The values in this table are provisional pending acquisition of more data.

Name of assurance scheme	No. of members	Geographical Coverage	Audit Frequency
Agricultural Industries Confederation	488	UK	12 months
British Egg Industry Council Code of Practice for Lion Eggs	1,700	UK	6 months
Red Tractor Farm Assurance - Beef and Lamb	24,426	England	18 months
Red Tractor Farm Assurance - Dairy	11,171	UK	18 months
Red Tractor Farm Assurance - Crops	16,618	England, Wales	12 months
Red Tractor Farm Assurance - Fresh Produce	2,220	UK	12 months
Red Tractor Farm Assurance - Pigs	2,155	England, Wales, NI	12 months
Red Tractor Farm Assurance - Poultry	2,103	UK	12 months
Quality Meat Scotland - Beef & Lamb	9,772	Scotland.	12 months
Quality Meat Scotland - Pigs	139	Scotland	12 months
Farm Assured Welsh Livestock - Beef & Lamb	7,296	Wales	18 months
Scottish Quality Crops	3,443	Scotland	12 months
Northern Ireland Farm Quality Assurance Scheme - Beef and Lamb	12,112	NI	18 months
Northern Ireland Farm Quality Assurance Cereals Scheme	848	NI	18 months
“Laid in Britain”	34	England, Wales, Scotland	12 months
Quality British Turkey	423	UK	12 months
Duck Assurance Scheme (Breeder Replacement, Breeder Layers, Hatcheries, Table Birds, Free-Range Table Birds)	97,354		
	120	UK	12 months
TOTAL	95,068		

*Membership numbers for 2017

Table 2. The total numbers of CRRU-approved training certificates and qualifications awarded by the following awarding organisations: BASIS (Registration) Ltd., City & Guilds, Lantra, Royal Society for Public Health

Time Period	Total number of certificates/qualifications issued
August 2015 to July 2016	7,285
August 2016 to July 2017	6,044
August 2017 to July 2018	5,498
total	18,827

The Continuing Professional Development (CPD) component of the stewardship scheme is now available. The concept is that the expertise of CRRU UK member companies, stakeholder organisations and individuals is used to create a series of CPD training modules made freely available at the CRRU UK website (<http://www.thinkwildlife.org/training-certification/continuing-professional-development-cpd-and-stewardship>). The modules, each comprising a PowerPoint presentation taking 45-60 minutes for completion, are supported by detailed trainers' notes on each page. The modules can be viewed independently by professional rodenticide users as a method of self-teaching. Alternatively, they can be downloaded by training organisations and used during face-to-face and on-line education events. Trainers may register these events with relevant awarding organisations (see Table 3) and participants can claim CPD awards for completion of the modules.

Membership of a registered CPD scheme is strongly promoted by CRRU for all competent professional rodenticide users but is not presently a mandatory

condition for proof of competence at point-of-sale.

A module on the status of anticoagulant resistance in rats and mice in the UK is nearing completion and four CPD modules currently available are:

1. Environmental Risk Assessments
2. Exposure of Wildlife to Rodenticides
3. Direct application of bait in burrows. Justification and mitigation measures
4. Changes to the classification of anticoagulants and permitted pack sizes.

There have been a total of 2,091 CRRU CPD module downloads since the introduction of the scheme on 31st July 2018. The module on Environmental Risk Assessment has proved particularly popular, with 794 downloads since the scheme was established. As the scheme develops, more data will be available on the numbers of views/downloads from and the numbers of CPD awards given to those who participate in formal training events that employ the CRRU CPD modules.

Table 3. Established UK CPD schemes covering all professional user groups.

Scheme Name	Provider
National Register of Spray Operators (NRoSO)	City & Guild/NPTC (National Proficiency Tests Council)
Pig Industry Professional Register (PIPR)	City & Guild/NPTC (National Proficiency Tests Council)
BASIS Professional Register	BASIS (Registration) Ltd.
BASIS PROMPT Register	BASIS (Registration) Ltd.
BASIS Amenity Training Register	BASIS (Registration) Ltd.
LANTRA Skill Plus	Lantra
In-house schemes are available in the professional pest management sector	Various
Training and Certification: users can repeat the approved training and certification options at regular intervals in order to maintain their knowledge to stewardship levels	BASIS, City & Guilds, Lantra, Royal Society of Public Health (RSPH)

4.4. Regulatory Work Group (Leader, Sarah Bull, BASF plc)

The role of the Regulatory Work Group is to ensure that CRRU operates within the regulatory framework imposed by the European Union's Biocidal Products Regulation, as implemented by the UK Competent Authority (CA), the Health and Safety Executive (HSE). The work group provides a single voice for authorisation holders in dialogue with HSE and seeks, where feasible, to harmonise label recommendations and application procedures to provide safe, effective, simple and consistent instructions to users.

Early in 2018, during the later stages of the renewal process, it became apparent that applicants for product authorisations were required to provide individual justifications for certain "non-standard" application methods (viz. 1. permanent baiting; 2. use of covered and protected bait points [instead of proprietary tamper-resistant bait boxes]; 3. direct bait application to burrows). Without such justification these important application methods would not have appeared on product labels and would have been unavailable to users. To save time and effort, both among authorisation applicants and the CA, the work group provided argued justifications, together with necessary risk mitigation measures. These proved acceptable to the CA and the non-standard uses are now permitted on some authorised product labels.

The work group has made significant contributions to CRRU guidance documents (CRRU UK, 2018a) and to the CPD materials made available at the CRRU UK website.

A requirement for the granting of authorisation for a professional rodenticide product to be placed on the UK market is the provision of a full range of product stewardship actions meeting the 'High Level Principles' published by HSE (see <http://www.hse.gov.uk/biocides/eu-bpr/rodenticides.htm>). This requirement is satisfied by membership of CRRU UK, and thereby participation in the UK Rodenticide Stewardship Regime. During 2018, three companies withdrew from CRRU UK, namely Antec Ltd., Impex Europa S.L. and Belgagri SA, and any products that the latter two companies may have had authorised are no longer for sale. Fourteen companies remain members of CRRU UK, of these thirteen hold product authorisations.

A total of 650 rodenticide products are currently supported by the work of CRRU and the stewardship regime and therefore carry labels requiring the implementation of stewardship conditions (see: <http://www.hse.gov.uk/biocides/eu-bpr/rodenticides.htm>). Additionally, 22 products are not supported by stewardship, mainly because their authorisations restrict their sale to non-professionals. Seven different anticoagulant active substances are used in 'stewardship' products, as follows: difenacoum (269 products available), bromadiolone (202), brodifacoum (146), difethialone (21), flocoumfen (4), coumatetralyl (9) and warfarin (2). The majority (644) of these stewardship products are permitted for use outdoors around buildings, while 334 products are also authorised for use outdoors in open areas, 325 outdoors at waste dumps and 363 in sewers. The total number of stewardship products has increased appreciably since last year (up from 349 to 650), probably due to the completion of the renewal process and the authorisation by some manufacturers of new lower-strength rodenticide products. However, many authorisations will expire in the coming months. These products provide a wide variety of options for professional users in integrated rodent pest management programmes and for the control of anticoagulant-resistant rodents (see section 4.6). [N.B. Figures quoted for numbers of products were correct on 4th January 2019.]

Figure 1. New CRRU guidance on internet sales of rodenticides in the UK.



GENERAL GUIDANCE FOR ALL INTERNET SALES OF RODENTICIDES IN THE UK

- **Only** products currently authorised in the UK by HSE are legal to sell online.
- The current UK Authorisation number for the product **must** be stated in the online description.
- All products offered for sale online **must** show representative pictures of the current legally authorised pack type as available for sale.
- All products offered for sale **must** be supplied in the original packaging with the original label as provided by the marketing company and / or authorisation holder.
- **Never** break down the original packaging into smaller amounts for sale. This is illegal.
- **Never** simply use the term “outdoors”. The area of use **must** be described as per the product label, i.e. “In & Around Buildings”, “Outdoors – Open Spaces”, “Outdoors – Waste Dumps”.
- Advertisements must comply with the following guidelines:
 - o <http://www.hse.gov.uk/biocides/eu-bpr/advertisement-requirements.htm>

GUIDANCE FOR SALE OF GENERAL PUBLIC USE PACKS OF RODENTICIDES ONLINE

- All products offered for sale **must** be labelled as being authorised for general public use (ie non-professional) and clearly identified as such in all descriptions.
- All products **must** be sold only in their original packaging.
- All anticoagulant based rodenticides **must** be below 30ppm active ingredient (0.003%).
- All pack sizes offered for sale **must** comply with restricted pack sizes for general public use (see table) – for second generation anticoagulants these are currently up to 300g for use against rats & mice and up to 100g against mice only.

mice only	grain, pellet or paste 50g
	wax block 100g
rats only or mice and rats	grain, pellet or paste 150g
	wax block 300g

GUIDANCE FOR SALE OF PROFESSIONAL USE PACKS OF RODENTICIDES ONLINE

- All products offered for sale **must** be products labelled as being authorised for professional use and clearly identified as such in all descriptions.
- All online description text for products for use ‘in and around buildings’, for use ‘outdoors – open spaces’ or ‘outdoors – waste dumps’ **must** clearly include the following text :

To be used only by professional users holding certification demonstrating compliance with UK rodenticide stewardship regime requirements.

Read the label before use. Using this product in a manner that is inconsistent with the label may be an offence. Refer to the CRRU UK Code of Best Practice (or equivalent) for guidance.

When this product is supplied to a user for the control of rodents, it shall only be supplied to a professional user holding certification demonstrating compliance with UK rodenticide stewardship regime requirements.
- All products **must** be sold only in their original packaging. These pack sizes may vary.
- The online seller **must** confirm the identity of the purchaser, **and** that the purchaser has the required certification and declaration as set out below, prior to supplying the product.
 - o www.thinkwildlife.org/training-certification/
 - o www.thinkwildlife.org/farm-assurance-schemes-arrangements-after-31st-december-2017/
- The online seller **must** keep records of each sale and the proof of certification presented by the purchaser.
- So called “self-declarations” of competence, whereby a purchaser simply ticks a box online to declare their compliance is **never** acceptable.

Failure to adhere to these guidelines may be an offence and may lead to the company concerned being reported to the Health & Safety Executive, Trading Standards and any other relevant body. Failure to comply may also lead to cancellation of the authorisation for sale of the product concerned.

For more information about CRRU UK and the UK Rodenticide Stewardship Regime :
www.thinkwildlife.org/stewardship-regime



VERSION 2 : APRIL 2018

4.5. Point-of-Sale Work Group (Leader Rupert Broome, Killgerm Chemicals Ltd.)

The projects implemented by the Point-of-Sale Work Group within the stewardship regime are focused on “governance of the supply chain”.

The project conducted in 2017 to pilot point-of-sale audits at a limited numbers of sales outlets provided invaluable information to permit a smooth transition to a full audit procedure in 2018. The pilot and the full audit process have been conducted by an independent agency, BASIS (Registration) Ltd. It is the responsibility of all product authorisation holders to ensure that their products are placed on the market only through outlets that are registered with the new Rodenticide Point-of-Sale (RPOS) audit scheme run by BASIS, and have passed an audit.

During 2017 and 2018, a total of 526 outlets registered for the Rodenticide Point-of-Sale audit. Among these, 263 registered only for the RPOS audit, while the remainder were already registered with BASIS for other store audit procedures and have had the RPOS audit added to their compliance programme. As at 1st October 2018, BASIS has completed 427 RPOS audits. As a result of these audits, 274 outlets were fully compliant and 70 were compliant after an advisory notice. 57 outlets failed the audits and require immediate remedial action to be permitted to continue trading. The outcomes of 26 audits are still in progress, and a further 99 audits remain to be scheduled. These figures indicate the remarkable performance of BASIS to get such a complex audit process operational from a standing start in 2017. The initial implementation period for the RPOS audit scheme ends on 31st December 2018 and, thereafter, all authorisation holders are committed to distribution only through outlets that have registered for and passed an RPOS audit.

A further project to implement governance of the supply chain is the operation of the on-line tool for reporting incidents where a failure to comply with point-of-sale competence checks has been observed (<https://www.thinkwildlife.org/stewardship-regime/report-a-concern/>). A total of 27 complaints have been made within this process and, of these, 23 relate to internet sales and allegations that proof of competence was not required for purchase of stewardship products. In 11 of these cases, investigation revealed that the system applied at the on-line outlet did, in fact, require proof of competence. Four complaints resulted in the re-working of the website so that it complied with CRRU guidance on internet sales of rodenticides, three resulted in the web-listing being removed and four were reported to HSE for action as they appeared to involve illegal activity (breaking down

of the original packaging and offering for sale). Other complaints included the sale of multiple product packs to amateurs and the supply at trade shows of free samples to participants without proof of competence. These were successfully resolved.

Learning has been applied from complaints about internet sales, and from other sources, so that an update was issued to the CRRU document that provides guidance to those who offer rodenticides for sale on the internet. The new document (Figure 1) clarifies a number of points in relation to marketing methods, packaging, pack sizes, labelling and retention of information about a sale/purchaser, including proof of competence. An obligation resides with authorisation holders to ensure that all on-line sales outlets offering their products are registered and RPOS audits are carried out by BASIS in the same way as conventional ‘bricks and mortar’ outlets.

4.6. Monitoring Work Group (Leader, Richard Moseley, Bayer CropScience Ltd.)

The Monitoring Work Group provides oversight of and reports on studies from independent contracted agencies on the progress of the stewardship regime in order to meet the HSE/GOG key benefit “monitoring compliance”.

Anticoagulant residues in barn owls (Centre for Ecology & Hydrology)

As in previous years a report has been provided by the Centre of Ecology & Hydrology on the distribution and concentrations of anticoagulant residues in a sample of barn owls (*Tyto alba*) collected during the year 2017 (Shore et al., 2018). The following paragraphs are directly quoted from the CEH report and summarise the results in respect of the HSE/GOG metrics for stewardship monitoring:

- Numbers of barn owls containing detectable residues of flocoumafen and difethialone. There was no significant difference in the proportion of barn owls with detectable liver residues of either flocoumafen or difethialone between the baseline years and 2017.
- The ratio of birds with “low” (<100 ng/g w.w.) vs “high” (>100 ng/g w.w.) concentrations for any single SGAR or for Σ SGARs. There was no significant difference between barn owls from baseline years and from 2017 for any individual compound or for summed SGARs (Σ SGARs)
- Average concentrations of brodifacoum, difenacoum, bromadiolone and Σ SGARs in the cohort of owls with “low” residues (<100

ng/g w.w.) and “high” residues (>100 ng/g w.w.). There was no significant difference between barn owls from baseline years and from 2017 in the concentrations of either “low” or “high” residues for bromadiolone, difenacoum and brodifacoum, or for all residues summed (Σ SGARs). Although not statistically significant, the median and 75th percentile values of “low residues” of most compounds and Σ SGARs were lower in 2017 [and 2016] than in the baseline years.

Overall, the lack of statistically significant differences in anticoagulant residue accumulation by barn owls in 2017, compared within baseline years, suggests that full implementation of stewardship since 2016 has yet to be reflected by a statistically significant detectable reduction in exposure of barn owls. However, there is some indication within the data set that some of the residue parameters are showing a decline but their magnitude falls short of that needed to reach conventionally-applied scientific requirements for statistical significance.

It is also apparent that the regulatory changes implemented in 2016 that permitted the use of the more potent anticoagulants, brodifacoum, difethialone and flocoumafen to be used outdoors for the first time, has led to no immediate statistically significant increase in exposure of barn owls to these substances.

Barn owl breeding performance (University of Reading and Wildlife Conservation Partnership)

The Barn Owl Monitoring Survey (BOMS) was carried out once more in 2017 to measure key breeding performance metrics in a sample of UK barn owl nests (Prescott et al., 2018a). The barn owls studied within the BOMS are assumed to carry residues of anticoagulant rodenticides of similar magnitude to those detected in the study described in the previous section, although no specific information is available to corroborate this assertion.

A total of 130 nests, from five different regions of the UK, were observed during 2017 and the metrics recorded were: nest site occupancy rate, nest productivity (i.e. mean number of chicks fledged in productive nests) and records of birds (both chicks and adults) that show any abnormal growth development.

Of the 130 barn owl nest sites monitored in 2017 (Prescott et al. 2018a), a total of 153 young birds fledged from 61 successful nests, with mean nest productivity of 2.51 chicks per successful nest, and a range across the five regions of 2.0 to 3.0 chicks per successful nest. If unsuccessful nests are included in the calculation, the mean number of chicks per nest was 1.18. No eggs or chicks showing abnormal development/growth were observed.

Table 4. Summary of barn owl breeding data from the BOMS study summarised from Prescott et al., 2018a.

Year	Parameter	Region 1 (N)	Region 2 (E)	Region 3 (C)	Region 4 (SE)	Region 5 (Midlands)	All Regions
2015	Total number of nests	25	25	25	25	30	130
	Nests that produced fledgling birds	5	4	13	12	7	41
	Total number of birds fledged	13	10	31	31	18	103
	Mean productivity per successful nest	2.60	2.50	2.38	2.58	2.57	2.51
2016	Total number of nests	25	25	25	25	30	130
	Nests that produced fledgling birds	7	9	11	16	18	61
	Total number of birds fledged	18	21	25	39	51	154
	Mean productivity per successful nest	2.57	2.33	2.27	2.44	2.83	2.52
2017	Total number of nests	25	25	25	25	30	130
	Nests that produced fledgling birds	8	9	13	15	16	61
	Total number of birds fledged	16	24	34	45	34	153
	Mean productivity per successful nest	2.00	2.67	2.62	3.00	2.13	2.51

BOMS breeding data show annual fluctuations in the breeding productivity of UK barn owl populations, although the data obtained in the last three consecutive years (2015-2017) are remarkably constant (Table 4). At 153, the numbers of chicks fledged from BOMS nests in 2017 was somewhat greater than the average (130, ranging from 78 to 186 in the years 2011 to 2017). It is generally considered that these fluctuations in breeding performance are caused by factors including climatic conditions, the availability of prey, the availability of nest sites and the numbers of birds in breeding condition (Prescott et al. 2018a).

Resistance in UK Rats and Mice (University of Reading)

Further work has been conducted at the University of Reading to collect rat and mouse tissue samples and to sequence DNA from them to detect common anticoagulant resistance mutations (Prescott et al. 2018b).

In the year 2018 to date, an additional 37 Norway rat tissue samples were sequenced and nine mouse samples. Among the rat samples, 13 (35.1%) were found to be susceptible and 24 (64.9%) carried a resistant mutation. Of particular interest was the fact that two new mutations, Y139F and Y139C, were found in the Anglo-Welsh Border resistance focus (actually Shropshire) where previously only Y139S had been found. This followed reports from a technician, very experienced in the area, of greater difficulty than before encountered in gaining control of rats using baits containing difenacoum. Also worthy of note was the discovery of resistance mutations in the counties of Essex, Monmouthshire, Somerset and West Yorkshire where they had not been found before. With the exception of the discovery of Y139C and Y139F in Wales, the circumstance of which suggest that this is indeed a new development, these findings do not necessarily mean that resistance is spreading. It is equally possible that these resistance foci have remained undetected for some time.

Few samples have been obtained from Scotland, Wales and Northern Ireland. There also remains a very large geographical area in the centre of England from which few, if any, samples have been obtained. Where they have been obtained rats tend to be predominantly susceptible. Samples from these areas are urgently required.

Among the nine mouse samples, only one was susceptible. These new findings bring the percentage of mouse samples carrying one or more resistance mutation to 88.7% (Prescott et al., 2018b). This supports the recommendation of the UK Rodenticide Resistance Action Group that neither the first-generation anticoagulants, nor the second-generation compounds bromadiolone and difenacoum, should be used against house mice in the UK (RRAG, 2018).

KAP Survey

No Knowledge, Attitudes and Practice (KAP) survey was conducted in 2018.

4.7 Communications Work Group

The work on communication conducted by CRRU is intended to promote all aspects of the regime, in particular a "competent workforce" and "governance of the supply chain".

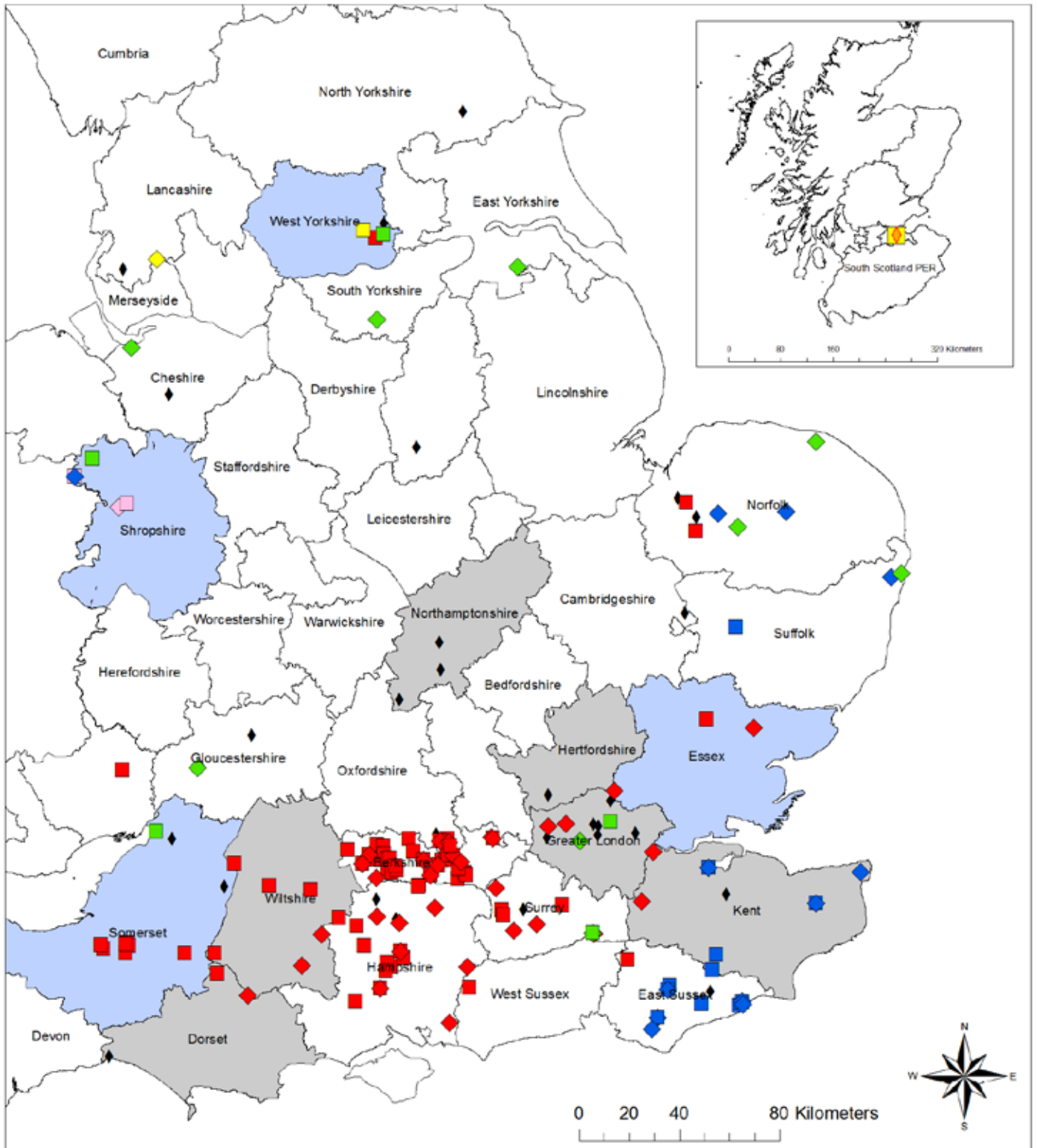
Effective communication is an essential element of a regime that attempts to change knowledge, attitudes and practices across three quite different rodenticide user constituencies. The CRRU communication strategy relies upon the provision of communications material by CRRU, as a first step. The vehicle for dissemination of this information is principally a series of informative press releases, produced at relevant times, covering all aspects of the work of CRRU (Table 5). This material is then disseminated to each user group through multi-media channels.

CRRU is known and trusted within the professional pest control sector, so the press releases are sent directly from CRRU to those who inform that sector. CRRU is less well known among the farming and gamekeeping sectors and trusted stakeholder partners, such as the National Farmers Union, the Agriculture and Horticulture Development Board, the National Gamekeepers Organisation and the Game and Wildlife Conservation Trust are used as intermediaries that place CRRU material with relevant opinion formers and information providers. The result of this strategy is the presentation of CRRU material, via printed and on-line media, to a wide range of professional rodenticide users.

The CRRU Task Force recognised from the 2017 KAP interim data that behavioural change among rodenticide users was significantly less in the agricultural sector than among professional pest control technicians and gamekeepers (CRRU, 2018b). Therefore, the Task Force decided that a special communication effort should be directed towards the agricultural sector in 2018. This has involved a number of communication projects focussed specifically at farmers and those involved in animal husbandry.

The engagement of all sectors with the information dissemination from the regime's communication effort is demonstrated by observed changes in knowledge, attitude and practice observed in periodic KAP surveys. A KAP survey will be conducted in 2019, or in early 2020, for comparison with 2015 preliminary data, prior to stewardship implementation, and 2017 interim data (CRRU UK, 2018b).

Figure 2. Available data on the geographical distribution of VKORC1 mutations in Norway rats across the UK. From Prescott et al. (2018b)



VKORC1 Mutations in the Norway rat

Y139C	Y139F	Y139S	L128Q	L120Q	Susceptible	L120Q_and_L128Q
Heterozygous	Heterozygous	Heterozygous	Heterozygous	Heterozygous	Homozygous	Heterozygous
Homozygous	Homozygous	Homozygous	Homozygous	Homozygous		



Counties where susceptible Norway rats have been found between March – August 2018

Counties where resistant Norway rats have been found between March – August 2018

Table 5. CRRU UK Press releases October 2017 to September 2018.

Title	Content	Date of release
WHISTLEBLOWER PROCESS INTRODUCED FOR RODENTICIDE POINT-OF-SALE BREACHES	A reporting process for suspected breaches of UK Rodenticide Stewardship Regime point-of-sale checks has been introduced. It can be found at HERE .	01 October 2017
2018 RODENTICIDE APPROVAL FOR QUALITY MEAT SCOTLAND	Quality Meat Scotland's farm assurance standard for rodent control has been approved for 2018 onwards by the UK Rodenticide Stewardship Regime. Since the regime's introduction by UK government in mid-2016, members of QMS have been considered stewardship compliant as a transitional measure. This would have expired on 31 December without the new approval.	02 October 2017
SIGN-UP CALL TO RODENTICIDE SELLERS FOR POINT-OF-SALE AUDITS	Suppliers of professional use rodenticides to pest controllers, farmers and gamekeepers are required to register with BASIS Registration Ltd by the end of December for the new UK Rodenticide Stewardship Regime Point-of-Sale audit process.	16 October 2017
2016 SEES NO INCREASE IN BARN OWL RODENTICIDE RESIDUES	No significant changes have been detected in barn owl liver residues of rodenticide between 2016 and a seven-year baseline. This comes from independent analysis by the Centre for Ecology & Hydrology (CEH) of barn owl livers supplied from the Predatory Birds Monitoring Scheme, a citizen science project.	17 October 2017
2018 RODENTICIDE COMPLIANCE FOR 11 ASSURANCE SCHEMES	Eleven assurance schemes with combined memberships of 95,000 farm businesses will be compliant with the UK Rodenticide Stewardship Regime for 2018.	11 December 2018
FARM ASSURANCE SCHEMES – ARRANGEMENTS AFTER 31ST DECEMBER 2017	Under transitional arrangements agreed between the Campaign for Responsible Rodenticide Use (CRRU) UK, all relevant stakeholder organisations and the Government Oversight Group ¹ (chaired by the Health and Safety Executive), members of farm assurance schemes whose standards involved a systematic approach to rodent pest management, with documentation and regular independent audit procedures, were considered competent to purchase professional rodenticide products for application outdoors. This transitional arrangement will end on 31st December 2017.	18 December 2017
ANOTHER RESISTANCE, THIS TIME RODENTICIDES, FOR FARMERS TO DEAL WITH	Just when farmers are getting the hang of rodenticide stewardship rules, introduced mid-2016, a new study by Reading University confirms that rats in some parts of the country are resistant to some of the most widely-used poison baits.	02 February 2018
RODENTICIDE-TRAINED GAMEKEEPERS, FARMERS AND PEST CONTROLLERS UP 13,000; MEMBERS OF APPROVED FARM ASSURANCE TOPS 97,000	Less than two years since the UK Rodenticide Stewardship Regime's mid-2016 introduction, 13,000 users of professional-use-only rat baits have undergone training and been awarded approved certification.	02 March 2018
ALL RODENTICIDE USERS ENCOURAGED TO UPDATE KNOWLEDGE	Farmers, gamekeepers and pest controllers are being encouraged to undertake knowledge updates to maintain their professional competence in the use of stewardship-label rodenticides.	05 April 2018
MIXED OUTLOOK FOR PRACTICAL RAT CONTROL FROM FARMERS	In roughly equal measure, concerns and reassurance about rat control on farms have been identified by a recent survey. Working with the NFU, UK Rodenticide Stewardship obtained information from 117 farm owners and managers.	24 July 2018
UPDATED RODENTICIDE GUIDELINES FOR ONLINE SALES	Guidelines for online sales of anticoagulant rodenticide products have been updated for recently introduced smaller packs and lower active ingredient levels in products for general public use.	24 July 2018
FREE INFORMATION MATERIALS SUPPORT CPD AND BEST PRACTICE RODENT CONTROL	A new set of information materials supporting effective and responsible rodenticide use has been published by UK Rodenticide Stewardship and is available free of charge to all users. Topics are: Exposure of wildlife to rodenticides; Direct bait application in burrows; Environmental risk assessments; and Changes to classifications and pack sizes. Each one includes detailed notes and some offer suggested additional reading.	07 August 2018
TOUGHER RODENTICIDE RULES FOR FARMERS, GAMEKEEPERS AND PEST CONTROLLERS ON PERMANENT BAITING	Tougher restrictions on permanent rodenticide baiting by farmers, gamekeepers and pest controllers, with legal backing, have been introduced by the Health and Safety Executive (HSE), the UK rodenticide regulatory body. A detailed booklet, CRRU Guidance: Permanent Baiting, is available from HERE . The practice is only approved where high potential for reinvasion is identified and when all alternatives have been considered. It is prohibited as a 'just-in-case' preventive measure when no signs of rats, nor high reinvasion threat, is present.	17 September 2018

5. CONCLUSIONS

The Regime will be evaluated by GOG in stages according to the delivery of three key benefits: 'supply chain governance', 'competent workforce' and 'monitoring compliance' (GOG, 2018). The

information that CRRU is required to present comprises 11 data sets, under six heads (see Annex 2).

5.1 Environmental Impacts (Monitoring Compliance)

CEH annual survey of residues in livers of 100 barn owls

Shore et al. (2018) reported the results of the annual study to monitor residues of anticoagulants in barn owls. All 100 barn owl carcasses received by CEH were autopsied and were found to have died from various causes, but mainly from road traffic collisions or starvation. Any haemorrhaging detected at post-mortem in birds was always associated with signs of trauma and so there was no clear evidence that any individual had died from anticoagulant rodenticide poisoning among birds collected in 2017. The CEH annual survey has revealed no significant diminution in either the frequency or the concentrations of anticoagulant residues in the livers of a sample of 100 barn owls that died during the year 2017, in comparison with data from the base-line years of 2007 to 2012. Although some of the metrics showed limited reduction in residue levels, none reached the level required for scientific statistical significance. With the regime in its infancy, it seems likely that any reduction in exposure brought about by its implementation would be small at this early stage. A further factor is that any increase in responsible rodenticide use instigated by stewardship in the large and important agriculture sector is likely to be apparent only sometime after the introduction of new farm assurance standards of 1st January 2018.

Annual survey of barn owl breeding performance

The survey of barn owl liver residues conducted by CEH for CRRU is used as a sentinel for those UK wildlife species that rely for food mainly on live small rodents. As a species, the barn owl in the UK has been moved from the Birds of Conservation Concern (BoCC) 4 amber list onto the green list, taking account of the population increases reported annually by the BTO's Breeding Bird Survey since 1995, ranging between 217% and 501% (Eaton et al., 2015). These increases have been due to a number of factors; probably most important among them are the efforts of conservation organisations such as the Barn Owl Trust (<https://www.barnowltrust.org.uk/>) and the Barn Owl Conservation Network (<http://www.bocn.org/>).

Barn owl breeding in the year 2017 was found to be at a level that was consistent with the two preceding years. None of the years 2015 to 2017 was particularly bad, as had been 2013, nor particularly good, as had been 2014, in terms of numbers of fledged chicks.

In a BTO Research Report (Henderson et al., 1993), barn owl annual mean productivity was presented for six specified regions of England and Wales between 1988 and 1990, and ranged between 2.6 and 4.2 (n=246). Similarly a report to the Environment Agency (Shawyer, 2010) reported an annual mean productivity between 2000 and 2009 ranging between 2.6 and 3.5 (n=581). These values are comparable with the data presented by the BOMS study, although the values for the years 2015-2017, at 2.51, 2.52 and 2.51 respectively, are at the lower end of these ranges.

Annual Review of WIIS Incidents

According to the government report (GOG, 2018), HSE/GOG is currently examining the feasibility of using data on several species from a variety of sources (PBMS and WIIS) as a further qualitative, or possibly quantitative, assessment of changes in the environmental impact of anticoagulant rodenticides.

5.2 Whether the rodenticides are effective (Competent Workforce)

Annual Report of training uptake and award of certification/qualification by CRRU-approved awarding bodies

Information on the award of certification/qualification is commercially sensitive and submitted to GOG in confidence. Aggregated figures for all awarding bodies (Table 2) show some reduction in the numbers of course participants receiving awards on an annual basis during the years 2015-2018. There was an initial surge in numbers caused by the requirement, introduced for the first time in 2016, for proof of professional competence at point-of-sale. After this initial surge, it seems likely that annual numbers acquiring certification/qualification will stabilise at a somewhat lower figure that reflects

the expansion of the professional pest control industry, the move towards greater professionalism across all user sectors and industry personnel turnover.

Annual Report of members of CRRU-approved farm assurance schemes

A strategic decision was made by the CRRU UK Task Force, and approved by HSE/GOG, that the most effective way to introduce new rodenticide stewardship requirements into the agricultural sector was by embedding CRRU guidance into the technical standards operated by the Farm Assurance Schemes (FAS) (Table 1). The amendment of FAS standards involves cycles of development of standards and stakeholder consultation, such that several years are required for new standards to be developed, introduced and employed in auditing. Consequently, only on 1st January 2018 were all CRRU-approved FASs operating to new standards which followed CRRU best practice guidance. It is anticipated that, as they impact such large numbers of audited premises (Table 1), changes in use practices will be translated into reductions in wildlife exposure to rodenticide.

Provision of up to date, relevant best practice guidance

CRRU has been active both to develop new guidelines and to review and re-issue established guidance. These are made available as both written documents and as CPD training modules, for free download from the CRRU website. All aspects of best practice and responsible use are covered.

The CRRU Code of Best Practice (CRRU UK, 2015) has been widely adopted by all user groups. It is under review by CRRU to determine whether or not new developments in rodenticide product labelling, regulation and use practice make necessary a revision. If necessary, a revision will be issued in 2019

Promotion of regime objectives and raising awareness by stakeholder organisations

A requirement to inform and engage with all user groups, in order to raise awareness and change behaviour in respect of responsible rodenticide use, has been a primary objective since the start of the regime. Changes in these parameters are measured in periodic KAP surveys. A KAP survey is planned for late 2019 or early 2020.

5.3 Resistance Monitoring (Competent Workforce): Annual report of the status of resistance monitoring in the UK and elsewhere in EU.

The report provided to HSE/GOG by CRRU UK, and prepared by the University of Reading (Prescott et al., 2018b), is the most comprehensive continuing resistance monitoring programme conducted in the EU. The severity and geographical extent of anticoagulant resistance among UK Norway rat and house mouse infestations is documented.

DNA sequencing of rat and mouse tissue samples at the University of Reading increases our knowledge of anticoagulant resistance in the UK. The data cannot tell us whether newly-discovered resistance foci have been present undetected for some time or have only recently developed. However, there is no doubt that resistance to anticoagulants in UK rodents is a significant impediment to effective rodent control in some areas and drives the necessity, across larger and larger areas of the UK, to use of the most powerful anticoagulant rodenticides to combat resistant rats and mice. This has obvious consequences for stewardship and its objective to reduce wildlife exposure.

The Reading UK data are provided to the CropLife International Rodenticide Resistance Action Committee (RRAC) and are mapped into on-line software that makes resistance information for the whole of Europe available in real time to rodenticide users (see <http://guide.rrac.info/resistance-maps/resistance-maps/>). The RRAC project also provides free DNA resistance testing of samples sent to the University of Reading, provided they carry the necessary information on location of collection and are from areas that increase our understanding of resistance distribution. The RRAC mapping tool is accompanied by resistance management guidance specific to each user, having different requirements according to resistance mutations found.

5.4 Awareness using the Knowledge, Attitude and Practice (KAP) survey (Competent Workforce/Monitoring Compliance).

No KAP survey was conducted in 2018. However, the data from the 2017 KAP survey were employed to direct communications efforts. In particular, it was apparent from a range of metrics within the 2017 KAP data that the agricultural sector lagged behind the other sectors in engagement, awareness and behavioural change. This is due in part to the very large and diverse nature of this sector, that some of it is difficult to reach using conventional multi-media channels and the fact that the sector faces a multitude of challenges of (probably) higher priority.

Additional communication efforts were made by CRRU to reach this sector in 2018. Furthermore, new FAS standards, to be applied and audited at the sites of more than 95,000 members, will serve to bring responsible rodent management higher up the farm agenda. A KAP survey to be conducted in late 2019, or early 2020, will show how successful these efforts to raise awareness and change use practices have been in the agricultural sector.

5.5 Point-of-Sale Information (Supply Chain Governance): Output from the Point-of-Sale Audit.

A corner-stone of the stewardship regime is the imposition of competence checks at the point-of-sale. As well as “supply chain governance”, these checks drive the “competent workforce” benefit because only appropriately certificated personnel can purchase professional rodenticides. The importance of this measure within the regime overall made necessary a procedure to audit its application.

This process was put in place and operated in full for the first time in 2018. The year was a permitted ‘implementation period’, which will end on 31st December 2018. Thereafter, all sales outlets that either fail to register for a RPOS audit, or do not satisfy BASIS auditors when one is conducted, will not be permitted to sell authorised rodenticide products carrying ‘stewardship conditions’. It is the responsibility of the authorisation holders, applied to them through the condition of authorisation for each product they put on the market, to ensure that their products are sold only through outlets that have satisfactorily passed an annual BASIS audit. The numbers of registered outlets (526 to this point in 2018) and the number of completed audits (427) are a testament to the organisation and determination of both BASIS and CRRU to ensure the process was operated effectively in 2018.

5.6 Training (Competent Workforce)

This aspect of the regime is covered in section 5.2 above.

5.7 General Conclusion and plan for 2019

With the developments described in the preceding sections of this report from the six stewardship work groups, all the substantive elements of the stewardship regime have been put in place. Therefore, the work of these groups over the coming years will be to ensure that all these elements are being fully implemented and monitoring is carried out to confirm that anticipated outcomes are delivered.

Annual reports on the delivery and achievements of the UK Rodenticide Stewardship Regime will be presented to HSE/GOG and a full review of the process will be conducted in 2020 (GOG, 2018). There are just two more years of stewardship implementation to show that the regime has made significant progress towards its aims to change user behaviour and reduce residues in wildlife.

NB. Throughout this document, where the acronym CRRU is used for the Campaign for Responsible Rodenticide Use, it refers to CRRU UK.

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ANNEXES

ANNEX 1. The HSE “High-Level Principles” and the key benefits they deliver (GOG 2018). Available at: <http://www.hse.gov.uk/biocides/eu-bpr/rodenticides.htm>. Date accessed: 15.10.18.

Government set the following principles for the UK’s anticoagulant Rodenticides Stewardship Regime.

- a. Use of Integrated Pest Management, including use of rodenticides, involving a hierarchy of risk controls for rodents.
- b. Responsible use of rodenticides, when demonstrated they are needed, because of their potential threat to human, animal health and the environment.
- c. Applicability to all suppliers, handlers and professional users of rodenticides approved under stewardship to address these risks.
- d. The need for the regime to be robust, effective and workable, while remaining as simple as possible.
- e. The need for the regime to cover the whole life-cycle of the rodenticide products: manufacture, supply chain, end-use, disposal and environmental fate.
- f. The enabling of good practice in the control of rodent populations, as part of an Integrated Pest Management system, while minimising resistance build-up and secondary poisoning in non-target species.

Delivery of key benefits, such as:

- **governance of the supply chain**, which gives governance over, and provides the driver for, later stages;
- **a competent workforce** capable of delivering stewardship standards and of demonstrating an appropriate understanding and attitude toward case-specific control of rodents and use of rodenticides; and
- **monitoring compliance** with the regime and its environmental impacts, and if possible of the level of conflict reduction – i.e. an assessment of whether rodenticides and stewardship together are actually tackling the problems

ANNEX 2. Overview of CRRU evaluation data to be provided to the GOG.

Required data		Data to be provided
1	Environmental Impacts (Monitoring Compliance)	1. CEH annual survey of residues in livers of 100 barn owls 2. Annual survey of barn owl breeding performance 3. Annual review of WIIS incidents
2	Whether the rodenticides are effective (Competent Workforce)	1. Annual report of training uptake and award of certification/ qualification by CRRU-approved awarding bodies 2. Annual report of number of members of CRRU-approved farm assurance schemes 3. Provision of up to date, relevant best practice guidance documents 4. Promotion of regime objectives and raising awareness by stakeholder organisations
3	Resistance monitoring (Competent Workforce)	1. Annual report of status of resistance monitoring in UK and elsewhere in EU
4	Awareness using the Knowledge, Attitude and Practice (KAP) survey (Competent Workforce/Monitoring Compliance)	1. KAP survey baseline study (published) 2. Repeated KAP surveys in 2017 and 2019
5	Point of sale information (Supply Chain Governance)	1. Output from the Point of Sale Audit. Interim results provided by June 2018.
6	Training (Competent Workforce)	(see point 2 above)

¹ Government is currently examining the feasibility of using data on several species from a variety of sources (PBMS and WIIS) as a further qualitative, or possibly quantitative, assessment of changes in the environmental impact of anticoagulant rodenticides.



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