Animals (Scientific Procedures) Act 1986

Non-technical summaries for project licences granted during 2016

Volume 15

Projects with a primary purpose of – Preservation of Species

Project Titles and keywords

1. **Fish migration and behaviour at barriers**
    - Fish; movement; behaviour; telemetry; conservation

2. **Behaviour and Ecology of Wild Mammals**
    - Ecology, behaviour, wildlife conservation, welfare

3. **Leprosy in red squirrels**
    - Leprosy, red squirrel, conservation, welfare

Project 1	**Fish migration and behaviour at barriers**	
Key Words (max. 5 words)	Fish; movement; behaviour; telemetry; conservation	
Expected duration of the project (yrs)	5	
Purpose of the project as in ASPA section 5C(3) (Mark all boxes that apply)		Basic research
		Translational and applied research
		Regulatory use and routine production
		Protection of the natural environment in the interests of the health or welfare of humans or animals
	x	Preservation of species
		Higher education or training
		Forensic enquiries
		Maintenance of colonies of genetically altered animals
Describe the objectives of the project (e.g. the scientific unknowns or scientific/clinical needs being addressed)	The aim of this research is to gain a robust understanding of the movements, migration patterns, distribution and behaviour of fish in relation to manmade river infrastructure such as weirs, dams and water abstraction intakes which have potential to delay or prevent free movement, and cause injury and mortality to fish. There are strong legislative drivers to improve fish passage at barriers and water offtakes and barrier removal/mitigation is underway, yet there remain key knowledge gaps which will lead to inefficient use of resources if not addressed. A wide range of potential barrier mitigation solutions are offered commercially to water managers, but robust tests of their efficacy under the full range of operating scenarios are lacking for most. The installation and maintenance of fish passage and guidance technologies may be very costly, hence research is urgently needed to underpin management decisions to ensure that mitigation measures are fit for purpose and cost-effective. Advancements gained from this project will both further scientific knowledge on the behaviour of migratory fish and provide robust management advice to statutory bodies on how best to mitigate for barriers to fish movement and therefore meet legislative obligations.	
What are the potential benefits	Ensuring unhindered migration for fish is a	

likely to derive from this project (how science could be advanced or humans or animals could benefit from the project)?	requirement under European legislation including the Water Framework Directive and The Eels (England and Wales) Regulation 2009. Findings from this research will provide an evidence base for devising policy, regulation and operational best practice to protect and enhance migratory fish species and meet legislative requirements.
What species and approximate numbers of animals do you expect to use over what period of time?	The 5 year programme of research will involve a maximum of 15,280 adult and juvenile fish of representative migratory species including trout and eels.
In the context of what you propose to do to the animals, what are the expected adverse effects and the likely/expected level of severity? What will happen to the animals at the end?	All procedures are classified as either mild or moderate severity. Most fish will be tagged so that their movements can be tracked. Tagging entails anaesthetising individuals then making a small incision through which the tag is gently pushed into the peritoneal cavity. Surgery typically lasts less than 3 minutes after which the fish is transferred to a holding cage in the river for recovery. Fish involved in the studies will be released into the wild after recovery. A possible adverse effect could be infection of the tagging wound. Infection risk will be minimised by taking adequate infection control measures (e.g. antiseptic precautions) during tag implantation and by applying a wide-spectrum antibiotic to the wound.
Application of the 3Rs	
1. Replacement State why you need to use animals and why you cannot use non-animal alternatives	The study programme aims to advance our understanding of behaviour of actively migrating fish in their natural environment. There is no appropriate replacement for wild fish because at present there is insufficient existing knowledge on fish behaviour to accurately predict and model the natural movements of wild fish. Tagging allows individuals to be tracked over a range of spatial and temporal scales and is therefore the most appropriate method for us to study free ranging wild fish in natural environments which can be inherently taxing or inaccessible to human observation. The use of state-of-the-art genetic analyses to study population dynamics means tissue will be sampled non-lethally and data can be gained that otherwise would require tagging/marking of 1000s of individuals.
2. Reduction Explain how you will assure the use of minimum numbers	The number of fish to be used is based on a statistical power analysis founded on the results of previous research both at this establishment and in the wider scientific literature. The use of telemetry

of animal	means it is easier to keep track of tagged individuals and data collection is not dependent on subsequent recapture, thereby yeilding a high rate of data return for each animal used. Further, the state-of-the-art acoustic telemetry we will use enables collection of large quantities of high quality data for each tag, thus minimising the number of fish used.
3. Refinement Explain the choice of species and why the animal model(s) you will use are the most refined, having regard to the objectives. Explain the general measures you will take to minimise welfare costs (harms) to the animals.	The proposed species have been chosen to deliver maximum benefit because particular knowledge regarding the movement and behaviour of these species at structures is lacking and they are among the most vulnerable to the negative impacts of manmade barriers. Previous research has shown that the proposed methods are suitable for the proposed species and that the information derived will be suitable for the questions being addressed. When they undergo a procedure with recovery fish will be monitored for an appropriate period to assess any adverse effects and ensure minimum suffering.

Project 2	**Behaviour and Ecology of Wild Mammals**	
Key Words (max. 5 words)	Ecology Behaviour Wildlife Conservation Welfare	
Expected duration of the project (yrs)	5 years	
Purpose of the project as in ASPA section 5C(3) (Mark all boxes that apply)	x	Basic research
		Translational and applied research
		Regulatory use and routine production
		Protection of the natural environment in the interests of the health or welfare of humans or animals
	x	Preservation of species
		Higher education or training
		Forensic enquiries
		Maintenance of colonies of genetically altered animals
Describe the objectives of the project (e.g. the scientific unknowns or scientific/clinical needs being addressed)	Mammals are very susceptible to ecosystem stresses arising through natural and man-made pressures, such as disease, habitat toss and climate change. Our objective is to collect data on the fundamental ecology of various UK mammals and to observe how their ecology and behaviour changes in response to naturally-occurring processes.	
What are the potential benefits likely to derive from this project (how science could be advanced or humans or animals could benefit from the project)?	A greater understanding of the natural history of mammals is fundamental to our appreciation of them and to our understanding of their habitat and welfare needs. Only with detailed baseline data is it possible to observe how populations are impacted by stressors, and what species conservation mitigation is effective and appropriate. Consequently, this work has fundamental benefit to society and to mammal conservation.	
What species and approximate numbers of animals do you expect to use	We study a wide variety of UK mammals (and mammals internationally), however our licensed work currently pertains only to badgers, hedgehogs and watervoles. In each case our greatest struggle is to	

over what period of time?	catch sufficient animals from the wild (and then returned immediately to the wild, after handling) to answer questions robustly. Over the 5-year study, we expect a maximum of 100 hedgehogs and watervoles to be studied; our work on badgers involves attempting to monitor the demographics on an entire population, comprising around 200 adults, with 50 cubs born each year.
In the context of what you propose to do to the animals, what are the expected adverse effects and the likely/expected level of severity? What will happen to the animals at the end?	Animals are trapped (with full attention to welfare), sedated, measured, some are blood sampled (disease I hormone / DNA screening), and some radio-collared and then released to the wild within a few hours at the site they were caught at. Badgers may be vaccinated against TB as part of the study, and we have not observed any swelling at the inoculation site, and thus we have seen no impairment of movement. It is not in the interests of our work to disrupt the animals natural behaviour and we see the work has no impact from re-capturing the animals (no loss of health or vigour) while tracking and video observation show us that any behavioural disruption, caused by capture, returns to normal behaviour patterns within a few hours of release.
Application of the 3Rs	
1. Replacement State why you need to use animals and why you cannot use non-animal alternatives	Although studying wild animals is fundamental to our behavioural ecology work, we still strive to use computer models and virtual models whenever possible.
2. Reduction Explain how you will assure the use of minimum numbers of animals	Working with wild mammals, a struggle is often to capture sufficient animals, and to re-capture key animals to make the study viable, but we take great care to ensure all studies are well-planned and successful. Again, we make as much use of the data collected (through computer model and statistical extrapolation) as is possible.
3. Refinement Explain the choice of species and why the animal model(s)	This is the key area among the 3Rs where our work seeks to minimise the experience of each animal. The majority of our work falls beneath ASPA thresholds, such as using camera-traps, video surveillance and

you will use are the most refined, having regard to the objectives. Explain the general measures you will take to minimise welfare costs (harms) to the animals.	field-signs to monitor animals. Only minimal numbers / volumes of samples are taken from animals (e.g. blood) for the purposes necessary, where new lab techniques can screen for disease, or assign parentage, from tiny amounts of blood. The tracking collars we use are state of the art and resemble little more than a pets' collar, but can record multiple parameters over many months. Ultimately, ensuring welfare is not only key to the quality of the data we want to collect (distressed animals would not behave naturally) but it is also often focal to the research we're doing. For example, we are able to measure stress hormone levels in blood samples to assess how well the animal is coping in its environment. Many of our scientific publications pertain directly to welfare.

Project 3	**Leprosy in red squirrels**	
Key Words (max. 5 words)	Leprosy, red squirrel, conservation, welfare	
Expected duration of the project (yrs)	5 years	
Purpose of the project as in ASPA section 5C(3) (Mark all boxes that apply)		Basic research
	X	Translational and applied research
		Regulatory use and routine production
		Protection of the natural environment in the interests of the health or welfare of humans or animals
	X	Preservation of species
		Higher education or training
		Forensic enquiries
		Maintenance of colonies of genetically altered animals
Describe the objectives of the project (e.g. the scientific unknowns or scientific/clinical needs being addressed)	The objectives of this project are to study and improve our understanding of red squirrel leprosy, a recently discovered disease that we have identified as being caused by the same bacteria that cause human leprosy. Affected squirrels show similar signs to humans with leprosy, such as hair loss, swelling and ulceration of the skin and infections of the nerves in the skin. The disease progresses slowly and eventually squirrels can die. The disease was first reported in Scottish red squirrels in 2014, caused by a bacterium called Mycobacterium lepromatosis, which was only recently (2008) found to be a cause of human leprosy. also It has now also been found that leprosy is affecting a large number of squirrels in an isolated population, though infection there is with a slightly different bacterium, Mycobacterium Ieprae, which is the traditional agent of human leprosy. Red squirrels are highly threatened and decreasing in numbers, mainly due to the introduced grey squirrel which competes with them for food and habitat, but also by diseases such as squirrelpox, and potentially	

	by leprosy. Although human leprosy has been well studied for a long time, very little is known about this disease in red squirrels, such as why it is only now being identified and only in red squirrels, how many squirrels are affected in the UK, how it is transmitted, what impact it has on individual squirrel health and welfare and also on their populations, and whether there is any risk to humans. Human leprosy is still an important disease affecting up to 250,000 people a year worldwide, but it does not occur any more in the UK, and is in fact very easily treatable with antibiotics UK. It is necessary to discover how important the threat of leprosy is to red squirrels, whether any other wild animals are affected or may carry this disease, and whether any changes are needed to conservation efforts for the red squirrel in the UK due to this disease threat. It is also necessary to determine if red squirrels or other wildlife pose any risk to humans from this disease, so that appropriate public health advice can be given.
What are the potential benefits likely to derive from this project (how science could be advanced or humans or animals could benefit from the project)?	The main benefits of this project are to the health, welfare and conservation of the UK red squirrel population. By gaining an understanding of leprosy, its prevalence, transmission and impact on both populations and individuals of the species, it will be possible to guide conservation management decisions and possible management or veterinary control interventions (e.g. vaccination) if these are deemed necessary or appropriate in order to limit the adverse effects of leprosy. This project will work specifically towards site management plans for red squirrel conservation and management on specific affected location(s) in collaboration with local bodies as appropriate. The findings will also inform conservation management of other red squirrel populations in the UK already known to be affected by leprosy. For example, it is anticipated that the findings of this study may have implications for habitat management to maintain healthy squirrel populations and minimise disease transmission risks.

	Further benefits of this study are a greater understanding of the potential origins of human leprosy, including the identification of wildlife reservoirs in countries where the disease remains endemic.
What species and approximate numbers of animals do you expect to use over what period of time?	Up to 500 red squirrels over 5 years
In the context of what you propose to do to the animals, what are the expected adverse effects and the likely/expected level of severity? What will happen to the animals at the end?	We will be studying wild red squirrels by trapping them humanely in cage traps in their natural environment, anaesthetising them, examining and taking samples, and then releasing them back to the wild. The severity category of this is mild. Expected adverse effects of this are negligible to low (<1%). We are using a capture and anaesthesia technique that we have used many times before in other red squirrel conservation projects and have to date not had any adverse effects at all. However, all trapping and anaesthesia carries some risk and it is possible that some squirrels may injure themselves or suffer anaesthetic complications or even death under anaesthesia. The taking of blood samples under anaesthesia may lead to localised bleeding at the sampling site. However, if when we trap and examine them any squirrels are found to be suffering as a result of having leprosy or any other disease, and it is judged that their chances of survival in the wild will be reduced, they will be humanely euthanased
Application of the 3Rs	
1. Replacement State why you need to use animals and why you cannot use non-animal alternatives	The purpose of this project is to study a specific, newly identified infectious disease affecting wild red squirrels. Therefore free-living squirrel populations need to be examined and sampled in order to identify and characterise this disease in its natural state. Alternatives to using the red squirrel are not possible if the objectives are to be achieved.
2. Reduction Explain how you will assure the use of minimum numbers	We aim to catch the minimum numbers of red squirrels necessary in order to be able to estimate the proportion of the general population (prevalence) that is affected by leprosy. So far we have found that in a sample of 25 dead red squirrels found at an affected

of animals	location, approximately 30% had leprosy symptoms, and 95% were found to be infected. Trapping here will therefore aim to capture at least 30% of the entire population (which is around 200) which means approximately 60 animals each year. Some squirrels may be trapped more than once as it is not possible to control which individual enters a trap. Prevalence in other squirrel populations,, is currently unknown and so as many squirrels as possible, given constraints of habitat, personnel, trap numbers and local populations, will be trapped in each selected location. As an example, in a population of unknown size, to detect leprosy at a prevalence of 10%, a sample size of 139 is required, and to detect leprosy at a prevalence of 95%, a sample size of 73 is required. However, in small, more diffuse populations this high number of trapped animals may not be achieved - nevertheless, important information on prevalence and progression of leprosy can be gained from combining information from as many trapped squirrels as possible, combined with ongoing post mortem surveillance and sharing of samples acquired during other conservation translocation projects.
3. Refinement Explain the choice of species and why the animal model(s) you will use are the most refined, having regard to the objectives. Explain the general measures you will take to minimise welfare costs (harms) to the animals.	The red squirrel is the only species in the UK in which leprosy has been identified. Other non-protected wild rodent species, e.g. mice, voles, rats, grey squirrels will also be sampled in order to identify other possible reservoir species, but all these will be acquired after death, mainly as part of routine pest control methods. The trapping, handling and anaesthetic method have been specifically designed and refined to minimise any stress experienced by the wild squirrel. Food and bedding are provided in the traps and they are checked at least every 12 hours. The entire procedure is carried out in the field at the trap site so animals do not have to be moved any distance once trapped. The use of gaseous anaesthesia removes any potential pain and distress from the administration of an anaesthetic by injection and also delivers oxygen at the same time to minimise any respiratory complications. The method of

	anaesthesia used avoids the need for any direct handling of the trapped squirrel while conscious, which has been found to greatly reduce any signs of stress, compared to other traditional methods of handling, examining and sampling conscious red squirrels. The method used means that squirrels recover very quickly form the anaesthetic and can be immediately released back to the wild. Euthanasia of squirrels affected and debilitated by naturally-occurring leprosy will remove any possibility of further suffering experienced by these animals compared to if they were left for the disease to progress naturally in the wild.