GB Wildlife Disease Surveillance Partnership

Quarterly Report: FOURTH QUARTER 2010 – Volume 12.4

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The VIDA diagnoses are recorded on the VLA FarmFile database and comply with agreed diagnostic criteria against which regular validations and audits are undertaken.

The investigational expertise and comprehensive diagnostic laboratory facilities of both VLA and SAC are widely acknowledged, and unusual disease problems tend to be referred to either. However recognised conditions where there is either no diagnostic test, or a clinical diagnosis offers sufficient specificity to negate the need for laboratory investigation, are unlikely to be represented. The report may therefore be biased in favour of unusual incidents or those diseases that require laboratory investigation for confirmation.

VLA RLs and SAC Veterinary Services have UKAS accreditation and comply with ISO 17025 standard.

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defra
Department for Environment Food and Rural Affairs

The Scottish Government

INTRODUCTION

The *GB Wildlife Disease Surveillance Partnership* comprising the Veterinary Laboratories Agency (VLA), Scottish Agricultural College (SAC), Institute of Zoology (IoZ), the Food and Environment Research Agency (FERA), the Centre for Environment, Fisheries and Aquaculture Science (Cefas), the Wildfowl and Wetlands Trust (WWT) and Natural England (NE) produces the *GB Wildlife Disease Surveillance Partnership Quarterly Reports*. The details of the individual partners areas of surveillance and research can be found at:-
http://www.defra.gov.uk/vla/reports/docs/rep_survrep_gbwsp.pdf

OVERVIEW

Lyme borreliosis or Lyme disease, is probably one of the most important wildlife related zoonotic diseases in Britain, but relatively infrequently mentioned in this report. To redress this imbalance we are pleased that two experts have kindly provided short introductory articles on their particular spheres of interest in this Wildlife Quarterly Report. Please see pages 7 – 9.

NOTIFIABLE DISEASE

Great Britain AI Wild Bird Surveillance (AIWBS): October - December 2010

H5N1 Highly Pathogenic Notifiable Avian Influenza (HPNAI) was not detected from any of the 453 wild birds tested during the last quarter in Great Britain (GB). Evidence of influenza A virus infection was however detected by RRT-PCR from a total of four wild birds (0.88%), of which three were sampled as part of wildfowl trapping activities (0.85%), and one that was found dead (1%) during the quarter (Table 1). The last detection of H5N1 HPNAI in wild birds in GB was during January-February 2008, from ten Mute swans (*Cygnus olor*) and one Canada goose (*Branta canadensis*) in South Dorset (Defra, 2008). During October 2010 Defra revised the AIWBS policy and approaches in GB, following changes to European Commission guidelines. The main emphasis is on AIWBS in *found dead birds*, with patrols of designated reserves by skilled wild bird ecologists and wardens continuing all-year-round. Members of the public are also asked to remain vigilant for mass mortality incidents and report these to the Defra Helpline (08459 33 55 77). The criteria for a mass mortality incident are five or more wild birds of any species at any location (irrespective of county) in England, Scotland and Wales. Further information is available at: http://www.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/ai/wildbirds/survey.htm

Table 1: Number of wild birds tested and results in GB – 4th Quarter

Surveillance activity	Number of birds tested*	Positive AI virus result and species of bird	Comments
Legally trapped (ringing)	355 *(874)*	H6N2†	Seasonal targeted surveillance during winter and spring only.
Found dead	98 *(103)*	nil‡	Scanning surveillance, all-year-round.

* Number of birds tested: figures for October to December 2009 are shown in brackets.

† Of the Legally trapped wild birds tested, one Mallard duck (*Anas platyrhynchos*) and one Teal (*Anas crecca*) tested positive for influenza A virus infection by Matrix gene RRT-PCR. H5 RRT-PCR and virus isolation in embryonated fowls' eggs were negative for these birds.

‡ Of the Found dead wild birds tested, one Shelduck (*Tadorna tadorna*) tested positive for influenza A virus infection by Matrix gene RRT-PCR. H5 RRT-PCR and virus isolation in embryonated fowls' eggs were negative for this bird.

Great Britain AI Wild Bird Surveillance (AIWBS): January - December 2010

H5N1 HPNAI was not detected from any of the 2,472 wild birds that were sampled and tested during 2010. Evidence of infection with other influenza A viruses was detected from a total of seventeen wild birds (0.69%) over the course of the year. This comprised thirteen wild birds that were sampled as part of wildfowl trapping activities (0.71%), and four that were found dead (0.62%) (Table 2). During 2009, a similar number of wild birds were tested (n=2,144) compared to 2010, with influenza A virus infection

detected from a total of 19 wild birds (0.89%). Further information regarding AIWBS activities in GB and survey results during 2009 can be found at:
http://www.defra.gov.uk/vla/reports/docs/rep_survrep_qtlyw0409.pdf

Table 2: Number of wild birds tested and results of AIWBS in Great Britain during 2010

Project	No. Birds Tested†	No. Positive*	Species Positive	Results‡
Legally Trapped	1,826 (1,716)	1	Whooper swan	H5 LPAI
		1	Teal	M gene x1
		1	Greylag goose	M gene x1
		1	Shelduck	M gene x1
		2	Mute swan	M gene x2
		2	Pintail	M gene x2
		5	Mallard	H6N2, M gene x4
Found Dead	646 (428)	1	Mallard	H1N1
		1	Whooper swan	M gene x1
		1	Mute swan	M gene x1
		1	Shelduck	M gene x1

No. Birds Tested†: Comparative figures for 2009 are shown in brackets.

No. Positive*: During 2010, influenza A virus infection was detected from 13 legally trapped wild birds and four wild birds that were found dead. In comparison, during 2009 influenza A virus infection was detected from a total of 19 wild birds (15 legally trapped and four that were found dead).

Results‡: M gene refers to the number of wild birds positive to influenza type A Matrix (M) gene RRT-PCR test and negative by H5 RRT-PCR and virus isolation in embryonated fowls' eggs.

Richard Irvine, Avian Virology, VLA

International H5N1 HPNAI Events: October - December 2010

VLA, in collaboration with Defra, monitors the international situation and distribution of Avian influenza detections. As a result, Defra currently considers there is an ongoing, low risk of introduction of notifiable avian influenza to the UK via a number of routes, including wild birds. The importance for all poultry keepers to maintain robust biosecurity measures, vigilance for clinical signs of disease and to promptly report suspect cases of avian notifiable disease remains undiminished.

There were no reports of H5N1 HPNAI detections in poultry or wild birds from EU Member States during the period October - December 2010 (ADNS, 2010). However, in south east Asia detections of H5N1 HPNAI from wild birds and poultry have been officially reported by a number of countries, including South Korea, Japan and Hong Kong (Figure 1). In South Korea there have also been numerous H5N1 HPNAI outbreaks (at least fifty have been reported) in different domestic poultry species during the same time period as separate incidents involving detections from wild waterfowl. Similarly, detection of H5N1 HPNAI has been reported in different regions of Japan from poultry and a variety of species of wild birds. An initial detection was reported from wild duck faeces sampled at Onuma Lake, Hokkaido Prefecture during October 2010. Genetic analysis of the H5N1 HPNAI viruses detected from these samples and from subsequent poultry outbreaks and affected wild birds confirmed the strains to be closely related clade 2.3.2 viruses. In Hong Kong AI wild bird surveillance activities led to the detection of H5N1 HPNAI from a large billed crow (*Corvus macrorhynchus*), a black headed gull (*Chroicocephalus ridibundus*) and an oriental magpie robin (*Copsychus saularis*) in separate regions. No spread to poultry was reportedly evident.

Interestingly, in Japan and South Korea some of the H5N1 HPNAI detections were from threatened species of wild birds (hooded cranes, *Grus monacha* and Baikal teal, *Anas formosa* respectively) located at large wintering grounds where large numbers of wild birds congregate and are fed. It has been postulated that the spread of disease to these countries may have been a result of migratory movements along a flyway that links these countries with the Sukhbaatar region in eastern Mongolia. The detection of H5N1 HPNAI clade 2.3.2 viruses was last reported from wild birds in this region during May 2010 (see http://www.defra.gov.uk/vla/reports/rep_surv_wildlife.htm). Therefore, the dynamic epidemiology of H5N1 HPNAI was further reinforced by continued isolations of clade 2.3.2 viruses from both wild birds

and poultry in Asia (Reid and others, 2011; Li and others, 2011, PROMED, 2011). To date only H5N1 HPNAI viruses of clade 2.2 and clade 2.3.2 have been isolated from wild birds. It remains to be seen if these viruses spread westward, specifically to Europe and within the EU. In a separate study, the migratory patterns of waterfowl were tracked by satellite to try and further elucidate their role in transboundary disease spread. It was reported that wild waterfowl on the eastern portion of the Central Asian Flyway may contribute to the spread of H5N1 HPAI into Mongolia each spring as they move across the Qinghai-Tibetan plateau to the north and east (UNFAO, 2010). Gaidet and others, (2010) have also reported on the likelihood of such virus dispersal via migratory movements of wildfowl.

Recent international events would imply that the risk of incursion and threat of AI to UK poultry is unchanged. However, wild waterfowl have to be considered as a potential source of primary introduction of AI viruses, as they represent the natural reservoir hosts. More extensive secondary spread of infection within and between poultry flocks may be mediated by poor biosecurity and movements of fomites, vehicles, personnel etc. The impact of disease may further exacerbated in areas of higher poultry population density. Therefore, vigilance for AI within existing surveillance frameworks should be maintained.

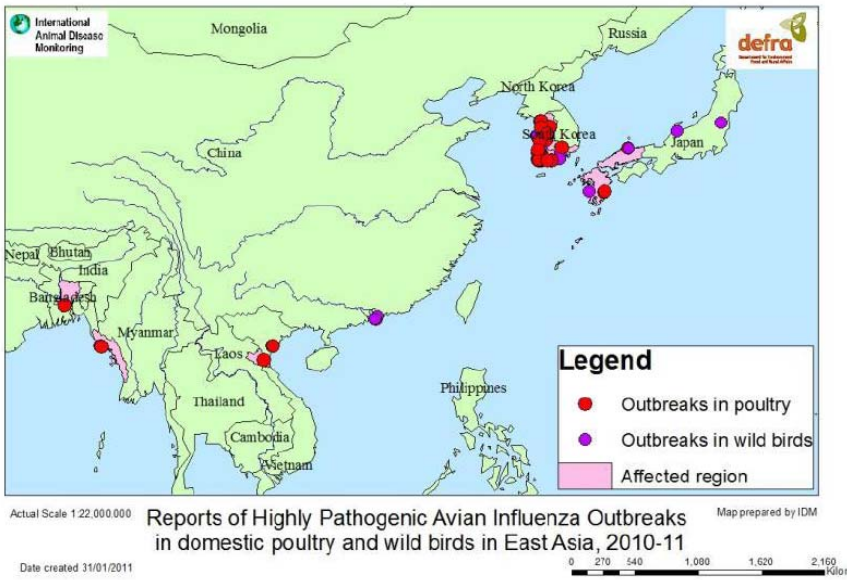

Figure 1

Other events during 2010 relating to the detection of avian influenza viruses from wild birds, including H5N1 HPNAI internationally, are summarised in previous GB Wildlife Surveillance Partnership quarterly reports: http://www.defra.gov.uk/vla/reports/rep_surv_wildlife.htm. In addition, infection of wild birds with virulent avian paramyxovirus type 1 (APMV-1) was reported in North America from July 2010. These episodes involved mass mortalities of a range of species. However, virulent APMV-1 strains – otherwise known as Newcastle disease (ND) viruses – were only isolated from affected Double-crested Cormorants (*Phalacrocorax auritus*). These wild bird ND episodes occurred at nesting colonies located in Maryland, Minnesota, North Dakota, and Wisconsin. A summary of these mortality events can be found at: http://www.nwhc.usgs.gov/publications/wildlife_health_bulletins/index.jsp.

During December 2010, two separate outbreaks of ND in unvaccinated meat pigeon flocks occurred in the north and south of Brittany, France. No epidemiological link was reported between the premises and the source of ND virus infection was considered to be wild birds (OIE, 2010; 2011). It is noteworthy that each year large numbers of game birds are hatched and transported from parts of north and west France into the UK from February onwards (Canning, 2005) and that virulent APMV-1 strains appear to be circulating in wild birds in northern France. Lapses in biosecurity may allow for direct or indirect contact of infected wild birds with susceptible poultry. Therefore, good flock biosecurity practices and vigilance for the clinical signs of ND are essential in poultry, feral pigeons and doves and other wild birds.

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UNFAO, (2010). FAOAIDEnews - Animal Influenza Disease Emergency, Situation Update 71, 16 November http://www.fao.org/docrep/013/al835e/al835e00.pdf

Avian Virology, VLA

Pigeon paramyxovirus 1 infection was the most likely cause of nervous signs and mortality in three thin feral pigeons (*Columba livia*). The isolation through enrichment media of *Salmonella* Typhimurium phage type 99 from one bird was considered to be an incidental finding.

SAC Consulting Veterinary Services

ZOONOTIC DISEASE

Salmonellosis in Wildlife: -

Routine salmonella sampling is carried out on pooled faecal samples from common (Eurasian) cranes (*Grus grus*) that are part of the re-introduction programme run by the Wildfowl and Wetlands Trust (WWT). *Salmonella* Agama was isolated from a pooled sample collected at the release site on the Somerset Moor. This area has a high badger (*Meles meles*) population and badgers are attracted into the area, where the cranes are present, by supplementary feeding. Salmonella Agama is widespread in free-living badgers in the west of England (Wray and others, 1977) and they are a possible source of infection or contamination.

Salmonella Mbandaka was isolated from pooled unidentified bird faeces collected during farm visits to two dairy units in the West Country. These visits were carried out in response to infections in dairy cattle where there was judged to be a human health risk. Disease prevalence in the cattle on both premises was very low. On one farm, environmental sampling, including pooled wild bird faeces, revealed fairly localised infection. Infection was widespread on the other. The pooled faecal samples were collected from the environment, thus samples could have been contaminated. However even if wild birds were infected their epidemiological role in these outbreaks is unknown. *S.* Mbandaka infection in cattle usually originates from contaminated soya. With continuous housing and year-round supplementary feeding, it also appears to becoming endemic on some farms and then spreading via usual local trading, movement and environmental routes (R. Davies, personal communication).

There were no reports of bird variant *Salmonella* Typhimurium (*S.* Typhimurium DT40 or 56) from farmed, domestic or zoo species in England and Wales during October – December 2010.

VLA Wildlife Group

Quality statement regarding this data: - UK data and the output of ad-hoc data retrieval from VLA FarmFile database. These figures are provisional. Research project and game bird isolates were excluded. All are from England or Wales.

Reference:

WRAY, C., BAKER, K., GALLAGHER, J. and NAYLOR, P. (1977) British Veterinary Journal, 133, 526-529

Cetaceans (CSIP)

No *Salmonella* sp. was isolated from any of eight cetacean carcasses sampled as part of the Cetaceans Strandings Investigation Programme (CSIP) this quarter. Two of 32 cetacean carcasses sampled in 2010 were positive for *Salmonella* sp.: these were harbour porpoises (*Phocoena phocoena*), received in January and September respectively (see Quarterly Reports 12.1 and 12.3).

IoZ, and VLA Truro

Other wild mammals

Salmonella Enteritidis PT11 (serotype I 9, 12:g, m) was isolated from the intestinal content of a first-year hedgehog (*Erinaceus europaeus*) submitted to the IoZ this quarter, which had died soon after admission to a veterinary practice in Leeds in September. There was respiratory tract pathology in association with lungworm infection. The *Salmonella* sp. was only isolated from the small intestinal contents; cultures from the liver, lung and heart were negative. The intestinal contents were 'fluid', but no gross abnormalities were noted in the intestinal tract, therefore it was unclear whether the infection was of pathological significance. *Salmonella* Enteritidis PT 11 infection is thought to be endemic in UK hedgehogs (Robinson & Routh 1999). *Salmonella* sp. is one of a number of hedgehog pathogens that present a potential zoonotic risk. *Salmonella* sp. was not isolated from four other hedgehogs sampled at the IoZ in 2010.

IoZ

Reference

Robinson, I., and Routh, A. 1999. Veterinary care of the hedgehog. In Practice 21: 128-137.

Wild birds

Salmonellosis was diagnosed in only two of 217 birds examined by the Garden Bird Health *initiative* (GBHi) in 2010; a greenfinch (*Carduelis chloris*) and a redpoll (*Carduelis flammea*) submitted in January and February respectively, from sites in Wales and Northern Ireland (see Quarterly Report 12.1), suggesting that the incidence of salmonellosis in garden birds in England and Wales likely remained very low in the winter of 2009/10.

No *Salmonella* sp. infection was detected in any of 23 wild birds (nine cirl buntings [*Emberiza cirlus*] and 14 corncrakes [*Crex crex*]) sampled at the IoZ for Natural England's Species Recovery Programme (SRP) in 2010.

IoZ

Passive surveillance for lyssaviruses in UK bats, 2010

Over 1200 bat carcasses were submitted to the VLA in 2010 for lyssavirus screening (see table). These included 20 Daubenton's (*Myotis daubentonii)* and six Serotines (*Eptesicus serotinus)*. Two bats were submitted with clinical suspicion of lyssavirus infection. All samples tested were negative.

Table. Bat species submitted to VLA for lyssavirus screening 2010*

Common name	*Latin name*	number submitted
Barbastelle	*Barbastella barbastellus*	2
Lesser Horseshoe	*Rhinolophus hipposideros*	17
Greater Horseshoe	*Rhinolophus ferrumequinum*	1
Brown long-eared	*Plecotus auritus*	131
Grey long-eared	*Plecotus austriacus*	0
Serotine	*Eptesicus serotinus*	6
Leisler's	*Nyctalus leisleri*	3
Noctule	*Nyctalus noctula*	8

Nathusius' pipistrelle	*Pipistrellus nathusii*	3
Common pipistrelle	*Pipistrellus pipistrellus*	879
Soprano pipistrelle	*Pipistrellus pygmaeus*	77
Bechstein's	*Myotis bechsteinii*	0
Natterer's	*Myotis nattereri*	18
Daubenton's	*Myotis daubentonii*	20
Brandt's/Whiskered	*Myotis brandtii or mystacinus*	51
Unidentified		15
Total		**1231**

*provisional identification only

Active surveillance for bat lyssavirus in UK bats 2010
Active surveillance for European Bat Lyssavirus type 2 in live Daubenton's bats has been undertaken over the summer months, in selected sites in Northern England. Samples were taken using minimally invasive techniques for serology (fluorescent antibody virus neutralisation test) and detection of virus in saliva (through PCR and virus culture). At least five of 170 bats tested were seropositive for antibodies to EBLV-2. Viral culture and PCR tests on saliva are ongoing.

Rabies surveillance in terrestrial wildlife
Vigilance continues for this notifiable disease in UK wildlife. Two wild foxes were tested for rabies this year, due to clinical suspicion of rabies. One was shot by a farmer in Carmarthen after displaying abnormal behaviour and hypersalivation. The second was caught in an urban area of South East London following an attack on two young children attributed to a fox. Both were negative for rabies.

Rabies and Wildlife Zoonoses Group, VLA Weybridge

West Nile Virus Surveillance
Between 1st April and 9th December 2010, the VLA has tested brain and kidney tissue samples from 204 wild and captive birds comprising 52 species by virus isolation through two passages in Vero cells, and by RT-PCR for WNV. *All samples were negative for WNV.* One hundred and thirteen of these tissue samples were received from Scottish Agricultural Colleges, 88 tissue samples were received from VLA regional labs, 2 tissue samples from Humboldt penguins were received from The International Zoo Veterinary Group and 1 tissue sample from a (Royal) raven was received from The Zoological Society of London.

Serum samples from 7 horses showing neurological signs were tested by WNV PRNT and by WNV competition ELISA all with negative results. Serum samples from 9 common cranes (*Grus grus*) were tested by WNV competition ELISA with negative results as part of health checks prior to their reintroduction into UK.
Rabies and Wildlife Zoonoses Group, VLA

Lyme Borreliosis/ Lyme disease
Lyme borreliosis is a significant wildlife related zoonotic disease in Britain. Vertebrate wild mammals and birds are reservoirs for the pathogen but rarely show clinical signs and therefore cases in wild animals in this country are rarely identified. As a consequence, the disease has been neglected in the Wildlife Quarterly Reports over the years, and to redress this balance the opportunity was taken to ask two experts, both working on a Defra RELU project, to provide introductory articles for this WQR on their respective fields of work. The RELU project is aimed at reducing the risks of arthropod borne diseases such as Lyme to countryside users. The first article is on Lyme disease in humans in the UK and the second on aspects of the pathogen epidemiology in ticks in the UK: -

Lyme borreliosis (LB)

Lyme borreliosis (LB) also called Lyme disease, is the most common tick-transmitted infection in the UK. About 1000 laboratory-confirmed cases are reported each year, and estimates suggest that there are between 2000 and 3000 cases annually (ie about 5/100,000 population). Most reported cases are associated with recreational exposure; a few occupationally-acquired cases are notified each year.

The infection, which is caused by spiral bacteria called *Borrelia burgdorferi*, can occur without any significant symptoms. The most common sign of infection is a rash called erythema migrans (EM), which slowly spreads from the site of a tick bite over days to weeks. It is not usually significantly itchy or painful, and may have a more deeply demarcated leading edge, giving a ring-like appearance. The EM rash occurs in about 90% of people with symptomatic infections and eventually disappears, even without treatment, but early diagnosis and antibiotic treatment helps to resolve EM rapidly and, more importantly minimises the risk of developing complications.

The bacteria can spread to other organs and tissues and may cause other symptoms in the following weeks or months. These most commonly affect the nervous system and can cause facial palsy (similar to Bell's palsy), and viral-like meningitis with headache and neck stiffness, which are the most common complications seen in children. Inflammation of the nerves of limbs or trunk (radiculopathy) is an additional complication, mainly in adults. This can cause severe pain, similar to that of shingles, but without the characteristic blistering rash of shingles. These neurological symptoms usually occur within about six weeks to four months of infection, but occasionally radiculopathy pain can develop more gradually and become apparent over many months, particularly in older people. Even without antibiotic treatment these complications usually settle down in the great majority of cases but treatment shortens the duration of symptoms, helps to relieve pain and minimises the risk of permanent tissue damage.

A small minority of untreated patients can progress to a condition called late neuroborreliosis, causing severe damage to the nervous system which can resemble features of multiple sclerosis. The infection will respond to antibiotics even at this late stage of infection, but recovery may be slow or incomplete as it will depend on the body's ability to heal the tissue damage, again underlining the importance of early recognition and treatment preventing potential complications. Other rare complications can affect the heart, causing slowing of the heartbeat rate. This can occur in the early weeks of infection, and usually settles within a short time. Lyme arthritis can affect large joints, usually the knee, where it can cause a large amount of swelling through fluid collection in the joint.

Antibiotic treatment (usually oral doxycycline or amoxicillin) is usually for two to three weeks, depending on the stage of the illness. Patients with severe nervous system disease may require intravenous treatment. Treatment outcomes are generally very good unless severe tissue damage had occurred in longstanding infection. Details of treatment recommendations and other information on LB, including prevention measures, are available on the Health Protection Agency and EUCALB websites and both provide links to other useful information sources.

The two main measures for preventing LB are avoidance of tick bites and early removal of attached ticks. Minimising skin exposure and using DEET-containing insect repellents are helpful, and permethrin-treated clothing is valuable for people who have frequent heavy occupational exposure to ticks. Most ticks do not carry *Borrelia burgdorferi*, and those carrying the bacteria will not transmit the organisms in the first few hours of their blood meal, so frequent checks for attached ticks and a thorough check (eg during a shower or bath) following exposure can help to minimise infection risk.

HPA website: http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/LymeDisease/

EUCALB website: http://meduni09.edis.at/eucalb/cms/index.php?lang=en

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More ticks, more Lyme disease

Ticks are parasites in their own right and also vectors (vehicles) of pathogens. Wounds caused by tick feeding may be invaded by opportunistic microbes (e.g. Staphylococci that causes pyaemia in lambs) or egg-laying flies. In the UK, in addition to diseases of veterinary importance caused by tick-transmitted agents (Louping ill virus, Anaplasma that causes tick-borne fever, or Babesia that causes red-water fever), Lyme disease in humans, caused by the genetically diverse group of bacteria, *Borrelia burgdorferi* s.l., is the most significant vector-borne disease throughout northern latitudes, from California to Europe to Japan. There is plenty of anecdotal evidence from livestock and pet owners that ticks have increased in distribution and abundance over the last one or two decades, and the available quantitative data, albeit inadequate, all tend to support these reports.

A number of different factors influence tick populations at different points of the tick's life cycle and at different seasons of the year. Like all hard (Ixodid) ticks, *Ixodes ricinus*, the common "sheep tick", has three life stages, larvae, nymphs and adults. Each stage feeds only once, taking huge blood meals over several days, before dropping to the ground to develop to the next stage over several months or even more than a year. Each new cohort of hungry host-seeking ticks of each stage emerges from the previous fed stage in the autumn. The majority, however, remain quiescent overwinter, and do not appear on the vegetation to start questing actively for hosts until the following spring once the temperature is high enough; nymphs (and adults) require a daytime air temperature of at least 7oC, while larvae require at least 10ºC. In southern England, these conditions commonly occur as early as January, so a few ticks can be found throughout the year, although numbers increase markedly in April and May as more ticks become active with rising temperatures. In cooler parts of the UK, ticks cannot be found until the spring.

Clearly, as winters and springs become warmer in the UK, as seems to be happening with global climate change, it will be possible for ticks to become active earlier in the year. Predicted hotter drier summers, however, will be less favourable for desiccation-susceptible ticks; replenishing their water content is energetically expensive, which increases their chance of dying of starvation before they find a host. Environmental stress is greatest where there is no shade from the vegetation, which is why ticks are associated with woodlands and with bracken and rough grazing areas on moorlands. Tick populations tend to die out on areas of improved, short-sward grazing.

Primarily, ticks need vertebrate hosts from which to take a blood-meal. Ixodes ricinus ticks are completely non-specific; they will attach to and feed from any vertebrate with which they come into contact, whether these are mammals, birds or reptiles. Because hungry larval ticks sit low down on the vegetation where moisture stress is least, they can attach to all species of any size whose feet touch the ground, from small rodents to large deer. Nymphs sit rather higher, usually above the level of the smallest rodents, so feed more on medium-sized hosts. Adult ticks sit highest of all so that deer and livestock are the most important hosts for this all-important reproductive stage, essential for the maintenance of tick populations. Furthermore, the more hosts of this type there are, the more quickly ticks will find them, improving their overall survival and reproduction, and resulting in larger tick populations. At the same time, however, ticks will remain in the host-questing part of the population for shorter periods, which could partially ameliorate the threat to humans. There is much experimental evidence from North America and the Europe that numbers of deer and ticks are correlated. The marked increase in the distribution and abundance of deer over the past two to three decades must have improved conditions for ticks, enabling tick populations to survive in places where they were previously absent, including rough areas within gardens and other peri-domestic settings.

There are many parts of the UK where conditions, in terms of climate, land cover and host abundance, are favourable for ticks. Some recreation sites, such as the New Forest and Thetford Forest, have reputations as 'hot-spots' for ticks and thereby for Lyme disease. This view is not justified by the facts. Ticks are no more abundant at these places than at many others with equally (even more) favourable conditions. The infection prevalence of B. burgdorferi s.l. in ticks is no higher, and indeed there is no evidence that the incidence of infection in humans is any higher. What is higher is the number of visitors, the overall exposure of the human population. This, however, does not increase the risk to each individual person. For example, ticks are found in Richmond Park at very low densities, and the occasional well-publicised cases of Lyme disease picked up there are as much the product of the exposure of thousands of visitors (five orders of magnitude higher than in the New Forest per hectare per day) as of the inherent hazard.

In summary, many of the recent environmental changes will have an impact on ticks, some of them favourable and others less so. Ticks have been part of the natural landscape for a long time and are unlikely to go away, but their impact can be minimized; the risk of their transmitting disease agents is directly proportional to their abundance, which can be limited by habitat, livestock and wildlife management. Overgrown habitats with plenty of deer are exactly what ticks like best! Personal protection by minimizing contact with ticks and self-examination for any attached ticks after exposure is very effective.

Professor of Parasite Ecology, Department of Zoology, South Parks Road, Oxford OX1 3PS

***Echinococcus* species in red foxes (*Vulpes vulpes*)**

In 2010, The Food and Environment Research Agency (Fera) investigated the presence of *Echinococcus granulosus* and *Echinococcus multilocularis* in faecal samples collected from red foxes (*Vulpes vulpes*).

Within this study 384 fox faecal samples from a tissue archive maintained at Fera were examined using a method of egg isolation followed by PCR, based on published primer sets. The samples represented foxes from Scotland and most English regions. All faecal samples tested negative for both *E. multilocularis* and *E. granulosus*. This study was commissioned by Defra.

FERA

EMERGING AND ENDEMIC DISEASES

SUBMISSIONS: Wild bird submissions this quarter to VLA DoWS –

Month	Number of ED1600 wild bird submissions	Number of ED1600 birds submitted	Number of wild birds examined	Wild birds examined for West Nile Virus
October	9	15	15	
November	2	3	3	
December	1	1	1	

Wild bird submissions to VLADoWS for 2010

	Number of ED1600 wild bird submissions	Number of ED1600 birds submitted	Number of wild birds examined	Wild birds examined for West Nile Virus
Jan - Dec	78	306	251	

Wild mammal submissions to VLADoWS for 2010

	Number of ED1600 wild mammal submissions	Number of ED1600 mammals submitted	Number of wild mammals examined
Jan - Dec	192	301	301

Wild bird submissions to projects managed at the IoZ,

Month		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
No. submissions	**GBHi**	11	8	4	8	21	21	26	35	35	28	15	5	**217**
	SRP	0	0	0	2	0	2	15	7	1	0	0	0	**27**

Review of investigations in to wildlife disease and mortality by VLADoWS 2010

Corvid Respiratory syndrome – investigations over several years have lead to suspicions that pasteurellosis is involved in the aetiology. A paper has been submitted for publication.	WQR 12.2 p.7.
Great crested newt mass mortality, suspected cause is toxicity due to road salt	WQR 12.1 p 15
Badger mange – *Sarcoptes* sp. infestation, possible first report in the UK. Published	WQR 12.1 p 9
Starling mass mortalities continuing incidents due to a variety of causes. Press interest	WQR 12.1 p 8
Demodex mange in roe deer. New condition in UK roe. Publication	
Bovine TB in an English wild boar. New UK host species. Publication	WQR 12.2 p 5
Warble in imported reindeer	WQR 12.3 p 3

Trichomonosis

Trichomonosis was suspected or confirmed in 105 (48%) of 217 garden bird submissions to the GBH*i* in 2010. Species affected, in decreasing order of prevalence, were as follows: 50 greenfinches (from 44 sites); 19 chaffinches (*Fringilla coelebs*) (from 17 sites); seven goldfinches (*Carduelis carduelis*) (from seven sites); five sparrowhawks (*Accipiter nisus*) (four from two wildlife hospitals, and one from a member of the public); four wood pigeons (*Columba palumbus*) (from four sites); four collared doves (*Streptopelia decaocto*) (from three sites); four tawny owls (*Strix aluco*) (three from a wildlife hospital and one from a member of the public); three bullfinches (*Pyrrhula pyrrhula*) (from three sites); three common buzzards (*Buteo buteo*) (from one wildlife hospital); two blackbirds (*Turdus merula*) (from two sites); two feral pigeons (*Columba livia*) (from one site); one dunnock (*Prunella modularis*) and one barn owl (*Tyto alba*) (from a wildlife hospital). Trichomonosis was diagnosed in carcasses submitted throughout the year, with a peak in the number of outbreaks from August to October, consistent with previous years since the emergence of finch trichomonosis in 2005. As in previous years, the greenfinch and chaffinch were the species most commonly diagnosed with trichomonosis.

IoZ

Trichomonosis in wood pigeons (*Columba palumbus*)

Signs of weight loss and death were described in 14 wood pigeons brought to a wildlife rescue centre over a four-month period. An unpleasant odour, inappetence and white masses in the oral cavity were described. The submitted bird had a pale swelling on the lower beak which contained a caseous core. There was also thickening of the oesophageal wall proximal to the crop with an irregular proliferative friable mass on the mucosal surface. Small numbers of trichomonads were detected in wet smears from the mass. Detection of trichomonad-like organisms in histological sections supported the suspected diagnosis of trichomonosis.

VLA Bury St Edmunds

Avian pox

Avian poxvirus infection was suspected or confirmed in 13 garden birds, from 12 sites, examined at the IoZ in 2010: ten great tits (*Parus major*) from nine sites, one starling (*Sturnus vulgaris*), one house sparrow (*Passer domesticus*) and one wood pigeon.

Avian poxvirus infection was first diagnosed in great tits in the UK in 2007, and appears to be an emerging infectious disease in Paridae (tit species). Reports received from the GBH*i* suggest that the incidence peaks in the autumn months, and, consistent with this, the majority of great tit submissions (six of the nine cases) in 2010 were received in October and November. Seven of the submitted great tit carcasses were from the south east of England, one was from Norfolk, and one was from Warwickshire. Reports received by the GBH*i* suggested that outbreaks of avian pox in great tits occurred across a wider geographical area than in previous years, with a westerly spread of infection across southern England.

IoZ

Orthopox virus infection in Great Tit (*Parus major*)

The carcase of an adult male Great Tit (*Parus major*) was submitted with an ulcerated mass on one wing. There had been reports of other small passerines being seen on feeders in the area having similar

lumps. There were multiple firm nodular swellings, measuring 1-3mm diameter, in the skin of the lower mandible, cranial neck and cheek. These nodules were covered by dry scabs. A linear (10mm X 5mm) ulcerated mass was also present along the cranial edge of one wing. Electronmicroscopic examination of material from the skin lesions identified an Orthopox virus. Sequencing is being undertaken to further characterise this virus. Avipox virus in Great Tits has been described in Central Europe (reference European Journal of Wildlife Research, Volume 56, No. 4, 529-534).

VLA Bury St Edmunds

***Escherichia coli* 2**

Escherichia coli 2 was isolated from four birds examined by the GBH*i* this quarter: a blackbird, a tawny owl, a greenfinch and a great tit. In all cases, the infection appeared to be incidental, or secondary to another disease, and none of these *E. coli* 2 isolates had the API profile characteristics of *E. coli* 086. *E. coli* 2 infections of a typical serotype O86 API profile were isolated from five garden birds submitted to the GBH*i* in May (see Quarterly Report 12.2); this serotype has been associated with mortality incidents in siskins and other finches, particularly in Scotland (Pennycott et al., 2002). Following a recent publication this bacterium has been reclassified as *E. albertii* (Oaks et al, 2010).

IoZ

References

J. Lindsay Oaks, Thomas E. Besser, Seth T. Walk, David M. Gordon, Kimberlee B. Beckmen, Kathy A. Burek, Gary J. Haldorson, Dan S. Bradway, Lindsey Ouellette, Fred R. Rurangirwa, Margaret A. Davis, Greg Dobbin, and Thomas S. Whittam1 (2010) *Escherichia albertii* in Wild and Domestic Birds. Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 16, No. 4, April 2010

Pennycott, T., Cinderey, R., Park, A., Mather, H., Foster, G.. 2002 *Salmonella enterica* subspecies *enterica* serotype Typhimurium and *Escherichia coli* 086 in wild birds at two garden sites in south-west Scotland. Veterinary Record 151: 563-567.

Wild bird reports from Scotland

Over 30 greylag geese (*Anser anser*) were found dead on an island in the north of Scotland. Five carcases were submitted for necropsy, but all had been partially predated. Two birds however showed multiple necrotic foci in the liver and *Pasteurella multocida* was isolated from lung and liver of two birds. Histopathology subsequently demonstrated lesions consistent with an acute bacterial septicaemia, and a diagnosis of **pasteurellosis (fowl cholera)** was made. Fowl cholera is a well-recognised cause of mortality in waterfowl in other parts of the world but such incidents in the UK are unusual.

Presumed trichomonosis was again the commonest infectious disease diagnosed in wild birds. Typical lesions were found in greenfinches (*Carduelis chloris*), chaffinches (*Fringilla coelebs*) and a goldfinch (*Carduelis carduelis*), originating from several different sites. One affected greenfinch had exhibited a pronounced head tilt before dying. A presumptive diagnosis of trichomonosis was also made in a woodpigeon (*Columba palumbus*) and in a thin sparrowhawk (*Accipiter nisus*) – both birds had large caseous masses partially obstructing the oropharynx and upper oesophagus.

A thin buzzard (*Buteo buteo*) was found alive but died the same day. One hock joint was swollen and infected, with scabs and open sores. The spleen was greatly enlarged and multiple large nodules were present on the liver. Smaller nodules were also noted in the mouth, on the heart, on the proventriculus, and on the kidney. ZN-stained smears from liver, spleen and hock demonstrated large numbers of acid-alcohol-fast bacilli typical of **avian tuberculosis**.

The cold weather resulted in an influx of waxwings (*Bombycilla garrulus*) into Scotland in November, and dead waxwings were submitted from four locations. On two sites, the cause of death was **trauma**, possibly window strikes. A bird submitted from a third site was very thin and had not been feeding. More than twenty birds were submitted from the fourth site, on which birds had been observed to be panting and dropping dead. Diffuse haemorrhages and blood clot formation again suggestive of trauma were found in the lungs, trachea, body cavities and over the cranium. The birds on this fourth site had been feeding on a variety of mountain ash known to contain **high levels of cyanide**, which may have contributed to their deaths.

The **cold weather** continued into December and probably contributed to the deaths of two buzzards (*Buteo buteo*) found dead at different locations. Both birds were thin and their gizzards contained tangled balls of vegetation but no food. Postmortem examination and tissue analysis of a buzzard from a different location revealed carbofuran poisoning to be the cause of death.

A barn owl (*Tyto alba*) was found dead on the floor of a barn underneath an owl roost. The bird was thin, with no food in the digestive tract. The vent was stained by faeces. The only significant finding was the demonstration of very large numbers of small thin-walled coccidial oocysts containing two sporocysts, considered to be ***Frenkelia species***. These coccidia can be found in healthy raptors but in this bird the very large numbers were thought to be significant.
SAC

Endoparasitism in mute swan (*Cygnus olor*) cygnets
For the second year in the past three years cygnets were slowly dying on a lake, within a large country estate. Four of this year's five cygnets had already died. There are a number of ducks and geese on the lake, these were unaffected. This cygnet was reportedly five months of age, and was emaciated. At PM, there was a catarrhal proventriculitis, the gizzard lining showed a number of superficial erosions, nematode worms were clearly evident. Gut content was blood tinged – many cestode worms were visible. A small number of leeches were attached to the tracheal mucosa.
This appeared to be a mixed parasite problem, parasites identified included the schistosome parasite *Ornithobilharzia pricei,* a duodenal fluke of the Echinostomatidae family, Amidostomum spp from the gizzard lining, the leeches were tentatively identified as *Theromyzum tessulatum*. We were unable to definitively identify the cestodes.
VLA Winchester
Comment; Schistosomiasis in cygnets.
Endoparasitism is frequently recognised as a cause of mortality in cygnets in their first summer throughout England. Several parasites are involved however the significance of schistosomes may not be recognised. In a new reserve in the North of England, cygnet broods have died over the past 4 years while the parents remained healthy. Multi-parasitism was diagnosed and it has been possible to catch the young and treat with anthelmintics however the losses continued. Histopathology revealed schistosomes in the blood vessels of the gastro-intestinal tract and as these would not have responded to the treatments it was concluded that schistomosiasis was the probable cause of the deaths. Efforts to counter this parasite in the swans are planned.
VLA

Wild Mammal submissions Oct - Dec 2010, VLADoWS

Month	Number of ED1600 wild mammal submissions	Number of ED1600 mammals Submitted	Number of wild mammals examined
October	13	13	13
November	7	16	16
December	11	11	11

Wild mammal submissions to projects managed at the IoZ, Oct – Dec 2010

Month	Number of wild mammal submissions		
	Species Recovery Programme	Hedgehog submissions	
October	3	3	
November	0	0	
December	0	0	

Trichinella surveillance in red foxes (*Vulpes vulpes*)
In 2010 The Food and Environment Research Agency (Fera) tested over 400 red foxes from throughout GB and approximately 150 Northern Ireland foxes for the presence of *Trichinella* using an artificial digest method. All muscle samples tested negative. Samples of cetaceans and pinnipeds were included in the testing, whenever they became available through our partner organisations (VLA and ZSL). This project was commissioned by the UK Food Standards Agency.
FERA

***Taenia* and related species in red foxes**
Anecdotally, the condemnation of lamb viscera and carcases associated with parasite infections is increasing (Eblex 2010). During 2009, the losses associated with infection of skeletal muscle with *Cysticercus ovis*, the metacestode (intermediate) stage of *Taenia ovis*, have been estimated at £7 million. In addition, losses associated with infection of the liver with *Cysticercus tenuicollis*, the metacestode (intermediate) stage of *Taenia hydatigena*, have been estimated at £500,000 (Eblex 2010). Dogs and wild canids are the final hosts for both these parasites and pasture contamination with ova shed in faeces can result in ingestion by grazing sheep.
Fox faecal samples from the Fera tissue archive, used for the *Echinococcus* study were also screened for *Taenia* and other closely related cestode species infections using a multiplex PCR primer. The samples represented foxes from Scotland and most English regions.
Of the 384 faecal samples tested, 35% were positive for Taenia and closely related species, illustrating the potential for foxes to contribute to the environmental burden of infective ova and potentially maintain a wildlife reservoir of infection.
FERA
Reference:
Eblex 2010. Accessed on 25 October 2010 via:
http://www.eblex.org.uk/documents/content/publications/p_lb_10_7.dog_parasites120710.pdf

The potential role of wildlife as reservoirs of infection for Johne's diseases in GB.
Paratuberculosis or Johne's disease is a chronic enteric disease of adult cattle, sheep and goats. It is a disease of considerable economic and welfare significance with a worldwide distribution, and has been associated with the aetiology of Crohn's disease in man (Stevenson *et al*. 2009). It is caused by *Mycobacterium avium* subspecies *paratuberculosis*, also known as MAP. Rabbits (*Oryctolagus cuniculus*) have been linked to the persistence of the disease in ruminant livestock in the UK (Judge *et al*. 2006), but the role of non-ruminant wildlife as reservoirs for infection has been less well documented (Beard *et al*. 2001, Stevenson *et al*. 2009).
As a preliminary screening tool for paratuberculosis, we are utilising non-ruminant wildlife carcases to obtain faecal samples for submission to VLA Starcross to test for the presence of *Mycobacterium avium* subspecies *paratuberculosis* using a real-time PCR assay which has been UKAS accredited for use with cattle faeces.
During 2010 faecal samples from 53 foxes were submitted, all of which tested negative. Regional distribution of samples is shown in Figure One.

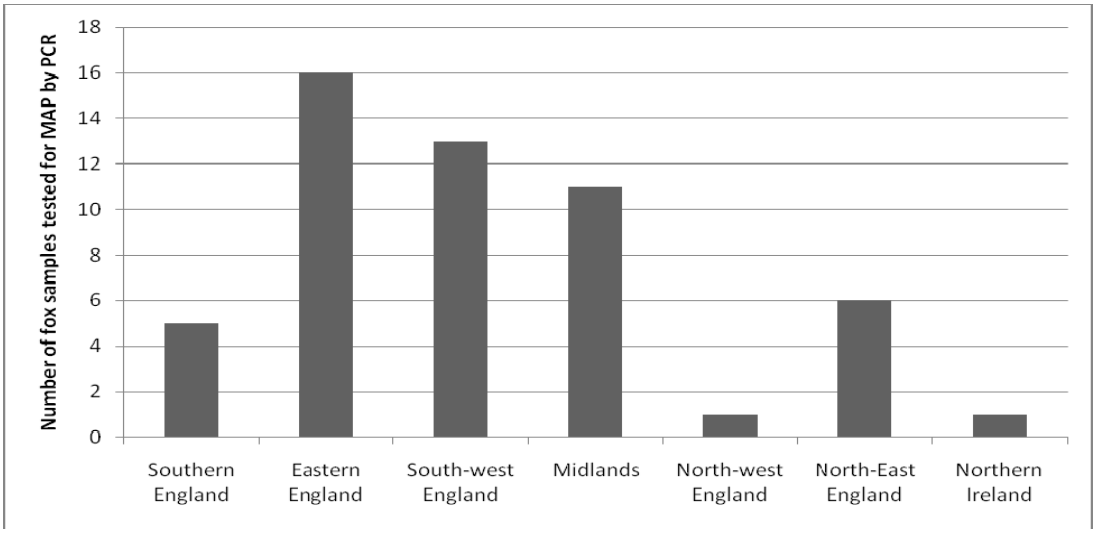

Figure One. Regional distribution of fox faecal samples tested for MAP using PCR during 2010.
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Cardio-respiratory parasites in foxes (*Vulpes vulpes*)

The parasite *Angiostrongylus vasorum* is a cardio-pulmonary parasite of canids, in which it may cause significant disease. There is increasing evidence for northern expansion of this parasite's range within Great Britain (Helm *et al.* 2009, Morgan *et al*. 2009).

During 2010, a total of 103 fox heart and lung samples were examined from around the UK, using methods described in Morgan *et al*. 2008. Twelve foxes from the Midlands, southwest and southeast England were found to be infected with *Angiostrongylus vasorum*. However, none of the 23 samples from the English-Scottish border region were infected. Unfortunately there were no samples from areas north of the midlands and south of the Border regions.
FERA

References:

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Disease surveillance in Eurasian badgers (*Meles meles*)

Data collection has been completed on a PhD project investigating the correlates for the establishment and progression of *Mycobacterium bovis* infection in individual badgers. Anticipated factors of interest include the age of detection of infection, mode of infection, gender, reproductive status and co-infection with macroparasites. Completion of this work is anticipated over the next quarter. In addition, data collection has also been completed on an MRes project on the interaction between infections of badgers by helminths and coccidia, that may in turn identify patterns of co-infection with *M. bovis*.

Data collection has also recently been completed on a PhD project investigating contact rates in an undisturbed badger population. The use of novel proximity logger technology and social network theory should allow for the quantitative analysis of both inter- and intra-group interactions. By identifying heterogeneities in contact patterns and space use, both above ground and below ground in the sett, we hope to further understand the transmission dynamics of bTB in a badger population.

FERA

***Pseudamphistomum truncatum* surveillance in American mink (*Mustela vison*)**

Pseudamphistomum truncatum is a parasitic digenean fluke of the gall bladder of a wide range of carnivores, which can also infect man. During 2010, four gall bladders from mink from Gloucestershire were examined using methods described in Simpson *et al*. 2009. No positive cases were found.

FERA

Reference:

Simpson, V.R., Tomlinson, A.J. and Molenaar, F.M. (2009) Prevalence, distribution and pathological significance of the bile fluke *Pseudamphistomum trunctaum* in Eurasian otters (*Lutra lutra*) in Great Britain. *Veterinary Record* **164**, 397-401.

Environmental toxicology – bioaccumulation of perfluorinated contaminants

Perfluorinated contaminants (PFCs), in particular perfluorooctane sulfonic acid (PFOS) are anthropogenic contaminants, produced from household stain and greaseproof repellents as well as fire fighting foam (Butenhoff *et al*. 2006). They persist in the environment and bioaccumulate through food chains (Giesy and Kannan 2001). They have been associated with pathological effects in marine mammals (Kannan *et al*. 2006) and poor foetal growth in man and other animals (Washino *et al*. 2009).

As part of a Defra funded joint York University and Fera research project, PFOS was quantified in samples of liver (2,812-7,989 µg/Kg), kidney (35-1,235 µg/Kg), blood (2,113-13,810 µg/Kg), skeletal (27-337 µg/Kg) and cardiac (57-436 µg/Kg) muscle from six American mink (*Mustela vison*) from Gloucestershire. The results were used to form part of a wider research project utilising mink from different geographical areas in the UK, with a view to determining both the scale and effects of the bioaccumulation of PFOS in wildlife. Mink from the highly (human) populated area of Gloucestershire were found to have an average PFOS concentration ten times higher in the liver than those found in a different study in less populated areas of the Isles of Lewis and Harris in the Western Isles.

FERA

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Cetacean submissions to the CSIP, from England and Wales, in 2010

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
No. submissions	7	5	3	2	1	1	4	4	4	4	2	2	39

N.B. Some stranded animals from this period have been frozen and are pending post-mortem analysis. Validated and finalised data for GB will be produced in the CSIP annual report covering this period and will be published at:
http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=15331&FromSearch=Y&Publisher=1&SearchText=strandings&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description.
CSIP

Wild amphibian submissions

A total of 33 common frog (*Rana temporaria*) carcasses from 14 mortality incidents were examined at the IoZ in 2010. Ranavirus infection was suspected or confirmed as the cause of death at nine sites; ranavirus mortality occurred predominantly in the summer months in the north and south east of England. Diagnostic investigation of tissues for ranavirus and *Batrachochytrium dendrobatidis* ('chytrid' fungus) infection is ongoing. One carcass was submitted from a site of mass mortality in Scotland, which appeared to have been caused by otter predation (see Quarterly Report 12.2).
IoZ

Aquatic animal diseases

Disease screening of *Dikerogammarus gammarus*

An invasive species of gammarid (*Dikerogammarus gammarus)* was found in Grafham water in September 2010, and more recently in two locations in Wales. Two hundred and fifty animals were collected from Grafham water for histology and pathogen screening. Histology indicated a relatively high apparent prevalence of an as yet undescribed gut gregarine parasite (protozoan of the order Gregarinida, typically occurring in the digestive tract and body cavity of invertebrates). The images suggested that the parasite may exist in two forms in the gut, at a prevalence of approximately 23%. In addition, a low prevalence of an encysted digenean parasite (<1%) was identified. External associates include a likely isopod infection (<1%) and free living or stalked ciliates (on most animals). The high prevalence of the gregarine provides the opportunity to pursue identification via electron microscopy and molecular approaches. Neither of these parasites had previously been described in *D. gammarus* (possibly because even in native stocks histopathology screening has not yet been undertaken). A comparison of infections in stocks from the Welsh and other European populations might provide insights into the spread of this invasive gammarid.

Bacilliform virus in crayfish

The mortality event of signal crayfish (Pacifastacus leniusculus) from the Trent River catchment has been investigated further (previously reported). Electron microscopy images depicted bacilliform virus. Virions appear to occur in arrays within infected nuclei hepatopancreatic (HP) cells and are interspersed with naked nucleocapsids and empty capsids. The measurements in the table are consistent with the description for a similar virus in this species from the US. To further identify this virus, the virions in HP of white clawed crayfish are the same.

Mortality of velvet swimming crabs.

The mass mortality of velvet swimming crabs (*Necora puber*) in Thanet, Kent has been reported for the 3rd year in succession (other species were also affected). In previous years samples have been analysed but no infectious agent was found. There was speculation that the crabs died of cold however, it is more likely that death was due to a sudden drop in salinity (resulting from high levels of water run off).

Ranavirus infections in amphibians

Experimental work at Cefas has shown that ranavirus can be transmitted to the common frog by cohabitation of naïve with infected animals, and also by indirect cohabitation via transfer of tank water. Transmission was demonstrated at both life-stages tested, tadpole and post-metamorph. Additional direct cohabitation experiments with frog and toad post-metamorphs also demonstrated transmission from one species to another.

Highlights for 2010

Francisellosis has recently emerged as an important disease in farmed cod in Norway. During 2010 Cefas worked with colleagues from Norway to investigate the causative agent of visceral granulomatosis in wild-caught-wild cod caught during the 70s and 80s. Archived formalin fixed paraffin-embedded tissues from the original North Sea cases were investigated for the presence of Mycobacterium spp. and Francisella spp. using real-time polymerase chain reaction, DNA sequencing and immunohistochemistry. Francisella noatunensis subsp. noatunensis was identified in association with pathological changes francisellosis occurred in wild-caught cod in the southern North Sea in the 1980s and 1990s and demonstrates that this disease predates intensive aquaculture of cod.

Investigation of eel mortality in eastern England resulted in the first identification of eel herpesvirus. The virus is widespread in Europe and may be an important cause of disease in wild eels. Cefas will work with the Environment Agency to determine the distribution of the pathogen. The results will inform the EA eel stocking policy.

Mortality of cockles in the Burry Inlet has been investigated for a number of years. During 2010, parasitologists at Cefas identified haplosporidian parasite infections which may play an important role in the problem.

CEFAS Weymouth

Biodiversity Action Plan and conservation concern Mammal Species

Bat *Geomyces destructans* surveillance in Great Britain

This is carried out in association with the Bat Conservation Trust (BCT). No evidence of *Geomyces destructans* has been discovered during 2010 and January 2011 in GB. This survey is gaining momentum as during the whole of 2010 only seven bats were submitted but during January 2011 eight bats were sampled. All the cases presented were presumed to be of saprophytic fungi growing on bat carcases. The disease caused by *Geomyces destructans,* in North America is called White-Nose Syndrome (WNS). *G. destructans* has not been detected so far in GB, but a range of other fungi have been isolated and these were judged to be saprophytic on bat carcases. *G. destructans* was first reported in hibernating bats in, New York State, in February 2006. 15 states in North Eastern and Mid Atlantic USA and two Provinces in Canada are now affected. Bat population declines ranging from 80-97% have been recorded in caves. The total losses are estimated to be over one million bats. This is the most catastrophic decline of Northern American wildlife caused by an infectious disease ever recorded. It is continuing to spread, with a new outbreak recently reported in Southern Indiana, a previously unaffected area. *Geomyces destructans* has, so far, been confirmed in six European countries (Czech Republic, France, Germany, Hungary, Slovakia and Switzerland). However, no bat mass mortalities associated with this fungus have been reported in Europe.

Species	Survey Period	
	1/1/2010-31/12/2010	1/1/2011-31/1/2011
Lesser Horseshoe bat (*Rhinolophus hippersideros*)	**5**	**2**
Greater Horseshoe bat (*Rhinolophus ferrumequinum*)	**-**	**3**
Natterer's bat (*Myotis nattereri*)	**-**	**2**
Unidentified bat (marked decomposition)	**2**	**1**
TOTAL	**7**	**8**

VLA Wildlife Group

Red Squirrels (*Sciurus vulgaris*)

2010 was a significant year for the future of the red squirrel in England. Approximately 45 cases of pox were diagnosed in red squirrels from the North of England; possibly a record. This reflects the position south of the Scottish borders where there are now large numbers of grey squirrels (*Sciurus carolinensis*) in contact with the remaining good populations of red squirrels (in good quality habitat in Cumbria and Northumberland). Mortality in these circumstances among the red squirrels is high. Surveillance co-ordination is good in the area as seen in the numbers of squirrels submitted to VLA however the progression of the disease can only be described as relentless. In addition, VLA have identified and published other risks to red squirrel survival in the area namely, adenovirus enteritis, lice infestation of juvenile animals, pet predation of squirrels using garden feeders and road traffic casualties.
VLA Penrith

Seals (Pinnipedia) 2010

Nine seals were received for post-mortem examination in 2010, of which all were grey seals (*Halichoerus grypus*). Six of these died during rehabilitation. Bacterial causes of death included pneumonia/pyothorax, *Serratia marcescens* septicaemia, *Arcanobacterium phocae*-associated omphalitis/peritonitis/hepatitis/ meningitis in a pup with a compound comminuted fracture of the mandible and a case of trauma with secondary bacterial infection including unilateral ocular abscessation and suspected optic nerve spread resulting in meningitis associated with *Citrobacter* sp. Further cases included non-suppurative encephalitis of unknown aetiology and perforation of the pylorus by ingested feathers. Two wild juveniles, one of which died four months post-rehabilitation, had evidence of trauma. In a third wild juvenile, the cause of death was undetermined, but the seal had a thickened, ulcerated mucocutaneous junction of suspected viral aetiology and further investigations into this are ongoing. In addition, VLA Bury examined one seal with superficial corkscrew lesions, one of a series seen in seals from Eastern English and Scottish coasts. The cause is not known however traumatic injury with propeller devices is the current suspected source of these unusual lesions.

VLA Truro

Cetaceans (CSIP)

All 39 cetaceans examined in England and Wales for the CSIP in 2010 were BAP-listed species (27 harbour porpoises, 6 short-beaked common dolphins [*Delpinus delphis*], one striped dolphin [*Stenella coeruleoalba*], one white-beaked dolphin [*Lagenorhynchus acutus*], one Risso's dolphin [*Grampus griseus*], one sperm whale [*Physeter catodon*], one Sowerbys beaked whale [*Mesoplodon bidens*] and one minke whale [*Balaenoptera acotorostrata*]). Validated and finalised data for GB will be produced in the CSIP annual report covering this period (see link above).

IoZ

Sixteen cetaceans were received for post-mortem examination at VLA Truro, in 2010 under the Defra-funded Cetacean Strandings Investigation Programme. The most common finding was bycatch (net entanglement), diagnosed in 8 animals, including 4 harbour porpoises (*Phocoena phocoena*), 3 common dolphins (*Delphinus delphis*) and one white-beaked dolphin (*Lagenorhynchus albirostris*). Two further harbour porpoises had lesions consistent with both bycatch and bottlenose dolphin attack, and there were also individual cases of bottlenose dolphin attack, likely common or striped dolphin attack in a malnourished suspect live stranded neonate and malnutrition in association with a peri-oesophageal abscess. Two common dolphins had live stranded, one when suffering from dystocia, and the death of one striped dolphin (*Stenella coeruleoalba*) was associated with malnutrition. An adult fin whale (*Balaenoptera physalus*) and a juvenile humpback whale (*Megaptera novaeangliae*) were too large for full post-mortem examination at the Regional Laboratory and, although limited sampling was carried out, the cause of death could not be established.

All marine mammals were sampled for brucellosis but no *Brucella* organisms were isolated in 2010.

VLA Truro

Hedgehogs

Five hedgehog carcasses were examined at the IoZ in 2010. As described above, *Salmonella* sp. was isolated from one case. Four of the five submitted cases were anorexic juvenile animals, found in the autumn, with respiratory tract pathology and lungworm infection. One was an adult hedgehog that appeared to have been predated (possibly by a fox).

IoZ

Biodiversity Action Plan and conservation concern Bird Species

Garden birds

Twenty-two carcasses of BAP-listed avian species were examined by the GBH*i* in 2010 (two barn owls, eight bullfinches, one dunnock, one house martin [*Delichon urbica*], six house sparrows, one song thrush [*Turdus philomelos*], one spotted flycatcher [*Muscicapa striata*], one starling and one swift [*Apus apus*]). Notable findings have been described above, and in previous quarterly reports for 2010 (Quarterly Reports 12.1, 12.2. and 12.3).

GBH*i*

Appendix 1

Diagnosis not reached Analysis October - December (Q4) 2010 and for the year 2010

The following is a summary of wildlife data analysed by the VLA from diagnostic submissions received by its 15 regional laboratories and 2 surveillance centers situated in England and Wales. The aim of this report is to review data where a diagnosis was not reached despite the sample receiving testing which was deemed adequate to allow the potential of a diagnosis to be reached. This allows monitoring of this class of submission with the aim of providing information on, and the early detection of new or emerging syndromes.

Overview

Data analysis revealed no changes thought to constitute evidence of emergence of new, undiagnosed disease.

During the fourth quarter of 2010, a *no diagnosis* was reached for only 4 of the 28 wildlife submissions undergoing reasonable testing over the period. These included 1 mute swan, 2 red squirrels and 1 Great Northern Diver.

In the 12 month period Q1 2010 to Q4 2010 there was no significant increase in the proportion of submissions from terrestrial mammals for which no diagnosis was reached despite reasonable testing (%DNR) compared with the last 5 years (Q1 2005 to Q4 2009). Nor was there any significant increase compared to the proportion of DNR in the previous year (Q1 2009 to Q4 2009). See Table 1.

Likewise, for wild/native birds no significant increases were observed in the proportion of submissions from for which no diagnosis was reached compared with the previous year or the previous 5 years or previous year (Table 1).

Table 1. Changes in % of undiagnosed submissions for native birds and mammals.

	% of Submissions for which Diagnosis Not Reached (reasonable testing)						
	Latest 12 months Q 1 2010-Q4 2010	Prior 5 years (Q1 2005 – Q4 2009)	Z		Previous year (Q1 2009 – Q4 2009)	Z	
Terrestrial mammals	4.52%	6.98%	1.16	▼	5.95%	0.60	▼
Native birds	23.88%	21.70%	-0.42	▲	27.27%	0.46	▲

▲▲ or ▼▼ Statistically significant increase or decrease (z >1.96 or z< -1.96)
(not calculated where N < 40)

For other species groups examined no significant increase in the proportion of submissions for which Diagnosis Not Reached was made, over the last 12 months, was found. The low numbers of submissions per quarter, and low number of DNRs mean comparisons by quarter is not reliable.

Looking at 2010 as a whole, there were 247 submissions of wildlife that underwent reasonable testing. Of these, no diagnosis was reached for 24 (9.6%) of them. Table 1 shows the breakdown by wildlife group in 2009.

Table 1. Number of submissions that underwent reasonable testing and number (%) DNR

Wildlife Group	Total submissions	Number (%) DNR
Bird of prey	6	0 (0%)
Garden bird	2	0 (0%)
Other bird	15	3 (20%)
Sea bird	21	4 (19%)
Swan	18	7 (39%)
Water birds	5	2 (40%)
Deer	10	1 (10%)
Marine mammal	3	0 (0%)
Squirrel	143	5 (4%)
Other terrestrial mammal	24	2 (8%)
TOTAL	247	24 (10%)

The groups are chosen based on species and numbers of submissions e.g. there are enough submissions of swans (all spp) to include this as a separate category but no specific garden bird species provides enough spp to warrant a separate category.

The group with the largest proportion of DNR in 2009 was swans and water birds, however the number of submissions for all categories except squirrels is low.
The data were analysed to look for trends in the %DNR over the 8 years of data available (2003-2010). Logistic regression, chi-squared tests and two-sample tests of proportions were used as appropriate.
Across all wildlife species combined there has been an overall decrease in the proportion of DNR submissions (p=0.001) over the last 8 years. When broken down and analysed by group, some species showed a small increase in DNRs over the years. As noted in 2009, there has been a significant year on year increase in the % of DNR for "garden birds" (p = 0.023) but the number of submissions that underwent reasonable testing for this group has dropped dramatically from 110 in 2006 to 4 in 2009 and 2 in 2010 and therefore, while the trend is probably accurate from earlier years, extrapolation to recent years is not reliable. The other groups showed no significant trend over the 7 years.
CERA VLA Weybridge

GBH*i*
The proportion of cases submitted to the GBH*i* in 2010 where a diagnosis was not reached (13%) was similar to previous years of the project.
IoZ

Appendix 2

Summary of Wildlife Disease Event Monitoring for 2010

In June 2010 a methodology for monitoring wildlife disease events nationally and internationally was developed by the Veterinary Science Team at Defra and a RVC veterinary fellowship candidate (Knight-Jones *et al*., submitted). In brief, electronic sources of information and reports on wildlife disease events were sourced. The majority of these sources were mailing lists which were subscribed to via a dedicated email address. This email account and other websites without mailing lists are checked each weekday by a non-specialist scientist.

Events fulfilling criteria a) and b) are recorded:

a) Wildlife involvement (vertebrates, not fish as UK-based horizon scanning for diseases of fish is conducted by the Centre for Environment, Fisheries and Aquaculture Science (Cefas; Anon, 2008)).
b) Relevant to the reasons for government intervention, that is events that threaten the UK in terms of 1) public health, 2) animal welfare, 3) the wider economy, environment (including biodiversity) and society, and 4) international trade.

Events fulfilling the following criteria, in addition to a) and b), are immediately reported to management in the Veterinary Science Team:

i. A Mass mortality in Europe or in a species analogous to a European species.
ii. A report describing a new disease.
iii. A report describing a significant change in prevalence or occurrence.
iv. A disease which the Veterinary Science Team at Defra are currently working on.
v. A disease of public concern in UK or Europe.
vi. A risk assessment or other scientific comment on risk potential of wildlife diseases.
vii. Information on disease drivers which could change UK governments risk profiles.
viii. A report of a notifiable disease (http://www.defra.gov.uk/foodfarm/farmanimal/diseases/atoz/notifiable.htm).
ix. A threat to a wildlife species' regional or national population survival.
x. A new wildlife disease event in the UK.

FFG, Defra

Table 1. includes a summary of the events recorded since June 2010.

Date recorded	Common name	Disease/Event (cause)	Country	Brief description/further information
05/01/11	Red winged blackbirds	Mass mortality (unknown)	USA	Mass die off similar to case reported 4/01/11
04/01/11	Spectacled teal	HPAI	South Korea	20 wild teal found dead with HPAI
04/01/11	Hooded cranes	HPAI	Japan	Five protected cranes have been found with HPAI.
04/01/11	Red winged blackbirds	Mass mortality (unknown)	USA	3000 birds died from unknown cause, may have been startled by fireworks
20/12/10	Barn owl	Mortality (cold weather)	UK	Increased barn owl mortality due to cold weather
15/12/10	Seals (common and grey)	Mortality (unknown)	UK	Mortalities in Orkney with same corkscrew pattern as other areas
15/12/10	Rodents	Hantavirus	USA	21 rodents tested positive for hantavirus near San Diego, (14 last year). No info on total numbers tested
14/12/10	Deer	Adenovirus haemorrhagic disease	USA	More deaths than previous years
13/12/10	Amphibians	Chytridmycosis	Australia & USA	Amphibians across Australia and the US may be recovering from chytridmycosis
10/12/10	Buzzards	Mortality (carbofuran poisoning)	UK	Two dead birds found dead by banned pesticide. At least 21 buzzards have been poisoned since 2009
10/12/10	Golden eagle	Mortality (carbofuran poisoning)	UK	Rehabilitated bird found dead
10/12/10	Garden birds, various species	Trichomonosis	UK	Seasonal increase in the number of trichomonosis incidents diagnosed

Date recorded	Common name	Disease/Event (cause)	Country	Brief description/further information
10/12/10	Deer	Adenovirus haemorrhagic disease	USA	Apparent increased mortality than in the past
09/12/10	Wild birds	HPAI	Korea	Subclinical infection found through surveillance in wild birds.
07/12/10	Grey seal	Mortality (unknown)	UK	Apparently increased mortality rate in seal pups. Possible link with human disturbance
28/11/10	Red kite	Mortality (poisoning)	UK	Four deaths due to poisoned bait and two due to eating dead poisoned carrion
17/11/10	Bats	White nose syndrome	CZ & SK	Increasing prevalence of WNS but not associated with increased mortalities
16/11/10	Rabbits	Myxomatosis	UK	Outbreak of myxomatosis in wild rabbits in Hampshire
28/10/10	Common seals	Increased illness (unknown)	UK	Seventy pups sick to date, normally only 150 ill pups per year (June-June).
26/10/10	Primate/human	Virus jump	USA	A (possibly adeno) virus has spread from monkeys where it was virulent to a sick human. It has not been transmitted between people.
25/10/10	White tailed deer	Epizootic Haemorrhagic Disease	USA	EHD outbreak - should stop due to colder weather
21/10/10	Penguins	Avian Paramyxovirus	Falkland Islands	Evidence for a New Avian Paramyxovirus Serotype 10 Detected in Rockhopper Penguins from the Falkland Islands
20/10/10	Wild boar	Increase in population	Europe	Increase in wild boar populations despite 10 fold increase in numbers culled in France; potential for increased disease transmission to livestock.
15/10/10	Bats	Mortality(physical trauma)	UK	New report says that wind turbine colour increases number of bat mortalities (white attracts insects and therefore insectivorous bats)
13/10/10	Red Squirrel	Squirrel pox	UK	Number of squirrel deaths due to poxvirus had increased by two thirds this year over last year
05/10/10	Seals (common and grey)	Increased mortality (unknown)	UK	Pup mortality six times higher in beach area visited by public
01/10/10	Birds	Mass mortality (unknown)	Russia	>1000 birds dead on a lake
30/09/10	Humans	Hantavirus	Chile	Human hantavirus cases up 40% on 2009
23/09/10	Gulls	AMR bacteria	UK	Seagulls reported carrying antibiotic resistant bacteria
25/08/10	Red Squirrel	Adenovirus	UK	Adenoviruses have been implicated in squirrel deaths
24/08/10	Minke whale	Stranding (unknown)	UK	IoZ cetacean strandings programme undertaking an autopsy to determine cause
23/08/10	Black tailed deer	Adenovirus haemorrhagic disease	USA	Twenty deer died in past month, disease first identified in CA since 1994
20/08/10	Greenfinches	Trichomonas	UK	GBHi publication on issue in PlosONE has produced press interest
20/08/10	Deer	EHD	USA	last outbreak of EHD in Illinois was 2007
31/08/10	Seals (common and grey)	Trauma	UK	Seals with lacerations (now known to be large underwater propellers)
16/08/10	Sea birds (cormorants and gulls)	Newcastle (potentially)	Canada	Over 1000 dead birds
09/08/10	Beavers	None	UK	Potential beaver population in Scotland of 50 illegally released beavers, potential source of zoonotic disease
09/08/10	Bats	White nose syndrome	USA	WNS may cause the local extinction (NE USA) of one bat species (common species little brown bat) within 16 years
09/08/10	Deer	Mass mortality (disease)	Spain	Originally presumed to be a virus such as BTV or EHD, later attributed to pasteurellosis
30/07/10	Humans	Hantavirus	Germany	736 cases in 2010 to date, up 100% from last year, probably due to increase in vole numbers
20/07/10	Red Squirrel	Squirrel pox	UK	Squirrel pox has spread further in Scotland

Date recorded	Common name	Disease/Event (cause)	Country	Brief description/further information
19/07/10	Fox	Rabies	Italy	Dramatic increase in rabies cases, mainly foxes but other mammals too
13/07/10	Red Squirrel	*Staphylococcus aureus*	UK	*Staphylococcus aureus* from humans feeding squirrels
12/07/10	Japanese macaques	Haemorrhagic disease	Japan	Disease outbreak in laboratory primates; not transferring to humans
06/07/10	Wild birds	HPAI	China	Started 9/5/10. 170 dead birds.
30/06/10	Fox	Rabies	Russia	Epidemiologists have expressed concern about number of people being bitten
29/06/10	Wild birds	HPAI	Russia	Outbreak started 5/6/10, 367 deaths
11/06/10	Common and European green toads	Chytridmycosis	Sweden	First report of chytridmycosis in Sweden; three outbreaks, 39 animals affected
04/06/10	Humans	Hantavirus	Germany	Increase in hantavirus infections in humans is probably due to an increased population density of the main animal reservoir, the bank vole (*Myodes glareolus*).