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International Animal Disease Monitoring Team

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## HIGHLY PATHOGENIC AVIAN INFLUENZA (HPAI): H5N1 IN A DUCK IN FRANCE AND AN UPDATE ON THE SITUATION IN EUROPE

Working Document – Version 1

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## 1 Disease reports

The following qualitative risk assessment has been based on information received from the European Commission (European Commission, 2006) and the World Organisation for Animal Health (OIE, 2006) and advice from expert ornithologists. The information covers reports up to 20 February 2006. However, the HPAI H5N1 situation has been changing rapidly and further developments are likely.

This assessment builds up on our preliminary assessment of the situation in Europe which covered the reports up to 16 February 2006 (Defra, 2006). It has been made as a result of the French authorities announcing the confirmation of highly pathogenic avian influenza (HPAI) H5N1 virus in a dead wild duck (Common Pochard - *Aythya ferina*) in the east of the country (the department of Ain) near to the city of Lyon. In accordance with EU rules, France has applied precautionary measures in the form of a protection (3 km radius) and a surveillance (10 km radius) zone (which includes the protection zone).



## 2 Situation assessment

France has confirmed the detection of the virus in a dead wild duck in eastern France. The virus has also been confirmed in wild birds in limited localities in other EU Member States (Greece, Italy, Slovenia, Austria, Germany and Hungary). H5 has been confirmed in Hungary, Slovakia and Bosnia Herzegovina (Swans).

### 2.1 Domestic poultry

There are no reports of the virus detection in domestic poultry (either commercial operations, free-range operations or back-yard poultry) in any of the affected EU Member States or neighbouring countries (western Russia, Belarus, mainland Ukraine except Crimea, Moldavia and Switzerland). The situation in the Balkan countries remains uncertain. The most recent report of infection in village poultry in the Danube delta was from Romania.

HPAI is a notifiable disease in the EU and any suspected deaths in domestic poultry are promptly investigated. Poultry appear to be highly susceptible to the disease and die very quickly. It is very likely that any point introduction into domestic poultry would be noticed and appropriately controlled.

### 2.2 Wild birds

On two occasions (October and November 2005), Croatia reported the detection of HPAI H5N1 virus in swans (species not stated - but most likely to be Mute Swans *Cygnus olor*) in two provinces. The virus has been reported in dead swans from north-western Bulgaria close to the border with Romania and Serbia and Montenegro

and in eastern Bulgaria close to the Black Sea. Bosnia & Herzegovina has reported finding H5 virus in two sick swans in February. Meanwhile, the virus has not been confirmed in samples collected from dead swans in Denmark and Sweden. Switzerland also reported negative findings in swans.

In all affected EU Member States, the virus was detected in dead wild birds that have been collected where die-offs have been reported. Further, the virus has been detected mainly in dead Mute Swans (*Cygnus olor*). The virus has been also been reported in either single or a few Whooper Swans (*Cygnus cygnus*), Cormorants (*Phalacrocorax carbo*), Grey Herons (*Ardea cinerea*), Mallards (*Anas platyrhynchos*), Common Pochard (*Aythya ferina*), Red-breasted Goose (*Branta ruficollis*) and Goshawk (*Accipiter gentilis*), seagull (*Larus* sp.) and Buzzard (*Buteo buteo*).

The clustering of these isolations in time in Europe is notable epidemiologically. This is most likely as a result of a movement of migratory species into the more eastern parts of Europe as a result of adverse weather conditions in the more favoured over-wintering locations. In turn this has resulted in these birds arriving in countries where surveillance for AI infection is more intensive and practically possible. The benefits of targeting surveillance towards dead birds, compared to surveying healthy live birds, is also evident from these recent findings. These aspects are discussed further in Section 2.3 below.

## **2.2.1 Anseriformes**

### **2.2.1.1 Mute Swan – *Cygnus olor***

The population of Mute Swans breeding in Britain is almost entirely sedentary with no migration to or from the mainland of Europe (Scott & Rose 1996). However, Wernham and others (2002) show that there is some short-distance movement of mute swans to and from the near European continent in response to periods of particularly severe winter weather. There have also been movements of mute swans to the near Continent not linked to cold weather. In contrast, there are three discrete populations of breeding birds in Europe. These are a northwest and central European population (which winters on the coast in some countries in the Baltic Sea region), the Black Sea/east Mediterranean population (which winters on the coasts of some countries in the Black Sea and Sea of Azov region) and a West-central Asian/Caspian region population (which winters on the coasts of some countries in the Caspian Sea region) (Scott & Rose 1986).

### **2.2.1.2 Whooper Swan - *Cygnus cygnus***

These birds are migratory. Most of the population that winters in the UK come from Iceland (Robinson and others 2004). However, a very small number of Scandinavian breeding birds may come to the UK during harsh winters. Two other populations winter in different areas of continental Europe although the breeding areas of these birds are not well known and probably overlap (Scott & Rose 1996). A population that breeds in Scandinavia and western Siberia (the northwest continental Europe population) winters in the Baltic Sea region. A population which breeds in Siberia west of Urals (Western Siberia/Black Sea/east Mediterranean population) winters around the northern parts of Black Sea. Whooper Swans can also move extensively in response to harsh winters.

### **2.2.1.3 Mallard - *Anas platyrhynchos***

There appear to be very limited movements of these birds between the UK and the rest of Europe. Wernham and others (2002) consider that the UK population is largely sedentary and does not move long distances during cold weather. Mallards from north, east and central Europe migrate south and west. Scott and Rose (1996) consider that European northern breeding birds are migratory, wintering in more southerly areas, while birds breeding in temperate areas are sedentary or dispersive.

### **2.2.1.4 Common Pochard - *Aythya ferina***

Wernham and others (2002) consider that no discrete populations are identifiable. It is thought that the birds wintering in the Mediterranean have the same origin as those wintering in northwest Europe. There appears to be considerable overlap in the breeding areas of birds wintering in the Black Sea/east Mediterranean region and those wintering in Southwest Asia, with many of these birds breeding in southern Siberia and central Asian republics.

### **2.2.1.5 Red-breasted Goose - *Branta ruficollis***

Red-breasted Geese breed on the Taimyr and Yamal peninsulas of northern Russia and migrate south to winter on the coasts of the north-west Black Sea (Scott and Rose 1996). In winter they occur notably at the Shabla and Durankulak lakes of Bulgaria, the lagoon/steppe complex of the Danube delta in Romania, and the Dobrogea plateau between the Danube and the coast and which spans the Bulgaria/Romania border (Hunter & Black 1996). Severe winter weather in the Black Sea region may sometimes force birds away from these areas.

The population is globally threatened and has been subject to significant recent research and targeted conservation actions (summarised by Hunter & Black 1996).

## **2.2.2 Pelecaniformes**

### **2.2.2.1 Cormorants - *Phalacrocorax carbo***

Cormorants are fish-eating birds. Wernham and others (2002) note that many birds breeding at coastal colonies in Britain winter close to their breeding areas while others may travel south along the English Channel coast to the coast of Portugal.

## **2.2.3 Ciconiiformes**

### **2.2.3.1 Grey Herons - *Ardea cinerea***

These are fish eating birds that are mainly found in freshwater wetlands, brackish estuaries and marine shallow rocky shores. Wernham and others (2002) record that the UK breeding population is sedentary and that their movements range appear to be predictable and very much influenced by rainfall patterns in the south and by temperature in the north. Ringing recoveries show that most birds that come to the UK are from Norway while lesser number may come from Denmark, the Netherlands and Sweden.

#### **2.2.4 Raptors and other birds**

We gather from one report from an affected EU Member State that some dead birds had their head or neck already missing. Thus, it is reasonable to expect the detection of the virus in samples from birds of prey or scavenging birds. However, to what extent these birds may play a role in the dissemination of the virus, apart from local spread, remains unknown.

In countries outside the EU, HPAI H5N1 virus has been detected in samples collected from dead feral pigeons and doves, sparrows, crows, munias, magpies and gulls.

### **2.3 Epidemiological considerations**

This document addresses two aspects to the assessment of the likelihood of introduction of the virus to the UK. One is developing situation in France and the other is developing situation in the EU and other countries neighbouring the EU.

#### **2.3.1 Developing situation in France**

A confirmed case of HPAI in a Common Pochard duck in eastern France is a new development which increases the likelihood that H5N1 may be found in the UK.

##### **2.3.1.1 Situation in eastern France**

A concern has been raised that potentially infected wild birds might migrate from the affected region in the east of France (the department of Ain near to the city of Lyon), bringing the virus to the UK. Preliminary discussions with ornithological experts suggest that the prevailing movement of wild birds from that region at this time of year is in an eastward direction away from the UK but there is some evidence of direct linkage for Pochard from this region to the UK. Large-scale movements of birds from the region in France to the UK would only be expected if there was a significant reduction in the local temperature.

The Common Pochard species is gregarious and the experts recognise a potential for an overlap of various populations in Europe in wintering areas in the Black Sea/east Mediterranean region and those wintering in Southwest Asia, with many of these birds breeding in southern Siberia and central Asian republics. Therefore, a possibility that a small number of these ducks from the affected region in France could arrive in the UK cannot be excluded even when the majority of birds are moving eastwards from the UK during their spring migration.

The other concern is the fact that the affected region of France is in the vicinity of the East Atlantic migratory flyway as is the UK. Britain has small breeding populations of a number of ducks (Wigeon *Anas penelope*, Gadwall *Anas strepera*, Teal *Anas crecca*, Pochard, Shoveler *Anas clypeata*) (Baker and others 2006). These range from several hundreds to the low thousands, depending on species. A proportion of these breeding birds may winter south of Britain, in France and Spain. There is also a much larger breeding population of Mallard, although they show more limited southward movement in winter. It is likely that small numbers of these species will shortly arrive in Britain, having traveled from or through central and northern France. The vast majority of individuals of these duck species breed further east (from Fenno-Scandia, in eastern Europe and across northern and central Russia). The majority of the individuals (hundreds of thousands to more than a million, depending on the species) in Britain and western Europe will therefore travel east from mid February onwards on their spring migration. However, a distinct possibility remains that a number of birds will migrate north from France and Spain into the UK.

Therefore, there is a possibility that the infected Pochard in France may have been a part of a wider population which could include birds that are already present in the UK or which may have passed through the UK en route to their current location in France. If that is the case, expert opinion is that there is now an increased likelihood that the virus may arrive to the UK, or it may already be present in at least small number of wild birds in the UK, thus far undetected. Nevertheless, the experts consider that this scenario should be carefully balanced against the results of surveillance of mainly healthy, but including a small proportion of dead wild birds in the UK (involving some 3,500 samples) and the results in the rest of the EU Member States although these were taken before any movements due to recent cold weather on the continent. The presence of any highly pathogenic avian influenza virus of H5 or H7 type has not been detected in any sample collected from live birds either in the UK or EU, so far.

### **2.3.2 Situation in north France**

There has been no reported case of the virus being present in northern France.

#### **2.3.2.1 Movements of migrating birds in northern France through Britain**

The indicative boundaries of the East Atlantic and the Black Sea-Mediterranean Flyways for waders (Stroud and others 2004), and of the North-west European and Black Sea/Mediterranean flyways for wildfowl (Isakov 1967) run through central or southern France. These boundaries are approximate and it is not possible to assign any bird in that area as being from one or other population.

There is a distinct possibility that any species passing through the north of France (even if traveling to breed in northeast Europe or Russia) may travel through, or mix with other migrating birds that travel through southeast England. Expert opinion is that the north of France is sufficiently close to the UK such that there is at least as much likelihood of exchange of birds between northern France and southeast England as there is, for example, between Kent and northern England. A similar situation probably exists for northwestern France along the Atlantic coastline (Brittany south to the Gironde Estuary).

### 2.3.2.2 Wild duck movements

In the UK, Mallards show more limited southward movement in winter compared to other ducks (Wigeon, Gadwall, Teal, Pochard, Shoveler). The expert ornithologists consider it possible that small numbers of these species may soon arrive in Britain, having traveled from or through central and northern France. A proportion of the Pochard population that breeds in Britain also winters in France and Spain.

With regard to movements of ducks from France, Cranswick (pers comm.) estimates that any case of H5N1 in Western France would be of relatively great concern to the UK.

### 2.3.2.3 Wild goose movements

Approximately 5,800 White-fronted Geese *Anser albifrons* and approximately 500 Bean Geese *Anser fabalis* over-winter in the UK (Hearn 2004a,b; Baker and others 2006). They will also migrate east and migration for British birds will already have begun. Greylag Geese *Anser anser* occur in Great Britain, but are either resident (30,000) or breed in Iceland (90,000). Another population of Greylag Geese occurs on continental Europe. They are migratory but there is very limited exchange of these birds between continental Europe and the UK, as shown by only very few UK ringed birds being recovered abroad. However, exchange of continental Greylag Geese with the UK has been demonstrated by a few sightings of foreign-ringed birds in the UK.

Many hundreds of thousands of White-fronted and Bean Geese winter in the Netherlands and northern Germany and they will migrate east from there (Madsen and others 1999). The Netherlands also supports large numbers of Barnacle Geese but this population does not visit the UK. Brent Geese, *Branta bernicla* (of the dark-bellied subspecies, *B. b. bernicla*), winter in Great Britain, northern France and the Netherlands (approximately 100,000 individuals winter in Great Britain out of an international population of approximately 250,000) (Ward 2004). These will also all migrate east to northern Siberia.

### 2.3.2.4 Other bird movements

We also mentioned that HPAI H5N1 virus has been reported in dead gulls (Great Black-headed Gulls – *Larus ichthyaetus*, Brown-headed Gulls – *Larus brunnicephalus* and Black-headed Gulls – *Larus ridibundus*). Discussions with expert ornithologists suggest that, although the first two of these species do not occur in Europe, gulls are a potentially important group because they are very numerous in the UK (ca 1,700,000 Black-headed Gulls in the winter - Baker and others 2006) and highly communal in nature. They also form a major avian "bridge" between wetland and terrestrial habitats. Gulls spend the night-time in communal roosts on waterbodies, both inland and coastal. During the day, they disperse widely to feed, using not only wetlands but also farmland, urban sites and rubbish tips. They are also highly mobile. Gulls will disperse tens of miles each day to forage. Daily interchange

between roosts and feeding areas between southern England and northern France would potentially be possible.

It is highly likely that gulls have become infected as spill over hosts since they scavenge and may feed on birds that have died with H5N1 HPAI. Gulls in terms of influenza epidemiology and ecology appear to be a unique host grouping in terms of susceptibility. They are reservoirs of viruses of H13 and H16 subtypes but generally not other subtypes. It is noteworthy that infections with other subtypes are rare (Brown, pers. comm.).

### **2.3.3 Developing situation in the EU and countries neighbouring the EU**

Reports from several Member States could suggest quick temporal and spatial spread of the virus westwards from the known previously affected areas in eastern Europe. The emerging evidence suggests random geographic detection rather than particular geographical clustering of cases (for example along a single migratory flyway). Therefore, these detections do not appear to fit to what may be expected for contiguous spread of infection, so far. They rather fit a concept of a single point introduction resulting in death of infected birds. We do not know the incubation period in the wild bird species reported to be infected. We also do not know whether they will shed significant quantities of the virus before they die and therefore the extent that they could play in dispersing the virus locally. This raises concerns on the potential existence of a 'silent' reservoir(s) of the virus. As mentioned above, the EU targeted surveillance of healthy wild birds between October and December 2005 has detected no positive HPAI virus (either H5 or H7), so far in free living apparently healthy birds.

#### **2.3.3.1 Swans**

The most recent detections of the virus were predominantly in dead wild swans, mainly Mute Swans. Some Mute and Whooper Swan populations in Europe are migratory, but appear to have limited movements. Some populations may winter in the affected areas in eastern Europe.

Compared to recent years, this winter appears to have been very harsh in some parts in eastern and central Europe. This event may have caused swans in the affected areas in eastern Europe to either move westwards towards different parts of the EU or eastwards towards countries in western Asia.

The virus has so far been detected in dead wild swans indicating their susceptibility to infection. Swans may prove to be a good indicator species for detecting the presence of the virus in the wider population of birds at any location because their deaths are more striking and identifiable than mortality in other smaller species.

It remains unknown whether swans may have been infected from domestic poultry in the currently affected countries in eastern Europe. It is expected that further studies of the virus isolates that have been collected from the affected countries will shed more light on what may have happened. These studies will have to be considered in the context of temporal and spatial spread of the virus or a possibility that the virus may already have been present in wide areas at a low level but remained undetected. This may also provide an answer as to whether other wild bird

cohabitants with swans are of more epidemiological importance in terms of the further geographical movement of the H5N1 virus.

### 2.3.3.2 Other birds

During the outbreak in Novosibirsk in mid 2005, Lvov and others (unpublished data currently subject to peer review) detected the virus in 19 out of 54 samples collected from wild ducks (18 samples positive out of 45 collected from Mallards – *Anas platyrhynchos* and Pochards – *Aythya ferina*) and Great Crested Grebe (*Podiceps cristatus*) (1 sample positive out of 2 collected). However the chronology of the outbreak in poultry in relation to infection in wild birds has not been clearly established. It is likely that the Great Crested Grebe is of limited significance.

Chen and others (2006) tested approximately 13,000 samples collected from apparently healthy wild migratory ducks in China during the period between October 2003 and March 2005. The HPAI H5N1 virus was detected in approximately 0.03% to 0.13% of samples. We have provided a brief description above (Section: 2.2.1 Anseriformes) on Mallard and Pochard and their behaviour in Europe.

Great Crested Grebe (*Podiceps cristatus*) are mainly fish eating birds. Wernham and others (2002) note that this species is now abundant in Europe and breeding in 32 countries (Hagemeijer & Blair 1997). In Britain, it is “found on large lowland lakes, reservoirs, meres and gravel pits with riparian fringe vegetation, reeds being the preferred breeding habitat. They are less widespread in western and northern England and largely absent from lochs of northern Scotland”. These are not especially gregarious birds outside the breeding season. There are only five recoveries of UK ringed birds on continental Europe over the last 90 years. This would suggest that this species is largely sedentary to the UK.

### 2.3.4 General comment

There are many uncertainties related to the species susceptibility, pathogenesis and ecology of the virus and potential pathways for transmission. Recent epidemiological evidence suggests that wild birds (swans, ducks, raptors, scavengers and other wild birds) die following infection. This evidence indicates that these birds may be of less epidemiological importance in the virus maintenance in the wild but may play a limited role in the dispersion of the virus if they become infected.

There is circumstantial evidence, based on a single event, that some species of waterbirds (e.g. Mallard and Great Crested Grebe) may be of greater epidemiological importance in maintenance of the virus in the wild and provide opportunity for other susceptible birds to become infected.

## 3 Preliminary conclusions

We are still in a very dynamic and uncertain situation. HPAI H5N1 virus has been found in a growing number of EU Member States in recent days and further developments are likely. So far, the virus has only been detected in dead wild birds.

There are no reports of virus detection in live wild birds or domestic poultry in any of the EU Member States, so far (other than a single hen exposed to a sick swan in Austria).

The confirmation of the virus in eastern France is a new development which increases the likelihood that HPAI H5N1 may be found in the UK or may already be present here but remains undetected. This is based on close geographic proximity to the UK and the potential for limited movements (particularly Pochard and other species of ducks) between France and the UK at this time of the year.

The most recent reports from other affected EU Member States demonstrate incremental increases in the likelihood of introduction of HPAI H5N1 virus from their currently affected areas to the UK. This estimate is mainly on the basis of the other currently affected EU Member States being more distant from the UK with limited opportunities for wild bird movements between these Member States and the UK at this time of the year.

Based on preliminary genetic analyses of the H5N1 HPAI viruses from wild birds in Europe it would appear they are very similar to each and to those from Siberia/Qinghai. This may indicate they have been in wild bird 'reservoirs' for a while and it is only now that they are apparently spreading or that critical infection load in bird populations is such that we are seeing die offs in spill over hosts.

Many uncertainties remain with regard to species susceptibility, pathogenesis and ecology of the virus and potential pathways for its transmission. Recent circumstantial evidence shows that wild birds such as swans, ducks, raptors, scavengers, gulls and some other wild birds (e.g. feral pigeons, magpies, sparrows) die following infection. Therefore, it is likely that these species may be of less epidemiological importance in maintaining the virus in the wild but may play a limited role in the dispersion of the virus by mechanical transmission or if they become infected.

Recent circumstantial evidence, based on extremely restricted information, indicates that a very small number of individual waterbirds (e.g. Mallard and Great Crested Grebe) may be infected with the virus without showing clinical signs. More systematic field studies (notably systematic surveillance of wild birds in those vicinities where the virus has been located) are urgently required to ascertain to what extent these species play a role in the maintenance of the virus in nature, its transmission over greater geographic areas and the potential of other susceptible species to become infected.

We continue to monitor developments, the results of the continued surveillance Europe, and Great Britain, are obviously crucial in assessing the risk of introduction of H5N1 into the UK.

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