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REPORT OF THE MEETING OF THE OIE WORKING GROUP ON WILDLIFE

Paris (France), 12 – 15 December 2017

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1. Opening

The meeting of the OIE Working Group on Wildlife (the Working Group) was held from 12 to 15 December 2017 at the OIE Headquarters in Paris, France. The meeting was chaired by Dr William Karesh.

Dr Matthew Stone, Deputy Director General of the OIE, welcomed the members. He pointed out the key importance for the OIE to have external expertise on the topics covered by the mandate of the organisation, in particular in wildlife. He mentioned that the Working Groups on Animal Welfare and Animal Production Food Safety were stopped but that the Working Group on Wildlife will continue with new terms of reference. The new terms of reference have been developed by the OIE Headquarters taking into account the comments from the Working Group on Wildlife. They expand the activities of the Working Group on biodiversity and the impacts of climate change on animal health. They have been endorsed by the Council and they will be proposed for adoption at the next General Session to the vote of the World Assembly of Delegates.

2. Adoption of agenda and designation of rapporteur

Professor Ted Leighton was appointed as rapporteur for the meeting. The agenda and the list of participants are provided in Appendices I and II, respectively.

3. Feedback from the meetings of the Scientific Commission for Animal Diseases and Terrestrial Animal Health Code Commission

The Working Group was provided information and guidance from the Scientific Commission meetings of February and September 2017. The Scientific Commission recommended the Code Commission consider listing *Vespa velutina*. The Code Commission suggested that they be considered as an invasive alien species. The International Union for the Conservation of Nature (IUCN) may take up this issue for their listing of invasive alien species, possibly with OIE participation.

The Commission postponed the discussion on Vaccination of Animals of High Conservation Value to its next meeting in February 2018. The Working Group noted the importance of the issue and recommended that its discussion paper on the Vaccination of Animals of High Conservation Value be shared with the *ad hoc* Group on avian influenza for consideration for the revision of the Chapter 10.4. of the *Terrestrial Animal Health Code* (*Terrestrial Code*).

4. Update of the Terms of reference of the Working Group on Wildlife and discussion on future activities of the Working Group

The Working Group reviewed a proposed revision for its Terms of Reference. Dr Matthew Stone and Dr Elisabeth Erlacher-Vindel provided background information for the discussion that included thinking on OIE engagement in areas related to climate change and biodiversity. Both climate change and biodiversity will be important themes for the Working Group going forward as well as work with emerging diseases. The Working Group agreed with the proposed Terms of Reference and was asked to advise OIE on ways to achieve more engagement in these new subject areas. The Working Group recommended highlighting how animal health can contribute to meeting biodiversity and climate related goals.

The Working Group began a preliminary discussion of climate change impacts on animal health, particularly with reference to wildlife. An initial list of indicators that may signal climate change related effects was developed:

1. Changes in population size and geographic distribution (including altitudinal change).
2. Altered feeding behavior of wildlife.
3. Altered (including novel) microbial fauna that typically inhabit a given species (including microbial agents with zoonotic potential).
4. As an indicator of the previous item, increased prevalence of previously lower-prevalence diseases.
5. Change in the timing of various life-history events. For example:
    - Altered breeding seasonality, such that some species begin mating earlier or later than usual. This could in turn potentially alter host-pathogen dynamics (e.g., Avian Influenza).
    - Impact the extent of migration for migratory species, which may in turn alter the frequency of breeding intervals.
    - Mass mortality events due to thermal or oxygen stress, starvation, and/or increased incidence of opportunistic infections.
    - Temperature dependent expression of disease due to pathogen sensitivity to environmental conditions.
    - The survival of vectors (ticks/biting flies etc.) due to milder winters and wider movement (naturally and human aided) of wildlife and livestock

This list will be further discussed in the Working Group during the coming year.

5. Disease reporting

5.1. Disease reporting 2016

Dr Paolo Tizzani, from the OIE World Animal Health Information and Analysis Department (WAHIAD), presented the disease reporting information for WAHIS-*Wild*, highlighting the decreasing trend of reporting between 2012 (71 countries) to 2016 (29 countries). The Working Group expressed its deep concerns about the decreasing trend of reporting.

5.2. Identification of critical points

Dr Tizzani presented the critical points that may interfere with the reporting for wildlife diseases. In particular he identified the following issues:

- Lack of communication between OIE and National Focal Points (FP) for wildlife;
- Problems for the FPs for wildlife to access WAHIS and lack of networking between the FPs for Wildlife and the FPs for Animal Disease Notification to the OIE;
- Difficulties of the FP on wildlife to complete the WAHIS-*Wild* reports online.

5.3. Proposals for report improvement

In order to solve the critical points, the WAHIAD, the OIE Science and New Technologies Department (SNTD) and the Working Group agreed on the following actions to improve the notifications from the OIE National FPs for Wildlife:

1. Send as soon as possible a letter to FPs for wildlife (with copy to the Delegate), including an Excel spreadsheet for reporting, and instructions for the Delegate to create a login access to the system.
2. February: send an email reminder to promote the reporting for 2017. It was suggested that this email includes short practical information on important dates on disease reporting and on the notification process: what to report, when to report, how to communicate, how to interact, etc. The document will be prepared by WAHIAD and SNTD in collaboration with the Working Group.
3. 3 March: communication of the SNT to the OIE NFP for Wildlife Day.
4. June 2018: send another reminder including the Annual report of the information previously submitted. The document will be prepared by WAHIAD and SNTD in collaboration with the Working Group.
5. November 2018: send final reminder to submit 2017 reports.

Moreover, additional actions were proposed, such as 1) perform training of FPs together (notification plus wildlife); 2) include the WAHIS-*Wild* link in the future OIE webpage dedicated to wildlife, 3) make publicly available the list of national FPs for wildlife.

5.4. Discussion on OIE listed diseases blocked for wildlife and revision of the list of non-OIE listed diseases

Dr Tizzani presented the list of OIE-listed diseases whose reporting is blocked for wildlife, to be included in the wild annual report, and the Working Group revised the list of diseases to be included, removed, or better defined for next year (see appendix III)

The Working Group highlighted the need that agents that are not notifiable to the OIE (such as the disease causing agents identified by the Working Group and OIE-listed diseases whose WAHIS reporting is blocked for wildlife) should be included in the voluntary reporting of non OIE-Listed diseases in wildlife, e.g. Lyssaviruses other than Rabies virus (formerly referred to as classical rabies virus, genotype-1) and proposed an update of the list accordingly.

The Working Group removed the following diseases from the list: Infection with Calicivirus in marine mammals, Infection with *Histomonas* spp., and Infection with *Batrachochytrium salamandrivorans* sp. Infection with Calicivirus in marine mammals was removed because of close similarity in clinical presentation to Foot and mouth disease. Modern virological methods now can easily and quickly distinguish these viruses from Foot and Mouth Disease viruses. Marine Caliciviruses do not appear to pose important health risks wildlife. Infection with *Histomonas* spp. was removed because it now appears to be of limited importance to wild or domestic birds. Infection with *Batrachochytrium salamandrivorans* sp. was removed because it was included in the OIE list of diseases, in May 2017, by the World Assembly of Delegates.

The Working Group added the following diseases: Infection with *Ophidiomyces ophiodiicola* (the agent of snake fungal disease) and Infection with morbilliviruses in other taxonomic groups of hosts. Infection with *Ophidiomyces ophiodiicola* (the agent of snake fungal disease) was added because it is a lethal emerging pathogen, spreading in both host and geographic range and has been found in North America and Europe in wild snakes. Infection with morbillivirus in other taxonomic groups of hosts was added because morbilliviruses other than canine distemper, rinderpest and PPR continue to cause important epidemics in wild species and have the potential to evolve into new emerging pathogens.

The Working Group also updated or specified some diseases already listed. Finally, the Working Group would consider at its next meeting and further consultation of the Aquatic Animal Health Standards Commission to add major pathogens of corals.

5.5. Validation of new species in WAHIS

Dr Tizzani presented a table with the newly added species in 2017 (N=5), and the Working Group corrected and validated them.

5.6. Update on WAHIS +

Dr Tizzani gave a quick presentation on the new improvements expected for WAHIS + and the potential impacts/changes for the wild annual report. The Working Group expressed its opinion based on previous experiences about: 1) Integrating different databases is very difficult; 2) It would be more useful to provide good extraction tools and expect that much analysis of data will occur outside the WAHIS platform.

6. Emerging and noteworthy wildlife issues and disease occurrences: reports from members of the Working Group on Wildlife

AFRICA

African Swine Fever: African Swine Fever (ASF) is an endemic and silent infection in most native wild porcines in sub-Saharan Africa. Significant outbreaks of ASF in domestic pigs were reported from Zambia, Côte d'Ivoire and Nigeria. The source of infection in these outbreaks was probably from infected ticks and native wild suids. Thereafter pig to pig transmission resulted in spread amongst herds and between pig farms.

Anthrax: A significant outbreak of anthrax was reported in Bwabata National Park in Namibia during which an excess of 150 hippopotami (*Hippopotamus amphibius*) as well as a few African buffalo (*Syncerus caffer*) died. There were also reports of a small number of elephant (*Loxodonta africana*) dying. The floating hippo carcasses in the Kavango River were considered a health threat to the local indigenous human populations as well as to livestock in downstream Botswana. People were advised not to handle or eat meat from carcasses, and a major effort was initiated to beach the carcasses and to bury them. Still in Namibia, in the Namib Desert, one of the rare desert lions (*Panthera leo*) also succumbed to anthrax. The outbreak was however confined to a small section of the Okvango River – particularly one lagoon where the density of hippo was very high. The outbreak did not spread much further and at the beginning of December had not resulted in any more deaths of hippo. There were reports of hippo deaths and a few elephants in northern Chobe National Park in Botswana late in December 2017 in the Linyanthi system (east of the Okavango system) that were also suspected to be anthrax (no confirmed diagnosis). Hippo carcasses that were accessible were buried.

Another significant anthrax outbreak occurred in Tanzania, mainly in the Arusha and Kilimanjaro districts. This outbreak involved hippopotami, elephants, zebra (*Equus burchelli*), wildebeest (*Connochaetes taurinus*), and various gazelles. There were also mortalities amongst livestock, and a vaccination campaign was undertaken to protect the Masai cattle. A second anthrax outbreak affecting mainly hippopotami occurred in the Ruaha National Park in Tanzania.

Three anthrax outbreaks in wildlife were reported from Mozambique (Limpopo National Park and private concessions on the boundary with the Kruger National Park in Mozambique south of Limpopo National Park). Elephants, lions, buffaloes and greater kudu (*Tragelaphus strepsiceros*) were affected.

Sporadic outbreaks of anthrax in wildlife and livestock were also reported from Burkino Faso (livestock), Zambia (Western Province - livestock), and Zimbabwe (Matabeleland North - hippopotami).

In Tanzania, Zambia and Zimbabwe, numerous human cases were also reported after people had handled or eaten meat from cattle or hippopotami carcasses.

An unusual form of anthrax caused by *Bacillus cereus* has been confirmed as the cause of death in large non-human primates in the West African rain forests of Côte d'Ivoire.

Avian Influenza: Significant outbreaks of Avian Influenza caused by the H5N8 virus were reported from South Africa. The initial report (June 2017) was in poultry in Mpumalanga Province and the disease then spread to poultry in Gauteng Province (July 2017). In August 2017 H5N8 infection was detected in farmed ostriches in the Western Cape Province, as well as in commercial poultry and wild birds. Further spread occurred to the Eastern Cape Province and North West Province in September. Infection also spread to "The World of Birds" – Africa's largest bird park located in Cape Town. All in all, a total of 28 outbreaks were recorded.

Bovine tuberculosis: The first cases of bovine tuberculosis (bTB) in white rhinoceros (*Ceratotherium simum*) and black rhinoceros (*Diceros bicornis*) were confirmed in the Kruger National Park, South Africa. This illustrates once again that when a bTB maintenance host (buffalo in this case) is present in an ecosystem, the infection may spill over into sympatric incidental hosts of another species. All the cases were diagnosed after the rhino died from other causes – primarily drought or poaching and in the white rhino were small incidental lesions. The black rhino had more extensive lesions but also showed signs of co-infection and was in poor condition from the drought prevailing at the time. The diagnosis has however resulted in rhino movements out of Kruger National Park being restricted until a test protocol can be developed for bTB in rhino and is feared to result in fewer rhinos moved to safety while poaching of rhino in the area is occurring at significant levels.

In 2016 a bull elephant that died in an emaciated condition was diagnosed with human TB (MTB) in the Kruger National Park. This is the first recorded case of human TB in wild African elephant and the source of the infection could not be established. In all likelihood the elephant came into contact with human waste or contaminated food at one of the picnic sites in southern Kruger National Park

Bubonic Plague: Bubonic plague is transmitted from wildlife (rodents) to humans by fleas. Although plague is endemic in Madagascar, this season has been uncharacteristic: it started a month early, has been predominately of the pneumonic form, and has most affected the largest urban centers of Madagascar (Antananarivo, Toamasina, Fianarantsoa and Antsirabe). Many of the district's current affected have no experience of the disease, which represents another challenge in addition to the difficulties in controlling the epidemic in urban areas.

The total number of cases (2348) is already 5 times higher than the average annual total of 400 (September to April). The spread of pneumonic plague in high-density urban areas is faster, with a risk of large-scale epidemics, while the implementation of health and non-health responses is confronted with access problems (difficulty in tracing contacts, especially in slums) and the frequent moving of people. The capital city of Antananarivo, the country's trade and transport hub, is most affected by this epidemic.

Crimean Congo Haemorrhagic Fever: Two cases of Crimean Congo Haemorrhagic Fever (CCHF) were reported from the Western Cape Province and Northern Cape Province in South Africa. Both victims were livestock farmers and they recovered from the infection. Three cases of CCHF were reported from farm workers in Namibia. Two of these cases were fatal. In all of these cases the victims reported having had tick bites. CCHF is transmitted from wildlife or livestock to humans by the bont-legged tick (*Hyalomma* spp). It may also be transmitted to humans by contact with tissues or body fluids of infected animals.

Foot and Mouth Disease: Foot and mouth disease (FMD) outbreaks in cattle were reported from several African countries. In April, 2017, Algeria reported an FMD outbreak in cattle caused by virus serotype SAT1. In South Africa, outbreaks in cattle in Mpumalanga Province and Limpopo Province, adjacent to the FMD endemic Kruger National Park were reported. Serotype SAT1 was isolated. In July an untyped outbreak was reported in cattle in Zambezi Province of Namibia. In August, an untyped virus caused eleven outbreaks in cattle in Manicaland Province of Zimbabwe. Botswana donated vaccine for control assistance during these outbreaks. In August, an FMD outbreak was reported in cattle adjacent to the Lengwe National Park in Malawi. In September, an untyped virus caused an outbreak of FMD in cattle in Ngamiland, Botswana.

Most of these reported outbreaks in sub-Saharan Africa were associated with contact with endemically infected buffalo although the outbreak in Ngamiland, Botswana was at least 130 km away from the nearest buffalo with no evidence of contact with wildlife and may have been cattle to cattle infection.

Lassa Fever: Outbreaks of Lassa fever occurred in 16 states in Nigeria (West Africa). Between December 2016 and April 2017, 164 cases were reported of which 149 were confirmed. By 28 April 2017, 68 fatalities had occurred and sporadic cases continued to be reported throughout the year. The Lassa fever virus is carried by rodents (*Mastomys* spp.) and control of this disease has been focused on rodent control at the village level.

Marburg Haemorrhagic Fever: An outbreak of Marburg haemorrhagic fever (MHF) has been reported from the Kween district of eastern Uganda. Several human fatalities are said to have occurred. Egyptian fruit bats and African green monkeys are known to carry the virus. These sporadic outbreaks of MHF may be linked to the bush meat trade.

MERS-CoVirus Infection: As of Monday 20 November 2017, a total of 1743 laboratory confirmed cases of MERS-CoVirus infection have been documented in Saudi Arabia and surrounding areas of the Middle East. From these infections, 705 deaths were reported giving a fatality rate of 40.4 %. The aetiological agent is a Coronavirus that circulates in camels, and many of the victims report close contact with camels.

Monkeypox: 20 human cases of monkeypox (with three fatalities) were diagnosed in the northern region of the Democratic Republic of Congo (DRC) during March and April 2017. By the end of May 2017, a total of 78 cases had been reported from the DRC and a further 3 cases from the Central African Republic.

Another outbreak of monkeypox occurred in Nigeria in October 2017: 94 cases were reported from 11 states in the country.

The virus clade from the Congo basin appears to be much more virulent than the clade from West Africa (Ghana Nigeria & Sierra Leone).

The monkeypox virus can infect primates and the disease was first seen in monkeys (hence the name), but they are not the maintenance hosts of the virus. Other forest dwelling mammals, such as rope squirrels (*Funisciurus* sp; an arboreal rodent) and terrestrial rodents in the genera *Cricetomys* and *Graphiurus*, appear to be the maintenance hosts and are the most likely source of infection. Humans become infected by bites or contact with tissues of infected animals, and hence bush meat may be an important source of infection.

Rift Valley Fever: In Niger, unexplained human illness and mortality, coupled with abortions and deaths in livestock led to the diagnosis of Rift Valley Fever (RVF). The disease has spread extensively in association with the activities of nomadic stock breeders and herders. There have been 240 human cases diagnosed with 32 deaths.

In Uganda, two human mortalities from RVF were reported.

The sylvatic cycle of RVF involves low grade circulation of virus between Aedine mosquitoes and wild ruminants. It appears as though virus maintenance relies on transovarial transmission from infected female Aedine mosquitoes to their environmentally resistant ova. The epidemic cycle involves rapid circulation of virus between many haematophagous insects and ruminant livestock, and most human infections occur through handling tissues or contact with body fluids of infected livestock.

ASIA

Avian Influenza: Outbreaks of High & Low Pathogenic Avian Influenza (HPAI/LPAI) of domestic poultry and wild birds occurred in several Asian countries. In Indonesia, avian influenza outbreaks have occurred continuously. Cases of HPAI infection of wild birds were reported from Nepal, Bangladesh, China, Hong Kong, Chinese Taipei, Russia and Japan from January until November 2017.

In Chinese Taipei, avian influenza control mainly targets the H5 and H7 sub-types of avian influenza and was conducted by collecting fecal samples of migrating birds from coastal wetlands and sera of domestic poultry from poultry farms every year. Highly pathogenic avian influenza (e.g. H5N2, H5N3 and H5N8) or zoonotic strains (e.g. H5N6) are controlled by movement control and culling measures. So far, H7N9 has never occurred in Chinese Taipei, but H5N2 and H5N8 have occurred sporadically, and H5N6 was already eliminated after 14 cases in early 2017.

In South Korea, 60 wild birds representing 14 species were found infected with HPAI virus (H5N6 and H5N8 subtype) during the winter season from November 2016 to March 2017. H5N6 subtype was detected from Baikal teal (*Anas formosa*), Gadwall (*A. strepera*), Green-winged teal (*A. crecca*), Mallard (*A. platyrhynchos*), Spot-billed duck (*A. poecilorhyncha*), Mandarin duck (*Aix galericulata*), White-fronted goose (*Anser albifrons*), Eagle owl (*Bubo bubo*), Goshawk (*Accipiter gentilis*) and Great crested grebe (*Podiceps cristatus*). H5N8 subtype was detected from Falcated teal (*A. falcata*), Green-winged teal, Grey heron (*Ardea cinerea*), Large egret (*Egretta alba modesta*), Mallard, Mandarin duck, White-fronted goose and Whooper swan (*Cygnus cygnus*).

In Japan, the biggest recent outbreak was from October 2016 to April 2017 and involved HPAI H5N6. Regarding wild birds, 210 dead birds representing 25 species and one of unknown species were found dead in this outbreak.

Positive cases also were observed in captive birds in zoos. In Japan, HPAI H5N6 subtype was found in a captive Black swan (*Cygnus atratus*) and 2 Snowy owls (*Bubo scandiacus*) that died at Akita Omoriyama Zoo of Akita Prefecture in November 2016. For control measures to prevent the spread of avian flu, the zoo culled 132 captive birds including one black swan, one whooper swan, domestic chickens and pheasants. The zoo was closed from 16 November 2016 to 28 February 2017. HPAI H5N6 subtype infection was also found in 3 black swans that died at Nagoya Higashiyama Zoo and Botanical Gardens of Nagoya Prefecture in November and December 2016, and in 4 Aleutian cackling geese (*Branta hutchinsii leucopareia*) and 1 Mallard that died in December. Some endangered birds were isolated in the biosafety facility (BSL-4) of the zoo. The zoo culled 1 mallard and 1 Eurasian wigeon (*A. penelope*) from which HPAI virus was detected. The zoo was closed from 11 December 2016 to 13 January 2017.

In the Republic of Korea, two Oriental white storks (*Ciconia boyciana*) died of HPAI H5N6 infection at Seoul Zoo in Seoul Grand Park on 15 December 2016. Eight Mandarin ducks, which are designated as national natural monuments in the country, were culled. The zoo was closed from 17 December 2016 to 30 March 2017.

In India, around 15 painted storks (*Mycteria leucocephala*) in the Gwalior Zoo, Delhi died of HPAI H5N8 subtype in October 2016. The other 12 painted storks were culled.

An outbreak of HPAI (H5N6 subtype) at the end of November 2017 among wild birds in South Korea and Japan, which extended over 500km, was caused by a new re-assortment virus comprised of last year's European H5N8 virus and an Asian H5N6. It is assumed that this re-assortment occurred because of overlapping of global flyways.

Canine Distemper: Fatal Canine Distemper Virus **(**CDV) related outbreaks were found in captive tigers in several locations of zoos in Thailand. CDV also was detected in bears, civets and macaques in the same settings. Other pathogens/causes are also under investigation as contributing to these mortalities.

Coronavirus infection: Outbreak of lethal diarrheal disease in pigs that began in January 2017 in China was caused by a Coronavirus (CoV) whose origin has been traced to wild local bats of the Genus *Rhinolophus*.

Tularemia: In Australia in September 2016, *Francisella tularensis* subsp. *holartica* was detected in archived tissue samples from common ringtail possums (*Pseudocheirus peregrinus*), following pathogen discovery research undertaken by the Australian Registry of Wildlife Health (ARWH) and the University of Sydney.

Rabies: In Kazakhstan, there were 3 cases of rabies involving a total of 25 golden jackals (*Canis aureus*). In Nepal, 20 people were bitten by a suspected rabid fox. The species of fox is not known. Three fox species exist in this region: Bengal fox (*Vulpes bengalensis*), Tibetan sand fox (*V. ferrilata*) and red fox (*V. vulpes*).

In Chinese Taipei, besides the eight spillover cases which include one juvenile dog bitten by a ferret badger (*Melogale moschata subaurantiaca*), one house shrew (*Suncus murinus*) in 2013 and six Formosan gem-faced civets (*Paguma larvata taivana*) during 2014-2015, all other rabies cases have been in the wild ferret badgers. At present, the strategy for controlling rabies is still focused on massive vaccination of dogs and cats to contain spread among dogs and cats or to humans. The confirmed cases of rabies, up to 15 November 2017, were found in 54 ferret badgers. There is a report that Chinese Taipei ferret-badger virus can be categorised into two clades by the characteristics of genome sequence different from some strains found in the other Asian countries and the USA. In India, rabies neutralising antibodies were detected from samples of Greater short-nose fruit bat (*Cynopterus sphinx*) and some insectivorous bats for the first time in 2017.

Rotavirus: A novel rotavirus (*Reoviridae*) caused high mortality in captive and feral pigeons (rock pigeon; *Columba livia*) across a number of states in Australia, late in 2016. Feral pigeon mortalities occurred in a location close to an affected domestic pigeon loft, with gross and histological findings consistent with the disease seen in the domestic pigeons.

***Salmonella enterica*:** The first diagnosis of *Salmonella enterica* Typhimurium DT160 in House sparrows (*Passer domesticus*) and in spotted turtle-doves (*Streptopelia chinensis*) was made in the Australian state of Victoria (mainland Australia) in 2016. *S. enterica* Typhimurium DT160 is endemic in the island state of Tasmania and has been diagnosed in 13 mortality events involving house sparrows there since 2009. Infected wild birds have the potential to be sources of infection for humans, domestic animals and other wild animals. *S. enterica* Typhimurium has significant zoonotic potential and human cases have been diagnosed in Australia.

Tick-Borne Infectious Diseases: The cases of tick-borne infectious diseases, such as Lyme disease, Scrub typhus or Tick-borne encephalitis virus infection, have been monitored nationwide in Japan, and the cases of spotted fever rickettsiosis have gradually increased. The incidence of Severe Fever Thrombocytopenia Syndrome (SFTS) has increased remarkably since 2013. This tick-borne infectious disease is mainly observed in western and southern parts of Japan. In 2017, a woman died of SFTS after a cat bite, a new infectious route for SFTS, from pet cat to human. Two cheetahs also died of SFTS at Hiroshima City Zoological Park, Japan. This is the first case of SFTS in zoo animals and also in wild species of cats. No infection was found in the other two cheetahs or among zoo staff and visitors. Acaricide was used to control and prevent this infectious disease at the zoo, and re-emergence has not occurred.

The increasing number of tick-borne diseases correlates with the population growth of Sika deer (*Cervus nippon*) and Wild boar (*Sus scrofa leucomystax*) which are natural hosts of the adult ticks. Hunting pressure on these species has been decreasing over time in Japan.

EUROPE

African swine fever: See Agenda Item 9.

***Batrachochytrium salamandrivorans*:** See Agenda Item 10.

Bovine tuberculosis: A surveillance program for Bovine tuberculosis (bTB) in wildlife has been implemented at a national level in France in 2011. This program combines targeted and general surveillance in ungulates (mainly wild boar) and badgers. In 2016-2017, 2.2% of 1752 hunted wild boar (retromandibular lymph nodes) were found infected with *Mycobacterium bovis* (PCR confirmed by culture). Most positive wild boar did not present any visible lesions but bTB-like lesions were reported by hunters in three animals confirmed as *M. bovis*-positive. Furthermore, in 2017, 2.9% of 528 road-kill badgers were found positive, and a similar percentage was found for 1628 trapped badgers. Wildlife cases have been observed in areas where bTB has been regularly detected in cattle, with the same strains shared by wild and domestic animals. Spatial wildlife and domestic clusters have been observed, mainly in southwestern France.

Brucellosis: In 2012, the Alpine ibex (*Capra ibex ibex*) population in the Bargy area (Haute Savoie), France, was identified as a wild reservoir for *Brucella mellitensis* biovar 3. Up to now, surveillance for *B. mellitensis* has been maintained in ibex in this area. In 2012-2015, the socio-spatial structure of ibex was found to strongly influence disease prevalence. In 2017 the local authority took this knowledge into account, and management currently relies on two strategies: test and cull (captures) in the less infected groups, and targeted culling (shooting) in the hot spot areas. Among 62 captured ibex in 2016-2017, estimated crude seroprevalence was still about 20-25% but this estimation needs to be confirmed though additional sampling in 2018-2019.

Chronic wasting disease in Scandinavia: See Agenda Item 7.

Dorsal dermatitis in moose: In the second half of 2015, a first large outbreak of extensive dorsal dermatitis was observed in trophy moose bulls in Sweden. The number of reports in 2016 was very low but another outbreak occurred in the fall of 2017, again in moose only from the southern half of Sweden. The cause(s) of this re-occurrence have not been clarified. According to reports from the field, it was potentially associated with massive hatching of deer keds (*Lipoptena cervi*) in 2015 and 2017; however, there were also numerous moose infested by deer keds that did not present dorsal ulcerations. Other factors that may contribute to chronic scratching resulting in traumatic pyodermatitis associated with secondary *Staphylococcus aureus* infection include an underlying infectious disease, *Chorioptes* mite infestation, and other unknown infectious agents.

***Echinococcus multilocularis*:** The presence of *Echinococcus multilocularis* was confirmed in golden jackals (*Canis aureus*) in Croatia. The only previous report of the parasite in this country was in red foxes (*Vulpes Vulpes*) in 2016. Both findings (on foxes and jackals) were confirmed by DNA sequencing. The golden jackal has been expanding his geographical range for many years and is a neozon in western European countries.

Feline immunodeficiency virus in lynx: An infection with Feline immunodeficiency virus (FIV) was detected by westernblot analysis (gold standard) for the first time in three Eurasian (*Lynx lynx*) from Switzerland previously known to be negative and coming from the same geographical area. Testing of more than 80 lynx formerly captured in Switzerland did not deliver any other positive result. The first FIV infection was observed in 2016, the other two early in 2017. The origin of the infection is unknown but a free-roaming domestic cat may have acted as a source of infection, with subsequent intra-specific transmission. These three FIV-positive lynx were captured for translocation and euthanized in quarantine; they presented a range of clinical signs and organ lesions attributable to FIV infection but that may also have been triggered by other factors including captivity stress. This finding is relevant in the context of lynx conservation, because Switzerland is a source for reintroduction and re-stocking in several other European countries. Monitoring of FIV infection will be continued and virological examinations aiming at isolating and characterizing the virus have been initiated.

Highly pathogenic avian influenza: A new outbreak of highly pathogenic avian influenza (HPAI), H5N8 strain, has spread to central and western Europe during the fall of 2016, probably through migratory birds. This epidemic occurred in 29 European countries and has been the largest ever recorded in the European Union in terms of number of poultry outbreaks, geographical extent and number of dead wild birds (especially in Anatidae). Despite a large number of human exposures to infected poultry that occurred during the on-going outbreaks, no transmission to humans has been identified.

In Switzerland, the disease was first detected in October 2016 in the northwest at the lake Constance and spread all over the country down to the lake of Geneva within a week. These two lakes are important stopover sites for migratory birds. The last positive case of the winter season was found on 1 January 2017. A total of 119 positive birds from 14 species were detected but thank to high biosecurity standards and a number of other factors, no introductions into commercial poultry of backyard flocks occurred. Nevertheless, the virus was detected again in juvenile mute swans and mallards found dead at Lake Neuchâtel and Lake Geneva in August 2017, suggesting that H5N8 may be maintained to some extent in healthy water fowl and circulate within the local populations.

In France, the first cases (decoy birds found dead in Northern France) were detected on 17 November 2016. Despite a reinforced surveillance of waterfowl mortality, cases in waterfowl were not as many in France as in neighbouring countries: 90 birds comprising 55 outbreaks. These cases concerned many different locations at the national level, with only some clusters observed along the Rhône River. Many outbreaks associated with the same H5N8 strain were observed in livestock in southwestern France, surprisingly outside of the main migratory routes or wetlands. Domestic outbreaks were associated with some cases in sedentary wild birds inhabiting the same areas, mainly Columbidae and birds of prey. The last case observed in France in wildlife was observed in a wild goose found dead on 25th February 2017 near the Rhine River.

In the Netherlands, the H5N8 outbreak caused high mortality among wild waterbirds. Thanks to a close cooperation between ornithologists, virologists, animal health organisations and other organisations involved in managing the H5N8 outbreak it could be documented that approximatively 13,600 wild birds (number considered to be underestimated) of 71 species were reported dead; most of the identified species were tufted duck (*Aythya fuligula* [39%]) and Eurasian wigeon (*Anas penelope* [37%]). H5N8 infection was confirmed in 21 species. The quality of reporting of wild bird deaths during this H5N8 outbreak was vastly improved compared with earlier outbreaks. Overall, the 2016–2017 H5N8 outbreaks in the Netherlands were associated with unprecedented high HPAI-related mortality rates in a wide range of wild bird species. This changes the paradigm of wild birds as unaffected agents of HPAI viruses, with increasing concerns about potential effects on their populations. The Netherlands and other important staging areas for migratory waterbirds across Eurasia that have been affected by the 2016–2017 H5N8 outbreaks are at risk for substantial numbers of bird deaths during future HPAI outbreaks.

***Klebsiella pneumoniae* subsp. *pneumoniae* in seals**: *Klebsiella pneumoniae* subsp. *pneumoniae* **(**Kpp) was isolated from three free-living juvenile common seals (*Phoca vitulina*) found ill or abandoned ashore on the east coast of England, independently from each other, in summer 2012. Postmortem examinations revealed lesions of neck abscessation, pleurisy and pyothorax in one seal, and omphalitis and peritonitis in a second seal. The third seal had a ruptured optic globe but survive. Kpp was recovered from lesion swabs: Sequence type (ST)398 was identified in one seal and ST11 in two seals, and all three isolates showed multiple antibiotic resistance in broth microdilution susceptibility tests. A fourth similar case was found in 2017, suggesting that antibiotic-resistant Kpp is an on-going issue in seals in the UK. ST11 represents an epidemic clone of Kpp which is found worldwide in man, often with extended-spectrum β-lactamase (ESBL) or, more recently, carbapenemase resistance. The resistance patterns and molecular typing of the Kpp isolates suggest that microbial marine pollution of human origin, possibly from human sewage, may have been the source of these infections in juvenile seals. *Klebsiella pneumoniae* is a common human nosocomial pathogen causing urinary, respiratory or generalised infections. The gastrointestinal tract of patients is considered one of the main reservoirs of the organism in cases of human infection. *Klebsiella pneumoniae* in human healthcare settings has developed increasing resistance to antimicrobials.

Non-infectious diseases: As in previous years, poisoning with endosulfan (officially out of market) was found as the most popular agent implicated in illegal wolf (*Canis lupus*) poisoning in Italy. Poisoning of wildlife with various toxic compounds was also recorded elsewhere, including birds and mammals in Switzerland.

A study in the UK on drowning of seabirds due to bycatch in fishing gear, showed that drowned birds consistently have a distinctive set of gross lesions. When combined with contemporaneous observations, the pathology may be sufficient to permit a diagnosis of drowning, especially where a batch of freshly dead birds is examined. The results of this study are likely to be of value when investigating stranding incidents, particularly where it is suspected that legislation aimed at protecting seabirds is not being complied with.

Oedema disease: A new outbreak of oedema disease was detected in wild boar in the Pyrénées-Orientales department in southwestern France. It started in September 2016 and according to the first estimations, about 75 dead or sick wild boar (*Sus scrofa*) have been observed. The serotype identified was *E. Coli* O139K82, like the one reported in the Ardèche department in the first recorded outbreak in 2013.

Other infectious diseases: As every year**,** cases of brucellosis (*Brucella suis*) in brown hare (*Lepus europeus*), paramyxovirosis in Eurasian collared dove (*Streptopelia decaocto*), botulism in waterfowl, myxomatosis in wild rabbits (*Oryctolagus cuniculus*) and paratuberculosis were diagnosed in France. In Switzerland, recurrent diseases diagnosed in 2017 included toxoplasmosis and leptospirosis in Eurasian beavers (*Castor fiber*), distemper and sarcoptic mange in red fox (*Vulpes Vulpes*), salmonellosis, trichomonosis and pox in passerine birds, Pigeon Paramyxovirus infections in Columbidae, and infectious keratoconjunctivitis (IKC, *Mycoplasma conjunctivae*) in ibex (*Capra ibex*) and chamois (*Rupicapra* spp.). Limited IKC outbreaks have also been recorded in chamois and ibex in Italy. Further observations in Italy included the first cases of sarcoptic mange and heartworms in free-ranging grey wolves (*Canis lupus*) in the Northern Apennines.

Ranid herpesvirus 3: Abnormal mortality and/or skin lesions were observed in common frogs (*Rana temporaria*) and common toads (*Bufo bufo*) in ponds from at least three different locations in Switzerland in March 2017. These lesions were found to be associated with the presence of herpesviruses, including the recently described Ranid herpesvirus 3 (RHV3), a candidate member of the genus Batrachovirus in the family Alloherpesviridae. RHV3 infection in free-ranging common frogs was associated with severe multifocal skin lesions with associated intranuclear inclusions. The RHV3-associated skin disease has features similar to those of a condition recognized in European frogs for the past 20 years and whose cause has remained elusive.

Rhabdoviruses in bats: At the end of 2016, a new rhabdovirus (belonging to the genus Ledantevirus) was detected in bats (*Pipistrellus kuhlii*) in Italy. This finding likely represents (beside lyssaviruses) the only bat-borne rhabdovirus isolated in Europe. Further investigations by PCR in 2017 allowed to identify a second case.

European Bat Lyssavirus (EBLV) 2 was found in Finnish Daubenton's bats (*Myotis daubentonii*) twice in the 2000's (2009 and 2016), both times close to the southwestern coast of Finland. A lyssavirus that was not either of the common EBLV (1 or 2) was found in a dead whiskered bat (*Myotis mystacinus*) in eastern Finland in August 2017. The virus seems to be of a new species, not described earlier. Further studies on the virus are ongoing.

Another newly detected virus in bats is the Bokeloh bat lyssavirus, which was found in a common pipistrelle (*Pipistrellus pipistrellus*). This finding is particularly noteworthy because the common pipistrelle is a species of bat that is widespread in Europe; it is one of the most common bat species in large parts of its range and it is commonly found sick or dead by people. Until now, it had never been found positive for any of the lyssaviruses occurring in Europe.

Snake fungal disease: Snake fungal disease (SFD) is an emerging disease of conservation concern in eastern North America. The fungus *Ophidiomyces ophiodiicola*, the causative agent of SFD, has been isolated from captive snakes outside North America, and detected in carcasses and molted skins of free-ranging snakes collected from 2010 to 2016 in Great Britain and the Czech Republic. The fungus was found in 26 (8.6%) specimens across the period of collection, including mainly grass snakes (*Natrix natrix*) and an adder (*Vipera berus*) from Great Britain and also a dice snake (*Natri tessellata*) from the Czech Republic. PCR, culture and histopathologic analyses confirmed that both *O. ophiodiicola* and SFD occur in free-ranging European snakes. Although skin lesions were mild in most cases, in some individuals they were severe and considered likely to have contributed to mortality. European isolates grew more slowly than those from the United States, and shown to belong to a clade distinct from the North American isolates examined. These genetic and phenotypic differences indicate that the European isolates represent novel strains of *O. ophiodiicola*. Further work is required to understand the individual and population level impact of this pathogen in Europe.

***Suttonella ornithocola* in tits (Paridae):** Several small scale mortality events in blue tits (*Cyanistes caeruleus*) have been observed at Finnish bird feeding places in March-April 2017. Samples from blue tits and one coal tit (*Periparus ater*) were received from three different locations. All the examined birds were in poor condition and the main other finding consisted in dark, edematous lungs. Histology revealed necrotic foci in the lung, with the presence of gram-negative bacteria, and the bacterium *Suttonella ornithocola* was isolated by culture. This gram-negative rod-shaped organism was previously found in British blue tits, coal tits, great tits (*Parus major*) and long-tailed tits (*Aegithalos caudatus*); the reported temporal occurrence and pathological findings in British birds were similar than those observed in Finland.

Tularemia: In a study performed in Sweden, antibodies against *Francisella tularensis* were reported for the first time in predators and scavengers in this country; chronic tularemia lesions were described in the European brown hare (*Lepus europeus*) and more acute cases in yellow-necked mice (*Apodemus flavicollis*). Like every year, cases of tularemia were also diagnosed in brown hare in France. Furthermore, tularemia was observed for the first time in a red squirrel (*Sciurus vulgaris*) in Switzerland.

Usutuvirus: In 2017, Usutuvirus (USUV) again caused substantial mortality in blackbirds (*Turdus merula*) and infected also other wild bird species in several countries. In Switzerland, increased mortality in wild birds was reported during the summer months; USUV infection was confirmed in a few blackbirds found in August, the other birds had died of other causes. By September 2017, extensive blackbird mortality was recorded throughout the Netherlands thanks to a collaborative project between the Dutch Wildlife Health Centre and other institutions, and 23 blackbirds were found positive for USUV. Additionally, serological studies showed that USUV circulates in Eurasian coots (*Fulica atra*) in the Netherlands. USUV circulation was also detected in France, where USUV-associated mortality was observed only in blackbirds. In 2016-2017, USUV was found in two French departments where it had already been found in the past (departments of Haut-Rhin and Rhône), and for the first time in three additional departments: Moselle (north-eastern France), Haute Vienne (west) and Loire (centre). In these three departments with recent USUV emergence, the USUV isolates showed a 98-99% sequence homology with the German strain. In Italy, USUV has been commonly found in the past years in the framework of the surveillance programme for West Nile Virus. The detected sequences belonged to two groups, with one circulating primarily in the northwestern part of the surveillance area and the other in the southeastern part. This pattern is believed to be the result of different routes of introduction from the North (over the Alps) and from the East, respectively.

NORTH AMERICA

Chronic Wasting Disease: Chronic Wasting Disease (CWD) appears to be spreading slowly in Canada from its centre of distribution in Saskatchewan and Alberta. No major extensions of the range of this disease were noted in 2017.

In the USA as of 14 December 2017, CWD has been found in wild cervids in 22 states, in captive cervids in 16 states, and in wild and/or captive cervids in 24 states. CWD recently was confirmed for the first time in wild mule deer (*Odocoileus hemionus*), in Montana. Unmanaged, CWD foci in wild cervids expand geographically while prevalence increases. Negative population impacts in white-tailed deer (*Odocoileus virginianus* [WTD]), mule deer, and wapiti (*Cervus canadensis*) have been reported in peer-reviewed scientific literature. To date, management of CWD in wild deer has met with limited success. In Illinois and an area in Colorado, sustained and targeted culling by sharpshooters appears to have kept the prevalence low while slowing expansion of the affected area.

Among captive cervids, CWD has been found in 90 herds in the U.S. since 1997. From 1 October 2016 to 30 September 2017, CWD was found in eight captive cervid herds, two of which were certified as being at low risk of having CWD. Since 1 October 2017, CWD has been detected in five additional captive deer herds, three of which were certified as being at low risk of having CWD.

In September 2017, researchers with the USDA-Agricultural Research Service, Oak Ridge Institute for Science and Education, and Iowa State University published results of a trial in which two-month-old domestic pigs (*Sus scrofa*) were inoculated intracerebrally or orally with the CWD agent. Pigs were euthanized at eight months of age (at typical slaughter weight), or at six years post inoculation, and tested for the presence of CWD prions by a number of methods. The authors summarised the results of the study: "*Disease-associated prion protein (*PrP^{Sc}*) was detected in brain and lymphoid tissues (…) as early as 8 months of age (6 months post-inoculation). Only one pig developed clinical neurologic signs suggestive of prion disease. The amount of* PrP^{Sc} *in the brains and lymphoid tissues of positive pigs was small, especially in orally inoculated pigs. Regardless, positive results in orally inoculated pigs suggest that it may be possible for swine to serve as a reservoir for prion disease under natural conditions.*"

The results of this study have raised concerns regarding the potential for feral hogs to further complicate the epidemiology and management of CWD in wild cervid populations as well as the potential for swine to represent a source of CWD exposure through domestic animal and human food chains.

Researchers from Canada and Germany presented preliminary results from a study in which they inoculated cynomolgus (crab-eating) macaques (*Macaca fascicularis*) with the CWD agent via four different routes (intracerebral, oral, blood transfusion, and skin scarification). As of May 2017, 10 of 21 macaques had died or were euthanised, and complete results were available for five animals. Two macaques that were intracerebrally inoculated with brain tissue from clinically affected deer or wapiti had microscopic lesions and positive immunohistochemical (IHC) staining in the central nervous system; one had neurological signs prior to death. One macaque that was fed brain tissue and two macaques that were fed muscle from clinically normal white-tailed deer that tested positive for CWD via ante-mortem tests developed neurological disease and all three had microscopic lesions and positive IHC staining in the nervous system. The authors plan to publish results of the study after its completion in 2018.

The genetic similarities between cynomolgus macaques and humans have increased concern for the potential transmission of CWD to humans via consumption of affected cervids. This potential has been a point of concern for many years and fortunately, the species barrier appears to be strong. However, public health authorities recommend avoidance of human or domestic animal exposure to the CWD agent while they continue to assess the risk. It should be noted that the available CWD tests are tools for disease surveillance and are not food safety tests.

Investigators in Wyoming identified CWD as a significant contributor to regional mule deer population declines. A study was conducted in an area of the state where CWD is endemic in mule deer with an annual prevalence exceeding 20%. Mule deer were captured from 2010-2014, tested ante-mortem for CWD by tonsil biopsy, released, and monitored by radio telemetry. The researchers found the mean annual survival rate for CWD-positive deer was 0.32 compared to 0.76 for CWD-negative deer. They did not observe any effects on pregnancy or fawn recruitment. The authors estimated an annual population decline of 21% and ran a population model that indicated a stable population if CWD were absent. This study adds to the long-suspected and growing body of evidence indicating that CWD can significantly impact free-ranging cervid populations. In view of the difficulty or impossibility of eradicating CWD with our current tools and knowledge, the authors' "*best recommendation for control of this disease is to minimize spread to new areas and naïve cervid populations.*"

Lymphoproliferative Disease in wild turkeys: For the first time in Canada, clinical disease due to lymphoproliferative disease virus (Retroviridae) was recognised in a wild turkey in the Province of Quebec. Infection with the virus is widespread among wild turkeys in Canada and the United States of America (USA), but clinical disease appears to be rare.

New World Screwworms: On 23 March 2017, the United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service announced the eradication of the New World screwworm (NWS) (*Cochliomyia hominivorax*) from the United States. Infestation with NWS was confirmed in Key deer (*Odocoileus virginianus clavium*) on the National Key Deer Refuge in Florida on 30 September 2016, although cases likely had been occurring since July 2016. The last NWS infestation case was confirmed on 10 January 2017.

Confirmed Key deer mortality associated with NWS was 135, and the only other documented wildlife infestation occurred in a single raccoon. A handful of cases were confirmed in pet dogs and cats, and two pet pigs in the Florida Keys and a stray dog on the mainland in Homestead, FL.

Eradication of NWS is the result of cooperative efforts of the USDA, Florida Department of Agriculture and Consumer Services (FDACS), U.S. Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FWC), local veterinarians, refuge volunteers, and others. A critical component of eradication efforts was the release of sterile screwworm flies: Approximately 3-4 million sterile flies were released twice a week in the affected Keys beginning in early October 2016, and releases occurred in the area of the affected stray dog on the mainland. More than 160 million flies were released. Twelve Key deer were immobilized and directly treated for NWS infestation, as were a few domestic animals, and remote treatment of free-ranging Key deer was accomplished through distribution of oral baits containing an anti-parasitic compound. Passive surveillance for NWS will be continued by the cooperating agencies.

The NWS incursion into the Florida Keys hit the endangered Key deer population hard. In the summer of 2016, the entire population was estimated at nearly 1000 individuals; 135 confirmed NWS-associated mortalities plus an unknown number of undetected mortalities suggest that approximately 20% of the population was lost to NWS. When added to 171 mortalities due to other causes, nearly 1/3 of the entire population may have been lost in 2016. However, the population is expected to recover without any long term impacts because few female deer were affected by NWS. More than 90% of documented cases occurred in male deer in which more than 90% of NWS-associated lesions occurred on the head, neck, and forelimbs. This likely is associated with fighting and antler rubbing during the rut.

North Atlantic Right Whale mortality: In summer 2017, 13 North Atlantic Right Whales were found dead in the Gulf of St. Lawrence in eastern Canada and five more were found entangled in ropes and nets associated with commercial fishing. This species is highly endangered with a total global population of only 458 animals. The summer feeding ground of this species recently has moved from the Gulf of Maine to the Gulf of St. Lawrence where the animals are exposed to far greater ship traffic and commercial fishing equipment. Of six whales brought to shore for autopsy, four had died acutely of blunt trauma (collision with ships most likely), one died of entanglement with fishing equipment and one was too decomposed to permit a firm conclusion. Canada took immediate partial steps to reduce risk of ship collision and entanglement. The species is in decline and loss of 13 adults imposes a major reduction in its recovery potential.

Orbiviral Hemorrhagic Disease: As of 1 December 2017, the Southeastern Cooperative Wildlife Disease Study at the University of Georgia, USA, has isolated nearly 150 epizootic hemorrhagic disease viruses (EHDV-1, -2, & -6) and bluetongue viruses (BTV-2, & -3) from 18 States. Several outbreaks have been reported in white-tailed deer throughout the central and eastern USA, and notably, there is a widespread and focally severe EHDV-2 outbreak primarily associated with the Appalachian Plateau physiographic region. For example, the Kentucky Department of Fish and Wildlife Resources received reports of more than 4,500 sick or dead white-tailed deer (*Odocoileus virginianus*), mostly in the eastern portion of the state. Once again, there have been reports of cattle infected with EHDV in areas where it was detected in wild deer; a finding that is becoming more common during regional EHD outbreaks.

This year's data reinforce concerns regarding the northern expansion of Orbiviral Hemorrhagic Disease (HD). For the third time in the last 11 years, parts of the upper Midwest and Northeast have experienced intense HD outbreaks. This year, EHD viruses have been isolated from multiple northern states, and the isolation of EHDV-6 from a white-tailed deer in Connecticut is the first confirmation of any EHDV in the state. Further, the Canadian Wildlife Health Cooperative and the Canadian Food Inspection Agency confirmed EHDV-2 infection in white-tailed deer in southern Ontario, a first for the Province. These developments demonstrate the need for a better understanding of the potential causes, as well as the impacts on wild deer populations, of the northern expansion of HD.

Interestingly, EHDV-6 has been isolated, in the USA, every year since its first detection in 2006. In addition to Connecticut, 2017 marks the first detection of EHDV-6 in Alabama, Pennsylvania, and West Virginia. Regarding exotic HD viruses, BTV-2 and BTV-3 were isolated from white-tailed deer in Louisiana and Alabama, respectively. This was the second consecutive year BTV-2 was isolated from Louisiana and the first detection of BTV-3 in Alabama. The increased detection of atypical BTV serotypes in the HD-endemic areas of the USA continues to be a concern. Many state wildlife agencies are working to gather data to better describe the impacts of this year’s outbreak.

Perkinsea-associated mass mortality of frogs: A retrospective review of anuran mortality events from 1999–2015 in the USA identified a protist belonging to the phylum Perkinsea as a significant cause of death. Systemic Perkinsea infections led to multi-organ failure and death in numerous anuran species and occurred over a broad geographic area. Livers from 19/19 affected tadpoles tested by PCR were positive for the Novel Alveolate Group 01 (NAG01) of Perkinsea, while only 2/81 (2.5%) of histologically normal tadpole livers tested positive (2/81), suggesting that subclinical infections are uncommon. Phylogenetic analysis demonstrated that the protist is associated with a phylogenetically distinct clade of NAG01 Perkinsea. These data suggest that this virulent Perkinsea clade is an important pathogen of frogs in the United States, and may be third most common infectious disease of frogs after ranavirus and chytridiomycosis.

***Trichomonas* infection in wild songbirds:** The incidence of clinical, often fatal, disease caused by *Trichomonas* sp. in songbirds of the finch family (Fringillidae) was very high in eastern Canada in summer 2017, particularly goldfinch (*Spinus triptus*), house finch (*Haemorhous mexicanus*), purple finch (*Haemorhous purpureus*) and pine siskin ((*Spinus pinus*). Since it is suspected that bird feeding stations can serve as centres of transmission among birds, energetic information campaigns were launched by government and non-government groups to ask the public to close such feeding stations until the end of October. No quantitative surveillance data are available but the bird-feeding public and suppliers of feed and feeders appeared to be well-informed by mid-summer and compliant in their wish to reduce the impact of the disease.

West Nile virus: An exceptionally large number of dead wild birds, mostly birds of prey, were found to be infected with West Nile virus (WNV) in the province of Quebec in summer 2017. While there is no extensive surveillance program specifically for WNV in wild birds in Canada, the virus was identified in birds submitted as part of the general wildlife disease surveillance program in Canada (Canadian Wildlife Health Cooperative).

7. Chronic Wasting Disease in Scandinavia

Since the first detection of CWD cases in Norway in 2016, the country has sampled and analysed about 31,000 reindeer (*Rangifer tarandus tarandus*), red deer (*Cervus elaphus atlanticus*), roe deer (*Capreolus capreolus*) and moose (*Alces alces*). By 1 December 2017, CWD has been detected in 9 free-ranging reindeer, three moose and one red deer.

Norway has implemented a culling plan aiming at destroying all 2,500 reindeer in the Nordfjella mountain area by 1 May 2018. The plan for CWD eradication includes a period of at least five years following removal of the last reindeer until the start of a restocking process. Surveillance in 2018 will include efforts to find possible healthy donor populations with favourable genetics for restocking. Since 2016, all cervids necropsied in the framework of the national general surveillance programme for wildlife health have been tested for CWD.

Furthermore, since all three CWD-positive moose detected in Norway were found not far away from the Swedish border, in 2017 a first round of targeted surveillance started in the county of Jämtland in Sweden on the other side of the border, with the aim of testing all hunted adult moose.

The EU-directive for CWD surveillance 2018 – 2020 has set a minimum level of 6,000 cervids (3,000 wild or semi-domesticated deer, and 3,000 captive deer) to be tested over a three-year period for all EU member states with moose, white tailed deer (*Odocoileus virginianus*) or reindeer (Sweden, Finland, Estonia, Latvia, Lithuania, Poland). Fallen or sick, euthanised cervids, as well as road-killed cervids are to be tested, except for fallow deer.

8. Update on Saiga antelope die-off in Kazakhstan and Mongolia

The Working Group discussed large mortality events of Saiga antelope (*Saiga t. tatarica*) in Kazakhstan in 2015 and of Saiga antelope (*Saiga t. mongolica*), ibex (*Capra siberica hagenbecki*), goitered gazelle (*Gazella subgutturosa*), bharal (*Pseudois nayaur*), and domestic small ruminants in Mongolia in 2017.

In Kazakhstan, no further mass mortalities have been observed since the 2015 outbreak. Field reports from 2017 indicate that population numbers appear to be recovering (>50,000 Central, >70,000 Ural, ~2,000 Utsiurt, and ~2,000 Kalmykia). Radio tracing collars were placed on around 50 individuals in each of the two large populations to assist with future assessments. Several papers are in press or under review related to the mortality event and the finding of *Pasteurella multocida.*

In Mongolia, Saiga antelope, ibex, goitered gazelles and Bharal were affected during a Peste des Petits Ruminants outbreak in 2017. This occurred during a PPR vaccination campaign of small ruminants that did not completely cover all livestock in the affected part of the country. Mortality of Saiga was estimated to be 55% of the entire population and very few calves of the year were observed during the summer. The significant mortality is in contrast to that observed in gazelles in Africa. There was a meeting, held in November 2017, of the Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADS). There is currently no evidence of fomite transmission in wildlife outbreaks, and no evidence of transmission by vultures (the virus is labile and does not infect birds). There is a tendency to assume pasture contamination and transmission as seen in Africa, but Saiga have very different grazing patterns so possibly transmission is more likely to occur at shared water sources, livestock feeding troughs or supplementary feeding areas. There is no evidence to support the utility of culling wildlife in this situation.

9. Update on African swine fever in Europe

African Swine Fever (ASF) has emerged in Georgia in 2007, from where it has spread into the neighboring states Armenia, Azerbaijan and the Russian Federation. In 2012 and 2013, Ukraine and Belarus also reported ASF. In 2014, ASF reached the European Union, where outbreaks were confirmed in Lithuania, Latvia, Estonia and Poland. New outbreaks continue to be detected in these countries, mainly in wild boar (*Sus scrofa*), but occasionally also in domestic pigs. ASF cases were detected in Moldova for the first time in October 2016. In 2017, the number of cases of ASF reported in wild boar and domestic pigs in Europe has further increased and the disease has progressed further westwards, with new foci far from the epidemic front. In June 2017, ASF was detected for the first time in Czech Republic in dead wild boar, about 400 km from the closest known cases; until October more than 100 additional cases were found. ASF outbreaks were also detected in domestic pigs in two small backyard farms in Romania in July but they were apparently successfully controlled. The origin of these two outbreaks was likely due to the introduction of contaminated raw ham to Romania by Ukrainian workers of the local hospital. ASF has also taken a jump westwards within Poland, where new foci were detected in wild boar in November, 100 km west from the epidemic front.

Human activities and movements together with the lack of biosecurity appear to play a central role in ASF spread in Eastern Europe. Furthermore, the virus now seems to be maintained in the wild and to further spread within wild boar populations. Contagiousness of ASF virus appears to be lower than expected, possibly explaining why geographical expansion of the disease in wild boar has been slower than formerly expected. However, the ability of the ASF virus to persist for long in the environment (including in carcasses), especially in cold weather conditions, is considered as a key factor for its persistence in the wild. Early removal of dead wild boar combined with population control have been proposed as measures to control disease spread - yet, these measures are expected not to be effective enough in practice due to their limited applicability under field conditions. Another worrying issue is the detection of antibody-positive wild boar, suggesting that some individuals survive initial infection and may act as virus carriers. Overall, ASF continues to expand its range in Eastern Europe and human factors in disease spread makes it impossible to predict where the next cases will occur.

10. Update on *Batrachochytrium salamandrivorans* in salamanders

The Working Group was briefed on the OIE listing of *Batrachochytrium salamandrivorans* in 2017. The Working Group applauded the listing of *B. salamandrivorans* by the World Assembly of Delegates and removed it from the list of non-listed diseases of wildlife used for voluntary reporting.

The recent arrival of *B. salamandrivorans* in Europe was followed by rapid expansion of its geographical distribution and host range, confirming the unprecedented threat that this chytrid fungus poses to western Palaearctic amphibians. Monitoring of the infection, disease and host population dynamics in a Belgian fire salamander (*Salamandra salamandra*) population for two years revealed that arrival of this chytrid is associated with rapid population collapse without any sign of recovery so far, largely due to lack of increased resistance in the surviving salamanders and a demographic shift that prevents compensation for mortality. It was shown that the pathogen adopts a dual transmission strategy, with environmentally resistant non-motile spores in addition to the motile spores identified in *B. dendrobatidis*. The fungus retains its virulence not only in water and soil, but also in anurans and less susceptible urodelan species that function as pathogen reservoirs. The combined characteristics of the disease ecology suggest that further spread of this fungus has the potential to rapidly extirpate highly susceptible salamander populations across Europe. Experts recommend the development of a pan-European early warning system to monitor the fungal invasive front, and to enforce emergency action plans that allow fast implementation of ex situ conservation in acutely threatened urodelan species.

11. Avian influenza: wild bird surveillance – update from OFFLU

Dr Gounalan Pavade updated the Working Group on the status of the OFFLU Wildlife Technical Activity concept note on wild bird surveillance for avian influenza. The concept note was presented to the Joint Meeting of the Chief Veterinary Officers and Chief Medical Officers on the Influenza Preparedness in the Context of One Health, which was held from 23 to 24 October 2017. The Working Group members took note of the presentation.

12. Rabies and its impact on biodiversity

A paper on rabies and its impact on biodiversity was written by the Working Group members and is ready to be submitted for consideration of publication in the OIE Scientific and Technical Review.

13. Collaborative Partnership on Sustainable Wildlife Management: update on the factsheets and other activities

Collaborative Partnership on Sustainable Wildlife Management (CPW) is a voluntary partnership of 14 international organisations with substantive mandates and programmes to promote the sustainable use and conservation of wildlife resources. OIE has been a member in this organisation since its start. The CPW meets on a regular basis, often in conjunction with other meetings like CITES, CBD and CMS. It has produced several fact sheets covering different topics related to wildlife management including one fact sheet on Wildlife Health. The OIE has participated in the production of these fact sheets and made sure that the issues of wildlife health and diseases are not overlooked. The CPW will launch a new working plan for its work in the upcoming three years. The work within CPW and the role of OIE was discussed during the meeting of the Working Group and Torsten Mörner agreed to be the contact person for the OIE.

14. Update on the International Council for Game and Wildlife Conservation and OIE joint project

The OIE is collaborating with the International Council for Game and Wildlife Conservation (CIC), the European Federation of Hunting Associations (FACE) and the State of Bulgaria to arrange a conference in Bulgaria in December 2017 for a training program for hunters regarding wildlife disease surveillance, with the focus on African Swine Fever. The training course is financed by grants from the European Union and the

Bulgarian state. The training course will be attended by around 20 representatives from hunting associations, and 10 OIE National Focal Points for Wildlife, with a total of around 40 people. The programme will include all aspects of surveillance of diseases in wildlife, epidemiology, biosecurity, ASF, and communication between the hunting community and veterinary authorities on a national and international level.

15. Update on Diseases Initiatives relevant for wildlife or biodiversity and set up at the regional or international level worldwide

The Working Group was informed that the OIE is seeking to participate more in collaborative activities relevant to its mandates with other international organisations focused on environment and biodiversity conservation. Some of these include the International Union for the Conservation of Nature (IUCN), Convention on Biological Diversity (CBD), Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES), Centre for Agriculture and Biosciences International (CABI), World Customs Organisation (WCO), and the International Maritime Organisation (IMO).

The OIE recently attended two meetings called among several of these organisations and is establishing itself within this network to better participate and define its role in issues associated with impact of climate change on animal health and biodiversity conservation. The Working Group considers this an excellent initiative by the OIE and noted that the Working Group's efforts will be assisted by these strengthened linkages, and that members of the Group can assist the OIE in these relationships.

16. Annual report from the OIE Collaborating Centres for Wildlife

Collaborating Centre for Research, Diagnosis and Surveillance of Wildlife Pathogens (Canada/USA): The annual report from 2016, sent to the OIE, was reviewed.

Collaborating Centre for Training in Integrated Livestock and Wildlife Health and Management (South Africa): The annual report from 2016, sent to the OIE, was reviewed.

The Working Group noted that both Collaborating Centres were very active in meeting the needs of OIE Member Countries and in supporting OIE programmes.

17. Training of OIE National Focal Points for Wildlife

Dr François Diaz, from the OIE Department of Science and New Technologies, reported to the Working Group on the successful fourth cycle of training workshops for OIE National Focal Points for Wildlife. The workshops were held in July 2016 in Belarus for Europe, in November 2016 in Kenya for Anglophone Africa and Middle East, in January 2017 in Togo for Francophone Africa, in March 2017 in Paraguay for Americas and in July 2017 in Indonesia for Asia. The fourth cycle was focused on wildlife disease surveillance, particularly from a diagnostic perspective, and also includes basic information on the OIE, presentations and discussion on regional wildlife health issues, and hands-on instruction in the use of *WAHIS-Wild*. The Collaborating Centre on Research, Diagnosis, Surveillance of Wildlife Pathogens (USA and Canada) presented the component on wildlife disease surveillance and prepared a training manual for this segment of the workshop.

Dr Diaz also informed the Working Group that the programme of the 5^{th} cycle was in development.

The Working Group stated its appreciation to the OIE for continuing to hold these important training workshops, and to the Collaborating Centre on Research, Diagnosis, Surveillance of Wildlife Pathogens for the extensive work they are investing in these workshops. They suggested the OIE to include more social science relevant to wildlife disease surveillance and management in the 5^{th} training cycle.

Dr Diaz reported to the Working Group that the Training Manuals for the first and second cycles of training workshops for the OIE National Focal Points for Wildlife were published on the OIE website and available in English, French and Spanish. The manual from the third cycle of training workshops is available in English and will be soon available in Spanish and French.

18. Past and upcoming Conferences/Ad hoc Group meetings (feedback from members and OIE Headquarters)

18.1. 2nd OIE Global Conference on Biological Threat Reduction, Ottawa, Canada, 31 October – 2 November 2017

In light of the Working Group's expansion of activities to include the recognition of strong links between land use and emerging diseases and biodiversity issues, the OIE work currently being implemented in the area of biological threat reduction was described. Activities related biological threat reduction has particular relevance to the Wildlife Working Group given that over 70 percent of emerging infectious diseases have an animal origin (domestic and wild animals).

In terms of a specific endeavor related to such activities, Dr Tianna Brand, Head, Programmes Department provided an overview of the 2nd OIE Global Conference on Biological Threat Reduction – *Enhancing Health and Security for All*. For the purposes of the conference 'Biological Threats' or 'Biothreats' are threats that result from or are exacerbated by infectious diseases of animals (including zoonoses) which may arise from natural or manmade disasters, laboratory accidents or from the deliberate manipulation or release of pathogens.

In her overview, she noted that the Conference was an opportunity to continue to foster awareness around the international mechanisms in place to reduce biological threats such as the Biological Weapons Convention and the UN Security Council Resolution 1540, as well as to highlight projects where the animal health, public health along with law enforcement and security sectors have contributed globally to biological threat reduction. As such four themes were explored: developments in non-proliferation instruments and global security initiatives; fostering responsible research and development; assessing systems, investing in collaborations to foster preparedness; and finally, current initiatives to address biological threats such as host resilience, advances in vaccine technologies as well as the Global Virome Project.

18.2. *Ad hoc* Group on Transport of Biological Materials, OIE Headquarters, 17-19 July 2017

A member of the Working Group participated in the *ad hoc* Group on Transport of Biological Materials. The Working Group went through the report and reviewed the draft chapter. The Working Group found the draft chapter to be practical and useful.

18.3. *Ad hoc* Group on the killing methods for reptiles commercially processed for their skins, meat, and other products, Electronic meeting, August 2017

The OIE Standards Department was invited to provide an update on their work developing animal welfare recommendations for the killing of reptiles for their skins, meat and other products.

Dr Leopoldo Stuardo informed the Working Group that following the recommendations of the Terrestrial Animal Health Standard Commission an *ad hoc* Group worked electronically at the end of 2016 to develop a stand-alone chapter for the killing of reptiles to be included in the *Terrestrial Code*. Dr Stuardo advised that due to the heavy workload of the Code Commission during their February 2017 meeting, the revision of the draft Chapter prepared by the *ad hoc* Group was postponed until its September 2017 meeting. In order to use the period of time between the two Code Commission meetings to improve the draft Chapter, a face to face to face meeting of the *ad hoc* Group was held in August 2017 and the revised draft chapter prepared by the Group was presented to the September 2017 meeting of the Code Commission.

During the Code Commission's review of the Draft Chapter, some modifications were made notably on the wording of the title in order to simplify it.

The Commission agreed to present the proposed draft chapter for comments of Member Countries, these comments will be provided to the *ad hoc* Group (electronically) so they can review them and provide a further revised Chapter to the Code Commission at its February 2018 meeting.

18.4. Relevant future *ad hoc* Group for the Working Group on Wildlife

The Working Group was informed that the OIE website now has a page that lists the past and future OIE *ad hoc* Groups. For the future *ad hoc* Groups, the dates are mentioned and also when available the terms of reference. The Working Group reviewed the current list and identified the *ad hoc* Group on Tsetse-transmitted trypanosomiasis. The Working Group suggested that a person expert in these pathogens in wildlife be included in this *ad hoc* Group.

19. Other business

19.1. Collaborative OIE project on capacity enhancement for Ebola virus surveillance

Ms Sophie Muset, EBO-SURSY (http://www.rr-africa.oie.int/projects/EBOSURSY/fr_index.html) project coordinator and technical lead, presented an overview of the project to the Working Group: A five-year project, launched in January 2017, implemented by the OIE and the Centre de Coopération International en Recherche Agronomique pour le Développement (CIRAD), the Institut de Recherche pour le Développement (IRD) and the Institut Pasteur (IP). The Project aims to strengthen national and regional early detection systems in wildlife in West and Central Africa (10 countries of focus) using a One Health multi-sectoral approach to better detect, differentiate and prevent future EVD outbreaks or outbreaks of other emerging zoonotic pathogens.

To achieve its objectives the project will focus on three main areas:

1. Building institutional and One Health capacity through teaching and training;
2. Contribute to increasing the communities' awareness of zoonotic diseases;
3. Reinforcing zoonotic disease surveillance protocols through field investigations and improved diagnostic assays.

Ms Muset mentioned that she would contact the Working Group when more information on the project is available.

19.2. OIE Webpage for Wildlife

The Working Group discussed the current accessibility of wildlife-related information on the OIE website. Because the website is indexed according to OIE structure, wildlife information is available in widely different places and can be very difficult to find. Therefore, the Working Group recommends that the OIE create a dedicated webpage for all of its wildlife-related information, with subpages and internal links as needed, so that all on-line material related to wildlife is accessible from this single website location: training manuals, guidance documents on risk assessment in wildlife health and on disease surveillance, Wildlife Working Group reports and materials, a link to WAHIS-*Wild* and similar items.

19.3. Recommended diagnostic test methods in wildlife

The OIE wishes to recommend diagnostic methods for all pathogens from the non-listed wildlife pathogen/disease list. The aim is to provide guidance to countries regarding the best diagnosis approach and to harmonise diagnostic methods. Currently, OIE does not provide recommended diagnostic protocols for non-listed diseases as only listed diseases are included in the OIE Manuals. Members of the Working Group commented that a number of fact sheets with diagnostic method recommendation for infectious diseases in wildlife species have already been produced by different groups, such as the Diagnosis Cards of the European Wildlife Disease Association (www.ewda.org), the Wildlife Health Fact Sheets of Wildlife Health Australia (www.wildlifehealthaustralia.com.au), or the fact sheets in the Transmissible Diseases Handbook of the European Association of Zoo and Wildlife Veterinarians (www.eazwv.org).

The Working Group undertook to search for on-line sources of reliable information on diagnostic methods that can be applied to specimens from wild animals for each of the non-listed pathogens for which annual voluntary reporting is requested from Member Countries by the OIE. This information will be provided to the OIE to be used to assist OIE Member Countries with wildlife disease surveillance and diagnosis.

20. Work programme and priority setting for 2018

The Working Group identified the following list of activities as the priorities for its work in 2018, in line with the newly proposed Terms of Reference. In addition to this list, the Working Group will respond to requests from the OIE as these are received.

- Strengthen collaboration with the Aquatic Animal Health Standards Commission and relevant OIE staff regarding the role of the Working Group in support of aquatic animal health.
- Communicate with the other OIE Commissions regularly to ensure the Working Group responds to new and on-going priorities and needs of the OIE.
- Explore ways to address issues of climate change and biodiversity as related to animal health, and continue to inform the OIE about issues associated with wildlife, including emerging diseases.
- Explore ways to support the engagement of Wildlife FPs with relevant projects, platforms and conferences, e.g. GHSA (Global health security agenda) and national One Health platforms.
- Assist the OIE in maintaining and developing partnerships and activities with relevant international organisations, providing contacts and insights as to OIE participation and representation.
- Contribute to the revision of the Tripartite (OIE-FAO-WHO) guide to zoonotic diseases.
- Provide contacts and assistance to the OIE in incorporating human dimensions and social science into the work program related to wildlife.
- Develop a short summary of the meeting to be shared with OIE Focal Points for Wildlife and as a basis for communication during the Wildlife Day on 3 March 2018.
- Support the WAHIAD department to encourage focal points on wildlife to report annually on non-listed wildlife diseases.
- Compile references to diagnostic methods appropriate to each pathogen on the non-Listed wildlife pathogen and disease list.
- Provide science-based and technical support for OIE broadly on wildlife issues, terrestrial and aquatic species and wild bees.
- Support OFFLU in its efforts to gather information on surveillance for avian influenza viruses in wildlife.
- Support OIE in its work with the Collaborative Partnership on Sustainable Wildlife Management.
- Continue to support the joint efforts of the OIE and the International Council for Game and Wildlife Conservation in the development of training materials for hunters and in the communication between hunters and veterinary services.

21. Date of next meeting

The Working Group proposed for its next meeting the following dates: from Tuesday 4 to Friday 7 December 2018.

22. Adoption of report

The report was adopted by the Working Group.

…/Appendices

Appendix I

MEETING OF THE OIE WORKING GROUP ON WILDLIFE

Paris (France), 12 – 15 December 2017

Agenda

1. **Opening**
2. **Adoption of agenda and designation of rapporteur**
3. **Feedback from the meetings of the Scientific Commission for Animal Diseases and the Terrestrial Animal Health Code Commission**
4. **Update of the Terms of reference of the Working Group on Wildlife and discussion on future activities of the Working Group**
5. **Disease reporting**
   - 5.1. Disease reporting 2016
   - 5.2. Identification of critical points
   - 5.3. Proposals for report improvement
   - 5.4. Discussion on OIE listed diseases blocked for wildlife and revision of the list of non-OIE listed diseases
   - 5.5. Validation of new species in WAHIS
   - 5.6. Update on WAHIS+
6. **Emerging and noteworthy wildlife issues and disease occurrences: reports from members of the Working Group on Wildlife**
7. **Chronic Wasting Disease in Scandinavia**
8. **Update on Saiga antelope die-off in Kazahkstan and Mongolia**
9. **Update on African swine fever in Europe**
10. **Update on *Batrachochytrium salamandrivorans* in salamanders**
11. **Avian influenza: wild bird surveillance – update from OFFLU**
12. **Rabies and its impact on biodiversity**
13. **Collaborative Partnership on Sustainable Wildlife Management: update on the factsheets and other activities**
14. **Update on the International Council for Game and Wildlife Conservation and OIE joint project**
15. **Update on Diseases Initiatives relevant for wildlife or biodiversity and set up at the regional or international level worldwide**
16. **Annual report from the OIE Collaborating Centres for Wildlife**
17. **Training of OIE National Focal points for Wildlife**
18. **Past and upcoming Conferences/Ad hoc Group meetings (feedback from members and OIE Headquarters)**
    - 18.1. 2nd OIE Global Conference on Biological Threat Reduction, Ottawa, Canada, 31 October – 2 November 2017
    - 18.2. *Ad hoc* Group on Transport of Biological Materials, OIE Headquarters, 17-19 July 2017
    - 18.3. *Ad hoc* Group on the killing methods for reptiles commercially processed for their skins, meat, and other products, Electronic meeting, August 2017
    - 18.4. Relevant future *ad hoc* Group for the Working Group on Wildlife
19. **Other business**
20. **Work programme and priority setting for 2018**
21. **Date of next meeting**
22. **Adoption of report**

MEETING OF THE OIE WORKING GROUP ON WILDLIFE

Paris (France), 12 – 15 December 2017

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Appendix III

Non OIE-listed diseases affecting wild animals (voluntary report on WAHIS-*Wild*)

1. Infection with agent causing chronic wasting disease (CWD)
2. Infection with low pathogenic avian influenza viruses (all subtypes)
3. Infection with Alcelaphine herpesvirus 1 or Ovine herpesvirus 2 (Wildebeest and sheep associated malignant catarrhal fever viruses)
4. Infection with Avian Paramyxoviruses (other than Newcastle Disease viruses)
5. Infection with Babesia spp. (noteworthy occurrences)
6. Infection with *Baylisascaris procyonis*
7. Infection with Borrelia spp.
8. Infection with circoviruses
9. Infection with equine influenza viruses (wild equidae)
10. Infection with elephant endotheliotropic herpesviruses (EEHV)
11. Infection with encephalomyocarditis virus
12. Infection with Caliciviruses in hares and rabbits (such as European brown hare syndrome virus)
13. Infection with Fasciola gigantica
14. Infection with Fascioloides magna
15. Infection with feline leukaemia virus (FeLV)
16. Infection with filoviruses
17. Infection with flavivirus (causing louping ill)
18. Infection with flavivirus (causing tick borne encephalitis)
19. Infection with flavivirus (causing yellow fever)
20. Infection with hantaviruses
21. Infection with Henipaviruses (Hendra viruses)
22. Infection with Henipaviruses (Nipah viruses)
23. Infection with Immunodeficiency viruses (Feline, Simian)
24. Infection with *Leptospira interrogans* ssp.
25. Infection with *Listeria monocytogenes*
26. Infection with Lyssaviruses other than Rabies virus
27. Infection with morbillivirus (canids and felids)
28. Infection with morbillivirus (marine mammals)
29. Infection with morbillivirus in non-human primates
30. Infection with morbillivirus in other taxonomic groups of hosts
31. Infection with Newcastle Disease viruses (wild birds)
32. Infection with parvoviruses
33. Infection with *Pasteurella* spp.
34. Infection with *Plasmodium* spp.
35. Infection with Pox viruses (other than those listed by the OIE)
36. Infection with *Pseudogymnoascus destructans* in bats (White-nose syndrome)
37. Infection with *Psoroptes* spp.

38. Infection with *Salmonella enterica* (all serovars)
39. Infection with *Sarcoptes scabiei*
40. Infection with *Theileria* spp. (noteworthy occurrences)
41. Infection with *Toxoplasma gondii*
42. Infection with *Trichomonas* spp. in birds and reptiles
43. Infection with *Yersinia enterocolitica*
44. Infection with *Yersinia pestis*
45. Infection with *Yersinia pseudotuberculosis*

<u>*Reptiles*</u>

46. Infection with Crocodilepox virus (Papillomatosis in crocodiles)
47. Infection with herpesvirus causing fibropapillomatosis in sea turtles
48. Infection with ranaviruses
49. Infection with *Trichinella nelsonei*, *zimbabwei* and *papouae*
50. Infection with *Ophidiomyces ophiodiicola* (the agent of snake fungal disease)

<u>*Non infectious disease*</u>

51. Algal toxicosis
52. Botulism
53. Chemical poisoning
54. Mycotoxicosis

<u>*Other*</u>

55. Diseases of unknown cause
56. Unusual morbidity or mortality event (cause undetermined)