Thursday September 6th – Archibald / Campbell

Aquatic Animal Health Management 3

Moderator – Kim Klotins (Canadian Food Inspection Agency)

1:15 PM	**Health Management 3**	Phelps - The Potential Risks of the Baitfish Pathway and Implications for Fish Health Management
1:30 PM		Price - A Retrospective Assessment of the Effect of Fallowing Duration on Piscirickettsiosis in Salmon Farms in Chile
1:45 PM		Jung-Schroers - Influence of a Nanofiltration – Reactor on the Bacterial Microflora and on *Ichthyophthirius multifiliis* Theronts in Recirculating Aquaculture Systems
2:00 PM		Dhar - Current Status of Acute Hepatopancreatic Necrosis Disease in Shrimp: Biology, Diagnostics and Disease Management
2:15 PM		Cunha - The Brazilian Shrimp Strategy to Keep Growing With the Global Diseases
2:30 PM		Roberts - Emergency Response to Ostreid Herpesvirus Microvariant in Feral Pacific Oysters (*Crassostrea gigas*)
2:45 PM		Yoshinaga - Biosecurity for Abalones in the Distribution Process of Imported Live Abalones and Its Problems

The Potential Risks of the Baitfish Pathway and Implications for Fish Health Management

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In an increasingly connected world, human activities introduce the risk of moving invasive species and pathogens to naïve populations, and drive disease spillovers between farmed and wild populations. This reality is playing out in the use of baitfish for recreational angling, as billions of farm-raised and wild-caught fish (and their accompanying hitchhikers!) are moved long distances overland and intentionally introduced into new environments. As a result, baitfish movement has been considered a high-risk activity for the movement of aquatic invasive species (AIS) and disease in Minnesota, with potentially major economic, ecological, and societal consequences. To obtain baseline data of risks posed by baitfish use, a survey of invasive species and pathogens was performed at baitshops across Minnesota. Golden shiners (n=30) were purchased at retail baitshops (n=34, 18 of which were sampled twice; 52 total) across the state during unannounced consumer visits. 33/52 cases included non-target species, such as fathead minnows, brook stickleback, and brown bullhead. Potentially significant pathogens were in many baitshops, inclulding *Aeromonas salmonicida* and *Ovipleistophora ovariae.* In addition, at least 9 novel viruses were identified from fish collected during the study. No regulated AIS or pathogens were found during the course of the survey; however, the presence of non-target species and important pathogens confirm that baitfish should remain a pathway of concern. Ongoing efforts to better define potential hazards, quantify the risk of introduction via bait movement, and risk mitigation strategies will also be discussed.

Conference Session Designation: (Aquatic Animal Health Management or Emergent Diseases)
Presentation Format: (Oral)

A Retrospective Assessment of the Effect of Fallowing Duration on Piscirickettsiosis in Salmon Farms in Chile

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Management of antimicrobial usage in salmon farming is a key issue in increasing the sustainability of the industry. In Chile, piscirickettsiosis, the disease caused by *Piscirickettsia salmonis*, has been the main reason to use antimicrobials during the seawater phase despite the efforts of industry and government to control this disease. Area-coordinated mandatory fallowing was introduced by authorities in recent years; however, the effectiveness of this measure to reduce the risk of piscirickettsiosis has not been evaluated. We assessed the effectiveness of fallowing using farm-level weekly production and mortality records provided by industry. We used a discrete-time survival model to estimate hazard of piscirickettsiosis and compared the hazards in farms with and without a history of piscirickettsiosis in the previous cycle while controlling for external sources of infection such as infected neighboring farms. In our data, the hazard of piscirickettsiosis was high regardless of species and fallow duration. No difference in hazard was observed when a farm was fallowed for three months or longer. Fallow periods shorter than three months were only assessed for rainbow trout. In this species, fallow periods shorter than three months lead to increased hazard at the beginning of the subsequent production period. These results suggest 3-month fallowing might be adequate to reduce exposure to *P. salmonis* from the previous production cycle.

Conference Session Designation: (Aquatic Epidemiology)
Presentation Format: (Oral)

Influence of a Nanofiltration - Reactor on the Bacterial Microflora and on *Ichthyophthirius multifiliis* theronts in Recirculating Aquaculture Systems

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Recirculating aquaculture systems offer the opportunity to keep high numbers of fish without the need of high amounts of fresh water due to recirculation and filtration of tank water. Problems can occur if the amount of nitrate, bacteria or parasites in the water increases.

To maintain a good water quality, nanofiltration of the water is described as one method to reduce the amount of bacteria in the water and to keep the chemical water parameters in an optimal range. We tested nanofiltration reactors with integrated denitrification membranes in four different recirculation aquaculture facilities. One system in each facility was run with the reactor and as control identical systems without reactor were used.

The aquaculture facilities were stocked either with carp, sturgeons, golden orfes or rainbow trout and the systems were run at a water temperature between 20 and 25°C. In three facilities the bacterial microflora was analysed in tank water, biofilms of tanks and partly also of the filters and on skin and gills of fish kept in the systems. In one of the systems cortisol measurements in the water and in the blood of fish were performed to determine the stress level of the animals in the system. In the fourth system fish were examined for infection with the parasite *Ichthyophthirius multifiliis* and the effectivity of nanofiltration against the theronts of this ciliate was determined.

Overall it could be shown that the reactor with a filtrating membrane could decrease the total amount of bacteria in the tank water of a recirculating aquaculture system. Also the amount of bacteria on the gills of fish was decreased in the systems with installed reactor. The diversity of bacteria was higher in the systems with installed reactor and the fish in this system seemed to have less stress. A reduction of stages of *Ichthyophthirius multifiliis* could also be detected in a system with installed reactor. One challenge was the increasing water temperature in systems with installed reactor and the operation of the reactor itself is time consuming. Yet, the usage of a reactor with filtrating-membrane can have a positive influence on fish health and welfare.

Conference Session Designation: (Aquatic Animal Health Management)
Presentation Format: (Oral)

Current Status of Acute Hepatopancreatic Necrosis Disease in Shrimp: Biology, Diagnostics and Disease Management

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Acute hepatopancreatic necrosis disease (AHPND) of shrimp, also known as an Early Mortality Syndrome (EMS), is an emerging disease that is threatening shrimp aquaculture worldwide. Since the emergence of the disease in China in 2009, the disease has spread to many countries in Asia and now it has spread to North America (Mexico and the US). The disease is caused by *Vibrio parahaemolyticus* carrying binary toxin genes, *pirA* and *pirB.* Recently, other *Vibrio* species carrying the binary toxin genes were shown to cause the disease. In experimental challenge, *V. parahaemolyticus* can cause 100% mortality within 48 hr. Typical AHPND acute phase presents multifocal necrosis and massive sloughing of epithelial cells from the medial region towards the distal region of the hepatopancreatic tubule. This is followed by massive bacterial infection in the HP lumen and hemocytic infiltration surrounding the affected tubule. OIE-recommended method for AHPND detection involves PCR amplification of *pirA* and *pirB* genes. Recently, we have sequenced the genome of a novel *V. parahaemolyticus* strain that carries both toxin genes, yet it does not cause AHPND. This shows the need to develop detection method alternative to DNA-PCR. Biosecurity and pond management remain the corner stone for the managing AHPND. Recently, functional feed has been developed as a therapeutic approach to contain AHPND. Efforts are now underway to develop AHPND-resistant lines of shrimp.

Conference Session Designation: (Aquatic Animal Health Management or Shellfish)
Presentation Format: (Oral)

The Brazilian Strategy to Keep Growing the Shrimp Industry with Global Diseases

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Transboundary diseases of whiteleg shrimp (*Litopenaeus vannamei*) are well documented as responsible for massive losses in the aquaculture industry worldwide. In Brazil, it has been registered the occurrence of infectious hypodermal and haematopoietic necrosis virus, infectious myonecrosis virus, white spot syndrome virus and infection with *Hepatobacter penaei* (necrotising hepatopancreatitis). Through molecular epidemiological methods, it has been observed that most of these infections were genetically similar to those occurring in other important shrimp producing countries. It is believed that the illegal introduction of risk material, mostly post larvae for genetic enhancement programs, has played a crucial role in the introduction and dissemination of highly contagious epidemic diseases in the country. National public policy for the legal import of risk material was considered adequate by recent assessment of OIE PVS Tool specifically applied for aquatic animal health service. Infectious diseases are considered the major constraint for the shrimp industry worldwide and the national stakeholders tend to defend a very conservative and protectionist approach when debating with the authorities legal imports of any crustacean materials, including species and products epidemiologically irrelevant for the introduction of any potential risk. Recent openings of important national shrimp companies for international investments are expected to rearrange the country's private sector, which has been continuously struggling with veterinarian authorities. Stakeholders support the application of precautionary measures whilst the Brazilian official veterinary service relies on international accepted and validated risk analysis tools. Compartmentalisation seems to be a proper plan to make possible the compliance with the World Trade Organization SPS Agreement for the import of post larvae for genetic enhancement programs in the country considering a globalized world full of economically important diseases not reported in Brazil. In the meanwhile, the Brazilian strategy to keep growing the shrimp industry with global diseases remains on the use of strains of specific pathogen resistant animals; post larvae coming from certified SPF broodstock; enhanced feed with vitamins, prebiotics, probiotics, enzymes, phytotherapics and other immunostimulants as well as the use of superintensive culture in biofloc technology system at different stocking densities in greenhouse-enclosed system, which is sustainable from an environmental perspective and more effective amongst a diverse number of biosecurity measures.

Conference Session Designation: (Aquatic Animal Health Management)
Presentation Format: (Oral)

Emergency Response to Ostreid Herpesvirus Microvariant in Feral Pacific Oysters (*Crassostrea Gigas*).

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The South Australian (SA) oyster growing sector has substantial value ($32 million / year) and importance to regional communities across the State. The sector largely comprises Pacific oyster (*Crassostrea gigas*) culture. Pacific Oyster Mortality Syndrome (POMS) is a disease caused by Ostreid Herpesvirus type 1 (OsHV-1) microvariant, which causes rapid high mortalities (up to 100%) in Pacific oysters. The SA government have collaborated with industry since 2012 to undertake prevention, preparedness and response activities to mitigate the threat of POMS, including development of State and national disease response plans: www.agriculture.gov.au/animal/aquatic/aquavetplan/. To date POMS has not been detected in SA oyster farms. POMS occurs in Europe, New Zealand and Australia (NSW). On 1 February 2016 the Australian State of Tasmania reported their first detection of POMS in oyster farms experiencing high mortalities. In SA, government and industry immediately responded to the potential introduction of OsHV-1from frequent importation of spat from Tasmanian hatcheries.

In July 2016 a barge from Sydney, NSW, arrived in Port Adelaide with Pacific Oysters on its hull. The barge was immediately quarantined and removed from the water. One oyster tested positive to OsHV-1. Subsequent tracing and surveillance did not detect infection in feral or farmed oysters in SA. This case demonstrated that biofouling on vessels can translocate OsHV-1 across continental-scale distances.

Passive surveillance over recent years has increased, with farmed oyster mortalities immediately investigated to rule out OsHV-1. Mortality events are generally localised (i.e. one farm) and likely causes have been attributed to a combination of environmental and/or husbandry stressors, and opportunistic *Vibrio* spp.

On 28 February 2018 SA confirmed its first detection of POMS, in Port Adelaide River feral Pacific oysters. Plankton samples (e-DNA) and Pacific oysters from the Port produced qPCR CTS <20, indicating high viral load. The closest oyster farming region is ~60km from Port Adelaide, while the closest oyster hatchery is ~25km away. The emergency response involved statutory restrictions on fishing vessel movements, livestock movements, feral oyster destruction using flame guns and other methods, and biofouling management. A communication and awareness campaign was developed and hydrodynamic modelling of viral particle dispersal and epidemiological analysis were used to inform surveillance. Extensive surveillance across SA has detected the virus only in Port Adelaide feral oysters.

Conference Session Designation: (Aquatic Animal Health Management)
Presentation Format: (Oral)

Biosecurity for Abalones in The Distribution Process of Imported Live Abalones in Japan and Its Problems

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Based on risk assessments, Japan revised rules for biosecurity of aquatic animals and expanded the list of aquatic animals and their epidemics subjected to import and domestic biosecurity measures in July 2016, which newly includes bacterial blister disease of Haliotis discus hannai, Haliotis discus discus, H. gigantean and H. madaka, and infection with abalone herpes virus of H. diversicolor diversicolor and H. diversicolor aquarilis. According to the new rule, when importers import and stock live abalones of those species in tanks and facilities draining directly to public water without disinfection of pathogens, they should obtain import permission in advance from the Ministry of Agriculture, Forestry and Fisheries by submitting import application attached with an inspection certificate issued by the competent authority of the exporting countries. Knowing the distribution process of imported live abalones is essential to make the biosecurity measures efficient. We examined the import statistics, and visited and interviewed importers and wholesalers to overview the distribution process of imported live abalones. We will introduce the distribution process and problems found in it from the view point of biosecurity.

Conference Session Designation: (Aquatic Animal Health Management)
Presentation Format: (Oral)