6.1 Diseases of Crustaceans

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Infectious diseases of decapod crustaceans (crabs, shrimp, lobsters and crayfish) are found in both wild and cultured hosts and can have significant ecological and economic impacts. The majority of diseases are reported from marine environments, however freshwater crustaceans such as crayfish and prawns are also susceptible to disease-causing organisms (ex. crayfish plague and white tail disease, respectively). In general, viral pathogens have and continue to pose the greatest risk to crustaceans under aquaculture conditions whereas protistan pathogens appear to be the most significant threat to wild crustaceans. At present there are nine crustacean diseases listed by the World Animal Health Organization (OIE) because of their economic importance and potential for transfer with live or dead crustacean commodities. Many others not listed are important regionally but are judged not to present a significant risk of being transferred to new regions or countries.

As commercial cultivation of crustaceans (primarily penaeid shrimp) grew since the 1980s so too has the number of viruses that have emerged. It is without question that viral pathogens (both DNA and RNA) have caused significant economic hardship with losses running into several billon $US globally. As countries around the world turn towards aquaculture of aquatic species (including several marine crustaceans) as a source of high quality food, the inherent practices of high stocking densities within enclosed and semi-enclosed coastal water bodies creates an ideal environment for disease outbreaks.

The scale of disease outbreaks in wild crustacean populations is hard to quantify as dead hosts quickly sink or rapidly become undiagnosable. The majority of diseases affecting wild crustaceans were discovered, in part, due to the existence of substantial economically important fisheries, or because of the host's ecological importance. In many instances comments from fishermen of dying, discolored, or otherwise unusual gross observations lead to further study facilitating pathogen discovery and eventual identification. Disease agents have historically been reported from large juvenile and adult crustaceans due to their ease of capture using conventional baited traps and bottom trawl gears. Few studies have examined larval and early benthic juvenile stages for the presence and effects of pathogens.

Depending on the host/system being studied, disease diagnosis relies on a combination of one or more techniques including gross observation, wet smear analysis, histopathology, transmission electron microscopy, and DNA-based detection techniques (PCR, QPCR, ISH, and DNA sequencing). Note that for many diseases of crustaceans, clinical signs are rarely pathognomonic and can vary between susceptible species. For comprehensive detection and especially for novel pathogen characterization, it is recommended that matching host tissues be preserved for histopathology, transmission electron microscopy, and DNA-based techniques. Histological evaluation of host tissues still remains the first line of investigation in many diagnostic laboratories and facilitates a presumptive diagnosis. Benefits include the ability to observe both the pathogen of interest and/or the affected host tissue (ex. tissue location, host response and associated pathology), and the ability to observe and document non-target/uncharacterized organisms of potential interest. Subsequent highly sensitive and specific molecular assays (single round

PCR, nested PCR, or QPCR) can then be employed to confirm the initial diagnosis and quantify the infectious agent. Likewise, species-specific in situ hybridization assays can be performed to localize the infective agent in the host tissue sampled. Occasionally antibody-based assays (immunofluorescence, enzyme linked immunosorbent assay) are utilized.