AQUACULTURE update

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Lack of pathogenicity of infectious hematopoietic necrosis (IHN) and viral hemorrhagic septicemia (VHS) viruses to sablefish (*Anoplopoma fimbria*)

The novirhabdoviruses, infectious hematopoietic necrosis virus (IHN) and viral hemorrhagic septicemia virus (VHS), are widespread on the west coast of North America (Bootland and Leong 1999, Myers and Winton 1995, Hedrick et al. 2003), with the geographic range of both viruses extending from California to Alaska. Both viruses have caused high losses of wild fish stocks in British Columbia.

In British Columbia, infectious hematopoietic necrosis virus is usually associated with sockeye salmon (*Oncorhynchus nerka*) in freshwater (Traxler and Rankin 1989); it is often detected at the fry and spawning adult life stages. In Pacific salmon the virus is rarely detected when fish are in the marine environment. However, the virus has been reported in a few marine species and is a serious pathogen for farmed Atlantic salmon (*Salmo salar*) in marine netpens (Kent et al. 1998, Traxler et al. 1998, St. Hilaire 2002, Saksida 2002). The source of virus infecting farmed fish is unknown but is likely from virus being shed from sockeye salmon (Traxler et al. 1997). There is no evidence that Atlantic salmon are infected in freshwater hatcheries prior to being moved to marine grow out sites.

Viral hemorrhagic septicemia is endemic in Pacific herring (*Clupea pallasi*) populations in British Columbia with some die-offs reported especially in captive herring when held in bait ponds. VHS virus has also caused extensive losses in sardine (*Sardinops sagax*) populations along the British Columbia coast over the past several years (Traxler et al. 1999). Sardines move up into waters off the coast during the *El Niño* events and ocassionally become stranded in bays and inlets when the warm water recedes. The colder water temperatures and lack of feed both contribute to increased stress on the populations which has resulted in high losses with many tonnes of fish dying during the winter months when water temperatures reach 7-8°C. In 1999, during an investigation into a fish kill of sardines resulting from VHS virus, a dead sablefish was recovered and tested positive for VHS virus only by molecular methods, viable virus was not recovered by cell culture (Hedrick et al. 2003). This single detection of VHS virus in sablefish by reverse transcription-polymerase chain reaction during the mass mortality event involving sardines may have been due to contamination; no virus was recovered by cell culture and only one of three dead sablefish tested positive for VHS virus. The VHS virus has also been isolated several times from farmed Atlantic salmon in British Columbia (Traxler et al 1995). Losses associated from this virus in farmed salmon have been relatively minor.

Sablefish are a prime candidate species for diversification of the aquaculture industry because of their high commercial value and recent development of hatchery technology which make farming this species feasible.

When raising a new species, it is important to determine the susceptibility of farmed fish to known aquatic pathogens so that the risk of diseases can be assessed.

The present experiment was conducted to determine the susceptibility of 400-500 g hatchery-reared sablefish to infection by IHN and VHS viruses. Viral challenges were conducted by intraperitoneal injection and by cohabitation. Replicate groups of 20 sablefish in separate tanks were marked by opercular punch and injected (0.1 mL) with strains of IHN and VHS viruses isolated from farmed Atlantic salmon. The amount of viable virus injected into each fish was 3.6 x 10^4 plaque forming units (pfu) of IHN virus and 8.0 x 10^4 pfu of VHS virus. This level of virus would have caused high mortality if injected into Atlantic salmon. After 24 h, twenty unmarked and uninjected fish were added to each tank. A control group consisting of twenty sablefish injected with Hank's balanced salt solution (HBSS) and 20 fish added after 24 h were also included in the study. Fish were held in tanks supplied with ambient sea water at a temperature ranging from 11-13°C. Fish were fed daily and monitored for losses for 52 days post-injection.

During the challenge one fish injected with VHS virus died on day 18. Virus testing of this fish did not detect the presence of VHS virus. There was no mortality in any of the other tanks (Table 1).

Table 1. Cumulative mortality of sablefish 52 days post-challenge

Virus	Injected	Cohabited
IHNV Tank 1	0/20	0/20
IHNV Tank 2	0/20	0/20
VHSV Tank 1	1/20	0/20
VHSV Tank 2	0/20	0/20
HBSS control	0/20	0/20

At the end of the 52 day holding period, six injected fish from each tank were removed, euthanized and tissues were assayed for the presence of virus. No virus was detected in any of the survivors that were tested.

From this study it is apparent that sablefish are resistant to infection with both VHS and IHN virus. The farming of sablefish is unlikely to result in losses due to either of the fish viruses commonly found in British Columbia.

In a separate but related project a total of 363 ocean-caught sablefish were tested for the presence of viruses. These fish were screened as part of a study to determine the prevalence of fish pathogens in wild marine fish. Neither of the viruses used in this study were detected in any of the captured fish.

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