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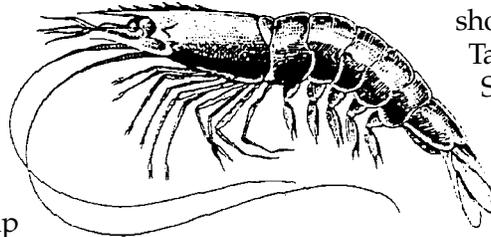
Shrimp Diseases

In May 1994, an outbreak of a relatively new and serious shrimp disease killed more than 95% of the *Penaeus vannamei* at an aquaculture farm in Kahuku, Hawaii. The malady that ravaged this farm and decimated its shrimp stocks was Taura Syndrome, an illness that previously caused more than \$100 million worth of damage to shrimp farms in South America but had not previously attacked shrimp farms in Hawaii.

While the severity of this bout of Taura Syndrome is somewhat atypical, the shrimp farmer's experiences in coping with the disease underscore the devastating impact that illness can have on the larval and growout production of marine shrimp, and the need for practical, cost-effective tools for disease management. Scientists working at the University of Hawaii, The Oceanic Institute, and the State of Hawaii's Aquaculture Development Program are seeking to learn more about Taura Syndrome and the Infectious Hypodermal and Hematopoietic Necrosis (IHHN), two major diseases that endanger the growout and broodstock production of *Penaeus vannamei* and *P. stylirostris* in Hawaii. While some important strides have been made in developing new preventative methods to combat these illnesses, additional research needs to be done, especially on methods to control the disease.

Taura Syndrome Virus

In 1994 the cause for Taura Syndrome was uncertain. Work conducted in Hawaii and Arizona led to the discovery of a previously unknown virus now called the Taura Syndrome Virus (TSV). Subsequent to the discovery of TSV, researchers at the University of Arizona have



shown TSV as the direct cause of Taura Syndrome. While Taura Syndrome Virus can infect both *Penaeus vannamei* and *P. stylirostris*, the expression of the disease and the severity of its symptoms differ in each animal. In general, *P.*

stylirostris is much more resistant to TSV than *P. vannamei*, and *P. stylirostris* stocks afflicted with TSV can still be successfully harvested and sold by a farmer with good management practices. In contrast, TSV may cause mortality rates as high as 75-80% in *P. vannamei*, significantly impacting the crop's economic viability.

TS and *Penaeus vannamei*

Taura Syndrome generally attacks juvenile *P. vannamei* (0.1 to 5.0 g) within two to four weeks after stocking in growout ponds or tanks. TSV is primarily an illness of the cuticle epidermis (outer exoskeleton) in shrimp. Shrimp in the chronic phase of TSV have scattered, black-spot lesions along their outer skin or shell. During TSV outbreaks, dead and dying shrimp will often be seen in seines or cast nets used for routine population sampling or found lying along the bottom of the grow-out tanks or raceways. Shrimp afflicted with the acute phase of TSV appear weak and disoriented, have soft-shells, and have expanded chromatophores (pigment spots) that may alter their color slightly. Infected shrimp also have empty digestive tracts.

Solutions

More research must be conducted in order to learn more about the way Taura Syndrome Virus is spread and to develop new methods to control the disease. One approach that minimizes the harmful impacts of TSV is to

grow *P. stylirostris* instead of *P. vannamei* in farms that have experienced high mortalities due to TSV infection episodes.

IHHNV and Runt Deformity Syndrome

The pattern of susceptibility seen with the Taura Syndrome Virus is reversed with another important marine shrimp virus, the Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV). While IHHNV is fatal to *Penaeus stylirostris*, *P. vannamei* are relatively resilient to the disease with certain modifications in management practices.

In *P. vannamei*, IHHNV infection can cause Runt Deformity Syndrome (RDS), an illness that often has a significant impact on a farm's productivity by reducing a shrimp's potential for growth. While healthy shrimp crops generally grow at uniform rates (simplifying harvesting, sorting, and marketing), IHHNV-infected shrimp crops typically have a large disparity in growth rates. RDS is a complex interaction between virus and host. Some scientists believe the impact of IHHNV is most severe when a shrimp is infected early in its life—either as an embryo or as a larvae. In farms stocked with IHHNV-infected shrimp that were exposed to the virus at an early life-stage (i.e. spawning, hatchery), fewer pounds of shrimp per unit area are produced using the same amount of feed. Crop losses from poor feed conversion, reductions in weight and increased sorting costs need to be closely managed by a farmer in order to turn a profit.

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Specific Pathogen-Free Broodstock

Penaeus vannamei broodstock that have not been infected with IHHNV will produce offspring that grow normally even in an IHHNV-infected environment, as long as these animals are stocked as juveniles. While specific pathogen-free stocked *P. vannamei* may eventually develop an IHHNV infection due to the virus they will continue to grow within a normal size range and fetch the same prices as non-infected shrimp. The offspring of the specific pathogen-free broodstock are still susceptible to IHHN; consequently IHHN-free shrimp should be used for broodstock rotation and consistent production.

New research

In the past, aquaculture researchers sought ways to remove IHHNV that reside in pond environments after an outbreak of disease. However, these efforts have had little success. Attempts to kill IHHNV by disinfecting a pond using lime were problematic with variable results. Current research is investigating methods of using high temperatures (i.e., solar radiation) rather than high pH to kill these shrimp viruses. Scientists are also seeking to better understand the ways in which TSV and IHHNV are transmitted. To this end, studies are examining the possible role that bird feces may play in spreading IHHNV and TSV infections among shrimp facilities and populations.

Where to turn for help

If your shrimp crop is experiencing any of the symptoms mentioned above, or if you would like more information on these marine shrimp diseases, contact one of the following:

- Aquaculture Development Program
at Anuenue Fisheries Research Center
1039 Sand Island Parkway
Honolulu, Hawaii 96819-4347
(808) 845-9561 Phone
(808) 845-4334 Fax
- The University of Hawaii Sea Grant
Extension Service
1000 Pope Road, MSB 226
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(808) 956-2873 Phone
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