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Farming high-health shrimps

Aquaculture Department, Southeast Asian Fisheries Development Center

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used. Routine sanitary work procedures include restricted access, the use of foot baths at the entrances to all doors, segregation of equipment by tank, regular cleaning and disinfecting of equipment and rooms, disinfection of shrimp waste and debris, and clean feed preparation areas. Effluent water is disinfected with chlorine prior to discharge into municipal sewers that terminate at landfills.

Founder populations

If collected from 10 sites, about 240 breeders (120 males and 120 females) are needed to maintain, if not increase, genetic diversity in founder populations. This number is based on the resources available, the biology of the shrimp, and the experiences in animal breeding programs.

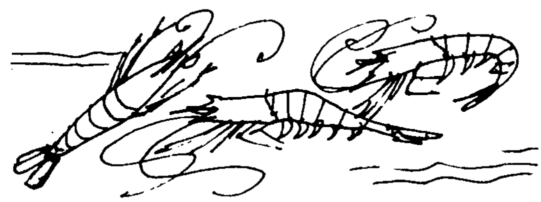
Other than IHHNV, several pathogens and potential pathogens are excluded from founder populations. These are:

- hepatopancreatic parvo-like virus, *Baculovirus penaei* and other baculoviruses. The reo-like viruses can not be excluded because no diagnostic method exists.
- rickettsia-like bacteria. Other bacteria are secondary invaders and exclusion is fruitless.
- microsporans like *Ameson* sp., *Agmasoma* sp., *Pleistophora* sp., and *Thelohania* sp.
- intermediate hosts of gregarine protozoans and of helminths

Fungi like *Fusarium solani* and fouling protozoan ciliates like *Zoothamnium* sp., *Acineta* sp., and *Hyalophysa* sp. are not excluded. They may only indicate stress. Crustaceans like the bopyrid isopods can be eliminated by removing infected *P. vannamei.* Their intermediate hosts are not found in quarantine tanks.

Some private fish farms in the U.S. are test-farming the specific pathogen-free fry produced from SPF broodstock provided by GCRLC.

Reference: JM Lotz. 1992. *Developing a specific pathogen-free (SPF) animal populations for aquaculture: a case study fo IHHN virus of penaeid shrimp.* p. 269-283. In: W Fulks and KL Main (eds). **Diseases of cultured penaeid shrimp in Asia and the United States.** The Oceanic Institute, Hawaii.



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Pond trials

Harlingen Shrimp Farms in Texas, U.S.A. has obtained yields ranging from 2.5 to 4.5 metric tons per hectare-crop. To achieve more consistent yields, the farm entered into a cooperative research agreement with the Gulf Coast Research Laboratory Consortium (GCRLC) in September 1990. The GCRLC supplied the farm with specific pathogen-free (SPF) broodstock to produce postlarvae for commercial-scale comparisons with selected farm stocks, named Texas broodstock source (TBS), which were IHHNV positive. The SPF broodstock were maintained in isolation from the farm stocks housed in the same facility. Regular inspection of the postlarvae indicated that the offspring were also SPF. The ponds stocked with postlarvae produced from SPF broodstock outperformed the TBS postlarvae in terms of survival, overall yield, and decreased size variation.

Reference: F Jaenike, K Gregg and L Hamper. 1992. *Shrimp production in Texas using specific pathogen-free stocks.* In: W Fulkfs and KL Main (eds).

In late 1982, Amorient Aquafarm in Hawaii initiated work on *Penaeus vannamei* at their maturation and hatchery site in Kahuku. From 1983 to 1989, no known viruses and other obligate pathogens were detected in the shrimps. In early 1989, however, infectious hypodermal and hematopoietic necrosis virus (IHHNV) was discovered in *P. vannamei.* The effect on shrimp production was dramatic, very slow growth rate that is characteristic of runt-deformity syndrome (RDS). In the IHHNV-infected RDS groups, the coefficient of variation in size (CV) increased from

10-20% to 40%, and pond yields decreased accordingly. In mid-1990, *Baculovirus penaei* (BP) infections were also found but without adverse impact on production. In January 1992, the farm was stocked with the progeny of SPF *P. vannamei* broodstock. As a result, RDS disappeared and production and yield improved.

Reference: N Carpenter and JA Brock. 1992. *Growth and survival of virus-infected and SPF Penaeus vannamei on a shrimp farm in Hawaii.* In: W Fulks and KL Main (eds).

Shrimp production in the U.S.

Over 2,600 metric tons of farmed shrimps were produced in the U.S. in 1993, continuing the dramatic climb in production that began in 1992. Texas, by far the largest producer, harvested 2,100 metric tons of heads-on shrimp, despite problems in some areas with (parasitic) gregarines. South Carolina continued its steady growth. Hawaii, which is still bearing the effects of severe flooding in 1991, maintained its production.

The availability of affordable and reliable supply of high health shrimp stocks has been credited with the industry's success. Because SPF stocks increase production, producers are expanding their culture area. In Texas, for example, just over 180 hectares of ponds were stocked in 1990. In 1993, that increased to about 590 hectares. Further increases are projected in succeeding years.

Major problems with low yields and profitability are being experienced in many shrimp farms outside the United States. It is generally agreed that the deteriorating quality of stock and water experienced by foreign producers is magnifying the faults that already exist in ineffective disease control programs. These problems open opportunities for U.S. producers to become world suppliers of high health and genetically improved shrimp stocks. The combination of increased domestic production of shrimp and seed export is projected to become a $500 million industry in the coming years.

Reference: ***Newsline***, Vol. 7, No. 7, Winter 1994. The Oceanic Institute.

Recent studies on fish health at SEAFDEC/AQD

Luminescent vibrios in hatcheries

One of the major problems in the otherwise successful *Penaeus monodon* hatchery industry in the Philippines is the occurrence of the luminescent bacterium *Vibrio harveyi*. The possible sources of the bacterium were investigated by SEAFDEC/AQD.

Eggs within the ovaries of wild-caught and ablated females in stage II and IV of ovarian development do not harbor the bacterium. But guts of these spawners and of pond-reared juveniles contain numerous luminescent bacterium. *V. harveyi* is also found in the exoskeleton-associated flora of females.

The marine diatom *Chaetoceros calcitrans* that is fed to shrimp larvae does not harbor *V. harveyi* at any phase of its growth. One-day old *Artemia salina* does not harbor resident *V. haveyi* population although its culture water contains small populations.

To reduce the incidence of luminescent vibriosis in hatcheries, preventive measures should be adopted. The eggs must be separated from the mothers and from feces as soon as possible after spawning. The present practice of spawning many females in big tanks should be modified because the set-up makes its difficult to remove the mothers and allows longer contact between them, their feces, and the eggs. *Artemia salina* nauplii should be rinsed well before being introduced into the larval rearing tanks as feed. Chlorination, ultraviolet irradiation, and filtration of the rearing water should be done to reduce the initial bacterial load. Reduction of the larval stocking density may also prevent luminescent vibriosis in shrimp hatcheries. Diatoms should continue to be used (rather than replaced completely with artificial feeds) for its antibiotic effect at high densities.

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