Health & Welfare

SPF line of Penaeus chinensis shrimp under development

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Chinese, U.S. institutions collaborate

The shrimp-farming industry in the continental United States is currently based mostly on the use of *Penaeus vannamei*. But because of the climatic requirements of this species, the industry is limited to producing only one crop per year. The short growing season (up to six months) and very narrow spring stocking period that increases competition for seed stock are additional limiting factor

To extend the growing season, an option could be the use of a cold-tolerant species of shrimp, such as *P. chinensis*. In addition to its tolerance of low temperatures, the species offers other desirable characteristics, including ease of propagation in maturation facilities, higher fecundity than *P. vannamei*, and an attractive growth rate at lower temperature that could be significant in obtaining a second crop during the colder part of the year.

A ripe female *P. chinensis*. WSSV, HPV, and IHHNV have been reported in this species.

No domesticated lines

However, no domesticated lines of *P. chinensis* are currently available to U.S. shrimp farmers. Any such line would have to be free of excludable pathogens, as required by the United States Marine Shrimp Farming Consortium. Some of the viral pathogens on the consortium list (Table 1) have been reported in *P. chinensis*: White Spot Syndrome Virus (WSSV), Hepatopancreatic Parvovirus (HPV) and Infectious Hypodermal and Hematopoietic Necrosis Virus.

Table 1. Working list of "specific" and excludable pathogens of American penaeids and Asian penaeids (August 2001).

Pathogen Type	Pathogen or Pathogen Group	Pathogen Category[1]
Viruses	* Taura Syndrome Virus, a picornavirus	C-1
	* White Spot Syndrome Virus, nimaviridae (proposed new family)	C-1
	* Yellow Head Virus/Gill Associated Virus/Lymphoid Organ Virus, roniviridae (proposed new family)	C-1
	* Infectious Hypodermal and Hematopoietic Necrosis Virus, a systemic parvovirus	C-2
	** Baculovirus penaei, an occluded enteric baculovirus	C-2
	** Monodon Baculovirus, an occluded enteric baculovirus	C-2
	** Baculoviral Midgut Gland Necrosis Virus, a nonoccluded enteric baculovirus	C-2
	Hepatopancreatic parvovirus, an enteric parvovirus	C-2
Prokaryote	Necrotizing Hepatopancreatitis, an alpha protobacteria	C-2
Protozoa	Microsporidians	C-2
	Haplosporidians	C-2
	Gregarines	C-3

[1] Category with C-1 pathogens defined as excludable pathogens that can potentially cause catastrophic losses in one or more American penaeid species. C-2 pathogens cause economically significant diseases and are excludable. C-3 pathogens cause less serious disease, but should be excluded from breeding centers, hatcheries, and some types of farms.
* Recognized by the Organization International des Epizooties (OIE) as a "Notifiable Disease" in May 1999.
** Recognized by the OIE as "Other Significant Diseases" in May 1999.

Development strategy

With the collaboration of the Yellow Sea Marine Fisheries Research Institute in Qingdao, China and Arizona Mariculture Associates, LLC in Dateland, Arizona, USA, the University of Arizona's Aquaculture Pathology Group has begun an effort to develop specific-pathogen-free (SPF) stocks of *P. chinensis*.

The strategy involves an independent quarantine in which wild shrimp are held under strict control while they are examined for the diseases of concern. They are not released into breeding centers until an F-1 generation free of these diseases is produced (Fig. 1).

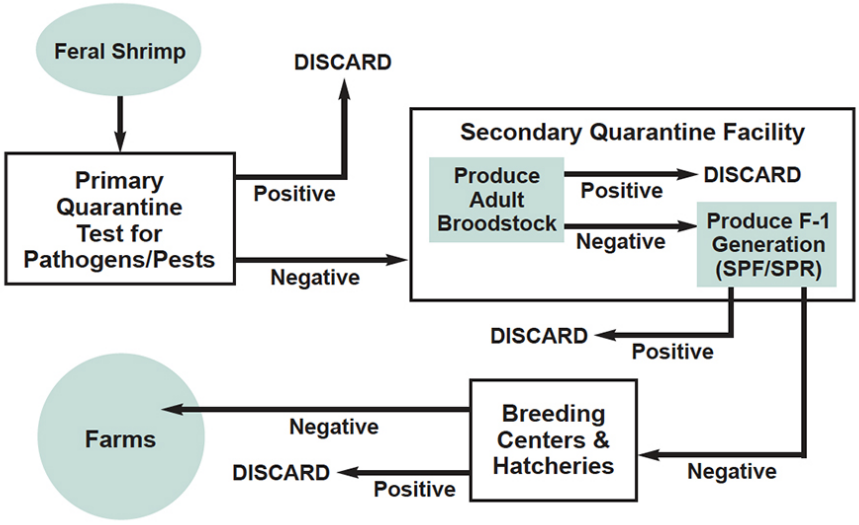

Fig. 1: Procedural steps for developing specific-pathogen free *Penaeus chinensis.*

Initial stocking

During mid-April 2001, a health evaluation was performed on wild female broodstock *P. chinensis* captured off the coast of Qingdao, China. A total of 36 gravid female shrimp were examined by polymerase chain reaction for the presence of WSSV and HPV, two of the most prevalent diseases affecting this species in China. About 7 percent of the shrimp showed WSSV and 2 percent tested positive for HPV.

Selection

Seven spawns, which were derived from seven different shrimp, were selected from females without disease. Nauplii from these seven shrimp were transported to the United States for continuation of the primary quarantine, larval rearing and postlarvae production at the University of Arizona's West Campus Aquaculture Center in Tucson, Arizona.

Quarantine and screening

The resultant postlarvae were kept under primary quarantine for about two months, while full disease-screening tests were performed. By the time the shrimp reached an average weight of 0.4 grams, no specific listed pathogens were detected. The shrimp were released into secondary quarantine to several collaborators in the United States.

Conclusion

The development and propagation of cold-tolerant and specific-pathogen-free penaeid shrimp stocks could expand aquaculture options in the United States by extending the growing season. A cooperative effort between institutions in China and the U.S. is now working to establish domesticated lines of *Penaeus chinensis*, a cold-tolerant species with additional positive production characteristics. An F1 generation of *P. chinensis* will be produced under secondary quarantine protocols, but before these shrimp are considered as a founder SPF population, they must be tested further.

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