

JIFSAN Good Aquacultural Practices Program

Hatchery Infrastructure and Operations



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Hatchery Infrastructure and Operations

This section discusses location and infrastructure hatchery requirements, as well as operational Good Aquaculture Practices (GAQPs). GAQPs effectively allow managers to evaluate all aspects of production to enhance production and product quality and safety. GAQPs are interrelated throughout all phases of production. Hatchery infrastructure includes location and requirements, while hatchery operations involve GAQPs.

Water quality requirements

Temperature:	28 – 32°C
DO	> 5 ppm
CO ₂	< 20 ppm
pH	7 – 8.3
Salinity	0.5 – 35 ppt
Chloride	> 300 ppm
Sodium	> 200 ppm
Total hardness as CaCO ₃	> 150 ppm
Ca hardness as CaCO ₃	> 100 ppm
Mg hardness as CaCO ₃	> 50 ppm
Total alkalinity as CaCO ₃	> 100 ppm
Unionized ammonia NH ₃	< .03 ppm
Nitrite (NO ₂)	< 1 ppm
Nitrate (NO ₃)	< 60 ppm
Total Iron	< 1ppm
Hydrogen Sulfide (H ₂ S)	< 2 ppb
Chlorine	< 10 ppb
Cadmium	< 10 ppb
Chromium	< 100 ppb
Copper	< 25 ppb
Lead	< 100 ppb
Mercury	< 0.1 ppb
Zinc	< 100 ppb

Hatchery Infrastructure

Site location should maximize distance from urban and agricultural activities, as well as river outflows. Hatcheries should be physically distant from production facilities. Hatcheries require access to standard industrial infrastructures to facilitate operations. Freshwater and seawater intake proximity to potential contaminants should be monitored under GAQPs. Be aware of agriculture, industry, population centers, river outflows, etc. Industrial infrastructure in the area should include sufficient power, roads, and airports.

Water quality is among the most critical of considerations during site selection. This is of equal importance to both fresh and saltwater resources. Listed are water quality ranges required during various hatchery production phases.

Hatchery water requires significant pre-treatment inclusive of solids removal, disinfection, carbon filtration, and binding of heavy metals.

Requirements

Seawater intake/treatment:

Well-point intake design

Settling chamber/sand filtration

Chlorine disinfection (100 ppm sodium hypochlorite for 10 minutes, and/or UV, Ozone)

Carbon filtration

Ethylene diamine tetra acetic acid (EDTA): to bind heavy metals (dosage is concentration dependent)

Freshwater intake/treatment:

Dependant upon source

Surface water similar treatment

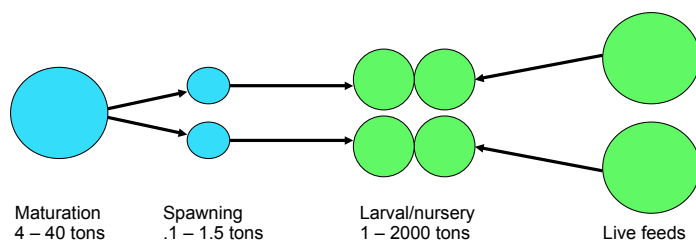
Hatchery design needs to be scaled in proportion to required post larvae (PL) production for growout. Species with seasonal availability of brood stock or spawning capabilities require larger infrastructure because facilities are not in continuous production. Hatchery sizing should be based upon species and production requirements: I.e., *P. monodon* seasonal production, *P. japonicus* year-round spawning.

Small: approximately 15 million PLs/year
3,500 m₂ hatchery footprint, and 600 – 800 tons water

Large: approximately 20 – 25 million PLs/year
5,000+ m₂ hatchery footprint, 1,000+ tons water

Hatchery Infrastructure Requirements

Hatchery components:



Systems: Quarantine, acclimation, maturation, spawning/hatching, larval/nursery, indoor live feeds.

Live feeds production is conducted in a separate area free of contamination. These live feeds are transferred to larval tanks as needed for feeding in the nursery. Live feeds algae/artemia should be about 20% of nursery capacity.

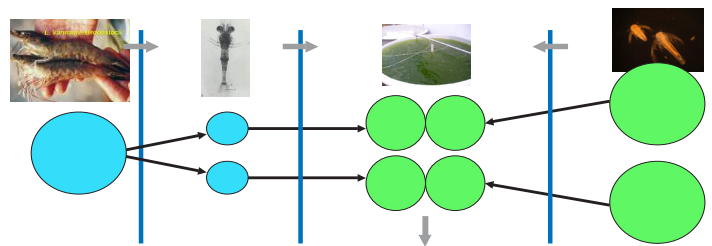
These recirculating system components are required to maintain optimal water quality parameters within the hatchery. These must be monitored and maintained on a daily basis.

Adequate space and appropriately equipped laboratory facilities are necessary for conducting standard laboratory analyses and feed preparation. In addition, facility security must be addressed from both an animal as well as human security perspective.

Recirculating system components

- Solids removal
- Biofiltration
- Sterilization (UV industrial standard)
- Aeration
- Thermal/photoperiod control
- Circulation pumps

Good Aquaculture Practices (GAQPs) begin during design of the hatchery facility. All hatchery production areas must be physically isolated from each other, with product and materials flowing only in the direction of highest to lowest biosecurity. Live feeds of water to nursery are acceptable, as well as internal water flow from spawning systems through nursery.



- GAQPs are designed to maximize production quality and safety. When designing a facility layout, proper influent water sterilization must be addressed. Movement of personnel and entry/exit disinfection is also of great importance. Footbath (200 ppm iodine) and hand dips (alcohol 70%) should be placed in all entry and exit locations.
- All equipment remains in its designated area and is sterilized in dips after every use. There should be no equipment crossover, all equipment should be sterilized in dips (100 ppm sodium hypochlorite for 10 minutes). All water from the hatchery is disinfected prior to discharge from the facility. All production component discharges are collected and disinfected (100 ppm sodium hypochlorite for 10 minutes) prior to discharge from facility.
- The quarantine area is where outsourced brood stock first enter the hatchery. Here GAQPs to maximize biosecurity are of utmost concern. These

Water filtered/sterilized

100 ppm sodium hypochlorite for 10 minutes

UV 9 X 105 uws/cm² for 60 minutes

Ozone 0.5 ug/ml for 10 minutes

include restriction of personnel access, appropriate entry/exit disinfection, personnel training and record keeping, validation of water pretreatment, imported brood stock SPF certification, disinfection and validation of equipment and brood stock diets, quarantine isolation (including sub-clinical screening for Listed Specific Pathogens via sentinel animals with stressors added and destruction and disinfection of all infected materials and subsequent complete quarantine disinfection), and finally, regular disinfection and drying of tanks, water and air lines.

Once validated as specific pathogen free in the quarantine area, brood stock are transferred to the maturation and spawning facility. Here, GAQPs are designed to maximize production biosecurity in the maturation and spawning facility. Maturation and spawning facility GAQPs include restriction of personnel access; appropriate entry/exit disinfection; personnel training and record keeping; validation of water pretreatment; validation of broodstock, egg, and equipment disinfection; regular disinfection and drying of tanks, water and air lines, and disinfection and validation of broodstock diets.

After spawning, the next production phase is the nursery. The GAQPs discussed here help maintain recommended biosecurity levels. From the nursery, post larvae are transferred to the production facility. In the nursery, the appropriate GAQPs to use are restriction of personnel access, appropriate

- entry/exit disinfection, personnel training and
- record keeping, validation of water pretreatment,
- disinfection and validation of larval live and
- weaning diets, maintenance of sentinel animals,
- validation of nauplii and equipment disinfection,
- and regular disinfection and drying of tanks, water,
- and air lines.

- The live feeds production facility is also
- maintained in a separate and biosecure area to
- minimize contamination of live feeds cultures.
- Live feeds are transferred as needed to the nursery.
- Restriction of personnel access, appropriate entry/
- exit disinfection and personnel training and
- record keeping are three of the GAQPs to use for
- personnel in this area. In addition, validation of
- water pretreatment, disinfection and validation
- of live feeds, validation of nauplii and equipment
- disinfection, and regular disinfection and drying
- of tanks, water and air lines are to be used on the
- equipment.

- To maximize environmental safety, all hatchery
- facility water effluent should be disinfected (100
- ppm sodium hypochlorite for 10 minutes) prior
- to discharge. Complete disinfection of quarantine
- brood tank discharge is mandatory!

References

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