

CHAPTER 13

Possum Kingdom State Fish Hatchery *Prymnesium parvum* Management Plan

Introduction

Possum Kingdom State Fish Hatchery is located in Palo Pinto County, Texas below Possum Kingdom Lake, the main source of water for the hatchery. The lake water comes to the hatchery through a 4.5-m (14.8 ft) deep intake valve (shallow water) or an 18-m (59-ft) deep intake valve (deep water). Additional water for the hatchery is provided by a well. Effluent water from ponds and indoor culture units can be reused in ponds after filtration by a re-circulation system. Culture units include 38 plastic-lined ponds (9.4 ha or 23.2 acres) and indoor raceway, 48-McDonald jar egg incubation system and six holding troughs. The incubation system can be operated as flow-through or closed system with filtration, heating and cooling capabilities. All holding troughs have flow-through capabilities but only four have re-circulation capabilities. The indoor re-circulation systems are equipped with an ultraviolet sterilizer for treating water infected with *P. parvum*.

Fish species cultured at this hatchery include striped bass *Morone saxatilis*, palmetto bass (female striped bass × male *M. chrysops*), channel catfish *Ictalurus punctatus*, smallmouth bass *Micropterus dolomieu*, koi carp *Cyprinus carpio*, bluegill *Lepomis macrochirus*, crappie *Pomoxis* spp., rainbow trout *Oncorhynchus mykiss*, and walleye *Stizostedion vitreum*.

P. parvum was first confirmed in Possum Kingdom Lake in 2001 following extensive toxin-related fish kills in the reservoir. This alga was found in our hatchery ponds in 2002 when ponds were filled with lake water following a renovation in 2001. This alga consistently appears to bloom during colder months (January-March), and blooms are usually associated with fish kills. During summer months, when temperatures exceed 28° C, the alga usually disappears or occurs in very low density and toxin-related fish kills are rare. Spring and fall appear to be transitional periods when *P. parvum* densities fluctuate and fish kills are sporadic.

Since 2001 staffs at Possum Kingdom and Dundee hatcheries in cooperation with the Hatcheries Golden Alga Task Force have been developing strategies for controlling the alga. The strategies that seem to work best for this facility are formulated into the management plan described below. As more effective or efficient strategies are developed this management plan will be updated.

***P. parvum* Management Plan**

This facility has adopted a prophylactic approach to managing *P. parvum* with the goal of elimination the alga from culture systems or keeping densities as low as possible. Therefore, if a single cell is detected in a water sample (i.e., 2,000 cells/mL), the infected pond is treated to control the alga. Before treatment, the un-ionized ammonia nitrogen (UIA-N) or Cu^{2+} concentration in the pond is determined and the difference needed to achieve the target treatment level is provided by applying ammonium sulfate or copper sulfate.

Brood fish Holding (striped bass or white bass)

- Fill indoor holding troughs with well water and operate as closed system
 - Check for the presence of *P. parvum* to be sure the system is free of the alga.
 - If no cells are present there should be no need for further monitoring.

Jar Rack Egg Incubation

- Fill egg incubation system with well water and operate as a closed system.
- Check system water for *P. parvum* cells.
 - If cells are present treat with UV radiation.
 - If no cells are present there should be no need for further monitoring.

Spring Fry Rearing (striped bass, smallmouth bass, koi carp, etc)

- Clean all pond bottom sediments 12-14 days before fry stocking.
- Begin filling ponds 11 days before fry stocking with deep lake water.
- Treat ponds with ammonium sulfate to achieve UIA-N level of 0.3 mg/L 6 days before stocking.
- Check ponds for presence of *P. parvum* 4 days and 1 day before fry stocking; treat if cells are present.
- For striped bass conduct 24-hour survival tests on all ponds before stocking.
- Check all ponds with fish for *P. parvum* once per week.
 - If *P. parvum* is present check affected ponds twice per week
 - Treat ponds containing *P. parvum* with ammonium sulfate to achieve UIA-N level of 0.3 mg/L if UIA-N is low and temperature is 15°C or higher.
 - Treat ponds containing *P. parvum* with copper sulfate (or Cutrine-Plus) to achieve 0.75 mg Cu^{2+} /L if temperature is less than 15 °C.

Spawning Ponds (smallmouth bass)

- Fill ponds with deep lake water
 - Check ponds for *P. parvum* once per week; when *P. parvum* is present check twice per week.
 - If *P. parvum* is present treat with ammonium sulfate to achieve 0.4 mg/L UIA-N.

Summer-Fall Fingerling Rearing (channel catfish and koi carp)

Management of *Prymnesium parvum* at Texas State Fish Hatcheries

- Begin to fill ponds with lake water 7 days before stocking.
- Check ponds for *P. parvum* 2 days before stocking
 - If *P. parvum* is absent continue to fill ponds according to culture guidelines.
 - If *P. parvum* is present treat to raise UIA-N to 0.4 mg/L if temperature is 15 °C or higher, or treat to raise Cu²⁺ to 0.75 mg/L if temperature is below 15 °C.
- Check ponds for toxin 1 day before stocking and select ponds with no toxin for stocking with fish.
- After stocking fish monitor pond temperature and pH daily and *P. parvum* once per week.
 - If pond temperatures are consistently above 28°C.
 - No treatment should be necessary but monitor *P. parvum* twice per week.
 - If pond temperatures are 15-28°C.
 - Monitor UIA-N and treat to raise UIA-N to 0.4 mg/L if *P. parvum* present.
 - If pond temperatures are below 15°C.
 - Monitor Cu²⁺ and toxin, and treat with Cutrine-Plus to raise Cu²⁺ to 0.75 mg/L if toxicity is present.

Winter Holding Ponds

- Monitor ponds for *P. parvum* once per week or twice per week if *P. parvum* present.
 - If water temperatures are up to 15°C treat to raise Cu²⁺ to 0.75 mg/L if *P. parvum* is present.

Raceway or Trough Culture (rainbow trout and channel catfish)

- 8 days before fish stocking fill with lake water and check for *P. parvum* cells.
 - If *P. parvum* is absent stock fish and operate raceway/trough as flow-through.
 - If *P. parvum* is present perform bioassay to test toxicity.
 - If lake water is not toxic stock fish and operate raceway/trough as flow-through.
 - If lake water is toxic do not use raceway/trough (Go to Trout Pond Production).

Trout Pond Production

Use ponds for trout production or holding, instead of indoor raceway or troughs, when lake water is toxic.

- 8 days before stocking fill ponds with lake water.
 - Treat with Cutrine-Plus to raise Cu²⁺ level to 1.0 mg/L if temperatures are less than 15°C.
 - Treat with ammonium sulfate to raise UIA-N to 1.0 mg/L if temperatures are 15°C and higher.
- 3 days before stocking check for *P. parvum* cells
 - If *P. parvum* is present treat as above.
- 1 day before stocking check for *P. parvum*.
 - If *P. parvum* is present test for toxicity.
- Stocking day
 - Stock only ponds with no toxicity.

Management of *Prymnesium parvum* at Texas State Fish Hatcheries

- After stocking
 - Check for *P. parvum* twice per week and if present treat as described above.
- If lake conditions improve harvest fish (e.g., trout) and move to indoor raceway.

Fish Harvest

- At harvest check incoming lake water for *P. parvum*
 - If *P. parvum* is absent harvest fish using lake water
 - If *P. parvum* is present perform bioassay: if negative harvest fish using lake water; if positive use well water.
 - Fish leaving the hatchery must be rinsed in well water before loading into hauling unit.
 - Fish to be transferred between hatchery culture units need not be rinsed with well water.

Fish Transportation

- Fill hauling unit with well water and check all compartments for *P. parvum* after loading fish (Note: all fish leaving the hatchery must be rinsed in well water before loading).
 - If *P. parvum* is absent deliver fish according to hatchery guidelines.
 - If *P. parvum* is present drain out some water, refill and re-check for *P. parvum*. Repeat until no *P. parvum* is found.
 - Upon return to the hatchery, disinfect hauling unit with 10% chlorine bleach.
- Use *P. parvum*-free lake water or well water to transfer fish between culture units on the hatchery.

Monitoring Sites

- Monitor *P. parvum* in lake water at the dam, hatchery intake water, and ponds and indoor culture units in use.