A Virtual Tour of the University of Maryland's Crane Aquaculture Facility.

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Abstract

The Crane Aquaculture Facility has a long history, starting nearly twenty years ago as a flow through facility at Baltimore Gas and Electric's Crane power plant. Today we are a small recirculating aquaculture system on the University of Maryland's College Park Campus. It is this College Park facility that will be the focus of your tour. The University of Maryland's Crane Aquaculture Facility (UMCAF) is a small research facility where our main focus is studying stress physiology in striped bass. UMCAF consists of three separate culture systems and an isolated smaller quarantine system. The tour will include design criteria, a description the systems and all their equipment, and a discussion of management issues.

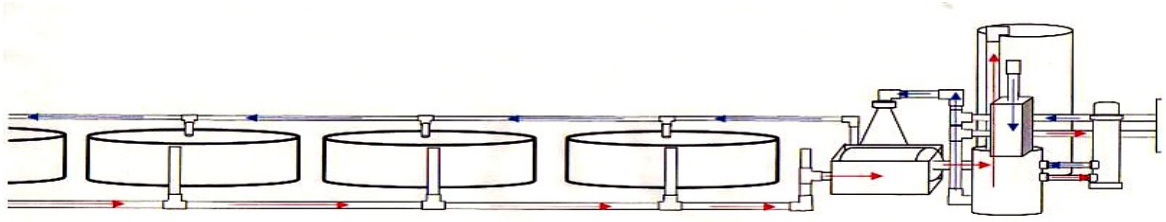
History

The Crane Aquaculture Facility (CAF) was originally built in 1982-1983 by Baltimore Gas and Electric (BGE), was located at the C.P. Crane power plant in Baltimore County, Maryland, and became operational May 1, 1983. The facility's stated purpose was to conduct aquaculture and economic research to determine the feasibility of producing striped bass using intensive culture techniques and discharge water containing waste heat from the adjacent electric generation facility.

Two years after the aquaculture research project was initiated, its mission was changed to help in the restoration of the depleted Chesapeake Bay striped bass population. Over the next five years, during the moratorium on striped bass fishing in Maryland, the CAF cooperated with state and federal governments in the restoration effort, producing over one million striped bass fingerlings for research and was designated by the Maryland Department of Natural Resources as the hatchery to produce upper Chesapeake Bay striped bass stocks (Choptank River, Nanticoke River, etc.). When the moratorium was

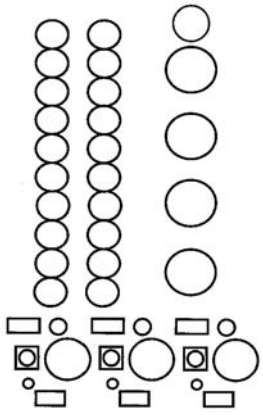
lifted in 1990, a consortium was formed between BGE, the Maryland Department of Agriculture's Office of Aquaculture and Seafood Marketing, and the University of Maryland for the purposes of domestication and genetic improvement of striped bass for the aquaculture industry.

In 1997, due to economic recession, financial support from both BGE and the Maryland Department of Agriculture abruptly ended. The striped bass aquaculture research program was supported by grants and operational support was temporarily provided by the University of Maryland Agricultural Experiment Station. Efforts were immediately initiated to relocate the facility and its research program to the University of Maryland. A building on the University of Maryland's College Park campus was modified to support a recirculation aquaculture system capable of maintaining significant striped bass populations over a two and one half year period, and the University of Maryland – Crane Aquaculture Facility became operational with the transfer of domestic and genetically selected striped bass into the new research facility in January of 2002. The research focus remains domestication and genetic improvement and its current emphasis includes efforts to conserve unique genetic material from domestic improved strains through cyropreservation and the evaluation of stress responsiveness as a selection marker for selective breeding of striped bass and white bass.



Design

a. Criteria



UMCAF was built to facilitate the research needs of Dr. Curry Woods of the University of Maryland's Department of Animal and Avian Sciences. His research interest centers around striped bass nutrition, reproduction and physiology. With the need for both experimental tanks and broodstock tanks and the potential for maintaining significant biomasses, UMCAF was designed with large biofilters akin to something that might be found in the aquaculture industry.

b. Description

UMCAF was designed with three nearly identical modules. Two of the modules are termed experimental and consists of 10 six foot in diameter tanks. The third module consists of 4 ten foot in diameter tanks and is used to house broodstock.

Apart from an increased flow rate to the larger ten foot tanks all modules have the same filtration / heating / chilling / etc equipment.

Below are the values used by Glenn Snapp of Water Management Technologies when sizing the equipment for UMCAF:

	Experimental 6Ft Systems	Broodstock 10Ft System
Rearing volume (m^3)	20	35.6
Number of tanks	(10) 6ft	(4) 10ft
Mean temperature (C^o)	20	20
Biomass (kg)	1199	2131
Feeding rate (% body weight/day)	2.67	1.5
Feed protein content (%)	40	40
Flow rate thru culture tanks (gpm)	175	262.5
Flow rate thru biofilter (gpm)	149	149
Biofilter volume (m^3)	4	4
Boifilter surface area (m^2)	2000	2000

c. Equipment

1. **Drumfilters:** Hydrotech 801. 2. Oxygen cone - WMT W350 (350 gpm).

3. **Biofilter:** Moving Bed Biofilter (MBB) 5' dia x 11' deep w/ m2 surface area.

4. **Foam fractionator:** RK2 2400.

5. **Heater:** Process Technologies 8 kW.

6. **Chiller:** Aqualogic 7-1/2 Hp heat pump.

7. **Ozone generator:** Pacific Ozone G23.

8. **Oxygen generator:** Air Sep AS12.

9. **Bulk liquid tank:** 500 gallon.

10. **Alarm system:** Allen Bradley SLC 500 w/ RSView HMI (Human Machine Interface).

11. **Pumps:** Preformance Pro 2 Hp PE pump with 316 SS hardware and shaft.

Management

Management of UMCAF is dependant on the biomass on hand at any given time and because we are a research facility this can vary greatly.

a. Water quality
   Various water quality parameters are monitored at UMCAF. Dissolved oxygen, temperature and pH are taken daily with calcium, salinity, ammonia, nitrite and nitrate being run weekly.

b. Water usage
   Water turnover at UMCAF is dictated by the nitrate level and is regulated by adjusting water flow out of the foam fractionator. Nitrate level is never allowed to exceed 100 ppm.

c. Alarm system
   The alarm system at UMCAF consists of three components, Rockwell's, "RS-View32" software, Windows XP's, "Remote Desktop Connection" and Raco's, "Chatterbox". RS-View32 monitors, power, dissolved oxygen, temperature, pumps, and drum filters. If there is a problem an auto dialer ("Chatterbox") calls a staff member. Staff can also monitor operations at home by logging into the UMCAF computer through Windows XP software (Remote Desktop Connection).

d. Quarantine
   Incoming fish are quarantine for a two month before being brought into UMCAF. During this time, a sub-sample of the incoming fish is tested for pathogens. Dr. Anna Baya of the Maryland Department of Agriculture's Animal Health Diagnostic Lab performs these tests.

Laboratory

Attached to the aquaculture facility is a dry laboratory (600 ft^2) were analytical equipment for conducting physiologic and cryogenic study and analyses are maintained. Research equipment includes but is not limited to: vapor pressure osmometer, controlled rate freezer, ELISA plate reader, protein analyzer, chloridometer, videomicroscopy equipment, refrigerated centrifuge, computers, etc..