

Mariculture at TAMUG

Academic Years 2012 and 2013

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Training



Learning opportunities at TAMUG in marine aquaculture are accomplished through course offerings, such as Mariculture (MARB423) with a strong emphasis on laboratory practices at the Sea Life Center, and through the Mariculture Research Fellowship.

1

Biosecurity



One cornerstone of aquaculture is biosecurity. Through proper management and sound system design, the facilities at TAMUG help prevent the spread of disease and pathogens within these facilities, and the introduction of exotic species to the wild.

2

Research



Both the Mariculture Lab at Sea Life Center, and the Aquatic Quarantine Facility at the Wetlands Center were designed to conduct research of aquatic organisms under strictly controlled conditions.

3

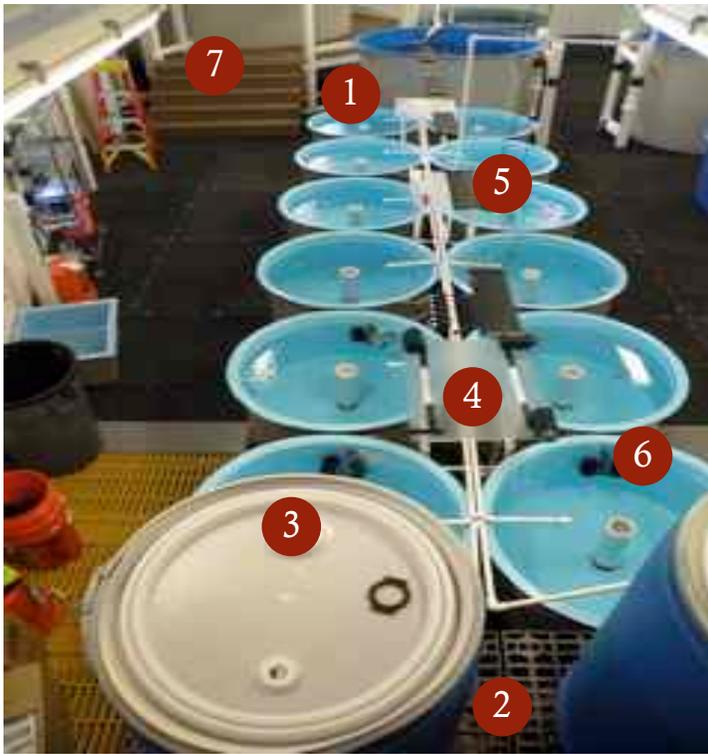
Department of
Marine Biology



Why marine aquaculture?

Global production of fish from aquaculture has grown substantially in the past decade, reaching 52.5 million tons in 2008, compared with 32.4 million tons in 2000. While aquaculture continues to be the fastest-growing animal food producing sector and currently accounts for nearly half (45.6 percent) of the world's food fish consumption, compared with 33.8 percent in 2000 (FAO 2010), the relative contribution of US aquaculture has failed to grow at the same pace in spite of the large potential of this sector. Similarly, biodiesel production from cultured marine microalgae represents a renewable and carbon neutral alternative to petroleum fuels (Chisti 2007), and the US is poised to attain leadership in that sector. However, future growth in both food and biofuel production requires trained personnel.

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The Mariculture Lab setup consists of two modular recirculating systems, each consisting of six circular tanks, sump, activated carbon filtration, UV disinfection unit, foam fractionator, chiller, heater and biofilter.

Culture of Model Species



Two species currently cultured at the mariculture lab are the sheephead minnow (*Cyprionodon variegatus*) and the inland silverside (*Menidia berylina*). Both species are capable of completing their life cycles within three months such that the mariculture students can mate, produce eggs, and raise larvae and juveniles to adulthood during a semester, using the scaled down methodologies employed in commercial aquaculture operations. These two species are commonly utilized in ecotoxicology laboratories, and thus the learning experiences acquired in the mariculture lab often translate into employment opportunities in the private and government sectors after graduation.

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Training of students in mariculture methods is accomplished at the new Mariculture Lab setup at the Sea Life Center.

1. The mariculture lab setup for MARB323 includes two complete replicate systems, each consisting of six *circular tanks*. Water in these systems is separate from the main recirculating system at the Sea Life Center, enabling full control of water quality parameters. Since the two systems are independent from each other, different environmental conditions can be setup according to the experimental needs .
2. Water from each system is returned by gravity flow to a *sump*, located below ground level, where mechanical (mesh) and chemical filtration through carbon filtration and foam fractionation is conducted. UV irradiation is carried to destroy waterborne disease agents.
3. Water pumped from the sump is sprayed to the top of *biofilter* column containing filter media allowing efficient degassing and denitrification of wastewater prior to returning to the culture tanks.
4. Each tank is fitted with an automated feeder that can be programmed to vary the amounts of feed dispensed and the frequency of feeding (up to three times per day).
5. LED lamps controlled with timers allow for modification of the duration night and day cycles useful when controlling the reproductive activities of fish under culture.
6. Supplemental aeration to each tank is attained with airlift pumps that also provide additional mechanical and biological filtration. These systems provide redundancy to the main circulation system, and are intended as a backup in case pump failure affects the main circulation system.
7. The mariculture setups share the air quality conditions of the Sea Life Center. Ambient temperature can be maintained constant relative to the surrounding air. However, each system is fitted with a water heater and a chiller that can increase or decrease water temperature relative to ambient.



Quarantine Facility

Promoting biosecurity

The Quarantine Facility, located at the Wetlands Center Pavilion, is a central component of animal care at TAMUG by guaranteeing the aquaculture biosecurity of both teaching and research experimental setups. Since the facility is physically removed from the Sea Life Center, animals can be safely held prior to their introduction to the recirculating systems in that center. The Quarantine Facility allows full control of environmental variables, and different water quality conditions can be setup for independent replicates systems. Systems are modular and can re-arranged according to the requirements of a specific project. Water to the facility is pumped from Galveston Bay and treated (see below) prior to use for animal rearing. The availability of this facility is particularly useful for those field studies that require short-term monitoring of wild-caught specimens prior to release to the wild. The environmental variables at the facility can be monitored online (see inset bottom right) and emergency calls via e-mail and phone (i-phone) can be transmitted if conditions deviate from specified ranges. Video monitoring of the facility can be monitored in real-time or recorded. Streamed video can be viewed from any Campus location via PC at <http://wetlandscamera.tamug.edu>.

Water filtration

Seawater for the Quarantine Facility is pumped from Galveston Bay and then subjected to mechanical filtration through a sand filter followed by a series of cellulose filters decreasing from 100 microns to 10 microns. Water is then UV irradiated to kill disease agents, microalgae, and wild fauna.



Additional features

- The mariculture lab at the Sea Life Center provides learning opportunities for both Mariculture (MARB 423) students, as well as for recipients of the Mariculture Training Fellowship.
- A total of \$16,000 is allocated to the Mariculture Training Fellowship. Fellows (undergraduate) conduct mariculture-related research under the direction of a faculty member at TAMUG.
- Water quality conditions (salinity, pH, dissolved organic compounds, and temperature) are monitored and logged electronically at the Quarantine Facility. Real-time video of this facility can be monitored and is recorded for later viewing.
- All laboratory animals, whether used for teaching or research at the Mariculture Training setup or at the Quarantine Facility, follow strict Animal Use Protocols (AUPs) monitored by the Institutional Animal Care and Use Committee (IACUC).



Electronic environmental monitoring

<http://165.95.48.247/status.sht>