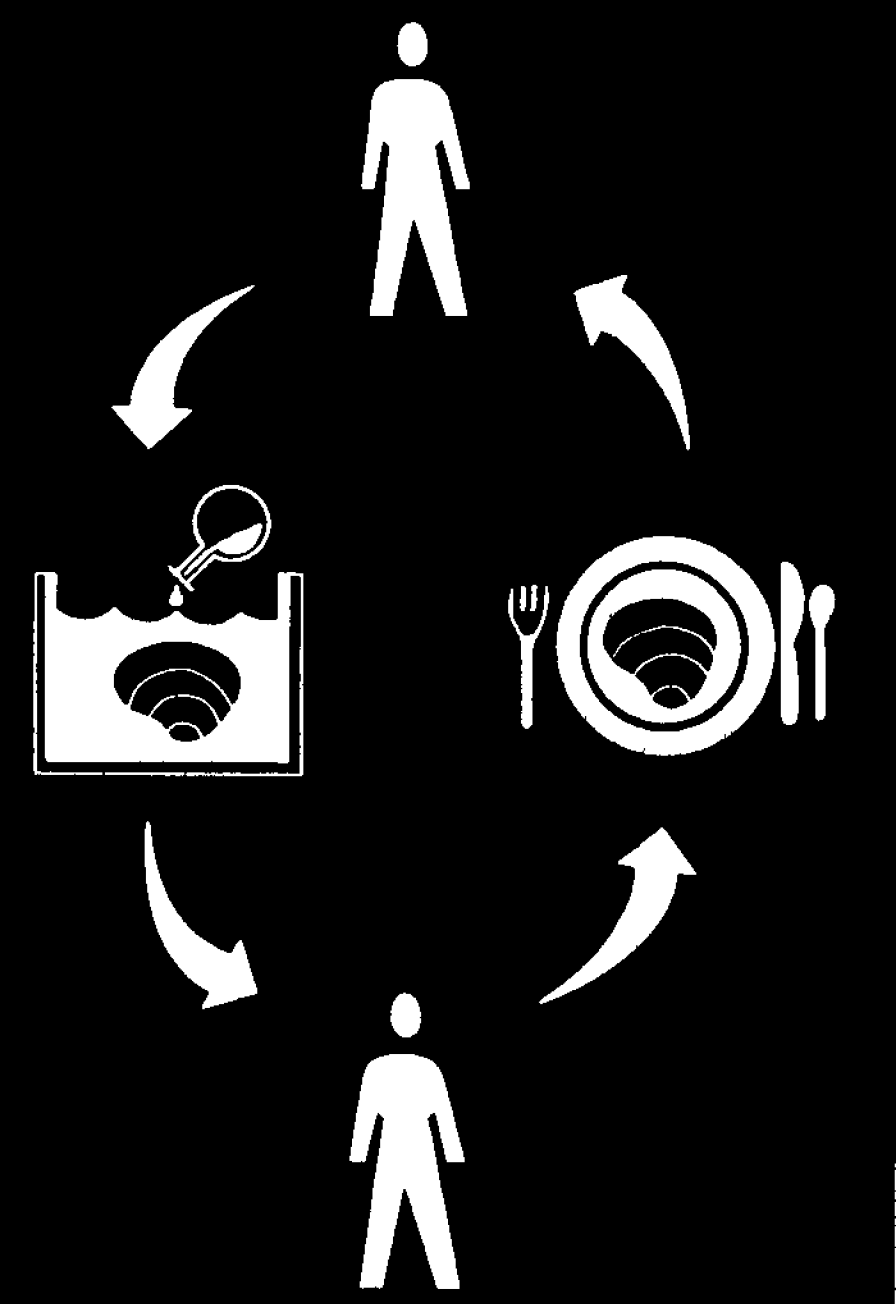
A Closed Cycle Mariculture Laboratory

A SEA GRANT PROJECT



College of Marine Studies University of Delaware

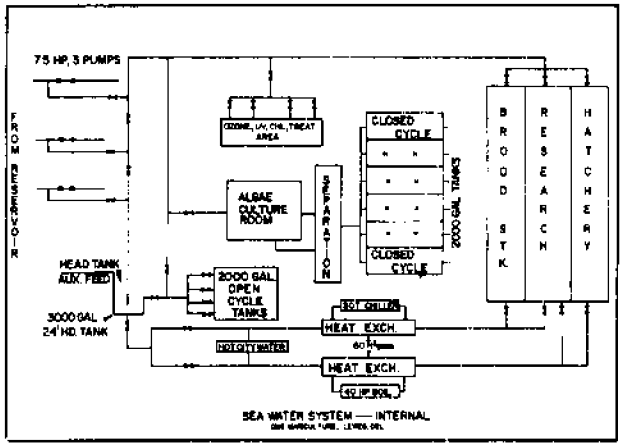
WHY MARICULTURE?

For centuries, man has farmed the land, developing highly sophisticated agricultural and animal husbandry techniques. Yet today, he remains primarily a "hunter" at sea. The University of Delaware's Mariculture Laboratory, located at the College of Marine Studies' Field Station in Lewes, Delaware, is an experimental effort to determine whether it is technologically and economically feasible to raise marine animals, specifically clams and oysters, from birth through market size in a controlled environment.

THE MARICULTURE LABORATORY

Seawater Systems

Two flow-through systems provide water for brood and hatchery areas as well as for ancillary research projects. A dual-pump, dual-feed, 400 gpm external seawater system delivers sea water from Delaware Bay to two 125,000-gallon settling and storage tanks.



Internally, a dual-pump, head-tank system delivers and distributes up to 400 gpm of a combination of heated, cooled, and ambient temperature seawater.

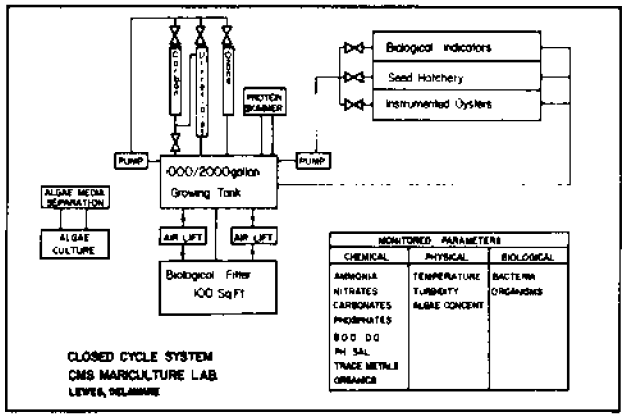
The growing area is serviced by recirculating seawater systems that are plumbed into biological filters.

First Floor

There are two controlled temperature rooms, one for brood stock maintained at 15°C and one for spawning, larval rearing, and setting maintained at 28°C. In the growing area, growing tanks are supported above large tanks that house the biological filters.

Second Floor

An algae culture room is maintained at 16°-18°C. Thirty-nine 200-liter cultures, 36 18-liter carboy cultures, and numerous flask and test cultures are housed there.



THE MARICULTURE CYCLE

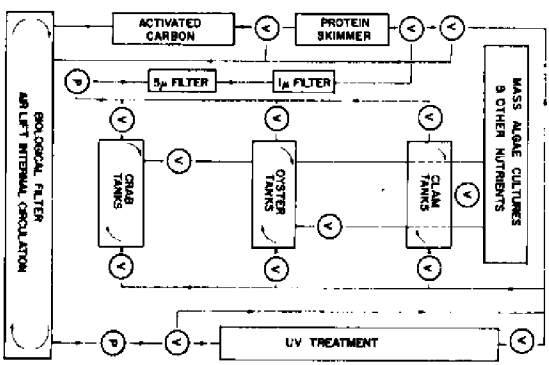
Clams and oysters normally spawn in the summer months. At the Mariculture Laboratory, spawning can be induced at any time of the year by transferring brood stock from holding tanks to the spawning room. There, the constant temperature of 28°C is warm enough to cause the shellfish to release eggs and sperm into the water.

From the union of sperm and egg comes the first stage of development, free-swimming larvae. After about three weeks of growth and

maturation, the larvae settle to the bottom where they "set." In nature, oysters set permanently; the substrate to which an oyster attaches is called "cultch." Clams also set when they are young, but the set is not permanent, since clams do move about on the ocean floor.

At the Mariculture Laboratory, the goal is to raise cultchless oysters, since these have a higher market value as cocktail oysters, with more perfectly shaped shells. To achieve this, the oysters are allowed to set on thin sheets of plastic, from which they are later removed.

After setting has taken place, the oysters or clams are transferred to the growing tanks, long plywood boxes built above a concrete block tank that houses the biological filter. The young shellfish are fed algae raised in the algae culture room. Eight experimental diets of four algal species are being tested to determine which supports optimum growth.



The environment for the oysters and clams is supplied by a recirculating seawater system from which waste material is continuously removed by the biological filter. This controlled environment recirculating system offers an economical means of maintaining the optimum temperature range, since the seawater need be heated only upon its initial arrival from the Delaware Bay. From then on, the water is maintained at the controlled temperature of the growing room.

WHY IS MARICULTURE IMPORTANT?

Expanding world populations make increasing demands on existing food supplies. Mariculture may be part of the answer to providing a high-protein diet for large numbers of people, but many problems of economic feasibility must first be solved.

The University of Delaware Mariculture Laboratory is the only demonstration project in the nation that is raising oysters and clams from egg to market in a controlled environment recirculating seawater system. It was designed by an interdisciplinary team of biologists, engineers, and chemists who were aided by a computer analysis of variables in terms of cost savings.

Innovations are continually being introduced in an effort to further refine and economize the process. While the Mariculture Laboratory has not been in operation long enough to raise shellfish through a complete life cycle, significant progress has been made. For example, researchers for the first time have succeeded in raising clams from spawning to seed size in a recirculating system.

The Mariculture Laboratory is supported under a grant from the Sea Grant Program of the National Oceanic and Atmospheric Administration in the Department of Commerce. The building that houses the Laboratory is loaned to the University by the Fish Products Company of Lewes, Delaware.