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Principles of Animal Husbandry for Shellfish Culturists

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Introduction

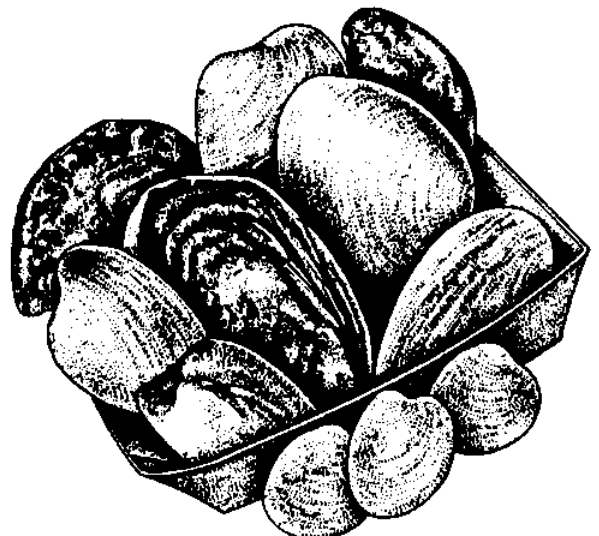
The cultivation and farming of shellfish shares many principles with animal husbandry and crop agriculture. From preparing grounds to planting seed, to monitoring the environment and ensuring plentiful food, shellfish farmers have to manage their crops wisely if they expect to rear healthy animals and run a profitable operation.

For over a hundred years, land farmers have sought information from the state or provincial agriculture schools on the latest farming or husbandry techniques. This partnership has increased harvests and produced stronger, healthier animals. Researchers and extension personnel can make specific recommendations about fertilizers, pesticides, nutrition and feed management, housing, and marketing.

In some areas, shellfish culture has become a significant part of the mission of many agriculture schools. Research and extension personnel work with water farmers just as the county agricultural

agents work with the land farmers.

In the last twenty years, aquaculture has grown exponentially. This has been especially true for the fish growers. Universities have been strong partners in this growth, and faculty can usually make specific recommendations on pond design, feed management, health and disease management, handling and transport of fish. Unfortunately, it is not always the same for the shellfish growers. Cultured clam and



oyster growers lack much of the specific information which they may need to insure optimum crop growth. Site specific conditions preclude hard and fast recommendations and often advisors can be at a loss for a precise answer to a problem. There are still many unanswered questions which will require extensive research, but until those questions are answered completely, shellfish growers must rely on the basic principles of animal husbandry to make the most of their growing area and season. This fact sheet aims to direct the shellfish grower to think more like a cattleman or horse breeder in order to understand what parameters affect this watery crop.

Basic Conditions

As with any organism being grown under controlled conditions, there are basic parameters which must be acknowledged. Whether the animal is a steer, hog, chicken, clam, oyster, scallop, or mussel, there are certain conditions which support a healthy organism and its growth, or conversely, if ignored lead to decreased production, disease, and eventually mortalities.

SUNLIGHT: Shellfish rely on sunlight only as it relates to photosynthesis which produces their food. Coupling light with nutrients and carbon dioxide make the phytoplankton bloom on which the bivalves feed. However, it is also photosynthesis which spurs much of the algal fouling on the nursery and growout equipment. That's why raceways and upweller tanks are often covered, and growout equipment cleaned of macro-algae.

WATER: For farm animals, ample potable water is integral to life. It ensures normal metabolic functions and the health of the animal. In shellfish culture, water not only provides those functions, but is the medium through which food and oxygen are supplied, and waste removed. Shellfish left in small amounts of standing water may soon use up the available oxygen and food, and die.

FOOD: Nourishment for any organism is essential. Shellfish need copious amounts of various algae to survive and grow. From the larval stage to a chowder, the amount and specific size needed varies, but never ceases. Clams and oysters like to feed with a flow of algae going past them. In fact, clams feed better with moving water containing lower concentrations of algae than in stagnant water overpopulated with algal cells. Once shellfish are planted in the field, they grow at the mercy of nature. However, when they are in the hatchery or land-based nursery, it is the culturist's responsibility to ensure sufficient feed. Supplying a good flow of water is essential to deliver enough algae for greatest growth. Flow and food are integrally linked.

Some research indicates that clams grow effectively when they receive water at 5 to 10 times the volume of seed in water per minute. That means that as seed grow, the water pumping requirements for the hatchery or nursery operator will increase as the original stocking of shellfish grow.

In an upweller, adequate flow is necessary to insure growth, but the flow of water would be considered too high when the seed are bouncing off the screen on the bottom of the upweller silo. In a raceway, water dropped in at one end must have enough algae to feed all the shellfish along its length. Therefore raceway length must not be so long that the seed at the end starve. A manageable length is no longer than 30 feet, with adequate flow.

WASTE REMOVAL: The result of all metabolic processes is waste. Neither farm animals nor shellfish want to live surrounded by their own waste products. Efficient removal through scheduled cleaning of upwellers or raceways with abundant water flow through the system is critical. Rising concentrations of nitrogenous wastes can impact growth and survival of the small seed.

SPACE/STRESS REDUCTION: Anyone who commutes on the subway could easily understand this concept. Over-crowding and lack of space for extended periods of time will ultimately affect any

living organism. Chicken farmers know the carrying capacity of their coops, and more importantly, know what will happen when that capacity is exceeded. Carrying capacity can be defined as the maximum biomass or quantity of an organism that can be grown in an area without impairing growth rate or survival.

Shellfish growers must not overstock upwellers or raceways. A specific recommendation is hard to make, since every site is different. The density will rely on trial and error over a few seasons. Experimentation with stocking densities, evaluating growth differences at varying rates and recording results for analysis will fine tune appropriate volumes. It is better to understock than overstock. Even in the field growout, over-concentration of shellfish in bottom plantings, in growout containers, or even in the estuary itself can lead to slowed production or reduced spawning.

TEMPERATURE: Anyone who has grown any shellfish can attest to the impact of low water temperatures on growth, and sometimes survival. As the water temperature decreases, shellfish will reduce their metabolic rate. At low temperatures, they will cease growth altogether. Very small cultured seed should not be forced into outside upwellers on ambient water before the water temperature is over 15°C (about 60°F). This limit will also allow for adequate natural phytoplankton production.

High water temperatures can also cause death. All shellfish have an upper temperature that is lethal to them, and that must be addressed in placing or covering of outside upwellers and raceways.



“An Atypical Clam Farm”

DISEASE PREVENTION: This is a function of all the other parameters. Sufficient space, adequate food supply, efficient waste removal, and absence of stress will help ensure a healthy crop. Also, operators should store broodstock separately, and if possible keep different spawns or crops separate as they grow.

MANAGEMENT: The first three letters of this word are the key. If the grower ignores his crop, it will go away. More crops have been lost because of too little management, than too much. The culturist must care for his "live stock" or there will be none.

FINAL COMMENTS

Growers in the hatchery, nursery and growout phases of shellfish culture should design their specific systems for less than perfect years. Sometimes one year will yield great production because everything was just right. The parameters of that year should not be the benchmark against which carrying capacity is based. More water flow and more space than necessary is a good management practice that will yield better returns.

When the shellfish farmers understand that his crop of seed is much more than little shells with squishy guts inside, and realizes that it is a living organism with essential requirements for maintaining life and growth, greater success will be theirs.

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