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STOCK AND YEAR CLASS SEPARATION

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A fish hatchery operation that rears brood fish for eggs, replacement stocks, and fish for stocking is more complex than an operation which produces only fish for stocking. A combination broodstock-production hatchery may have many species of fish, comprised of many year classes. The placement of various species and sizes of fish within the hatchery system can be of major importance because of water quality demands, possible disease transmittal, and the volume of waste generated.

All salmonids, large and small, require water that is high in oxygen, moderate in temperatures, and low in metabolic waste levels (Laio, 1971). Small fish and adult fish generally do not tax water quality as much as fish approaching release or market size because of the lower densities (in kilograms per cubic foot) involved. Among species, fish have different requirements for water quality. Brook trout cannot tolerate poor water conditions, rainbows are more tolerant and brown trout are the most tolerant. As fish size increases, so does their tolerance for "used" water. However, attempts to rear broodstock in re-used water in a Michigan hatchery resulted in increased disease problems, mortalities, inferior eggs, and prolonged spawning. Rainbow and brown trout broodstock being held in raceways below 500,000 production rainbows experienced mortalities of 1% per day or greater. After moving these fish into ponds above the production fish, losses began to decrease and declined to less than 1% per month.

While pathogen-free and/or disease-resistant fish should be the goal, progress toward this goal is often slow. Disease-free fish and eggs are available from certified sources. Eggs from diseased fish can be disinfected with iodophors or water-hardened in a solution of erythromycin phosphate to control pathogens for which there is no vertical transmission. These measures are helpful when attempting to eradicate disease organisms, but they usually prove fruitless if diseased fish are present in the hatchery water supply or if "carrier" fish are present in the hatchery system.

Separation or isolation of fish stocks is one way to prevent the introduction or spread of diseases within a hatchery. If new disease-free stocks are introduced into the hatchery, or if stocks resulting from disinfected eggs and future brood stock are placed below mature, disease- carrying fish, contamination of the new stocks will occur and the disease will continue to be present in the hatchery. Isolation of infected fish from future brood stock. production fish, and eggs should help to prevent the spread of disease within a hatchery.

Depending on hatchery design, complete separation can be very simple or almost impossible to achieve. Since most fish pathogens require a host and are waterborne (Wood 1968), the placement of disease-free fish in unused, fish-free water should prevent exposure to disease organisms. Fish of unknown disease status should never be located above disease-free fish or below fish that have a known infection. Diseased fish should not be placed above fish known to be disease-free.

Isolation or separation of a fish stock can be accomplished by the following:

1. Always place disease-free fish upstream from known or suspected diseased fish.
2. Place diseased fish downstream from fish already in the hatchery.
3. Smaller fish should be upstream from larger fish.
4. If rearing units consist of a series of ponds on a two or three pass system, use a separate series of ponds to raise different year classes of a single species. If raising mixed species, place the species requiring highest quality water in the first pass, or the species showing least tolerance to disease in the first pass. Proceed through second or third pass ponds using fish more tolerant of lower quality water or with less disease susceptibility.
5. An isolated area in the hatchery system should be utilized as a quarantine area. Raising fish of unknown disease status for a period of 6 months to two years should indicate the presence of any disease organisms the new fish may have, due to mortalities or to the detection of specific pathogens during regular disease inspections.

Introductions of infected or carrier fish from other hatcheries or sources should be avoided. Introducing a new disease organism or a different strain of an existing disease can create very serious problems. Again, isolation of suspect fish from existing stocks and disinfection of fish handling equipment should prevent the spread of disease organisms to other fishes. Even so, many possibilities exist for contaminating "clean" stocks.

The utilization of "wild" fish for hybridization to broaden the gene pool, and to improve survival of stocked fishes, is on the increase. Although these fish may be free of detectable disease organisms, they usually show little resistance to pathogens that may be present in the hatchery system. Treatments often prove ineffective, and prolonged mortalities may occur until these fish develop a resistance to the pathogen.

Stress is a major factor in fish disease outbreaks and mortalities (Wedemeyer 1970; Klontz et al. 1979). Stresses are often present, even under quality rearing conditions. Many “normal” activities stress fish and can cause serious disease outbreaks in healthy appearing fish. Monthly sampling, thinning operations, fin-clipping, pond cleaning, and spawning operations can be stressful. Mature fish are obviously stressed during spawn-taking, but fish in nearby ponds may also be affected. Extended activities associated with sorting and spawn-taking often cause fish in adjacent units to become excited and go off their feed. Birds, animals, and hatchery visitors can cause stress to fish and help to spread disease from pond-to-pond. Physical barriers are the only effective means of preventing this type of stress and spread of disease organisms (Ostergaard 1981; Salmon and Conte 1981).

The placement of various sizes of fish within the hatchery system can also be critical relative to the generation of solid wastes. Fecal materials that easily pass thorugh a 2 x 2 mesh screen at the foot of a mature brood stock pond will tend to plug a 6 x 6 mesh screen at the head of the lower pond if used to produce small production fish.

Separation of fish stocks by species, size, or use is difficult in a facility not designed for rearing and holding brood and production fish. The ideal hatchery would consist of a series of double- or triple- pass ponds with 900 to 2,400 cubic feet of rearing space. Small ponds would be used to accommodate small numbers of future brood stock (5,000 - 20,000), small lots of mature brood stock (50 +), and select production fish. Large ponds would be utilized for maturing brood stock (1,000 - 10,000), mature fish (500 - 5,000) and large lots of production fish (50,000 100,000). Such a pond system would allow for the segregation of fish by size, species, age, and disease status. A large number of ponds in combination with limited water reuse would produce both quality fish and eggs.

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