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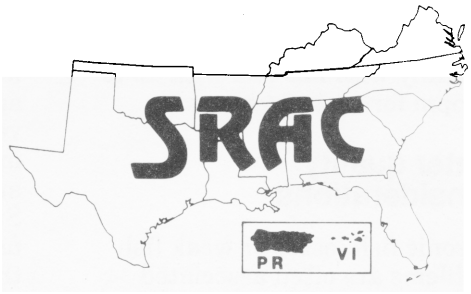

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Transportation of Warmwater Fish

Procedures and Loading Rates

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Experience and research have shown that transportation results can be improved by the addition of certain chemicals. Any chemical used should produce an economical and proven benefit. If food fish are transported, only chemicals and drugs approved by the Food and Drug Administration can be used. Tropical fish, ornamentals and baitfish are not exempt from this restriction.

Use salt for transport

Common table salt is widely used in fish transport. It should contain no iodine. The concentration of salts in the blood of most fish is 1 to 1.2 percent. Adding salt to the transport water reduces the mineral difference between the water and fish blood which lessens the effects caused by this osmotic imbalance. Salt is added to make solutions of .05 to 1 percent (500 to 10,000 ppm), depending on the species of fish. This is equivalent to 0.4 to 8 pounds of salt per 100 gallons of water. Use the lower rates on freshwater fish.

Transport truck used to load live catfish.

Use of anesthetics

Some species are very excitable and sensitive to handling and hauling stress. Anesthetics are useful for sedating such fish, and to reduce the metabolic activity. This means less oxygen consumption and less carbon dioxide and ammonia buildup. Also, energy is conserved which is available for maintaining ion balance. Fish can be over-anesthetized and die. Broodfish and species like redfish, largemouth bass, and hybrid striped bass respond well to anesthetics.

A popular anesthetic is MS-222. It is approved for use on food fish, and a 21-day withdrawal period is required before fish are consumed. The recommended level of anesthesia during transport should permit fish to be caught easily by hand but not cause total loss of activity or equilibrium. MS-222 is used at 15 to 66 ppm for 6 to 48 hours to sedate fish during transport.

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Red drum and hybrid striped bass have been transported successfully with MS-222 with 10 to 20 ppm for up to 24 hours.

Water quality considerations

Chronic fish losses or weak fish problems are often associated with handling and transporting fish in very soft water (less than 10 ppm hardness). Hardness and alkalinity levels from 50 to 100 ppm are preferable. Sodium bicarbonate and calcium chloride will increase alkalinity and hardness, respectively, are safe to use and have no restrictions. Add approximately 5 grams per 100 gallons of water to increase the alkalinity by 10 ppm. Add about 30 grams per 100 gallons to increase the hardness by 50 ppm.

Anti-foaming agents are used to combat the formation of scum or foam on the water surface. Foam buildup interferes with observing fish and may inhibit some gas exchange. Dow Corning's 10 percent anti-foam AF®is used at 1 ounce per 100 gallons of water and is nontoxic.

When fish are crowded, stressed and excited, water quality can deteriorate rapidly. Oxygen is an important limiting factor in fish transport. Proper aeration equipment and careful monitoring before and during loading, in transit and at unloading sites will assure adequate levels (See SRAC Publication No. 390).

Water temperature is important in dissolved oxygen dynamics and consumption rates by fish. Cooling water reduces metabolism rates (oxygen consumption) and increases the volubility of oxygen in the water. Maintain oxygen levels at 6 to 7 ppm but higher levels may be beneficial on extended trips.

Carbon dioxide will accumulate during the trip, but high oxygen levels, air circulation and water agitation all help reduce any adverse effects. Ammonia can also increase in hauling situations and is not removed by agitation. Starving fish before transport, using clean water and lowering the water temperature all help reduce ammonia. The pH of hauling water should be 7 to 7.5; higher pH increases the toxicity of un-ionized ammonia. Well-buffered water helps keep pH in balance.

Temperature critical factor

Temperature is very critical because it influences other water quality variables. Inadequate acclimation (tempering) for temperature differences during loading or unloading will stress or kill fish. Temper fish at least 20 minutes for each 10 degrees Fahrenheit difference in water temperature. Some species are very sensitive to temperature shock, while others are quite hardy. Smaller fish are more sensitive than larger ones.

Rapid changes in pH, hardness, alkalinity, temperature and other variables may cause stress or even death. It is advisable to mix receiving water with hauling water before releasing fish into a pond. This tempering is recommended if the pH difference is 1 or more units or the temperature difference is more than 10° F.

Fish loading guidelines

Load fish carefully into transport units. Delicate fish should be given mild sedation while in the holding vat. Increase the oxygen supply while fish are being loaded. Check dissolved oxygen (DO) in hauling unit to assure adequate concentrations near air-saturation.

Do not overload dip nets or loading baskets. Fish should be handled rapidly, and delicate, scaled species should be kept in water whenever possible. Avoid the warmest times of the day and direct, bright sunlight. Minimize the time out of water on windy days when the drying effect is greatest. Avoid injuries (broken or damaged fins and scale loss), which provide sites for opportunistic infections. Adverse effects from stress are additive and cumulative. Salt, anesthetic or a bacteriostat in the hauling water can minimize stress.

Always avoid temperature shock. Any sudden temperature difference of more than 10° F can harm fish, particularly smaller ones. Cold winter air and wind chill factors can cause temperature shock when fish are moved in nets.

To lower water temperature about 10° F use ice at 1/2 pound per gallon. Avoid using ice made from chlorinated drinking water, as some species are extremely sensitive to chlorine. Lowering the temperature during transport quiets fish, lowers their rate of metabolism and increases the oxygen saturation level. For short trips, the hauling temperature should be similar to that of the water at the destination. For trips longer than 8 to 12 hours, tempering can begin several hours before arrival.

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