

COCAHOE HAULING, HOLDING, & HANDLING

Water quality the most important factor to manage while hauling minnows. Maintaining good water quality can make the difference between healthy, active bait or unhealthy bait and few return customers.

Density: To keep minnows healthy during hauling, 1 pound of fish will require at least 1 gallon of water. When fish are crowded, stressed and excited, water quality will deteriorate rapidly. The major factors that limit loading density are adequate oxygen levels and the buildup of toxic waste products from the fish themselves.

Temperature: Temperature influences other water quality variables, and it directly influences the metabolism of fish. While loading and unloading fish, acclimate slowly for temperature differences or else fish will become stressed and/or die. Acclimate fish at least 30 minutes for each 10-degree difference in water temperature. Adding about 1/2 pound of ice per gallon of water will generally lower the water temperature by about 10° F. Ice made from chlorinated drinking water can cause problems as it dissolves, keep it sealed in plastic containers. Lowering the temperature during transport quiets fish, lowers their metabolism and increases the oxygen level. For short trips (less than one hour), the hauling temperature should be similar to that of the water at the destination.

Water Sources: A suitable water supply is needed for short-term holding and hauling. If well or tap water is used, salt must be added to match the salinity of the water bait will be collected from. Cool, uncontaminated well water is usually preferred for hauling fish, but water should not be more than 5 to 10 degrees cooler than the water the fish are collected from. Ideally, hauling tanks should be insulated so cooler water will tend to remain cool for at least several hours. If water from a tap or hose comes from a chlorinated supply, the chlorine must be neutralized before adding fish. Many commercial compounds are available for this use, and some also neutralize ammonia. Make sure your chlorine remover will also neutralize chloramine, which is often used in rural water supplies since it breaks down much more slowly than chlorine.

Natural water from bayous or marshes where fish are collected will already have the correct salinity that the bait is accustomed to, but this water source often has dissolved organic material, a heavy algal bloom, or other organisms that can remove oxygen from the water and produce ammonia. Raw, untreated surface waters are also more likely to have harmful fish pathogens such as bacteria and parasites.

Physical Condition: One critical factor to the successful handling and transport of fish is to make sure they are healthy and in good condition before they are hauled. If fish have already been crowded in traps with low oxygen and high stress for some period of time, they will already be in poor condition and subject to any disease organisms they contact. For minnows, salt or commercially available anesthetics or antibacterial compounds in hauling water can minimize stress.

Aeration and Oxygen: Two common methods of aerating water during hauling involve the use of mechanical agitators or compressed oxygen. Because fish are densely crowded and excited it is essential to have an aeration system that can provide dissolved oxygen (DO) faster than it is consumed by the bait.



An oxygen meter or test kit is important for measuring oxygen concentrations in transport and receiving waters. Oxygen levels and water temperature can be monitored easily by using an oxygen meter. A low-cost alternative is to use test kits based on glass ampules with contents that change color depending on the oxygen content of the water - for a cost of roughly \$1 per test.

Oxygen concentrations in hauling tanks should be maintained above 5 parts per million (ppm) at all times. However, these levels may be difficult or impossible to attain when only using agitators - an oxygen cylinder with tubing and airstones is a more practical, efficient approach for maintaining adequate dissolved oxygen in hauling tanks. Additionally,

excessive agitation can be harmful to delicate scaled fish. For all of these reasons, diffused oxygen is the preferred aeration method for hauling small fish.

Oxygen cylinders are available from some industrial gas or welding suppliers. Pressure regulators are needed for each oxygen tank, and flow meters can be installed to adjust oxygen flow rates. Various diffusers such as airstones or porous tubing are available commercially for dispersing oxygen in the hauling tank.

Agitators can be used either alone or in combination with pure oxygen. Agitators also provide back-up aeration for emergency situations when oxygen supplies run out. Cooling water with ice reduces metabolism rates of fish and increases the solubility of oxygen in the water. As fish breathe, over time carbon dioxide (CO₂) will accumulate in the hauling tank. High oxygen levels, air circulation and water agitation during hauling will all help to reduce any adverse effects from accumulated CO₂.

Other Water Quality Characteristics: Salinity, water hardness, alkalinity and pH test kits should be used to check transport and waters the fish will be held in. If you deliver fish to sites where chlorinated water is used, a chlorine test kit is also helpful to be sure chlorine in waters has been neutralized. If not, chlorine and chloramine neutralizers will be needed to dechlorinate water. A 12-volt submersible pump is useful for adding water and for acclimating fish by pumping water into or out of the hauling tank to exchange water slowly and avoid any shock from temperature or water quality differences. Ammonia can also increase in hauling situations and is not removed by agitation. Fasting fish before transport, using clean water and lowering the water temperature all help reduce ammonia. Ideally, the pH of hauling water should be 7 to 7.5; higher pH increases the toxicity of ammonia to aquatic animals.



Chronic fish losses or weak fish problems are often associated with handling and transporting fish in soft water, or transferring fish from saltwater to freshwater. Hardness and alkalinity levels from 50 to 100 ppm are preferable. Sodium bicarbonate and calcium chloride will increase alkalinity and hardness and are safe to use. Add approximately 1 teaspoonful of baking soda per 100 gallons of water to increase the alkalinity by 10 ppm. Add about 6 teaspoonfuls of calcium chloride per 100 gallons to increase the hardness by 50 ppm.

Hauling Tank Design and Construction: Most commercially manufactured hauling tanks are insulated. Urethane foam, plastic foam and corkboard are common insulating materials, but they can also be used with home-made tanks, glued to the outer surface. Tanks should be equipped with an overflow drain to maintain water level and allow agitators to function at the proper operating depth. Another feature is an air vent or scoop to permit air circulation in the space between the water surface and tank top.

Disease Management: Prophylactic treatment with approved chemicals can reduce pathogenic organisms that could cause problems during or after transport. Formalin maybe used in holding vats for 15- minute to 1-hour baths, but appropriate safety measures such as gloves, safety glasses, etc. should be taken when using this compound. Avoid over-treating with excessive doses or combinations of chemicals, and be prepared to flush any treatment with clean water (with the same salinity, hardness, alkalinity, etc.) if fish show any signs of stress.

Hauling tanks and equipment, such as dip nets, should be dried and/or disinfected between loads of fish. This practice reduces the possibility of spreading disease pathogens from one group of fish to another. Tanks and equipment can be thoroughly air-dried or treated with chlorine in approximately 1 teaspoon of bleach per 5 gallons of water solution for an hour. Flush tanks thoroughly after chlorine treatment. A 5 percent solution of formalin can also be used to disinfect.



Nets, Netting, and Handling: Select the proper mesh size and net material for harvest seines and dip nets to avoid injuring fish. Use soft 3/16- inch knotless nylon mesh nets for delicate minnows, and do not overload dip nets or loading baskets since the fish at the bottom can suffer serious damage from the weight of the animals on top of them. Bait should be handled rapidly and delicate, scaled species should be kept in water whenever possible. When netting and transferring fish, avoid the warmest times of the day and direct, bright sunlight.

Partial drying of the skin surface or gills can occur while moving small minnows. This in turn can allow for bacterial and parasitic infections to occur, so minimize the time out of water on windy days when the drying effect is greatest. Cold winter air and wind chill factors can also cause temperature shock when fish are moved in nets.

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