

# Fisheries Transport Systems

AQS325

6. Week

Carry by salt

<b>Weeks</b>	<b>Topics</b>
1. Week	Carry fish by iced water
2. Week	Carrying the fishes by cooled sea water
3. Week	Carry fishes with ice
4. Week	Carry by cooled store
5. Week	Carry by freezing
6. Week	Carry by salt
7. Week	Fish transport: rules
8. Week	Carry alive fish
9. Week	Carry alive fish with oxygen
10. Week	Carry alive crustacean
11. Week	Carry alive larvae
12. Week	Carrying equipment
13. Week	Carry by frigorific track
14. Week	Carry fishes long distance

Various chemical additives have been used to transport live fish. With few exceptions, there is little evidence to support claims of any real benefit. Research has shown that anesthetics can produce the same stress response as handling. However, anesthetics are beneficial for calming excitable fish that might injure themselves in transit. Currently, the only additives recommended for food fish transport are food grade salts. Sodium chloride -- table salt -- is the most common. Several other biologically important salts are used also.

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[www.ca.uky.edu/wkrec/Wurtspage.htm](http://www.ca.uky.edu/wkrec/Wurtspage.htm)

<http://www2.ca.uky.edu/wkrec/salttrans.htm>

Fish and other vertebrates have a unique and common characteristic. The salt content of their blood is almost identical. Vertebrate blood has a salinity of approximately 9 g/l (a 0.9% salt solution) and a pH of 7.4. Approximately 77% of the salt in blood is sodium and chloride. The remainder is made up primarily of bicarbonate, potassium and calcium. Sodium and potassium salts are critical for the normal function of heart, nerve and muscle. An 8 g/l (0.8%) salt solution made with table salt (sodium chloride) would match the sodium content of blood.

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Fish blood is brought into close contact (1- or 2-cell separation) with the environment as it flows through the small blood vessels (capillaries) of the gills and skin surface. Salts diffuse from areas of high concentration (blood) to areas of low concentration (fresh water). Therefore, salts (primarily sodium and chloride) are slowly but continuously lost (osmotic leakage) to the environment. The gills and skin are coated with a thin layer of mucus which helps reduce the loss of salts to the surrounding fresh water. Lost salts are replaced by re-absorbing them from the water or during food digestion. Body energy is used to replace salts.

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Netting or handling removes some of the protective mucous coating from fish. Transferring and transporting fish to and from ponds and live-haul tanks requires handling and travel which cause stress. Transport stress and loss of mucus increase salt leakage from the blood; placing higher energy demands on fish that are already weakened. Excessive salt loss can cause heart failure as well as nerve and muscle spasms (tetany). The addition of sodium chloride limits or prevents (depending on concentration) the loss of salt during transport.

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If fish are placed in a 9 g/l salt solution, no salt loss will occur because the concentrations of the solution and blood match. The addition of salts to transport water stops or minimizes salt loss by reducing or eliminating concentration differences between fish blood and environmental water. This reduces energy demands and diffusion leakage while providing a large supply of environmental salts for re-absorption and replacement of lost blood salts.

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In combination with handling stress, salt concentrations 10 g/l (1.0%) or greater could be harmful to fish during live transport. Fish blood is a 9 g/l salt solution, higher concentrations in hauling water cause the loss of water from blood (osmosis) while salts from the transport solution diffuse into the blood. This could cause fish to become dehydrated. A 10 g/l salt solution is approximately 10% higher than blood (9 g/l) and could create a 10% dehydration during transport. It is generally accepted that a 10% dehydration can be lethal to most vertebrates. Therefore, it would be advisable to use transport solutions containing less than 9 g/l salt. An 8 g/l sodium chloride solution matches blood sodium content and is slightly lower than 9 g/l; preventing dehydration and shock by keeping kidneys active and salt loss low.

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Traditionally, 0.5 to 2 g/l (0.05 to 0.2%) sodium chloride solutions have been used to reduce stress during fish transport. However, as discussed above, an 8 g/l (0.8%) sodium chloride solution more closely duplicates fish blood. Some of Kentucky's live-haulers use 5 to 8 g/l (0.5 to 0.8%) sodium chloride mixtures and have had excellent success transporting channel catfish and other species. An 8 g/l solution is formulated by dissolving 6.4 lbs of food grade sodium chloride (feed mixing salt or table salt) in each 100 gallons of unloaded water (no fish) or 4 and 3/4 level teaspoons in each gallon (Table 1). It is important to remember that salts are highly corrosive to metal surfaces (e.g. truck beds, chassis and body).

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