

Fisheries Transport Systems

AQS325

3. Week

Carry fishes with ice

Weeks	Topics
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

Ice is used in fisheries to chill the fish from surrounding temperature level down to 0°C and to keep it at this temperature. The weight of ice needed to chill 1 kg fish (0°C) can be calculated theoretically as shown below (in practice Some more ice will be needed):

Table

Weight of ice needed to chill 1 kg fish from various ambient temperatures

Starting temperature of fish (°C)	Weight of ice needed (kg)
30°	0.34
25°	0.28
20°	0.23
15°	0.17
10°	0.12
5°	0.06

The necessary quantity of ice required to maintain the fish chilled will depend upon the ambient temperature, the insulative properties of the container, the place of the individual box within the load and the length of the storage.

In the following is given an example of ice requirements to chill and maintain in chill condition fish held in individual boxes and within a stack of boxes.

Table Ice requirements for chilling and storage of fish

		Melting of ice per box of 50 kg fish					
		1 box			35 boxes		
Surrounding temperature (°C)		+30	+20	+10	+30	+20	+10
Chilling fish (kg)		21	14	7	21	14	7
Keeping chilled (kg/h)		3	2	1	1	0.7	0.3

For practical purposes the following rules of thumb can be given to calculate ice requirements:

1. Fish boxes: Ice to fish ratio in tropics are 1 kg ice to 1 kg fish, and ice to fish ratio in temperate climate and in insulated van are 1 kg ice to 2 kg fish.
2. Insulated tanks: Water to ice to fish ratio in tropics are 1 kg water to 2 kg ice to 6 kg fish and in temperate climate 1 kg water to 1 kg ice to 4 kg fish.

Necessary volume of ice to chill the fish down to a temperature of 0°C is included in the above mentioned rules. If the fish is already chilled the volume of ice can be reduced accordingly.

The fish carrying capacities of various boxes and containers depend on the density of the mixture of ice and fish.

Table Density of different types of ice

Type of ice	Bulk weight kg/dm ³ = l	Specific volume m ³ /ton
Crushed block	0.690	1.45
Tube	0.565	1.80
Plate	0.570	1.75
Flake	0.445	2.25

Assumed that density of fish is 0.95 kg per dm³ (1 litre) the density of 1 dm³ (1 litre) of the mixtures of ice and fish in fish boxes, and water, ice and fish in tanks, areas follows:

Table Fish to ice ratio using different types of ice

Type of ice	Ice to fish ratio		Water to ice to fish ratio	
	1:1	1:2	1:2:6	1:1:4
Crushed block	0.82 kg	0.86 kg	0.90 kg	0.92 kg
Tube ice	0.75 kg	0.82 kg	0.87 kg	0.89 kg
Plate ice	0.76 kg	0.82 kg	0.87 kg	0.90 kg
Flake ice	0.70 kg	0.78 kg	0.84 kg	0.87 kg

From this table the capacity to carry ice and fish in different boxes and tanks can be calculated.

As examples the weight of crushed block ice and fish is calculated for the types of fish boxes described in Section 5.4.

Table Icing using different types of boxes in temperate and tropical climates

Type of box	Volume (litres)	Tropics		Temperate climate	
		kg ice	kg fish	kg ice	kg fish
A	26	10.7	10.7	7.5	15.0
B	22.9	0.9	0.6	3.12	6
C	42	17.2	17.2	12.0	24.0
D	70.28	7.28	7.20	1.40	2
E	90	36.9	36.9	25.8	51.6

For an insulated tank with a volume of 1 000 litres, the similar calculation gives (crushed block ice).

Table Fish to ice ratio in an insulated tank in temperate and tropical climates

Tropics			Temperate climate		
water	ice	fish	water	ice	fish
100 kg	200 kg	600 kg	153.3 kg	153.3 kg	613.4 kg

References

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