Practical Aquaculture 10

By

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The closed system النظام المغلق

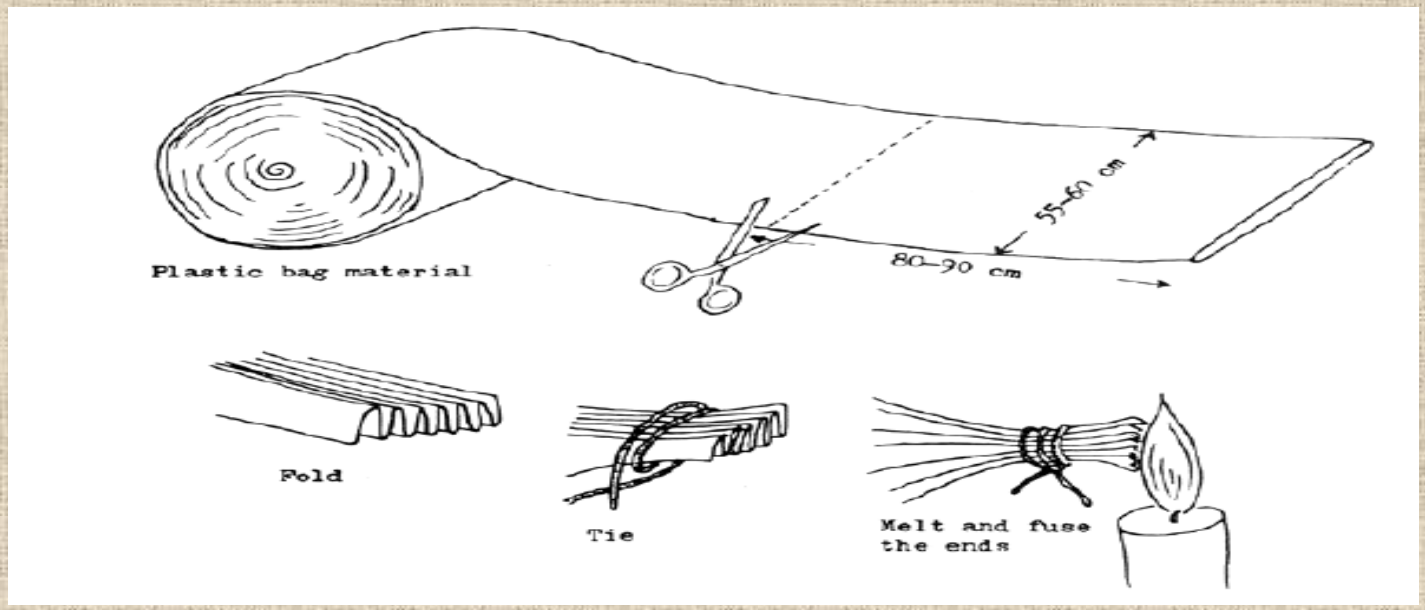
تستخدم اساسا لنقل اليرقات لكن يمكن استعمالها للأمهات - تقلل حجم ووزن الماء - استخدام وسائط نقل عادية يمكن النقل لمدة اطول - غير مكلفة

Polyethylene Bags

اكياس اما سمكية او خفيفة شفافة ابعادها 0.8 – 1.1 X 0.35 – 0.45

النهاية العليا مفتوحة والنهاية السفلى يفضل غير حادة لمنع اختناق الأسماك في الزوايا يفضل استخدام كيس مضاعف حيث يوضع كيس خفيف داخل كيس سميك .

النوع الاخر منها يكون بشكل مفتوح الطرفين عرضه 0.4 – 0.5 م ويعتمد الطول حسب المطلوب وتغلق احدى النهايتين بشكل محكم وحسب الشكل ادناه

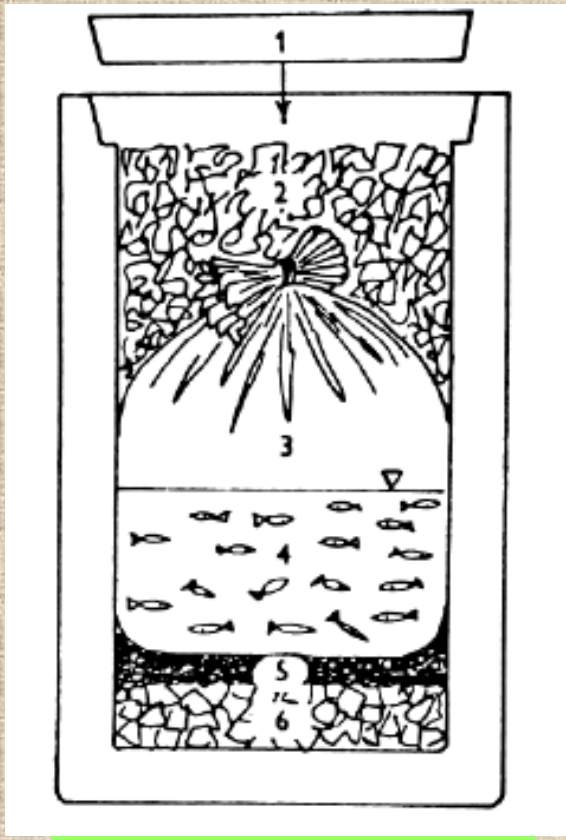


الماء المستخدم للنقل يفضل ان يكون بنفس نوعية الماء الذي تعيش فيه الاسماك قبل نقلها لكن خالي من المواد الملوثة والشوائب

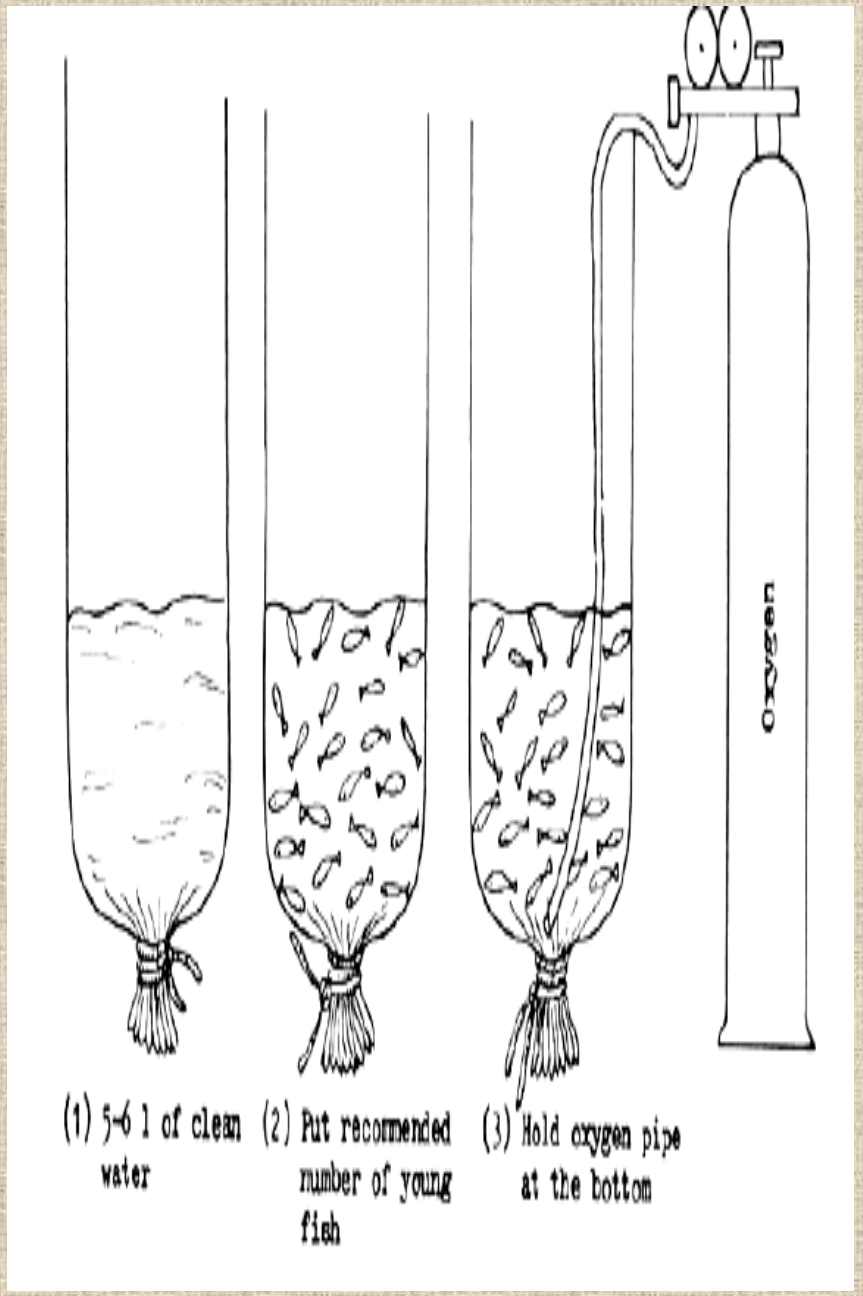
تنقل اليرقات بعد انتهاء التغذية وامتصاص الغذاء عند نقل يرقات متغذية حالا يجب تقليل العدد للنصف

عند تبديل الاوكسجين تزداد نسبة البقاء 20 – 40 % وعند تبديل نصف الماء وكل الاوكسجين تزداد 90 – 100 %

عند نقل يرقات الشبوطيات يجب ان لا تزيد مدة النقل عن 24 ساعة



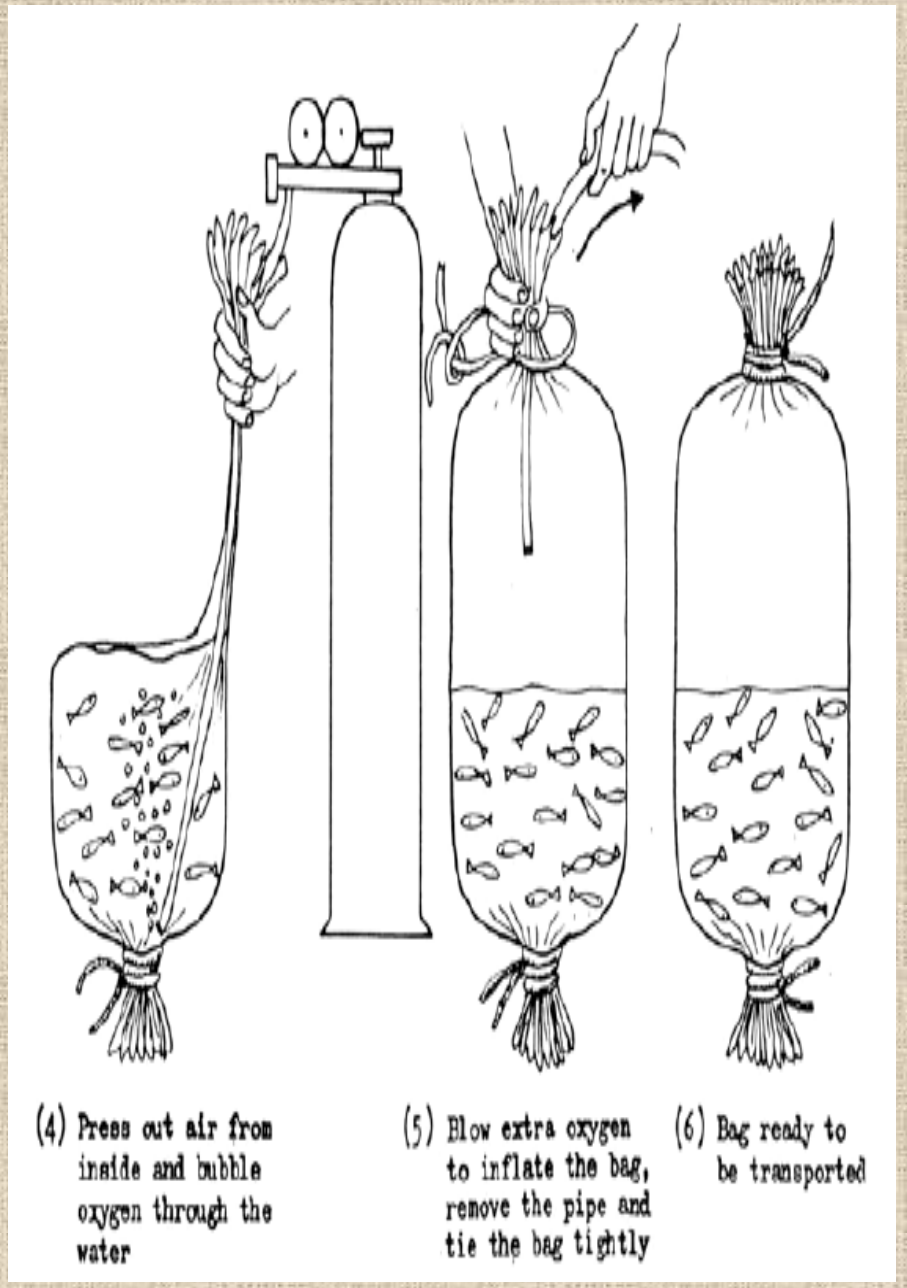
نقل الاكياس في حاوية فلينية



(1) 5-6 l of clean water

(2) Put recommended number of young fish

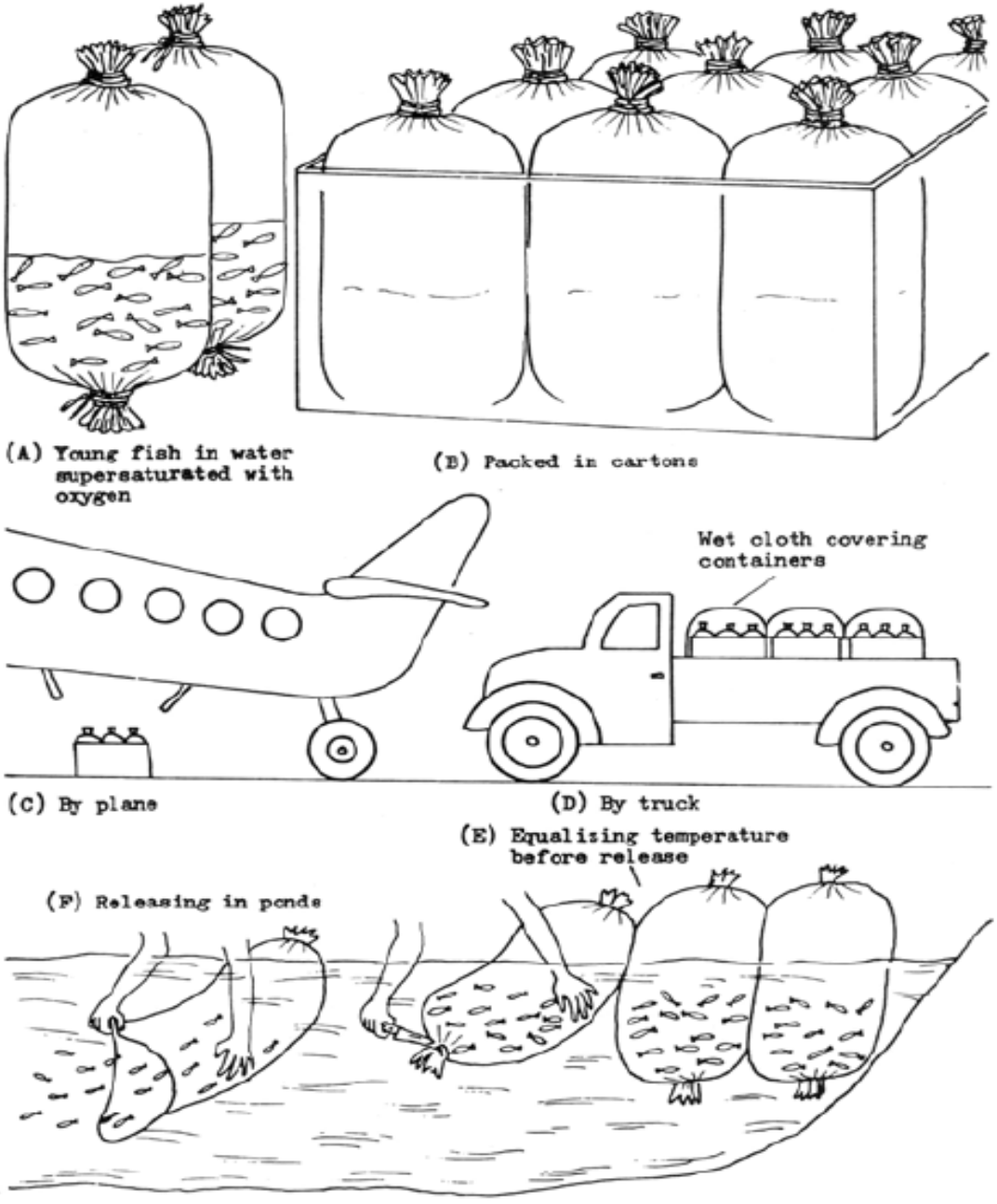
(3) Hold oxygen pipe at the bottom

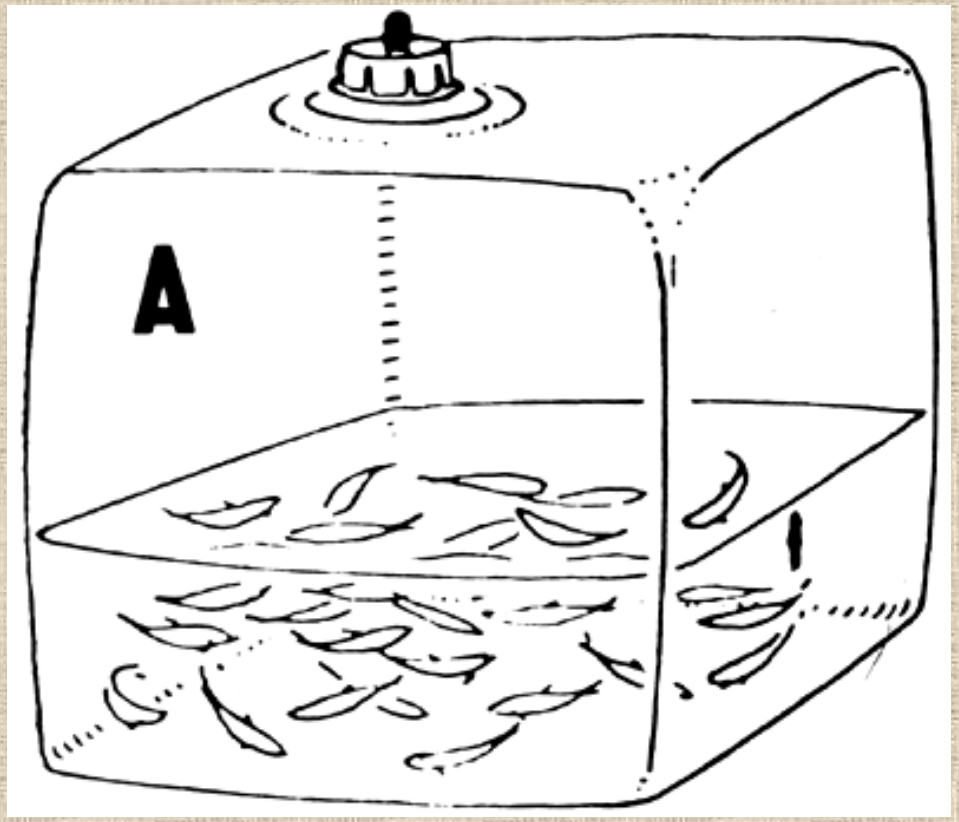


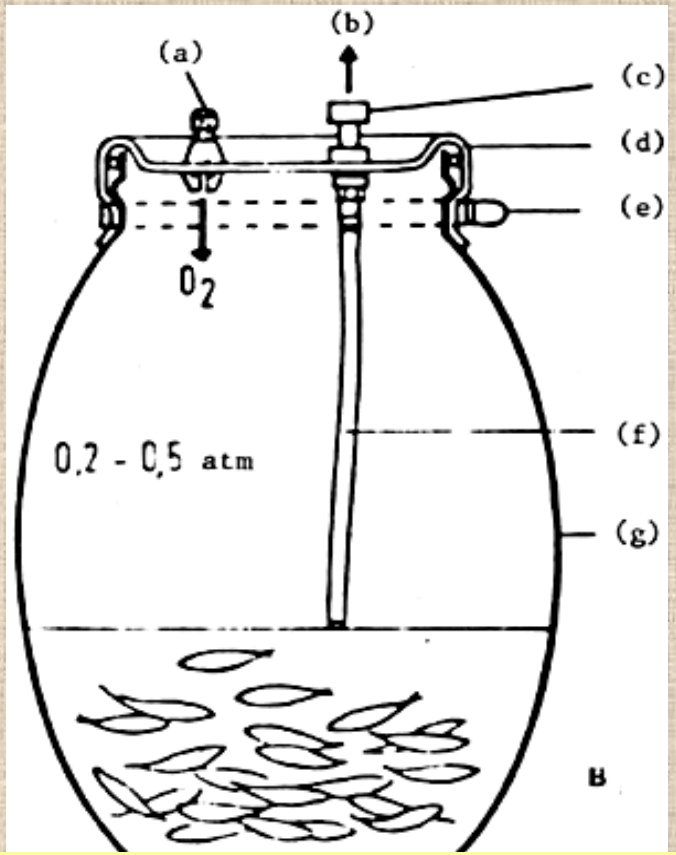
(4) Press out air from inside and bubble oxygen through the water

(5) Blow extra oxygen to inflate the bag, remove the pipe and tie the bag tightly

(6) Bag ready to be transported


(A) Young fish in water supersaturated with oxygen
(B) Packed in cartons
Wet cloth covering containers
(C) By plane
(D) By truck
(E) Equalising temperature before release
(F) Releasing in ponds





(a) Aerator with screw cap; (b) Water;
(c) Water inlet with screw cap;
(d) Tight cover; (e) Tightening ring;
(f) Plastic pipe; (g) Plastic container

Container volume 25 liters, the oxygen-inlet value is built in the screw cap;

Container volume 50–150 liters, vertical plastic pipe keeps water at the required level

عدد اليرقات (الف) التي يمكن نقلها بالأكياس حجمها 50 لتر (20 لتر ماء :30 لتر اوكسجين)

Fish species	Water temperature															
	10°C				15°C				20°C				25°C			
	Duration of transport (in h)															
	4	8	12	24	4	8	12	24	4	8	12	24	4	8	12	24
Brown trout	20	15	10	5												
Brook trout	20	15	10	5												
Rainbow trout	25	20	15	10	20	15	10	5	15	10	5	3				
Grayling	40	30	25	20	30	25	20	15								
Lavaret	80	60	50	40												
Peled	120	80	70	60	100	60	40	30								
Pike	80	50	40	30	50	30	25	20								
Carp					200	150	100	50	120	80	60	40	100	80	60	30
Tench					100	80	60	30	60	40	30	15	60	40	30	15
Grass carp									60	50	40	30	40	30	25	15
Sheatfish									60	50	40	30	40	30	25	15
Asp					100	80	60	40	80	60	40	20				
Chub					100	80	60	40	80	60	40	20				
Barbel					100	80	60	40	80	60	40	20				
Nase					100	80	60	40	80	60	40	20				

لاحظ ات اقل درجة حرارة لنقل يرقات الشبوطيات هي 15 م°

Basic parameters of polyethylene bags and survival of large individuals of some important fish (in h)

(a) Carp

Individual Weight of fish (kg)	Length of fish (cm)	Length of bag (cm)	Volume of bag (lit.)	Amount of water (lit.)	Amount of oxygen (lit.)
1	37	65	40	19	20
2	46	65	40	18	20
3	53	65	40	17	20
4	58	65	40	16	20
5	63	73	45	17	23
6	67	77	47	17	24
7	70	80	49	17	25
8	74	84	52	18	26
9	76	86	53	17	27
10	79	89	87	33	44
15	91	101	99	34	50
20	100	110	108	34	54

OPEN SYSTEMS OF FISH TRANSPORT

The open systems have many technical variants, ranging from small transport fish-cans, containers for fish transport within the territory of a fish farm, up to special fish transport trucks and tank wagons.

General Technological Notes

In all cases of fish transport in open systems, it should be borne in mind that even a short-time transport of 10–30 m in open plastic or metal tanks should be done under the conditions of constant air or oxygen supply. This is very important to the welfare of fish even if dissolved oxygen content of water seems to be satisfactorily high in the tank. Transport longer than half an hour should be in completely filled and closed tanks to prevent splashing and injuries to young fish bumping into each other in the well of the tank.

The weight of fish that can be safely transported in a tank depends on the efficiency of the aeration system, duration of the transport, water temperature, fish size and fish species.

If environmental conditions are constant, the carrying capacity of a transport unit depends upon fish size. It has been suggested that the maximum permissible weight of trout in a given tank is directly proportional to their length. Thus, if a tank can safely hold 50 kg of 5 cm trout, it could hold 100 kg of 10 cm trout, and 150 kg of 15 cm trout .

Reported loading rates for fish vary widely among farms, and maximum carrying capacities of different types of transport units have not been determined. Some calculations of loading rates for various fish species are presented by Piper et al., (1982). Under ideal conditions, the maximum load of 20–28 cm rainbow trout is 3–3.1 kg/liter of water for 8 to 10 h. Similar loading rates are appropriate for brook, brown, and lake trout of the same size. Channel catfish can be safely transported at loadings presented in Table 17. If the trip exceeds 16 h, it is recommended that a complete water change be made during transport.

Weight (in kg) of channel catfish that can be transported per litre of 18°C water (Piper *et al.*, 1982)

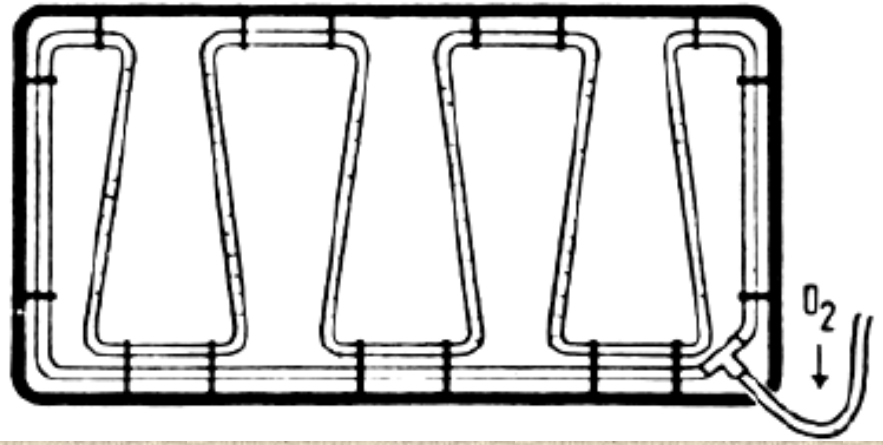
Number of fish (per kg)	Transit period (in h)		
	8	12	16
2	0.75	0.66	0.57
4	0.71	0.57	0.41
9	0.60	0.49	0.35
110	0.41	0.30	0.24
276	0.35	0.26	0.21
552	0.26	0.21	0.18
1 100	0.21	0.20	0.15
2 200	0.15	0.12	0.08
22 000	0.02	0.02	0.02

Circulation is needed to maintain well-aerated water in all parts of the tank. Transport success is related to tank shape, water circulation pattern, aerator type and other design criteria. Warm water transport tanks may be compartmented. Compartments facilitate fish stocking at several different sites on a single trip, permit separation of species, and act as baffles to prevent water surges. Tanks in current use have 1 000–2 700 liter capacities, averaging about 1 700 liters. However, 4 500 liter tanks occasionally are used in the USA to transport catchable size catfish, trout and bass

Although most tanks presently in use are rectangular, the trend in recent years has been towards elliptical tanks, such as those used to transport milk. This shape has several advantages: V-shaped, elliptical or partially round tanks promote better mixing and recirculation of water as the size of the tank increases. This shape also conforms to a truck chassis and holds the centre of gravity towards the area of greatest strength.

Some advantages of aerator systems over gasoline-driven water pump systems are

− Temperature increases from aerators are less than 0.5°C per hour, compared with 1.3°C with pumps;
− aerators and the oxygen injection system can operate independently. There are advantages to carrying small sizes of certain species of fish on oxygen alone. Oxygen also can be used as a temporary backup system if aerators fail;
− usually, aerators have fewer maintenance problems;
− costs of recirculating equipment and aerators strongly favor aerators;
− use of aerators eliminates the space required between the tank and truck cab for pumps and plumbing.



Aeration grate of a transport tank
Porous PVC hose fitted in a frame corresponding to the size of the tank

The calculation of the transport density standard for the fry can be demonstrated by the following example (the calculation applies to C. lavaretus): planned transport time is 2 h; water at the temperature of 6°C contains 7.5 mg. 1-1 oxygen; at this temperature, the lethal oxygen threshold is 1.50 mg.1-1, and the intensity of oxygen utilization is 3 mg. per 1 000 fry per hour . Hence, one liter of water contains the following amount of oxygen available to the fry: 7.5-1.5 mg. 1-1 = 6 mg. 1-1. This amount per liter, converted per one hour of transport time, can be utilized by the following amount of fry:

3 mg. h-1 oxygen 1 000 fry, one needs For
6 mg. h-1 oxygen, therefore x fry, one has For
x = 2 000 fry . 1-1 . h-1

Transport time is planned to be 2 h; hence, the amount of fry should be divided by two: 2 000 fry : 2 = 1 000 fry ◦ 1^{-1}.

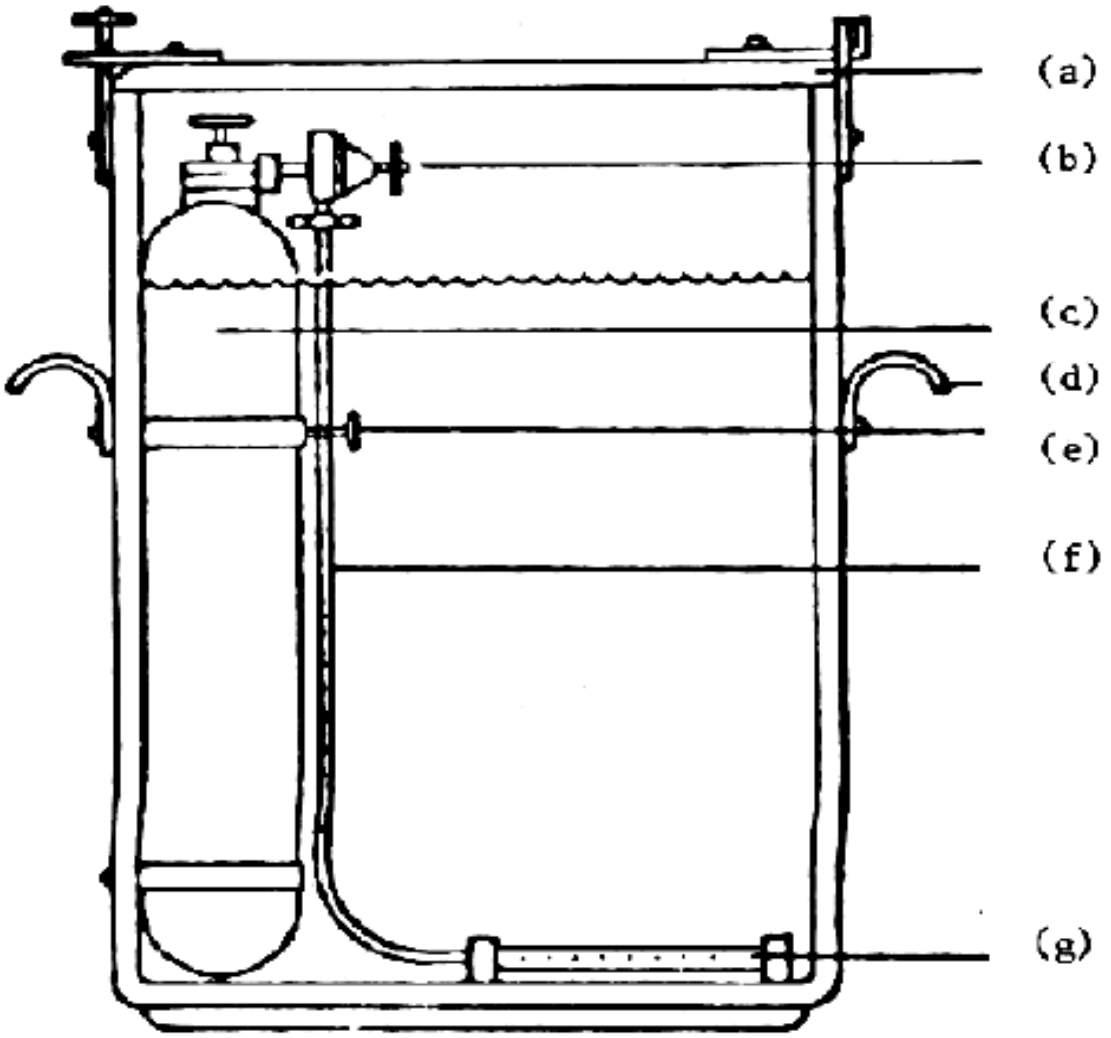
Average lethal oxygen threshold for the early fry of *Coregonus*spp. in function of water temperature (in mg. 1^{-1})

	Temperature (in °C)					
	4	6	8	10	12	14
C. lavaretus	1.3	1.5	1.5	1.7	1.7	1.8
C. albula	1.3	1.4	1.5	1.6	1.7	1.8

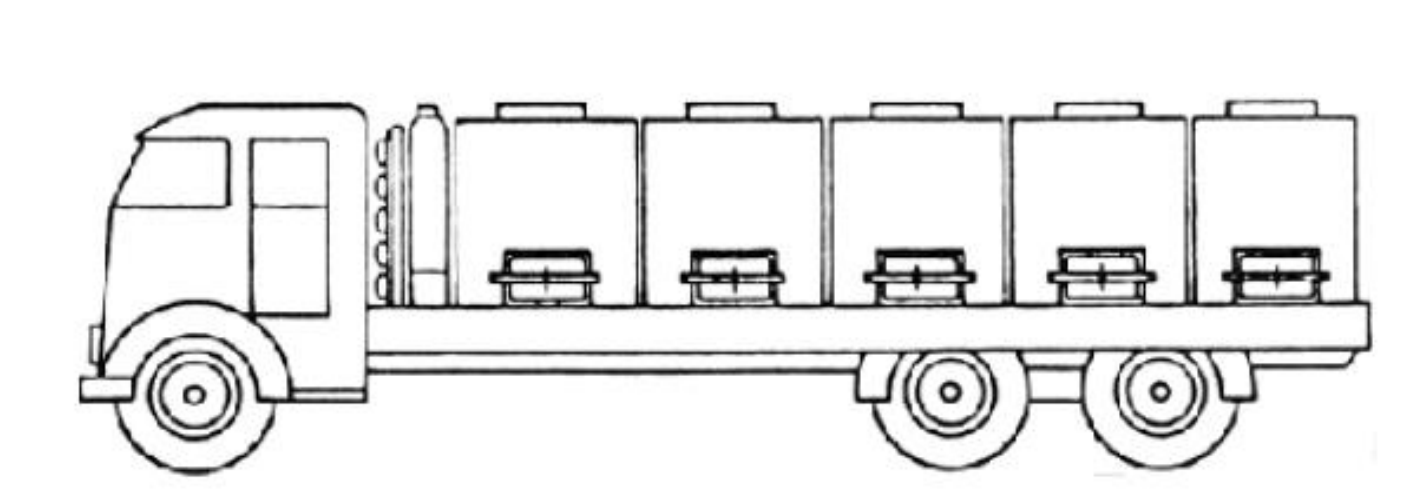
Average oxygen consumption by the fry of *Coregonus*spp. in function of the water temperature, in milligrams per 1 000 fry per 1 h

	Temperature (in °C)					
	4	6	8	10	12	14
C. lavaretus	2.7	3.0	3.8	4.0	4.8	4.8
C. albula	1.1	1.4	1.6	1.6	1.9	2.1

Small transport container for fish fry or trout



(a) Removable cover; (b) Reduction valve;
(c) Oxygen tank (5–7 lit.); (d) Handle; (e) Support;
(f) Pressure piping; (g) Aeration device.



Installation of transport tanks on a truck. The transport capacity of the truck is about 8 000 liters; when the truck is combined with a trailer, the volume of the fish tanks is about 15 000 liters