SHAD TAKEN IN MACKEREL GILL-NETS.

By CAPT. J. W. COLLINS.

[From a letter to Prof. S. F. Baird.]

A Friendship "mackerel dragger"—a 25-ton pinkey—while fishing with mackerel gill-nets in Ipswich Bay, about half-way from the Isle of Shoals to Halibut Point, on the night of June 9, took 27 full-grown shad, which would average 4½ pounds each, besides about a bushel of small shad. The latter have a black tip to their nose, and are called smutty-nosed shad by the fishermen. They are about the size of large alewives, so Captain Martin tells me, who saw both the large and small shad taken by this vessel.

About the 12th of June Capt. David Malonson, of schooner Crest of the Wave, caught about 8 barrels of large shad, but no small ones, in a purse-seine, 8 miles northeast from Cape Cod light.

The shad were apparently mixed with mackerel, since 20 barrels of the latter fish were taken in the seine at the same time. There have been other instances of the capture of shad by the mackerel fishermen this spring, the particulars of which we have not yet fully learned.

GLOUCESTER, MASS., *June* 22, 1882.

TRANSPORTATION OF LIVE FISH.*

[From the official report of the International Fishery Exposition, Berlin, 1880.]

The following report relates mainly to the means of transporting live fish, exhibited in Class IV, with the exception of those destined for the transportation of young fry. With regard to these, competent pisciculturists who have a larger experience will report. It is only the transportation of large fish, such as are brought to market, are exhibited in aquaria, and are used for stocking ponds, of which I intend to speak in this report.

The comparatively small number of articles exhibited to illustrate the transportation of live fish—whilst nearly all other departments of the exhibition were well represented—showed clearly how little the development of means for transporting fish has advanced of late years. It certainly has not kept pace with the rapid development of general means of transportation. The great importance of fish, more especially of salt-water fish, as a popular article of food urgently demands that suitable means of transporting fish should be furnished. This applies particularly to transportation by railroad. For transporting fish by water the

* "*Transport lebender Fische*," from *Amtliche Berichte über die Internationale Fischerei-Ausstellung zu Berlin*, 1880. Translated from the German by HERMAN JACOBSON.

old method, to have perforated vessels, mostly in the shape of boats, fastened to boats, to be towed by them along the rivers, may be considered satisfactory as far as common vessels and fishing-boats are concerned, whilst it is not suited to transportation by steamers.

With regard to transportation by steamer, Messrs. Busse & Co., of Berlin, have taken a step in the right direction. This firm constructed some years ago a steamer specially arranged for transporting live fish, which carries regularly the fish accumulated at various points of the Swedish and Danish coasts (mostly eels) to Stettin, whence they are carried by water in perforated vessels to Berlin, which city is reached in about 60 hours. Berlin has, in consequence, become a considerable market for eels, and this trade is growing in importance from year to year. The above-mentioned firm alone sells annually about a thousand hundredweight of eels.

Under No. 518, Messrs. L. Busse & Co. had exhibited a model of their steamer. The illustration of the steamer shows in the center the perforated vessel for the fish, the cross walls of which are, of course, watertight.

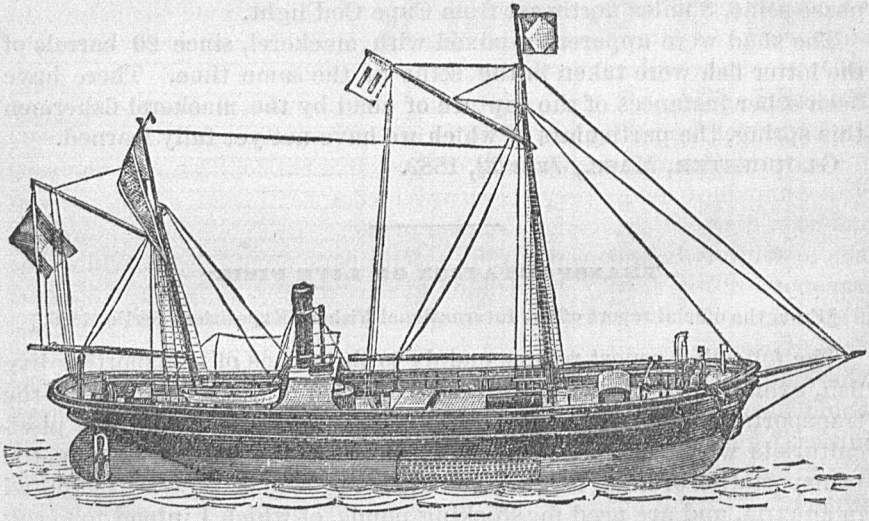

Fig. 1.

The eel, being accustomed to migrate from the rivers to the sea, and *vice versa*, can easily stand the transportation through salt and freshwater.

Whilst this method of transporting fish by water has been very successful, transportation by railroad is still in an exceedingly backward condition. The difficulties to be overcome are, of course, much greater, because the natural conditions of transportation by water have to be artificially supplied. In addition to this, there is the extraordinary increase of the cost of transportation, owing to the quantity of water,

which is in itself absolutely worthless, but is nevertheless necessary for live fish. Supposing I ship by railroad a barrel containing 10 per cent. fish and 90 per cent. water, and it will be seen that I pay the railroad company ten times the freight which I pay for other goods.

If I received by railroad ten pounds of meat, vegetables, or other articles of food, I get for the price of the freight the full weight, with the exception of the tare. Ten pounds of fish, however, demand, in the first place, 90 pounds of water, and, besides this, the tare weight of the cask or barrel, which is generally very heavy.

With some fish the proportion is still more unfavorable, thus especially with those which are brought to Berlin from distant seas for the purpose of stocking aquaria. In this case we can only count about 1 pound of fish to 100 pounds of water, so that nearly the entire freight is paid for absolutely useless matter, viz, water, and very frequently it happens that when fish arrive at their destination they are found to be dead! The transportation by railroad of live fish, therefore, offers difficulties which can hardly be overcome. As long as the railroad companies do not lower their rates for transporting fish, live fish, and more especially salt-water fish, will never be regularly shipped by railroad. The rates of freight are so high that only persons of means will be able to enjoy the luxury of fresh salt-water fish in inland towns.

For transporting other articles of food, live cattle, beer, &c., the railroad companies have everywhere provided special cars, whilst nothing has been done for the transportation of fish. In my opinion, however, it is absolutely indispensable that special cars should be provided for transporting live fish, if any trade in this article is to be built up, and if greater safety to the fish is to be guaranteed. It will hardly be possible to provide such cars by private means. The expense, the question where to keep them, the comparatively small use which the owner would have of them, the matter of rates, &c., all these are great difficulties, which, however, would be overcome at once if the government would make a beginning. As the state has of late years become the owner of nearly all our railroads, this would be the most natural solution of the problem. Years ago I entertained the idea of urging my company to procure a specially-constructed car for transporting fish for the Berlin Aquarium; but in consequence of the hard times, and in consideration of the fact that unless likewise used for some commercial purpose there would not be sufficient use for such a car, I gave up the idea. The exposition again revived the idea of having a special car constructed for the transportation of fish. In conjunction with the royal inspector of railroads, Mr. Bartels, I therefore drew up a plan, which I hope will be favorably received by the administration of railroads and be carried out by them. Quite recently an Austrian railroad official has got a patent for a specially-constructed car, which is principally intended for the transportation of fresh fish on ice, and of live fish.

Kretschmer's model of a specially-constructed railroad car, which was exhibited under No. 522, seemed impracticable and not sufficiently adapted to the purpose.

There is not the slightest doubt that the consumption of salt-water fish would increase very considerably if we could succeed in bringing them to the inland markets in a live condition. The prejudice of the general public against dead fish, if they be ever so fresh, is so deeply rooted that it would be utterly in vain to expect that it will be overcome very soon. During the hot summer season there is, moreover, great danger that salt-water fish will spoil during a journey of any length.

At present fresh-water fish are generally transported in kegs or barrels, two-thirds or three-fourths filled with water. The quantity of fish to each barrel depends on their kind, the season of the year, the temperature of the water, and the length of the journey. For short journeys no special arrangement is necessary, whilst for long journeys some precautionary measures are absolutely required. Fish need oxygen just as much as other animals, and this they find in the element in which they live. Water contains (though not in very great quantities) air—a mixture of oxygen and nitrogen. Consequently water contains oxygen, and receives new supplies of this element from the air with which it comes in contact. In water with little or no oxygen, fish will soon perish. The demand for oxygen is, of course, greater the more fish are contained in a comparatively small quantity of water. In rivers or in the sea the number of fish is so small as compared with the quantity of water that there will never be any lack of oxygen; but if fish are to be kept or transported in a limited quantity of water the introduction of air is absolutely necessary. During the journey the water in the vessel, which is not entirely filled, is in constant motion, and therefore presents a considerable surface to the air, so that during a short journey sufficient oxygen is in this manner introduced into the water. If the water stands for any length of time it must be agitated, or air must be introduced in some way. In shaking the vessels, however, the fish suffer, and it is therefore better to introduce air into the water direct. This may be done by filling with water a simple squirt or sprinkler, such as gardeners use for watering flowers, and by squirting this water into the vessels with some force from a short distance. The same end may be obtained by lashing the water by a vertically-placed fly-wheel, fastened to one part of the vessel, and separated from the other part by a perforated wall. Sometimes vessels are provided with a tube of turned iron or brass which has many small openings in the place where it rests on the bottom. This tube is connected with a pair of bellows or a rubber bag placed outside the vessel, and through it air is introduced into the water.

Mr. Schuster, mayor of Freiburg (Baden), has, in the transporting vessel exhibited by him, replaced this contrivance, which frequently needs

repairing, by a simple but far more expensive air-pump, A, which consists of a metal vessel in the shape of a broad cylinder, with a leather lid or valve, the piston of which can be moved up and down with the hand. At the first pressure the tube is emptied and air enters into it, which at the second pressure enters the water through the openings in the tube, &c. At B there is a tin ice-box, which should not have any sharp edges, against which the fish might hurt themselves.

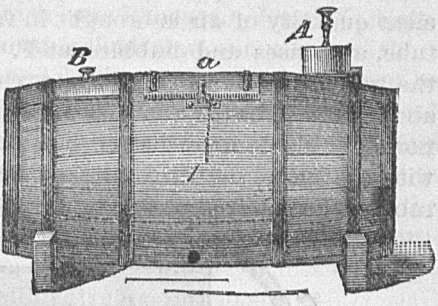

FIG. 2.

As regards fresh-water fish, it may be laid down as a general rule that they will keep best when transported in water of the lowest possible temperature. The colder the water the more oxygen will it absorb, whilst the quantity of oxygen consumed by the fish will decrease in proportion as the temperature gets lower. The lowering of the temperature, therefore, offers a twofold advantage, and the use of ice cannot, consequently, be too strongly recommended. To avoid any violent concussions, which might hurt the fish, the barrel may be placed on springs, as was shown in a transporting vessel from Velp, Holland.

Of the different methods of introducing air I prefer the one where air is introduced through tubes by means of an air-pump or bellows, because thereby the hurtful carbonic acid formed by the breathing process of the fish is more thoroughly expelled, and the vessel can be entirely filled with water. Beating or lashing the water is always injurious to the fish.

As long as specially-constructed railroad cars for transporting live fish are not provided, persons who ship live fish will have to resort to various more or less satisfactory means of transportation. For the use of the Berlin Aquarium I have constructed an apparatus which I consider as specially suited for transporting fish a considerable distance. It was exhibited under No. 514. It had been my object to meet the following conditions, which have to be considered more or less in transporting fish: 1, to provide sufficient air for the water; 2, to keep the water free from slime and other impurities; 3, to maintain a suitable temperature; 4, to prevent the beating or shaking of the water, and thus to protect the fish from injuries. Fish with broken scales or fins will not keep well.

This object I have reached in the following manner by connecting three vessels:

From the transporting vessel proper, No. 1 (see Figs. 3 and 4), as much water flows into vessel No. 2, on the same level, as is introduced from the raised vessel No. 3. Through the spigot *d* the water flows into an air-tight rubber tube connected therewith, which empties at the bottom of the vessel, or near it, at the place marked F, which is as far re-

moved from the outlet as possible. At D some thin air-tubes are connected with the spigot (or rather soldered to it), through which a sufficient quantity of air is brought in from the water flowing through the tube, and rises and bubbles at F. The more powerful the current of the water, and the higher the pressure in vessel No. 3, all the more abundant will be the quantity of air which enters the water. The water flows out above a perforated inner lid, where at E a connection is made with the vessel destined for the outflowing water by means of a rubber tube. The water first of all flows into a perforated vessel containing

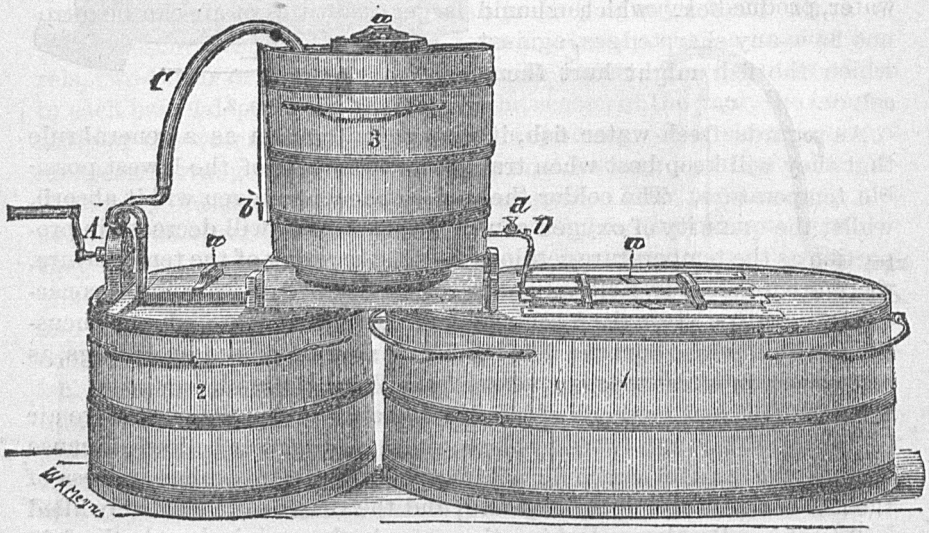

FIG. 3.

fine gravel—the filter—and thus enters the vessel No. 2 in a purified condition. By means of a simple suction and forcing pump, A, with the sucker B, the water is, through the tube C, pumped into the raised vessel. In the center of the firm outer lid there is a perforated stopper, *a*, and below it a large opening in the inner lid, which can also be closed by a perforated lid; this is intended for filling, removing, and observing the transporting vessel No. 1. A floating lid, *c*, in vessel No. 3 indicates the height of the water by a plummet, *b*, connected therewith. Through the lid *a* the quantity and temperature of the water in vessel No. 2 can be observed, and, if necessary, it can be cooled off by means of ice.

In this manner all the necessary conditions are fulfilled. The shaking of the water has been rendered impossible, as in consequence of the outlet-pipe, fastened between the upper and inner lids, the vessel is always entirely filled with water, and is still sufficiently provided with air. The introduction of water with the air at the bottom of the vessel serves to expel the carbonic acid and thus constantly renews the water. Whilst the raised vessel can be pumped full in 15 minutes, it takes the

water several hours to flow out, so that the person in charge of the fish is not worked too hard. This apparatus has been very successfully used in the journey from Trieste to Berlin, which lasts 72 hours. Vessel No. 1 contains 24 hundred-weight, and the two others half that quantity. If there are enough persons to superintend and do the work, vessel No. 3 can be dispensed with by pumping water from vessel No. 2 into vessel No. 1 direct, through tube C, which should be *provided with air-tubes*, and which must reach to the bottom of the vessel. I prefer this method to the first-mentioned one, as in consequence of the greater pressure of the water, produced through the pump, larger quantities of air can be intro-

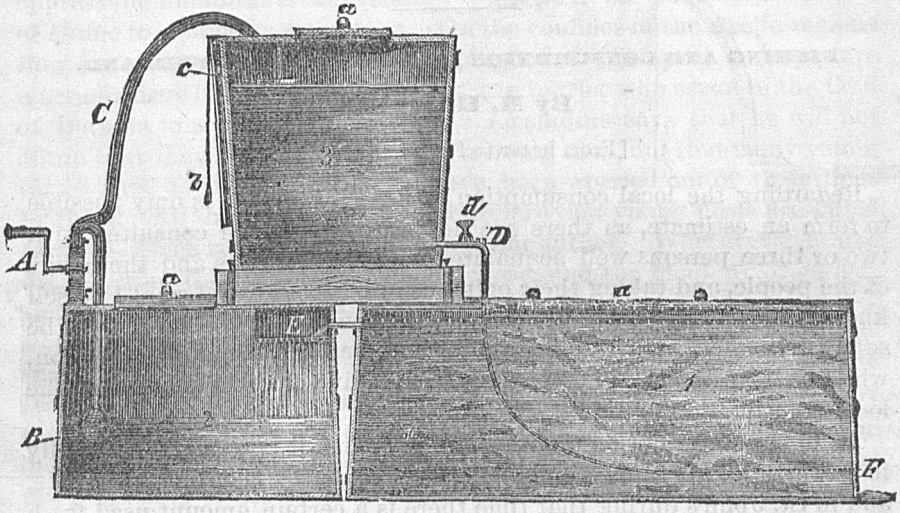

FIG. 4.

duced into the water. It is also possible to introduce air simultaneously into several vessels by one pump, by means of several narrow tubes, which must of course be furnished with air-tubes. In the projected railroad car for transporting fish the airing of the various transporting vessels is to be accomplished on this principle.

In transporting fish any considerable distance some precautions should be observed, which I must briefly mention in conclusion. If possible, only perfectly sound fish should be transported; these fish ought to be kept confined for some time prior to being transported; a few days before the journey is commenced no food should be given to them, so that there is no danger that the water becomes impure by the vomit or excrements of the fish. It is advisable, if any way possible, to change the water during the journey. This is of course easier with fresh-water than with salt-water fish, as it is nearly always possible to obtain good spring water during the journey. It is more difficult, but not impossible, to change sea water during the journey. For this purpose concentrated salt water, such as is for sale at the Berlin Aquarium, should be taken

along, and to it should be added 6 times its weight of pure spring water. During the journeys from Trieste to Berlin the change of the salt water has several times been made at Vienna. For transporting marine animals artificial salt water is to be preferred to the natural salt water. The latter contains organic matter, especially a large number of animalcula belonging to the copepods, infusoria, &c., which soon die and make the water turbid and impure. No such danger need be apprehended if artificial salt water is used. I therefore strongly recommend the use of artificial salt water for transporting marine animals.

FISHING AND CONSUMPTION OF FISH IN NEWFOUNDLAND.

By M. HARVEY.

[From letter to Prof. S. F. Baird.]

Regarding the local consumption of fish of course it is only possible to form an estimate, as there are no returns. I have consulted with two or three persons well acquainted with the fisheries and the habits of the people, and taking their opinions into account, and what I myself know, I should judge that the consumption of codfish here might be safely estimated at a quintal and a half per head of the population, which is now about 180,000. This would give 270,000 quintals as the local consumption of cod.

As to the consumption of other kinds of fish it is so small as hardly to be worth taking into account. The salmon season lasts only six weeks, and in St. John's during that time there is a certain amount used fresh among the middle and upper classes, but the working people hardly ever use it. Where it is caught, which is only in comparatively few localities, a certain amount is used fresh by the catchers, who are few in number. Hardly any of it is used pickled; all is tinned or salted and exported.

Herring are not much used. The Labrador fishermen generally salt and bring home each a keg or half barrel for winter use. The whole does not amount to much, but I could give no estimate of the consumption of either herring or salmon. Cod is the favorite food.

The seal fishery of this year is one of the very worst on record, owing to the enormous masses of heavy ice and prevailing easterly winds, driving it in on shore, so that vessels could not move about. The number of seals brought into St. John's was 139,222. All the returns are not in for other places, but the whole catch will not exceed 149,222. It is fortunate in one way, as it will help to save the seals longer from extermination, which on the present system is inevitable.

The increased value of the export of cod in 1881, arose largely from enhanced prices caused by failure of the Norwegian fisheries.

ST. JOHN'S, NEWFOUNDLAND, *June* 13, 1882.