19.—DIRECTIONS FOR COLLECTING AND PRESERVING FISH.

By TARLETON H. BEAN.

1. Wash the fish thoroughly in water to remove the slime and dirt that are almost invariably present upon them, not omitting the inside of the mouth and the gills. In cleansing fish that have a tough, scaleless skin, or such as have the scales firmly fixed, use a stiff paint brush or a scrubbing brush; for thin-skinned fish and such as have deciduous scales a softer brush must be taken. Some fish are covered plentifully with tenacious mucus that is with great difficulty removed by water alone; in such cases a solution of two tablespoonfuls of alum in a pint of lukewarm water will be found efficacious.

2. It is often necessary to preserve fish that are stale, or partially digested, and offensive to the smell. Such examples may be thoroughly disinfected by the use of the disinfecting solution of chloride of soda. Use a tablespoonful of the solution in one pint of water. With this wash the gills and pour it into the mouth and stomach, allowing it to return by the mouth.

3. Inject alcohol in the mouth and the vent to preserve the viscera. Make small incisions in the belly and in thick parts of the body to allow the alcohol to penetrate the tissues. It is often necessary to remove the liver, stomach, and intestines from large fish and to preserve these separately, numbering them so as to correspond with the fish from which they are taken.

4. It is a good plan to keep freshly collected fishes in weak alcohol for a day or two; a mixture of two parts of 95 per cent. alcohol to one of water will answer for this temporary immersion. Some species are exceedingly soft and flabby, falling to the bottom of a glass jar or other receptacle, becoming partly imbedded in their own mucus, and rapidly disintegrating in consequence. Such specimens should either be suspended in the alcohol by a thread or string from the neck of the jar or the hook sometimes found on the inside of the stopple, or a bed of excelsior or muslin should raise them from the bottom; these are necessary precautions which will prevent many losses. After the fish have been kept for not more than two days in the weak alcohol, transfer them to a mixture of three parts of 95 per cent. alcohol to one of water. Ordinarily this latter will preserve specimens that are not crowded too much at least three months; some, of course, will remain in good condition still longer; but, generally, three months will reduce the preservative power of the liquid so far as to make a renewal of alcohol necessary. The tendency with many collectors is to overcrowd specimens, and, as a result, museums frequently receive a lot of half-rotten material which is too valuable to be thrown away and is yet always a source of trouble and disappointment. A jar, tank, or case of any kind should never be

expected to accommodate more than half its own bulk of fish, and even this proportion will require watchfulness to avoid loss. If a collection freshly caught is to be shipped to a distant museum or private collection, observe the directions about cleansing the fish and preserving the viscera separately if needful, and then use nothing weaker than a mixture containing three parts of 95 per cent. alcohol and one part of water. A good mixture which will carry fish in very nice condition is the following: 95 per cent. (or absolute) alcohol, 3 quarts; water, 1 quart; glycerine, 1 pint; borax, 1 ounce. There is nothing better, however, than the mixture of three parts of alcohol and one of water.

5. The extensive collections of the United States Fish Commission are usually packed in copper tanks, which are tin-lined within. The lid of the tank is made to screw in the top, and its diameter is always as great as the dimensions of the top will allow. The tanks (called Agassiz tanks) are made to contain 4, 8, or 16 gallons. Strong chests, of a size large enough to accommodate a 16-gallon tank, are used for shipping; the hinges and hasps of these chests are riveted on; handles are screwed on at the sides, and each chest is furnished with a strong lock. The chest may contain one 16-gallon tank, or two of 8 gallons, or four of 4 gallons, or one of 8 gallons and two of 4 gallons, as may best suit the convenience of the collector. When several tanks make up the complement it is usual to separate them by thin wooden partitions.

Cases made of ordinary tinned sheet-iron are much more generally used than the expensive copper cans, and they will answer well enough if the joints are perfectly tight and the top is securely soldered on.

Oak kegs, holding about 10 gallons each and provided with iron hoops, are capital containers for large fishes, and they will stand the wear and tear of railway travel better than most other receptacles.

Glass preserving-jars may be shipped long distances with comparative safety, but they must be tested, by inverting them, to insure tightness; the top of the jar and the rubber band should be wiped dry; wrap the jars in strong paper and pack them in some material that will prevent breakage.

When corked bottles are used, tie a piece of bladder securely over the cork. Where seals and sea-lions occur, the throat, as prepared by the Aleuts for example, will be found an excellent covering. It is necessary to wet the membrane to make it pliable. Whenever jars, bottles, or any other small containers are filled with fish which are not provided with tin tags, write plainly with a lead-pencil on heavy manila or writing paper the name of the place where the fish were taken, the date of capture, and the name of the collector. Put a label of this kind inside of each bottle; it will remain legible for years.

6. Each specimen should be provided with a numbered tin tag, which is to be fastened, whenever possible, by means of a string passed through the right gill-opening and out at the mouth. When the string *must* be tied around the body or tail of the fish it should be fixed securely and

yet without injuring any of the fins. A catalogue is to be kept by the collector, in which the numbers corresponding with those on the tags must be entered, with notes as to place, time, and mode of capture, and other particulars which will be more fully mentioned further on. Wrap each fish separately in common coarse muslin (the coarser the better), and tie the ends securely. Do not tie the string so tightly around the body of the fish as to make furrows and wrinkles in the skin. If tin tags are not at hand, a label written firmly on stout paper with a lead-pencil should be wrapped inside of the covering of the fish. It is necessary always to fill the receptacle in which specimens are packed—a bottle or jar may be either filled with alcohol or the specimens may be wrapped in muslin. It is not a good plan to put tow, excelsior, or cotton-wool on top of fish, as it presses them close together and prevents the free circulation of alcohol between them. For long journeys it is desirable to secure better protection than the muslin wrapping alone affords. This may be gained by placing beds of excelsior or thin wood shavings between the layers of fish and at the bottom and top of the case.

A plainly-written card placed at the top of the box, so as to be seen when the lid is removed, telling its contents and by whom it was sent, will save much trouble when the collection is to be unpacked.

7. Notes of color, taken from the fresh specimens, should be sent with them if the fish are to be described in the museum. The collector should also preserve in his own books a record of life-colors under the catalogue numbers corresponding with the tin tags fastened on his fish. He can then obtain the identification of his species by their numbers and publish his studies upon them at his own pleasure.

8. Local names of fish should always accompany the specimens when obtainable.

9. It is desirable to know whether or not the species is abundant; whether different sizes of the same fish are found; whether they associate in schools or not; whether they are permanent residents or migratory; if migratory, by what routes they come and go; whether they form an important article of food; what they feed upon and what species prey upon them; the depth and character of the bottom on which they occur; the mode of capturing them; the uses made of them and the various products which they go to form, in short, everything bearing upon the life history or the economic applications of the species should be noted in detail.

10. Before washing the fish look them over for external parasites; examine the gills and the inside of the mouth carefully, as these are favorite situations. These parasites often furnish a clew to the migrations of the fish; remove them if they can be taken off entire, if not, let them remain, and call attention to their presence in your shipping notes. Preserve the parasites in vials or bottles, and provide them with labels stating from what fish they came and in what situation they were found.

To preserve fish indefinitely in glass jars, observe the following directions: first, select a jar of the proper size to accommodate the specimen amply, without bending or distorting it in any way; put in the fish with the tail down in nearly all cases; the tail may often rest upon the bottom of the jar, or the fish may be suspended from the hook which is now found in the stopple of the modern museum jars; cover the fish completely with the alcoholic mixture referred to in the closing sentence of paragraph 4; discoloration of the alcohol is a sign that its preservative power is weakened and calls for a renewal; fishes in alcohol will never make a good show unless the liquid is kept clear and clean. A label giving the name of the fish, place of its capture, and name of its captor, should be tied on the neck of the jar by means of a piece of narrow tape passed through holes punched in the ends of the paper. The jars must have accurately ground glass stopples. It is best to use no kind of sealing wax to coat the joint of the stopple; simply wipe the glass perfectly dry, close the jar properly, and there will be little danger of evaporation. Do not let the direct sunlight strike your jars, and keep them well removed from stoves, registers, and the like.

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20.—PLANTING AND CATCH OF SHAD IN COOSA RIVER, ALABAMA.

By CHAS. W. SMILEY.

A report of the number of shad taken at Wetumpka, on the Coosa River, has been received from Mr. Cabot Lull, which is as follows: In 1879, 1,000; in 1880, 600; in 1881, 55; in 1882, 35; in 1883, 22. These fish were caught in eight traps at that place.

Concerning this report, which was forwarded by Mr. T. S. Doron, of Montgomery, Ala., the latter remarks: "I think it is as accurate as can be obtained. Mr. Lull seems to think that the shad had disappeared. I know that the rise in the water has prevented the catch of shad during the past three years. Those caught last year were large fish, some weighing four pounds each."

In connection with the above it is interesting to know what deposits of young have been made in this vicinity by the United States Fish Commission. The deposits in 1876, 1877, 1878, and 1879 were as follows:

July 11, 1876, in Alabama River at Montgomery	90,000
May 29, 1877, in Tallapoosa River at Montgomery	75,000
June 9, 1878, in Tallapoosa River at Salisbury	50,000
June 13, 1879, in Coosa River at Lebanon	45,000

In 1880 and 1881 there were no deposits made.

UNITED STATES FISH COMMISSION, *May* 14, 1883.