

CONCERNING THE PRESERVATION OF SEA FISH BY
A FORMALIN AND SODA SOLUTION, COMMONLY
REFERRED TO AS 'JORES' SOLUTION'

BY R. J. CUNINGHAME

I believe I am correct in stating that what is known as 'Jores' preservative solution has been but seldom employed for the preservation of sea fish weighing upwards of half a pound to ten or fifteen pounds, and as I am at present completing the preparation of a large collection of sea fishes made at Mombasa, British East Africa, the following remarks and observations may be found useful to others contemplating the employment of this chemical solution.

The formula for 'Jores' solution, and comments thereon, may be found in 'The Principles of Pathological Histology,' by H. R. Gaylord, M.D., and Ludwig Aschoff, M.D., and I quote the more essential information concerning the action of the formula.

On page 45 will be found Section VIII, on methods for the preservation of the natural colours of the tissues, and the following extract has been made :

'It is occasionally desirable to preserve the colour in microscopic specimens for future reference. . . . The tissue is hardened in Formaline to which are added various salts, and in this it takes on a grayish appearance. After being sufficiently hardened, the necessary time depending on the size of the preparation and its consistence, the specimen is transferred to weak alcohol, in which it recovers its original colour, when it is transferred to a preserving fluid in which it is kept. Preparations which have been kept in the preserving fluid for a period of time, and have lost their colour, may be restored by returning them to alcohol. . . .

'Plenty of fixing solution should be employed and the preparation must be placed in the position it should occupy after hardening. . . .

'The length of time required for fixation in the case of small

specimens is about twenty-four hours, larger organs requiring from two to eight days, the length of time during which the preparation should be exposed to the action of the alcohol varies from one to six hours. At no time during the steps of the process is the specimen washed in water. Both the Formaline salt-fixing solution and the alcohol may be used repeatedly.

' 2. Jores ¹

(A) Fixing solution : Sodium chloride .	1.0
Magnesium sulphate	2.0
Sodium sulphate	2.0
Aqua dest.	5 to 10 parts

(B) Alcohol.

(C) Preserving fluid, Glycerine and water (equal parts).'

It will be seen from the above that this process was primarily designed and intended for the fixation of the original colours of such delicate substances as tissues, membranes, and comparatively thin sections of the organs of animals, and for such it seems to be eminently successful ; but when we come to employ it for the treatment of such large masses as a five-pound fish, the question of handling becomes somewhat altered.

For the collection and preservation of fishes in any considerable numbers, three or five gallon tanks and one large tank up to forty gallons capacity should be utilised.

When a large quantity of sea fish are placed in one tank the formalin soda solution will become greasy, opaque, greenish in colour, and a very considerable amount of debris remains in suspension. If the specimens are allowed to remain undisturbed for a week or ten days in such a solution, many of them will become discoloured permanently ; while in others (especially the more scaleless fishes) the skin becomes impregnated with minute green particles. These particles are deposited on the fish on placing a newly collected specimen into an old solution, the action of the formalin hardens up the skin enclosing the green particles, and so far I have been unable to dislodge those particles without serious injury to the specimen. Freshly caught fish must be placed in new or fairly newly

¹ *Ibidem*, Bd. VII, 1896, S. 134.

made solution. After they have been well acted on, they may be transferred to the old or stock tank, but I consider it most important to remove all specimens from the stock tank once a week, take out the solution, and return same through four layers of thick house flannel. The process is most laborious, but it renders the old stock solution practically free from debris, and materially diminishes the chances of staining or discolouring the specimens.

As regards the preparation of fish over half a pound, before they are placed in the solution certain details *must* never be omitted.

The main object is to allow the introduction of the solution (and this applies not only to the formalin and soda, but to any liquid preservative agent) into the entire mass of animal matter which is being preserved as speedily, liberally, and uniformly as possible, and this is of much importance in tropical climates.

There are three methods of effecting this, which I will describe.

For instruments you require only two knives; one of these should have a blade of about two inches and the other four inches, fitted into a thin handle like a scalpel. The blade of the two-inch knife should not exceed three-eighths of an inch in breadth, and that of the other about half an inch, but they *must* be sharpened on both sides, thereby forming a sort of spear without a high median ridge.

With fish from half a pound to, say, three pounds, being of normal fish proportions, and not semicircular or round as a plate as many tropical fish are, you simply insert the knife through the ventral orifice upwards to the dorsal line. Draw the blade tailwards about one inch, and then manipulate it so as to free all flesh from the backbone and the spinal processes. Having thoroughly done this, perform the same operation all round the shoulders. When doing this, great care should be exercised not to damage the internal organs: but at the same time, after all the flesh has been separated on one side, a small incision should be made from the ventral orifice forwards for not more than half an inch, to allow free ingress of the solution. Now turn the specimen over, and with the small knife treat the side that has not been separated from the bone.

Begin near the gills, and insert the blade carefully under a scale and plunge it in till it meets the backbone or a rib. Do not move it laterally nor raise or depress the blade, as this will break up the edges of the scales; simply raise the scale with the point, plunge in the blade and then withdraw it. Do this at, say, the four corners of every square inch of skin surface, being careful not to puncture the intestinal area. Then rinse this specimen in water and immerse in the formalin solution.

The second method is used when treating fish of deep girth or round-shaped tropical fish weighing from four to ten pounds.

Make a line of three or more incisions two and a half inches long, and the same distance apart, right along the middle of the fish between the gill cover and the tail on the top of the backbone; then insert the knife and free all the flesh as before explained; make a one-inch opening in the vent, turn the fish over, and puncture it under the scales deeply as mentioned above.

The third method is simply to puncture the fish under the scales on both sides and make the ventral incision. This practice is quite reliable for fish up to five pounds and produces unblemished specimens, but when it comes to handling heavy fish I much prefer the second method of free incisions.

Many fish show a decided tendency to float in the solution and some refuse to sink at all. With all fish the air should be expressed by hand-pressure on their being placed in the solution. If after that they do not remain below the surface, place a small flat piece of stone in one of the incisions, never employ any metal or coins. It is essential that the specimens remain completely submerged, as the portion remaining out of the solution will inevitably lose all its colour very shortly, though complete preservation will most probably take place.

If the fish are overcrowded in a tank and freshly caught specimens are introduced, there is also a danger of partial and local loss of colour, through some portion of the fresh specimen being kept in close contact with an old specimen in the tank. I have seen specimens ruined, as regards colouration, in twenty-four hours by overcrowding.

When transportation takes place every individual specimen must be wrapped in butter muslin, otherwise the fins and tails will be frayed and often broken.

Every specimen should be labelled by a leather tag, numbered, and noted up in the collector's catalogue.

As regards the preservation of the colours of the sea fish, I have not been very successful if the specimens are left over two months in the formalin soda solution. The best results seem to be obtained by leaving the specimens in the formalin for about two weeks and then transferring to alcohol for about half an hour, and then place them permanently in glycerine and water, equal parts of each.

Like many other good things this 'Jores' method is very expensive, and properly to handle and preserve a large collection of, say, 250 fish ranging in size up to ten pound specimens, the cost for solution alone may come to £25.

Warning.—It should be remembered by those who work with 'Jores' solution, when using it in bulk, that the continual daily submersion of the hands and arms in the tanks, sometimes for over an hour at a time, renders the collector very liable to toxæmia. The skin absorbs a large quantity of the salt contained in the solution, and after some weeks of work a severe rash breaks out not only on the hands and arms but on many parts of the body and legs. This form of drug poisoning is most disagreeable, and I strongly advise all who employ 'Jores' solution in large quantities to provide themselves with long india-rubber gloves reaching well above the elbow.

THE SNAKES OF BRITISH EAST AFRICA

By C. W. HOBLEY

If one thinks of the matter it will be generally admitted that a knowledge of the snakes of this country is a matter of importance to all who are resident in it. From an economic point of view snakes have a value, for they kill and eat large numbers of rodents which damage gardens and crops, some