New Implements for Fish Tagging

By

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I. The "Tagging Sluice"

In Report No. 2 on the Norwegian-Icelandic herring tagging experiments it was mentioned that double and external taggings had been introduced and some of the first results were shortly described (FRIÐRIKSSON and AASEN, 1952, p. 29). The purpose of introducing double tagging is firstly to compare the efficiency of the internal and external tags under different circumstances, and secondly to investigate the behaviour of the internal tag in the fish, the healing of the inflicted wound and so on (AASEN, 1958). Even if all earlier experience pointed towards the conclusion that properly executed taggings on herring in good condition did not harm the fish seriously, it was found advisable to treat the herring extra carefully when double taggings were to be carried out. A special apparatus has therefore been constructed. This implement (Fig. 1) has been named "The Tagging Sluice" (AASEN, 1953). It consists of four main parts:—

(a) a container for sea water and live herring (right);
(b) a sluice arrangement (middle) with sluice gates leads the herring from the container into
(c) a pivoting cradle which rests half submerged in
(d) a tagging container filled with sea water (left).

The first container or live tank is made of vulcanized, natural rubber. It is suspended in a framework of galvanized iron and rests on 7 legs with adjustable feet also made of the same material (Fig. 1). In front, towards the sluice, a small-mesh seine net is fastened to the frame and is kept to the bottom by small lead weights. This is used for guiding the fish, one at a time, head first into the sluice entrance.

When the first sluice gate (Fig. 1) is opened, the water streams into the sluice chamber and the fish follows. The sluices consist of a flat box of stainless steel and the gates are made of two plates of celluloid interlined with sponge rubber. This simple arrangement keeps the sluice chamber fairly watertight. There is a small seepage, which, however, is no particular drawback in work at sea. When the second sluice gate is opened the water flows, and carrying with it the fish, into a cradle arrangement, presently to be described (Figs. 2–5).

The cradle is made of stainless steel lined with sponge rubber modelled to fish shape. In open condition it exposes the dorsal side of the fish except the

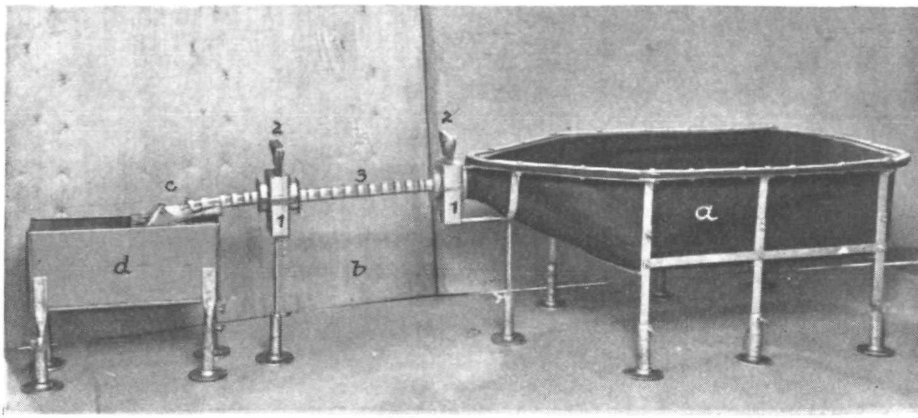

Figure 1. "The tagging sluice". (a) Container for sea water and fish. (b) Sluice arrangements: 1, sluices; 2, sluice gates; 3, chamber. Note: The second sluice is in later models mounted on the tagging container as seen in Fig. 2 and the separate supporting leg taken away. (c) Cradle. (d) Tagging container.

head which is covered. The top part of the cradle consists of two hinged flaps and a screen-lock (Fig. 2), serving dual purposes and interacting in the following manner: in forward position (Fig. 3) the screen-lock keeps the flaps apart and covers the opening next to the head part thus forming a comparatively deep channel which prevents the fish from flipping outside the cradle. In backward position (Fig. 4) the screen-lock keeps the flaps closed over the dorsal side of the fish exposing only the part between the dorsal fin and the head (where the external tag is to be fitted) and the tail (for measurement). The screen-lock is hinged on two pivots on which the cradle can be made to rotate in the vertical plane. The hinging is effected through circular holes in the lower parts of the screen-lock, slit open downwards with slits somewhat narrower than the diameters of the holes. The hinge parts of the pivots have correspondingly smaller diameters in the inner and outer parts. When mounting the screen-lock a moderate pressure at its sides will allow it to be slipped onto the pivots while the springiness of the steel keeps it locked when the pressure is released and the holes enter onto the parts with the larger diameters. Removal of the screen-lock takes place in the reverse order. The pivots on the cradle are resting on a frame sliding on the tagging container (Fig. 2). In backward position the frame brings the hind part of the cradle underneath the mouth of the sluice which also aids in keeping the hinged flaps apart (Fig. 3). In forward position the frame brings the cradle free of the sluice mouth, the flaps can be closed and the cradle made to rotate (Fig. 4). In order to accomodate fish of different lengths, there are three cradles and sluices designed to deal with the size groups 15 to 23 cm, 20 to 33 cm, and 31 to 45 cm.

The object of the rotation is to bring the fish in a position with the belly upwards for internal tagging. On the ventral side of the the cradle there is a trap door. When open, that part of the belly is exposed where the internal tag is to be inserted (immediately behind the ventral fins). For insertion of the tag is used a "tagging gun" (Fig. 5) described by FRIÐRIKSSON and AASEN (1952b, pp. 7–9).

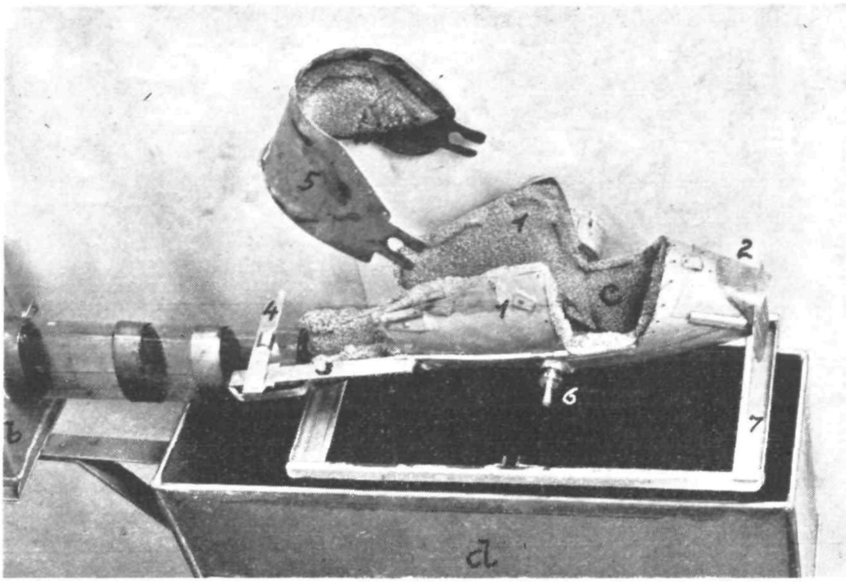

Figure 2. (b) Second sluice. (c) Cradle: 1, hinged flaps; 2, window for control during measurements; 3, ruler; 4, hinged transverse bar; 5, screen-lock; 6, pivot; 7, sliding frame. (d) Tagging container.

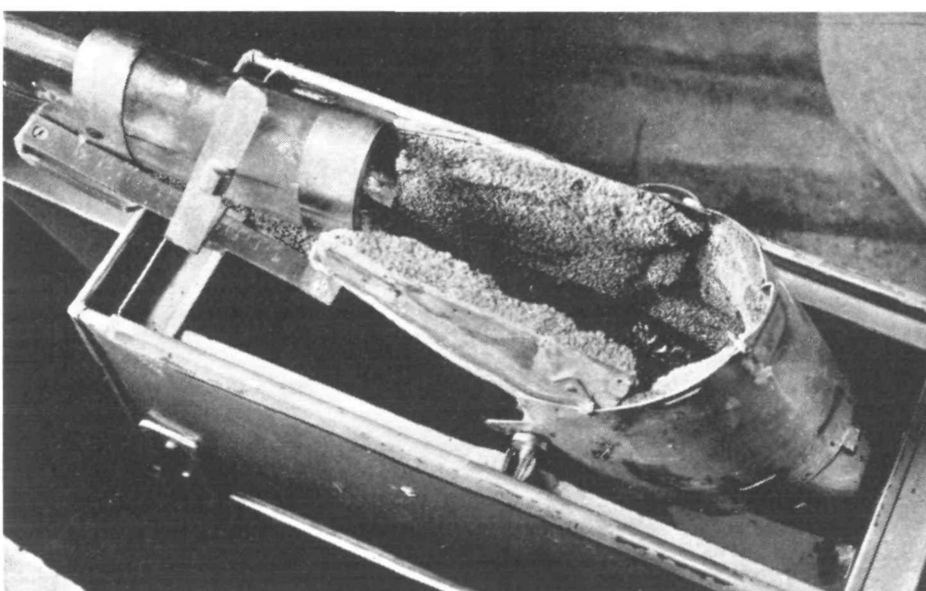

Figure 3. The screen-lock in forward position.

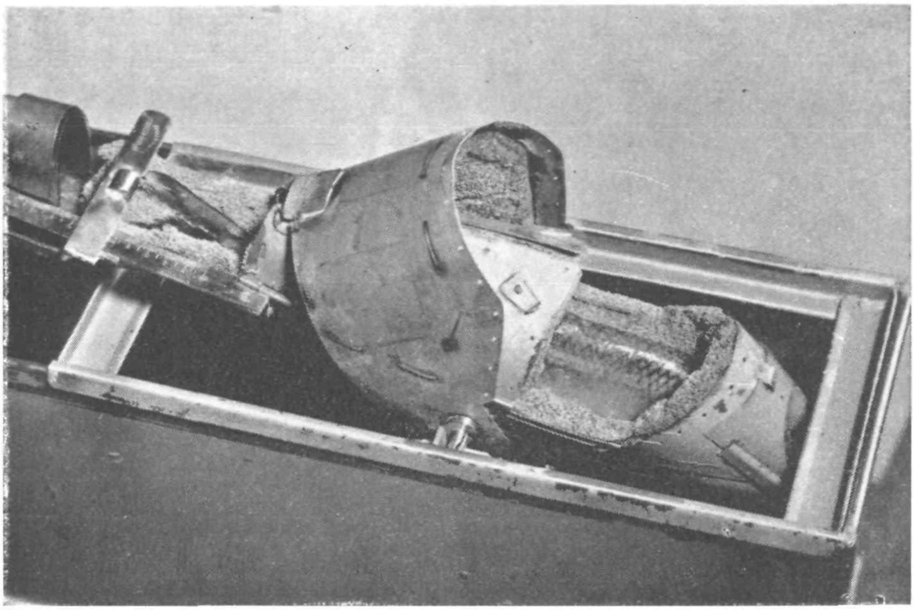

Figure 4. The screen-lock in backward position. The fish is ready for tagging and measurement.

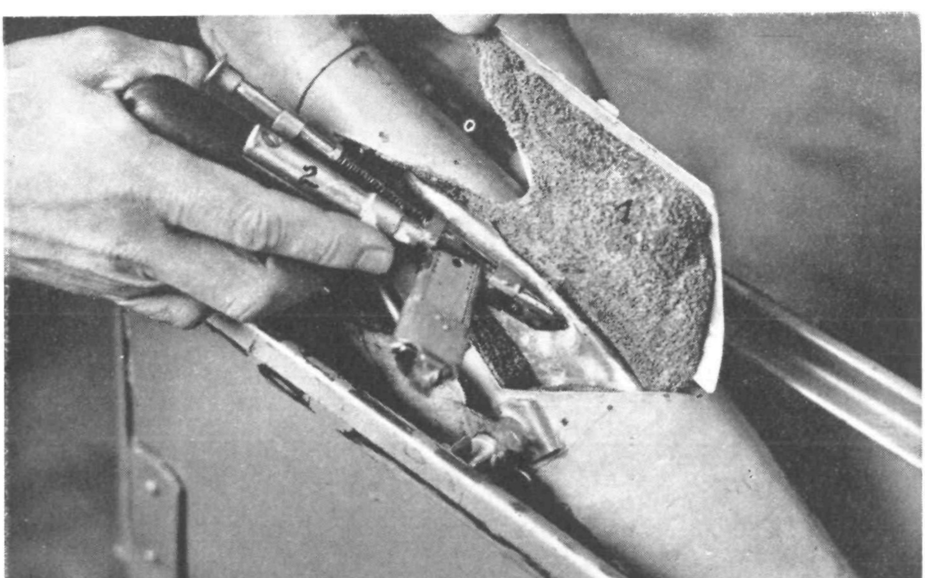

Figure 5. Showing the fish belly up inside the cradle ready for insertion of the internal tag. The trap door, 1, is open. 2. The "tagging gun".

Figure 6. The "tagging sluice" in operation during large herring taggings in Norway in spring 1954. By courtesy of Mr. SCATTERGOOD, USA (front), in the background Mr. TIBBOE, Canada, in centre the designer of the sluice, Mr. AASEN, Norway.

Before the fish is released from the cradle length measurements may be taken and scale samples collected if so desired. A ruler is fixed to the posterior part of the cradle (Figs. 2–4). A hinged transverse bar is mounted on the ruler to ensure easy and accurate measurements. The bar is flipped aside when the fish is led into the cradle and can be moved longitudinally on the ruler, that is, the bar in measuring position moves at right angle to the ruler. To control that the snout of the fish is at the correct zero point, a window is fitted in the top head part of the cradle. The scale samples are most conveniently picked individually in the usual manner by means of forceps.

When the fish has been tagged, the lock-screen is removed, the cradle is lifted out of the frame and placed upside down into a tub with sea water placed within easy reach of the tagger (Fig. 6). The flaps are opened and the fish liberated. When a suitable quantity of fish, dependant on the size of the fish and the tub used, is reached, the tub is lowered into the sea and tipped and the small school swims away. (The tub shown in Fig. 6 will hold about 20 fish of say 35 cm.) A similar tub is used for transferring the fish from the keep net to the live tank. The dipping of the fish from the keep net into the tub for transference to the live tank is the roughest part of the handling. It is here that the loss of scales and so forth is heaviest as the fish under such circumstances gets frantic. Otherwise, the loss of scales and other external damage to the fish is surprisingly small and quite negligible with the tagging sluice method. It has been noticed that even the slime cover on the body is not visibly damaged to any extent since the slightest pressure on the soaked sponge rubber will result in an outward flow of water.

The "tagging sluice" may be used with advantage on schooling fish species which occur with a small size range within the school. If the fish is not available in fairly great number, the process tends to become tedious, and if the size range is large it will be necessary to change over cradles and sluices during the tagging which accordingly is slowed down. Although the "tagging sluice" was designed for double tagging of fish, it naturally can be used for single tagging as well, both internally and externally.

It has been noticed during work that in the smallest size range (p. 159) the fish of 15–16 cm rather frequently get stuck in the openings for the sluice gates. There is no particular difficulties in rectifying this weakness, and indeed this has been done by GUNDERSEN (1959) in his sprat tagging experiments where a modified "tagging sluice" was employed with success. Otherwise the "tagging sluice" has been used extensively for herring tagging in Norway, and it has also been tried successfully for tagging of mackerel.

II. The "Hammock Live Container"

The live tanks in common use are almost universally rigid structures made of wood or iron or other inflexible material. These have, as well known, disadvantages on a ship under sea conditions where wave actions will tend to toss the water about in the tank, spilling some of it over the sides and otherwise make the fish inside seemingly uncomfortable, at least cause it to behave in an abnormal manner. Also (when they are not permanent installations) there are the difficulties of transporting and storing such vessels, rapidly increasing according to size. In an effort to overcome these difficulties a new type of live container has been designed and tried out in the spring of 1959 during mackerel tagging experiments in Norwegian waters.

In order to deal with the latter problem, the principle of designing a dismountable structure was employed, the impression being that more often than not, bulk is more disadvantageous than weight during transport and storage. For this size of container, the overall dimensions of the framework being $80 \times 80 \times 120$ cm, 42 mm (outer diameter) galvanized water pipes were found sufficient. The diameter of the pipes in the bottom frame is somewhat smaller, 32 mm (Fig. 7). The pipes are firmly screwed together by $\frac{1}{2}''$ screw-bolts. In order to supply good fixings for the screws, solid bolts of brass are driven into the pipes where the fixings are, and as additional support these brass strengthenings are made as shallow holes and taps in every fixture. The four legs are rubber tipped to counteract slidings on the deck of the ship. On wooden decks this has the additional advantage of not scraping during movements. The

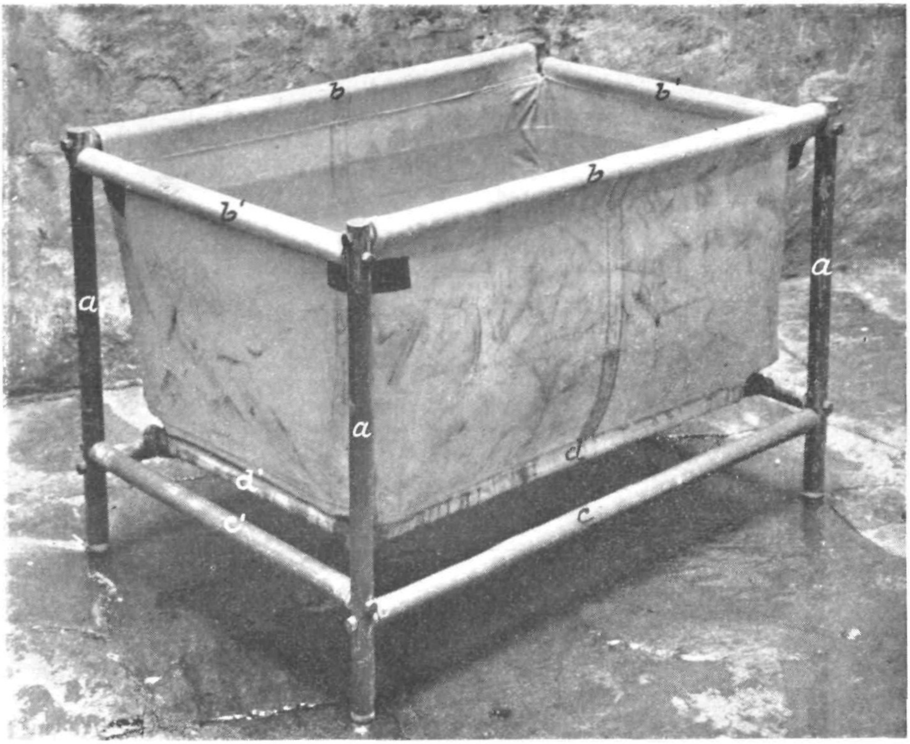

Figure 7. The "hammock live container". (a) Legs; length: 80 cm, diameter: 42 mm, material: galvanized water pipe. (b) and (b¹) Suspending frame; lengths 120 cm and 80 cm, diameters and material as in (a). (c) and (c¹) Supporting frame; lengths, diameters, and material as in (a). (d) and (d¹) Bottom frame; lengths 102 cm and 65 cm, diameter 32 mm, material as in (a). Canvas: American, Mount Vernon No. 3. Vertical distance between suspending frame and bottom frame: 52 cm. Greatest depth (in middle): 64 cm.

framework can be erected and dismantled in five minutes. The longitudinal and transverse bars are interchangeable and so are the screw-bolts. The legs are also interchangeable, but only in pairs as will be evident from a scrutiny of Fig. 7 (and Fig. 8). This framework is absolutely rigid when properly put together. But even if the weight of the waterfilled container is sufficient to keep it in place during moderate movements of the ship, it is advisable to lash it onto the bulwark or other solid structures in case of adverse weather.

The first problem, that of water movement, has been approached by suspending a container made of canvas on the frame. In the ideal case this container should be in same position (relative to the earth) during the ship's movements, in other words, it should behave as a hammock. This has not been achieved fully in the present design, but experience at sea has shown that there is a great improvement from the conventional rigid containers, a feature which is illustrated in Figure 8, where the "hammock live container" is shown in a 15° list. The flexibility of the canvas, the movable suspension, together with the weight of the water (about 600 kg), will keep the water level in the

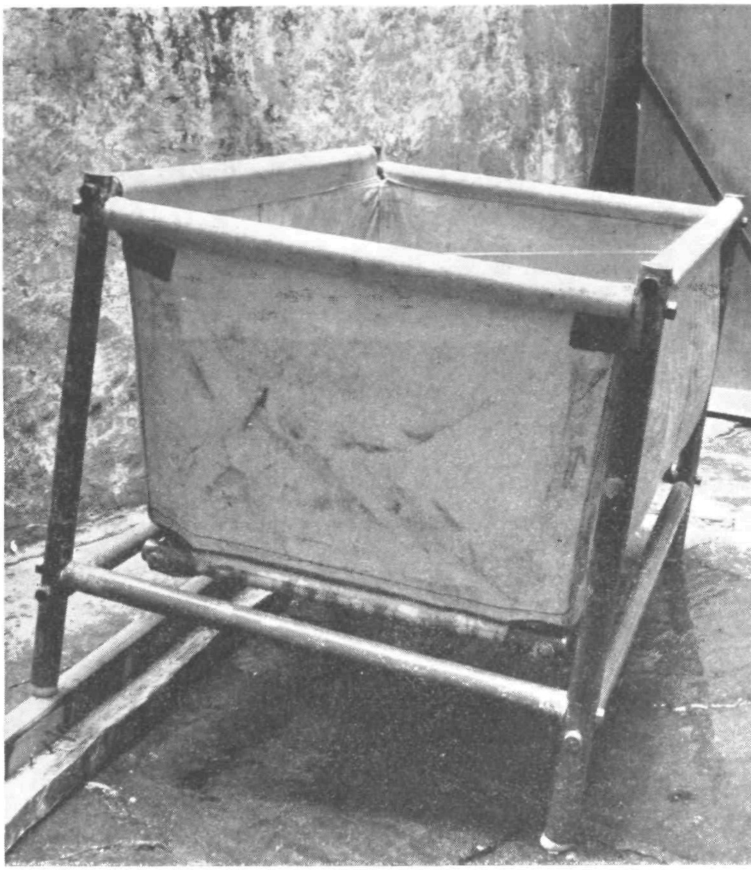

Figure 8. The "hammock live container" in a 15° list.

container comparatively quiet dur'ng fairly heavy wave actions both in rolling and pitching, but slightly less so if the sea is coming in on the bow or the quarter.

An ordinary pouch of canvas will enevitably take odd shapes unless it is strengthened somehow at the bottom. This question has been dealt with by introducing a bottom frame of the same material as the suspending frame (the diameter of the pipe being somewhat smaller), and screwed together in the same manner. In order to keep the extreme bottom part in shape two diagonal bars (slightly curved) are fitted onto the bottom frame as illustrated in Figure 9.

It has been preferred to make the canvas container of non-impregnated material. The reason for this is firstly that it has been noticed during tagging work that fishes (at least many of them, e.g. mackerel and herring) within certain limits, are able to change colour dorsally (FRIÐRIKSSON and AASEN, 1952, p. 16) according to the environment, making them difficult to see and catch except against a very light background in dusk or dull weather. Secondly, it may also be that the various impregnating chemicals are harmful to the fish.

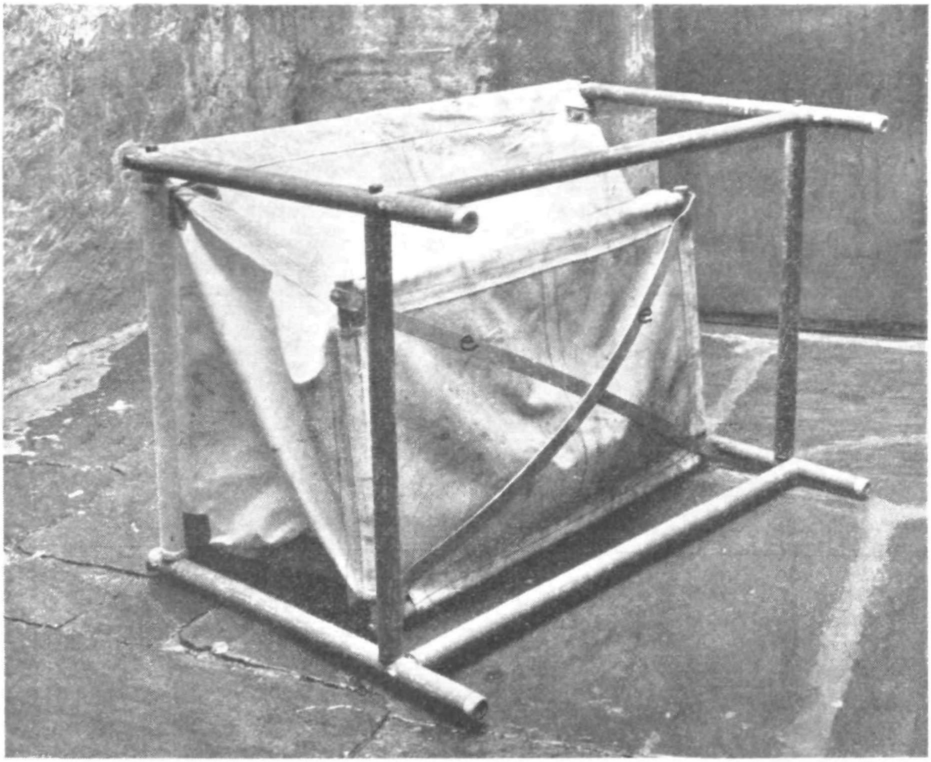

Figure 9. The "hammock live container" seen from the underside. (e) Diagonal bars; dimentions, 120 × 3·2 × 0·5 cm; material: galvanized iron.

In lack of adequate knowledge on this point, the non-impregnated material has been chosen.

For filling the "hammock live container" water from the ordinary deck cleaning pumps has been used with no visible ill-effects to the fish. For emptying the vessel a syphon of say 1″ rubber hose will do quick work.

III. Summary

Two new implements for fish tagging have been described: "The Tagging Sluice" and "The Hammock Live Container".

The first device is especially advantageous for double tagging of fish, but it may be used also for single tagging, both internally and externally. Since the fish is virtually untouched by hand during the tagging operations, the sluice is recommended for tagging of delicate fish (e.g., herring and mackerel).

The second implement's chief virtue is that it makes it possible to keep fish under sea conditions in a comparatively quiet environment. The structure can be easily dismantled for transport and storage.

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