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Midwater Trawl — RMT 1+8**

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## A COLLAPSIBLE RECTANGULAR MIDWATER TRAWL - RMT 1 + 8

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### *Abstract*

A collapsible version of the RMT 1 + 8 midwater trawl is described for vessels having an A-frame, towing winch and lifting winch for trawl launching and recovery. The major modification to the RMT 1 + 8 trawl is the incorporation of a pair of Kelly's eyes into the RMT 8 side wires, and the replacement of the RMT 1/RMT 8 link wires with chain. Collapsing of the trawl is accomplished by pulling the RMT 1/RMT 8 link chain and the RMT 8 side wires through two accessory towing blocks on the A-frame using the lifting winch. These modifications compact the trawl for safe, quick and easy launch and recovery, and eliminate the need for an extensible stern crane.

### INTRODUCTION

The rectangular midwater trawl (RMT 1 + 8) described by Baker *et al.* (1973) is becoming a standard sampler for micronekton (Hempel *et al.* 1979, Merrett and Roe 1974, Roper 1977). The 8.75 m high RMT 1 + 8 trawl is difficult to launch and recover from most research vessels, and usually requires an extensible crane on the stern of the vessel (Clark 1969, Baker *et al.* 1973, Roe and Shale 1979). Robertson (1979) describes a collapsing method to retrieve the RMT 8 which relieves the necessity of a stern crane, but because of the handlifting involved, reduces the weight on the bottom bar. The reduced weight limits the towing speeds that can be used. We describe here a refinement to the Robertson method that applies commercial midwater trawling equipment and techniques. This system was developed for the R.V. *Sprightly*, a converted 43 m ocean-going tug with a 3.2 m high

by 2.6 m wide stern A-frame and two towing winches. The refinement consists of making the net collapsible so that it may be launched and recovered with limited deck facilities.

### METHODS

#### *Equipment requirements*

A stern mounted A-frame, capable of fore and aft movement, and three towing blocks on the A-frame are necessary. The two lateral towing blocks must be wide enough to permit the Kelly's eye stopper to be pulled through easily. Two winches are required; one for trawling and one for surface launching and surface recovery of the net. This second winch can have a smaller wire capacity as long as it can safely lift the weight of the net. The commercial midwater trawling equipment used was a Kelly's eye and stopper available from the Parson Chain Company, Stourport-on-Severn, Worcestershire, DY13 9AT, England.

### *Modifications to the RMT 1 + 8*

The following discussion uses the terminology of Baker *et al.* (1973) and Roe and Shale (1979). The modified RMT 1 + 8 is shown diagrammatically in Figure 1. The basic net and most of the bars including the 228 kg weighted bottom bar have been retained. We changed the upper fixed bar to one designed by D. Brown (Scripps Institute of Oceanography) in order to accommodate a pressure-time triggering mechanism to open and close the net (Fig. 2). The original bar design and opening-closing mechanism (Baker *et al.* 1973, Roe and Shale, 1979) could also be used in our collapsible system. The RMT 1/RMT 8 link wire has been replaced by a 0.5 m long, 8 mm diameter wire strop (Fig. 1,b) and a 3.13 m length of 12.5 mm diameter galvanised steel chain (Fig. 1,c). The upper eye of the strop is shackled to the lower support pin at the end of the upper fixed bar, and the lower end is shackled about 0.6 m from the end of the chain (Fig. 1 and 3). A third shackle connects the chain to the eyebolts on the ends of the lower fixed bar (Fig. 1,j). The lower ends of the chains are shackled to the upper side of the stoppers on the Kelly's eyes (Fig. 3,a;b). The RMT 8 side wires (Fig. 1,g) are passed through the Kelly's eyes and shackled to the lower side of the stoppers. A 0.7 m chain (Fig. 1,f) connects the Kelly's eyes to the lower fixed bar (Fig. 1,j). This chain is about 50 mm greater than the distance between the support lug on the A-frame and the stern of the ship. The only other modification to the original design of the RMT 8 was to make all bars out of heavy-walled, mild-steel boiler tube.

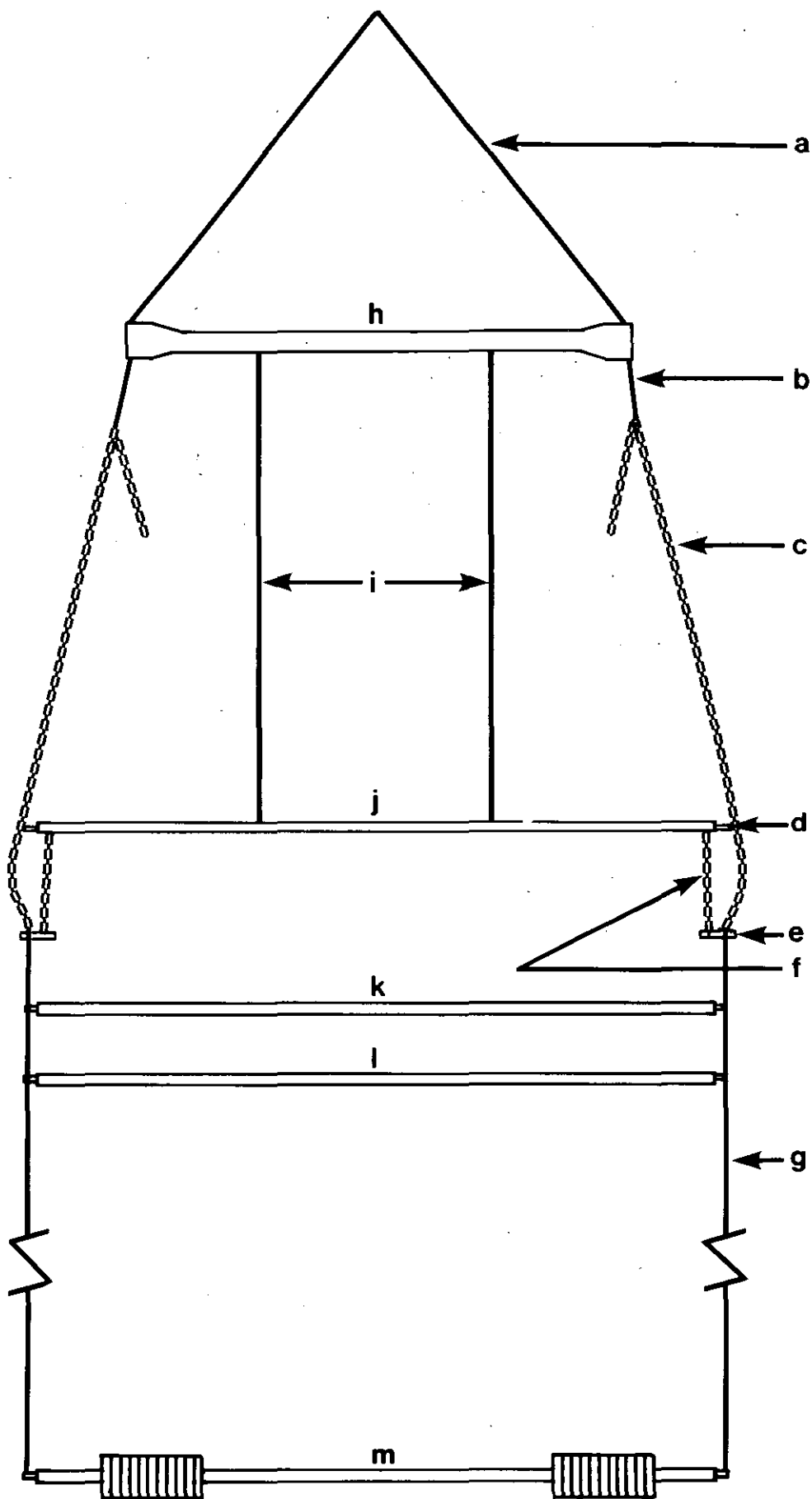
### *Recovery*

For simplicity, we will describe the system for the RMT 8 net on the RMT 1 + 8 frame only. Incorporation of the RMT 1 net introduced no problems. One winch operator and one person on each side of the A-frame are needed to recover the net.

We will begin the recovery description by assuming the towing point (Fig. 4c) is snug against the central towing block (Fig. 4d). The A-frame is then moved forward and the trawl warp is retrieved until the upper fixed bar is between the support legs of the A-frame (Fig. 5). Two wire slings (Fig. 5,b) are passed through the support pins at each end of the upper fixed bar, and then shackled to the support legs of the A-frame.

Fig. 1. Diagram of the modified RMT 1 + 8 frame. The bars are drawn to scale, but the side wires and the chains are not. The RMT 1 bars are omitted for clarity. Parts b-e replace the RMT 1/RMT 8 side wires in Roe and Shale (1979).

- a. towing bridle
- b. 8 mm dia. x 0.5 m wire strop
- c. 12.5 mm dia. x 3.13 m galvanised steel chain
- d. eyebolt on lower fixed bar
- e. Kelly's eye and stopper (see fig. 3 for detail)
- f. 8 mm dia. x 0.7 m long high tensile steel chain
- g. RMT 8 side wire (8 mm dia. x 4.30 m long)
- h. upper fixed bar (see fig. 2 for detail)
- i. RMT 1 side wire (8 mm dia. x 1.99 m long)
- j. lower fixed bar
- k. closing net bar
- l. opening net bar
- m. weight bar



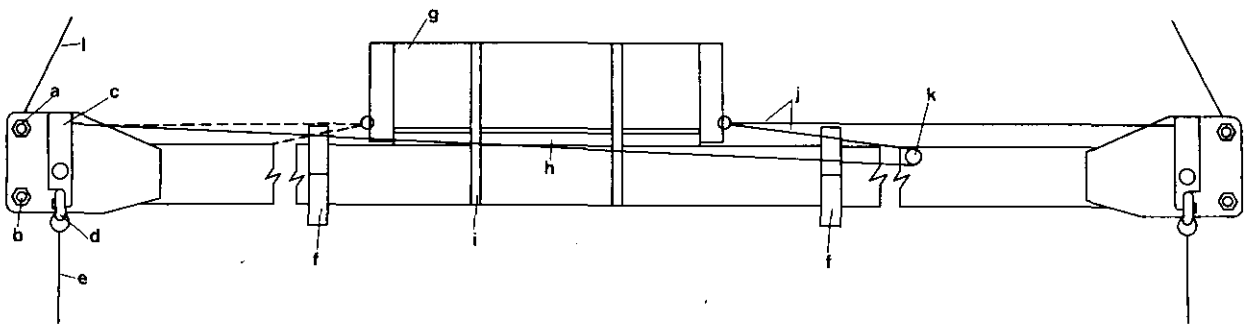


Fig. 2. Drawing of the modified upper fixed bar (not to scale)  
 a. upper support pin b. lower support pin c. release lever  
 d. release ring e. release bridle f. RMT 1 side wire clamp  
 g. pressure/time release h. cradle for pressure/time release  
 i. jubilee clips holding release in cradle j. trip wires  
 k. pulley l. towing bridle.

The free ends of the RMT 1/RMT 8 link chain (Fig. 5,c and Fig. 6,a) are shackled to the two lifting warps (Fig. 6,b). The main trawl warp is slackened, and the A-frame is moved aft, lowering the upper fixed bar to the deck. The main trawl winch is not used again during the recovery procedure; all subsequent operations are carried out using the second winch, the lateral lifting warps, the accessory towing blocks and the A-frame. The galvanised chain is next pulled up (using the lifting warps) allowing the short wire strips (Fig. 1,b and Fig. 5,d) to be unshackled. This disconnects the ends of the upper fixed bar from the main wire frame of the net, and allows the rest of the net to be recovered by hauling in on the lifting warps. The weight of the trawl is supported by the lifting warps. These are retrieved further until the lower fixed bar (Fig. 7,a) is above deck level. The A-frame is then moved forward until the lower fixed bar slides into the lugs (Fig. 7,b) on the A-frame support legs. Bolts are fixed through

the lugs to secure the bar. Figure 8 shows the lower fixed bar (a) secure in the lugs (b) with the chain (c) ready for unshackling, and the second, 0.7 m chain (d) leading to the Kelly's eyes (e). The lifting warps are slackened, and the galvanised chain is unshackled from the eyebolts at either end of the lower fixed bar. The A-frame is moved fully aft, and the lifting warps are pulled in. This pulls the chain (Fig. 9,a), Kelly's eye stopper (Fig. 9,b) and RMT 8 sidewire (Fig. 9,c) through the accessory towing blocks with the RMT 8 side wire sliding through the Kelly's eye (Fig. 9,d). This sliding can be seen in Figure 10. The net and weight bars are lifted as the net 'collapses' (Fig. 11). When the net bars and the weight bar are clear of the deck, the A-frame is swung forward, and the weight bar is lowered into the bottom pair of lugs on the A-frame support legs (Fig. 12). The net hardware is on deck and secure. The cod end of the RMT 8 net is retrieved by a lazy line tied to the lower fixed bar.

### Shooting

Shooting is the reverse of recovery. The cod end of the net is thrown over the stern, and the net is allowed to stream aft. The A-frame is positioned directly above the weighted bar so a direct lift can be made of both the weighted bar, and subsequently the lower fixed bar from their seat in the lugs on the A-frame support legs. As the weighted bar is lowered over the stern, the RMT 8 side wires slide down through the Kelly's eyes and through the eyebolts on the ends of the net bars. The net bars are held at deck level by the release bridles to the top fixed bar. The RMT 8 net closing bar is held just under the Kelly's eyes when the net is shot.

### DISCUSSION

It takes about 10 minutes to either shoot or recover the net. A further 10 minutes is needed to wash the cod end, change buckets, and reset the opening-closing triggering mechanism. The procedure is safe, simple, and removes the necessity of hand-lifting the net. One additional modification is proposed to simplify the operation. Both sets of restraining lugs on the A-frame support legs will be replaced with a triangular piece of steel plate extending from the support legs to the stern of the ship. Slots will be cut to hold the lower fixed bar, the two RMT 8 net bars, and the weight bar. This will have the effect of shortening the A-frame arc.

The modifications we have made to the RMT 1 + 8 trawl and the shooting and recovery procedures should allow this trawl to be used from any vessel that has a stern

A-frame and two winches. This should allow the RMT 1 + 8 to be used more widely.

### ACKNOWLEDGEMENTS

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Fig. 3. Details of the Kelly's eye arrangement. A Trawlex TXKE 10 Kelly's eye and stopper (available from Parsons Chain Company, England) were used.

- a. 12.5 mm diameter galvanised steel chain
- b. Trawlex TX stopper
- c. Trawlex TXKE 10 Kelly's eye
- d. RMT 8 side wire
- e. 8 mm x 0.7 m high tensile steel chain





Fig. 4. General layout of the stern of the R.V. *Sprightly*.  
The towing point has been pulled to the towing block.

- a. A-frame support leg
- b. towing warp
- c. towing point
- d. central towing block
- e. lateral towing blocks
- f. lifting warps
- g. upper fixed bar
- h. lower fixed bar



Fig. 5. Recovery: The A-frame has been moved forward and the support slings (b) have been inserted past the support pins at the ends of the upper fixed bar (a), and shackled around the A-frame support legs. The free ends of the galvanised chain (c) and the 8 mm diameter x 0.5 m wire strop (d) are also shown.



Fig. 6. Recovery: The A-frame has been swung back astern, and the lifting warps (a) have been shackled to the galvanised chain (b). The top fixed bar is resting on the deck, and the supporting slings are shown (c).

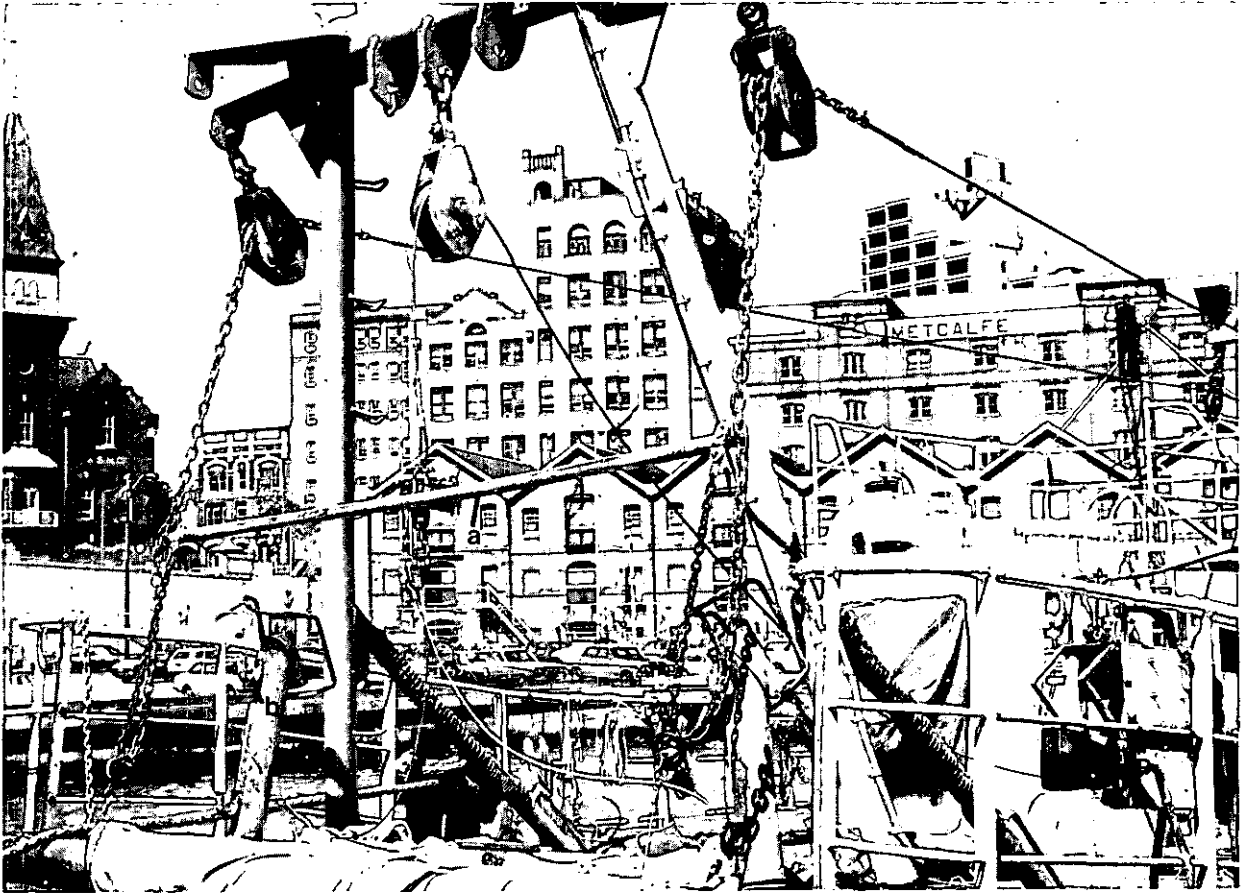


Fig. 7. Recovery: The lower fixed bar (a) has been recovered above deck level, by pulling in the lifting wires on the second winch. The A-frame is being swung forward so the lower fixed bar will slide into the lugs (b) on the A-frame support legs.



Fig. 8. Recovery: The lower fixed bar (a) is in the support lugs (b). The galvanised chain can be unshackled (c) from the end of the lower fixed bar. During this step, the weight bar and the net bars are supported by the chain (d) leading from a lug on the lower fixed bar to the Kelly's eye (d).

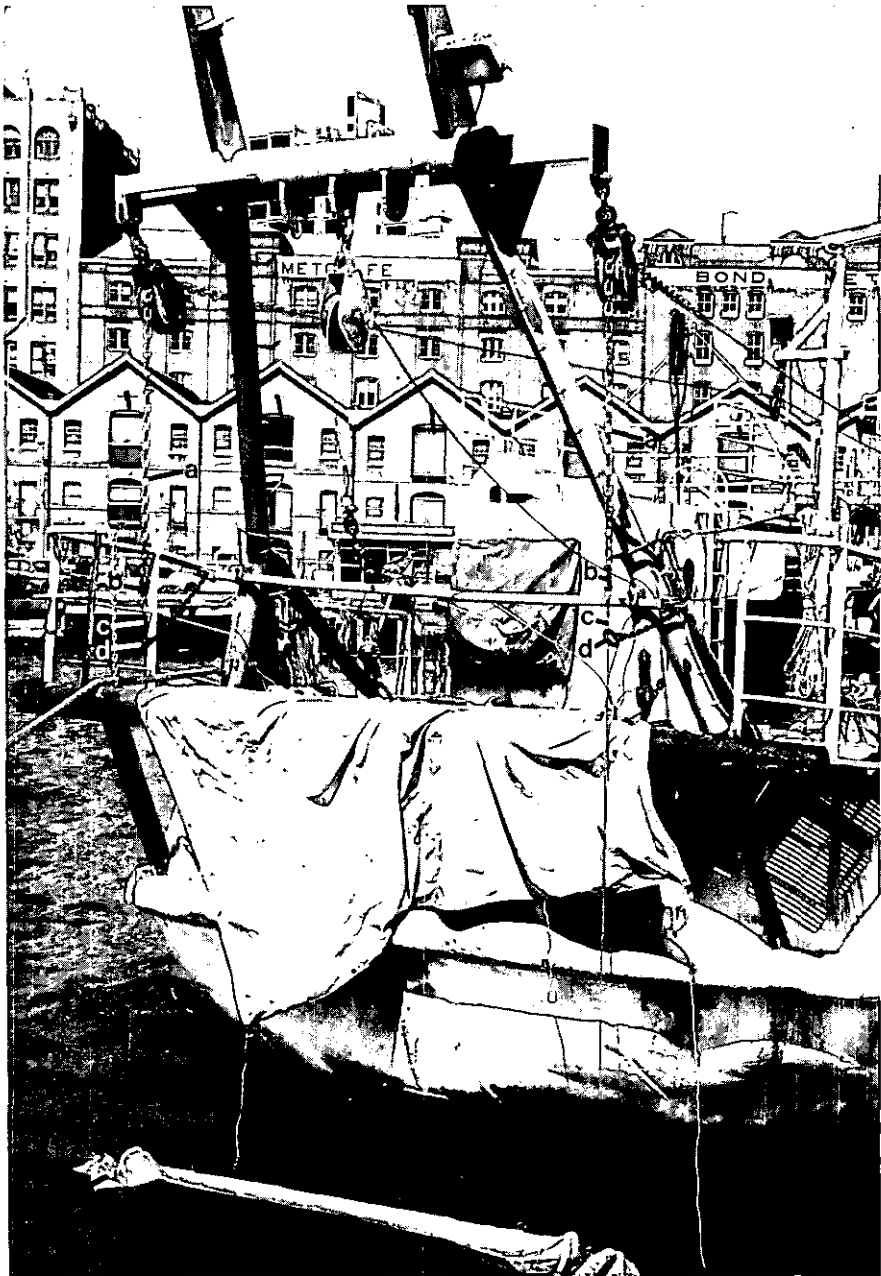


Fig. 9. Recovery: The A-frame has been swung astern, and the lifting wires are further recovered, pulling the galvanised chain (a) through the accessory towing blocks. The Kelly's eye stoppers (b) and RMT 8 side wires (c) are pulled up through the Kelly's eye (d).

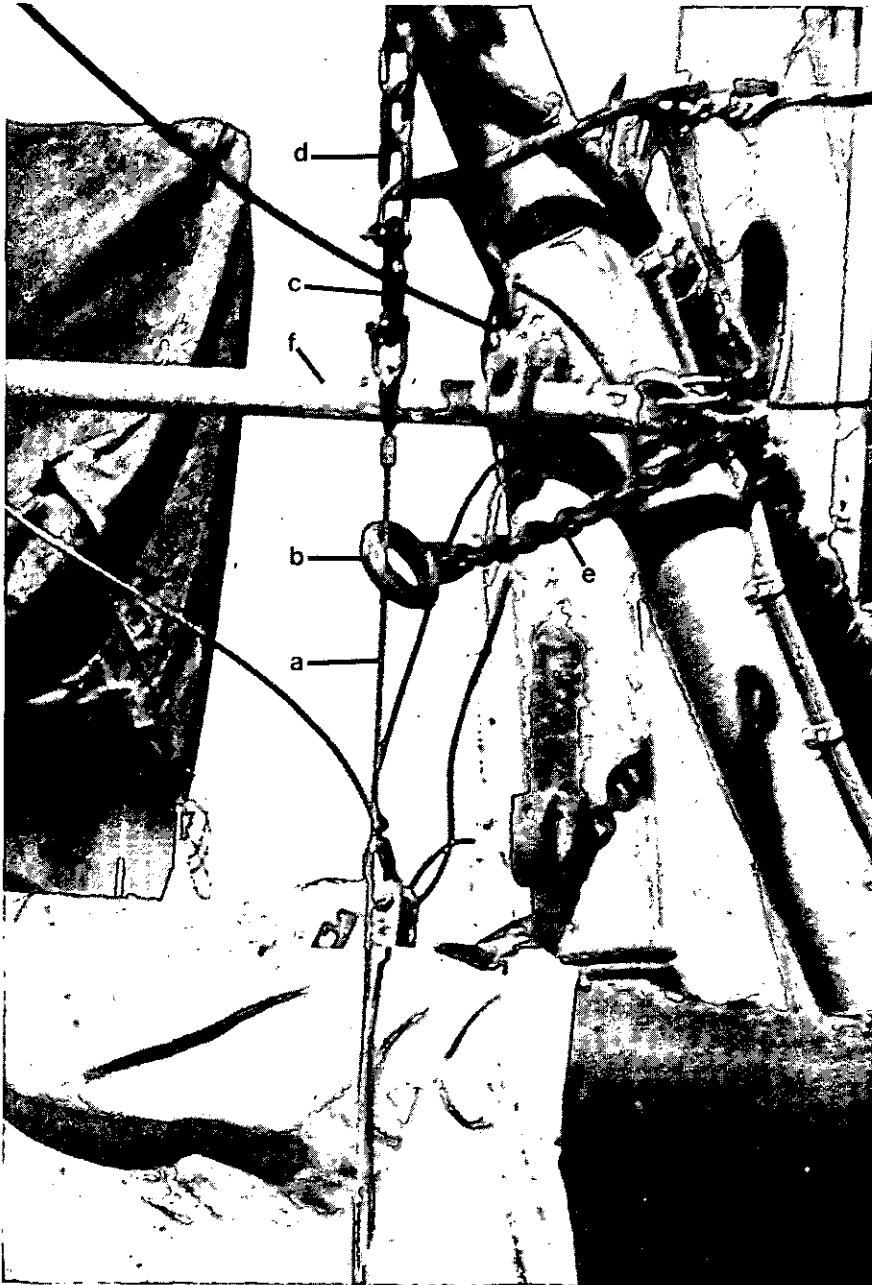


Fig. 10. Enlargement from Figure 9 showing how the RMT 8 side wire (a) passes through the Kelly's eye (b) as the lifting bridles are recovered through the accessory towing blocks. The Kelly eye stopper (c) is side on in the photograph. The RMT 1/RMT 8 link chain (d), and the high tensile chain (e) on the lower fixed bar (f) are shown.

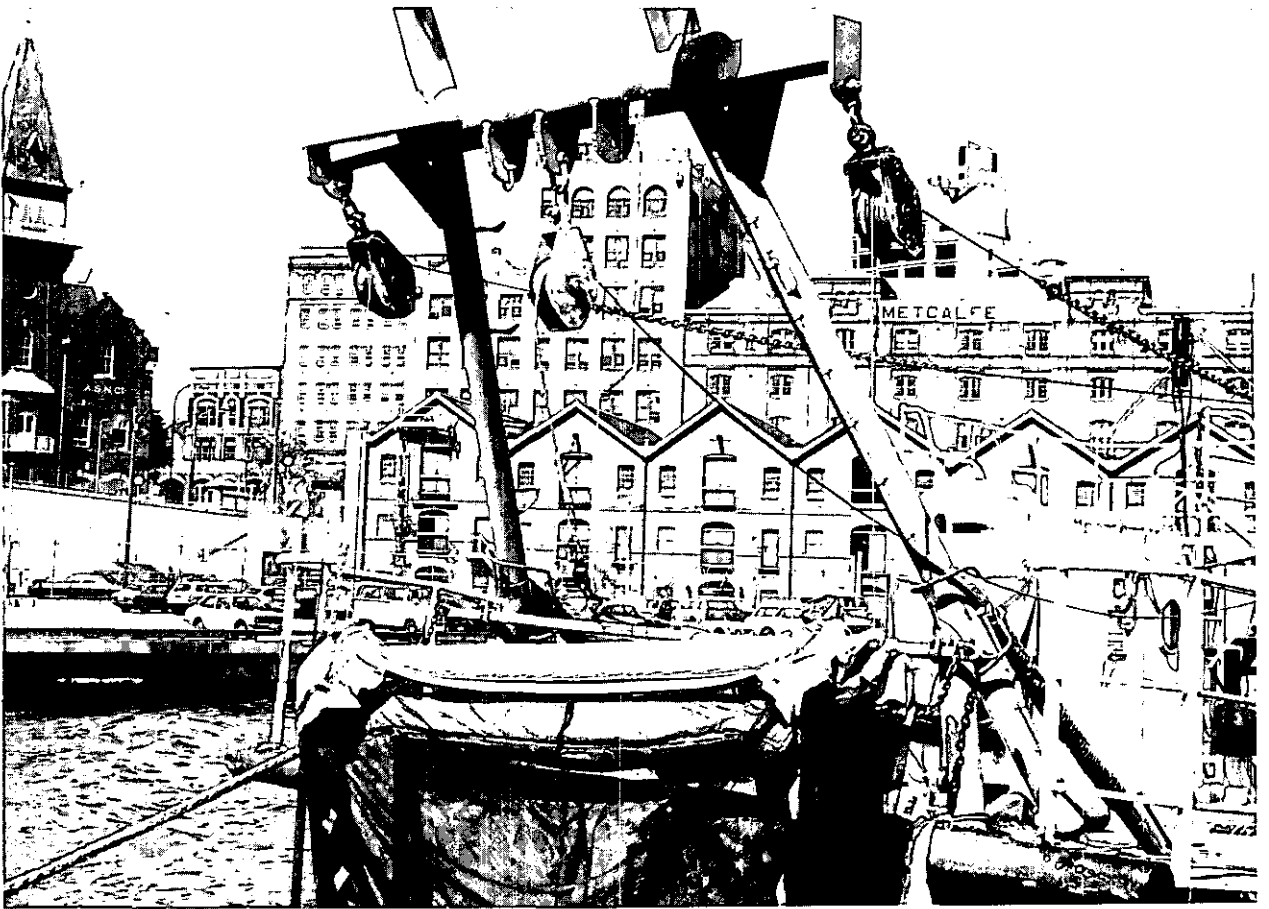


Fig. 11. Recovery: The lifting wires have been recovered further, pulling the galvanised chain, Kelly's eye stoppers, and RMT 8 side wires through the accessory towing blocks and 'collapsing' net as the net and weight bars are pulled up above deck level.



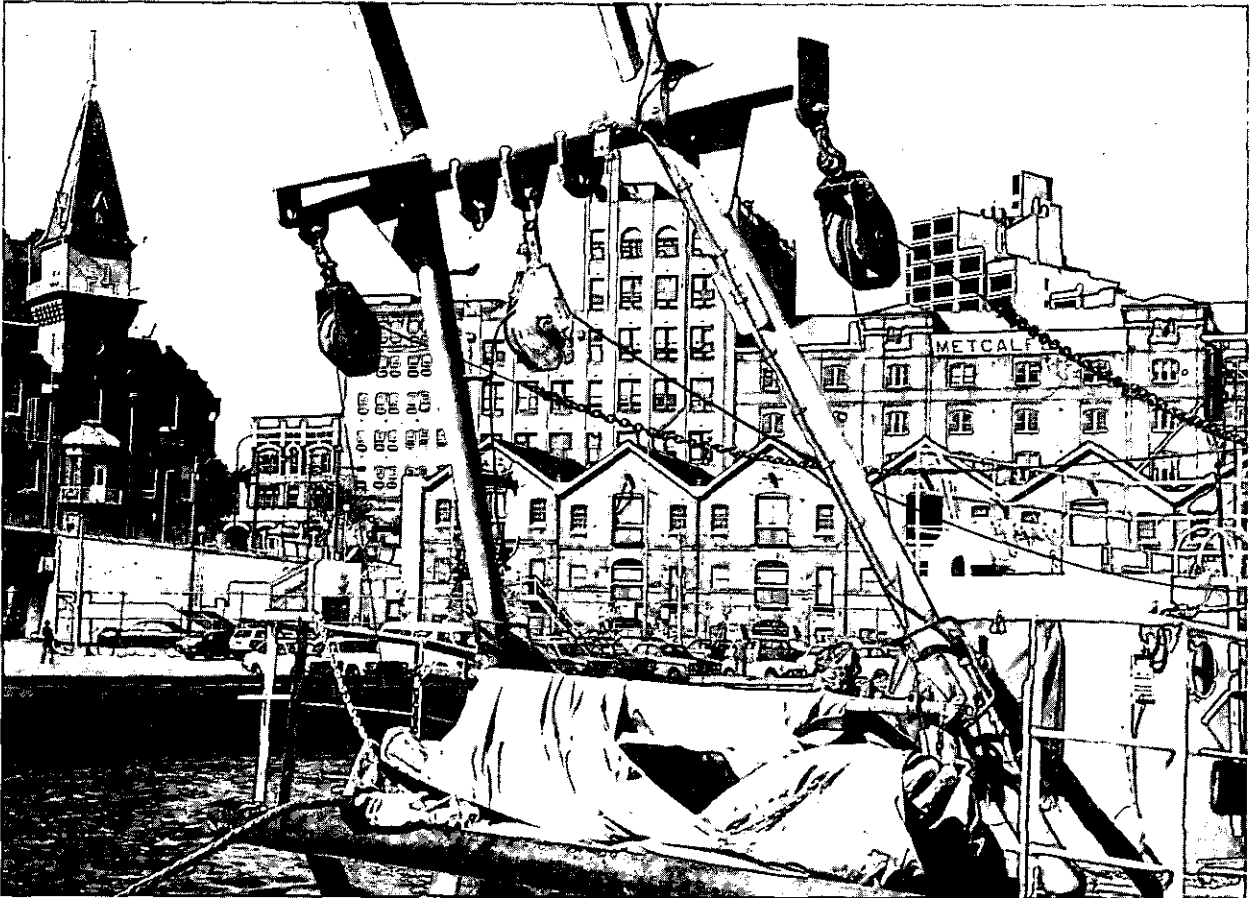


Fig. 12. Recovery: The RMT 1 + 8 in the stowed position. The A-frame was swung forwards, and the weight bar lowered into the lugs on the A-frame support legs. The entire trawl, including the upper fixed bar, has been wrapped in a tarpaulin to protect it.