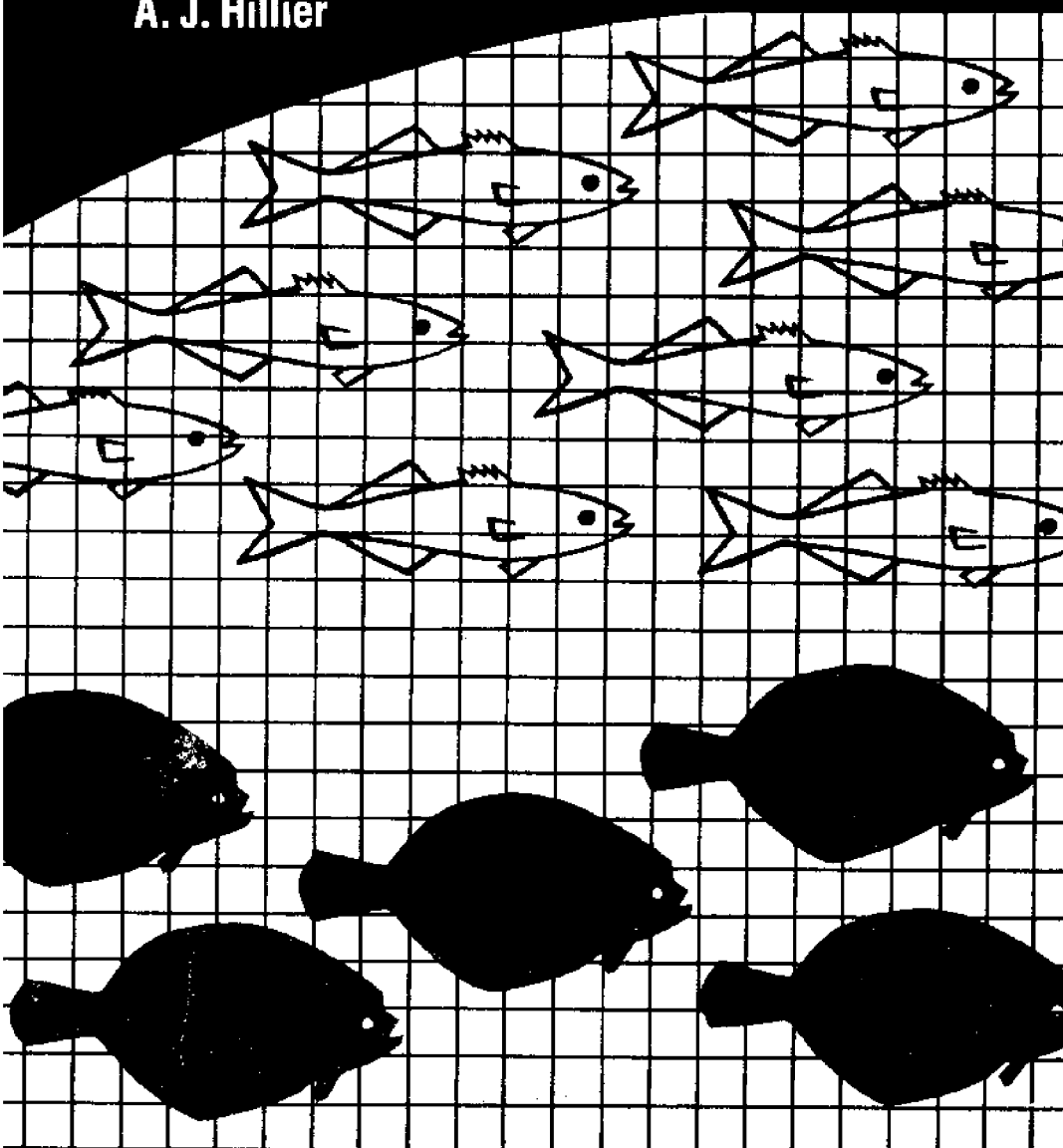
URI High Rise Series

# Bottom Trawl Manual

A. J. Hillier



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## Introductory comments*

The original design of the URI 340 High Rise, Heavy Duty Bottom Trawl was made in 1972 under a contract from the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration. At that time, one net was built for evaluation during fish sampling trials being carried out jointly by the United States and the USSR off the New England coast.

Catch rates from the net during these trials showed it to be considerably more effective than the standard "Yankee" types, which are in general use by New England trawlers. In particular, it was able to catch higher swimming species, while at the same time tending the bottom well to maintain catches of fish like flounder.

This manual has been prepared to provide fishermen and other potential users with the basic plan of the net as well as information on adapting its rigging to suit a range of vessel sizes and horsepower.

The initial net design was improved greatly by information from research on the performance of bottom trawls undertaken in the University of Rhode Island Department of Fisheries and Marine Technology as part of the Sea Grant Program. Development was continued using model experiments in a hydraulic flume at the University of Florida. Current tank testing involves two full-sized models for squid trawl development. The net models for 150- and 400-horsepower vessels use 1½-inch lines or a graduated tailpiece. The continuing efforts on this trawl's development are being funded by the URI Sea Grant Program.

*Survey results.* An initial survey of people who have built and fished the trawl found that 75 percent of the respondents felt the trawl caught 25 percent more of species sought than the nets they previously used. A total of 35 percent felt its value lies in its ability to catch higher swimming species, such as bluefish, rock trout, whiting and scup. Half of the respondents felt it is effective in catching flatfish like fluke and flounder while the other half disagreed.

The designer would like very much to receive additional comments from fishermen who have built and used the net. Particularly useful would be information on relative efficiency compared to other gear, and ideas for changes to make the net more effective. When combined with the results of model experiments, such information should mean greater net efficiency.

Please mail your comments to Professor A. J. Hillier, Fisheries and Marine Technology Department, 210 Woodward Hall, University of Rhode Island, Kingston, Rhode Island 02881.

*The author teaches in the Department of Fisheries and Marine Technology, University of Rhode Island. Drawings showing the construction of various sweep gears are by Paul Schuman, a graduate of the URI commercial fisheries program. This publication is sponsored by NOAA Office of Sea Grant, Department of Commerce, under grant 04-3-158-3. The U.S. government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon. Kingston 1974

*The chafing problem.* A few users of the net have reported excessive chafing of the lower wings and signs of overstressed twine at the square. Experiments in the hydraulic flume confirmed these possible problems and showed that a very simple modification could overcome them.

If chafing occurs, 5 meshes should be cut from each side of the wide (forward) end of the square only. On rehanging the net, the length of the square at the headrope will be reduced by 1 foot on each side, but there is enough twine in the wing to make up this difference.



## URI 340/280/200 net instructions

These instructions are standardized to suit any of the above nets. When properly rigged, these nets will tend bottom well while giving a headline height perhaps double that of the standard "Yankee" net. The plans shown here give net dimensions considered most suitable for a wide range of vessel operations with reference to factors such as boat size, horsepower, etc.

A working knowledge of nets and gear is assumed, but various publications which may be helpful are available from the University of Rhode Island Marine Advisory Service. These include *How to Plan and Cut Nets, Cutting Web Tapers* and *Computing Horsepower Used in Trawling.* (See the back cover for information on how to order these.)

*Mesh size.* The plans shown assume a standard mesh size of 5 inches. If a different mesh size is required, simply multiply all the mesh numbers on the plan by 5 and then divide the result by the new mesh size. Thus, if a 3½-inch mesh were required and the mesh number were 140, the required number would be

$$(140 \times 5)/3\tfrac{1}{2} = (140 \times 5 \times 2) / 7 = 200^*$$

Of course, the various tapers should remain the same as given on the net plans, no matter what size of mesh is used.

*Hanging the net.* The number of dog ears on the lower wings should be multiplied by the mesh size to find the length of rope (in inches) in which the net should be hung. For example, 100 five-inch dog ears equal 500 inches of stretched twine hung at a 1:1 ratio, which gives 500 inches (or 41 feet, 8 inches) of rope. The hanging rope should be stopped to the sweep in even bights throughout the full length.

The lower belly should be hung at a 2:1 ratio. In other words, a 5-inch mesh is hung in 2½ inches of rope, which is then hung to the sweep rope with even bights as is done in the wings.

The square is hung in the same manner as the lower belly. However, this length should be determined before the wings are hung. This is done by

*If the required mesh size is less than 3 inches, allow about a 5 percent increase in meshes.

counting the number of meshes on the square after the wings are sewn on. Thus, 48 five-inch meshes equal 240 inches of stretched twine. At a 2:1 ratio the square is hung into 10 feet of headrope.

The remainder of the headrope is then divided by 2 to give the length of both wings. If the headrope is to be 50 feet long, and 10 feet of it is to be used to hang the square, 20 feet will be left for each wing. This figure multiplied by 12 and then divided by the number of dog ears on the top wing will indicate exactly how far apart to hang the dog ears.

It is recommended that the headrope be made in three pieces with each wing and square having a separate headrope. Then only the broken section needs to be replaced should the headrope part, thus saving time and money. Also, with separate headropes, the corners of the net are marked, which is especially useful when replacing a wing or square or mending a badly torn net.

*Rigging the net.* This net was designed to be used with legs between the net and the doors. Legs should have a minimum length of 10 fathoms in order to allow the net to open on the wing ends to give greater headline height. Up to 25-fathom-long legs have been used with success, but in such cases light wire should be used on the top leg, such as ½-inch wire of 6 x 19 construction. Smaller wire may be used, based on boat size and horsepower.

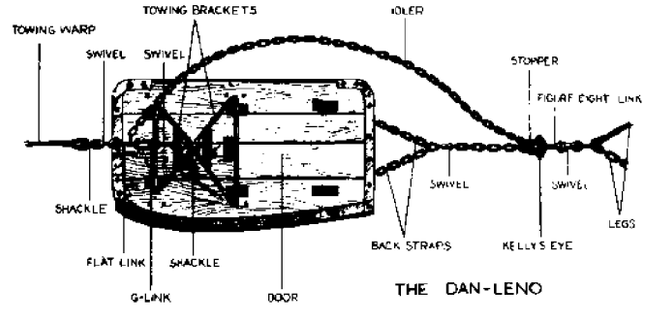
If chain is used for the bottom legs, it should be checked weekly for stretch and readjusted if necessary. An overlong bottom leg will cause the net to dig hard into the bottom and also cause the headrope height to decrease.

The URI 340/280/200 net is designed so that the headline may be slacked up to 5 feet on each end and still maintain sufficient overhang to catch "off-bottom" fish. However, if the net is to be used in a combination, such as for catching flounder, and at the same time, cod, whiting, hake, scup, etc., a piece of chain should be fastened to the end of each bottom wing. The weight of this chain will vary, and each skipper will have to experiment a little until he is satisfied that the wing ends tend bottom efficiently. Tank testing of the models has also indiciated that the bottom legs or sweep may be slacked up to 2 feet to make the net dig harder without any loss in headline height.

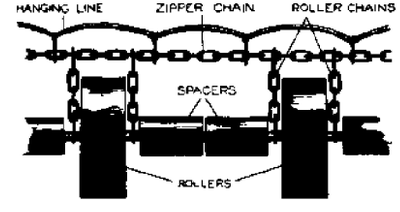
Note that only 3 meshes on each side should be used for lacing the top of the net to the bottom. This lacing should be reinforced from cod end to wing ends with a rope of adequate size.

*Floats.* The number of floats will vary, of course, according to the type of bottom, sweep and species sought; size and power of boat, etc. Thus, again trial-and-error is the best way to determine the number of floats, but the skipper should consider all the factors mentioned here.

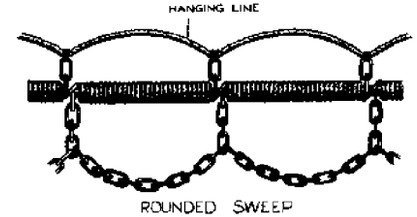
*Doors.* Various skippers who now have these URI nets are still using the same doors as for their previous nets.



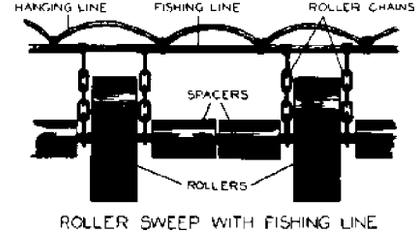
THE DAN-LENO



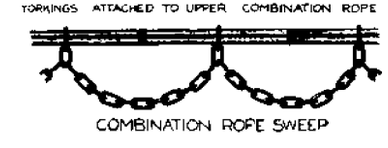
ROLLER SWEEP WITH ZIPPER CHAIN



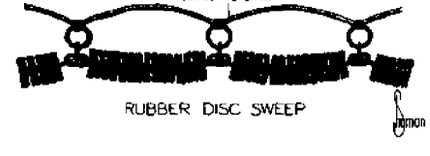
ROUNDED SWEEP



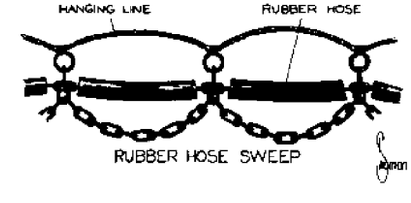
ROLLER SWEEP WITH FISHING LINE



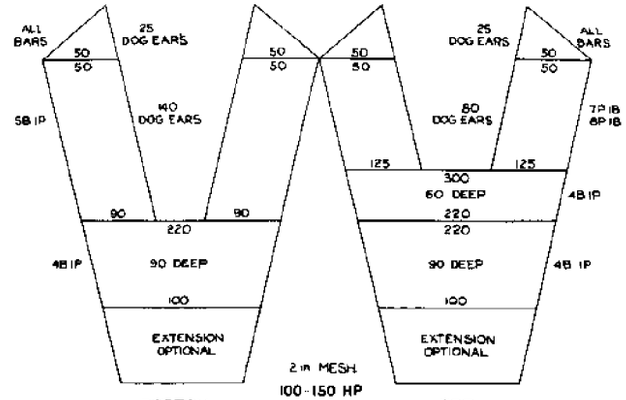
COMBINATION ROPE SWEEP

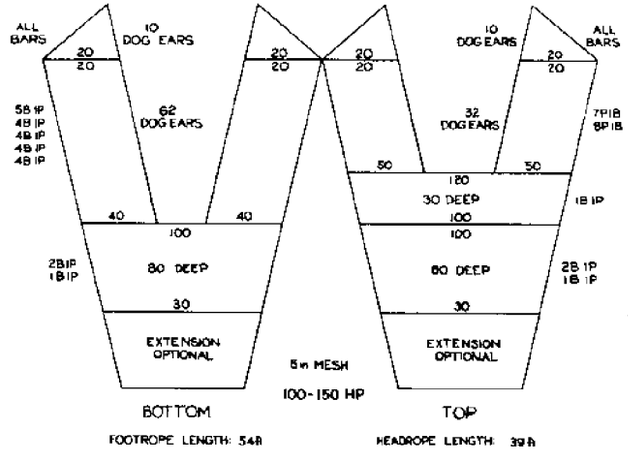


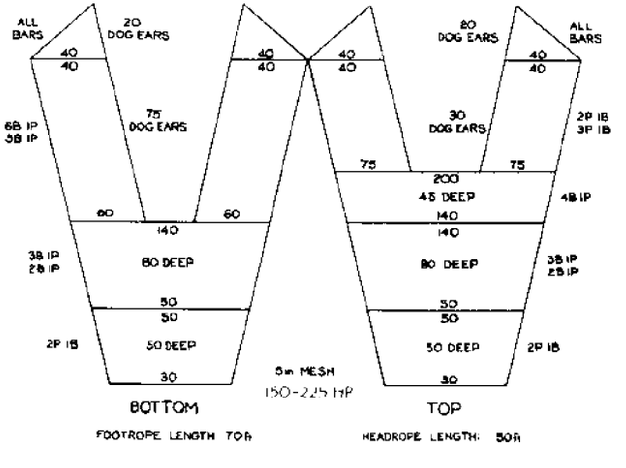
RUBBER DISC SWEEP

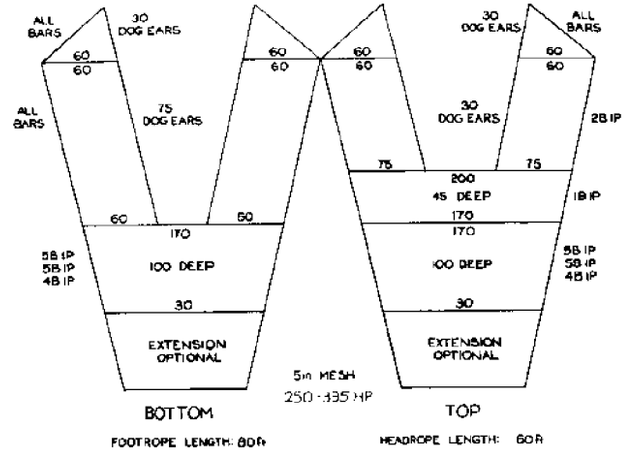


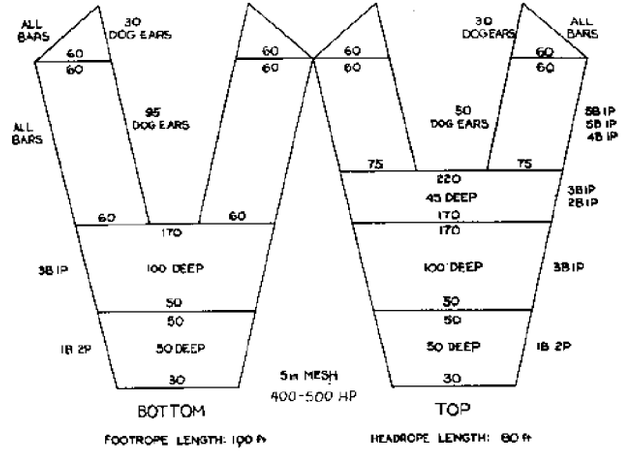
RUBBER HOSE SWEEP

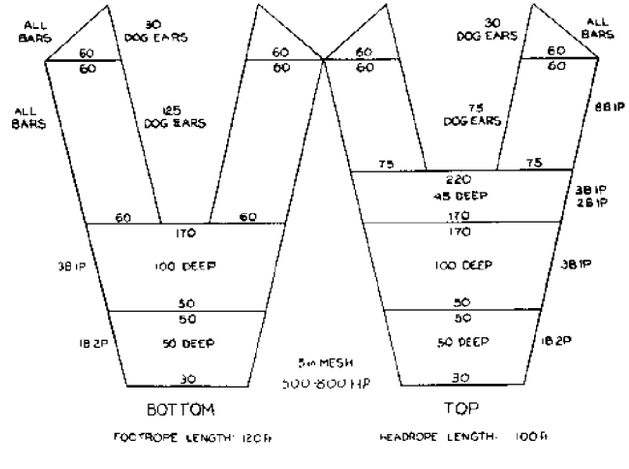

ALL BARS
25 DOG EARS
50
50
140 DOG EARS
90
220
90 DEEP
100
EXTENSION OPTIONAL
5B IP
4B IP
2 in MESH
100-150 HP
BOTTOM
FOOTROPE LENGTH: 54 ft
80 DOG EARS
125
300
60 DEEP
7P IB
6P IB
4B IP
HEADROPE LENGTH: 39 ft
TOP


ALL BARS
10 DOG EARS
20
20
62 DOG EARS
40
100
80 DEEP
30
EXTENSION OPTIONAL
5B IP
4B IP
2B IP
1B IP
5in MESH
100-150 HP
BOTTOM
FOOTROPE LENGTH: 54ft
32 DOG EARS
50
120
30 DEEP
7P IB
6P IB
HEADROPE LENGTH: 39ft
TOP


ALL BARS
20 DOG EARS
40
75 DOG EARS
60
140
80 DEEP
50
50 DEEP
EXTENSION OPTIONAL
6B IP
5B IP
3B IP
2B IP
2P IB
5in MESH
150-225 HP
BOTTOM
FOOTROPE LENGTH 70ft
30 DOG EARS
75
200
45 DEEP
4B IP
HEADROPE LENGTH: 50ft
TOP


ALL BARS
30 DOG EARS
60
75 DOG EARS
100 DEEP
EXTENSION OPTIONAL
5B IP
4B IP
5in MESH
250-335 HP
BOTTOM
FOOTROPE LENGTH: 80ft
30 DOG EARS
2B IP
75
200
45 DEEP
1B IP
170
HEADROPE LENGTH: 60ft
TOP


ALL BARS
30 DOG EARS
60
95 DOG EARS
100 DEEP
50
50 DEEP
EXTENSION OPTIONAL
5B IP
4B IP
3B IP
2B IP
1B 2P
5in MESH
400-500 HP
BOTTOM
FOOTROPE LENGTH: 100ft
50 DOG EARS
75
220
45 DEEP
170
HEADROPE LENGTH: 80ft
TOP


ALL BARS
30 DOG EARS
60
125 DOG EARS
100 DEEP
50
50 DEEP
EXTENSION OPTIONAL
6B IP
3B IP
2B IP
1B 2P
5in MESH
500-800 HP
BOTTOM
FOOTROPE LENGTH: 120ft
75 DOG EARS
75
220
45 DEEP
170
HEADROPE LENGTH: 100ft
TOP

## Other fisheries publications

Please include publication number and title when ordering any of the following publications from the Marine Advisory Service, University of Rhode Island, Narragansett Bay Campus, Narragansett, Rhode Island 02882. Please make checks payable to the University of Rhode Island.

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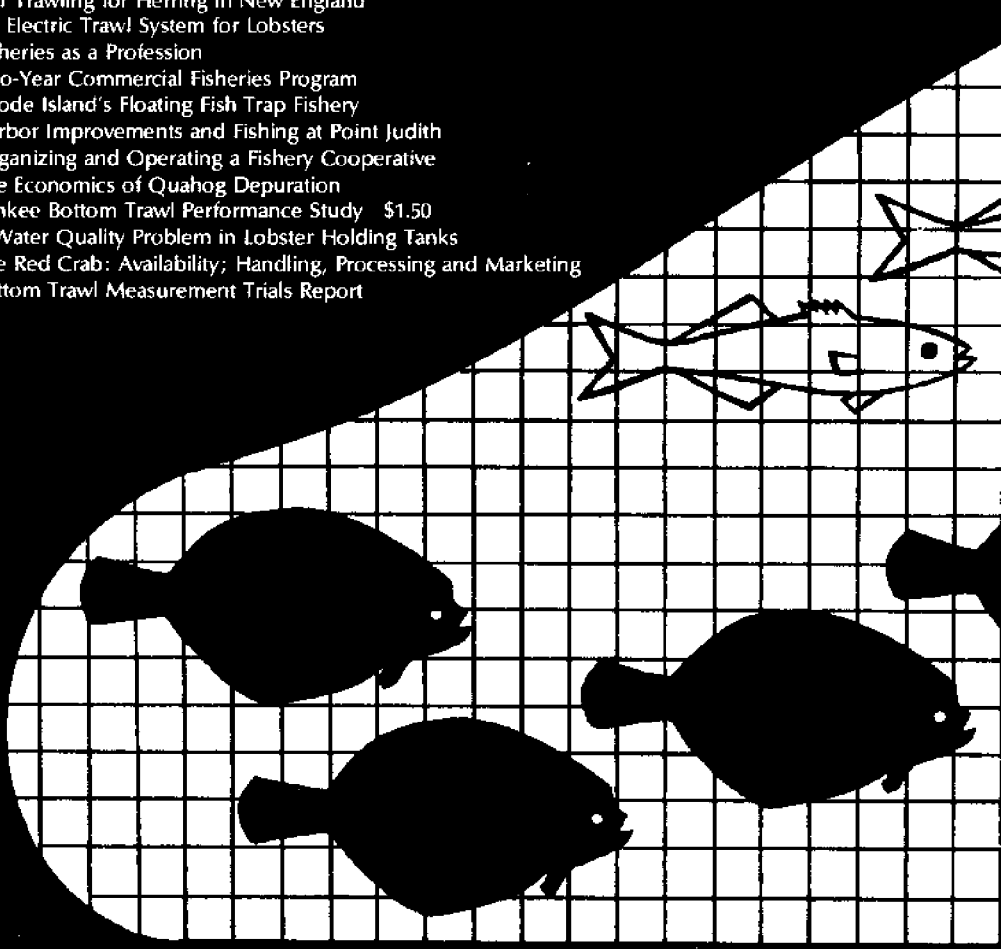
P 4 Long-Lining for Swordfish
P 10 Migration and Growth of Deep-Sea Lobsters, *Homarus americanus*
P 13 Cutting Web Tapers
P 14 Computing Horsepower Used in Trawling
P 15 Selecting a Radar Set for a Fishing Vessel
P 127 Chartwork for Fishermen and Boat Operators $3.00
P 131 Navigation for Fishermen and Boat Operators $3.50
P 133 How to Plan and Cut Nets 25¢
P 136 Fisheries Cooperatives: Their Formation and Operation
P 137 Pair Trawling for Herring in New England
P 140 An Electric Trawl System for Lobsters
P 219 Fisheries as a Profession
P 255 Two-Year Commercial Fisheries Program
P 262 Rhode Island's Floating Fish Trap Fishery
P 263 Harbor Improvements and Fishing at Point Judith
P 270 Organizing and Operating a Fishery Cooperative
P 282 The Economics of Quahog Depuration
P 300 Yankee Bottom Trawl Performance Study $1.50
P 301 A Water Quality Problem in Lobster Holding Tanks
P 308 The Red Crab: Availability; Handling, Processing and Marketing
P 312 Bottom Trawl Measurement Trials Report



P 319 Socio-Economic Research Issues in Fisheries Development
P 343 Financing Fishing Vessels
P 344 The Benefits of Fisheries Regulation: A Case Study of the New England Yellowtail Flounder Fishery
P 346 Fishermen of Galilee $3.00
P 349 Calculation of Trawling Gear Drag
P 350 Calculation of Trawling Gear-Trawler Interaction
P 351 User Manual for RECON 4: A Bio-Economic Simulator of a Fishery
P 352 Calculation of Fishing Net Drag
P 356 Ocean Pout Parasites