

An in-depth look at a popular, effective, and economical salmon fishing method.

## Puget Sound Drum Seining

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**ABSTRACT**—Drum seining for salmon in Puget Sound, Washington, began in 1950. By 1970, the drum fleet consisted of 88 vessels. Special drum seining gear includes a net drum about 8 ft. long with 8-ft. diameter flanges, a fairlead to level wind the net onto the drum, and a ring stripper which holds the purse rings at the surface after pursing is complete. Drum seine gear is subject to greater wear and tear than gear used with a power block. Drum seining reduces vessel crew size from six fishermen, required when power block seining, to four men. Drum seines are set at less than full speed to prevent the skiff from capsizing if a net backlash occurs, but net recovery is much faster than when using a power block. Jellyfish tentacles and injuries caused by objects falling from the net are also eliminated. Drum seiners can operate more effectively over shallow, rock strewn bottom. A review of catch records for power block and drum seining during 1966-70 suggests that both vessel and crew of drum seiners achieve higher annual earnings.

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### INTRODUCTION

Drum seining (Fig. 1) is an effective and economical means of fishing for Pacific salmon, *Oncorhynchus* spp. Although it is widely used in Washington State and British Columbia and is continually growing in popularity among fishermen, the method, its advantages, disadvantages, and economic aspects have never been described in detail. This report, based on information assembled by personnel of the National Marine Fisheries Service, has been prepared to satisfy that need. Certain portions are necessarily generalized so that the most commonly used approach could be described; other portions refer to specific gear components or procedures observed aboard cooperating vessels.

**Figure 1.**—Drum seiners are shown at different fishing stages. One vessel has completed its circling maneuver and simultaneously purses and drums the net aboard while the second vessel nears the end of its set. Precise, cooperative timing between the vessel captains will permit the first vessel to complete its net retrieval and move out of the other's net just before it is closed.





Figure 2.—The *Finn* has a fixed-net reel attached to the main deck whereas the reel of the *Patty J.* has been recessed into the deck; the latter also has a pivoting feature. Note that both vessels carry power blocks used earlier in the season when fishing Alaskan waters.

## HISTORY OF DRUM SEINING

Seining for salmon in Northwest waters began in the late 1800's. Changes in the gear and methods have occurred, keeping pace with development of modern materials and power sources. The first net reel (Anonymous, 1935) was constructed and installed by Captain Dick Suryan of Hoonah, Alaska, in 1935 for his new seiner *Rio de Oro*. His results with the reel were not recorded and no further reference is made to the fishing method until Nick Kelly of Nanaimo, B.C., reintroduced the drum system shortly before 1950 (Anonymous, 1953a).

Drum seining was introduced in Puget Sound by Frank Green of Oak Harbor, Wash., with his vessel *Nonsuch* in 1950.

By the 1953 fishing season, 11 Puget Sound seiners had converted from pulling the seine aboard with the aid of a power roller to the easy handling drum. By midseason of that year, drum seiners were averaging more fish per day than conventional purse seiners (Anonymous, 1953b). Drum vessel crews were composed of five men. Sets were completed in about 40 minutes—considerably faster than nine men pulling the net aboard by the conventional method (Smith, 1954). In 1973, hauling time had been further

reduced to about 23 minutes with a four-man crew.

Drum seining attributes became well established and new vessels continued to join the fleet. By 1970, 88 drum seiners fished Puget Sound compared to 179 power block seiners. It should be emphasized that virtually all purse seining for salmon in British Columbia is done by the drum method. Over 370 Canadian drum seiners were licensed in 1972. In spite of early drum seining success, other factors influenced its acceptance in the fishery. Philips (1971) attributes the limited utilization of this major fishing gear breakthrough in Puget Sound to two major factors. First, Alaska enacted legislation to prohibit using the drum seine method. Since many Washington State salmon seiners began the fishing season in Alaska and later moved south, there was less economic incentive for a vessel to maintain two complete fishing systems. Second, the power block went into production in early 1955; 200 were sold within a few months. The power block also reduced work load and crew size, although not to the same degree as the drum system, and power blocks could be readily installed on a wide variety of vessels at much less cost. Most important, it could be legally used in the Alaska fishery.

## GEAR COMPONENTS

This section of the paper is devoted to describing those items of equipment used in drum seining that are different from block seining; components common to both systems are not discussed.

### Net Drum

As with most fishing gear, the net drum size varies somewhat depending upon the vessel size and personal preferences of the captain. Typically the drum has a 10-inch to 24-inch diameter steel pipe core, 8 ft. in length between the flanges. Each end flange has a diameter of 8 ft. The main engine supplies hydraulic power to rotate and pivot the drum and move the fairlead (level wind).

Figure 3.—The *Patty J.* is equipped with a hydraulically-driven pivoting drum and table to follow the changing angle to the net during retrieval and to reduce the opening between net ends.



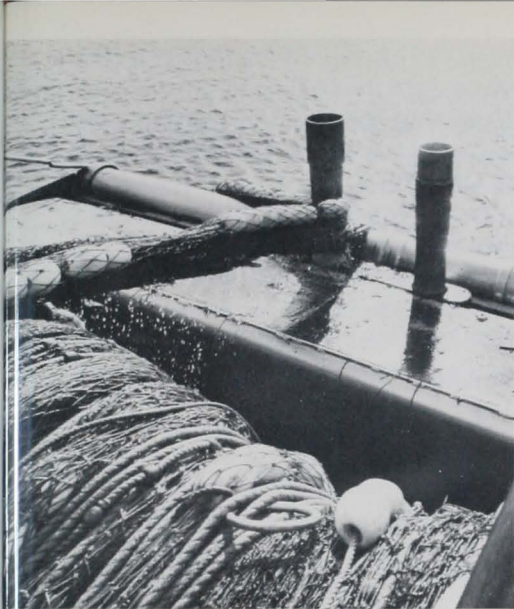


Figure 4.—The free-wheeling fairlead posts are hydraulically moved back and forth across the drum face to level wind the net during retrieval.

Drums are either recessed through the deck into a well for improved vessel stability or mounted above the main deck (Fig. 2). The latter method permits simpler conversion to other fisheries, whereas a false deck must cover a recessed drum well.

A few drum seiners have the drum, fairlead, and stern roller incorporated into a hydraulically powered turntable that can rotate up to 180° to follow the changing angle leading to the net (Fig. 3). Fishermen consider the pivoting table to be a convenience rather than essential for fishing success.

### Fairlead (Level Wind)

A fairlead is used in conjunction with a roller across the vessel's stern or net table to facilitate even distribution of the net as it winds onto the drum. The level wind consists of two parallel vertical freewheeling posts about 8 inches in diameter, set 18-20 inches apart (Fig. 4). The posts travel back and forth by hydraulic power across the face of the drum. The fairleads can be tipped down or moved to the extreme starboard end of their track to keep them free of the net during a port set.

### Ring Stripper or Hairpin

Drum seine fishermen use either a hairpin or a ring stripper to hold rings after pursing is complete (Fig. 5). The hairpin was first reported in *Pacific Fisherman* (Anonymous, 1953a) as a

necessary companion development of the drum system.

### Net

Considerable extra wear and damage occurs to a drum seine. Corkline floats are severely compressed on the drum, especially those placed on the drum near the core (Fig. 6). Floats which can withstand the tearing and crushing forces are more expensive than those used on most block seines. Often floats are strung on a secondary line which is in turn lashed to the main corkline. In this way, one or two more floats can be strung per fathom, and floats flop back and forth to reduce strain and tearing of the floats as they are wound onto the drum.

Purse lines wear out as much as seven times faster than those used on block seines because of added abrasion when passing purse lines through rings held at the surface. Wear and jamming is reduced by leaving the rings untied to slide the full length of the bridle. However, free mounted purse rings produce greater wear on the ring bridle.

Figure 5.—After pursing is complete, rings are threaded onto a stripping device, then lifted high enough to bring the web clear of the water. Note one fisherman, holding the net out of the water, walks the rings aft to the fixed drum.

### Purse Line

Purse lines, of spliceable, braided nylon line, ¾- to 1-inch diameter, are made up in 30 fm sections. The sections have spliced eyes in each end and are joined by lashing or by steel figure eight links. The use of sections permits replacement of worn line without total replacement. It is also possible to purse part of the net while the net is on the drum, by disconnecting a purse line connector and hauling on the free end. Occasionally the purse line doesn't wind onto the drum uniformly with the net. When this occurs, an extra 5- or 10-fathom section of purse line can be added for temporary use.

### FISHING OPERATIONS

Drum seining techniques are generally similar to power block fishing except for the operations discussed here.

### Crew Assignments

Four men can readily handle the complete fishing operation with minimal physical labor (Anonymous, 1953c). The captain maneuvers the vessel during setting and towing. During pursing and net retrieval, he carries out assorted deck assignments



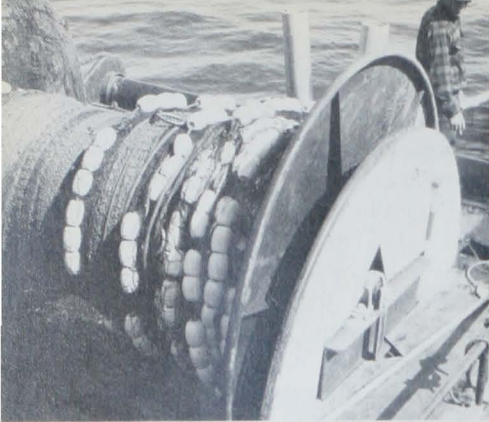


Figure 6.—Severe strain and compression forces are placed upon floats placed near the drum core. Some relief is provided by stringing floats on a separate corkline which is then laced to the "main" corkline.

including watching for and removing tangled fish or debris from the net.

The cook handles the purse winch and purse line since pursing is normally carried out from one end while simultaneously drumming aboard the net from the other end. After pursing, he monitors the rings and purse line passing onto the drum. Rings must be carried aft to the drum on vessels

Figure 7.—The skiff keeps one end of the net tied to the bow as the set begins to reduce the likelihood of a backlash turning the skiff over. A nearby skiff tows one end of its net after setting is complete.

with fixed reels to prevent an opening in the net (Fig. 5).

Drum controls, including net winding, fairlead positioning, and table pivoting, are manipulated by the engineer. The skiffman's duties are essentially the same as for block seining.

### Backlash

Because of the danger of backlashing, drum seiners set more slowly than conventional vessels. A backlash can occur when the drum speed exceeds that of the net during setting or when the net fouls on the drum. When the net is wound on the drum it is under considerable tension which can cause it to bind between earlier wraps or between a wrap and a flange. A foreign object entangled in the net can also cause a hangup. Backlashes are dangerous—particularly for the skiff operator. Should one occur when only a short length of net is in the water, the sudden pull may capsize the skiff. As the amount of net out increases, the danger decreases because the net in the water absorbs backlash shock.

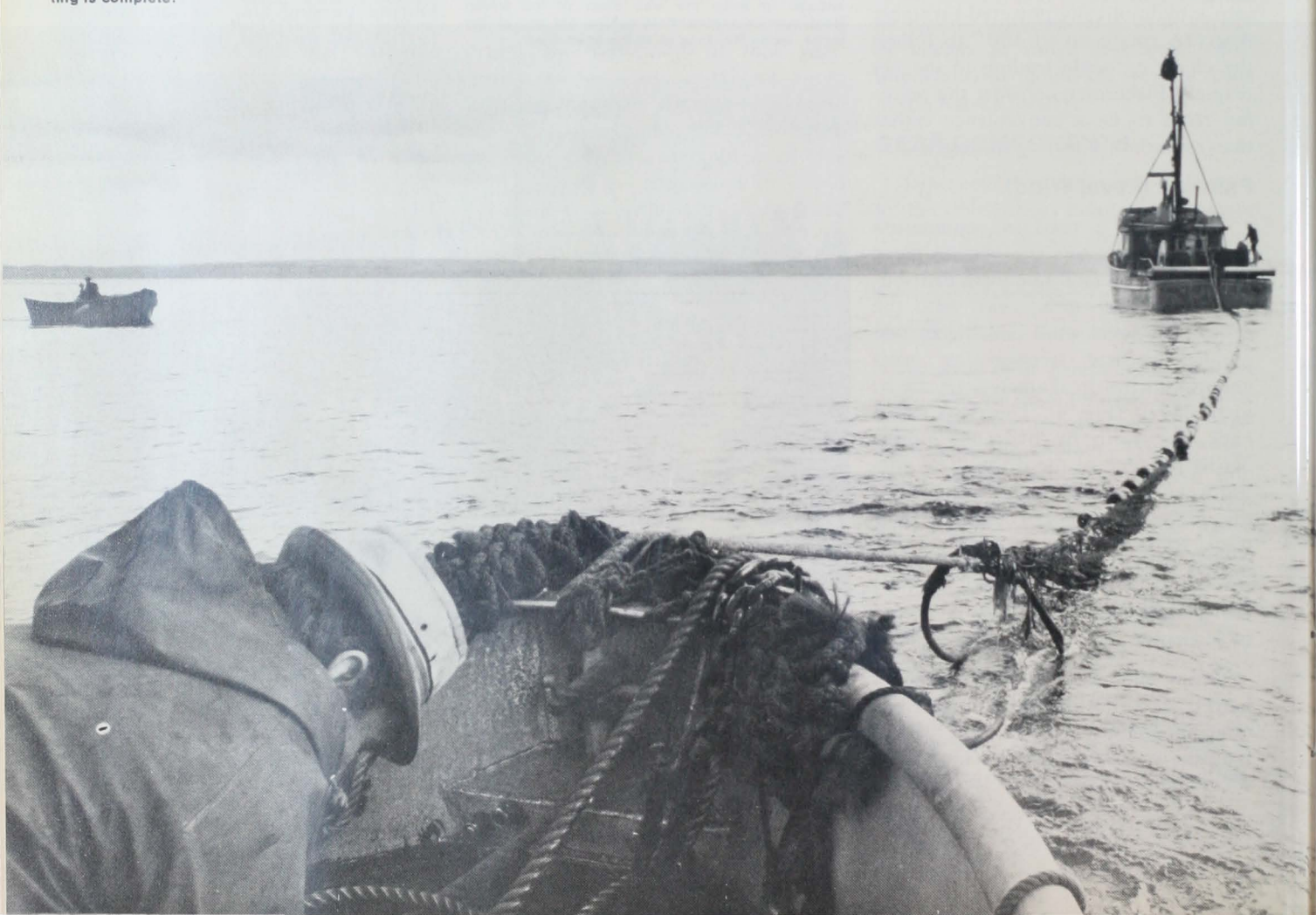
*Fishing News International* (Anony-

mous, 1972) reports that skiff operators reduce the likelihood of capsizing because of backlash by keeping the skiff's bow pointed toward the ship and net (Fig. 7).

A heavy polypropylene web lead-line strip in the drum seine reduces snags which might contribute to backlash because objects tend to fall free from the slick material.

### Towline

Fishing strategy determines whether the net hauling end will be transferred from the drum to a mast towing cable or be payed out on a long towing warp stored on the drum core. Usually a short rope strap at the end of the net corkline is attached by a quick release link to a cable about 40 feet long affixed part way up the vessel mast. As the net end is payed out, net strain is taken by the mast towing cable. The net end is held in this position just astern of the vessel during the holding-open process and while the net is towed closed. Once the drum begins to retrieve the net, the mast cable is released.



## Net Configuration

Generally, the drum seine maintains an open kidney shape during retrieval. The skiff can readily hold the vessel out of the net despite a tendency for it to be pulled into the net during active hauling, so when this happens, small bow and stern bends are formed in the net. Net collapse is minimal when drumming and pursing are carried out simultaneously.

## Pursing

The purse line arrangement used on drum seines permits hauling procedures to vary depending on fishing conditions. Although a drum seine can be pursed from both ends, it is not commonly done in practice. Normally the net is pursed from the bunt end while the hauling end is drummed directly on board. Most drum seines have the purse line terminated from 30 to 60 fathoms short of the hauling end. Consequently, that amount of net must be drummed aboard before reaching the purse line. However, once the hauling-end purse line is reached while retrieving the net, the purse line can be disconnected to permit pursing both ends simultaneously.

When numerous vessels are fishing in a confined area and net setting room is limited, any part of the drum seine can be quickly set and retrieved, pursing as few or many rings as the captain chooses. Block seines either cannot set or must conflict with other vessels to get their complete net out so both purse line ends can be reached and the net can be lifted to the power block. Occasionally block seines set and retrieve portions of their net by a time-consuming process requiring the boom and power block to be lowered to the deck and the net placed in the block.

Since the ends of the purse line of the power block seine are retrieved over purse blocks on a single davit, the net is drawn together from a single point, thereby minimizing the space between net ends alongside the boat. In a drum seining operation, this potential fish escape route is up to twice as large since one end of the net is drummed from the vessel's stern while the other is pursed at the mid-ship davit. Vessels equipped with a pivoting drum can reduce the open



Figure 8.—Drumming continues at high speed after the table has been turned because it is not necessary to walk rings aft. Ring bridles and web moving across the narrow space between fairlead and stripper tend to inhibit fish from taking the potential escape route under the vessel.

spacing between purse lines by rotating the drum table to the ship's side close to the pursing davit (Fig. 8). Drum seine fishermen do not believe the larger net opening contributes to a significant fish loss.

## Handling Purse Rings

Upon completing the pursing operation when the rings reach the surface, they can be immediately placed on the stripping device or held by tension on the purse line.

Aboard the *Patty J.*, a typical Puget Sound drum seiner, drumming was continuous at about 4 ft./sec. after the rings surfaced. Enough strain was maintained on the purse line to hold the rings at the surface even though the purse line was fed through the rings onto the drum (Fig. 9). This practice greatly increased purse line wear but reduced the time and effort required to place all rings on the ring stripper, onto which the last 30 rings were lifted at one time.

In contrast to power block fishing, the drum seine purse line is not removed from the rings when rings are placed on a hairpin or ring stripper. The purse line is returned with the net to the drum after passing through all remaining rings.

## Net Repair

Net repairs such as tears, broken ring bridles, etc., are difficult to make on the boat because damaged sections

cannot be easily kept accessible on the reel. Regulated short fishing periods each week in Washington State and close proximity to servicing docks permits the crew to periodically transfer their nets to trailer mounted power drums for repair during these enforced fishing breaks.

Any portion of the drum seine can be conveniently set and retrieved, so it is possible to expose an area requiring service in this manner. However, only the short distance from drum to stern roller or fairlead can be worked on at any one time (Fig. 10). Unfortunately the net cannot be put into the water during closed fishing periods for maintenance. Drum seiners which carry a power block quite often transfer the net from the drum through the block to the deck for repairs.

## OPERATIONAL ADVANTAGES AND DISADVANTAGES

The primary advantage of drum seining over conventional power block seining is that a crew of only four is necessary instead of six or seven. This is particularly important when experienced crewmen are difficult to hire. Even with the reduced crew, actual labor is less per man.

Operational speed also favors the drum seining technique. Typically a drum seine can be set and retrieved in 23 minutes while the power block seiner requires about 35 minutes.

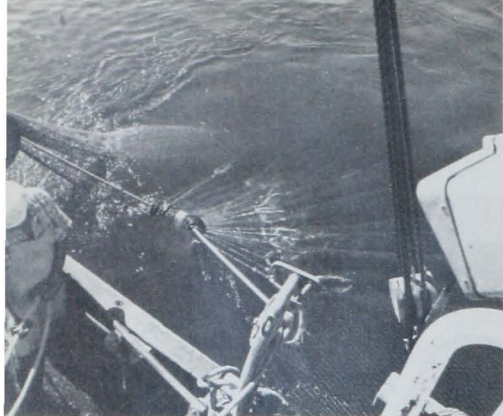


Figure 9.—Rings are held at the surface while net retrieval continues by maintaining a strain on the purse line. The point at which rings are lifted onto the stripper varies among vessels.

Consequently, the drum seiner can achieve more sets per day.

Certain injuries and delays commonly encountered in block seining are reduced in the drum seining operation. Severe stings from jellyfish tentacles dropping out of the net into the eyes and face, for example, are eliminated, as are injuries from falling fish, sticks, and broken purse rings, since no gear is lifted overhead. Leadline rollups are not uncommon, especially when seiners fish shallow water and the net contacts the sea floor. Drum-seine fishermen can continue fishing with a rollup along nearly any

Figure 10.—Fishermen aboard the drum seiner *Patty J.* work in the confined space between the drum well and stern to clear a web rollup.



portion of the hauling end. Frequently they will make repeated shallow water sets with a rollup before returning to deep water to clear the leadline.

Drum seiners can more effectively fish over shallow, rock-strewn bottom. Leadlines or purse lines which hang up on rocks or other snags can be freed by temporarily halting pursing and then drumming toward the snag. While drumming, the vessel can be maneuvered over or around the snag.

The advantages of drum-seine fishing must be balanced against certain limitations. Rollups caused by tension placed on the seine during set and retrieval appear to be somewhat more common when drum seining both in shallow water when the leadline contacts bottom and in deep water.

Alaska fishing regulations presently preclude use of drums in that fishery. Therefore, a drum vessel fishing in Washington State which wants to also fish in Alaskan waters must also have a complete power block system.

Port sets are the common method of setting both drum and power block seines. Commonly, fishing strategy dictates that a reverse (starboard) set be made. Reverse sets are less convenient when drum seining because during the first set in the new direction, the leadline tends to cross over the corkline as it comes off the reel.

Some drum seine construction details such as incomplete purse line differ from a power block net so the net is not interchangeable without modification (Fig. 11).

## FLEET COMPOSITION

Drum seiners make up a varying percentage of the Puget Sound seine fleet because the number of power block seiners varies. This, in turn, is related to the anticipated abundance of fish each year. Between 1966 and 1970, the power block fleet fluctuated between 104 and 273 vessels. By 1970, the drum fleet consisted of 88 vessels (unpublished report provided by Captain Johnnie Dontos).

Drum seiners tend to fish selected areas of Washington State. These are usually the shallower fishing grounds such as Point Roberts, Boundary Bay, and West Beach.

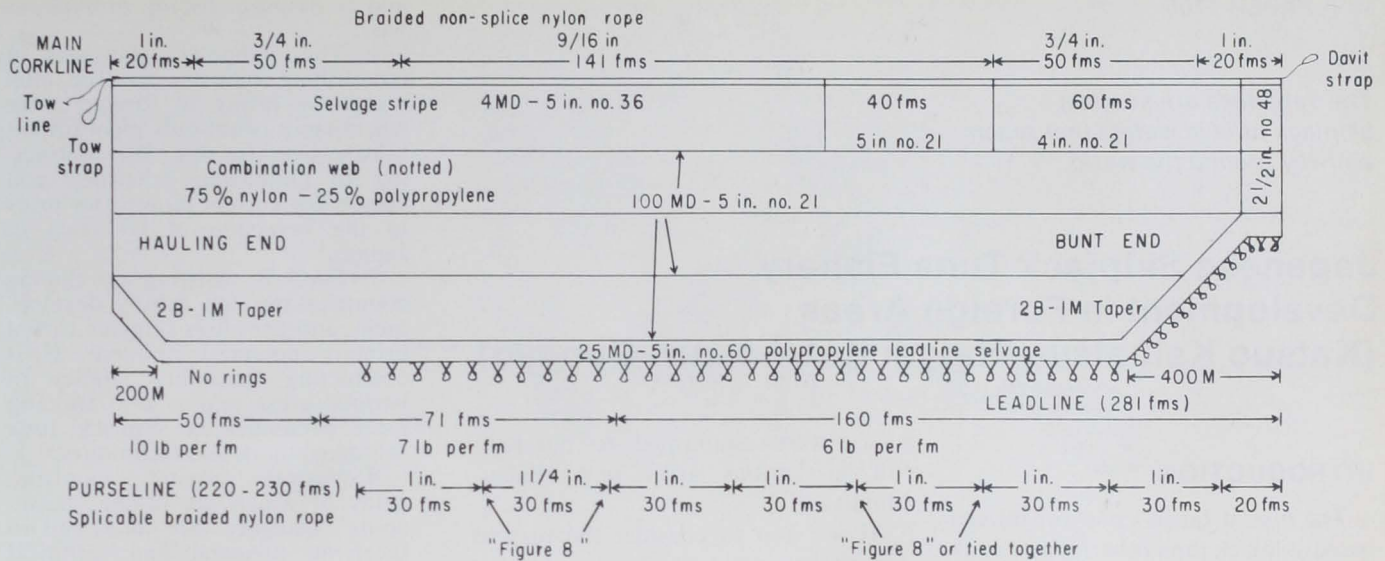
Available statistics do not completely reflect the economic merits of drum or block seining. The capital outlay for a drum seiner is about \$10,000 higher than a comparable block seiner. Also, maintenance for the drum seine is greater. This is offset by the fact that a drum seine can be set easier and faster, which makes it worthwhile to make sets when fish are fewer and more scattered. During periods of "scratch fishing" drum vessels tend to fish on the more valuable species, such as chinook salmon, *O. tshawytscha*.

An economic study of the two fishing methods was prepared by Captain Johnnie Dontos from 1966-70 data gathered by the Washington State Department of Fisheries.<sup>1</sup> Using his data, the following comparisons were drawn from 4-man drum seiners and 6-man power block seiners which were above the fleet average for earnings during the 1966-70 seasons.

	Drum vessels	Power block vessels
Days fished per season	49	36
Daily crew share	\$ 73	\$ 60
Crew share per season	3,577	2,160
Daily vessel share	292	238
Vessel share per season	14,308	8,568

This cursory examination tends to substantiate the drum seine fisherman's view that his fishing method is more efficient and profitable.

<sup>1</sup>Data on file, Northwest Fisheries Center, National Marine Fisheries Service, 2725 Montlake Blvd. E., Seattle, WA 98112.



Ring bridles - 7/16 in. nylon rope  
 45 - 11ft hung to 9ft leadline at 11 ft intervals  
 15 - 6ft hung to 5.5 ft leadline at 6 ft intervals (bunt end)

Hang-in  
 Corkline 12 fms web to 10fms line  
 Leadline 12 fms web to 9.6 fms line

Figure 11.—Diagram of Puget Sound drum seine.

## ACKNOWLEDGMENTS

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