PRELIMINARY PROGRESS REPORT, SAN PEDRO WETFISHING PROJECT:

FISHING FOR ANCHOVIES

The San Pedro Wetfish fleet contains about 31 boats belonging to the San Pedro Fishermen's Cooperative. They vary in length from 60 to 110 feet, with capacities of 50 to 200 tons of fish. While a few of the newer boats are built of steel and aluminium, the majority are constructed of wood.

Even the older boats utilize modern technology, and all carry modern radio and electronic equipment. All have ship-to-shore, high-frequency, and 'CB' radios. Many have several of each with additional high-power transreceivers, ship-to-airplane, and emergency radios, plus various back-up units. Most have some sort of auto-pilot to help steer, and utilize radar, sonar, and depth recorders in various combinations.

Although fishing boats have sailed from San Pedro since before World War II, the most important period of the fleet's history dates from the early 1960's. In 1958 the Puretic Powerblock was developed in San Pedro. It did not find early acceptance in San Pedro, and only after it had been adopted and refined by the fishermen of the Northwest did it return to San Pedro. Anthony M. was the first San Pedro fisherman to use the power-block in 1962, and by 1968, the entire fleet had converted to its use.

Around the same time as the acceptance of the powerblock, nets constructed of synthetic fibers were introduced. The synthetic fibers made possible the construction of nets much larger, stronger, and more durable than those of natural fibers. The powerblock made it possible to handle the new, larger nets. The equipment and its use will be discussed later

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when the net setting process is described.

The Seiner

The Southern Explorer is an example of the larger purse seiner wetfish boats in the San Pedro fleet (Figure 1). It is, however, somewhat specialized in that it concentrates on the taking of anchovies. While its home port is San Pedro, its base of operation during the anchovy season is Port Hueneme, California, approximately 50 miles northwest of San Pedro. This base puts it closer to the fishing grounds located off Point Dume and reduces the time spend in transit.

The Southern Explorer was built in 1944 by the Al Larson Boat Works, Terminal Island, California, and is of wood construction. It is 90 feet long, 25 feet wide, and has a draft of from 8 feet empty to 11 feet loaded. The fish-well capacity is 200 tons of anchovies or 180 tons of tuna. The ship's main engine is a 400 horsepower Enterprise diesel, which burns .5 gallons of fuel per mile and produces a cruising speed of approximately 9 miles per hour. Approximately 5,000 gallons of diesel fuel are carried aboard out of a total fuel capacity of 10,000 gallons. For extended trips, an additional 12,000 gallons may be added by utilizing the brine tanks for fuel. This would give the boat approximately 10,000 miles of coverage under power. Two 6-71 GMC diesel engines are used as auxilary powerplants and drive a 60kw direct current generator, the refriguartion units, and various hydraulic pumps and winchs.

Electronic gear includes: (1) two depth recorders; (2) one directable sonar unit with a range of 3,000 yard; (3) two radar units with a 50 mile range; (4) one each of a high-frequency, ship-to-shore, ship-to-airplane,

and a CB radio. In additon, the boat is wired with a public address system.

The net utilized for anchovy fishing is of a 'combination' type and may be used for other wetfish fishing, i.e. the capture of squid or mackeral. It is 325 fathoms long and 40 fathoms deep, with a maxium fishing depth of 25 fathoms (1 fathom = 6 feet). It is constructed of a synthetic twine woven into mesh strips approximately 100 fathoms long and 10 fathoms wide. These 'strips' are laced together along their edges with twine to make the net. The mesh size of the Southern Explorer is 3/4 inch for the body of the net and 9/16 inch for the fish bag or 'sack'.

A skiff is used to anchor one end of the net during the set and to hold the boat steady while the net is pulled aboard. The Southern Explorer's skiff is 20 feet long and 15 feet wide.

The spacial arrangement is one of 3 'decks' with 10 'areas'. At the top of the mast, which functions as both a vantage point and a support for the main boom, is the 'crow's nest'. This is in reality a small room which contains a seat, an intercom and public address unit, and remote radio units which are wired into the main systems. It is partially enclosed to provide shelter from the elements. The mast and the crow's nest are collectively referred to as the 'mast'.

The 'upper deck' contains the 'bridge', and a storage area called the 'stack'. The bridge is the forward area where the steering, navigation, and communication equipment is located. It includes the upper cabin where the skipper's cabin is located.

The Southern Explorer has dual controls for steering; one set inside the cabin and one outside and forward. The sonar, one depth recorder, an auto-pilot control, and one radar unit are located outside within easy

reach of the ourside wheel. The fish pump is stored on and controlled from this deck. The entire deck is referred to as 'up top' or 'up above (Figure 2).

The 'middle deck' is the largest on the boat and contains the most areas. At the front is a small open deck where the anchor, its winch, and various cletes for securing lines are located. This area is called the 'bow'. Behind the bow is the 'main deckhouse' where the crew's quarters (cabin), the head, the galley and various storage areas are located. The main deckhouse is divided into two areas: the 'galley' and the 'cabin'.

To the rear of the main deckhouse is a large open area called the 'working deck'. The various pieces of equipment for setting and retrieving the net are located here. This is the area where the majority of the work activities take place. This area is simply referred to as 'on deck'. At the rear of the seiner is the 'netpile' where the net, bouys, rings, chains, and skiff are located (Figure 3).

The 'lower deck' is divided into two areas. The 'fish-well' is the cargo area where the fish are funnelled after capture, and the 'engine room'. The engine room houses the main and auxiliary engines, the generators, the reduction drive gears, the refrigeration condensors and various other machinery. It is located below the main deckhouse. This deck also has the shaft alley which contains the shaft and bearings which transfers power from the main engine to the propellor. On boats of this size, most of the shaft alley is enclosed and is accessable only during major maintenance. This entire deck is referred to as 'below' (Figure 4).

To recap, the 'decks' on the boat are: (1) the 'upper deck', (2) the 'middle deck', and (3) the 'lower deck'. The 'areas' are: (1) the 'mast',

(2) the 'bridge', (3) the 'stack', (4) the 'bow', (5) the 'cabin', (6) the 'galley', (7) the 'main working deck', (8) the 'engine room', (9) the 'net-pile', and (10) the fish-well'.

Accommodations

The accommodations aboard the Southern Explorer are comfortable, if somewhat cramped, and serve as 'home' for seven of the crewmen while fishing out of Port Hueneme. Three of the crew, the cook, engineer and one deckhand have residences in Port Hueneme and usually spend the nights there. The seiner does not have air conditioning, and ventilation throughout the ship is achieved by opening doors and portholes. The galley is well equipped and modern, and serves as the crew's lounge. A color television is mounted in the galley, as well as a diesel fuel stove and a large electric refrigerator. All of the interior is painted, but carpeting is lacking.

The cabins reflect the formal division of status between the skipper and the rest of the crew. In the forward portion of the deckhouse is an area referred to as the "fo'c'sle". It is a large cabin with ten bunks. Each bunk may be described as adequate. They measure 27 by 72 inches, and each is equipped with a reading light, a shelf above the foot, a mattress, and a curtain which, when drawn shut, closes it off from the rest of the cabin. The bunks are arranged in two tiers along each side of the cabin. The cabin has a small wash-basin at one end, above which, is a small medicine cabinet containing the crew's shaving gear and toothbrushes. Storage facilities for the crew's personal effects consists of two trays located belos the bottom of each pair of bunks. Hanging clothes are kept inside the bunk or hung in the corner (Figure 3).

The skipper's cabin is located on the upper deck (Figure 2). It contains a slightly larger bunk, 36 by 78 inches. Drawer space is larger as the cabin contains a table-like shelf along two walls which contains drawers. The shelf functions as a desk for writting or navigation. Hanging clothing is stored in a small cabinet.

Accommodations in the fo'c'sle are noisy. As the is right above the engine room, the noise and vibration of the engines are transmitted through the floor to the bunk area. In addition, the main access to the engine room is through a hatch located on the starboard (right) side, between the sets of bunks. Any person entering the engine room exposes the crew to additional noise. The lighting is poor, except in the bunks where the reading lights are quite bright. The floor is covered with linoleum.

The Crew

The social, familial, and ethnic basis of the fleet's composition cannot be overemphasized. Almost all of the key men and skippers are of either Italian or Slavic descent. Recent years have seen an increase in the number of Latin-Americans in the crews; however, the fleet as a whole, both in ranks of owners, skippers, and general crewmen, is dominated by these ethnic groups. Besides controlling the boats themselves, men of these ethnic backgrounds own the yards where the boats are built and maintained, the chandleries from which supplies are purchased, the companies to which the fish are sold, and many of the other infrastructual elements of the land-based portions of the industry.

The Southern Explorer carries a crew of ten including the skipper. All are of Yugoslavic descent except one who is a Costa Rican. Kinship

relations exist between five of the ten: the skipper, first mate, and the cook are brothers; their second cousin and his son are general deckhands.

The chain of authority is as follows, in desending order: skipper, first mate, chief engineer, cook, winchman, skiffman, crewman.

The skipper is Johnnie Z.; age 62. He has been fishing since his mid-teens and is generally regarded, both by the fishing community and his crew, as a good skipper and fisherman. He owns twenty per cent of the boat; along with his son, a stock broker, who owns twenty per cent; the skipper's brother the first mate, who owns twenty per cent. The remaining forty per cent of the seiner is owned by the Starkist Cannery.

The first mate is Anthony Z.; age 58. He is the skipper's brother and owns twenty per cent of the seiner. He, also, has been fishing since his teens. His position on the boat is also referred to as the 'mast-man' or the 'deck boss'. As the mast-man he directs the boat to where the fish are. His are the eyes that detect the slight changes is the ocean which spell the presence of fish. Some, but not all fishermen, have these 'good-eyes'. After the boat has approached a fish school, he decends from the crow's nest and takes over the watch of the directable sonar. He can tell amazing things about the size of the school, the size and type of the fish, their density, behavior, direction of travel, depth, and the liklihood of being able to catch them, all from minuscule visual clues. While watching the sonar, he directs the path of the boat and signals the release of the skiff to begin the setting of the net, and during the setting, he directs the siener's course as to encircle the largest amount of fish.

The engineer is Nick A.; age 64. He is not related to any other of the crewmen and has been on the boat for approximately two years. Nick

has served as a merchant marine for ten years, mostly in the Far East including duty in Viet Nam during the period of U.S. involvement in the war. His duties are to be able to fix and maintain all the machinery aboard with the exception of the sophisticated electronic gear. Nick participates very little in the authority structure of the vessel. Only on things mechanical does he make recommendations to the skipper for a certain action.

The cook is Vince Z.; age 68. His the skipper and first mate's brother. His kinship tie with the skipper and his vast amount of experience places him higher in the authority structure than a normal cook would be. Vince has been a 'master-fisherman' for over ten years with the Food and Agriculture Organization in Rome. His work dealt mainly as a teacher of fishing techniques and technology in underdeveloped countries, perticularly in the Philippines. He is well known world-wide as a designer of sein nets.

The skiff-man is Desco; age 28. Desco is a young man born in Yugoslavia. He is single and has been on the boat approximately five years. He exhibits a desire to be upwardly mobil in the fishing industry. His position of skiff-man is one usually reserved for older, more experienced men. A chance remark by one of the officers aboard stated that Desco "knew more about fishing six months after coming aboard than one of the men who he had fished with for seventeen years."

The winch-man is Jaco. Jaco has fished with the skipper for seventeen years. He assumes the role of deck boss when the first mate is involved with other tasks, such as directing the set from the sonar unit.

The four crewmen are: Rudy, the Costa Rican; Roco, a man from Yugoslavia; Visko, the second cousin of the 'Z' brothers; and Teo, the 22 years

old son of Visko. Roco, Visko, and Teo speak little or no English.

The roles and duties of each of these men will be further explained later when fishing operation is described.

Finding Fish

The skipper of the Southern Explorer, through his many years of experience, knows in what general areas the fish may be expected to be found. One of these areas is around Point Dume, approximately a two and a half hour run down the coast from Port Hueneme. Two other boats from Port Hueneme fish this area, with the Southern Explorer often working in conjunction with one of them. Anchovy fishing iS done only during the daylight hours and no sets are started after darkness falls. Sets begun before dark are often finished after nightfall, however.

Once the boat has arrived in the general area, the mast-man climbs into the crow's nest atop the mast to search for visual 'signs' of fish. A sign is where there is no direct visual contact with the quarry. One of the most common signs is a flock of sea birds. The flock is evaluated as to their size, species, number and behavior. Large birds are considered a better sign than small birds; large flocks are better than small flocks. Pelicans, which only congregate on the water when fish are present, are considered a very good sign. Birds which are 'working' (diving, swooping, or moving in vertical patterns) are better than birds flying level (horizontal patterns).

A second category of signs is that of 'breezer'. This is a group of marine life swimming close to the surface causing a slight alteration in the wave action or sea surface pattern. These are ranked according to

their size, with large affected areas better than small; and their 'strength', light to medium to heavy depending on the texture of the surface disturbance.

The third sign is what is called 'color'. It is an almost imperceptible change in the surface coloration of the water. It is a dark spot similar to a shadow moving across the water and is caused by a dense school of fish swimming near the surface.

Actual visual sightings of fish on the surface also form categories. 'Shiners' are where the reflections of the sun off of the shiny silver fish are seen from above the water. 'Finners' are where only the dorsal and tail fins are seen. 'Jumpers' are where the fish leap out of the water into the air, often to escape predation from larger fish.

These categories of signs and sightings often occur in combination with one another and their values are additive. Working birds and color together are perferable to either birds or color alone.

The Southern Explorer often works in conjunction with a small spotter airplane, which being faster and has a higher vantage point, may cover much more territory looking for signs of fish. By being in radio communication with the seiner, he may direct the boat to a promising area. If a set is made under his direction, he receives five per cent of the net profits for that set. One plane will often spot for several boats, directing the closer one to the fish.

As soon as the skipper makes a decision to stop the search pattern of criss-crossing the general area and to investigate a certain sign, he puts the crew on 'stand-by'. On stand-by each of the crew goes to his station from which he will operate at the beginning of the set. The skiff-man and his helper (Teo) enter the skiff, and the deck crew get ready to release

the skiff. At this point the electronic sonar comes into play. On the Southern Explorer, the mast-man climbs down from the crow's nest and locates the school of fish exactly. The seiner may circle the school of fish several times to determine the size of the school, it's density, direction of travel, and where the net should be dropped to insure a catch.

Several elements enter into a skipper's decision to set the net or not. Usually he must evaluate these elements very quickly to avoid having the fish escape.

He knows anytime he actually sets the net, he is committing the boat and crew to a minimum of one and a quarter hours to three hours of work depending on the conditions. Under normal conditions it takes almost the same amount of time to make a 'skunk' set (one in which no fish are caught) as it does to make a set with a large amount of fish captured. Since anchovies are not processed or cleaned in any way aboard the boat, the only added time is that neccessary to 'sack' the fish and pump them aboard. This is a small amount of time when compared to the time it takes to set and retrieve the net.

Wear and tear on the equipment also must be considered. Each setting of the net puts tremendous strain on the equipment. Running gear such as cables must be replaced often and skippers do not wish to subject men or machines to the dangers of a set without being reasonably sure of getting some fish out of it.

Weather conditions also play a large role in the decision process. He must take into account the surface chop, swell, wind, and underwater currents, all of which affect the net. Rain or fog may impair the skipper's vision and prevent his directing the set.

The skipper must also consider the condition of the crewmen themselves. If five or six sets have been made that day and the crew is tired or exhibiting signs of fatigue, the skipper may omit a set he might have otherwise made.

All these elements are combined with the skipper's mental tone. If it is nearing the end of a long day with only a small load, or after a period of more than a couple of days withour fish, a skipper is more inclined to set when he otherwise might not.

The Set

There are three major technological elements to the setting and retrieving proccess: (1) the seine net, (2) the skiff, and (3) the seiner itself.

The construction and various parts of the seine net are shown in Figure 5. Seine nets for anchovies range from 200 to 450 fathoms in length, and from 20 to 40 fathoms deep. When stacked on the rear net deck it may occupy an area of 25 by 25 feet, be six or seven feet tall, and weigh over five tons. It is constructed of treated nylon twine of various sizes depending on what part of the net it is used for and the overall size of the seine itself. The heavest twine is usuallyin the sack portion as it must support the most weight.

The seine is made up of a series of panels or 'strips' which run longitudinally. These strips are laced together by hand with an appropriate weight twine. Where these panels meet and are laced together is called the 'lacings'.

At each end of the seine is a thick stainless steel ring usually shaped

like a capital 'D' or a triangle, and called the 'oertza'. One is the 'bow oertza' and the other simply the 'oertza'.

The net's maximum depth is slightly off-center towards the bow oertza. The bow oertza is the first part of the net off the deiner and the last part to be brought back aboard after the set. Immediately adjacent to it is that area of the net called the 'sack', which is used to concentrate and hold the fish while they are taken onboard.

The nylon twine of which the net is constructed has a neutral buoyancy factor. This means that the bottom edge must be weighed down and the top must be held on the surface. To achieve these conditions, a series of steel rings and chains are attached to the bottom edge and a series of plastic-coated cork floats are strung on a heavy nylon rope attached along the top of the net. This is the 'corkline'.

The rings and chains perform two other functions besides weighing the net down. The rings act as eyelets through which the'purse line'is run. This purse line is used to draw the bottom of the net closed after the fish have been surrounded by the seine. The chains separate the bottom of the net from the rings and purse line. This prevents the net webbing from becoming entangled in the rings or purse line as the bottom is being winched closed.

Attached to the oertza is a cable which is used to draw that end of the net to the seiner completing the encirclement of the fish. This is called the 'towline'.

The skiff is the second element of the setting process (Figure 6). It is a wide, flat-bottomed boat with a powerfull diesel engine. It has three 'skids' or runners on the bottom to permit it to be pulled aboard and up onto the stern of the seiner. The seiner has a specially constructed

stern for this purpose. The skiff's rudder and propeller are enclosed in a steel-mesh cage to prevent their becoming entangled in the net, cables or lines. It has a large post to which the various lines and cables may be anchored, and a rubber guardrail to prevent damage when the skiff is thrown against the seiner by wave action. There are two fittings, one on the foredeck is used to release the skiff into the water from its stand-by position above the netpile, and the other is a bridle arrangement under the bow used to haul the skiff back aboard.

The mast has atop it the crow's nest, and, in addition, it serves as the anchor for supporting the main boom via the cables. At the end of the main boom is the powerblock, a hydraulically-powered, hourglass shaped, hard rubber roller through which the net is reeled back aboard (Figure 9). The major cables used in the set, the purse line, corkline, and the towline, are controlled by the main winch. The 'choker' winch is used during the final stages of 'sacking-up', and the fish pump delivers the fish to the separator or 'hopper' on the main working deck (Figure 3).

These are the important technological components of the set procedure.

The net actually gets from the seiner into the water in the following manner. Prior to making the set, the equipment is arranged as in Figures 1 and 3. The net is carefully stacked on the net deck or the seiner so that the oertza is at the lower left front of the netpile, and the bow oertza is at the top rear of the netpile. The rings, chains and bottom of the net are stacked to the left side of the seiner, and the corkline and surface portion of the net are to the right. The seine is stacked so that it will feed smoothly of the stern.

The skiff is positioned on the downward slanted stern of the seiner

with both the bow oertza and one end of the purse line secured to its post. The skiff is held in place by a cable fitted with a quick-release fitting on the end which is anchored to the mast of the seiner. The other end is mounted securely to the bridle at the bow of the skiff.

The oertza, at the front, lower left of the netpile, is attached to the towline, a cable which runs up the left side, through a roller-post to the main winch. The end of the purse line, which runs from the skiff up through the rings, feeds into the main winch.

At the stand-by position, we have one end of the net, the bow oertza and purse line, attached to the skiff, and the other end of the net, the oertza and the other end of the purse line, connected to the seiner.

When the skipper, or in the case of the Southern Explorer the first mate, thinks the seiner is in the proper position relative to the wind, waves and fish, he orders the skiff released. On the Southern Explorer this is accomplished by Jaco, the winch man, hitting the quick-release fitting located over the main winch with a sledge hammer. The skiff with Desco, the skiff man, and Teo, his helper, then drops off the stern 'slide' into the water.

As the skiff hits the water, the cables attached to its anchoring post swing it around so that the skiff is facing the opposite direction from the direction the seiner is travelling. The skiff in the water provides enough resistence so that the net and purse line start being pulled over the stern and into the water. The skiff man then starts his engine and begins pulling in the opposite direction from the net, attempting to hold the bow oertza end of the seine as stationary in the water as possible.

Sets are usually made at cruising or higher speeds. The seiner circles the fish, always turning to the left and as it approaches the skiff, the school of fish is encircled by the net. A line that is connected to the bow oertza and the purse line is thrown from the skiff to the working deck, where it is attached to a winch and the skiff end of the net is pulled aboard. It is important that the skiff stay to the inside of the circle for the line to be transferred to the left side of the seiner. As the net arrives, the bow oertza is snapped into a fitting on the railing where it usually will remain for the rest of the set. The purse cable is run into the main winch.

For normal methods of retrieving the seine to function properly, all of the net must be run off of the boat and into the water. Ideally, the oertza will drop off the stern of the boat just as it reaches the skiff. However, it is difficult to judge the seiner's speed and arc to achieve this ideal. Skippers usually plan for the oertza to run off into the water slightly before the seiner reaches the skiff. Here is where the towline is used. When the oertza, the last part of the net, runs off the stern, the towline which is attached to the oertza starts unwinding off of its drum in the main winch. It will continue to unwind until the seiner rendezvouses with the skiff. After the bow oertza is retrieved from the skiff and secured, the towline is ordered winched back aboard bringing the oertza back to the seiner. The towline is disconnected and a line is attached directly to the oertza. This line is fed through the powerblock at the end of the main boom and the oertza is lifted a few feet out of the water. A line is tied around the net at deck-level and secured to the left railing.

This type of set where part of the entrapping circle is made up by the towline, may be used by a skipper who decides to extend the circle. For example, one afternoon aboard the Southern Explorer, a large school of anchovies were located. The seas were running very high and the seiner was pitching badly in the water. The schools of fish sighted on this day were extremely "shy" and "spooky". They would dive or scatter when ever the boat approached. As we approached, this school stayed together and at a shallow depth. The signal to "go" was given and the set was started. However, about half-way around, the school split into two smaller schools. The skipper, naturally wanting the largest catch possible, extended the circle using a large amount of towline to encompass both schools of fish. Unfortunately, the high seas sank part of the corkline as the net was being winched aboard and allowed about two-thirds of the fish to escaped.

The skiff, once free of its lines, motors to the rear of the seiner and crosses-over the towline or the net corkline. No damage is done due to the skids and the cage around the skiff's propeller and rudder. The skiff drops of the man who was assisting the skiff driver. On the Southern Explorer this was Teo. A heavy line is attached to the skiff's post and it proceeds straight away from the seiner's right side. As the line becomes taut, the skiff continues to pull at the direction of the skipper. This keeps the seiner off the net and, also, the net out from under the seiner.

At this point the net is "set". Both oertzas are secured to the left side of the seiner, the purse cable is attached to the main winch at both ends, and the skiff is holding the seiner off the net. The relationship between the seiner, seine net, and the skiff is shown in Figure 7.

The setting of the seine may appear simple; however, in fact it is not. Besides having to deal with a school of fish which may move quickly and unpredicably in one or more of five directions, many of the elements in the process allow only one attempt to perform them correctly. If the skipper meets the skiff too soon, all of the net may not have dropped into the water or part of the school may be outside the net circle. If the bow oertza is not transferred properly or a line slips while it is being hooked up, the result may be losing the oertza and possibly the whole net. A very costly mistake.

Once the net is set, it virtually out of the control of anyone. The net is so large and the ocean forces so strong that no means of controlling it are available. The set must be done in conjunction with the ocean forces and not against them. For example, the set must start and end from a down-wind position. If a set is made from an up-wind position, by the time the set is completed, the wind may have blown the seiner over the net. Forces of tides, currents and waves also must be considered to be able to predict their effects on the underwater portions of the net. This type of quick-action decision-making takes years of experience under all types of conditions and it requires great amounts of skill and competence.

Net Retrieval

When the oertzas are secured, the pursing or closing of the bottom of the net begins. The winch man, when instructed by the deckboss or skipper, starts winching in both ends of the purse line. Throughout this process, close attention is apid to the underwater configuration of the net. The skipper may order one or both the lines stopped or slowed if a

portion of the net starts drifting towards the center or the corkline starts sinking.

The pulling of the net through the water, plus lifting the rings and chains at the same time, results in a tremendous strain on the purse line. The strain is further amplified by the rings sliding on the cable. The construction of the twisted, wire cable tends to act as a file which cuts into the rings as it is drawn through them, and, in addition, it wears the strands of the cable itself. These factors result in frequent replacement of the rings and purse cable to avoid breakage.

The purse cable is constructed of several cables of differing diameters being spliced together. The smallest diameter cable is at the two ends and the largest is in the middle. The winch man must ajust the speed at which the two ends of the purse line are being retrieved so that when the rings all come together at the side of the seiner, they are gathered on this heavy center section of the line. Only this section is strong enough to support the rings and chains as they are brought up onto the deck.

One of the worst potential problems of a seiner may occur during the pursing sequence; the "roll-up". A part of the net mesh is pulled through the rings or tangled around the purse line. It may be caused by an underwater surge or force wrapping the mesh around the cable, or a worn portion of the cable snagging in the mesh pulling it through the rings.

A roll-up at sea may produce several problems, all of which result in costly delays. To untangle the net may take several hours to perform in itself. Secondly, each part of the net is designed to take only the normal stresses. In a roll-up, uneven stresses are placed on portions of the net not designed for abnormal forces. Large tears and rips in the net often

result and their repairs are difficult, time consuming and expensive. Repairing the damage may even force the seiner to return to a dock where the net is transferred to land for repairs.

In addition, the net cannot be left in the water. It must be retrieved and brought back aboard the seiner. During a roll-up the powerblock may not be used. But, because the operation normally uses the powerblock, the nets have become very large and heavy, and it becomes very difficult to get them back aboard the seiner without the use of the powerblock. When the size and weight of the net are combined with adverse weather conditions, the hauling aboard of the seine by hand truly becomes a nightmare for the crew.

To have the "rings up" and secured on the deck is of major importance and brings a great relief to the crew and skipper. A roll-up is no longer possible and the fish now have no escape from the net. Prior to the rings being up, the seine has a large gap under the boat by which the fish may escape while the net is being pursed closed. The fish are kept away from this area by the crew beating on a large steel plate mounted to the left rail for this purpose. The vibrations travel through the hull of the boat into the water scaring the fish back towards the center of the net. Firecrackers and dye coated rocks may also be trown into the water to scare the fish away from the open portion of the net.

Once the rings are drawn up out of the water at the port side of the vessel, the very hazardous job of lifting them aboard and securing them begins. This operation produces more strain on the equipment than any other. The rings and chains are hanging form a block on the boom by the purse line and are very heavy. A line must be threaded through the rings

and connected to a "choker" winch on the starboard (right) side of the work deck. In order to feed the line through, one man must stand on the rings while several of the crew hand him the line and steady the rings which may pitch and sway with the rolling of the seiner. If, as it may often happen, the purse cable snaps, the rings will fall into the sea and the two ends of the broken heavy wire cable will slash back across the work deck towards the main winch. Things such as this may occur no matter how well the equipment is maintained, and the uncertainty of possible injury or death is always present.

Once the line has been threaded through the rings and attached to the choker winch, the rings are pulled over the railing and lowered to the deck near the right rear of the work deck. As soon as the rings are secured, the net is ready to be brought aboard (Figure 8). While the crew readies the net, the winch man starts winding one end of the purse line off its drum, through the secured rings, and onto the other drum in the main winch. This must be accomplished with just the right amount of tension on the line. Tension is produced by means of a brake on the drum which is being unrolled, and the amount of the brake's tension is controlled by the winch man. If too little tension is applied, the cable may coil loosely around the drum and the next time the net is set, it may overrun itself and resemble a bad backlash on a fisherman's reel. If too much tension is applied, the cable may snap or a ring might break. Judging the correct amount of tension comes only with experience.

On the Southern Explorer, the engineer attempted this job on two different sets one afternoon. On both occassions, the cable had to be unwound by hand, then rewound on the drum. Bringing in the net is called "rolling

net", and is one of the most time consuming parts of the process. It is also one of the most dangerous and miserable periods for the crew. The whole crew, with the exception of the skipper, is involved with stacking the net as it is brought aboard (Figure 9).

When the signal to "roll it" (starting the process) is given, the powerblock pulls the oertza up from where it was secured on the railing, and through the powerblock. The main boom is swung back inboard and the oertza falls directly onto the net deck with the net going up through the powerblock as it is pulled upward out of the water. As the powerblock pulls the net through, the net is stacked on the net deck. The net must be stacked so that all of its parts will run off smoothly, and in the proper order when the next set is made. There are three separate "tasks" associated with the stacking of the net which acomplish this end.

First, the chains and rings must be stacked in the proper order along the left (port) side of the net deck. This prevents them from becoming entangled in the net during the set, and permits the purse line to be threaded through the rings prior to making the set. As the portion of the net to which a ring is attached goes up through the powerblock, that ring must be released from the securing line so that it may go up through the powerblock. Once through the powerblock, it drops down onto the deck. As they are attached to the seine on long chains, it may fall some distance before the other side of the chain catches it. Falling rings are only one of the hazards faced by the men stacking net.

The task of stacking the rings as they come down through the powerblock is done by two men; the cook and one of the more experienced deckhands (Vince and Jaco). One man pulls the rings and chains over to the

left side while the other man threads the "tagline" through the rings. It is important that the rings be pleaced in the proper order on the tagline. Misplacement may cause a roll-up.

Secondly, the net itself must be spread evenly and in proper order over the net deck. This takes four men, or even more in rough weather. The men performing this job must work together as the net is heavy and comes through the powerblock in up to 250 foot widths. The shape of the net makes necessary the continual passing of portions of the net back and forth between the men as the net is spread over the net deck. As the net pile becomes higher and higher the men must stand on top of it in order to spread it evenly back and forth across the pile.

Third, the corkline must be stacked along the right side of the net deck. They are normally stacked from side to side and from front to back in a six foot wide strip, generally even with where the net is being stacked at the time. Stacking corks is a tiring job, but becomes easier with experience. The corkline must be continually twisted and manhandled into the proper configuration. Whereas, a portion of the mesh may be out of place or overlapped, the corks must all be properly placed.

The men working on the netpile are exposed to conditions ranging from irritating to very dangerous. The powerblock is 30 to 40 feet overhead, and a strong wind may turn the wet net in to a large sail pulling the men off their feet. In addition, the seiner rocks from side to side in the swells and waves, and may produce a corresponding swing in the falling net. This swinging net is very dangerous to the men stacking the rings and chains.

Men working on deck wear helmets of aluminum, steel, or shatter-

proof plastic for head protection. All types of sealife adhere to the net and are pulled through the powerblock overhead. Small fish, crabs, sea weed, pieces of wood, and other flotsam regularly fall onto the net-pile and the men stacking.

One of the most irritating, in more ways than one, is jellyfish. These are round, umbrella-shaped sea creatures from which trail long strands containing a stinging poison. Their entire bodies and tentacles are of a jelly-like substance. As the seine is pulled through the water it picks up the jellyfish, chops them up as the net goes through the powerblock, anddrops them in small pieces on the men below stacking the net. Any portion of a jellyfish with a stinging cell, even though dismembered, can produced a large red welt on the skin that ranges from mildly annoying to very painful.

Men working on the netpile wear waterproof, rubber coats with hoods and pants of the same material for protection against being stung and from the water which pours off of the net. Even so, the jellyfish may slip down your sleeve and the pieces adhering to the net sting your hands.

Many things more dangerous than jellyfish may come through the power-block. Sharks and other fish many become entangled in the net. As most of these larger fish are caught by their fins or tails, which are swept-back, when they pass through the powerblock they often drop free of the net. Every attempt is made to free these as they pass by the deck. The man at the console running the powerblock will often reverse the net flow in order to shake something free. If, however, the seine is being retrieved after dark, objects caught in the net may pass undectected. This results in large heavy objects, such as 200 pound sharks, falling 30 or more feet

to the netpile producing a very dangerous situation for the men working below.

Everything falling from the powerblock or entangled in the net, except very small items, must be removed before the stacking can continue. Fish left in the net smell terrible after a few hours, may cause the net to foul as it runs off, or attract sharks when in the water. The usual method is to carry the objectable item to the right side railing and toss it overboard; no little task with a five foot shark writhing and snapping.

As more of the seine is brought aboard, the circle of net in the water becomes smaller and smaller. Only at the very end does the net become more than a fence to keep the fish in. Care must be taken not to cluster the fish too tightly as the net may be overstressed. None of the equipment used could hold the large weights obtained in some sets. One of the newer San Pedro boats made a set that threatened to tip the boat over. Luckily, the net was overstressed and split before this happened.

Brailing the Fish Aboard

When almost all of the net is aboard and stacked, the "sacking up" operation begins. While most of the net is aboard, it still extends down a 100 feet or more underwater. The bottom of the net must be brought up to the surface. This is achieved by the crew standing at the left railing and gathering up the loose net into one compact mass. The deck-boss threads a rope sling through the webbing of the net. This sling is raised via a block attached to a boom. When the sling is 15 or 20 feet above the deck, a large rope line called the "choker" is wrapped around the net at deck level. The choker is connected to its own winch located

across the work deck on the right side. The choker winch pulls the line taut and prevents the net from slipping back into water when the sling is released. The sling is then moved back down and the process repeated until the fish are concentrated in the sack (Figure 10); that portion of the net constructed of the heaviest twine. This sacking up process is repeated from time to time during the brailing operation to keep the remaining fish concentrated.

Brailing (the process of getting the fish out of the net and into the fish-well) is a relatively simple task aboard the Southern Explorer. After the fish are sacked up to the proper density, the fish-pump is raised by a boom from its storage area on the bridge deck, swung out over the left side of the seiner, and lowered into the water inside the sack area. A large rubber tube approximately 18 inches in diameter is attached to the pump, runs across the forward portion of the work deck, and is connected to the fish hopper. The hydraulically operated pump works as a dredge pumping water and fish up through tube and into the hopper. The hopper separates the fish from the water by allowing the water to drain out through the holes in its bottom. It also has a ramp down which the fish are funneled into the fish-well after the hatch-cover has been removed. Once the sack has been emptied, it is a simple job to pull the rest of the net aboard. This done by the crew by continuing the process used in the choking up operation to raise the bottom of the net. However, hands and manpower is used rather then the winch. After all of the net has been brought up and the trash dumped over the corkline, that part of the net is pulled through the pwerblock and placed on top of the netpile. The bow oertza is the last portion of net through the powerblock. The

seiner is now ready to make another set.

Another method of brailing is used by the majority of the San Pedro purse seiners. These boats are not equipped with fish-pump, instead they use what resembles a large, long handled scoop net (Figure 6). This is called "the brailer" and may hold from one half to a ton fish. It is made of small mesh webbing laced to a steel loop approximately three to four feet across. Attached to this metal ring is a long metal pole approximately 15 to 20 feet ling. A small cable or chain is threaded-through the webbing at the bottom of netting opposite the hoop. As the bottom of the brailer is open, by pulling on a rope attached to bottom cable, the bottom of the brailer may be closed. When the tension is released on the rope, the bottom of the net opens up again.

Attached to the hoop in three or four places are lines making up a "bridle". Connected to this bridle are two cables. One runs up to a boom swung out over the sack. This cable lifts the brailer out of the water and above the railing. It is controlled either at the console or at the railing just forward of the sack. The other cable runs to the main winch and is used to pull the brailer inboard and over the fist well.

In this type of brailing, the skiff serves an important part. Once the fish are sacked up the skiff is released from its job of holding the boat steady. Its line is taken back aboard and it motors back around the seiner and along side the sacked up net picking up two men from the deck. Once along side the corkline the skiff's bow and stern are secured to the seiner with ropes, and the corkline, on the side opposite the seiner, is pulled aboard the skiff and anchored to cleats attached to skiff's right side.

The two men in the skiff hold the brailer's handle near the hoop, and as the cables on the bridle are slacked off, the men raise the brailer's handle as high in the air as they can. This results in the brailer sliding down the side of the skiff in a vertical position. The men put all their weight on the handle and force it deep into the sack. When the skiff driver thinks the brailer is raised to a level that will clear the railing, the men in skiff must control the handle. This handle, if left unattended, whips around creating a dangerous condition for the men in the skiff. Control is difficult as both the skiff and the seiner are moving, but with different motions.

After being lifted high enough to clear the railing, the brailer is pulled inboard over the hatch to fish-well. Close attention is paid when the brailer is swung aboard as there is no means of stopping it. If pulled too forceably it may swing all the way over to the right side, and it may also swing forward and backward with the pitch of the seiner. The man controlling the cables must be highly skilled to cope with the effects of the wind and roll of the boat.

Once over the hatch, the line holding the bottom of the brailer net closed is release allowing the fish to fall into the hold. Most of the water drains out through the net meshed, and when combined with crushed fish, makes a very slick deck surface. After dumping a load of fish, the bottom of the brailer is secured closed by pulling its line taut, the brailer is swung out over the sack and the process repeated until the fish are all on board. The brailer is then passed back to the skiff where it is stored. The skiff casts off and lashes down the brailer and other gear in preparation for lifting the skiff back aboard the seiner. The deck

crew replace the hatch cover, feed the remaining net through the powerblock and finish stacking it.

Retrieving the Skiff

After the main work deck has been cleared, the process of getting the skiff back aboard is begun. A double block with a large hook is released from its securing place, usually on the mast, and taken to the rear of the netpile. Two men do this by dropping the hook to the deck and unwinding several coils of its cable off a drum in the main winch. The two crewmen then pick up the hook and drag it around the netpile on the left side. Two men pulling hard may just overcome the friction of the cable and hopefully the cable will run off the drum smoothly.

The skiff now is following the seiner and is properly centered. The seiner is moving slowly after being dead in the water during the retrieval and brailing operations. The skiff driver's helper pulls the skiff's bridle and a short line with an eye, up out of the water and into the bow of the skiff, ready to pass to the men on the seiner. The skiff comes slowly up to the stern of the seiner and attempts to line up his center guide. This often takes several attempts as the skiff is big, slow, and hard to control in the best of weather conditions.

Once the runner is in the recessed groove,the skiff driver applies full power anddrives the skiff one or two feet up on the seiner's stern. The deckboss, who has been directing this operation, takes the bridle and snaps it into the double-block's hook. When they are connected, the deckboss signals the man at the control console to start winching the doubleblock and skiff aboard. It is important that the skiff be tightly

wedged into its grooves prior to hooking up the lines. A wave or a sudden swell may cause the skiff to jump its guides and slide across the stern.

The skiff is drawn up until it is high enough to reach the cable from which it was released at the beginning of the set. The cable is connected with the quick-release fitting and the bridle line is relaxed until all the strain is on the release cable.

When the skiff is up and secured the set is complete except for cleaning up. Cables are rewound on their drums and attached once again to the proper components, the deck is washed down, and all the equipment is put away. No one slacks off working until the boat is completely ready for another set.

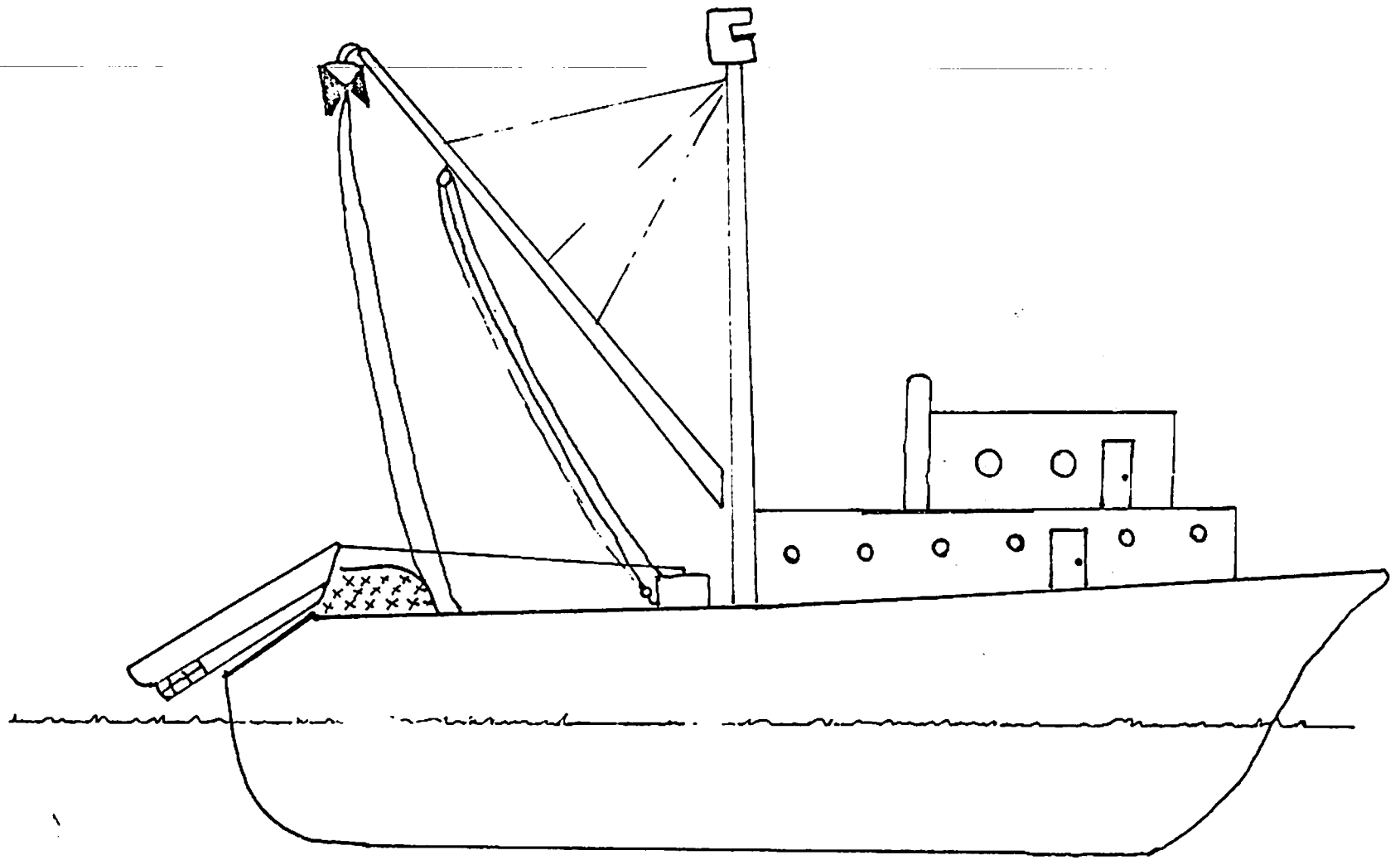

FIGURE 1. A large purse seiner in the 'stand-by' position.

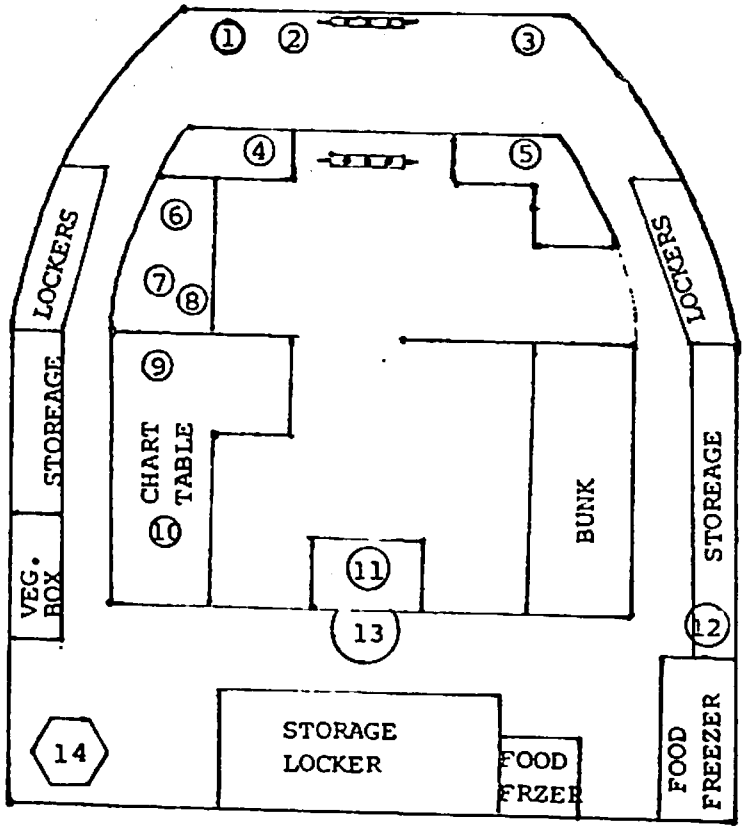

FIGURE 2. 'Up top', the bridge deck and equipment locations on the Southern Explorer.

1. Sonar
2. Depth recorder
3. Radar
4. Auto-pilot
5. Ship-to-shore radio
6. 'CB' radio
7. Radar
8. Depth recorder
9. Multi-band radio
10. VHF radio
11. Wash basin
12. Arch welder
13. Exhaust stack
14. Fish pump.

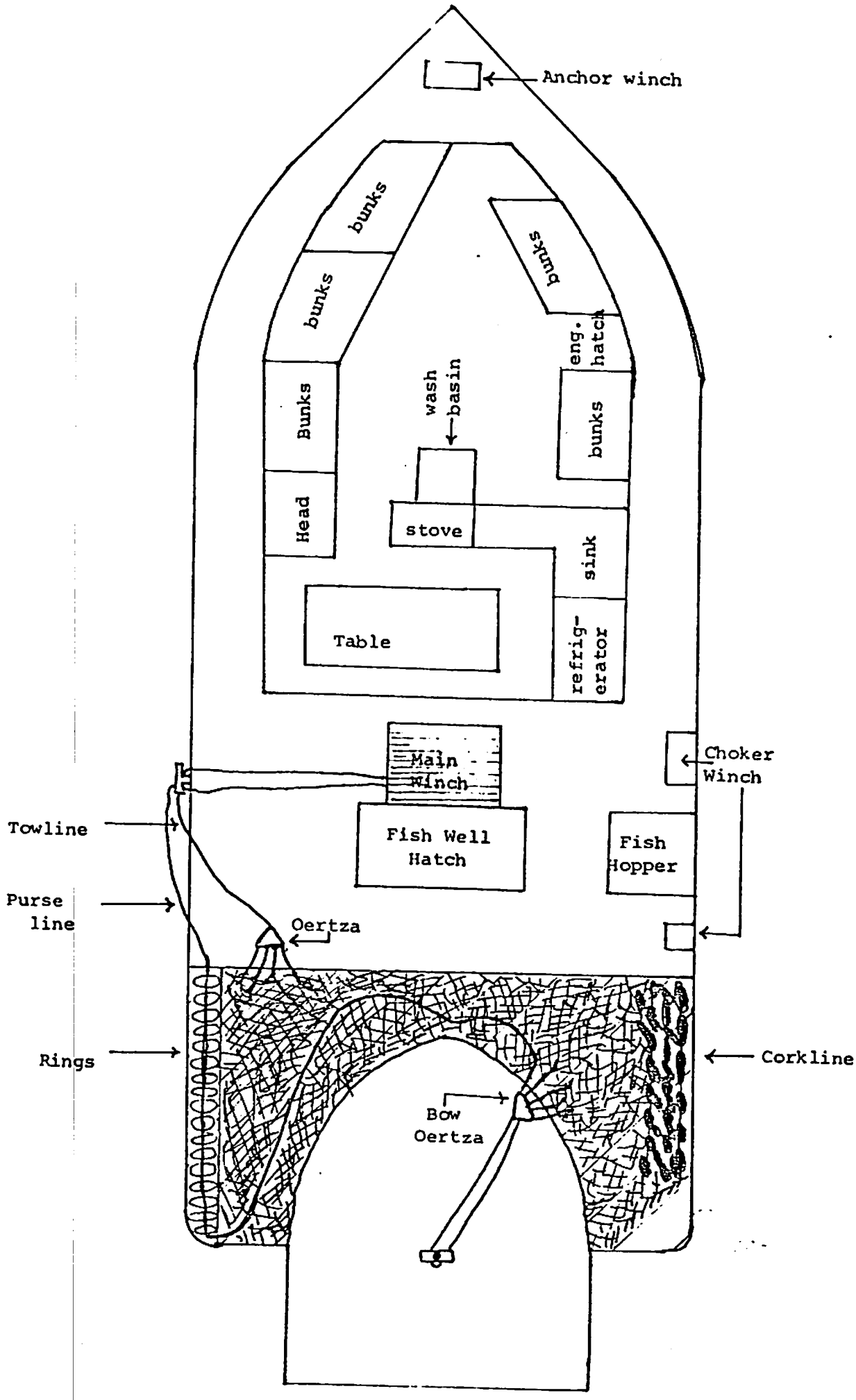

FIGURE 3. The 'middle deck' of the Southern Explorer.

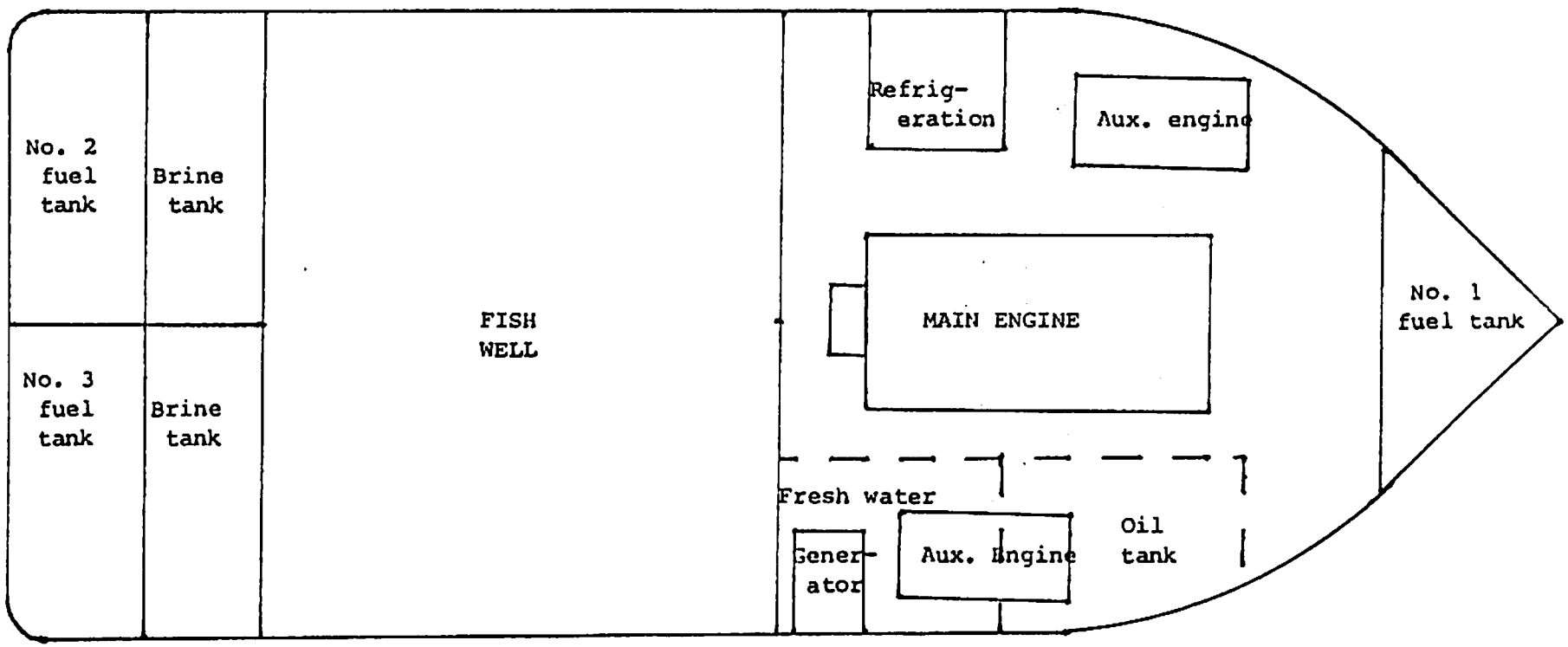

FIGURE 4. 'Below deck', the engine deck of the Southern Explorer.

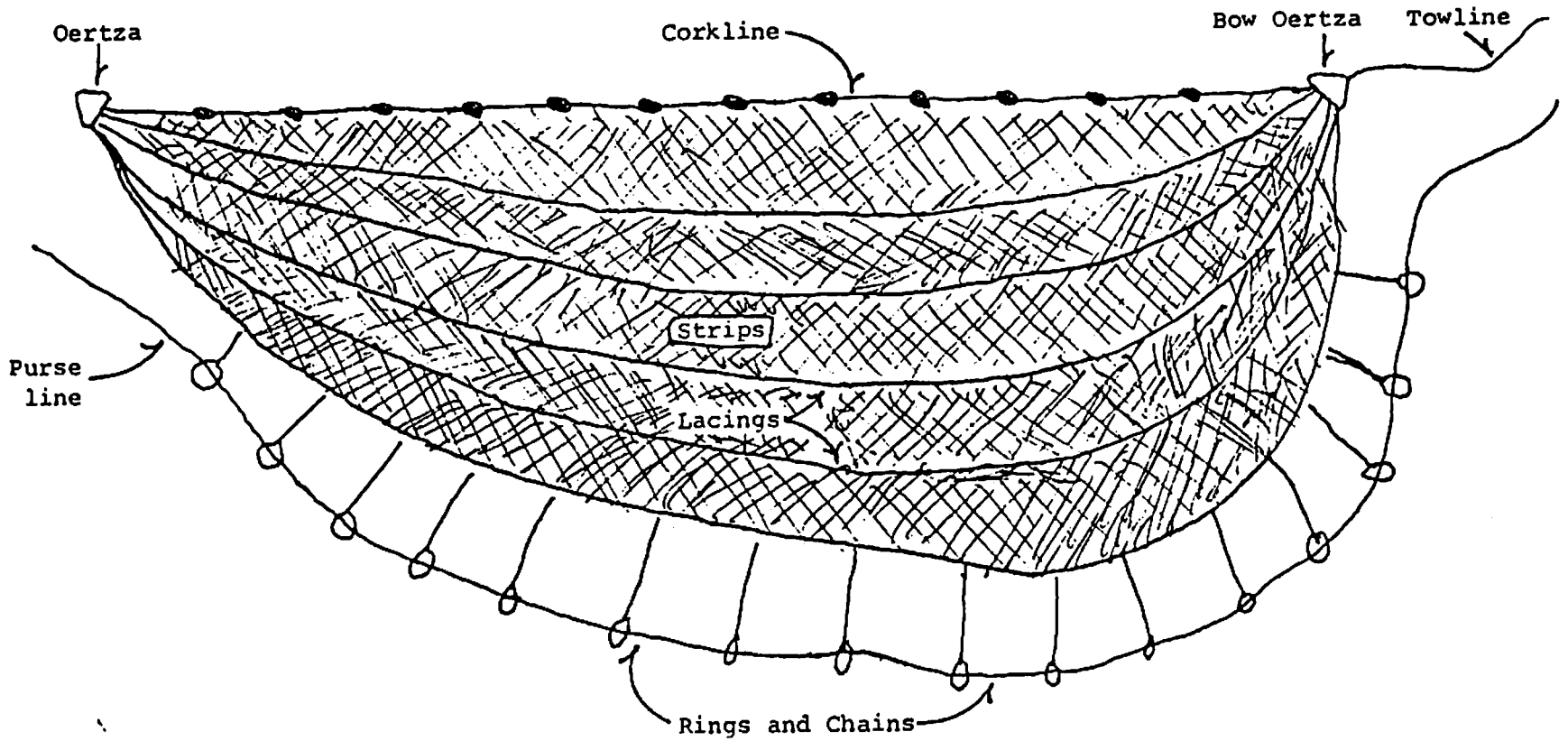

FIGURE 5. The seine net and its various component parts.

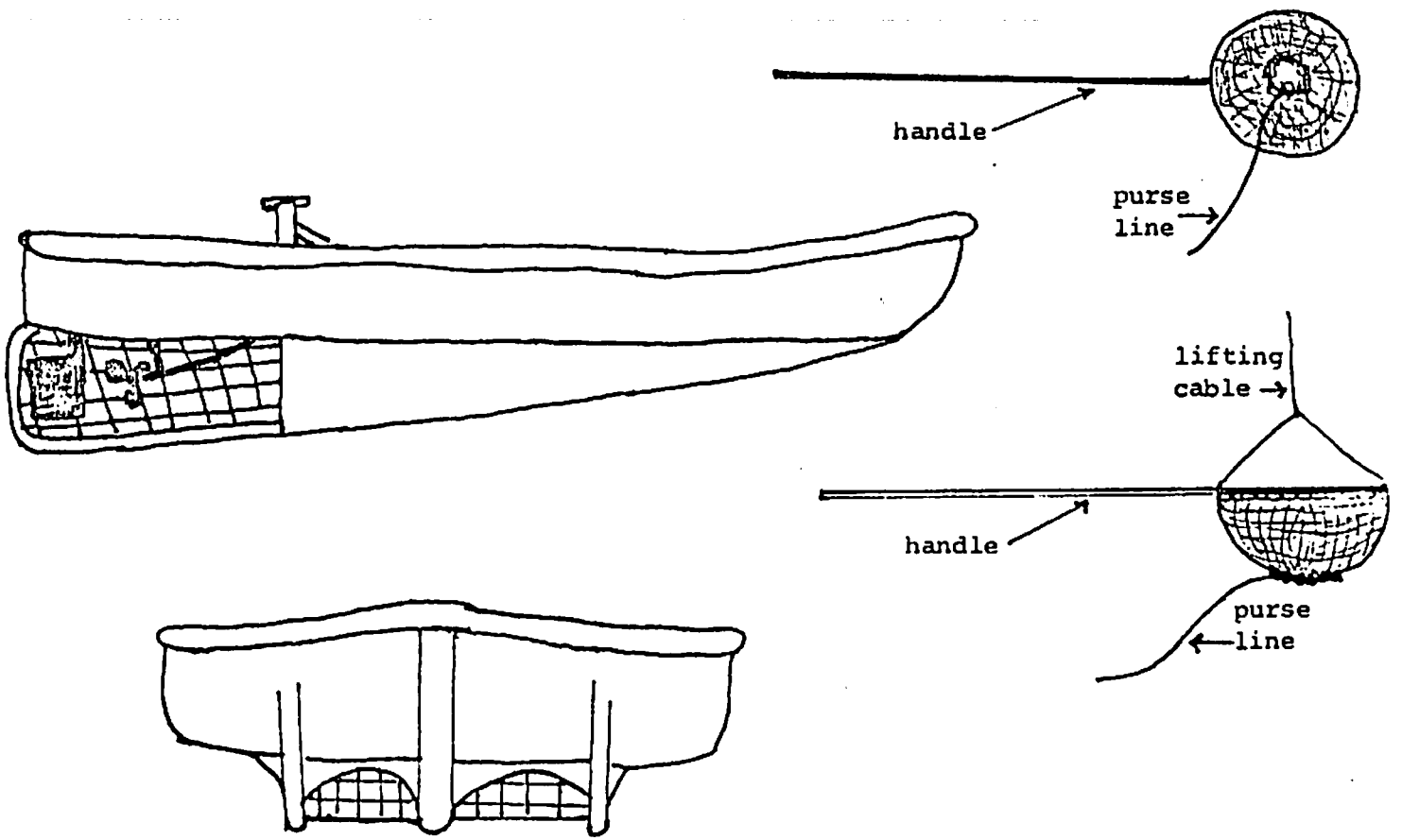

FIGURE 6. The skiff and brailer.

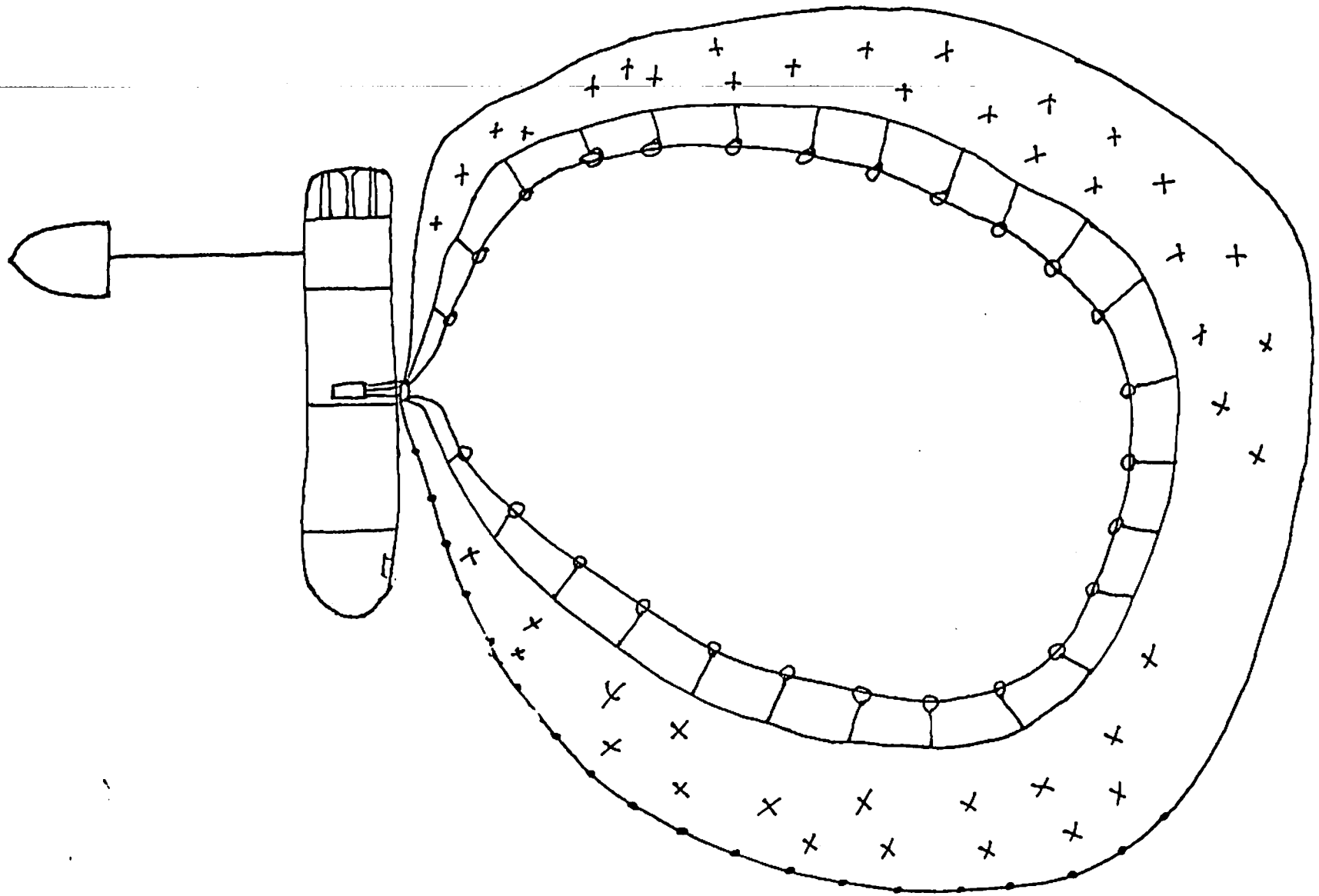

FIGURE 7. The net set prior to begining the pursing operation.

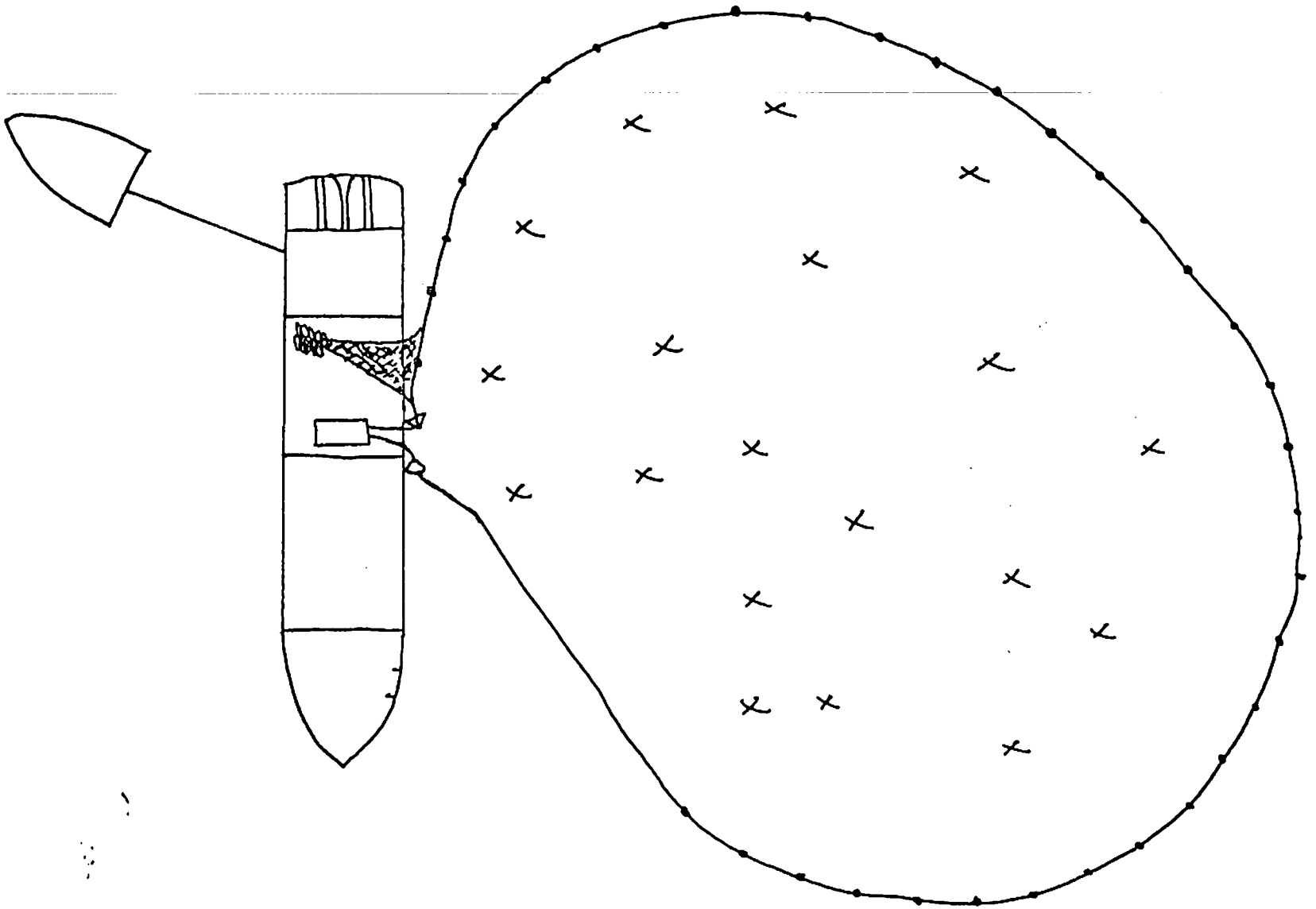

FIGURE 8. 'Rings up' and the bottom of the net closed off.

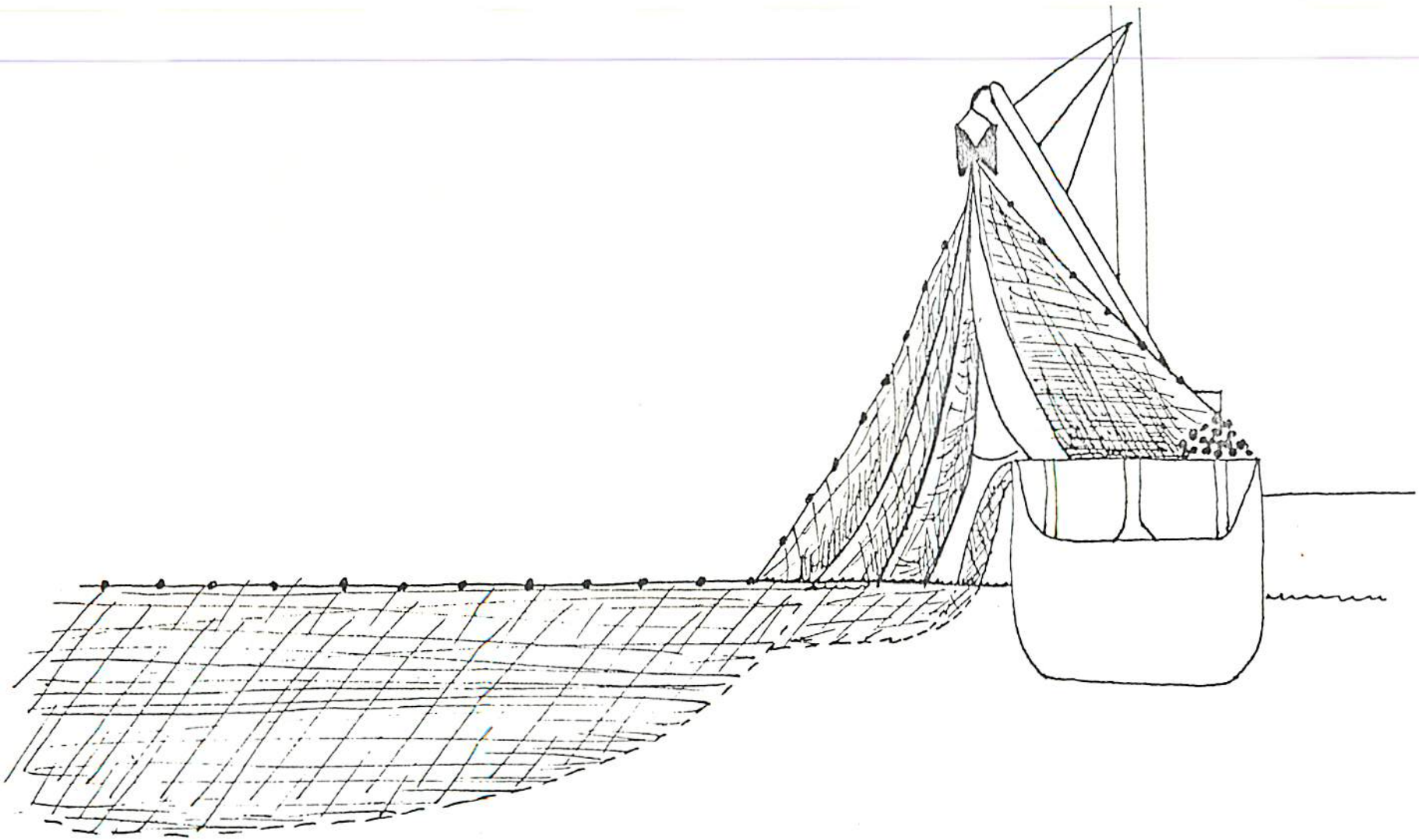

FIGURE 9. 'Rolling net', bringing in the net with the rings aboard.

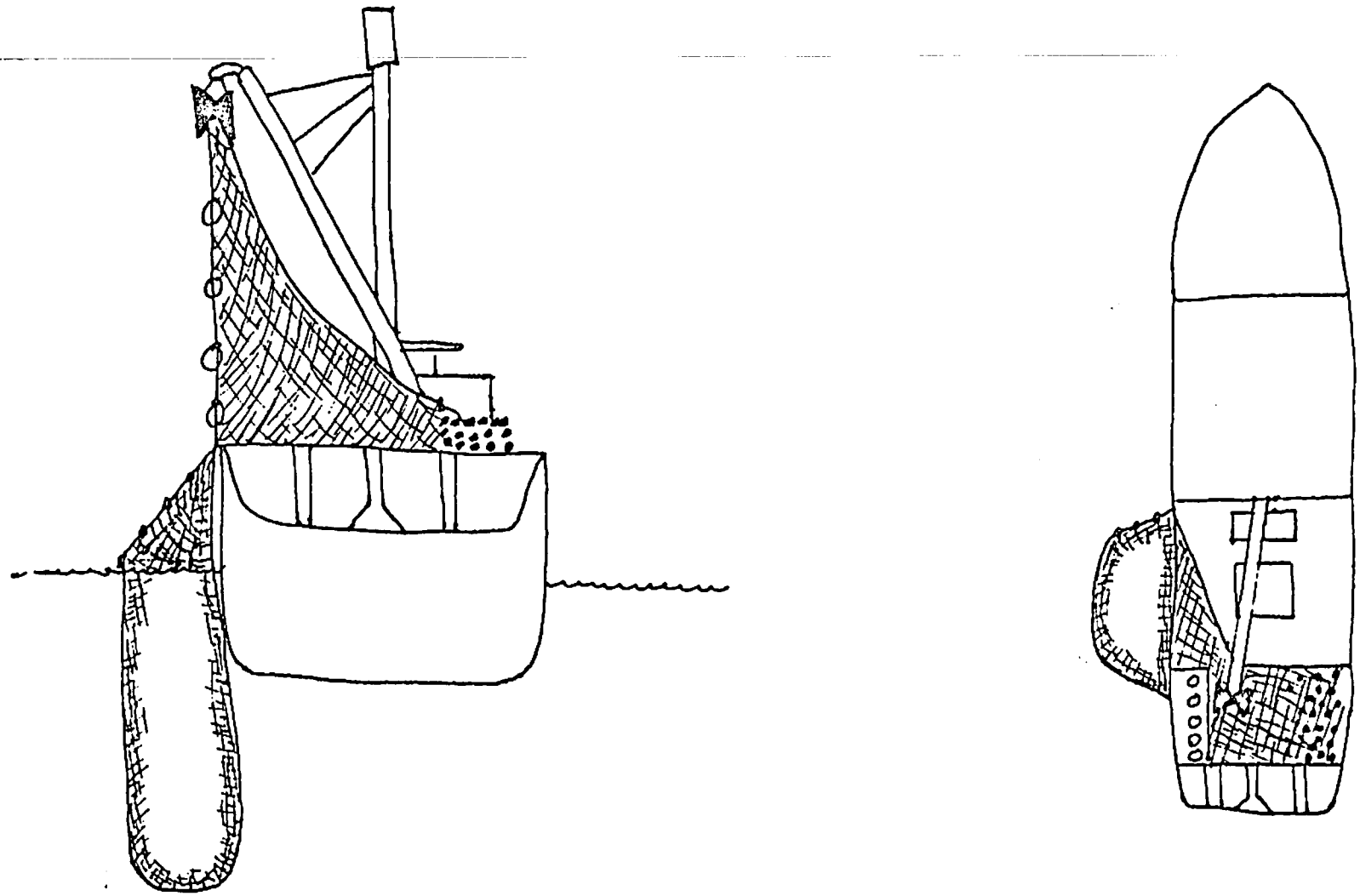

FIGURE 10. 'Sacked up' and ready to brail the fish aboard.