3. Trap Nets.

a. General Fisheries Characteristics

Trap nets are considered to be a type of fishing trap. The use of traps involves installing stationary barriers ("wings") in the path of fish migration that guide the fish into the trap. The traps are constructed in such a way as to allow easy access and difficult egress. The side panels of the trap nets are usually made to reach the sea surface, and they are frequently referred to as *open-top* traps. There are also trap nets which are fully or partially closed off on top.

Trap nets are used in coastal marine fisheries and in large inland bodies of water. They are used to catch schooling fish or dispersed fish in areas where their harvest using other types of fishing gear is difficult. There is no requirement to monitor the amount of fish entering the trap. In the Far East, trap nets are used to catch salmonids, herring, smelts and navaga [tom cod].

Among the disadvantages of trap nets are their passivity, labor intensity during installation, the high cost of the larger-sized nets and the greater likelihood of damage due to storms. However, trap nets are the most appropriate choice for fishing salmonids, since the schools move along the shoreline as they approach their spawning grounds. In addition, this type of fishing gear does not require great expenditures of energy and yields high-quality fish.

b. Trap Net Construction and Installation Methods

Trap nets consist of the wings, an entrance ("heart"), and one or two traps, with a number of cribs to match the number of traps. There are also trap nets that lack cribs and those which combine the heart and the cribs.

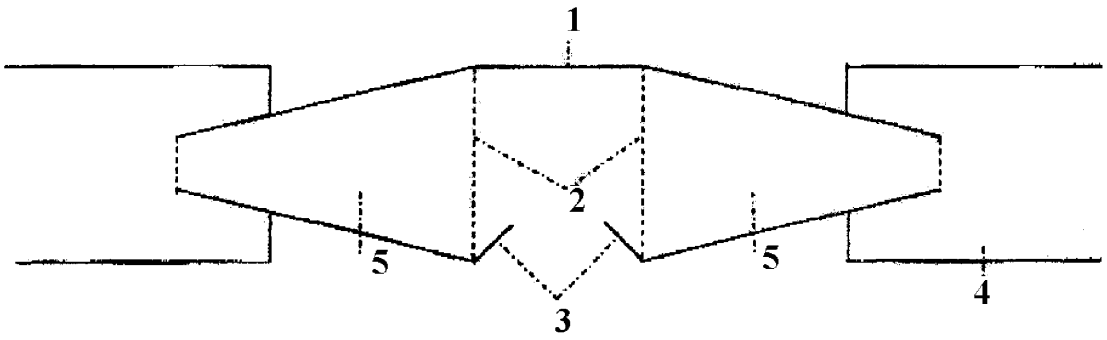
The web-panel wings that guide the fish into the trap net are installed perpendicularly to the path of the fish in such a way as to close the body of water off from the sea bottom to the water's surface. Following along the wing, the fish enters straight into the *heart*, formed from vertical net panels called *wing panels* that are installed at a narrowing angle and form a narrow opening on the heart side that makes it difficult for the fish to find its way back out of the entrance. The fish then passes along an *inclined entryway* that ends in a narrow opening, through which it enters the trap. The inclined entryway is an chute made of webbing that runs from the sea bottom to near the surface of the water. The width and height of the inclined entryway decrease evenly as it gets closer to the trap, and at the entrance into the trap it is usually no more than 2-3 meters in width and 3-4 meters in height. This type of entryway possesses particularly high holding capacity. If these dimensions are smaller than that, the capacity of the trap is greater, but the fish finds it harder to enter. In practice, when the fish is at its maximum run, there have not been any problems observed with the fish entering the trap.

When the catches are large, a crib is added to the trap to hold the fish and prevent its escape from the trap through the entryway.

Dual-crib trap nets are used when the fish run is at its maximum and is just as likely after entering the heart to follow the current or run against it, i.e., will enter either crib. Trap nets that combine the heart and the cribs are efficient when catching schools of fish, but it is necessary to monitor the fish entering the net and drive it into the crib immediately after the school has entered.

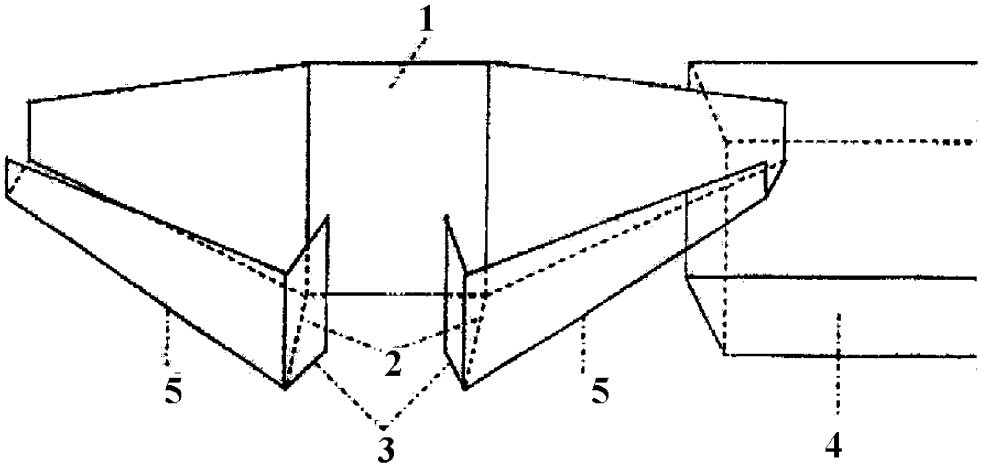
Schematic of the heart of a dual-crib salmon trap net with inclined entryways:

a. Plan View

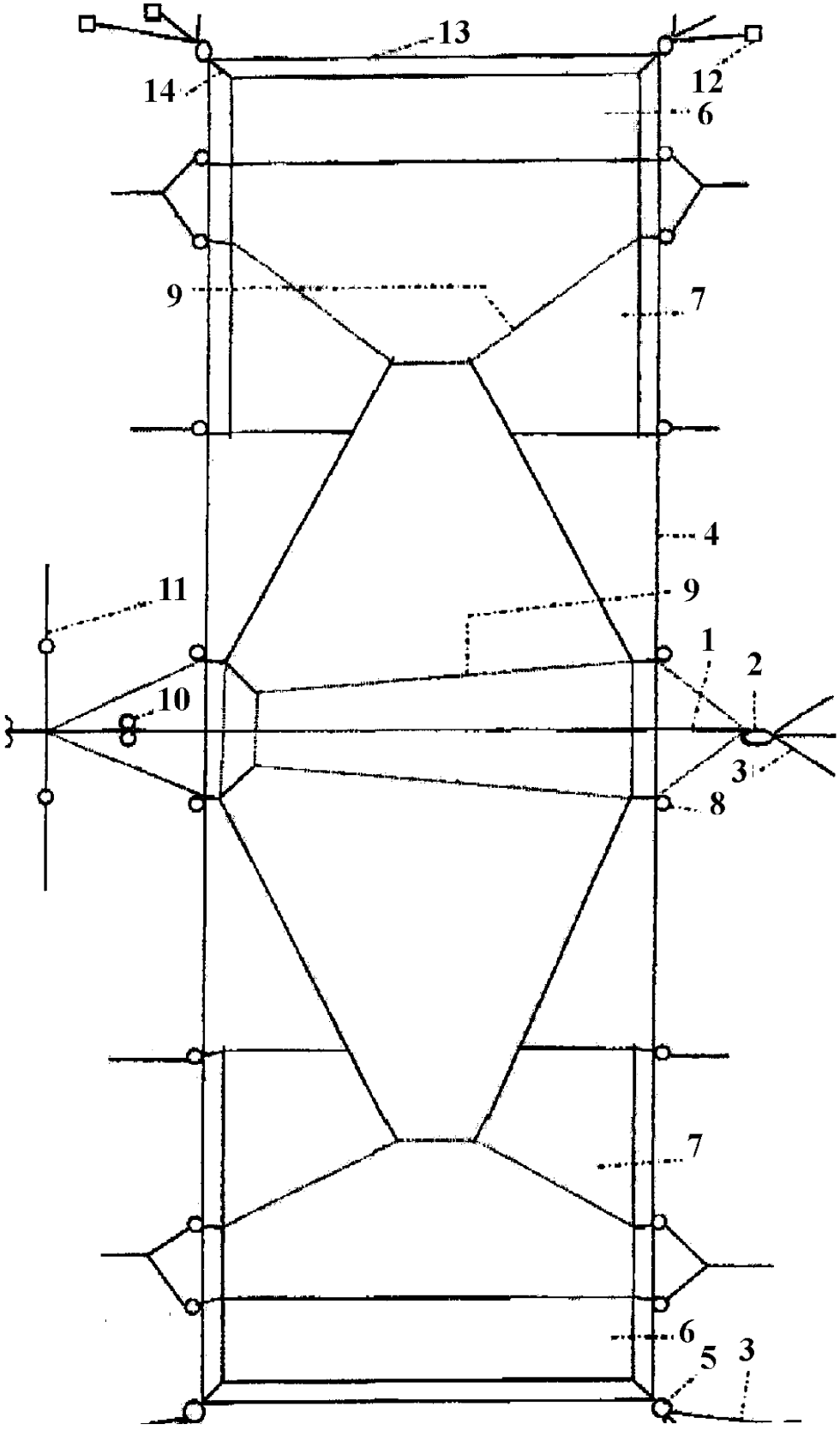


1. Front wall of the heart
2. Lower panel of the inclined entryway
3. Wing panel
4. Trap
5. Inclined entryway

b. Side View



Schematic of installation of soft-framework dual-crib salmon trap net



1. Central (lead)
2. Head buoy
3. Stays
4. Frame
5. Corner buoy
6. Crib
7. Trap
8. Frame floats
9. Wing panel stay cables
10. Central (lead) floats
11. Wing stays with floats
12. Anchor (pickle)
13. Draw line
14. Trap stay cables

Most commonly installed is the soft-framework trap net. The basis of this type is a strong central line made of thick capron or of a combination material (the *central* or lead line), stretched out at the water's surface. One end of the central line is fastened to the shore and the other, attached to the central buoy (the head buoy) is fastened with a series of stays to the anchors or "*pickles*" - a "pickle" is a bag made of web filled with rocks or a number of jute bags filled with sand and tied together with (*anchor*) line. The weight of these pickles can reach 1.5-2 MT each. The length of the stays must be 3-4 times the depth at their location.

The sea side of the central line is fitted with the *frame* made of combination line (most frequently used is *Diline* because of its strength, lightness and buoyancy). The perimeter of the frame is somewhat greater than the trap net, with the trap net itself hung on the frame with rope strops (*seizing*). The corners of the frame are fitted with corner buoys, and the spots where it attaches to the trap net are given additional buoyancy (using *floats*). The corner buoys and spots where the frame attaches to the trap net are also supported with a system of stays.

In order to prevent the deformation of the wings in the current and during stormy weather, the central line is fastened with perpendicular stays. The number of stays depends on the length of the central line and the strength of the current at the location. The trap net is hung on the frame starting at one of the corners, gradually moving to the opposite corner, attaching it in the appropriate spots. To achieve vertical stretch, the foot rope is hung with weights. Then a mesh wing is hung on the central line from the trap net to the shore. The foot rope of the wing is hung with weights at certain intervals, the number of which is determined by the amount needed to remain stable in storms and against the current. The wing must be measured and correspond to the depth, taking tidal action into account. If the wing is not deep enough, the foot ropes could be subjected to stresses due to storms and tidal action that might be enough to detach the foot ropes and weights. If the wing is deeper than needed, this could lead to the entire wing being wrapped around the central line and make the trap net unusable.

Trap nets with *wings attached at the bottom*, where the central line is stretched along the bottom between the central anchors and the shore, have become quite wide-spread. The central line is also reinforced against lateral displacement by stays. The head rope is fitted with an adequate number of floats to allow it to submerge during stormy weather and rise to the surface under operational current speeds.

There is also a method for erecting a hard-framework trap net, based on the use of wooden pilings 6-8 cm in diameter that are driven up to 1 meter deep into the bottom. The ends of the pilings extend above the water's surface, with each piling reinforced by stays. The pilings of the wing and the trap are connected together with a thin line to form a frame used to hang the trap net itself. The headrope of the trap net extends above the water and is not fitted with floats. The web portion of the wing is hung on the central line that connect the wing pilings. This type of trap net construction is convenient for shallow water and in areas that are protected from storms.

c. Fishing Techniques

Trap nets are erected for an extended period of time, and their productivity depends to a great extent on the location selected.

At the site where erection of the trap net is planned, the depth is measured along the wing line at an interval corresponding to the length of one wing section, then the trap net rigging is installed (the central line and frame) and the trap net itself is hung.

In order to dump the fish from the net, the trap net is lifted (this occurs at a frequency that is based upon visual observation and depends on the amount of fish that has entered the trap net).

In order to lift the net, a skiff is sent into the trap, and fishermen standing alongside the gunnel lift the web and chase the fish into the crib. From there, a brailer or fish pump is used to lift the fish onto a vessel to be transported to shore or to a fish-processing vessel.

At the end of the run, the trap net is disassembled in the reverse order to its assembly. First the wing and the trap net, then the frame and the central line. If the vessel is outfitted with auxiliary cargo gear, the stays and anchors are lifted.

In order to avoid problem situations and to ensure normal trap net operation, its condition is checked continuously. During the operation of the trap net, particularly in the first days following its installation, the lines under load are subject to stretching and must be regularly tightened to preserve the proper shape of the trap net. Particular attention must be paid to the wing and the entryway into the trap net, since the proper operation of the entire trap net depends on them.