

**Report Describing Aspects of Diver
Supported Ghost Net Recoveries**

by

William L. (Bill) High

March 1993

Ghost net File turned over to Bob Lauth, (AFSC-RACE)

Ghost Net Recovery by Scuba Divers

by

William L. High

BACKGROUND

Ghost nets, those lost or abandoned by commercial fishermen, may continue to trap and entangle marine life for periods up to 6 years or more. In Washington State, an intensive salmon gillnet fishery has resulted in many partial or nearly complete nets left on the sea bed. When a surface deployed net, which hangs from the surface vertically downward to depths of about 70 feet, inadvertently drifts into a more shallow obstruction or a rough sea floor, it may snag. If the fisherman is unable to pull the net free, invariably, they salvage the surface floats by cutting them free of the nylon web. The leadline remains on the sea floor and the web, no longer held at the surface, slowly settles broadly across the snagged object and sea floor. As a result, a canopy of 5-7 inch stretch measure mesh nylon web, up to 300 feet long and 70 feet wide is left to trap crabs, fish, diving birds and marine mammals.

Some nets do relatively little harm, particularly those which lay in close contact with the sea floor. A few crabs and near-bottom fish species are trapped from time to time. Whatever fish were beneath the web as it settled to the bottom eventually die. A few diving birds become gilled. The magnitude of damage increases when the dead and dying individuals attract other animals. The net then becomes an intermittent but long-term killing machine although the total numbers of animals may be relatively low.

At the extreme, the damage can be considerable. I believe that our experience with the Point Roberts, WA net in 1985 was such an example. The 300 foot long, nearly intact net had been snagged on a couple of boulders and abandoned along the east side of the Spit. Several salmon were gilled at the time of its loss. In the immediate vicinity lay Boundary Bay, site of a significant Canadian and U.S.A. Dungeness crab fishery. At the time of the net abandonment, a large population of female crab were present. Within the estimated 6-8 days between the net's loss and our dive team's arrival on the scene, more than 1,000 crab were trapped while attempting to reach the dead salmon and individuals of several other species which became entangled after the net's loss.

A small portion of that net, or another which was nearby, was initially recovered by a local diver. It contained over 300 dead crab. His report prompted the Washington Department of Fisheries to solicit assistance of the Canadian Coast Guard and the National Marine Fisheries Service (NMFS) dive team. In most cases, all NMFS ghost net recovery efforts included NOAA divers from other units such as the Pacific Marine Center and the NOAA Dive Office. During the recovery of the large Point Roberts net, we were able to release several hundred crab alive but, hundreds more died. While swimming the length of the net prior to its retrieval, we observed hundreds more crab moving toward the death trap. Had the net not been recovered, it would have eventually entangled many thousands of female crab (see attached separate incident report).

In 1990, another group of abandoned gill nets were discovered draped over a sunken vessel (either a dry dock or barges) near Seattle. Three harbor seals, numerous diving birds and some fish were seen trapped. Because of the height of the structure off bottom (about 15 feet) and its large area, the web formed vast canopies off-bottom which made it more likely that animals such as the seals and birds would be entangled. Our dive team was

able to remove most of the more harmful web over a 2 day period. (see attached separate incident report).

At two locations where web had been entangled and abandoned, the shipwreck Dauntless north of Meadow Point and the Navy degaussing range railway north of Jefferson Head, dive specialists Rob Loghry and Laurel Touchette assisted me in a study, during the 1970s and early 1980s, to gain estimates of how long nets might continue to trap animals. In general, the effectiveness of the nets diminished over time but, for over 6 years, some of the nets remained intact and trapped birds and fish.

DANGER TO RECOVERY DIVERS

Ghost nets pose a potential danger to scuba divers who may inadvertently become entangled as they pass by the often nearly invisible net and especially to divers who attempt, as a conservation effort, to recover the net. At least one recreational diver died several years ago when entangled in a net underwater. Many divers have reported entanglements with near fatal consequences. To most divers, the net is not perceived as a serious threat. It is made of thin threads and the diver believes he can avoid having it catch on his diving gear. A few successful swims near nets invariably breeds complacency, thereby setting the stage for disaster. Divers must be well trained, disciplined, and have a thorough safety plan before attempting to retrieve ghost nets.

Often, when a diver becomes snagged by gillnet web, he turns round in an attempt to better see the cause of his restraint. In doing so, he usually increases the degree of entanglement. Panic quickly sets in and it becomes very difficult for diving partners (if close by) to extract the frightened diver.

The Washington Department of Fisheries, Patrol Division, points out that private citizens should not recover ghost nets. There are certain legal implications to possessing another person's net and, it would be illegal to possess fishing gear out of season or without a valid commercial fishing license regardless of its actual condition. However, the logic of an enforcement officer expressing any concern over a volunteer group of divers recovering a lost or abandoned net that is the responsibility of that officer to recover himself, escapes me. When a fisherman cuts away the floatline, he has made it rather clear that the remainder is abandoned since the means to locate it has been removed.

Over the years, I have trained numerous divers to work within the vicinity of webbing (trawl, purse seine and gill net). I believe some of those divers, as well as others with whom I have discussed the dangers of working around web, under-estimate the hazard. Frequently, skilled divers abandon safety measures after a few minutes of uneventful work clearing a ghost net. However, experienced working divers, operating within the framework of a carefully thought out safety plan can quickly and safely recover major portions of ghost nets.

DEVELOPING A SAFETY PLAN

A net recovery plan of action must usually be prepared without full access to all relevant information. The person reporting the net either cannot be reached for an interview or they failed to note facts useful to the recovery effort. An information request form was developed to be sent to and completed by the informant. Even when available information suggests the net poses little danger, it is wise to plan a survey dive prior to the recovery attempt. From that report, an on-site specific protocol can be finalized.

There is a tendency to undertake ghost net recovery with inadequate surface support. Considerable coordination of people and equipment is often needed. Personnel, in addition to the divers, are needed to haul the net pieces to the surface, assist the divers and operate boats. The divers usually remain underwater while the net is pulled aboard ship. Once back on board ship, the divers have dive related responsibilities to pursue rather than be called upon to haul lines and web or arrange for proper disposal of the web. One or more large stable working platforms are essential. The diver support boat must be dedicated to that sole purpose and not be diverted to other assignments. We began the Point Roberts net search and recovery with 5 boats and completed the effort on day two with only 2 operational vessels remaining. Also, the foul smelling net and decaying animal remains must be kept away from the divers' equipment.

A variety of methods have been tried to separate the web from the sagged object(s). Seldom is it possible to bundle the web, attach a heavy line between the net and vessel, then pull the web free. Frequently, we were able to bundle a small net portion and then, with the vessel taking a light strain, cut the web from the snag sites. This approach usually tended to draw the loosened web away from the diver's working area, greatly reducing the likelihood of his entanglement.

Diver knives are poor web cutting tools. We found that large, well-sharpened butcher knives quickly cut through most web entanglements and leadline.

Dive Team Deployment

The number of divers placed underwater and their assignments vary according to the extent of entanglement and perceived danger. When the volume of web is low or, it is concentrated (bundled) near the bottom, there is little likelihood of diver envelopment. Small, one mesh snags in diver gear may occur but will not lead

to entrapment of a diver experienced in net removal. Under such circumstances, it is appropriate to use a 2-person underwater team. One diver works on the web while the second diver stays a few feet away, out of potential contact with the net. If the working diver is entangled, he immediately stops all movement, raises one hand, slows his breathing rate, and waits for the safety diver to disengage him. When he is free, the safety diver signals (by one squeeze to the working diver's arm or leg), that the work can continue. In most cases, a 2-person standby team is at the surface prepared to assist.

When web is draped over a wreck, reef of other high relief object, the chances for serious entanglement are much greater. On these occasions, we usually deployed a 3-person team. Only a single diver worked on the web while the second diver remained close behind him for previously described safety and to ensure no loose web drifted around the working diver. The third diver remained beyond the influence of the net unless required to assist the primary safety diver. Visibility is often reduced as the work progresses so selecting a time when some tidal current is present helps to keep the working area clear.

Some ghost net recoveries have been made using only a 3 person underwater team without having additional standby divers at the surface. In most cases however, and especially when the survey dive and recovery are to be made on the same outing, backup divers are an appropriate safety measure. Dive teams may be alternated during an extended recovery effort allowing for surface decompression but, those taking over surface standby safety duty after completing a working dive, must have sufficient bottom time remaining to function as rescue divers.

There is a tendency, as the number of successful ghost net recovery experiences increase, for divers to accept recovery assignments using fewer divers and to use the 2 diver-down option when ill-advised. The safety diver becomes bored since it seems he has nothing to do and, all too soon, the safety diver may be

found cutting web alongside the assigned working diver. In order that each diver has the opportunity to perform work, the team members should change places part way through the dive. The exchange serves 2 purposes. First, the safety diver is more willing to stay out of the web knowing he will have a chance to participate. Secondly, the web cutting diver consumes air much more quickly than the safety diver. With the tasks exchanged when about one third of the air supply is consumed, more bottom time is achieved. By that plan, one third of the air supply is available for a safe departure from the working area. During removal of low hazard nets, we have terminated the working dive with as little as 600 psig of air remaining in cylinders.

Most NOAA working divers are adequately trained and experienced to participate in ghost net recoveries. Experienced personnel should supervise the dive and ensure that all aspects of the work are carefully reviewed in a pre-dive planning session.

Ghost Net Recovery
Off Magnolia Bluff (Seattle, WA)
June 13-14, 1990

Report On Ghost Fishing Net Removal

by

William L.(Bill) High
NOAA Diving Supervisor
June 22, 1990

At the request of the Washington Department of Fisheries (WDF), collateral duty divers from several Seattle National Oceanic and Atmospheric Administration (NOAA) units participated in the recovery of ghost gill nets entangled off Magnolia Bluff, Admiralty Inlet, Washington. Diving operations were carried out from a 28 ft WDF patrol vessel (captain Howard Oliver) on June 13-14, 1990. Additional surface support was provided by a 50 ft salmon tender from the Puget Sound Gillnetters Association, and the 34 ft WDF hydroacoustic vessel, R/V Pasquale. This report summarizes the diving operation, our findings and the results of removal efforts.

Information pertinent to the net recovery effort was received from (1) recreational diver Dan Reynolds, (2) Wayne Palsson (WDF), (3) Reynold's video tape and (4) prior experience in the area by Bill High. Based upon these sources, a preliminary operations plan was formulated and a pre-dive meeting held for dive team members on June 13 (see attached meeting outline). Representatives of the WDF and various news media persons also attended.

Initial Findings

The wreck site was immediately located at a floating temporary marker buoy previously placed by Wayne Palsson. The dive support boat was secured directly to the work area by entangling its anchor in a segment of gill net web. Dive teams descended the anchor line or later, the net haul lines.

An exploratory dive was made by Bill High and Andy Cohen. Upon reaching the wreck at approximately 60 ft they were located on the northeast inside upper edge of a large drydock lying upright on a sand-silt sea bed. The dock is comprised of two large hulls, 200 ft or more in length, oriented approximately NE to SW, each hull is about 20 ft across and stands 15 ft proud. Distance between hulls is 30-40 ft. The survey dive progressed SW along the inside wall of the southeast hull. At its end, in 105 ft of water, the team crossed over to inside the northwest hull and proceeded shoreward about half way before ascending.

Extensive gill net coverage was noted throughout the drydock. Multiple layers of web lay in close contact with the upper deck of each hull. Numerous drapes of web extended between the two hulls and beyond out onto the sea bed. No corklines were noted but numerous leadlines were present. One or more layers of web lay

close to the hull sides in most places. Many net canopies were seen between the hulls and along the extreme west and east sides.

All web showed evidence of having been in place for many months or up to several years. Brown algae adhered to meshes and lines. Anenomes and other invertebrates were attached to dense web accumulations.

An accurate estimate of the total volume of web is difficult. Nonetheless, it is obvious that numerous net segments have been abandoned on this site. Undoubtedly, more than 1,000 linear feet of leadline was present with its associated web. This is the most extensive net loss site I have encountered.

Numerous entangled animals in various stages of decomposition were seen. We noted two hair (harbor) seals; a dozen or more diving birds; several fish, including a recently caught salmon, and 3 red rock crab. This was however a superficial examination and some additional animals were likely caught.

Net Removal Techniques

It was immediately obvious that neither the diving capability nor surface support was adequate to undertake a complete removal effort. In my view, complete removal was not warranted. Dive teams were instructed to remove web that was held away from the structure, including drapes and canopies. Whenever possible, the web was to be cut away and allowed to fall to the sea floor where its ability to entangle local animals was greatly reduced. The available divers were arranged into two man teams with one diver assigned to net removal activity while the second stood by for safety and to dis-entangle the working diver when caught in the web.

Each diver was equipped with a large, sharp butcher knife. The web yielded readily to sweeping motions of the knife. Leadlines were somewhat more difficult to cut through.

Heavy lines were carried to the underwater working site from the surface support vessels. Numerous segments of web were tied off and cut free from the drydock. As the web was cut, surface handlers lifted the loose material away from the working divers. Several times, partially cut pieces were pulled free by the large 50 ft fishing vessel supplied by the Puget Sound Gill Netters Association.

Results

A total of 6 team dives were made on June 13 to a maximum of 105 ft for about 20 minutes each. Required surface interval between each team's dives was 2 hours to eliminate decompression obligations. On the 14th, only 4 divers were on site so 4 dives to a maximum of 90 ft were made.

Some freed net segments were pulled to the surface while others fell to the sea floor. For the most part we removed the web perceived to be the most damaging to marine animals. Overall, I estimate that we removed about 30% of the total web, which constituted over 80% of the most damaging netting. The east side of the east hull received only minimal attention.

At the request of the news media, a video camera was taken on one dive and satisfactory footage was obtained of the working divers for use by local news stations. A copy of that tape was to be returned to WDF and the Alaska Fisheries Science Center. At the writing of this report the video tape had not been received. Bill High and Andy Cohen also took a several surface pictures and underwater slides of the net and divers. The news media operated from the salmon tender and were shuttled by the R/V Pasquale.

A final survey of the entire structure was not possible on the 14th because no more diver underwater time was available. We did determine that most, if not all net drapes and canopies between the two hulls had been removed or dropped to the sea bed. Much web along the west side of the west hull was cut away as well as web on its north end. Considerable web lying close to the west side of the east hull was rendered less harmful.

Discussion and Conclusions

The efforts of Howard Oliver, his vessel and those persons operating the salmon tender were essential to the success achieved. Similar support probably will be the minimum necessary for all future attempts at ghost net recovery. Each diver performed his duties safely and efficiently. A variety of emergency backup and support services and equipment was on hand but not needed.

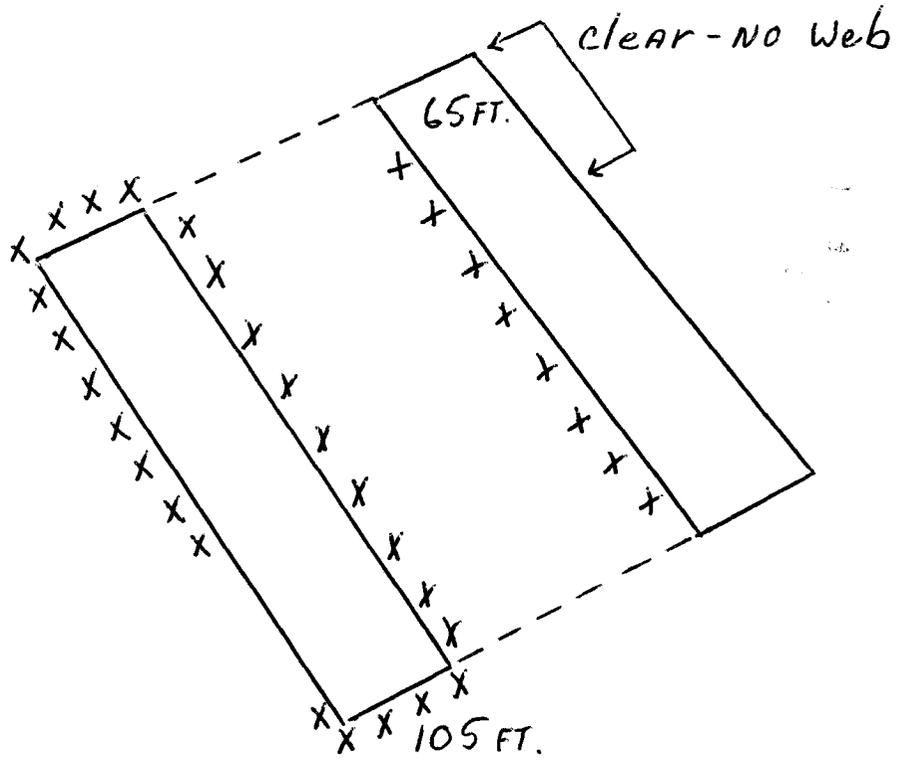
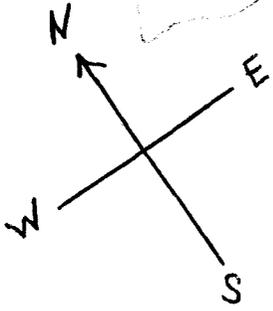
A future diving survey of the entire wreck may be of some general interest to better define the level of continuing danger to marine animals. Two or more dives would be required. Because of the depth (over 100 ft), more than one team may be needed.

There was discussion about the likelihood of future net losses on this structure and the need for some form of marking during the fishing season. WDF patrol officer H. Oliver reported that the dry dock site is no longer within commercial fishing boundaries so it is unlikely that additional nets will be lost on it.

The media coverage of this previously not well known diving site may precipitate further recreational diving activity. The wreck constitutes a continuing danger to sport divers. Frequent minor entanglements by our skilled and trained divers demonstrate the potential for a serious incident.

MAGNOLIA BLUFF

4-mile
Rock



X = area of web removal effort