REPORT OF THE WORKING GROUP ON GHOST FISHING

(Paul A. Breen, Chair)

OVERVIEW

Ghost fishing is a potentially serious problem because of the very large volumes of fishing gear now in use. Only a small percentage of this gear lost annually would amount to a very large loss. The increasing use of nondegradable materials such as plastic, vinyl-coated wire, and fiberglass means that lost fishing gear may persist in the marine environment for a long time.

Of the many gear types in use worldwide, the working group considered traps and gillnets to be of primary interest. Ghost fishing is well documented in coastal gillnets and in a few studied trap fisheries; it is much less well documented in pelagic gillnet fisheries. For most trap fisheries, no directed work has been done and whether ghost fishing takes place is not known. Much more work is required to study ghost fishing in specific trap fisheries and in pelagic gillnet fisheries.

Trawls and longline gear types probably cause smaller ghost fishing problems than do traps and gillnets. For other gear types, no evidence exists that ghost fishing takes place.

For American lobsters, the estimated economic waste is several million dollars annually. In other trap fisheries where it has been measured, the loss to ghost fishing appears to be a significant percentage of the reported catch. It seems certain that if other trap fisheries were examined further, serious ghost fishing situations would be discovered.

Mitigation of ghost fishing is technologically simple for traps, but requires situation-specific materials research, legislation, and industry education. Mitigation of ghost fishing by nets is more difficult. Both timed-failure devices and degradable meshes should be developed and tested for nets.

The lower priority problems of ghost fishing by trawls and longlines are poorly documented.

GEAR TYPES

The working group reviewed the various gear types in use with respect to their potential for ghost fishing. Traps, tangle nets, and pelagic gillnets were considered to have the highest potential for ghost fishing because of their passive mode of fishing and the very large quantities

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In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

presently in use. Bottom trawls and coastal gillnets were considered to have the next priority. Longlines, both benthic and demersal, and lures were considered at a third level of importance.

With the many other gear types in use, the working group has no reason to suspect significant ghost fishing problems.

FRAMEWORK

The working group devised the following framework for summarizing and evaluating the existing information on ghost fishing impacts. The following questions apply to each species, gear type, and location problem. The working group recognized dangers in generalizing or extrapolating from one species or trap type to another.

- Does ghost fishing take place in a particular situation; i.e., for a particular species/gear type/location combination?
- At what rate does lost gear catch and kill target and nontarget species?
- How is gear lost?
- At what rate is gear lost, or alternatively, how much lost gear is there?
- At what rate does lost gear cease to fish?
- What actions have been taken to reduce gear loss?
- What actions have been taken to reduce the ghost fishing life span of fishing gear?
- What actions have been taken to enhance the recovery of lost gear?

ANALYSIS

The working group reviewed the existing data and analyses by gear type in the context of the framework devised. The analysis is presented in the format outline above. Further information on traps and gillnets can be found in the review by Breen (1990 [this document]).

Traps

Does Ghost Fishing Take Place?

Ghost fishing has been documented in traps in the fisheries for American lobster and Dungeness crab through simulated lost trap studies. For the Western Australian snapper fishery, ghost fishing is suggested by a preliminary lost trap study. Ghost fishing seems likely from observations in fisheries for king crabs, snow crabs, and Pacific sablefish.

Observations and short-term escapements have been used by some workers to suggest that ghost fishing does not occur, for instance in Western Australian snapper. However, the working group considers the published evidence inadequate to reject the hypothesis that lost traps ghost fish for any species.

For most of the world's trap fisheries, the question of ghost fishing is not addressed by published reports. From studies of the few species so far examined, it seems likely that many more trap fisheries suffer from ghost fishing.

At What Rate Does Lost Gear Catch and Kill Target and Nontarget Species?

The rate of capture by lost gear has been measured in American lobsters at 10% of the catch rate by the commercial fishery. For Dungeness crabs in a sheltered British Columbia bay, lost traps killed 10 crabs per trap year. For Atlantic snow crabs, a lost trap fishes only for the life of the bait, then stops fishing. No capture rate estimates are available for other species.

How Is Gear Lost?

Trap gear is lost in a myriad of ways. Vessel traffic and tow boating sever buoylines or drag traps into deep water. Buoylines chafe and break. Buoys may become detached, or can be attacked by marine birds or mammals.

Storms and strong currents may "drown" traps. Traps may be snagged on rocky bottom. Traps are carried away by trawlers or gillnetters. Buoylines are cut by vandals or in fishing disputes.

At What Rate Is Gear Lost, or How Much Lost Gear Is There?

Estimates of annual trap loss rates vary from 5 to 30% based on estimates made from surveys of fishermen (see Breen 1990). For Dungeness crabs annual estimates vary from 11 to 18%. These rates are probably typical of most trap fisheries. In two surveys of Dungeness crab fishermen, it was estimated that about 50% of lost traps continue to ghost fish.

In the Alaska king crab fishery, it is estimated that 30,000 lost traps remain on the fishing grounds. In the U.S. portion of the American lobster fishery, it was conservatively estimated in 1978 that 187,000 traps could be ghost fishing.

No estimates are available for other trap fisheries.

At What Rate Does Lost Gear Cease to Fish?

Traps without timed-failure devices might ghost fish for years. Treated wooden lobster traps may last 2 years; metal king crab traps may last 10-15 years. No experimental results are available.

What Actions Have Been Taken to Reduce Gear Loss?

To reduce trap loss rates, some jurisdictions have regulations that require traps to be buoyed with marked buoys. In some areas, seasonal and area closures create temporal or spatial separation of trap and other fisheries. In Washington State, buoys must be foam-filled and buoylines weighted to prevent losses from buoys sinking or vessels running over buoylines. In Washington State, trap fishermen are notified of potential gear conflicts. High technology navigation systems allow trap gear to be relocated with more precision. Educational programs have reduced gear loss.

All these actions are taken from American lobster and Pacific west coast jurisdictions. Apart from buoyage and marking requirements, little is known about actions to reduce trap loss in fisheries outside North America.

What Actions Have Been Taken to Reduce the Ghost Fishing Life Span of Fishing Gear?

Devices to reduce the ghost fishing life span of a trap are required in all traps in Alaska, Washington, Oregon, and California; in Pacific sablefish traps in Canada; and in American lobster traps in Connecticut.

Actions taken to prevent ghost fishing outside North America have not been published.

What Actions Have Been Taken to Enhance the Recovery of Lost Gear?

The working group is aware of no programs to recover lost traps, except that a small-scale commercial operation once operated in Canada to recover Dungeness crab traps. In Alaska, king crab traps caught by domestic trawlers are slashed before being discarded. Trap recovery is probably opportunistic.

Pelagic Gillnets

Does Ghost Fishing Take Place?

Ghost fishing in a pelagic salmon gillnet was reported in a lost net recovery, and ghost fishing was documented in a simulated lost net study.

At What Rate Does Lost Gear Catch and Kill Target and Nontarget Species?

In one experimental simulation of lost pelagic gillnets, two fish were caught by 1,500 m of net in the first 3 days.

How Is Gear Lost?

Pelagic gillnets may be lost when cut by vessel traffic, broken by storms or large marine mammals, or when the fishing vessel fails to relocate her gear.

At What Rate Is Gear Lost?

The rate of gillnet loss has been estimated in one study at 0.05% per set. This estimate, from the Japanese salmon mothership fishery, appears to be the only available estimate.

Density of lost gillnet fragments observed from passing vessels has been estimated in several studies presented at this conference.

At What Rate Does Lost Gear Cease to Fish?

Two studies suggest that nets less than 2 km long fish for only a short time after loss and then rapidly aggregate into a solid mass. The net tends to remain open longer when attached to a large buoy.

What Actions Have Been Taken to Reduce Gear Loss?

Japan requires gillnets to carry radar reflectors at each end of the unit to prevent cutting by vessel traffic. Radio communication is used to direct vessel traffic around nets. To prevent loss in bad weather, shorter sets are made. Japan requires nets to be marked with radio transmitters, and old gillnets to be recycled. No information is available from other countries.

What Actions Have Been Taken to Reduce the Ghost Fishing Life Span of Fishing Gear?

No actions have been developed to reduce the ghost fishing life span of a pelagic gillnet.

What Actions Have Been Taken to Enhance the Recovery of Lost Gear?

Japan requires nets to carry radio buoys and radar reflectors, and requires old nets to be recycled. Japanese research vessels pick up fishing debris.

Coastal Gillnets

Does Ghost Fishing Take Place?

Ghost fishing by Pacific salmon gillnets has been documented, and observations of ghost fishing by Pacific herring gillnets have been reported. Experimental results confirm ghost fishing in demersal gillnets in Newfoundland, New England, and New Zealand.

At What Rate Does Lost Gear Catch and Kill Target and Nontarget Species?

Catch rates of lost gillnets have not been estimated in any published study.

How Is Gear Lost?

Coastal gillnets are lost when nets become fouled on the bottom or on snags; broken by storms, marine mammals, or large fishes; cut by vessel traffic; or carried away by trawlers.

At What Rate Is Gear Lost?

Rates of gear loss for coastal gillnets are not immediately available. A submersible survey in a known area in New England found a density of 0.23 nets/ha. A Newfoundland study reports numbers of gillnets retrieved in direct retrieval operations.

At What Rate Does Lost Gear Cease to Fish?

Lost gillnets may become tangled (leadline over corkline) or balled up (tangled in the horizontal plane). Fouling increases visibility and reduces catches. No precise estimates of the rates of these processes are available. Ghost fishing has been observed in Pacific herring gillnets 7 years after net loss.

What Actions Have Been Taken to Reduce Gear Loss?

Most jurisdictions require proper marking and lighting of gillnets to prevent cutting by vessel traffic. Radar reflectors are required on gillnets in New England.

What Actions Have Been Taken to Reduce the Ghost Fishing Life Span of Fishing Gear?

Recent New England experiments have examined degradable corklines and the effect of degradable panels along the net.

What Actions Have Been Taken to Enhance the Recovery of Lost Gear?

A Newfoundland program was conducted in 1975-76 to recover lost gillnets with specially designed recovery gear. In the British Columbia herring fishery, efforts are made to ensure that all gear has been recovered at the end of an open fishing period.

Bottom Trawls

Does Ghost Fishing Take Place?

Ghost fishing has been reported where trawl netting was stretched across bottom features or snags.

At What Rate Does Lost Gear Catch and Kill Target and Nontarget Species?

No estimates of catch rates by lost trawls are available.

How Is Gear Lost?

Trawls are lost when the net or doors become snagged on bottom obstructions. Snagging incidents may result in partial loss of the net. Trawls have been lost when fouled by submarines.

At What Rate Is Gear Lost?

No rates of trawl loss are immediately available. Some logbook programs may contain this information.

At What Rate Does Lost Gear Cease to Fish?

No information.

What Actions Have Been Taken to Reduce Gear Loss?

Snag charts reduce the incidence of net loss on wrecks or other obstructions. High technology navigation systems allow trawls to be set more accurately in known areas.

What Actions Have Been Taken to Reduce the Ghost Fishing Life Span of Fishing Gear?

There appear to be no actions taken with respect to trawls.

What Actions Have Been Taken to Enhance the Recovery of Lost Gear?

The working group uncovered no information on this question.

Longlines

Does Ghost Fishing Take Place?

Pacific halibut are reported to strike and be caught on bare hooks. Lost halibut longlines may thus ghost fish.

At What Rate Does Lost Gear Catch and Kill Target and Nontarget Species?

No estimate of the rate of ghost fishing by longlines is available.

How Is Gear Lost?

Longlines are lost when snagged on bottom features.

At What Rate Is Gear Lost?

No estimates of loss rate or density of lost gear are immediately available. Some logbook programs may contain information.

At What Rate Does Lost Gear Cease to Fish?

There appears to be no information with respect to longlines.

What Actions Have Been Taken to Reduce Gear Loss?

There appears to be no information with respect to longlines.

What Actions Have Been Taken to Reduce the Ghost Fishing Life Span of Fishing Gear?

There appears to be no information with respect to longlines.

What Actions Have Been Taken to Enhance the Recovery of Lost Gear?

There appears to be no information with respect to longlines.

RECOMMENDATIONS

The working group made recommendations at three levels of priority: high, medium, and low. Within each level no attempt was made to assign priorities.

High Priority Recommendations

1. Fishery agencies responsible for trap and tangle net fisheries should conduct lost gear simulations to determine whether ghost fishing occurs and, if it does, the rate at which target and nontarget species are killed. If a ghost fishing problem is discovered, the rates of gear loss should be estimated through logbook programs or questionnaire surveys. In some situations, useful information might be obtained from surveys of fishing gear manufacturers.

2. Where ghost fishing has been demonstrated or is suspected in a trap fishery, the fishery agency should decide what timed-failure mechanism would be most appropriate to reduce the life span of traps and how soon to cause timed failure to happen. Research under actual fishing conditions should then be conducted to determine the most appropriate regulation for timed-failure devices. Industry should be consulted and involved in this research.

3. Further studies with simulated lost pelagic gillnets should be conducted. In order to simulate the loss of an entire net, studies should use nets approximating the length of commercial nets. More studies on smaller sections are also required. These studies should examine whether ghost fishing takes place and, if it does, then the rate of ghost fishing and the rate at which the nets form a tangled mass or otherwise cease to fish.

4. Direct observations should be made of lost pelagic gillnets to determine their shape and to determine the apparent rate at which ghost fishing for fish, birds, sea turtles, and marine mammals is taking place. These observations should be collated, made available, and distributed by a central agency such as the Food and Agriculture Organization of the United Nations.

Medium Priority Recommendations

1. Research should be continued and new programs developed to examine potential timed-failure mechanisms in gillnets and tangle nets. Both degradable net components and degradable mesh should be considered. In the former case, possible ghost fishing by sunken gillnets must be evaluated with appropriate experiments. In the latter case, the consequences of generating many small fragments must be examined. This research should also address the costs of timed-failure mechanisms for gillnets and tangle nets.

2. Fishery agencies should examine existing data or undertake new programs to estimate the rate of gear loss in fisheries using pelagic or coastal gillnets, trawls, or longlines.

3. Where ghost fishing has been demonstrated or is suspected with any gear type, the responsible fishery agencies should conduct research into the fishing life span of gear after loss.

4. In those fisheries for which an estimate of the impact of ghost fishing is available, ghost fishing should be examined as a mortality source in stock assessments and incorporated in fishery management plans.

5. In those jurisdictions where timed-failure devices are already required in traps, the rate of compliance with such regulations and attitudes of industry should be examined.

Low Priority Recommendations

1. Studies should examine whether ghost fishing takes place by longline gear, especially for Pacific halibut and tunas but also for other species as appropriate. If ghost fishing does occur, then studies should be conducted to measure the rate at which hooks of various kinds cease to catch fish.

2. Where it has not been done, charting of snags should be carried out to help vessels prevent net loss.

3. The possibility of encouraging or requiring vessels to retain recovered lost fishing gear for disposal on land should be explored.

4. Research should be initiated on possible positive effects of lost gear, especially lost traps acting as habitat for American lobster and floating masses of pelagic gillnet acting as fish aggregating devices.

LIST OF PARTICIPANTS

Norihisa Baba, National Research Institute of Far Seas Fisheries, Fisheries Agency, the Government of Japan
Paul A. Breen, New Zealand Ministry of Agriculture and Fisheries
Douglas G. Chapman, University of Washington
John Davis, Canada Department of Fisheries and Oceans
Satsuki Matsumura, National Research Institute of Far Seas Fisheries, Fisheries Agency, the Government of Japan
Tracie McKenzie, Northeast Region, NMFS, NOAA
Minoru Morimoto, Ministry of Agriculture, Forestry, and Fisheries, Fisheries Agency, the Government of Japan
Joji Morishita, International Affairs Division, Fisheries Agency, the Government of Japan
David E. Ortman, Friends of the Earth
Yasuji Tamaki, Fisheries Agency, the Government of Japan
Yoh Watanabe, National Research Institute of Far Seas Fisheries, Fisheries Agency, the Government of Japan