Reducing Impacts of Gear

B1. Identify, quantify and reduce the impacts of ghost fishing gear.

B2. Research on the movement and effects of derelict fishing gear and other plastics in ecosystems.

B3. Research to estimate mortality rates and their impacts on affected species caused by derelict fishing gear and marine debris.

B4. Assess the interaction of vessels with fishing gear and marine debris

Reducing Impacts of Gear: Recommendation B1

Title: Identify, quantify and reduce the impacts of ghost fishing gear.

Issue(s): Lack of data and the effects of ghost fishing on commercial and non-commercial species.

Concern: Ghost fishing gear can result in fish mortality equal to or greater than that of the commercial harvest.

Theme: Assess the magnitude of the problem so as to determine appropriate responses.

Author(s): Gerald Brothers and Gary Dunlin

I. Description:

There are some documented estimates of fish and non fish mortality due to ghost fishing gear. Up until now, there has been little systematic work carried out to analyze this impact on commercial fisheries throughout the world. Comprehensive surveys need to be carried out to establish the cause and extent of gear loss in representative waters.

The physical evolution of gear lost under a wide range of conditions needs to be studied in order to assess the potential for these gears to carry on fishing for prolonged periods.

Using these two research tasks, it should be possible to quantify the impact on mortality to target and non-target marine species. The results of these research areas could be widely disseminated to fishermen and governmental agencies. Information acquired should give them the incentive to do all in their power to reduce gear losses.

II. Methods/Steps for Implementing Action:

A. Carry out ghost fishing clean-up programs to quantify the amount of lost and abandoned fishing gear.
B. Develop model to calculate the amount of fish mortality caused by ghost fishing gears.
C. Identify source of gear losses

D. Develop awareness campaign, hilighting cost of ghost fishing to fishermen, and thereby provide incentive to reduce losses.
E. Establish management plan to reduce ghost fishing
    -Zoning—defining fishing period for active and passive fishing gears.
    -Individual Quota system
    -Limit amounts of gear
    -Gear tagging program
    -Observer coverage
    -Mandatory tending of gear
    -Mandatory reporting of loss of fishing gear

III. Type of Action:

Research, Regulatory and Educational

IV. Where should Action be Implemented (specify general geographic areas)?

Include minimum spatial extent: It is difficult to restrict studies to particular areas owing to the global nature of the marine debris problem. The action should be tasked into areas where the problem is identified as such.

Habitat Type Affected: Not provided

V. Who Implements Action?

Government agencies, in cooperation with the fishing industry.

VI. What is Cost of Action (Estimate)?

The cost is dependent on the location and magnitude of the problem. Off Atlantic Canada, a program was estimated to cost $10 million (Canadian). Off the United Kingdom a program in certain targeted waters cost $900,000.

VII. Who Finances?

Not provided

VIII. What are the Benefits (environmental or economic) from Implementation?

Giving fishermen and managers the incentive to reduce gear losses will result in both environmental and economic benefits.

IX. Identify the Resources (living or physical) Affected by Action:

All marine species.

Reducing Impacts of Gear: Recommendation B2

Title: Research on the movement and effects of derelict fishing gear and other plastics in ecosystems.

Issue(s): Persistence; lack of knowledge and data

Concern: lack of understanding of the breakdown processes: physical, chemical, biological; the lack of knowledge of the ecosystem impact of these breakdown products; degradation products may provide a direct pathway for these substances to be incorporated into the food web at low trophic levels

Theme: Assess the magnitude of the problem so as to determine appropriate responses.
Author(s): Murray Gregory, Arnold Carr

I. Description:

Because of the persistence of abandoned and derelict fishing gear, as with all other marine debris made with synthetic materials introduced into the marine environment are impacting marine and ecosystems in an ever-accumulating manner. The accumulation of synthetic materials in the marine environment was first recognized in the late 1950's, but little importance was attached to observations at that time. It was considered a minor nuisance. By the1980's, the increased use and disposal of persistent plastic materials, as is found in fishing gear, was an acknowledged problem of such magnitude that it generated several international conferences. By the late 1990's, the increased use of plastic materials in fishing activities, as elsewhere in society, and the resulting casual disposal in the marine environment brought the problem to a global scale.

The first recognition of the impacts of derelict fishing gear and other marine debris in the marine debris were visual and aesthetic. They were focused on shorelines. As more derelict fishing gear entered the marine debris stream, attention was drawn to the direct biophysical impacts of entanglement and ingestion.

The magnitude of impacts of derelict fishing gear and other marine debris is only recently becoming appreciated. These include:

- Alien introductions through attached and associated biota

- Degradation of larger debris into microplastics and it's assimilation into key parts of the ecosystem (eg. the sea surface microlayer)
- Contaminants(eg. organochlorines and endocrine-active substances) adhering to microplastics and accumulating in marine organisms (eg. birds, turtles and fish) upon ingestion. Eating plastics may constitute a novel direct pathway into wildlife populations.

II. Methods/Steps for Implementing Action:

A. Establish the nature of the degradation pathways
B. Determine the extent that degradation products are contaminated by other potentially toxic compounds
C. Devise means to interrupt the pathway of these contaminates into the marine environment [Given the pipeline character of marine debris delivery to the marine environment, this will be a long term process. However, the potential impacts of these type of contaminants are subtle, progressive, accumulative and long term.]

III. Type of Action:

Research, Monitoring, Regulatory and Educational

IV. Where should Action be Implemented (specify general geographic areas)?

Include minimum spatial extent: Global with presently recognized hot spots

Habitat Type Affected: Potentially, all habitats.

V. Who Implements Action?

Research institutions supported by government or private funding

VI. What is Cost of Action (Estimate)?

One Time (Start up)	Annual O & M
$100,000 to $500,000	$100,000 to $500,000

VII. Who Finances?

Probably government and/or private funding.

VIII. What are the Benefits (environmental or economic) from Implementation?

Maintenance of quality within ecosystems.
Reduced possibility of elimination of species.

VIII. Identify the Resources (living or physical) Affected by Action:

The marine ecosystem.

Reducing Impacts of Gear: Recommendation B3

Title: Research to estimate mortality rates and their impacts on affected species caused by derelict fishing gear and marine debris.

Issue(s): Depletion of target and non-target marine species; Effects on single species have larger effects on ecosystem as a whole; Structure and function of ecosystems and their foodwebs could have adverse effects on economic and social benefits.

Concerns: Negative economic impact on fishing industries; Long term effects on resource availability and quality of life.

Theme: The extent of mortality on the various species affected by marine debris and the population consequences.

Authors: Chuck Fowler, Nancy Hoffman, and Adam Hill

I. Description:

Studies are needed to provide information on the physical and chemical processes that lead to mortality caused by marine debris.

II. Methods/Steps for Implementing Action:

Specific methodologies will depend on the question being asked and the species or population of interest and the source of mortality. Not everything can be studied nor all questions answered. Species with key roles in their ecosystems and debris that is of suspected concern will determine priorities. Research should include, tagging studies, laboratory studies, physiological studies, behavioral studies, population dynamics, and toxicological studies (i.e., endocrine suppression and immune system suppression) to study direct effects. Indirect effects would be studied by monitoring studies to identify long term changes in community composition.

III. Type of Action:

Research, Monitoring and Assessment

IV. Where should Action be Implemented (specify general geographic areas)?

Include minimum spatial extent: It is difficult to restrict studies to particular areas owing to the global nature of the marine debris problem. However, this group identified ecosystems containing commercially valuable species, coral reef ecosystems containing species of concern, ecosystems of exceptional diversity, ecosystems where large

concentrations of debris occur, and benthic systems potentially altered by the settling of microplastic debris.

Habitat Type Affected: Not provided

V. Who Implements Action?

International, federal, state and local organizations, and various partnerships.

VI. What is Cost of Action (Estimate)?

One Time (Start up)	Annual O & M
>$1,000,000	>$1,000,000

VII. Who Finances?

Initial emphasis on government funding, followed with greater reliance on private lending from trusts and appropriate stakeholders.

VIII. What are the Benefits (environmental or economic) from Implementation?

Produces information that is useful in the education process that results in environmental and economic benefits. Furthermore, resulting information can lead more directly to management action.

IX. Identify the Resources (living or physical) Affected by Action:

Although species of commercial importance are expected to be better conserved, this action does not exclude other species in marine ecosystems.

Reducing Impacts of Gear: Recommendation B4

Title: Assess the interaction of vessels with fishing gear and marine debris.

Issue(s): Fishing gear, both active and derelict, and other marine debris can become a hazard to navigation and put mariners and rescuers, their vessels, and consequently the marine environment at risk.

Concerns: Fouling of vessel propellers, rudders, keels, thrusters, water intakes; drifting while disabled; crew, passengers and rescuer safety; dangers of going overboard to remove gear; risk to environment from disabled vessel; financial burden to vessel operators from lost time and repair; the generation of derelict gear by vessels becoming fouled in active gear.

Theme: Assess the severity of the problem to determine appropriate responses.

Authors: Lane Johnson and Brad Barr

I. Description:

Anecdotal reports and preliminary studies seem to suggest that a problem exists with regard to the interactions of vessels with active and derelict fishing gear, and generally with floating debris in navigable waters. This problem may be particularly significant in areas where derelict debris accumulates because of ocean currents, and where fishing effort is high. It may involve the fouling of propellers, keels, rudders, thrusters, and water intakes, requiring the often dangerous task of removing the gear at sea. Vessels disabled by fouled gear and other debris may collide with other vessels or icebergs while adrift, or ground when near shore, potentially leading to discharges of oil and fuel. These problems can also lead to considerable cost to vessel operators in terms of repairs and downtime, and potentially costs in terms of cleanup of oil and fuel spills. Vessels, large and small, may also generate derelict gear when the fouling incidents occur with active fishing gear, also causing potential environmental problems from the gear lost.

II. Methods/Steps for Implementing Action:

A. Develop an assessment body, preferably under an existing agency or organization, to address the following approach ideas.

B. Increase reporting of fouling incidents –
    1. Proceedings from this body be used to: encourage reporting, through directed outreach to commercial vessel operators, fishing captains, and recreational boaters, involving incidents that meet USCG vessel casualty reporting thresholds
    2. Encourage reporting, this similar directed outreach, of incidents that fall below USCG reporting thresholds to assist in conducting robust statistical analyses of data collected. The Coast Guard's Field Incident Reporting System (FIRS) might be used as a model or example for such a mechanism.
    3. Establish a mechanism for collecting and analyzing data reported…focused on answering question "Is this a problem?"
    4. Investigate possible economic incentives for reporting. Look at models like gear compensation programs administered by National Marine Fisheries Service.

C. Begin process of engaging international community in this issue. Coordinate with International Maritime Organization through Legal Committee's "Wreck Removal Convention" whose chartered mandate includes drifting material that poses a hazard to navigation or threat to marine environment. Focus of coordination would be quantifying extent of problem worldwide, public safety, and the economic impacts of fouling incidents.

III. Type of Action:

Research, Monitoring, Economic, Educational, Assessment

IV. Where should action be implemented?

A. Spatial Extent: Action should focus with vessels that operate in all US waters, particularly where significant fishing effort and/or areas where debris collects and persists.
B. Habitat Types Affected: Principally surface of water column/pelagic environment, but potentially coral reefs and other sensitive near-shore benthic habitats (ghost fishing).

V. Who Implements Action?

USCG may be the best candidate to conduct assessments for US waters, but in collaboration with other US Federal agencies with related responsibilities (like

NOAA). USCG is currently responsible for investigating and monitoring marine vessel casualties of US and visiting foreign vessels of certain magnitudes.

VI. What is cost of action?

For all US waters, assessment may cost $1M start-up and $100-500K per year O&M. For a regional pilot study, estimate start-up at $100K and annual costs of around $50-75K.

VII. Who finances?

This assessment should be funded through Congressional appropriation to DOT/USCG.

VIII. What are the benefits (environmental and economic) from implementation?

Benefits from assessment relate to assessing extent of problem…no direct environmental or economic benefits from assessment. Benefits will accrue from implementation of solutions if they are found to me necessary and appropriate.

IX. Identify the Resources (living or physical) affected by Action:

See response to VIII.