Halibut Bycatch Management Implications for Area 2A and Evaluation of an Informational Video

by

Erica Fruh

Project Report

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Oregon State University
Corvallis, Oregon 97331

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Newport, Oregon 97365-5294

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Abstract

Concern over the incidental catch of non-targeted species in commercial and recreational fisheries has greatly increased. Public attention, negative publicity, controversies between differing fisheries and gear groups and the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act have led to an increased awareness of the issue. The Pacific halibut (*Hippoglossus stenolepis*) is a valuable fish in several commercial and recreational fisheries of the northeastern Pacific Ocean. There is growing concern over the incidental catch of halibut in fisheries targeting other species. The Oregon Department of Fish and Wildlife in cooperation with the Oregon Trawl Commission, the National Marine Fisheries Service, the International Pacific Halibut Commission and the commercial fishing industry have prepared a video on avoiding halibut bycatch and reducing the discard mortality of incidentally caught halibut. Approximately 575 copies of this video were distributed to commercial shrimp and groundfish permit holders in Oregon and Washington. ODFW would like to evaluate the video and its distribution to try to determine if it was an effective tool in reducing halibut bycatch and mortality. A survey of commercial fishermen was conducted to establish the effectiveness of the distribution of the video, to determine whether the video was an effective communication tool, whether viewing the video is likely to reduce halibut discard mortality and to gather suggestions on ways of improving communication between ODFW and fishermen.

1.0. Introduction

1.1. Definition of Bycatch

McCaughran (1992) defines bycatch as 'that portion of the catch returned to the sea as a result of economic, legal or personal considerations plus the retained catch of non-targeted species'. The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) defines bycatch as 'the fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards'. The legal definition never mentions the non-target species that are taken by the directed fishery. Bycatch can be caused by multi-species interactions, lack of gear selectivity or regulation induced discard. The majority of bycatch is returned to the sea.

The Magnuson-Stevens Fishery Conservation and Management Act calls for management measures that shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch (16 U.S.C. 1851, 50 CFR 104-297 (9)). Legal mandates and the high economic value of the halibut resource have led to increased pressure on fisheries managers and industry to reduce the amount of halibut incidentally taken in other fisheries. Hall (1996), lists five possible means of reducing bycatches: 1) increasing the selectivity of the fishery by choices of gear, areas, or seasons; 2) modifying deployment conditions; 3) increasing the fraction released alive either from the gear, or 4) later, from the deck; or 5) increasing the utilization to make catches out of the incidental captures.

The Oregon Department of Fish and Wildlife (ODFW) cooperated with the International Pacific Halibut Commission (IPHC), the Oregon Trawl Commission (OTC),

the National Marine Fisheries Service (NMFS) and the fishing industry to produce and distribute an informational video that identifies and demonstrates ways of reducing halibut bycatch and decreasing the mortality of incidentally caught halibut. The video addresses the trawl and longline fisheries of the Pacific Northwest, which account for the bulk of the halibut bycatch in this region.

1.2. Description of the Video

The video begins by introducing and explaining the role of the International Pacific Halibut Commission. The video uses the comments of several management biologists and fishermen to explain the issue of bycatch, why it is important and what can be done to reduce halibut bycatch mortality. Footage from trawl vessels, longline vessels and shrimp vessels is used to show how halibut are incidentally taken in commercial fishing operations and how they should be handled to minimize mortality. Underwater cameras attached to the headrope of the net are used to show halibut escapement and the use of fish excluder panels in shrimp trawls.

Suggested methods of reducing halibut bycatch include: shorter tow durations, slower tow speeds, and avoiding areas where halibut are known to be abundant. Handling and release instructions for quick and gentle handling of the fish once they are brought onboard are demonstrated for trawl and hook and line fisheries.

1.3. Distribution of the Video

Mailing lists of west coast groundfish limited entry permit holders and shrimp permit holders in Washington and Oregon were obtained from federal and state agencies. A

letter sent with the video asked that the permit holder share the video with crew members aboard their vessel (Appendix I). The video package also included a laminated placard of illustrated handling and release instructions for posting onboard the fishing vessel (Appendix I).

1.4. Goals and Objectives of the Project

Through this project, ODFW hopes to evaluate this video and its effectiveness as an information source.

The task is to determine if this video:

a. was effectively distributed.
b. was viewed by boat captains and their crews.
c. portrayed halibut bycatch as an important issue.
d. influenced actions taken by the fishermen in avoiding or handling halibut.
e. was a useful medium for communication with fishermen.

A survey that included telephone and face to face interviews was determined to be the best method of evaluating this video. Questions were designed to determine if the video met its objectives effectively. The purpose of this project is two-fold; first to evaluate the video as a method of dispersing information and on it's content and secondly to identify means for ODFW and other management agencies to better communicate with the fishing community.

2.0 Background

2.1. Pacific Halibut

The Pacific halibut (*Hippoglossus stenolepis*) is one of the most sought after commercial and recreational fishes in the Pacific Ocean. Pacific halibut can be found on

the continental shelf and upper continental slope of the North Pacific Ocean and have been recorded from Santa Barbara, CA to Nome, AK. Halibut are demersal, living on or near the bottom, and prefer water temperatures ranging from 3 degrees to 8 degrees C. Halibut have been taken at depths up to 300 fathoms, but most are caught between 15 (27m) to 150 (275m) fathoms (IPHC, 1996a). The IPHC manages the Pacific halibut resource as a single stock (Trumble et. al., 1991). It is reasoned that egg and larval drift counter the migration of juvenile fish and provide homogeneity throughout the coast. Spawning grounds are off the coast of northern British Columbia and through the Gulf of Alaska (Trumble et. al., 1991). Currents carry the eggs and larvae northward and westward to shallow water where the larvae can settle to the bottom. This drift must be countered through migration to the south and east to return to the spawning grounds. It is thought that the halibut found off the Washington, Oregon and California coasts have migrated from Alaska. Halibut tend to move from summer feeding grounds on the continental shelf to the deeper water of the continental slope. This usually occurs in the autumn and the reverse movement happens each spring.

Halibut is considered to be a hardy fish that will survive capture and discard if handled moderately well. Halibut lack a swim bladder, which reduces the effects of pressure changes. The scales are deeply buried in the skin and difficult to remove (a descaled fish is more susceptible to disease and injury) and the body is strong and muscular. All of these attributes allow increased survival after incidental capture.

2.2. The International Pacific Halibut Commission

The International Pacific Halibut Commission was established in 1923 and serves the purpose of joint management of the Pacific halibut between Canada and the United States (Policansky, 1986). A six-member board gather each year to set catch limits, write fishing regulations, oversee biological research and design programs and policies for the halibut resource (IPHC, 1996a,b). Monitoring is a large part of the IPHC program, which includes information on numbers, biomass, growth rate, fecundity and catchability. Information from commercial catches and research sampling is used to set catch limits, quotas and allocation of the biomass available to the fishery. The IPHC divides the north Pacific into 10 regulatory areas, and sets separate catch limits for each (Figure 1).

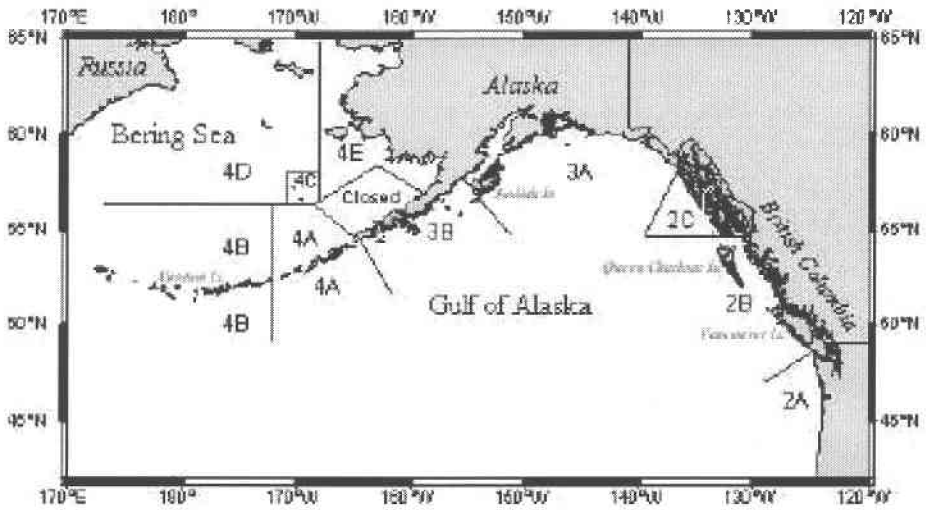

Figure 1. IPHC Regulatory Areas (IPHC, 1998)

2.2.1. Historical Management

Retention of net or trawl caught halibut has been prohibited by the IPHC since 1944. Halibut has been designated as a prohibited species for groundfish trawl fisheries and other gear fisheries if the season is not open or the fishermen does not own a quota share by the North Pacific Fishery Management Council (NPFMC). Fishermen incidentally capturing halibut are required to "return any catch of prohibited species or parts thereof to the sea immediately..." (16 U.S.C. 1855, 50 CFR 675.20 (c)(3)).

2.2.2. Modern Management

Groundfish fisheries in Alaska operate under a bycatch cap system, which closes the fishery when a designated volume of halibut discard mortality is reached. Annual bycatch mortality limits and the allocation of these limits are set by the NPFMC, and are based on economic factors, biological conservation of the halibut stock, and the maintenance of international treaty obligations between the U.S. and Canada (Wilson and Weeks, 1996). Allocation of these limits allows individual fisheries to be shut down when they have reached their designated amount of halibut bycatch. There exists no comparable management regime for Area 2A.

2.3. Halibut Mortality

Halibut bycatch can have effects on both the halibut fishery and other fisheries where it is not the targeted species. Several studies have been undertaken to determine the discard mortality rates of halibut caused by incidental capture in other fisheries. Bycatch mortality through the incidental capture of halibut in other fisheries is the second largest

source of removals from the stock (IHPC, 1996a). Fishing mortality is not always a direct result of capture; it can be caused by a number of other encounters with fishing gear (Appendix II).

The effects of this incidental capture are not completely understood. Spending time in the trawl or on a hook may have detrimental effects on the survival of the halibut even if released immediately. The changes in pressure with depth, crushing, dragging and drowning can all cause injuries that lessen the chances of survival. Williams et. al. (1989) set the assumption of 100% mortality for halibut caught in the pink shrimp fishery due to the long tow duration, the small size and ease of injury to the incidentally caught fish.

2.3.1 Trawl Induced Mortality

The first study on this subject was conducted by Hoag (1975). He used return rates of 2,000 tagged halibut to determine a mortality rate for trawl captured and released halibut and arrived at an estimate of 50% mortality. Each halibut was assessed for its condition before it was returned to the sea. The condition factors each have an associated survival percentage. Clark et. al. (1992) revised Hoag's results and recommended survival rates of the following: 80% for excellent condition, 45% for poor condition and 10% for dead or likely-to-die fish (Appendix III). The discard mortality rate is determined by multiplying the proportion of fish in each condition by the survival estimate for that category (Williams and Wilderbuer, 1995). In 1998, the Bering Sea trawl fisheries for rockfish and flatfish estimated halibut discard mortality rates from 64 to 78% (NPFMC, 1998).

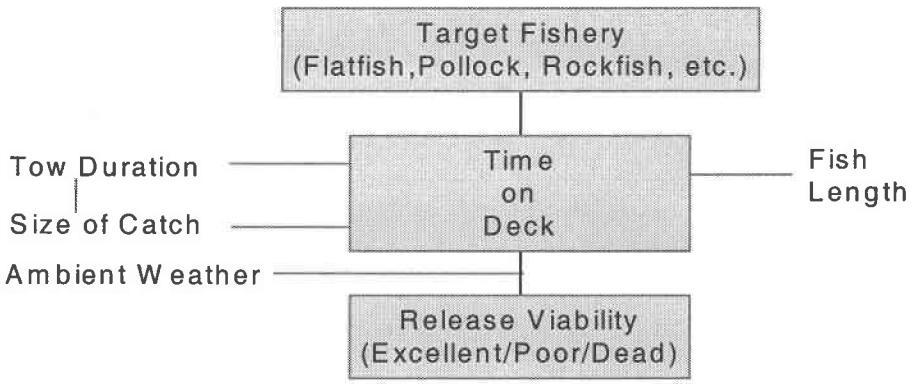

Figure 2. Model of factors influencing mortality of trawl-caught halibut. (from Williams, 1998)

Factors contributing to increased mortality rates include size of catch, fish length, and time on deck (Figure 2), with deck time being the most significant (Hoag, 1975). Larger catch sizes contribute to increased mortality through greater crushing within the trawl and longer sorting times when the net is dumped on deck (Williams and Wilderbuer, 1995). Neilson et. al. (1989) listed handling time, total catch, fish length, maximum depth fished and trawl duration as potential factors influencing halibut survival. Alderstein and Trumble (1993), found that halibut bycatch rates increase during the night hours and suggest limiting bottom fishing to daylight hours. In 1993, the IPHC conducted a sorting experiment aboard a factory trawler using grids and enhanced sorting techniques to improve halibut discard mortality rates. This experiment found that on deck sorting was the most effective at returning excellent condition halibut to the sea. The other sorting methods required that the halibut were out of water for longer periods of time and this factor greatly decreased their condition (IPHC, 1993). Richards et al. (1995) showed that catch weight, tow time and tow depth have statistically significant effects on the

probability of survival of trawl caught halibut. They determined that mortality can be substantially reduced if fishers quickly released trawl caught halibut. They found that even minor decreases in the time spent on deck increase the halibut's chance of survival.

Average size of incidentally caught halibut varies among fisheries, areas, seasons and years (Williams et. al., 1989). Bycaught halibut in trawl fisheries tend to be smaller then those harvested by the directed fishery (Trumble et. al., 1991). This affects future stock productivity through maturity, reproductive capacity, survivorship and growth. Smaller fish are less likely to be reproductively mature and have a lower reproductive capacity. By allowing these fish to grow, a gain in stock biomass occurs. The directed fishery suffers a reduction in catch limits to maintain reproduction and reduced recruitment caused by the bycatch of pre-recruits. Sullivan et al. (1994) determine the yield loss to the fishery, through the absence of bycaught fish, to be the total bycatch mortality for that year multiplied by 1.3. Trumble et. al. (1991), places loss to the fishery at 1.6 metric tons for each metric ton of bycatch.

2.3.2. Longline Induced Mortality

Longlines are the standard gear for the halibut fishery. The commercial fishery began using handlines from dories in 1888. The potential survival of halibut caught and released in the hook and line manner is very high (Appendix IV). Circle and semicircle hooks catch halibut in the mouth and cause little damage (Trumble, 1995). One main cause of injury in the longline fisheries is from the use of automatic hook strippers (called crucifiers) that rip the hook from the fish as it is brought onboard and gaffing or pewing the fish to bring it onboard or sort it. Gaffs and pews can cause fatal injuries if the fish is

wounded in the head or gill area. Factors influencing longline caught halibut survival can also include soak time, predation, and time on deck (Figure 3).

2.4. Trawl and Longline Fisheries of Area 2A

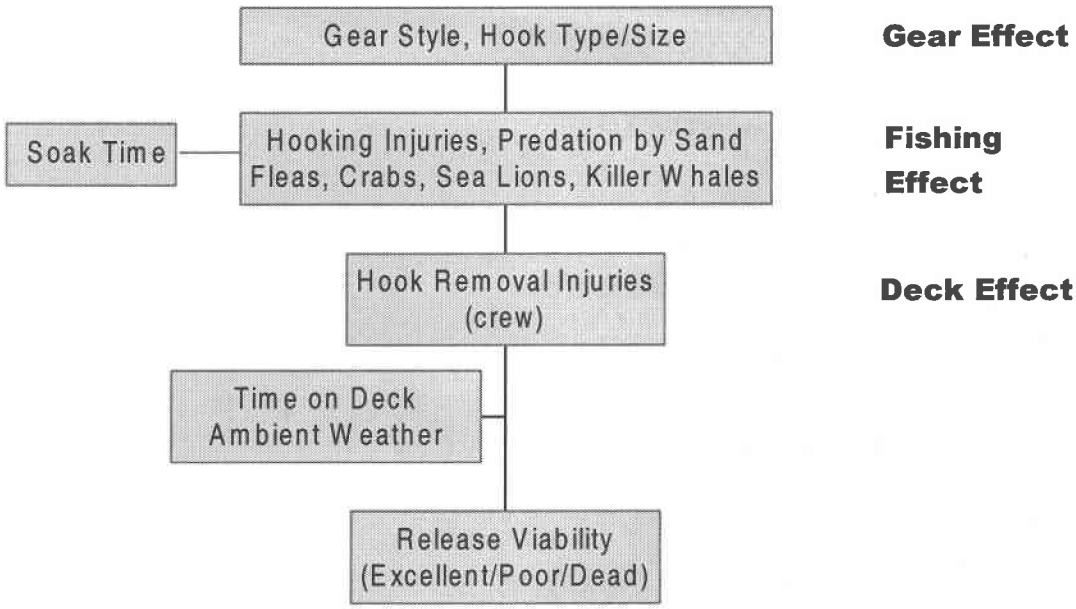

Figure 3. Model of factors influencing mortality of longline-caught halibut. (from Williams, 1998)

The fishing areas off the coasts of California, Oregon and Washington are designated Area 2A by the International Pacific Halibut Commission. There is concern and uncertainty surrounding the magnitude of incidentally caught halibut and the mortality caused by discard in the recreational and commercial fisheries of this area. This region has not been as closely monitored as the regions farther north, because of its relatively small contribution to the commercial halibut fishery.

In Area 2A year-round trawl fisheries exist for commercially important groundfish species and seasonal longlines fisheries for sablefish (*Anaplopoma fimbria*) and some rockfish (*Sebastes* spp.). There also exists a trawl fishery for pink shrimp (*Pandalus jordani*) in this region. These fisheries do not target halibut, but halibut are sometimes caught incidentally. Recent observer studies (1987 and 1992) have been conducted (Pikitch et al, 1998) to determine bycatch rates. Williams et al. (1998) has estimated bycatch rates for 1995 and revised the 1992 estimates of Pikitch et al (1998).

Table 1. Summary of Pacific halibut bycatch mortality estimates, in pounds (net weight), for West Coast domestic shore-based fisheries. (from Williams et al., 1998)

Fishery	1987	1992	1995
Groundfish bottom trawl			
Rockfish	41,255	53,562	139,660
Nearshore mixed	115,631	106,002	95,492
Deepwater complex	151,464	225,425	313,282
Total	308,351	384,989	548,435
Shrimp Trawl	81,847	42,725	50,000
Hook & Line	16,000	16,000	16,000
TOTAL	**406,198**	**443,714**	**614,435**

Table 1. breaks the bycatch estimates down by fishery and target species. These studies were short-term projects; there exists no long-term data for halibut bycatch in Area 2A. The longline information in the table comes from a single study in 1994, and due to the lack of more recent information the value has been carried forward (Williams et al., 1998).

Table 1 shows an increase in halibut bycatch mortality in West Coast fisheries over time. This could be due to increases in fishing effort or increases in the bycatch levels of existing fisheries. Pikitch (1998) estimates annual total removals through bycatch at 558,300 pounds in 1992, the total directed halibut catch was 437,000 pounds (IPHC, 1997). In 1996, the total directed catch of halibut in Area 2A was 295,000 pounds, the bycatch mortality was 433,000 pounds (IPHC, 1997). These estimates place the total removals due to bycatch at higher levels than the directed catch of this area.

2.5. Management of Halibut in Area 2A

The total allowable catch of halibut within Area 2A is divided among four primary fisheries: the directed commercial fishery (17.6%), incidental catch during the salmon troll fishery (3%), the treaty-Indian fishery (35%) and the sport fishery (44.4%). Area 2A is the only area with a sport fishery limit. The halibut bycatch mortality for Area 2A in 1996 was estimated at 433,000 pounds (IPHC, 1997). This is the amount of halibut that is estimated not to have survived being caught as bycatch, the actual volume of halibut bycatch is even higher. Discard mortality rates of 50% for trawl fisheries, 16% for longline fisheries and 12% for pot fisheries are used in these estimations (Salveson et al., 1992).

Recent stock assessments of Area 2A show that overfishing of halibut has occurred (exploitation rates over 0.35), and that stocks have been maintained through high recruitment levels (Trumble et al., 1991). Local depletion is also a potential problem in this area because halibut do not redistribute between Oregon and Washington subareas (Trumble et al., 1991). Movements tend to be under 100 miles in distance.

At the present, there are no halibut bycatch control measures in the groundfish fisheries off Washington and Oregon (Clark and Hare, 1998). ODFW, OTC and the Pacific States Marine Fisheries Commission have implemented a pilot voluntary observer program (Enhanced Data Collection Program, EDCP) for the collection of groundfish discard data in Oregon, Washington and California. These observers are also utilized to collect halibut data. However, this project will only provide three years of data and this has not yet been released. The number of fish taken in each tow, their length and their condition as they are released is recorded. A halibut is assigned a condition category of excellent, poor or dead (Appendix III). Each of these categories has a standard percentage of survival associated with it and that is what is used to determine discard mortality. The problem with partial observer coverage is that it may provide estimates of halibut survival that are biased high or perceived to be biased high (Richards et al., 1995). This is because the presence of an observer may influence the fisher's behavior and create an increase in the care or speed with which the halibut are released. Hoag (1975) reported that halibut did receive better care from fishermen when data was being collected.

There have been no spawning areas identified within Area 2A, and it is believed that all of the halibut found in this region have moved through Alaskan waters.

2.6. Alaskan Bycatch Management

In Alaska, fisheries operate under an Olympic-style system, there is a race for fish to see who can catch the most before the catch or bycatch limits for the fleet are reached and the fishery is shut down. This is a result of the harvesting and processing demand for

groundfish exceeding the available supply (Wilson and Weeks, 1996). These bycatch limits are set at the beginning of the year. Annual discard mortality rates are determined in the Alaskan groundfish fishery using viability data collected through NMFS observers.

Since 1978, foreign and joint-venture trawlers operating in Alaskan waters have carried observers from the National Marine Fisheries Service (NMFS) that collect data on the number and condition of bycaught halibut. Longline vessels were included in 1984.

An observer program was instituted for domestic vessels in 1990. Observer coverage is 100% for vessels over 125 feet, 30% for vessels 60 to 125 feet and smaller vessels carry observers only on demand. Alaska also uses bycatch quotas, which can close the fishery before the total allowable catch (TAC) of target species is harvested.

3.0. Methodology

3.1. Developing the Survey

The questions asked in the survey were based on the project objectives. It was determined what knowledge was hoped to be gained through the survey and this was turned into questions. Questions were kept simple and usually contained only one part. The same questions were asked of all participants and answers were standardized using a ranking system (Appendix V). The subject was asked to answer most questions using a scale of 1 to 5 with 5 being the highest; however open-ended questions designed to elicit participants' opinions or suggestions were also used. Responses to these questions were recorded by the interviewer.

3.2. Developing the Survey List

The list of commercial fishing license holders in the state of Oregon (as of April 16, 1997) was used as a basis for determining who would be interviewed. Fishers living in other states, but fishing within Oregon waters must have an Oregon commercial license. Current phone numbers were found for the license holders using ODFW commercial license applications in Newport and Charleston and local telephone books. Applications for permits in other fisheries not associated with halibut bycatch were removed from the list. A total list of 839 possible participants was developed and a random number generator was used to select 300 names to be called. The phone list for the Oregon Trawl Commission was used as a second source of interviews in the hopes of reaching a greater number of permit holders. The final source of interviews was face to face meetings on the docks of Newport and Charleston, OR.

3.3. Conducting Interviews

License holders were called and interviewed with a standard list of questions. The interviews were kept as identical as possible, with one person doing all of the interviewing. An introduction followed by a description of the project and a request for the interview started all conversations. Telephone calls were made from the Newport, OR, ODFW office on several different days. Calls were made after 5pm in an attempt to increase the response rate.

4.0. Results

4.1. The Interview Process

Of the 300 randomly selected commercial license holders, 110 were never reached due to incorrect telephone information, they had moved or they were out to sea (Figure 4). Fifty of the 300 held commercial licenses for fisheries that were not within the target group i.e. participated in salmon trolling, bait or developmental fisheries. Eight of the 300 were retired or not actively fishing. Eighty-five of those eligible for this study had not seen the video. Of these eighty-five, ten worked in the targeted fisheries but had never seen the video, two were permit holders that never received their copy, two were permit holders that received the video, but never watched it and three were crew members that had never watched it. Forty-two of the randomly selected 300 were permit holders that should have received copies of the video in the mail. Of these forty-two, twenty-six were interviewed, two never received the video, four had gotten the video but never watched it and eleven were never reached.

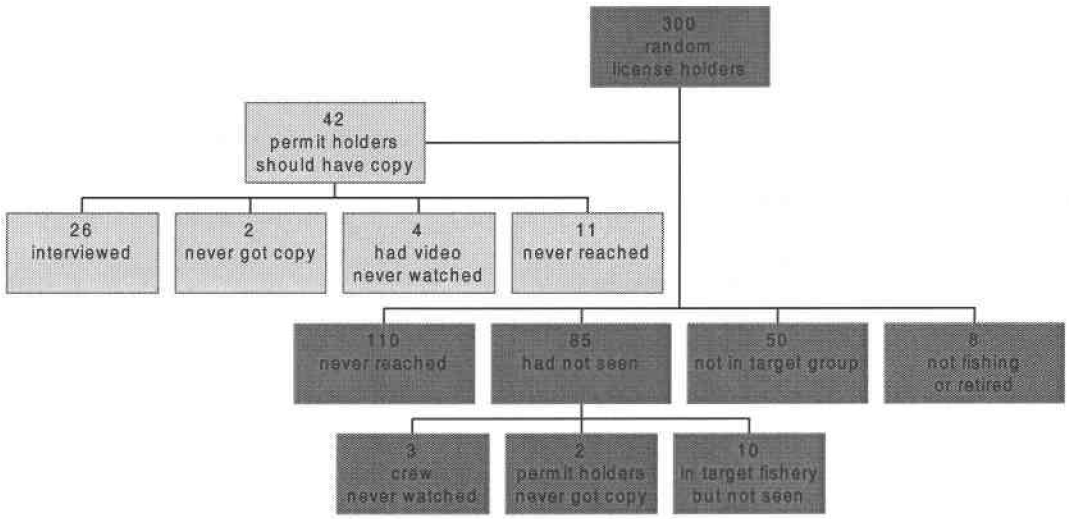

Figure 4. Distribution of interviews

One of the four who had not watched the video, was interviewed at a later time after viewing the video. Out of the thirty-one permit holders contacted, thirty had received the video.

4.2. Distribution

Thirty-three interviews were conducted from the original list of 300, ten from the OTC list and two dock interviews. Fourteen additional copies of the video were mailed out when they were requested by fishermen from the original list of 300. Follow-up interviews were obtained from nine of these. Three of these follow up interviews were removed from the data set due to the fact they were not involved in the targeted fisheries. This gives a total data set of fifty-one interviews. Thirty-nine of those interviewed were permit holders, who should have received their copy of the video in the mail, twelve were crewmen who should have gotten the video from a permit holder. When asked how they had received the video, 90% (35 of 39) of the permit holders did receive the video in the mail (Figure 5). Two permit holders received the video through the second mailing and two were given the video by persons involved with its production. Of the twelve interviewed crewmen, one received the tape in the mail, seven were shown or given the video to watch and four received the tape in the second mailing. Forty-five percent of those interviewed, said that they had watched the video two or more times. Permit holders were asked if they had shared the video with their crews as suggested in the letter accompanying the video (Figure 6).

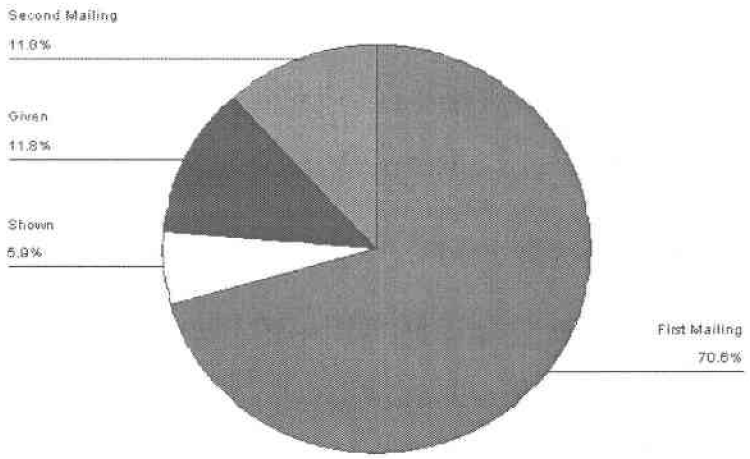

Figure 5. How did you receive the video?

Nineteen of the thirty-nine (49%) that received the video in the mail said that they had shared the video with their crew members, and seven of these said they still had the video aboard their vessel. One permit holder shared it with his family only and one OTC member showed the video repeatedly in his Brookings, OR restaurant.

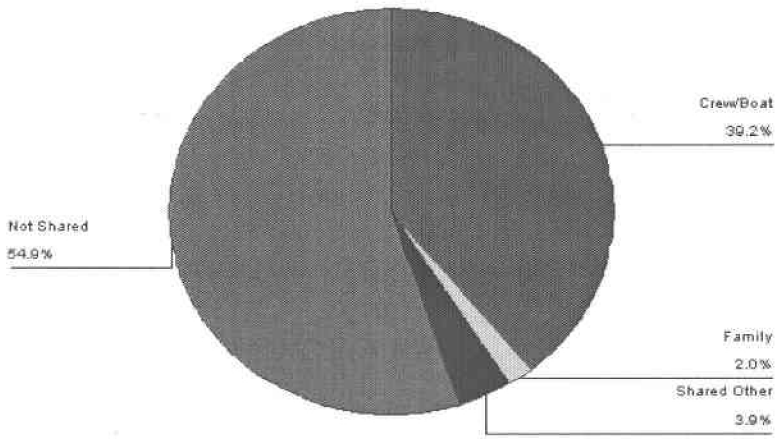

Figure 6. Did you share the video?

4.3. The Issue of Halibut Bycatch

Sixty-nine percent (35 of 51) of those interviewed said they thought halibut bycatch was an important issue (Figure 7). There was no significant difference between the answers of crew, permit holders and OTC members. When asked why this was an important issue, several answers were repeated many times:

- *bycatch is killing or wasting too many fish, all bycatch should be utilized*
- *conservation, returning the fish to the water alive*
- *more are appearing in trawls, more being caught than before*

Others passed it off onto other fisheries:

- *its important to trawlers, but I longline*

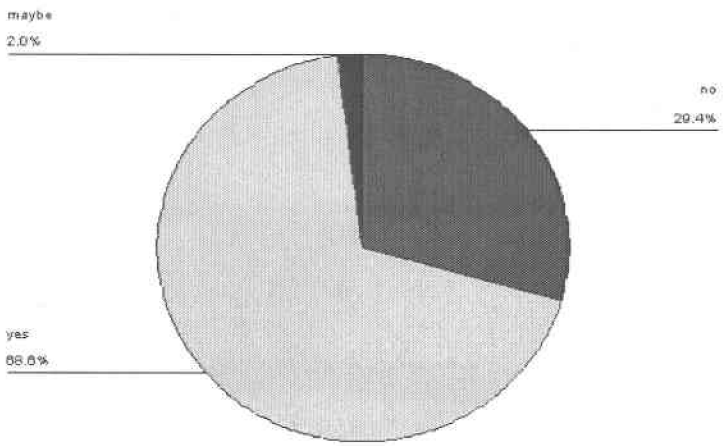

Figure 7. Is halibut bycatch an important issue?

When interviewed, spot prawn fishermen blame shrimpers, longliners blame trawlers and the buck continues too be passed gear group to gear group. Only three of the fifty-one

interviewees answered yes that seeing the video did change their thoughts about the halibut bycatch issue (Figure 8). These three all agreed that it was an important issue. Everyone agreed that the safe handling and release techniques outlined in the video were useable aboard their vessel. Twenty-four percent (12 of 51) answered that they would change their handling techniques after viewing this video. The remainder stated that these practices were already in use aboard their vessels.

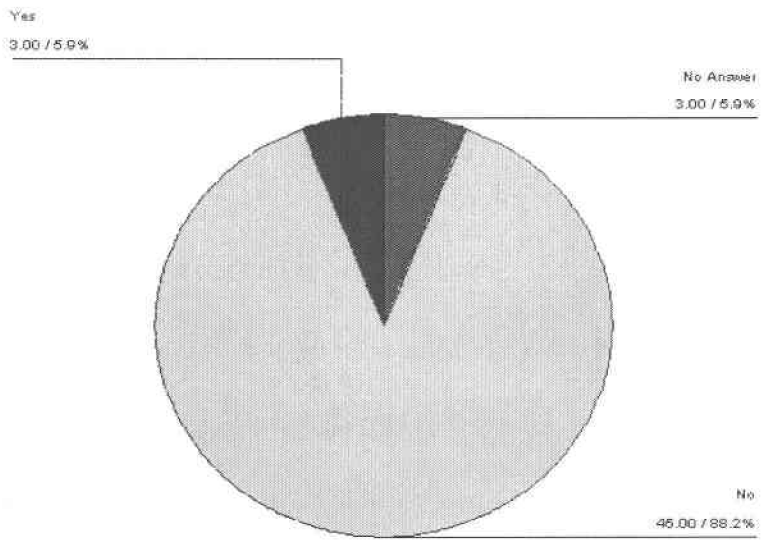

Figure 8. Has seeing the video changed your thoughts on the issue?

4.4. Video Topics and Content

The second section of the survey was designed to evaluate the video itself. Subjects were asked to rank the video from 1 to 5 with 1 being poor and 5 being excellent. The average ranking for the video outlining the importance of halibut bycatch and leading to awareness of the issue was a 4. There was no significant difference in the answers given by crew, permit holders and OTC members. The video received an average ranking of

3.7 for identifying ways of reducing halibut bycatch. The video received an average ranking of 3.1 for its ability to influence the actions of the viewer. The crewmen found the information in the video more influential to their actions aboard the vessel, while the permit holders felt that seeing the video had not changed their actions when encountering halibut (Figure 9).

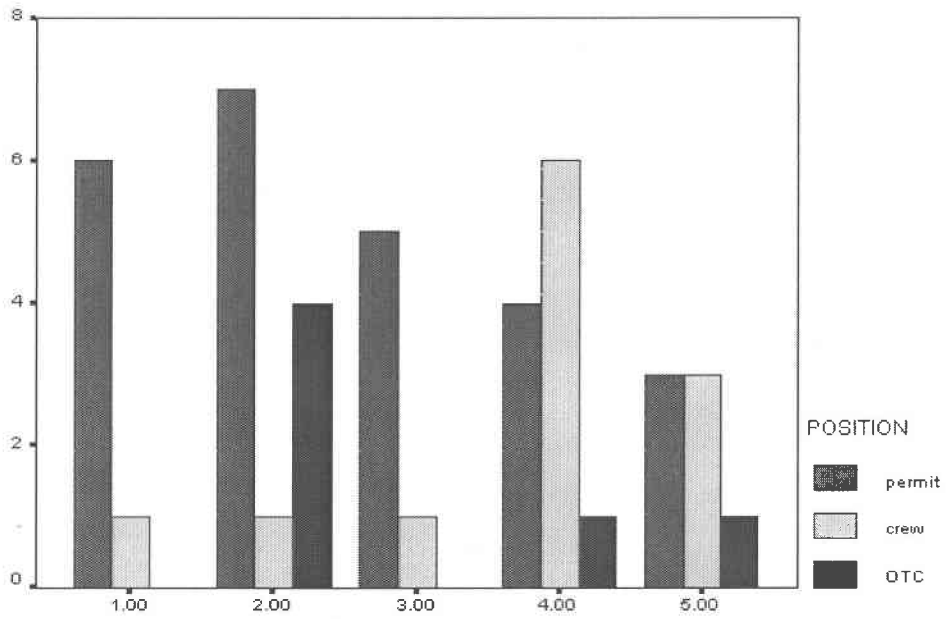

Figure 9. The video influenced my actions in avoiding and handling halibut.

4.5. Developing Better Communication

The last section of the survey was designed to garner suggestions from the fishermen on ways to improve communication between themselves and management agencies. The video was given a score of 4.2 as a good format for getting information to fishermen. The next question was an open ended one looking for direct suggestions from the fishermen

on ways the Oregon Department of Fisheries and Wildlife can better communicate with them. Suggestions included:

- *increased presence on the docks*
- *more contact between agency and industry, face to face*
- *broader mailing lists, include crew and deckhands*
- *get management personnel onboard vessels, can't regulate from shore*

The final question asked the best method of getting information to that individual, with several suggestions of practices now employed (Figure 10). The mail was the overwhelming favorite means of getting information to eighty-six percent (44 of 51) of those surveyed. Other suggestions included public meetings, a regular newsletter and postings at processing plants.

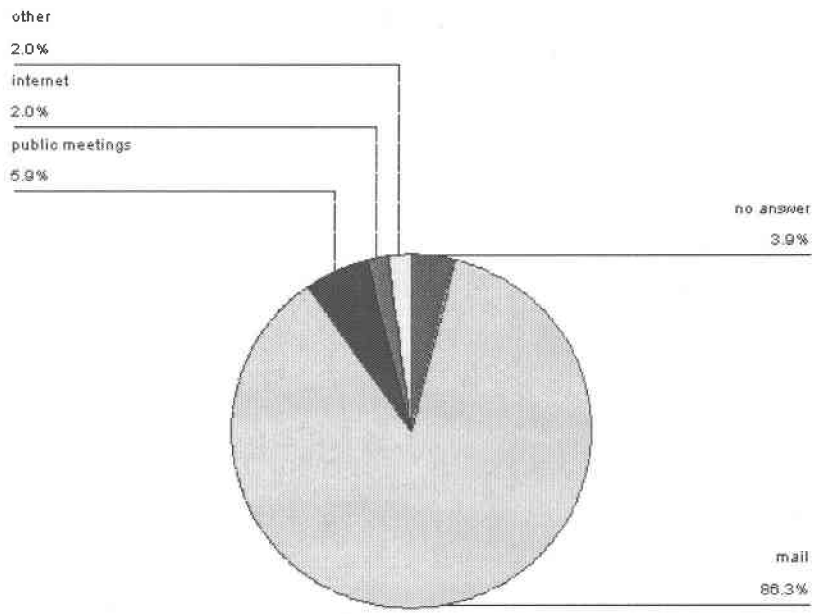

Figure 10. The best method of receiving information.

5.0 Discussion

The objectives of this video were to inform fishermen of the importance of halibut bycatch, suggest methods of reducing halibut bycatch and demonstrate proper release and handling techniques when halibut are captured. The primary objective of this project was to determine if the video met its objectives and its effectiveness as a method of disseminating information to fishermen.

5.1 Distribution of the Video

A total of 575 videos were distributed in the initial mailing. Lists of the commercial groundfish and Oregon and Washington shrimp permit holders were used because they provided coverage of the three states making up Area 2A. These are existing lists that are fishery specific. There was some overlap between lists, duplicate names and addresses were searched for and eliminated to avoid sending multiple copies of the video to the same individual. The rationale behind sending the video to permit holders was; 1) to target the trawl and shrimp fisheries, where halibut bycatch was understood to be a concern and, 2) utilize the trickle down theory and depend on these people to share the video with their skippers and crew members. A few of the permit holders that were interviewed said that they had never received a copy of the video and a few even had the video in their home or on their vessel, but had never watched it. Of the twelve crew members interviewed, seven had acquired the video through the trickle down method. It was suggested that the video be sent to crew members also, but there exists no accurate listing of crew members in Oregon. The Oregon Department of Fish and Wildlife keeps records of commercial fishing licenses, but does not record the fishery in which the

licensee is participating. Some salmon and tuna fishers were removed from the interview list due to the fact that their license applications also included boat or fishery registrations. This was a good means of excluding boat owners, but is not effective for crewmen. The number of crewmen reached was also limited by the fact that there was no access to the Washington or California records of commercial fishing licenses.

The Oregon Trawl Commission mailing list was used to expand the interview coverage because most members of the Commission are permit holders that would have been sent copies of the video. It should be mentioned that not all OTC members are permit holders, and not all permit holders are OTC members. These two groups are kept separate in the results section because a random selection process was not utilized on the OTC list. This list should have provided a high percentage of video viewers, due to the large number of permit holders included in its membership.

When asked if they had shared the video with anyone, fifty-five percent (28 of 51) said no. Only thirty-nine percent (20 of 51) of those interviewed had shared the video with their crew or others aboard their fishing vessel. This was not the desired result. Again, the possibility of a larger mailing distribution or direct contact with fishermen directly on the vessels could be a better approach.

5.2. The Video as a Tool

Overall, the use of a video to distribute information was received favorably. If a better method of distributing the video can be developed this could prove to be a very effective means of providing information to fishermen. Seventy-five percent of those interviewed had access to a VCR aboard their vessels. The video format was well received, and

favorable remarks were made that *it was brief and to the point*, that *a visual tool is better then reading a long letter* and that it was *a good medium for sharing information with the crew*. One viewer liked the fact that the video used both fishermen and biologists as speakers, and that they worked together on the video. Questions were raised about the cost of creating and distributing the video and whether this money could be better spent on other things, but overall the response was positive.

5.3. The Issue of Halibut Bycatch

When asked if halibut bycatch was perceived as an important issue, sixty-nine percent (35 of 51) of those interviewed said that it was an important issue. When asked if seeing the video had changed their thoughts on the issue, eighty-eight percent (45 of 51) said no. Seventy-six percent (39 of 51) of those interviewed stated that they would not change their halibut handling and release techniques after viewing the video.

The subject of the wastefulness of throwing away useable fish was brought up in several interviews. The fishermen feel that they should be allowed to retain dead halibut for personal use aboard the vessel. New regulations allow salmon trollers to retain one halibut per twenty salmon retained. Fishermen also expressed interest in retaining dead fish for donation to charity of local food banks. These fish would be landed at no profit to the fishermen. Management is concerned that allowing the retention of prohibited species would lead to fishermen catching larger numbers of that species. The fishermen want to reduce their waste and would like to see the fish put to use.

5.4. Content of the Video

The second section of the survey dealt with evaluating the content of the video. The viewer was asked to rate the video on a scale of one to five with five being the highest. On the subject of the importance of halibut bycatch and the video's ability to increase individual awareness of the issue, the average ranking was four. It was acknowledged that the video did meet its objective here, but the overall sentiment was that this information was already known. The majority of those interviewed stated that they were already aware of the issue and its importance prior to viewing the video. One stated that the video *refined and highlighted* the issue, but it was *nothing novel*. Another observed that the video was *good for public* awareness, but the information was redundant to fisherman.

The second question asked if the video identified methods of reducing halibut bycatch. The video received an overall average ranking of 3.7. Dislike for the avoidance methods outlined in the video was expressed:

- *you can't 'know' where they are because they are transient fish*
- *just not practical*

Two fishermen mentioned the economic incentive to remain in a good area even if there was halibut being caught. Alderstein and Trumble (1993), have shown that changes in the time of day fished can reduce the bycatch of halibut and other prohibited species. Limiting fishing to daytime hours reduces the chance of encountering halibut.

The third question asked if the video influenced the viewers actions in avoiding and handling halibut. This question received an overall average ranking of 3.1. This ranking was lower due to the fact that the majority of viewers claimed the suggested practices

were already in use aboard their vessels. It was mentioned that if there is a large tow of halibut it is not possible to handle all of them nicely. One fisherman mentioned that since the halibut are not worth any money to them, that no one had a vested interest and handling would suffer.

5.5. Improving Communication

The third section dealt with means of improving communication between industry and management agencies, particularly the Oregon Department of Fish and Wildlife. Overall, the fishermen interviewed felt that ODFW did a reasonable job in communicating with industry. The most common suggestion was to get biologists and managers down on the docks and onboard vessels. Fishermen feel that managers would make better decisions if they were more actively involved with the fishery:

- *they need a daily working knowledge of the fishery to set regulations*
- *managers can't regulate from shore*

Other suggestions included more information through the mail, more videos, or a regular newsletter. It seems ironic that fishermen would suggest receiving information through the mail, after our attempt at distributing the video by mail did not achieve the desired results. The larger problem seems to be getting the fishermen to actually watch the video once they have it in their possession. One possible solution is to hold a public showing at a meeting or even the local coffeehouse that fishermen frequent. One suggested a broader mailing list that would include deckhands and crew. This would circumvent the problem of relying on permit holders and skippers to pass on information, which was not very successful in this instance. For this to occur the license applications need to list the

fishery or fisheries the applicant will be involved in and what their position will be. A potential obstacle of this list is the fact that a skipper can purchase a blanket crew license for the boat that covers anyone fishing on that vessel. This allows the skipper flexibility with crew members, but hinders getting in touch with individual fishermen. Three fishermen mentioned the fact that they would like to see some feedback from management on the logbook data that they have provided. One fisherman suggested a toll free number for the Newport ODFW office, so fisherman can reach the agency for answers to questions. The fishermen interviewed wanted to feel that management was listening to what they had to say and was being honest with them.

There appears to be an undercurrent of mistrust between management and industry. The fishermen feel that management is trying to take away their livelihood or at least make it more difficult to earn a living. Management does the best they can with the data that is available. They do allow that the data are not perfect and coverage is not 100%.

6.0. Role of Management

The problem faced in this situation is how management of halibut affects the groundfish fisheries and how the management of groundfish affects halibut. Both fisheries can have drastic influence on each other. Management must consider the equitability of any regulations, limits or closures and their effects on both fisheries.

Modern fisheries management theories are based on the concept of minimum levels of sustainable spawning biomass, which is a change from past management that focused on maximum sustainable yield (Symes, 1996). Problems with this new management include a lack of accounting for variability in the ocean environment, oversimplification of fish

stock behavior, uncertainty in abundance estimates, and a lack of consideration for multi-species interactions within an ecosystem. Further disruptive effects are caused by scarce resources, technological development and human behavior. There needs to be a mechanism established for conflict resolution among competing resource interests (Murawski, 1991). In this instance, the groundfish fishery and the directed halibut fishery. For the management of interacting species and fishermen to work, a framework must be established for evaluating the multi-species/ multi-fishery consequences of existing management decisions and for developing a set of management goals for the parties involved (Murawski, 1991).

Multi-species interactions are identified through co-occurrence of animals in space and time, simultaneous capture due to indiscriminate harvesting technique or interdependencies from predator/ prey or competitive interactions (Murawski, 1991). Better understanding of resource co-occurrence and species interactions will lead to better management, such as more selective fishing gears and time/ area closures. The ability to manage ecosystems for specific goals depends on understanding of the operation and response of that system to perturbations.

Hall (1995), lists the objectives of bycatch management as: 1) avoid the extinction of species, 2) retain the basic structure and function of ecosystems, 3) rebuild the depleted populations, and 4) control increasing populations. This list focuses on the physical management of the resource and its place in the environment. According to Murawski (1995), bycatch management has set several goals including full utilization of resources, eliminating over-exploitation, reducing conflicts, separating fact from fiction, minimizing the regulatory burden and defining milestones. This list of goals focuses more on the

management perspective and shows the direction of future management decisions. It takes into account the management of the parties involved with the resource and not just the resource.

6.1. Management Incentives

Management approaches now in use focus on disincentive regulations (bycatch quotas, area and fishery closures), Murawski (1991), wonders if positive incentives would be more effective. Hall (1995), developed a list of possible incentives to fishermen that could lead to decreases in bycatch levels.

- Individual vessel bycatch limits- this would increase fishing time for cleaner fishing vessels, and promote development of more selective gears and cleaner fishing strategies
- Selective licenses- licenses for the better areas would be granted to those with the cleanest fishing ratios, or lowering the cost of licenses for these fishermen
- Economic advantages- the best performances could be rewarded through lower taxes, lower fees, free services or subsidies
- Individual awards and honors- could accompany the material benefits in one of the other options
- Full retention of captured biomass- this would make it economically not viable to fish with large bycatches, and would act as an incentive for cleaner gear development

It is hoped that gear modifications or changes in fisher behavior can reduce the bycatch mortality to levels that will prevent the need for major fishery closures (Richards et al., 1995). Bycatch limits do decrease the amount of bycatch, but there are problems with this method. They provide no incentives to the individual for reduction of bycatch. If a bycatch limit is set, then the fisherman has to fish harder and faster than the next guy to get his share before the fishery is closed. This leaves little time for concern about the handling of halibut. Bycatch can be reduced through reduction of the level of effort or reduction of the average bycatch per unit of effort (Hall, 1995).

IPHC supports the concept of individual quotas, but understands the obstacles to be faced before this can be applied to Alaskan groundfish fisheries. The northeast Pacific region is one of the few areas in the world where discards are added to landings when Total Allowable Catch (TAC) annual harvest levels are being set (Alverson and Hughes, 1995). In this scenario, the allowable level of halibut bycatch would be allocated to individual vessels, groups of vessels or to specific fisheries on an annual basis (Wilson and Weeks, 1996). Individual quotas take away the need to fish as much as possible before the TAC is met to get your share. In theory, this creates a cleaner fishery by allowing the fishermen to take their time and fish more carefully and selectively.

6.2. Management Economics

Discards from certain fisheries can negatively impact catch opportunities in competing fisheries but constitute fisheries that add significantly to the total available food supply and overall economic health of a region's fisheries (Alverson and Hughes, 1995). Groundfish fishermen see halibut as an unavoidable consequence of their fishing practices, while to halibut fishermen it is their livelihood.

Smith (1995), identifies impact costs, control costs and management/enforcement costs as the factors involved in controlling bycatch reduction strategies. Impact costs are the sum of costs, in forgone profits, to the fishermen that target the bycaught species. Control costs affect the fishermen that cause the bycatch, either by raising costs or reducing revenues. He also outlines management objectives as effective, efficient, done at least cost, fair and equitable, and balance the various costs across the affected parties.

6.3. Influencing Fisher Behavior

Richards et al. (1995) specifically identify the importance of fisher education in the reduction of halibut bycatch mortality and recommend it as a component of any potential management plan. The fishermen need to be shown that halibut mortality can be greatly reduced the quicker they can get the fish back into the ocean. Murawski (1995), identifies the individual behaviors of captains, crews, dealers and buyers as the key to achieving bycatch goals.

There are at least nine entities (including the four coastal states) involved in the management of the fisheries in the northeastern Pacific Ocean. Fisheries management in this region is dependent upon cooperation between these entities and industry. They must identify and work toward common goals and establish clear lines of communication.

The North Pacific Fisheries Management Council (NPFMC) approaches discard mortality by reducing the encounter rate of halibut and fishing gear, increasing the selectivity of the gear to avoid halibut, or reducing the mortality rate of those halibut that are caught and discarded (Trumble, 1995). NPFMC introduced careful release requirements for longline fisheries in 1993, to try to reduce halibut mortality caused by handling (Trumble, 1995). Methods included careful shaking, gangion cutting and hook straightening as prescribed techniques. The idea was to reduce the practices of automatic hook strippers, gaffing during release and leaving the fish on deck. One problem discovered was that owners might support the program, but were not able to assure compliance on their vessel. Owners did not always properly instruct operators and operators did not always monitor the release methods onboard. The program was jeopardized by inexperienced, unaware or uncaring fishermen (Trumble, 1995). This may

have been prevented through better communication between owners and their crews or better crew education. The program was considered successful because of the cooperation between management and industry.

6.3.1 Bering Sea Example

The 1990 domestic trawl flatfish fishery in the Bering Sea is a case example of incentives lowering the bycatch rate through changes in fisher behavior. The incentive in this instance was a longer fishing season in which to maximize catch of the target species. The season was closed in March of 1990 when the bycatch cap of 567 metric tons was thought to have been reached. Checking and verification of data determined that the cap had not been reached and there were 46 metric tons under the cap remaining. The fishery reopened the beginning of August 1990, and had only utilized 37.7 metric tons of the apportioned limit through November 4, 1990. The bycatch rate dropped from 14.6 kg of halibut per mt of groundfish to 1.64 kg of halibut per mt of groundfish (Wilson and Weeks, 1996). Some of the decrease in bycatch may be due to the time and location of the fishery, but the bulk of the decrease can be attributed to a change in fishing practices and fisher behavior.

6.3.2. Canadian Example

Canada has reduced their trawl fleet halibut bycatch in Area 2B from 1.5 million pounds in 1995 to 307,000 pounds in 1996, through the implementation of an individual vessel bycatch quota program (IPHC, 1997). The Department of Fisheries and Oceans had set the following goals for management of its groundfish trawl fisheries: keeping to

groundfish management quotas, provide reliable information on catches and discards, minimizing halibut waste, providing a year round trawl fishery and minimizing incidental catches of all non-target species (IPHC, 1997). To meet these goals, Canada adopted 100% on-board observer coverage in 1996. They also established individual bycatch quotas for the vessels that account for 95% of the total trawl landings. Costs of the observers were covered by the vessel. The quota for each trawler was determined by dividing the bycatch cap of the area by the number of vessels participating in the IVBQ fishery. In 1996, this gave each vessel 4,600 pounds of halibut mortality in the Hecate Strait region and 6,100 pounds for the Vancouver Island region. Each vessel's bycatch quota was divided into trimesters and when the limit was reached that vessel was finished fishing in that area for the trimester. The vessels were allowed to switch areas or continue to fish using midwater trawls.

The immediate reaction of the fleet was to reduce towing time, improve handling of discarded fish, an increased area/time/depth selectivity to avoid halibut. The fleet caught less then 60 percent of their IVBQ for the year. The average vessel caught less then 25 percent of its IVBQ in Hecate Strait and less then 15 percent off Vancouver Island. This combination of strict bycatch limits and individual accountability for each vessel is credited with the vast reduction in halibut bycatch between 1995 and 1996 (IPHC, 1997).

6.4. Better Management for 2A

Development of a more effective management program for Area 2A would require more research on the halibut population in this area, bycatch mortality rates and more attention to the problem from management agencies. The institution of the EDCP observer program is a good means of gathering data on the actual bycatch rates of halibut in the trawl fisheries of 2A. As of now, this program covers a very small percentage of the trawl fleet and the project is only funded through the end of 1998. Observer coverage should be extended to a larger percentage of the trawl fleet and to longline vessels. Analysis and publication of the data gathered in this program will be key in establishing better halibut management within Area 2A.

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Appendix I.

Oregon

DEPARTMENT OF
FISH AND
WILDLIFE

MARINE REGION

23 December 1996

Dear West Coast Fisheries Participant

The Oregon Department of Fish and Wildlife (ODFW), in cooperation with the Oregon Trawl Commission (OTC) and many others in the fishing community, has prepared the enclosed video on avoiding halibut bycatch and reducing the discard mortality of incidentally caught halibut. As many of you already know, bycatch and discard in marine fisheries have caught the public's attention and is the source of negative publicity for many fisheries. At the same time, prohibited species bycatch also creates and fuels controversies between differing fisheries and gear groups.

There is substantial uncertainty concerning the magnitude of halibut bycatch and discard mortality in recreational and commercial fisheries. However, the limited studies which have been done suggest that it represents a substantial fraction of the combined commercial and recreational quotas. ODFW and the OTC are cooperating on a data collection program which will improve our understanding of halibut bycatch. As this program moves forward, there are also simple and straightforward things that ANY fisher can do to reduce halibut bycatch and discard mortality. These include, among other things, short, careful tows when trawling near halibut grounds, and careful handling and quick sorting and release of halibut which come up as bycatch. Recreational and commercial hook-and-line fishers can help reduce halibut discard mortality by careful release measures such as leader or gangion cutting and hook-straightening when halibut are incidentally caught out of season.

The enclosed video (sixteen minutes long) is being sent to all limited entry qualified groundfish and shrimp trawl permit holders. You can help us by showing this video to your crew and adopting the careful release measures illustrated. Please leave it on board for periodic review and training of new crew. We have also included a laminated placard produced by the Alaska Draggers Association and the University of Alaska Marine Advisory Program which covers much the same material. The video and placard also are being distributed to Sea Grant Extension agents, the Pacific Fisheries Management Council, the International Pacific Halibut Commission, the Fishermen's Marketing Association, halibut charterboat owners, and others to help get the word out and to document the cooperative efforts that ODFW and the fishing community are taking to minimize this problem.

Bycatch and discard mortality are creating a negative image for many fisheries. Care, simple steps, and open discussion can help address both the substance and the perception of this problem. Please watch this video, show it to your crew, and help us to minimize this problem.

Thank you for your help.

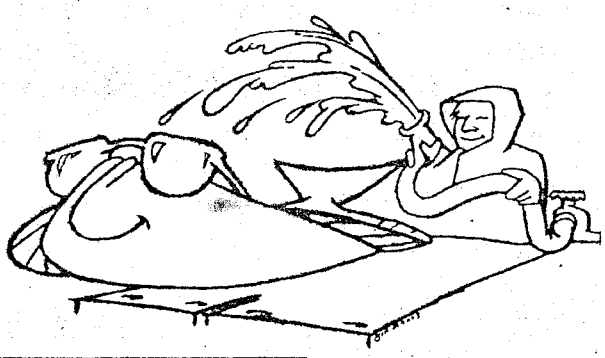
Sincerely,

Neal Coenen
Marine Programs Manager

John A. Kitzhaber
Governor

2040 SE Marine Science Dr.
Newport, OR 97365
(541) 867-4741
FAX (541) 867-0311

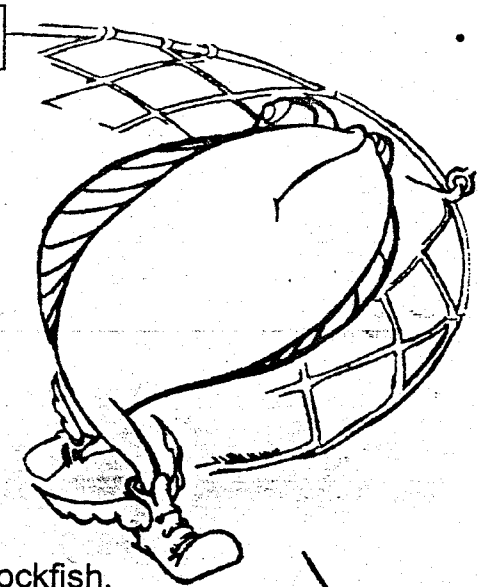
Halibut Bycatch
Increasing Survival



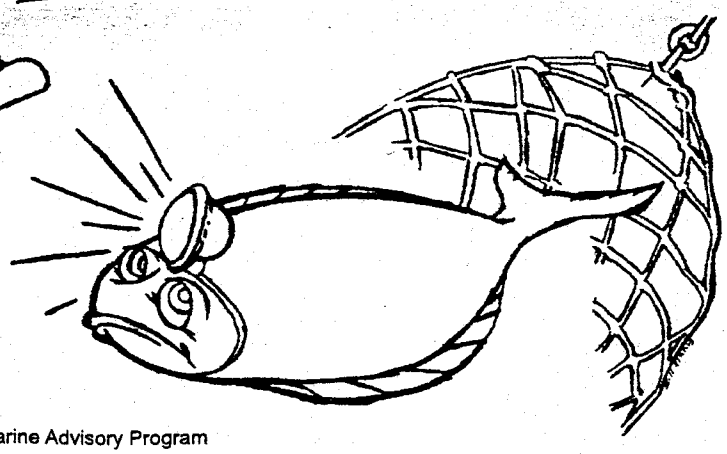
On Deck Strategies

- Use a large volume deck hose to "boil" fish so halibut can swim to top. In warm/dry weather keep them wet.
- Open checkers quickly to spread fish.
- Larger, live halibut are likely to be first out of zippered codend. Wash them down ramp as quickly as possible.
- Avoid gills when handling.

Fishing Strategies



- Avoid high bycatch areas.
- Warn other fishermen in area of halibut bycatch.
- Do a short test tow in new areas. It is easier to move than to sort.
- Slow down tow speed.
- Use longer drop chains on foot rope when fishing for rockfish.
- Be wary of nighttime tows when fishing for flatfish.
  10 halibut per tow in daylight =
  100 halibut per tow at night.
- Shorten tows when bycatch goes up.
- The stern ramp is best for discards. Avoid the prop wash for over the side discards on twin screw boats.
- Sort the catch as quickly as possible.



Produced by the Alaska Draggers Association and University of Alaska Marine Advisory Program
Adopted and reprinted by the Oregon Department of Fish and Wildlife

Appendix II.

Potential sources of fishing mortality: [1]

$$F = (F_{CL} + F_{RL} + F_{SL}) + F_B + F_D + F_O + F_A + F_E + F_G + F_P + F_H$$

where:

F Sum of all direct and indirect fishing
F_{CL} Commercial landing mortalities

F_{RL} Recreational landing mortalities

F_{SL} Subsistence landing mortalities

F_B Illegal and misreported landing mortalities

F_D Discard mortality

F_O Drop-out mortality

F_A The mortality resulting in fish that avoid gear but die from stress or incurred injury

F_E The mortality resulting in fish that contact and escape gear that subsequently die

F_G The mortality resulting from fish that are caught and die in ghost fishing gears

F_P The mortality resulting from predation of fish that have escaped or are stressed from fishing gear that otherwise would have lived

F_H The mortality of fish that die or are lost as a result of gear habitat modifications

[1] From Alverson and Hughes, 1995.

Appendix III.

Criteria used by EDCP observers to determine halibut condition in trawl fisheries (Williams and Wilderbuer, 1995 and EDCP observer instruction package).

1) **Excellent**- no sign of stress (20% mortality)

-Injuries, if any, are minor.
-Muscle tone or physical activity is strong, jaw may be tightly clenched.
-Gills are deep red (not pink) and fish is capable of closing gill cover (operculum) tightly for at least 5-10 seconds.

2) **Poor**- Alive, but showing signs of stress (55% mortality)

-Moderate injuries may be present; hemorrhaging on white side approximately 25%; severe fin fraying; slight bleeding from edges; moderate abrasions or cuts.
-Muscle tone or physical activity is weak: intermittent movement, may respond if stimulated; body appears limp.
-Gills are red (not pink) and fish is capable of closing gill cover (operculum) weakly and not sustained.

3) **Dead**- No sign of life ,or if alive, likely to die from severe injuries or suffocation (90% mortality)

-Vital organs may be damaged: body or body cavity may be ripped open; severe skin lacerations; sediment in mouth; hemorrhaging on white side 50% or more.
-No sign of muscle tone or physical activity.
-Severe bleeding may occur.
-Gills may be pink or white and fish is not able to close gill cover (operculum) and jaw may be open.

Appendix IV.

Criteria used to determine halibut condition in longline fisheries. (Willams and Wilderbuer, 1995 and NMFS)

1) **Excellent**- no sign of stress (3.5% mortality)

- hook injuries are minor (limited to the hook entrance/exit hole, torn lip) and located in the jaw or cheek
- Bleeding, if present, is minor and limited to the jaw area
- No penetration of the body by sand fleas (check eyes, fins, anus)
- Muscle tone or physical activity is strong
- Gills are deep red

2) **Poor**- alive, but showing signs of stress (52% mortality)

- Hook injuries may be severe: broken jaw; punctured eye
- Vital organs are not injured
- Bleeding may be moderate, but not from gills
- No penetration of the body by sand fleas (check eyes, fins, anus)
- Muscle tone or physical movement may be weak or intermittent; little, id any, response to stimuli
- Gills are red

3) **Dead**- no sign of life or, if alive, likely to die from severe injuries (100% mortality)

- Vital organs may be damaged: torn gills, gaff wound to head or body, jig injury to viscera, side of face torn loose or missing jaw
- Sand fleas have penetrated the body (they usually attack the eyes first, but also fins and anus).
- Severe bleeding may occur, especially from the gills.
- No sign of muscle tone; physical activity absent or limited to fin ripples or twitches
- Gills may be red, pink or white.

Appendix V.

Survey Questions:

1) Have you seen the halibut bycatch video made by ODFW?

yes no

1a) If yes, how did you get it? Was is mailed? Shown to you? Given to you?

2) If yes, how many times?

2 4 6 8+

3) Do you think halibut bycatch is an important issue?

yes no

Why?

4) Has seeing the video changed your thoughts about halibut bycatch as an issue?

yes no

5) Are the safe handling and release techniques useable aboard your vessel?

yes no

6) Would you change your handling and release techniques after viewing this video?

yes no

If no, why?

Please rate the following questions from 5 to 1, 5 if you feel the video did a good job or 1 if it did poorly.

1) The video outlined the importance of halibut bycatch and made me aware of the issue.

5 4 3 2 1

2) The video identified ways of reducing halibut bycatch.

5 4 3 2 1

3) The video influenced my actions in avoiding and handling halibut.

5 4 3 2 1

Answers to the following section are to help ODFW and other agencies to better communicate with fishermen. Please rank a 5 as good and a 1 as poor.

1) Was the video format a means of getting information to fishermen?

5 4 3 2 1

2) How can ODFW better communicate with fishermen?

3) What is the best method to get information to you?

Mail?	Web pages?
Public meetings?	Fishermen's Associations/newsletters?
Newspaper?	Other?