FISHERIES DIVERSIFICATION PROGRAM

Environmental Awareness and Conservation Technology

Project Summary: EACT- 8.2001.DFO

Annual Review: 2000 - 2001



Canada



FISHERIES DIVERSIFICATION PROGRAM

ENVIRONMENTAL AWARENESS & CONSERVATION TECHNOLOGY

2000 - 2001 ANNUAL REPORT

When The Atlantic Groundfish Strategy (TAGS) ended, the governments of Canada and of Newfoundland and Labrador introduced in August, 1999, a new program supporting the transition of rural communities from dependency to self-reliance: the Canadian Fisheries Adjustment and Restructuring Initiative (CFARI). A critical part of this initiative is the \$81.25 million Canada-Newfoundland Agreement for the Economic Development Component of the CFARI. This funding is shared 80 per cent (\$65 million) by the Government of Canada, through the Atlantic Canada Opportunities Agency (ACOA), and 20 per cent (\$16.25 million) by the Government of Newfoundland and Labrador, through the Department of Intergovernmental Affairs. The overall objective of the Economic Development Component is to help rural areas adjust to the realities of the new fishery, and to make these communities less dependent on seasonal industries and income support programs.

The \$10 million Fisheries Diversification Program is part of the Economic Development Component of the CFARI. The Program has four basic objectives:

- To diversify the province's fishing industry in an environmentally sustainable way.
- To maximize the value of the fishing industry to the province's economy.
- To pursue research and/or development initiatives that are of long-term, industry-wide benefit.
- To make the benefits of research and/or development initiatives available to the whole industry.

Environmental Awareness and Conservation Technology is one of four components of the Fisheries Diversification Program; it is managed by the Department of Fisheries and Oceans. The other three components are Emerging Fisheries Development, Productivity and Product Development, and Market Intelligence and Trade Development, and are managed by the provincial Department of Fisheries and Aquaculture.

The Environmental Awareness and Conservation Technology component funds efforts to enhance awareness of the impacts that new fisheries have on their environments and ecosystems, thereby reducing the possibility of conflicts between emerging and traditional fisheries. This component also focuses on conservation technology, a relatively new area of investigation which is receiving increasing attention world-wide. The component pursues gear technology-related solutions to harvesting problems, such as species by-catch and size selectivity - in both traditional and emerging fisheries - availing where possible of ongoing national and international research in conservation technology.

Following are brief summaries of projects initiated under the Environmental Awareness and Conservation Technology component that were completed in fiscal year 2000-01 or are still underway.



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TURBOT SIZE SELECTIVITY IN OTTER TRAWLS - VESSELS OVER 65'

Project Report: EACT- 6.2001.DFO (FDP 258-A)

- Otter Trawl Turbot Selectivity Experiments in 3KL by the F.P.I. FV Pennysmart, May-June, 2000 Project Report: EACT- 7.2001.DFO (FDP 258-B)

- Otter Trawl Turbot Selectivity Experiments in 0B2G by the Clearwater FV Atlantic Enterprise, May-June, 2000 Project Report: EACT- 8.2001 (FDP 258-C)

- Report on Greenland Halibut (Turbot) Selectivity Experiments Carried Out Aboard the Atlantic Enterprise (Phase II) Project Summary: EACT- 7.2001.DFO (FDP 258)

- Greenland Halibut (Turbot) Experiments Carried Out Aboard Commercial Vessels

Otter trawl turbot catches often exceed the small-fish protocol, which requires that no more than 15 per cent of a catch should be under 45 cm in length. Based on FRCC advice, the Minister of Fisheries and Oceans announced in 1998 an increase in the minimum mesh size for turbot otter trawls, to 155 mm from 145 mm. Industry subsequently asked DFO to revert to 145*mm mesh, noting that most of the small turbot caught in otter* trawls are meshed in the forepart of the trawl (the wings square and bellies). DFO agreed, provided the industry worked with the department to resolve the small-fish problem. In early 2000, members of the Turbot Industry/DFO Working Group, including FPI, suggested that work be resumed on mesh size selectivity in turbot trawls. FPI submitted a project proposal for a Turbot Otter Trawl Mesh Size Selectivity project. The proposal was approved for funding, and DFO commissioned the development of scientific protocols for the experiment. The experiment was carried out onboard the FVPENNYSMART, using FPI's 'Millennium' standard turbot trawl with 160-mm mesh in the forepart (wings, square and bellies) and 145-mm mesh in the extension and the codend. Fishing trials were carried out during April 24-May 3, in NAFO Division 3K, to (a) determine the selectivity curve for a 145mm mesh codend on an unmodified standard trawl, and (b) compare the catch performance of an unmodified standard trawl with one having a small-mesh (80 mm) forepart. A





report on the project was written and distributed to industry. Following the success of the FPI project, Clearwater Fine Foods requested permission from DFO to carry out a similar experiment under the same scientific protocols, specifically to collect additional comparative fishing data. Permission was granted for an experiment onboard the FV Atlantic Enterprise using a standard trawl (145-mm mesh cod-end and 160-mm mesh body) and a trawl with small mesh (100 mm) in the forepart section. Comparative fishing trials were carried out May 21 to June 13, 2000, in NAFO Divisions 0B and 2G. The resulting data was analyzed by a consultant, and a report was completed and distributed to the industry. A second Clearwater proposal was subsequently approved, for an experiment designed (a) to develop a selectivity curve for a trawl with 145-mm mesh cod-end and a 100-mm mesh forepart section, and (b) to conduct additional comparative fishing, as in their first experiment. Fishing was conducted in NAFO Division 0B during November 15, 2000, to January 1, 2001. Reports on the three test fisheries have been published and distributed. A project summary report encompassing all three experiments has also been completed and distributed. Results from the three experiments showed that using small mesh in the forepart of the trawl eliminates meshing and does not increase the catch of small turbot.

GILLNET ENVIRONMENTAL IMPACT AWARENESS FDP Project no. 260

Because of the tendency of lost or abandoned gillnets to continue fishing (the phenomenon known as 'ghost fishing') the use of gillnets, particularly in cod fishing and especially in Placentia Bay, has become highly controversial among both fish harvesters and fisheries managers. A local video production company was contracted to produce a videotape highlighting the problem of lost and abandoned gillnets, and stressing the need to use gillnets responsibly so as to minimize adverse effects on fish stocks and the marine environment. To secure video footage and still photographs, Ralph Ryan, owner-operator of a 45' fishing vessel, was contracted to drag for lost gillnets in inner Placentia Bay. With funding from the Canadian Centre for Fisheries Innovation, Memorial University's Marine Institute designed and constructed a retrieval device to be towed along the seabed and hook into any nets found there. Dragging was carried out over a six-day period, in waters near Bordeaux Head and Bar Haven Island. A small number of nets were recovered which permitted the capture of adequate video footage and still photographs for the project. A 23-minute video, The Gillnet Debate, has been produced and made available to the fishing industry and other interested groups, through direct distribution and through inclusion in a series of videotape lending libraries established in DFO Detachment Offices and provincial Dept. of Fisheries and Aquaculture field offices. The video features interviews with local fishermen discussing the pros and cons of gillnet use in fishing cod, and a statement of 'best practices' fishermen should follow in using gillnets.

LOBSTER BY-CATCH IN ROCK CRAB POTS Project Report: EACT-4.2001.DFO (FDP 280) - Reducing Lobster By-Catch in Rock Crab Pots

Rock crab and lobster habitats overlap. As a result, a significant problem in the emerging rock crab fishery is lobster by-catch. Memorial University's Marine Institute, in consultation with the university's Ocean Sciences Laboratory (OSL) at Logy Bay, designed and tested a modified rock crab pot that would significantly reduce lobster by-catch. In Phase I of the project, four different modifications of the standard rock crab pot were constructed and tested in an OSL laboratory tank. One of these modified pots seemed particularly promising. In Phase II of the project, this one and a fifth modification were tested in sea trials at Newtown, Bonavista Bay, and these two plus a sixth and seventh modification were tested in sea trials at Foxtrap, Conception Bay. The at-sea tests were conducted during September-October, 2000. In both the laboratory tests and the at-sea tests, the standard rock crab pot was used as a control with which to compare the performance of the modified pots. Two of the seven modifications were very effective in reducing lobster by-catch. It was recommended that these two be further tested in the 2001 fishery. A project report has been published and

THE GILLNET DEBATE





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distributed to industry. It was subsequently decided that the two best-performing pots would undergo slight additional modification and be introduced into the 2001 fishery.

INTERACTION BETWEEN SHRIMP TRAWLING AND THE SNOW CRAB RESOURCE Project Report: EACT-1.2001.DFO (FDP 281)

- Report on the Interaction between Shrimp Trawling and the Snow Crab Resource



This is a two-phase project. The first phase was carried out in 2000; the second will be carried out in 2001. The following is a brief summary report on the first phase. The project stems from concerns expressed by crab fishermen about high numbers of crab being caught with broken or missing legs; some fishermen fear that damage is being caused by shrimptrawling on crab-fishing grounds. Its primary objective is to determine if shrimp trawling on crab grounds has a negative impact on the crab resource, through injury and mortality. A 19.8-metre commercial fishing trawler capable of carrying and operating together a shrimp trawl and two 50-pot fleets of crab gear conducted three five-day fishing trips. The first and third trips were to be crab pot fishing trips, the second a shrimp trawling trip in the same area. Because of poor fishing conditions during the first trip, in the Hawke Channel, fishing was shifted to the La Scie area and the first (crab-fishing) trip was repeated, but reduced to three days. Two Fisheries

Observers were onboard during each trip to monitor the conduct of the experiment and to collect data on the size and condition of the crab caught. All three trips in the crab-shrimpcrab sequence in the La Scie area were conducted on the same fishing grounds, so researchers could compare the conditions of crab caught before the shrimp trawling to the condition of crab caught in the same area after the shrimp trawling. Resulting data showed no significant difference in the condition of crab caught before and after trawling for shrimp on the same grounds. A report on Phase I has been published and distributed to the industry. (Phase two will comprise three five-day shrimp-fishing trips, one in each of spring, summer and fall, 2001, using a standard shrimp trawl with three retainer bags to collect for observation any crab which go under the trawl's footrope.)



CRAB CONSERVATION HARVESTING VIDEOTAPE AND BROCHURE *FDP Project no. 283*

This is a two-part, two-year project combining proposals put forward independently by the Halifax-based international consulting and quality-control firm Tavel Ltd., and Memorial University's Fisheries and Marine Institute in partnership with the Canadian Centre for Fisheries Innovation (CCFI). The Marine Institute and the CCFI are developing a videotape and brochure highlighting 'best practices' for handling, holding and transporting live snow crab at sea. A working draft of the text and lay-out of the brochure was completed in 2000/01. Illustration, text editing, final design and publication will be done in 2001/02. A working draft of the text (voicetrack) and 'story-line', as well as detailed lists of video and graphic illustration requirements, have been developed for the video. Filming, graphics production, sound track and final editing and production will be completed in 2001/02. The videotape will be placed in the DFO-DFA videotape province-wide library system (See 'Responsible Fishing Videotape Libraries - FDP Project no. 288). The brochure will be distributed to all crab harvesters. Tavel Ltd. are developing onboard handling systems for snow crab vessels: a sorting table and discard chute for 35/45-foot vessels, and a sorting table-discard chute, plus a delivery chute to the hold, for 45/65-foot vessels. These systems will enable fishermen to more efficiently sort out under-sized, soft-shelled and female crab and return them to the sea with minimal effect on individual crabs' viability. The aim is reduced mortality among discards. During 2000/01, after consultations with fishermen, systems were designed and constructed for a 35' boat and a 65' boat. During 2001/02 the systems will be installed and tested, and any necessary modifications will be made.

DANISH SEINE SIZE SELECTIVITY

Project Report: EACT-2.2001.DFO (FDP 284)

Reducing Retention of Small Fish in the 3Ps Danish Seine Fishery for Witch Flounder

The FFAW submitted a proposal to carry out a Danish Seine Mesh Size Selectivity study on witch flounder in Fortune Bay. The project was approved and funded. Four Danish-seine vessels ranging in size from 49 ft. to 58 ft. were each outfitted with seines having one of four experimental cod-ends: 130mm diamond mesh, 155-mm diamond mesh and 155-mm square mesh (there were two of these). DFO developed project protocols and provided experimental fishing licences and four Fisheries Observers for the project. In September, 2000, the vessels made a total of 27 sets, using the different cod-ends, in



Fortune Bay. Catches were sampled and the weights and lengths of individual fish in each sampled were recorded. (With respect to catch rates, the

data from one of the vessels was not used. as its net did not fish properly.) The data was analyzed by FFAW to determine which net performed best with respect to (1)



size of fish retained, and (2) quantity of fish retained. Analysis showed that the average size of the witch flounder retained by the 155-mm diamond mesh gear was significantly larger than that retained by the 130-mm diamond mesh and the 150-mm square mesh. However, the catch rate with the 155-mm diamond mesh gear was only about half that with the other two nets, because of the greater escapement of fish, large as well as small, through the larger diamond mesh. The catch rates and the average size of fish caught was about the same for the 130-mm diamond mesh and the 155-mm square mesh nets. A report on the project has been published and distributed to the industry.

IMPACT OF CATCH-AND-RELEASE ON ATLANTIC SALMON

Project Summary: EACT-6.2001.DFO (FDP 285)

Effects of Catch-and-Release Angling on Atlantic Salmon on the Conne River

This project was undertaken during June 8 - July 19, 2000, to fill a gap in research on the effects of catch-and-release angling on Atlantic salmon. Very few earlier studies gave primary concern to actual survival of salmon caught and released, and very few involved salmon caught by normal angling procedures. The primary objective of the project was to assess the survival rate of Atlantic salmon caught and released under normal angling

procedures and variable environmental conditions. Other objectives were to provide guidance to anglers on catch-and-release practices to reduce fish mortality: to increase the awareness of the conservation impact of catch-and-release angling, and; to generate advice to fisheries managers on minimizing catch-andrelease mortality.

During the period June 8 - July 4, a total of 69 salmon were captured on the Conne River, Bay d'Espoir,

tagged, and held for over two weeks in observation cages in the river. Twenty of the salmon were taken from the trap on the DFO salmon counting fence on the river; 49 were angled in the usual manner, in waters just downstream of the counting fence, by a total of 19 anglers participating in the experiment.

Maximum daily water temperatures of 22°C or higher were recorded on 15 days during the study; minimum daily water temperatures averaged 16.9°C from about mid June to July 19. The maximum recorded water temperature was 24.6°C, on June 23. (The final project report noted that these water temperature conditions were not as extreme as has been observed during some other years on the Conne River.) Four (8.2%) of the angled salmon

died, three within hours after being caught, one died a week later. None of the fish taken from the counting fence trap died. These results were consistent with most earlier experiments indicating that when salmon are handled properly in suitable water temperature conditions, mortalities are low in catch-andrelease angling. A project summary report has been completed and distributed to DFO staff, the angling community and other interested

groups, and a research document was prepared for the January, 2001, salmon stock assessment meetings. The DFO Science staff who conducted the experiment have submitted a detailed scientific report for publication in the scientific journal Fisheries Management and Ecology.



RESPONSIBLE FISHING VIDEOTAPE LIBRARIES *FDP Project no. 288*



Nearly 120 videotape productions on fisheries related topics have been copied and placed in 18 DFO offices and five Department of Fisheries and Aquaculture offices throughout the province. The videotapes will be available on loan to fishers and others in the fishing industry, students and the general public. While these video libraries contain a wide variety of fisheries and fish habitat related films, the key focus is on responsible fishing, conservation technology (e.g., gear selectivity) and environmental awareness (relating to both marine and inland resources). The primary objective of the library system is to promote these three basic concepts and to provide appropriate advice and information. A brochure has been published and distributed with the videotapes listing library locations and video titles available. The brochure will also be distributed to all DFO satellite offices and DFA field offices. Fish Harvesters' Resource Centres, the FFAW, schools and other appropriate locations. With the basic library established, this project will now focus on expanding the content with new and appropriate material from public and private sector sources locally, nationally and internationally.

REDFISH OTTER TRAWL SIZE SELECTIVITY *Project Summary: EACT-5.2001.DFO (FDP 289)*

- Reducing the Percentage of Small Redfish in Otter Trawl Catches

The relatively small (90-mm) mesh in redfish otter (bottom) trawls, and the bony surface of the fish itself, results in large amounts of small redfish being caught in this gear. In 1999, fish harvesters caught only 3,000 tonnes of the overall 8,500tonne redfish quota in NAFO Divisions 3NO. The main reason was the frequent overrunning of the small-fish limit of 15 per cent of landings (The small-fish protocol requires that when landings of redfish under 22 cm in length exceeds 15 per cent of total landings, the fishery will be closed for at least 10 days.) In an effort to find a remedy for this situation, Cape Mariner Enterprises submitted a proposal to the FDP for assistance to test the Icelandic Ex-It system. The Ex-It system is a Plastic grating constructed in six sections which are tied together to form a flexible whole that can be wound onto a net drum with the net itself. The grating is installed into the net's lengthening piece, and allows small fish to escape from the net. For this experiment, two Ex-It systems were used, one with 30-mm spacing between the bars, and one with 35-mm spacing. Sea trials were carried out in NAFO Division 3-O in March, 2001, by the 20-metre multi-purpose vessel MV Cape Mariner. Because of high winds, only 10 sets were completed during the trip. On the first three sets, a retainer bag was used to capture (for data collection purposes) the fish escaping the trawl through the Ex-It system. The first two sets used the



Ex-It system with 35-mm bar spacing, the remaining eight used the 30-mm unit. A total of 12,158 kg of fish were caught: 4,431 kg redfish, 2,781 cod, 1,766 haddock and 3,180 other species. Because of the small number of sets, and problems with the retainer bag, conclusive findings could not be made. There were clear indications, however, that the Ex-It system would reduce the percentage of small fish in redfish catches. A project summary report on the experiment was prepared and distributed.

COD BY-CATCH IN THE AMERICAN PLAICE GILLNET FISHERY

Project Report: EACT-3.2001.DFO (FDP 290)

- Reducing Cod By-Catch in the 4R Gillnet Fishery for American Plaice



The major constraint on the directed American plaice gillnet fishery in NAFO Division 4R has been the excessive by-catch of Atlantic cod. In an effort to find a

way to reduce cod by-catch, while maintaining or improving plaice catches, the FFAWU submitted a proposal to conduct a test fishery using gillnets of different mesh sizes and configurations. Five varieties of net were used: 1) control gear - 190-mm (7.5") mesh, 24 meshes deep, with floats at three fathoms; 2) 190-mm mesh x 24 meshes deep, no floats, but 30-inch tie-down straps at 20 feet; 3) 190-mm mesh x 12 meshes deep, no floats; 4) 203-mm (8") mesh x 24 meshes deep, no floats, but 30-inch tie-down straps at 20 feet; 5) 203mm mesh x 12 meshes deep, no floats. Each variety of net was fished in fleets of six 50-fathom nets, set parallel to each other in specific locations. The experiment was carried out during September 21 - October 6, 2000, in 4Rc, using a 10.44-metre vessel. Both plaice and cod catches were sampled, with individual fish being weighed and measured. Findings indicated that the best gears for maximizing the catch of

commercial-sized plaice while reducing the cod by-catch were the 190-mm and 203-mm, 12-mesh deep nets with no floats. However, catch rates during the experiment were so low, due to a lack of fish in the area at the time, that no firm conclusions could be drawn from the data collected. A project summary report on the experiment was prepared and distributed to the industry. It recommended that further test fishing be carried out in 2001.



NORTH ATLANTIC CONFERENCE ON RESPONSIBLE FISHING

FDP Project no. 291:

- Working Together - Securing the Future: A Report of the Second North Atlantic Responsible Fishing Conference

In recent years, North Atlantic fishing nations - especially Canada, have undertaken and continue to undertake a considerable body of applied industrial research work in responsible fishing and conservation harvesting techniques and equipment. In November, 2000, the second North Atlantic Conference on Responsible Fishing was held at Memorial University's Fisheries and Marine Institute in St. John's. (The first was held in March. 2000, at Fraserburgh, Scotland) The overall objective of the



conference was to give practising fishing skippers an opportunity to consider and assess recent and current responsible fishing/ conservation harvesting research and to plan for future collaborative work. Ninety delegates from reference, and to select members, for a North Atlantic Responsible Fishing Council. A proceedings report was compiled by the Marine Institute and distributed to workshop delegates.

BY-CATCH REDUCTION IN SHRIMP BEAM TRAWLS Project Summary: EACT-1.2001.DFO (FDP 292)

- By-Catch Reduction in Shrimp Beam Trawls

Participants in the shrimp beam trawl fishery recently developed in Fortune Bay are required to use a Nordmore grate, with 22-mm bar spacing, in their gear to reduce bycatch of other species. Even with the use of the Nordmore grate, however, a by-catch of small flatfish is possible, because of the small-mesh construction of the shrimp trawl's cod-end. DFO developed this project to test the use different toggle and chain lengths in their gear fittings to see whether longer toggles and chains would reduce by-catch without the loss of shrimp. A 10.44-metre vessel conducted a test fishery during the past winter. The Department of Fisheries and Aquaculture supplied a 12.2-metre beam trawl for the project. A model of the trawl was tested in Memorial University's Marine Institute flume tank, and changes were made to the full-scale trawl to current design problems in the lower front belly of the trawl that prevented its toggles and chains from extending to their full lengths. It was proposed that the trawl would be fished using, on alternate days, 12", 28" and 36" toggles and chains. Fishing was conducted in NAFO subdivision 3Ps on 13 sea-days, between November 25, 2000, and January 26, 2001. A total of 20 sets were made. The trawl did not appear to operate properly, seeming not to be in contact with the bottom. Modifications involving weights and floats did not appear to satisfactorily solve the problem. As a result, only three sets were made with 28" toggles and chains, and not at all with 36" toggles and chains. Shrimp catches were



extremely low, ranging from nil to 120 kg. By-catches were nil or negligible. It could not be determined whether the low catches were due to gear problems or the absence of shrimp and fish in the area at the time. A project summary report has been published and distributed to shrimp beam trawl fishers and other stakeholders.

TURBOT OTTER TRAWL SIZE SELECTIVITY - VESSELS UNDER 65' FDP Project no. 297

The otter trawl turbot fishery in Atlantic Canada has been catching quantities of small turbot, which reduces the overall economic value of landings and causes the fishery to be shut down whenever the catch of small fish exceeds 15 per cent of the total catch. A large proportion of the catch of small fish consists of turbot meshed in the forepart (wings, bellies and square) of the trawl. Preventing this meshing, and allowing the small turbot to escape the trawl, would significantly enhance the economic viability of the fishery, while at the same time reducing negative environmental impact. Encouraging results have been obtained from experiments on large offshore trawlers in dealing with this problem, but work also needs to be done on vessels in the under-65' class, where considerations such as gear costs and fuel economy may require different approaches. Researchers proposed an experiment similar to the one with offshore vessels, using a trawl modified to have smaller mesh in the forepart. The protocols for this project have been developed and copies are available. However, because of adverse weather conditions in the fall of 2000, atsea testing has been delayed until 2001/02.

SHRIMP TRAWL BOTTOM IMPACT FDP Project no. 298

Bottom otter trawling is said by many to have a negative impact on the seabed and on species inhabiting the seabed, including the valuable snow crab resource. The resulting controversy and criticism of the practice has often been severe, especially since the entry of 350 new vessels into the shrimp otter trawling fishery. It is feared the controversy could even negatively effect shrimp market prices for both harvesters and processors. Semi-midwater trawling, in which only the 'doors' or 'otter boards' of a bottom trawl are in contact with the seabed, has long been used in France to harvest squid and some groundfish species. In recent years the technology was introduced into Newfoundland's west coast redfish fishery as a means of reducing cod by-catch. The technology also significantly reduces the impact of otter trawling on the seabed and on bottom-dwelling species such as crab. This project has been developed to compare the effectiveness of semi-midwater trawling to standard bottom trawling technology in harvesting shrimp. A trawl model has been constructed, and tested in the flume tank at Memorial University's Fisheries and Marine Institute. With funding from the Canadian Centre for Fisheries Innovation, the Marine Institute and Canadian Navigator II Ltd., a full-scale

SNOW CRAB BY-CATCH IN TURBOT GILLNETS FDP Project no. 299

From the beginning of the turbot gillnet fishery in Newfoundland and Labrador, snow crab - now the province's most valuable commercial fish species - have been a by-catch. Mortality among this by-catch is thought to be virtually 100 per cent; also, picking meshed crab from gillnets is labourintensive, time-consuming, and often destructive of gear. The impact on crab stocks is worrisome, especially since the nonselective gillnets catch not only the legal-sized male crab that are permitted to be kept in the crab fishery, but also the undersized and female crab which regulations require crab fishermen to return to the sea for conservation purposes.

SNOW CRAB SURVIVABILITY *FDP Project no. 307*

The snow crab has become the dominant species in the Newfoundland and Labrador commercial fishery, currently representing more than 50 per cent of the industry's total landed value. The total allowable catch (TAC) has been increased steadily in the past decade, reaching 87,853 tonnes in 1999. However, DFO researchers found evidence in 1999 of reduced recruitment in crab stocks off Newfoundland's northeast coast, and local TACs were subsequently lowered. It is critically important to keep non-commercial crab mortality at a minimum. This project targets the discarding of unwanted

commercial catch. Fishermen are required to sort all female crab and undersized male crab from their catch and return them to the sea,

crab from the



semi-midwater shrimp trawl, suitable for the under-65' vessel class, has been constructed. Since the northern shrimp quota for vessels under 65' was caught quicker than expected in 2000, at-sea testing has been delayed until 2001/02. Fisheries and Oceans Canada (National Capital Region), with funding from the Program for Energy Research and Development, will monitor the sea trials to determine whether semi-midwater trawling also results in reduced fuel consumption by fishing vessels.

Norway has experimented, with some success, in reducing the by-catch of red crab in cod gillnets by modifying the moorings so that the nets are suspended off the sea floor. This project will use a commercial gillnet vessel to fish three 20-net fleets of gillnets, two fleets to be set in the traditional manner and the third to be set in between them and suspended from the bottom. The project was approved late in the 2000 fishing season. Because of adverse fall weather conditions, implementation of the project has been postponed until 2001/02.

and there are fears that fishermen are also discarding increasing numbers of small but legal-sized male crab, a practice commonly called high-grading. In the past it has been assumed that most of the crabs returned to the sea survived the capture, sorting and release process. However, an experiment carried out by DFO in 1994 cast doubt on that assumption. The overall objective of this project is to try and assess the levels of mortality among crabs released or discarded in the crab pot fishery. The project will compare the survival of crab caught in the usual manner but placed immediately in underwater holding cages, with the survival of crab caught and placed in underwater holding cages after being handled onboard as they might be in the commercial fishery. Memorial University's Fisheries and Marine Institute has developed scientific protocols for the experiment. At-sea testing is planned for 2001/02.

IMPACT OF MARINE PLANT HARVESTING Project Report: EACT-5.2001.DFO (FDP 311)

- Impact of Harvesting on Marine Plants, Margaree-Grandy Sound Area

LGL Associates Ltd. was contracted to carry out a study to determine the impact that traditional marine plant harvesting methods have on the sustainability of the marine plant resource on the southwest coast of Newfoundland. The study concentrated mainly on the rockweed Ascophyllum, since that is the resource predominantly harvested in the area; some attention was also paid to the associated rockweed Fucus. Field investigations were performed November 8-16, 2000, at 14 different site in five zones: (1) Margaree - one site (2) Isle aux Morts - seven sites (3) Coney Bay - one site (4) Burnt Island - one site (5) Grandy Sound - four sites. Samples of marine plants were collected from six to nine locations at each site. All samples of Ascophyllum and Fucus were weighed; a proportion of them were measured (length from holdfast to tip) and their branches were counted. Findings included a number of areas completely bare of marine plants, which could indicate poor harvesting practices that pull the plants (holdfast cells included) from the rocks rather than cutting them cleanly above the holdfast. Biomass estimates of Fucus obtained in the study were consistently similar to estimates obtained from a 1998 study. Biomass estimates of Ascophyllum were consistently (1.5 times to 3.5 times) higher than those obtained in the 1998 study. It is noted, however, that approximately one-third of the apparent increase in

RESPONSIBLE FISHING PROGRAM IN HIGH SCHOOLS *FDP Project no. 314*

Over-exploitation and environmental degradation, and the resulting loss of biodiversity, sustainable yields and economically viable fisheries have given rise to fisheries crises around the world in recent years. The collapse of Atlantic Canada's northern cod and other groundfish fisheries and serious problems in British Columbia's salmon fishery are prime examples. One response to this has been the development of the concept of Responsible Fishing. Through community-level training programs and workshops, Canadian fish harvesters have helped develop and implement changes in their fisheries. In 1997, a fisherman in Prince George, B.C., responding to a statement that young people were getting a very negative view of the industry through the media and, in some cases, the educational system, proposed a High School Training Module in Responsible Fishing. As a result, a Ascophyllum biomass could possibly be accounted for by a difference in approach between the two studies. Nonetheless, findings indicate that the rockweed resource within the study area has experienced some



recovery from the effects of over-harvesting and "virtual devastation" reported in the area during 1998. (Because of the lack of pre-harvest data, it was not possible to compare current biomass values and other findings with the original or 'natural' state of things in the area.) A project report has been completed and distributed to the industry and other interested parties. It recommended that future marine plant biomass surveys and harvesting compliance monitoring programs conducted in Newfoundland should strive to match the Maritime Provinces standard of a five-year time frame and a larger, randomized, sampling effort.

Responsible Fishing Module is now being offered in eight British Columbia high schools as part of a Social Studies course on commercial fishing. The module covers: the economic importance of the industry to the province; fisheries management responsibility; how the industry is regulated; fishing methods and commercial species, and; the future of the industry. The Eastport Peninsula Lobster Protection Committee submitted a proposal to the FDP for funding to develop a Responsible Fishing Module for the Eastport Peninsula High School curriculum. Funding was approved and the committee contracted expertise to develop the curriculum, and held a workshop to get input from all stakeholders. The module has been developed and is intended to be included in the social studies curriculum and pilot-tested this fall in Eastport.

CRAB, SHRIMP AND TURBOT WORKSHOP

Project Summary: EACT-4.2001.DFO (FDP 334)

- Gear and By-Catch Concerns: Interactions in the Turbot, Crab and Shrimp Fisheries in 2J3KL

On February 27-28, 2001 a workshop was held in Gander to discuss three important issues: (1) turbot and cod by-catches in shrimp otter trawls (2) impact of shrimp otter trawling technology on snow crab stocks (3) snow crab by-catch in turbot gillnets. A total of 85 stakeholders participated in the workshop, representing the Fishery, Food and Allied Workers Union (FFAW), the Fisheries Association of Newfoundland and Labrador (FANL), Fisheries and Oceans Canada (DFO), the provincial Department of Fisheries and Aquaculture (DFA), the Canadian Centre for Fisheries Innovation (CCFI), the Newfoundland Association of Co-ops, aboriginal groups, individual processors, and the four harvesting fleet sectors (under 35', 35'-64'11", 65'-100', and over 100'). In preparation for discussions, a paper entitled "Crab-Shrimp-Turbot Interactions" was distributed. For each of the three workshop segments, DFO staff presented available data and preliminary discussions were held. Following the discussions, an action plan, including proposed management measures for 2001 and additional study issues, was developed for each segment. Regarding the turbot-cod by-catch issue, it was concluded this is not a significant problem in the shrimp otter trawl fishery at this time. A three-point action plan was developed: (a) continue to monitor all by-catch rigorously (b) conduct lostyield analysis for cod, as has been done for turbot and redfish (c) consider the possibility of conducting experiments to compare by-catches in shrimp trawls using rockhopper footgear with by-catches using bobbin (roller) footgear. During discussion of the impact of shrimp trawling on crab stocks, DFO summarized a project conducted in 2000 in the La Scie area, in which crab pot fishing was alternated with shrimp otter trawling on the same grounds. Speaking for their area, Labrador crab fishermen spoke of a high incidence of broken crab being taken in the area, and of a decline in local crab stocks; they suggested that areas of high crab concentration should be closed to otter trawling. Participants agreed that while some observations by researchers and fishermen appear to indicate that shrimp otter trawling has little impact on crab stocks, certain other observations seem to

suggest otherwise. A seven-point action plan was developed: (a) complete the second phase of the La Scie experiment (b) examine grading data for information on broken crab landed in different areas (c) review inshore and offshore Observer data for information on incidents of crab by-catch (d) compare rockhopper and bobbin footgears in their interactions with the bottom and their by-catch levels (e) review existing data to determine potential crab consumption by turbot, cod and seals (f) develop onboard handling systems for efficient release of under-sized, soft-shell and female crabs (g) review research data and literature on snow crab by-catch and the impacts of trawling on seabed life forms. The issue of snow crab by-catch in turbot nets received the most attention. Much of the discussion focused on whether or not there should be a turbot fishery inside of 350 fathoms in 2001, and the style of such a fishery if one were to take place. It was agreed that crab bycatch is not a significant problem in water deeper than 350 fathoms, and no problem at all in a turbot longline fishery. There was a clear consensus that there is a serious problem with snow crab by-catch in the turbot gillnet fishery in water depths less than 350 fathoms; that crab by-catch levels must be reduced; that a complete closure of the turbot fishery is not the solution to the problem, and; that corrective measures adopted for 2001 should be reviewed before the 2002 fishery. Three separate action plans were proposed. It was agreed that a combination of two of these should be followed: (1) that the season would start with hook-and-line fishing only, and that gillnet test fishing would occur upon request from fishermen in specific areas (2) that a variety of conservation measures be applied in any test fishery, including a 10 per cent crab bycatch limit, by-catch triggered closures of at least 14 days, tagging of all turbot nets, and maximum numbers of nets for outside 350 fathoms (500), inside 350 fathoms (150) and inshore (30). It was agreed that in many crab fishing areas, if fishermen do not request a turbot gillnet fishery, only longlining would be permitted for the entire season. A project summary report has been completed and distributed.







WORKSHOP ON IMPACT OF SCALLOP FISHING ON LOBSTER HABITAT

Project Summary: EACT-3.2001.DFO (FDP 340)

- Impact of Scallop Harvesting on Lobster Habitat

Since the moratorium on cod fishing was implemented in Placentia Bay in 1993, many fishers have turned to scallop dragging to replace lost income. Also, many lobster fishers harvest scallops after the spring lobster fishery is over. Lobster catches in Placentia Bay have declined over recent years. The possible impact of scallop dragging on lobster stocks inhabiting the same area has been studied in other parts of Atlantic Canada, but not in Placentia Bay, though lobster fishers have raised the issue at Lobster Advisory Committee meetings for several years. On February 26, 2001, a group of scallop and lobster fishers and representatives from the Fish, Food and Allied Workers Union, DFO and the provincial Department of Fisheries and Aquaculture held a workshop at Swift Current to discuss the impact of scallop fishing on lobster habitat and to recommend possible solutions to the problem. From an underwater videotape shown at the start of the workshop, it was clear that although scallops and lobsters sometimes inhabit the same general area, their immediate habitats within that area are very different throughout most of the year. However, there is evidence that lobster move onto typical scallop habitat during their annual molting period, in July and August. Scallop fishers noted that they rarely caught lobsters in their gear. They felt that activities such as



poaching, increased lobster fishing effort, and gillnetting by-catches were the cause of much of the apparent decline in lobster stocks. Lobster fishers felt that scallop fishing should be closed during the lobster fishing season, to prevent gear conflicts, and during the July-August lobster molting period. Participants agreed on a recommendation to close scallop fishing in Placentia Bay inside (north of) a line from Point Verde in the east to Red Harbour Head in the west. A project summary report of the workshop has been completed and distributed.

WORKSHOP ON SALMONID BY-CATCH IN EEL FYKE NETS Project Summary: EACT-2.2001.DFO (FDP 341) - Workshop on Reducing Salmonid By-Catch in Eel Fyke Nets

Salmon and trout are frequently a by-catch in eel fyke nets, which are generally set in estuaries, rivers and ponds. Following industry-government workshops during 1993-95, experiments in reducing salmonid by-catch were conducted and three different devices were determined to be effective in accomplishing this objective. In 1995 it was made mandatory for eel fishers to use one or another of these devices in their



operations. However, recent inspections of eel fyke nets by DFO Fishery Officers has shown that in some areas some of those devices are less effective that first thought. On March 14, 2001, a workshop was held at Deer Lake to provide an opportunity for eel fishers and other stakeholders to discuss

the problem. DFO reported that the salmonid by-catch is higher on the west coast of Newfoundland than in other eel fishing areas in the province. Workshop participants noted that the exclusion devices devised to reduce by-catch depended on steady stream current in order to work at maximum effectiveness. They noted that this worked well on the east coast, where most fishers work in more or less fast-flowing rivers, but not so well on the west coast, where most fishers set their nets in estuarial tidal waters. It was agreed that solutions to the problem would probably be site-specific because there was no one method that would work well in all the different locations where eel fishing is conducted. DFO committed to work with fishers to identify specific problem areas and to develop measures to further reduce salmonid bycatch without threatening the viability of individual eel fishing operations. The workshop produced five recommendations: (1) that eel fishers be required to use logbooks and that DFO should further analyze catch and effort data (2) that all eel fyke nets be permanently numbered (3) that eel fishers who use the plastic funnel by-catch exclusion device must install it properly (4) that eel fishers who don't use a wire cylinder in the end of their net must install a hoop or ring to prevent mortality among any salmonids that get into the net (5) that eel fyke net leaders should have small mesh, constructed of large twine, to prevent the meshing of salmonids. A project summary report has been completed and distributed.

The following organizations, agencies and firms have been important contributors in developing and implementing the various projects completed by The Fisheries Diversification Program - Environmental Awareness and Conservation component in fiscal year 2000-2001. Most of these were contracted to carry out different segments of projects, many contributed funding or other tangible assets to projects, some developed project proposals, all brought vital expertise to the projects in which they were involved. Their partnership has been critical to the ongoing success of the program:

- All Material Products Inc.
- Canadian Centre for Fisheries Innovation
- Can-Nav Enterprises Ltd.
- Cape Mariner Enterprises
- Clearwater Fine Foods Ltd.
- Department of Fisheries & Aquaculture
- Memorial University
 - Biology Department
 - Fisheries and Marine Institute
 - Centre for Aquaculture and Seafood Development
 - Centre for Sustainable Aquatic Resources
 - Oceans Science Centre
- Fisheries and Oceans Canada
 - Fisheries Management Sector
 - (National Capital Region)Fisheries Management Sector
 - Fisheries Management Sector (Newfoundland Region)
 - Oceans, Science and Environment Branch
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