PACIFIC FISHERIES

RESPONSIBLE FISHERIES

SUMMARY

Shrimp Beam-Trawl Selectivity — British Columbia

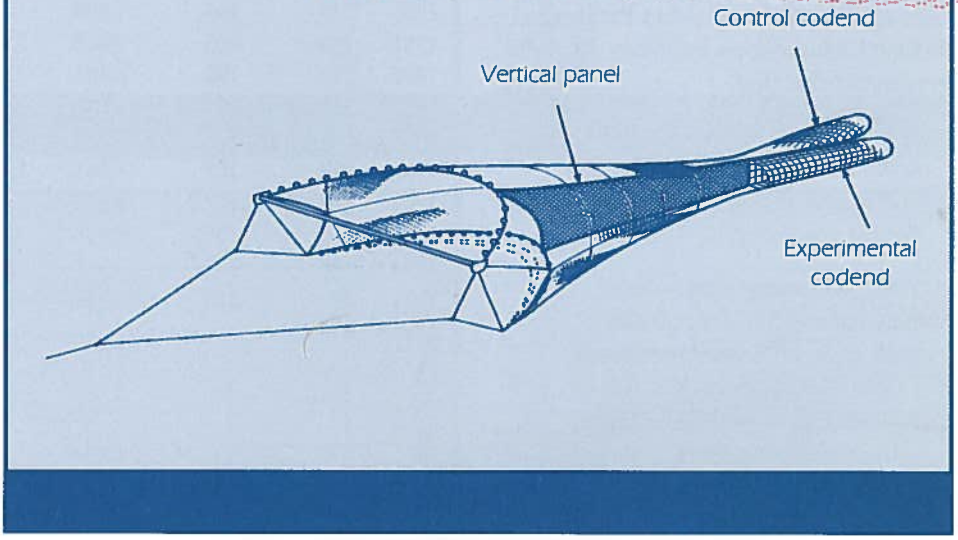
October 1997

Beam-Trawling (see figure 1) is a historic method of fishing that dates back to the days of sail and takes its name from the beam (or "pole") used to keep the mouth of the net open. With the advent of power-driven vessels the beam-trawl was largely replaced by the otter-trawl, which sweeps a larger area and is kept open by otter-boards or "doors". Trawling for shrimp in British Columbian waters originated in the Point Grey area of Georgia Strait during the 1890s. During the 1940s, beam-trawlers were reported to be operating in Clio Channel, off Johnstone Strait and in the vicinity of Deep Bay off the east coast of Vancouver Island. The current emphasis on "Responsible Fishing", particularly concerns over bycatch and seabed degradation, has led to a revival in beam-trawling as a viable method of fishing, lending itself admirably to the relatively low-powered, smaller vessels (30 to 45 feet in length) displaced from the salmon fishery. Fishing is carried out in depths ranging from 60 to one 110 metres. The nets are rigged to achieve neutral buoyancy, thus minimizing impact on the surface of the soft, smooth seabed where the bulk of the fishing is conducted. Of the 250 or so currently licensed shrimp-trawlers, about 200 have selected the beam-trawling method of fishing.

From 1987 to 1994 the number of vessels fishing shrimp in Canadian waters off the coast of British Columbia averaged around 175, comprising

Figure 1

Trouser codend beam-trawl



around 150 "beam" trawlers and 25 "door" trawlers. The overall annual catch during this period remained reasonably consistent at around 2,600 tons. In 1995 the number of boats increased to 216, largely due to a downturn in the salmon fishery, and the catch more than doubled to over 6,000 tons (see figure 2) with a landed value of around $13.6 million. The increase in catch is paralleled by the increased fishing effort from around 7,000 fishing days in 1994 to 14,000 days in 1995.

Experiments to reduce the incidental bycatch of juvenile shrimp and untargeted species of fish have been conducted on the West Coast in recent years and have concentrated on otter-trawlers, owing to the notable reduction in overall bycatch on similar East Coast vessels following the introduction of various excluders, particularly the "Nordmore Grate". This device was chosen for selectivity trials in British Columbia and experiments were conducted on the 65-foot shrimp-trawler *Beaufort Sea* in 1993 and 1994, resulting in a bycatch of less than 10 per cent. As a consequence of the trials, grates have been installed on approximately 40 otter-trawlers and 10 beam-trawlers.

A joint Department of Fisheries and Oceans (DFO)/B.C. Ministry of Agriculture, Fisheries and Food project was conducted from May to August, 1996, in order to obtain current data on bycatch in beam and otter trawls, to see the difference in bycatch between the

two gear types, and to establish the parameters for a more comprehensive survey to be conducted in 1997. A summer student was engaged to conduct sampling in various areas including Chatham Sound (Area 4), Comox (Area 14), Crofton/Chemainus (Area 17), Fraser River/Howe Sound (Areas 28/29) and West Coast Vancouver Island/ Barkley Sound (Areas 23/123).

Recognizing the increased pressure on the stock from the influx of new entrants to the fishery in 1995, participants at the Shrimp Industry Management Strategy Workshop held in Parksville, British Columbia on February 29, 1996 recommended that

- a series of controlled shrimp beam-trawl selectivity experiments be conducted during 1996 on commercial fishing vessels; and
- these selectivity experiments be conducted in accordance with protocols developed from "The Methodology Manual — Measurement of Fishing Gear Selectivity" published by Responsible Fishing Operations, Fisheries Management, DFO.

The protocols agreed upon between DFO and the B.C. Beam-Trawlers' Association (BCBTA) included the following:

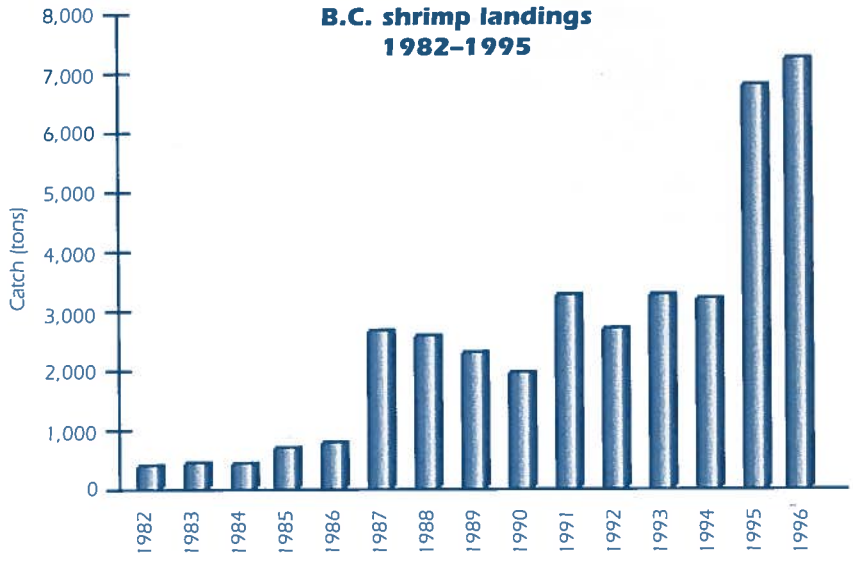
- Proper planning of the selectivity experiments with specific, achievable objectives. Minimum number of tows; towing speed; duration of tow; time of day; depth of tow and area to be fished will be specified. Geographic locations will be chosen from areas fished commercially with reasonable environmental conditions.
- Use of the trouser-trawl method in selectivity experiments, with each leg of the trawl attached on opposite sides of a vertical panel inserted in the main body of the net. The control codend and test codend should be as

Figure 2

Shrimp landings (tons) by trawl, including effort and value from the sales slips, 1982 to 1996[1].

Year	Number of Eligible Licences	Number of Vessel Landings	Fishing Effort (days)	Shrimp Landings (tons)	Total Landed Value ('000s $)	Whole Landed Value ($/kg)	– X CPE[2] (tons/day)
1982	249	n/a	4,230	398	863	2.17	0.09
1983	249	120	8,076	411	1,095	2.66	0.05
1984	249	114	6,783	408	1,022	2.50	0.06
1985	249	102	6,337	678	1,180	1.74	0.11
1986	249	102	5,580	768	1,240	1.61	0.14
1987	249	165	9,027	2,643	4,609	1.74	0.29
1988	249	190	6,763	2,561	3,248	1.27	0.38
1989	249	174	6,982	2,299	2,838	1.23	0.33
1990	249	173	6,360	1,940	2,637	1.36	0.30
1991	249	185	7,564	3,265	4,430	1.36	0.43
1992	249	162	6,123	2,683	3,499	1.30	0.44
1993	249	158	6,139	3,283	3,499	1.07	0.53
1994	249	165	7,311	3,192	4,776	1.50	0.44
1995	249	216	14,331	6,778	13,663	2.02	0.47
1996[1]	249	–	19,192	7,247	11,225	1.55	0.38

(1) 1996 preliminary data to February 10, 1997



close as possible to the overall dimension of a single codend used in the commercial fishery.

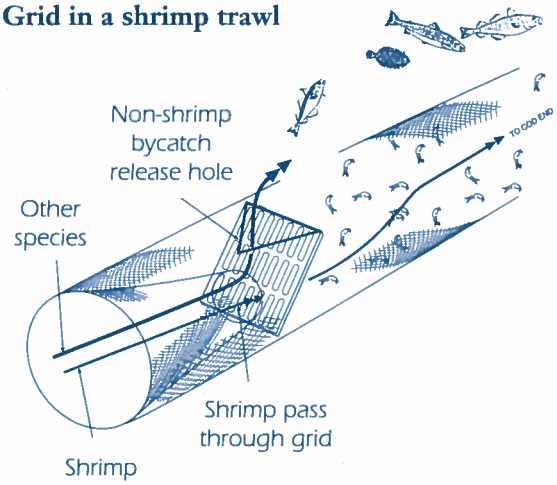
- Use of a vessel typical of that used in the beam-trawl shrimp fishery in British Columbia and will have an experienced captain.
- Use of an underwater camera to observe the functioning of the gear and fish behaviour prior to actual experimentation, and a computer-based, data management system will record and analyze pertinent data, such as swept area, distance run, gear geometry and water temperature.

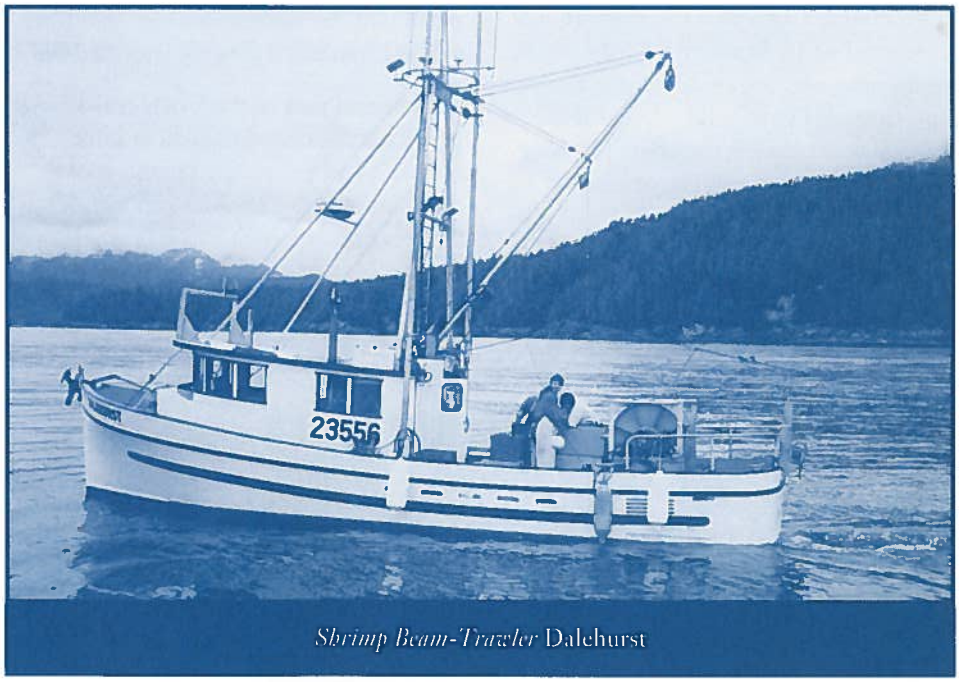
In addition, the protocol required that only tows with catches of 250 or more shrimp would constitute a valid tow. For small catches, all shrimp and bycatch would be measured using electronic calipers. A random sample would be measured for large catches. A final report, including videotape, would describe the materials and methodology used, an analysis of the results, conclusions and recommendations. The report would be distributed to industry and a workshop held to convey results and initiate discussion.

Experiments were carried out in the Barkley Sound area during the summer of 1996, utilizing two beam-trawlers (see photograph) and an experimental net constructed by Cantrawl Pacific Fishing Services Ltd. Results were inconclusive, due mainly to difficulty in operating and handling the larger than normal net and it was considered that the tests were not representative of actual operating conditions. In particular, it was felt that the reduced towing speed resulting from the increased drag of the experimental net, did not permit sufficient flow of water through the Nordmore Grate to allow it to operate properly. As a consequence, it was decided to suspend the at-sea trials until additional experimental work could be carried out on net design and excluding devices, at an appropriate facility.

Figure 3

The Nordmore Grid in a shrimp trawl





Shrimp Beam-Trawler Dalehurst

The Fishing Technology Unit (FTU) of the Marine Institute in St. John's, Newfoundland, undertakes industrial research and development to address the specific needs of fish-harvesters and gear manufacturers. The Unit's primary testing facility is the Flume Tank — the aquatic equivalent of a wind tunnel. With its sophisticated video recording, computer software, sensor equipment and special features, this advanced facility serves the entire fishing industry. Staff members with expertise in fisheries and mechanical engineering, fish behaviour, fishing technology and fishing gear have worked on projects worldwide for a variety of national and international clients. The FTU was requested to submit a proposal for a one-week training session, during which various models of shrimp-trawls would be tank-tested in the Flume tank,

the largest of its kind in the world. Topics to be covered included

- dynamics of a beam-trawl system as seen in the Flume Tank;
- trawl gear components and their role in bycatch avoidance;
- modelling of contemporary Pacific Coast beam-trawls in the Flume Tank; and
- responsible fishing: selectivity and conservation.

A satisfactory proposal was received from FTU and, with financial support from Human Resources Development Canada (HRDC) and DFO, BCBTA arranged for a one week session at the FTU Flume Tank during January–February, 1997.

The British Columbia contingent consisted of 15 beam-trawl fishermen, representatives of two net manufacturers and three DFO officials. Local fish-harvesters attended the trials in order to confirm the suitability of beam-trawling for a test fishery that will take place in Newfoundland waters during 1997. A total of nine, one-third scale net models, provided by five different net manufacturers, were tested in the Flume Tank and modified to correct perceived deficiencies. In addition, a full-size Nordmore Grate and accelerator, installed in a codend extension, was "towed" at various speeds to assess performance under actual operating conditions.

Tank testing of the various net models clearly demonstrated the differences in the underwater shape of the individual two-panel and four-panel nets, and suggested means of reducing slack in webbing, adjusting head-line height, maintaining bottom contact and ensuring that the extension and codend sections remain open to permit the escape of non-target species. The performance of each net was documented and video-taped and the results forwarded to the BCBTA for further analysis. It is anticipated that this analysis will lead to further at-sea experimental work later in 1997.

An integral part of the beam-trawl project is the dissemination of information to all interested shrimp-trawl fish-harvesters. The principal forum for this process was a two-day workshop held in Nanaimo on 10–11 April 1997, at which time the representatives of the BCBTA who were selected to attend the Flume Tank trials in Newfoundland presented the results of their findings to all workshop participants, in conjunction with representatives of the major net manufacturers. Newcomers to the industry, and those who were unable to attend the Flume Tank trials, observed and listened to the results of experiments relating to large-mesh panels; towing speed; headline, footrope and sole-rope configuration; knotless twine; and details of hard and soft excluders. This information will enable them to set up and operate their nets and ancillary equipment in such a manner as to ensure that bycatch and seabed impact are kept to an absolute minimum. In addition, various speakers from industry and government addressed the participants on issues such as the management of the shrimp fishery, underwater photography, use of satellite navigation systems and bycatch reduction. The exchange of information between government and industry is expected to result in an improved understanding of the challenges facing the industry and assist in arriving at decisions that will ensure a long-term, viable fishery.

Shrimp beam-trawl with Nordmore Grate in the Flume Tank being observed by Skipper Stan Logan.

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DFO/5614
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Cat. No. Fs23-300/4-1997
ISBN 0-662-63223-0

Printed on recycled paper