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**An Overview of Joint Science/Industry Surveys
on the Scotian Shelf, Bay of Fundy, and Georges Bank**

by

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¹La présente série documente les bases scientifiques des évaluations des ressources halieutiques sur la côte atlantique du Canada.

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Abstract

Since 1993, when the cod fishery on the eastern Scotian Shelf was closed, there has been significant growth in the cooperation between fishermen and the Department of Fisheries and Oceans (DFO) scientists. This is particularly evident in the establishment of seven surveys jointly conducted by DFO Science and the fishery industry in the Scotia-Fundy Region. Typically, these surveys are designed cooperatively by both parties but with guidance from Science. The surveys are conducted using fishing vessels, often at their expense, and the data recorded under scientific protocols. On-shore processing is supervised by Science by, again, often funded by the industry. Analysis of the collected data is undertaken by Science with discussion of the results with the industry partner before inclusion in the assessment. The willingness of the industry to cooperate in these surveys comes at a time of declining Science budgets and increasing fishing interests in non-traditional species. Over the long-term, these surveys promise to become an integral part of the assessments of the Region's fish resources. This report describes each of these surveys -- background, set-up, survey design, sampling and data processing protocols. It notes the common elements and the differences and where appropriate, makes recommendations on improvements.

Résumé

Depuis 1993, année de la fermeture de la pêche de la morue dans l'est de la plate-forme néo-écossaise, on a constaté un net accroissement de la coopération entre les pêcheurs et les scientifiques du ministère des Pêches et des Océans (MPO). Le phénomène s'est manifesté particulièrement dans l'établissement de sept relevés de recherche exécutés conjointement par les Sciences du MPO et par l'industrie de la pêche de la Région de Scotia-Fundy. Habituellement, ces relevés sont conçus en collaboration par les deux parties, sous l'encadrement des Sciences. Ils sont réalisés à partir de bateaux de pêche, souvent aux frais des propriétaires de ces derniers, et les données obtenues sont consignées selon des protocoles scientifiques. Le traitement des données à terre, souvent financé par l'industrie, s'effectue également sous la surveillance des Sciences. Ces dernières procèdent à l'analyse des données recueillies et discutent des résultats avec les partenaires de l'industrie avant de les inclure dans les évaluations. La volonté de l'industrie de collaborer à ces relevés survient à une époque où les budgets des Sciences diminuent et où l'intérêt croît pour la pêche d'espèces non traditionnelles. À plus long terme, les relevés de cette nature promettent de faire partie intégrante des évaluations des ressources halieutiques de la Région. Le présent rapport décrit chacun des relevés en question - contexte, organisation, conception, protocoles d'échantillonnage et de traitement des données. Il fait ressortir les points communs et les divergences et, lorsqu'il y a lieu, présente des recommandations sur les améliorations à apporter.

Introduction

In September 1993, the cod fishery on the Eastern Scotian Shelf was closed as a result of scientific advice on the state of the stock. The fishing industry in Cape Breton began lobbying the government for the opportunity to conduct some type of fishing activity to aid in the assessment of the 4Vn resource, the feeling being that Science had seriously underestimated stock size and thus yield. A test fishery was immediately put in place in cooperation with the Marine Fish Division (MFD), and involved vessels fishing in locations specified by fishermen in 4Vn. A number of operational problems were encountered in the establishment of this test fishery, primarily due to the rapidity in which it was implemented. Notwithstanding this, it provided many useful lessons for other like surveys that have since been established in the Region. To date, there are now seven joint Science/Industry surveys either implemented or on the drawing board in the Region, with more likely being added as new fisheries develop. This is not only stimulated by the new Emerging Fisheries Policy which requires new license holders to undertake survey activity with Science but also due to a growing awareness in industry of the importance in these activities. Over the past number of years, communication between Science and industry has improved considerably. This has paved the way for cooperative ventures such as joint surveys. Also, as one industry sector enters into these new partnerships, it has stimulated others to do the same. The result of this has been a growth of survey effort unsurpassed since extended jurisdiction. In 1995, a total of 638 fishing locations were sampled in these surveys. This compares to 436 stations conducted on the DFO (Department of Fisheries and Oceans) surveys. It is evident that these surveys will become an integral component of the Region's groundfish stock assessments.

This increased survey activity has not been without its downside. All these surveys started at different times, with different fishing groups and different funding structures. Therefore, coordination and standardization have been both difficult and indeed, perhaps undesirable at this early stage of development. However, now is a good time to review the overall program, understand the objectives, design, and operations of each survey, and where practical, make recommendations for improvements. The first step in this review is a compilation of the information on each survey. This was done by MFD staff at two meetings held at BIO on 17 and 23 November (see Appendix 1 for list of participants). It became evident during these discussions that there were a number of operational issues that would benefit from a common approach. A series of recommendations were thus made. In addition, there were concerns for some of the survey designs that require dialogue with the industry partners. Finally, recommendations were made on improving data processing and the communication of survey results.

This report summarizes discussion on joint Science/industry surveys conducted by MFD staff at meetings in BIO on 17 and 23 November 1995. The report was subsequently tabled at a meeting of the Statistics, Surveys and Sampling Committee (SSSC) in Moncton during 27 - 30 November, during which like reports on the surveys in the other DFO Regions were discussed. The results of these discussions will be transmitted to the industry partners by Regional Science staff during 1996.

Overview of the Survey Program

The current joint Science/ Industry survey activity on the Scotian Shelf, Georges Bank and in the Bay of Fundy is summarized in Table 1. Three Fixed Gear (FG) surveys in 4Vn has thus far been completed. The program in 4VsW, which is sponsored by the Fishermen and Scientists Research Society (FSRS), has only just begun with one survey completed. The 4Vn and 4VsW surveys are funded by both DFO and HRD (Human Resources Development) under the Memorandum of Understanding on Sentinel Surveys between the two departments. Discussion on the Mobile Gear (MG) survey in 4X started in 1994 but it took considerable time determining how administratively the ITQ fleet could use part of its quota to fund the

survey. The first survey was conducted at the same time as the DFO summer bottom trawl survey in July 1995. Discussion with the South West Nova Scotia Fixed Gear Association (SWNSFGA) on a joint survey started in the fall of 1994. However, there is as yet no agreement as to how the survey is to be funded. A group of fixed gear fishermen who traditionally fish Georges Bank agreed to use part of their ITQ in a survey during August 1995. Finally, the 4X Monkfish and 4VsW Skate surveys were both initiated in 1995 under the Emerging Fisheries Policy. In these, survey activity is a condition of license for entry in the directed fishery.

Table 1. Summary of Joint Science/Industry Surveys conducted on the Scotian Shelf, Georges Bank and in the Bay of Fundy since September, 1994

Survey	Date Initiated	On-Going Timing of Surveys	No of Surveys Completed to Date	Science Project Leader	Industry Partner	Funding Source
4Vn Fixed Gear	September 1994	June September	3	Tim Lambert	Five Cape Breton FGAs	DFO HRD
4VsW Fixed Gear	October 1995	March October	1	Paul Fanning Kees Zwanenburg	FSRS	DFO HRD
4X Mobile Gear	July 1995	July	1	Peter Hurley	ITQ Cte	Industry
4X Fixed Gear	in planning	TBA	NA	Don Clark	SWNS FGA	TBA
5Z Fixed Gear	August 1995	August	1	Joe Hunt	FG ITQ Vessels	Industry
4X Monkfish	October 1995	September	1	Dianne Beanlands	ITQ Cte	Industry
4VsW Skate	August 1994	April October	4	Jim Simon	Skate Fishermen	Industry

MFD staff considered the following characteristics of each of these surveys during the meetings of 17 and 23 November:

- The survey objectives i.e. abundance estimates, distribution, etc.
- Survey design and sampling protocols
- Where did the proposal originate - was this an industry or DFO initiative?
- Who are the participants, how were they selected, was there any training?
- How was the data processed? How was the survey documented?
- How was the survey paid for?
- How did the survey work out - was the original design adhered to or was it modified?
- What major problems were encountered and what changes are required?

The sections on each of the surveys below outlines these features along with problem areas and recommendations identified during the discussion. At the end of the report, there is an overview that provides comment on issues and problems common to either some or all of the surveys. Recommendations to address these are given.

4Vn Sentinel Survey

Objectives

The main goal of the 4Vn Sentinel Survey is to provide an index of abundance of the 4Vn cod stock. In addition, the survey provides information on the abundance and distribution of other species taken as bycatch along with cod. The survey also fulfills the desire of the inshore fishing industry to take an active role in the determination of the status of the 4Vn cod stock while providing information to the DFO that it would be unable to obtain with its own resources. This survey forms an adjunct to DFO groundfish surveys that have been carried out in this area during the past two decades.

Origin of Survey Proposal

In late 1993, after the closure of the 4Vn cod fishery, the fishing industry in Cape Breton began lobbying the government for the opportunity to conduct some type of fishing activity to aid in the assessment of the status of the 4Vn stock. During the summer of 1994, a team made up of personnel from the Department of Fisheries and Oceans (DFO) Operations and Science Branches and Human Resources and Development (HRD) worked out the details of a sentinel fishing program for the 4Vn area off Cape Breton. There was a wide disparity in the amount of fishing wanted by the industry and the amount required by Science to do an adequate assessment of the abundance of the fish stock. By August 1994, a compromise plan had been formulated which would have good scientific value and adhere to conservation principals, while allowing sufficient fishing to qualify for assistance under the Atlantic Groundfish Strategy (TAGS) program of the HRD. This program consisted of two three-week periods (during June and September) for a survey of the abundance of resident 4Vn cod and two six-week periods (October/November & April/May) for monitoring the migration of Gulf of St. Lawrence cod to and from Sydney Bight. The surveys would be carried out by six longliners (five trips each) and the migration monitoring by one longliner (six trips). The project would be funded by DFO and HRD and monies gained from sale of catch would be used to subsidise the operation of the project.

A number of fishermen's organisations were interested in participating in the sentinel survey. Therefore, to facilitate the operation of the venture, an umbrella organisation - the 4Vn Sentinel Fishery Association - was formed. This association comprised representation from five industry groups - the North of Smokey Fishermen's Association, the Glace Bay Fishermen's Association, Maritime Fishermen's Union - Local #6, the Port Morien Fishermen's Association, and the 4Vn Hook and Line Association. Also, three persons not associated with the fishery but residents of the three geographical areas represented by these five associations were named to the Board of Directors. Timothy Lambert and Fred Allen (DFO) were named as ex-officio members. Two officers were elected; they were by acclamation, Greg Organ (North of Smokey F.A.), Chairman, and Kevin Nash (Glace Bay F.A.), Manager. The 4Vn Sentinel Fishery Association was duly incorporated and registered with the N.S. Registrar of Joint Stock Companies.

Survey Design and Sampling Protocol

Survey Design

A stratified random sampling scheme was used, similar to that used by DFO groundfish surveys. The sampling area was approximately 4000 sq nautical miles (13,750 km²), comprising all of 4Vn within the 100 fathom contour and with the omission of about 650 sq miles in the south-east corner of the subdivision. This last area ranged from about 50 miles from shore at its nearest point to about 80 miles at its furthest which was considered an impractical distance to travel. This sentinel survey area was thus virtually identical to the area surveyed as 4Vn by the DFO July groundfish survey. The sampling area was divided into three strata on the basis of depth. Sixty set locations were selected randomly and assigned proportionally among the three strata (Table 2). The survey area with the set locations for the September 1994 survey is shown in Figure 1.

Table 2. The three depth strata for the 4Vn Sentinel Survey.

Depth (fath)	Depth (m)	Area (nm ²)	Area (km ²)	% of Total	# of Sets
<30	<55	1,070	3,674	25	15
30 - 49	55 - 91	1,320	4,532	32	19
50 - 100	92 - 183	1,780	6,112	43	26

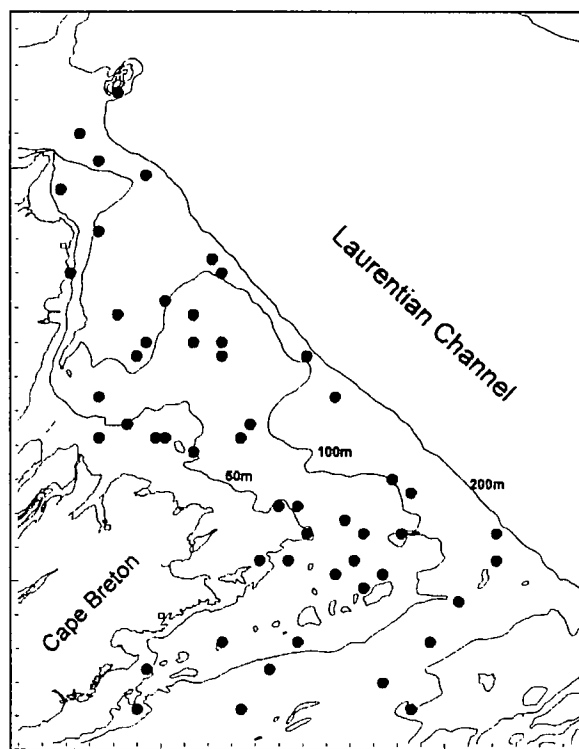


Figure 1. 4Vn Sentinel Survey - Survey area and set locations, September 1994.

Fishing Gear

Fishing sets, gear specifications and methods of deployment were standardized in consultation with industry. The original proposal of gear specifications was:

- One set consisted of five tubs of gear.
- A tub of gear contained 450-500 hooks.
- Hooks were to be No. 12 circle.
- Gangions were to be 18 in. long, made of 150-200 lb. test (3-4 lb. linear weight) braided nylon set 6 ft apart along the groundline.
- Bait was to be mackerel.
- Soak time was to be 3 to 6 hours.

An additional standardisation was added to recognise a tactic common in the Cape Breton area; the groundline had floating line spliced to it at intervals to raise hooks off the bottom. The floating line is added every 60 hooks; thus from the anchor, by groups of hooks: 30-normal back line; 60-floating line spliced in; 60-normal; 60-float; 60-normal; 60-float etc

Statistics collected after the survey to monitor the degree of conformity to standards showed the following gear values for the six boats :

	Minimum	Average	Maximum	Standard Deviation
Soak Time (hours)	2.6	6.2	12.1	2.0
Hooks (total)	2,225	2,295	2,550	60
Hooks (per tub)	445	460	510	12
Length of set (km)	3.5	3.9	4.5	0.3

Sampling Protocol

The following protocol was conducted on each set:

- Surface temperature taken.
- Temperature recorder attached to one string of gear before setting and removed after gear is retrieved at end of the set; recorder delivered to field data coordinator for data recovery.
- Standard set and gear details recorded.
- Count and total weight estimate recorded for all species, including discards.
- Sample of 200 cod, randomly selected, reserved for individual length and weight measurements.
- From each of these random samples of 200 cod, otoliths collected from a random sub-sample of 50 fish
- All measurements recorded on data sheets.

Each boat was provided with a sampling kit which, along with instructions on sampling protocol, included measuring board, scales, clipboard, pencils, data sheets, temperature recording instruments, a wheelhouse logbook for recording of information other than that recorded on data sheets (presence of other sealife such as whales, seals etc.; damage to gear; tide and current conditions, weather; any unusual event), and tables for conversion of measurement units.

Selection of Participants

Applicants for participation in the survey had to meet the following criteria:

- be a single groundfish only licence holder
- be eligible for HRD Income Assistance through TAGS
- be the head of an active fishing enterprise
- have fished full-time for seven years
- have earned 75% of income or annual revenues of \$20,000 from fishing.

In addition, the applicants had to be prepared to make a multi-year (3-5) commitment to the project. Also the Board decided to make it mandatory that boats must be decked over, have good navigational equipment and carry lifeboats.

Data Processing

The data forms used are a modified Observer Program form set. Information on end of setting of gear and beginning of haul back of gear; also numbers of individual species of fish are collected in addition to the standard Observer data set. Data sheets are collected and scanned for errors by the field coordinator before being returned to the scientific coordinator. Next, a data technician does an additional visual error check before passing the sheets on for key punching, after which the data, in electronic form, are loaded to a database via a computer error checking system written for the Observer Program. The sentinel survey database, in the form of Oracle tables on a mainframe computer, are finally downloaded to a PC platform (Paradox database) for analysis.

Documentation is produced by the Scientific Authority in the form of a report which is delivered to industry representatives, survey participants and DFO management. In addition a DFO Atlantic Fisheries Research Document is prepared.

Costs and Funding Agencies

DFO Science, Human Resources Development (HRD) and Enterprise Cape Breton Corporation (ECBC) provided funding for this project. On average, surveys have cost about \$125 K each to run. Initially HRD provided about \$100 K and DFO \$25K. ECBC provided funding on a cost shared basis up to \$45 K and sales of fish are credited to the project. Thus ECBC provided about \$22 K per survey and fish sales have averaged about \$10K per survey. HRD deducts ECBC's contributions and the proceeds of sale of fish from its costs; therefore, actual HRD funding per survey is about \$68 K.

Results

The survey was quite successful. To date, 85 of a possible 90 trips have been completed over three surveys. These missed trips were due to mechanical breakdown. Data collection problems have been minimal and it has generally been possible to correct entry errors on data sheets. Some temperature data was missed due to malfunctioning equipment and some initial operator inexperience.

Problems

The main problem has been delays due to difficulties in arriving at budgets acceptable to HRD. Top-up of crew's salaries is desirable but not possible under HRD rules. A \$50 per person per week bonus was found acceptable by Ottawa HRD management but overruled by regional HRD. DFO had arranged that monies from sale of fish revert to the crown, which would turn this over to the 4Vn Sentinel Fishery Association. It was assumed these funds could be accumulated to cover possible shortfalls and for continuation of the survey after cessation of present funding. However, HRD had decided it be the sole claimant of all revenues accruing from sale of fish. Thus, there is little incentive for the project managers to ensure that all fish are sold and not given away by boat owners. This matter needs to be resolved between the two departments in 1996.

Eastern Scotian Shelf Sentinel Survey

Objectives

The objectives of the Sentinel Survey in 4VsW are:

- To develop indices of fish abundance using commercial fishing vessels to supplement the fishery independent estimates of fish abundance developed by the Department. These operations would be concentrated in, but not restricted to, the inshore midshore waters of the area of operations.
- To use commercial fishing vessels to monitor the migratory patterns, local distributions, spawning condition, spawning locations and size structure of fish populations.
- To use commercial fishing vessels to collect biological samples from local fish populations in support of research on stock structure, diet analysis, and other relevant topics.
- To gather information on by-catches of non-target species and oceanographic conditions (etc), thereby providing information that would allow the Department to consider a more "ecosystem based " approach to resource assessment and management.
- To provide for a continuation of the process of co-education between fishermen and fisheries scientists / managers initiated through such projects as the Fishermen and Scientists Research Society (FSRS) and the 4Vn Sentinel Survey initiatives.
- To continue to improve the degree of co-operative research between the Department and the fishing industry in support of long-term sustainable fisheries management.

Origin of Survey Proposal

This survey originated as a joint DFO / HRD initiative. A Memorandum of Understanding signed between these two Departments made it possible to allocate TAGS funds from HRD and A-base funding from DFO to this survey. Industry participation was solicited through the Fishermen and Scientists Research Society (FSRS) which acted as a sponsor for the project.

Survey Design and Sampling Protocol

The survey adopted a stratified random design using the Scotia-Fundy summer groundfish depth strata as the primary stratification scheme. Three new strata, extending from the shoreline to the 50 fathom isobath, were defined. The allocation units used to determine fishing locations within each stratum were also the same as those used in the summer surveys (2.5x2 minutes). A total of 300 sets were planned at the outset of the survey. Sets were initially allocated to strata on a proportional area basis with some modifications to deal with contingencies. The total numbers of sets allocated to some of the large offshore eastern strata were reduced because of the anticipated difficulties in getting coverage in these areas. Strata 43, 44, and 45 were combined into a single stratum.

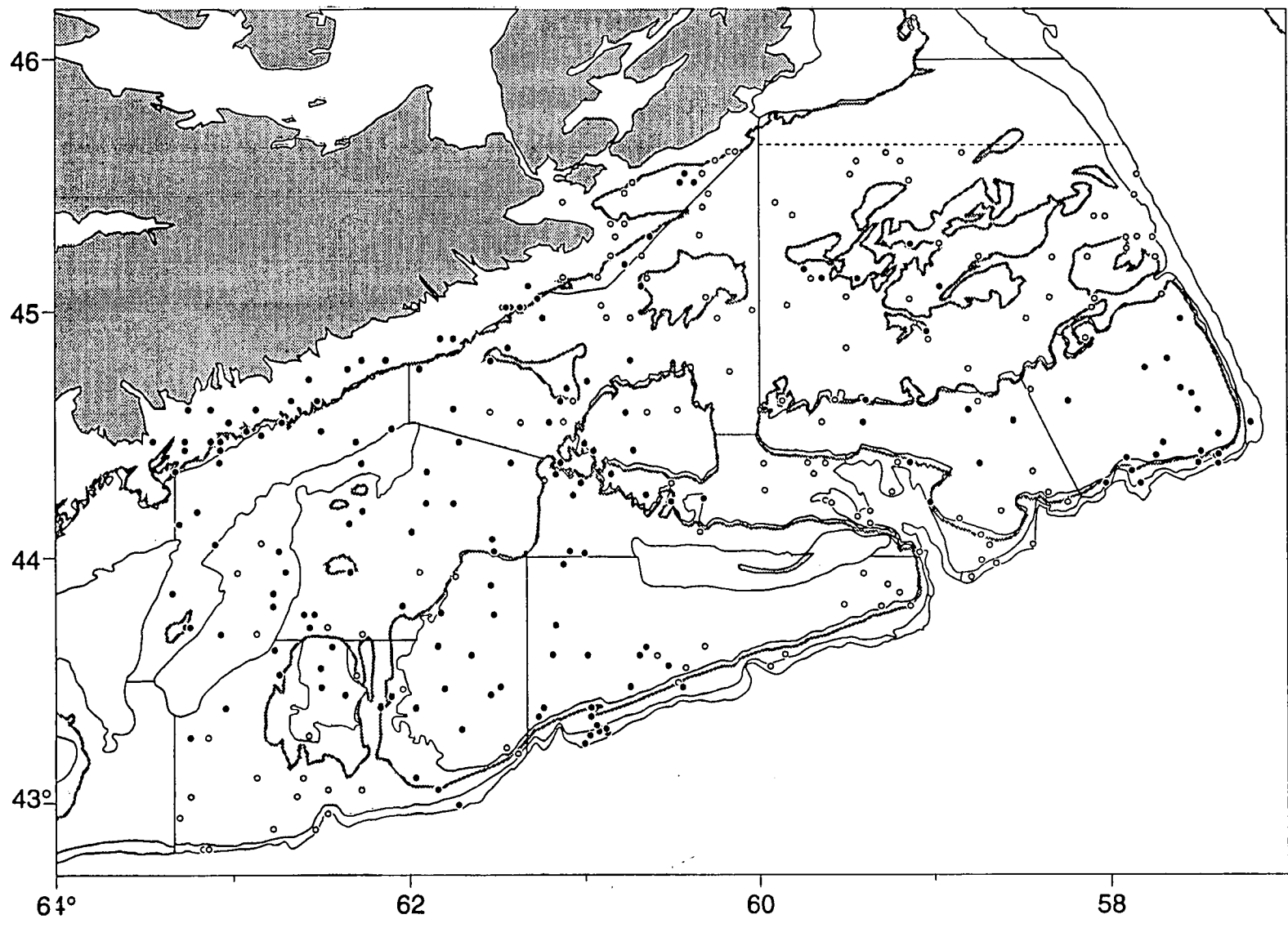


Figure 2. 4VsW Sentinel Survey - survey area and set locations, October/November 1995.

At the outset of the survey, each of the 16 participating vessels was assigned all of the sets of which they were to complete a specified number per week for a total of 5 weeks. This weekly allocation was necessitated by the HRD rules which provided payments for weeks of work rather than the number of sets completed in the survey. Vessels were divided into three categories depending on overall length and the areas usually fished. Truly inshore vessels were assigned a total of two sets per week, midshore vessels four sets per week and offshore vessels 6 sets per week. For all vessels, the first survey trip was accompanied by a certified observer. Observers were used on a proportion of subsequent trips to deal with particular issues.

Each vessel was also provided with a list of sampling requirements which specified the special sampling required for each set. Routine sampling for all survey sets included recording of total weights and numbers for all species caught.

Each vessel was also assigned a specific fish plant for landing for all survey catches. At each plant an agreement was established with a fish processor to purchase the catch, and to provide bait, and fuel to the participants. The objective was to pay for all bait and fuel using the proceeds from the catch

Selection of Participants

The participants were chosen from the TAGS eligible fishermen normally fishing in the area from Sambro to southern Cape Breton. Initially two organizations, the FSRS and the Cape Breton Sentinel Fishery Association formally agreed to act as co-sponsors of the project. They were therefore responsible for advertising the project, soliciting participants and jointly with DFO representatives choosing the final participants from the original pool of applicants. As no vessels from Cape Breton applied to participate, the FSRS became sole sponsor of the project. Since the total number of applicants closely approximated the total required number of participants the selection process was moot.

Data Processing

Data were collected using the data forms, editing procedures and data base structure already in place for the Scotia-Fundy observer program.

Costs and Funding Agencies.

This survey was funded jointly by HRD and DFO. Under the ministerial memorandum of understanding the two Departments agreed to share the costs of this project such that DFO would contribute 10% of the funds made available by HRD and the original allocations were \$1.3M HRD, and \$130K DFO. HRD reduced its contribution to this project to just over \$320K and DFO reduced its contribution to \$120K.

Results

Of the 300 planned sets, a total of 219 were completed (Figure 2). In general, the original design was strictly adhered to. One additional set was allocated to take advantage of an opportunity to complete extra sets in an area where only a small proportion of the total allocated sets had been completed. Cod was the most abundant species caught, followed closely by haddock. Dogfish and skates were the next most abundant groups, with hake ranking fifth.

The most striking result of the survey is that the majority of all cod caught during the survey were caught in the newly defined strata inside the 50 fathom contour. These areas have not been surveyed by Departmental groundfish surveys. Another notable result is that significant catches of white hake were made in the Emerald Basin in locations where fishermen generally have not fished before.

The length-frequencies derived from the sentinel survey show that the gear is highly selective for the larger specimens of all species. Very few fish under 35 cm were caught. The survey as presently designed will not give estimates of incoming recruitment.

Proceeds from the sale of fish from the survey were just sufficient to pay for the costs of both bait and fuel. A final accounting will likely show a differential of under \$1000.

Problems

The negotiations surrounding the use of HRD funds, and the subsequent reduction of these funds was the major difficulty faced in getting this project off the ground. These discussions and re-negotiations resulted in a delay beyond the planned start-up date of just under one month, and precluded the completion of the winter survey.

The rules under which the HRD funds were to be utilized are not consistent with the overall objectives of the project and need to be modified to maximize the probability of successful future ventures. The total monies available to the project is presently based on the total person weeks involved. This necessitates the involvement of a large number of participants over a relatively long period of time. Ideally monitoring surveys such as these should be conducted in the shortest possible time to ensure that the effects of migration, mortality, and recruitment during the survey, are minimized. The use of TAGS funds provided a disincentive for crews of participating vessels and made it difficult for skippers to find willing crews. Since crew members on TAGS who stayed home were receiving the same remuneration as those out working, it was difficult to convince some crew members to work for their money.

There was some concerns of impropriety during the survey. These included filleting and not recording fish, discarding and not recording small fish, fishing outside the assigned fishing location, and fishing additional gear. It appears that these events, if they occurred at all, were isolated and infrequent.

At the review workshop conducted following the completion of the survey, and which the majority of participants attended, it was stated that there were significant misgivings on the part of a number of participants, and on the part of many of the non-participating fishermen in their communities regarding the validity of the survey design. The whole concept of randomly assigned fishing locations was not considered to be conducive to determining the "amount of fish in the ocean". The issue was widely debated, and a presentation showing the benefits of the design was given. It is necessary to continue the process of education regarding the validity of stratified random approach, but is equally important that means of better incorporating the local knowledge and experience of the fishermen into these surveys be developed. One suggestion was that a proportion of the total number of survey sets be "fisherman directed".

The 4X ITQ Survey

Objectives

The objectives of the survey in 4X are:

- To provide an annual index of abundance (pre-recruit and adult) and distribution of cod, haddock and winter flounder in NAFO Division 4X
- To allow the collection of basic biological information on survey species.

Origin of Survey Proposal

At the annual Scotia-Fundy consultation on Science programs and priorities held in Yarmouth on 19 October 1994, participants expressed the opinion that Science could obtain better and cheaper data from jointly run Science/Industry surveys. It was recommended that a separate series of discussions be scheduled with representatives of the mobile gear fleet to plan a cod/haddock survey in NAFO Division 4X in 1995. Therefore, on 10 February 1995, Bob O'Boyle and Peter Hurley attended a meeting of the ITQ Committee to present an overview of what they saw as the survey objectives, some operational considerations and implementation possibilities. Rather than work out the details at that meeting, a Surveys Working Group was struck and members solicited. The Surveys Working Group met on 22 February to develop a survey plan. Budget details were subsequently added after discussions were held with Regional and Ottawa management. The survey proposal was presented to the ITQ Committee 23 May 1995 and received approval.

Survey Design

The survey area consists of all of NAFO Division 4X, out to approximately 200 fathoms and includes the inshore areas not currently covered by the DFO summer groundfish research vessel survey. The area is divided into 211 equal sized survey blocks. Each survey block consists of 30 "minor blocks" from the DFO research vessel survey design (minor blocks are 2.5 minutes latitude by 2 minutes longitude). Survey blocks are constructed to follow the DFO research vessel survey stratum boundaries as closely as possible, and to follow bottom contours when stratum boundaries could not be followed.

One set is made in each survey block. The exact location of the set within a block is at the discretion of the vessel captain. Captains are encouraged to select the set location before sailing and are discouraged from searching for fish prior to setting.

The survey is conducted at the same time as the DFO research vessel survey. A three week window is used to allow the vessels some flexibility. Vessels fish during daylight hours only, working a 12 hour day. The survey requires about 50 vessel-days.

Vessels are selected so that designated blocks are in the general vicinity of their home ports, to minimize unnecessary steaming. Survey vessels are selected to be as similar in fishing power as possible.

The standard gear is a 280 Balloon trawl, rigged with 14 inch "cookie" foot gear, no ground warps, and 120 foot bridles. Rigging is as uniform as possible. A codend liner is used. Vessels are constrained to tow in a standard manner i.e. into the tide, in a fairly straight course, for a distance of 1 nautical mile as determined by GPS/Loran C/track plotter. Vessels attempt to tow at 2.5 knots.

Selection of Participants

Three <65' ITQ vessels were selected by the ITQ Committee. Selection was based upon factors such as general fishery knowledge, ability to conduct the survey, and willingness to cooperate in the project for the long-term.

Data Processing

Total number and total weight of each species caught were determined. Length frequencies were collected for cod, haddock, pollock and winter flounder. No detailed sampling was conducted. Detailed sampling data the summer bottom trawl survey will be used. Bottom temperature was collected during the tow. Scanmar measurements of headline height and wing spread were obtained for each vessel. Each vessel carried one trained sampler (acceptable to Science - former certified observers). Vessel crew assisted the sampler in processing the catch and recording data. Observer Program data formats and protocols were used.

Data forms were processed as per the Observer Program. Visual data edits, data keypunching, and data editing through the Observer Program edit system were all contracted out. Data are loaded into an Oracle database.

Cost and Funding Agencies

The survey costs of vessel charters, gear, Observers including data collection, entry and editing, and the survey coordinator were borne by the ITQ fleet. This was accomplished using an unallocated portion of the ITQ fleet quota.

The ITQ committee designated an industry coordinator who worked with the DFO Science contact at BIO to implement the survey. This coordinator was responsible for on-going deployments of the survey vessels to the survey area. As well, the coordinator was to ensure that all data collected was processed as planned. The ITQ Committee conducted the vessel selection, based on factors such as general fishery knowledge, ability to conduct the survey and willingness to cooperate in the project for the long-term. The survey was conducted under the current license conditions, amended to incorporate the requirements of the survey as stated above.

Results

Three <65' vessels were selected by the ITQ Committee. The Committee felt that the available quota would only provide compensation for 30 vessel-days. The survey blocks were divided between these vessels and blocks were assigned priorities based on previous research vessel survey results for cod and haddock. Survey blocks outside the area covered by the research vessel survey were given a high priority, with the exception of blocks in Chignecto Bay, Minas Basin, Mahone Bay and the mouth of Halifax Harbour which were excluded. License conditions were provided for the period 26 June to 15 July which permitted these vessels to fish with a small mesh liner. The vessels fished from 26 June to 8 July, and completed a total of 139 sets (Figure 3) in the 30 vessel-days available. Scanmar gear was used to determine headline height and wing spread for six tows on one vessel and two tows on each of the other two vessels.

Problems

The entire survey area was not covered. Only 139 of 211 survey blocks were sampled in the time that the three vessels were available. The vessel assigned to the eastern portion of the survey area was unable to find acceptable towing locations in the inshore blocks of the area, east of Port Mouton. Two vessels used 300 Balloon trawls rather than the specified 280 Balloon. One vessel carried only one crew member which caused delays in processing the catch. Bottom temperatures were obtained for only approximately half of the tows. The Observer Program data format does not include number of fish caught and set locations are only recorded to the nearest minute. These problems will be addressed in 1996.

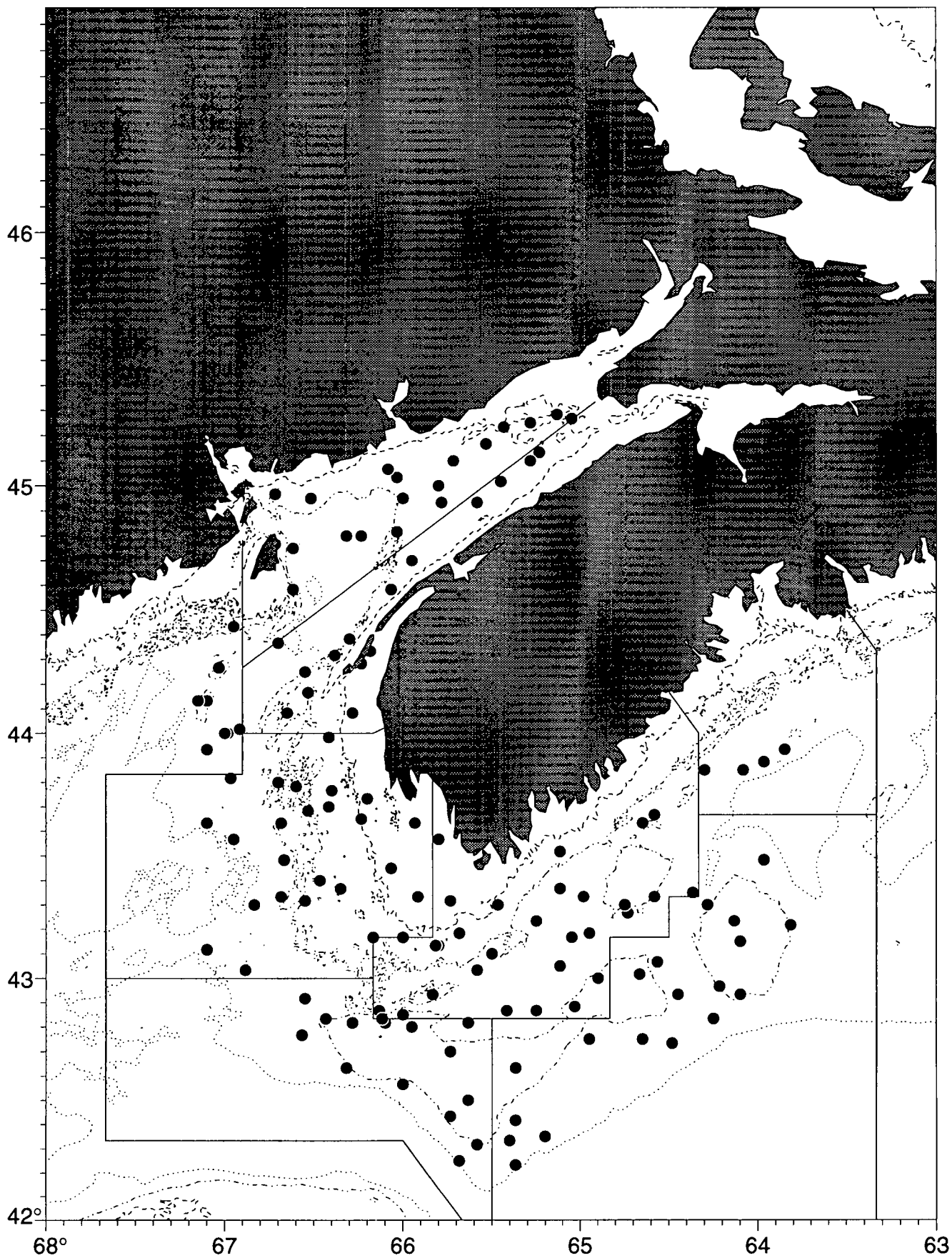


Figure 3. 4X ITQ survey - survey area and set locations, July 1995.

4X Monkfish Survey

Objective of the 1995 Survey

The aim of the 1995 4X monkfish survey was exploratory in nature, looking at spatial distribution as the primary objective and abundance secondarily. The information collected in year one will be used to re-stratify the survey area to provide an index of abundance. As well, the collection of basic biological data was carried out.

Origin of Proposal

Monkfish have historically been caught almost exclusively as a bycatch of groundfishing and scallop ventures. Until recently, markets were not specific to monkfish and most of the catch went to shack or was given to the crew. Now, however, monkfish is supplementing the dwindling supply of traditional groundfish as well as finding new markets i.e. Korea, for both whole fish and livers. Over the last few years, the landed weight of monkfish caught by mobile gear < 65' in the 4X area went from less than 200 t to over 600 t annually. In 1994, the pattern of fishing changed from that of a bycatch fishery to more of a directed fishery as the mobile gear fleet increased its number of monkfish directed trips.

In order to control the development of this and other non-traditional species fisheries, 1995 licence conditions limited the bycatch level for these species until the feasibility of allowing various management options i.e. higher bycatch levels, seasonal fisheries or directed fisheries could be examined. Therefore, using the Policy for the Management of Emerging Fisheries as a guide, DFO solicited applications from the mobile gear sector <65' to conduct a directed monkfish fishery in the 4X area on an exploratory basis in 1995, with potential for extension on a 3 to 5 year basis. The objectives of the plan were:

- 1) To define the eligibility criteria and selection process.
- 2) To define the science requirements for this project.
- 3) To define the operational rules for the ensuing fishery.

A dedicated monkfish survey was part of the scientific requirements of the project. This component of the plan in fact originated with industry. During 1994 and early 1995, several proposals were received from industry requesting that they be permitted a directed monkfish fishery, including a Science component for which they would pay the associated costs. As stated above, DFO decided to go ahead with a small directed commercial fishery with this survey as a main component.

Survey Design

The intent of the survey design was to cover the entire 4X/5Y area. As with the 4X mobile gear survey, the area 4X/5Y area was partitioned into 211 equal sized blocks. These blocks are the "minor blocks" from the DFO summer groundfish survey. Participants were required to do one set per block, with the stipulation that if that block could not be sampled due to gear/bottom problems, a set was required in another block. The exact location of the set was left to the discretion of the captain, although they were requested to make the locations as random as possible given the gear constraints.

It was recognized that there would be basic vessel differences in terms of trawl used (240-300 balloon) and fishing power (200-540 hp). Other factors were kept as consistent as possible. Flounder gear was used with no ground warps, a 120 ft bridle and no chafing gear. Scanmar equipment was not used. 130 square mesh was used by all vessels. Small mesh gear was not used due to lack of availability and anticipated bycatch of small fish. Vessels were required to tow a straight course for a distance of one nautical mile. As well, auxiliary data sheets were filled in for each set giving position, tow speed and comments at 5 minute intervals. Lat/long was requested in hrs, min, and sec in order to be able to assign the sets to the appropriate strata.

Selection of Participants

The proposals received from fishermen were rated on the following criteria:

Eligibility:

- Must have a valid groundfish licence, mobile gear <65'
- Must have a catch history of at least 20 tons of monkfish in 1994 and be able and willing to cover science requirements, operational rules and bear all related costs

Application:

Applications had to include information showing that they met the above-mentioned criteria. They were also required to provide the following information:

- business plan including estimates of operational costs, expected markets and sales revenues;
- estimates of additional costs to cover the scientific component of the fishery and required tonnage of monkfish to both cover costs and incur a reasonable profit;
- a detailed fishery plan showing the expected areas and dates of fishing and plans for the data collection, catch sampling, and reporting activities required under this program.

Selection:

A total of 200 metric tons of monkfish was allocated for this program. A joint DFO/industry selection committee reviewed all applications and screened them against the basic eligibility criteria. This bidding method allowed applicants some latitude in putting together a realistic proposal based on current market prices and their individual costs. Initially many of the proposals received were very similar, to the extent that it was not possible to differentiate between applicants based solely on these written submissions. Consequently it was decided, in consultation with the ITQ Committee to supplement the written proposals with personal interviews to complete the selection process. Subsequent to these interviews, five vessels were informed that they were the successful candidates. The remaining applications were kept on file as an eligibility list should any of the successful candidates fail to meet the performance criteria.

Special licence conditions were issued on 1995 groundfish licences in mid September, allowing the selected vessels to direct for monkfish. The issuance of these special licence conditions in 1995 did not imply any further commitment by DFO to issue special licence conditions on an annual basis thereafter, nor will those who have received these conditions in 1995, or any subsequent year of the program be given priority access should this exploratory monkfish fishery evolve to a commercial phase. It should be noted that performance criteria were introduced and that failure to meet these will result in the special licence condition being revoked and another vessel being selected, based on an eligibility list.

Data Processing

Observers collected biological information during the survey. This included estimated catch weights and length frequencies for all species, as well as a small amount of detailed information on monkfish (length, weight, otoliths for 40 monkfish) where possible.

Because the survey trips were observed, the data was entered into the observer data base as per standard procedures. As well, all monkfish trips were loaded into a separate database specifically for monkfish. Because

the monkfish program is also a commercial venture, observers were also required on 50% of their monkfish directed trips and industry volunteered to collect the same data (fill in observer forms) on the other trips. The creation of the separate data base allows this data to be incorporated easily. As well, separate tables will be created to handle the auxiliary information collected during the survey.

Costs and Funding Agencies

The proposals submitted by the industry participants included covering all costs incurred by the scientific portion of the program including observers, data entry, and provision for a summer student. There was no HRD involvement.

Results

In general, the survey was successful, although not all blocks were covered due to problems with weather, gear/bottom conflicts etc. However, 141 of the 189 total blocks were covered (Figure 4). The survey was scheduled to take place between Oct 7-21. One vessel was unable to finish its portion of the assigned blocks due to the onset of bad weather in combination with vessel size, and crew problems. The vessel owner tried to lease another boat but was unsuccessful as most available vessels are trying to catch up their remaining groundfish quota. One of the other participating vessels completed most of the remaining blocks in early November.

Problems

As the aim this years survey was intended to look at distribution rather than abundance, in order to set up an appropriate stratification scheme for next years survey, we had few major problems. Industry was very co-operative in trying to complete all the survey stations however weather, bottom type, etc did play a part in limiting coverage of some blocks.

Moving the survey to an earlier month i.e. September and restratification of the area based on the results of the 1995 survey may eliminate some of these problems. The use of different sized vessels and nets may be more difficult to evaluate. At times, a lack of communication between the participants and the observers resulted in some minor problems with data collection. These will be resolved next year.

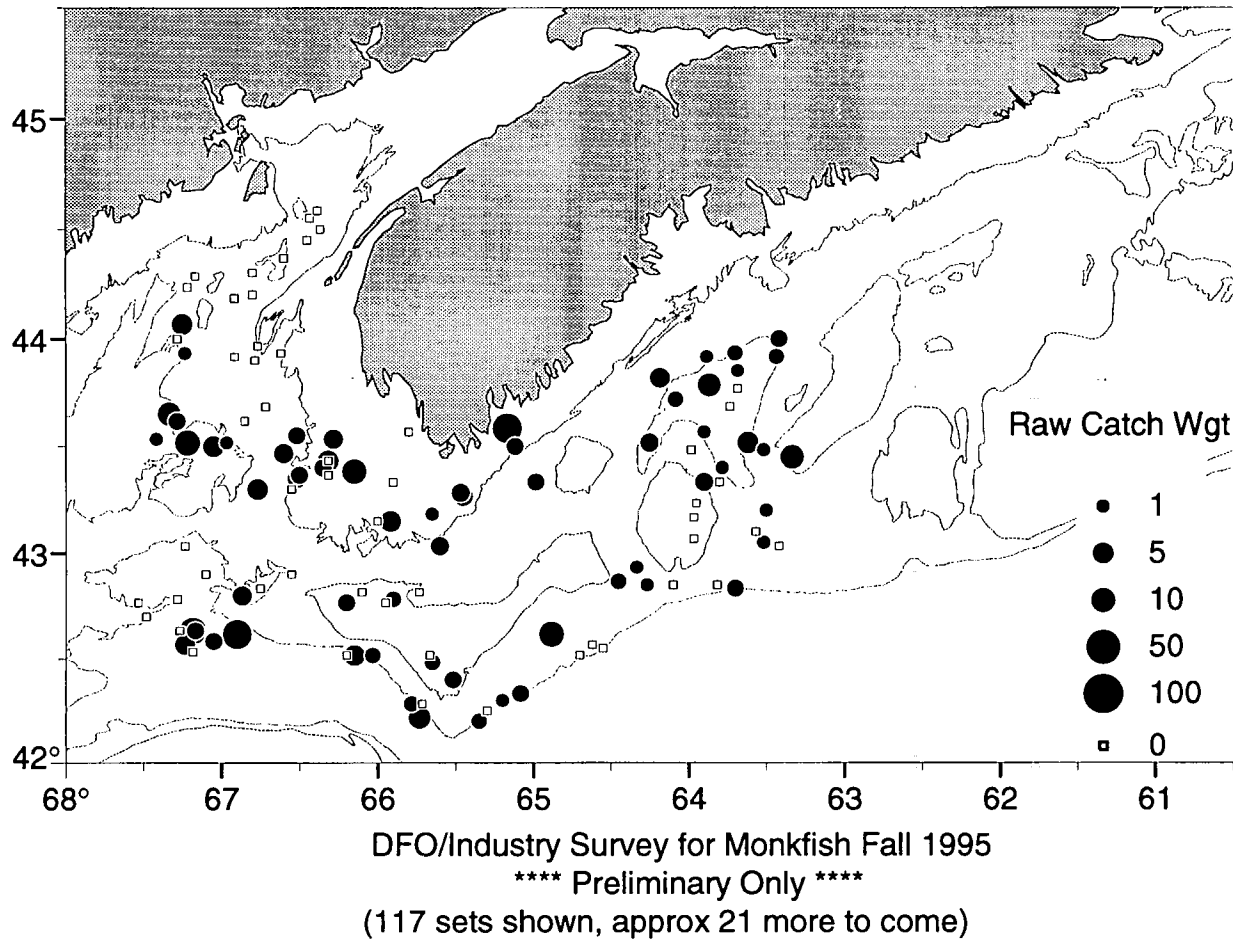


Figure 4. 4X monkfish survey - survey area and set locations, October 1995.

Georges Bank Fixed Gear Survey

Objectives

This hook and line survey is to provide an index of groundfish, particularly cod and haddock, abundance for the Canadian zone of Georges Bank (5Zj,m)

Origin of Survey Proposal

A proposal to conduct a survey on Georges Bank originated with the SWNS Fixed Gear Association, probably in response to the 4X Fixed Gear survey which was in planning.

Survey Design

The Canadian zone of Georges Bank was stratified into 31 x 10' rectangles with one standard set to be conducted per box. For the first survey, the location of the set within each box was the choice of the captain, but will be fixed for subsequent surveys. The survey was conducted in August, 1995.

Selection of Participants

Five vessels were selected by the SWNS FG Association based on history and interest. Fishing assignments were made to ensure a good mix of expected high and low catch rates for each vessel. Two meetings were held with participants to ensure that the principles of the survey were understood.

Data Processing

Sampling was completed by members of the Observer Program using standard Observer sampling protocol. A supplementary summary sheet (Figure 5) was also used to capture information on additional factors such as tide, weather, etc. All Observer data were entered to the Observer database and then extracted to separate tables and deleted from the Observer database to avoid confusion with 'normal' observed trips.

Costs and Funding Agencies

All vessel costs were assumed by the SWNS Association. Unused quota from the fixed gear allocation was assigned to cover survey catches. Per diem costs for Observers was shared by DFO and Association.

Results

Overall, results were good and the agreed protocol was followed.

Problems

The following problems will require addressing in the next survey:

- relatively small sample size to determine abundance estimate. Time associated with each set (6-8 h) limits number of observations with no replicate sampling in boxes.
- substantial part of the total area unsurveyed due to pre-selection of boxes to be fished by Association. Unfished boxes were assumed to have zero catches (Figure 6).
- selectivity of fixed gear will have to be incorporated in abundance index.
- timing may a significant factor in catch rates. Fishermen noted that best catches are made during slack and minimum tide cycles.
- subsequent surveys should increase sampling by use of more vessels. The standard set protocol should be easily followed by new vessels (number hooks, bait, soak time, etc)
- impact of factors influencing catch (tide, diel effects, gear saturation (skates, etc), loss of bait, etc) are difficult to evaluate.

1995 Georges Bank Hook and Line Survey

Vessel Name: _____ CFV Number: _____

Captain's Name: _____

Wind Speed: _____ (knots) Wind Direction: _____ Current: _____ (knots)

Weather: (cloud, rain, fog, clear) _____ Tide: _____ (flood, ebb, slack)

Survey Set Number: _____ Box Number: _____ Date: _____ 1995

Bait Used: squid Hook Size: EZ 12 Hooks Set: _____ Tubs: _____ Strings: _____

	Time	Latitude	Longitude	Depth (fm)
Start of Set	_____	_____	_____	_____
End of Set	_____	_____	_____	_____
Start of Haul	_____	_____	_____	_____
End of Haul	_____	_____	_____	_____

Catch Composition	Number Caught	Weight Caught (kg)
Species: _____ COD	_____	_____
Species: _____ HADDOCK	_____	_____
Species: _____ POLLOCK	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____
Species: _____	_____	_____

Remarks: (vessels/gear in area, bait in water, sand fleas etc) _____

Figure 5. Supplementary sheet used in Georges Bank Hook and Line Survey.

4VsW Skate Survey

Objectives

The objectives of the 1994 surveys were to collect basic biological information on skates, determine the impact of the fishery on both skates and bycatch species and to initiate an annual series of surveys that would provide trends in stock abundance and distribution in the area of the fishery. Information on wing weight to round weight would be collected to evaluate the conversion ratio used by the industry.

The objectives of the 1995 surveys were similar to 1994, though the design was changed to allow an unbiased estimate of biomass to be calculated for the survey area.

Origin of Proposal

In early 1994, a directed fishery for skates was initiated in response to new markets for skate wings. Skates have been caught as a bycatch in other fisheries with reports of high discarding. By July 1994, 1200t had been landed and the fishery was closed until the status of the fishery could be reviewed. Fishery participants recognized that the information base to guide harvesting of this fishery is limited and proposed a joint industry/science survey in 1994. After discussions with industry in August, two surveys were planned for 1994 using an additional 800t allocated for this purpose. The results of the surveys were reviewed during the fall 1994 Regional Advisory Process and in consultation with industry, two additional surveys were conducted in 1995 using a stratified random design.

Survey Design

Based on input from industry, DFO survey information and distribution of the 1994 fishery two surveys were planned in a portion of 4VsW. These surveys were carried out within a 3-4 day period by the four vessels prosecuting the fishery, during August and September of 1994. Twenty transects were chosen to spread the survey effort over the entire area (figure 7a). Three sets were made per transect stratified by depth (<50 fm., 51-100 fm., >100 fm.). The exact set location within each depth strata was at the captains' discretion. The vessels ranged in size from 45'(1) to 65'(3). Rockhopper footgear was used by all vessels. Gear used on the surveys were 300 Balloon trawl by three vessels and 280 Balloon by the other. All vessels used 155 mm square codends. Each vessel was allowed to resume normal fishing practices at the end of the survey using 255 mm square codends. Survey tow times were 45 minutes with towing speeds not indicated.

On board sampling was carried out by observers from the International Observer Program following standard protocols. Catch weight of all species were enumerated. Length frequencies were to be taken of all species. Detailed sampling of all skate species such as individual length, weight, wing width was collected.

The 1995 surveys were conducted during April and October covering the same general area as the 1994 surveys. A stratified random design survey was chosen to give unbiased estimates of abundance. The extent of the survey was strata 46 to 58 and stratum 64 of the summer research vessel survey (Figure 7b). Stratum 64 was omitted in October. A minimum of 3 sets per stratum were planned with larger strata having up to 5 sets for a total of 48 sets per survey. In addition, the captain was allowed 3 sets within his assigned fishing area, with the location at his own discretion. The same gear was used in 1995 as 1994 except for 12 inch codends. In October towing speed was standardized to approximately 2.5 knots and tow distance was recorded. Sampling protocols were similar to 1994. Length frequencies of only skate were collected and purse counts were added to the detailed information.

Selection of Participants

The four vessels associated with the skate fishery were chosen to conduct the survey. No industry organizations were formally associated with the proposal. The processor associated with the fishery has acted as the coordinator of the vessels conducting the survey.

Data Processing

Survey data forms were processed according to the Observer Program protocol. An additional two measurement codes were added to the detailed forms.

In addition to the surveys, the fishery permit in 1995 required at least 50% coverage by observers. It was agreed that industry would attempt to use observers hired through the TAGS program, with an honours student acting as the coordinator. Industry would pay for 50% of the student's salary. Due to the small amount of data expected, the Observer Program offered to enter the information gratis. This arrangement never occurred due to the uncertainty with the observer contracts and lack of data. The 4Vn Sentinel Survey Association took over the observer aspect of the skate fishery in September with the same honours student coordinator. Processing of the data was to follow the same format as the 4Vn Sentinel Survey information.

Cost and Funding Agencies

The entire costs of the joint industry/science surveys were borne by industry. Science provided support in the design of the survey and additional training of observers. The coverage of the fishery by TAGS observers required a substantial amount of time and effort to get that program underway. A small amount of sampling equipment was also provided. The proposal by the 4Vn Sentinel Survey Association to manage the observers was accepted by HRD. This proposal totaled \$35,000 and only required some training and equipment costs(<\$500) to DFO.

Results

1994

The two surveys were highly successful. The vessels completed 58 and 59 sets out of 60 within the 4 day periods. Distribution plots of all species of skates were generated and comparison of bycatch rates of other species for the 155 mm and 255 mm mesh nets estimated. The extent of the problem of discarding undersized skates became evident. The level of detailed sampling though, was not adequate to reconsider the conversion rate issue.

1995

The stratified random survey design was used to enable calculation of abundance levels and to allow comparisons with the results of our research surveys. Stratum 64 was dropped at the beginning of the April survey as the stations were within the haddock nursery area. The April survey was less successful than hoped. Only 35 of the 44 stations were occupied and many of these were not in their assigned depths. One stratum was missed completely. The captains discretion stations were also not well considered by two of the vessels. A post-survey meeting with the fleet resolved these problems and indications are that the October survey was a success. Bycatch was nil and discarding of undersized skate was about half of 1994. The distribution of skates were similar to 1994. Again the number of length frequencies taken were less than hoped but the amount of detailed individual measurements(1,300) in April and October was excellent.

Problems

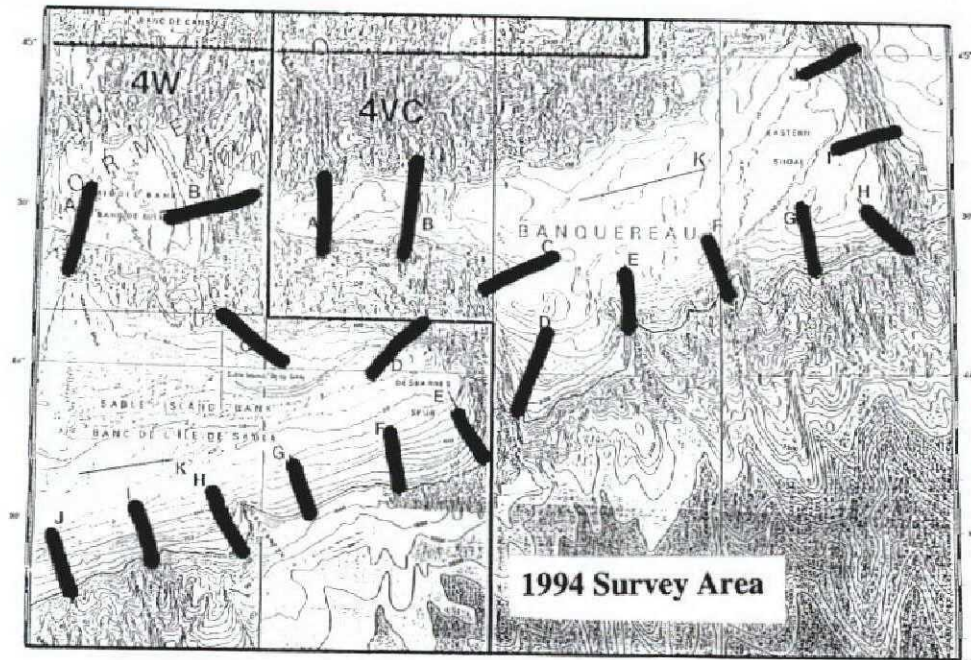
Species identification has been a problem on all of the surveys. In 1994, winter skate were misidentified as barndoor skate. Sculpins and flatfish were also misidentified. These problems were reported to the contractor. In 1995, winter and little skate were incorrectly separated on length frequencies. The difficulty has been with only one of the observers on each survey. The instructions to the vessels have to be very detailed. When flexibility was given to the vessels, two of the vessels made decisions that seriously affected the survey. It is important to explain how their decisions impacted on the analysis.

The captains discretion stations were added to the survey to address their concern that the survey missing the highly concentrated skate fishery. These stations should be considered in our analysis of the fishery. The fleet is considering changing their mesh size to 16 inch square mesh to further reduce to discarding of undersized skates.

Should the 1996 survey adjust to this reality or standardize the net for future surveys at the 1995 configuration? With this emerging fishery we are both on a sharp learning curve that is changing constantly.

The major problem with the skate fishery was the attempt to use TAGS participants as observers. The processor had great difficulty in dealing with the TAGS program. When these problems were settled, the participants would quit immediately after training. Once an independent coordinator took over the program, many of the difficulties disappeared.

(a)



(b)

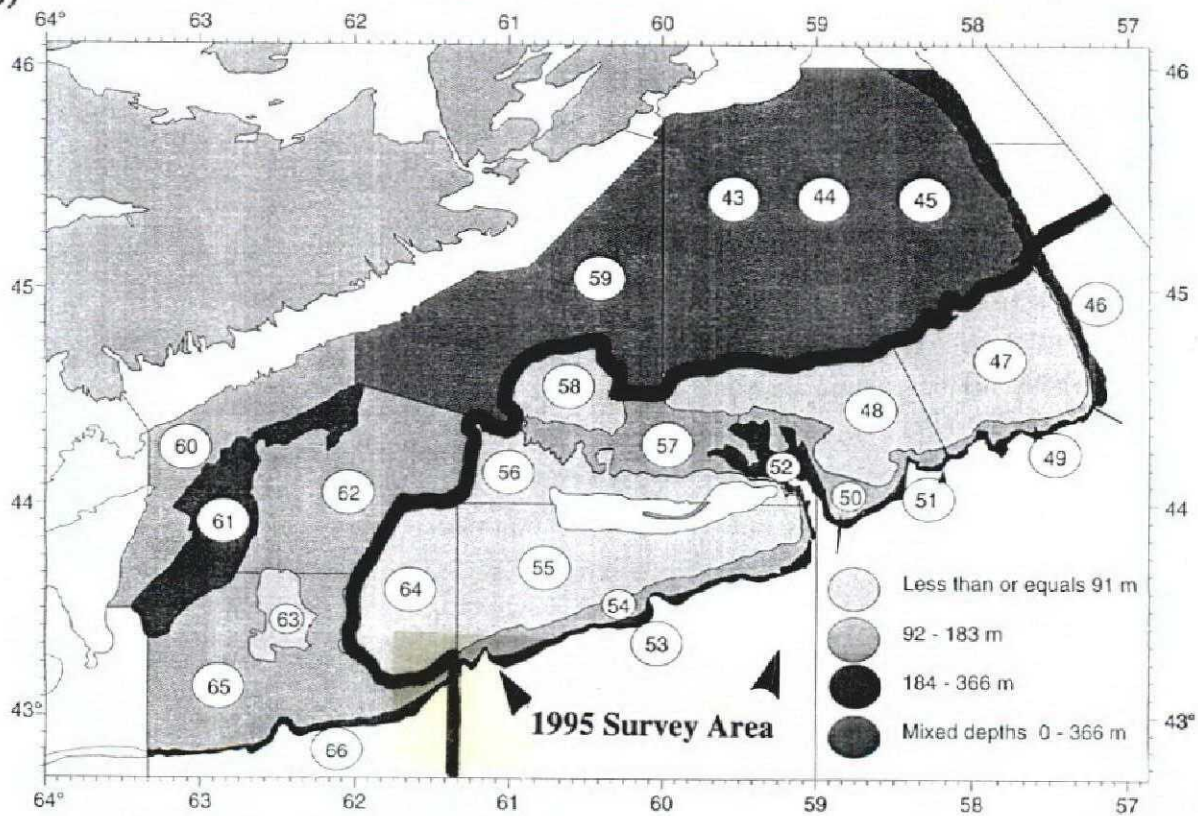


Figure 7. 4VsW skate survey - (a) 1994 survey area, and (b) 1995 survey area.

Summary

Table 3 provides an overview of the main characteristics of each survey. Below are summarized some of the more general issues raised in the discussion of these surveys.

Objectives

Except for the Monkfish survey, all surveys were intended to provide indices of abundance which could be used in the assessments. In the case of monkfish, discussions will be held with the industry partners in 1996 to develop a new design which concentrates sampling effort on the monkfish resource. There was some discussion on the possibility of combining this and the 4X mobile gear survey to have an almost 300 station survey in September. This may not be possible as the monkfish survey uses flounder gear while the mobile gear survey uses 280 and 300 Balloon trawls.

It is likely that more survey activity will be added as both traditional fisheries sectors (i.e. 4X FG) and new fisheries develop their survey plans. Where possible, when proposals are brought forward by industry, consolidation with existing surveys should be considered before initiating a new survey.

Survey Design

The 4VW surveys use the stratified - random design taken from the DFO groundfish surveys. Initial indications are that monkfish will adopt this design as well. In 4X/5Z, a fixed station design has been adopted. A concern raised is that a fixed station design has the potential to introduce variable bias if all stations are not sampled in each survey or if there is little or no spatial persistence and only few stations are sampled. It is important to note that the sampling intensity of the 4X MG survey in particular is high with the current design requiring that all block be sampled each survey. The group recommended that there be further discussion with the industry partners to ensure that they understand the importance of sampling as many of the survey blocks as possible.

Selection of Participants

Most survey participants were chosen by the industry partner. The selection criteria used for the monkfish survey were very rigorous and could be used as an example in new surveys and when participants drop out of existing surveys. One issue is the inter-vessel differences in fishing power that these surveys have. A useful analysis is to examine the vessel-specific historical catch rates to understand how they compare among themselves and with the other vessels in the fleet. While it is realized that the survey gear and design will modify vessel-specific catchabilities, such an analysis will provide the broader trends.

Fishing Gear and Sampling Protocol

There was a considerable amount of variability among the surveys in the gear used, how it was used, and the sampling protocol. Much of these protocols have been negotiated among the survey partners. Notwithstanding this, all recognized the need for standardization within each survey - for instance, a move toward one trawl type and mesh size, which fishes for a set time, distance and speed. There was considerable variability among the fixed gear surveys in gear configuration and deployment. Much of these are influenced by local conditions i.e. tides in the Bay of Fundy. However, the group saw an opportunity to examine FG catch rates in relation to soak time to better define this parameter. Also, while the sampling unit of a trawl is well defined, that of fixed gear is not. The group recommended that discussions be held with the industry partners to solicit their views on the effective range of fixed gear. The group saw this as part of the more general need for criteria to define good and reject sets.

All surveys used the Observer Program to both collect and process the data. A number of problems were noted with the observer-collected data, in particular regard to species identification. Generally the observers do well when they are collecting the 'core' information and not so well otherwise. The group concurred that when problems are identified that they be brought to the attention of the Observer Program management. Regarding the data processing, the Observer Program has been the logical software system to piggyback onto. However, at the moment, the data processing is not structured to allow individual surveys to edit their own information without accessing the more general IOP database. This has created a data confidentiality problem which has slowed processing. A plan is currently being developed to partition the database by survey so that the entire data stream - from entry to analysis - is separated from IOP proper.

A number of the surveys had supplementary data collection requirements that necessitated creation of new database variables and tables. It was agreed that a study of these individual requirements be undertaken to see if a more generic data structure can be established. It was noted also that some of the variables in the IOP proper (i.e. lat and long seconds not recorded) may need modification. This would be considered at the same time.

Survey Documentation

The group discussed how best to document these surveys. Currently, only the 4Vn survey has been submitted as a Research Document. Is this the best series to use? Some suggested production of more formal technical/manuscript or industry reports although cost is an issue. While there was not a consensus, the chair, R. O'Boyle, felt that annual production of a Research Document for each survey is a good starting point. In addition, the current report should be further improved and submitted as a Research Document. This would then fully document the survey designs and background. Subsequent documents would focus on that year's survey results.

On the issue of reporting, the group considered that this information should be part of a Web site being considered by the Maritimes Science Branch. The DFO surveys could also be part of this.

Costing and Funding Agencies

An issue raised on the 4X mobile gear survey is the status of the small fish. All surveys should and appear to be recording the small fish. However, in some cases it may not be recorded on the DFO logs which are also being filled out during the survey. The group considered that any fish caught during the survey should be recorded and counted against the quota.

The two sentinel surveys (4Vn and 4VsW) were wholly funded by HRD and DFO under the terms of a Memorandum of Understanding (MOU) signed in 1995. The use of the HRD funds in the two surveys has been subject to numerous HRD restrictions which have caused on-going friction between the funding partners. The following table outlines the funding (\$000s) history for these surveys:

Agency	4Vn			4VsW		
	MOU	Proposal	Actual	MOU	Proposal	Actual
DFO	183	75	50	130	120	120
HRD	400	315	185	1300	727	324
ACOA	-	45	40	-	-	-
Fish Sale	-	?	25	-	89	50

Under the terms of the MOU, the ratio of HRD to DFO funds was to have been 10:1. Indeed, this was the ratio initially used for the 4VsW survey (1300:130). However, the severe policy restrictions by HRD on how the money could be spent resulted in proposal submissions with 4-6:1 ratios. The actual funding has ratios of 3-4:1. In addition, regarding the 4Vn survey, while Ottawa HRD approved \$212K funding, the

Regional HRD office only approved \$185 and retained the rest. Finally, any revenue being generated by fish sales are being retained by HRD and not being split between the funding partners.

The group considered that there have been serious problems with HRD on the funding of these projects. It recommended that the other Regions be solicited to determine if like problems occurred elsewhere. These matters should be brought to the attention of DFO, Ottawa.

Concluding Remarks

The first year of joint industry/Science surveys is now complete. Overall, the surveys went well and promise to become an integral component of the stock assessments. While problems were identified, they were not major and recommendations have been made to their resolution. The next step is for individual survey leaders to meet with their groups and discuss the results of this review and develop further recommendations for improvements.

Table 3. Overview of Joint Science / Industry Surveys on the Scotian Shelf, Georges Bank and in the Bay of Fundy

		4Vn	4VsW	4X Mobile	4X Fixed	5Z Fixed	4X Monkfish	4VsW Skate
Objectives	Abundance Index	X	X	X	X	X/Canadian Side		X
	Special Studies	X	X				Distribution	X
Design	Fixed			X	X	X	X	
	Stratified-Random	X	X					X
Strata	Definition	New - By Depth	Summer Survey	NA	NA	NA	NA	Summer Survey
	Survey Area, sq. nm.	3612	28115	23632	23632	?	18556	9388
	Total Number of Blocks	NA	NA	211	211	31	189	NA
	Sampling Unit Size	2.5 x ?	1.5 x ?	1 x ws	TBA	1.5 x ?	1 x ws	2nm x 65 ft
No Sets	Planned	60	300	202	TBA	24	189	48
	Completed	60	219	139	TBA	31	141	48
Participants	DFO Selected							
	Industry Selected	X		X	X (likely)	X		X
	DFO/Industry Selected		X				X	
Vessels	Number	6	16	3	TBA	5	5	4
	Type	FG	FG	MG	FG	FG	MG	MG
	LOA, ft	45	32-60	44-63	TBA	45	38,42,45,65,65	45, 65,65,65

Table 3. Overview of Joint Science / Industry Surveys on the Scotian Shelf, Georges Bank and in the Bay of Fundy

Gear	Trawl Type	NA	NA	280/300 Balloon	NA	NA	Flounder 240,260,300,300,? Balloon	280,300,300,300 Balloon
	Scanmar			X(1)				
	Distance over Bottom, nm	NA	NA	1	NA	NA	1	Not Specified
	Tow Speed, knots	NA	NA	2.5	NA	NA	Not Specified	2-3
	Tow Duration, min	NA	NA	Not Specified	NA	NA	Not Specified	45
	Mesh/hook size	Mustad Short Shank No. 12 circle	Mustad Short Shank No. 12 circle	Liner	TBA	EZ Bait No 12	130 mm sq	305 mm sq
	No hooks/set	2500	1500	NA	TBA	1500	NA	NA
	Soak Time,h	4 to 6	2 minimum	NA	TBA	6	NA	NA
	Time during day	Set at Dawn	dawn+_2h	daylight	TBA	Not Specified	Not Specified	Not Specified
	Bait type	Frozen Mackerel	Frozen Mackerel	NA	TBA	Squid	NA	Not Specified
	Bait sized (Y/N)?	N	120 lbs/tub	N	TBA	N	NA	NA
Sampling Protocol	Total Numbers & Weight	All Species	All Species	All Species	All Species	All Species	All Species	All Species
	Length Frequency	Cod	Cod, Haddock, Hake, Cusk, Halibut	Cod, Haddock, Pollock, Winter Flounder	TBA	Cod, Haddock, Pollock	All Species	Skate
	Detailed fish	Cod	Cod, Haddock, Hake, Halibut		TBA	Cod, Haddock, Pollock	Monkfish	Skate
	Special sampling	Gonads, Maturities, Stomachs	Gonads, Maturities, Stomachs		TBA		Some	Some
Oceanography	Surface Temp	X						
	Surface Salinity							
	Bottom Temp	X	X	X				
	Bottom Salinity							

Appendix 1. List of Participants

R. O'Boyle (chair), Kees Zwanenburg, Mark Showell, Peter Comeau, Jim Simon, Scott Wilson, Bob Branton, Peter Hurley, Paul Fanning, Chris Annand, Tim Lambert, Joe Hunt