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Proceedings of the Workshop on Greenland Halibut

Montreal, Quebec
27 February – 2 March 2001

D.B. Atkinson - Chairperson

Department of Fisheries and Oceans
Northwest Atlantic Fisheries Centre
White Hills Road East
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St. John's, Newfoundland A1C 5X1
CANADA

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ABSTRACT

Based on DFO/Industry/province pre-NAFO Scientific Council discussions held in St. John's, Newfoundland during May 2000, it was agreed that a workshop focussed on Greenland halibut would be timely given the interest in this resource within Atlantic Canada including the north, as well as the international aspects of the fishery. Funding for such a workshop was obtained, and therefore, a Steering Committee chaired by D. Bollivar was struck, with the purpose of determining the Terms of Reference, venue, participants and agenda. The Workshop was held in Montreal, PQ during 25-27 January 2001. There were 34 participants comprising representatives from DFO, industry, provinces, Nunavut and the Labrador Inuit Association. Discussions were wide-ranging and lively throughout. This document contains information as presented as well as summaries of the discussions on the various topics. It should be noted that formats vary and reflect the manner in which the presenters and rapporteurs provided material.

A consensus summary including recommendations was developed. It is hoped that these will help guide Canada's activities with regard to sustainable exploitation of Greenland halibut into the future.

RÉSUMÉ

Suite aux discussions MPO/industrie/provinces tenues à St. John's (Terre-Neuve) en mai 2000 en vue de la rencontre du Conseil scientifique de l'OPANO, il a été convenu qu'il serait opportun d'organiser un atelier sur le flétan du Groenland, étant donné l'intérêt porté à cette ressource au Canada atlantique, y compris dans le Nord, ainsi que les aspects internationaux de cette pêche. Des fonds ont été obtenus pour la tenue d'un tel atelier, et un comité directeur présidé par D. Bollivar a été créé. Ce comité était chargé de déterminer le cadre de référence de l'atelier, l'endroit où il allait avoir lieu, les personnes qui allaient y participer et son ordre du jour. L'atelier fut tenu à Montréal (QC) du 25 au 27 janvier 2001. Un total de 34 participants y ont assisté, y compris des représentants du MPO, de l'industrie, des provinces, du Nunavut et de l'Association des Inuits du Labrador. Le présent document contient l'information présentée ainsi que des sommaires des discussions tenues sur divers sujets. Il est à noter que les formats varient et reflètent la façon dont les présentateurs et les rapporteurs ont fourni le matériel.

Un sommaire consensuel contenant les recommandations formulées a aussi été produit. On espère que ces recommandations aideront à orienter les activités futures du Canada pour l'exploitation durable du flétan du Groenland.

BACKGROUND

Greenland halibut is a groundfish resource distributed in both the western and eastern North Atlantic. In the Northwest Atlantic it is distributed from Davis Strait in the north to NAFO Divisions 3NO in the south and the Gulf of St. Lawrence. It is an important commercial fishery resource throughout this area of distribution, both domestically and internationally in Greenland waters and outside Canada's 200-mile limit.

Current management is domestic (Gulf of St. Lawrence), bilateral with Greenland (Davis Strait) and international through NAFO (2GHJ3KLMNO). Assessments are domestic (Gulf of St. Lawrence) and international (NAFO – Davis Strait (0+1) and 2GHJ3KLMNO).

It is considered that in the Northwest Atlantic, Greenland halibut make up one large stock complex. Recent information, however, suggests that there are different spawning components throughout the area of distribution, at least north of Divisions 3NO.

In the Canadian context, interest in the resource in Davis Strait has increased in recent years, both by commercial interests south of the area as well as Nunavut. Research in the area, however, has been sporadic and is generally lacking.

Further south, in 2GHJ3KLMNO, research has increased in recent years but there is still a lot to be learned. Prior to the 1990's there was virtually no fishery outside Canada's 200-mile limit; all catches were taken inside the Canadian Zone. Beginning in 1989, however, Spain and Portugal began reporting catches of Greenland halibut from Flemish Pass and around Flemish Cap. Catches later extended into Divisions 3NO. This fishery was unregulated and catches rapidly expanded to be in excess of 60,000 t per year. Frustrated with ineffective attempts at management through the NAFO process, Canada acted unilaterally in 1995 and arrested the ESTAI, a Spanish trawler. This incident finally brought uncontrolled fishing on the stock to an end and quota management, through NAFO, began.

In the 2GHJ3KLMNO area, although the research survey data available suggest that about 75% of the resource is within Canadian waters, the current pattern of the fishery is such that about 75% of the catch is taken outside 200 miles in 3LMNO. Since the majority of catches taken overall in the fishery are from bottom trawling, the fishery is primarily targeting juvenile fish as the larger, mature individuals generally avoid trawls.

For many years, Canada has struggled within NAFO to bring about reasonable management practises for transboundary stocks including Greenland halibut. This has included efforts related to bycatches, mesh regulations, observer coverage, and minimum fish sizes to name a few. As with any international forum, gains in these areas have involved trade-offs, and some of these in recent years have involved Greenland halibut issues.

During the May 2000 pre-NAFO Scientific Council Consultations with industry and provincial representatives held in St. John's, there was considerable discussion on Greenland halibut in the Northwest Atlantic. In summary, discussion included:

- The fishery in Davis Strait and its split between SA 0 and SA 1 including the inshore 1A fishery and Nunavut perspectives re a possible similar split in the inshore Baffin Island area (including research needed to clarify this).
- The results of the 1999 survey to Division 1A (trawlable biomass estimate of about 80,000 t) and implications as well as the planned survey for 2000 in Div. 0B.
- The links between SA0+1 and the SA2+3KLMNO resource.

- In conjunction with the above, it was indicated that there is a lack of understanding as to why the quotas have been going up in the southern areas but not in the north. If it is one stock complex then the thought is that increases should occur everywhere.
- The exploitation outside 200 miles including that of juveniles in relation to the distribution of biomass and Scientific Council's ongoing recommendations concerning distribution of effort more in line with distribution of biomass.
- The work of scientists in attempting to develop an acceptable VPA for the resource that will then better enable Scientific Council to comment on exploitation rates and patterns and move forward in the development of Precautionary Approach biological reference points.
- The fact that the advice from Scientific Council that refers to 'catches not exceeding' rather than identifying specific TAC's gives flexibility to Fisheries Commission to make changes to the TAC yet remain within the Scientific Council advice. On this point it was agreed that if the advice of Scientific Council was such that the problem related to Scientific Council advice on distribution of effort according to distribution of biomass could be further exacerbated by Fisheries Commission actions, then this should be looked at closely.
- The current practise of Greenland halibut being what some might call a 'trade-off' resource used by Canada to achieve other objectives.
- Overall there was a clear need identified for Canada to be able to better understand the scientific information we have on Greenland halibut and, based on this, the need for us to rethink our entire strategy for dealing with this resource both bilaterally with Greenland and internationally through NAFO.

In order to advance this, it was agreed (and indeed, strongly endorsed) that a major workshop should be held on Greenland halibut during which all of the important issues can be thoroughly discussed and a path for the future developed. There was a Nordic Workshop on Greenland halibut (scientific) scheduled for November 2000 (B. Brodie, R. Bowering and M. Treble participated) and it was considered that results of that WS would be a valuable contribution to a Canadian WS. Thus the scheduling for a Canadian initiative would reasonably be Jan. - Feb. 2001.

Steering Committee

During the July consultation meeting between DFO, industry and provinces in preparation for the Annual NAFO meeting, it was agreed that a Steering Committee should be established to develop the Terms of Reference, and plan the overall Workshop including participation and contributions, and venue. The Steering Committee consisted of:

- D. Bollivar, SeaFreez (Chair)
- R. Bowering, DFO
- M. Treble, DFO
- T. Dooley, Province of Newfoundland and Labrador
- R. Andrews, consultant and representative of Nunavut
- B. Rashotte, DFO

The Steering Committee developed the Terms of Reference (Annex 1) as well as the agenda for the meeting (Annex II), possible participants and presenters. B. Atkinson was nominated Chair of the Workshop. Mr. H. Clarke and Dr. A. May were invited to participate to bring an 'independent' perspective to discussions, as they are both familiar with and experienced in fishery issues but are currently not directly involved in the fisheries at present.

The Workshop was held at the Delta Montreal, Montreal PQ during 25-27 January 2001. There were 34 participants (Annex III).

Day 1

Welcome

B. Atkinson welcomed the participants to the Workshop and briefly described the background motivation for it. He expressed gratitude to DFO for providing funding, and thanked the Steering Committee, especially Dave Bollivar, for their hard work in pulling it together. Rapporteurs were selected for each of the question/discussion sessions.

The following are details of presentations, discussions surrounding them and the general issues, as well as Workshop conclusions and recommendations.

Area 0 Greenland Halibut Science – M. Treble, DFO, Winnipeg

Greenland halibut (Reinhardtius hippoglossoides) biology, distribution and abundance in Baffin Bay and Davis Strait

Margaret Treble

Stock Assessment Biologist
Dept. of Fisheries and Oceans

Topics of Discussion

- Offshore Fishery - NAFO 0A (Baffin Bay/Davis Strait) and 0B (Davis Strait) otter trawl exploratory fisheries
- Inshore Fishery - Cumberland Sound winter long-line fishery
- Future research needs

Offshore Otter Trawl Fishery

- In 1993 a small test fishery took place within 200 km of Qikiqtaarjuaq (long-line and gillnet)
- In 1994 this exploratory fishing continued, covering a larger area (long-line, gillnet and otter trawl)

Offshore Fishery Con't

- In 1996 an exploratory offshore otter trawl fishery began off the coast of Baffin Island, NAFO Div. 0A.
  - Catches have varied with effort, 42 t to 330 t.
  - Initially, restrictions were placed on the fishing effort in order to determine stock distribution
  - 27 "Sentinel" locations were selected and certain tow parameters were standardized (e.g. tow duration).
  - Biological data is provided to us by onboard fisheries observers

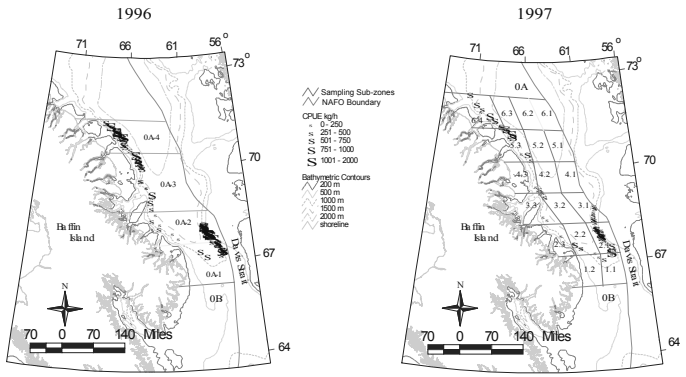


Figure 1. NAFO Division 0A Exploratory Fishery catch per unit effort (kg/h) for Greenland halibut, 1996 and 1997. The sampling sub-zones were expanded in 1997 in order to better distribute effort to determine Greenland halibut distribution.

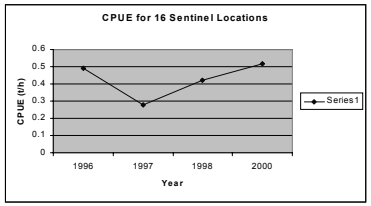
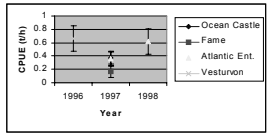
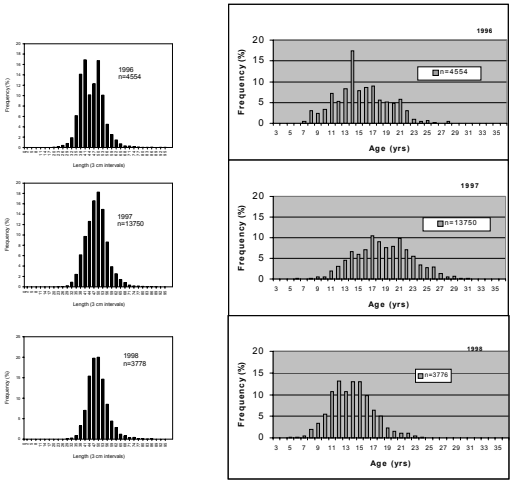


Table 1 . Non-standardized mean CPUE (kg/h) in NAFO Div. 0A for all vessels combined, by month (single otter trawl, no net damage, tow duration >=2hrs.).

		Mean		
Year	Month	CPUE (kg/h)	s.d.	# tows
1996	Sept.	648	495	28
	Oct.	674	3	69
	Overall	667	364	97
1997	Sept.	338	295	5
	Oct.	382	286	63
	Nov.	149	114	14
	Overall	340	277	82
1998	Sept.	619	302	12



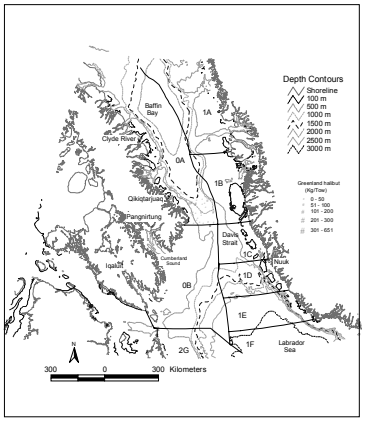


Scientific Surveys

- 1998 - A proposal was developed to conduct a series of random stratified surveys in NAFO SA0.
- Funding was received from the NWMB and DFO (SSF)
  - A survey of Division 0A was completed in 1999
  - A survey of Division 0B was completed in 2000
  - A repeat of the surveys in both Divisions 0A and 0B is planned for 2001

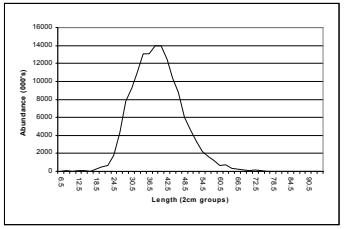
Division 0A Survey

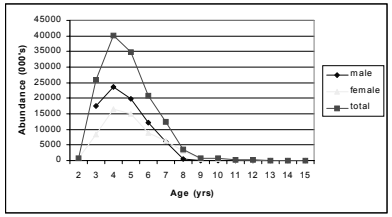
- Greenland halibut were present in all tows with the highest densities between 1001 m and 1250 m.
- Catches per tow varied from 3.8 to 650.6 kgs and 12 to 1007 fish



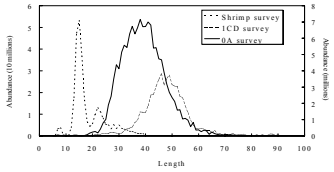
0A Results con't

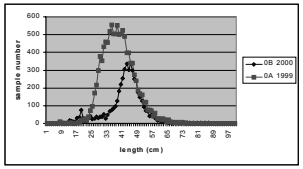
- Total estimated biomass was 83,340 t
- Total estimated abundance was 141 x 10^6
- Lengths ranged from 6.5 cm to 94.5 cm with 71.5% less than 42.5 cm. Modal length was 38.5 cm
- Age distribution ranged from 2 to 15 yrs with 96% less than 8 yrs. Modal age was 4 yrs





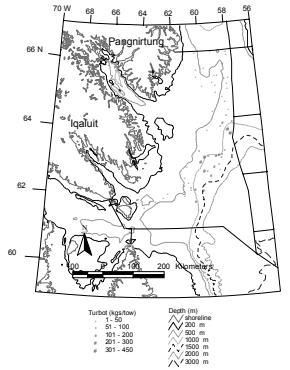
Length frequencies of GHL in the Greenland shrimp survey (left axis), the Greenland surveys in 1CD and the Canadian survey in 0A (right Axis) (O. Jørgensen NAFO SCR 00/38)





Division 0B Survey

- Greenland halibut were present in all tows
- Catches per tow varied from 0.5 to 427.2 kgs and 1 to 558 fish
- Estimates standardized to km^2 and calculations of estimates of abundance and biomass are not yet available



NAFO 0B Greenland halibut catch (kgs/tow), October 9-19, 2000 .

0B Surveys Con't

- 1986 survey covered 200 to 1250 m
- Technology has changed since 1986 and the current surveys extend from 400 m to 1500 m
- Current fisheries are concentrated between 1000 and 1300 m and are known to extend to 1500 m and deeper

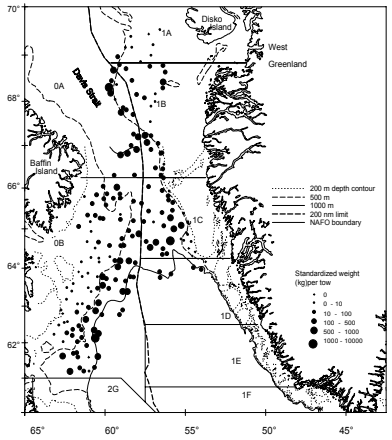


Figure shows the standardized catch per tow (kg) for the 1986 survey of Subarea 0 and 1 (from Dr. R. Bowering, DFO Newfoundland).

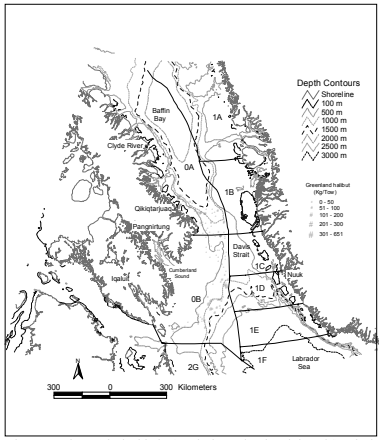


Figure 1. Northwest Atlantic Fisheries Organization northern boundaries and Greenland halibut catch (kg/tow) for the 1999 and 2000 surveys of NAFO Divisions 0A and 0B.

Cumberland Sound Research Tagging Project

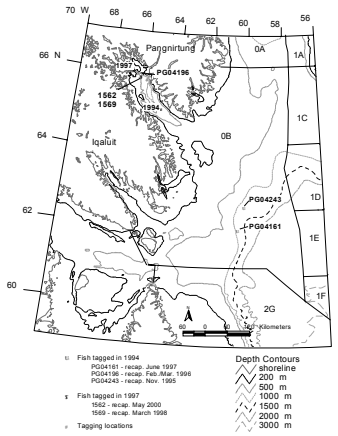
- Research in Greenland has demonstrated that Greenland halibut do not migrate out of the fjords
  - The fjord is seen as a "dead end" for these fish, they do not contribute to offshore spawning in Davis Strait and do not appear to spawn in the fiords either.
  - Greenland's inshore fishery is therefore dependent on fish from the offshore and since 1994 it has been managed as a separate stock.
- It has been suggested that this may also be the case for fish in Cumberland Sound

Mark/Recapture Project

- A method to tag fish on the ice during the winter fishery was developed in 1997
  - 1673 tags were applied between 1997 and 2000.
  - Two fish have been recaptured, both within Cumberland Sound during the winter fishery. One in 1998 and one in 2000.

Previous Tagging Project

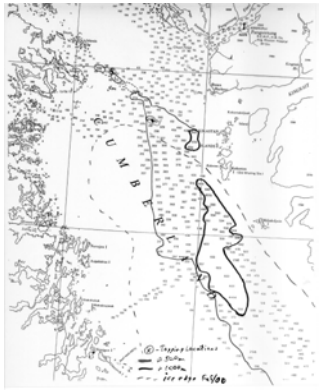
- 407 Greenland halibut were tagged in Cumberland Sound in 1994 as part of an exploratory fishery off southeast Baffin Island (Northlands Consulting 1994)
- Three of these tagged fish have been recaptured, two in Davis Strait and one on the winter fishing ground in C.S.



Cumberland Sound Winter Long-Line Fishery

- Began in 1987 and has operated each year since then
- Occurs only in winter and the fish is exported fresh
- Timing and extent of development of the ice platform varies from year to year.
- TAC allocated to Cumberland Sound has been 500 t since 1994.

Year	Quota (t)	Harvest (t)	Fishermen	Length of Season (weeks)
1987	6	4.1	6	9
1988	100	10.6	9	7
1989	250	180.0	43	14
1990	300	255.0	77	18
1991	300	139.3	61	12
1992	530	430.1	93	21
1993	625	425.2	115	18
1994	500	401.7	107	17
1995	500	284.6	97	17
1996	500	61.0	30	16
1997	500	65.9	12-15	16
1998	500	61.2		11
1999	500	34.2	10-12	14

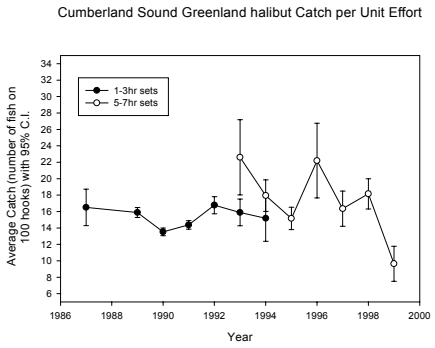


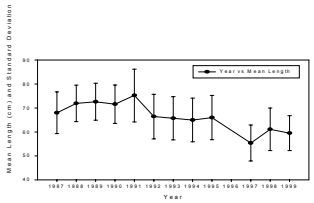
Slide is a copy of a portion of the nautical chart for Cumberland Sound. Solid red line approximates the 500 m contour and the solid blue line the 1000 m contour. The brown dotted line shows the land-fast ice edge of Feb. 14, 2000. The black x's show tagging locations for 1997 to 2000.

Photo shows extent of land-fast ice (grey shades beyond white shoreline) for SE Baffin Island on February 14, 2000 (from the Meteorological Service of Canada).

Data Collection and Monitoring

- Began in 1987
  - Annual two week trip to the fishing area
  - Log book system developed for fishermen to record catch and effort data
- Revised in 1997
  - Sampling at Pangnirtung fish plant
  - Annual feedback of logbook data directly to fishermen





Year	Mean Length (cm)	Modal Length (cm)	Mean Weight (Rd) (kg)	Sample Size	Sampling Period
1987	68.0	70	3.64	250	March
1988	71.9	75	4.14	154	March
1989	72.6	70	4.15	114	March
1990	71.6	70 & 75	4.05	149	Feb/April
1991	75.2	75	5.19	52	March
1992	66.4	55	3.28	147	March
1993	65.7	55 & 56	3.13	150	
1994	65.0	60	3.08	156	
1995	66.0	60	3.21	147	March 25-26
1997	55.4	50	1.81	1372	May 2-9
1998	61.1	55	2.56	847	March 17-May 6
1999	59.4	50	2.28	900	March 23-April 28

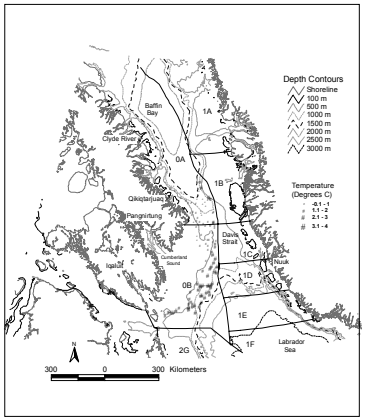


Figure 4. Bottom temperatures within NAFO Subarea 0. Data for 0A are from 1999 and data for 0B are from 2000.

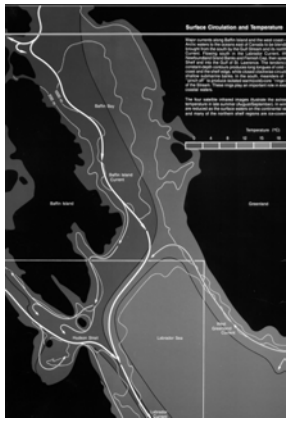


Figure shows surface circulation and temperature for Baffin Bay and Davis Strait. Light blue is 8°C, purple next to Greenland is 4°C and mauve next to Baffin Island is 0°C (scanned from DFO poster series).

Questions/Comments

B. Chapman: What are the possible reasons for relatively small size of the turbot caught in the survey in OA?

Ans: Maybe larger fish migrate to the south. They also appear to grow slower therefore fish of same age smaller when compared to southern fish.

C. Cabot: The fish that are tagged in the sound where are they recovered (and at what depth) and what conclusion can you reach on migration from these results?

Ans: Not enough information yet to determine the seasonal migration patterns. Fish are being recovered in 400-1500m of water.

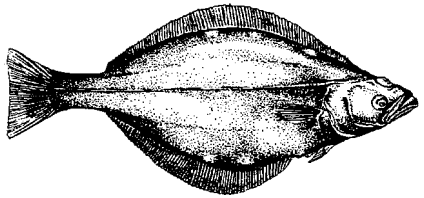
H. Clarke: There appears to be a low rate of return from fish tagged in the sound and effort appears to be decreasing is there any explanation for this?

Ans: Effort has declined in recent years, some harvesters lost their gear and never replaced it. Also fishery is dependent on ice conditions and in recent years conditions have not allowed harvesters to get to areas where they can harvest larger fish. As a result catch rates are down and size of fish is down.

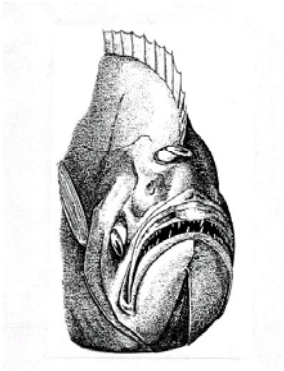
C. Bonnell: What are the results from the tag study in the Greenland Fjord Fishery?

Ans: No tags have been recovered outside the Fjord therefore it appears that the fish that enter the Fjords do not contribute back to the spawning biomass.

Area 2+3 Greenland Halibut Science – R. Bowering, DFO, St. John's



PICTURE OF NORMAL GREENLAND HALIBUT
- -NOTE SIMILAR TO MOST FLATFISH IN GENERAL APPEARANCE
- -EXCEPT EG. LARGE HEAD, SQUARE TAIL, LARGEST SIZE (OTHER THAN TRUE HALIBUTS)

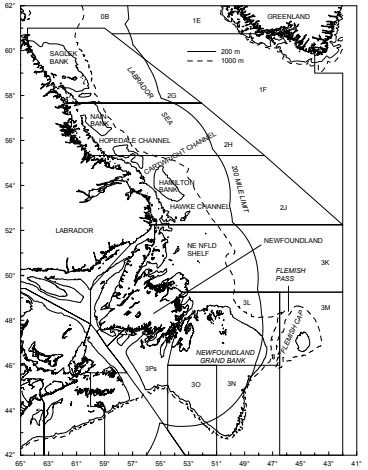


UGLY TURBOT (AS SEEN BY SHRIMP AND CAPELIN)

- -NOTE DISTINCTION OF OWN GENUS BASED ON SEVERAL UNIQUE CHARACTERISTICS
- -POSITION OF LEFT EYE (WIDE RANGE OF PERIPHERAL VISION)
- -BODY SHAPE (ELONGATED AND COMPRESSED) WITH SAME MUSCULATURE ON BOTH SIDES
- -DARK PIGMENT ON UNDERSIDE

THESE FEATURES ALLOW IT TO BE A FAST SWIMMER AND A GOOD HUNTER OF FOOD. IT CAN TRAVERSE THE WATER COLUMN AND CAN CONTROL ITS GRAVITATIONAL POSITION SWIMMING EITHER HORIZONTALLY OR VERTICALLY. IT HAS BEEN OBSERVED AT THE SURFACE OVER OCEANIC DEPTHS

STUDY AREA



Map of major place names and NAFO Divisions mentioned in the text.

LIST OF STOCK STRUCTURE STUDIES

- -NOTE THE DIFFICULTY IN DISCRIMINATING POWER OF THE VARIOUS METHODS
- -GREENLAND HALIBUT GENETICALLY THE SAME THROUGHOUT THE NORTH ATLANTIC (EXPLAIN WHY EG. CONTINUOUS DISTRIBUTION IN DEEP WATER)
- -DOES **NOT MEAN THERE ARE NOT SEPARATE SPAWNING COMPONENTS**

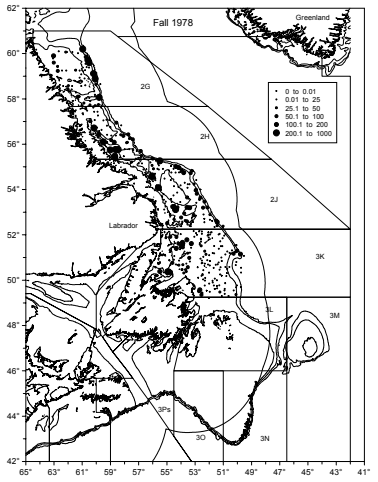
Stock identification studies of Greenland halibut in the Northwest Atlantic.

METHOD USED	REFERENCE
UNIVARIATE ANALYSIS OF MERISTICS	TEMPLEMAN (1970)
FECUNDITY VARIATIONS	BOWERING (1980)
PROTEIN ELECTROPHORESIS	FAIRBAIRN (1981)
BLOOD PROTOZOA AS BIOLOGICAL TAGS	KHAN et al. (1982)
SEXUAL MATURITY AND DISTRIBUTION PATTERNS	BOWERING (1983), BOWERING & CHUMAKOV (1989)
EXTERNAL TAGGING STUDIES	BOWERING (1984)
MULTIVARIATE ANALYSIS OF MERISTICS	MISRA & BOWERING (1984)
MULTIVARIATE ANALYSIS OF MORPHOMETRIC DATA	BOWERING (1988)
EXTERNAL TAGGING STUDIES	RIGET & BOJE (1989)
MERISTICS AND PROTEIN ELECTROPHORESIS	RIGET et al. (1992)
EXTERNAL TAGGING STUDIES	BOJE (1994)
PARASITIC INFESTATION RATES	ARTHUR & ALBERT (1993)
HELMINTH PARASITE INFESTATION RATES	BOJE et al. (1997)
MITOCHONDRIAL DNA	VIS et al. (1997)
MERISTICS	RASMUSSEN (1999)

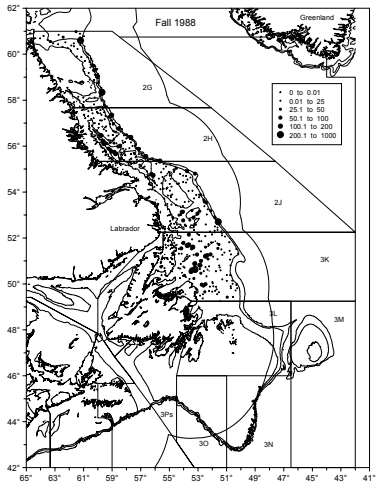
DISTRIBUTION MAPS FOR SA2+3 – 1978; 1988; 1991; 1996; 1999 AND 2000

- -NOTE THE CHANGES IN DISTRIBUTION AND ABUNDANCE OVER TIME AND THE APPARENT RE-DISTRIBUTION IN THE LATE 1990'S
- -NEVERTHELESS, THE CENTERS OF DISTRIBUTION DO NOT APPEAR TO HAVE CHANGED OVER TIME WITH THE POSSIBLE EXCEPTION OF DIVISION 2G

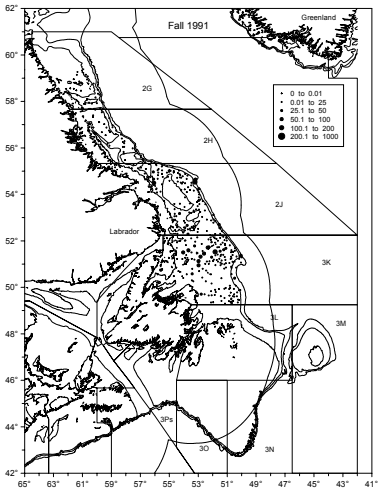
WAS THERE A SHIFT TO THE SOUTHEAST INTO FLEMISH PASS WHERE THE LARGE UNREGULATED FISHERY OF THE EARLY 1990'S DEVELOPED?



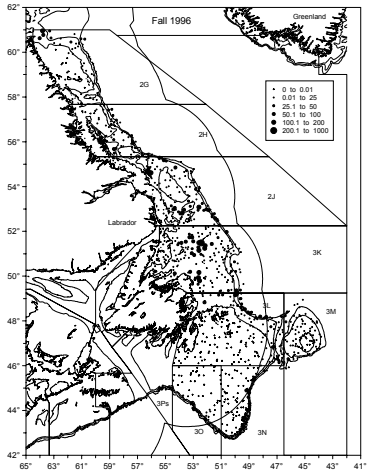
Distribution (kg. per set) of Greenland halibut from Canadian fall surveys during 1978.



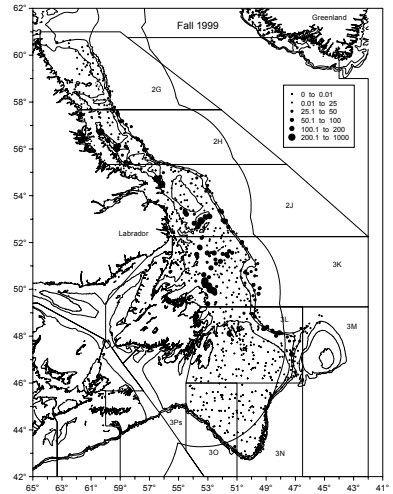
Distribution (kg. per set) of Greenland halibut from Canadian fall surveys during 1988.



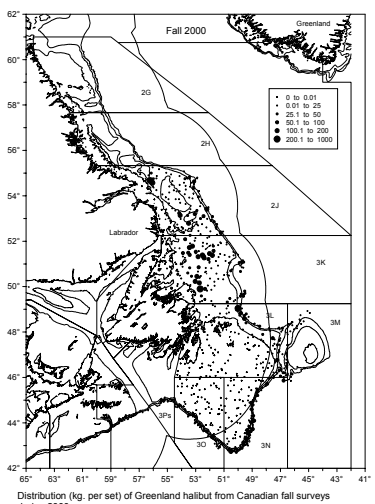
Distribution (kg. per set) of Greenland halibut from Canadian fall surveys during 1991.



Distribution (kg. per set) of Greenland halibut from Canadian fall surveys during 1996.

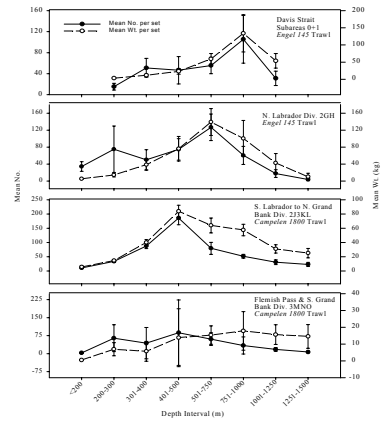


Distribution (kg. per set) of Greenland halibut from Canadian fall surveys during 1999.



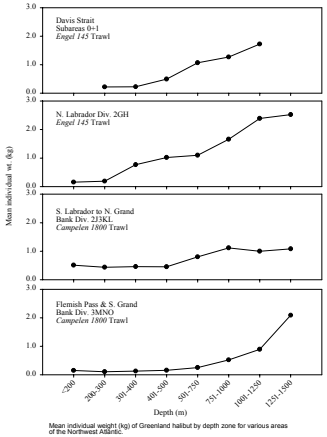
Distribution (kg. per set) of Greenland halibut from Canadian fall surveys during 2000.

DISTRIBUTION BY DEPTH ZONE FOR VARIOUS AREAS IN SA0-3



Mean number and weight (kg) per set (+/- 2S.E.) by depth interval of Greenland halibut from Canadian surveys in Subareas 0+1, Div. 2GH, Div. 2J3KL and Div. 3MNO separately.

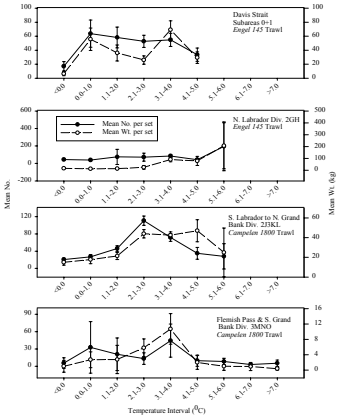
AVERAGE FISH SIZE BY DEPTH ZONE
NOTE THE PROPONDERANCE OF LARGER FISH IN DEEPER WATER AND VICE-VERSA



Mean individual weight (kg) of Greenland halibut by depth zone for various areas of the Northwest Atlantic.

DISTRIBUTION BY BOTTOM TEMPERATURE INTERVAL

NOTE VARIABILITY IN "OPTIMUM" TEMPERATURE BUT NEVERTHELESS, THE TEMPERATURE RANGE WHERE FISH ARE DISTRIBUTED IS RELATIVELY NARROW (MAINLY 0-4C)



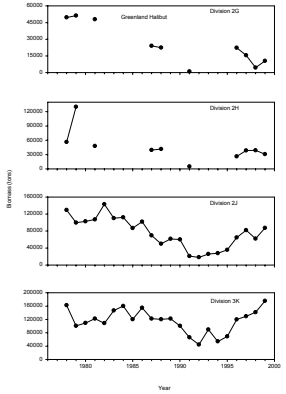
Mean number and weight (kg) per set (+/- 2S.E.) according to bottom temperature of Greenland halibut from Canadian surveys in Div. 2GH, Div. 2J3KL and Div. 3MNO separately.

BIOMASS INDICES - DIVISIONS 2G, 2H, 2J, 3K (CANADIAN SURVEYS DURING FALL)

NOTE THE DECLINES FROM LATE 1970'S AND EARLY 1980'S WITH NO APPARENT REASON FOR THE MAGNITUDES OF THE DECLINES

AND

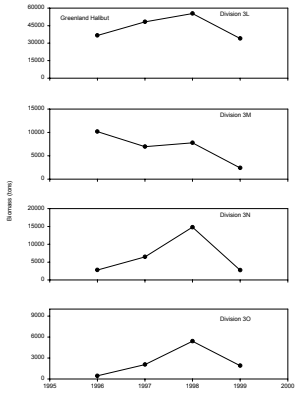
NOTE INCREASES FOR THE LATE 1990'S ESPECIALLY IN DIVISIONS 2J AND 3K



Campelen biomass estimates by NAFO Division from Canadian fall surveys during 1978-99.

BIOMASS INDICES - DIVISIONS 3L, 3M, 3N, 3O (CANADIAN SURVEYS DURING FALL)

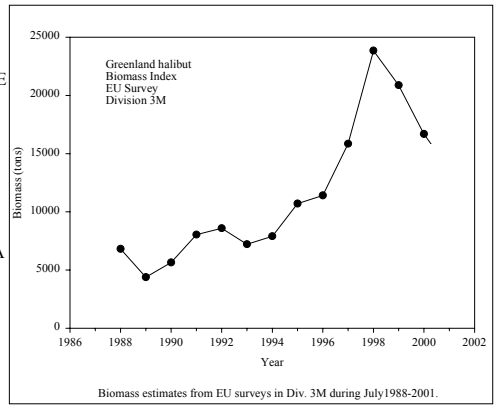
NOTE VERY POOR COVERAGE, THUS MAKING IT DIFFICULT TO DRAW ANY CONCLUSIONS REGARDING BIOMASS INDICES FOR THIS AREA



Campelen biomass estimates by NAFO Division from Canadian fall surveys during 1996-99.

DIVISION 3M (EU SURVEYS DURING JULY)

-NOTE THE INCREASING TREND FROM THE LATE 1990'S
-BIOMASS DECLINED SOMEWHAT FROM 1998 TO 1999
-PRELIMINARY DATA SUGGEST A FURTHER DECLINE FROM 1999 TO 2000 (AROUND 17,000 TONS)

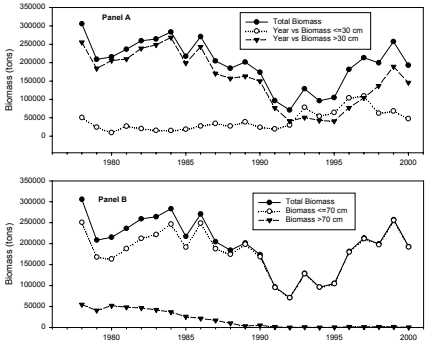


Biomass estimates from EU surveys in Div. 3M during July1988-2001.

BIOMASS INDICES BY SIZE GROUPING IN DIVISION 2J AND 3K (CANADIAN SURVEYS DURING FALL)

BIOMASS INDEX IN PANEL (A) BASED ON MINIMUM LEGAL SIZE LIMIT (30 CM). NOTE THE CHANGEOVER IN THE > AND < 30 CM IN 1999 AS THE STRONG RECRUITMENT GROWS

BIOMASS INDEX IN PANEL (B) BASED ON APPROXIMATE KNIFE-EDGE LENGTH AT MATURITY (M+F) OF 70 CM. NOTE DECLINE IN >70 CM FISH SINCE EARLY 1980'S TO VIRTUALLY NOTHING SINCE 1990. NO CHANGE EXPECTED UNTIL STRONG YEAR-CLASSES REACH 70 CM IN SEVERAL MORE YEARS TIME

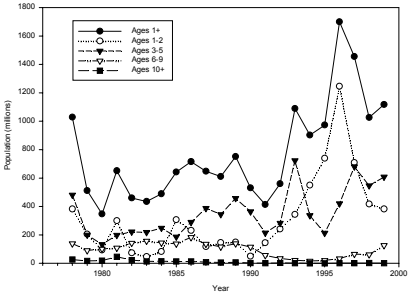


Biomass (tons) of Greenland halibut by length grouping from Canadian fall surveys conducted in Div. 2J+3K during 1978-2000. Biomass was calculated using the at sea L/W equations as applied to Campelen or Campelen equivalent abundance indices. The annual L/W equations were applied to 1990-98; the 1990 equation was applied to 1978-89; the average of 1997-99 was applied to 1999 and 2000.

POPULATION ABUNDANCE INDICES BY AGE GROUPING IN DIVISION 2J AND 3K (CANADIAN SURVEYS DURING FALL)

NOTE THAT THE ENTIRE INCREASE IN ABUNDANCE IN RECENT YEARS IS DRIVEN BY GREENLAND HALIBUT <6 YEARS OLD.

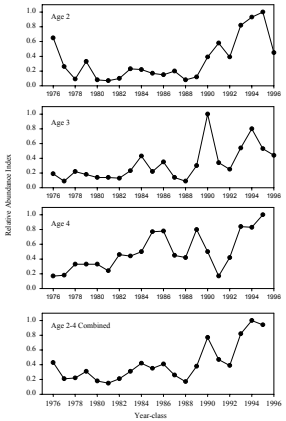
INDEX FOR AGES 6 AND OLDER SHOULD START TO SHOW SOME INCREASE AS THE STRONG MID 1990'S YEAR-CLASSES GET OLDER



Trends in population abundance estimates by age category from Canadian fall surveys in Divisions 2J and 3K combined during 1978-99.

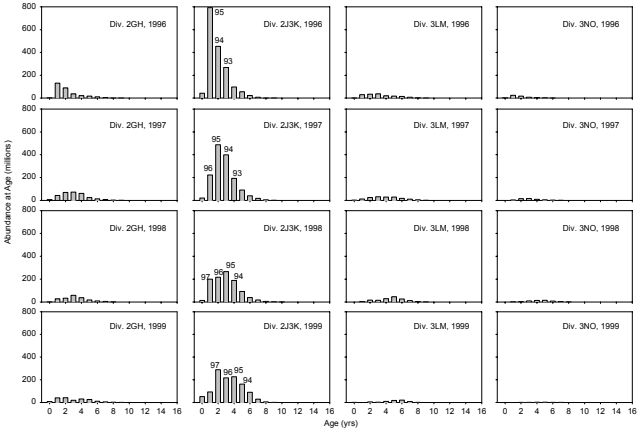
RECRUITMENT INDICES

OVERALL AVERAGE LINES SHOWN
- -NOTE THE SIGNIFICANTLY IMPROVED RECRUITMENT DURING THE 1990'S
- -NOTE THE CHANGE IN SURVEY GEARS AND THE POSSIBLE INFLATED ESTIMATES OF THE 1990'S YEAR-CLASSES EVEN THOUGH THEY ARE STRONG NEVERTHELESS
- -NOTE THE AVERAGE LINE MAY ALSO BE INFLATED BECAUSE OF THE HIGH RECENT POINTS. DESPITE THAT, RECRUITMENT WAS APPARENTLY BELOW AVERAGE DURING THE EARLY 1980'S AND MAY PARTLY EXPLAIN THE DECLINE DURING THE 1980'S EVEN THOUGH FISHING PRESSURE WAS CONSIDERED TO BE LOW



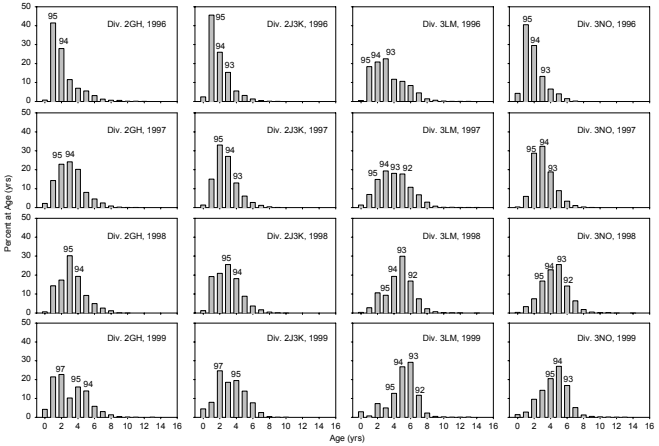
Relative index of abundance for pre-recruit year-classes of Greenland halibut from bottom trawl surveys in NAFO Div. 2J, 3K of the Northwest Atlantic.

RECRUITMENT INDICES



Greenland halibut abundance at age (millions) by year and NAFO Division groupings from Canadian fall surveys during 1996-99.

RECRUITMENT INDICES

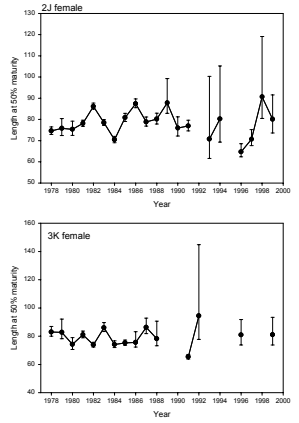


Greenland halibut percent at age by year and NAFO Division groupings from Canadian fall surveys during 1996-99. Numbers on graphs represent year-classes.

SIZE AND AGE AT SEXUAL MATURITY

DIVISIONS 2J & 3K M_{50}'S BY LENGTH FOR FEMALES ONLY

- -NOTE THE ANNUAL VARIABILITY OVER TIME BUT NO PARTICULAR TREND (UNLIKE SOME OTHER STOCKS SUCH AS COD AND OTHER FLATFISH THAT HAD DECLINING TRENDS AS THE STOCKS COLLAPSED)
- -NOTE THAT THE M50 FOR FEMALES REPRESENTS APPROXIMATELY 13 YEARS OLD. VERY FEW OF THESE FISH ARE IN THE MEASURABLE POPULATION AND ARE POORLY REPRESENTED IN THE CATCHES



Length at 50% maturity (± 95% fiducial limits) for female Greenland halibut from Canadian fall RV surveys from 1978 to 1999.

SIZE AND AGE AT SEXUAL MATURITY

Length (cm) and age at 50% maturity for males and females for Div. 2GHJ and 3KLMNO combined from 1996 to 1999.

Year	Male		Female	
	Length	Age	Length	Age
1996	59.8	10.1	74.1	12.0
1997	60.5	10.2	76.2	12.6
1998	61.4	10.0	81.7	13.3
1999	57.4	8.8	79.2	12.7

LENGTH AND AGE AT M50 FOR ALL DIVISIONS COMBINED FROM 1996-99

- -NOTE THE DIFFERENCES BETWEEN MALES AND FEMALES ALTHOUGH BOTH ARE POORLY REPRESENTED IN THE CATCHES
- -NOTE THE RELATIVE STABILITY IN THE VALUES OVER THE 4 YEAR PERIOD EXAMINED

SPAWNING

PERCENTAGE AND NUMBER OF FEMALE GREENLAND HALIBUT OBSERVED IN VARIOUS STAGES OF SPAWNING CONDITION

- -THERE ARE MUCH HIGHER PERCENTAGES ASSOCIATED WITH THE MORE NORTHERLY REGIONS. IS CONSISTENT WITH THE OLD THEORY OF A NORTHWARD MIGRATION FOR SPAWNING ALTHOUGH RECENT RESEARCH IN DEEP WATER SHOWS CLEARLY THAT SPAWNING DOES OCCUR THROUGHOUT THE DISTRIBUTION AREA FROM DAVIS STRAIT TO FLEMISH CAP

Percentage and (number) of adult females in Canadian fall RV surveys that were spent in the last year (SPL), maturing for the present year (MATAP), spawning (SPAWN), spent in the present year (SPENT), or maturing for the next year (MATNEXT). The survey series is divided into three time periods, 1978-1986, 1987-1995 and 1996-1999. The percentage that was immature (IMM) is also given.

Period	Area	IMM	SPL	MATAP	SPAWN	SPENT	MATNEXT
1978-1986	2GH	88	0	0.2 (2)	7.5 (80)	0	92 (983)
	2J3K	95	0.1 (1)	0.3 (5)	4.8 (77)	13 (205)	82 (1319)
1987-1995	2GH	95	0	0.2 (1)	0.5 (2)	48 (207)	52 (225)
	2J3K	99	0	0.9 (2)	0.9 (2)	22 (48)	76 (165)
1996-1990	2GH	99.8	0	0	2.6 (1)	18 (7)	80 (31)
	2J3K	99.9	0	0	0	8 (4)	92 (51)
	3LM	99.7	0	0	0	23 (10)	77 (34)
	3NO	99.9	0	0	0	8 (1)	92 (11)

Percentage and (number) of adult females in the Canadian fishery that were spent in the last year (SPL), maturing for the present year (MATAP), spawning (SPAWN), spent in the present year (SPENT), or maturing for the next year (MATNEXT). The survey series is divided into two time periods, 1993-1995 and 1996-1999. The percentage that was immature (IMM) is also given.

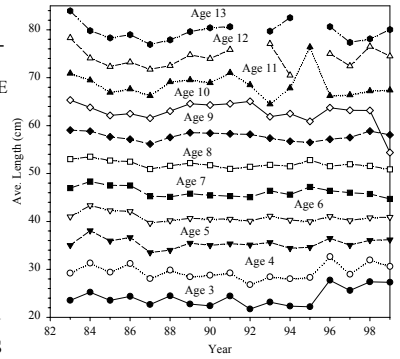
Period	Area	IMM	SPL	MATAP	SPAWN	SPENT	MATNEXT
1993-1995	0B	23	0	0	0	32 (345)	68 (736)
	2GH	48	0	19 (50)	0.1 (3)	32 (838)	66 (1755)
	2J3K	69	2.8 (47)	64 (1053)	1.2 (20)	11.7 (194)	21 (345)
	3LM	71	5 (9)	94 (170)	0	1.1 (2)	0
1996-1999	0B	35	0	28 (282)	15 (148)	57 (573)	0
	2GH	64	0	38 (105)	24 (67)	38 (105)	0
	2J3K	92	0.3 (2)	82 (563)	5.7 (39)	11.3 (77)	0.4 (3)
	3LM	74	1 (3)	94 (293)	1 (3)	4 (13)	0
	3NO	45	0	91 (386)	0.7 (3)	5 (21)	3 (13)

GROWTH PATTERNS

MEAN LENGTH AT AGE FROM DIV. 2J & 3K (COMBINED) CANADIAN FALL SURVEYS (SEXES COMBINED) FROM 1977-99

- -NOTE THAT THERE IS LITTLE VARIABILITY IN THE MEAN SIZE AT AGE OVER THE 20 YEAR PERIOD EXAMINED INDICATING RELATIVE STABILITY IN GROWING CONDITIONS
- -HIGH VARIATIONS IN THE OLDER AGES MOST LIKELY AN ARTIFACT OF LOW SAMPLE SIZES AS WELL AS INCREASED IMPRECISION IN INTERPRETING OLDER AGES FROM THE OTOLITHS

Greenland halibut average length (cm) at age from Canadian surveys in Div. 2J & 3K combined and sexes combined during 1983-99



FEEDING PATTERNS

MAJOR DIET COMPOSITION FOR THE 3 YEARS STUDIED (1981, 1982 & 1984)

- -NOTE THE COMPOSITION VARIED LITTLE OVER THE 3 YEARS
- -CAPELIN COMPRISED THE BULK OF THE PREY
- -SHRIMP AND GONATUS SQUIDS WERE NOT A BIG PLAYER IN THOSE YEARS

Stomach contents of Greenland halibut taken during Canadian research vessel surveys conducted in autumn of 1982, 1983 and 1984.

Prey items	Occurrence(%)			Number(%)			Weight (%)			Mean PFI		
	1981	1982	1984	1981	1982	1984	1981	1982	1984	1981	1982	1984
Invertebrata (misc)	0.9	0.4	0.9	0.6	0.3	0.8	0.2	+	0.1	+	+	+
Cephalopda	4.1	1.7	1.4	2.8	1.3	1.1	2	0.6	1.3	0.07	0.04	0.03
Crustacea (total)	26.4	16.7	17.9	34.6	30.5	26.7	1.9	1.7	1.7	0.06	0.04	0.05
Hyperidae	8.8	3.6	5.7	14.5	10.8	10.9	0.1	+	0.1	0.02	0.01	0.02
Gammaridae	4.7	2.9	1.5	6.9	7.8	1.9	0.1	0.2	+	0.01	+	+
Mysidacea	1.2	+	-	1.4	+	-	+	+	-	+	+	-
Euphausiacea	1	0.8	1.4	0.9	1	1.7	+	+	+	+	+	+
Natantia												
Pandalus borealis	3.6	4.8	5	4	5.4	5.9	1	1.1	1	0.02	0.02	0.02
Others + unident.	5.2	5	4.5	3.9	4.5	4.4	0.6	0.4	0.5	0.01	0.01	0.01
Others + unident.	4.4	1.1	2	3	0.9	1.8	0.1	+	+	0.01	+	+
Selachii	+	-	0.2	+	-	0.2	+	-	0.4	+	-	+
Pisces (total)	38.7	42.6	42.7	62	68	71.3	95.8	96.6	95.9	1.29	1.35	1.32
Mallotus villosus	18.9	23.1	21.9	41.3	45.6	45.3	46.2	45.9	39	0.89	0.99	0.86
Myctophidae	1.2	0.1	0.9	1.5	0.1	1	0.6	+	0.8	0.01	+	0.02
Gadidae												
Gadus morhua	0.4	0.5	0.6	0.2	0.4	0.5	5.1	5.6	6.5	0.02	0.03	0.03
Boreogadus saida	1.5	0.6	1.9	3.1	0.6	2.4	4.5	0.6	0.9	0.06	0.01	0.03
Others + unident.	-	-	+	-	-	+	-	-	+	-	-	+
Macrouridae	0.4	0.1	0.3	0.3	0.1	0.2	3.8	1.3	1.2	0.01	0.01	0.01
Anarchichadidae	0.1	0.1	0.2	0.1	+	0.1	0.7	1	0.9	+	+	+
Zoarcidae	0.7	0.6	0.2	0.4	0.1	0.2	5.9	7.5	1.1	0.02	0.03	0.01
Sebastes sp.	1.6	1.6	3	1.1	1.3	2.3	13.1	11.3	21.6	0.05	0.05	0.09
Pleuronectidae												
Reinhartius hip-poglossoides	1.4	1.1	1.6	1.1	0.9	1.3	8.6	9.7	10.4	0.05	0.04	0.06
Others + unident.	1.1	1	0.7	0.8	0.9	0.6	1.4	3.5	1.6	0.01	0.01	0.01
Others	0.4	0.3	0.4	0.3	0.2	0.3	0.2	0.5	1.7	+	+	0.01
Unidentified	14.3	15.9	15.5	11.8	17.4	17.1	5.8	9.6	10.3	0.16	0.19	0.21
Unidentified + misc-laneous	1.6	1.6	0.7				0.1	1.2	0.6	+	+	+
Total										1.42	1.44	1.41

FEEDING PATTERNS

DIET COMPOSITION FROM GREENLAND HALIBUT IN THE DEEP WATERS OF DIVISION 3K DURING SPRING 1992

-NOTE THE INCREASED IMPORTANCE OF GONATUS SQUIDS IN THE DIET

Prey items from stomachs of Greenland halibut caught off Eastern Newfoundland during April 3-May 18, 1992; percentage in parenthesis.

Prey taxon	Occurrence	Number	Weight	PFI
Crustacea				
Natantia	1 (0.40)	-	4.0 (0.05)	0.001
Pisces				
Chiasmodon niger	5 (2.01)	1 (0.68)	140.3 (1.58)	0.052
Mallotus villosus	1 (0.40)	4 (2.70)	27.0 (0.30)	0.014
Reinhardtius hippoglossoides	1 (0.40)	1 (0.68)	609.5 (6.87)	0.050
Sebastes mentella	1 (0.40)	-	553.0 (6.23)	0.096
Scopelosaurus sp.	1 (0.40)	1 (0.68)	134.5 (1.52)	0.020
Lycodes vahlii	1 (0.40)	1 (0.68)	14.6 (0.16)	0.005
Gadidae				
Gadus sp.	1 (0.40)	1 (0.68)	313.1 (3.52)	0.027
Gaidropsarus sp.	1 (0.40)	1 (0.68)	408.0 (4.60)	0.026
Macrouridae				
Macrourus berglax	1 (0.40)	1 (0.68)	389.2 (4.39)	0.032
Macrourus sp.	1 (0.40)	1 (0.68)	46.4 (0.52)	0.008
Nemichthyidae	1 (0.40)	-	29.0 (0.32)	0.016
Unidentified fish	5 (2.01)	6 (4.05)	141.4 (1.59)	0.033
Mollusca				
Gastropoda, Buccinidae	1 (0.40)	2 (1.35)	0.90 (0.01)	0.002
Cephalopoda				
Teuthoidea				
Gonatus sp.	187 (75.10)	124 (83.78)	6041.0 (68.05)	2.151
Chiroteuthis sp.	2 (0.80)	3 (2.03)	14.1 (0.16)	0.009
Unidentified squid	6 (2.41)	1 (0.68)	8.2 (0.09)	0.004
		-		
Unidentified material	1 (0.40)		2.5 (0.03)	0.003

Number of stomachs	249	
Empty stomachs	33 (13.65)	
Predator length (cm): mean	50.7	
minimum	34.0	
maximum	87.0	

Questions/Comments

A. May: There appear to be good recruitment coming from a small biomass, does science have an explanation for this?

Ans: The biomass has been more stable in the north and the lower cod predation and cooler temperatures may be improving survival.

C. Cabot: Is there a relationship between turbot in the north and south?

Ans: Yes, tagging work confirms that some fish in the south originated in the north.

C. Cabot: There is a lot of fish in 2GH but it doesn't show up in the survey because of difficult towing conditions.

Ans: True, there is a portion of 2G not surveyed for the reasons stated.

R. Simmonds: Is it true that the larger/older fish, predominately females are in deep water?

Ans: Older data from block surveys indicated very little smaller fish deep, however more recent information shows increasing amount of small fish in deep water. There is a larger percentage of female fish in deep water.

H. Clarke: Abundance is increasing in 2J +3K but does not appear to be in the north, do you expect it to increase in the north?

Ans: Conditions may be better in 2J+3K, but not sure if the increase in the south will occur in the north.

R. Simmonds: Do larva come to the surface and drift in current?

Ans: Some do and commonly settle in shrimp areas (holes) to the south

NAFO Greenland Halibut Science – B. Brodie, DFO, St. John's

Greenland Halibut (Turbot)

Subarea 0 + Divisions 1A (offshore) and 1B – 1F

Summary

- Catches close to TAC of 11,000 t from 1996-99.
- Recent catches taken by fixed and mobile gears.
- CPUE in trawler fishery (0B+1CD) stable in 90's.
- Stable age composition in recent catches.
- Surveys in SA 1 indicate decline observed up to the mid 90's has stopped and stock size is similar to the late 80's and early 90's.
- New surveys in Div. 0A in 1999, and 0B in 2000.
- The 1995, 97, and 98 year-classes (at age 1 in the surveys) are above average.
- Attempts at analytical models not successful.
- NAFO SC recommended continuation of TAC of 11,000 t in 2001, specifically for 0B + 1B-F.
- NAFO SC suggested a TAC of 4,000 t in 2001 for offshore area of 0A + 1A, based mainly on the biomass estimated in the 0A survey in 1999.

Greenland Halibut (Turbot)

Division 1A (inshore)

Summary

- 3 main fishing areas – Disko Bay, Uummannaq, Upernavik, in West Greenland fjords. New grounds being explored north of Upernavik.
- Inshore dependent on recruitment from offshore. Spawning is only sporadic in fjords. No fish tagged inshore have been recovered offshore.
- Catches highest in Disko Bay. Catch increased 3-fold in 1A since early 90's, to 25 000 t in 98-99. Catches in each area above SC-advised catches.
- About 75% of recent catches taken by longline. Gillnets being phased out - banned in some areas.
- Fish in Disko Bay smaller than in other 2 areas. Longline surveys in all areas do not indicate major changes in abundance.
- Increased fishing mortality indicated in all 3 areas. Perhaps some growth overfishing in Upernavik.
- In Disko Bay survey, the 1995, 97, and 98 year-classes are above average.
- Attempts at analytical models not successful.
- No improvement in stock status in any area. SC concluded no change in TAC advice for 2001: 7900 Disko Bay; 6000 Uummannaq, 4300 Upernavik.
- Increased landings in recent years cause for concern. Exploitation of spawning stock (Davis Strait) and by-catch in the shrimp fishery should be taken into account in managing the fjord fisheries.

Greenland Halibut (Turbot)

Subarea 2 + Divisions 3KLMNO

Summary

- Catches 19,000 - 24,000 tons from 1996-99.
- Recent catches taken by fixed and mobile gears. Stable age composition in recent catches.
- Trawler CPUE increased since mid 90's.
- 50% of males are mature around 60 cm, females between 74 and 82 cm.
- Canadian, EU surveys show increases since 1995.
- Improved recruitment in early - mid 90's. The 1994 and 1995 year-classes appear to be quite strong.
- Analytical models show resource has increased since mid 90's. Fishing mortality has declined in recent years from very high level in early 1990's.
- Projections at the 1999 fishing mortality level correspond to catches in 2001 of 44,000 tons.
- NAFO SC recommended a TAC of 40,000 t in 2001. Uncertainty around 1994-95 year classes and their expected contribution to fishery in 2000-01.
- NAFO SC expressed concerns over continued exploitation of juveniles, as well as the effect of the Greenland halibut fishery on other species.
- SC also noted that fishing effort should be distributed similar to biomass to ensure sustainability of all spawning components.

Questions/Comments on 1A-F

D. Bollivar: What impact is the Fjord fishery having on the Canadian quota?

Ans: Biologically it is having no impact as fish don't appear to come out of the Fjords.

Cont'd: Is it possible that the fishery is taking the most of the fish therefore few are getting out?

Ans: There is more effort than there use to be but tagging has been going on for 10 years with thousands of tags put on, one would expect some to show up outside the Fjord if any significant amount moved out.

Cont'd: Can the Canadian fishery impact the Greenland Fjord Fishery?

Ans: Most fish in the northern Fjords were spawned in David Strait therefore if the spawner biomass in the Strait was reduced it could impact the Greenland fishery.

A. May: It is difficult to believe that the small boat Fjord fishery could harvest 25,000t.

Ans: Agree, but during the fishing season harvesters basically live on the boats.

C. Bonnell: Does the turbot in all the Fjords originate from Davis Strait?

Ans: In the Fjords south of Nuuk most of the fish comes from east Greenland, to the north most from Davis

R. Andrews: With no commercial date and only 1 survey in OA how was the 4,000t TAC established in that area?

Ans: The Scientific Council of NAFO considered this a precautionary level.

Questions/Comments on 3LMNO

B. Chapman: The quota established for turbot by NAFO appear to be too high for spawner stock rebuilding given the 1999 reference point.

Ans: It may not be that the quota is too high but that the age of first capture should be older than what it currently is.

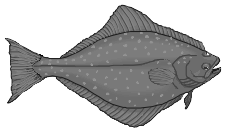
Discussion on Science and Research Priorities

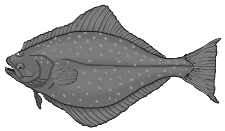
1. Can we make any educated guesses about GLH in SA 0 and 1 without adequate research? Concern re lack of/sporadic research in 0+1 area.
2. Questions were asked regarding quota increases in the southern areas but not in SA 0+1 given the biological knowledge suggesting is one stock throughout the entire area.
3. Question raised as to whether offshore fishery in 0B would 'hurt' inshore in 1A (Greenland inshore fishery).
4. Question of whether GLH caught inshore off Baffin Island are 'isolated' from the offshore resource in a similar manner to those in the inshore of Greenland in 1A.
5. Ongoing research on Greenland halibut throughout the Canadian and Greenland zones of Davis Strait is necessary in order to permit and promote orderly development of the various fisheries based on conservation considerations and an objective of sustainability within a precautionary framework.
6. Canada should pursue additional bilateral research, and invest in additional research on Greenland halibut in the Davis Strait area so as to enable better overall understanding of the resource in the Davis Strait area and their links to the resource further south. The results of such research would allow appropriate discussions regarding proportional split in allocations based on biomass distribution in the offshore areas of 0AB + 1ABCD
7. Question of whether GLH caught inshore off Baffin Island are 'isolated' from the offshore resource in a similar manner to those in the inshore of Greenland in 1A was raised.
8. Canada should invest in further research on Greenland halibut in the inshore areas of Baffin Island to determine their affiliation with the resource in the offshore so as to allow for appropriate development of this inshore fishery.

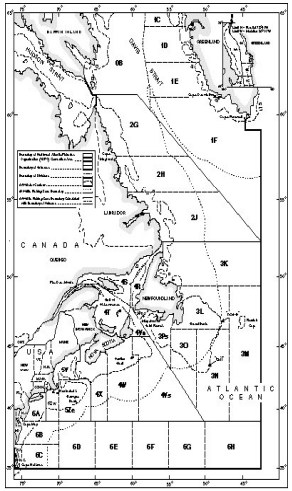
Management and Regulation of the Fishery – B. Rashotte, DFO, Ottawa

FISHERIES MANAGEMENT PRESENTATION

GREENLAND HALIBUT WORKSHOP







Sub-area 0 (SAO)

- There are four species which are transboundary in Davis Strait - roundnose grenadier, shrimp, Atlantic Salmon and Greenland Halibut

History of Zone

- December 17, 1973: Agreement Relating to the Delimitation of the Continental Shelf Between Greenland and Canada was signed. Delimited the Continental Shelf in Davis Strait between the two countries for the purpose of exploration and exploitation of the natural resources of the Continental Shelf.
- 1977 - extension of fisheries jurisdiction
- 1979 - dividing line between Sub-area 0 and 1 was adjusted. The line between Sub-area 0+1 equates to the equidistant line between Canada's and Greenland's 200-mile zones.

History of Allocations

- Prior to 1977, Greenland Halibut in SAO was managed by ICNAF.
- Today this stock is assessed by the NAFO Scientific Council, at the request of both Canada and Greenland. However, the NAFO Fisheries Commission does not discuss management of this stock as it is found entirely within Canada and Greenland waters.
- The TACs for 1977 were global for Sub-areas 0+1 with no breakdown between Canadian and Greenland fishing zones.
- In 1978 annual bilateral meetings were initiated to establish TACs for sub-areas 0+1 and to divide the TACs between the two parties.

The 1978 arrangements

	TAC	EC	CANADA
Greenland Halibut	25,000 t	24,500 t	500 t
Roundnose Grenadier	8,000 t	7,500 t	500 t
Shrimp	40,000 t	39,000 t	1,000 t

1979 Arrangements

	TAC	EC	CANADA
Greenland Halibut	20,000 t	18,000 t	2,000 t
Roundnose Grenadier	8,000 t	7,500 t	500 t
Shrimp	29,500 t	27,500 t	2,000 t

1980 Arrangements

	TAC	EC	CANADA
Greenland Halibut			3,500 t
Roundnose Grenadier	8,000 t	7,200 t	800 t
Shrimp	29,500 t	27,000 t	2,500 t

1981 Arrangements

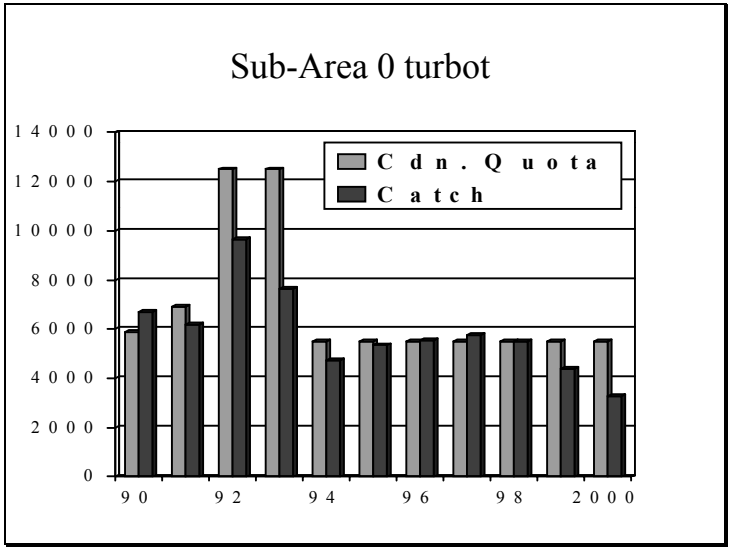
	TAC	EC	CANADA
Greenland Halibut	25,000 t	20,000 t	5,000 t
Roundnose Grenadier	8,000 t	6,400 t	1,600 t
Shrimp	29,500 t	27,000 t	2,500 t

	TAC	EC	CANADA
Greenland Halibut	25,000 t		12,500 t
Roundnose Grenadier	8,000 t		4,000 t
Shrimp	29,500 t		5,000 t

2000 Arrangements

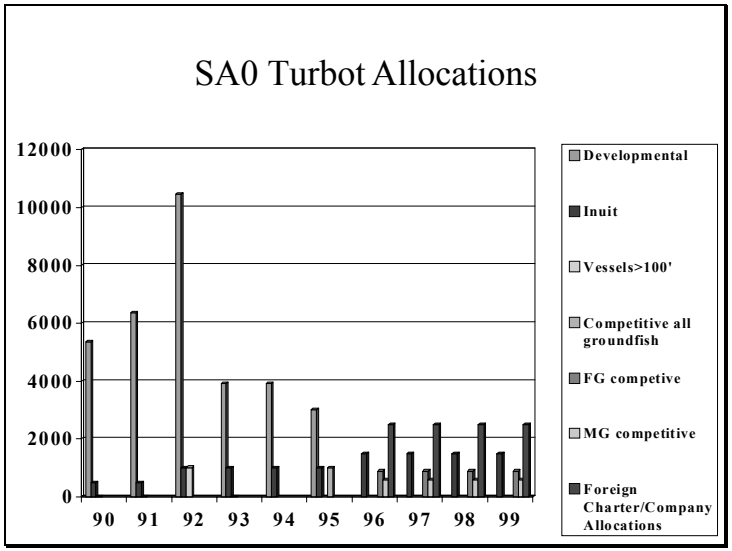
	TAC	EC	CANADA
Greenland Halibut	11,000 t	5,500 t	5,500 t
Roundnose Grenadier	Moratorium		---
Shrimp	65,000 t	55,650 t	9,350 t

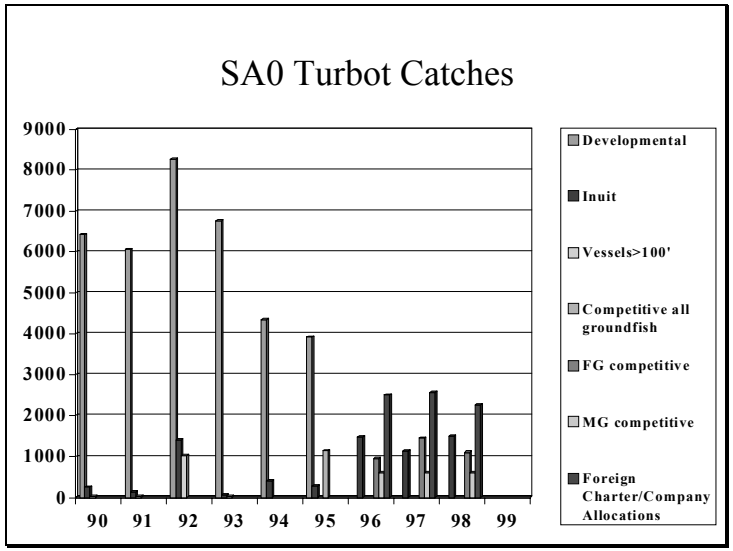
- From 1982 - 1984 impossible for Canada and EC to establish joint management arrangements for Davis Strait.
- Greenland withdrew from EC on January 1, 1985.
- First management related discussions since 1980-81 took place in November 1986.
- Despite discussions, separate management regimes have applied to the two sides of Davis Strait boundary since 1981.



0 GREENLAND HALIBUT - QUOTA VS. CATCH
1990-2000

	Allocation	Catch	Over/Under
1990	5900	6686	786
1991	6900	6199	-701
1992	12500	9671	-2829
1993	12500	7628	-4872
1994	5500	4743	-757
1995	5500	5347	-153
1996	5500	5834	334
1997	5500	5956	456
1998	5500	5508	8
1999	5500	4386	-1114
2000	5500	5356	-144





0 Greenland Halibut 1990-2000 by Fleet

	Developmental		Inuit		Vessels>100'		Competitive all groundfish		FG Competitive		MG Competitive		Foreign Charter/Company Allocations	
	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch
1990	5360	6431	500	255	20	0								
1991	6360	6058	500	141	20	0								
1992	10460	5661	1000	385	1020	3625								
1993	4920	6763	1000	46	20	20	6540	799						
1994	3925	4343		400			6575		1000		1000			
1995	3500	3919	1000	285			1000			736		407		
1996			1500	1772			1500			957		604	2500	2501
1997			1500	1338					900	1451	600	600	2500	2567
1998			1500	1539					900	1106	600	604	2500	2259
1999			1500	400					900	1893	600	596	2500	1497
2000			1500	1341					900	870	600	588	2500	2557

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HISTORY

1990 -Turbot Developmental Program introduced for NAFO 0,2 and 3KL.
1992 - 2J3KL removed from Developmental
1993 - Competitive quota for Canadian vessels
- GNWT test fishery for turbot in 0A
1994 - Conservation Harvesting Plans introduced indicating min. mesh size (for gillnets 5.5" in 100-400 fathoms, 7.5" in waters >400 fathoms), 145 diamond for trawlers, DMP, observer coverage,
1996 - Developmental allocation reduced to 2500t and replaced by Foreign Charter Fishery
- 1500t Competitive quota split 900fg/600mg
- fg restricted access after Sept. 30
- Nunavut provided 500t offshore allocation
- Nunavut 300t exploratory quota for 0A
1997 - limits on number of gillnets introduced: 200 (5.5") in <400 fathoms or 500 (7.5") in waters >400 fathoms, min. fish size (45cm) in protocols
1998 - 5 -year Mgt. plan introduced including:
Company Allocations; Canadianization;
observers for fg vessels, net tagging
2000 - Expanded exploratory in 0A announced for 2001 - 4,000t TAC

2+3KLMNO Greenland Halibut

Background/History of the Stock

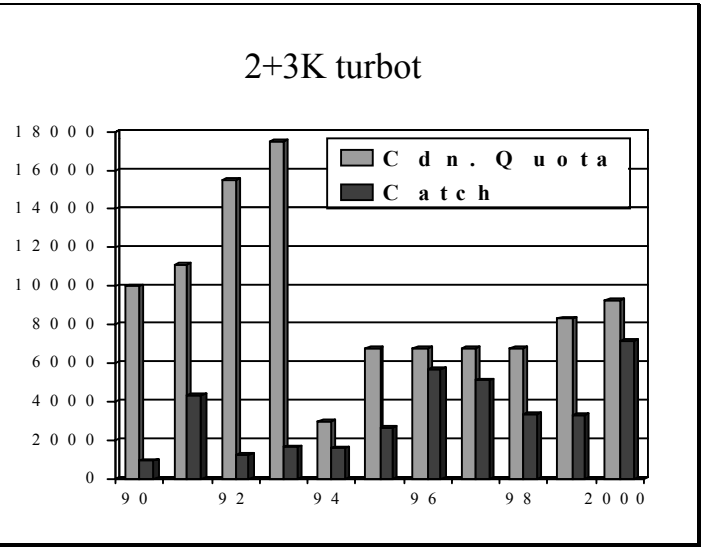
- The stock areas for management purposes (for that portion found in Sub-areas 2 and 3) have changed a number of times.
- The first management unit in 1978 was 2J+3KL.
- In 1979 this changed to 2+3KL and remained this way until 1984 when the management units changed to 2GH and 2J3KL.
- In 1994 the management units changed once more to Sub-area 2 and 3KLMN and then in 1995 the current management units were introduced (2+3K and 3LMNO).
- Up until the mid 1990s, the Sub-areas 2+3 Greenland halibut had been under Canadian management. Since 1995 the stock TAC for 2+3 is set by NAFO.

2+3KLMNO Greenland Halibut

- Catches increased sharply in 1990 due to a developing fishery in the NRA in Divisions 3LMN and continued at high levels during 1991-94.
- The NAFO Fisheries Commission set the first NAFO TAC (27,000t) for Greenland halibut in Sub-areas 2+3 at its 1994 meeting, for the 1995 fishery, but could not agree on a sharing formula at that time.
- A Special Meeting of the Commission was held in early 1995 to decide on such a sharing formula for this stock. At that time, it was agreed that 20,000t would be assigned to Divisions 3LMNO, to be under NAFO management and the remaining 7,000t would be assigned to 2+3K and under Canadian management.

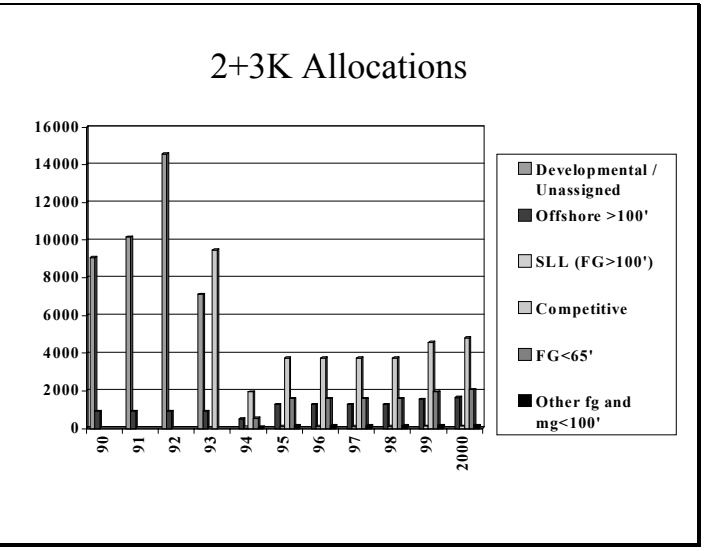
2+3KLMNO Greenland Halibut - cont'd

- A sharing arrangement was also agreed to for the 20,000t, although the European Union objected to their share subsequently undertaking what Canada believed was a uncontrolled and unsustainable fishery which resulted in what was to be known as the "Turbot War".
- Since 1995, overall catches in Sub-areas 2+3 have been well below the TAC levels which remained at 27,000t until raised to 33,000t for 1999 and 35 000 for 2000 and 40 000t for 2001.

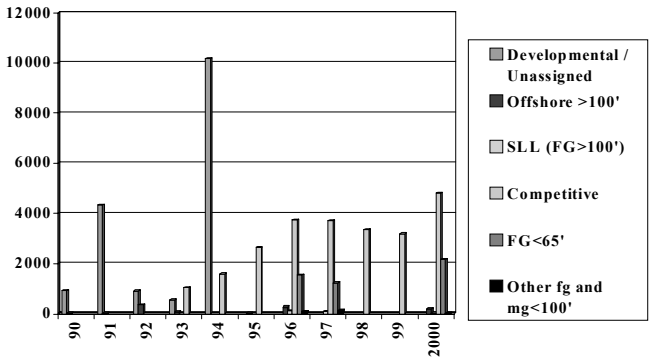


2+3K GREENLAND HALIBUT - QUOTA VS. CATCH
1990-2000

	Allocation	Catch	Over/Under
1990	10000	947	-9053
1991	11100	4340	-6760
1992	15500	1232	-14268
1993	17500	1627	-15873
1994	3000	1579	-1421
1995	6790	2635	-4155
1996	6790	5703	-1087
1997	6790	5126	-1664
1998	6790	3358	-3432
1999	8300	3192	-5108
2000	8793	7157	-1636



2+3K Catches



2+3K Greenland Halibut 1990-2000 by Fleet

	Developmental / Unassigned		Offshore		SLL (FG>100')		Competitive		FG<65'		Other FG and MG <100'	
	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch
1990	9070	928	910	19								
1991	10170	4337	910	3								
1992	14570	892	910	340								
1993	7110	526	910	64			9460	1037				
1994			476		31		1931	1579	520		42	
1995			1262	1	94		3727	2634	1580		127	
1996			1262	262	94	96	3727	3727	1580	1545	127	73
1997			1262	406	94	72	3727	3716	1580	811	127	121
1998			1262		94		3727	3358	1580		127	
1999			1543		115		4555	3192	1932		155	
2000			1635	183	121	6	4827	4802	2046	2155	164	11

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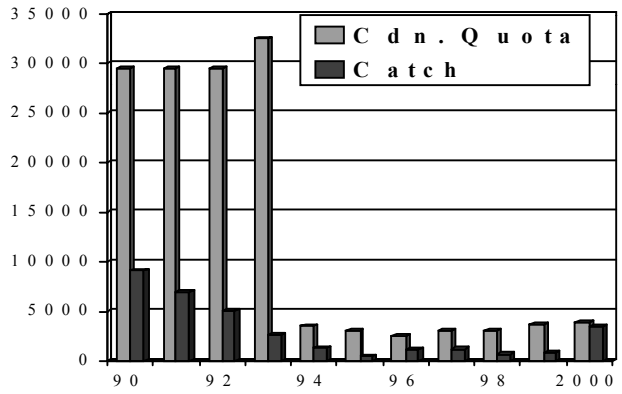
2+3K turbot

1978 - First management unit 2J+3KL
1979 - Changed to management unit 2+3KL
1984 - Changed to management unit 2GH
1994 - Changed to management unit Sub-Area 2
- Conservation Harvesting Plans introduced indicating min. mesh size (for gillnets 5.5" in 100-400 fathoms, 7.5" in waters >400 fathoms), 145 diamond for trawlers, DMP, observer coverage,

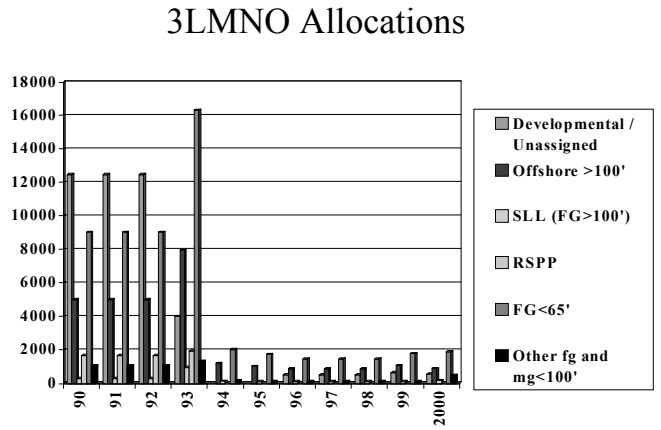
1995 - Changed to current unit 2+3K
- NAFO set first TAC for Sub-Areas 2+3 (27,000t) with 7,000t assigned for 2+3K
- Min fish size in NRA established at 30 cm

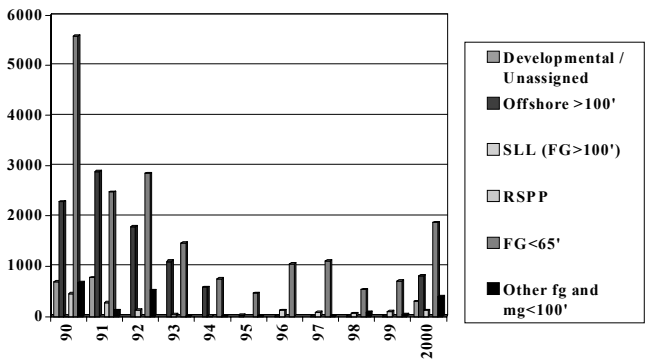
1997 - limits on number of gillnets introduced: 200 (5.5") in <400 fathoms or 500 (7.5") in waters >400 fathoms, min. fish size (45cm) in protocols

3LMNO turbot



3LMNO GREENLAND HALIBUT - QUOTA VS. CATCH 1990-2000			
	Allocation	Catch	Over/Under
1990	29500	9114	-20386
1991	29500	6930	-22570
1992	29500	5062	-24438
1993	32500	2592	-29908
1994	3500	1319	-2181
1995	3000	476	-2524
1996	2500	1172	-1328
1997	3000	1191	-1809
1998	3000	681	-2319
1999	3667	817	-2850
2000	3890	3467	-423





3LMNO Greenland Halibut 1990-2000 by Fleet

	Developmental / Unassigned		Offshore		SLL (FG>100')		RSPP		FG<65'		Other FG and MG <100'	
	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch	Allocation	Catch
1990	12480	686	5000	2286	280	5	1650	443	9050	5586	1040	108
1991	12480	774	5000	2885	280		1650	274	9050	2475	1040	522
1992	12480		5000	1781	280	124	1650		9050	2848	1040	309
1993	4000		7978	1097	961	34	1922		16341	1457	1298	4
1994			1201	574	119	1			2020	740	160	4
1995			1030	13	102				1731	462	137	1
1996			858	9	85	117			1443	1046	114	
1997	500		858	4	85	80			1443	1102	114	5
1998	500		858	5	85	53			1443	526	114	97
1999	611		1049	1	104	86			1763	698	140	32
2000	648	294	1113	801	110	111			1870	1870	149	391

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3LMNO turbot

1984 - Management unit was 2J3KL
1994 - Changed to management unit 3KLMN
- Conservation Harvesting Plans introduced indicating min. mesh size (for gillnets 5.5" in 100-400 fathoms, 7.5" in waters >400 fathoms), 145 diamond for trawlers, DMP, observer coverage,.

1995 - Changed to current unit 3LMNO
- NAFO set first TAC for Sub-Areas 2+3 (27,000t), 20,000 assigned to 3LMNO
- sharing arrangement established for 3LMNO but EU objected to share leading to "Turbot Dispute"
- Min fish size in NRA established at 30 cm

1997 - limits on number of gillnets introduced: 200 in <400 fathoms or 500 in waters >400 fathoms, min. fish size (45cm) in protocols

Specific Concerns Regarding This Stock

- There are two main areas of concern regarding this stock.
- The first concern relates to areas of catch. During 1996-98, catches from 3LMNO represented 73-80% of catches from 2+3KLMNO. Given that about 19-25% of the surveyed biomass was located in 3LMNO in 1996-98 the impact of this catch level in only part of the stock area is unknown.
- The other main issue of concern is the continuing high catches juvenile fish.

NAFO Management Measures Relating to 2+3KLMNO Greenland halibut

- Minimum fish size – 30 cm – vessels shall not retain any fish under this size. If the amount of undersized fish in any one haul exceeds 10% by number, the vessel shall immediately change fishing area (minimum 5 nautical miles)
- Minimum mesh size – 130 mm

Current Canadian Management Measures for 2+3KLMNO Greenland Halibut

- Minimum fish size – 45 cm – all fish to be landed.
- Small Fish Protocol
- Minimum mesh size for trawls – 145 diamond or 155 square (for vessels <65' – 155 mm diamond or 165 mm square mesh in the codend and lengthening piece and 155 mm diamond in the remainder of the trawl)

Current Canadian Management Measures for 2+3KLMNO Greenland Halibut -cont'd

- Minimum hook size - #14 – in depths greater than 300 fathoms (for <65' vessels)
- Vessels 65-100': minimum mesh size for gillnets – 7.5" – maximum of 500 nets of 50 fathoms each.
- Vessels <65': minimum mesh size for gillnets – 6" – a maximum of 500 nets (of 50 fathoms each) in water depths greater than 400 fathoms and a maximum of 200 nets in water depths between 100 and 400 fathoms.
- 100% dockside monitoring
- Observer coverage

The Northern Turbot Developmental Program/Foreign Charter Fishery

- Began in 1990
- The three Northern turbot "stocks" formed part of this Program at the start. In 1992 the 2J3KL component was removed from the Program leaving only 0 and 2GH. In 1994 2GH was also removed.
- Quota (Division 0) has been as high as 10,460t (of Canadian quota of 12,500t) in 1992 to low of 2,500t in recent years (5,500 Canadian quota).

The Northern Turbot Developmental Program/Foreign Charter Fishery - cont'd

- 1994, "Panel on the Use of Foreign Vessels in Canadian Waters" advised that full Canadianization of both harvesting and processing should ontinue to be the primary goal.
- The Panel supported the continued use of foreign vessels in the 1995 SAO turbot fishery provided that: 1) sufficient quotas were made available to the Inuit and Canadian competitive fishermen; 2) allocations for foreign harvesting only be given to participants that complied with NTDP criteria in 1994.

The Northern Turbot Developmental Program/Foreign Charter Fishery - cont'd

- In announcing the 1996 Northern turbot quotas, the Minister noted that as a step towards Canadianization, the amount of quota available for harvest by foreign charters would be decreased.
- The Minister also announced in 1996, that it was time to begin phasing out the use of foreign charters in this fishery.
- In 1998 the use of foreign vessels in this fishery was terminated.

HISTORIC DATA

DEVELOPMENTAL GROUNDFISH PROGRAM - TURBOT

1994[2]

	1990[1]		1991		1992		1993[2]		1994[2]		1995[4]	
	Quota	Catch	Quota	Catch	Quota	Catch	Quota	Catch	Quota	Catch	Quota	Catch
DIVISION 0	5,360	6,431	6,360	6,058	10,460	5,661	4,920	6,763	3,925	4,343	3,500	3,919

1996		1997		1998		1999		2000		2001	
2,500[5]	2,501	2,500	2,567	2,500[6]	2,259	2,500	2,557	2,500	1,700	2,500	

	1990[3]		1991		1992		1993	
	Quota	Catch	Quota	Catch	Quota	Catch	Quota	Catch
DIVISION 2GH	9,070	928	10,170	4,337	11,570	892	7,110	[2]

	1990[3]		1991	
	Quota	Catch	Quota	Catch
DIVISION 2J3KL	12,480	686	12,480	746

1. Developmental quota based on uncaught allocations for period 1984-1988
2. In 1993 developmental and competitive offshore quotas permitted to be caught in either Area 0 or 2GH. Catches reported under Area 0 for both.
3. Management units changed to sub-area 2 and 3KLMN.
4. Management units changed to 2+3K and 3LMNO.
5. Developmental quota changed to Foreign Charter Fishery.
6. Foreign Charter Fishery changed to company allocations.

Sub-area 1

- In Sub-area 1, the fishery conducted in Divisions 1B-F is an offshore fishery. In the early to mid-1980s an inshore fishery developed in 1A. This inshore fishery is conducted in the inner parts of the ice fjords. Catches in these fjords do not have any effect on the stock found in other parts of 0+1. There is no information on the status of the stock in the offshore portions of 1A as traditionally there has been little or no fishing in this area.
- Greenland has been able to substantiate a separate inshore fjord fishery in Division 1A because, through scientific studies beginning in the mid-1980s, they have proved that the stock is separate and that it does not contribute to the offshore stock. This fishery has been accepted by the NAFO Scientific Council as a distinct fishery since 1994.

1978 Arrangements

- For 1978, annual bilateral meetings were initiated to establish TACs for Sub-areas 0+1 and to divide these TACs between the two parties.
- Canadian interest in fishing shrimp in Davis Strait increased significantly during 1978.

1979 Arrangements

- Canada succeeded in increasing its share of the shrimp TAC from 1,000t in 1978 to 2000t in 1979. To secure this increase Canada agreed to relatively small shares of Greenland halibut and roundnose grenadier, which at that time were of marginal interest to Canadians.

1980 Arrangements

- Canada approached negotiations for 1980 seeking an increased share of shrimp TAC and improved access to the EC zone.
- Canada proposed percentage splits based on estimates of the proportion of stocks available in each zone.
- Canada was willing to maintain its existing (1979) quotas for Greenland halibut and roundnose grenadier but sought 3,500t of shrimp and asked that Canadian quotas increase to equal the proportion of the shrimp stock found on the Canadian side of the boundary.
- EC offered 2,500t of shrimp with access to EC zone, which Canada accepted. As a trade off the Canadian allocation of Greenland Halibut and roundnose grenadier were increased to 3,500t and 800t.

1981 Arrangements

- But in December 1980 the EC informed Canada there would be no access for shrimp in Community waters in Sub-area 1 without both sides approving the Canada-EEC long-term agreement (LTA).
- In February 1981 Canada informed the EC that in advance of a joint management agreement, Canada was establishing the following 1981 TACs for Sub-area 0:

- 1. 5,000t – shrimp – 17%
- 2. 12,500 t Greenland Halibut and 4,000t roundnose grenadier, at 50% of the levels of previously agreed TACs for entire area.

Questions/Comments

All questions and comments are included after the Fisheries Management presentations below.

Management and Regulation of the Fishery – B. Hunt, DFO, Iqualuit

B. Hunt was unable to attend the Workshop.

Questions/Comments

See above.

Management and Regulation of the Fishery – G. Brocklehurst, DFO, St. John's

TABLE 1

Greenland Halibut Fishery *

Southern Based Vessels Licensed to Fish NAFO Division 0B
Competitive Quotas

Vessel Size	Number of Vessels	Active Vessels 2000
<65 ' Fixed Gear	**12**	**4**
65' – 100' Fixed Gear **	**5**	**3**
>100' Mobile Gear **	**5**	**2**
Scandinavian Longliners	**3**	**3**

* Effective in 2000, access to the competitive turbot quota in OB, was restricted to those vessels/companies which historically participated in this fishery.

** Refers to companies.

TABLE 2

TURBOT FISHERY - NAFO DIVISION 0B

GEAR CONFLICT RESOLUTION

To minimize gear conflict in the 0B Competitive Turbot Fishery between Fixed and Mobile Gears, the following agreement was reached starting in 2000:

1. **Prior to September 30 each year, there is no restriction on where fixed gear can fish in NAFO Division 0B.**

2. After September 30, gillnets would be restricted to fishing that portion of Division 0B north of 63°10', and longline vessels would be restricted to fishing north of the line or in areas deeper than 750 fathoms.

TABLE 3

SA0 TURBOT FISHERY

LICENCE CONDITIONS

FIXED GEAR

1. **Maximum of 500 gillnets (50 fathoms) may be used; only 200 gillnets can be set in depths less than 400 fathoms.**

2. **No fishing in water depths less than 100 fathoms.**

3. **Only gillnets with a minimum mesh size of 6" may be used in water depths from 100-400 fathoms.**

4. **Only gillnets with a minimum 7 ½ " mesh size may be used in water depths over 400 fathoms.**

(cont'd)

TABLE 3 (cont'd)

5. **Hook and Line gear must be equipped with a minimum hook size of #14 circle or equivalent.**

6. **All gillnets must be tagged.**

7. **Lost gillnets must be reported to DFO immediately.**

8. **Observer coverage and dockside monitoring mandatory.**

9. **Daily hails mandatory for all vessels including vessels less than 65'.**

10. **Fishing is not permitted in the Nunavut Settlement Area.**

11. **Minimum mesh size – Otter trawl 145 mm.**

12. **Minimum fish size – 45 cm.**

TABLE 4

GREENLAND HALIBUT CONDITIONS

Subarea 2 and 3

1. **In NAFO Division 3L, fishing for Turbot inside 12-mile limit only after successful, Industry-funded test fishery.**

2. **In NAFO Divisions 3NO, fishing is not permitted in water depths less than 400 fathoms.**

(cont'd)

TABLE 4 (cont'd)

3. Division 3L Inshore Conditions:

a) Licence valid for a portion of Trinity Bay.

b) Maximum of 30 nets.

- **10 nets in water depths 170-200 fathoms.**
- **10 nets water depths 200-225 fathoms.**
- **10 nets water depths 225-250 fathoms.**

c) All non-groundfish by-catch to be returned to water.

d) Within 24 hours, report to DFO all catch and by-catch.

e) Fishery observer must be carried each trip and paid by fisher.

TABLE 5
GROUNDFISH LICENCES

Groundfish Licences <65 feet (Fixed Gear, Mobile Gear and Danish Seine) 2J3KL, 3Ps and 4R3Pn as of December 2000							
Gear	**NAFO**	**<35**	**35-44**	**45-54**	**55-64**	**Total**	
Danish Seine	3PN	0	1	6	1	8	
Total Danish Seine		0	1	6	1		8
Fixed Gear	2J	171	4	15	12	202	
Fixed Gear	3K	1,002	106	75	77	1,260	
Fixed Gear	3L	1,049	199	59	99	1,406	
Fixed Gear	3PS	895	134	7	3	1,039	
Fixed Gear	3PN	112	6	0	1	119	
Fixed Gear	4R	818	61	15	5	899	
Total Fixed Gear		4,047	510	171	197		4,925
Mobile Gear	3K	0	0	0	5	5	
Mobile Gear	3L	0	0	0	21	21	
Mobile Gear	3PS	0	0	0	3	3	

Mobile Gear	**3PN**	**1**	**0**	**1**	**2**	**4**	
Mobile Gear	**4R**	**4**	**0**	**11**	**46**	**61**	
Total Mobile Gear		**5**	**0**	**12**	**77**		**94**
Grand Total							**5,027**

TABLE 6

GREENLAND HALIBUT FISHERY – 2000

SA 2 + 3

ACTIVE VESSELS

	VESSEL LENGTH CATEGORY		
NAFO AREA	**<65'**	**65'-100' ***	**>100' ***
2+3K	**220**	**2**	**2**
3LMNO	**197**	**5**	**2**

*** Refers to active companies.**

TABLE 7

NAFO CONSERVATION & ENFORCEMENT MEASURES

FOR VESSELS FISHING GROUNDFISH IN THE NAFO REGULATORY AREA

1. **Vessels operating in the NAFO Regulatory Area shall report to DFO:**

- **entry into Regulatory Area**
- **exit from Regulatory Area**
- **movement from one NAFO Division to another**
- **transhipment of fish in the Regulatory Area.**

2. **Vessels fishing Greenland Halibut must report their catch every Tuesday to DFO.**

They must provide information on:

a) Division of capture

b) Species caught

c) Quantity

(cont'd)

TABLE 7 (cont'd)

3. **All Canadian vessels that fish groundfish or shrimp in the NRA will carry an observer at all times.**

4. **All vessels fishing NAFO stocks shall be inspected at each port of call.**

Questions/Comments

Why are there different mesh sizes by depth in SA 2+3? If there is a conservation issue regarding fish sizes captured why not 1 size throughout? (If smaller fish are in the shallower zones why is smaller mesh allowed?)

It was noted that a book by Scott Parsons has a section dealing with interactions/bilaterals with Greenland.

The issue of the requirement to tag gear in the northern zone was raised. Why is it not a requirement for the southern zone. The perspective that it should be mandatory for all fisheries in all areas was put forward.

Comment expressed by Nunavut about the potential for gillnets to harm narwhals that overwinter in 0A. The issue of ghost nets was also raised; both for northern as well as southern areas (crab).

The issue of crab bycatch in gillnets in the southern areas was raised as a point of concern as was the potential for bycatch of small Greenland halibut in the shrimp fisheries.

Clarence Cabot raised his objection to mobile gear having access to 0B before September 30.

The question of possible management measures for any fishery in 0A was raised. It was suggested that management measures in place in 0B should also be in place in 0A.

The issue of consistency in management between Canadian (SA 0) and Greenland (SA 1) fisheries was also raised. The point was made that they should be.

Question of allocation split of 4000 t for 0A and 1A between Canada and Greenland (net is actually 2000 t since Minister already commit 2000 t to Nunavut) was raised seeking clarification of what would happen.

Capacity issue was raised – numbers of licences for amount of fish available.

A question was raised regarding how well are the fishing regulations adhered to in the Canadian zone? It was argued that Canada should review the current fishery regulations for Greenland halibut in the context of how well they are being adhered to, and in the context of how feasible it is to enforce them. The objectives of the regulations should be considered and the risks of not achieving the objectives if the regulations are not followed nor can be reasonably enforced should be considered.

International Management Perspective – R. Steinbock, DFO, Ottawa

SUB-AREA 0+1 GREENLAND HALIBUT

International Aspects

Canada/Greenland Fisheries Relations

- Relations with Greenland generally positive.
- No bilateral fisheries agreement with Canada but there have been discussions on a possible fisheries cooperation agreement.
- Annual bilateral fisheries consultations (March 7-8, 2001 in Ottawa)
  - to explore ways to improve cooperation in conservation and ensure fisheries management regimes for Greenland halibut and shrimp are compatible, and
  - to strengthen cooperation on management of seal hunt and verify harvest activities.
- Canada is also seeking a fair distribution of shares of Greenland halibut and shrimp.

Multilateral Cooperation

- In NASCO, Canada is also key party in negotiation of regulatory measures affecting West Greenland salmon.
  - In 1999, Greenland agreed to two-year restriction of salmon catch equivalent to amount used for internal consumption - 20t. Canada agreed to bilateral research program aimed at improving biological sampling of salmon in Greenland.
- In NAFO, Greenland is one of 4 coastal States. It supports 100% observer coverage.
- Joint Committee on Narwhal and Beluga
- NAMMCO - Canada cooperates scientifically.
- North Atlantic Fisheries Ministers Conference.

Canada/Greenland Quotas -1

- Greenland does not fish Greenland halibut in NAFO SA 2+3
- Canada and Greenland have historically shared Davis Strait SA 0+1 Greenland halibut TAC equally (50%-50%) based on late 1970s agreement to share then unknown distribution.
- TAC for stock in 1980s and early 1990s was 25,000t.
- Total catches were very low, less than 1,000t, until the early 1990s.

4

Canada/Greenland Quotas -2

- NAFO Scientific Council has noted there is no biological basis for conducting separate assessments for Greenland halibut thoughout SA 0-3 but has advised that separate TACs be maintained for different areas of the distribution of Greenland halibut.
- Greenland is also harvesting an additional 20,000t Greenland halibut in the fjords in the inshore section of SA 1A. NAFO Scientific Council has concluded the fish in the fjords do not contribute to the offshore spawning stock.

5

Canada/Greenland Quotas -3

- Based on Cdn catches from 1990-94, over 70% of offshore catch was caught in Cdn zone.
- Since 1995 Canada has attempted to reach agreement with Greenland on a re-distribution of the offshore quota shares to reflect this catch history for the offshore stock.
- In 1997, Canada informed Greenland that with the establishment of a separate management unit for the fjords in Greenland, the quota for the remaining offshore component should be divided on the basis of historical catch.

6

Canada/Greenland Quotas -4

- At that time, Canada unilaterally increased its share of the TAC to 60% and set the Cdn TAC at 6,600t.
- TAC was readjusted to 5,500t (50%) following court case by NWMB.
- Based on NAFO Scientific Council advice for a 11,000t TAC in 1999, Greenland set its quota for SA 1 (B-F) Greenland halibut at 5,500t and Canada established its quota for 0 Greenland halibut at 5,500t.

8

Canada/Greenland Quotas -5

- A three-year joint scientific survey of Greenland halibut began in 1999.
- When completed, this survey will provide much needed data about the biomass distribution of the stock and identification of spawning areas.
- This information will be key to the future development of a Canadian position on sharing of the TAC with Greenland.

Current Situation

- Canadian stakeholders are unsatisfied with current sharing arrangements and want representations to Greenland for a more equitable sharing which would result in greater than 50% share of offshore TAC for Canada.
- Canada currently has very little leverage and it will be difficult to achieve change in Greenland's position.
- Increased leverage will be by developing sound arguments based on results of the joint scientific survey - stock distribution and spawning.
- Until information becomes available, Canada should reiterate claim for higher share and continue its cooperation with Greenland.

9

NORTHWEST ATLANTIC FISHERIES ORGANIZATION (NAFO)

2+3 GREENLAND HALIBUT

International Aspects

FOREIGN FISHING

- **Foreign vessels fished freely outside 3 miles.**
- **1950 - International Commission for Northwest Atlantic Fisheries (ICNAF) was established to investigate, protect and conserve the fishery resources of the Northwest Atlantic.**
- **In the 1970s ICNAF started to institute quotas and national allocations.**
- **NAFO entered into force on January 1, 1979 after Canada's extension of fisheries jurisdiction to 200 miles in 1977.**

4

WHAT IS NAFO?

- Multilateral fisheries management organization;
- comprises 18 Contracting Parties; and
- manages fish stocks outside 200-mile limits of coastal States (Canada, USA, France (SPM) and Greenland).

5

NAFO'S OBJECTIVE

- Through consultation and cooperation contribute to:
  - optimum utilization;
  - rational management; and
  - conservation of the fishery resources of the Convention Area.
- In absence of NAFO, no agreed rules for fisheries on straddling stocks - multilateral "free for all"

6

NAFO'S ROLE IN MANAGEMENT

- **Stock assessments on basis of scientific data.**
- **Establishes agreed Total Allowable Catches.**
- **Establishes quota allocations to Contracting Parties.**
- **Establishes conservation measures - minimum mesh and fish sizes, bycatch rules, marking of boats and gears, reporting requirements.**
- **Scheme of Joint International Inspection and Surveillance - conducts surveillance, coordinates inspections, monitoring and control measures including observers, satellite tracking devices and dockside inspections.**
- **NAFO Compliance Scheme against Non-Contracting Party vessels.**

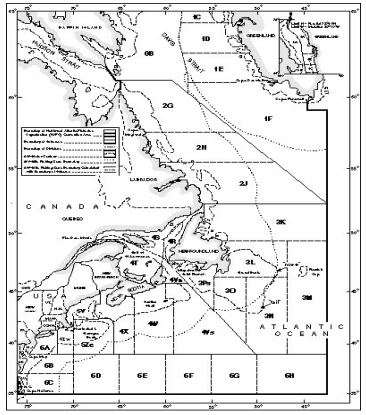
8

NAFO REGULATORY AREA

- Approximately 30,000 square miles of fishing grounds:
  - Nose (Division 3L)
  - Tail (Divisions 3NO)
  - Flemish Cap (Division 3M)

9

MAP OF THE CONVENTION AREA



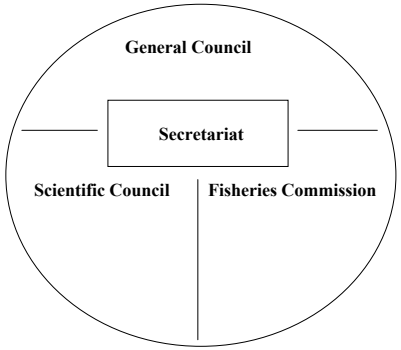
10

NAFO-REGULATED STOCKS

- **Straddling Stocks**
  - **3NO Cod**
  - **3LN Redfish**
  - **3LNO American plaice**
  - **3LNO Yellowtail**
  - **3NO Witch**
  - **3NO Capelin**
  - **3LMNO Greenland halibut**
  - **3+4 Squid**
  - **3L Shrimp (as of 2000)**
- **Discrete stocks**
  - **3M Cod**
  - **3M Redfish**
  - **3M American plaice**
  - **3M Shrimp**

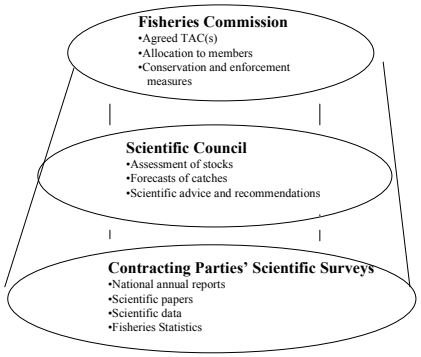
11

STRUCTURE AND FUNCTION



12

ASSESSMENT ADVICE TO FISHERIES COMMISSION



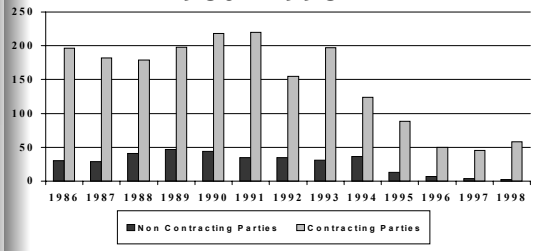
13

CATCHES IN THE NAFO REGULATORY AREA

- 1992 - Total groundfish catches of 153,365t
- 1999 - Total groundfish catches of 66,498t
  - Total regulated Species: 34,005t
  - Total non-regulated Species: 32,493t
- 1999 - Total shrimp catches of 41,069t

14

NUMBER OF FISHING VESSELS IN THE NAFO REGULATORY AREA - 1986 - 1998



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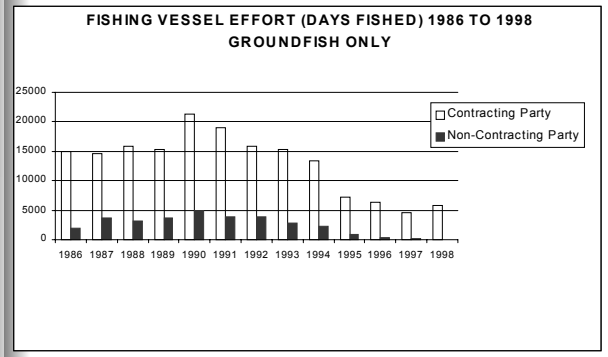

16

NAFO-PAST PROBLEMS

- **Increased influence of Spain after it joined the EU in 1986.**
- **Ineffective compliance with NAFO conservation measures.**
- **Repeated use of NAFO objection procedure primarily by the EU to set unilateral quotas much higher than those allocated by NAFO.**
- **EU objection to the NAFO enforcement regime.**
- **Unregulated fishing by Non-Contracting Parties (NCPs).**
- **Overfishing and stock decimation.**
- **Culminated in 1994 with Bill C-29 to deal with NCPs and in 1995 in the Canada-EU turbot dispute.**

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CANADA-EU TURBOT DISPUTE -1

- Faced with warnings from SC about declining stock, TAC for 2+3 Greenland halibut set at 1994 NAFO annual meeting at 27,000t for 1995 - no decision on sharing formula.
- Sharing arrangement agreed at Feb 1995 NAFO Special meeting (Canada - 60%, EU -12.6%).
- EU subsequently objected and set unilateral quota of 18,630t (69%).
- Mar 3, 1995, CFPA Regs amended to add vessels of Spain & Portugal as class of fishing vessels subject to prohibition of s. 5.2 of Act of fishing for listed straddling stocks.
- Mar 9, 1995, ESTAI boarded and seized for fishing contrary to Canadian law

CANADA-EU TURBOT DISPUTE -2

- Dispute resolved on April 20, 1995 - Canada agreed to a reallocation of quota to EU subject to strict new enforcement measures on fisheries in NRA.
- Measures (effective May 5) included 100% independent observer coverage, satellite tracking devices on 35% of vessels, 100% dockside inspection on vessels fishing NAFO stocks and increased NAFO boarding and inspection provisions at sea and requirement for flag State to respond within 72 hours of an apparent infringement.

CANADA-EU TURBOT DISPUTE -3

- NAFO meeting in Sept 1995 approved revised shares (Canada - 37%, EU - 41%, Japan - 7.6%, Russia - 9.4%, Others - 4.9%) and new NAFO control and enforcement measures as of Jan 1, 1996.
- 1995 NAFO meeting also agreed for 1995 that 20,000t would be assigned to Divs 3LMNO (NAFO), and 7,000t assigned to Divs 2+3K (Canada).
- Split to help ensure fishing effort was spread more evenly throughout stock area. This also sets the basis for future discussion on quota shares based on the distribution of the biomass.

CANADA-EU TURBOT DISPUTE -4

- Mar 28, 1995 - Spain applied to ICJ to adjudicate its fisheries dispute with Canada claiming, inter alia, that Bill C-29, constitutes violation of international law.
- ICJ claims no jurisdiction in the matter.

POST 1995 IMPROVMENTS TO CONSERVATION AND ENFORCEMENT MEASURES

- Management
- Scheme of Joint International Inspection and Surveillance
- 100% Observers
- Satellite tracking devices
- More effective dockside inspections.

18

UNFA

- Aug 4, 1995, Conference on Straddling and Highly Migratory Fish Stocks adopted convention for new international controls on high seas fishing.
- Dec 4, 1995, Convention was opened for signature and ratification, at which Canada signed Convention.
- Aug 3, 1999, Canada ratified the Convention.
- Convention comes into force when 30 States have ratified. To date, 27 States have ratified.

CURRENT SITUATION

- Foreign overfishing of the past is over.
- NAFO enforcement measures adopted in 1995 have resulted in the world's tightest international control regime.
- Compliance rates have improved dramatically since 1995. At end of 1990s, number of citations for serious infringements decreased by more than 80%.
- However, observer reports from EU vessels during 1999/2000 show several trends which are reason for concern - frequent incidents of exceeding bycatch limits, misreporting catches and high catches of stocks under moratoria.
- 1/3 of observer reports- evidence of violations.

19

2000 NAFO MEETING: CONCLUSIONS

- NAFO Scientific Council advice was adopted as basis for fisheries management decisions and TACs for straddling stocks
- NAFO 100% observer coverage continues in the NRA. NAFO agreed to extend the date for any amendments to be applied from 2001 to 2003.
- Improvements to NAFO measures - restrictions to avoid excessive bycatches of non-target species.
- Agreement on process to implement stronger measures to protect juvenile fish and reduce bycatch at 2001 annual meeting .
- NAFO agreement to continue work on the precautionary approach in the NRA.

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2+3 Greenland Halibut - Protection of Juvenile Fish-1

- In 1995, NAFO established minimum fish size for turbot in NRA at 30 cm - related to minimum mesh size of 130 mm in NRA. Larger Min Size would result in excessive discards.
- Cdn proposals to NAFO to increase minimum mesh size have been resisted.
- Given SC advice that catches consist mainly of young, immature fish, measures should be adopted pursuant to Precautionary Approach (UNFA).
- For increased mesh size, consider using Article XI(3) of NAFO Convention - FC to ensure consistency between its decisions in NRA and any measures for relevant stocks taken by coastal state within 200 miles.

2+3 Greenland Halibut - Protection of Juvenile Fish -2

- Article 61 of UNCLOS obliges States to consider effects of fishing operations on “species associated or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species…”
- Need to build compelling case to justify Canadian proposals for depth restrictions - additional data, scientific evidence and GIS presentation.

2+3 Greenland Halibut - Precautionary Approach

- UNFA mandates implementation of precautionary approach (PA) to fisheries management both domestically and by RFMOs.
- Sept 1999 NAFO meeting - Resolution to guide implementation of PA within NAFO.
- PA Working Group met in spring 2000 and succeeded in adopting a consensus report for recommendations to FC in Sept 2000. Report contains action plans for implementation of PA for 3NO cod, 3LNO yellowtail flounder and 3LNO American plaice.
- Small Group Meeting on PA in spring 2001 to consider next steps - additional implementation plans.

2+3 Greenland Halibut - Repatriation of turbot quotas

- Scientific Council noted that while 75-81% of 2+3KLMNO Greenland halibut biomass is distributed within coastal State waters, 74% of allocation and 80% of catch is directed in NRA.
- SC again recommended that fishing effort should be distributed in similar fashion to biomass distribution to ensure sustainability of all spawning components.
- Application of this approach becomes increasingly important as overall TAC is increased.
- While long-term objective, need to develop scientific rationale and strategy.
- Will be difficult to get CPs to concede fish.
- Within Canada, careful not to raise expectations.

Questions/Comments

Discussion focussed on the Canadian position at NAFO and during bilaterals with Greenland.

The issue of biomass distribution (about 75% inside the Canadian zone) in contrast to effort distribution (about 25% inside the Canadian zone) was raised with the point being made that Canada should push to have this changed.

It was stated that there should be consistency of management measures inside and outside 200-mile limit (Canada pursuing but limited success to date).

Canada's should continue pursuit of conservation initiatives in NAFO related to Greenland halibut; a) better protection of juveniles, b) better protection of other species from bycatch, and c) allocation re-alignments based more closely on biomass distribution.

The point was made that Canada not use Greenland halibut quotas and allocations for 'trade-off' purposes when pursuing other objectives.

Comment by the FRCC on Management Measures – R. Andrews, FRCC

Ray began by stating that the Workshop was overdue and very happy Bruce Atkinson decided to proceed with it.

He noted the FRCC's involvement went back to when Herb Clarke was asked to review state and future direction of Greenland halibut.

Ray provided a handout (FRCC 2000 recommendations for Greenland halibut) which he summarized. He proceeded to highlight concerns as follows:

A. Sub-Area 0+1:
   1. The key is to get a multi-year Science program in the north.
   2. Canada and Greenland should endeavor to get consistency in management measures.
   3. By-catch in shrimp fishery has been and continues to be a concern.
   4. There is concern with use/abuse of gillnets.
   5. Otter trawls should use 145 mm diamond until further studies direct us to proper mesh-size.

B. 2+3KLMNO:
   1. FRCC does not agree with recommended TAC. Key concern is the protection of juvenile fish.
   2. Minimum fish size should be 45 cm
   3. By-catch of American plaice, cod, etc. major concern.
   4. By-catch in International shrimp fishery major concern.
   5. Need sustainable harvest and 100% observer coverage in NRA.
   6. Need to consult with Industry/Science to designate closed areas for juveniles (e.g.: Hawke Channel).

Ray summarized four activities/issue suggested by FRCC:
1. Science in north.
2. Mesh-fish size
3. Protection of a) juveniles, b) geographical areas
4. By-catch

Questions/Comments

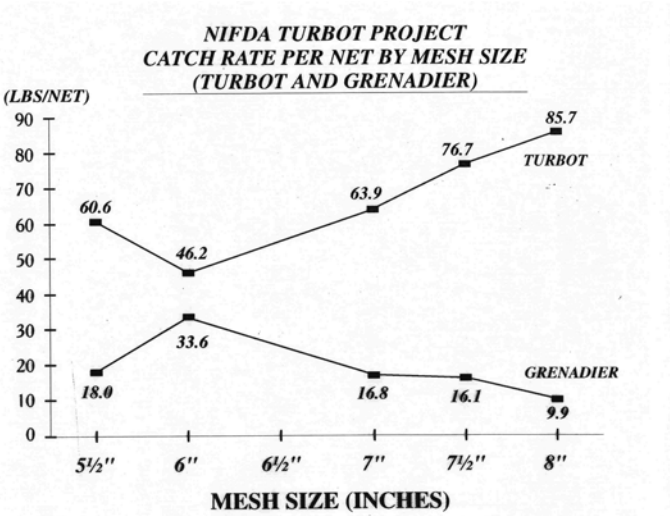
- Greenland has introduced 100% use of Nordmore grate in their waters effective Jan. 1, 2000, which should reduce by-catch of juvenile turbot.
- The different rules in the NRA versus the Canadian zone were noted, (e.g. 145 mm –130 mm mesh).
- There are EU studies which indicate that requiring 145 mm will not change size distribution in the catch.
- There are also studies showing going from 145 mm to 155 mm won't change size composition but has negative impact on catch rates. There is a similar argument for 130 mm-145 mm.
- Industry highlighted a major by-catch problem with snow crab fishery, which will only worsen with expected proliferation of gillnets in inshore waters in 2001. Suppliers have sold 14,000 nets. DFO was criticised for not sending strong message that "This is not a matter of fact fishery".

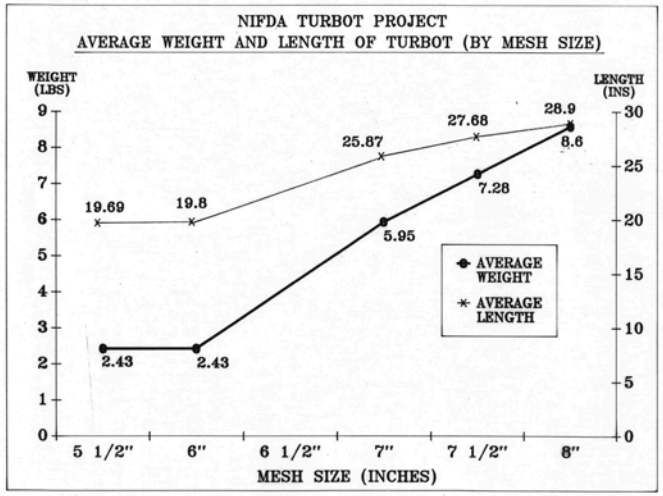
- It was stated that the FRCC should spend more time analyzing impacts of its recommendations “instead of throwing them out”.
- We don’t have a good understanding where we should be going on the question of mesh-size and fish size. To obtain L50 we would need 205mm.
- Point was made that if catch was only large fish then the TAC would be set lower.
- It was suggested that a Working Group of this group be formed to aid FRCC in their long-term planning process
- FRCC member noted he would look forward to industry providing solutions and direction where FRCC should be going.

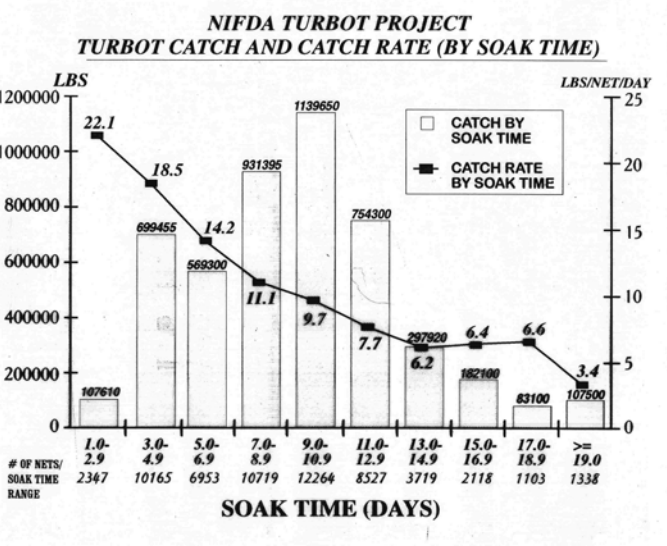
Mesh Size Studies and Development Programs – G. Brothers, DFO, St. John's

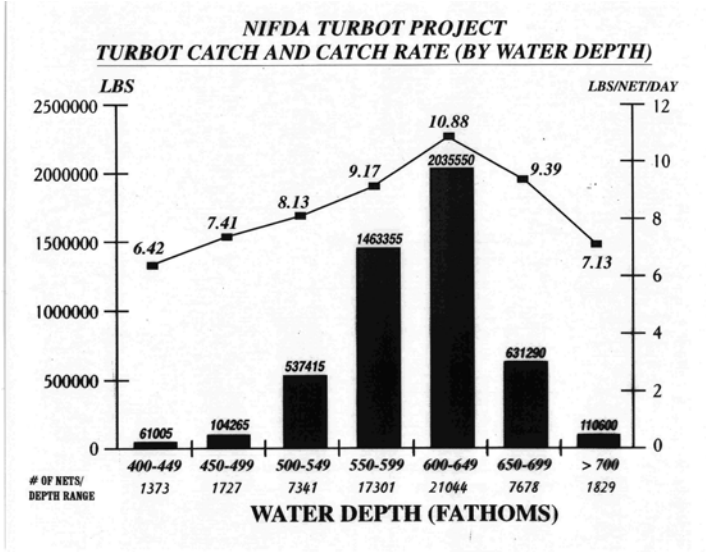
DEEP WATER TURBOT GILLNET PROJECT – 1992

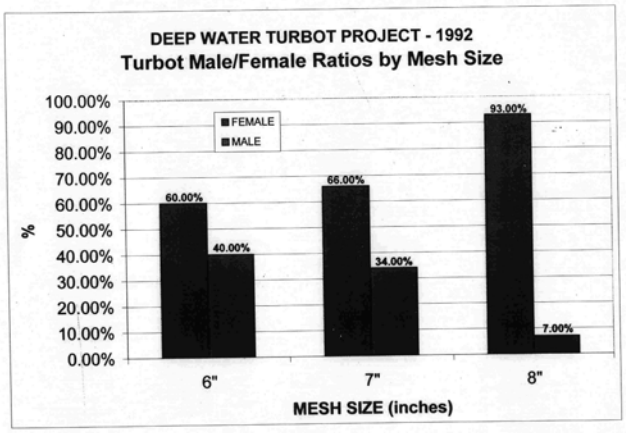
- # OF VESSELS – 22
- # OF VESSEL FISHING DAYS – 864
- # OF NETS HAULED – 59,293
- AREA FISHED – 2J3KL
- WATER DEPTH – 350-800 FATHOMS
- SEASON – MAY 1 – OCTOBER 23











DEEP WATER TURBOT PROJECT – 1992
Total Catch

LBS.	TURBOT	ROUGHHEAD GRENADIER	SKATE	WOLFFISH	CHIMAERA	BLACK DOGFISH	BLUE HAKE	PORCUPINE CRAB	TOTAL
KEPT	5,371,800	556,000	--	3,000	1,400	--	--	1,000	5,933,200
DISCARD	275,900	400,000	201,550	126,300	47,800	30,650	16,700	15,000	1,113,900
% TOTAL	80%	13.5%	2.8%	1.8%	0.7%	0.4%	0.2%	0.2%	7,047,100
% DISCARD	4.9%	41.8%	100%	98%	97%	100%	100%	94%	

TURBOT OTTER TRAWL SELECTIVITY BACKGROUND

- 1996 - MESH SIZE INCREASED FROM 135MM TO 145MM
- 1998 – BASED ON FRCC ADVICE, THE MINISTER ANNOUNCED A FURTHER INCREASE IN MESH SIZE FROM 145MM TO 155MM DIAMOND OR 165MM SQUARE
- 1998 – INDUSTRY ORGANIZED A TURBOT WORKING GROUP AND REQUESTED DFO TO REVERT THE MESH SIZE TO 145MM BASED ON THE FACT THAT MUCH OF THE SMALL TURBOT ARE MESHED IN THE TRAWL WINGS AND BELLIES
- 1998 – DFO AGREED UNDER THE CONDITION THAT INDUSTRY, IN CONJUNCTION WITH DFO, PARTICIPATE IN TURBOT OTTER TRAWL SELECTIVITY EXPERIMENTS.

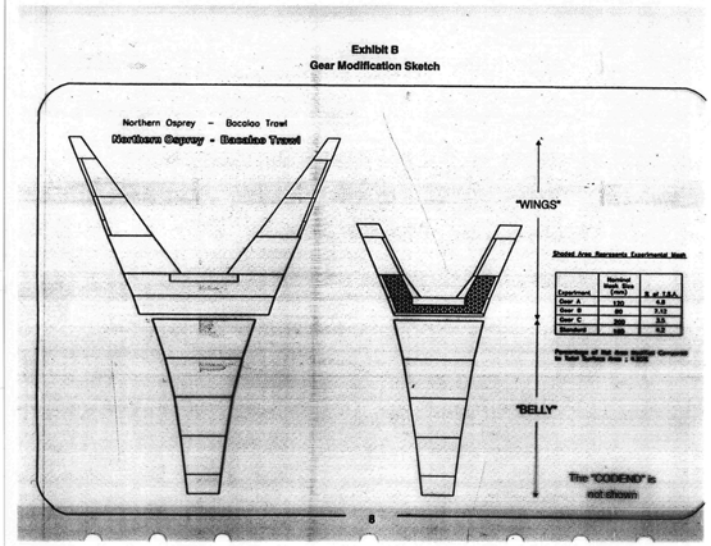
GREENLAND HALIBUT (TURBOT)
SELECTIVITY EXPERIMENTS
CARRIED OUT ABOARD THE
M.V. NORTHERN OSPREY
(24 August – 22 September 1998)

EXPERIMENTAL DESIGN

- AREA FISHED – NAFO DIVISION 0B
- PROTOCOL DEVELOPED OUTLINING THE PARAMETERS OF THE COMPARATIVE STUDY
- THE ALTERNATE HAUL METHODOLOGY USED – VESSEL ALTERNATELY HAULED THE STANDARD TRAWL AND ONE OF THE EXPERIMENTAL GEARS
- PAIRED TOWS CONDUCTED WERE SIMILAR IN DEPTHS FISHED, SET DIRECTION, AND LENGTH OF TOW

DESCRIPTION OF GEARS TESTED

- Experimental gear A consisted of a turbot trawl with a section of the lower first belly and lower wings constructed of 120mm mesh and a 145mm mesh codend.
- Experimental gear B consisted of a turbot trawl with a section of the first lower belly and lower wings constructed of 80mm mesh and a 145mm mesh codend.
- Experimental gear C consisted of a turbot trawl with a section of the first lower belly and lower wings constructed of 200mm mesh and a 145mm mesh codend.
- Standard gear consisted of a turbot trawl with 160mm mesh in the fore part and a 145mm mesh codend.



DATA COLLECTION

- 75 tows completed
- 52 valid tows: (24 standard, 11 gear A, 7 gear B, and 10 gear C)

RESULTS: CATCH RATE PER HOUR OF FISHING

- T-test results indicate that there is no statistical difference in catch rates (per hour) of gears tested.

CATCH PER HOUR SUMMARY (MEAN VALUES)

Type of Gear	Number of Fish	Small Fish		Weight of Fish (kgs)
		#	%	
Standard Gear	447	84	19	621.59
Modified Gear A	470	106	23	611.39
Modified Gear B	429	97	23	558.80
Modified Gear C	467	90	19	694.48

RESULTS: SIZE COMPOSITION OF FISH CAUGHT IN VARIOUS SECTIONS OF THE GEAR BY GEAR TYPE

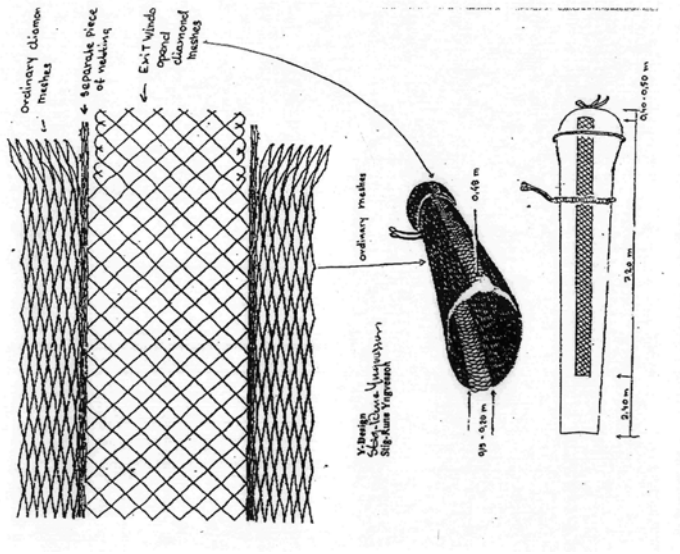
- Paired comparisons of the percentage of small fish by section shows: belly section – range 28 to 32% - (not statistically different); codends – range 13 to 21% and wings – range 22 to 32% - (statistically different).

Mean Percentage of Small Fish Caught in Different Parts of the Gear

	Codend		Belly		Wings		Total	
	Small	Large	Small	Large	Small	Large	Small	Large
Standard Gear	38.510	251.08	20.41	42.86	25.25	68.42	84.17	362.36
	SF%: 13.30		SF%: 32.26		SF%: 26.96		SF%: 18.85	
Gear A	60.83	263.72	20.38	47.35	25.13	52.39	106.35	363.47
	SF%: 18.74		SF%: 30.09		SF%: 32.42		SF%: 22.64	
Gear B	63.80	237.82	17.02	42.19	16.14	52.42	96.67	322.43
	SF%: 21.15		SF%: 28.75		SF%: 23.54		SF%: 22.58	
Gear C	49.23	255.30	21.41	52.34	19.67	69.41	90.31	377.05
	SF%: 16.16		SF%: 29.04		SF%: 22.08		SF%: 19.32	

CONCLUSIONS

- The total catch rate per hour is approximately the same for the standard gear and each experimental gear – A, B, and C in numbers of fish and weight of fish.
- The distribution of the catch in various sections of the net (belly, wing, & codend) is similar for each gear. Catch distribution ranges from 65 – 70% in the codend; 14 – 16% in the belly; and 16 – 21% in the wings.
- The number of fish caught in the belly and wing sections represent approximately 30% of the overall catch.
- A change in mesh size of 80mm, 120mm, and 200mm restricted to the small area of the first lower belly and lower wing sections of turbot trawls does not reduce the capture of small fish to the acceptable regulatory level of 15%.
- The entire forward and mid part of the net would likely need to be in smaller mesh eliminate meshing.



TURBOT OTTER TRAWL FISHERY 1999
SUMMARY OF OBSERVER DATA

 # 1 VESSEL

- Period = May to June
- NAFO Sub-Area: OB
- Minimum mesh size = 145mm
- Number of samples = 42
- % < 45cm: 3

 # 2 VESSEL

- Period = June to July
- NAFO Sub-Area: 3K-2J
- Minimum mesh size = 145mm
- Number of samples = 18
- % < 45cm: 33

 # 3 VESSEL

- Period = September to October
- NAFO Sub-Area: OB
- Minimum mesh size = 145mm
- Number of samples = 41
- % < 45cm: 23

 # 4 VESSEL

- Period = October to November
- NAFO Sub-Area: 3K
- Three samples 15% < 45cm
- NAFO Sub-Area: 2J
- Two samples, 48% < 45cm
- Minimum mesh size: 130mm

 # 5 VESSEL

- Period = November to December
- NAFO Sub-Area: OB
- Minimum mesh size = 145mm
- Number of samples = 26
- % < 45cm: 21

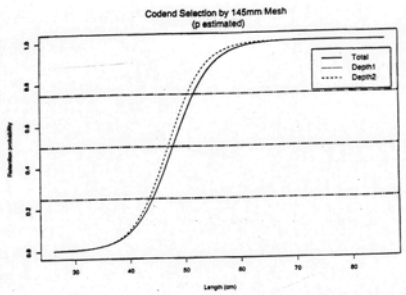
GREENLAND HALIBUT (TURBOT)
SELECTIVITY EXPERIMENTS
CARRIED OUT ABOARD THE
F.V. PENNYSMART
(April – May 2000)

OBJECTIVE OF AT-SEA TRIALS

- Obtain sufficient data to successfully generate selectivity curves for a standard 145mm turbot trawl codend;
- Quantify the incidence (number) of small fish retained in a standard (145mm) codend, the various parts (front end, mid-section, and codend) of the (standard) trawl, and the trawl with a 80mm mesh installed in the forepart of the net.

EXPERIMENTAL DESIGN

- Area fished – NAFO Division 3K
- Protocol developed outlining the parameters of the study.
- The trouser trawl methodology used in experiment 1 – vessel hauled FPI trawl divided into two sections by a vertical panel. Attached to one side of the panel was a 145mm standard codend and to the other side a codend having a 50mm small mesh liner.
- Experiment 2 alternate haul methodology modified single codend trawl with small mesh (80mm) forepart (with and without liner).
- Tows conducted were similar in depths.
- All tows approximately 4 hours duration.
- Two experienced observers monitored the experiment and collected data.



Selection of Greenland halibut in 145 mm diamond mesh codends
Selectivity for combined hauls
L 25 44.04 cm.
L 50 47.16 cm.
L 75 51.45 cm.
SR 7.41 cm.
SF 3.29

CONCLUSION

1. The selectivity of the 145mm codend tested in experiment 1 has been determined as L25 = 44 cm L50 = 48 cm and L75 = 51 cm. This compares with the L50 of 37.6 cm with a 130mm mesh codend as reported by Spain.

2. Use of small mesh (80mm) in the forepart and body of the trawl prevents meshing. Preliminary results indicate that elimination of the meshing (which comprises a large % of small fish) allows the codend to provide for the escape of small fish thereby decreasing the overall catch of smaller fish.

GREENLAND HALIBUT SELECTIVITY EXPERIMENTS CARRIED OUT

ABOARD THE ATLANTIC ENTERPRISE (May – June, 2000)

OBJECTIVE OF AT-SEA TRIALS ABOARD ATLANTIC ENTERPRISE

- Quantify the incidence (number) and weight of small fish retained in a standard (145mm) codend and 160mm in the fore part of the trawl.

- Quantify the incidence (number) and weight of small fish retained in the codend of the experimental gear (145mm codend) and having the forepart of the trawl constructed of small mesh (100mm).

M/V "ATLANTIC ENTERPRISE" November – December, 2000

EXPERIMENT #	DESCRIPTION OF EXPERIMENTS	NO. OF SETS
1	100mm mesh in forepart 145mm mesh in codend vs 100mm mesh in forepart 45mm mesh in codend	12 12
2	100mm mesh in forepart 145mm mesh in codend vs 160mm mesh in forepart 145mm mesh in codend	13 12
3	160mm mesh in forepart 45mm mesh in codend vs 160mm mesh in forepart 145mm mesh in codend	14 13
4	100mm mesh in forepart 145mm mesh in codend vs 160mm mesh in forepart 145mm mesh in codend	22 20
	TOTAL	118

RESULTS

- The amount of fish meshed in the fore part of standard gear is considerably less than the number of fish meshed in the fore part of trawls in other turbot experiments of the past.
- There is no significant change in the percentage of small fish caught in standard gear vs.experimental gear [redacted]
- Fish meshed in fore part are smaller than fish caught in the codends.
- Retention rates of small fish in both gears were between 26 and 28%, indicating that the small mesh netting in the fore part did not produce an adverse effect on the capture of small fish.

M/V "ATLANTIC ENTERPRISE" TURBOT OTTER TRAWL SELECTIVITY NOVEMBER – DECEMBER 2000

OBJECTIVE

- Develop selectivity curves for turbot trawl with small mesh (100mm) in the fore part and 145mm mesh in the codend.
- Develop selectivity curves for turbot trawl with 160mm mesh in the fore part and 145mm mesh in the codend.
- Carry out comparative study between turbot trawl with 160mm mesh in the fore part and 145mm mesh in the codend and turbot trawl with 100mm mesh in the fore part and 145mm mesh in the codend.

ONGOING WORK

Project 1 – Atlantic Enterprise

Objectives:

1. To generate selectivity curves for a turbot trawl having a small mesh (100mm) in the fore part of the net and 145mm mesh in the lengthening piece and codend.
2. To generate selectivity curves for a standard turbot trawl (160mm mesh) in the fore part and 145mm mesh in lengthening piece and codend.
3. Compare size of turbot in the small mesh trawl (100mm) fore part and 145mm codend to that of a standard trawl with 160mm mesh in the fore part and 145mm mesh in the codend.

ONGOING WORK

Project 2 – Noble Mariner

Objectives:

1. To generate selectivity curves for a turbot trawl (145mm codend) as used on vessels less than 65 feet, having a small mesh (50-100mm) in the fore part of the trawl.
2. To assess the effectiveness of a small mesh (50–100mm) in the fore part of the net of a trawl (145mm codend) in reducing the capture of undersized turbot (less than 45cm).

Questions/Comments

- Industry noted that Industry-DFO Working Group example how they can work together to solve a problem
- It was noted that most of work was done in context of minimum fish size of 45 cm. Was 45 cm meaningful/appropriate length. By achieving it have we done something measurable. It remains for us to ask right questions.
- It was pointed out that target of 15% < 45 cm was difficult to achieve with 145 mm mesh. Therefore the validity/relevance of these numbers should be questioned.
- It was noted that 98% of the fish are 42-48 cm.
- 93% of the catch of 8” gillnets is female
- Brodie questioned how meaningful the 45 cm is biologically, and stated the 15% maximum under the small fish protocol is not achievable with the 145 mm mesh in the codend.

Discussion of Domestic and International Management Issues and Priorities

1. Is a need to re-visit proportional split of allocations during bilaterals with Greenland (B. Steinbock indicate is being considered but more science needed).
2. Is need to rethink relationship with Denmark (on behalf of Greenland) in NAFO and implications for Canadian positions during bilateral discussions.
3. Questions of adjacency and access raised including access of northern people to resources further south similar to access more southern residents have to northern resources.
4. Issue of effort distribution compared to biomass – SA 2+3KLMNO.
5. Consistency of management measures inside and outside 200-mile limit (Canada pursuing but limited success to date).
6. Need to follow-up with results of Canadian mesh selection work in NAFO.
7. Concern expressed about Canada's 'lack of control' internationally and the impacts on ability to achieve objectives.
8. Concern expressed regarding impacts of domestic conservation measures if cannot achieve similar results internationally.
9. Suggestion that Canada should be 'stingy' as a matter of public policy.
10. Concerns expressed regarding political implications of possible initiatives in the shorter term when objectives are longer term ('optics' issue domestically).
11. How well are the fishing regulations being adhered to in the Canadian zone from Subarea 0 south?
12. What is the capacity to enforce the regulations in the Canadian zone, particularly in Davis Strait?
13. Specific concerns expressed regarding enforcement in SA 0.
14. It was noted that there have been solutions found to gear conflict issues in the northern areas and perhaps these could be considered for areas further south.
15. It was considered that deepwater gillnet gear requirements be standardized (e.g., headrope thickness requirements to prevent breakage).
16. Question raised as to whether it may be possible to 'mark' nets so as to be able to locate if lost.
17. It was noted that a single solution does not necessarily address a problem in all areas and this needs to be factored into recommendations.
18. Restricting fishing to depths >600 m would assist in dealing with juvenile catch issue.
19. Restricting fishing to depths > 600 m would result in 'destroying' the small boat fishery.
20. It was noted that fees have gone up significantly in recent years but it is not clear that these increases have been passed, in part, to science for increased research. This includes the fees charged for observer coverage. While the observer charges are put toward the program, it is not clear how science may have benefited from this.

21. Concerns were expressed with regard to the rationale applied for deployment of observers and to what extent there is consideration of scientific needs.

Day 2

Day 2 began with the Chair summarizing the discussions and overall consensus points made during Day 1. These will be included during the wrap-up on Day 3.

Industry Perspectives on the Fishery and Issues – B. Chapman, GEAC

1. In light of the fact that a large proportion of the fishing mortality is juvenile turbot, the TAC should be kept lower than what it might otherwise be at a given biomass level. The current TAC of 40,000 mt appears to be too high in relation to the spawning stock biomass being at or near record low levels, and in comparison to the long term average catch of 30,000 mt experienced when the SSB was at normal levels.
2. Canada should take a more aggressive stance:
   (a) With Greenland to increase our share of the 11,000 mt TAC
   (b) With NAFO to increase the share of the 2+3KLMNO TAC to 2+3K which has the highest proportion of the overall biomass
3. While recognizing that the catch of juvenile turbot is going to continue to be a main feature of the turbot fishery (a necessity if the inshore gillnet and both the foreign and Canadian trawler fisheries are to continue), reasonable efforts should be made to mitigate the capture of younger turbot than is necessary. This may be achieved through gear modifications, restrictions on the depth of fishing, enforcement of minimum mesh sizes, etc).
4. DFO should modify existing requirements:
   (a) to permit smaller mesh in the foreparts of the trawl used in the commercial fishery, in order to reduce meshing and reduce the capture of <45 cm turbot
   (b) to adopt a reliable and predictable annual review mechanism to establish the percentage allowance for <45 cm turbot in the trawler catch that is consistent with the size selected with the use of 145 mm mesh in the codend
4. The proliferation of gillnets is leading to a gear conflict situation. Measures similar to those in place in the 0B fishery should be employed in the 2+3KL fishery.
5. The current approach to accessing the competitive quotas is not equitable due to DFO requirements for trawlers to ‘give way’ to fixed gear, combined with DFO denying trawlers the opportunity to fish before the fixed gear fleet. The result is that trawlers are being forced out of the competitive fishery.
6. Canada’s approach to managing the stock and to fishing effort should recognize the needs and constraints of the marketplace in relation to:
   - The need for good quality
   - Price elasticity that may be ‘managed’ through the quantity and timing of catches
   - Product mix resulting from the size of the fish being caught e.g. the market cannot reasonably absorb all small turbot nor all large turbot

<u>Questions/Comments</u>

Following Chapman’s presentation, there was considerable discussion and questions raised. One of the more pertinent points or questions provided was that Science felt rather confused since the presentation was raising issues that were not compatible. For example, the

Chapman presentation indicated that the TAC was too high under present conservation plans. Secondly, the group was very much concerned about the juvenile fish problem, but in the final analysis, they were anxious to catch more small fish while the issue was being resolved.

It was further pointed out that DFO could drop the fish size to 40 centimetres but also drop the quota by 25 percent to compensate for catching more of the smaller immature fish. It was pointed out that in this situation there was the question of reallocation since, if Canada did not catch the required quota, it could be reallocated via a NAFO process.

There was discussion on the possibility of a 155mm mesh, however it was pointed out that research done on a commercial basis indicated that this mesh size would result in a 25-percent reduction in catch, but just a one-percent reduction in the number of small fish. It was pointed out that this work was done based upon percentages for the number of fish, and not by weight. In this case considerable questions were raised about the fact that the number of small fish was reduced by only one percent, but the catch by 25 percent.

The question of mesh size was raised in conjunction with gill nets versus otter trawls. It was suggested that the six-inch gill net and the 145mm otter trawl would select the same fish size, that is six to eight-year-olds.

Natural mortality was discussed and Science indicated that it was in the range of 10 to 15 percent overall. However, it was indicated that it might be somewhat higher for the male portion of the stock.

There was considerable discussion about the objectives for this stock. There was discussion pertaining to the view of Science as well as the view of the FRCC. In the meantime, industry had differing views based upon the fixed-gear component and the mobile-gear component. However there seemed to be a consensus that stock rebuilding was the collective view.

There was considerable discussion about the fact that Canadians are not in control of this stock since foreigners are catching 75 to 80 percent of the total, based upon NAFO areas 0, 1, 2 and 3. However, it was agreed that we must try and improve our position and start with a hierarchy of objectives. An example given was that we argue for the lowest possible TAC if that indeed is our objective, especially from a conservation point of view. It was generally agreed that the lower the TAC, the better chances we had of preserving the stock. The question really becomes, how little can we get away with for allocation to foreigners. Finally, in this regard, we had to ask ourselves the question of how to maximize our advantage as Canadians.

Since participant Art May was strongly suggesting a prioritization of objectives, it was also generally agreed that the objectives that we have had to date have been put forward in isolation, and there must be a strong effort to bring them together to have a unified approach, and a hierarchy of objectives. Certainly all agreed that trying to match effort distribution with biomass location was a major item on which Canadians could improve their position.

In building on the May approach, it was noted that:

- in the future, the TAC increase will come from the NAFO Scientific Council and Canada should resist this approach.
- sharing based upon normal or historical distribution, i.e. 75 to 80 percent inside the 200-mile limit, would certainly be a very laudable position for Canada.
- the scientific council has been concerned over the concentrated harvesting and negative impact, hence this will support the Canadian position.
- we certainly are not playing on a level playing field, since NAFO is dealing with a

mesh size of 130mm while Canada has 145mm and the small fish protocol is 30cm for NAFO and 45cm for Canada.

- we certainly should aim to stop fishing in nursery areas, and stress that it should happen in water depths of greater than 600 metres.

However, it was strongly pointed out that to take such a strong position may not be successful and we may indeed lose any vote pertaining to this in NAFO. Furthermore, it was pointed out that our continued insistence upon 100-percent observer coverage, which we seem not to ever want to change from a political perspective, is forcing us to deal with the foreigners with one hand tied behind our back.

Industry Perspectives on the Fishery and Issues – C. Bonnell, Nunavut

Nunavut's Turbot Industry

Presentation to the Turbot Workshop

Introduction

- Within Nunavut there are a number of organizations/agencies with a mandate relating to fisheries and fisheries development.
- These groups include The Nunavut Wildlife Management Board, Department of Sustainable Development, Nunavut Tunngavik Incorporated and the Department of Fisheries and Oceans.
- In response to the need to address fisheries issues in Nunavut, the above groups came together to form the Nunavut Fisheries Working Group.
- This informal group was formed to provide a forum to discuss fisheries issues and promote sustainable fisheries development in Nunavut

Topics of Discussion

- History
  - Inshore
  - Offshore
- Nunavut Access and Allocation
- Northern Science
- Conservation Issues
- Constraints to Development
  - Infrastructure
  - Current Fisheries Policies
- Issues and Concerns
  - Domestic
  - International

History (Inshore)

- 1986 – Initial experiments conducted in Cumberland Sound on under-ice longlining.
- 1987- Allocation of 500t granted in management plan.
- 1990- harvest reached 225t
- 1992- Inshore turbot quota raised to 1,000t. 93 licensed fisherman actively involved in fishery.
- 1993- Construction of new fish plant in Pangnirtung.
- 1994 – harvests topped off at 400t
- Currently entering 15th year of fishery.
- In recent year catch rates have deteriorated (45t in 2000) due mainly to poor ice conditions.

History (Offshore)

- 1992 – Cumberland Sound Fisheries provided 500t offshore allocation.
- 1993 - GNWT conducts test fishery in Division 0A
- 1996 – 500t offshore allocation granted to Nunavut.
- 1996 - Nunavut granted 300t exploratory quota for 0A
- 1997 – Nunavut offshore quota in 0B increased from 500 to 600t (overall TAC reduced from 27.4% to 24%).
- 1997 – Nunavut offered groundfish license to fish offshore allocation in Sub-area 0 (600t).
- 1998 – Nunavut offshore allocation reduced to 500t.
- 2000 – Nunavut allocation in Sub-area 0 maintained at 27% (including inshore allocation).
- 2001 – Nunavut receives entire Canadian share of 4,000t turbot quota in 0A.

Fisheries Access

- Nunavut currently has no groundfish license to access the turbot resource
- Several thousand groundfish licenses exist for southern enterprises to fish both adjacent and non-adjacent waters.
- Since 1994, more than 250 commercial licenses have been issued to aboriginal groups under the Aboriginal Fisheries Strategy. Nunavut interests do not qualify for this program because we have a land claim agreement in place.
- Many parties feel that for Nunavut to fully benefit from the Canadian turbot resource it must have access to both adjacent and non-adjacent stocks so that it can invest in vessels and other infrastructure.
- Turbot is the only commercial groundfish species available to Nunavut

NLCA

Article 15.3.7

- *Government recognizes the importance of the principles adjacency and economic dependence of communities in the Nunavut Settlement Area on marine resources, and shall give special consideration to these factors when allocating commercial fishing licenses within zones I and II. Adjacency means adjacent to or within a reasonable geographic distance of the zone in question. The principle will be applied in such a way as to promote fair distribution of licences between residents of the Nunavut Settlement Area and the other residents of Canada in a manner consistent with Canada's interjurisdictional obligations.*

Fisheries Allocation

- 1995 – Canadian quota for Division 0B was set at 5,500 tons. 1,500 tons (27%) provided to Nunavut residents (1,000 inshore, 500 offshore)
- 2000 – Nunavut obtained 100% of Canadian share of 4,000 ton increase in Divisions 0A + 1A for 2001.
- Significant progress has been made over the past year, however, many Nunavut interests feel that there is still quite a ways to go to establish a level of fairness and equity for Nunavut in the Atlantic Fishing Industry.
- This new allocation will be the first TAC to be established in 0A.

Northern Science

- Historically scientific effort on Turbot in Sub-area 0 has been practically non-existent.
- Until 1999, the last comprehensive scientific research activity took place in 1986.
- In 1999 a survey was carried out in 0A by DFO/NWMB using a Greenland vessel.
- Similar survey was conducted in 0B in fall of 2000.
- Complete survey of 0A and 0B will be conducted in 2001.
- Require continuing long-term comprehensive research activity in Sub-area 0.
- Davis Strait is still considered the primary spawning area for all of 0+2+3

Conservation Concerns

- Lack of enforcement capacity in Sub-area 0 provides little deterrent for illegal activities.
- Serious concerns with loss of gillnets and extended soak times.
- Concerns over by-catch of juvenile turbot in northern shrimp fishery.
- Concerns over increased abundance of harp seals in Nunavut waters the potential impact on the turbot resource.

Constraints to Development

Infrastructure

- No communities in Nunavut currently have harbour facilities capable of docking vessels even of modest size.
- DFO currently manages a Small Craft Harbour Program but to date have not extended this program to Nunavut.
- Adjacent fishers cannot benefit from the resource unless they have adequate docks for vessels to land their catch.
- Docking facilities in coastal Nunavut also creates an opportunity to invest into the processing sector.

Constraints to Development

Current Fisheries Policies

- Many Nunavut interests feel that current fisheries policies are outdated and do not address the issues and concerns most relevant to Nunavut fishers.
- Under Canada's Sector Management Policy, the waters adjacent to Nunavut fall within Sector 1 which is aligned with Newfoundland.
- Many Nunavut interest feel that current licensing policy has not permitted Nunavut to access sufficient resources in adjacent waters or any resources at all in non-adjacent waters.
- Atlantic fisheries policies are aimed at maintaining or reducing capacity which is in complete contrast with Nunavut's attempts to develop "a" capacity.

Issues and Concerns

Domestic

- Nunavut allocations in 0B currently stands at approximately 27% while other Atlantic provincial jurisdictions receive 80-90% of their adjacent resources.
- For the past 3-4 years TAC increases have occurred in Sub-areas 2+3. Many Nunavut interests feel they should be allocated a portion of those increases for the following reasons:
  - Establish a level of equity to a shared Canadian resource.
  - Prior to 2000, Canada had left an average of 5,000t of turbot in the water over 5 years.
  - Provide Nunavut with an opportunity to develop a more economically viable industry.

Issues and Concerns

International

- 50/50 turbot sharing arrangement between Canada/Greenland in 0 + 1.
  - How was it reached?
  - What is the relationship between Greenland's Fjord fishery and the offshore?
- Concerns over by-catch of juvenile turbot in Greenland's expanding shrimp fishery.
  - Problem
    - No observers on vessels
    - No grates being used in shrimp trawls
- Request that Canada receive greater than 50% of the 4,000t increase in 0A because
  - Greenland is currently harvesting in excess of 20,000t in its inshore waters.
  - Survey was conducted in 0A
  - Survey was partially funded by NWMB

Questions/Comments

- There was a general discussion of the tagging program both in Greenland and Canada and why Canada couldn't treat its inshore as Greenland has done (i.e. count as separate quota area). It was pointed out that Canada's tagging results are not conclusive yet.
- Others stated that room should be made for Nunavut interests to participate.
- Nunavut should state what they want, who it should be taken from and how to compensate any individual removed.
- Government policy is to rationalize the groundfish industry but reality in Newfoundland is different. There has been a total redirection of effort to snow crab and shrimp. While numbers have dropped, there is 4-5 times the killing power out there than in 1992.
- Ben Kovic provided insight into the Greenland side of the equation. He stated there are 3 communities and there is a lot of pressure on turbot in the fjords. As in Newfoundland when cod went down, Newfoundlanders went offshore and into other fisheries. Similarly in Greenland in 1994 when the Government banned the beluga drive in these 3 areas these fishermen needed to find an alternative. This is probably why the turbot effort built up. The Homerule Government is really run by the harvesters and is hard for Government to bend.
- When questioned Ben stated the inshore fishery runs all year long with 18-20' vessels. It was also noted that they use factory vessels some years where inshore vessels can offload.

Industry Perspectives on the Fishery and Issues – U. Snarby, offshore trawler captain

The information presented represents the views of a fisherman working on a fishing vessel.

There are a number of reasons why turbot allocations are not taken in a given year. One key element relates to markets and price. There is also a degree of scepticism due to Canadian policies outside 200 miles.

It was observed that the Spanish fishery is conducted using Spanish vessels and Spanish officers but third country crews. Catch rates outside 200 miles are such that Canadian industry could not make money.

People are interested in better protecting juveniles but people must remember that there would be a negative impact on markets if all of the fish were >60 or 70 cm. This must be taken into consideration during contemplation of regulations.

Fishers using trawls are working at reducing meshing. It is believed that when fish mesh, they weigh down the head rope with the result being that larger fish escape over the top of the trawl.

He believes that Canadian fishermen have been ‘sacrificial lambs’ during international negotiations. This applies to shrimp in Davis Strait as well as turbot as seen through the unilateral decisions following on the ESTAI incident.

In commenting on the FRCC recommendations, he observed that there is a seasonal component to the capture of juveniles in the north and south and that this should be taken into consideration. More generally, he considered that the FRCC needs to take a closer look at available data before making recommendations.

Questions/Comments

There was little in the way of commentary/questions on the presentation.

Industry Perspectives on the Fishery and Issues – R. Simmons, 65 foot vessel captain

Rex Simmonds made a presentation on behalf of the four boats who have formed an association of those who freeze fish at sea. He stressed that their focus was primarily in 0B where there was 1,500 tons of fish available on a competitive basis, with 900 of this being allocated to the fixed-gear sector. He stressed that their group was very much concerned about the economics of fishing nets and longlines with the former preferred from an economic point of view. Secondly, he was very much concerned that the large amount of fees going to DFO from the various fleet sectors could not at least be partially recovered to carry out DFO science. Thirdly, he was also questioning the amount of research being carried out in 2G and 2H by Science of DFO. Science indicated that they would not be doing any more research in 2G for a while, and that 2H would be carried out every second year. He also made a strong point to seek DFO regulation to provide for rope-breaking strength, which would reduce the loss of nets and further reduce ghost net fishing. He also indicated that in the north, a tagging system was used for all gill nets, as supervised by DFO and that a lot of benefits could be forthcoming from this activity. Finally, he stressed that the 600-metre minimum depth would put most of the small boat activity ashore and this should be reviewed in detail before any regulatory action is taken.

Questions/Comments

Observers came in for considerable discussion, especially as it pertains to a coordinated role for them, and the provision of good information following their work at sea. A plan in advance of the fishery seemed to be an absolute essential, so that activities for Science, management and other factors could be well understood. Secondly, it was felt that a consolidated report on a regular and early basis to all parties, including industry and the FRCC, was critical.

Questions/Comments on the Topic Generally

- With respect to viability, it was stated that foreign vessels outside 200 miles use foreign crews from third world countries that are paid less. Canadians could not survive on catch rates foreigners have outside 200 miles. It is difficult to compete when playing is field not level.
- With respect to the small fish protocol it was pointed out that the forenet does not select for turbot. Experiments with small mesh in forenet eliminated meshing and what gets in cod end is larger. The reason for this is that when they mesh in forenet the headline drops and large turbot swim over the top.
- With respect to closing Hawke and St Anthony Basin to protect small turbot it was stated that the offshore fishery is in January-April period and there is no bycatch. During the last week of April-May the net is full of juvenile turbot. It is believed that this has something to do with the first full moon. The problem is apparently in the inshore fishery in the summer months.
- With respect to rock-hopper gear versus steel gear it was stated that one can't find one solution to fix every problem. In some areas such as the Flemish Cap one must fish lower to the bottom to catch shrimp but the bottom while smooth is hard.
- It was stated that Canada should take more hard-line positions when negotiating with foreigners.

Discussion of Questions Relating to Establishing New Priorities for Research, Management and International Objectives for Greenland Halibut

The issues that formed this agenda item are captured in the section detailing the development of Workshop Conclusions and Recommendations below.

Day 3

The Chair invited H. Clarke and A. May to provide their perspectives on the discussions that had taken place.

H. Clarke provided comments in 3 categories:

1) Science: More resources are needed, such as surveys and tagging. Workshop should make a strong recommendation in this regard.
2) Management: A precautionary and consistent approach to management is required over the entire stock. There is a need to be more proactive.
3) International: Some perceptions are different from reality, e.g. belief that foreign overfishing does not exist. Canada should not be afraid of an aggressive approach at NAFO.

Organizers of the Workshop should write a letter to senior DFO management outlining the outcome. This does not have to reflect a consensus.

A. May noted that the discussion around scientific issues is the same as it was several years ago. Long-term scientific efforts are needed to produce results. An example is the international effort devoted to the Greenland salmon fishery in the 1960's. Objectives are required in the management of the turbot resource, and these must be prioritised. At times, the interests of some may have to be sacrificed for the common good. Canada needs to be aggressive in support of its fish stocks, and strong leadership from DFO and its minister is essential.

Both presenters thanked the workshop organizers for the opportunity to participate.

Development of Workshop Conclusions and Recommendations

Discussion of several points followed their presentations. It was agreed that a Workshop report would be produced for distribution, but that a memo to senior Departmental staff outlining workshop views on other issues, Canadian positions, etc. would also be required.

The chairman then distributed a summary of key issues and recommendations for discussion. Participants commented on several of these, and a number of clarifications and revisions were proposed. Among the recommendations was one to strike a working group from workshop participants to continue progress on several initiatives. It was suggested to extend the mandate of the current DFO-Industry WG (D. Bollivar, chairman) to include the planning and long-term initiatives discussed in the workshop, with the intention of being proactive.

Finalization of Recommendations

Workshop participants came to agreement on the following issues:

Subareas 0 + 1

Research

1. Can we make any educated guesses about GLH in SA 0 and 1 without adequate research? Concern re lack of/sporadic research in 0+1 area?
2. Is a need to re-visit proportional split of allocations during bilaterals with Greenland (B. Steinbock indicate is being considered but more science needed).
3. Questions were asked regarding quota increases in the southern areas but not in SA 0+1 given the biological knowledge suggesting is one stock throughout the entire area.
4. Question raised as to whether offshore fishery in 0B would 'hurt' inshore in 1A (Greenland inshore fishery).
5. Need for multi-year science program indicated.
6. Concern expressed by Nunavut regarding harp seals. Large numbers move into the area and feed extensively during summer. What do they eat?

> **Recommendation:** ***Ongoing research on Greenland halibut throughout the Canadian and Greenland zones of Davis Strait is necessary in order to permit and promote orderly development of the various fisheries based on conservation considerations and an objective of sustainability within a precautionary framework. Canada should pursue additional bilateral research, and invest in additional research on Greenland halibut in the Davis Strait area so as to enable better overall understanding of the resource in the Davis Strait area and their links to the resource further south. The results of such research would allow appropriate discussions regarding proportional split in allocations based on biomass distribution in the offshore areas of 0AB + 1ABCD.***

1. Question of whether GLH caught inshore off Baffin Island are 'isolated' from the offshore resource in a similar manner to those in the inshore of Greenland in 1A.
2. Could a separate 'quota' be set for Cumberland Sound without taking it off the offshore quota?

> **Recommendation:** ***Canada should invest in further research on Greenland halibut in the inshore areas of Baffin Island to determine their affiliation with the resource in the offshore so as to allow for appropriate development of this inshore fishery.***

Management

1. Question raised regarding fishing regulations on Greenland side of Davis Strait (SA 1). Are they similar to Canadian regulations or not? Point made is that they should be.
2. FRCC has indicated need for consistency in management measures on Canadian and Greenland sides.
3. FRCC and Nunavut expressed concerns regarding Greenland halibut bycatch in the shrimp fishery.

Recommendation: ***Canada should investigate details of regulations applied to Greenland fishery for Greenland halibut offshore in 1B and promote consistency in the regulation of offshore fisheries in the Canadian and Greenland areas during bilateral discussions.***

1. Question regarding potential regulations for any fishery in 0A. Issue of gear (gillnets) raised in conjunction with ghost fishing – protection of narwhals.

Recommendation: ***There must be careful consideration of potential impacts of fishing gear and regulations imposed for the Greenland halibut fishery in 0A on other important and possibly vulnerable species in the 0A area before expanded fishing for Greenland halibut is permitted.***

1. Questions of adjacency and access raised including access of northern people to resources further south similar to access more southern residents have to northern resources.
2. Insights given into why there has been significant expansion of the inshore fishery off Greenland. Increase related to ending of beluga driving and netting.

Allocations

1. Question of allocation split of 4000 t for 0A and 1A between Canada and Greenland (Minister committed that Nunavut would get 100% of Canadian share of 0A +1A quota).

Recommendation: ***Canada should pursue further bilateral research and invest in additional research on Greenland halibut in the Div. 0A and 1A portions of Davis Strait area so as to enable appropriate discussions regarding proportional split in allocations based on biomass distribution in the offshore areas of 0AB + 1ABCD.***

International

1. Is need to rethink relationship with Denmark (on behalf of Greenland) in NAFO and implications for Canadian positions during bilateral discussions.

Recommendation: ***Canada should review its position during bilateral discussions with Greenland in the context of the links to NAFO issues.***

Subarea 2 + 3KLMNO

Research

1. Concerns expressed regarding the continuing lack of adequate research in the 2GH area.
2. For arguments regarding distribution of fishing effort in relation to biomass, is important to have adequate data on biomass in 2GH area.

Recommendation: ***The DFO should give consideration to making adequate resources available to allow ongoing monitoring and research on Greenland halibut and other resources (such as shrimp) in the 2GH area. This should include exploration of possible partnering between DFO and industry for data collection.***

Management

1. Why are there different mesh sizes by depth in SA 2+3? If there is a conservation issue regarding fish sizes captured why not 1 size throughout? (If smaller fish are in the shallower zones why is smaller mesh allowed?)

Recommendation: ***The issue of different mesh size regulations in different depth zones should be revisited in the context of objectives associated with use of the larger mesh. If the objective is conservation and protection of smaller juveniles, then consideration should be given to a consistent and appropriate mesh size to be used at all depths.***

1. Tagging of fishing gear in southern zone – not done now but should it be a requirement?
2. Issue of ghost nets further south too – crab.

Recommendation: ***Recognizing that there are perspectives for and against such action, it is recommended that the possible requirement for all fixed gear to be tagged should be explored for the SA2+3KLMNO area.***

1. FRCC has recommended possible area closures for protection of juveniles (Hawke Channel and St. Anthony Basin).
2. Catch and bycatch of smaller Greenland halibut has a seasonal component that should be considered when discussing possible area closures.
3. Bycatch of crab in turbot gillnet fishery.
4. Bycatch of small GLH in shrimp fishery including formal expressions of concern by the FRCC.

Recommendation: ***Workshop participants endorse the initiative of Fisheries Management to address the issues of crab bycatch in the Greenland halibut gillnet fishery, and small Greenland halibut in the shrimp fishery beginning with the Workshop planned for late February 2001 in Gander, Newfoundland.***

1. Restricting fishing to depths >600 m would assist in dealing with juvenile catch issue.
2. Restricting fishing to depths > 600 m would result in 'destroying' the small boat fishery.

Recommendation: ***The DFO, in consultation with industry, should consider possible restriction of the mobile gear fishery to depths greater than 600 m.***

1. Capacity issue raised – numbers of licences for amount of fish available.

Allocations/International

1. Issue of effort distribution compared to biomass – SA 2+3KLMNO.
2. Consistency of management measures inside and outside 200-mile limit (Canada pursuing but limited success to date).
3. Need to follow-up with results of Canadian mesh selection work in NAFO.
4. Concern expressed about Canada's 'lack of control' internationally and the impacts on ability to achieve objectives.
5. Concern expressed regarding impacts of domestic conservation measures if cannot achieve similar results internationally.
6. Suggestion that Canada should be 'stingy' as a matter of public policy.
7. Concerns expressed regarding political implications of possible initiatives in the shorter term when objectives are longer term ('optics' issue domestically).

Recommendation: ***Workshop participants endorse Canada's continued pursuit of conservation initiatives in NAFO related to Greenland halibut; a) better protection of juveniles, b) better protection of other species from bycatch, and c) allocation re-alignments based more closely on biomass distribution.***

1. Some, including the FRCC, do not agree with quotas as established for Greenland halibut for 2000 or 2001 emphasizing concern regarding protection of juveniles. Concern expressed that we may be 'spending our interest' now.
2. From an international perspective, what is being reported as happening is not what is actually taking place on the water.

Northwest Atlantic

Research

1. Observation made that mesh studies have been done in relation to current minimum size regulations (i.e., 45 cm minimum) but there has not been work done to determine whether this is reasonable in the context of interest in protecting juveniles.
2. Little in the way of knowledge of any investigations regarding impacts of allowing different amounts of juveniles to escape has been available as part of the overall discussions of juvenile captures.

Recommendation: ***Analyses demonstrating what the incremental benefits of allowing more smaller juveniles to escape should be carried out and taken into consideration during future discussions of issues pertaining to protection of juveniles.***

1. Fees have gone up significantly in recent years but it is not clear that these increases have been passed, in part, to science for increased research. This includes the fees charged for observer coverage. While the observer charges are put toward the program, it is not clear how science may have benefited from this.
2. Concerns were expressed with regard to the rationale applied for deployment of observers and to what extent there is consideration of scientific needs.

Recommendation: ***The DFO should hold discussions internally between Science and Fisheries Management as well as with stakeholders regarding the deployment of observers, the information collected, and how the information is being used. Such discussions should include considerations of current shortcomings including data availabilities and analyses. These discussions should also include considerations for ensuring efficiencies into the future.***

1. The implications for appropriate stock delineation of Greenland halibut resources throughout the Northwest Atlantic are still considered to be among the major issues of concern for management.
2. It is of particularly high profile considering that management comprises a combination of national, bilateral (Canada-Greenland) and multi-national (NAFO) harvesting and enforcement measures.
3. Some areas identified as problematic are, for example: 1) the Cumberland Sound-Davis Strait relationship 2) the Division 0A-1A relationship with southern Davis Strait 3) the inshore Greenland and offshore Davis Strait interaction 4) and relationships within Subareas 2 and 3 and between Subareas 2 and 3 with the Davis Strait, among others.

4. In addition to the importance of definitive stock identification, if and where possible, the elucidation of interactions among various stock components and migratory patterns is of special significance. Such knowledge is necessary in order to avoid local depletion and allow for appropriate catch allocations with the latter having national as well as international ramifications.
5. Although many stock identification studies using a variety of tools have been carried out over the years the results have been less than definitive. It is considered that the best tool for providing the most useful information in a practical as well as scientific sense is a relatively large-scale external tagging experiment.
6. In order for such a project to be successful it would also require involvement and co-operation among all international players (Canada, Greenland and other NAFO Contracting Parties with Greenland halibut allocations) in the Greenland halibut fisheries of the Northwest Atlantic.

   Recommendation: ***The DFO should hold discussions internally, with stakeholders, as well as with international parties (Greenland and NAFO Contracting Parties) regarding the possibility of mounting a large scale international tagging program to gain the best possible insights into stock dynamics that will be useful and applicable to future longer term management objectives and strategies.***

1. There is a serious problem regarding the lack of scientific information and all recommendations related to science need to be made strongly and acted upon if at all possible.

Management

1. Minimum Canadian landing size of 45 cm represents the mid-point between 30 cm (minimum size in NAFO Regulatory Area) and 60 cm (length used by Scientific Council to approximate minimum length for spawners).
2. Mesh selection studies indicate the L_{25} (length at which 25% of the fish available to the trawl are retained) is about 45 cm for 145 mm codend.
3. In otter trawls, small fish problem is for lengths of about 42 – 48 cm and these are the sizes that get meshed in the net in front of the codend.
4. Overall results indicate that with current size mix of fish available, the possibility of achieving the less than 15% requirement for fish under 45 cm is low with 145 mm codends.
5. Is no forum at present to discuss other aspects of trawl mesh sizes in relation to bycatch of undersized fish (<45 cm).

   Recommendation: ***Based on selectivity studies and knowledge of the current population structure, the possibility of achieving the less than 15% bycatch level of <45 cm fish is low. While the minimum size target of 45 cm should not be changed (represents the L_{25} for 145 mm gear; same criterion as used by NAFO to establish 30 cm minimum size in that area), consideration should be given, on an annual basis, for flexibility in application of the regulation so as to allow normal harvesting practises to continue. Work should continue with regard to gear modifications to reduce catch of fish less than 45 cm.***

Further, preliminary studies suggest decreasing mesh size in parts of the trawl in front of the codend result in increased proportions of larger fish being retained. Discussions should take place with DFO to explore the possibility of continuation of the relaxation of regulations with regard to trawl mesh sizes while studies are continuing.

1. It was noted that although discussions focussed on bottom trawls, similar issues exist with regard to gillnets. For example, selectivity of 6 inch mesh gillnet is approximately the same as that for 145 mm codend.

Recommendation: ***Any discussions with regard to gear size in relation to conservation issues should include discussion of all gear types in use or proposed for use.***

1. How well are the fishing regulations being adhered to in the Canadian zone from Subarea 0 south?
2. What is the capacity to enforce the regulations in the Canadian zone, particularly in Davis Strait?
3. Specific concerns expressed regarding enforcement in SA 0.
4. Concerns have been raised regarding improper use of gillnets in fishery in 0B.

Recommendation: ***Canada should review the current fishery regulations for Greenland halibut in the context of how well they are being adhered to, and in the context of how feasible it is to enforce them. The objectives of the regulations should be considered and the risks of not achieving the objectives if the regulations are not followed nor can be reasonably enforced should be considered.***

1. There have been solutions found to gear conflict issues in the northern areas and perhaps these could be considered for areas further south.

Recommendation: ***The DFO should examine current solutions to gear conflict issues in the north and discuss, with industry, their possible application to areas further south.***

1. It was considered that deepwater gillnet gear requirements be standardized (e.g., headrope thickness requirements to prevent breakage).
2. Question raised as to whether it may be possible to ‘mark’ nets so as to be able to locate if lost.

Recommendation: ***There should be a review of gear requirements in the deepwater gillnet fishery with the aim of developing standards to be used by all fishers in order to minimize breakage and losses.***

1. With mesh size of 155 mm (codend), the catch of undersize fish relative to the overall catch does not change much but overall catch rates decline by up to 25% (reason unknown at present).
2. This work, with industry closely involved, indicates the very positive things that can happen with such relationships with regard to accomplishments.
3. Different gears catch different sizes of fish, and that different sizes are caught at different times of the year.

4. Market conditions are such that a variety of fish sizes is desirable. Not as great a market if all fish >60 or 70 cm.
5. There are different economic returns associated with different gears (e.g., longlines versus gillnets) that are still being explored.

Recommendation: ***There needs to be better overall integration of recommendations for management of the fishery taking into consideration overall objectives, but acknowledging the realities of the domestic and international fisheries and their management, the markets, and the science.***

Longer Term Objectives

1. There should be better articulation and prioritization of objectives and the need to place recommendations in that context.
2. There will not be successes if future approach is to manage the 'status quo'.
3. Concern expressed regarding apparent insufficient consideration of possible impacts of recommendations on fishers and fishing industry e.g., what is actually practical, and what might 'spin-off' impacts be.
4. A single solution does not necessarily address a problem in all fishing areas and this needs to be factored into recommendations.

Recommendation: ***In making recommendations regarding Greenland halibut (and other fisheries) all bodies should be clear as to what the specific objective is expected to achieve in the context of their overall objective for the resource. They should consider the practical implications of any such recommendation in the context of impacts on the industry (including safety at sea issues) as well as enforcement possibilities. It was noted that their discussions to develop longer-term outlooks and objectives should help in this regard.***

Further, before making recommendations, it should be ensured that all data available have been considered, secondary impacts have been contemplated, and appropriate consultations have taken place.

1. There needs to be common management application over the entire area and this needs to be developed through pro-active thinking rather than by simply reacting as specific issues arise.

Continuing Work

1. Question raised as to what follow-on activities might be based on Workshop results and recommendations.

Recommendation: ***Consideration be given to establishment of an ongoing Working Group of industry and DFO participants to continue development of Greenland halibut fishery processes. It was noted that a Working Group chaired by D. Bollivar was already in place, and it was considered that this may serve as a basis for a group with expanded mandate.***

General Comments

1. Issues discussed during Workshop have been around for many years.

2. Much less acrimony during discussions than in the past – a sign of good progress regarding working together for solutions.
3. There is ongoing focus and debate regarding seals. Does anyone know about possible impacts of whales whose populations have been increasing?

Adjournment

In closing, the Chair asked to have copies of all workshop presentations available for inclusion in the final report. Participants were also asked to send any final comments on the workshop recommendations to the Chair. Thanks were extended to all attendees, and the Chair noted the excellent co-operation that existed throughout the meeting. Special thanks were extended to the Steering Committee, chaired by D. Bollivar, who looked after the excellent meeting facilities and arrangements, to J.C. Bourque for his translation services, and to C. Grenier, for her excellent work during the meeting.

Annex I

Terms of Reference

The Greenland Halibut Workshop will provide a forum through which parties interested in the biology, fisheries and sustainability of the Greenland halibut resource in the Northwest Atlantic can meet and share knowledge and experiences. It will be a forum through which overall strategies and priorities for future research, management and international negotiation can be tabled and discussed, and recommendations agreed upon through consensus.

The Workshop will include:

- Presentations of the biology, life history and stock structure of Greenland halibut in the NW Atlantic;
- Presentations on the various fisheries for Greenland halibut, past present and future, and their economic importance;
- Presentations on the management of the Greenland halibut as practised domestically and internationally;
- Discussion and recommendations on appropriate management within the bounds of current knowledge and uncertainty taking into account the Precautionary Approach;
- Discussion and recommendations on research priorities and objectives, and;
- Discussion and recommendations on possible perspectives for international discussion and negotiation.

The materials presented at the Workshop as well as conclusions reached will be collated into a Workshop Report available to all participants as well as government officials and other interested parties.

Annex II

GREENLAND HALIBUT WORKSHOP

Montreal, Delta Montreal

January 25-27, 2001

PROGRAM

Thursday January 25, 2001

8:00 – 9:00	Breakfast
9:00 – 9:15	Welcome – Steering Committee
	Purpose of Workshop – Workshop Chairman – B. Atkinson
9:15 – 9:45	Area 0 Greenland Halibut Science – M. Treble DFO Winnipeg
9:45 – 9:55	Question Period
9:55 – 10:25	Area 2&3 Greenland Halibut Science – R. Bowering DFO, St. John's
10:25 – 10:35	Question Period
10:35 – 10:55	Coffee Break
10:55 – 11:25	NAFO Greenland Halibut Science – W. Brodie DFO St. John's
11:25 – 11:35	Questions
11:35 – 12:15	Discussion on Science and Research Priorities
12:15 – 1:15	Lunch
1:15 – 2:15	Management and Regulation of the Fishery – B. Rashotte DFO Ottawa, B. Hunt DFO Iqaluit, & G. Brocklehurst DFO St. John's
2:15 – 2:30	Question Period
2:30 – 3:00	International Management Perspective –R. Steinbock DFO Ottawa
3:00 – 3:10	Question Period
3:10 – 3:25	Coffee Break
3:15 – 3:35	Comment by the FRCC on Management Measures – R. Andrews FRCC St. John's
3:35 – 3:45	Question Period
3:45 – 4:15	Mesh Size Studies and Development Programs - G. Brothers DFO St. John's
4:15 – 4:25	Question Period
4:25 – 5:15	Discussion of Domestic and International Management Issues and Priorities
6:45 – 7:30	Reception
7:30	Dinner

Friday January 26, 2001

8:00 – 9:00	Breakfast
9:00 – 10:00	An Industry Perspective on the Fishery and Issues
	Informal Presentations by Nunavut, B. Chapman – Groundfish Enterprise Allocation Council, U. Snarby – Captain of an Offshore Trawler and a Representative of the Small Boat Fishery
10:15 – 10:30	Question Period
10:30 – 10:45	Coffee Break
10:45 – 12:00	Discussion of Questions Relating to Establishing New Priorities for Research, Management and International Objectives for Greenland Halibut
12:00 – 1:00	Lunch
1:00 – 3:15	Continuation of Discussion
3:15 – 3:30	Coffee Break
3:30 – 5:00	Continuation of Discussion

Saturday January 27, 2001

8: 00 – 9:00	Breakfast
9:00 – 10:15	Development of Workshop Conclusions and Recommendations
10:15 – 10:30	Coffee Break
10:30 – 11:30	Finalization of Recommendations
11:30	Lunch

Annex III

GREENLAND HALIBUT WORKSHOP
JANUARY 25-27, 2001
MONTREAL, QUEBEC
ATTENDANCE LIST

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