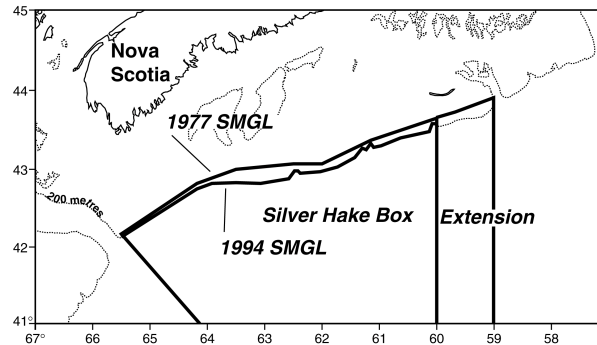




## Bycatches in the Silver Hake fishery on the Scotian Shelf Slope: Evaluation of the Small Mesh Gear Line



### Background

The foreign Scotian Shelf (Div. 4VWX) silver hake fishery was unrestricted in terms of area and season of fishing up until extension of jurisdiction in 1977, when a minimum mesh size of 60 mm was required and the fishery was restricted to deeper waters (>100-150 m) in a defined area along the edge of the shelf. This area became known as the "Silver Hake Box" and its shoreward boundary as the "Small Mesh Gear Line" (SMGL). Subsequently, some fishing was permitted to the east, with this area being called the "Extension".

These measures were considered adequate until 1992-93, when industry representatives began demanding that the bycatches of cod, haddock and pollock from the silver hake fishery be eliminated. Separator grates were made mandatory on all vessels fishing for silver hake in August 1993. A revised SMGL which approximated the 190m depth contour was implemented, and the Extension was eliminated, at the start of the 1994 season. Scientific advice at the time stated that these changes would greatly reduce bycatches of haddock and pollock, and probably also cod, while still allowing effective prosecution of the silver hake fishery. It was also noted that fishing deeper would be crucial to reducing the accidental capture of small haddock, since the grate used by the fishing industry would not be effective in releasing small immature haddock.

These new restrictions on fishing area were endorsed by the Harris Panel on Foreign Fishing and strictly enforced in 1994. In subsequent years, modifications and exemptions were requested by Cuban authorities to facilitate navigation in and around the canyons on the shelf slope and to generally improve fishing conditions for silver hake. A number of these were granted, providing an opportunity to evaluate the accuracy of the original advice.

### Summary

- Recent bycatch reductions were the result of decreased fishing effort, reduced abundance of bycatch species, mandatory use of separator grates, and restrictions on fishing area.
- Few of the predicted benefits from the 1994 revision of the SMGL have been realised due to subsequent modifications and the granting of exemptions.
- Catch rates of silver hake were not affected by restrictions on fishing area.

**Observed Catch (tonnes)**

common name	1989-93	1994	1995	1996	1997	1998
	avg					
silver hake (,000)	57.0	6.9	16.3	22.4	12.1	6.1
<b>pollock</b>	<b>1640</b>	<b>10</b>	<b>56</b>	<b>134</b>	<b>54</b>	<b>8</b>
spiny dogfish	1369	14	30	92	81	9
short-fin squid	1036	1290	715	442	521	710
skates (ns)	922	16	19	33	5	11
herring (Atlantic)	912	0	6	181	227	117
mackerel (Atlantic)	593	39	58	82	109	7
hake (ns)	489	58	11	75	31	24
<b>haddock</b>	<b>348</b>	<b>8</b>	<b>32</b>	<b>47</b>	<b>24</b>	<b>13</b>
redfish (unseparated)	300	19	41	54	66	11
monkfish, angler	172	7	20	89	49	20
<b>cod (Atlantic)</b>	<b>150</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>
baskingshark	105	9	20	9	3	4
argentine (Atlantic)	78	8	92	209	504	5
American plaice	64	13	18	23	11	23
cusck	58	0	0	1	1	0
halibut (Atlantic)	56	1	3	5	2	1
thorny skate	50	2	19	42	27	9
red hake	43	1	124	288	195	75
witch flounder	39	2	19	25	19	24
dog fishes (ns)	39	0	0	0	0	0
winter skate	38	1	78	122	45	41
American lobster	34	4	7	13	8	5
alewife	28	0	0	14	11	5
~300 other species	227	9	85	108	175	30

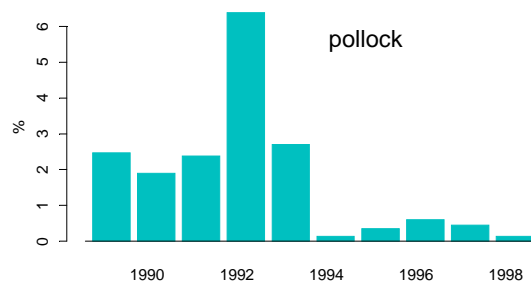
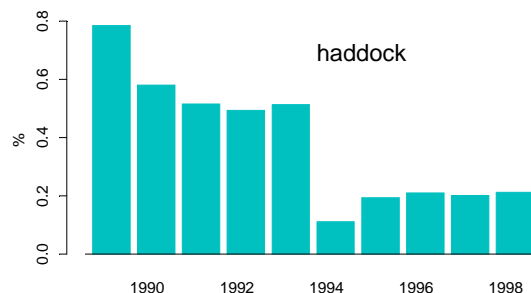
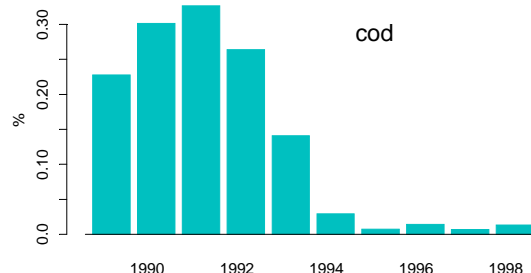
**Introduction**

This document provides an analysis of bycatch in the foreign small mesh gear fishery on the Scotian Shelf slope for 5 years before and after the introduction of fishing area restrictions at the beginning of 1994. Data used in this analysis are from the Canadian observer program in 1989-98. Over 83,000 fishing sets where silver hake was the main species sought were analyzed. A similar analysis was attempted for the domestic fishery in Emerald and Lahave basins, however observer coverage levels were so low as to make a satisfactory analysis impossible.

**Results**

The bycatch quantities of almost all of the non-target species decreased after 1993. In particular, bycatch rates (% of silver hake) of

cod, haddock, and pollock since 1994 have decreased by 95%, 70% and 90% respectively, compared to the the 1989-93 average.

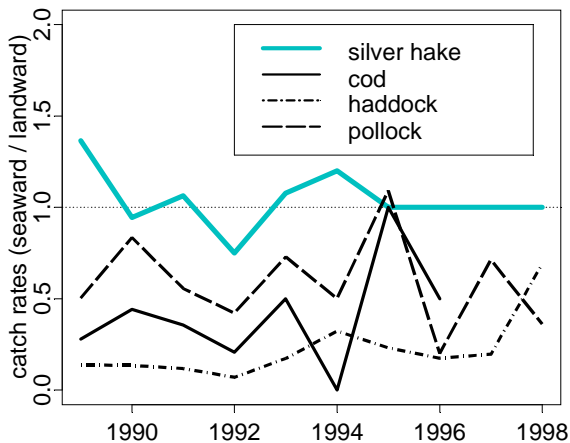


Fishing effort seaward and landward of the 190 meter depth contour and in the *Extension* shows that 1994, the first year of the revised *SMGL*, was the only year where there was a noticeable change in the distribution of fishing from that in 1989-93.

	1989	1990	1991	1992	1993
seaward	7.5	17.7	23.0	16.7	10.4
landward	12.9	13.0	11.8	4.4	7.0
extension	1.6	5.3	4.8	3.4	2.9

	1994	1995	1996	1997	1998
seaward	4.7	6.2	10.6	7.8	1.9
landward	0.9	5.7	7.5	3.4	2.5
extension	0.0	0.8	0.2	0.9	0.5

The silver hake catch rate was almost always as high or higher seaward of the 190 m contour as it was landward. The cod, haddock, and pollock bycatch rates seaward of the 190m contour were usually 50%, 80% and 40% lower than they were landward.

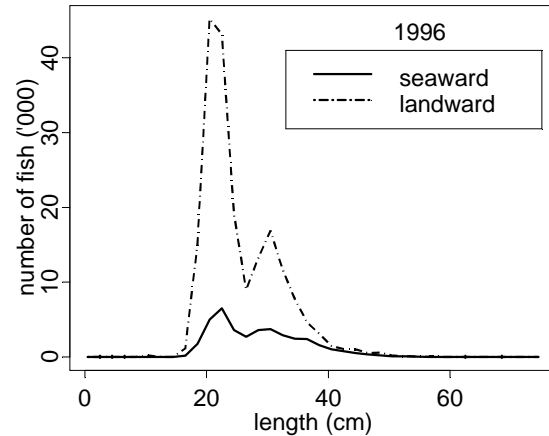


Fishing in the *Extension* almost always resulted in higher catch rates of haddock than seaward of 190 m in the *Silver Hake Box*.

		Haddock catch rate (kg/hr)				
		1989	1990	1991	1992	1993
seaward		4.4	2.2	2.2	1.7	2.4
extension		128.3	23.6	13.3	4.9	5.8
		1994	1995	1996	1997	1998
seaward		1.0	0.9	0.8	0.9	2.0
extension		...	3.7	15.9	1.0	3.8

This pattern was also observed for cod but not for pollock.

Bycatches landward of 190 m contain both more and smaller haddock than seaward. Thus, the difference in haddock bycatch rates is greater when expressed as numbers of fish rather than weight.



**Conclusions**

The bycatch changes in the the shelf slope fishery between 1989-93 and 1994-98, particularly for cod, haddock and pollock, are the result of several factors. Fishing effort in this component of the fishery in 1994-98 was only about 40% of that in the earlier period, which would reduce the bycatch quantities proportionately (but not bycatch rates). Changes in the abundance of cod, haddock and pollock between periods would affect both the bycatch tonnages and the bycatch rates. The introduction of separator grates was projected to reduce the bycatch rates by weight of these species by 75-95% (depending on species). The present analysis confirms that restriction of fishing to waters of deeper than 190 m and elimination of the *Extension* would reduce bycatch rates by a further 40-80% depending on species.

The most problematic bycatch species is haddock, as bycatches are composed in large part by small haddock, comparable in size to silver hake, which are not released by the separator grate. Restriction of area of fishing is the primary measure available to reduce bycatches of small haddock.

The present analysis shows that the distribution of fishing did not change greatly after the 1994 revisions were introduced, only

58% of fishing effort being at 190m or deeper, compared to 53% in the five years prior. Thus, because of further modifications and exemptions, few of the predicted benefits of the revised *SMGL* have been realized.

A number of factors are relevant to ensuring conditions for effective prosecution of the silver hake fishery. The present analysis shows that restricting the fishery to depths of about 190 m or deeper and eliminating the *Extension* has no appreciable effect on silver hake catch rate. Thus, given that the 1994 regulatory changes do not reduce silver hake catch rate, yet reduce bycatch considerably, there appear to be no biological reasons to allow exemptions.

### ***Reference***

Branton, R. 1998. Effects of Scotian Shelf Slope small mesh gear fishery regulations on the bycatch rates of cod, haddock, and pollock in the period 1983-98. DFO Can. Stock Assess. Sec. Res. Doc. 98/138.

### ***For more Information***

Contact: Robert Branton  
Marine Fish Division  
Bedford Institute of  
Oceanography  
1 Challenger Drive, Dartmouth  
Nova Scotia, B2Y 4A2

TEL (902) 426-3537  
FAX (902) 426-1506  
Email: brantonb@mar.dfo-  
mpo.gc.ca

This report is available from the:

Maritimes Regional Advisory Process  
Department of Fisheries and Oceans  
P.O. Box 1006, Stn. B203  
Dartmouth, Nova Scotia  
Canada B2Y 4A2  
Phone number: 902-426-7070  
e-mail address: MyraV@mar.dfo-mpo.gc.ca

*La version française est disponible à l'adresse  
ci-dessus.*



### ***Correct citation for this publication:***

DFO 1998. Bycatches in the Silver Hake fishery on the Scotian Shelf Slope: Evaluation of the Small Mesh Gear Line. DFO Maritimes Regional Fisheries Status Report 98/8E.