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Canadian Science Advisory Secretariat

Research Document 2002/031

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Document de recherche 2002/031

A study of by-catches in herring bait nets in Newfoundland, 2001

Étude des prises accessoires dans les filets de pêche au hareng-appât à Terre-Neuve en 2001

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ISSN 1480-4883

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ABSTRACT

The effect of bycatches of Atlantic salmon (*Salmo salar*) and cod (*Gadus morhua*)in the bait fishery in inshore Newfoundland was investigated. Levels of bycatches in 2001 were examined by analysing the license file for numbers of fishers and location fished, conducting a phone survey to determine how many fishers actively fished, fishing experimentally with bait nets and traditional herring nets, surveying catches in bait nets by Enforcement Staff and studying tag returns of repeat spawners from Campbellton River. Data from DFO Licensing Section indicated that in 2001 there were about 3,600 licenced bait fishers in Newfoundland and Labrador. A phone survey of licensed bait net fishers indicated that about 46% actively fished for herring in 2001 and that bait was obtained principally for the lobster (*Homarus americanus*) fishery followed by crab (*Chionoecetes opilio*) and cod fisheries. Experimental fishing was carried out in three locations and a total of six salmon, one sea trout (*Salvelinus fontinalis*) and one smolt were caught. Numbers of salmon found in pelagic nets during patrols by Enforcement Staff and the numbers of salmon reported during herring index fishery were very low. Overall conclusions, based on the information presented for 2001, were that the legal fishery for herring to use as bait has a low incidence of salmon or cod being caught but that the bycatch of pollock (*Pollachius virens*) could be important. Bycatches can be reduced by controlling the sites fished and eliminating those near salmon runs or with high bycatches of salmonids and groundfish, setting nets at least one fathom deep, and setting nets parallel to shore where possible. The setting of nets parallel to shore may increase the bycatch of pollock and reduce the catch of herring (*Clupea harengus*).

RÉSUMÉ

Nous avons étudié l'impact des prises accessoires de saumons atlantiques (*Salmo salar*) et de morues (*Gadus morhua*) dans la pêche côtière à l'appât à Terre-Neuve. Nous avons examiné les niveaux de prises accessoires de 2001 en effectuant une analyse du dossier des permis pour connaître le nombre de pêcheurs et leurs lieux de pêche, un sondage téléphonique afin de déterminer le nombre de pêcheurs actifs, une pêche expérimentale à l'aide de filets de pêche de poisson-appât et de filets à harengs traditionnels, une surveillance des prises dans les filets de pêche de poisson-appât (réalisée par le personnel chargé de l'application de la loi) et une étude des recaptures de saumons marqués ayant déjà frayés dans la rivière Campbellton. Des données de la Section des permis de Pêches et Océans Canada montrent qu'il y avait en 2001 environ 3 600 pêcheurs de poisson-appât détenteurs d'un permis à Terre-Neuve et au Labrador. Un sondage téléphonique de ces pêcheurs a révélé qu'environ 46 % d'entre eux ont pêché activement le hareng en 2001 et que le hareng-appât a principalement servi à la pêche au homard (*Homarus americanus*), mais aussi à la pêche au crabe des neiges (*Chionoecetes opilio*) et à la morue. Nous avons effectué une pêche expérimentale à trois endroits et nous avons pris au total six saumons, une truite de mer (*Salvelinus fontinalis*) et un saumoneau. Les prises de saumons trouvées dans les filets pélagiques par le personnel chargé de l'application de la loi et les prises de saumons signalées dans la pêche indicatrice du hareng étaient très peu élevées. En nous appuyant sur les données de 2001, nous concluons que la pêche légale du hareng-appât entraîne peu de prises accessoires de saumons ou de morues, mais que les prises accessoires de goberges (*Pollachius virens*) pourraient être importantes. Le nombre de prises accessoires peut être diminué en interdisant la pêche près des parcours de migration du saumon ou aux endroits où les prises accessoires de salmonidés et de poissons de fond sont importantes, et en plaçant les filets à au moins une brasse de profondeur et, si possible, parallèlement à la rive. Les prises accessoires de goberges pourraient augmenter et les prises de harengs (*Clupea harengus*) diminuer dans des filets mouillés parallèlement à la rive.

INTRODUCTION

Many species of fish are currently low in abundance in Atlantic Canada. This is especially so for Atlantic salmon, a species which is currently declining over most of its range in North America (Anon. 2000). As well, Atlantic cod is in low abundance at least in some areas of the Newfoundland Region (Anon. 2001). The causes of these declines have variously been attributed to fishing and climate (Dempson et al. 1998). Fishing gear and, in particular gillnets, while being directed at one species frequently catch other non-targeted species. The catches of these other species, labelled bycatches, frequently go unrecorded particularly when it is illegal to retain them. Bycatches are frequently blamed as the cause of declines of some of these non-target species and such is the case with salmon. Therefore, it is important to examine and quantify the magnitude of bycatches in all fishing gear.

The main focus of this project was to assess the numbers and species caught in pelagic gear fished to catch herring and mackerel (*Scomber scombrus*) for bait. In addition, the potential for reducing bycatches by setting gear parallel to shore compared to perpendicular was examined.

METHODS

The approaches used to examine the level of bycatches in nets set for bait were several fold. We examined the licensing data to learn about the amount of gear being fished and it's distribution. The relative magnitude of bycatches was investigated through records of Fisheries and Oceans made by Enforcement Staff, a phone survey of bait net fishermen, experimental fishing by nets set for bait and in other experimental gear. Effect of bait nets on a single salmon stock were derived from the results of tagging experiments carried out on repeat spawning salmon at Campbellton River.

Licence Data

The Fisheries and Oceans (DFO) Licensing Section is responsible for issuing licenses to fishers for all species fished. The Licensing Section provided information current to 27 April, 2001 on fishers name and home port, fishing area, and NAFO Division.

Telephone Survey of Bait Net Fishers

A telephone survey was conducted using the data received from the Licensing Section to contact fishers for more detailed information on their fishing activities. In total, 1,211 bait net fishers out of 3,538 licensed were contacted and asked the following questions:

1. Did you actively fish bait nets in 2001?
2. What community did you fish from?
3. What type of bait net was fished, i.e. herring, flounder or both?
4. Number of nets actively fished?

5. Fathoms of net actively fished?
6. Date when fishing began and ended in 2001?
7. What fishery was the bait used for?
8. Species and numbers of fish caught other than herring?

Herring Index Fishery

In 2001, Herring Index Fishers were asked to record the catch of all species in the herring index fishery nets. The intent of the herring index fishery is to collect information essential to the herring stock assessment program and as such utilises standard herring gill nets fished at standard locations and dates (Wheeler et al. 1999). At each site, there was about 164 m of net fished divided equally into nets of mesh sizes 51 mm, 57 mm, 64 mm, 70 mm, and 76 mm.

Surveys by Enforcement Staff

Fisheries and Oceans Enforcement Staff were requested to record the number of pelagic gill nets that were checked during their marine patrols. Also date, location and numbers and species of fish in the net when hauled were recorded.

Experimental Fishing

In order to provide an independent source of information on species potentially retained in gill nets set for bait, four sites were selected to conduct experimental fishing. The nets were checked daily and catch removed and recorded. Fisheries and Oceans Staff were present at all times when the nets were checked and Fisheries and Oceans staff recorded species and numbers of fish caught. The four sites were at Charlottetown and Glovertown both in Bonavista Bay, Burgeo on the South Coast, and in St. Mary's Bay (Fig. 1). The site in St. Mary's Bay was dropped as the bait fishery there had closed. Fishers were hired to set and haul their own gear in locations where bait nets had previously been set. Resource Management chose the general locations and specific fishers were hired on the basis of recommendations made by the Fishery Officer in the area.

Charlottetown: Charlottetown is located in Clode Sound along the east side of Bonavista Bay. Three salmon rivers run into this sound: Northwest River, Southwest River and Salmon River. Salmon returning to any of these rivers would pass by the Charlottetown area and the experimental bait nets set there. The nets in this area are set close to the community and are all within visual range of the community. The nets were set parallel and perpendicular to shore but in a manner to reflect the bait fishery norm in the area.

Glovertown: is located in Bonavista Bay at the mouth of the Terra Nova River, a major salmon river. The nets were set parallel and perpendicular to shore but in a manner to

reflect the bait fishery norm in the area. The nets in this site are approximately 12 km (6 miles) from Glovertown, just outside the caution signs for the Terra Nova River.

Burgeo: is located on the south coast of Newfoundland with several salmon rivers in its immediate vicinity. The bait fishery in this area is the most active of the three areas studied as there is a hook and line cod fishery there requiring bait. The cod fishery is based on an individual quota system and as such it continues on for a longer period of the year than in other areas and bait is required longer and later in the season than in the other study areas. The nets were set parallel and perpendicular to shore but in a manner to reflect the bait fishery norm in the area.

Effects on salmon stock in Campbellton River

In order to demonstrate the effect of bait nets on a salmon stock, Floy tagging data from repeat spawners previously published for Campbellton River was utilized. Number of tags recovered were expressed as a percent of the total and per 1000 returns to the counting fence at Campbellton River. Details on the Floy tagging study are given in Downton et al. (2001).

RESULTS

Licence data

There were 3,538 bait net licenses issued by Fisheries and Oceans as of 27 April, 2001 (Table 1). They are distributed around the island of Newfoundland and along the coast of southern Labrador (Fig. 2). The highest concentration of bait net licences in Newfoundland is in Fishing Area 4 with 20.8% of the total number of licences and the lowest is in Fishing Area 12 with 1.5%. There were no licenses issued for Fishing Area 1 in northern Labrador. Each licencee is permitted to fish two nets of maximum length of 40 fathoms and maximum mesh size of 67 mm. In order to receive a licence to fish for bait they must have a valid fishing licence for a species requiring bait, i.e. lobster. Nets must be set one fathom below the surface of the water and in Fishing Areas 12-14 in western Newfoundland all nets must be set parallel to the shore.

Telephone survey of bait net fishers

In total, 1,211 or about 34% of 2001 bait net licencees were contacted by phone and, of these, 557 fished for herring for bait in 2001. The other licencees either did not fish or fished exclusively for winter flounder (*Pseudopleuronectes americanus*) to use as bait. It is important to differentiate between those fishers setting nets for herring as bait from those setting nets for winter flounder. This is because bait nets for flounder are set on the bottom and as such would have minimal bycatch of salmonids. Most active fishers were fishing for herring and mackerel and also for flounder with only a few fishing solely for flounder.

In total, about 46% of the bait net fishers contacted actively fished for bait in 2001 which would mean that of the 3,538 bait net fishers about 1,600 were actively fishing herring for bait in 2001. The fishers indicated that the herring caught were mainly used to fish for lobsters (97%); whereas the secondary usage was crab (76%) and/or cod (8%). The licensees indicated that on average they fished 36 fathoms of gear but that the gear was not in the water fishing for the entire period of time permitted under the conditions of licence. Fishers reported fishing an average of 61 days (8.7 weeks) in 2001. Sites where bait nets were fished were generally near to the home community of the licensee.

The bait fishers reported the following bycatches and numbers in 2001:

Species	**Number**	**Percent**
Sculpins	2309	28.9
Lumpfish	2046	25.6
Cod	1889	23.7
Cunners	544	6.8
Pollock	280	3.5
Tomcod	241	3.0
Rock cod	192	2.4
Crab	136	1.7
Seabirds	136	1.7
Seals	105	1.3
Skate	29	0.4
Salmon	25	0.3
Trout	11	0.1
Others	43	0.5
Total	**7986**	**100.0**

The bycatches of cod were the third highest reported at 23.7% while salmon and trout were low at 0.3% and 0.1%, respectively. The bycatch of salmonids was 36, which is 0.0074 salmonids per fisher per week fished. If this is an accurate reflection of the actual rate then the approximately 1600 herring bait fishers would have caught about 100 salmonids in 2001.

Also of importance is the time and duration that bait nets were fishing. Since bait nets are set to provide bait for specific fisheries, nets can only be set out when that fishery is open and there is a requirement for bait. Under the conditions of licence, bait nets could be fishing for 41 weeks depending on the specific licence. On average, fishers set nets for bait for only 8.7 weeks usually in the period of April to June. Exceptions to this occurred along the south coast where bait nets were set in July-August for the cod fishery and in the late fall and winter. An examination of the date of removal for bait nets revealed that about 80% of nets were removed from the water by the 1st week of July (Fig. 3). Since

substantial salmon runs occur in the July-August period and as most bait nets were out of the water in 2001 at this time, potential bycatch is obviously minimized during this time.

Herring Index Fishery

In total, there were 23 Herring Index Fishers in 2001. They are distributed from White Bay in Fishing Area 3 to Fortune Bay in Fishing Area 11 (Table 2, Fig. 1). There were none in Fishing Areas 12 – 14 on the West Coast. Fishing dates ranged from 31 March to 20 July for a total of 777 fishing days. The gear is different than bait nets in that the herring index nets are constructed much deeper than typical bait nets. Also, the mesh sizes fished ranged from 51 to 76 mm while bait nets are restricted to mesh sizes less than 67 mm. These differences in the type of gear should lead to greater catch efficiency for the index fishery nets compared to bait nets, i.e. the catch of salmon would be potentially higher in the index nets. In total, there were eight salmonids caught and reported by the 23 fishers in 2001. The eight salmon were repeat spawners and were caught in Notre Dame Bay by the same fisher. There were no other salmonids reported. There were 0.07 salmon caught by index fishers for each week fished.

Surveys by Enforcement Staff

During patrols of coastal waters by Fisheries and Oceans Enforcement Staff, there were 889 pelagic gillnets checked for violations during May to October. In total, there were 20 salmon found during coastal patrols.

Experimental Fishing

Experimental fishing was conducted at three sites (Charlottetown, Glovertown, and Burgeo) during June to August, 2001 (Table 3, Fig. 1). The most common species caught during the experimental fishing were herring and mackerel supporting the contention that the nets were set in potential bait net berths (Fig. 4). In total, there were eight salmonids caught at the three sites during the experimental fishing. The eight fish consisted of six salmon, one salmon postsmolt, and one sea brook trout. There were no salmonids caught at Charlottetown while six salmonids were caught at Glovertown and two at Burgeo. The eight salmonids were caught over a total of about 7 weeks of fishing for a rate of 1.2 salmonids per week. Of the eight salmonids caught only one was caught in the nets set parallel to shore and seven were caught in the perpendicular set nets (Fig. 4). While low overall these results would tend to support the benefits of reducing salmonid bycatch by setting all bait nets parallel to shore, wherever possible. Also of note is that the fishers involved in the study reported that bycatches of salmon in herring gear were rare in their areas, in spite of their proximity to major salmon rivers.

There were also several other species caught in the experimental nets besides salmonids, mackerel and herring (Table 3). Pollock were the most abundant of the other species

caught but only were present in experimental bait nets fished near Burgeo. Most species were lower in number in the perpendicular set gear compared to parallel. However, herring, which were the target species, were about 50% lower in number in the parallel set nets than in the nets set perpendicular to shore. Mackerel were slightly less frequently caught in perpendicular compared to parallel to shore set gear while pollock were 178% more commonly caught in the parallel set gear. Cod, while low overall in total numbers in the experimental nets, were about 50% lower in the gear set parallel to shore. While there are some benefits for salmonids in setting gear parallel to shore there clearly will be fewer herring caught and on the south coast more pollock.

Effects on salmon stock in Campbellton River

In total, out of 4,400 repeat spawners tagged with Floy tags, there have been 49 returned from bait fishers (Downton et al. 2001). In terms of returns to Campbellton River, for every 1000 salmon returning 35 additional salmon would have been taken by bait nets based on the tagging study. Also, the tag returns from bait nets have a very high annual variability ranging from 1 to 18 per year. In terms of 1000 salmon to Campbellton, bait net captures ranged from a low of 4 per 1000 in 1994 to a high of 132 in 2001. No consideration has been given for non-reporting of tags, which would increase the actual effect on the salmon stock in Campbellton River. The overall effect of the captures of Campbellton River salmon in bait nets can be determined by the increase in spawners if those fish had spawned and assuming that the repeat spawners have the same distribution and capture rate as first time returning grilse. Repeat spawners tend to be found inshore for longer periods of time than do the grilse and as such should have a higher rate of capture. Over the period of 1994-2000, the percent of conservation requirements achieved for Campbellton River would have increased by 6% had the salmon caught in bait nets returned to the river and spawned. This calculation assumes no non-reporting of tags and that grilse and repeat spawners behaved the same in terms of the duration of time spent near bait nets.

DISCUSSION

When all information related to salmonid bycatches in herring bait nets is considered including the overall low numbers of salmonids caught in bait nets during experimental fishing, observations by DFO Enforcement Staff during marine patrols, and reports from licenced bait net fishers suggests that the effect of the fishery on salmonids returning to rivers is low overall; at least in the year 2001. However, this does not preclude there being areas with localized bycatch problems and does not suggest that it will be low in all years. In fact, the information collected is relevant only to the 2001 season. Information from tagging of repeat spawners at Campbellton River indicated that the number of salmon caught in bait nets varied considerably from year to year but on average the effect on numbers of salmon returning to Campbellton River is low. Also, the diligence of DFO staff in keeping bait nets away from areas with high salmon abundance, setting bait nets one fathom deep in the water column, and on the West Coast setting bait nets parallel to

shore should help in keeping salmonid bycatch low. Furthermore, as a disincentive, any fisher with lucrative fishing licences such as lobster or crab could potentially lose the right to fish by abusing their fishing privileges by purposely trying to catch salmon under the guise of fishing for bait. The bycatch of cod was also low overall. Other than the target species of herring and mackerel, pollock occurred in the highest numbers but only in experimental fishing near Burgeo. Pollock were also more numerous in nets set parallel to shore rather than perpendicular. The high bycatch of pollock is probably due to the fact that different from cod and other groundfish, pollock spends much of its time moving through the water column rather than on the bottom (Scott and Scott 1988).

Reddin (1978) from a survey of DFO Enforcement Staff provided estimates of bycatch in various types of non-salmon gear including herring bait nets. It was estimated that 29% of salmon landings in 1976 on the Island of Newfoundland occurred as a bycatch in non-salmon gear. Overall, it was estimated that bait nets took 64% of the total bycatch. Also, Reddin (1978) indicated from catches in salmon research gear that 95% of the salmon caught were in the upper 2 m of net. It was from this study that the requirement arose to set the headropes of herring bait nets at least one fathom deep in the water. Also at that time Enforcement Staff were directed to ensure that nets were not set in areas with potentially high numbers of salmon. It is presumably these changes and perhaps annual variability that has reduced the problem of salmonid bycatches in bait net gear.

Dempson et al. (1999) reported numbers of salmon observed at counting facilities with marks, some of which occurred due to encounters with fishing gear. The percentages of salmon so marked, varied from site to site as well as annually, but generally were less than 20%. Are the numbers of marked salmon consistent with a low overall removal or mortality due to bait net gear? There are several different types of fishing gear in the water, both legal and illegal, that can potentially mark salmon including salmon gear set by poachers both in freshwater and in the sea. Also, predators can be responsible for some of these marks. In addition, for salmon returning to rivers along the south coast of the island of Newfoundland there is a legal, albeit small, commercial and recreational net fishery in St. Pierre-Miquelon area that can mark salmon. Because the numbers of salmon involved cannot be quantified it is impossible to judge if overall numbers of marked salmon are consistent with low levels of bycatch in bait nets.

Fishing for bait is an important aspect of fishing activities due to high cost of bait and the increased need for bait with the development of the inshore crab fishery. The lower quotas of groundfish available for harvest in many areas in the last few years also means the profitability of fishing enterprises has decreased dramatically making the need for inexpensive bait more important. In spite of the requirement for bait, it is essential to examine the level of bycatches of all species in each directed fishery as levels of mortality are becoming critical for some species. This is especially so for cod and salmon that have experienced significant declines in abundance in recent years. For salmon, the return rates to counting facilities in some areas are lower than when there was a commercial salmon fishery.

Overall conclusion is that the bait fishery where gear is legitimately set for herring is having little effect on salmon returns; at least from information on the 2001 fishery. Also, the bycatch of cod in bait nets appears to be minimal. However, bycatch of pollock along the south coast was high. It is recommended that bait nets continue to be set at least one fathom deep in the water. The requirement on the west coast of Newfoundland to set nets parallel to shore rather than perpendicular should be expanded to other areas of the province where and when practical to do so. However, Resource Managers should be aware that in some areas of the south coast setting nets parallel to shore will increase the bycatch of pollock and for all areas will decrease the catch of herring. Also, there could be some sites where bycatches of salmonids are of concern and DFO Enforcement Staff should continue efforts to ensure that bait nets are kept away from areas of potentially high salmon abundance. Since the need for bait is reduced by mid-June in most areas of the island of Newfoundland, requiring the removal of bait nets while salmon are running along the coast would appear to be potentially a very effective method for reducing salmonid bycatch further and should be considered.

ACKNOWLEDGEMENTS

The assistance of fishers Dennis Chaulk Sr., Dennis Chaulk Jr., Frank Oram, and Jim Dominey is gratefully acknowledged. DFO Enforcement and Resource Management staff who were involved at several stages of planning and execution of this project were essential to its success.

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Table 1. Extant bait net licences issued by Licencing Section, DFO, St. John's, Newfoundland as of 27 April, 2001.

Fishing Area	**Number**	**Percent**
1	0	0
2	102	2.9
3	156	4.4
4	734	20.8
5	302	8.5
6	242	6.8
7	250	7.1
8	141	4.0
9	53	1.5
10	368	10.4
11	331	9.4
12	54	1.5
13	310	8.8
14	495	14.0
Total	3538	100.0

Table 2. List of herring index fishers and activities including bycatch of salmonids in 2001.

Number	Fishing Area	Area	Date Start	Date End	Days Fished	Net type	Headrope Depth (m)	Bottom Depth (m)	Gear Amount (m)	Salmon Caught
1	11	Harbour Breton, South Coast	30-Apr	1-Jun	33	Deep	2	37	152	0
2	6	Thornlea, Trinity Bay	20-Apr	13-Jun	51	Deep	2	15	152	0
3	10	Swift Current, Placentia Bay	2-Apr	1-May	30	Deep	2	18	152	0
4	10	Red Hr. Placentia Bay	14-May	8-Jun	26	Deep	1	13	152	0
5	6	Heart's Content, Trinity Bay	7-May	8-Jun	33	Deep	0.5	22	152	0
6	5	Tickle Cove, Bonavista Bay	6-May	6-Jun	26	Deep	1	18	15	0
7	4	Jacksons Cove, Notre Dame Bay	11-Jun	11-Jul	31	Deep	2	37	152	0
8	4	Leading Tickles, Notre Dame Bay	2-Jun	2-Jul	31	Deep	1-2	25	152	0
9	5	Charlottetown, Bonavista Bay	1-Jun	30-Jun	30	Deep	2	25	152	0
10	10	Long Hr., Placentia Bay	6-Apr	5-May	30	Deep	4	27	152	0
11	6	New Bonaventure, Trinity Bay	14-May	20-Jul	49	Deep	2	20	152	0
12	5	Wareham/ Fair Is., Bonavista Bay	21-May	19-Jun	30	Deep	1	19	152	0
13	5	Salvage, Bonavista Bay	18-May	1-Jul	45	Deep	1	20	-	0
14	3	Sop's Arm, White Bay	24-Jun	20-Jul	27	Deep	2	21	152	0
15	3	Westport, White Bay	8-Jun	9-Jul	32	Deep	1	22	152	0
16	3	Ming's Bight, Baie Vert Peninsula	28-May	27-Jun	31	Deep	2	18	152	0
17	11	Belloram, Fortune Bay	21-Apr	15-May	25	Deep	4	128	152	0
18	9	Mall Bay, St. Marys Bay	20-Apr	25-May	44	Deep	1	17	152	0
19	9	O'Donnells, St. Marys Bay	5-May	14-Jun	41	Deep	2	22	152	0
20	6	Hickman's Hr., Trinity Bay	12-May	15-Jun	30	Deep	4	37	152	0
21	4	Herring Neck, Notre Dame Bay	7-May	18-Jun	43	Deep	2	22	152	0
22	4	Point au Bay, Notre Dame Bay	7-May	2-Jun	27	Deep	1	11	152	8
23	11	Harbour Mille, Fortune Bay	31-Mar	1-May	32	Deep	4	32	152	0

Table 3. Summary of results from experimental fishing in Newfoundland, 2001.

Area	Fishing dates	No. of nets	Orientation	Catch															
				Salmon	Smolt	Trout	Herring	Mackerel	Pollock	Cod	Tom cod	Rock cod	Flatfish	Crab	Lump	Cunner	Sculpin	Starfish	Catfish
Charlottetown	June 11 - June 23	2	Parallel	0	0	0	94	0	0	9	2	3	0	3	1	1	3	0	1
		3	Perpendicular	0	0	0	1132	0	0	15	0	54	10	14	4	14	1	3	0
Glovertown	June 13 - June 23	2	Parallel	0	0	0	42	0	0	0	0	0	0	0	0	0	0	0	0
		2	Perpendicular	4	1	1	63	0	0	6	0	10	0	0	0	0	0	0	0
Burgeo	June 27 - July 3	2	Parallel	1	0	0	236	241	221	0	0	0	0	0	0	0	0	0	0
		2	Perpendicular	1	0	0	230	25	158	2	0	0	0	0	0	0	0	0	0
Burgeo	July 4 - 10	1	Parallel	0	0	0	195	54	0	0	0	0	0	0	0	0	0	0	0
		2	Perpendicular	0	0	0	256	190	3	0	0	0	0	0	0	0	0	0	0
Burgeo	August 6 - 12	2	Parallel	0	0	0	576	56	65	0	0	0	0	0	0	0	2	0	0
		2	Perpendicular	0	0	0	515	119	0	0	0	0	0	0	0	0	0	0	0
Burgeo total	All dates	5	Parallel	1	0	0	1007	351	286	0	0	0	0	0	0	0	2	0	0
		6	Perpendicular	1	0	0	1001	334	161	2	0	0	0	0	0	0	0	0	0
All sites	All dates		Parallel	1	0	0	1143	351	286	9	2	3	0	3	1	1	5	0	1
			Perpendicular	5	1	1	2196	334	161	23	0	64	10	14	4	14	1	3	0
Totals				6	1	1	3339	685	447	32	2	67	10	17	5	15	6	3	1

Figure 1. Map of Labrador and Newfoundland showing Fishing Areas (boxes and dashed lines), sites for Herring Index Fishery (numbers), and 3 experimental fishing sites.

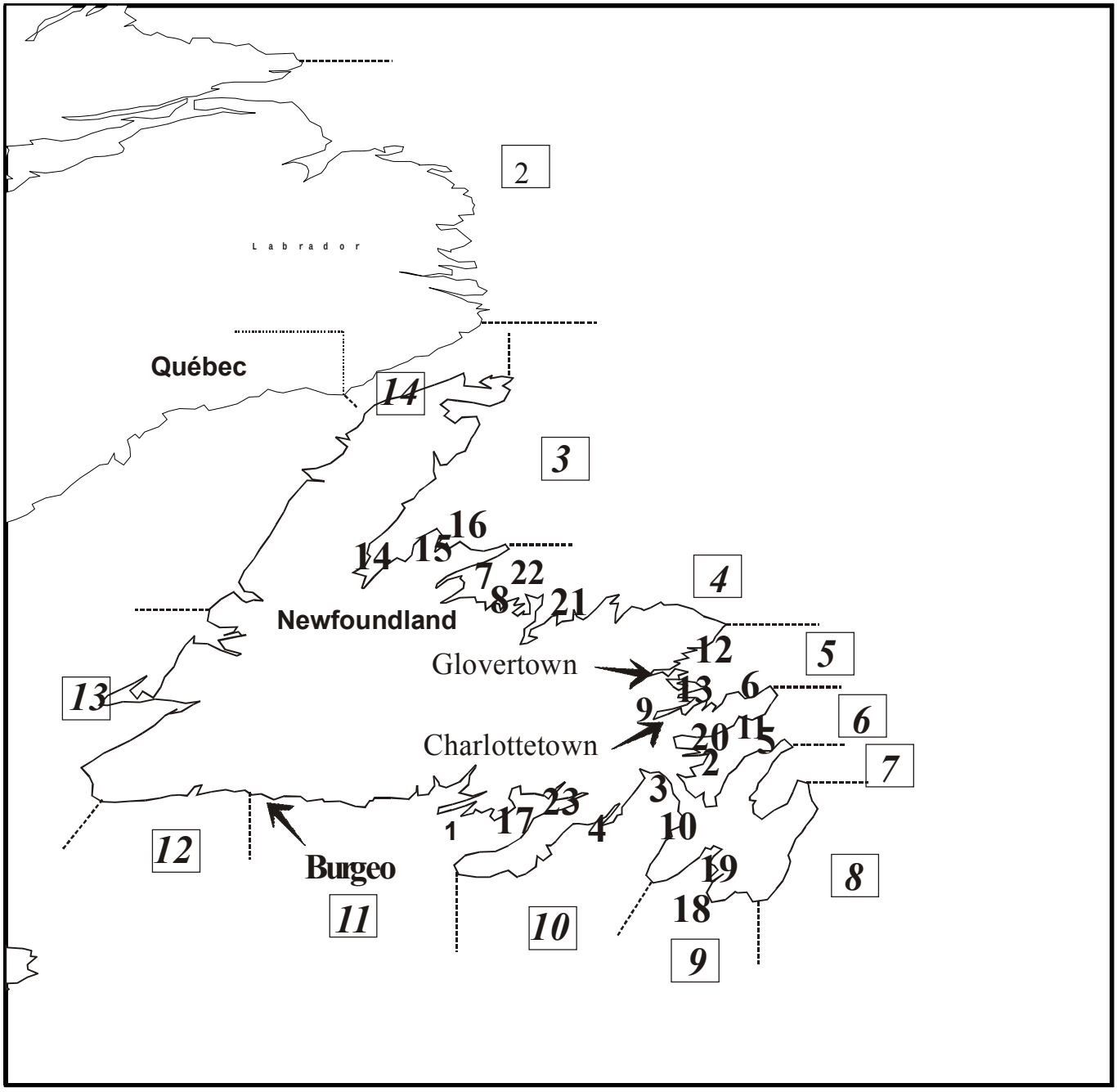

Figure 2. Numbers of bait net licences issued for each Fishing Area in Newfoundland and Labrador.

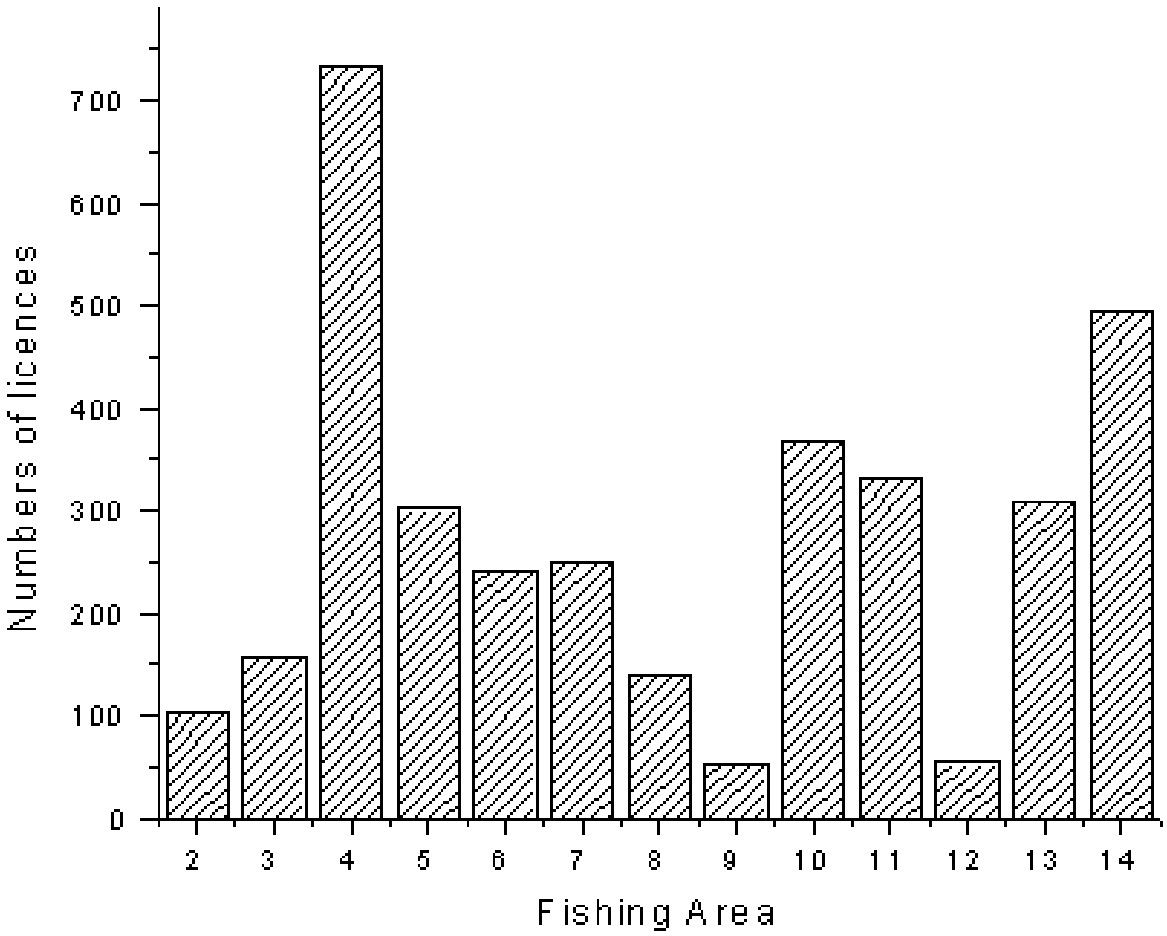

Figure 3. Counts and cumulative counts of date of setting out (left) and removal (right) of bait nets in Newfoundland, 2001.

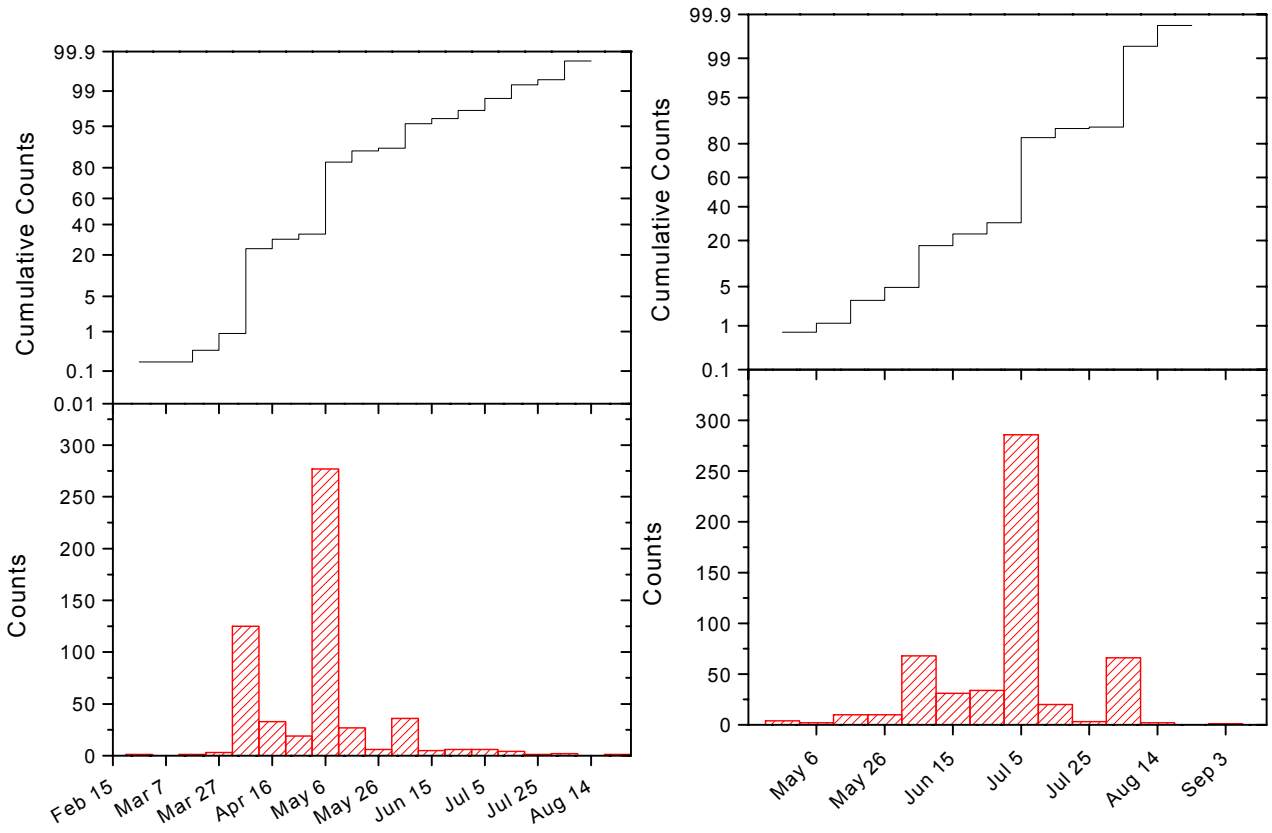

Figure 4. Catch of various species of fish in parallel compared to perpendicular gillnets set for bait nets.