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Sentinel Surveys 1995-2002: Catch per Unit Effort in NAFO Subdivision 3Ps.

Pêches Sentinelles 1995-2002 : prises par unité d'effort dans la sous-division 3Ps de l'OPANO.

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ABSTRACT

Sentinel enterprises collected catch rate and biological information on inshore cod resources in 3Ps for 1995-2002. Data were presented on weekly catch rates and annual relative length frequencies (number at length divided by amount of gear) by year and gear type. Gillnet catch rates in 2002 remained low compared to 1996-1998 catch rates. Linetrawl showed some improvement in catch rate so far in 2002 although catches were composed of smaller fish.

RÉSUMÉ

Des entreprises de pêche sentinelle ont recueilli des données biologiques et des données de taux de capture sur la morue côtière de 3Ps durant la période 1995-2002. Elles ont présenté des taux de capture hebdomadaires et des fréquences de longueurs relatives annuelles (nombre par longueur divisé par la quantité d'engins) par année et par type d'engin. En 2002, les taux de capture au filet maillant sont demeurés faibles par rapport aux taux pour la période 1996-1998. Les taux de capture à la ligne traînante se sont améliorés quelque peu en 2002, mais les prises étaient constituées de poissons plus petits.

INTRODUCTION

Sentinel survey projects were formally announced by the Minister of Fisheries and Oceans in October 1994. The surveys in the DFO Newfoundland Region are an extension of the index fishermen's project from the Northern Cod Science Project with modifications to allow for science activities achievable only under a fishing moratorium. Sentinel data collection has continued during the index fishery of 1998 and commercial fisheries in 1999-2002.

The sentinel survey has the following objectives:

1. To develop a catch rate series for use in resource assessments.
2. To incorporate the knowledge of inshore fishers in to the resource assessment process.
3. To describe the temporal-spatial distribution of cod in the inshore area over a number of years through, for example, the use of catch rate information, tagging studies, by-catch information and fishers' observations.
4. To gather length frequencies, sex and maturity data and sample ages for use in resource assessment.
5. To establish a long-term physical oceanographic and environmental monitoring program of the inshore areas.
6. To provide a source of biological material for other researchers. For example, tissue for genetic, physiological and toxicological analyses, cod stomachs for food and feeding studies and by-catch information.

Participants

The primary collectors of data in the sentinel survey are inshore fishers. Through consultation with inshore fishers and fisheries organizations, traditional inshore fishing grounds have been identified and mapped, resulting in 16 locations in NAFO Subdivision 3Ps.

Fishers from communities within the boundaries of the identified coastal areas and who met eligibility criteria were invited to apply to participate in the survey. Where more than one application was received from an area, the project partner conducted a draw or lottery to select the participant. While there was considerable interest in the project in most areas, there were many sites from which only one application was received and others where additional canvassing was required to enlist participants. Selected participants were required to complete a six-week course designed by the Marine Institute of Memorial University in consultation with DFO. Topics covered included scientific sampling methods and equipment, computer use, resource assessment basics and presentation skills.

In order to minimize inter-annual enterprise effects on data collection, participants are expected to remain with the survey over a number of years. It is also expected that most of the sampling activities will continue once commercial fishing operations resume and the sentinel participants will form a core of index fishers.

Sites

Sampling was conducted at 16 sites in NAFO subdivision 3Ps. The specific location of each site was chosen after consultation between DFO scientists, fishermen and the Fish, Food and Allied Workers Union (FFAW). Site selection was based on the need to survey throughout inshore areas

and targeted historical fishing areas and historical gear use patterns. In 2001 a site in Grand Bank was added and for 2002 a site in Fair Haven was added to replace a retirement in Little Harbour East.

Sampling Strategy

In 1995, sampling was conducted over fifteen weeks. Since then, each site is allocated a minimum number of weeks (12 weeks from 1996-1998, 6 in 1999, 8 in 2000, and 10 in 2001 and 2002) and additional time is allocated based on fish sale revenue. The timing of sampling was determined after discussions with fishers but was targeted for seasonally appropriate times based on historical fishing patterns. There was minimal disruption of these time frames in 1999 through 2002 due to the opening of the commercial fishery.

There were no traps involved in Sentinel sampling in 3Ps in 1999 or 2002, two traps were used in 2000 and three in 2001. Participants used either baited trawl lines or gillnets for the remaining weeks of the survey. Non-trap sites fished either baited trawls or gillnets for the full survey. While traps are in the water continuously, they were hauled three days per week. Hook and line and gillnet crews fished up to three days per week. Fishing days in the week were selected at the discretion of the crew and depend primarily on weather conditions.

When a cod trap was hauled, the crew estimated how much fish by weight had been caught, removed a random sample for biological sampling and released the remaining catch. Meshed and/or dead, floating fish were retained and brought ashore. Fishers were instructed to release as much live fish as possible.

Hook and line crews fished two tubs of baited linetrawl. Each tub consisted of approximately 500 hooks for a total of 1000 hooks per fishing day. Gillnet crews fished a maximum of six fifty fathom 5 ½ inch monofilament gillnets. Nets were rigged 2-3 to a fleet and up to three fleets were fished per fishing day. Selected sites fished one 3¼ inch monofilament gillnet tied to one 5 ½" gillnet one day per week. All fish caught in gillnets and on hooks were landed and measured. If catches exceeded 500 kg per week, the numbers of nets in a fleet were cut back. However, some consideration was given to bottom topography and net performance when reducing the number of nets in a fleet. Similarly, the number of hooks per tub was reduced if landings exceeded 500 kg per week. Other measures were considered if fish are particularly abundant in an area and catches appear to be excessive even with the minimal amounts of gear possible.

Prior to the start of sampling in 1995, a fixed (control) location on the fishing grounds was established for each site and will remain fixed for the duration of the project. Each fishing day, up to half of the gear was set at the control site. When competition with commercial fishers prevented setting at the control site, gear was set as close to the control grounds as possible. The remainder of the gear (experimental) was set at one or two other locations on the fishing grounds at the discretion of the crew. The location of each fishing set was plotted on a nautical chart. The time of the set and the soak time for the gear were recorded. Other environmental observations were recorded, including wind direction and speed, percent cloud cover, tide conditions, presence of invertebrates (bait) and other fish species in the area, marine mammals, sea birds and any other variables which might have influenced fishing behavior. Selected sites were equipped with a CTD

(measuring temperature and salinity at depth). At these locations, casts were conducted in the vicinity of fishing sets each fishing day. CTD locations were fished for subsequent years if possible.

When the gear was retrieved, catches from the control and experimental gear were kept separate and sampled on shore. All fish from gillnet, handline and linetrawl, and a sample of the catch from traps, were measured for length and sex. Otoliths were sampled on a length-stratified basis and stored in manila envelopes with relevant information recorded on the outside. Every other week, selected sites collected a sample of up to 100 frozen fish. These were transported to St. John's for detailed biological sampling. All information was recorded on forms similar to those used by the Port Sampling Section and on DFO Research Vessels.

Other biological samples were collected as needed.

Data Presentation

The data are summarized for all of 3Ps and presented by gear type. Summaries for each enterprise follow, in general, organized from east to west. This paper presents data for gillnet (5 ½" and 3 ¼" mesh) and linetrawl. The relative length frequency plot depicts the number of fish at length scaled by total amount of gear fished so that changes in length frequency distribution may be compared across years. Lengths, in 1cm intervals, are from both control and experimental gear, and for gillnet and linetrawl represent every fish measured, as the total catch is measured. Length frequency summaries for NAFO division are shown as an average of the relative length frequencies for each fisher in the division. The second figure on each summary sheet gives catch details broken down by year, including total number of sets (Nhauls), number of sets in which no fish were caught (Nzero), and number of fish caught (Nmeas). The CPUE figures show control and experimental catches combined, in number of fish per net or per 1000 hooks by week and are constructed by calculating a daily catch rate for each set and averaging all the CPUEs for all sets in a given week.

RESULTS

Data summarizing Sentinel survey activity in 3Ps for 1995 through 2002 are presented in figures 1-100. Sixteen inshore fishing enterprises representing communities from St. Bride's to Burgeo participated in the 3Ps Sentinel Survey for 2001 and 2002. In 2001 a total of 497 sets of 5 ½" gillnet and 62 sets of 3 ¼" gillnet resulted in total measurements of 7351 fish. Three hundred and seventy-six sets of linetrawl resulted in 18274 measurements for 2001. Data collection is ongoing in 2002.

Figures 1 and 2 show all set locations (excluding zero catch) and catch per unit effort in scaled symbols that were surveyed in 1996 and those surveyed in 2001. Figure 1 was included as a comparison to the most recent completed year. Linetrawl and gillnet are shown separately. Control sites were generally consistent from year to year but shifts in location may have resulted due to weather or tide conditions or competition for sites by commercial activity.

Figures 3 and 4 show the overall average CPUE (catch per unit of effort) for all of 3Ps and by community for 5 ½" gillnet and linetrawl. Gillnet CPUE is considerably lower in recent years in all communities. Linetrawl also declined from 1996-2000 but in 2001 and 2002 overall mean CPUE

has increased. This increase is due largely good catches of small fish in Burgeo and Ramea and some special sets on Burgeo Bank. As well, in 2002, the participant in Burgeo could not fish the required weeks in the first quarter due to mechanical failure. These weeks fished in previous years had lower catch rates and moderated the yearly mean CPUE.

Figures 5 and 6 give average length frequencies scaled by amount of activity. Gillnet catches in 3Ps, compared to other NAFO areas (Fig. 5), were highest from 1995-1997. Since then, 3L has had higher mean catch rates. All areas have shown lower catch rates since 1998. For linetrawl (Fig. 6) catches declined in 3Ps from 1995-1998, but an increase in seen 2002.

Figure 7 shows mean relative length frequencies from 1995-2002 for the three main gears used for Sentinel. Five and a half inch gillnet catches declined steadily from 1995-2002. Three and a quarter inch gillnet also declined during this time with changes in which mode of fish size was dominant in various years. The mode of larger fish (second peak in the frequency) was highest in 1996 and much less prominent from 2000-2002.

The summary data for 3Ps gillnet, in Figures 8-46, give an indication of catch rate change since inception of the Sentinel Survey in 1995. Gillnets show the narrowest range of selectivity of Sentinel Survey gears, targeting fish in the 50cm to 80cm range. In general, catch rates from 5 ½" gillnets were lowest in 2001 and 2002, considerably lower than the best catch rates seen in 1996. Most sites showed lower or similar catch rates than those of 2001. Only one site showed higher catch rates than 2001; Seal Cove had higher catch rates based on 3 sets in 2002.

Small mesh gillnets (3 ¼") were used in 3Ps since 1995 in order to get information on smaller size ranges of fish. Figures 47-70 summarize the results. One 3 ¼" gillnet (35 fathoms) was fished in combination with one 5 ½" Gillnet (50 fathoms) primarily on experimental sites. A strong bimodal peak in length frequency distribution results from this mesh size as the gear selects two size ranges of fish. The first and strongest peak, in most cases, is between 35cm and 47cm. Fish in this size range are meshed while the larger fish (52cm to 65cm) are caught by the lips and generally entangle as they twist around.

Overall mean catch rates in the small mesh gear were lower in 2002 than those seen in 1996 through 2001.

Figures 71-100 summarize the data from the linetrawl portion of the 3Ps Sentinel Survey. Linetrawl shows a much wider selectivity curve than gillnet and catches mainly fish between 29cm and 83cm.

Linetrawl catch per unit effort declined consistently from 1995 through 2000. For 2001 and 2002, catches appear higher and composed mainly of smaller fish. The increases seen in 2002 linetrawl data are due to high catches in experimental sets on the Burgeo Bank which were not surveyed to the same extent in previous years, and also due to the absence of first quarter sets in Burgeo which might have moderated the mean catches as in previous years.

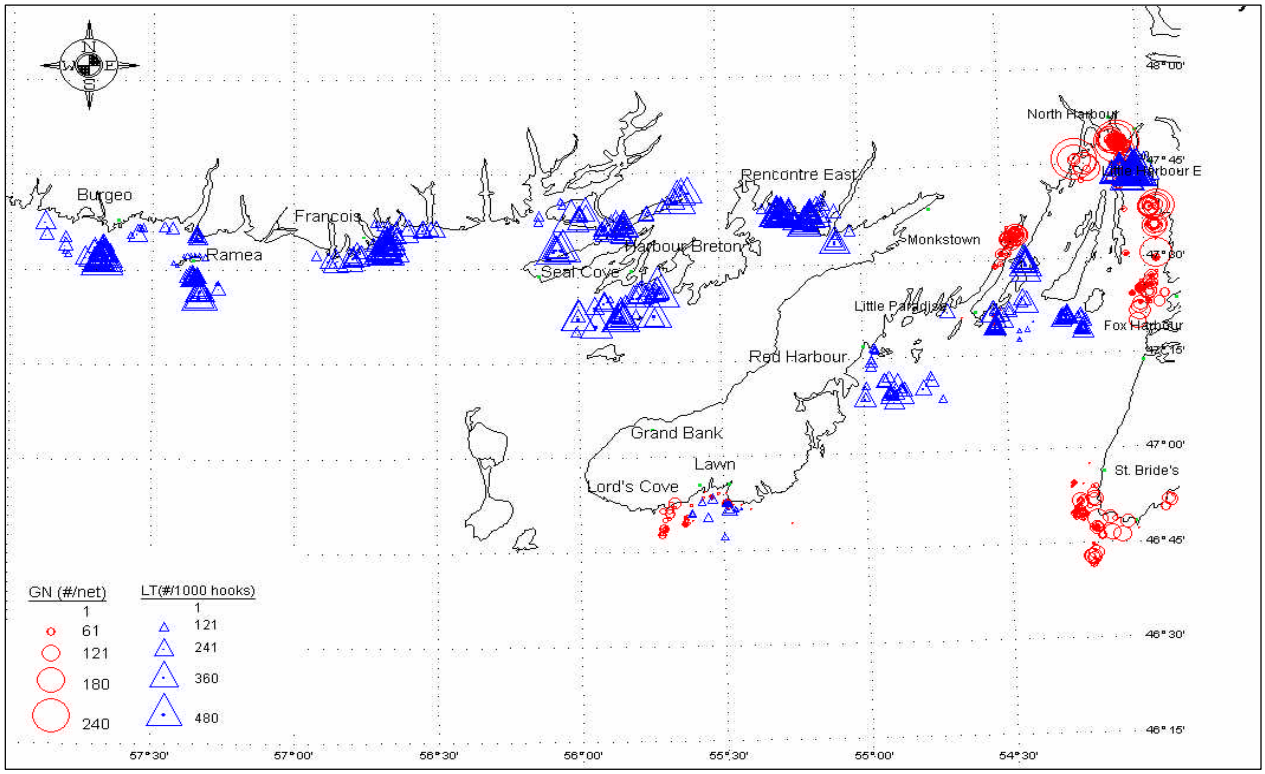


Figure 1. 1996 Catch per unit effort (numbers of fish per net or 1000 hooks)
5 1/2" gillnet and linetrawl in NAFO subdivision 3Ps.

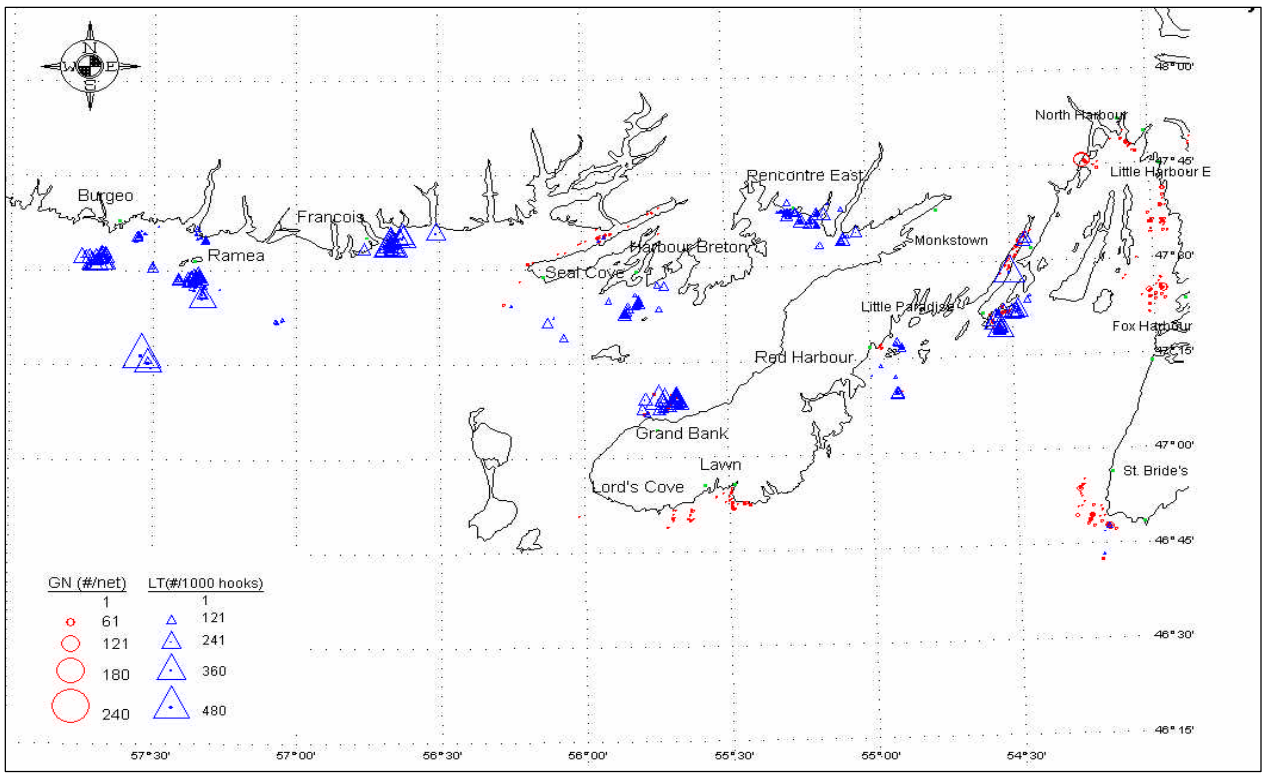
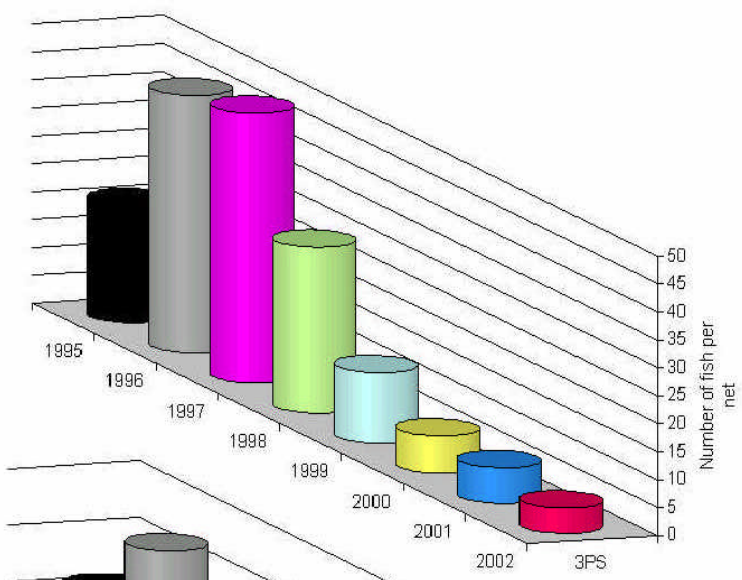


Figure 2. 2001 Catch per unit effort (numbers of fish per net or 1000 hooks)
5 1/2" gillnet and linetrawl in NAFO subdivision 3Ps.



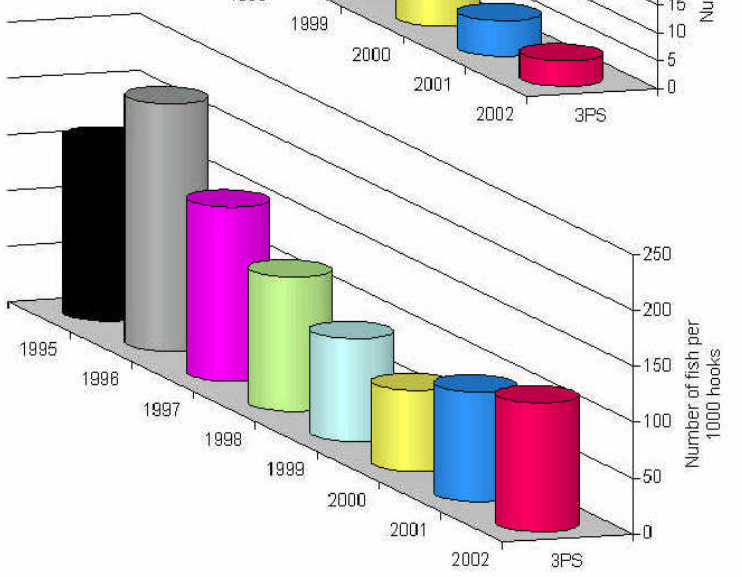
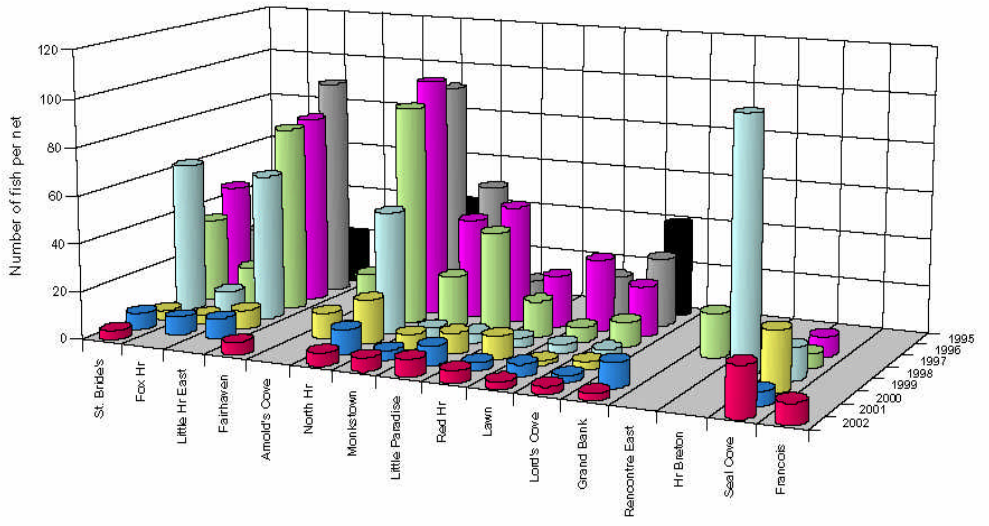


Figure 3. Overall mean CPUE for 3Ps 5 1/2" gillnet (top) and linetrawl (bottom) 1995-2002.



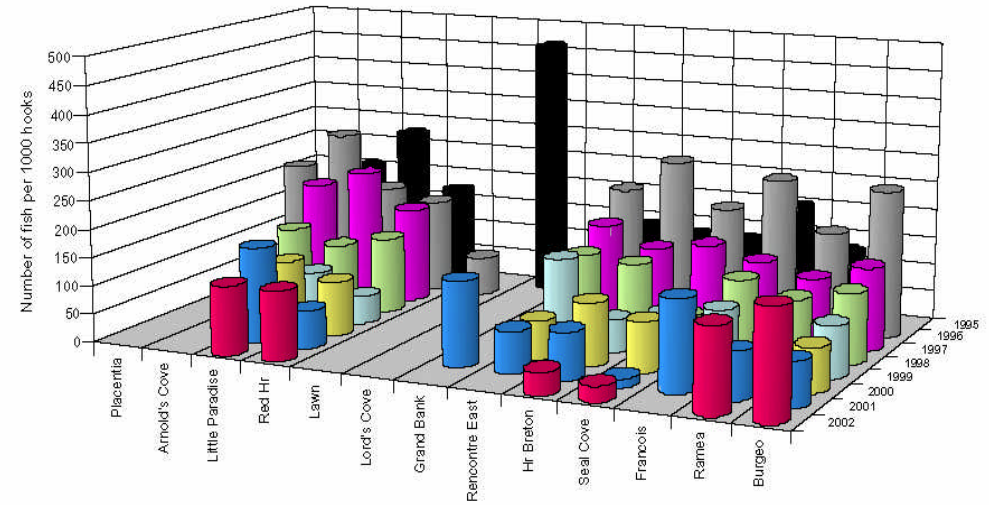


Figure 4.Mean CPUE by senitnel community in 3Ps for 5 1/2" gillnet (top) and linetrawl (bottom) for 1995-2002.

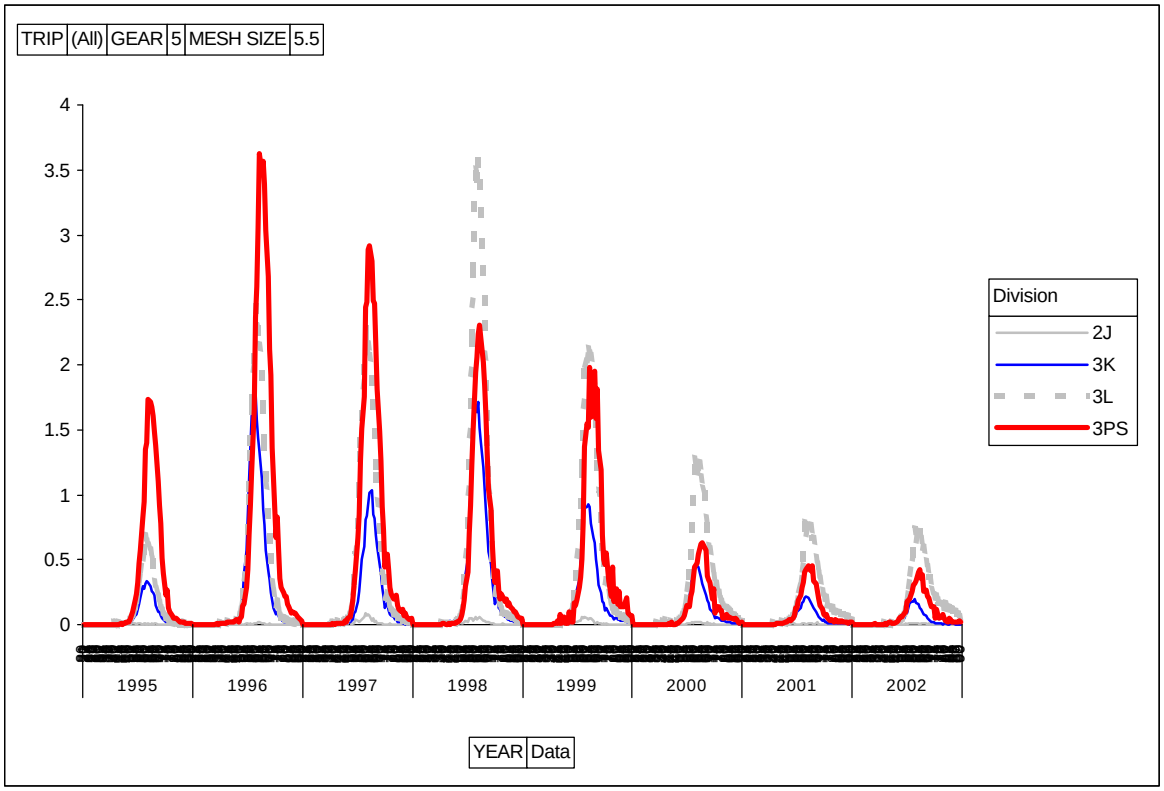


Figure 5. Mean relative length frequencies by division 1995-2002 for 5 1/2" gillnet. Frequencies range from 20cm-90cm for each year.

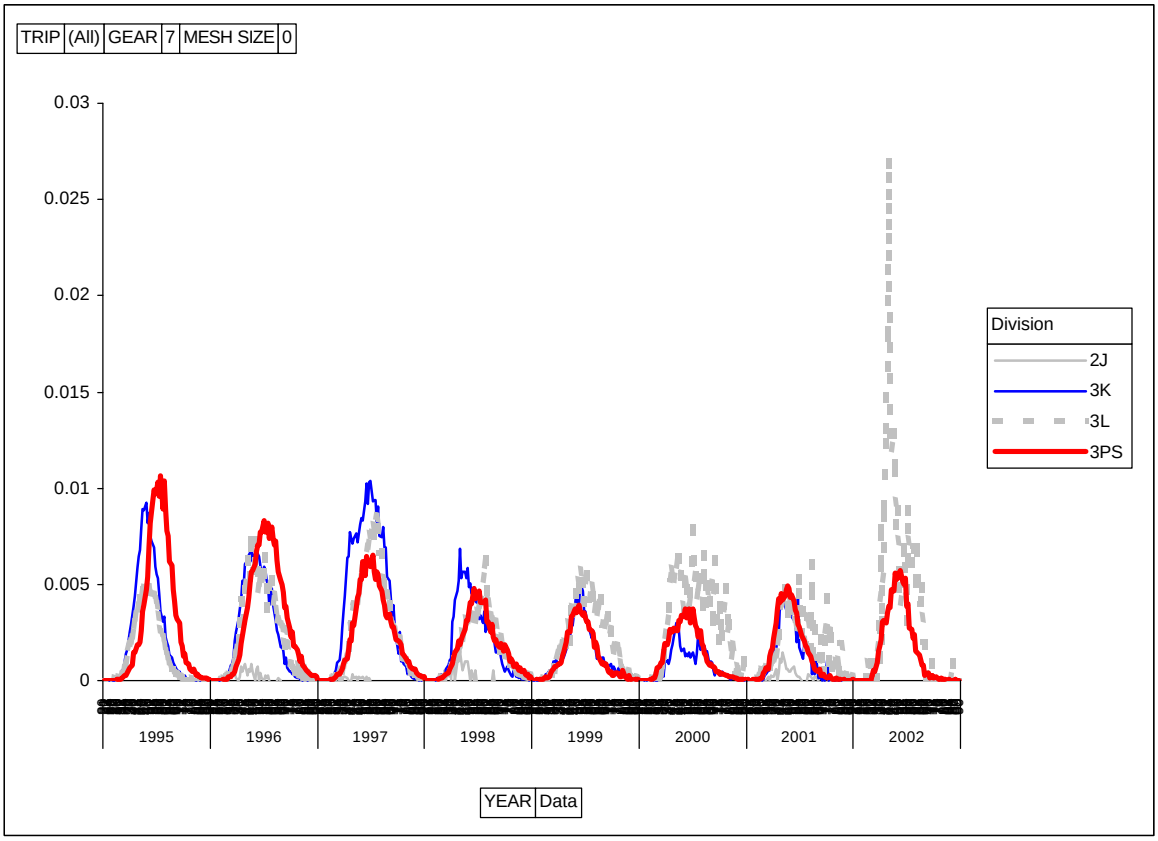


Figure 6. Mean relative length frequencies by division 1995-2002 for linetrawl. Frequencies range from 20cm-90cm for each year.

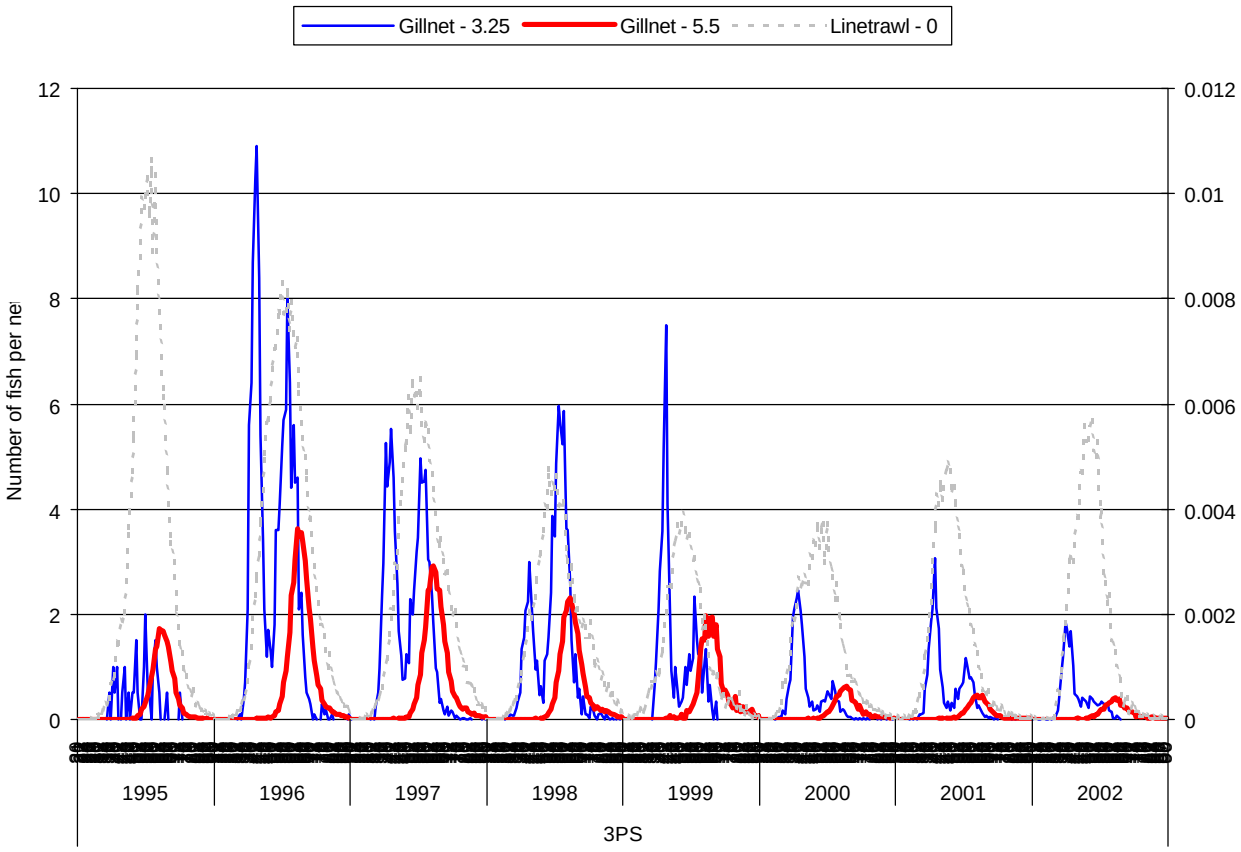


Figure 7. Mean relative length frequencies for 3Ps 1995-2002 for gillnet (5 1/2" and 3 1/4") and linetrawl.

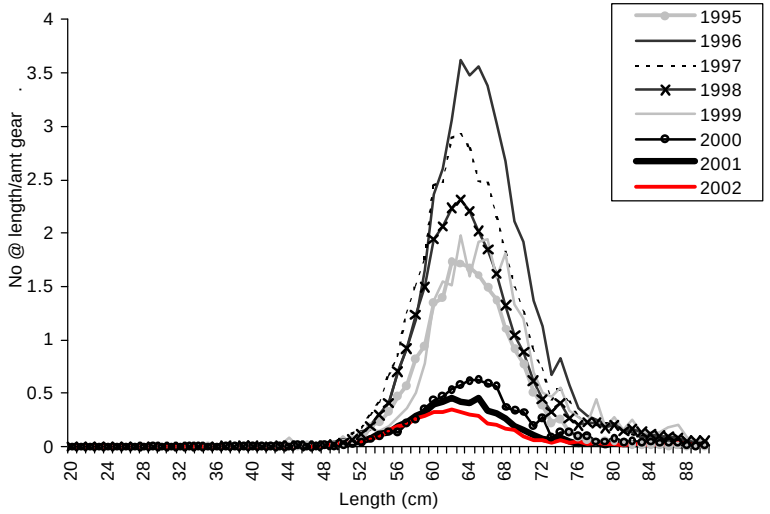
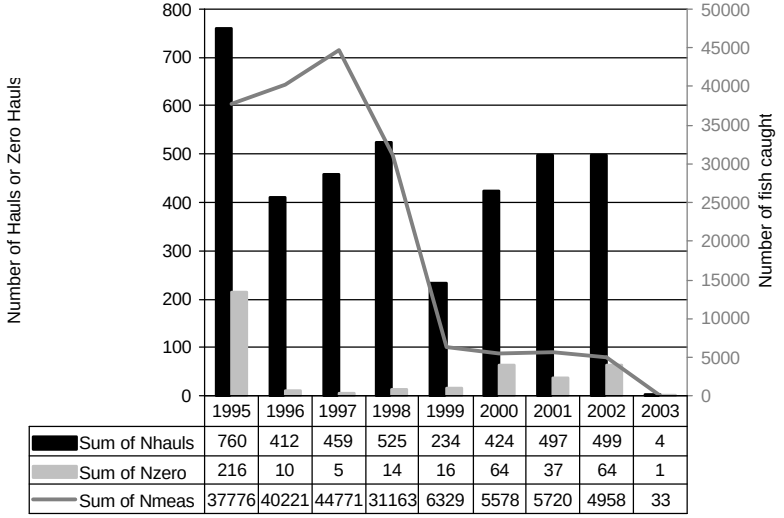


Figure 8. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Ps Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	760	412	459	525	234	424	497	499	4
Sum of Nzero	216	10	5	14	16	64	37	64	1
Sum of Nmeas	37776	40221	44771	31163	6329	5578	5720	4958	33

Figure 9. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Ps Gillnet 5 1/2 in.

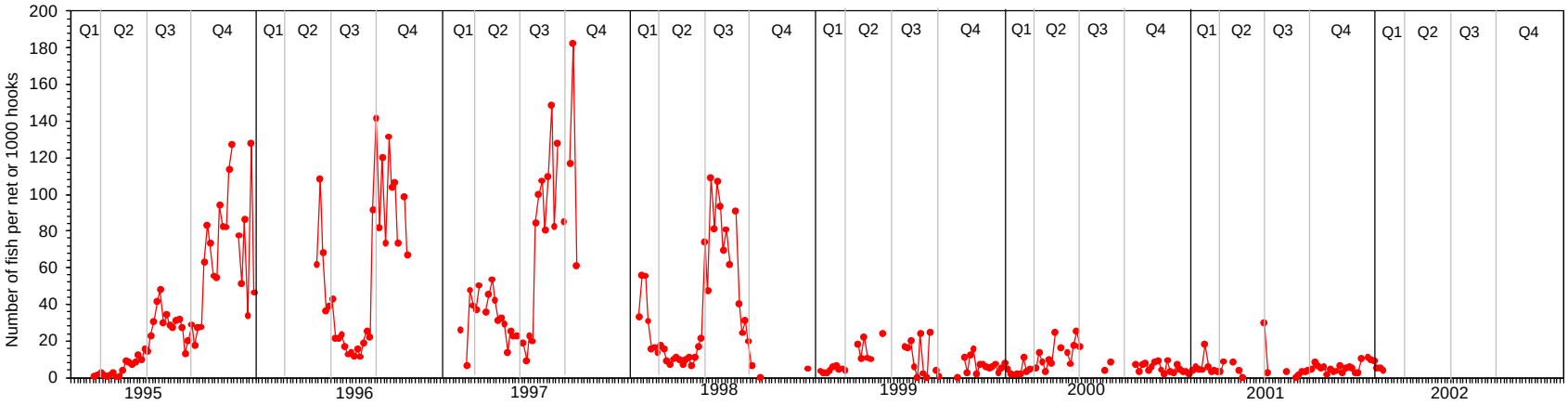


Figure 10. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Ps Gillnet 5 1/2 in.

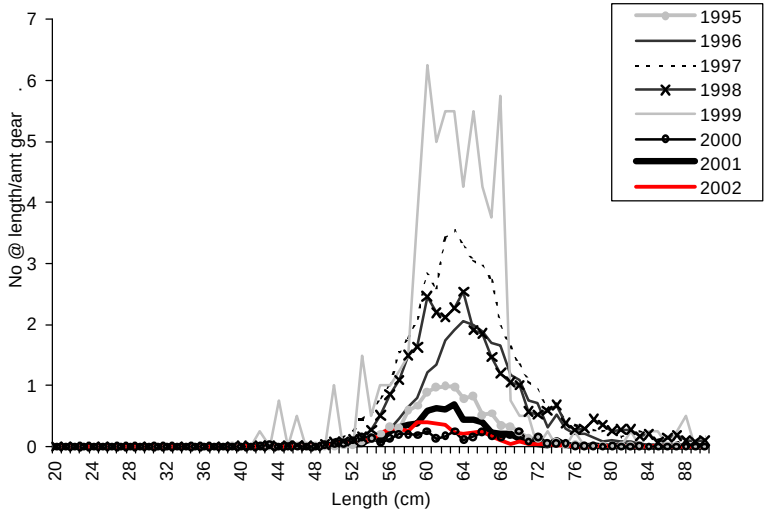
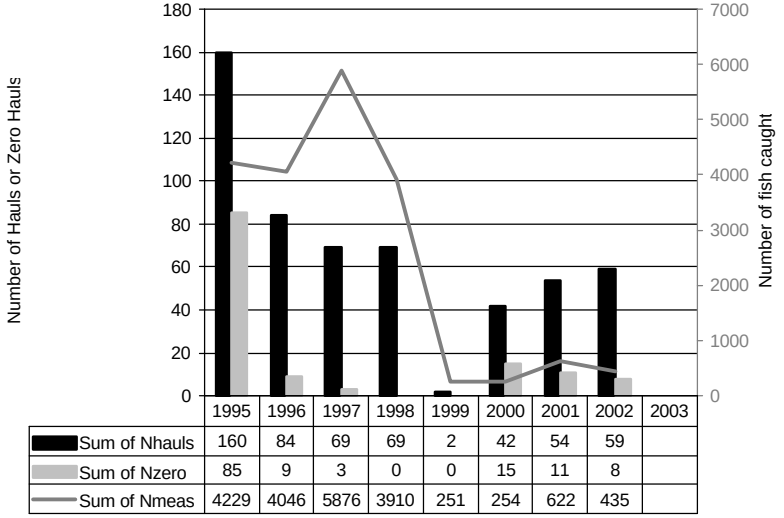


Figure 11. Relative length frequency (number at length / amount of gear) for control and experimental gears, St. Bride's Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	160	84	69	69	2	42	54	59	
Sum of Nzero	85	9	3	0	0	15	11	8	
Sum of Nmeas	4229	4046	5876	3910	251	254	622	435	

Figure 12. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, St. Bride's Gillnet 5 1/2 in.

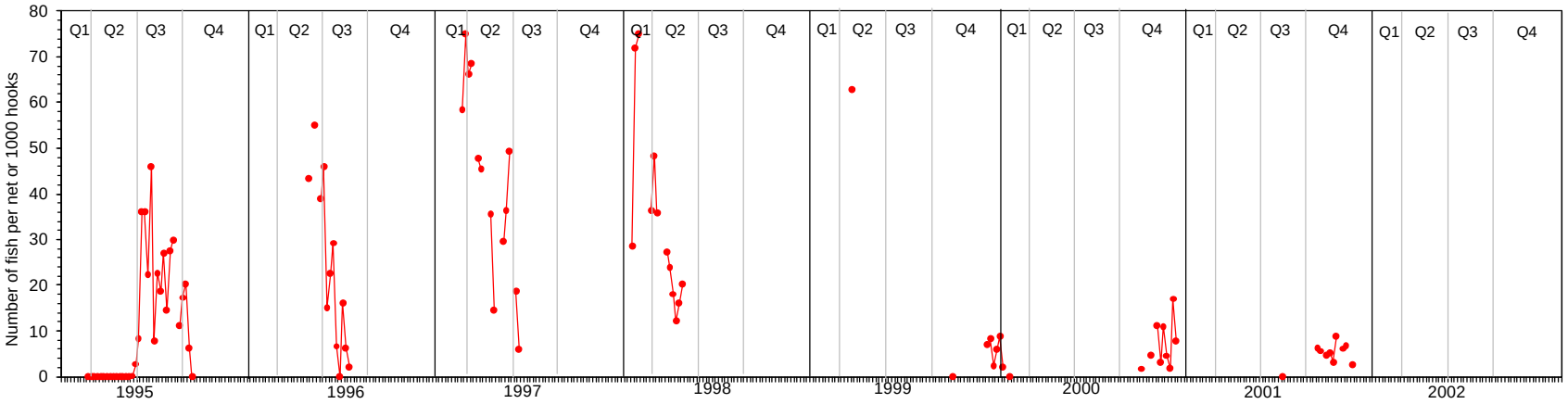


Figure 13. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, St. Bride's Gillnet 5 1/2 in.

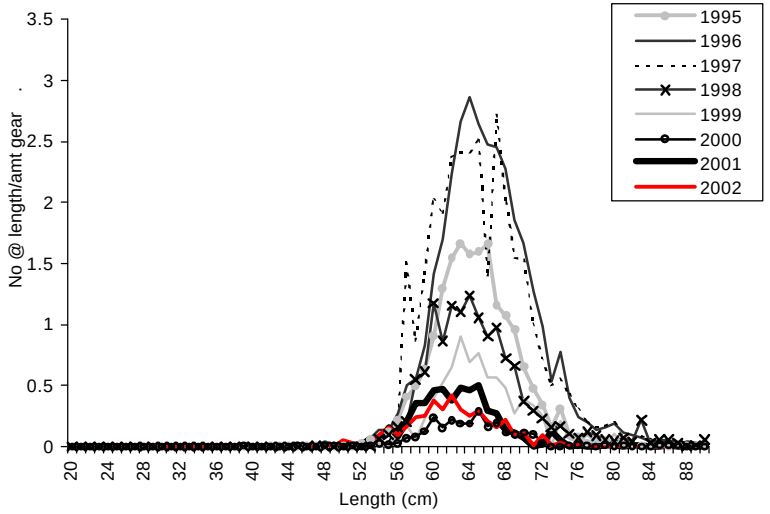
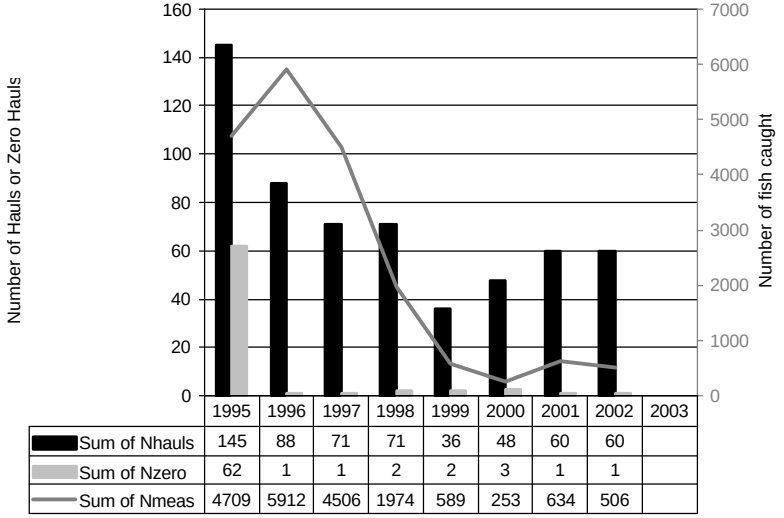


Figure 14. Relative length frequency (number at length / amount of gear) for control and experimental gears, Fox Hr Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	145	88	71	71	36	48	60	60	
Sum of Nzero	62	1	1	2	2	3	1	1	
Sum of Nmeas	4709	5912	4506	1974	589	253	634	506	

Figure 15. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Fox Hr Gillnet 5 1/2 in.

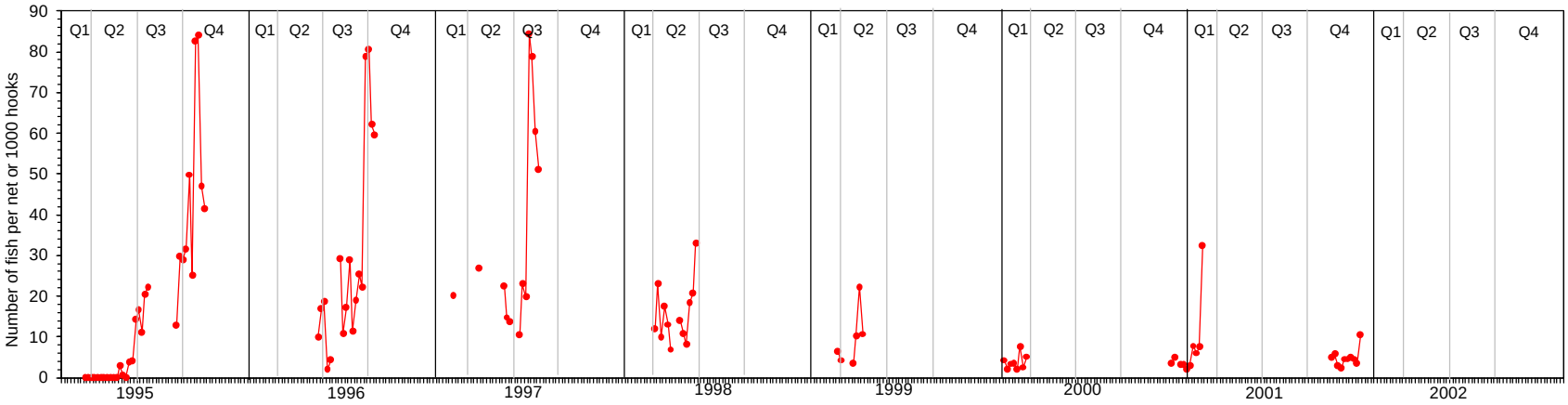


Figure 16. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Fox Hr Gillnet 5 1/2 in.

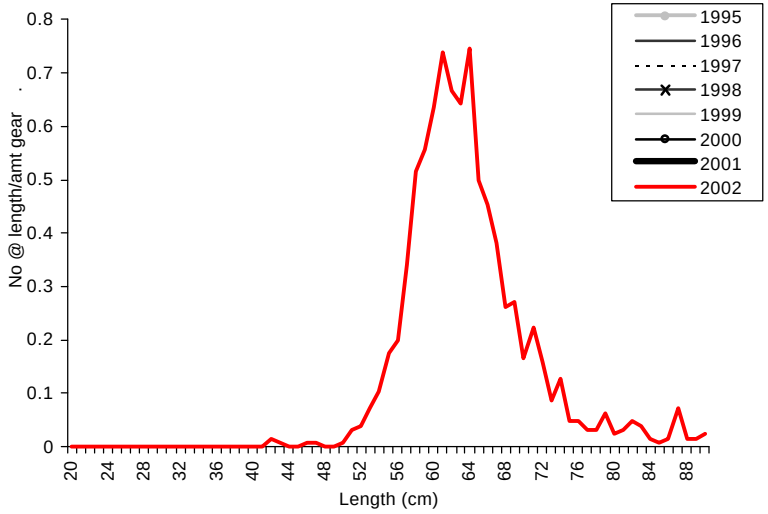


Figure 17. Relative length frequency (number at length / amount of gear) for control and experimental gears, Fairhaven Gillnet 5 1/2 in.

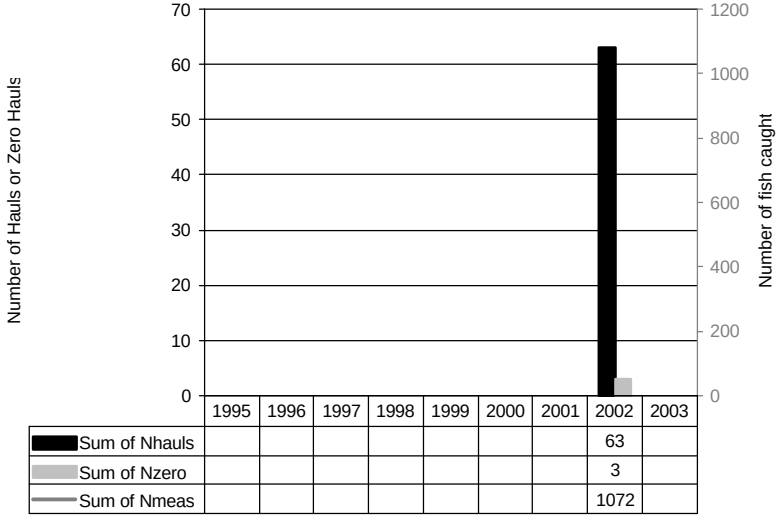


Figure 18. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Fairhaven Gillnet 5 1/2 in.

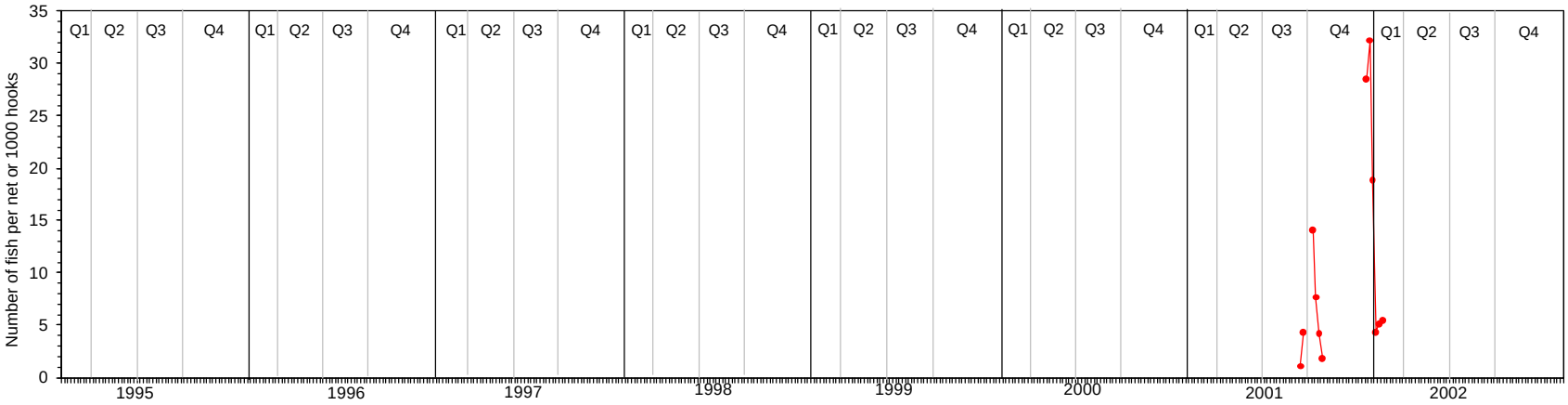


Figure 19. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Fairhaven Gillnet 5 1/2 in.

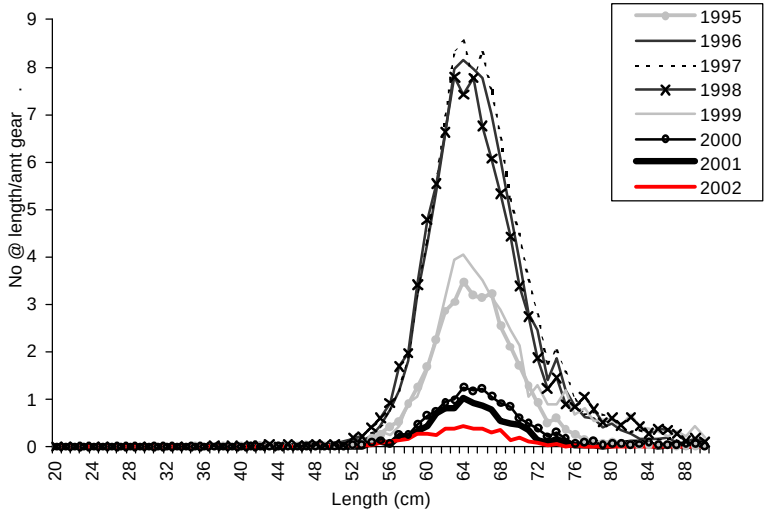
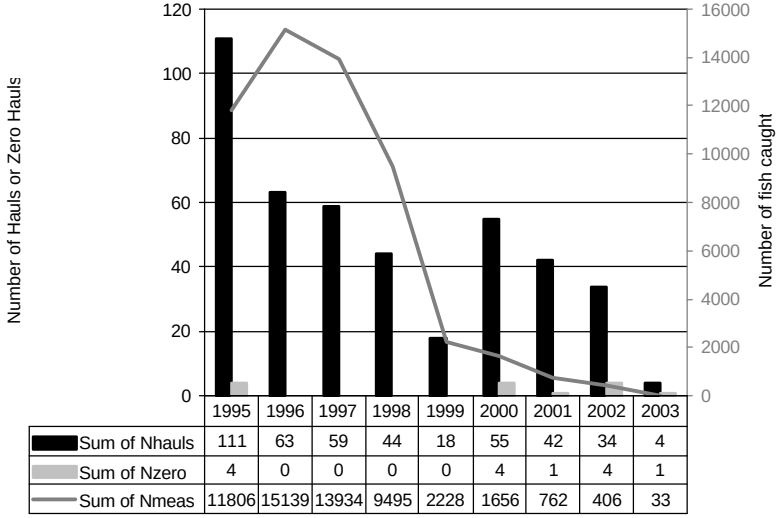


Figure 20. Relative length frequency (number at length / amount of gear) for control and experimental gears, North Hr Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	111	63	59	44	18	55	42	34	4
Sum of Nzero	4	0	0	0	0	4	1	4	1
Sum of Nmeas	11806	15139	13934	9495	2228	1656	762	406	33

Figure 21. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, North Hr Gillnet 5 1/2 in.

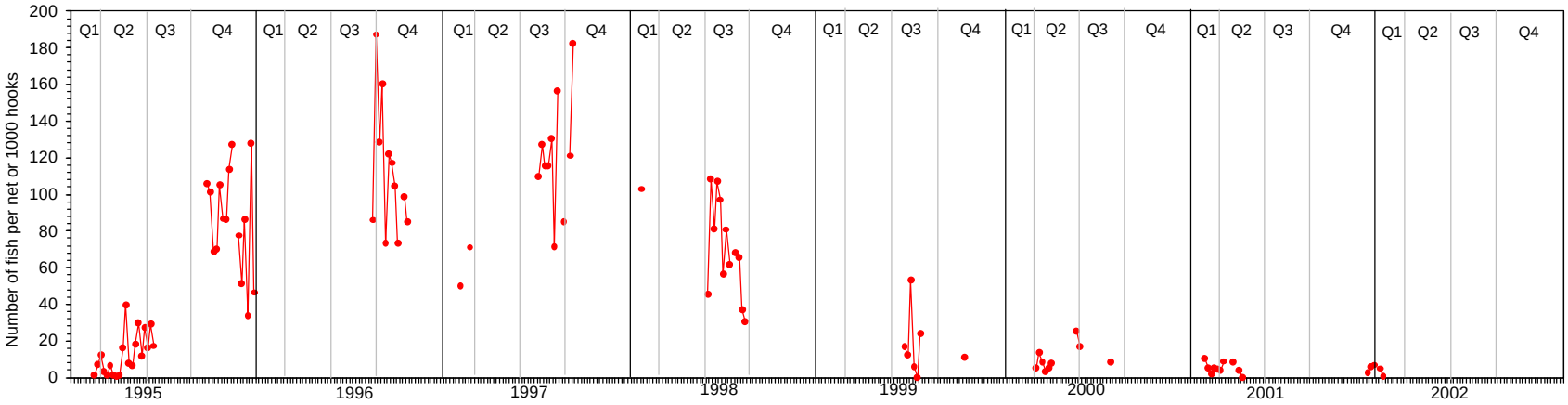


Figure 22. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, North Hr Gillnet 5 1/2 in.

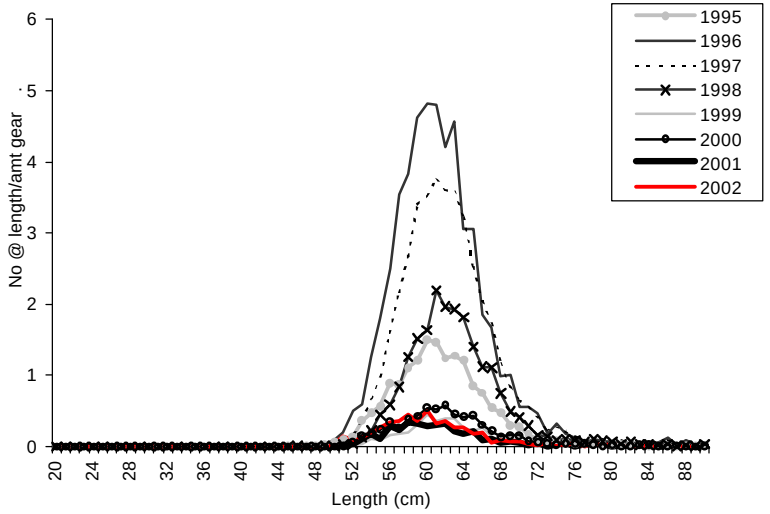
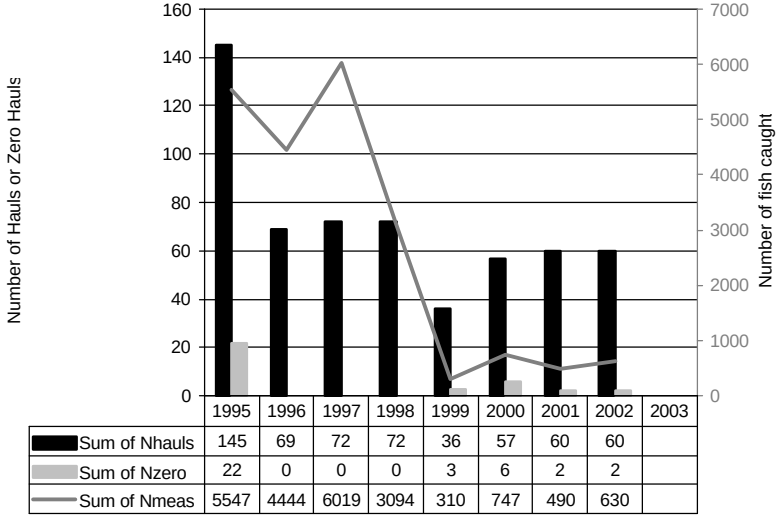


Figure 23. Relative length frequency (number at length / amount of gear) for control and experimental gears, Monkstown Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	145	69	72	72	36	57	60	60	
Sum of Nzero	22	0	0	0	3	6	2	2	
Sum of Nmeas	5547	4444	6019	3094	310	747	490	630	

Figure 24. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Monkstown Gillnet 5 1/2 in.

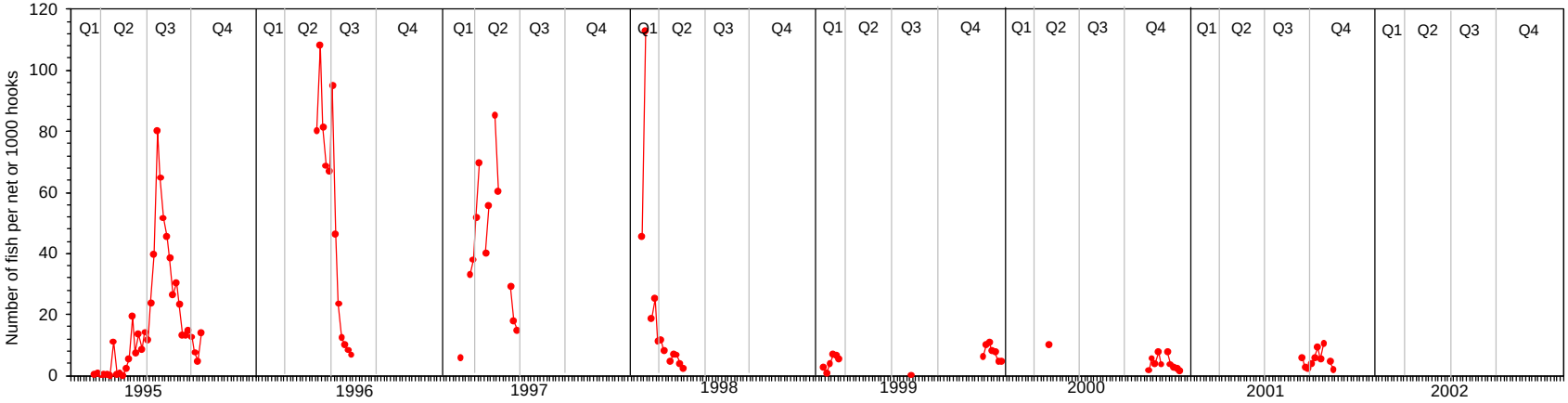


Figure 25. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Monkstown Gillnet 5 1/2 in.

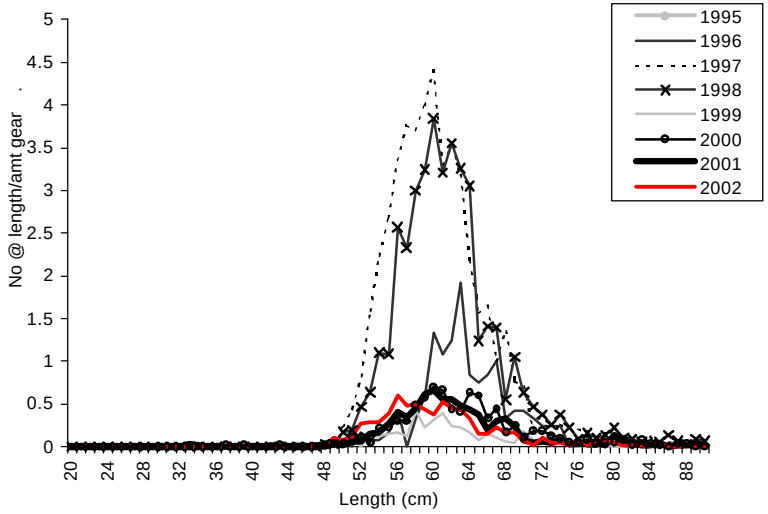
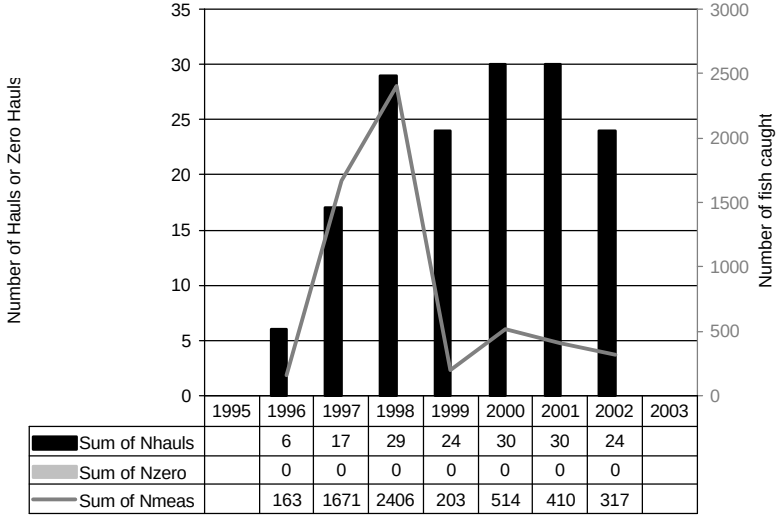


Figure 26. Relative length frequency (number at length / amount of gear) for control and experimental gears, Little Paradise Gillnet 5 1/2 i



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls		6	17	29	24	30	30	24	
Sum of Nzero		0	0	0	0	0	0	0	
Sum of Nmeas		163	1671	2406	203	514	410	317	

Figure 27. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Little Paradise Gillnet 5 1/2 in.

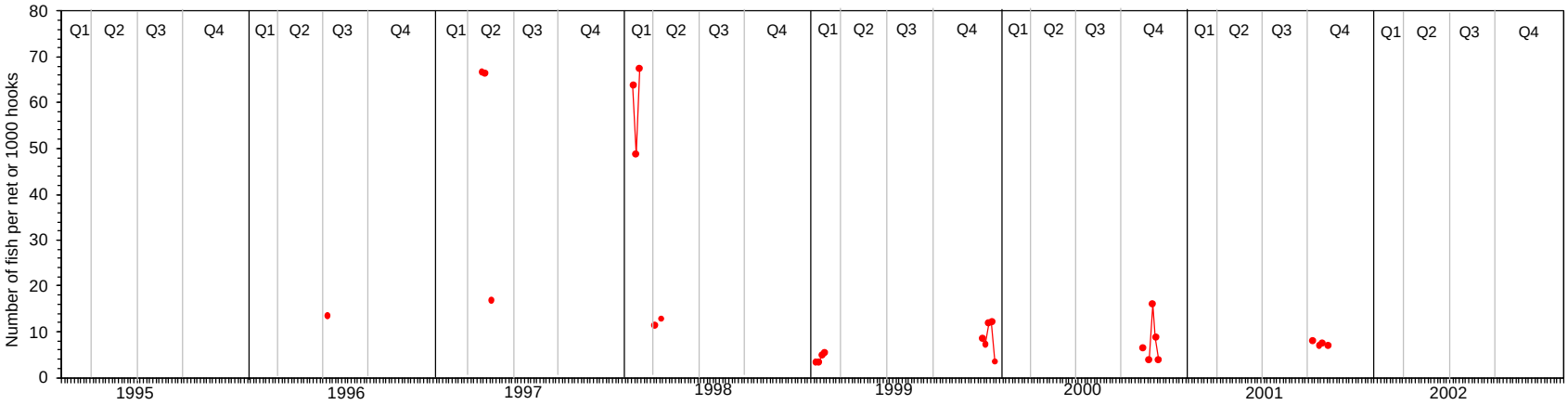


Figure 28. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Little Paradise Gillnet 5 1/2 in.

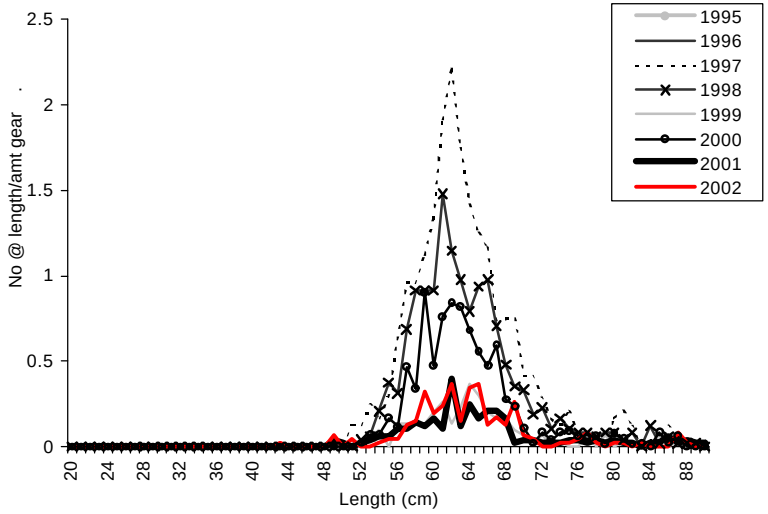
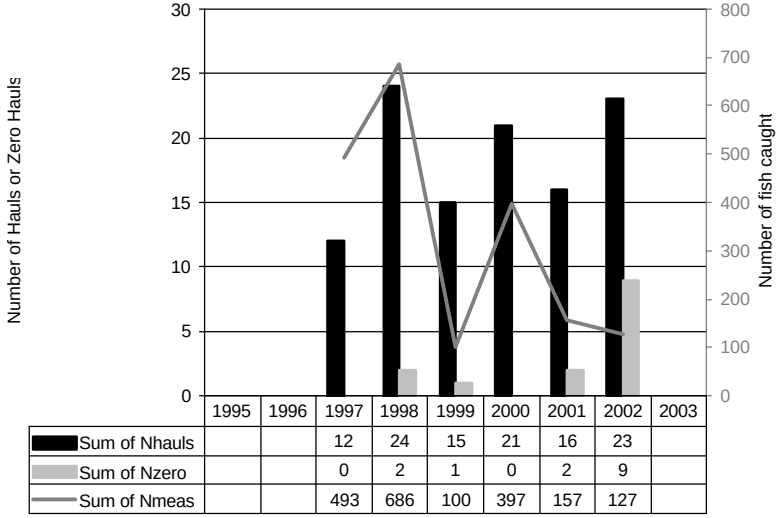


Figure 29. Relative length frequency (number at length / amount of gear) for control and experimental gears, Red Hr Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls			12	24	15	21	16	23	
Sum of Nzero			0	2	1	0	2	9	
Sum of Nmeas			493	686	100	397	157	127	

Figure 30. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Red Hr Gillnet 5 1/2 in.

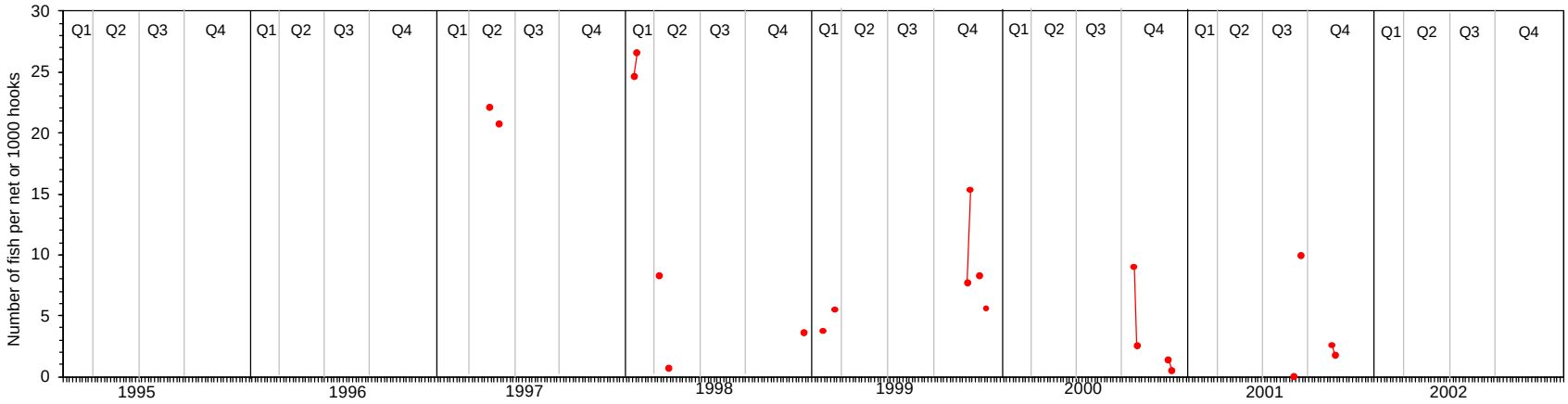


Figure 31. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Red Hr Gillnet 5 1/2 in.

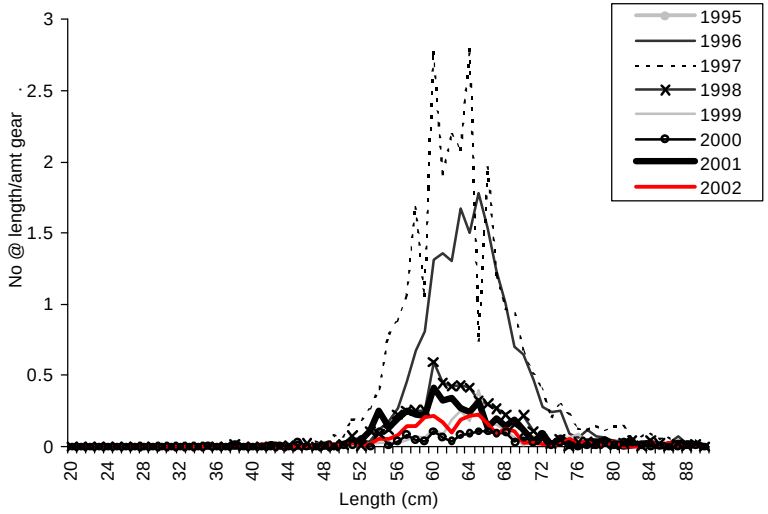
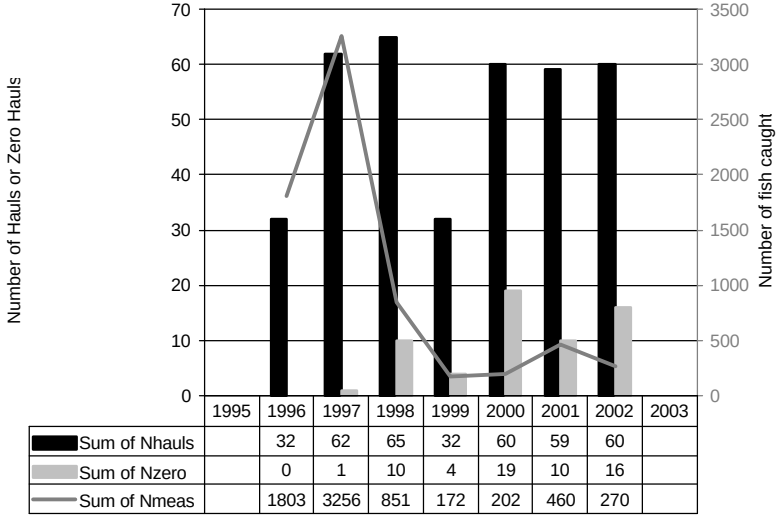


Figure 32. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lawn Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls		32	62	65	32	60	59	60	
Sum of Nzero		0	1	10	4	19	10	16	
Sum of Nmeas		1803	3256	851	172	202	460	270	

Figure 33. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lawn Gillnet 5 1/2 in.

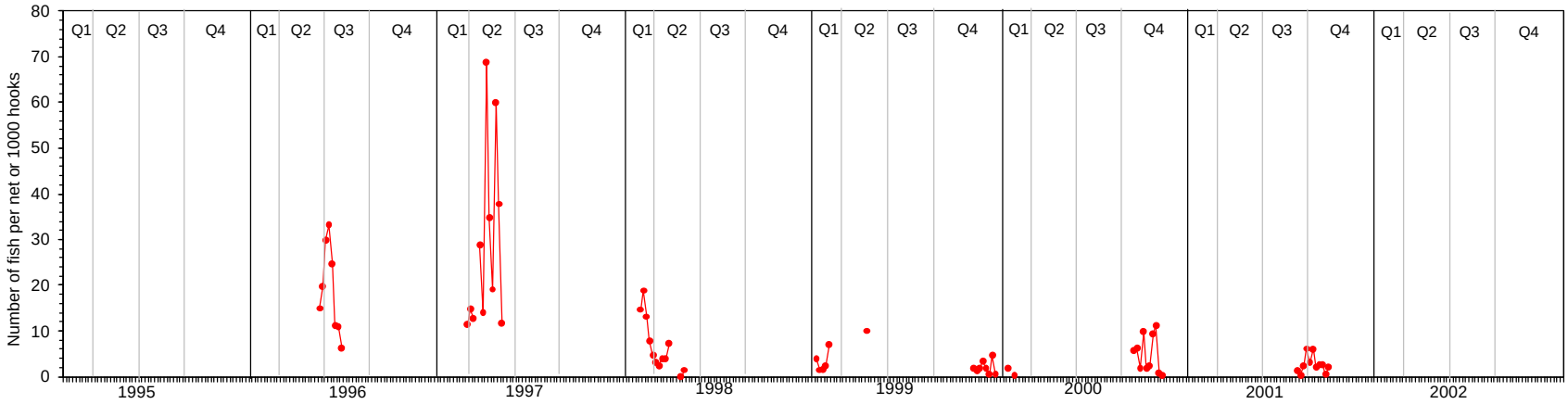


Figure 34. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Lawn Gillnet 5 1/2 in.

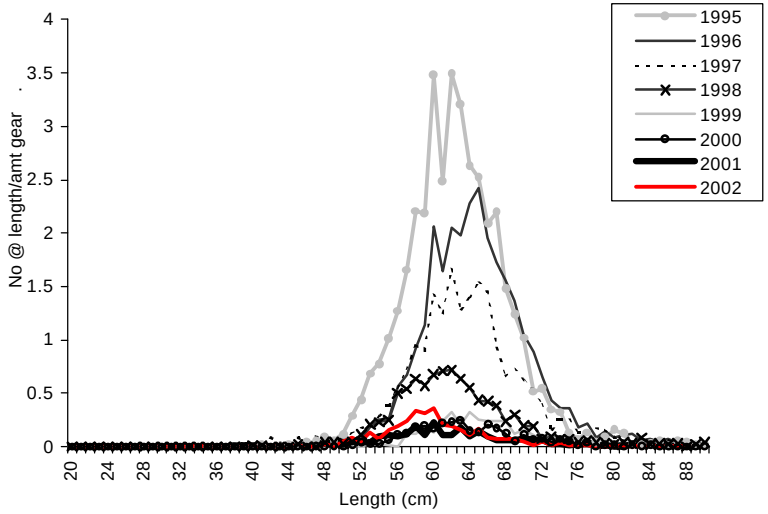
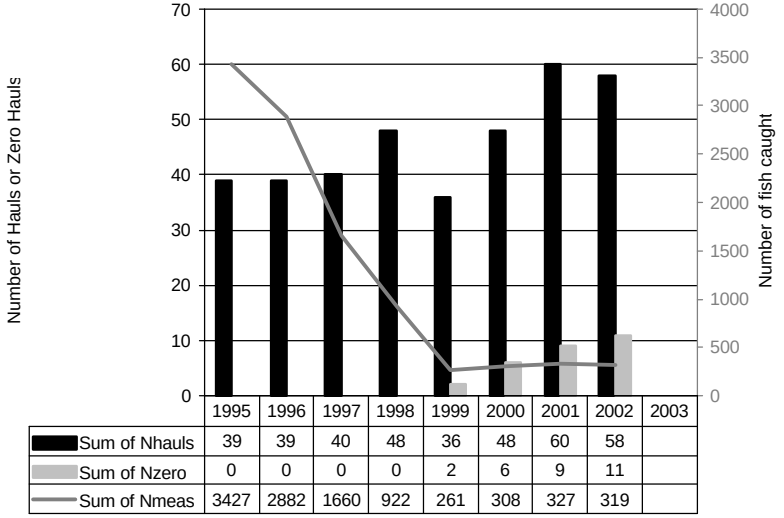


Figure 35. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lord's Cove Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	39	39	40	48	36	48	60	58	
Sum of Nzero	0	0	0	0	2	6	9	11	
Sum of Nmeas	3427	2882	1660	922	261	308	327	319	

Figure 36. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lord's Cove Gillnet 5 1/2 in.

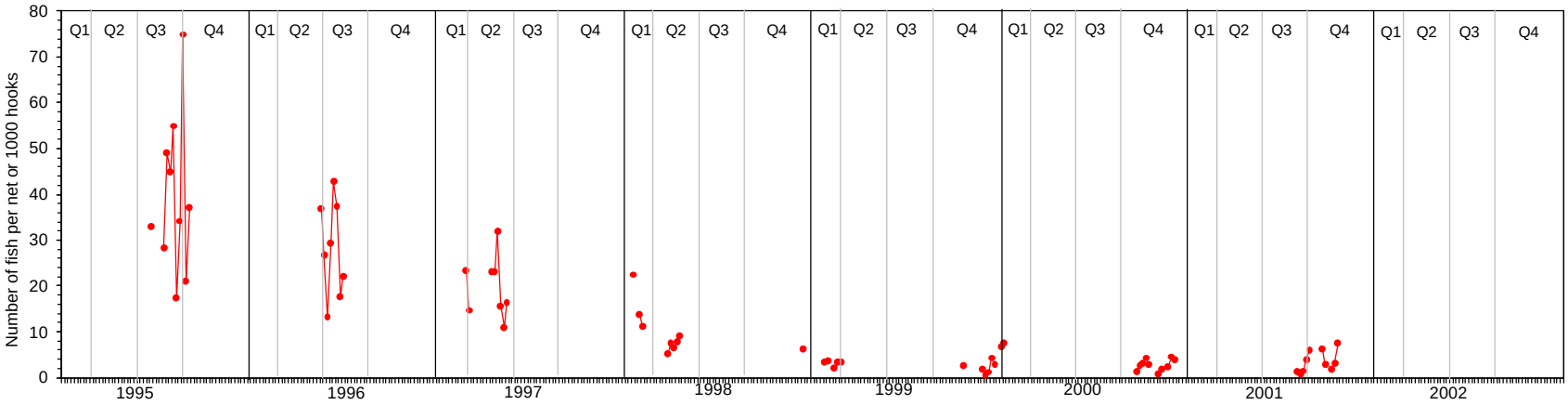


Figure 37. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Lord's Cove Gillnet 5 1/2 in.

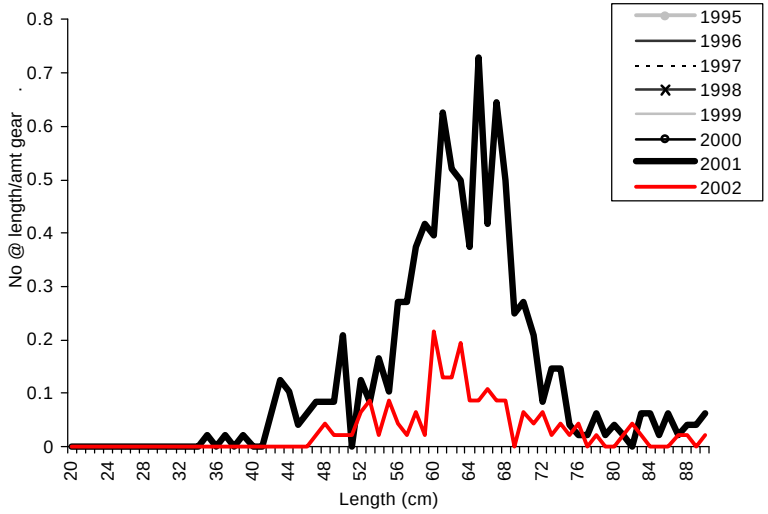


Figure 38. Relative length frequency (number at length / amount of gear) for control and experimental gears, Grand Bank Gillnet 5 1/2 in.

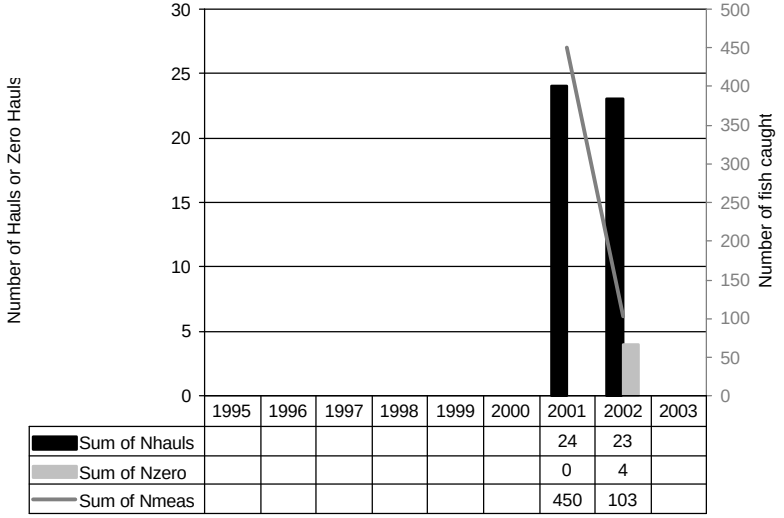


Figure 39. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Grand Bank Gillnet 5 1/2 in.

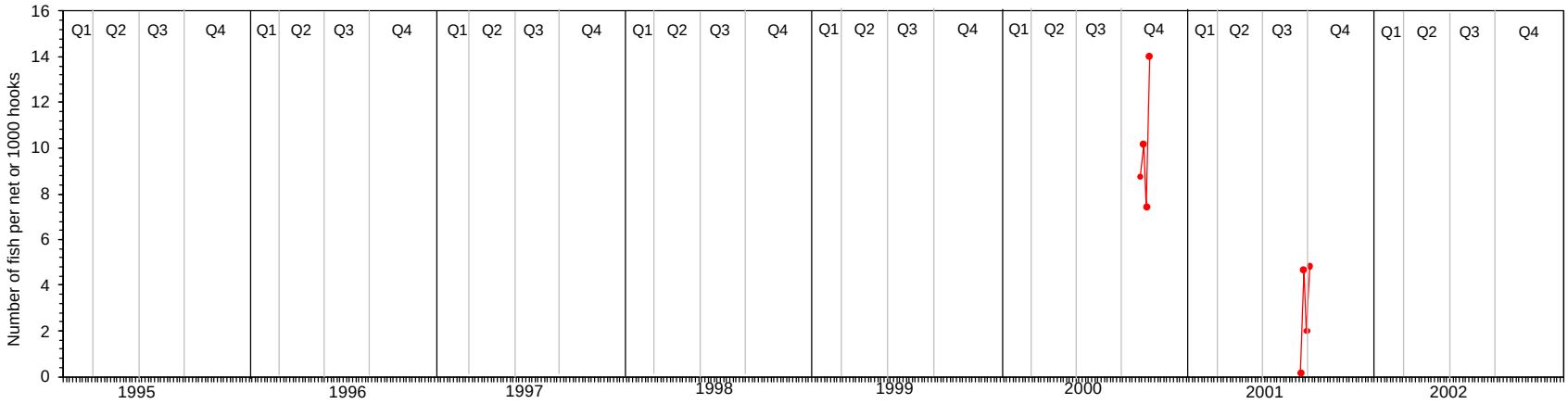


Figure 40. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Grand Bank Gillnet 5 1/2 in.

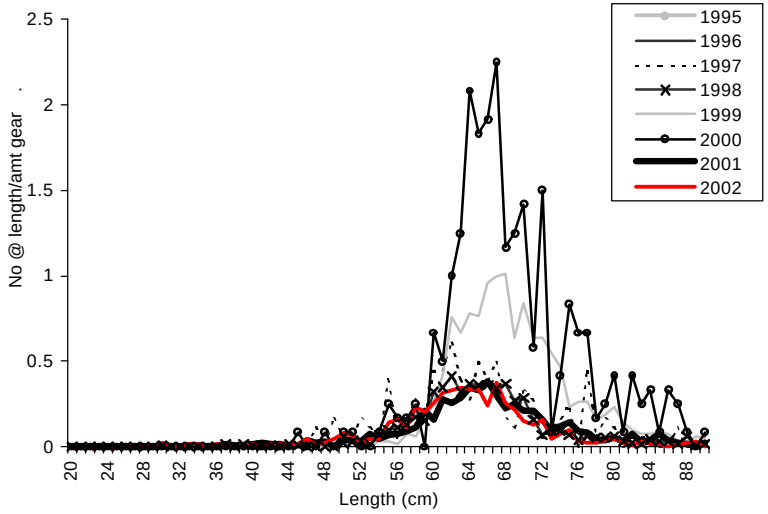
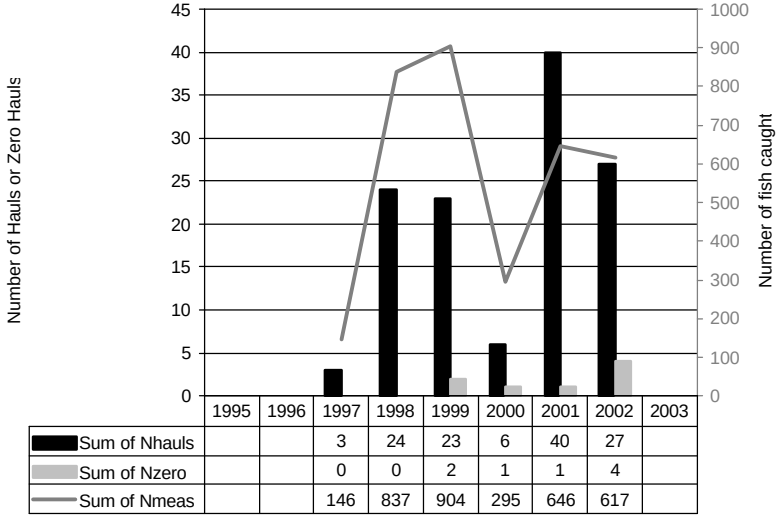


Figure 41. Relative length frequency (number at length / amount of gear) for control and experimental gears, Seal Cove Gillnet 5 1/2 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls			3	24	23	6	40	27	
Sum of Nzero			0	0	2	1	1	4	
Sum of Nmeas			146	837	904	295	646	617	

Figure 42. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Seal Cove Gillnet 5 1/2 in.

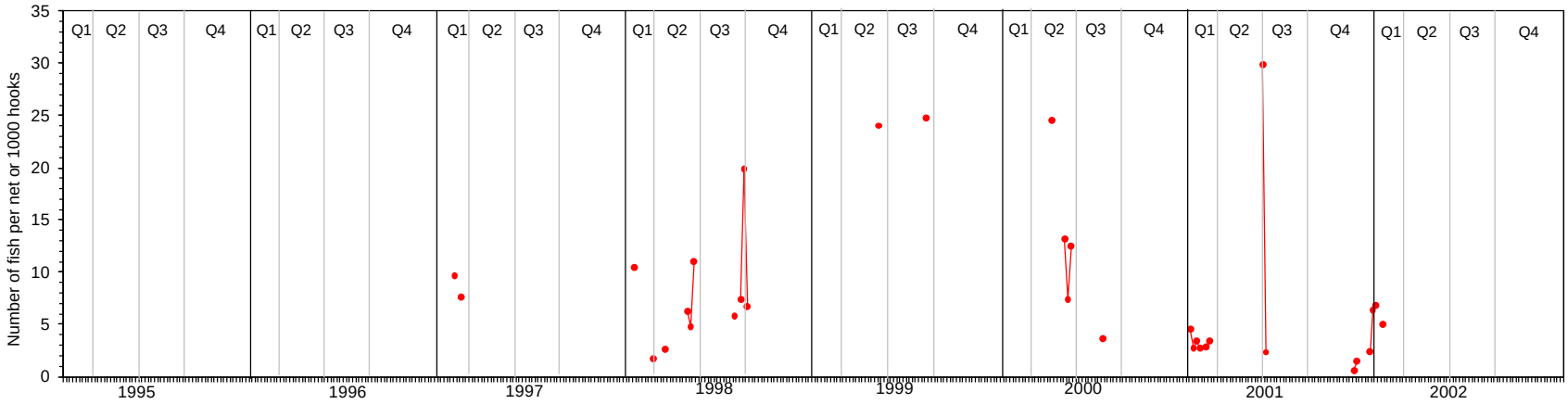


Figure 43. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Seal Cove Gillnet 5 1/2 in.

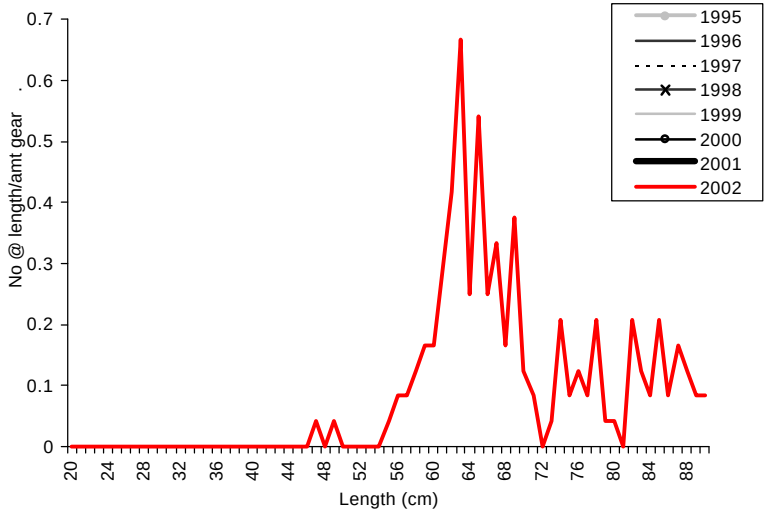


Figure 44. Relative length frequency (number at length / amount of gear) for control and experimental gears, Francois Gillnet 5 1/2 in.

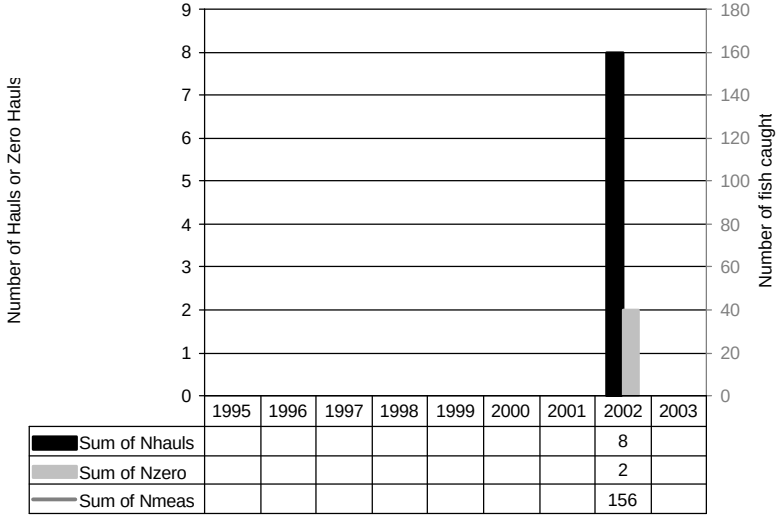


Figure 45. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Francois Gillnet 5 1/2 in.

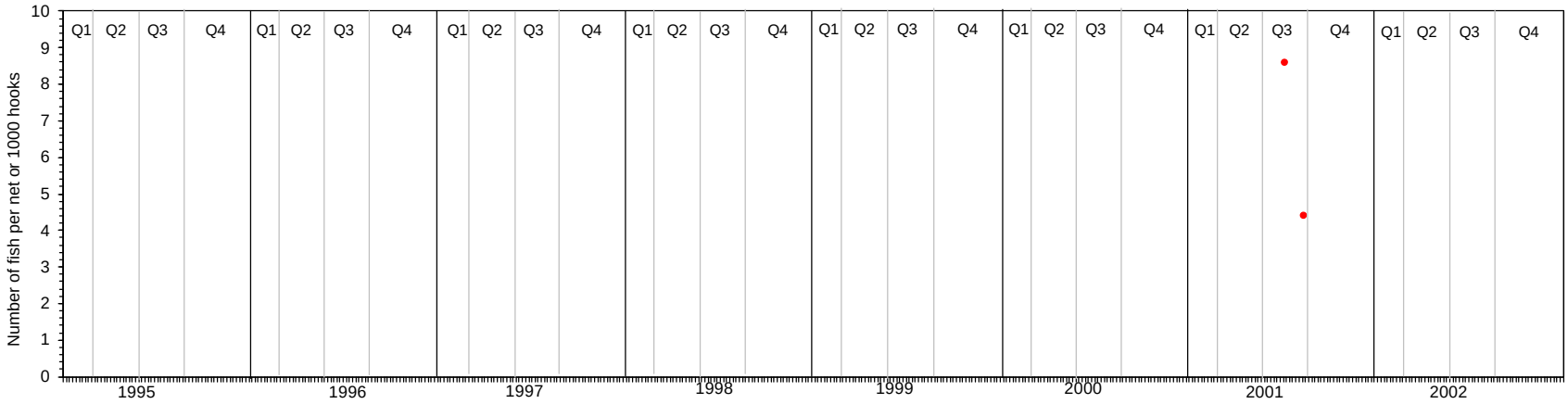


Figure 46. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Francois Gillnet 5 1/2 in.

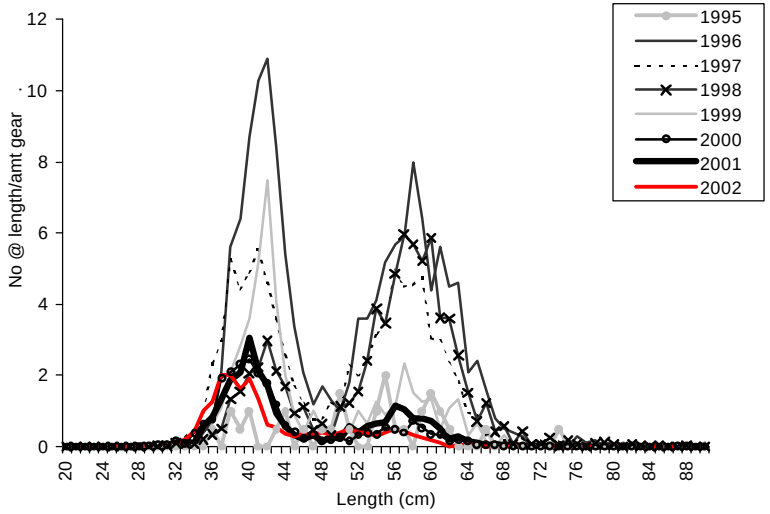
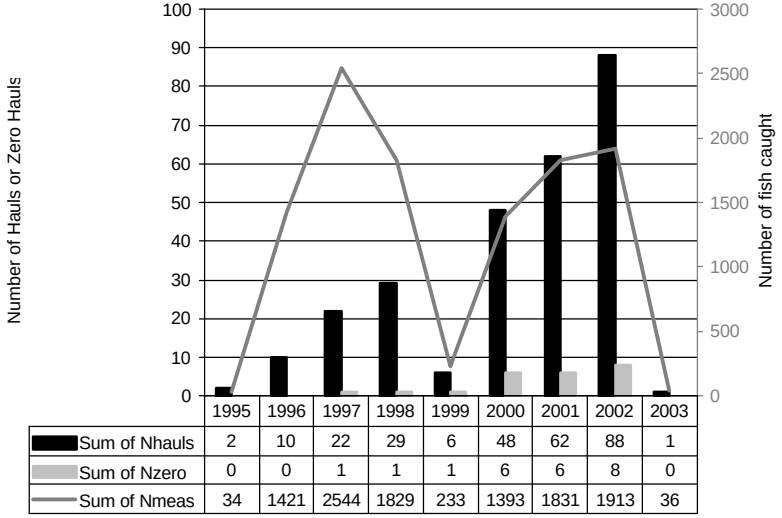


Figure 47. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Ps Gillnet 3 1/4 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	2	10	22	29	6	48	62	88	1
Sum of Nzero	0	0	1	1	1	6	6	8	0
Sum of Nmeas	34	1421	2544	1829	233	1393	1831	1913	36

Figure 48. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Ps Gillnet 3 1/4 in.

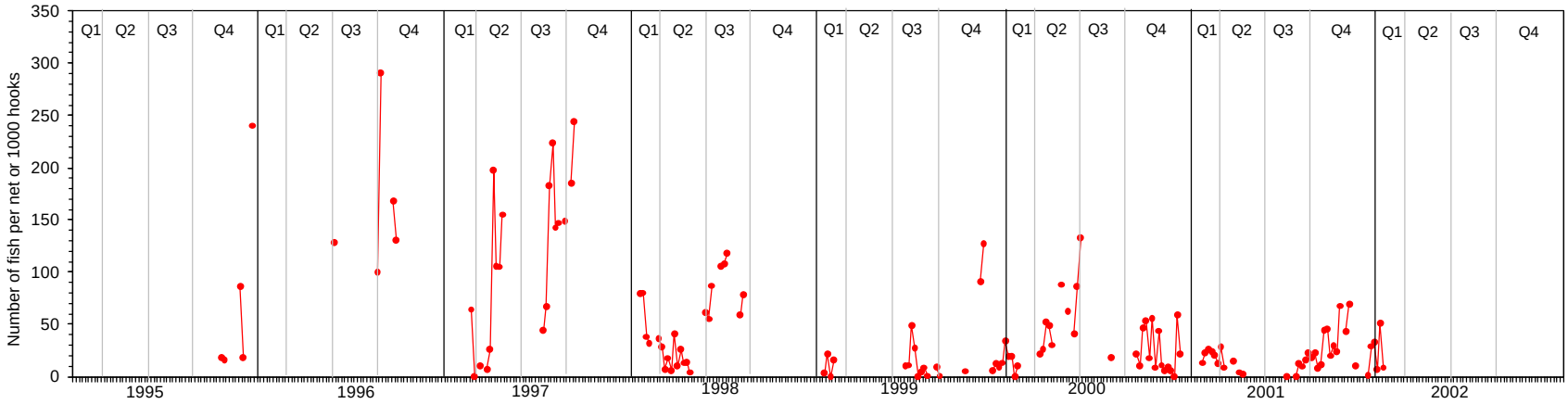


Figure 49. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, 3Ps Gillnet 3 1/4 in.

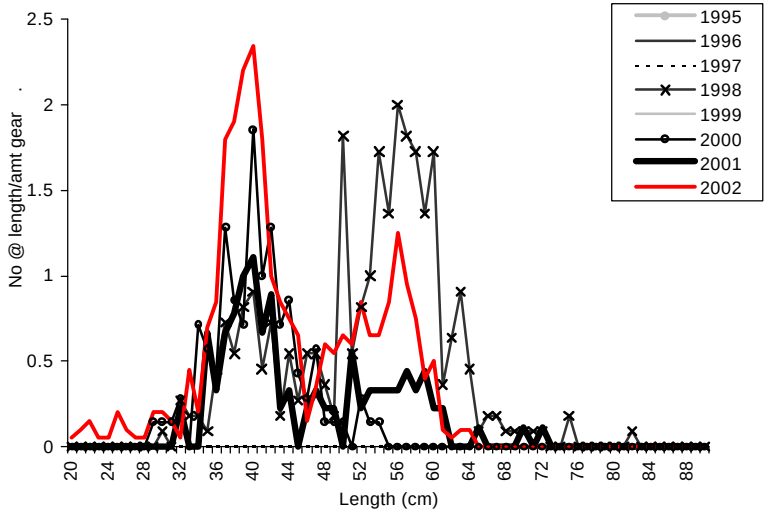
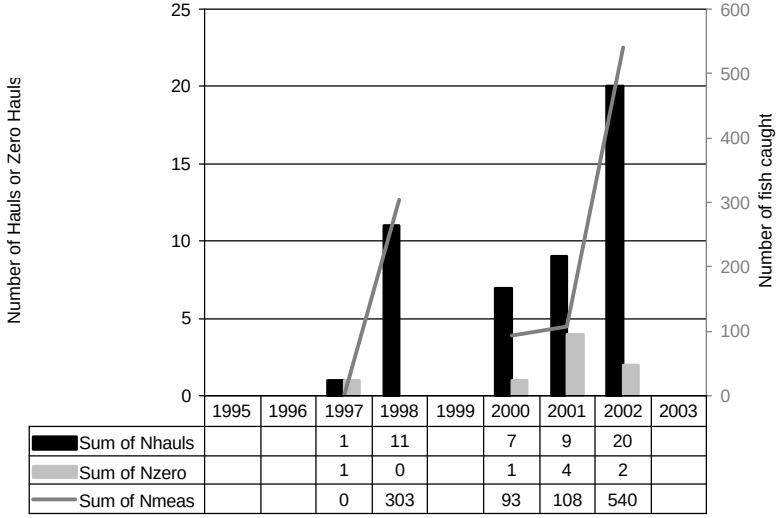


Figure 50. Relative length frequency (number at length / amount of gear) for control and experimental gears, St. Bride's Gillnet 3 1/4 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls			1	11		7	9	20	
Sum of Nzero			1	0		1	4	2	
Sum of Nmeas			0	303		93	108	540	

Figure 51. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, St. Bride's Gillnet 3 1/4 in.

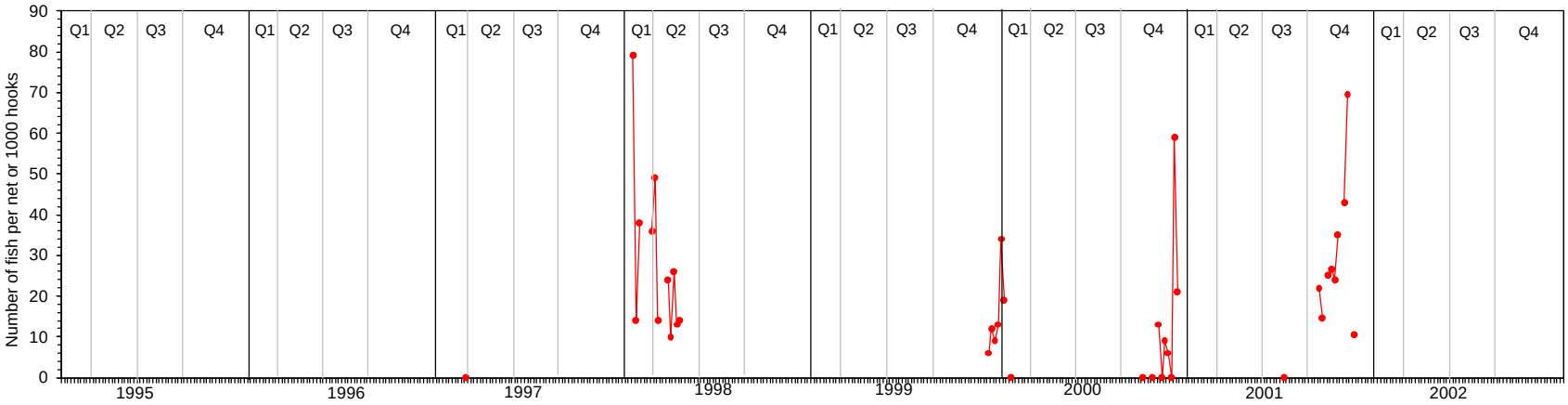


Figure 52. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, St. Bride's Gillnet 3 1/4 in.

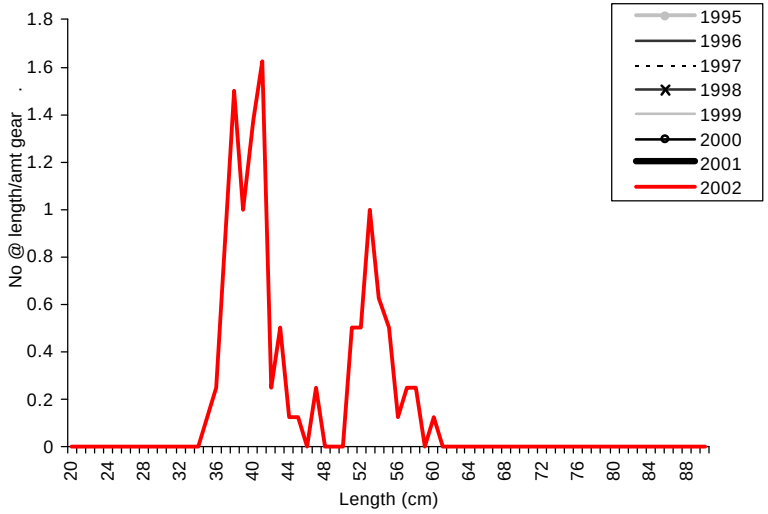


Figure 53. Relative length frequency (number at length / amount of gear) for control and experimental gears, Fairhaven Gillnet 3 1/4 in.

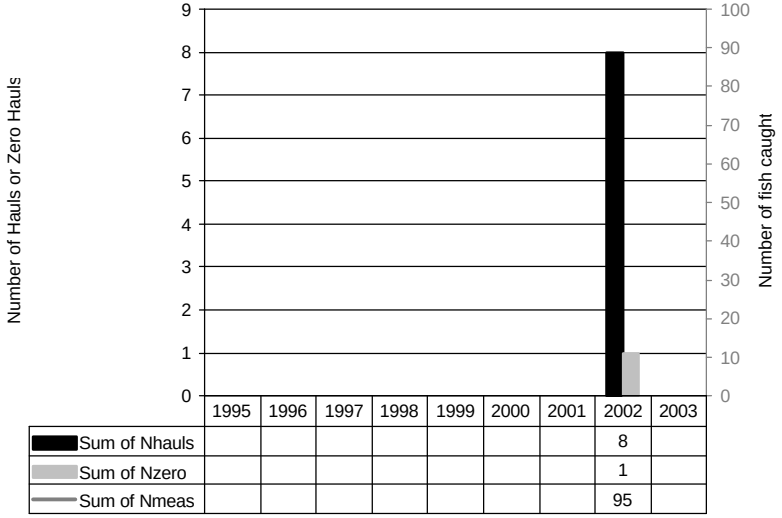


Figure 54. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Fairhaven Gillnet 3 1/4 in.

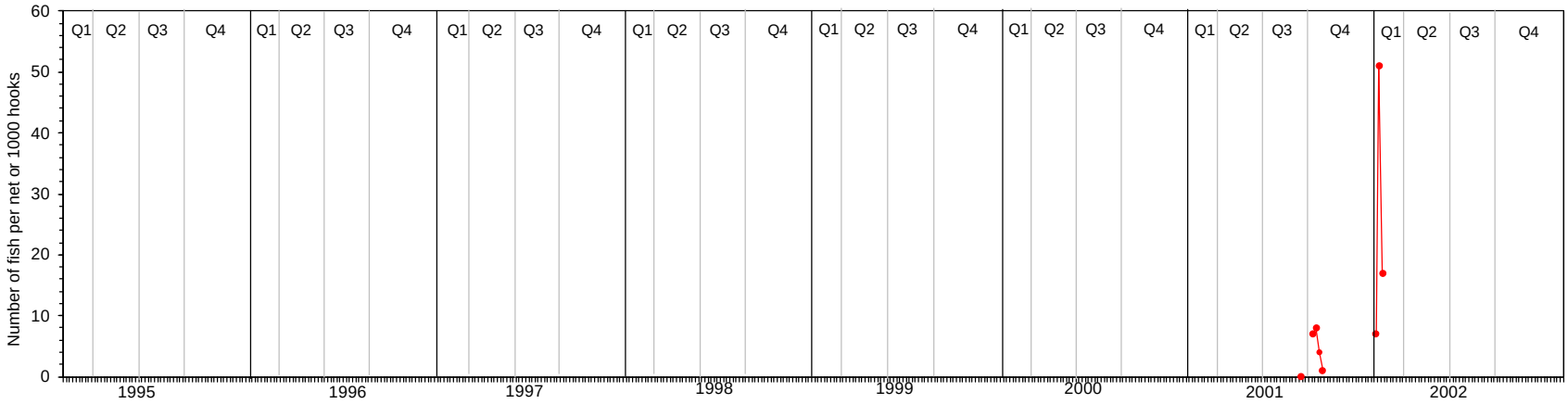


Figure 55. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Fairhaven Gillnet 3 1/4 in.

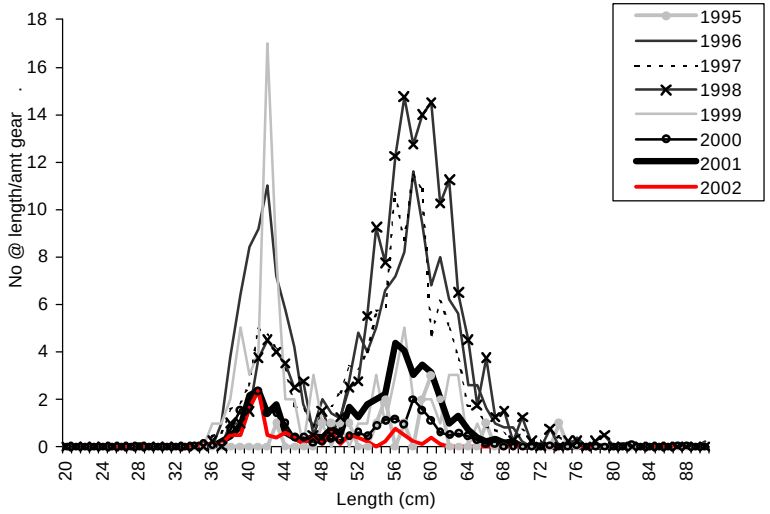
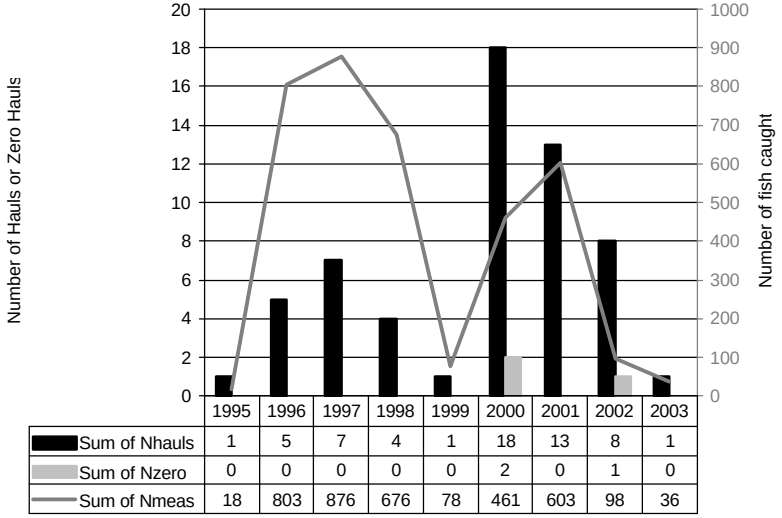


Figure 56. Relative length frequency (number at length / amount of gear) for control and experimental gears, North Hr Gillnet 3 1/4 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	1	5	7	4	1	18	13	8	1
Sum of Nzero	0	0	0	0	0	2	0	1	0
Sum of Nmeas	18	803	876	676	78	461	603	98	36

Figure 57. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, North Hr Gillnet 3 1/4 in.

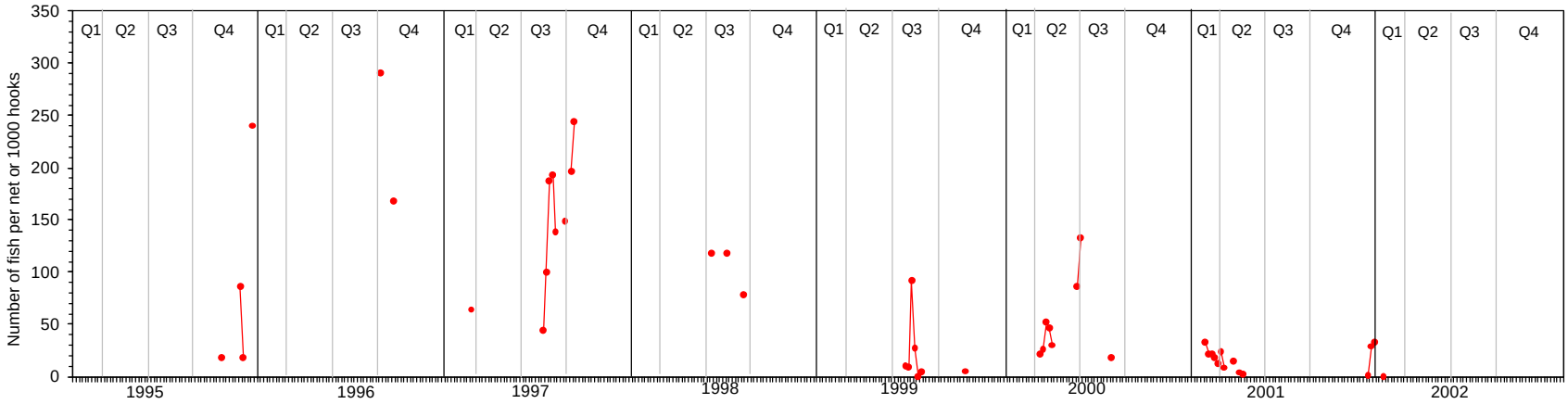


Figure 58. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, North Hr Gillnet 3 1/4 in.

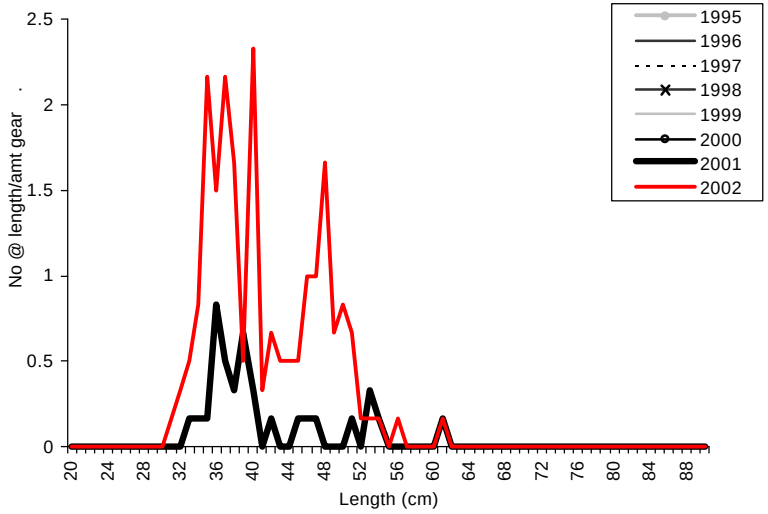


Figure 59. Relative length frequency (number at length / amount of gear) for control and experimental gears, Little Paradise Gillnet 3 1/4 i

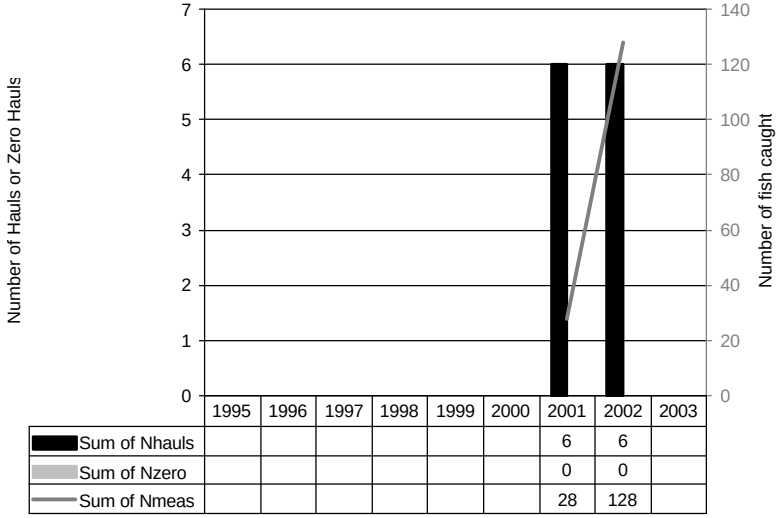


Figure 60. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Little Paradise Gillnet 3 1/4 in.

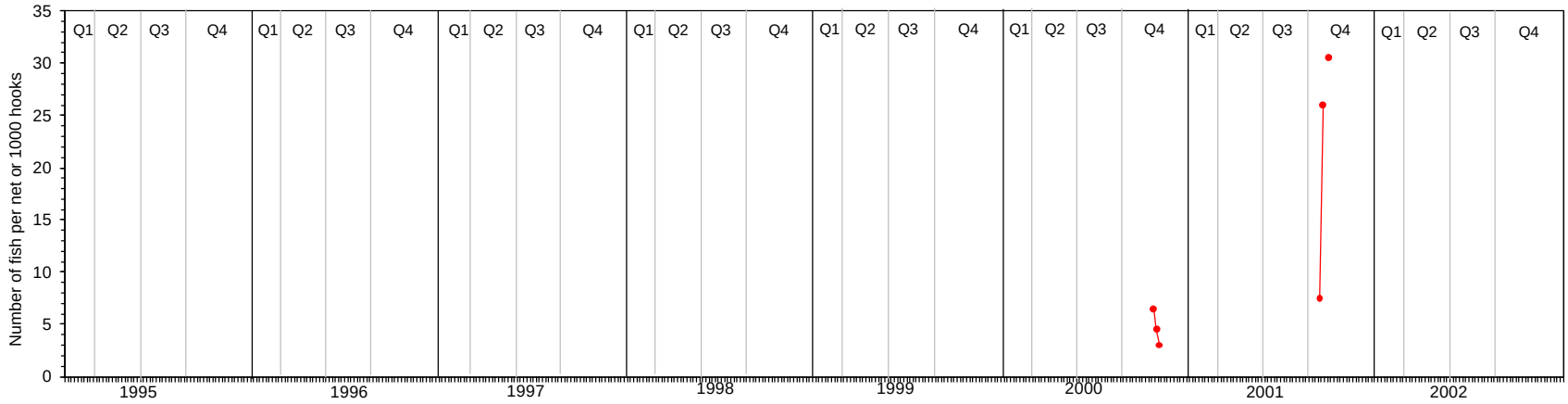


Figure 61. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Little Paradise Gillnet 3 1/4 in.

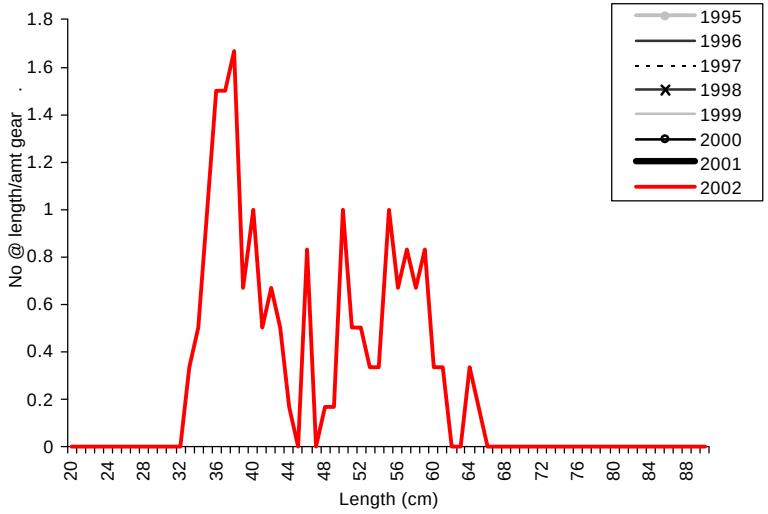


Figure 62. Relative length frequency (number at length / amount of gear) for control and experimental gears, Red Hr Gillnet 3 1/4 in.

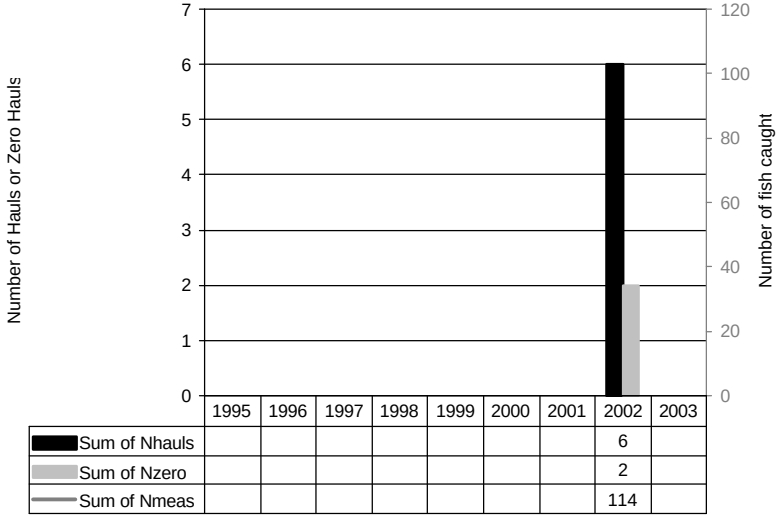


Figure 63. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Red Hr Gillnet 3 1/4 in.

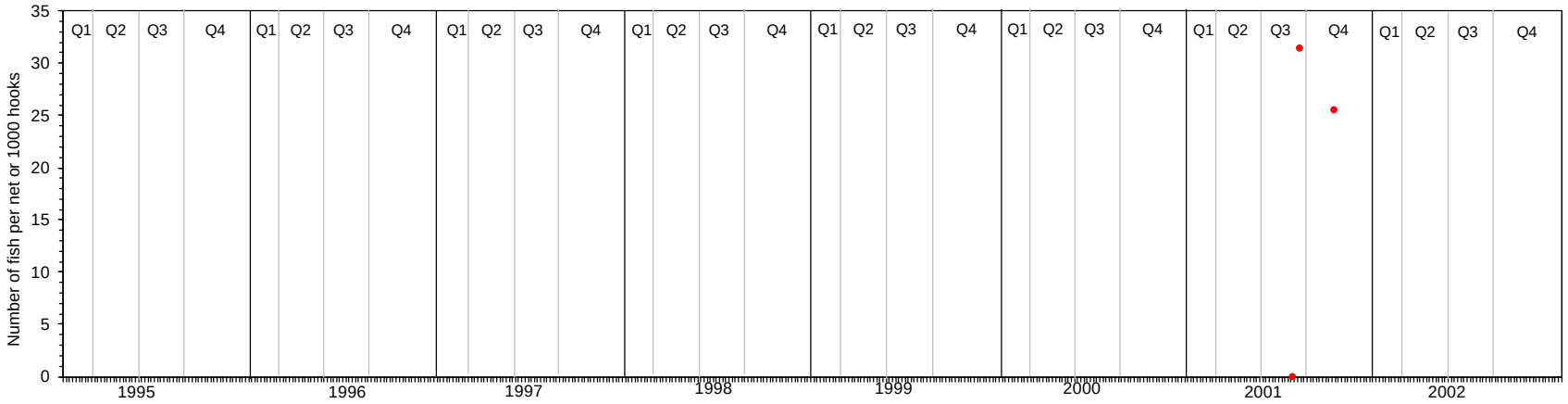


Figure 64. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Red Hr Gillnet 3 1/4 in.

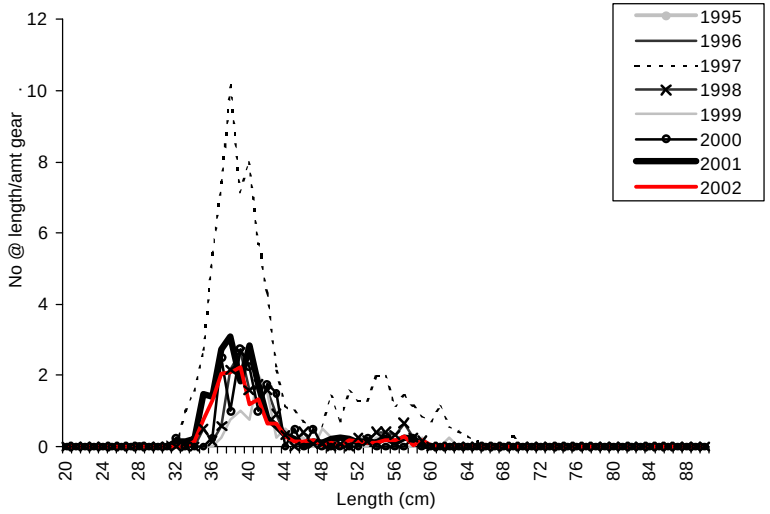
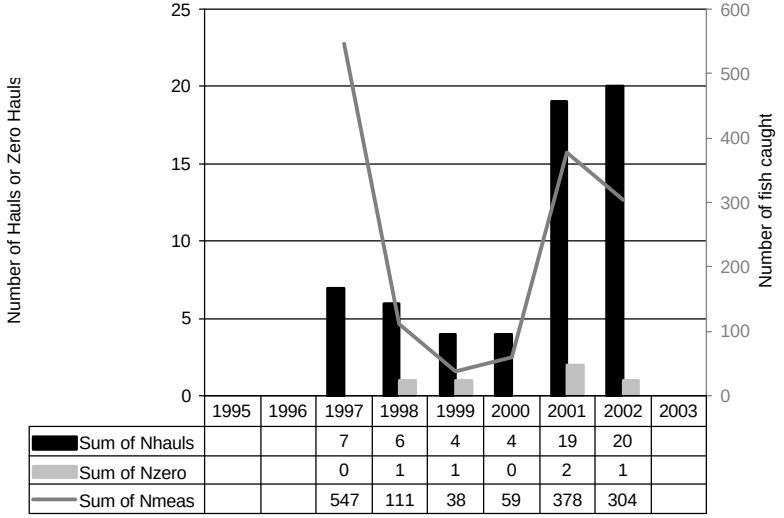


Figure 65. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lawn Gillnet 3 1/4 in.



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls			7	6	4	4	19	20	
Sum of Nzero			0	1	1	0	2	1	
Sum of Nmeas			547	111	38	59	378	304	

Figure 66. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lawn Gillnet 3 1/4 in.

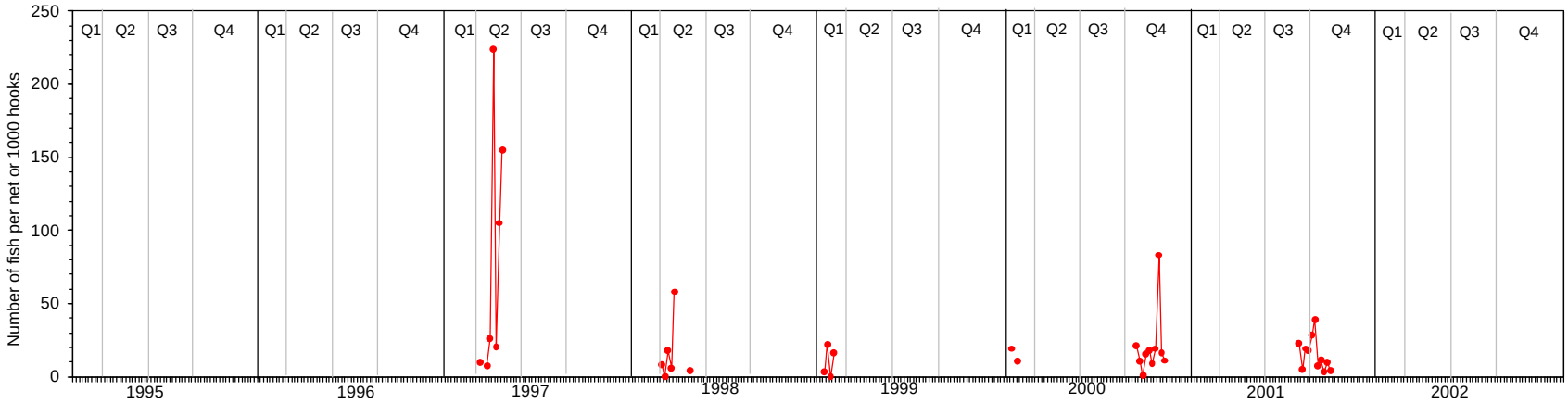


Figure 67. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Lawn Gillnet 3 1/4 in.

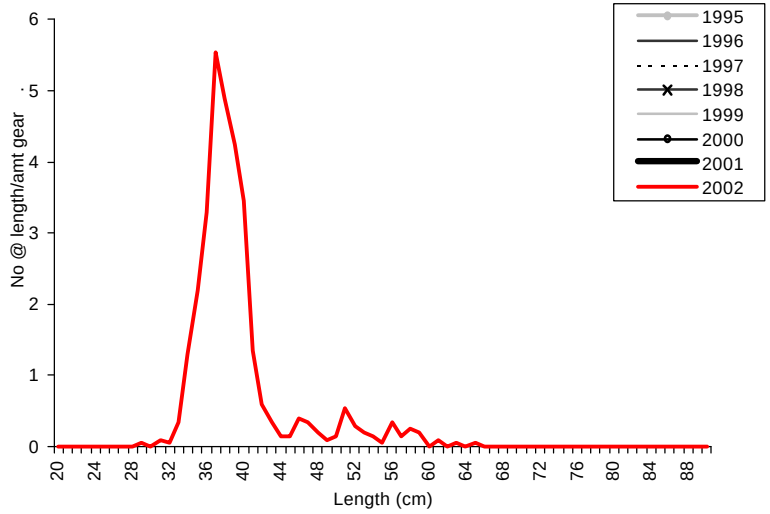


Figure 68. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lord's Cove Gillnet 3 1/4 in.

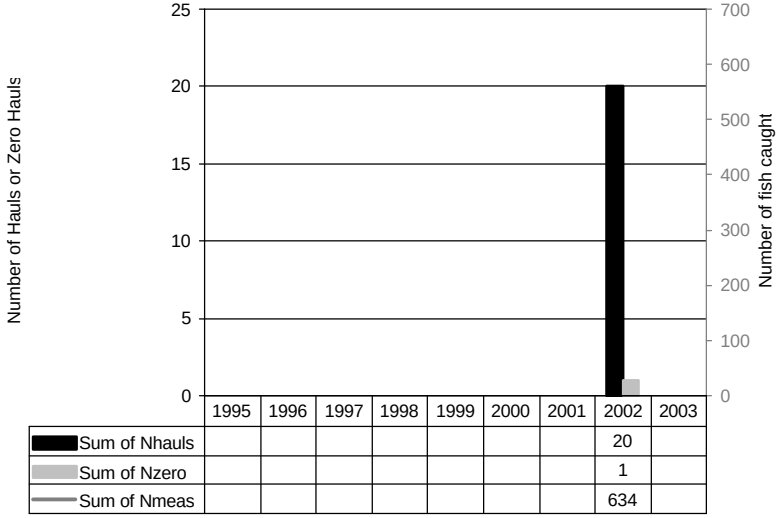


Figure 69. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lord's Cove Gillnet 3 1/4 in.

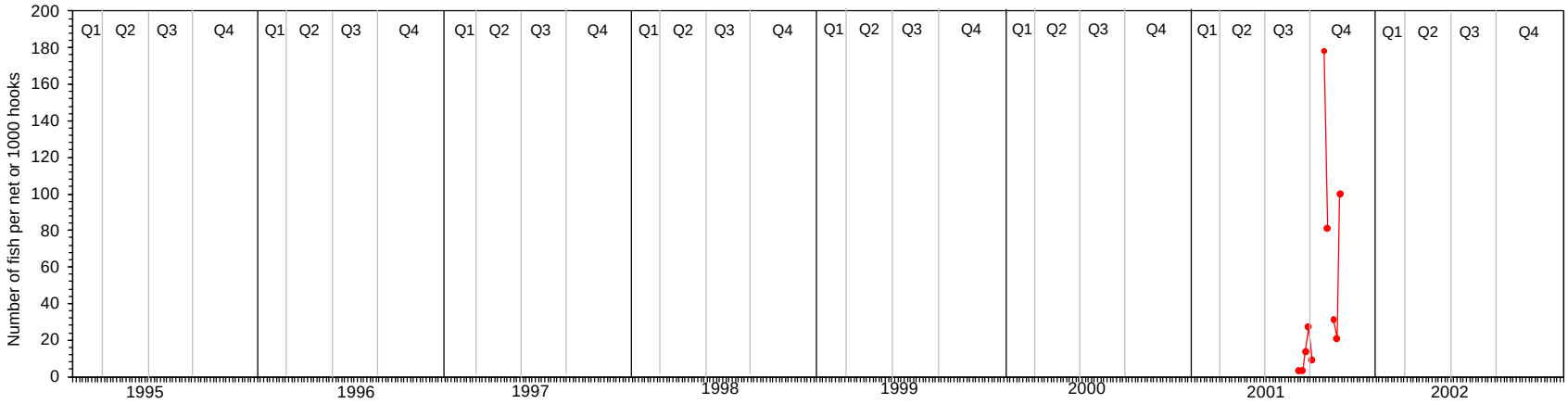


Figure 70. Catch per unit effort (in numbers of fish per net) for all sets (control and experimental) averaged for each week, Lord's Cove Gillnet 3 1/4 in.

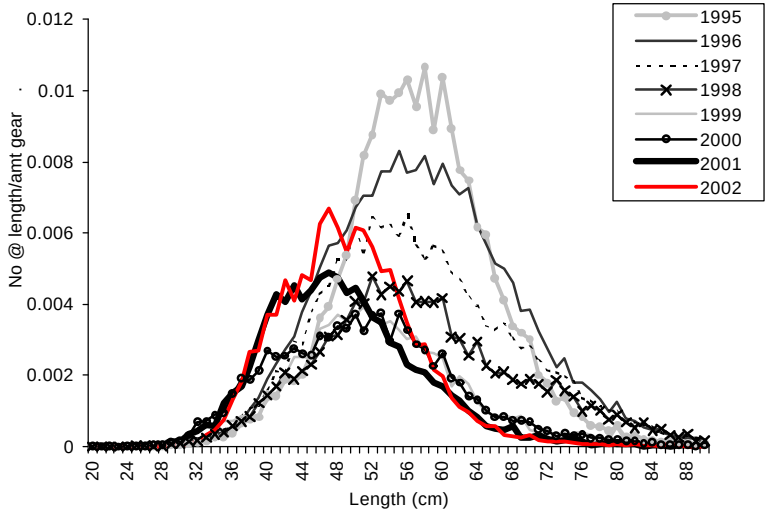
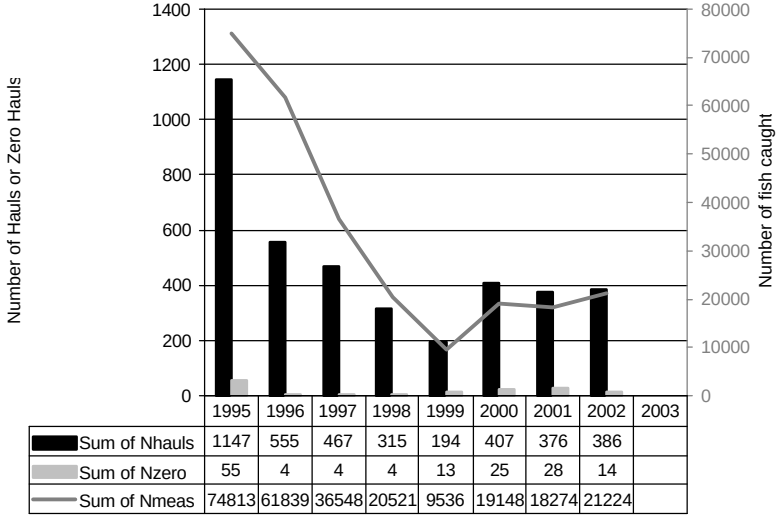


Figure 71. Relative length frequency (number at length / amount of gear) for control and experimental gears, 3Ps Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	1147	555	467	315	194	407	376	386	
Sum of Nzero	55	4	4	4	13	25	28	14	
Sum of Nmeas	74813	61839	36548	20521	9536	19148	18274	21224	

Figure 72. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, 3Ps Linetrawl .

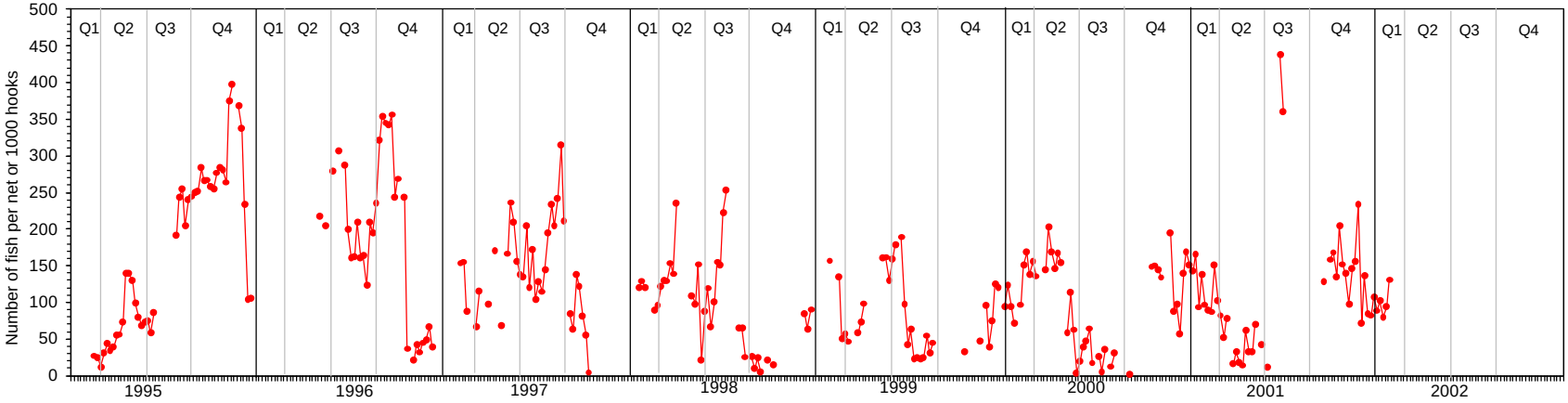


Figure 73. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, 3Ps Linetrawl .

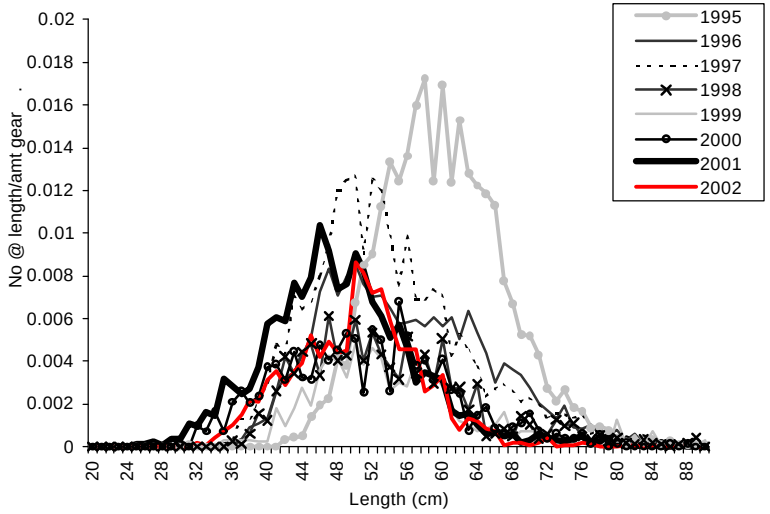
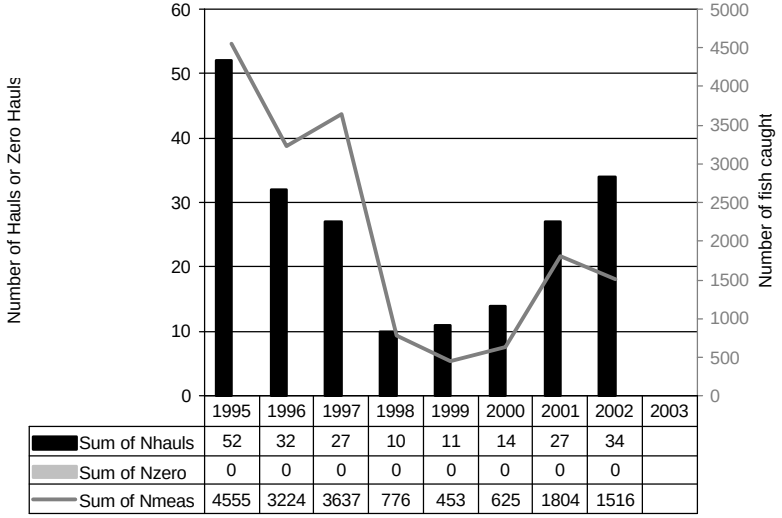


Figure 74. Relative length frequency (number at length / amount of gear) for control and experimental gears, Little Paradise Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	52	32	27	10	11	14	27	34	
Sum of Nzero	0	0	0	0	0	0	0	0	
Sum of Nmeas	4555	3224	3637	776	453	625	1804	1516	

Figure 75. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Little Paradise Linetrawl .

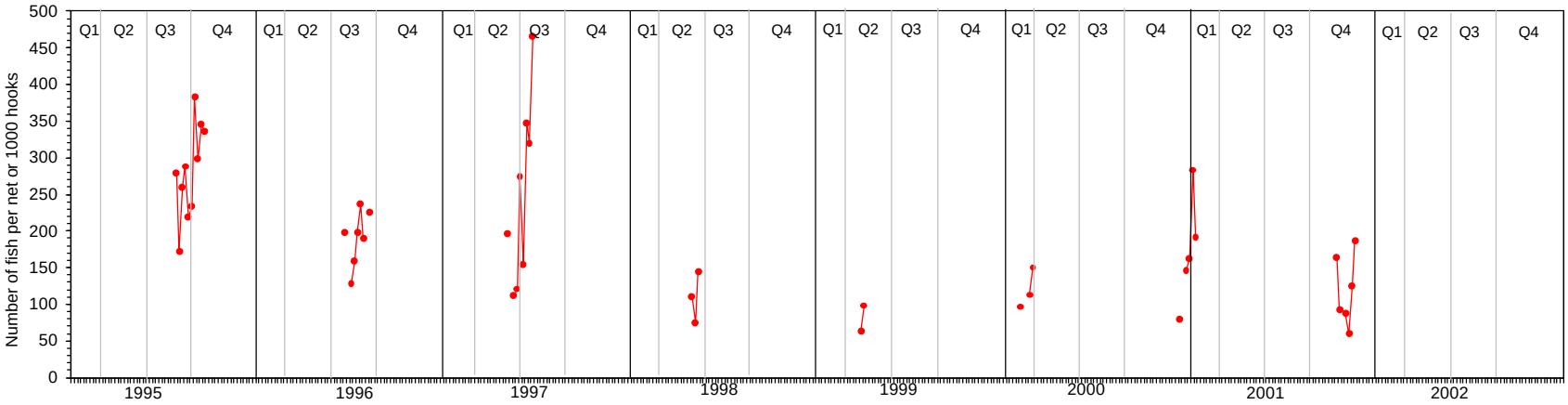


Figure 76. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Little Paradise Linetrawl .

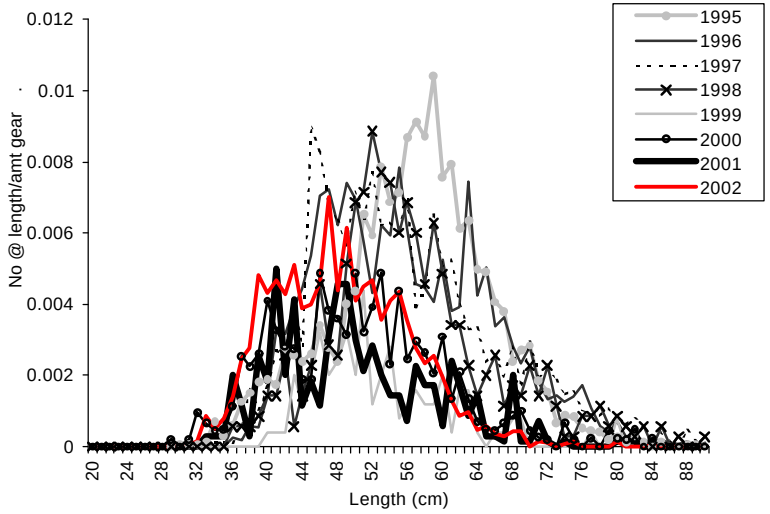
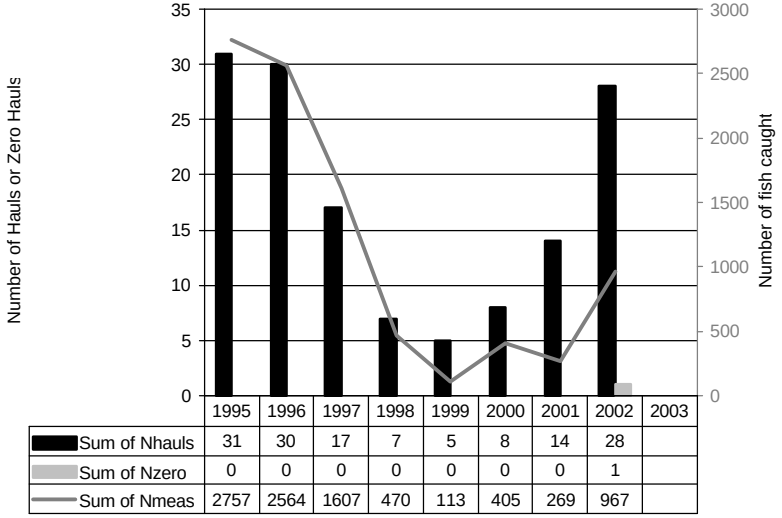


Figure 77. Relative length frequency (number at length / amount of gear) for control and experimental gears, Red Hr Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	31	30	17	7	5	8	14	28	
Sum of Nzero	0	0	0	0	0	0	0	1	
Sum of Nmeas	2757	2564	1607	470	113	405	269	967	

Figure 78. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Red Hr Linetrawl .

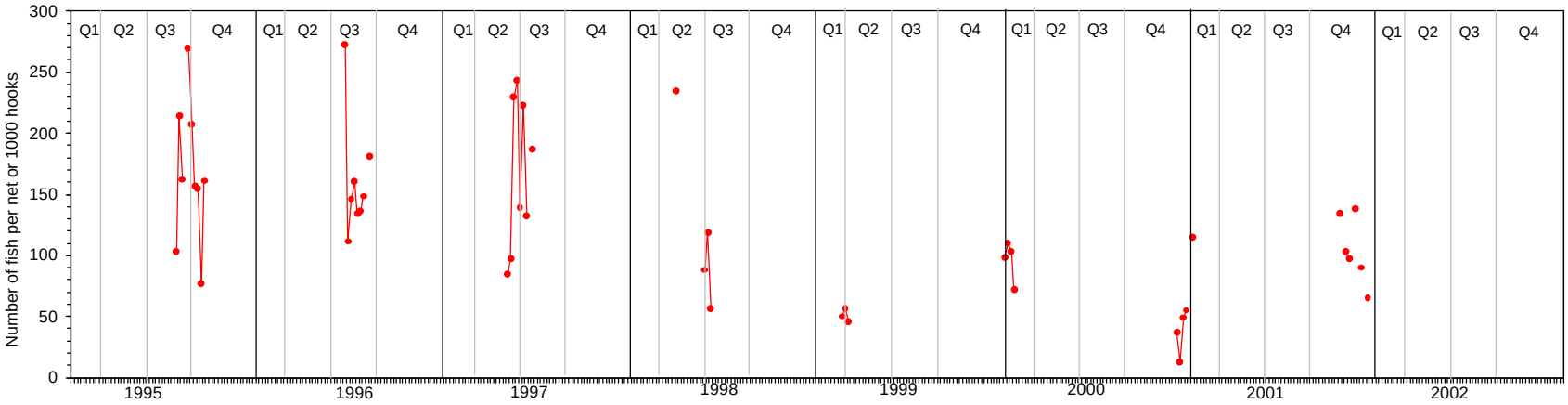


Figure 79. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Red Hr Linetrawl .

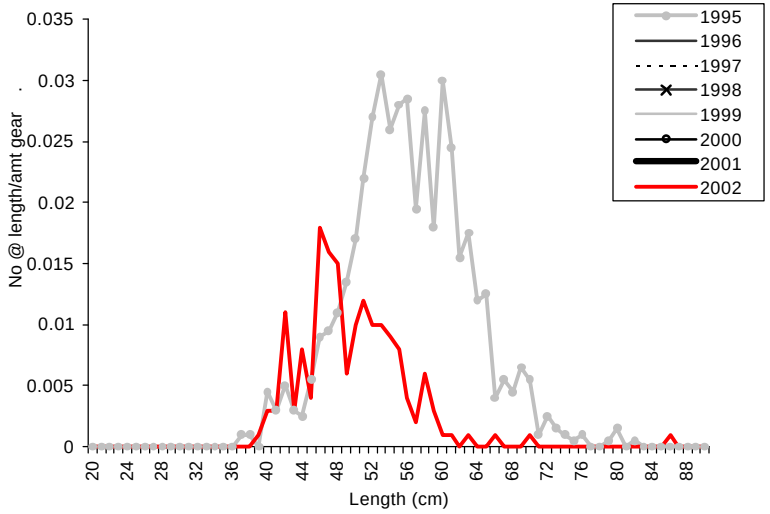


Figure 80. Relative length frequency (number at length / amount of gear) for control and experimental gears, Lord's Cove Linetrawl .

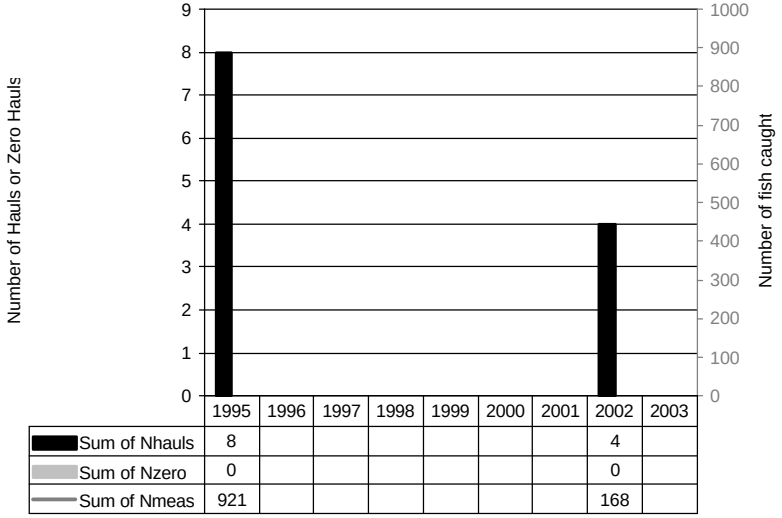


Figure 81. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Lord's Cove Linetrawl .

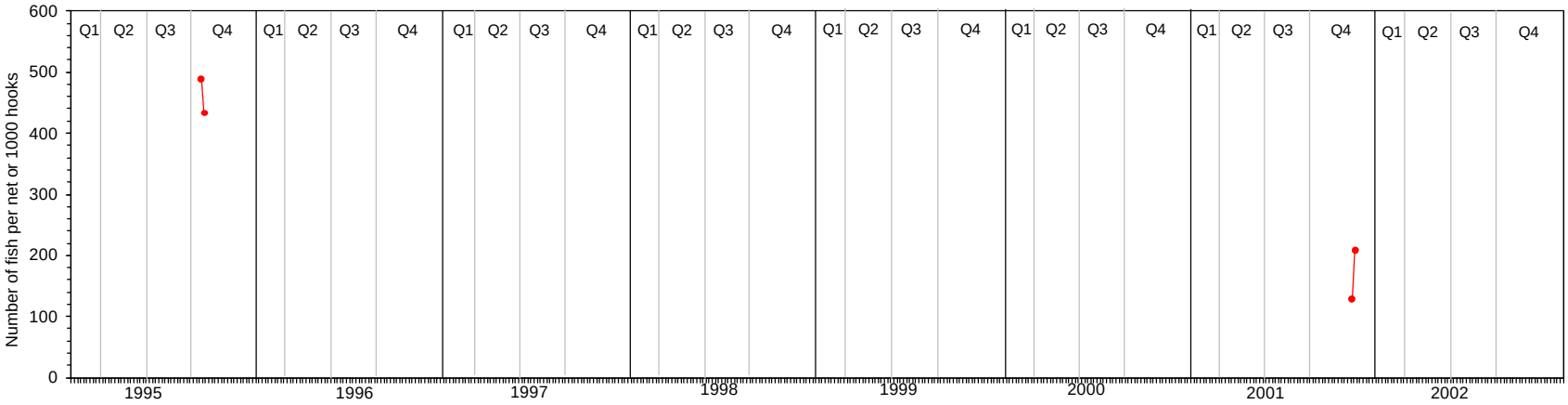


Figure 82. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Lord's Cove Linetrawl .

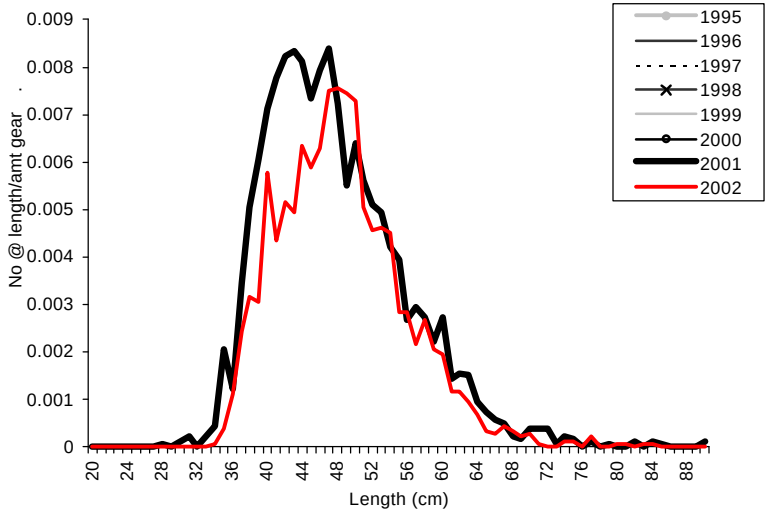


Figure 83. Relative length frequency (number at length / amount of gear) for control and experimental gears, Grand Bank Linetrawl .

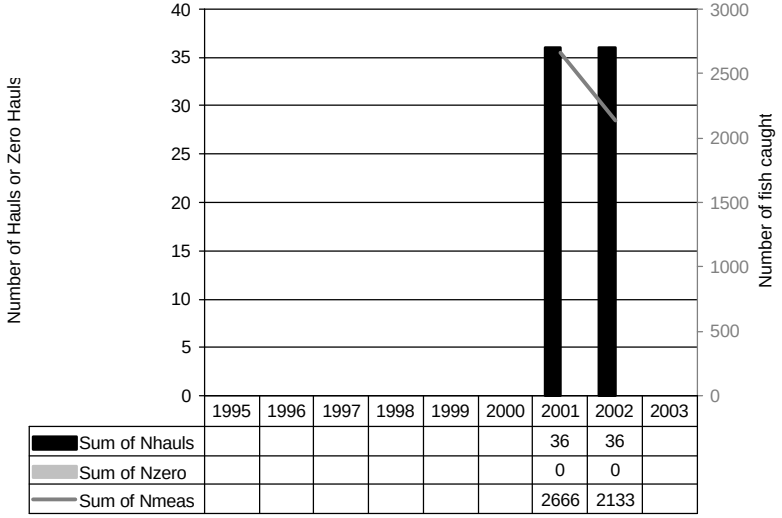


Figure 84. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Grand Bank Linetrawl .

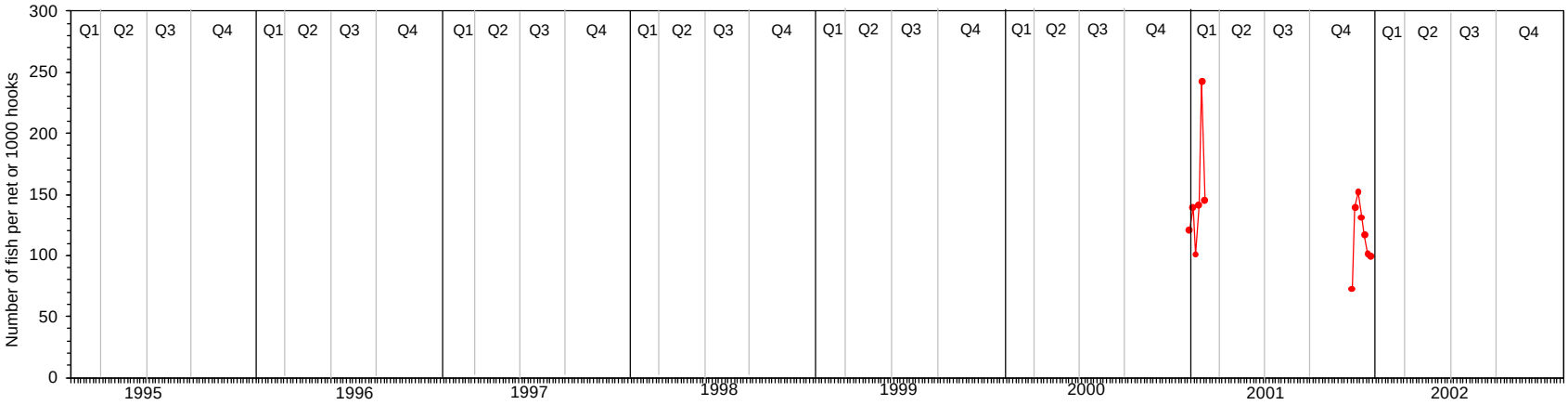


Figure 85. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Grand Bank Linetrawl .

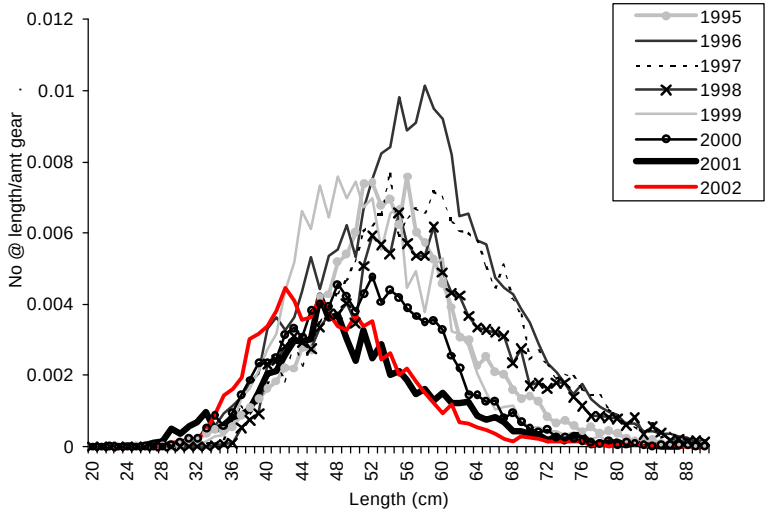
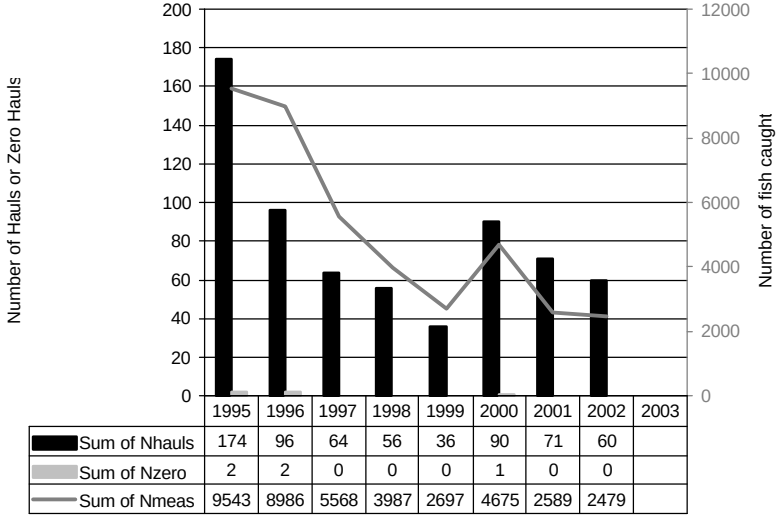


Figure 86. Relative length frequency (number at length / amount of gear) for control and experimental gears, Rencontre East Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	174	96	64	56	36	90	71	60	
Sum of Nzero	2	2	0	0	0	1	0	0	
Sum of Nmeas	9543	8986	5568	3987	2697	4675	2589	2479	

Figure 87. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Rencontre East Linetrawl .

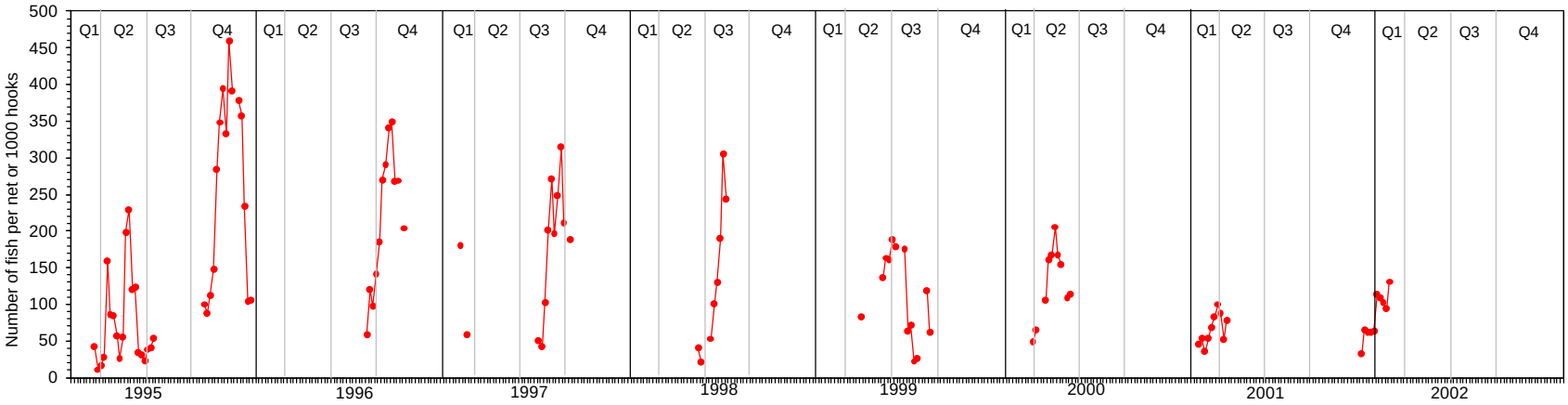


Figure 88. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Rencontre East Linetrawl .

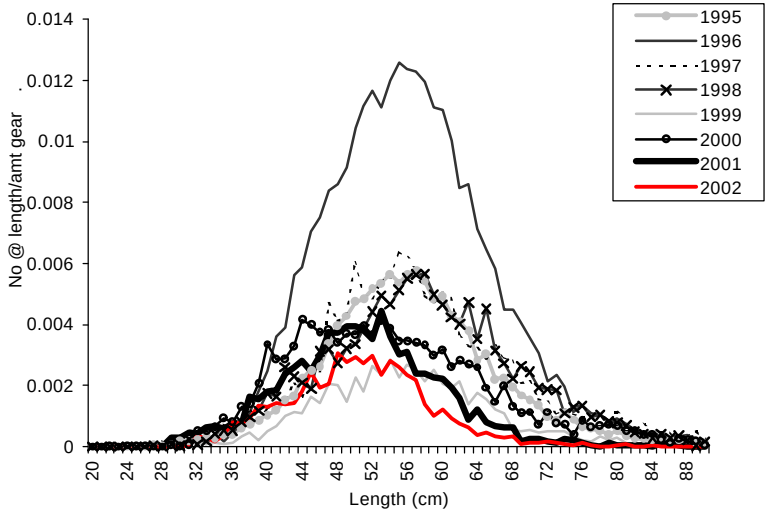
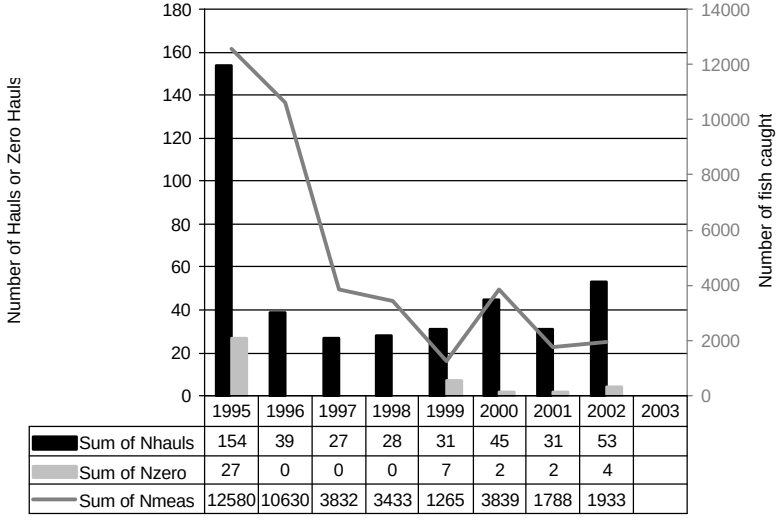


Figure 89. Relative length frequency (number at length / amount of gear) for control and experimental gears, Hr Breton Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	154	39	27	28	31	45	31	53	
Sum of Nzero	27	0	0	0	7	2	2	4	
Sum of Nmeas	12580	10630	3832	3433	1265	3839	1788	1933	

Figure 90. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Hr Breton Linetrawl .

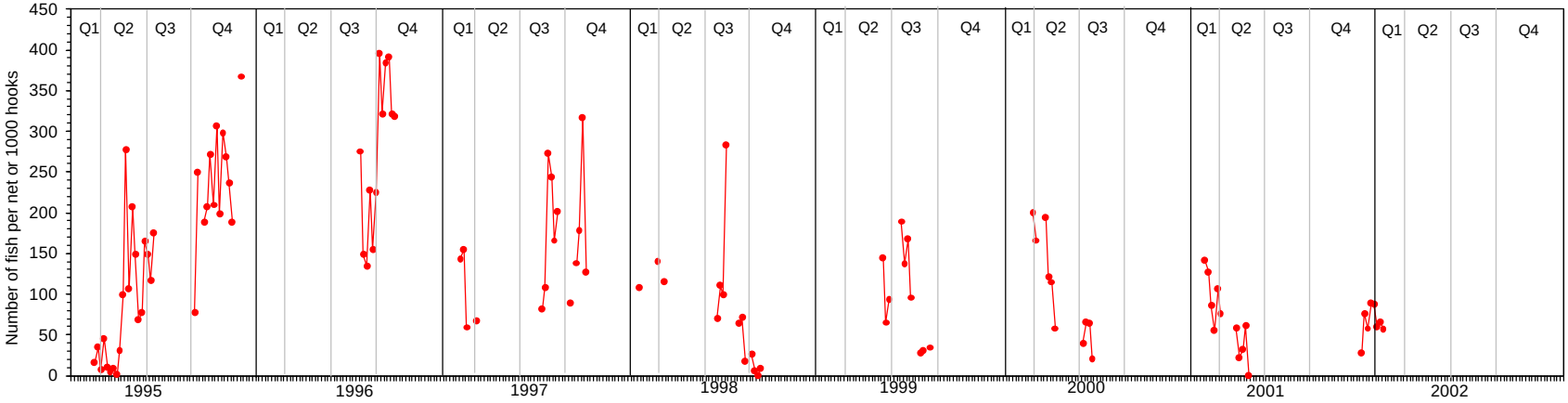


Figure 91. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Hr Breton Linetrawl .

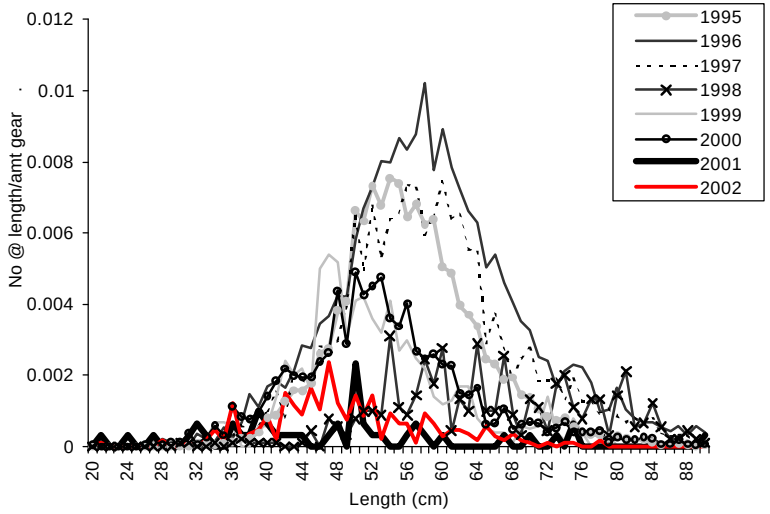
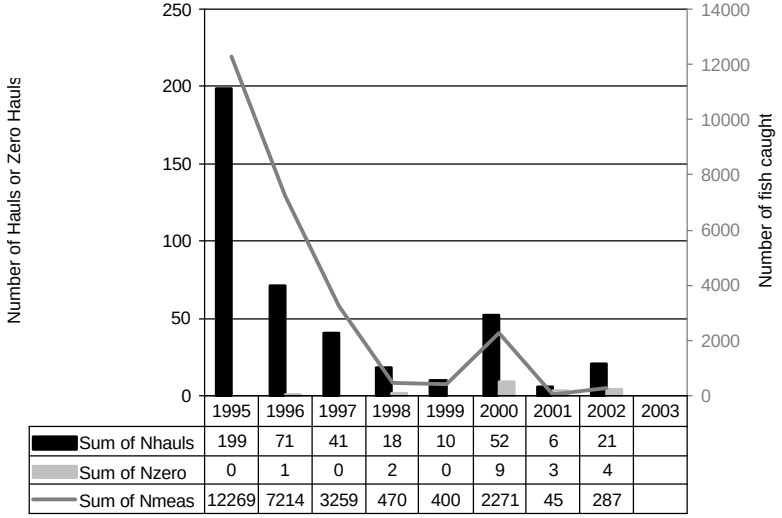


Figure 92. Relative length frequency (number at length / amount of gear) for control and experimental gears, Seal Cove Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	199	71	41	18	10	52	6	21	
Sum of Nzero	0	1	0	2	0	9	3	4	
Sum of Nmeas	12269	7214	3259	470	400	2271	45	287	

Figure 93. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Seal Cove Linetrawl .

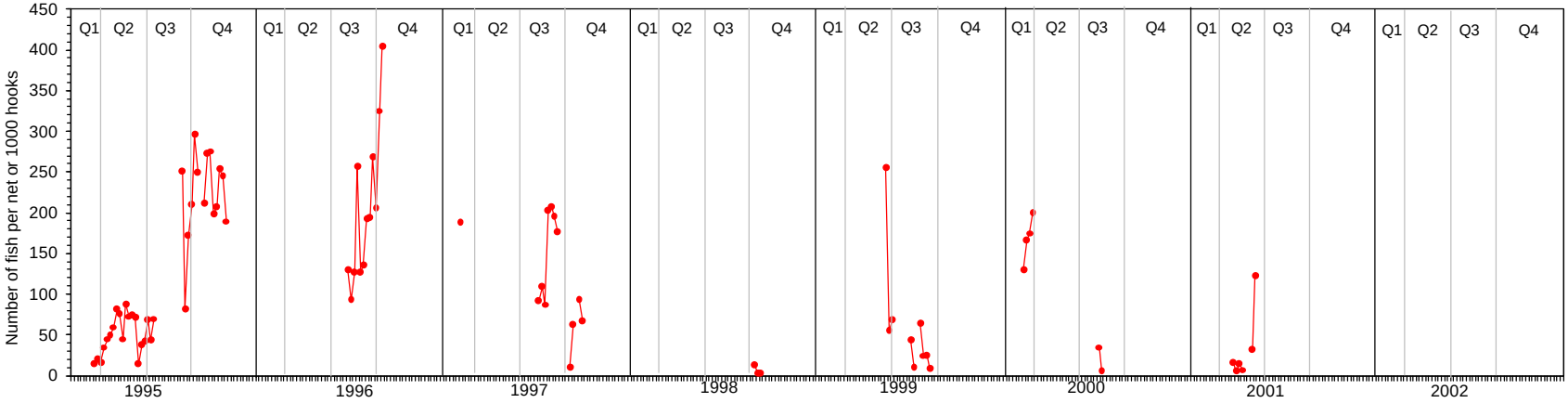


Figure 94. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Seal Cove Linetrawl .

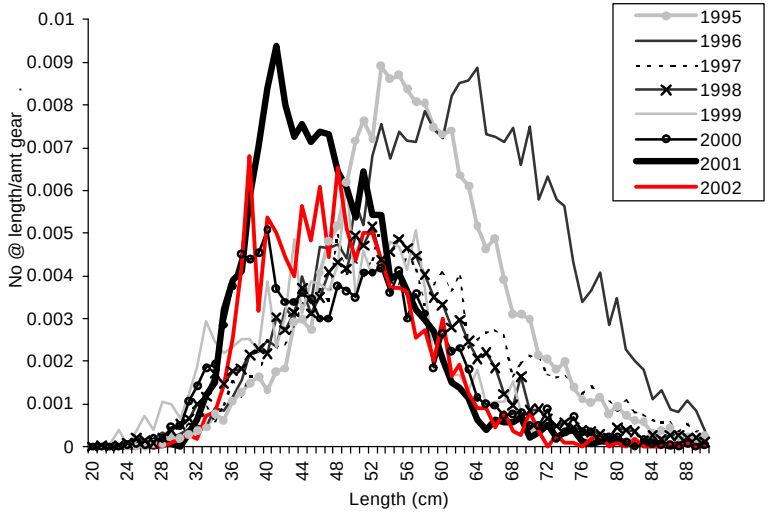
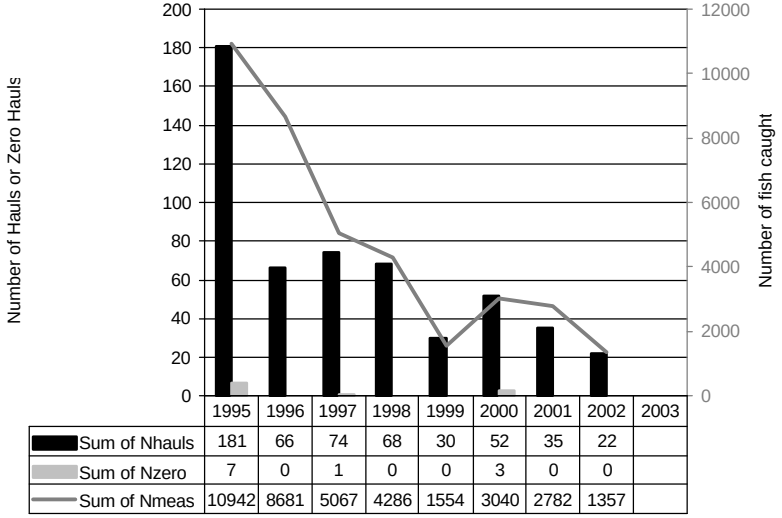


Figure 95. Relative length frequency (number at length / amount of gear) for control and experimental gears, Francois Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	181	66	74	68	30	52	35	22	
Sum of Nzero	7	0	1	0	0	3	0	0	
Sum of Nmeas	10942	8681	5067	4286	1554	3040	2782	1357	

Figure 96. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Francois Linetrawl .

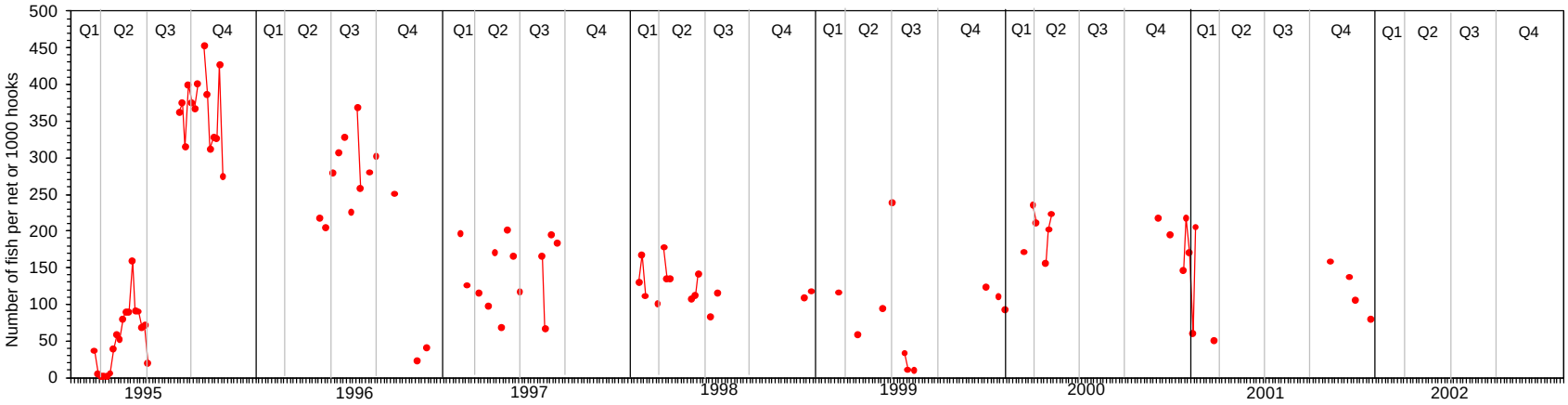


Figure 97. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Francois Linetrawl .

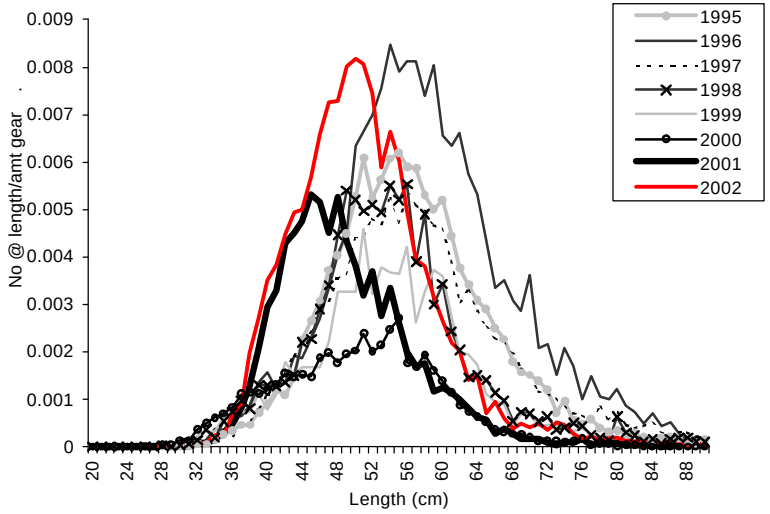
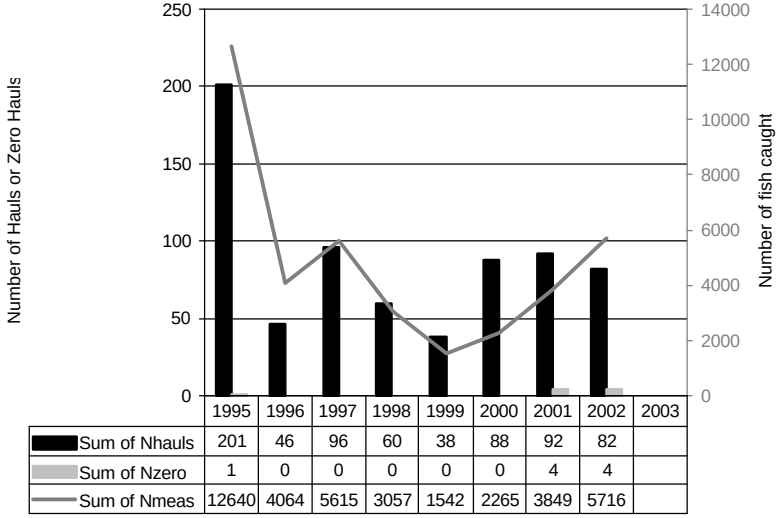


Figure 98. Relative length frequency (number at length / amount of gear) for control and experimental gears, Ramea Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls	201	46	96	60	38	88	92	82	
Sum of Nzero	1	0	0	0	0	0	4	4	
Sum of Nmeas	12640	4064	5615	3057	1542	2265	3849	5716	

Figure 99. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Ramea Linetrawl .

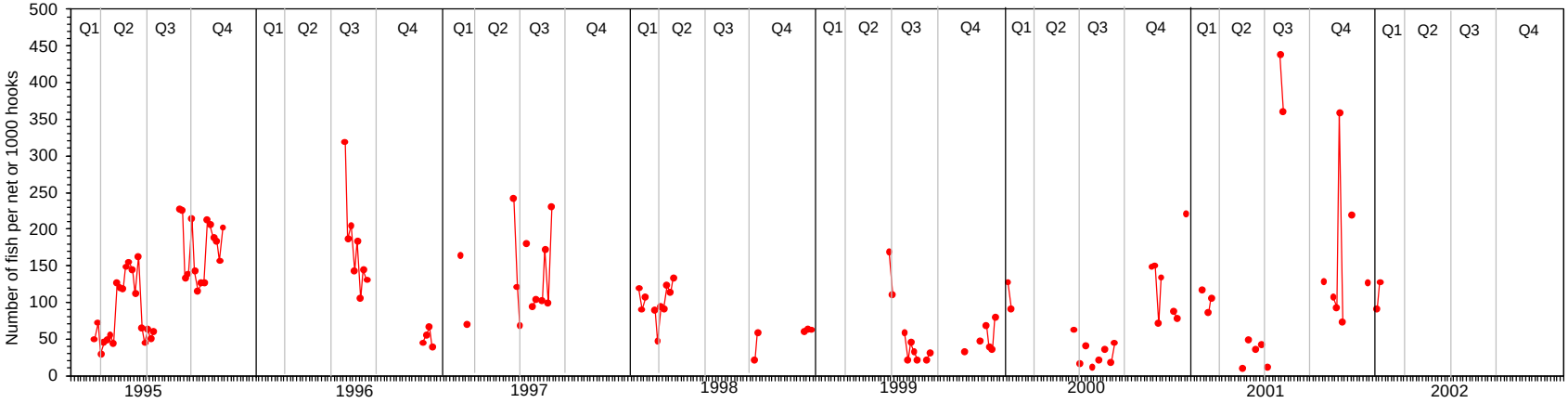


Figure 100. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Ramea Linetrawl .

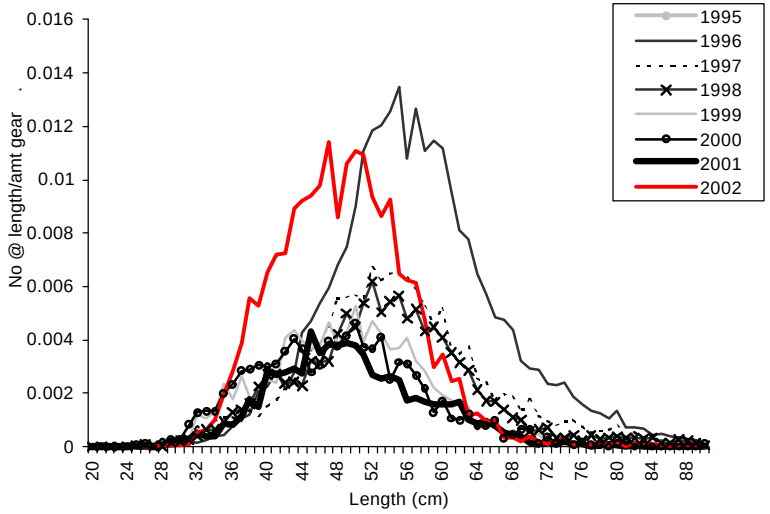
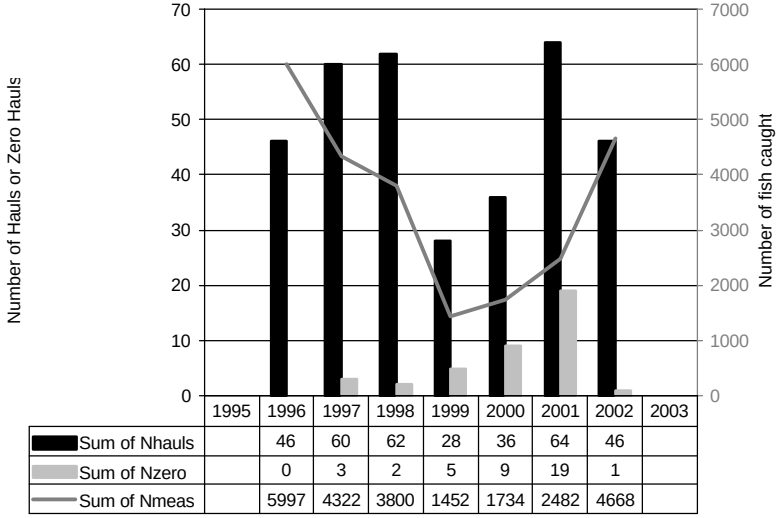


Figure 101. Relative length frequency (number at length / amount of gear) for control and experimental gears, Burgeo Linetrawl .



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sum of Nhauls		46	60	62	28	36	64	46	
Sum of Nzero		0	3	2	5	9	19	1	
Sum of Nmeas		5997	4322	3800	1452	1734	2482	4668	

Figure 102. Number of hauls (Nhauls), number of zero catch hauls (Nzero) and total number of fish caught (Nmeas), for control and experimental gears, Burgeo Linetrawl .

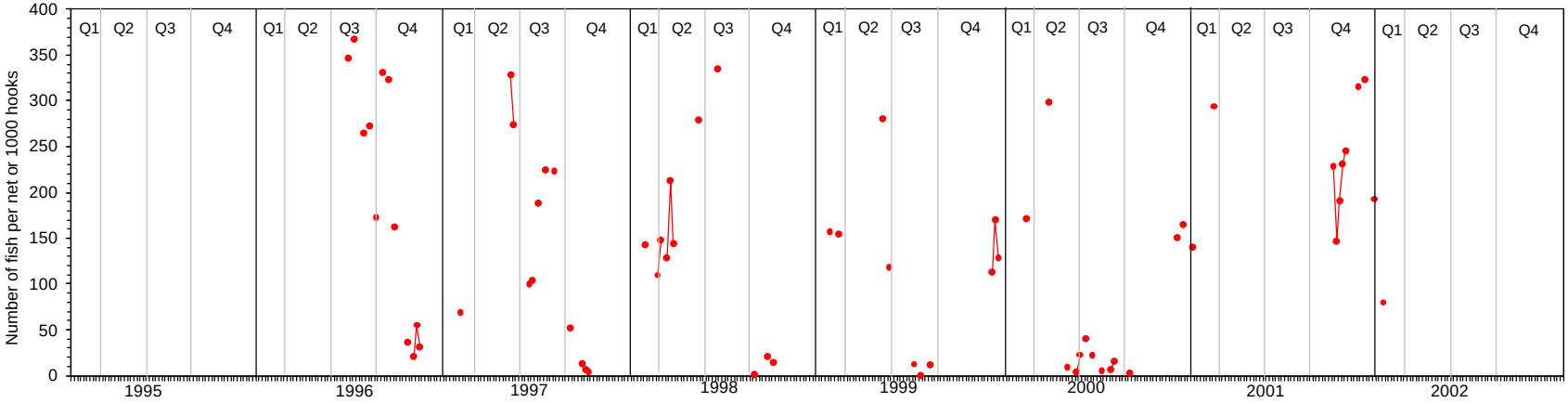


Figure 103. Catch per unit effort (in numbers of fish per 1000 hooks) for all sets (control and experimental) averaged for each week, Burgeo Linetrawl .