

PORTLAND CANAL JUVENILE CHUM
SALMON CODED WIRE TAGGING PROJECT, 1989



By
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TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	iv
LIST OF FIGURES	v
ABSTRACT	vi
INTRODUCTION	1
OBJECTIVES	1
METHODS	1
RESULTS	3
Summary of Fyke Net Catches	3
Summary of Coded Wire Tagging	3
Analysis of Length Weight Data	4
CONCLUSIONS	4

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1.	Summary of the Fish Creek fyke net catches 18 February to 27, May 1990	6
2.	Summary of coded wire tagging of Fish Creek juvenile chum salmon 19 February to 25 May 1990	9
3.	Mean lengths and weights of Fish Creek juvenile chum fry by week, 1990	10

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. The Salmon River drainage showing the Fish Creek tributary	11
2. Fish Creek showing the fyke net and tagging site	12
3. Fish Creek chum fry out-migration by 12 hour count days	13
4. Fish Creek chum fry outmigration by hour February 18 to February 25, 1990	14
5. Fish Creek chum fry outmigration by hour February 27 to March 6, 1990	15
6. Fish Creek chum fry outmigration by hour March 8 to March 15, 1990	16
7. Fish Creek chum fry outmigration by hour March 18 to March 25, 1990	17
8. Fish Creek chum fry outmigration by hour March 27 to April 3, 1990	18
9. Fish Creek chum fry outmigration by hour April 5 to April 12, 1990	19
10. Fish Creek chum fry outmigration by hour April 15 to April 22, 1990	20
11. Fish Creek chum fry outmigration by hour April 24 to May 1, 1990	21
12. Fish Creek chum fry outmigration by hour May 3 to May 10, 1990	22
13. Fish Creek chum fry outmigration by hour May 13 to May 20, 1990	23
14. Fish Creek chum fry outmigration by hour May 22 to May 24, 1990	24

ABSTRACT

Annex IV, Chapter 2 of the Pacific Salmon Treaty identifies specific concerns by both Alaska and Canada for chum salmon (*Oncorhynchus keta*) originating in Portland Canal tributaries. In an effort to learn more about the interception rates, harvest rates, migratory timing and migration routes of these fish a coded wire tagging study was initiated on Fish Creek near Hyder Alaska in 1988.

This report covers the third year of the tagging study. During the 1990 field season a total of 300,694 wild juvenile chum salmon fry were coded wire tagged with half-length tags from 18 February to 25 May 1990. The fry were captured during the evening hours in two fyke nets attached to aluminum holding boxes and tagged the following day. A total of 3,104,843 chum fry and 372,899 pink fry were captured in the nets through the duration of the project. The first adult returns from this tagging project are expected to return in 1990.

INTRODUCTION

The chum salmon (*Oncorhynchus keta*) stocks of southern Southeast Alaska and northern British Columbia have been designated as stocks of special concern to the U.S./Canada Pacific Salmon Treaty. Annex IV, Chapter 2 of the Pacific Salmon Treaty identifies specific concerns by both Alaska and Canada for chum salmon originating in Portland Canal tributaries. These chum salmon stocks contribute to the fisheries of both countries and the effective management of these fisheries requires knowledge of the interception rates, harvest rates, migratory timing and migratory routes.

In an effort to determine these parameters for Portland Canal chum salmon stocks a juvenile coded wire tagging project was initiated on Fish Creek, a tributary of the Salmon River near Hyder Alaska in 1988 (Fig. 1). This report covers the third year of the project.

OBJECTIVES

1. Identify the migratory timing and migration routes of Fish Creek chum salmon by the use of coded wire tagging methodology.
2. Estimate the total rate of exploitation of Fish Creek chum salmon by the gill net and purse seine fisheries in Alaska and the net and troll fisheries of British Columbia.
3. Obtain size, age, sex composition, stream life and migratory timing of the Fish Creek chum salmon escapement.
4. Obtain an estimate of the survival rate of Fish Creek chum salmon.
5. Identify problems in the coded wire tagging of wild juvenile chum salmon fry (tag loss, tagging mortality and straying of tagged fish).

METHODS

A site on Fish Creek approximately 2.4 km upstream from its confluence with the Salmon River was chosen in 1988 as the capture and tagging site as it was easily accessible by road and was below the major spawning areas for chum salmon (Fig. 2). Out-migrant chum fry were captured in two fyke nets attached to 1.5m X 0.9m aluminum holding boxes. The fyke nets were 0.45m by 0.9m and were placed to fish a column of water 0.9m wide. The nets were spaced 4.0m apart and placed in the center of the stream. From 18 February to 22 April, 1.0m high leads of plastic netting (3.2mm mesh) were placed from the fyke nets to the stream banks,

effectively funneling all out-migrant fry into the two nets. The leads were removed due to high water on 25 April and were replaced on 8 May when water levels receded.

The enumeration of the fyke net catches was accomplished by the gravimetric method on 12 hour counting nights. A sub-sample of known weight was enumerated by species and the total weight of the fish captured was then expanded to estimate the total number of pink and chum fry. On nights when the nets were fished only to capture fish for tagging the next day the number of fry was visually estimated. A total of 10,000 to 30,000 fry were held each night for coded wire tagging the following day.

The coded wire tagging operations were conducted in a 7.0m tagging trailer which was parked next to Fish Creek at the fyke net site. The trailer was equipped with a 105 L anesthetic tank, tagging table and laboratory area. The trailer was wired for 110 volt AC current which was supplied by a 3500 watt gasoline generator.

The chum fry were anesthetized with MS-222 (tricaine methanesulfonate) at a concentration of 40 mg/L. Since MS-222 lowers the ph of the water, the solution was buffered with sodium carbonate (Na_2CO_3) back to the ph of Fish Creek water (7.5). To reduce stress, non-iodized salt was added to the solution at a concentration of 0.5% to replace salts lost due to handling, and to stimulate mucus flow. An effort was made to insure that the fry were not left in the anesthetic solution for more than five minutes.

The adipose fins of the chum fry were removed with surgical grade microscissors before being passed on to the tagging machine operator. Only fry that had completely absorbed their yolk sacs were selected for tagging. All pink and coho salmon fry and chum salmon fry with visible yolk sacs were released back into Fish Creek.

The tagging equipment consisted of a Northwest Marine Technology Mark IV tag injector, quality control device and power supply.¹ All chum fry were tagged with half-length coded wire tags.

The quality control device was set up so that fry with tags were routed from the tagging trailer through a 63.5mm diameter pipe and out to a holding pen in Fish Creek. If the quality control device did not detect a tag, the device routed the fry into a bucket. These fry were then passed through the device again and if they did not register a tag the second time they were returned to the tagging machine operator and re-tagged.

At the end of the tagging day the tagged chum fry were held in holding pens and released during the late evening hours. Tagged fish mortalities were recorded at the time of release. Tag retention samples were also conducted at this time. A random sample of 200 fry was passed through the quality control device each

¹ Mention of trade names does not constitute endorsement by ADF&G.

night and the number of fry without tags were recorded. Tag retention percentages and tagged fish mortalities were then used to calculate the total number of valid tags released.

A total of 200 chum fry were sampled for length and weight each week. The fry were measured to the nearest 0.05mm and weighed to the nearest 0.001g.

RESULTS

Summary of Fyke Net Catches

The numbers of fry captured in the fyke nets are summarized in Table 1. A graph of the bi-weekly 12 hour counts is presented in Fig. 3. The decision was made in 1988 to only attempt exact estimates of out-migrant fry every other night using the gravimetric method. On Sunday and Thursday nights the nets were fished for a 12 hour period (1800 to 0600 hours) and on Tuesday nights the nets were fished for a four to six hour period two to three hours before and after the last nights peak count. On the other nights the nets were fished only long enough to capture a sufficient number of chum fry for tagging the next day. On these nights the counts were made by visual estimation. During the study period the nets were fished for a total of 746.0 hours and captured a total of 3,104,843 chum salmon fry and 372,899 pink salmon fry.

The nightly out-migration did not commence until after dark, between 1800 and 1900 hours. Peak fry movement was between 2000 and 2400 with an occasional smaller peak between 0200 and 0600 hours. The out-migration usually ceased by 0600 hours. Figures 4-14 are graphs of the net catches, by hour, for the nights that 12 hour and 4 hour counts were made.

Since chum fry were captured the first night the nets were set in Fish Creek (17 February) it was once again obvious that the out-migration had been underway for a number of days prior to our arrival in Hyder. It is difficult to determine a peak period of out-migration as the plastic mesh wings, which were funneling all of the fry into the nets, were removed on 22 April due to high stream-flows.

Catches increased steadily through March, and peak catches occurred on 1 April and 5 April with counts in excess of 200,000. Catch rates declined during mid May and the nets were removed on 28 May.

Summary of Coded Wire Tagging

Tagging at Fish Creek commenced on 19 February. A summary of the tagging is presented in Table 2. Problems with tag placement and tag retention continued to plague this project. Experimenting with different head molds, needles, tag

injectors and machine operators helped to obtain an overall tag retention rate of 95.0%. Tagging related mortalities was again low at only 0.2%. In order to spread the tagging over the duration of the out-migration, we established a tagging goal of 5,000 tags per day. The total goal for this year was 300,000 tags released. The crew continued to tag until 25 May. The total number of tags released for the season was 300,694. The first adult returns from the 1990 tagging are expected in 1992 as ocean age 3 fish.

Analysis of Length Weight Data

The mean lengths and weights, by week, are summarized in Table 3. The weekly mean lengths and weights for the 1990 season ranged from 37.5mm to 40.1mm and 0.335g to 0.407g, respectively. The overall mean lengths and weights of Fish Creek chum fry were 38.75mm and 0.381g, respectively.

CONCLUSIONS

This was the third year of a proposed six year study designed to determine the interception rates, harvest rates, migratory timing, and migration routes of Portland Canal chum salmon stocks by the use of coded wire tagging methodology. During the first two years of the Fish Creek project 145,870 and 224,539 chum fry, respectively, were tagged with half-length tags. Due to the continued success of this project, the tagging goal for 1990 was increased to 300,000. In spite of various problems with the tagging equipment the tagging goal was reached, with 300,649 valid tags being released into Fish Creek. It is recommended that the tagging goal for the 1991 season remain at 300,000.

The capture method for 1990 was identical to the previous years, when two fyke nets, attached to aluminum holding boxes, were anchored in mid stream. Plastic Vexar wings were attached from the nets to the stream banks and remained in place until they were removed due to high water. The 1990 catches of 3,104,843 chum fry and 372,899 pink fry were similar to the 1989 catches with the noted exception that the project was in operation 15 days longer than in 1989, and the nets were fished an additional 208 hours. In spite of the increased fishing time required to catch the fry, it appears that the eggs deposited in Fish Creek in 1989 experienced good overwinter survival.

During the first two years of this project, tag placement and tag retention were problems that had to be confronted on a daily basis. Close attention to head molds, needle points, cutter edges, and drive roller condition was necessary. In spite of these problems, overall tag retention increased to 95% from 94% in 1989 and 92% in 1988. Other prerequisites for a successful tagging operation included surgical grade fin clipping microscissors and a properly prepared anesthetic solution. As in 1988 and 1989, tagging-induced mortalities were in

the range of 0.2%; a direct result of paying close attention to tag placement and monitoring of the anesthetic solution.

The overall mean length and weight of the Fish Creek chum fry in 1990 showed little difference from 1988 and 1989, with the possible exception of a slight increase in length and weight during the weeks of 11 March to 24 March (Table 3). The overall mean length in 1990 was 38.75mm, a slight decrease from 39.7mm in 1988 and 39.0mm in 1989. The overall mean weight of the fry in 1990 was 0.381, down slightly from 0.390 for both 1988 and 1989.

Adult chum salmon from these three years of tagging should enter the U.S. and Canadian fisheries and return to Fish Creek to spawn starting in 1990. The first adults will be ocean age 3 fish from the 1988 tagging, with 4 and 5 year old fish returning in 1991 and 1992, respectively. Returning adults from the 1989 to 1991 tagging will continue to enter the fisheries and return to Fish Creek through 1995. Tag recoveries from the fisheries of both countries and from Fish Creek should provide much needed information for the effective management of the Portland Canal chum salmon stocks.

Table 1. Summary of the Fish Creek Fyke Net Catches 18 February to 27 May, 1990.

Date	Chum Fry		Pink Fry		Coho Fry		Dolly Varden		Total Hours Fyke Nets Fished	Enumeration Method
	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative		
02/18	1,440	1,440	18	18			6	6	13	Gravimetric
02/19	1,000	2,440	100	118			3	9	13	Visual
02/20	1,600	4,040	150	268			4	13	13	Visual
02/21	2,000	6,040	300	568			4	17	13	Visual
02/22	2,383	8,423	98	666			9	26	13	Gravimetric
02/23	1,728	10,151	72	738			0	26	13	Gravimetric
02/24	Nets Not Fished									
02/25	3,130	13,281	116	854	7	7	7	33	13	Gravimetric
02/26	1,950	15,231	50	904	2	9	6	39	13	Visual
02/27	3,000	18,231	200	1,104	1	10	7	46	13	Visual
02/28	3,000	21,231	200	1,304	0	10	1	47	13	Visual
03/01	7,250	28,436	343	1,647	2	12	3	50	13	Gravimetric
03/02	7,000	35,436	300	1,947	0	12	0	50	13	Visual
03/03	Nets Not Fished									
03/04	9,278	44,714	538	2,485	3	15	7	57	13	Gravimetric
03/05	7,000	51,714	400	2,885	1	16	4	61	13	Visual
03/06	6,000	57,714	400	3,285	0	16	1	62	13	Visual
03/07	7,000	64,714	400	3,685	2	18	11	73	13	Visual
03/08	9,849	74,563	479	4,164	15	33	11	84	13	Gravimetric
03/09	Nets Not Fished									
03/10	Nets Not Fished									
03/11	18,453	93,016	1,438	5,602	12	45	0	84	13	Gravimetric
03/12	18,000	111,016	1,400	7,002	1	46	0	84	5	Visual
03/13	26,948	137,964	1,899	8,901	11	57	1	85	5	Gravimetric
03/14	14,000	151,964	1,000	9,901	2	59	2	87	5	Visual
03/15	53,429	205,393	3,909	13,810	5	64	1	88	12	Gravimetric
03/16	Nets Not Fished									
03/17	Nets Not Fished									
03/18	78,656	284,049	3,187	16,997	3	67	0	88	12	Gravimetric
03/19	Nets Not Fished									
03/20	22,310	306,359	73	17,732	5	72	1	89	5	Gravimetric
03/21	20,000	326,359	750	18,482	10	82	0	89	5	Visual
03/22	59,269	385,728	4,176	22,658	15	97	3	92	12	Gravimetric
03/23	22,000	407,728	2,000	24,658	22	119	0	92	5	Visual
03/24	Nets Not Fished									
03/25	115,001	522,729	13,469	38,127	4	123	0	92	12	Gravimetric
03/26	18,000	540,729	750	38,877	0	123	0	92	5	Visual
03/27	81,866	622,595	9,673	48,550	0	123	0	92	5	Gravimetric
03/28	24,000	646,595	2,976	51,526	2	125	0	92	5	Visual
03/29	181,786	828,381	25,734	77,260	4	129	0	92	12	Gravimetric
03/30	Nets Not Fished									
03/31	Nets Not Fished									
04/01	213,721	1,042,102	34,718	111,978	14	143	0	92	12	Gravimetric
04/02	30,000	1,072,102	3,720	115,698	13	156	1	93	5	Visual
04/03	127,299	1,199,401	7,403	123,101	12	168	0	93	5	Gravimetric
04/04	25,000	1,224,401	5,000	128,101	13	181	0	93	5	Visual
04/05	205,275	1,429,676	49,686	177,787	44	225	8	101	12	Gravimetric

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Table 1. (page 2 of 3.)

Date	Chum Fry		Pink Fry		Coho Fry		Dolly Varden		Total Hours		Enumeration Method
	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Fyke Nets	Fished	
04/06	Nets Not Fished										
04/07	Nets Not Fished										
04/08	168,993	1,598,669	15,552	193,339	52	277	0	101	12		Gravimetric
04/09	50,000	1,648,669	5,000	198,339	17	294	0	101	5		Visual
04/10	123,044	1,771,713	11,375	209,714	32	326	4	105	5		Gravimetric
04/11	50,000	1,821,713	5,000	214,714	5	331	0	105	5		Visual
04/12	136,392	1,958,105	12,810	227,524	104	435	0	105	12		Gravimetric
04/13	Nets Not Fished										
04/14	Nets Not Fished										
04/15	61,507	2,019,612	13,746	241,270	29	464	3	108	13		Gravimetric
04/16	30,000	2,049,612	5,000	246,270	12	476	0	108	7		Visual
04/17	76,995	2,126,607	17,188	263,458	11	487	3	111	7		Gravimetric
04/18	45,000	2,171,607	7,500	270,958	3	490	0	111	7		Visual
04/19	115,714	2,287,321	12,274	283,232	15	505	0	111	12		Gravimetric
04/20	Nets Not Fished										
04/21	Nets Not Fished										
04/22	21,833	2,309,154	4,315	287,547	13	518	1	112	13		Gravimetric
04/23	30,000	2,339,154	5,000	292,547	9	527	2	114	13		Visual
04/24	55,264	2,394,418	10,860	303,407	41	568	0	114	5		Gravimetric
04/25	30,000	2,424,418	5,000	308,407	11	579	3	117	5		Visual
04/26	75,944	2,500,362	4,881	313,288	24	603	6	123	13		Gravimetric
04/27	Nets Not Fished										
04/28	Nets Not Fished										
04/29	65,098	2,565,460	17,944	331,282	19	622	0	123	13		Gravimetric
04/30	40,000	2,605,460	8,000	339,282	4	626	0	123	6		Visual
05/01	38,806	2,644,266	10,755	350,037	15	641	0	123	8		Gravimetric
05/02	30,000	2,674,266	6,000	356,037	10	651	0	123	7		Visual
05/03	17,008	2,691,274	2,544	358,581	16	667	0	123	13		Gravimetric
05/04	Nets Not Fished										
05/05	Nets Not Fished										
05/06	22,028	2,713,302	1,139	359,720	6	673	0	123	13		Gravimetric
05/07	50,000	2,763,302	2,500	362,220	11	684	0	123	6		Visual
05/08	70,592	2,833,894	3,717	365,937	23	707	0	123	9		Gravimetric
05/09	40,000	2,873,894	2,000	367,937	32	739	0	123	6		Visual
05/10	54,297	2,928,191	828	368,765	48	787	0	123	13		Gravimetric
05/11	Nets Not Fished										
05/12	Nets Not Fished										
05/13	30,727	2,958,918	780	369,545	16	803	0	123	13		Gravimetric
05/14	6,000	2,964,918	300	369,845	17	820	0	123	6		Visual
05/15	22,840	2,987,758	593	370,438	38	858	0	123	6		Gravimetric
05/16	20,000	3,007,558	500	370,938	0	858	0	123	6		Visual
05/17	17,886	3,025,644	398	371,336	64	922	0	123	13		Gravimetric
05/18	15,000	3,040,644	400	371,736	40	962	0	123	6		Visual
05/19	15,000	3,055,644	400	372,136	0	962	0	123	6		Visual
05/20	6,640	3,062,284	140	372,276	130	1,092	0	123	13		Gravimetric
05/21	5,000	3,067,284	75	372,351	97	1,189	0	123	6		Visual
05/22	7,280	3,074,564	123	372,474	68	1,257	0	123	7		Gravimetric
05/23	5,000	3,079,564	75	372,549	40	1,297	0	123	6		Visual

--continued--

Table 1. (page 3 of 3)

Date	Chum Fry		Pink Fry		Coho Fry		Dolly Varden		Total Hours Fyke Nets Fished	Enumeration Method
	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative		
05/24	9,779	3,089,343	150	372,699	173	1,470	0	123	13	Gravimetric
05/25	7,500	3,096,843	100	372,799	0	1,470	0	123	13	Visual
05/26	7,500	3,104,343	100	372,899	0	1,470	0	123	13	Visual
05/27	500	3,104,843	0	372,899	0	1,470	0	123	13	Visual
Total		3,104,843		372,899		1,470		123	746	

Table 2. Summary of the coded wire tagging of Fish Creek juvenile chum salmon 19 February to 25 May 1990.

Date	CWT Code	Number Tagged	Mortalities	Tag Retention	Valid Tags Released
2/19-3/14	04-01-01-11-01	34,467	73	92.5%	31,814
3/14-3/26	04-01-01-11-02	38,081	100	96.9%	36,804
3/26-4/04	04-01-01-11-03	38,779	125	93.1%	35,987
4/04-4/13	04-01-01-11-04	38,285	78	94.6%	36,218
4/13-4/23	04-01-01-11-05	40,528	35	97.8%	39,602
4/23-5/02	04-01-01-11-06	39,054	45	94.9%	37,020
5/02-5/11	04-01-01-11-07	38,919	56	90.1%	35,016
5/11-5/22	04-01-01-11-08	38,313	96	95.1%	36,344
5/23-5/25	04-01-01-11-09	12,065	128	99.6%	11,889
Totals		318,491	736	95.0%	300,694

Table 3. Mean lengths and weights of Fish Creek juvenile chum fry by week, 1990.

Week	Mean Length	Mean Weight	Sample Size
2/18-2/24	38.30	0.383	200
2/25-3/03	39.20	0.398	250
3/04-3/10	39.25	0.404	200
3/11-3/17	40.15	0.407	250
3/18-3/24	39.45	0.407	200
3/25-3/31	39.30	0.391	200
4/01-4/07	38.70	0.384	200
4/08-4/14	38.45	0.372	200
4/15-4/21	38.70	0.383	200
4/22-4/28	38.70	0.388	200
4/29-5/05	38.10	0.361	200
5/06-5/12	37.90	0.354	200
5/13-5/19	38.05	0.367	200
5/20-5/26	38.15	0.349	200
5/27-5/28	37.45	0.335	100
OVERALL MEAN	38.75	0.381	3,000

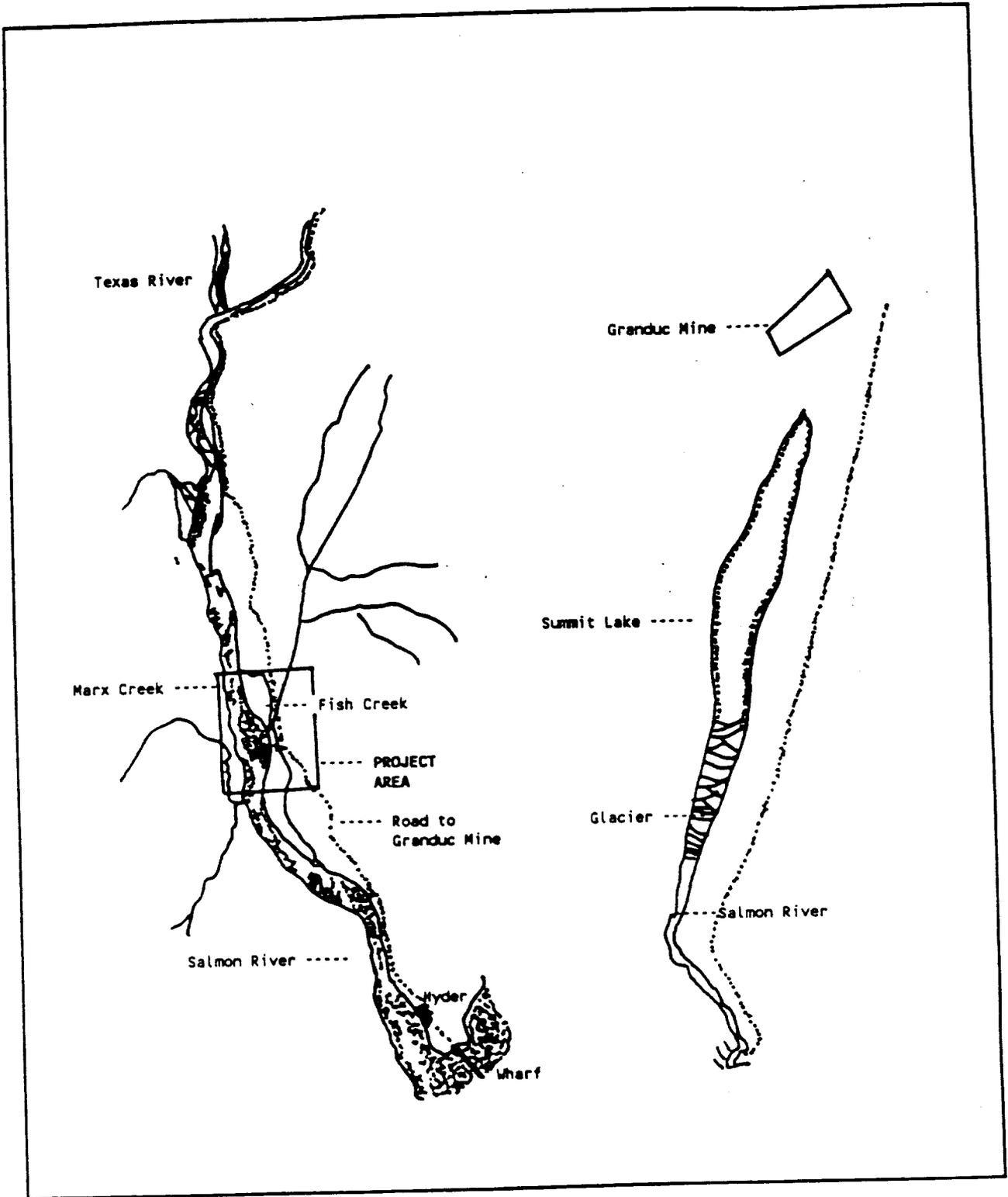


Figure 1. The Salmon River drainage showing the Fish Creek tributary.

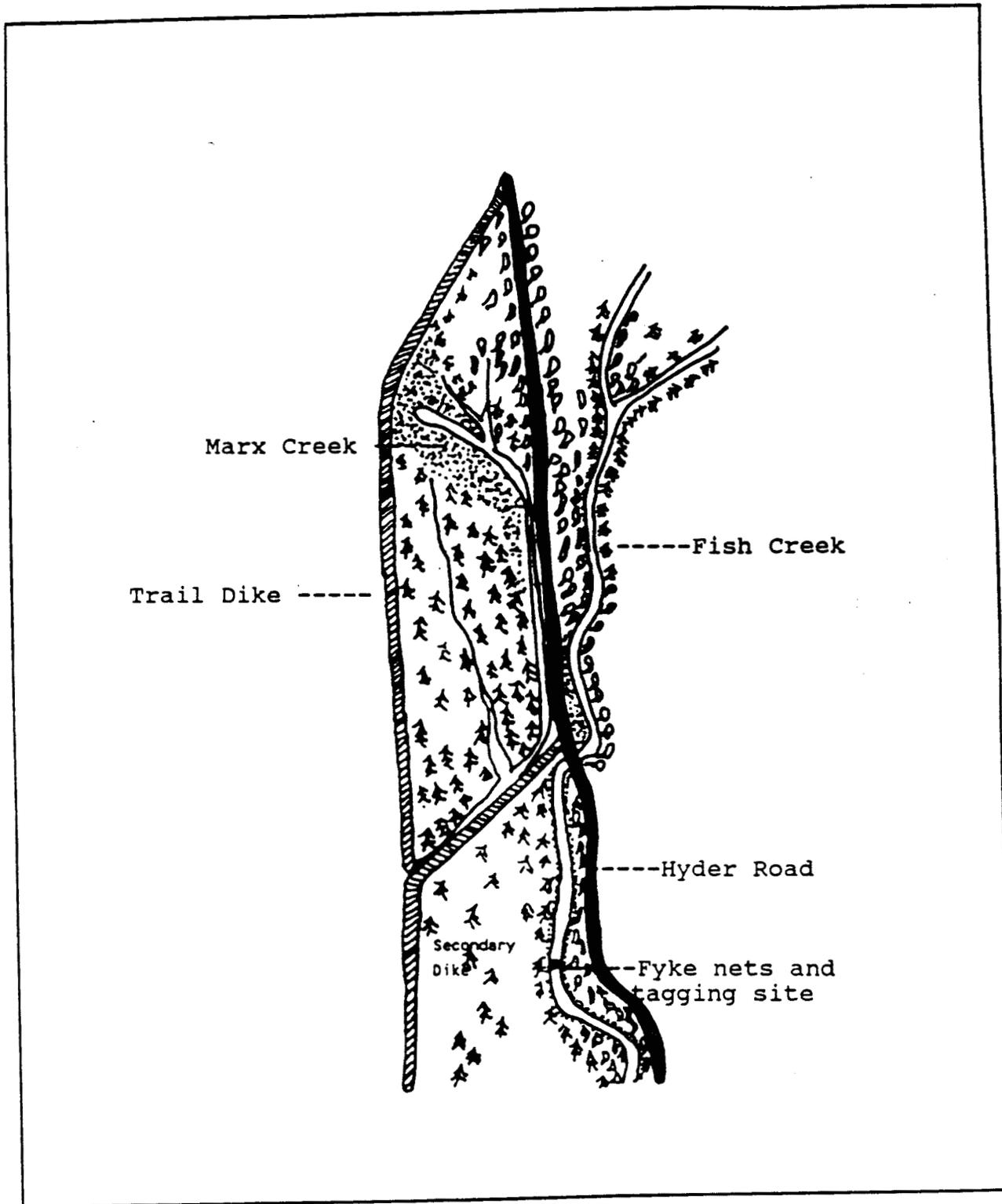


Figure 2. Fish Creek showing the fyke net and tagging site.

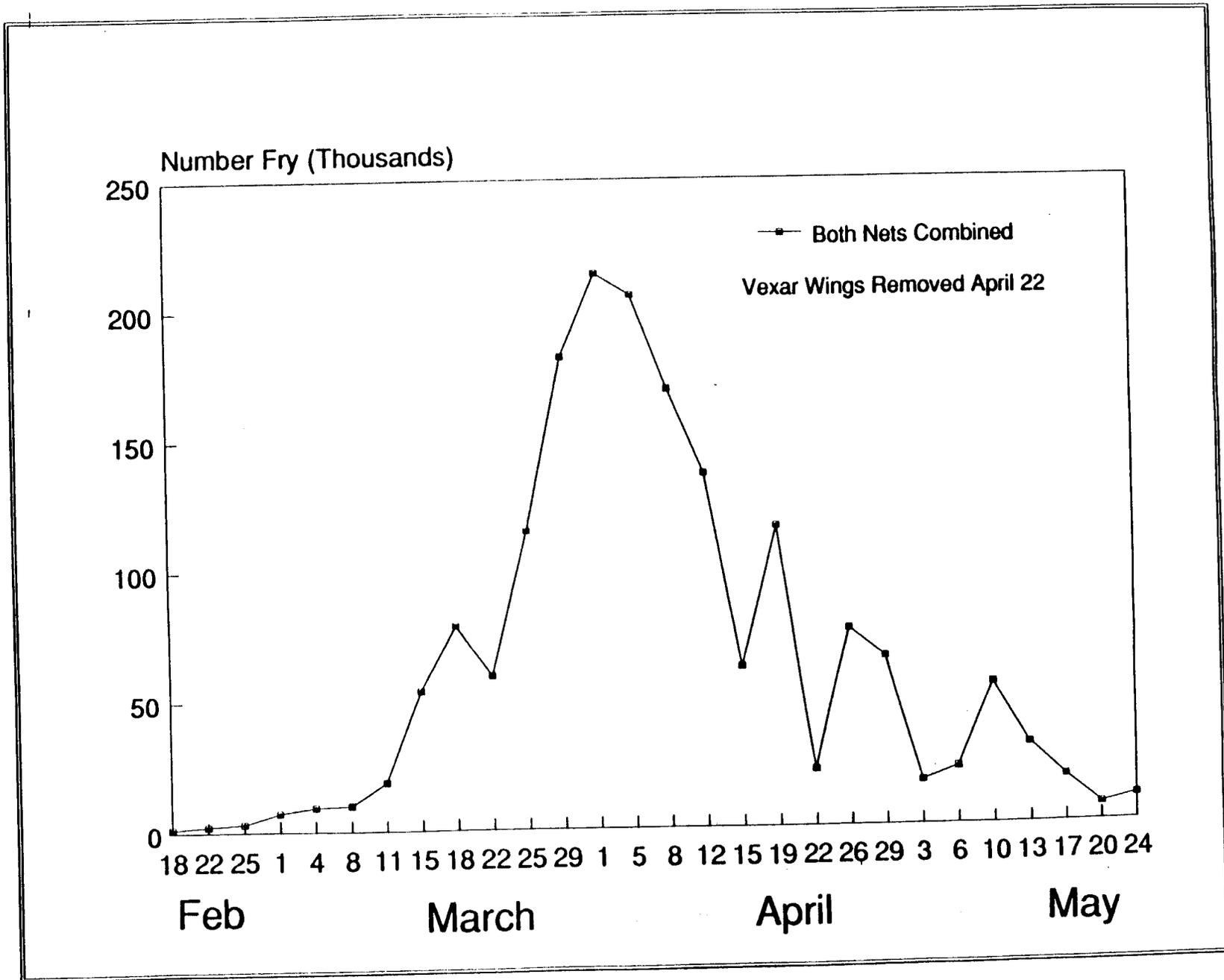


Figure 3. Fish Creek chum fry out-migration by 12 hour count days.

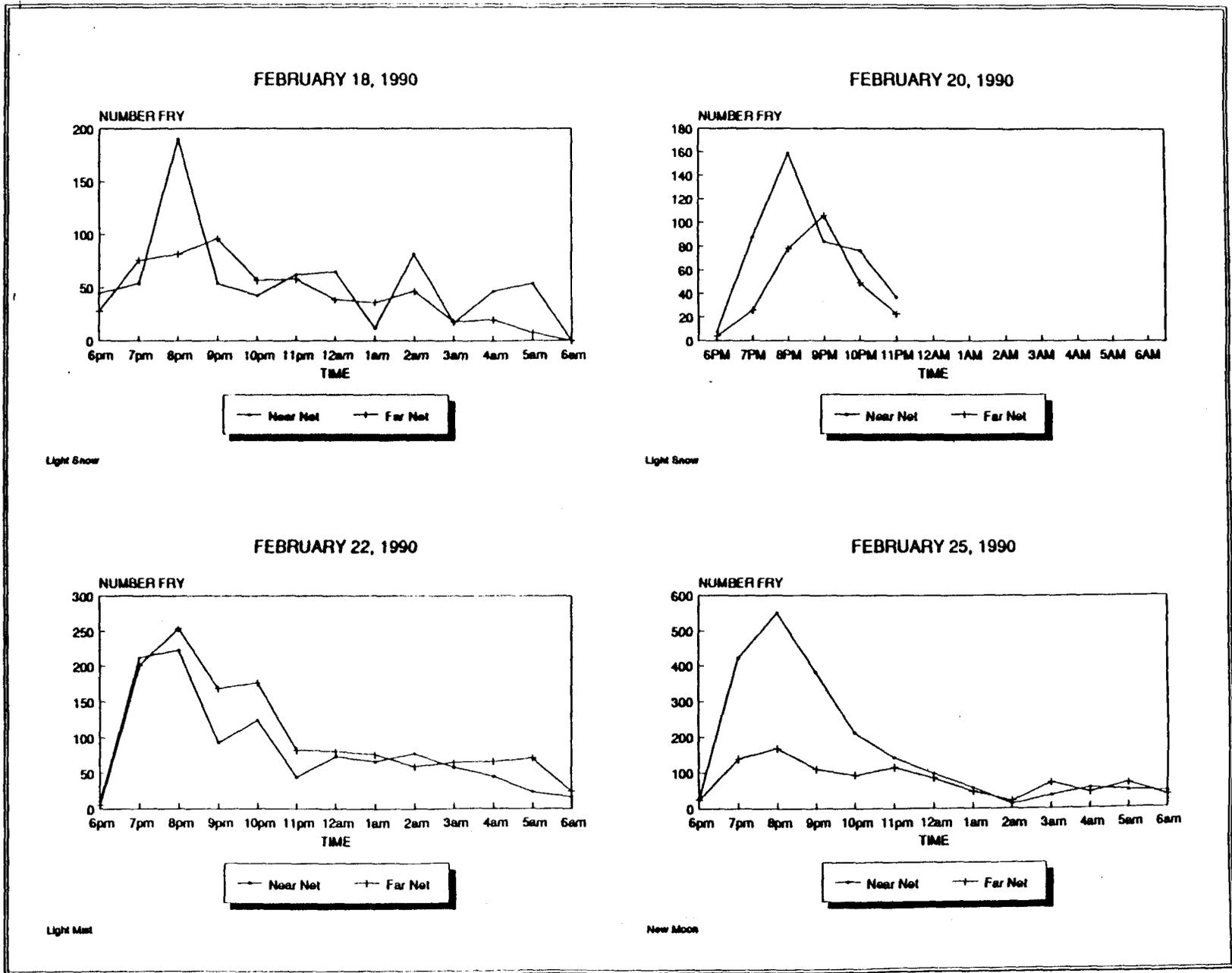
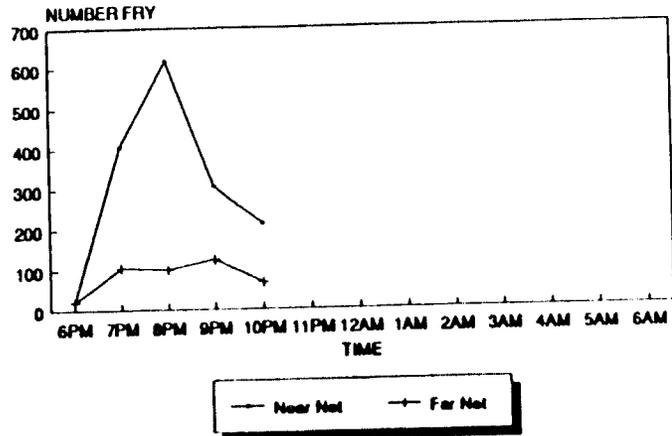


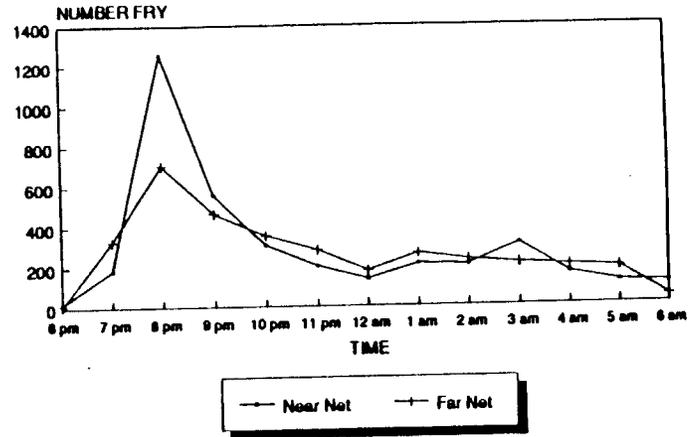
Figure 4. Fish Creek chum fry outmigration by hour February 18 to February 25, 1990.

FEBRUARY 27, 1990



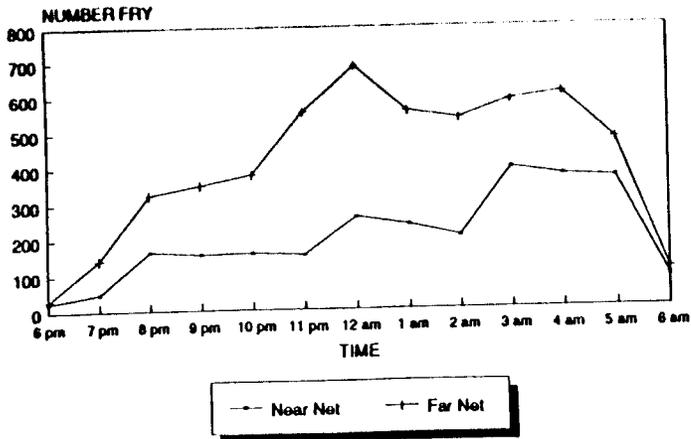
Partly Cloudy

MARCH 1, 1990



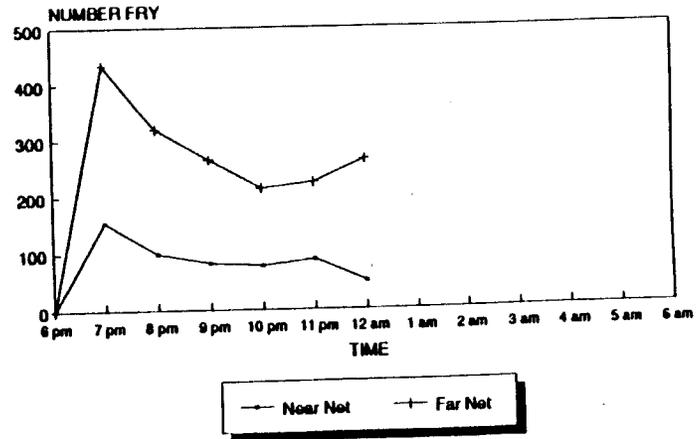
High Overcast

MARCH 4, 1990



1st Quarter Moon

MARCH 6, 1990



Light Snow

Figure 5. Fish Creek chum fry outmigration by hour February 27 to March 6, 1990.

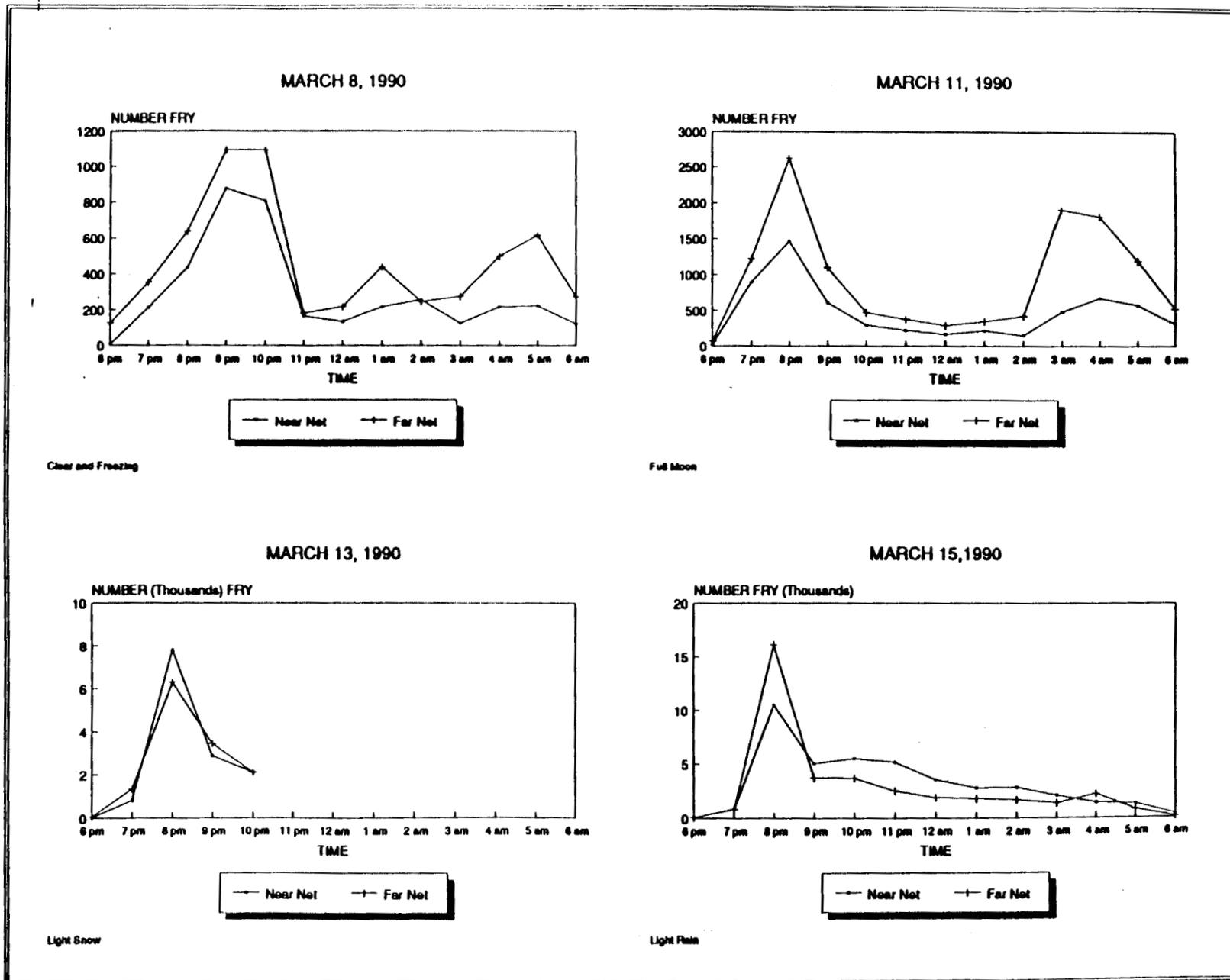


Figure 6. Fish Creek chum fry outmigration by hour March 8 to March 15, 1990.

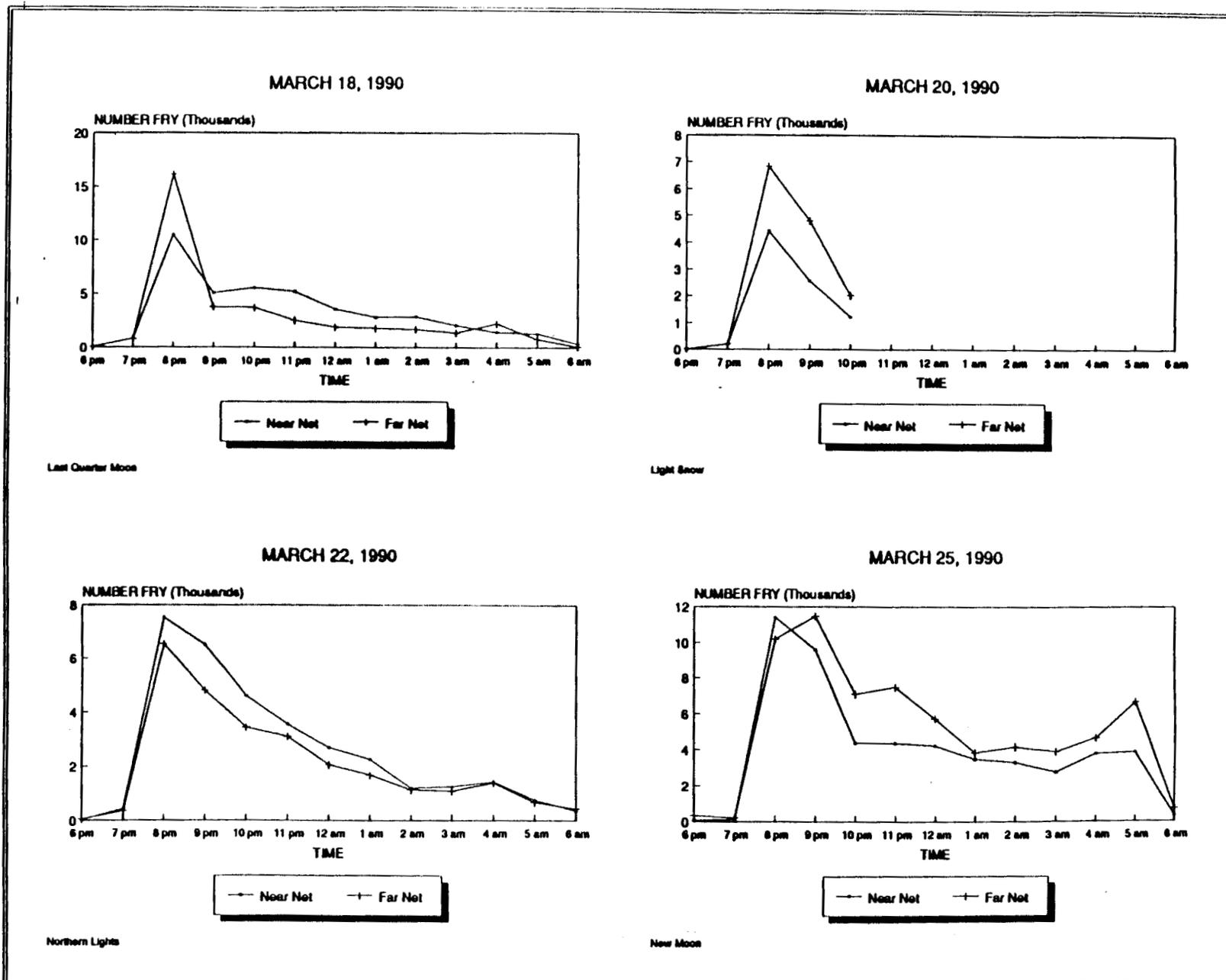
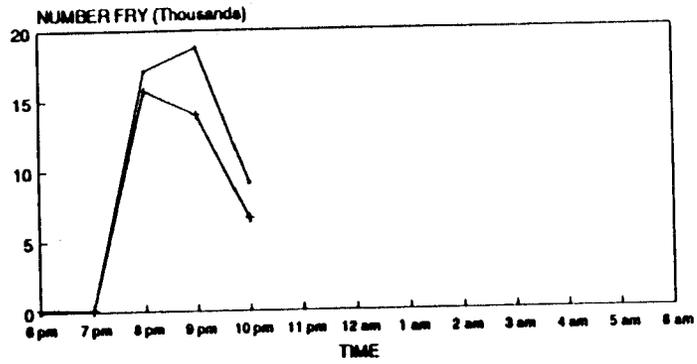


Figure 7. Fish Creek chum fry outmigration by hour March 18 to March 25, 1990.

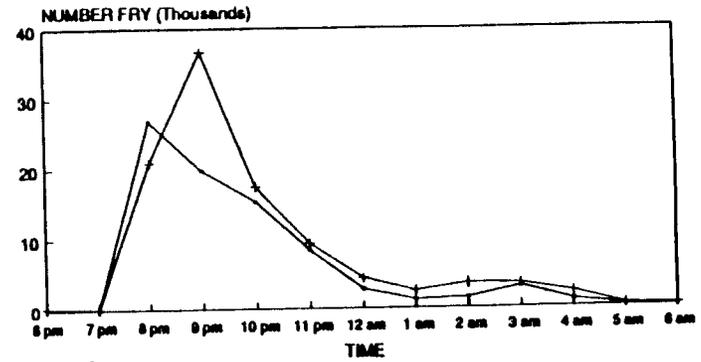
MARCH 27, 1990



Near Net Far Net

Near Moon

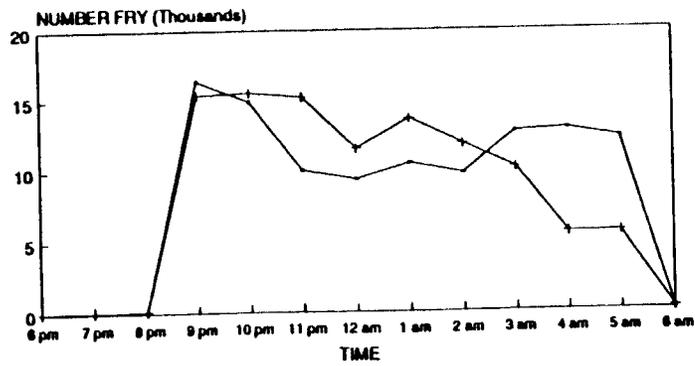
MARCH 29, 1990



Near Net Far Net

Low Clouds

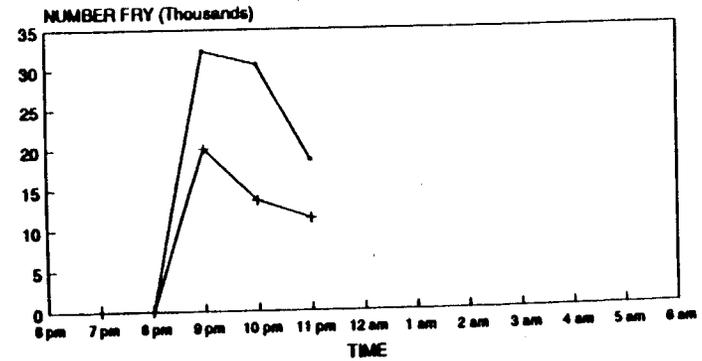
APRIL 1, 1990



Near Net Far Net

Daylight Savings Time

APRIL 3, 1990

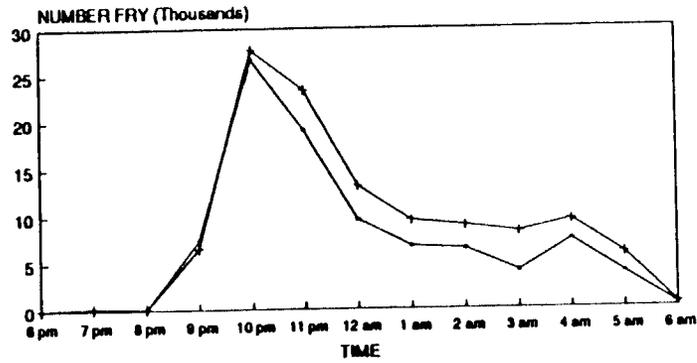


Near Net Far Net

Clear and Bright

Figure 8. Fish Creek chum fry outmigration by hour March 27 to April 3, 1990.

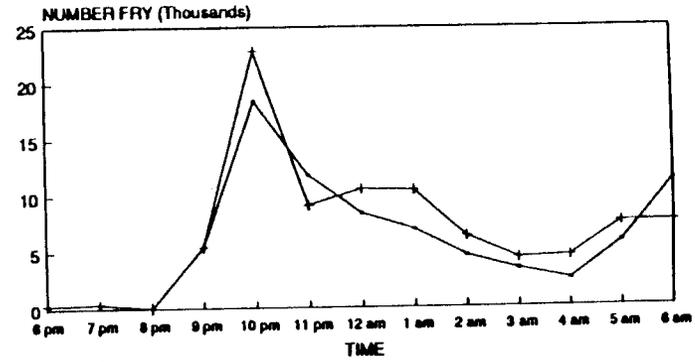
APRIL 5, 1990



— Near Net + Far Net

1st Quarter Moon

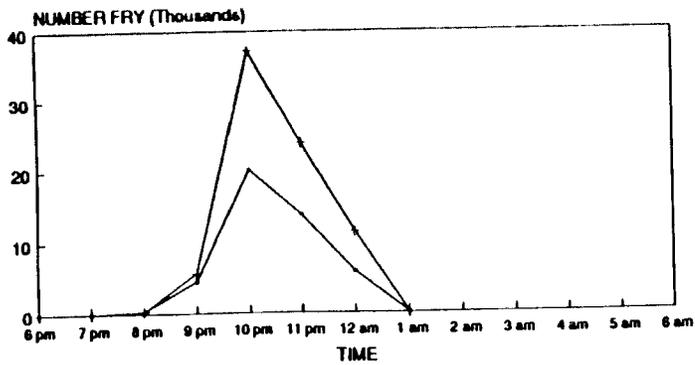
APRIL 8, 1990



— Near Net + Far Net

Clear and Bright

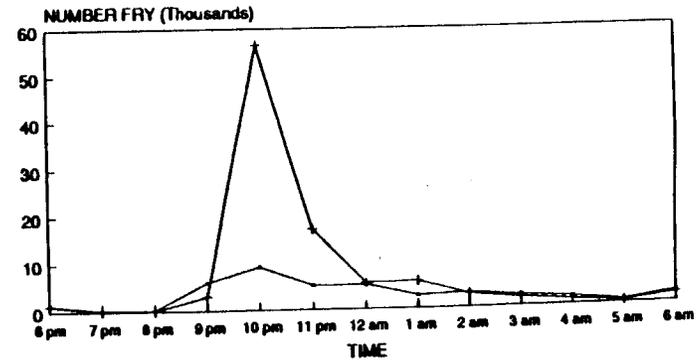
APRIL 10, 1990



— Near Net + Far Net

Full Moon

APRIL 12, 1990



— Near Net + Far Net

Clear and Bright

Figure 9. Fish Creek chum fry outmigration by hour April 5 to April 12, 1990.

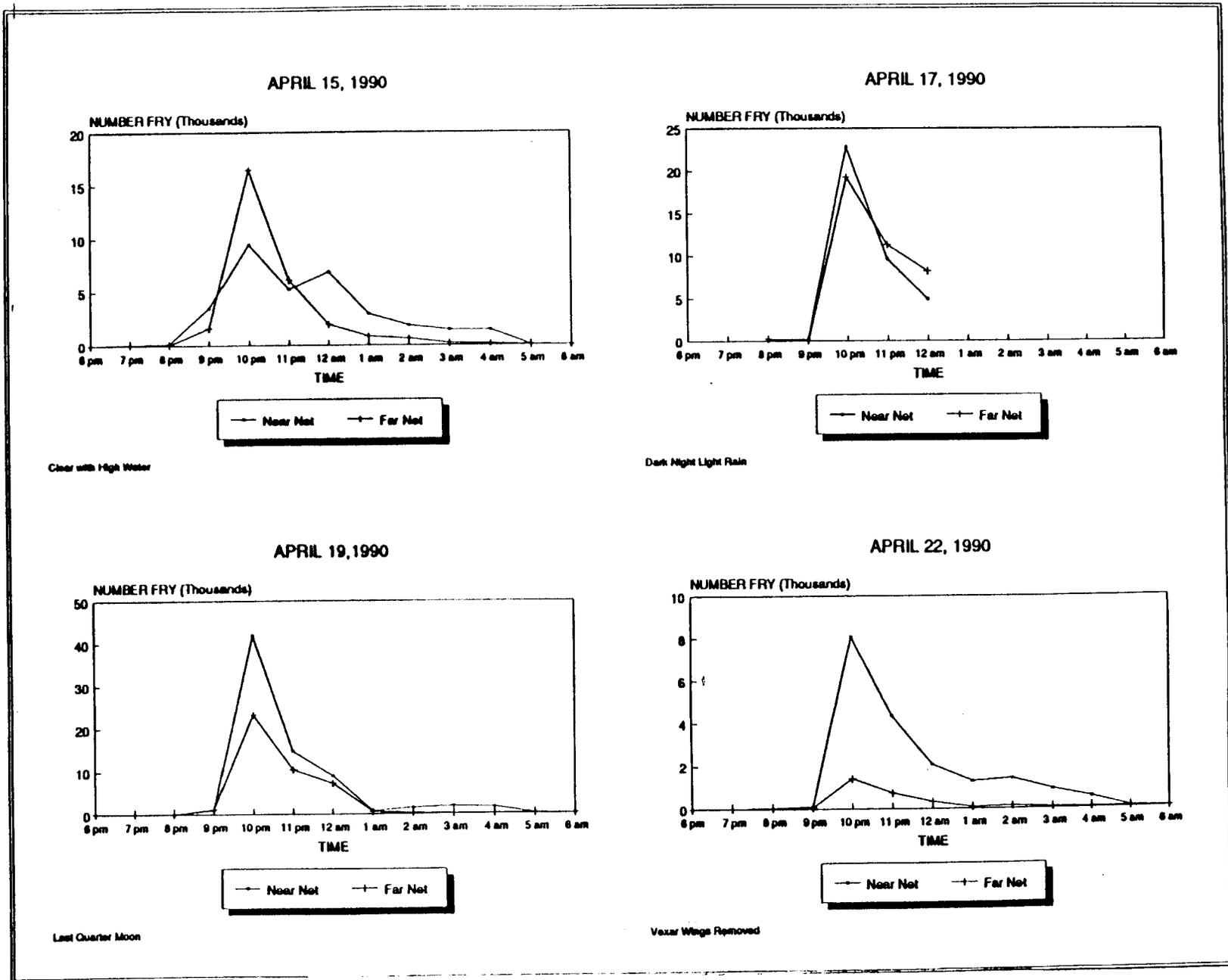


Figure 10. Fish Creek chum fry outmigration by hour April 15 to April 22, 1990.

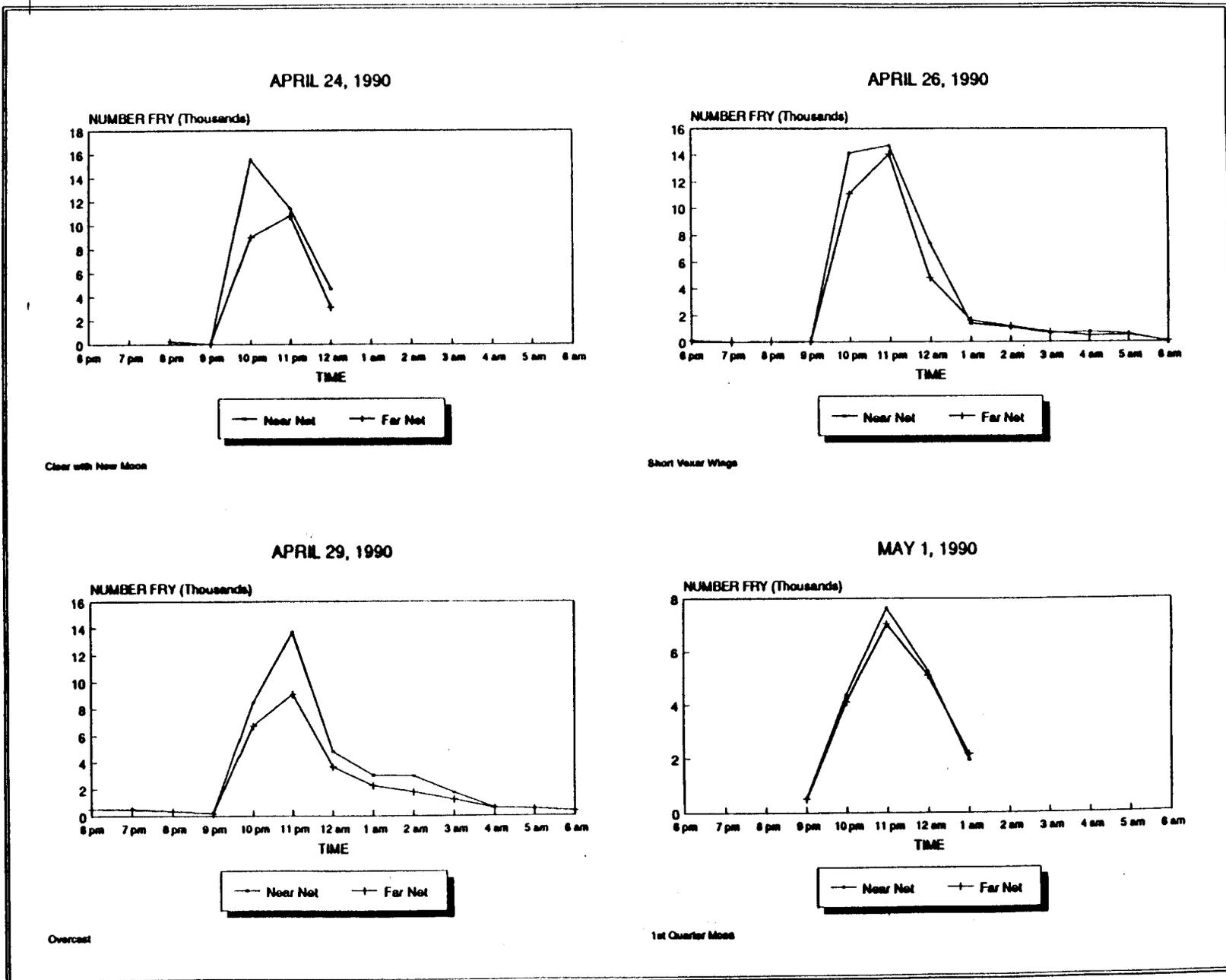


Figure 11. Fish Creek chum fry outmigration by hour April 24 to May 1, 1990.

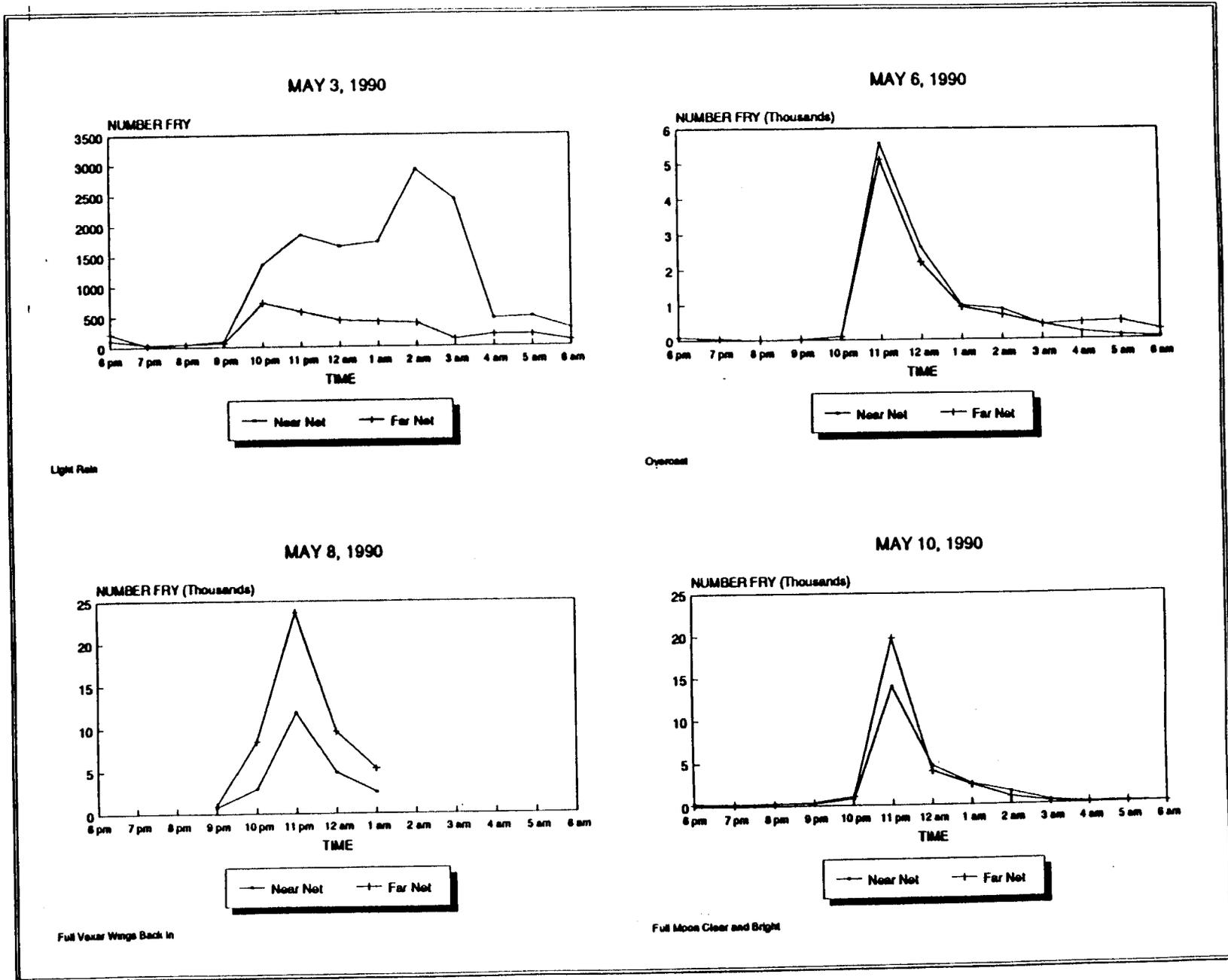


Figure 12. Fish Creek chum fry outmigration by hour May 3 to May 10, 1990.

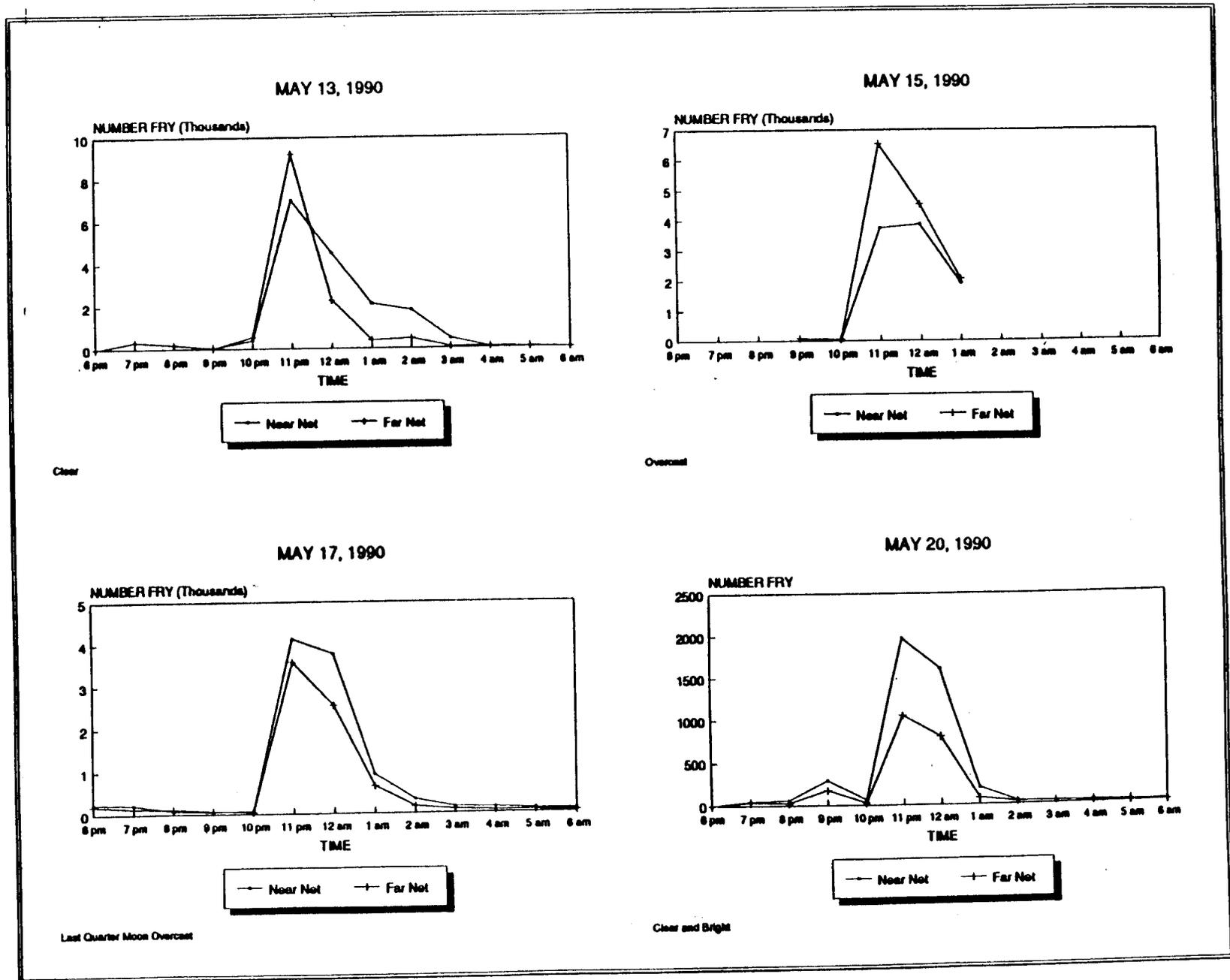
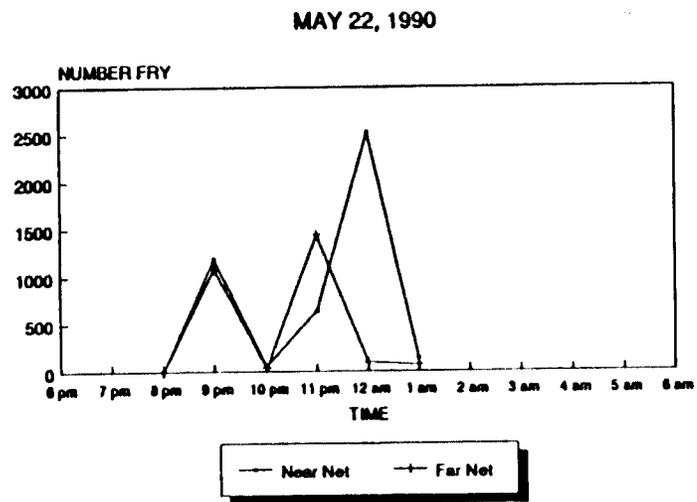
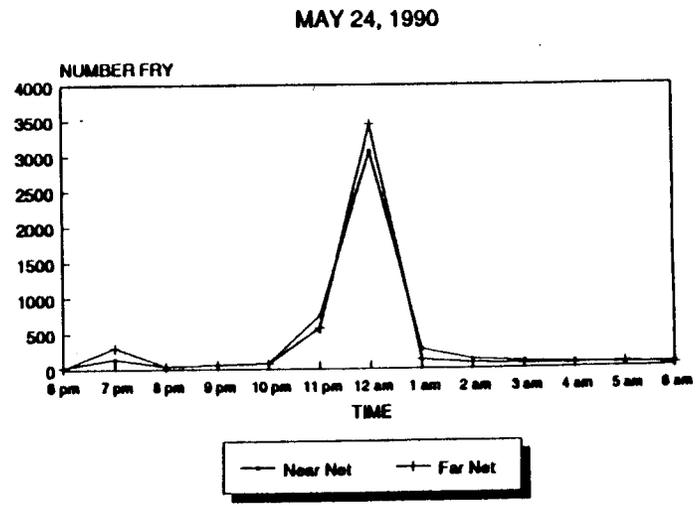


Figure 13. Fish Creek chum fry outmigration by hour May 13 to May 20, 1990.



Clear



New Moon Overcast

Figure 14. Fish Creek chum fry outmigration by hour May 22 to May 24, 1990.

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