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Study N-8

STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for
INTERIOR BURBOT STUDY, PART B:
FIELDING LAKE BURBOT INVESTIGATION

by

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RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish
Investigations of
Alaska

Project: F-10-1

Study: N-8 Study Title: NORTHERN PIKE/BURBOT

Job No: N-8-1 Job Title: Interior Burbot Study

Cooperator: Richard D. Peckham Part B: Fielding Lake
Burbot
Investigation

Period Covered: July 1, 1985 to June 30, 1986

ABSTRACT

Burbot, *Lota lota* (Linnaeus), population abundance was estimated in Fielding Lake during summer 1985. The population estimate for burbot greater than 275 mm in length was 1,761 (90% CI \pm 7%) or 3.3 burbot/hectare (1.3 burbot/acre). The biomass of burbot over 275 mm was estimated to be 2.0 kg/hectare (1.7 lbs/acre). Variability in the size composition of burbot marked versus those recaptured indicated that the population estimate may be biased low. In July and August the mean catch rates of burbot in one net-night hoop trap sets was 0.649 and 0.833, respectively. The July, August and September catch rates for two to five net-night sets was 2.390, 1.576 and 2.575, respectively. Length frequency of 584 burbot captured in hoop traps and 221 burbot captured by fyke nets and electrofishing is presented along with the age-length relationship of 105 burbot with ages ranging from 0 to 18 years. Electrofishing and fyke net catch rates during August ranged from 0.2 burbot per hour caught in fyke nets to 41.5 burbot per hour caught by night electrofishing.

KEY WORDS

Fielding Lake, burbot, population estimate, catch per unit effort (CPUE), age and growth, length frequency.

BACKGROUND

Little past data is available for burbot in Fielding or other interior Alaska lakes. Increased popularity of set lines fished in the summer and an apparent decline in the size composition of burbot harvested in Fielding Lake became a concern to the Alaska Department of Fish and Game

(ADF&G) in 1981. In 1982, various types of gear including fyke traps, hoop traps, and set lines were fished by ADF&G staff to sample and evaluate the burbot resource in this 536 hectare (1,325 acre) lake. Relatively few burbot were captured (Peckham 1983). The statewide harvest survey (Mills 1982 and 1983) estimated that total man-days of fishing effort (for all species) in Fielding Lake more than doubled from 1981 to 1982. Estimated harvest of burbot increased from 249 to 365. The mean length of burbot sampled in the angler harvest in 1982 and 1983 was 433 mm. Burbot of this size generally have a mean weight of about one pound and range from 5 to 7 years of age.

During fall 1984, a more intensive sampling effort was conducted using various types of traps including pyramid traps and hoop traps. A total of 107 burbot ranging from 285 to 1,020 mm with a mean of 467 mm were captured. Hoop traps were the most effective gear type utilized in 1984 with catch averaging about two burbot/net night. A total of 102 burbot were tagged with Floy tags and released in 1984 (Peckham 1985). The burbot fishery in Fielding Lake was closed by emergency order from 17 May to 31 December 1984. A sport fish regulation proposal by the staff and the Delta Fish and Game Advisory Committee was approved by the Board of Fisheries during their fall meeting in 1984. The new regulation allows for the taking of burbot by set line from 15 October through 15 May only, rather than during the entire year.

This study was developed to provide estimates of population abundance, size composition, age at size, and catch per unit effort (CPUE) for the Fielding Lake burbot population. Such quantitative information is currently unavailable for lake burbot populations in Alaska and is needed for future fishery management.

Table 1 provides common and scientific names of all fish species mentioned in this report.

RECOMMENDATIONS

1. Develop and initiate a sampling schedule for monitoring winter sport harvest of burbot in Fielding Lake to document fishery changes resulting from regulations implemented in 1985.
2. Conduct annual stock status monitoring of the Fielding Lake burbot population to document annual abundance and size composition.
3. Initiate research to document timing and location of burbot spawning in Fielding Lake.
4. Research size selectivity of the hoop trap sampling gear and its effect on estimates of abundance.

Table 1. List of common names, scientific names and abbreviations.

Common Name	Scientific Name & Author	Abbreviation
Arctic grayling	<i>Thymallus arcticus</i> (Pallas)	GR
Burbot	<i>Lota lota</i> , (Linnaeus)	BB
Lake trout	<i>Salvelinus namaycush</i> (Walbaum)	LT
Round whitefish	<i>Prosopium cylindraceum</i> (Pallas)	RWF
Slimy sculpin	<i>Cottus cognatus</i> Richardson	SSC

OBJECTIVES

1. To estimate the Fielding Lake burbot population abundance (Age III and above) and develop a CPUE statistic for this population.
2. To estimate size composition of burbot in Fielding Lake.
3. To estimate CPUE of juvenile burbot (Ages 0-II and establish an index for annual comparison of recruitment strength).

TECHNIQUES USED

Burbot were sampled with baited hoop traps in Fielding Lake during 1985 (see Part C of the overall investigation for additional details concerning specific of hoop trap fishing methodology). Burbot were also captured with fyke nets and with electrofishing gear (see Ridder 1983 for gear specifics).

The population abundance of Fielding Lake burbot was determined by the Schnabel estimate described by Ricker (1975).

Burbot ages were determined by examination and counting of annuli on otoliths and vertebrae (see Part A of the overall investigation for additional details concerning specimen preparation).

FINDINGS

Population Abundance and Biomass

Fielding Lake burbot population abundance during summer-fall 1985 was estimated to be 1,761 (90% CI \pm 7%) burbot 275 mm in length and greater. The estimate was based on a total of 546 burbot marked and released during July and August and 110 burbot caught during September (Table 2).

From 16-20 July, 156 burbot were captured in baited hoop traps and released. The total included 148 new fish which were tagged with Floy tags and given a partial right pelvic fin clip and 8 burbot that had been tagged during prior work in 1982 and 1984 (Peckham 1983 and 1985). An additional 390 burbot (including some fish tagged in prior years) were marked similarly and released from 19 to 28 August. Between 23 September and 27 and additional 110 burbot were caught and examined for tags or fin clips. Fielding Lake burbot sampling data from 1985 was examined for possible size bias problems in the calculated Schnabel population estimate. The size composition of the recaptured burbot appeared to be larger than the size composition of the marked burbot at large. The effect of this potential bias on the estimate is that the population estimate is probably too low, and the actual number of burbot in Fielding Lake in 1985 probably exceeded the calculated population estimate. Additional research is needed to better quantify this bias

Problem

Table 2. Burbot catch summary and population estimates, Fielding Lake, 1985.

Month	Sample Period	Catch (C)	Recaps (R)	Marks Released	Cumulative Marks (M)	Exploitation (u)
July	1	156	0	156	0	
August	2	137	5	0	156	0.032
August	3	60	6	0	156	0.038
August	4	48	5	0	156	0.032
August	5	83	7	0	156	0.045
August	6	55	2	0	156	0.013
August	7	56	5	390	156	0.032
September	8	60	21	0	546	0.038
September	9	50	22	0	546	0.040
Totals			73	546		

Population Estimate: 1,761

90% Confidence interval: $\pm 7.29\%$

The estimated biomass of burbot 275 mm and greater in length is 2.0 kg/hectare (1.7 lbs/acre). This is based on a mean weight of 0.61 kg (1.34 lbs) for 445 burbot weighed in 1985.

Catch per Unit Effort (CPUE)

A study entitled "Hoop Trap Catch Per Unit Standardization" was partially conducted on Fielding Lake in conjunction with this research and results of that study are reported in Part C of the overall investigation. For simplicity in presentation, only summary CPUE data will be presented in the report. In July and August the mean burbot catch rates for one net-night (NN) sets was 0.649 and 0.833, respectively (Table 3). The July, August, and September catch rates for two to five NN sets was 2.390, 1.576 and 2.575, respectively.

Fielding Lake was closed to sport fishing with set lines during the time period that sampling was conducted (July through September). Assuming that natural mortality and recruitment were negligible during this period, the Fielding Lake burbot population can be considered closed. Therefore, similar index values for each month would be expected. This was not the case (Table 4). The index for 2-5 NN sets in August was lower than the July and September indices although 95% confidence intervals overlapped. The difference in monthly indices may be related to sample sizes. More than twice as many 2-5 NN sets were made to estimate the August index (92 sets) than were made for the July (40 sets) and September (39 sets) indices. When 40 or fewer sets were made and distributed over six depth strata, many strata had five or fewer observations in them (Table 4) which may have affected the accuracy of the estimates for these strata. Because of the small number of sets made in some strata definite conclusions concerning burbot distribution cannot be made. However, the apparent trend was that burbot occupied deeper water in July than in the other two months. In August and September, burbot appeared to be more uniformly distributed throughout the first four depth strata.

Length Frequency

A total of 584 burbot captured in hoop traps was measured for total length and an additional 221 burbot captured with electrofishing gear and fyke nets were measured (Table 5). Size selectivity of the gear types is apparent. Hoop traps did not capture burbot smaller than 250 mm in length due to hoop trap mesh size and possibly due to netting locations and depths. Some burbot up to 325 mm in length were gilled in the one inch bar mesh, and others were observed slipping through the mesh as the trap was lifted. Predation of smaller burbot by larger burbot has also been observed, presumably while the fish were confined in the trap. Burbot in the 400-424 mm size group were predominant in hoop trap catches, comprising 19.3% of the sample. Burbot from 325 to 524 mm comprised 89.1% of the total sample. Only 5.3% of the burbot captured by hoop traps were larger than 524 mm in length.

Fyke net and electrofishing catches (19-23 August) were limited to burbot 449 mm and less in length. Sampling with these gear types is

Table 3. Stratified estimates of mean catch of burbot per hoop trap set for 1-NN and 2-5 NN effort groups for Fielding Lake, by month.

Month	One Net-Night Sets			Two to Five Net-Night Sets		
	Mean Burbot Catch Per Trap	95.0% CI	Sample Size (Traps)	Mean Burbot Catch Per Trap	95.0% CI	Sample Size (Traps)
July	0.649	0.305-0.992	34	2.390	1.703-3.076	40
August	0.833	0.370-1.296	156	1.576	1.113-2.040	92
September			0	2.575	1.668-3.481	39

Table 4. Mean catch of burbot in Fielding Lake for 2-4 net-nights sets, by month.

Depth Interval	July		August		September	
	Mean Burbot Catch Per Trap	Sample Size (Traps)	Mean Burbot Catch Per Trap	Sample Size (Traps)	Mean Burbot Catch Per Trap	Sample Size (Traps)
1 - 20 ft	1.00	14	1.69	16	1.93	14
21 - 30 ft	2.43	7	1.67	45	3.50	6
31 - 40 ft	3.00	4	2.23	22	2.20	10
41 - 40 ft	6.50	4	1.50	6	3.60	5
51 - 60 ft	5.80	5	0.33	3	2.00	2
60 ft plus	3.00	6		0	6.00	2

Table 5. Length frequency distribution of burbot, Fielding Lake, 1985.

Length Range (mm)	Number of Burbot	Percent of Total
50-74	0	0.0
75-99	5	0.6
100-124	56	7.0
125-149	27	3.4
150-174	36	4.5
175-199	20	2.5
200-224	18	2.2
225-249	17	2.1
250-274	7	0.9
275-299	19	2.4
300-324	30	3.7
325-349	62	7.7
350-374	76	9.5
375-399	87	10.8
400-424	115	14.3
425-449	71	8.8
450-474	71	8.8
475-499	37	4.6
500-524	21	2.6
525-549	12	1.5
550-574	5	0.6
575-599	3	0.4
600-624	3	0.4
625-649	1	0.1
650-674	1	0.1
675-699	0	0.0
700-724	0	0.0
725-749	0	0.0
750-774	1	0.1
775-799	0	0.0
800-824	1	0.1
825-849	2	0.2
850-874	0	0.0
875-899	0	0.0
900-924	0	0.0
925-949	1	0.1
<u>50-949</u>	<u>805</u>	<u>100.0%</u>

limited to shoreline areas of less than three meters in depth. A total of 78.6% of the burbot captured by fyke nets and electrofishing gear was in the 100-249 mm size range.

Age-Length Relationship

A total of 105 burbot caught in hoop traps and fyke nets, by electrofishing gear and obtained from anglers was sampled for age determination between 1982 and 1985 (Table 6). The data are not necessarily representative of age class abundance due to the variable gear types and time frame from which the sample was obtained. Age class 7 was the most prevalent in the sample, comprising 16.2% of the total. Burbot of age 7 ranged from 364 to 600 mm in length with a mean of 442 mm. Age 0 burbot sampled in late August had a length range of 93-112 mm with a mean of 104 mm. The oldest burbot captured was age 18 and was 1,016 mm in length.

Catch per Unit Effort (CPUE) of Juvenile Burbot

Fyke nets and boat-mounted electrofishing gear utilized from 19 to 23 August 1985, in Fielding Lake were found to be effective methods for capturing burbot ranging in length from 75 to 449 mm (Table 7). Night electrofishing was by far the most effective method of capture (41.5 burbot/hour). Burbot were captured by day electrofishing at a rate of 6.2 burbot/hour while the capture rate for fyke traps was 0.2 burbot/hour or 4.3 burbot/net night.

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Table 6. Size at age data for Fielding Lake burbot, 1982-1985**.

Age Class	No. of Burbot	% of Burbot	Length (mm)			
			Mean	Min	Max	Standard
0	12	11.4	104	93	112	6
1	4	3.8	171	163	181	9
2	4	3.8	239	224	272	23
3	0	0	-	-	-	-
4	8	7.6	304	227	391	51
5	14	13.3	386	352	451	28
6	11	10.5	406	355	455	34
7	17	16.2	442	364	600	59
8	12	11.4	465	374	619	79
9	13	12.4	508	412	582	53
10	3	2.9	484	407	538	59
11	2	1.9	546	500	592	65
12	2	1.9	663	570	756	132
13	1	1.0	730			
14	0	0	-			
15	1	1.0	740			
16	0	0	-			
17	0	0	-			
18	1	1.0	1016			
Totals	105	100.0	393	93	1016	161

** Includes samples from sport catch, hoop traps, fyke nets and electrofishing.

Table 7. Fyke net and electrofishing catch rates, Fielding Lake, 19-23 August, 1985.

Gear	Catch					
	Hrs.	BB	GR	LT	RWF	SSC
Electrofishing:						
Night (2330-0300)						
Total Hours	4.10	170	125	13	0	0
Fish/Hour		41.5	30.5	3.2	0.0	0.0
Electrofishing:						
Day (2400-1500)						
Total Hours	0.48	3	1	0	0	0
Fish/Hour		6.2	2.1	0.0	0.0	0.0
Fyke traps						
Total Hours	263.9	47	120	0	102	45
Fish/Hour		0.2	0.5	0.0	0.4	0.2
Fish/Net Night		4.3	10.9	0.0	9.2	4.1

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