Dworshak Reservoir Investigations-

Trout, Bass and Forage Species

Annual Report
1988

by

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ABSTRACT

The Nez Perce Tribe and the Idaho Department of Fish and Game (IDFG) entered into separate intergovernmental agreements with the Bonneville Power Administration in a cooperative four-year effort to study impacts of Dworshak Dam operation on resident fisheries. This second annual report focuses on rainbow trout, smallmouth bass, and forage species. The kokanee assessment is included in the IDFG agreement, and is not addressed herein.

For the period March 1988 through February 1989, an estimated 154,558 angler-hours were expended to catch 20,037 rainbow trout, 3,933 smallmouth bass, and 142 bull trout. Estimated catch of other species, including cutthroat trout, whitefish, suckers, and squawfish totalled 84. Subcatchable rainbow trout (135 to 185mm) caught and released by boat anglers comprised 53% (12,770) of the total catch. An estimated 88.6% of the smallmouth bass caught were under the minimum legal size limit of 305mm and were released. Estimated harvest of smallmouth bass was 450.

The highest monthly catch rate documented for all species excluding kokanee was 1.81 fish per hour during October. Severe weather conditions during February reduced effort and no fish were documented in the creel. Cumulative catch rates through the survey period for rainbow trout and smallmouth bass were .13 and 02 respectively. The lowest monthly catch rates generally occurred when fishing pressure was the highest, with fishing effort targeting on kokanee during the May through July high use periods. The Arlee strain rainbow trout was somewhat more vulnerable to boat anglers than the Shasta strain during the early post-release period.

Relative abundance of smallmouth bass gill netted in Elk Creek Arm increased from 4.2% in 1980 to 20.7% in 1988. No redside shiners were gill netted during 1988. Post-1974 gill net catch rates suggest that the redside shiner was in decline prior to establishment of smallmouth bass.

Mean lengths and condition (K) factors for Shasta and Arlee strain rainbow trout were very similar. Current growth of smallmouth bass through age III compares favorably to other Idaho reservoirs. Overall growth is generally better than other smallmouth bass populations at similar latitudes.

Analysis of stomach samples showed considerable similarity in food habits of the Shasta and Arlee strain rainbow trout, with Cladocera being of major importance. Fish and Trichoptera were prominent in smallmouth bass diets, but not in the Shasta and Arlee samples. Terrestrial insects comprised major portions of both the rainbow trout and smallmouth bass diets.

INTRODUCTION

Following construction of Dworshak Dam by the U.S. Army Corps of Engineers (CE), initial filling of Dworshak Reservoir began on 27 September 1971. The subsequent conversion of 86.2km of the North Fork Clearwater River to a 6,644 hectare artificial lake has had a profound influence on resident fish and fisheries. Also, reservoir operation results in annual pool level fluctuations that exert a chronic effect on reservoir habitat.

Recognizing the pervasive influence of Dworshak Dam on resident fisheries, the Northwest Power Planning Council in its Columbia River Basin Fish and Wildlife Program [903(e)(4)] provided that:

> BPA shall fund a study to assess the impacts of the original construction and current operation of Dworshak Dam on the resident fishery. This study will include the following research concerns of the Nez Perce Tribe: 1) population dynamics of kokanee; 2) reservoir productivity; 3) food habits of rainbow trout; 4) population dynamics and habitat preferences of smallmouth bass: and 5) the status of forage species. Recommendations detailing specific protection, mitigation and enhancement opportunities, consistent with the requirements of 804(e)(16), may be submitted to the Council [804(e)(12)].

The Nez Perce Tribe, along with the Idaho Department of Fish and Game (IDFG), executed intergovernmental agreements with Bonneville Power Administration in a cooperative effort to study the five concerns stated above. This report is the second annual report of a four-year project that addresses growth and food habits of rainbow trout (Oncorhvnchus mvkiss), food habits, population dynamics and habitat preferences of smallmouth bass (Micropterus dolomieu), and status of forage species. Findings reported herein are for the period March 1988 through February 1989. IDFG will address population dynamics of kokanee (Oncorhvnchus nerka) and reservoir productivity.

DESCRIPTION OF THE PROJECT AREA

Dworshak Dam is located on the North Fork Clearwater River 3.2 km upstream from its confluence with the Mainstem Clearwater River (Figure 1). Maximum pool was first attained on 3 July 1973 (Horton 1981). At normal full pool elevation (1,600 feet mean sea level), Dworshak Reservoir extends 86.2km along the North Fork Clearwater River Canyon, encompassing 6,644 hectares surface area with 282km of shoreline. Maximum width at full pool is 2743m, and average width is 547m.

RESERVOIR OPERATION

The primary purposes of Dworshak Dam are flood control and power production. Dam operation is integrated with the total system of Columbia River reservoirs to meet power system load requirements and to provide flood control regulation on the lower Columbia, lower Snake, and lower Clearwater Rivers. Power production is highest during the fall, winter, and early spring.

Expected minimum discharge through the turbines from April to July is 2,000 cfs. Reservoir evacuation begins in September and generally continues through March. Refilling occurs with the influx of spring flows from April to July. The date of filling to normal full pool varies from mid-June to late July, depending on run-off conditions.

The normal operating range of Dworshak Reservoir is from 1,445 to 1,600 feet mean sea level (Figure 2). Annual pool level fluctuations in excess of 30.5m are common.

FISH SPECIES AND ABUNDANCE

Prior to impoundment, fish species present in the study area included steelhead trout (Oncorhynchus mykiss), chinook salmon (Oncorhynchustschawytscha), cutthroat trout (Oncorhynchus clarki), bull trout (Salvelinus confluentus), brook trout (Salvelinus fontinalis), mountain whitefish (Prosopium williamsoni), brown bullhead (Ictalurus nebulosus), smallmouth bass, chiselmouth (Acrocheilus alutaceus), northern squawfish (Ptychocheilus oresonensis), bridgelip sucker (Catostomus columbianus), largescale sucker (Catostomus machrocheilus), speckled dace (Rhinichthys osculus), longnose dace (Rhinichthys cataractae), redside shiner (Richardsonius balteatus), and Pacific lamprey (Entosphenus tridentatus).

Following impoundment, a Memorandum of Understanding between the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service designated that 100,000 pounds (45,360kg) of resident fish be stocked annually to mitigate dam induced losses. A stocking program of various species, including cutthroat trout, bull trout,

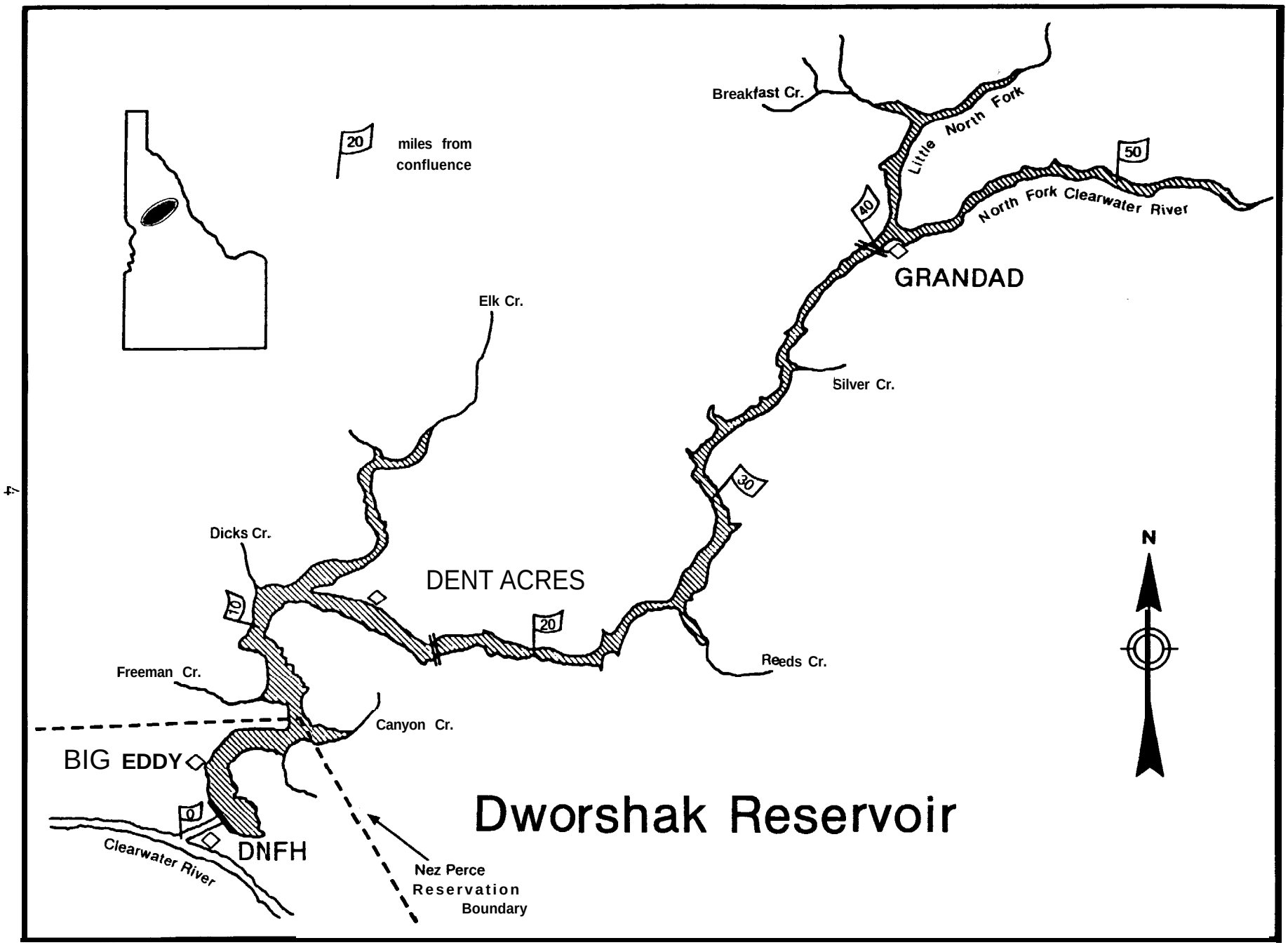
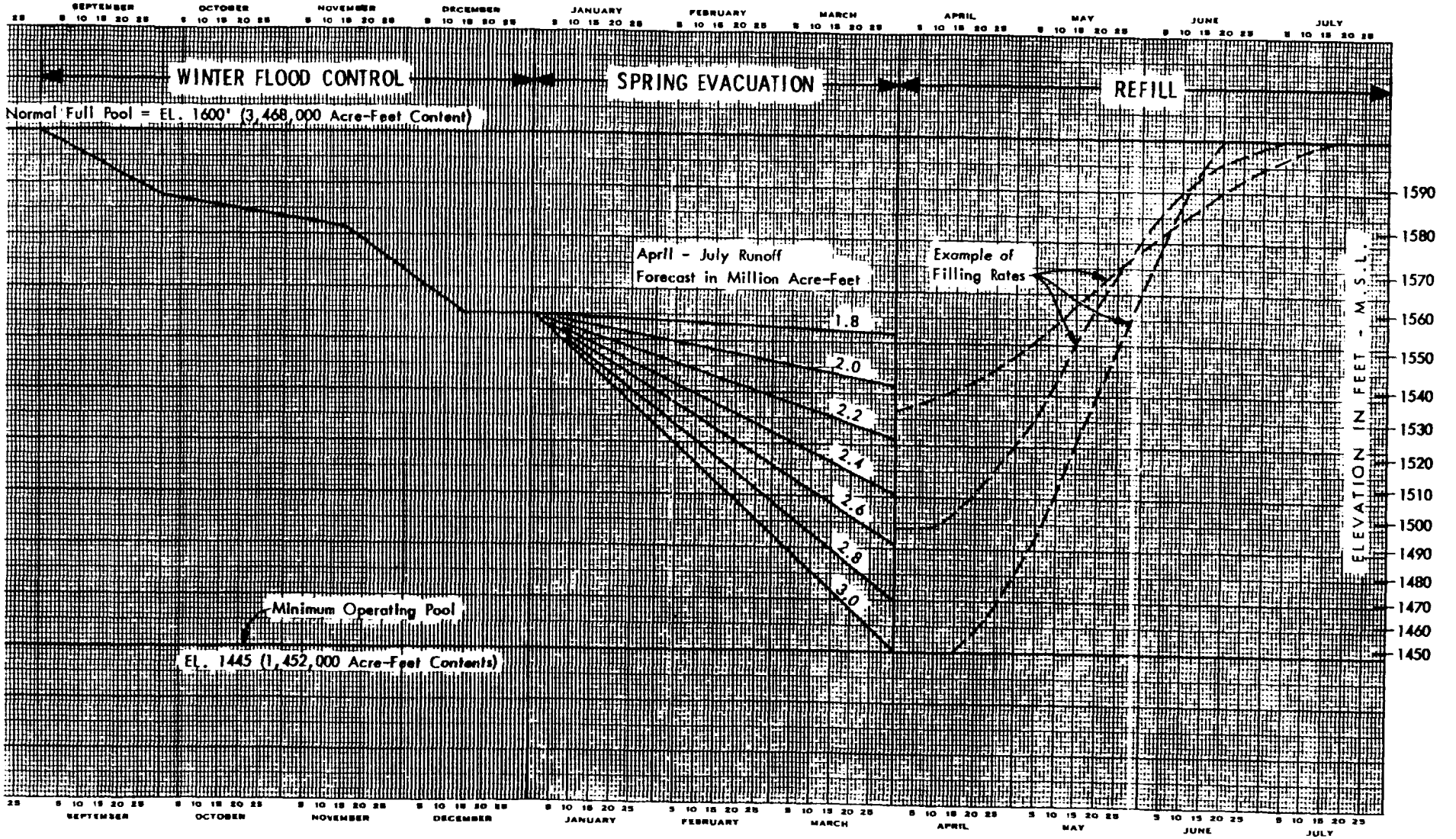


Figure 1. Dworshak Dam and Reservoir, North Fork Clearwater River, Idaho



U.S. Army Corps of Engineers' operating curve for flood control,
Dworshak Dam and Reservoir, Idaho.

rainbow trout, smallmouth bass, and kokanee, followed (Miller 1987). Smallmouth bass were stocked in 1975, 1977, and 1979. Kokanee were stocked from 1972 through 1975, and in 1977 and 1979. Rainbow trout have been stocked annually since 1972 (Table 1).

Horton (1981) reported that largemouth bass (Micronterus salmoides) entered the creel as early as 1976, apparently from contaminated smallmouth bass stocking. Horton (1981) also confirmed the presence of northern pike (lucius), but indicated a low probability of a viable population becoming established. A lamprey ammocete was also collected by Horton while electrofishing near river mile 50. Lamprey parasitism on sport fish in Dworshak Reservoir has been reported by Ball and Pettit (1974), Pettit (1976), and Wallace and Ball (1978). Twenty fish species are known to inhabit Dworshak Reservoir (Table 2).

LIMNOLOGY AND HABITAT

Falter et. al (1979) characterized Dworshak Reservoir as a deep, coldwater reservoir with the lower 32.2km being monomictic and the upper reservoir being dimictic. Falter's work showed that, after three years, the reservoir dropped from moderately productive to oligotrophic. Wave action on exposed side and bottom sediments was identified as a continuous source of turbidity. Phosphorus was noted as the nutrient generally limiting algal growth. Considering the pronounced oligotrophy of Dworshak Reservoir, Falter mentioned the possibility of using sterilized sewage wastes from recreation sites to stimulate productivity in certain embayments.

Tributary feeder streams influence reservoir habitat in the immediate inflow areas as well as in the major arms. Pettit (1976) stated that, because of the inflow of organisms in the vicinity of stream mouths, fish have a tendency to concentrate in these areas. Falter (1979) found water quality in Elk Creek Arm to be more similar to Elk Creek than the North Fork Clearwater River. During the 1977 low run-off year, Falter (1982) recorded a sharp early summer temperature increase in Elk Creek Arm (EC4 site), probably as a result of warm Elk Creek inflows.

Floating log rafts at specified log dump locations, such as Merry's Bay, Canyon Creek, and Little North Fork River, locally influence habitat parameters including water quality and cover. In situ bioassay by Falter et. al (1979) showed that log leachates generally increased algal production. A toxic response was noted in some algal genera. Pettit (1976) noted that invertebrates found in fish stomachs were associated with floating debris.

Fluctuations in water level, coupled with the characteristic unstable steep-sided banks, essentially preclude establishment of rooted littoral vegetation. Rooted terrestrial vegetation does occur on some gentler slopes, however, these areas are above the waterline during the reservoir evacuation period.

Table 1. Stocking of resident fish into Dworshak Reservoir by year, 1972 to 1988 (modified from Miller 1987).

Year	Species	Number	Size Range (cm)	Weight (kg)
1972	Kokanee	1,012,745	6-9	4,616
	Rainbow trout	1,043,506	Fry-30	45,322
1973	Kokanee	591,192	Fry	393
	Rainbow trout	2,554,170	Fry-30	134,808
1974	Cutthroat trout	45,463	13	2,285
	Rokanee	217,288	6	1,999
	Rainbow trout	1,070,260	6-30	19,075
1975	Cutthroat trout	111,010	5-17	797
	Bull trout	122,789	Fry	107
	Kokanee	2,898,417	Fry-5	2,368
	Rainbow trout	917,856	Fry-30	114,301
	Smallmouth bass	100,253	Fry-23	Unknown
1976	Rainbow trout	763,286	5-25	64,113
1977	Kokanee	2,450,000	Fry	1,113
	Rainbow trout	1,162,670	5-28	34,217
	Smallmouth bass	50,000	Fry	15
1978	Rainbow trout	25,936	25-30	13,412
1979	Kokanee	11,177,464	Fry	985
	Rainbow trout	1,313,524	5-25	92,541
	Smallmouth bass	100,000	Fry	20
1980	Rainbow trout	1,616,245	5-25	36,052
1981	Rainbow trout	861,429	5-25	87,049
1982	Rainbow trout	153,956	8-28	34,940
1983	Rainbow trout	574,255	8-23	58,503
1984	Rainbow trout	67,561	23-28	27,285
1985	Rainbow trout	120,000	23	40,000
1986	Rainbow trout	156,773	15	14,388
1987	Rainbow trout	174,256	9-11	5,095
1988	Rainbow trout	294,908	15	28,120

Table 2. Fish species inhabiting Dworshak Reservoir, Idaho (modified from Horton 1981).

ommon Name	Scientific Name
Chiselmouth'	Acrocheilus alutaceus
Bridgelip sucker	Catostomus columbianus
Largescale sucker	Catostomus macrocheilus
Sculpin	Cottus spp.
Northern pike	Esox lucius
Pacific lamprey	Entosphenus tridentatus
Brown bullhead	Ictalurus nebulosus
Smallmouth bass	Micropterus dolomieui
Largemouth bass	Micropterus salmoides
Kokanee	Oncorhynchus nerka
Crappie'	Pomoxis niaromaculatus
Mountain whitefish	Prosopium williamsoni
Northern squawfish	Ptychocheilus oreaonensis
Longnose dace	Rhinichthys cataractae
Speckled dace	Rhinichthys osculus
Redside shiner	Richardsonius balteatus
Cutthroat trout	Oncorhynchus clarki
Rainbow trout	Oncorhynchus mykiss
Bull trout	Salvelinus confluentus
Brook trout	Salvelinus fontinalis

[1] Chiselmouth were documented prior to impoundment. Ball and Cannon (1972) reported possible eradication from the 1971 squoxin treatment. Occurrence of chiselmouth was confirmed during 1988 project gill-netting.

[2] Occurrence of Pomoxis sp. reported by Roseburg (1988). Occurrence of Pomoxis nisromaculatis was confirmed by project gill-netting during 1988.

MATERIALS AND METHODS

CREEL SURVEY

Due to the large area1 extent of Dworshak Reservoir, the impoundment was divided into three sections: Dworshak Dam to Dent Bridge (Section I); Dent Bridge to Grandad Bridge (Section II), and; Grandad Bridge to the upstream limit of the reservoir (Section III). These survey sections correspond to those used by Pettit (1976).

A stratified two-stage probability sampling regime as described by Malvestuto (1983) was employed using non-uniform probabilities commensurate with use data provided by CE. Sampling probabilities assigned were 0.8 for Section I, 0.1 for Section II and 0.1 for Section III. Thus, the area receiving the most fishing effort was sampled more frequently. CE use data were also utilized to adjust sampling probabilities to reflect seasonal use patterns, such as boat anglers following the late summer migration of kokanee towards spawning areas.

Five weekdays and five weekend days per month were sampled to: (1) interview anglers for catch rates (fish per hour), (2) count anglers to determine fishing pressure (angler-hours) and (3) collect pertinent biological data from the creel. One A.M. angler count and one P.M. count were made on each sample day by boat. The A.M. angler count time was randomly selected and the interval between the A.M and P.M counts varied from 4.0 to 7.5 hours, depending on daylength.

Monthly estimates of angler-hours were calculated as the product of the mean number of anglers per hour (mean instantaneous count) and the total monthly daylight hours (weekday and weekend). Catch rates were calculated for each species, as well as each identifiable hatchery rainbow trout strain, from monthly summaries of interview data. Monthly catch estimates were calculated as the product of the monthly catch rates of each species (or strain) and estimated effort.

Lengths, weights, scale samples, and stomach samples were taken from specimens observed in the creel.

The creel survey was conducted jointly with IDFG.

FISH ABUNDANCE AND DISTRIBUTION

Variable mesh horizontal gill nets were use to determine relative abundance and species composition. Nets used were 1.8m by 45.8m and consisted of six equal panels of 13, 19, 25, 38, 51, and 63mm bar mesh monofilament. Net design was equivalent to that used by Ball and Cannon (1972) except for the addition of the 13mm bar mesh panel.

Gill net sample sites approximated locations used by Pettit (1976) and Horton (1981). One floating and one sinking net were fished per sample set. Nets were set at dusk and retrieved the following morning.

Sampling date, location, net-hours fished, type of set (floating or sinking), water depth, numbers of each species (or hatchery rainbow trout strain) caught, fish lengths and weights were recorded.

Gill net data reported by Pettit (1976) and Horton (1981) were used as bases for comparison.

GROWTH

Hatchery Rainbow Trout Strains

Data collection for growth comparisons of Shasta and Arlee strain hatchery rainbow trout was initiated in the late spring of 1988. Both groups were reared at Hagerman National Fish Hatchery, Hagerman, Idaho. Hatchery rearing was conducted to minimize differences between strains release at time of release. Mean sizes at release for Shasta and Arlee strain rainbow trout were 158mm and 157mm, respectively (Table 3). Pre-release health evaluations were conducted for both strains and no differences in fish health were detected.

Project personnel were present during fish stocking to direct balanced releases at individual release sites. Fish were released from fish transportation trucks ferried to specific release sites by a CE barge.

The 1988 Shasta strain and Arlee strain release groups were marked with left ventral and right ventral fin clips, respectively, for field identification. Length and weight data were obtained from anglers and gill netting.

Smallmouth Bass

Length, weight , and scale samples were obtained from anglers, hook and line sampling, and gill netting.

As in Horton (1981), the relationship of the scale radius to total fish length was determined by linear regression. Acetate impressions were made from readable scales and were magnified for reading on a microfiche projector. Distances in mm from the focus to the outer edge of the scale (radius) and from the focus to the outer edge of each annulus were measured. The y-intercept of the body-scale regression was used for back-calculation of length at age, L_i, following the Lee formula as described by Carlander (1981):

Table 3. Date, location, weight, number, and length of Shasta and Arlee strain rainbow trout released in Dworshek Reservoir by the U.S. Fish & Wildlife Service, 1988.

Date	Strain	Fin Clip	Location	Ueight	Number	Fish/pound	Length (mm)
31-May-88	Arlee	rv	Bruce's Eddy	800	8128	10.16	159
31-May-88	Arlee	rv	Opposite Bruce's Eddy	800	8128	10.16	159
31-May-88	Arlee	rv	Big Eddy	750	7620	10.16	159
31-May-88	Arlee	rv	Big Eddy	800	8272	10.34	158
31-May-88	Arlee	rv	Point opposite Big Eddy	800	8272	10.34	158
31-May-88	Arlee	rv	Freeman Creek	800	8404	10.51	157
31-May-88	Arlee	rv	Freeman Creek	800	8800	11.00	155
31-May-88	Arlee	rv	Canyon Creek	800	8800	11.00	155
31 -May-88	Arlee	rv	Canyon Creek	800	8509	10.64	157
31-May-88	Arlee	rv	Indian Creek	800	8024	10.03	160
02-Jun-88	Arlee	rv	Dick's Creek	800	8024	10.03	160
02-Jun-88	Arlee	rv	RM 2.5 Elk Creek Arm	800	9125	11.41	155
02-Jun-88	Arlee	rv	RM 2.5 Elk Creek Arm	800	9160	11.45	153
02-Jun-88	Arlee	rv	RM 0.8 E. side Elk Creek Arm	800	9053	11.32	154
02-Jun-88	Arlee	rv	Dent Acres	800	8816	11.04	155
02-Jun-88	Arlee	rv	Dent Acres	750	8265	11.02	155
02-Jun-88	Arlee	rv	Dent Bridge	500	5510	11.02	155
02-Jun-88	Shasta	lv	Dent Acres	800	8928	11.16	154
02-Jun-88	Shasta	lv	Dent Acres	800	8928	11.16	154
02-Jun-88	Shasta	lv	Dent Bridge	300	3348	11.16	154
02-Jun-88	Shasta	lv	RM 0.8 E. side Elk Creek Arm	720	8035	11.16	154
06-Jun-88	Shasta	lv	Bruce's Eddy	800	8888	11.11	155
06-Jun-88	Shasta	lv	Opposite Bruce's Eddy	800	8888	11.11	155
06-Jun-88	Shasta	lv	Big Eddy	750	8333	11.11	155
06-Jun-88	Shasta	lv	Big Eddy	800	8288	10.36	158
06-Jun-88	Shasta	lv	Point Opposite Big Eddy	800	8288	10.36	158
06-Jun-88	Shasta	lv	Freeman Creek	800	8288	10.36	158
06-Jun-88	Shasta	lv	Freeman Creek	800	8084	10.11	159
06-Jun-88	Shasta	lv	Canyon Creek	800	8016	10.02	160
06-Jun-88	Shasta	lv	Canyon Creek	800	8016	10.02	160
06-Jun-88	Shasta	lv	Indian Creek	800	7930	9.91	161
08-Jun-88	Shasta	lv	RM 2.5 Elk Creek Arm	1000	9680	9.68	162
08-Jun-88	Shasta	lv	RM 2.5 Elk Creek Arm	550	5236	9.52	163
08-Jun-88	Shasta	lv	RM 5 Elk Creek Arm	1000	9680	9.68	162
08-Jun-88	Shasta	lv	RM 5 Elk Creek Arm	800	7624	9.53	163
08-Jun-88	Shasta	lv	Dick's Creek	1000	9520	9.52	163
Subtotal Shasta				14920	153998		
Ueighted mean length							158
Subtotal Arlee				13200	140910		
Ueighted mean length							157
Total				28120	294908		

$$L_i = a + \frac{L_c - a}{S_c} S_i$$

Where a = y-intercept of the body-scale regression

L_c = length of the fish at capture

S_c = scale measurement to the edge of the scale

S_i = scale measurement to each annulus.

Mean length at age was obtained from back-calculated lengths. These data were used to fit the von Bertalanffy growth equation, $l_t = L_\infty (1 - e^{-K(t-t_0)})$. Per Everhart and Young (1981), a Walford plot of mean length at age n versus length at age n+1 was used to derive estimates of ultimate length, L_∞, and the growth coefficient, K. Linear regression of the natural logarithm of $L_\infty - L_t$ versus age t was used to determine t_0.

For comparison, a von Bertalanffy growth equation was also derived from previous mean length at age data obtained by Horton (1981).

FOOD HABITS

Stomach samples were collected from gill netting, electrofishing, and fish brought to the creel. Preserved stomach contents were labeled and sent to the University of Idaho aquatic entomology laboratory for identification and enumeration. Insects were identified to family or genus. Non-insects were identified to order.

Hynes (1950), Usinger (1971) and Bowen (1983) cited limitations in the various approaches to quantitatively describe diet. For example, frequency of occurrence data describe the uniformity with which groups of fish select their diet, but do not indicate the importance of various types of food selected. The use of percent by number of different food items may give distorted results if the fish species ingests a large number of small prey. Usinger (1971) indicated that, until dietetic food values of food species are known, there is no practical advantage of weight values over volume. Bowen (1983) mentioned that hybrid indices developed to compensate for the perceived biases of individual methods have no biological basis for their interpretation.

To provide a diverse reference for analyzing diet, fish stomach contents were analyzed by percent by volume, percent by number, frequency of occurrence, and the Coefficient of Importance (C.I.) as used by Ersbak and Haase (1983).

RESULTS AND DISCUSSION

CREEL SURVEY

Creel survey data indicated an estimated 154,558 angler-hours were expended on Dworshak Reservoir from March 1988 through February 1989 (Figure 3). Monthly total fishing pressure for the period ranged from a low of 292 angler-hours during January to a high of 45,818 angler-hours during July.

Bank angling constituted 4.6% of the total (7,111 angler-hours), while boat angling comprised 95.4% (147,447 angler-hours)(Figure 4). Bank angling peaked during March at 1,523 angler-hours. Bank angling as a percent of total angling was highest from October through February, corresponding to the period of least boat angling. Boat angling was highest from May through July, peaking in July at 44,851 angler-hours.

Total fishing pressure for sections I, II, and III was 112,092 (72.5%), 30,372 (19.7%), and 12,094 (7.8%), respectively (Figure 5). An estimated 77.1% of the bank fishing (5,480 angler-hours) occurred in section I. Highest respective monthly use periods by boat anglers for sections II and III were during August (59.4%) and September (46.6%). Sections II and III combined supported 84.0% and 67.4% of the total boat angling effort during August and September, respectively. Boat angling above Dent Bridge was virtually non-existent from October through February. Section III was closed to fishing from September 11 through February per state regulation.

The combined monthly catch rates for all species excluding kokanee were highest during October (1.81), November (.98), and December (1.07)(Figure 3). The highest estimated catch for all species excluding kokanee was during July (12,716), corresponding to the period of most fishing pressure, and comprising 52.6% of the total catch (24,195).

Shasta strain hatchery rainbow trout planted in 1986 provided the highest catch per unit effort during March and April (Tables 4, 5, and 6). However, by July these fish were absent in the creel. The Kamloops strain planted in 1987 provided a relatively low but steady return for fishing effort. The June boat angling catch rate of .10 fish per hour for Kamloops rainbow trout was the highest monthly rate observed in section III for identifiable hatchery rainbow trout.

During July, the presence in the creel of rainbow trout unidentified as to strain increased substantially, especially in section I, and corresponded to the catch and release of small rainbow trout by boat anglers targeting on kokanee. Arlee strain rainbow trout appeared in the creel as early as June, whereas the Shasta rainbow trout (1988 plant) did not enter the creel until

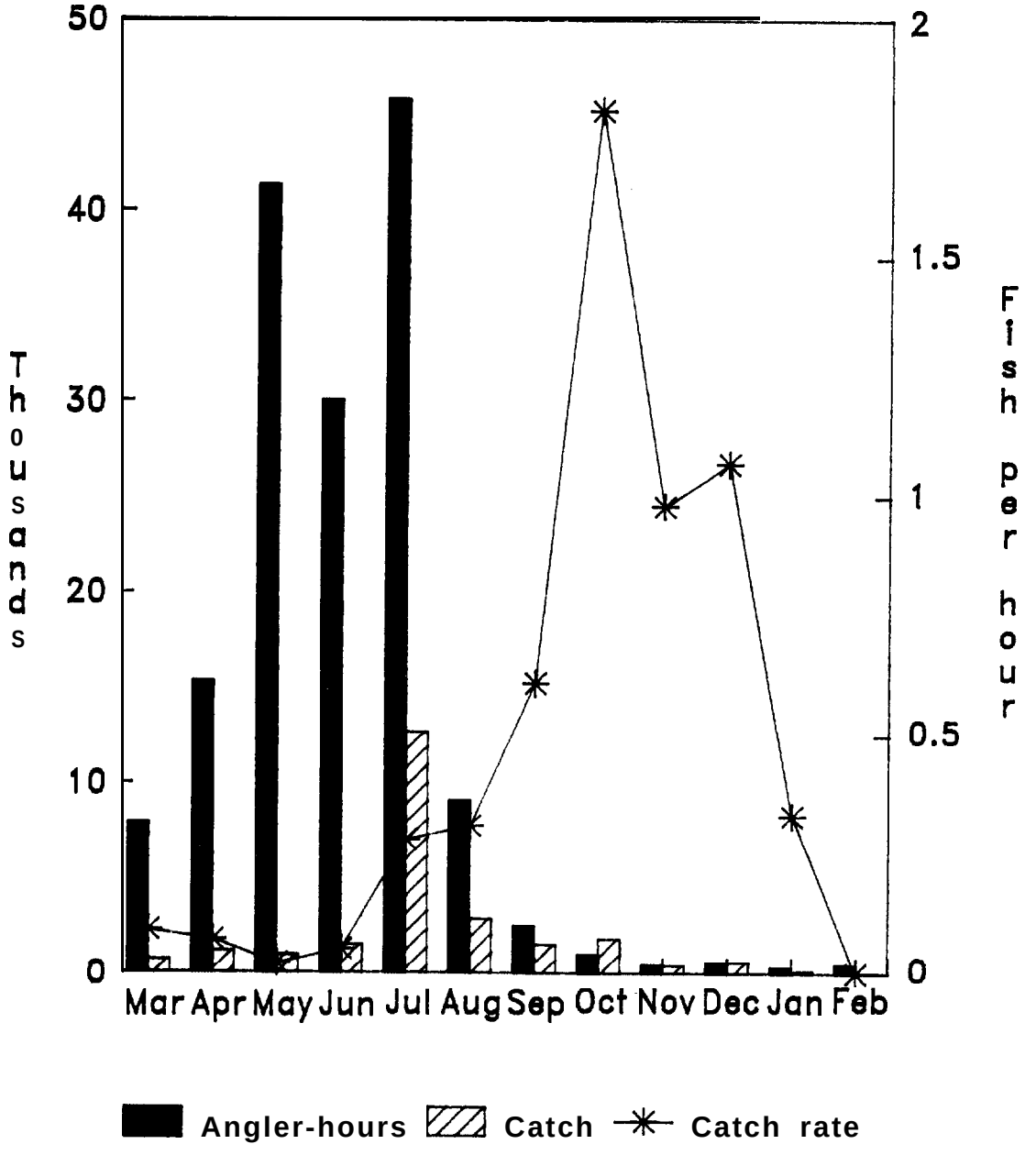


Figure 3. Total effort, catch and catch rate for **species** excluding kokanse, March 1988 through February 1989, Dworahok Reservoir, Idaho.

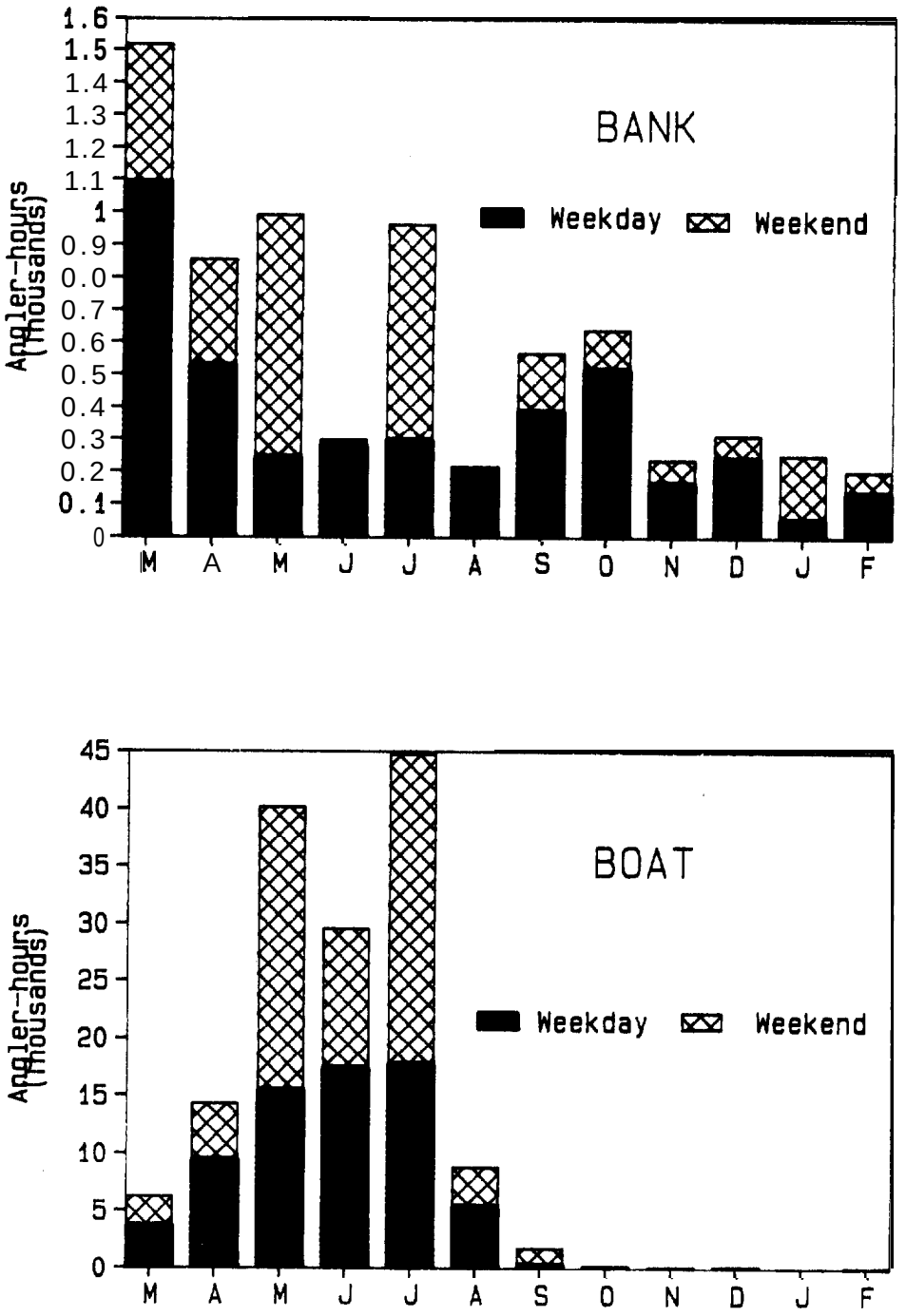


Figure 4. Monthly fishing pressure during weekdays and weekends, March 1988 through February 1989, Dworshak Reservoir, Idaho.

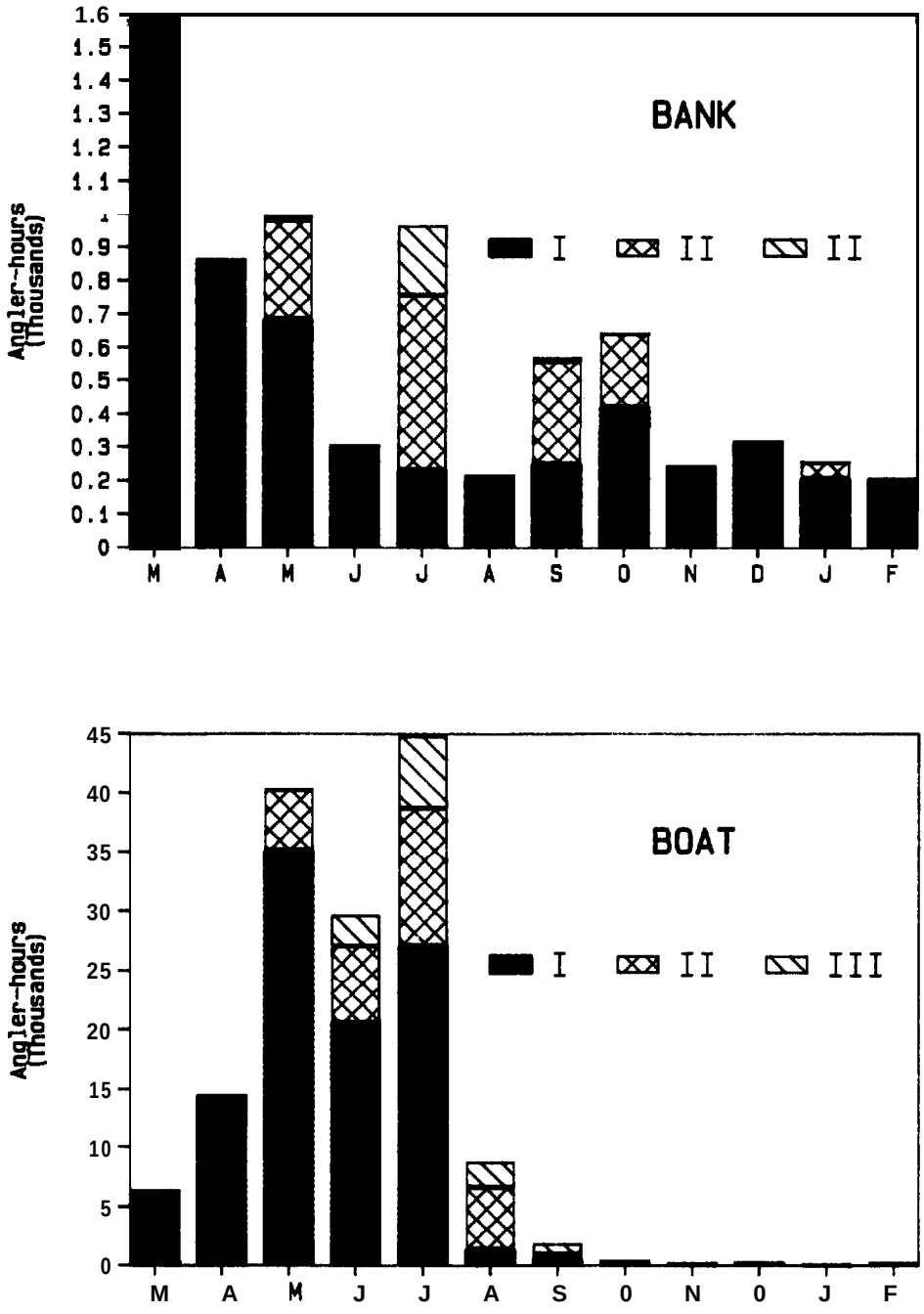


Figure 5. Monthly fishing pressure for bank and boat anglers by section, March 1988 through February 1989, Dworshak Reservoir, Idaho.

Table 4. Estimated monthly catch rates (fish per hour) for bank and boat anglers per species and strain from March 1988 through February 1989, Dworshak Dam to Dent Bridge (section I), Dworshak Reservoir, Idaho.

Species/ Strain	March		April		May		June		July		August		September		October		November		December		January		February	
	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo
Shasta 2 rbt[1]	-	-	-	-	-	-	0.00	0.00	0.00	0.03	0.00	0.15	0.00	0.19	0.38	0.08	0.58	0.00	0.75	0.14	0.23	0.00	0.00	0.00
Arlee rbt	-	-	-	-	-	-	0.00	0.00	0.00	0.03	0.00	0.41	0.00	0.00	0.18	0.08	0.69	0.00	0.69	0.00	0.23	0.00	0.00	0.00
Shasta 1 rbt[2]	0.31	0.00	0.44	0.02	0.04	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kamloops rbt	0.04	0.01	0.18	0.02	0.04	0.01	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.02	0.00	0.14	0.03	0.00	0.00	0.00	0.00	0.00
Wild rbt	0.01	0.00	0.02	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Other rbt	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.08	0.22	0.06	0.15	0.00	0.95	0.09	1.55	0.14	0.71	0.16	0.00	0.00	0.00	0.00	0.00
Bull trout	0.02	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Smallmouth bass	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.89	0.00	0.87	0.00	1.00	0.00	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All species/ strains	0.38	0.02	0.72	0.04	0.09	0.02	0.25	0.03	0.24	0.17	0.93	0.11	0.44	0.41	0.49	1.73	1.40	0.37	1.70	0.14	0.37	0.00	0.00	0.00
Ba and bo combined	0.09		0.07		0.03		0.04		0.29		0.74		1.19		1.19		1.28		1.07		0.39		0.00	

[1] Shasta strain rainbow trout planted in 1988.

[2] Shasta strain rainbow trout planted in 1986.

Table 5- Estimated monthly catch rates (fish per hour) for bank and boat anglers per species and strain from March 1988 through February 1989, Dent Bridge to Grandad Bridge (section II), Dworshak Reservoir, Idaho.

Species/ Strain	March		April		May		June		July		August		September		October		November		DEcember		January		February	
	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo
Shasta 2 rbt'	-	-	-	-	-	-	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arlee rbt	-	-	-	-	-	-	0.10	0.00	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shasta 1 rbt[2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kamloops rbt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wild rbt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other rbt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.26	0.00	0.15	0.00	0.08	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bull trout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Smallmouth bass	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.01	0.29	0.09	1.33	0.15	0.00	0.53	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALL species/ strains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.33	0.37	0.00	0.31	0.00	0.65	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba and bo combined	0.00		0.00		0.00		0.04		0.37		0.31		0.37		4.00		0.00		0.00		0.00		0.00	

[1] Shasta strain rainbow trout planted in 1988.

[2] Shasta strain rainbow trout planted in 1986.

Table 6. Estimated monthly catch rates (fish per hour) for bank and boat anglers per species and strain form March 1988 through February 1989, Grandad Bridge to end of pool (section III), Dworshak Reservoir, Idaho.

Species/ Strain	March		April		May		June		July		August		September		October		November		December		January		February	
	b a	l m	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo
Shasta 2 rbt'	-	-	·	·	-	-	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Arlee rbt	·	·	·	·	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Shasta 1 rbt[2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Kamloops rbt	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.10	0.00	0.01	0.00	0.00	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Wild rbt	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Other rbt	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bull trout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Smal Lmouth bass	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.02	0.00	0.00	0.50	0.23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
All species/ strains	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.12	0.00	0.04	0.00	0.01	0.50	0.23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ba and bc combined	0.00		0.00		0.21		0.12		0.04		0.01		0.23		n/a		n/a		n/a		n/a		n/a	

1 Shasta strain rainbow trout planted in 1988.

2 Shasta strain rainbou trout planted in 1986.

July. A boat angling catch rate of .41 fish per hour in August for the Arlee strain, as compared to .15 fish per hour for the Shasta strain, again showed a tendency for the Alee strain to be more catchable by boat anglers during the early post-release period (Figure 6).

Unidentified hatchery rainbow trout comprised 53.0% (12,730) of the total catch through the survey period (Figure 7)(Tables 7, 8, and 9). Presumably, these fish were the Shasta and Arlee strains released in 1988, and caught and released primarily by boat anglers as subcatchables (135-185mm). Estimated catches of Shasta and Arlee strain rainbow trout based on positive creel identification were nearly equal at 2,061 (8.5% of total catch) and 2,014 (8.3% of total catch), respectively.

Smallmouth bass accounted for 16.0% (3,933) of the total estimated catch, excluding kokanee. Smallmouth bass under the 305mm legal size limit (88.6%) were released. The estimated harvest of smallmouth bass was 450 (.003 overall harvest rate).

Fishing for rainbow trout is most prominent in Dworshak Reservoir during the late fall and winter bank fishery. Catches during other periods are largely incidental to kokanee fishing. Hatchery rainbow trout releases should target on the seasonal bank fishery. Hatchery stocking should maximize use of alternative rainbow trout strains providing the highest number of quality fish to this fishery.

Although the total catches of the 1988 Shastas and Arlees were similar, creel data suggest the Arlees to be somewhat more vulnerable to boat anglers during the early post-release period. Boat fishing targeting on kokanee is so intense during the spring period when rainbow trout are stocked that even slight differences in catchability during this period could substantially affect the number of fish caught by the nontarget boat fishery. Hooking mortality and harvest of subcatchable hatchery rainbow trout ultimately reduce availability of these fish to the winter bank fishery targeting on rainbow trout. The Shasta strain appears to be more suited to the Dworshak trout fishery based on these criteria, however, additional follow-up regarding differential total return to the creel is needed before a final analysis can be made.

Smallmouth bass was the most important non-hatchery based fishery in Dworshak Reservoir, excluding kokanee. A higher proportion of keeper size fish in the bass population would enhance this fishery.

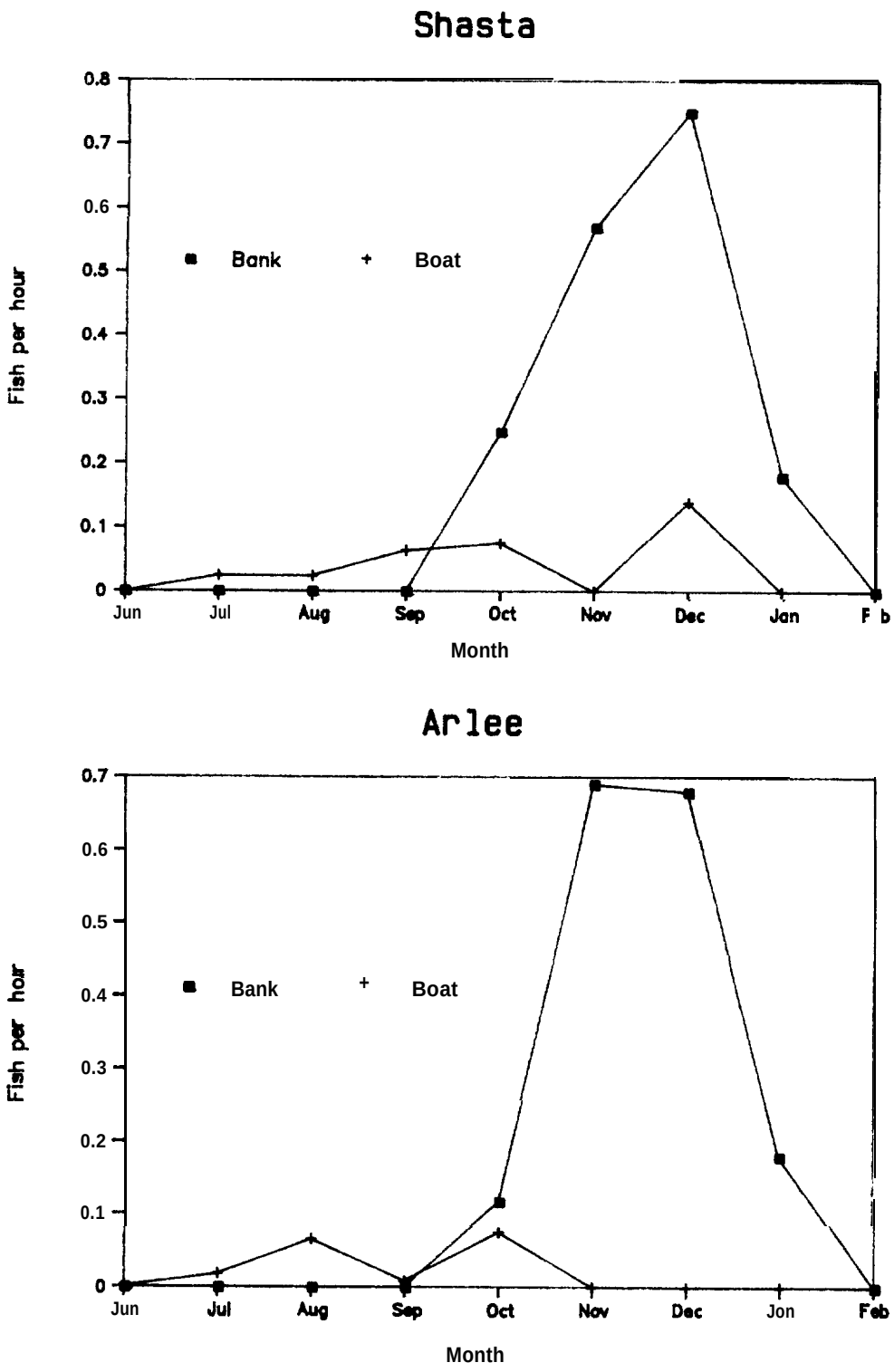


Figure 6. Catch rates by bank and boat anglers for Shasta and Arlee strain rainbow trout (1988 release), June 1988 through February 1989, Dworshak Reservoir, Idaho.

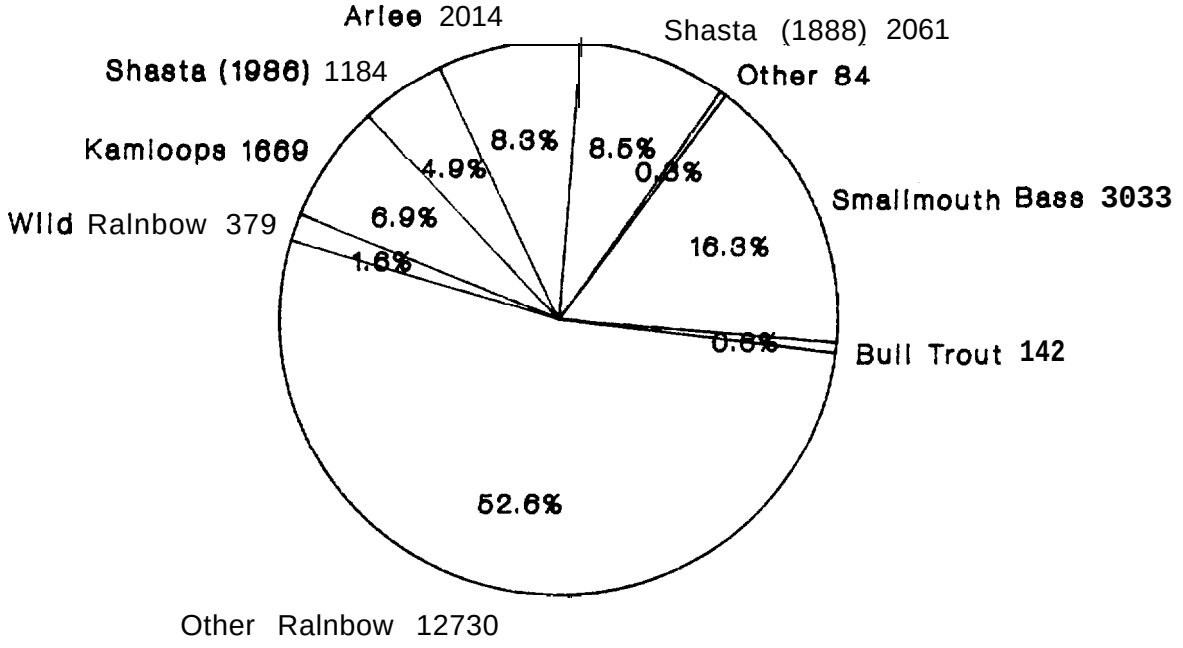


Figure 7, Percentages of total estimated catch by species and strains, excluding kokanee, March 1988 through February 1989, Dworshak Reservoir, Idaho.

Table 7. Estimated monthly catch for bank and boat anglers per species and strain from March 1988 through February 1989, Dworshak Dam to Dent Bridge (section I), Dworshak Reservoir, Idaho.

Species/ Strain	March		April		May		June		July		August		September		October		November		December		January		February	
	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo
Shasta 2 rbt[1]	-	-	-				0	0	0	868	0	211	0	120	161	26	140	0	239	31	48	0	0	0
Arlee rbt							0	62	0	732	0	580	0	0	75	26	168	0	218	0	48	0	D	0
Shasta 1 rbt[2]	446	19	376	260	29	0	90		00		00		0	0	D	0	0	0	0	0	0	0	0	0
Kamloops rbt	67	70	158	260	29	176	28	268	0	54	0	0	D	30	0	5	0	10	10	0	0	0	0	D
Wild rbt	17	0	21	0	29	176	0	21	0	27	0	0	0	15	0	D	0	0	10	0	0	D	0	D
Other rbt	0	19	0	0	0	387	0	515	19	5911	12	211	0	586	38	538	34	52	52	0	0	0	0	0
Bull trout	34	0	63	0	0	35	00		00		0	0		00	0	0	0	0	10	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	35	37	0	209	108	186	D	253	0	42	5	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	35	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0
All species/ strains	583	108	618	521	87	844	75	865	228	7701	199	1001	253	781	316	600	341	63	541	31	96	0	0	0
Ba and bo combined	691		1139		931		940		7929		1200		1034		917		403		571		96		0	

[1] Shasta strain rainbow trout planted in 1988.

[2] Shasta strain rainbow trout planted in 1986.

Table 8. Estimated monthly catch for bank and boat anglers per species and strain from March 1988 through February 1989, Dent Bridge to Grandad Bridge (section II), Dworshak Reservoir, Idaho.

Species/ Strain	March		April		May		June		July		August		September		October		November		December		January		February	
	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo
Shasta 2 rbt[1]	-	-	-	-	-	-	0	0	0	163	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arlee rbt	-	-	-	-	-	-	0	0	0	81	0	0	0	16	0	0	0	0	0	0	0	0	0	0
Shasta 1 rbt[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kamloops rbt	0	0	0	0	0	0	0	123	0	23	0	47	0	0	0	0	0	0	0	0	0	0	0	0
Wild rbt	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other rbt	0	0	0	0	0	0	0	39	0	2978	0	795	0	32	440	0	0	0	0	0	0	0	0	0
Bull trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	39	154	1093	0	795	0	210	440	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All species/ strains	0	0	0	0	0	0	0	239	174	4338	0	1637	0	258	880	0	0	0	0	0	0	0	0	0
Ba and bo combined	0		0		0		239		4512		1637		258		880		0		0		0		0	

[1] Shasta strain rainbow trout planted in 1988.

[2] Shasta strain rainbow trout planted in 1986.

Table 9. Estimated monthly catch for bank and boat anglers per species and strain from March 1988 through February 1989, Grandad Bridge to end of pool (section III), Dworshak Reservoir, Idaho.

Species/ Strain	March		April		May		June		July		August		September		October		November		December		January		February	
	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo	ba	bo
Shasta 2 rbt[1]	-	-	-	-	-		0	0	0	55	0	0	0	D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Arlee rbt	-	-	-	-	-		0	8	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Shasta 1 rbt[2]	0	0	0	0	0	0	0	24	0	0	D	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Kamloops rbt	0	0	0	0	0	1	0	253	0	55	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Wild rbt	0	0	0	0	0	1	0	24	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Other rbt	0	0	0	0	0	4	0	0	0	55	0	15	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bull trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Smallmouth bass	0	0	0	0	0	8	0	0	0	110	0	0	7	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
All species/ strains	0	0	0	0	0	14	0	308	0	275	0	15	7	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ba and bo combined	0		0		14		308		275		15		206		n/a		n/a		n/a		n/a		n/a	

[1] Shasta strain rainbow trout planted in 1988.

[2] Shasta strain rainbow trout planted in 1986.

FISH ABUNDANCE AND DISTRIBUTION

A total of 335 fish were gill netted during 498.6 net-hours of effort (.67 fish per hour) at locations throughout the reservoir from August through December (Table 10) (Appendix A). Rainbow trout comprised 31.9% of the catch, virtually all of which were of hatchery origin. Following rainbow trout in abundance as indicated by gill net catches were suckers (24.2%), smallmouth bass (17.6%), squawfish (14.9%), and other trout (0.3%). Other species including whitefish, crappie, and chiselmouth made up 11.0% of the catch.

Reservoir-wide comparisons of 1988 data with earlier data indicate that the overall gill net catch rate (all species) has continued to decline from the 1974 peak of 3.99 fish per net-hour (Figure 8). Relative abundance of redside shiners in the catch dropped from 69.9% composition in 1975 to 0.0% in 1988 (Figure 9), while smallmouth bass increased from 1.2% to 17.6%.

Elk Creek Arm gill net data for 1988 compared to earlier years indicate a surge in catch rates, especially for redside shiners, in 1973 (Figure 10). Total catch rates (all species combined) declined abruptly from 8.23 fish per hour in 1973 to 3.53 fish per hour in 1974. A relatively moderate decline in total catch rates occurred from 1980 (.75 fish per hour) to 1988 (.52 fish per hour). Smallmouth bass catch rates increased from .03 to .11. Smallmouth bass comprised 4.2% of the Elk Creek Arm gill net catch in 1980, as compared to 20.7% in 1988 (Figure 11).

The 1988 gill net effort confirmed the presence of black crappie in Dworshak Reservoir, with one taken in Elk Creek Arm on August 16, and chiselmouth, with one caught near Salmon Landing (r.m. 52) on August 30.

The lack of redside shiners in the 1988 gill net catch constituted the most dramatic change in catch rate and species composition. Because redside shiners were so dominant from 1973 through 1975, the reservoir-wide and Elk Creek Arm total catch rate trends mirrored that of the redside shiners.

Eight smallmouth bass were first collected in gill nets during 1974, with the documented distribution limited to section I (Pettit et al., 1975). A total of 16 smallmouth bass were netted in 1975, all in section I (Pettit, 1976). Gill netting, seining and creel data confirmed reservoir-wide distribution of smallmouth bass in 1980 (Horton, 1981). Post-1974 reductions in reservoir-wide and Elk Creek Arm catch rates would suggest that the redside shiner population was in decline prior to reservoir-wide establishment of smallmouth bass. Post-1974 decreases in gill net catch rates for additional species, including squawfish and suckers, suggests a general decline in reservoir productivity. Thus, the 1973 through 1975 stocking efforts to expand smallmouth bass populations likely occurred during a downward trend of its

Table 10. Horizontal gill net catch and catch rate by species and strains, 1988, Dworshak Reservoir, Idaho.

Date	Location	Net type	Net-hours	Shasta Rbt	Arlee Rbt	Other Rbt	Smb	Kok	Sq	Su	Other	Total
08/02/88	Elk Creek Arm	float	14.5				2					2
08/16/88	Elk Creek Arm	float	15.2				2					3
08/16/88	Elk Creek Arm	sink	15.0				6		4	5	1	17
08/17/88	Elk Creek Arm	float	15.5				1					1
08/17/88	Elk Creek Arm	sink	15.5	7		7	3	3	3	3		26
08/30/88	Little N. Fork	float	17.0				2		13	6		21
08/30/88	Little N. Fork	sink	14.7					17	7	10	1	35
08/30/88	Salmon Landing	float	15.0				20	1	10	9	1	41
08/30/88	Salmon Landing	sink	13.8				14		3	14	7	39
08/31/88	Magnus Bay	float	16.0	2								3
08/31/88	Magnus Bay	sink	16.0	1			2		3	2		8
08/31/88	Reed's Creek	float	18.2			2	1		2			5
08/31/88	Reed's Creek	sink	18.2	1	1		2		3	5	1	13
09/29/88	Elk Creek Arm	float	16.8	6	1			2				9
09/29/88	Elk Creek Arm	sink	17.0	2					1	5		9
09/30/88	Elk Creek Arm	float	17.0	6	1		2					9
09/30/88	Elk Creek Arm	sink	16.8	5								6
10/20/88	Freeman Creek	float	18.0	18	2							20
10/20/88	Freeman Creek	sink	18.2	2	1					3		6
10/21/88	Canyon Creek	float	17.2	10					1			11
10/21/88	Canyon Creek	sink	17.2							6		6
11/22/88	Indian Creek	float	19.5	2	2					2		6
11/22/88	Indian Creek	sink	19.8							8		8
11/23/88	Merry's Bay	float	18.2	13	8			2				23
11/23/88	Merry's Bay	sink	18.9	2						2		4
12/22/88	Merry's Bay	float	19.2									2
12/22/88	Indian Creek	float	18.4							1		1
12/23/88	Freeman Creek	float	21.5									0
12/23/88	Freeman Creek	float	20.2									1
Total			498.5	79	19	9	59	27	50	81	11	335
Catch rate				0.16	0.04	0.02	0.12	0.05	0.10	0.16	0.02	0.67

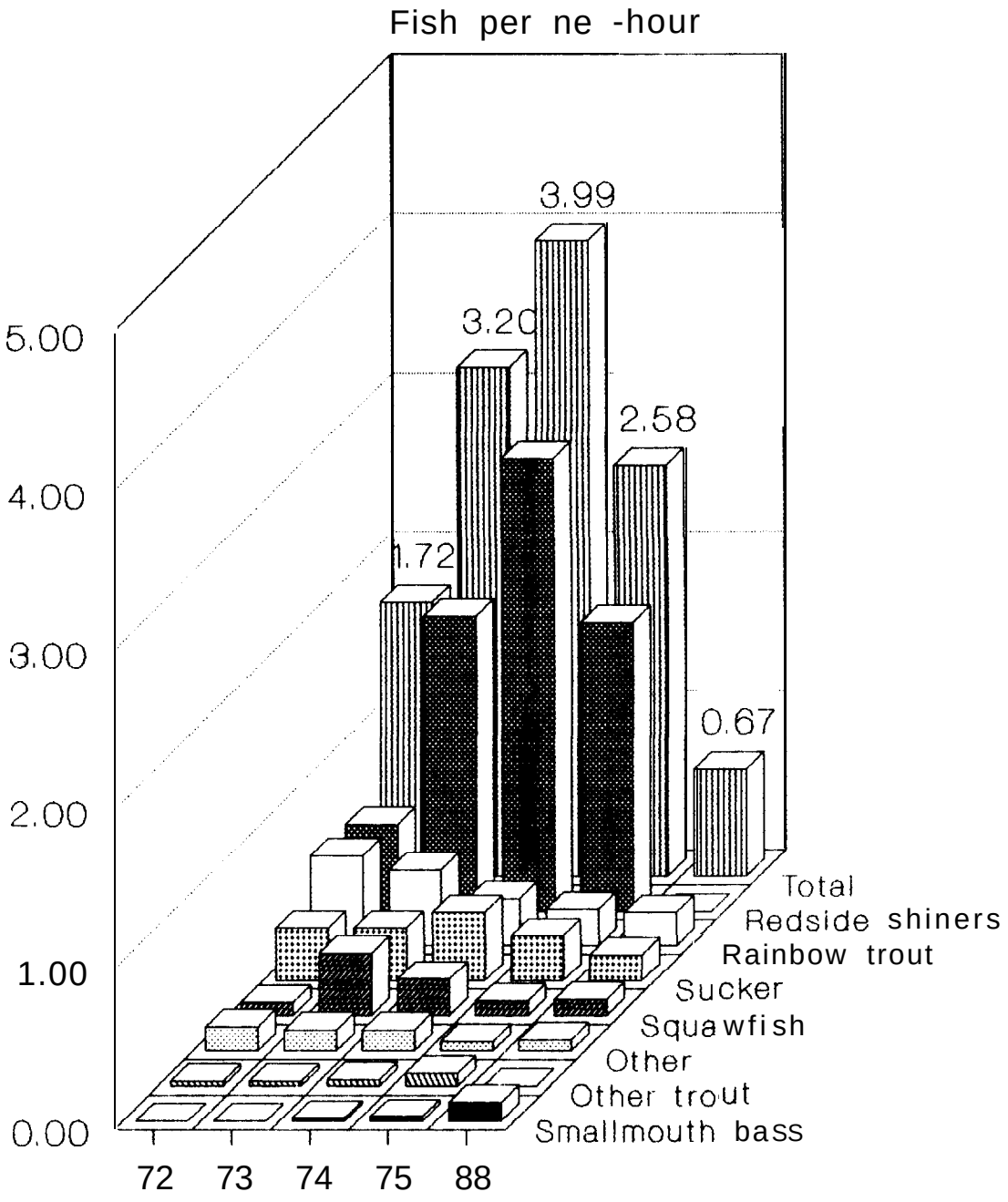


Figure 8. Annual reservoir-wide horizontal gill net catch rates from 1972 through 1988, Dworshsk Reservoir, Idaho.

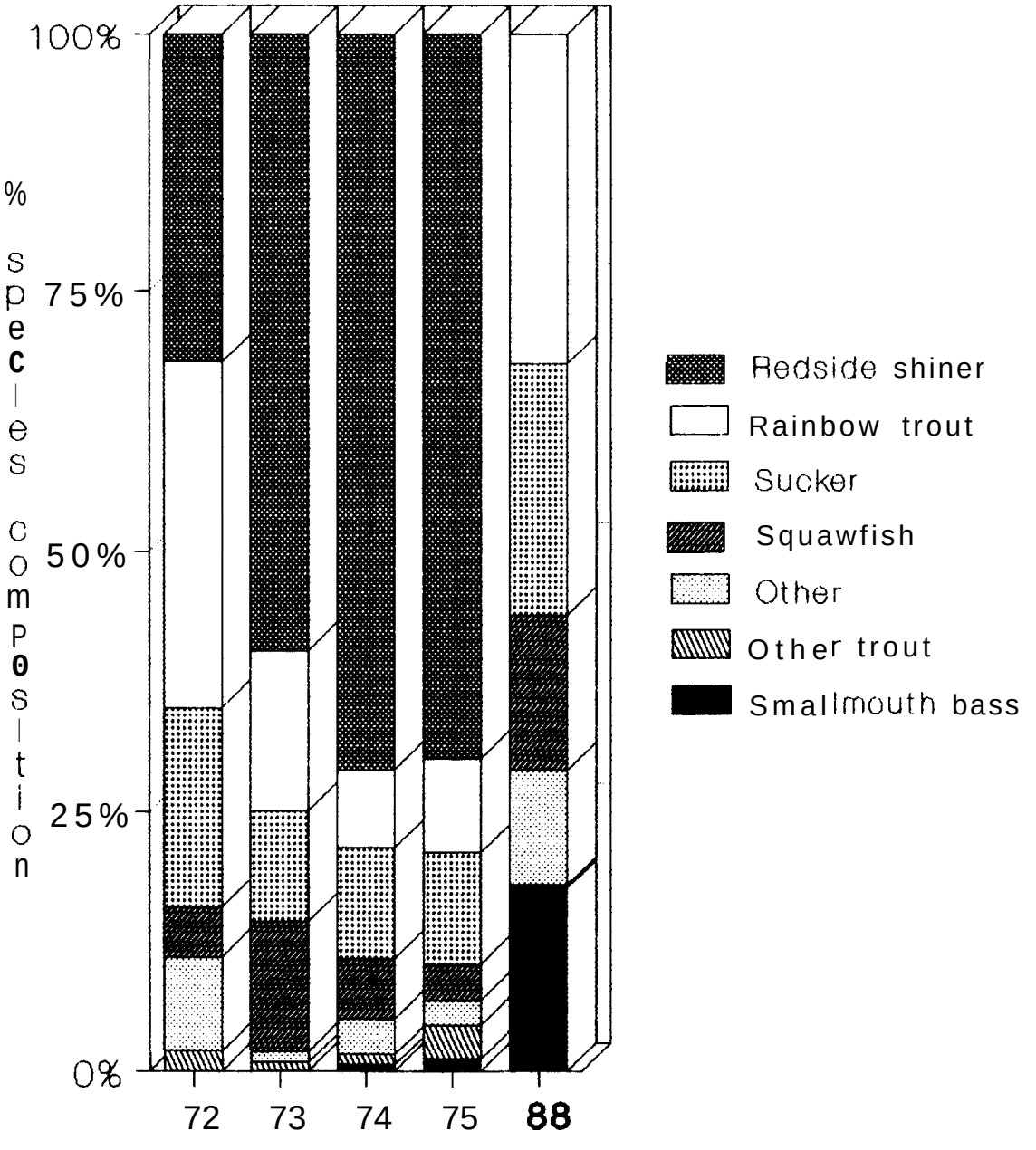


Figure 9. Annual reservoir-wide percent species composition trom horizontal gill net collections, 1972 through 1988, Dworshak Reservoir, Idaho.

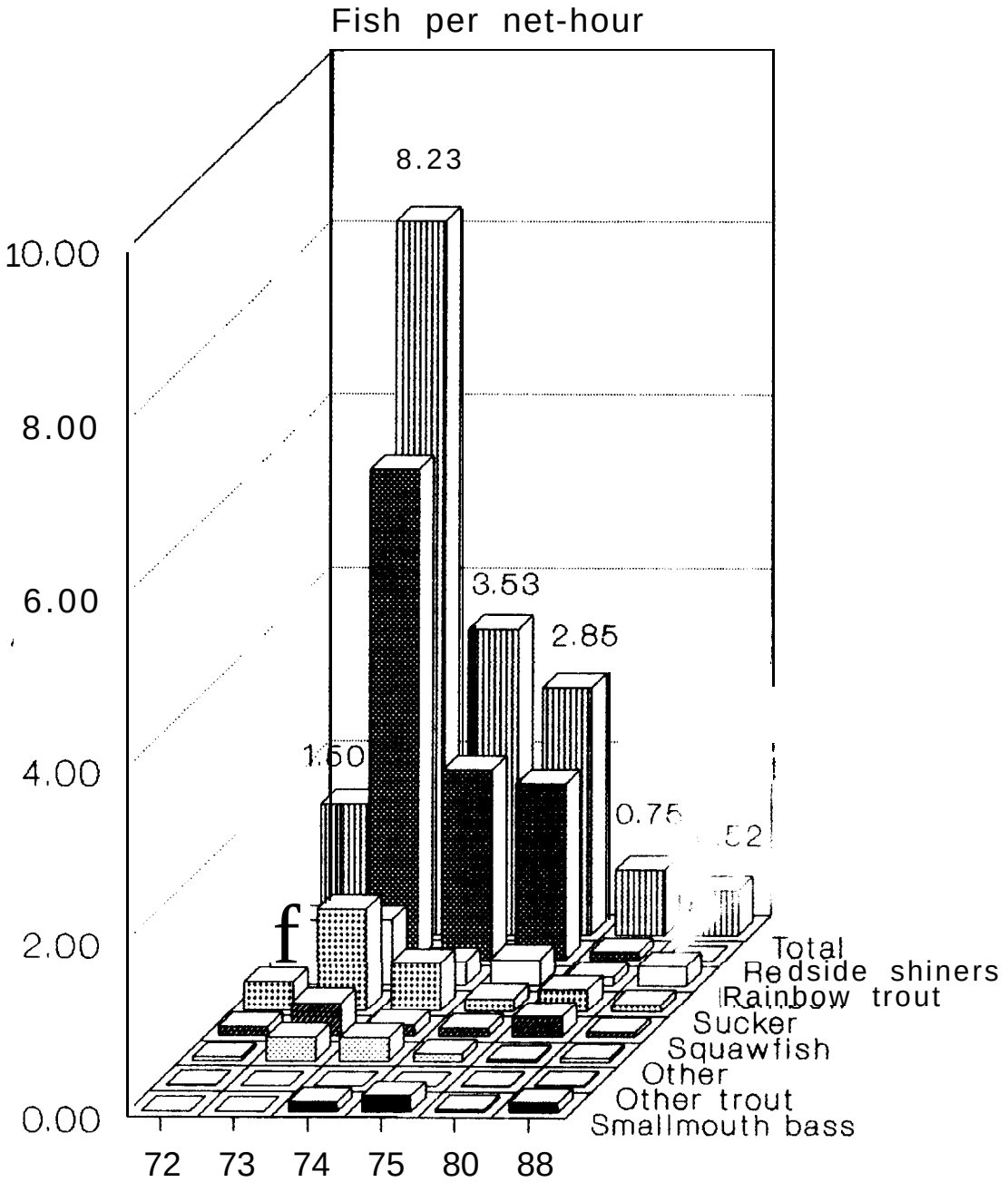


Figure 10. Annual Elk Creek Arm horizontal gill net catch rates from 1972 through 1988, Dworshak Reservoir, Idaho,

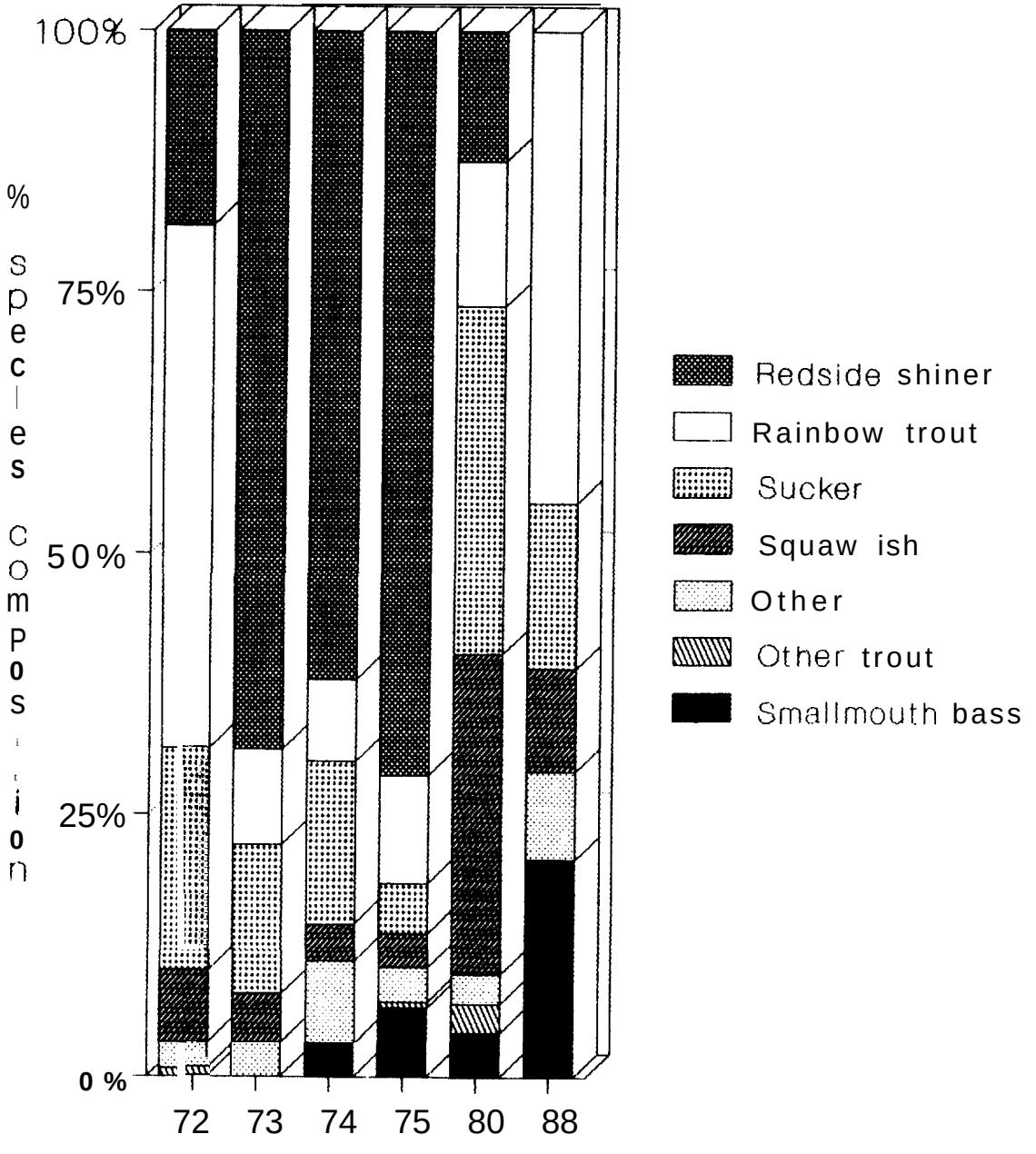


Figure 11. Annual Elk Creek Arm percent species composition from horizontal gill net collections, 1972 through 1988, Dworshak Reservoir, Idaho.

target prey base.

Elk Creek Arm gill net catch rate data indicate that smallmouth bass numbers have increased since 1980. The 1988 percent composition of smallmouth bass in Elk Creek Arm was the highest recorded to date. Reservoir-wide gill net collections produced the highest smallmouth bass catch rates and percent composition to date.

GROWTH

Hatchery Rainbow Trout Strains

November mean lengths and condition (K) factors for Shasta and Arlee strain rainbow trout released in 1988 were very similar (Table 11). These data indicated that the six-month growth increments for Shasta and Arlee strain rainbow trout were 73mm and 78mm, respectively.

Planned 1989 hatchery rainbow trout releases will be similar to 1988. Fin clips will again be used for field identification.

Smallmouth Bass

A strong correlation (r^2=.92) was indicated from a body-scale linear regression for a 66 fish sample (Figure 12). Mean length at age data indicate excellent early growth, averaging 99mm at age I (Table 12). Expected age at recruitment to legal size (305mm) is age IV+ or V.

Von Bertalanffy growth equations indicate a considerable reduction in smallmouth bass growth rate and ultimate size from 1980 to 1988 (Figure 13). Although the growth rate of smallmouth bass in Dworshak Reservoir has declined, the current growth through age III is as good or better than that documented by Rohrer (1985) for smallmouth bass in Brownlee Reservoir, Idaho (Figure 14). Smallmouth bass growth in Dworshak Reservoir is generally better than the mean growth compiled by Bennett et al. (1986) for other populations in similar latitudes. Dworshak bass approximate a moderate growth pattern as described by Anderson and Weithman (1978).

In view of adequate growth and minimal harvest, additional data on stock structure, mortality, and available prey are needed to address factors that may be limiting recruitment of legal size smallmouth bass to the Dworshak Reservoir fishery.

Table 11. **Mean lengths and condition (K) factors** (p=0.05) **for Shasta and Arlee strain rainbow trout (1988 release) gill netted during November, 1988, Dworshak Reservoir, Idaho.**

Strain	Mean length (mm)	K factor	Sample locations
Shasta	**232** (±4), n=16	**90.06** (±2.92), n=14	Merry's Bay and Indian Creek
Arlee	**235** (±6), n=10	**90.23** (±1.90), n=8	Merry's Bay and Indian Creek

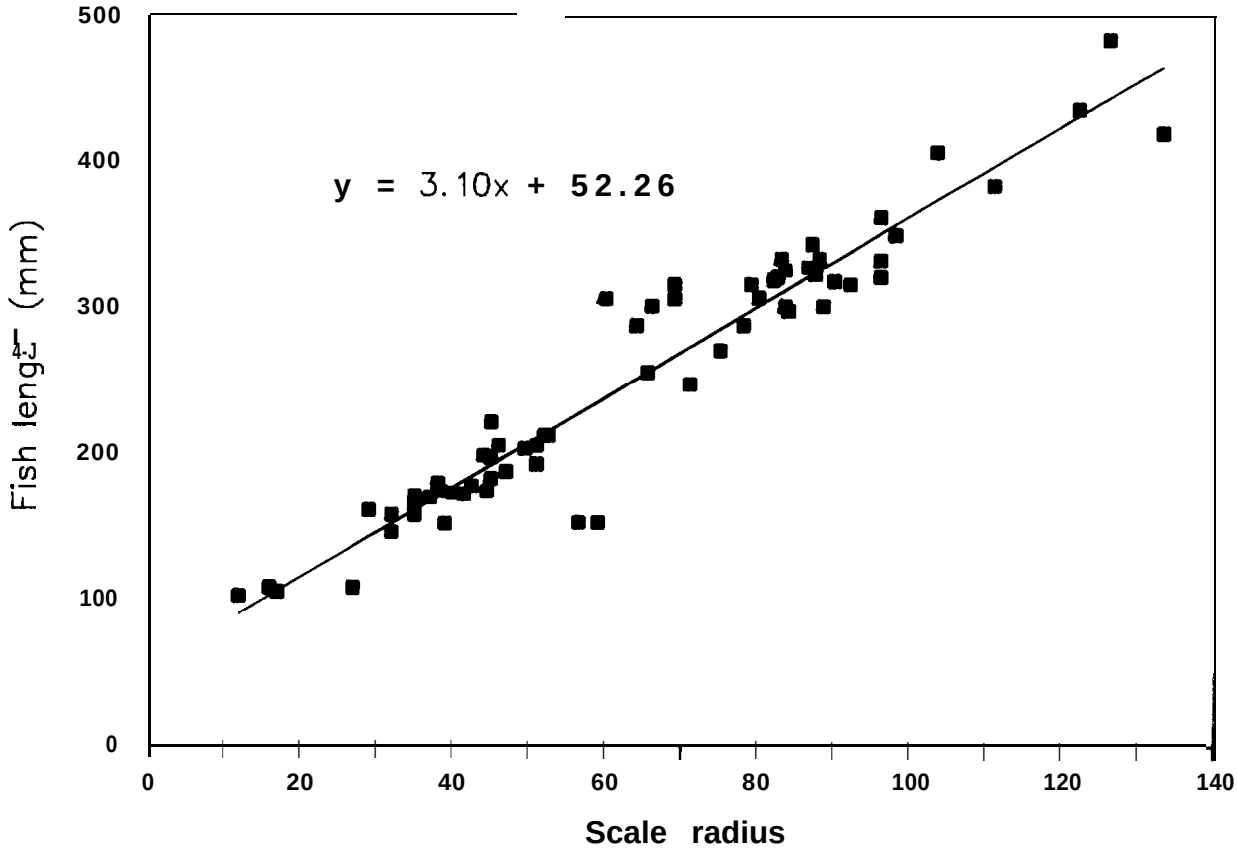


Figure 12. Body-scale regression for 66 smallmouth bass, 1988, Dworshak Reservoir, Idaho.

Table 12. Calculated total lengths (mm) at each annulus and annual increments of growth for 63 smallmouth bass sampled from July through October, 1988, Dworshak Reservoir, Idaho.

Age Class	Year class	Number of fish	Calculated mean length at each annulus (mm)							
			1	2	3	4	5	6	7	8
I	1987	14	106.0							
II	1986	11	96.0	157.4						
111	1985	20	98.2	178.8	241.8					
IV	1984	7	95.8	163.7	225.7	284.6				
V	1983	6	96.5	157.4	234.2	292.8	337.2			
VI	1982	4	98.1	163.8	214.9	262.9	307.1	343.3		
VII	1981	0								
VIII	1980	1	103.6	134.4	209.6	267.7	298.4	370.2	428.3	462.5
Number of fish			63	49	38	18	11	5	1	1
Weighted mean			99.2	167.1	234.0	281.6	322.7	348.7	428.3	462.5
Mean growth increment			99.2	67.9	66.9	47.6	41.1	26.0	79.6	34.2

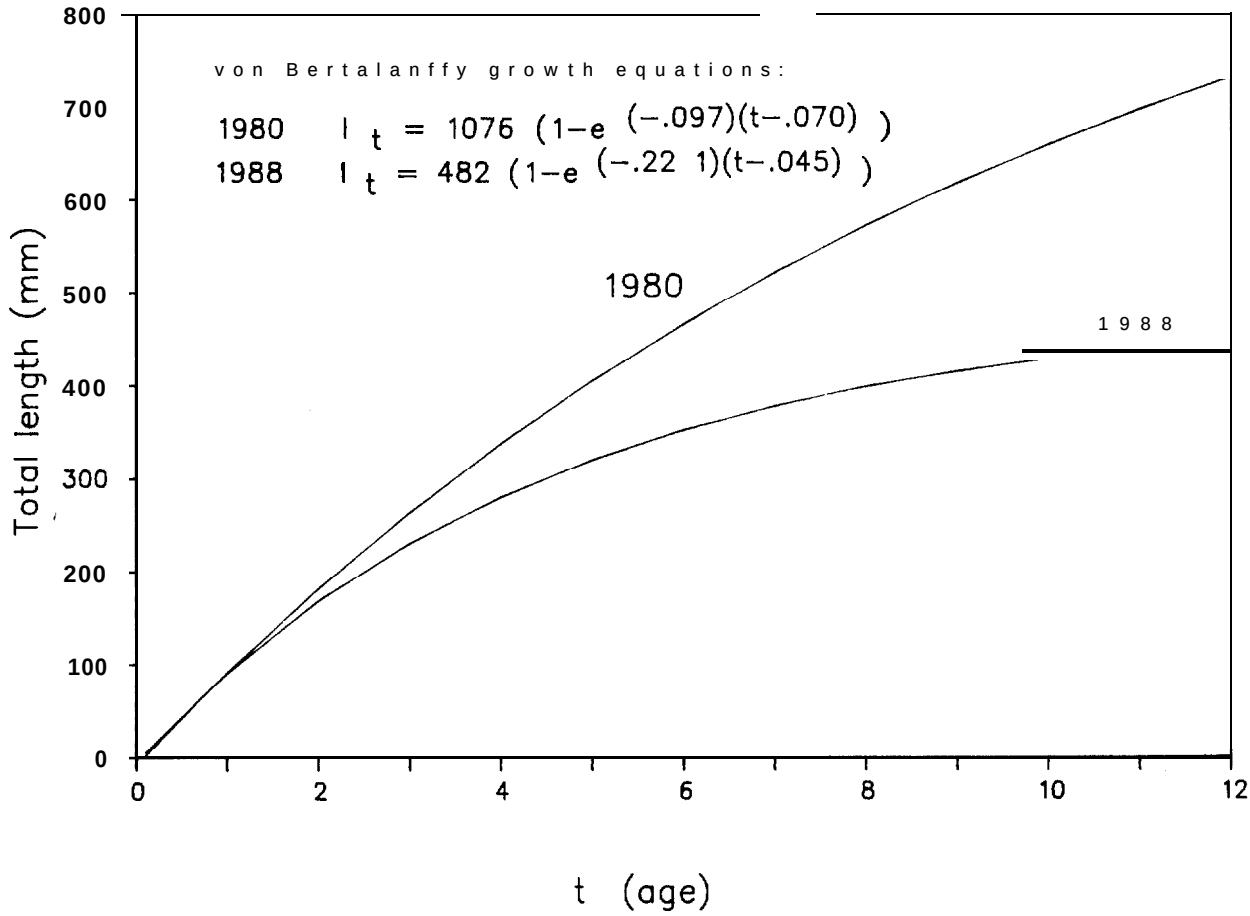


Figure 13. Von Bertalanffy growth equations for smallmouth bass based on data from Horton (1981) and 1988 samples, Dworshak Reservoir, Idaho.

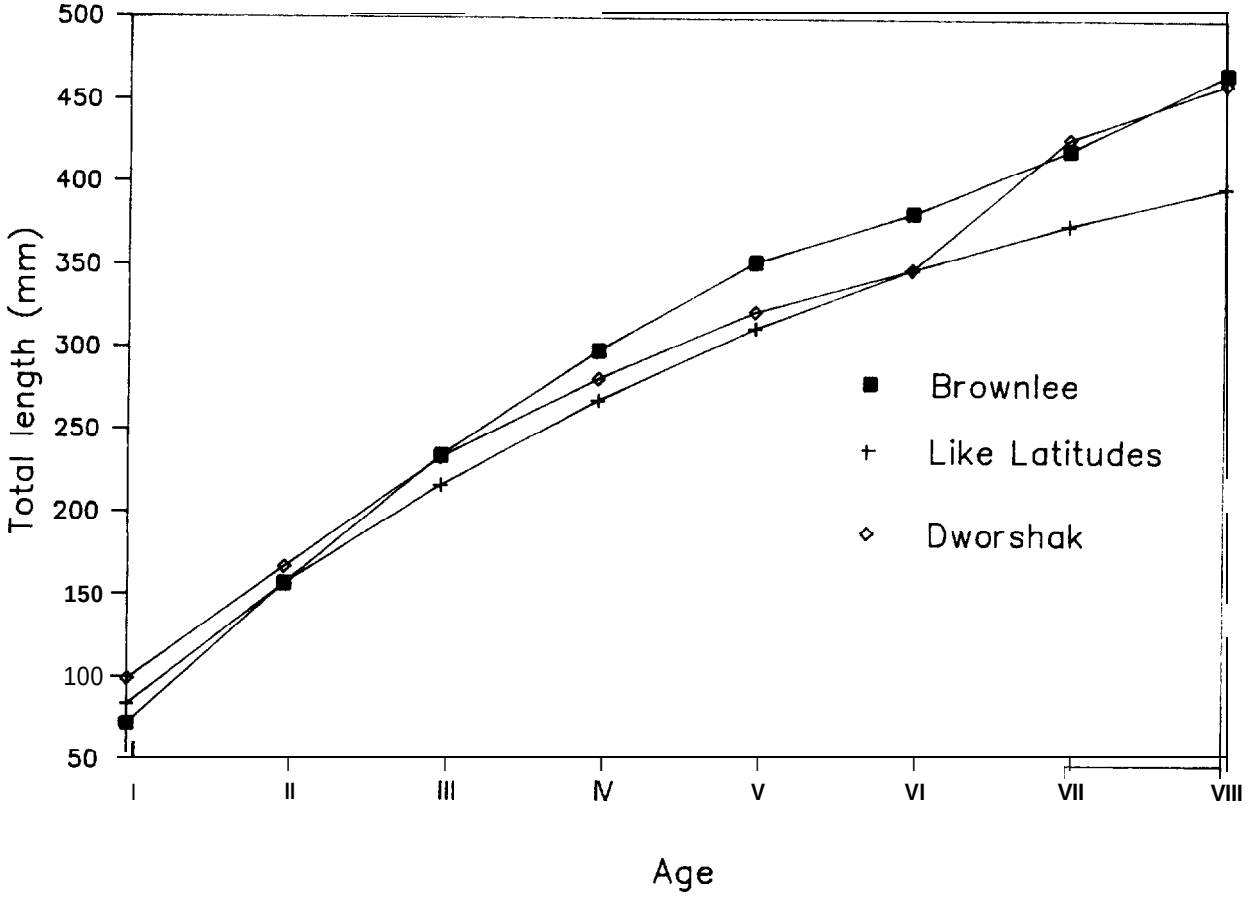


Figure 14. Comparison of mean lengths (mm) at age of smallmouth bass in Brownlee Reservoir, Idaho (Rohrer 1985), Dworshak Reservoir, Idaho, and other locations at similar latitudes (Bennett et al. 1986).

FOOD HABITS

Rainbow Trout

Preliminary comparisons of Shasta and Arlee food habits are limited due to the small sample size. Additional stomach samples are to be collected during 1989 and 1990 for both the 1988 and 1989 release groups. These data will increase the sample size for the first-year post-release period and will provide new information for the second-year post-release period.

Preliminary assessments of food habits by the percent frequency of occurrence, percent by number, and Coefficient of Importance (C.I.) methods indicate Cladocera, Hymenoptera, and Homoptera to be the most prominent taxa for both the Shasta (n=13) and Arlee (n=10) strains (Figure 15).

Diptera, Hemiptera, and Coleoptera also occurred frequently in both Shasta and Arlee stomach samples, but in low numbers. The percent frequency of occurrence of Diptera, mostly chironomids, was considerably higher in the Arlee samples (26.7%) than the Shasta samples (17.0%).

Cladocera, Hymenoptera, and Homoptera combined comprised 73.2% of the total food volume in the Arlee samples. The more diverse Shasta samples included substantial volumes of Acanthochitonida (Phvsa sp.) and Hemiptera. Although Phvsa sp. ranked the highest percent by volume in the Shasta samples, this taxon occurred in only one specimen.

Analysis by percent by number, percent frequency of occurrence, and the C.I. methods showed considerable similarity in food habits of the Shasta and Arlee strains, with Cladocera being of major importance. The sizeable contributions of Hymenoptera, mostly ants, and Homoptera to the diets of both rainbow trout strains highlight the importance of terrestrial food sources to rainbow trout in Dworshak Reservoir.

Smallmouth Bass

Hymenoptera, Diptera, fish, and Trichoptera occurred in smallmouth bass stomachs (n=25) most frequently and in the greatest numbers, and thus produced the highest C.I. values (Figure 16). Fish, including sculpins, salmonids, and unidentifiable fry composed the highest percent by volume (44.3%).

Intensive utilization of Hymenoptera by smallmouth bass and rainbow trout further underscores the role of non-aquatic food input to the Dworshak Reservoir system. Other major components of the smallmouth bass diet, fish and Trichoptera, constituted a comparatively minor portion of the trout diet.

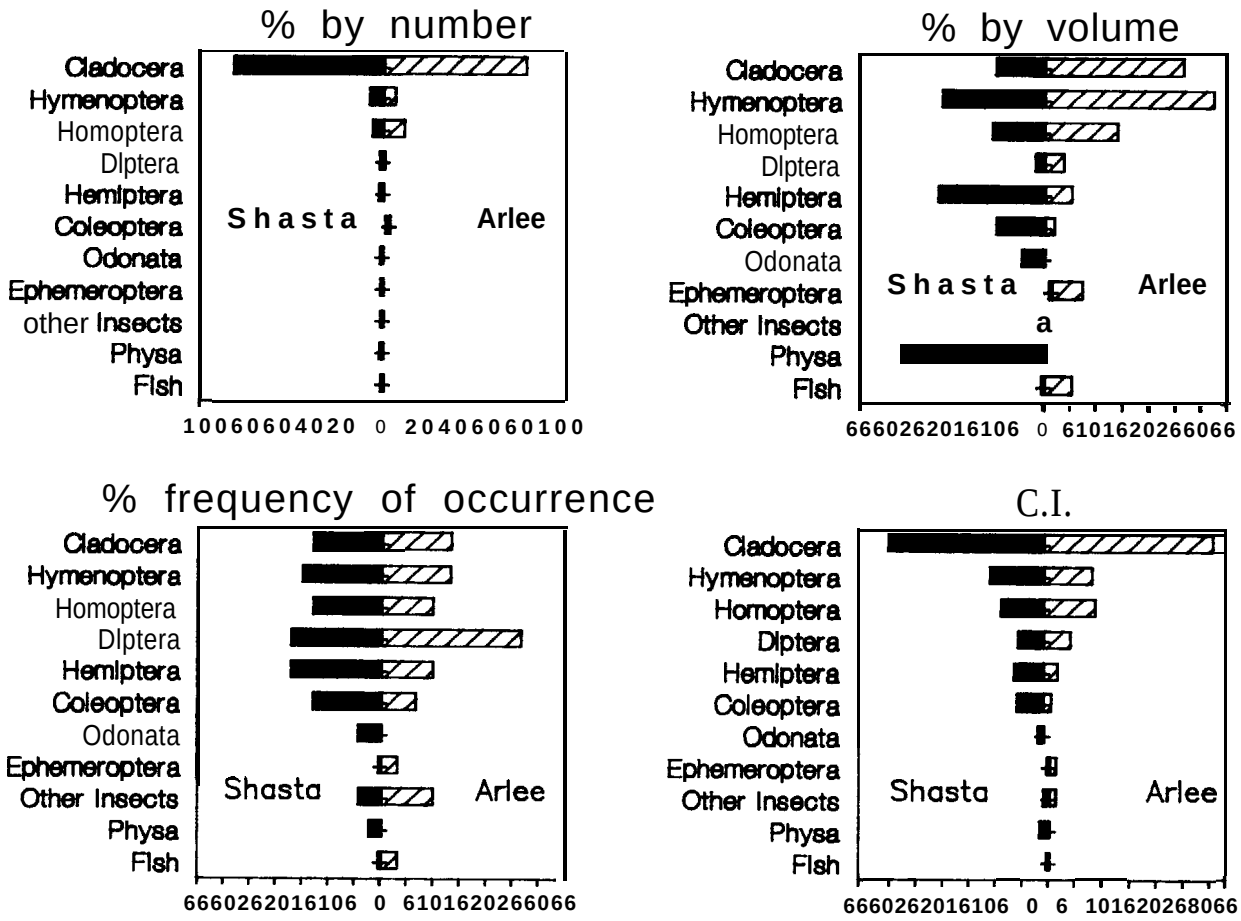


Figure 15. **Food items contained in stomachs of Shasta (n=13) and Arlee (n-10) stmin rainbow trout by percent by number, percent by volume, percent frequency of occurrence, and Coefficient of Importance (C.I.), 1988, Dworshak Reservoir, Idaho.**

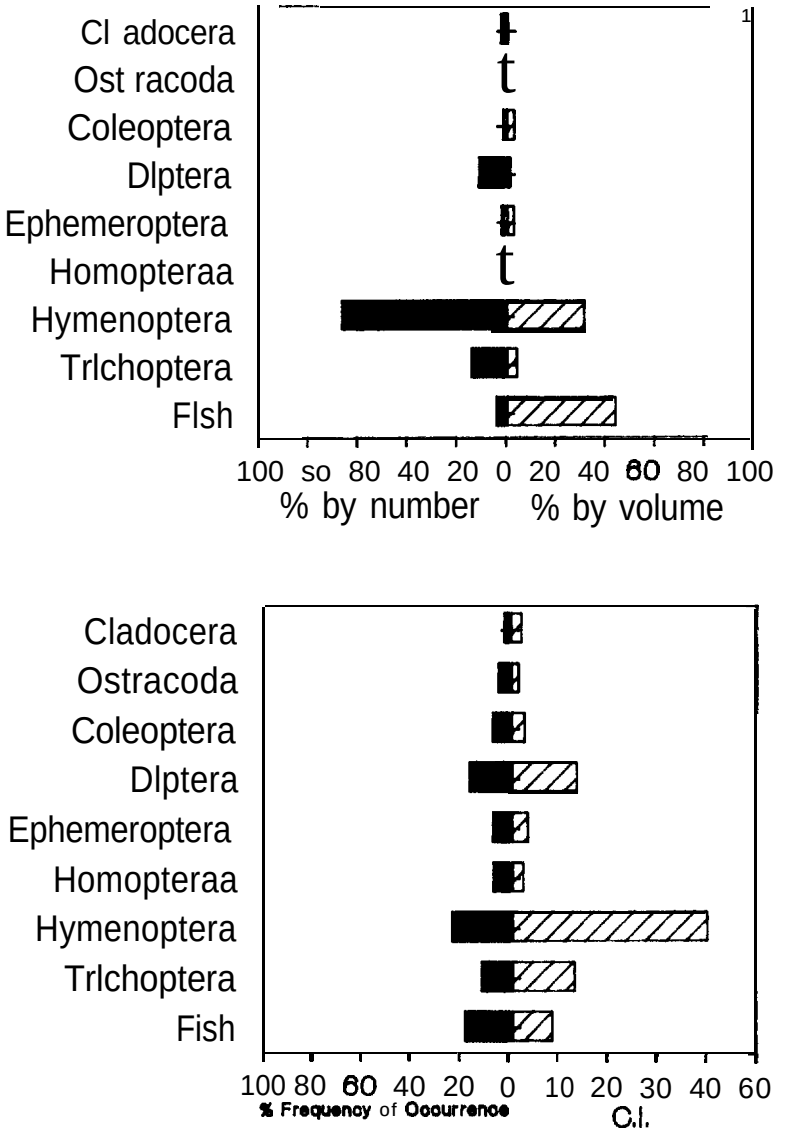


Figure 16. Food Items contalned In stomachs of smallmouth bass (n=25) by percent by number, percent by volume, percent frequency of occurrence, and Coeffiolent of Importance (Cl,), 1888, Dworshak Reservoir, Idaho.

SUMMARY AND CONCLUSIONS

An estimated 154,558 angler-hours were expended from March 1988 through February 1989 to catch a total of 20,037 rainbow trout, 3,933 smallmouth bass, and 142 bull trout. Estimated catch of other species, including cutthroat trout, whitefish, suckers, and squawfish totalled 84. An estimated 98% of the rainbow trout caught were of hatchery origin. Catches of Shasta strain and Arlee strain rainbow trout released during 1988 were very similar at 2,061 and 2,014, respectively. Subcatchable (135-185mm) rainbow trout caught and released by boat anglers comprised an estimated 53% (12,730) of the total catch through the survey period. The estimated harvest of legal size smallmouth bass (305mm minimum total length) was 450.

The highest monthly combined catch rate documented for all species excluding kokanee was 1.81 fish per hour during October. The lowest monthly catch rates for species other than kokanee occurred during May through June when fishing pressure was the highest and fishing effort was targeting on kokanee.

Creel data indicated that the Arlee rainbow trout strain was somewhat more vulnerable to boat anglers than the Shasta strain during the early post-release period. Hatchery rainbow trout strain selection and stocking efforts should be managed primarily to accommodate the late fall and winter bank fishery. Additional return to creel data is needed to determine if early catchability of the Arlee strain by boat anglers is a valid liability.

Relative abundance of smallmouth bass in Elk Creek Arm has increased since 1980. Reservoir-wide gill net collections produced the highest smallmouth bass catch rates and percent composition to date. No redside shiners were gill netted in 1988. Post-1974 reductions in Elk Creek Arm and reservoir-wide gill net catch rates would suggest that the redside shiner population was in decline prior to establishment of smallmouth bass.

Six-month growth increments for Shasta and Arlee strain rainbow trout were very similar, at 73mm and 78mm, respectively. Although smallmouth bass growth rate has declined since 1980, current growth through age III in Dworshak Reservoir is as good or better than many Idaho reservoirs, and overall growth is generally better than the mean growth of other smallmouth bass populations at similar latitudes. In view of adequate growth and minimal harvest, additional data on stock structure, mortality, and available prey are needed to address factors that may be limiting recruitment of legal size smallmouth bass to the smallmouth fishery.

Analyses of Shasta and Arlee strain rainbow trout stomach samples showed considerable similarity in food habits of the Shasta and Arlee strain rainbow trout, with Cladocera being of major

importance. Fish and Trichoptera were major components of the smallmouth bass diet, but were of comparatively minor importance in the Shasta and Arlee strain diets. Terrestrial insects comprised major portions of both the rainbow trout and smallmouth bass diets. Additional stomach samples to be collected during 1989 and 1990 will increase the sample sizes for diet analyses.

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APPENDIX A

Gill net field data, 1988, Dworshak Reservoir, Idaho.

Appendix A. Gill net field data, 1988, Dworshak Reservoir, Idaho.

Date	Location	Float(f) or sink(s)	Net-hours	Species or strain	Length	Weight
08/02/88	e0.8	f	14.5	smb	177	59
08/02/88	e0.8	f	14.5	smb	170	54
08/16/88	e0.8	f	15.2	smb	107	12
08/16/88	e0.8	f	15.2	smb	171	52
08/16/88	e0.8	f	15.2	hrbrv	191	68
08/16/88	e0.8	s	15.0	smb	332	530
08/16/88	e0.8	s	15.0	smb	203	84
08/16/88	e0.8	s	15.0	smb	205	98
08/16/88	e0.8	s	15.0	smb	151	42
08/16/88	e0.8	s	15.0	smb	173	56
08/16/88	e0.8	s	15.0	smb	187	70
08/16/88	e0.8	s	15.0	hrblv	206	90
08/16/88	e0.8	s	15.0	cr	255	250
08/16/88	e0.8	s	15.0	sq	572	0
08/16/88	e0.8	s	15.0	sq	555	1520
08/16/88	e0.8	s	15.0	sq	247	130
08/16/88	e0.8	s	15.0	sq	312	220
08/16/88	e0.8	s	15.0	su	448	795
08/16/88	e0.8	s	15.0	su	372	510
08/16/88	e0.8	s	15.0	su	373	435
08/16/88	e0.8	s	15.0	su	384	510
08/16/88	e0.8	s	15.0	su	350	430
08/17/88	e3.1	f	15.5	smb	157	42
08/17/88	e3.1	s	15.5	smb	166	0
08/17/88	e3.1	s	15.5	smb	221	112
08/17/88	e3.1	s	15.5	smb	317	475
08/17/88	e3.1	s	15.5	hrblv	214	96
08/17/88	e3.1	s	15.5	hrbu	199	0
08/17/88	e3.1	s	15.5	sq	262	0
08/17/88	e3.1	s	15.5	su	402	0
08/17/88	e3.1	s	15.5	su	388	0
08/17/88	e2.8	s	15.0	hrblv	90	76
08/17/88	e2.8	s	15.0	hrblv	212	99
08/17/88	e2.8	s	15.0	hrblv	225	93
08/17/88	e2.8	s	15.0	hrblv	193	66
08/17/88	e2.8	s	15.0	hrblv	202	66
08/17/88	e2.8	s	15.0	hrblv	196	68
08/17/88	e2.8	s	15.0	hrbu	213	90
08/17/88	e2.8	s	15.0	hrbu	212	100
08/17/88	e2.8	s	15.0	hrbu	208	78
08/17/88	e2.8	s	15.0	hrbu	209	68
08/17/88	e2.8	s	15.0	hrbu	320	90

08/17/88	e2.8	s	15.0	wrbt	213	86
08/17/88	e2.8	s	15.0	kok	211	94
08/17/88	e2.8	s	15.0	kok	212	87
08/17/88	e2.8	s	15.0	kok	294	205
08/17/88	e2.8	s	15.0	sq	370	0
08/17/88	e2.8	s	15.0	sq	360	0
08/17/88	e2.8	s	15.0	su	350	0
08/30/88	13.6	f	17.0	smb	182	0
08/30/88	13.6	f	17.0	smb	212	0
08/30/88	13.6	f	17.0	sq	310	0
08/30/88	13.6	f	17.0	sq	228	0
08/30/88	13.6	f	17.0	sq	275	0
08/30/88	13.6	f	17.0	sq	217	0
08/30/88	13.6	f	17.0	sq	265	0
08/30/88	13.6	f	17.0	sq	195	0
08/30/88	13.6	f	17.0	sq	270	0
08/30/88	13.6	f	17.0	sq	256	0
08/30/88	13.6	f	17.0	sq	268	0
08/30/88	13.6	f	17.0	sq	257	0
08/30/88	13.6	f	17.0	sq	257	0
08/30/88	13.6	f	17.0	sq	281	0
08/30/88	13.6	f	17.0	sq	200	0
08/30/88	13.6	f	17.0	su	370	0
08/30/88	13.6	f	17.0	su	375	0
08/30/88	13.6	f	17.0	su	440	0
08/30/88	13.6	f	17.0	su	420	0
08/30/88	13.6	f	17.0	su	295	0
08/30/88	13.6	f	17.0	su	401	0
08/30/88	13.5	s	14.7	bull	314	0
08/30/88	13.5	s	14.7	kok	301	0
08/30/88	13.5	s	14.7	kok	286	0
08/30/88	13.5	s	14.7	kok	289	0
08/30/88	13.5	s	14.7	kok	311	0
08/30/88	13.5	s	14.7	kok	323	0
08/30/88	13.5	s	14.7	kok	295	0
08/30/88	13.5	s	14.7	kok	297	0
08/30/88	13.5	s	14.7	kok	286	0
08/30/88	13.5	s	14.7	kok	292	0
08/30/88	13.5	s	14.7	kok	300	0
08/30/88	13.5	s	14.7	kok	334	0
08/30/88	13.5	s	14.7	kok	305	0
08/30/88	13.5	s	14.7	kok	283	0
08/30/88	13.5	s	14.7	kok	294	0
08/30/88	13.5	s	14.7	kok	304	0
08/30/88	13.5	s	14.7	kok	315	0
08/30/88	13.5	s	14.7	kok	302	0
08/30/88	13.5	s	14.7	sq	332	0
08/30/88	13.5	s	14.7	sq	395	0
08/30/88	13.5	s	14.7	sq	332	0
08/30/88	13.5	s	14.7	sq	500	0

08/30/88	13.5	s	14.7	sq	325 0
08/30/88	13.5	s	14.7	sq	231 0
08/30/88	13.5	s	14.7	sq	221 0
08/30/88	13.5	s	14.7	su	452 0
08/30/88	13.5	s	14.7	su	40 1 0
08/30/88	13.5	s	14.7	su	375 0
08/30/88	13.5	s	14.7	su	362 0
08/30/88	13.5	s	14.7	su	476 0
08/30/88	13.5	s	14.7	su	421 0
08/30/88	13.5	s	14.7	su	373 0
08/30/88	13.5	s	14.7	su	400 0
08/30/88	13.5	s	14.7	su	395 0
08/30/88	13.5	s	14.7	su	400 0
08/30/88	SL	f	15.0	kok	290 0
08/30/88	SL	f	15.0	smb	287 0
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08/30/88	SL	f	15.0	smb	2 0 0 0
08/30/88	SL	f	15.0	smb	100 0
08/30/88	SL	f	15.0	smb	100 0
08/30/88	SL	f	15.0	smb	102 0
08/30/88	SL	f	15.0	smb	102 0
08/30/88	SL	f	15.0	smb	106 0
08/30/88	SL	f	15.0	smb	156 0
08/30/88	SL	f	15.0	smb	203 0
08/30/88	SL	f	15.0	smb	105 0
08/30/88	SL	f	15.0	smb	187 0
08/30/88	SL	f	15.0	smb	106 0
08/30/88	SL	f	15.0	smb	107 0
08/30/88	SL	f	15.0	smb	100 0
08/30/88	SL	f	15.0	smb	105 0
08/30/88	SL	f	15.0	sq	497 0
08/30/88	SL	f	15.0	sq	285 0
08/30/88	SL	f	15.0	sq	382 0
08/30/88	SL	f	15.0	sq	264 0
08/30/88	SL	f	15.0	sq	277 0
08/30/88	SL	f	15.0	sq	270 0
08/30/88	SL	f	15.0	sq	262 0
08/30/88	SL	f	15.0	sq	284 0
08/30/88	SL	f	15.0	sq	235 0
08/30/88	SL	f	15.0	sq	251 0
08/30/88	SL	f	15.0	su	402 0
08/30/88	SL	f	15.0	su	377 0
08/30/88	SL	f	15.0	su	443 0
08/30/88	SL	f	15.0	su	39 0 0
08/30/88	SL	f	15.0	su	383 0
08/30/88	SL	f	15.0	su	37 0 0

08/30/88	SL	f	15.0	su	385	0	
08/30/88	SL	f	15.0	su	377	0	
08/30/88	SL	f	15.0	su	388	0	
08/30/88	SL	f	15.0	cm	351,	0	
08/30/88	SL	s	13.8	hrbrv	228	120	
08/30/88	SL	s	13.8	smb	327	410	
08/30/88	SL	s	13.8	smb	323	390	
08/30/88	SL	s	13.8	smb	195	92	
08/30/88	SL	s	13.8	smb	187	88	
08/30/88	SL	s	13.8	smb	166	60	
08/30/88	SL	s	13.8	smb	167	60	
08/30/88	SL	s	13.8	smb	100	14	
08/30/88	SL	s	13.8	smb	114	16	
08/30/88	SL	s	13.8	smb	96	1	4
08/30/88	SL	s	13.8	smb	112	14	
08/30/88	SL	s	13.8	smb	107	14	
08/30/88	SL	s	13.8	sm'b	104	12	
08/30/88	SL	s	13.8	smb	107	0	
08/30/88	SL	s	13.8	smb	1.95	96	
08/30/88	SL	s	13.8	wf	348	390	
08/30/88	SL	s	13.8	wf	355	395	
08/30/88	SL	s	13.8	wf	373	530	
08/30/88	SL	s	13.8	wf	374	475	
08/30/88	SL	s	13.8	wf	354	405	
08/30/88	SL	s	13.8	wf	354	410	
08/30/88	SL	s	13.8	wf	379	530	
08/30/88	SL	s	13.8	sq	520	0	
08/30/88	SL	s	13.8	sq	330	0	
08/30/88	SL	s	13.8	sq	368	0	
08/30/88	SL	s	13.8	su	449	0	
08/30/88	SL	s	13.8	su	373	0	
08/30/88	SL	s	13.8	su	397	0	
08/30/88	SL	s	13.8	su	380	0	
08/30/88	SL	s	13.8	su	441	0	
08/30/88	SL	s	13.8	su	369	0	
08/30/88	SL	s	13.8	su	377	0	
08/30/88	SL	s	13.8	su	383	0	
08/30/88	SL	s	13.8	su	370	0	
08/30/88	SL	s	13.8	su	410	0	
08/30/88	SL	s	13.8	su	382	0	
08/30/88	SL	s	13.8	su	373	0	
08/30/88	SL	s	13.8	su	424	0	
08/30/88	SL	s	13.8	su	3'85	0	
08/31/88	MAGB	f	16.0	hrblv	216	78	
08/31/88	MAGB	f	16.0	hrblv	216	90	
08/31/88	MAGB	f	16.0	smb	160	44	
08/31/88	MAGB	s	16.0	hrblv	218	98	
08/31/88	MAGB	s	16.0	smb	306	355	
08/31/88	MAGB	s	16.0	smb	161	44	
08/31/88	MAGB	s	16.0	sq	540	0	

08/31/88	MAGB	s	16.0	sq	447	0
08/31/88	MAGB	s	16.0	sq	312	0
08/31/88	MAGB	s	16.0	su	399	0
08/31/88	MAGB	s	16.0	su	350	0
08/31/88	r0.8	f	18.2	hrbu	210	90
08/31/88	r0.8	f	18.2	hrbu	207	89
08/31/88	r0.8	f	18.2	smb	333	585
08/31/88	r0.8	f	18.2	sq	2 10	0
08/31/88	r0.8	f	18.2	sq	205	0
08/31/88	r0.8	s	18.2	hrblv	211	86
08/31/88	r0.8	s	18.2	hrbrv	206	10 0
08/31/88	r0.8	s	18.2	smb	158	46
08/31/88	r0.8	s	18.2	smb	111	18
08/31/88	r0.8	s	18.2	wf	269	0
08/31/88	r0.8	s	18.2	sq	259	0
08/31/88	r0.8	s	18.2	sq	270	0
08/31/88	r0.8	s	18.2	sq	267	0
08/31/88	r0.8	s	18.2	su	442	0
08/31/88	r0.8	s	18.2	su	400	0
08/31/88	r0.8	s	18.2	su	275	0
08/31/88	r0.8	s	18.2	su	240	0
08/31/88	r0.8	s	18.2	su	380	0
09/30/88	e4.6	f	17.0	hrbrv	205	88
09/30/88	e4.6	f	1'7.0	hrblv	230	104
09/30/88	e4.6	f	17.0	hrblv	226	84
09/30/88	e4.6	f	17.0	hrblv	232	114
09/30/88	e4.6	f	17.0	hrblv	216	52
09/30/88	e4.6	f	1'7.0	hrblv	231	102
09/30/88	e4.6	f	17.0	hrblv	215	96
09/30/88	e4.6	f	17.0	smb	157	44
09/30/88	e4.6	f	17.0	smb	179	64
09/30/88	e4.6	s	16.8	hrblv	233	110
09/30/88	e4.6	s	16.8	hrblv	233	106
09/30/88	e4.6	s	16.8	hrblv	231	108
09/30/88	e4.6	s	16.8	hrblv	220	98
09/30/88	e4.6	s	16.8	hrblv	223	106
09/30/88	e4.6	s	16.8	smb	383	925
09/29/88	e0.8	f	16.8	hrblv	215	80
09/29/88	e0.8	f	16.8	hrblv	216	80
09/29/88	e0.8	f	16.8	hrblv	222	100
09/29/88	e0.8	f	16.8	hrblv	227	104
09/29/88	e0.8	f	16.8	hrblv	224	98
09/29/88	e0.8	f	16.8	hrblv	234	306
09/29/88	e0.8	f	16.8	hrbrv	219	98
09/29/88	e0.8	f	16.8	kok	235	118
09/29/88	e0.8	f	16.8	kok	289	185
09/29/88	e0.8	s	17.0	hrblv	255	130
09/29/88	e0.8	s	17.0	hrblv	240	11%
09/29/88	e0.8	s	17.0	kok	297	220
09/29/88	e0.8	s	17.0	sq	592	0

09/29/88	e0.8	s	17.0	811	445	0
09/29/88	e0.8	s	17.0	su	419	0
09/29/88	e0.8	s	17.0	su	380	0
09/29/88	e0.8	s	17.0	su	450	0
09/29/88	e0.8	s	17.0	su	416	0
10/20/88	FRCR	f	18.0	hrblv	233	118
10/20/88	FRCR	f	18.0	hrblv	240	118
10/20/88	FRCR	f	18.0	hrblv	248	126
10/20/88	FRCR	f	18.0	hrblv	231	108
10/20/88	FRCR	f	18.0	hrblv	242	130
10/20/88	FRCR	f	18.0	hrblv	232	104
10/20/88	FRCR	f	18.0	hrblv	234	114
10/20/88	FRCR	f	18.0	hrblv	245	120
10/20/88	FRCR	f	18.0	hrblv	223	100
10/20/88	FRCR	f	18.0	hrblv	239	130
10/20/88	FRCR	f	18.0	hrblv	233	118
10/20/88	FRCR	f	18.0	hrblv	234	126
10/20/88	FRCR	f	18.0	hrblv	219	94
10/20/88	FRCR	f	18.0	hrblv	228	102
10/20/88	FRCR	f	18.0	hrblv	235	120
10/20/88	FRCR	f	18.0	hrblv	229	98
10/20/88	FRCR	f	18.0	hrblv	242	130
10/20/88	FRCR	f	18.0	hrblv	235	102
10/20/88	FRCR	f	18.0	hrbrv	223	112
10/20/88	FRCR	f	18.0	hrbrv	222	108
10/20/88	FRCR	s	18.2	hrblv	220	85
10/20/88	FRCR	s	18.2	hrblv	238	120
10/20/88	FRCR	s	18.2	hrbrv	330	108
10/20/88	FRCR	s	18.2	su	390	0
10/20/88	FRCR	s	18.2	su	422	0
10/20/88	FRCR	s	18.2	su	373	0
10/21/88	CANCR	f	17.2	hrblv	219	88
10/21/88	CANCR	f	17.2	hrblv	228	110
10/21/88	CANCR	f	17.2	hrblv	225	108
10/21/88	CANCR	f	17.2	hrblv	229	114
10/21/88	CANCR	f	17.2	hrblv	222	108
10/21/88	CANCR	f	17.2	hrblv	235	122
10/21/88	CANCR	f	17.2	hrblv	230	114
10/21/88	CANCR	f	17.2	hrblv	225	120
10/21/88	CANCR	f	17.2	hrblv	234	106
10/21/88	CANCR	f	17.2	hrblv	238	120
10/21/88	CANCR	f	17.2	sq	434	980
10/21/88	CANCR	s	17.2	su	434'	0
10/21/88	CANCR	s	17.2	su	425	0
10/21/88	CANCR	s	17.2	su	467	0
10/21/88	CANCR	s	17.2	su	442	0
10/21/88	CANCR	s	17.2	su	416	0
10/21/88	CANCR	s	17.2	su	430	0
11/23/88	MERBA	f	18.2	hrblv	223	102
11/23/88	MERBA	f	18.2	hrblv	234	116

11/23/88	MERBA	f	18.2	hrblv	221	95
11/23/88	MERBA	f	18.2	hrblv	235	125
11/23/88	MERBA	f	18.2	hrblv	232	117
11/23/88	MERBA	f	18.2	hrblv	233	119
11/23/88	MERBA	f	18.2	hrblv	240	114
11/23/88	MERBA	f	18.2	hrblv	220	97
11/23/88	MERBA	f	18.2	hrblv	240	125
11/23/88	MERBA	f	18.2	hrblv	232	108
11/23/88	MERBA	f	18.2	hrblv	234	110
11/23/88	MERBA	f	18.2	hrblv	205	89
11/23/88	MERBA	f	18.2	hrblv	227	102
11/23/88	MERBA	f	18.2	hrbrv	232	112
11/23/88	MERBA	f	18.2	hrbrv	224	106
11/23/88	MERBA	f	18.2	hrbrv	240	123
11/23/88	MERBA	f	18.2	hrbrv	234	109
11/23/88	MERBA	f	18.2	hrbrv	246	135
11/23/88	MERBA	f	18.2	hrbrv	239	125
11/23/88	MERBA	f	18.2	hrbrv	228	108
11/23/88	MERBA	f	18.2	hrbrv	233	119
11/23/88	MERBA	f	18.2	kok	232	115
11/23/88	MERBA	f	18.2	kok	241	121
11/23/88	MERBA	s	18.9	hrblv	235	130
11/23/88	MERBA	s	18.9	hrblv	225	94
11/23/88	MERBA	s	18.9	su	434	0
11/23/88	MERBA	s	18.9	su	450	0
11/22/88	INCR	f	19.5	hrblv	146	0
11/22/88	INCR	f	19.5	hrblv	238	0
11/22/88	INCR	f	19.5	hrbrv	244	0
11/22/88	INCR	f	19.5	hrbrv	222	0
11/22/88	INCR	f	19.5	su	385	0
11/22/88	INCR	f	19.5	su	372	0
11/22/88	INCR	s	19.8	su	389	0
11/22/88	INCR	s	19.8	su	431	0
11/22/88	INCR	s	19.8	su	436	0
11/22/88	INCR	s	19.8	su	405	0
11/22/88	INCR	s	19.8	su	458	0
11/22/88	INCH	s	19.8	su	404	0
11/22/88	INCR	s	19.8	su	410	0
11/22/88	INCR	s	19.8	su	385	0
12/22/88	INCR	f	18.4	su	416	632
12/22/88	MERBA	f	19.2	hrblv	245	108
12/22/88	MERBA	f	19.2	kok	243	122
12/23/88	FRCR	f	21.5	none	0	0
12/23/88	FRCR	f	20.2	hrbrv	241	112