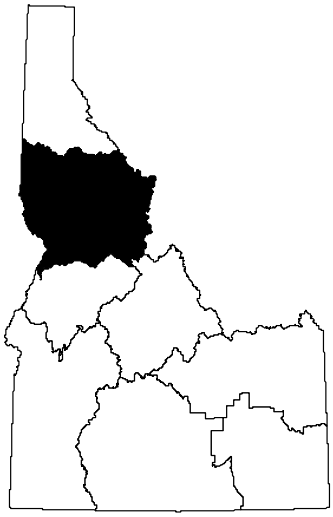
FISHERY MANAGEMENT INVESTIGATIONS

IDAHO DEPARTMENT OF FISH AND GAME

FISHERY MANAGEMENT ANNUAL REPORT

Cal Groen, Director



CLEARWATER REGION

2005

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2005 Clearwater Region Fishery Management Report

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2005 Clearwater Region Fishery Management Report

Abstract

Regional personnel continued to compile 12 years of mountain lake management data into a comprehensive database/management plan. The plan addresses alpine lake management at the landscape level. Fifth and sixth hydrologic unit codes (HUCs) were chosen as the landscape scale for management purposes. Rainbow Lake was resurveyed to determine effectiveness of brook trout *Salvelinus fontinalis* suppression by introduced tiger muskellunge *Esox lucius* X *E. masquinongy*. Brook trout were removed from the outlet of Ice Lake.

Fish stocking to enhance local angling opportunities included 5,030 fingerling sized kokanee salmon *Oncorhynchus nerka*, 148,870 fingerling sized rainbow trout *O. mykiss*, 4,881 fingerling sized westslope cutthroat trout *O. clarkii lewisi*, 279,657 catchable sized rainbow trout, and 2,651 catchable sized channel catfish *Ictalurus punctatus* in regional lowland lakes and ponds. Clearwater Region fisheries management personnel conducted standard lake surveys on six lowland lakes and reservoirs. In addition, a creel survey was conducted on eight lowland lakes and reservoirs to provide information on effort and harvest.

A total of 202 channel catfish, and 60 largemouth bass *Micropterus salmoides* were transferred from Winchester Lake to Tolo Lake. Additionally, 1,500 black crappie *Pomoxis nigromaculatus* were removed from Mann Lake and exchanged with the Washington Department of Fish and Wildlife (WDFW) for tiger muskellunge. The tiger muskellunge are used as an experimental method for brook trout removal in high mountain lakes, and to supplement existing populations in lowland lakes.

Seven children's fishing clinics were held on Free Fishing Day, June 11, 2005. An estimated 265 children and 359 adults attended the events. Several local businesses donated a variety of fishing tackle which was given away as prizes at each event.

GRANT OBJECTIVES

1. To collect and maintain information for fishery management decisions on mountain lakes, lowland lakes and reservoirs, and rivers and streams including angler use and success, fish population characteristics, spawning potential, stocking success, limnology, morphology, genetics and notes on other aquatic life and develop appropriate management recommendations.

2. To manage wild populations of native and introduced fish to maintain desired sport fishing opportunities, to protect native fish populations and for the collection of broodstock for specific management programs.

3. To improve/restore habitat on degraded streams within Idaho with good potential to enhance wild trout recruitment.

4. To create and improve habitat in reservoirs for sport and forage fish species.

Methods

Fish community surveys on mountain lakes were performed utilizing gill nets, angling, and standard backpack electrofishing methods. Gill nets were used in Rainbow Lake and Wildhorse Lake. Two gill nets, 50 m long and 1.8 m deep were set in the lake in early evening. Mesh sizes were 10 mm, 16 mm, 22 mm, 26 mm, 30 mm, 34 mm, and 38 mm. The gill nets were removed the next morning after 12 hrs, and all fish collected were measured for length (mm) and weight (g). Fish collected by angling were measured for length and weight, and angling time was recorded as rod-hours.

Backpack electrofishing was utilized to collect and remove brook trout from the outlet of Ice Lake. Electrofishing was conducted with 2-3 person teams. One person operated a Smith Root Model 15D generator powered backpack electrofishing unit and netted fish. The other team member(s) netted fish and/or carried a 5-gallon holding bucket. The electrofishing unit was typically operated at the I-5 and O-5 settings at 500-800 volts pulsed DC current.

The annual smallmouth bass *Micropterus dolomieu* survey of Dworshak Reservoir consisted of electrofishing three shoreline sites in their entirety: Magnus Bay, Swamp Creek Bay, and the shoreline beginning directly across from the Dent Boat Ramp to the Dent Bridge. Electrofishing time is recorded for each section, and all fish are weighed and measured for total length.

Fish community surveys were conducted on Elk Creek Reservoir, Mann Lake, Moose Creek Reservoir, Soldier's Meadow Reservoir, Tolo Lake, and Winchester Lake using Idaho Department of Fish and Game (IDFG) standard survey protocol. Results were reported in catch-per-unit-effort (CPUE). One "unit" of effort consisted of: one hour of boat electrofishing, one floating and one sinking gill net, and one trap net. Boat mounted electrofishing was conducted using pulsed D.C. current from a portable generator and a Coffelt VVP-2E pulsator. Standard floating and sinking experimental gill nets were 45.7 m long by 1.8 m deep with six panels of different size mesh. Mesh sizes were 19.0 mm, 25.4 mm, 31.8 mm, 38.1 mm, 50.8 mm, and 63.5 mm square. Indiana style trap nets consisted of a front box maze of two, 1.8 m wide by 0.9 m high steel frames with center braces and four 0.8 m diameter hoops with two 0.2 m throats, and a 15.2 m long x 0.9 m high leader. Mesh size was 19.0 mm throughout. Fisheries management personnel also utilized these standard electrofishing, trapping, and netting techniques for trapping and transplanting fish from Winchester Lake for stocking into Tolo Lake.

Regional fishery management staff conducted creel surveys on eight lowland lakes (Deer Creek Reservoir, Elk Creek Reservoir, Mann Lake, Moose Creek Reservoir, Soldier's Meadow Reservoir, Spring Valley Reservoir, Waha Lake, and Winchester Lake) from January 16 – December 31, 2005. A survey interval consisted of two week periods. Surveys and angler counts were conducted a minimum of 4 weekdays and 4 weekend/holiday days per interval. We recorded instantaneous counts of anglers; number of rods used; total hours fished; number of fish harvested and released by species; species targeted; and fish lengths. We utilized the creel census computer program developed by IDFG to calculate estimates and confidence intervals (McArthur 2005).

PROJECT I. SURVEYS AND INVENTORIES
Job a. Mountain Lake Investigations

Results and Discussion

Two 12-hour gill net sets were used to sample Rainbow Lake, resulting in the capture of 48 brook trout ranging in length from 110-300 mm. No tiger muskellunge were collected. In-lake habitat complexity, a large inlet, connectivity with outlet fish populations, and low stocking rates of tiger muskellunge may have limited the effectiveness of brook trout removal. However, predation by tiger muskellunge appears to have substantially reduced brook trout abundance (Figure 1) and has altered the size structure of the population (Figure 2) since their introduction in 1999.

A total of 1,713 brook trout were removed from the first 800 m of Ice Lake's outlet stream. Six hundred sixty-four of these were age-0, and 1,049 were age-1+. A length frequency distribution of a sub-sample of these fish is shown in Figure 3.

Two 13-hour gill net sets in Wildhorse Lake resulted in the capture two tiger muskellunge 710 mm and 813 mm in length, and four westslope cutthroat trout ranging in length from 170-250 mm. Two gill nets were then set continuously for three days resulting in no fish collected. No other tiger muskellunge were observed in the lake.

Management Recommendations

1. Continue monitoring Ice Lake and Rainbow Lake to determine long term effectiveness of tiger muskellunge introductions to manage brook trout size distribution.

2. Expand the tiger muskellunge program to additional mountain lakes to gain information regarding the effectiveness of this technique as a management tool.

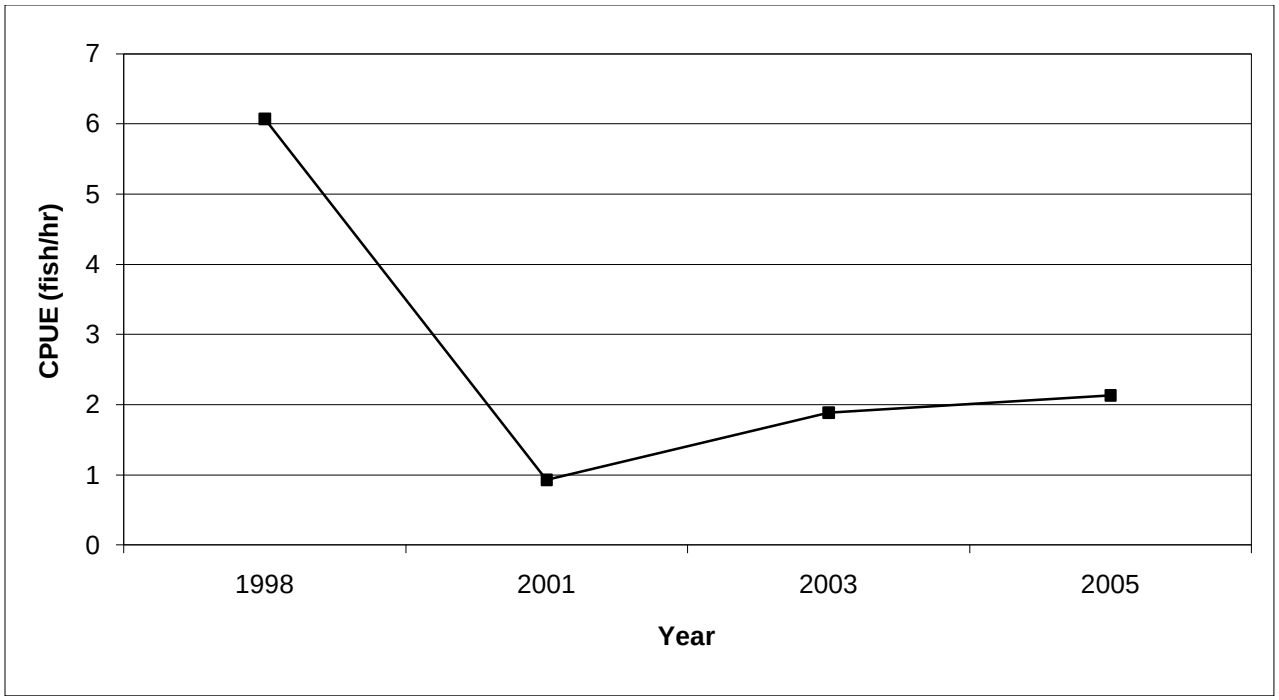


Figure 1. Gill net catch per unit effort (CPUE) of brook trout collected in Rainbow Lake, Idaho, from 1998-2005.

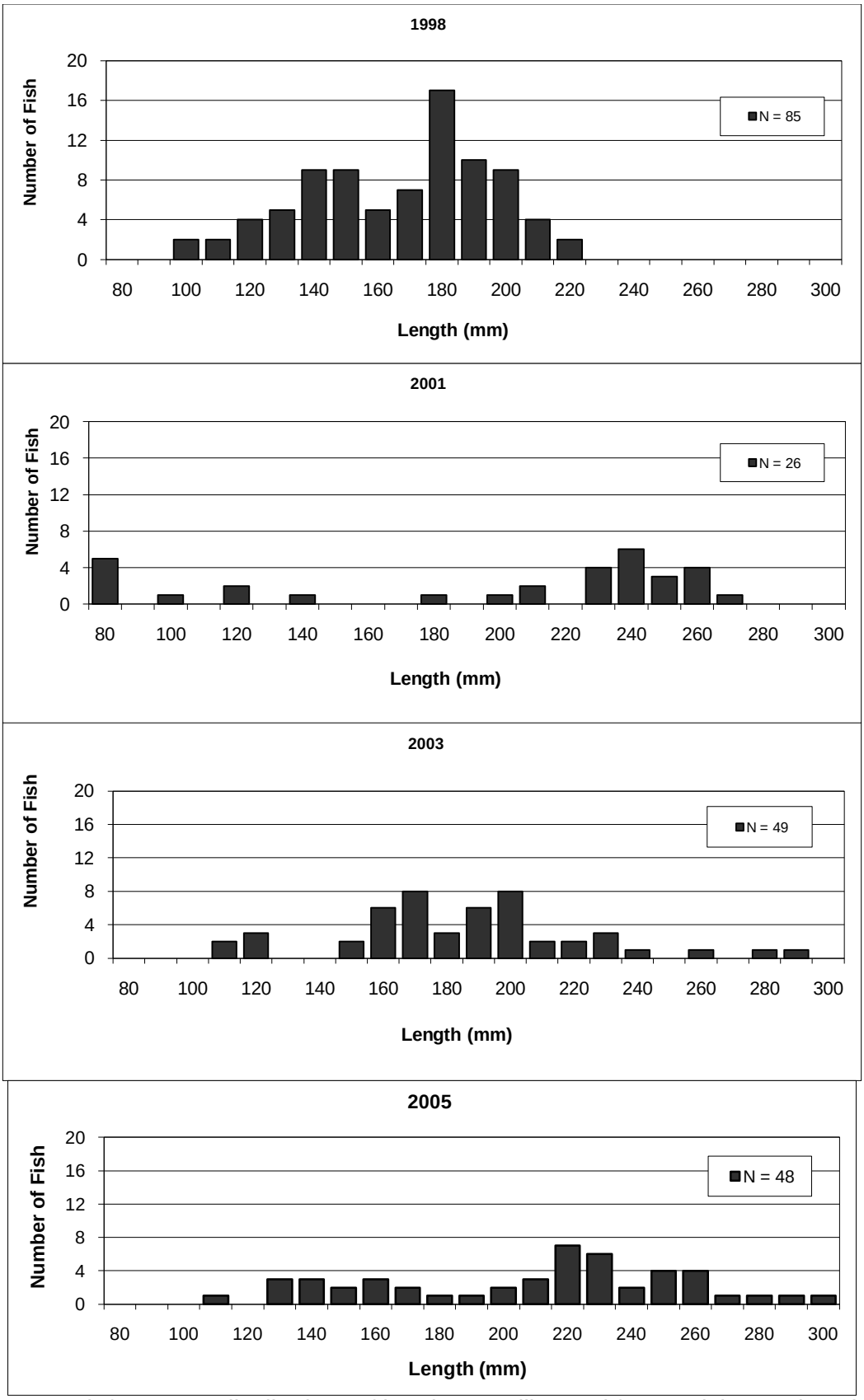


Figure 2. Length frequency distributions of brook trout gill netted from Rainbow Lake, Idaho, from 1998-2005.

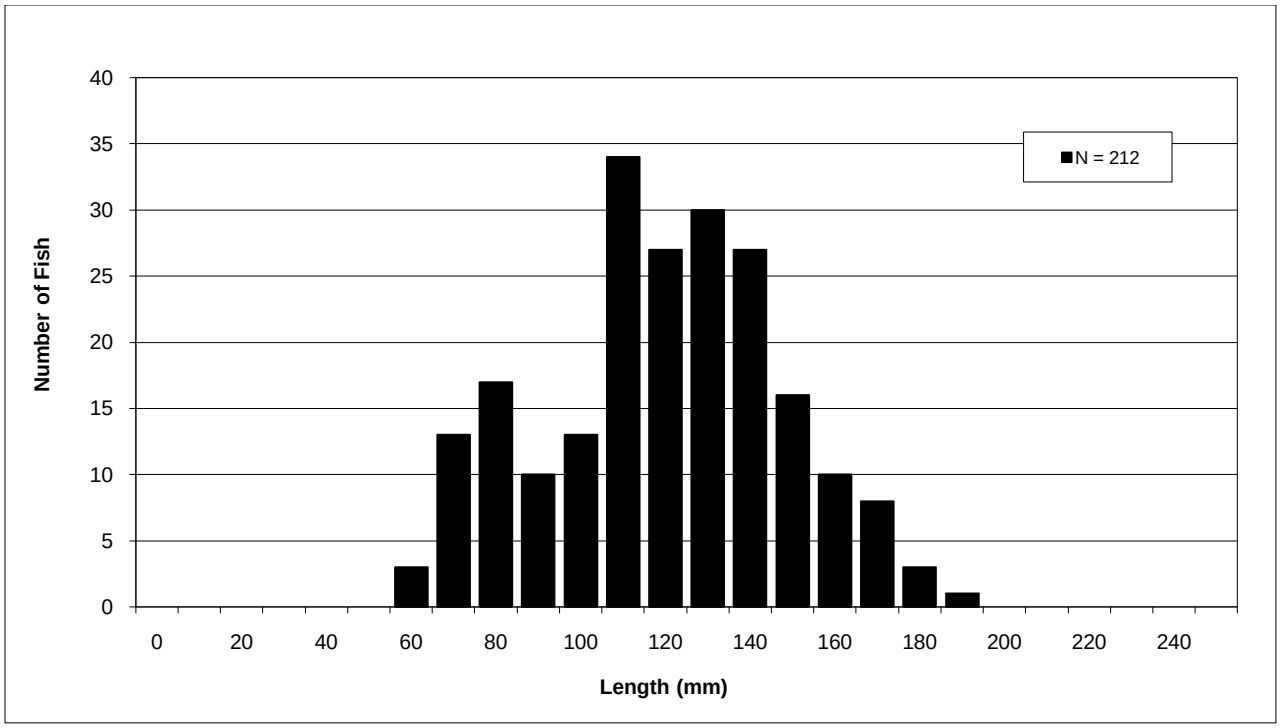


Figure 3. Length frequency distribution of a sub-sample of brook trout removed through elecrofishing from the outlet of Ice Lake, Idaho, during 2005.

2005 Clearwater Region Fishery Management Report

Job b. Lowland Lake Investigations

Results and Discussion

Fish Stocking and General Population Management

We enhanced resident fish populations and sport fishing in lowland lakes and reservoirs of the Clearwater Region by stocking approximately 148,870 fingerling rainbow trout, 4,881 fingerling westslope cutthroat trout, and 5,030 fingerling kokanee in 2005 (Table 1). Lakes, ponds and reservoirs were stocked with 279,657 catchable sized rainbow trout in 2005 (Table 2). Additionally, 2,449 catchable sized channel catfish were stocked into Winchester Lake and 202 catchable sized channel catfish were stocked into Tolo Lake.

Clearwater Region personnel collected black crappie from Mann Lake on April 25 using electrofishing gear. These fish were transferred to the WDFW in exchange for tiger muskellunge, which were utilized as a management tool for removing brook trout from mountain lakes.

Seven children's fishing clinics were held on Free Fishing Day, June 11. An estimated 265 children and 359 adults attended the events.

Population Surveys

Dworshak Reservoir

Our annual smallmouth bass monitoring survey was conducted on Dworshak Reservoir June 27-29. A total of 106 smallmouth bass were collected in 19,992 seconds of electrofishing. This is the second lowest number of smallmouth bass collected during the monitoring survey since 1994 (Figure 4). Stormy weather during the sampling period resulted in poor electrofishing conditions. The fish collected ranged in length from 130-340 mm (Figure 5). Smallmouth bass proportional stock density (PSD) (Anderson 1980) was 9.5 in 2005, slightly below the values seen in 2003 and 2004 (Figure 6).

Elk Creek Reservoir

Clearwater Region fisheries management personnel conducted a standard lowland lake survey of Elk Creek Reservoir on June 6, 2005. This survey resulted in the capture of 367 fish, including smallmouth bass (N = 83), largemouth bass *M. salmoides* (N = 38), black crappie (N = 100), pumpkinseed *Lepomis gibbosus* (N = 109), brown bullhead *Ameiurus nebulosus* (N = 28), bluegill *L. macrochirus* (N = 6), and brook trout (N = 3). A comparison of CPUE between samples collected in 1995, 1997, 2001, and 2005 is shown in Figure 7. Largemouth bass, smallmouth bass, crappie, and pumpkinseed abundance have all increased since the last sample in 2001. The smallmouth bass length frequency shows that not only was there an increase in numbers, but that there was a shift toward larger fish with numerous fish over 300 mm (Figure 8). There were no smallmouth bass collected over 300 mm in the previous two samples. The largemouth bass collected were primarily in the 130-330 mm length range, with a few fish over 450 mm (Figure 9). In contrast to the previous two samples, no largemouth bass

<130 mm were collected in 2005. Similar to smallmouth bass, black crappie also had a shift in size structure toward larger fish (Figure 10). Even though pumpkinseeds have increased in numbers, their length frequency distribution has stayed relatively constant over the last three surveys (Figure 11). Brown bullhead numbers have increased slightly over the 2001 sample, but as with pumpkinseed, their length frequency distribution has stayed constant over the last three surveys (Figure 12). Bluegills were collected for the first time since 1997. These fish ranged in length from 60-159 mm (Figure 13). Substantially fewer brook trout were collected in 2005 than in previous samples. The three fish collected ranged from 190-259 mm in length (Figure 14).

Mann Lake

Clearwater Region fisheries management personnel conducted a standard lake survey of Mann Lake on June 7, 2005. This survey resulted in the capture of 210 fish, including largemouth bass (N = 81), black crappie (N = 37), bluegill (N = 22), pumpkinseed (N = 67), channel catfish (N = 3), and brown bullhead (N = 2). A comparison of CPUE and percent composition between samples collected in 2001, 2003, and 2005 is shown in Figure 15. Largemouth bass numbers and biomass have increased steadily since the 2001 survey. The length frequency distribution shows multiple strong age classes and a marked increase in the numbers of larger fish (Figure 16). This suggests a substantial improvement in the largemouth bass population over the last five years. In contrast, the number of black crappie collected has declined over the last three surveys. However, the length frequency distribution (Figure 17) shows a shift towards larger fish, with an average size increasing from 150-160 mm in 2001 to 190-200 mm in 2005. This increase in size may be the result of increased harvest and the annual removal of pre-spawning fish by IDFG personnel for WDFW. Bluegill catch rates and average size increased over the last three surveys, whereas their biomass has stayed constant during the last three surveys (Figures 15 and 18). This is confirmed by comparing the length frequency distributions (Figure 18) from the last three surveys. A similar situation is seen with pumpkinseed. Their numbers increased substantially in the 2005 survey, while the biomass of those fish remained similar to that of the 2001 and 2003 surveys. This can be seen in the length frequency distributions (Figure 19), which show a shift towards smaller fish in the 2005 sample. Brown bullheads were collected for the first time, indicating that they have recently been introduced into the reservoir, or have been present in such low numbers that they have avoided capture during sampling.

Moose Creek Reservoir

Clearwater Region fisheries management personnel conducted a standard lake survey of Moose Creek Reservoir on June 23, 2005. This survey resulted in the capture of 155 fish, including largemouth bass (N = 73), bluegill (N = 58), black crappie (N = 10), pumpkinseed (N = 12), and brown bullhead (N = 2). A comparison of CPUE between samples collected in 2001, 2004, and 2005 is shown in Figure 20. Largemouth bass and bluegill experienced increases in both numbers and biomass in the 2005 sample, an indication that these populations are improving. For bass, this is evidenced by an increase in the number of middle and larger size fish (Figure 21). Bluegills have seen a shift in length frequency distribution towards larger fish (Figure 22). After seeing substantial increases in numbers, black crappie and pumpkinseed both experienced drops to the lowest levels seen over the last three surveys. Even though fewer fish were collected, black crappie size distribution continued to see a shift toward larger fish (Figure 23). Little change has been seen in the pumpkinseed length frequency during the last three samples (Figure 24). There was a slight increase in the number of brown bullhead collected.

Soldier's Meadow Reservoir

Clearwater Region fisheries management personnel conducted a standard lake survey of Soldier's Meadow Reservoir on June 8, 2005. This survey resulted in the capture of 124 fish including black crappie (N = 92), and brown bullhead (N = 32). A comparison of CPUE between samples collected in 2003 and 2005 is shown in Figure 25. The 124 fish collected in 2005 is twice the number of fish collected in the 2003 sample. However, the biomass of fish collected was lower in 2005. This was due to the sharp decreases in black crappie and largemouth bass numbers and biomass. A comparison of black crappie length frequency distribution shows that while their numbers decreased, there was no change in the size structure (Figure 26). Brown bullhead, on the other hand, saw a sharp increase in numbers and biomass, but the fish caught were much smaller in 2005 than in the 2003 sample (Figure 27).

Tolo Lake

Clearwater Region fisheries management personnel conducted a standard lake survey of Tolo Lake on June 21, 2005. This survey resulted in the capture of 336 fish, including white crappie *P. annularis* (N = 312), largemouth bass (N = 15), and black crappie (N = 9). A comparison of CPUE effort between samples collected in 1997, 2003, and 2005 is shown in Figure 28. White crappie CPUE declined substantially from 2003 to 2005. These fish have seen drastic changes in length frequency distributions over the last three samples (Figure 29), with very few fish over 200 mm in any of these samples. This is indicative of a stunted population with highly variable recruitment. Largemouth bass numbers have remained low and steady. This population does not see appreciable spawning and recruitment, and is therefore maintained by routine stocking of catchable size fish. A comparison of length frequency distributions of largemouth bass shows little change over time with most fish in the 180-280 mm range with a few larger fish present (Figure 30). Black crappies were present again in low numbers in 2005. These fish ranged in length from 80-219 mm in length (Figure 31).

Winchester Lake

Clearwater Region fisheries management personnel conducted a standard lake survey of Winchester Lake on June 22, 2005. This survey resulted in the capture of 451 fish, including largemouth bass (N = 180), bluegill (N = 119), yellow perch *Perca flavescens* (N = 128), black crappie (N = 16), brown bullhead (N = 7), and channel catfish (N = 1). A comparison of CPUE between samples collected in 2001, and 2003-2005 is shown in Figure 32. The 2005 sample saw a drop in numbers and biomass for largemouth bass, bluegill, black crappie, and brown bullhead from the 2004 sample. However, there appears to be a general increase in numbers in these populations and yellow perch since 2001. Largemouth bass are showing a shift in length frequency distribution toward larger fish (Figure 33). The PSD value for bass was 29.0, a slight drop from 2004, but much higher than the 2000-2003 samples (Figure 34). The bluegill length frequency distribution is similar to previous samples except for a lack of fish under 100 mm (Figure 35). This may indicate very poor spawning success or even the loss of this year class. Yellow perch numbers and biomass have stayed fairly constant over the last three years. Additionally, there has been little change in their length frequency distribution over that time period (Figure 36). Black crappies have seen a slight shift in length frequency distribution toward larger fish (Figure 37). Brown bullhead and channel catfish are present in low numbers, while no tiger muskellunge were collected in 2005.

Creel Surveys

A standard lowland lake creel survey was conducted on Deer Creek Reservoir, Elk Creek Reservoir, Mann Lake, Moose Creek Reservoir, Soldier's Meadow Reservoir, Spring Valley Reservoir, Waha Lake, and Winchester Lake.

We estimated total angling effort on the eight sampled lowland lakes in the Clearwater region at 160,250 hours in 2005. Angler effort consisted of 69.9% bank, 26.3% boat, and 3.8% ice hours. Effort ranged from a high of 52,100 hours on Winchester Lake to a low of 3,646 hours on Waha Lake. Levels of effort have declined at Spring Valley Reservoir, Soldier's Meadow Reservoir, Elk Creek Reservoir, and Waha Lake from 1993 to 2005 (Figure 38). Mann Lake saw a slight increase in effort in 2005 over 1999. Winchester Lake and Moose Creek Reservoir saw substantial increased in effort in 2005. Excluding Deer Creek Reservoir (did not exist during previous surveys), total angling effort in 2005 was 25% higher than in 1999, and excluding Deer Creek Reservoir and Waha Lake (no data for 1993) effort in 2005 was 3% higher than in 1993.

Anglers caught an estimated 371,554 fish from the eight lowland lakes during 2005, generating an overall catch rate of 2.3 fish/hour. This compares to overall catch rates of 1.2 fish/hour in 1999 and 1.1 fish/hour in 1993. The highest catch rate was reported on Waha Lake at 3.8 fish/hour and lowest catch rate was reported on Deer Creek Reservoir at 1.3 fish/hour (Figure 39). Overall catch rates were higher in every lake in 2005 than in either 1993 or 1999. Catch rates of hatchery rainbow trout ranged from a high of 1.5 fish/hour in Elk Creek Reservoir to 0.8 fish/hour in Spring Valley Reservoir and Winchester Lake (Figure 40). Thus, we are currently meeting our management goal of catch rates of 0.5 fish/hour in our lowland lakes and reservoir (IDFG 2007).

Anglers harvested a total of 176,291 fish from the eight lowland lakes during 2005, 47.4% of the total fish caught. The harvest composition consisted of 46.5% hatchery rainbow trout, 21.6% black crappie, 16.5% yellow perch, 13.2% bluegill, 1.1% pumpkinseed, 0.7% largemouth bass, 0.2% smallmouth bass, and 0.1% each of naturally produced brook trout, brown bullhead, and hatchery channel catfish. Harvest ranged from 6,480 fish in Soldier's Meadow Reservoir to 67,525 fish in Winchester Lake (Figure 41). An overall harvest rate for the lowland lakes was estimated to be 1.1 fish/hour, compared to 0.97 fish/hour in 1999. Harvest rates ranged from a high of 2.7 fish/hour in Waha Lake to 0.5 fish/hour in Deer Creek Reservoir. Overall harvest rates were generally either close to previous years or substantially higher, as in the case of Mann Lake and Waha Lake (Figure 42). Angler preference appears to be shifting from hatchery trout to warmwater species at Mann Lake, Spring Valley Reservoir, Waha Lake, and Winchester Lake. This is evidenced by both increases in the harvest of warmwater species (crappie, bass, bluegill, and yellow perch), and declines in the harvest of hatchery trout.

Just over 197,090 catchable rainbow trout were stocked in lowland lakes in 2005. Of these, 82,429 were harvested. This is a return to creel rate of 42%. The return to creel ranged from a high of 84% at Moose Creek Reservoir to a low of 22% in Soldier's Meadow Reservoir. Many of the lowland lakes are experiencing declines in harvest rates of hatchery trout (Figure 43), and the percent of the fishery supported by catchable trout (Table 3). This indicates a potential need to reduce the number of hatchery rainbow trout stocked in some of the regions lowland lakes.

Deer Creek Reservoir

Total angler effort on Deer Creek Reservoir during 2005 (May 20 – September 30) was estimated at 14,709 hours. The creel survey was conducted only during this time period due to the closure of road access from October 1 – May 19. The effort consisted of 63.4% bank and 36.6% boat (Figure 44). No ice fishing was observed during the survey; however, limited ice fishing does occur on the reservoir. Deer Creek Reservoir supported 313 angler effort hours per ha (127 hours per acre).

Anglers caught an estimated 21,838 fish from Deer Creek Reservoir during 2005, resulting in a catch rate of 1.4 fish/hour (Figure 39). Anglers harvested 8,929 fish from Deer Creek Reservoir during 2005 (Table 3), 40.9% of the total fish caught. The harvest rate was estimated to be 0.6 fish/hour (Figure 42). Hatchery rainbow trout accounted for 100% of the harvest (Figure 45). Anglers released 12,908 (59.1%) of the hatchery trout they caught.

In addition to the catchable size rainbow trout, fingerling westslope cutthroat trout have also been stocked into the reservoir. These fish should begin appearing in the creel in 2006. Brook trout are also present in the reservoir but none were observed in the creel survey.

Elk Creek Reservoir

Total angler effort on Elk Creek Reservoir during 2005 was estimated at 10,912 hours. This is a 29% decrease from the level of effort in 1999, and a 35% decrease from the level of effort in 1993 (Figure 38). The effort consisted of 70.8% bank, 27.1% boat, and 2.1% ice anglers (Figure 46). Elk Creek Reservoir supported 584 hours of angling effort per ha (236 hours per acre) in 2005.

Anglers caught an estimated 23,591 fish from Elk Creek Reservoir during 2005, resulting in a catch rate of 2.2 fish/hour (Figure 39). This is higher than catch rates of 1.3 fish/hour during 1993 and 1.4 fish/hour in 1999. Anglers harvested 11,047 fish from Elk Creek Reservoir during 2005 (Table 3), 47% of the total fish caught. The harvest rate was estimated to be 1.0 fish/hour (Figure 42). The harvest composition consisted of 94.1% hatchery trout, 3.3% black crappie, 1.1% bluegill, 0.9% naturally produced brook trout, 0.3% black bullhead, and 0.1% each of smallmouth bass and largemouth bass (Figure 47). Brook trout harvest decreased substantially from an estimated 5,097 in 1999 to 103 in 2005.

Harvest of hatchery rainbow trout decreased slightly from an estimated 11,224 in 1999 to 10,392 in 2005 (Table 3). While the number of hatchery trout stocked in Elk Creek Reservoir has remained fairly constant, the number of those fish harvested has been declining. As a result, the hatchery trout return to creel has dropped from 53% in 1993 to 30% in 2005 (Table 3). Harvest rates for hatchery rainbow trout have ranged from 0.74-0.95 fish/hour over the three creel surveys, and the catch rate in 2005 was 1.5 fish/hour, three times the management goal of 0.5 fish/hour. Additionally, the percent of the fishery supported by hatchery trout has remained high (Table 3). This indicates the importance of these fish in the reservoir. However, the decline in return to creel and angler effort, combined with the high catch rate indicates a need to reevaluate the annual stocking in the reservoir.

Mann Lake

Total angler effort on Mann Lake during 2005 was estimated at 21,562 hours (Figure 38). This is a 17% increase from the level of effort in 1999, but a 30% decrease from the level of effort in 1993 (Figure 38). The effort consisted of 57.4% bank and 42.6% boat anglers (Figure 48). While no ice fishing surveys were conducted in 2005, there was limited ice fishing in December. Mann Lake supported 532 hours of angling effort per ha (216 hours per acre) in 2005.

Anglers caught an estimated 67,407 fish from Mann Lake during 2005, resulting in a catch rate of 3.1 fish/hour (Figure 39). This is substantially higher than catch rates of 1.0 fish/hour during 1993 and 1.3 fish/hour in 1999. Anglers harvested 39,122 fish from Mann Lake during 2005 (Table 3), 58% of the total fish caught. The harvest rate was estimated to be 1.8 fish/hour (Figure 42). The harvest composition consisted of 71.7% black crappie, 21.1% hatchery trout, 4.2% pumpkinseed, 2.5% bluegill, 0.4% largemouth bass, and 0.1% channel catfish (Figure 49). Mann Lake has shifted from a hatchery trout driven fishery to a warm-water fishery. In 1993, angler harvest was 100% rainbow trout and lake trout *Salvelinus namaycush*. In 2005, rainbow trout accounted for only 21% of the harvest. The biggest change has occurred in the black crappie harvest, which has increased from no harvest in 1993 to account for 72% of the harvest in 2005. This increase is likely due to a slow but steady increase in the average size of black crappie from 160 mm in 1993 to 203 mm in 2005.

Harvest of hatchery rainbow trout decreased from an estimated 24,365 in 1999 to 8,271 in 2005 (Table 3). While the number of hatchery trout stocked in Mann Lake has remained fairly constant, the number of those fish harvested has been declining. As a result, the hatchery trout return to creel has dropped from 58% in 1993 to 24% in 2005 (Table 3). A decline in harvest rates of hatchery trout has also been seen, dropping from 0.9 fish/hour in 1993 to 0.4 fish/hour in 2005. However, the catch rate in 2005 was 0.9 fish/hour, still almost twice the management goal of 0.5 fish/hour. Additionally, the percent of the fishery supported by hatchery trout has dropped considerably, from 90% in 1993 to 21% in 2005 (Table 3). This is partially due to a shift in angler preference from hatchery trout to black crappie. The decline in return to creel, harvest rate, and percent of the fishery supported by hatchery trout, combined with the high catch rate indicates a need to reevaluate the annual stocking of rainbow trout in the reservoir.

Soldier's Meadow Reservoir

Total angler effort on Soldier's Meadow Reservoir during 2005 was estimated at 9,215 hours (Figure 38). This is a 19% decrease from the level of effort in 1999, and a 38% decrease from the level of effort in 1993 (Figure 38). The effort consisted of 76.0% bank, 22.4% boat, and 1.6% ice anglers (Figure 52). Soldier's Meadow Reservoir supported 228 hours of angling effort per ha (92 hours per acre) in 2005.

Anglers caught an estimated 16,161 fish from Soldier's Meadow Reservoir during 2005, resulting in a catch rate of 1.8 fish/hour (Figure 39). This is higher than catch rates of 1.5 fish/hour during 1993 and 0.9 fish/hour in 1999. Anglers harvested 6,531 fish from Soldier's Meadow Reservoir during 2005 (Table 3), 40% of the total fish caught. The harvest rate was estimated to be 0.7 fish/hour (Figure 42). The harvest composition consisted of 73.4% hatchery trout, 25.2% black crappie, 1.1% brown bullhead, and 0.3% kokanee (Figure 53). Black crappie are becoming an important component of the fishery, having gone from 4.8% of the harvest in 1993 to 25.2% of the harvest in 2005.

The number of hatchery rainbow trout harvested from Soldier's Meadow Reservoir has been declining over the last decade, decreasing from an estimated 15,893 in 1993 to 4,791 in 2005 (Table 3). The extremely low harvest in 2005 occurred despite stocking twice the requested number of fish. This may be partially due to anglers releasing 5,001 (51.1%) of the hatchery trout they caught. The return to creel has dropped from 79% in 1993 to 22% in 2005 (Table 3). Harvest rates of hatchery rainbow trout have also dropped, from 1.1 fish/hour in 1993 to 0.52 fish/hour in 2005. However, the catch rate in 2005 was 1.1 fish/hour, twice the management goal of 0.5 fish/hour. Additionally, the percent of the fishery supported by hatchery trout has fluctuated, but has not shown an overall downward trend (Table 3). The decline in angler effort and hatchery trout return to creel, combined with the high catch rate indicates a need to reevaluate the annual stocking in the reservoir.

Moose Creek Reservoir

Total angler effort on Moose Creek Reservoir during 2005 was estimated at 19,874 hours (Figure 38). This is a 67% increase from the level of effort in 1999, and a 41% increase from the level of effort in 1993 (Figure 38). The effort consisted of 74.7% bank, 13.1% boat, and 12.2% ice anglers (Figure 50). Moose Creek Reservoir supported 1,823 hours of angling effort per ha (738 hours per acre) in 2005.

Anglers caught an estimated 36,753 fish from Moose Creek Reservoir during 2005, resulting in a catch rate of 1.9 fish/hour (Figure 39). This is higher than catch rates of 1.38 fish/hour during 1993 and 1.0 fish/hour in 1999. Anglers harvested 12,347 fish from Moose Creek Reservoir during 2005 (Table 3), 34% of the total fish caught. Harvest rate was estimated to be 0.6 fish/hour (Figure 42). The harvest composition consisted of 82.8% hatchery trout, 11.3% bluegill, 3.0% black crappie, 2.6% pumpkinseed, and 0.3% largemouth bass (Figure 51). Angler preferences have changed little over the last decade.

Harvest of hatchery rainbow trout increased from an estimated 7,993 in 1999 to 10,222 in 2005 (Table 3). Anglers also released an additional 7,334 (41.8%) hatchery trout. Both the number of hatchery trout stocked in Moose Creek Reservoir and the number of fish harvested have fluctuated. Harvest has not shown a general trend either up or down. The hatchery trout return to creel has ranged from 46% 1999 to 84% in 2005 (Table 3). Harvest rates of hatchery trout have dropped from 1.0 fish/hour in 1993 to 0.5 fish/hour in 2005. The catch rate in 2005 was 0.9 fish/hour, almost twice the management goal of 0.5 fish/hour. The percent of the fishery supported by hatchery trout has stayed consistent, ranging from 83% in 2005 to 89% in 1999 (Table 3).

Spring Valley Reservoir

Total angler effort on Spring Valley Reservoir during 2005 was estimated at 28,997 hours (Figure 38). This is a 12% decrease from the level of effort in 1999, and an 18% decrease from the level of effort in 1993 (Figure 38). The effort consisted of 81.4% bank, 11.2% boat, and 7.4% ice anglers (Figure 54). Spring Valley Reservoir supported 1,464 hours of angling effort per ha (593 hours per acre) in 2005.

Anglers caught an estimated 52,031 fish from Spring Valley Reservoir during 2005, resulting in a catch rate of 1.8 fish/hour (Figure 39). This is higher than catch rates of 1.0 fish/hour during 1993 and 1.2 fish/hour in 1999. Anglers harvested 21,246 fish from Spring

Valley Reservoir during 2005 (Table 3), 41% of the total fish caught. The harvest rate was estimated to be 0.7 fish/hour (Figure 42). The harvest composition consisted of 65.5% hatchery trout, 21.2% bluegill, 11.5% black crappie, and 1.8% largemouth bass (Figure 55). Angler preference has been shifting from hatchery trout to warm-water fish. Warm-water species accounted for only 1.8% of the harvest 1993, but accounted for 34.5% of the harvest in 2005. This shift has been a result of an improved fishery for black crappie, bluegill, and largemouth bass, all of which have seen substantial increases in number and percent of harvest.

The number of hatchery rainbow trout stocked in Spring Valley Reservoir was lower in 2005 than in 1993 and 1999. Additionally, harvest of hatchery rainbow trout has decreased from an estimated 24,365 in 1993 to 13,907 in 2005 (Table 3). The hatchery trout return to creel has fluctuated, but dropped to its lowest point at 42% in 2005, down from a high of 67% in 1999 (Table 3). This may be partially due to anglers releasing 8,904 (39%) of the hatchery trout they caught. A decline in harvest rates of hatchery trout has also been seen, as harvest has dropped from 0.8 fish/hour in 1993 to 0.5 fish/hour in 2005. Additionally, the percent of the fishery supported by hatchery trout has dropped considerably, from 96% in 1993 to 66% in 2005 (Table 3). The catch rate in 2005 was 0.8 fish/hour, above the management goal of 0.5 fish/hour (IDFG 2007). The decline in angling effort, return to creel, harvest rate, and percent of the fishery supported by hatchery trout indicates a need to reevaluate the annual stocking of rainbow trout in the reservoir.

Waha Lake

Total angler effort on Waha Lake during 2005 was estimated at 3,649 hours (Figure 38). This is an 11% decrease from the level of effort in 1999 (Figure 38). The effort consisted of 62.6% bank and 37.4% boat anglers (Figure 56). Waha Lake supported 96 hours of angling effort per ha (39 hours per acre) in 2005.

Anglers caught an estimated 13,914 fish from Waha Lake during 2005, resulting in a catch rate of 3.8 fish/hour (Figure 39). This is substantially higher than catch rate of 0.6 fish/hour during 1999. No catch rate estimates from Waha Lake were generated in 1993. Anglers harvested 9,919 fish from Waha Lake during 2005 (Table 3), 71% of the total fish caught. Harvest rate was estimated to be 2.7 fish/hour (Figure 42), substantially higher than the harvest rate of 0.5 fish/hour in 1999. The harvest composition consisted of 72.7% yellow perch, 23.8% hatchery trout, 2.8% smallmouth bass, 0.5% splake , and 0.3% kokanee (Figure 57). No harvest estimates were generated from Waha Lake in 1993.

Harvest of hatchery rainbow trout increased slightly from an estimated 1,737 in 1999 to 2,357 in 2005 (Table 3). The catch rate of hatchery rainbow trout was 1.3 fish/hour, well above the management goal of 0.5 fish/hour. However, the hatchery trout return to creel was only 28% in 2005, slightly lower than the 32% in 1999 (Table 3). This may be partially due to anglers releasing 2,341 (49.8%) of the hatchery trout they caught. The percent of the fishery supported by hatchery trout has dropped considerably, from 90% in 1999 to 24% in 2005 (Table 3). This is due to the harvest of over 7,000 yellow perch in 2005 as compared to no harvest of these fish in 1999.

Winchester Lake

Anglers caught an estimated 141,374 fish from Winchester Lake during 2005, resulting in a catch rate of 2.7 fish/hour (Figure 39). This is more than twice the catch rates of 1.1 fish/hour during 1993 and 1.3 fish/hour in 1999. Anglers harvested 67,741 fish from Winchester

Lake during 2005 (Table 3), 48% of the total fish caught. Harvest rate was estimated to be 1.3 fish/hour (Figure 42). The harvest composition consisted of 34.8% hatchery trout, 32.0% yellow perch, 24.2% bluegill, 7.9% black crappie, 0.9% largemouth bass, and 0.2% channel catfish (Figure 59). Angler harvest has shifted from hatchery trout to warm-water fish since 1993 due to the establishment of illegally introduced yellow perch and black crappie. Warm-water species accounted for 38% of the harvest in 1993 but accounted for 65% of the harvest in 2005.

The number of hatchery trout stocked in Winchester Lake has steadily declined from 1993 (42,288) to 2005 (32,225). Additionally, the harvest of hatchery rainbow trout has decreased from an estimated 40,739 in 1993 to 23,560 in 2005 (Table 3). However, the hatchery trout return to creel has increased from 60% in 1993 and 1999 to 73% in 2005 (Table 3). A decline in harvest rates of hatchery rainbow trout has been seen, as harvest has dropped from 1.0 fish/hour in 1993 to 0.5 fish/hour in 2005. However, the catch rate in 2005 was 0.8 fish/hour, above the management goal of 0.5 fish/hour (IDFG 2007). Additionally, the percent of the fishery supported by hatchery trout has dropped considerably, from 62% in 1993 to 35% in 2005 (Table 3). This is partially due to the shift in angler harvest from hatchery trout to warm-water species. Even though there has been a decline in the number of hatchery trout harvested, the harvest rate, and the percent of the fishery supported by hatchery trout, the increase in return to creel to 73% and the catch rate slightly above the management goal indicated no need to reduce the number of catchable size trout stocked in Winchester Lake. Conversely, observations made in the field (checking fish for marks during creel surveys) concluded that no rainbow trout stocked as fingerlings were harvested during creel surveys in 1999 or 2005. This failure of fingerling establishment in Winchester Lake is likely due to competition and predation from perch, crappie, and largemouth bass.

Management Recommendations

1. Write a management plan for lowland lake surveys to define goals and objectives of lowland lake program and develop an annual work plan for lowland lakes.

2. Remove Soldier's Meadow Reservoir and Tolo Lake from Family Fishing Waters designation.

3. Re-evaluate annual stocking rates of catchable and fingerling hatchery rainbow trout in regional lowland lakes.

Table 1. Fingerling rainbow trout, kokanee, and westslope cutthroat trout stocked in the lowland lakes and reservoirs of the Clearwater Region, Idaho, during 2005.

Water	Month	Rainbow trout	Kokanee	Cutthroat trout	Total
Deer Creek Reservoir	October			4,881	4,881
Mann Lake	April	39,984			39,984
Soldier's Meadow Reservoir	April	28,938			28,938
Spring Valley Reservoir	April	35,020			35,020
Waha Lake	May	14,976	5,030		20,006
Winchester Lake	April	29,952			29,952
Total		148,870	5,030	4,881	158,781

Table 2. Catchable size rainbow trout stocked in lakes, ponds, and reservoirs of the Clearwater Region, Idaho, during 2005.

Water	April	May	June	July	August	September	Total
Camp Grizzly Pond			560				560
Campbell's Pond	2,001	4,140	812			1,010	7,963
Deer Creek Reservoir		20,387					20,387
Dworshak Reservoir	50,657						50,657
Elk Creek Reservoir		7,140	14,842	7,350		5,010	34,342
Fenn Pond		1,080	1,590			1,000	3,670
Five Mile Pond		504	2,820				3,324
Henry's Gulch Pond	525	2,610	504				3,639
Hordeman Pond	248						248
Karolyn's Pond		1,041	1,874		1,400		4,315
Levee Pond	375	402	825			1,237	2,839
Mann Lake	19,450	7,350				7,800	34,600
Moose Creek Reservoir	7,200					5,010	12,210
Powell Pond		1,440	1,000		500		2,940
Robinson Pond			2,160				2,160
Soldier's Meadow Reservoir		9,000	12,800				21,800
Spring Valley Reservoir	9,600	12,400	986			10,140	33,126
Waha Lake	8,400						8,400
Wilkins Pond			252				252
Winchester Lake	11,000	11,625	9,600				32,225
Total	109,456	79,119	50,625	7,350	1,900	31,207	279,657

Table 3. Estimates of return rate to creel, and percent of fishery supported by hatchery rainbow trout, for lowland lakes in the Clearwater Region, Idaho, in 1993, 1999, and 2005.

1993

		Hatchery Rainbow Trout							
Lake	Total Harvest (all fish)	Hatchery trout harvested	Catchables Stocked	Catchables Harvested	fingerling trout % of trout harvest	Catchable Return Rate	% of fishery supported by	Catch Rate (fish/hour)	Harvest Rate (fish/hour)
Winchester Lake	41,317	40,739	42,288	25,543	37	0.60	98.6	-----	0.95
Spring Valley Reservoir	27,417	26,924	45,000	26,116	3	0.58	98.2	-----	0.76
Mann Lake	28,471	24,365	42,290	24,203	1	0.57	85.6	-----	0.79
Soldier's Meadow Reservoir	17,620	15,893	15,070	11,888	25	0.79	90.2	-----	1.06
Moose Creek Reservoir	16,990	14,187	20,650	14,187	0	0.69	83.5	-----	1.01
Elk Creek Reservoir	17,027	16,755	30,210	15,900	5	0.53	98.4	-----	0.95
Total	148,842	138,863	195,508	117,837	15	0.63	92.4	-----	0.92

1999

		Hatchery Rainbow Trout							
Lake	Total Harvest	Hatchery trout harvested	Catchables Stocked	Catchables Harvested	fingerling trout % of trout harvest	Catchable Return Rate	% of fishery supported by	Catch Rate (fish/hour)	Harvest Rate (fish/hour)
Winchester Lake	39,171	21,622	35,000	21,622	0	0.62	55.2	-----	0.64
Spring Valley Reservoir	27,668	22,826	32,530	22,826	0	0.70	82.5	-----	0.70
Mann Lake	21,085	12,546	35,000	12,546	0	0.36	59.5	-----	0.68
Soldier's Meadow Reservoir	8,667	8,407	13,391	8,407	0	0.63	97.0	-----	0.74
Moose Creek Reservoir	9,057	7,961	17,450	7,961	0	0.46	87.9	-----	0.67
Elk Creek Reservoir	16,337	10,962	27,500	10,962	0	0.40	67.1	-----	0.72
Waha Lake	1,934	1,582	5,500	1,582	0	0.29	81.8	-----	0.39
Total	123,919	85,906	166,371	85,906	0	0.49	75.9	-----	0.65

2005

		Hatchery Rainbow Trout							
Lake	Total Harvest	Hatchery trout harvested	Catchables Stocked	Catchables Harvested	fingerling trout % of trout harvest	Catchable Return Rate	% of fishery supported by	Catch Rate (fish/hour)	Harvest Rate (fish/hour)
Winchester Lake	67,741	23,560	32,225	23,560	0	0.73	34.8	0.84	0.45
Spring Valley Reservoir	21,246	13,907	33,126	13,907	0	0.42	65.5	0.79	0.48
Mann Lake	39,122	8,271	34,600	8,271	0	0.24	21.1	0.89	0.38
Soldier's Meadow Reservoir	6,531	4,791	21,800	4,791	0	0.22	73.4	1.06	0.52
Moose Creek Reservoir	12,347	10,222	12,210	10,222	0	0.84	82.8	0.89	0.52
Elk Creek Reservoir	11,047	10,392	34,342	10,392	0	0.30	94.1	1.50	0.95
Waha Lake	9,919	2,357	8,400	2,357	0	0.28	23.8	1.28	0.65
Deer Creek Reservoir	8,929	8,929	20,387	8,929	0	0.44	100.0	1.25	0.54
Total	176,882	82,429	197,090	82,429	0	0.43	61.9	1.06	0.56

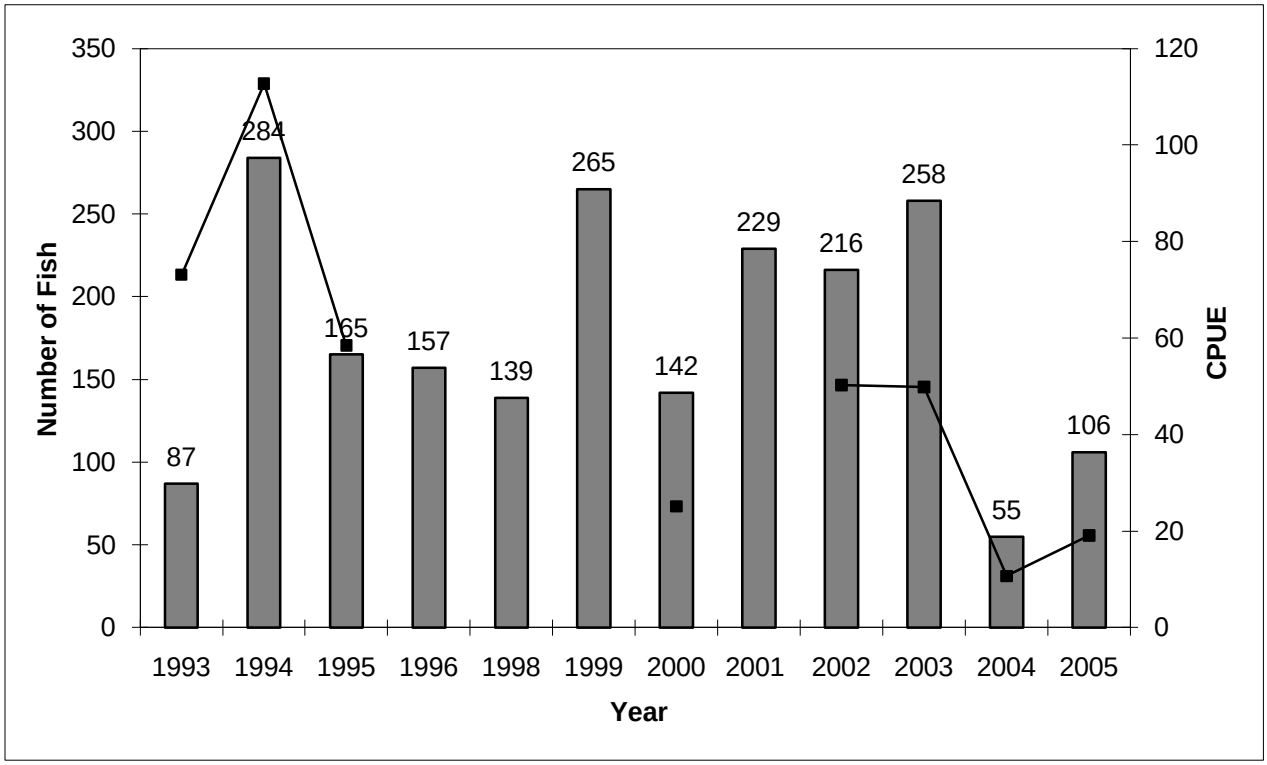


Figure 4. Number and catch per unit effort (CPUE) of smallmouth bass collected during annual population surveys of Dworshak Reservoir, Idaho, from 1993-2005 (N values shown).

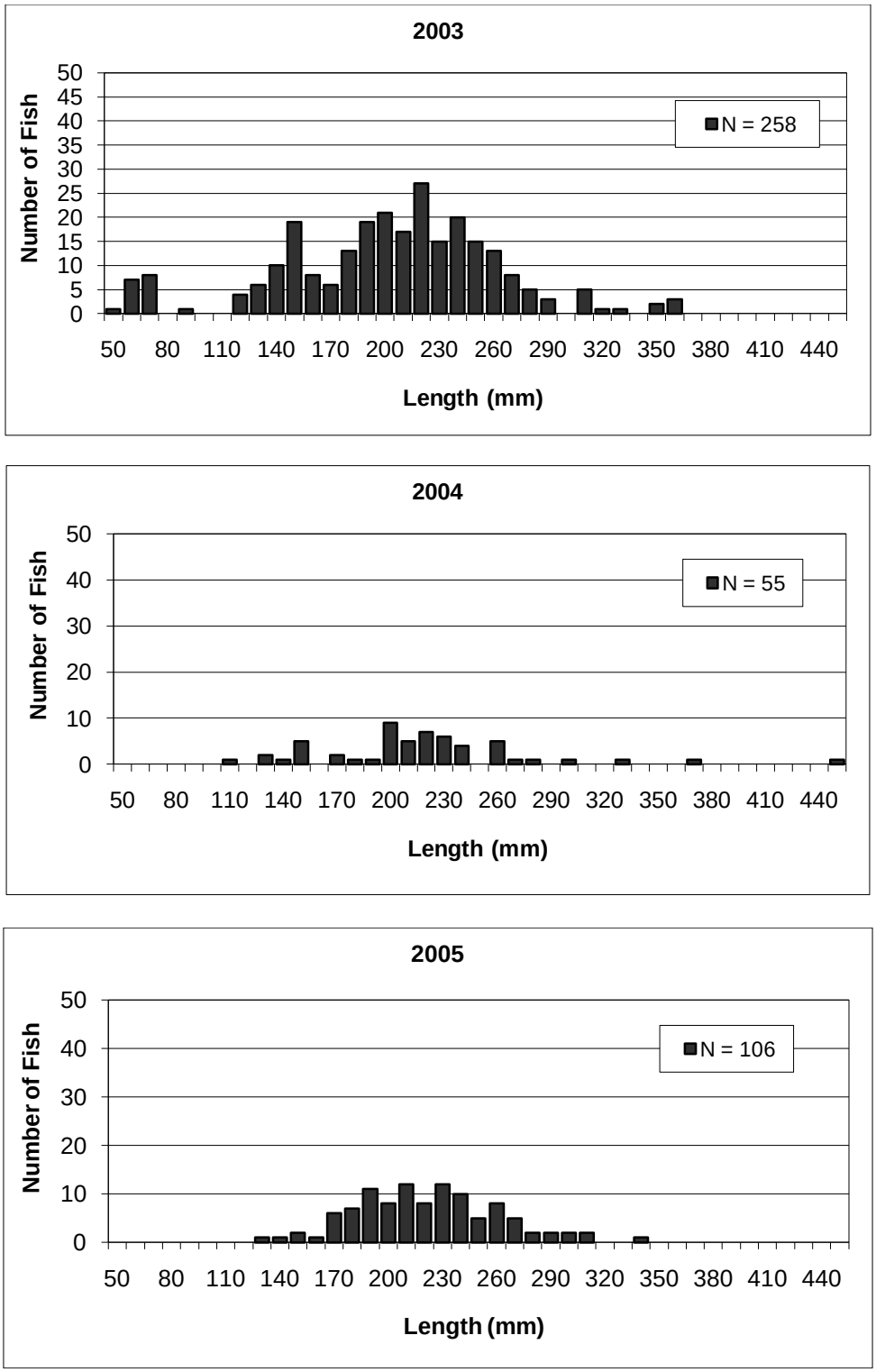


Figure 5. Length frequency distributions of smallmouth bass collected during annual population surveys of Dworshak Reservoir, Idaho, from 2003-2005.

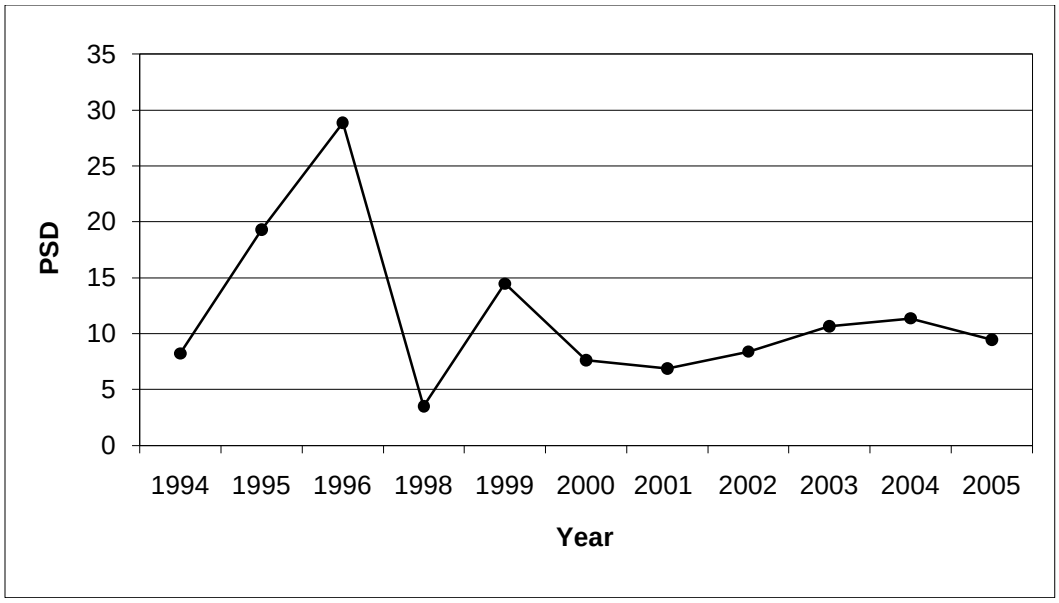


Figure 6. Proportional stock density (PSD) values of smallmouth bass collected during annual population surveys of Dworshak Reservoir, Idaho, from 1994-2005.

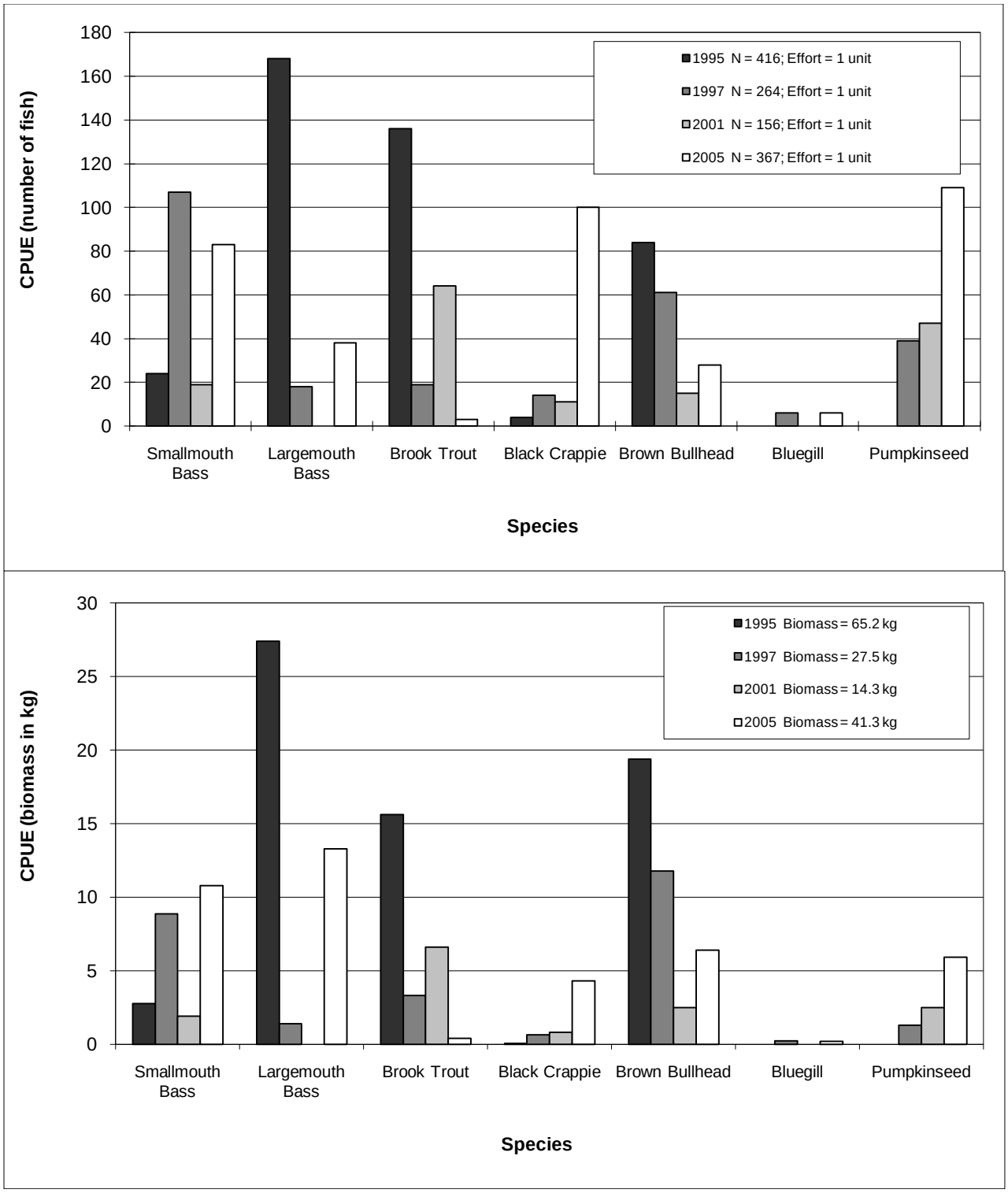


Figure 7. Catch per unit effort (CPUE) of fish collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1995, 1997, 2001, and 2005.

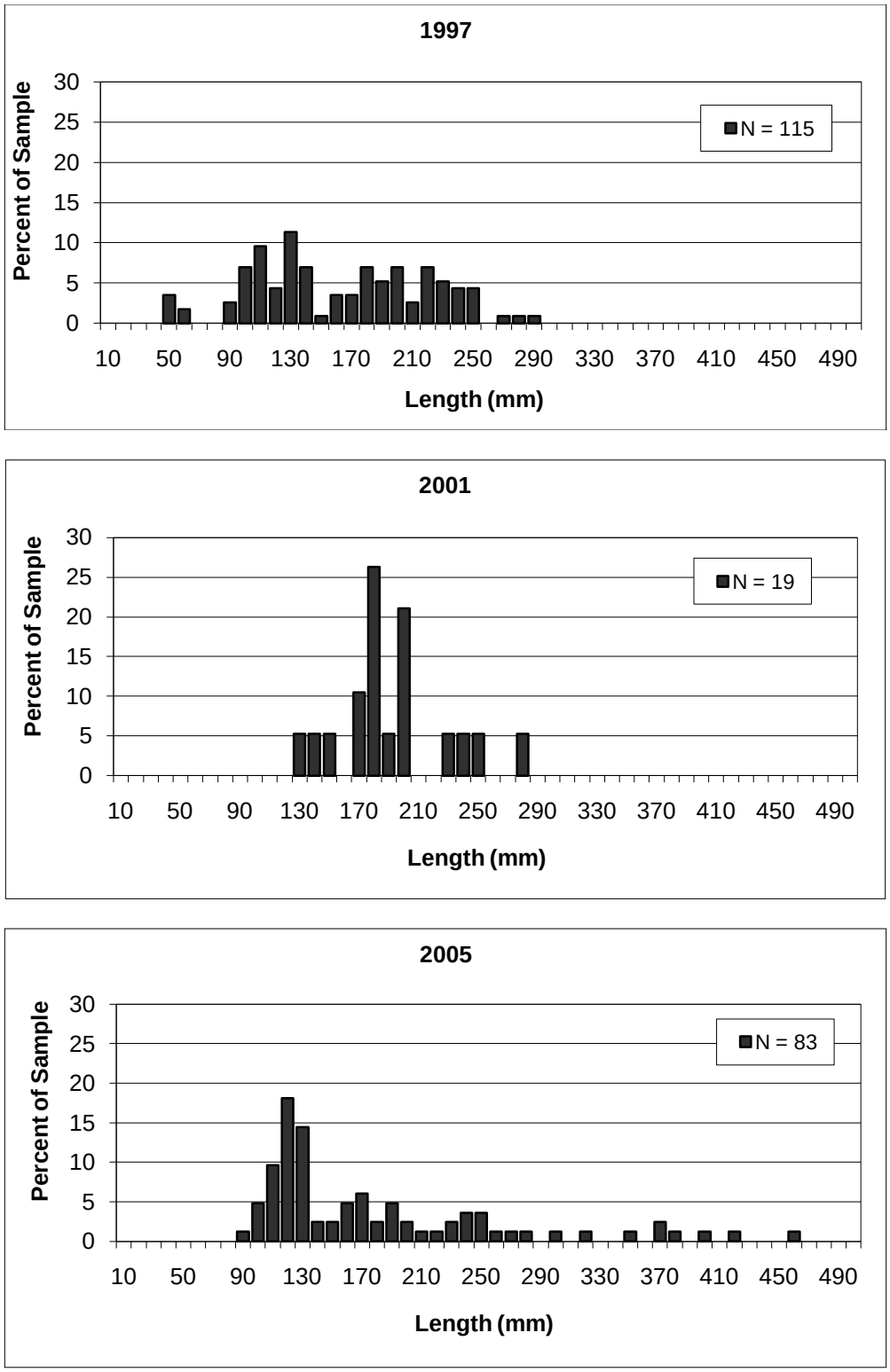


Figure 8. Length frequency distributions of smallmouth bass collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1997, 2001, and 2005.

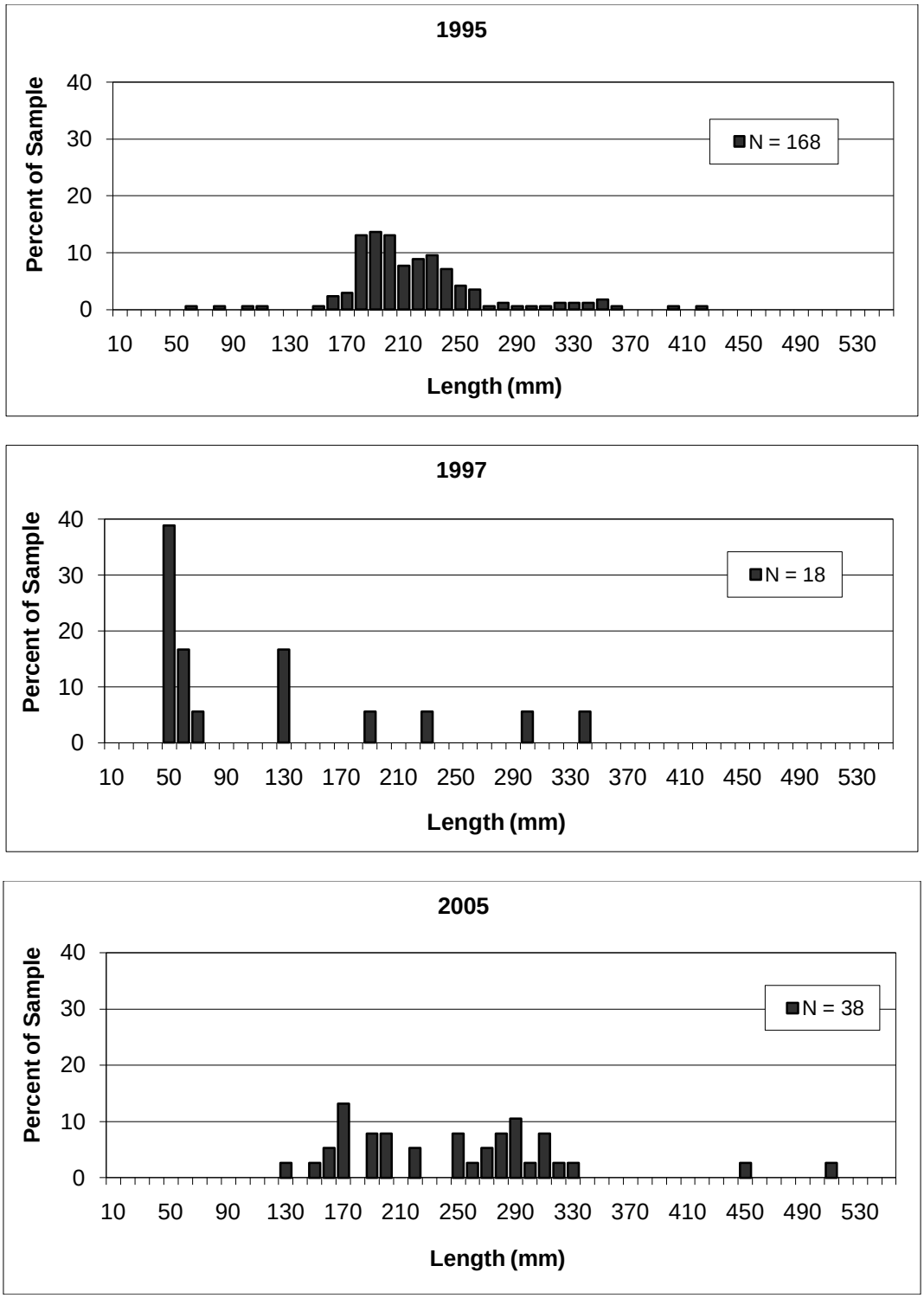


Figure 9. Length frequency distributions of largemouth bass collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1995, 1997, and 2005.

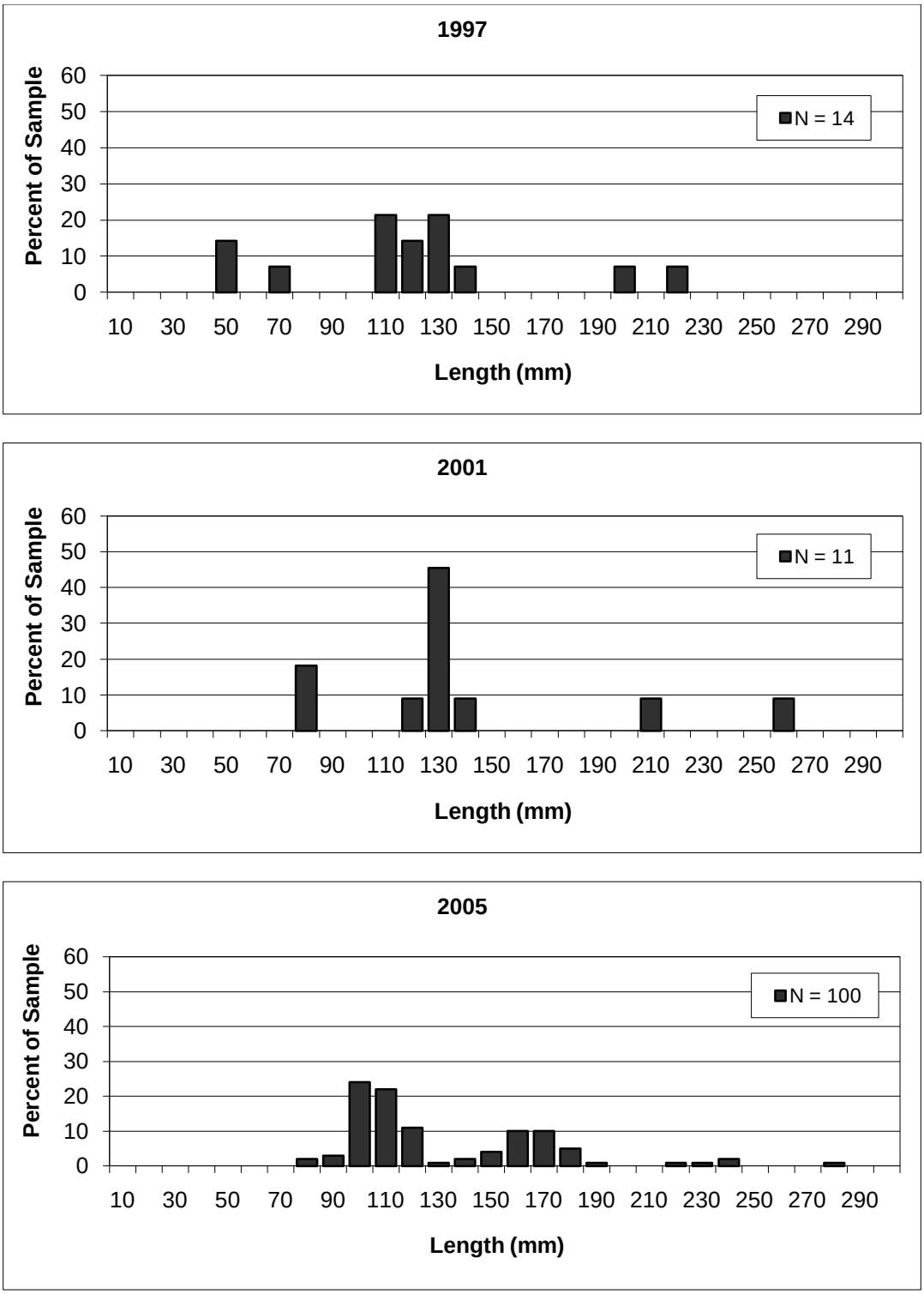


Figure 10. Length frequency distributions of black crappie collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1997, 2001, and 2005.

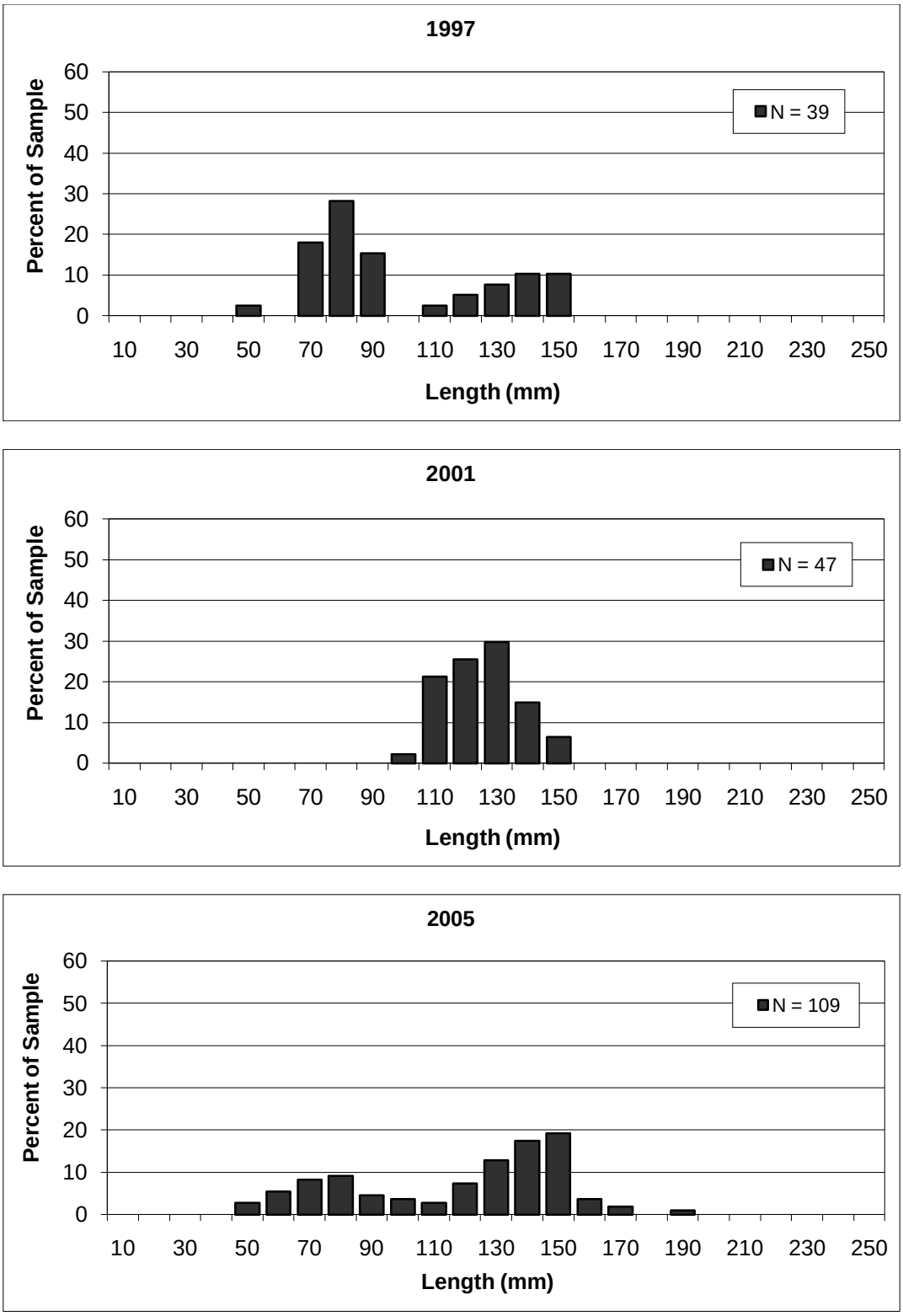
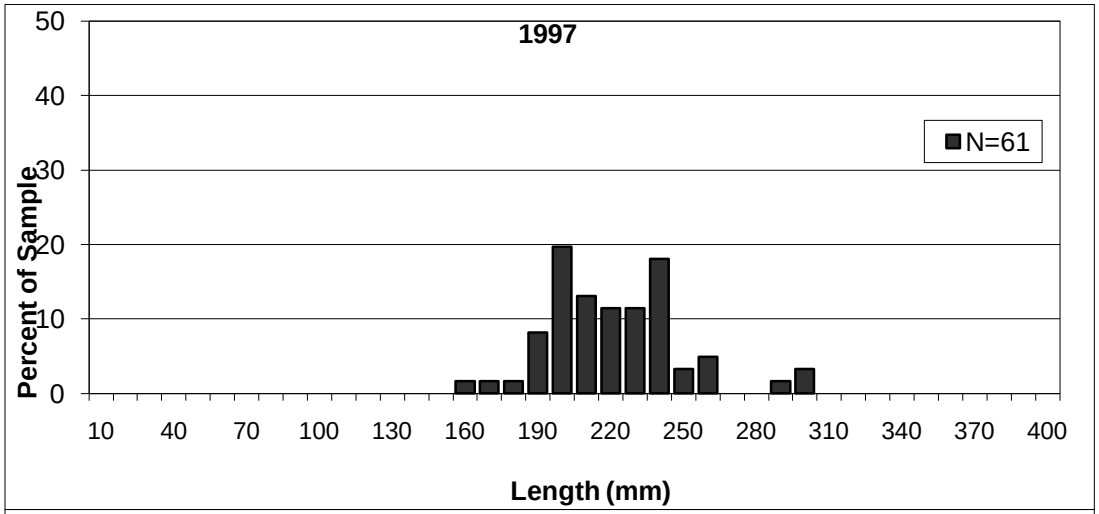
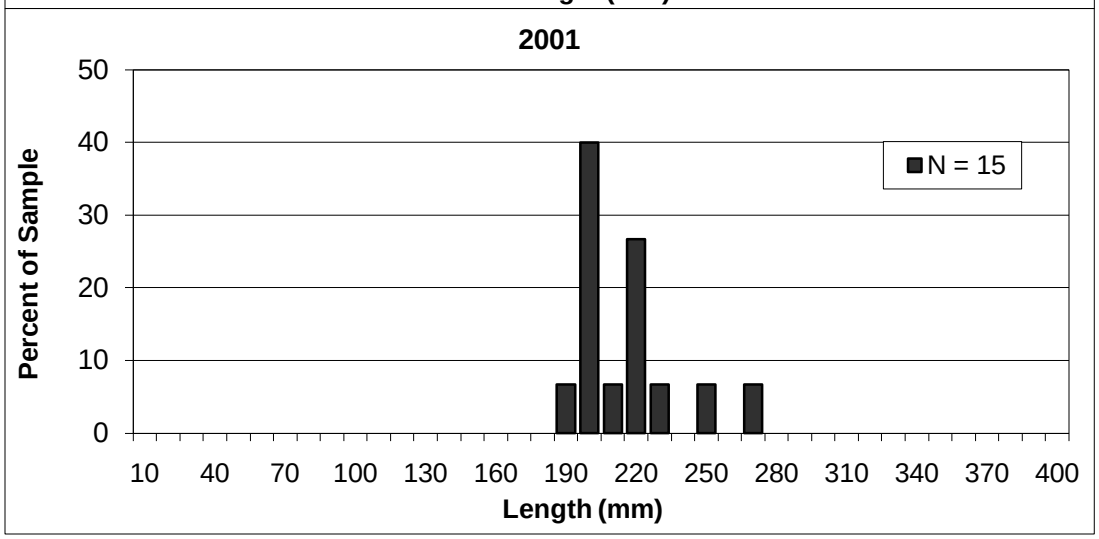


Figure 11. Length frequency distributions of pumpkinseed collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1997, 2001, and 2005.


1997
N=61
Percent of Sample
Length (mm)
0
10
20
30
40
50
10 40 70 100 130 160 190 220 250 280 310 340 370 400


2001
N = 15
Percent of Sample
Length (mm)
0
10
20
30
40
50
10 40 70 100 130 160 190 220 250 280 310 340 370 400

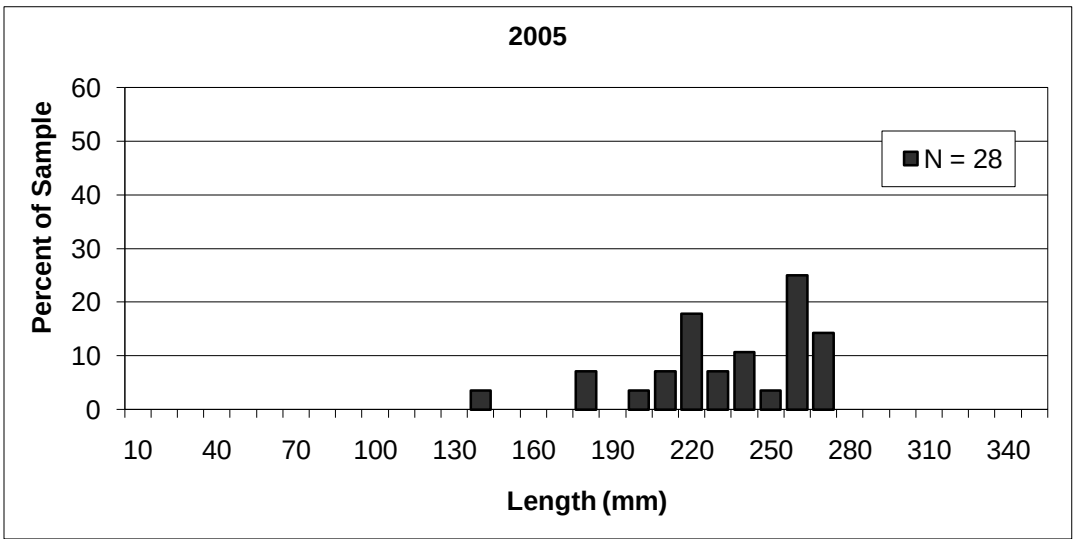
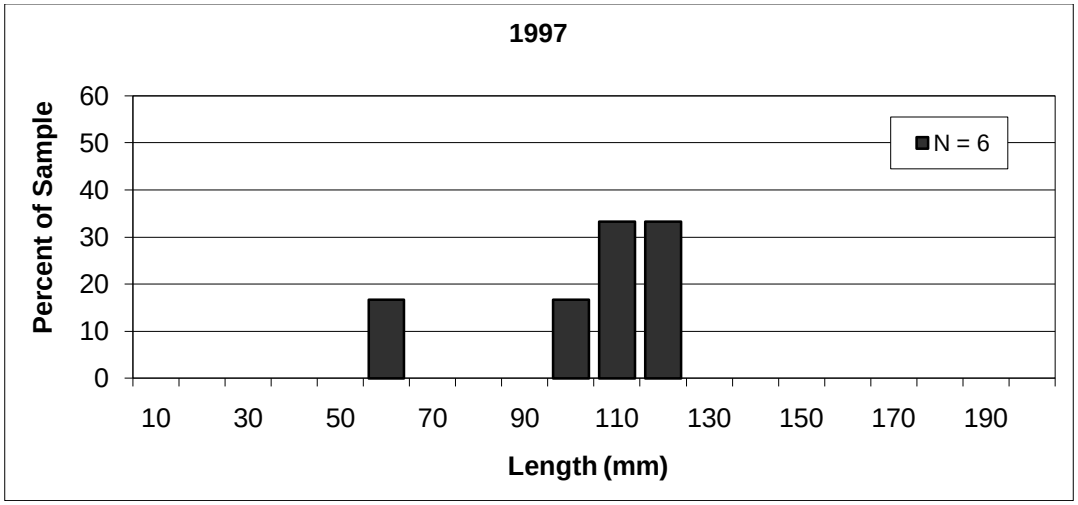

2005
N = 28
Percent of Sample
Length (mm)
0
10
20
30
40
50
60
10 40 70 100 130 160 190 220 250 280 310 340

Figure 12. Length frequency distributions of brown bullhead collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1997, 2001, and 2005.



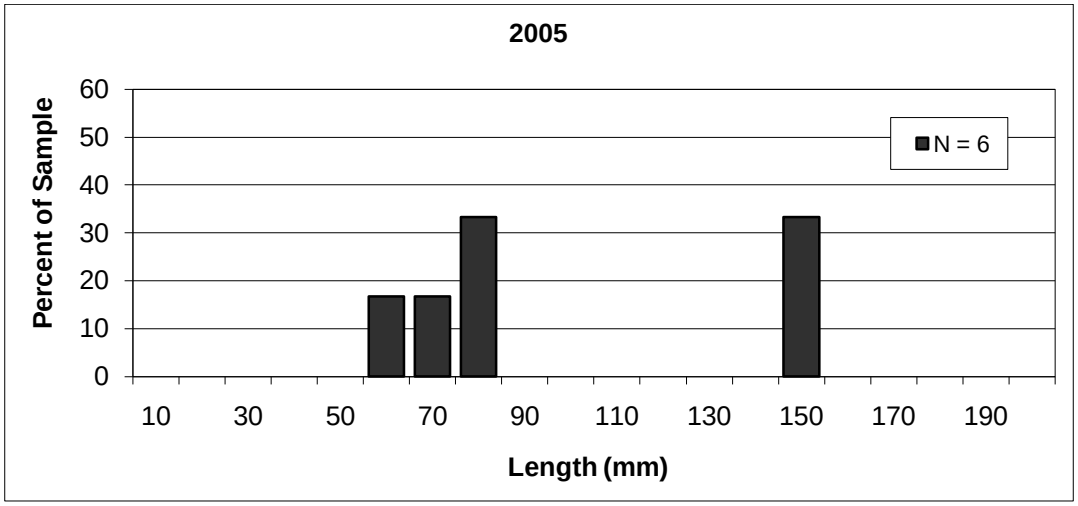


Figure 13. Length frequency distributions of bluegill collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1997 and 2005.

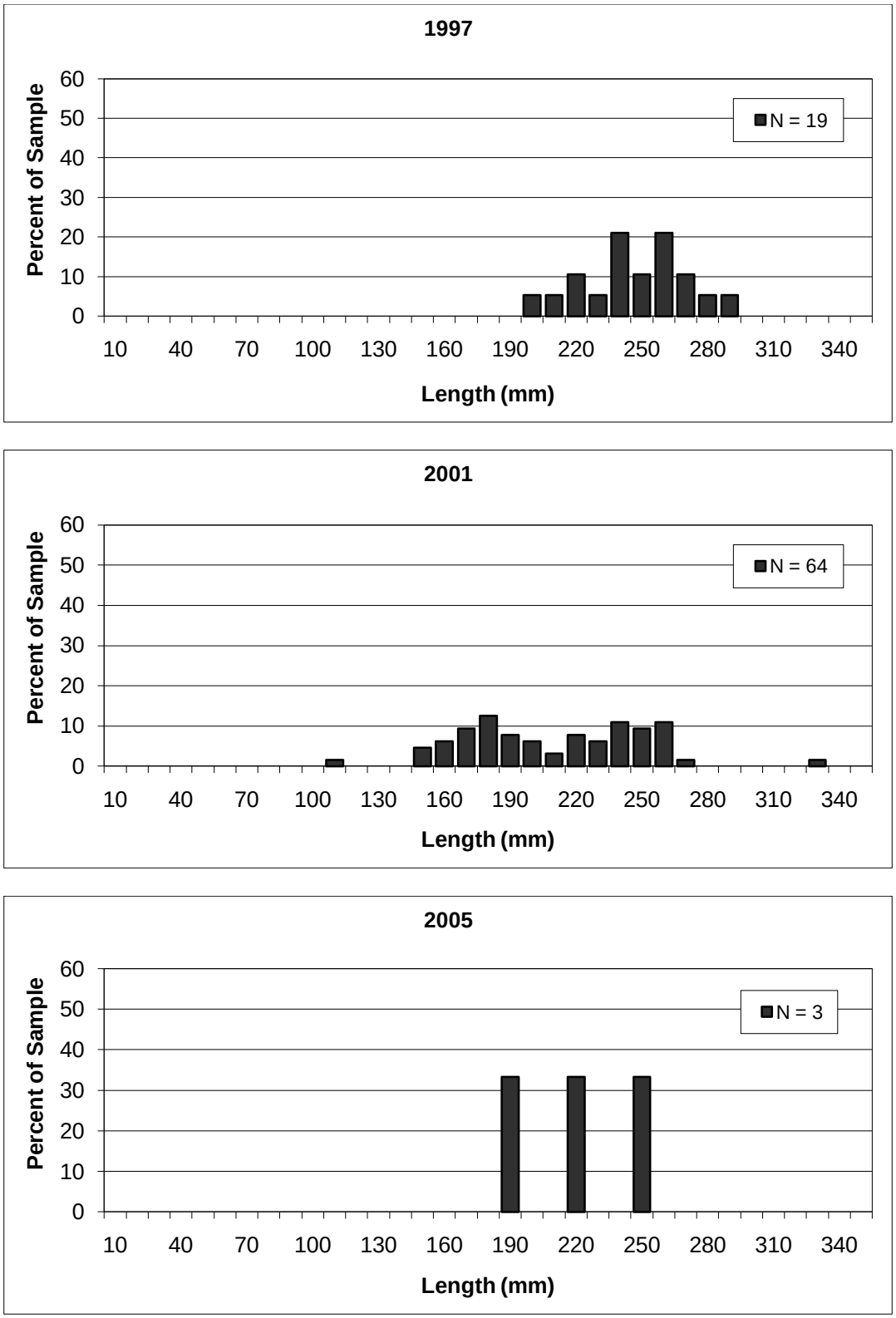


Figure 14. Length frequency distributions of brook trout collected from standard lake surveys of Elk Creek Reservoir, Idaho, in 1997, 2001, and 2005.

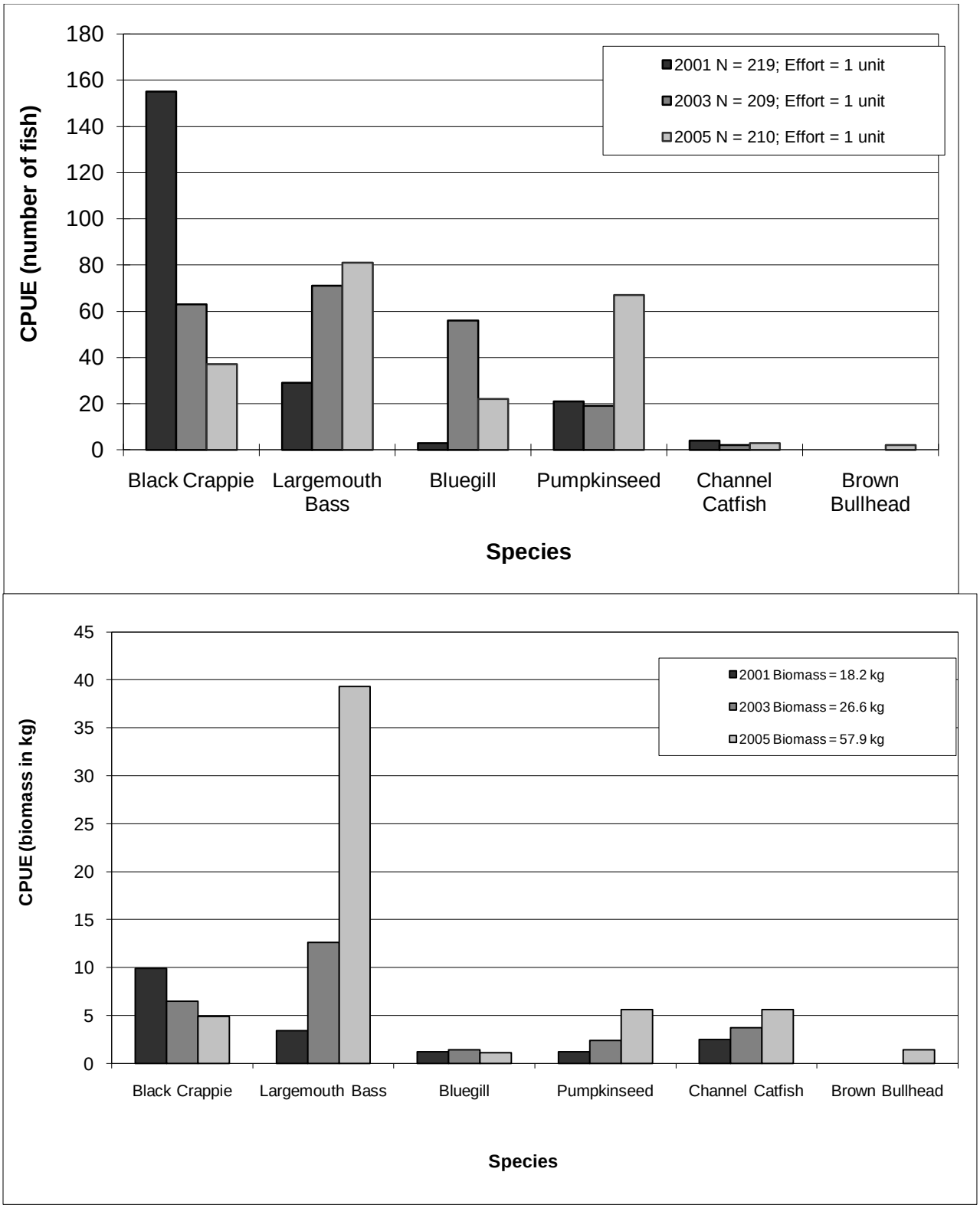


Figure 15. Catch per unit effort (CPUE) of fish collected from standard lake surveys of Mann Lake, Idaho, in 2001, 2003, and 2005.

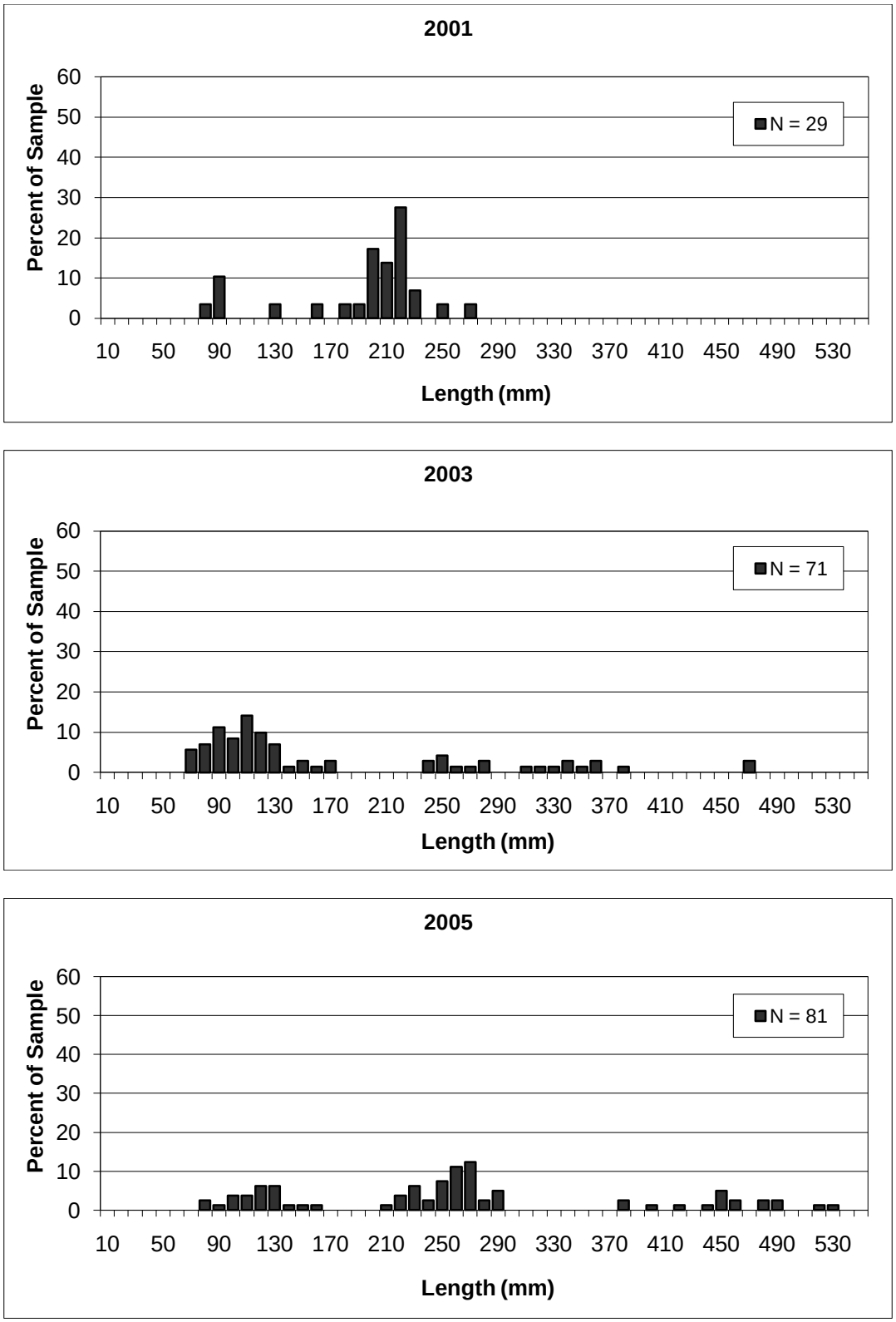


Figure 16. Length frequency distributions of largemouth bass collected from standard lake surveys of Mann Lake, Idaho, in 2001, 2003, and 2005.

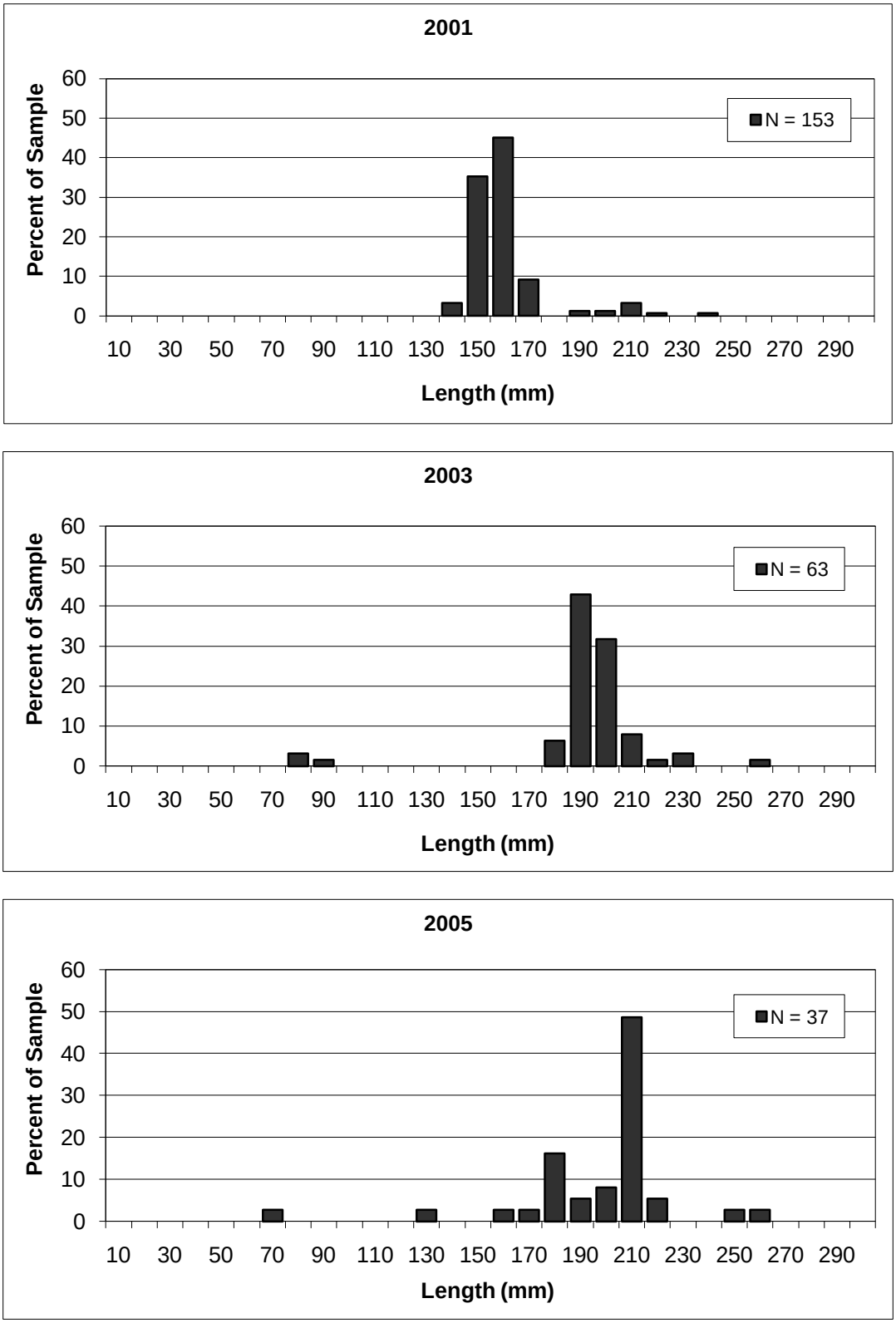


Figure 17. Length frequency distributions of black crappie collected from standard lake surveys of Mann Lake, Idaho, in 2001, 2003, and 2005.

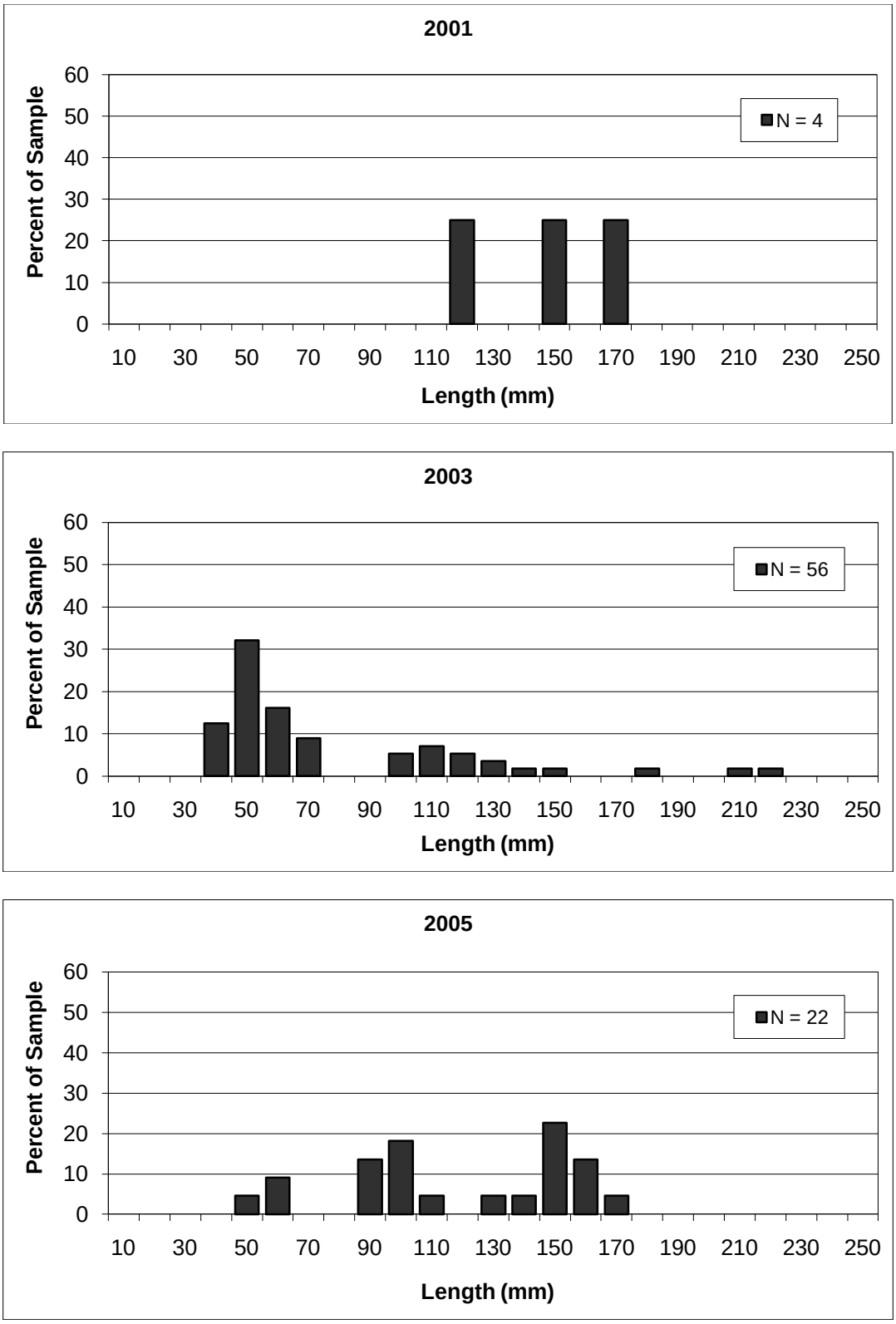


Figure 18. Length frequency distributions of bluegill collected from standard lake surveys of Mann Lake, Idaho, in 2001, 2003, and 2005.

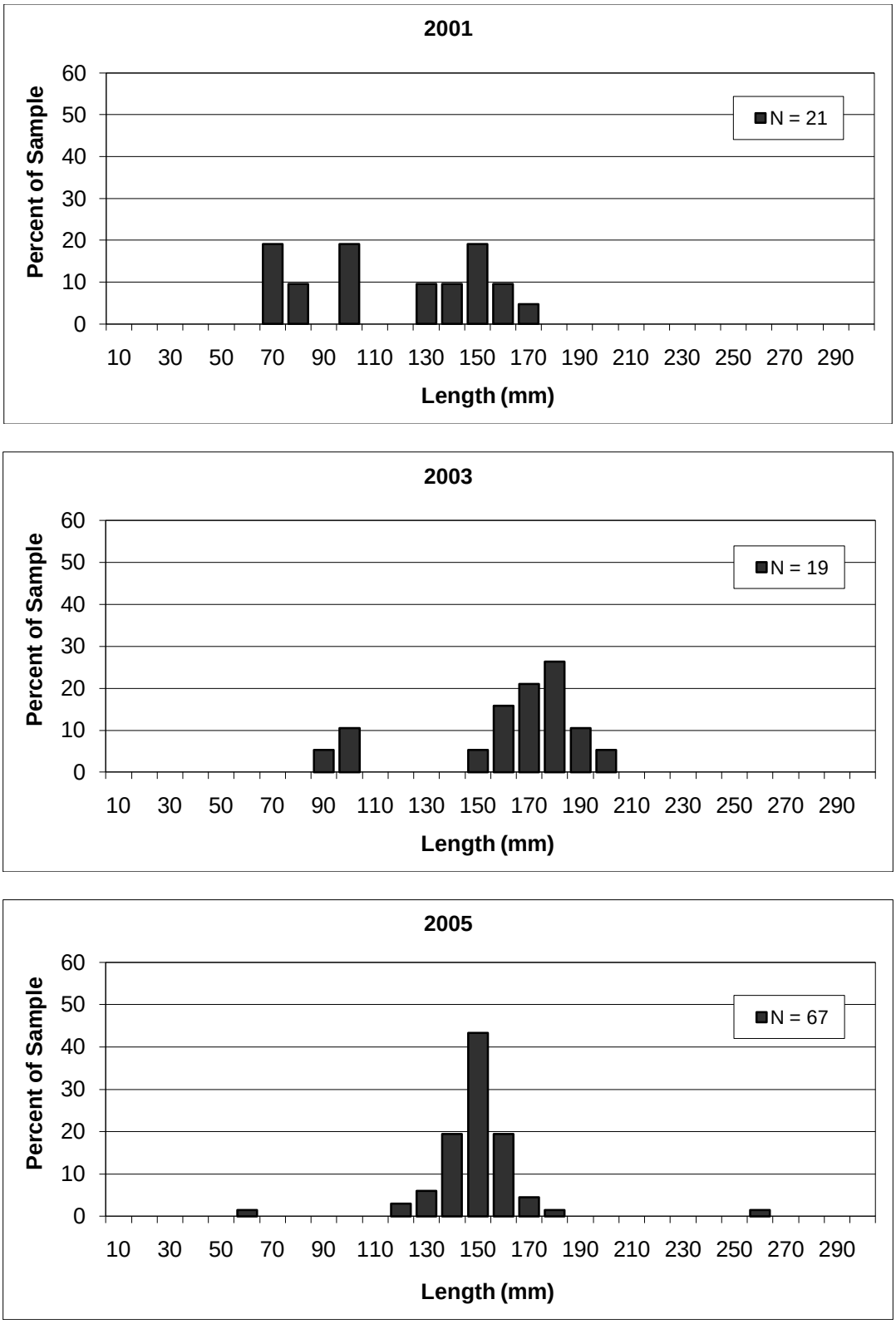


Figure 19. Length frequency distributions of pumpkinseed collected from standard lake surveys of Mann Lake, Idaho, in 2001, 2003, and 2005.

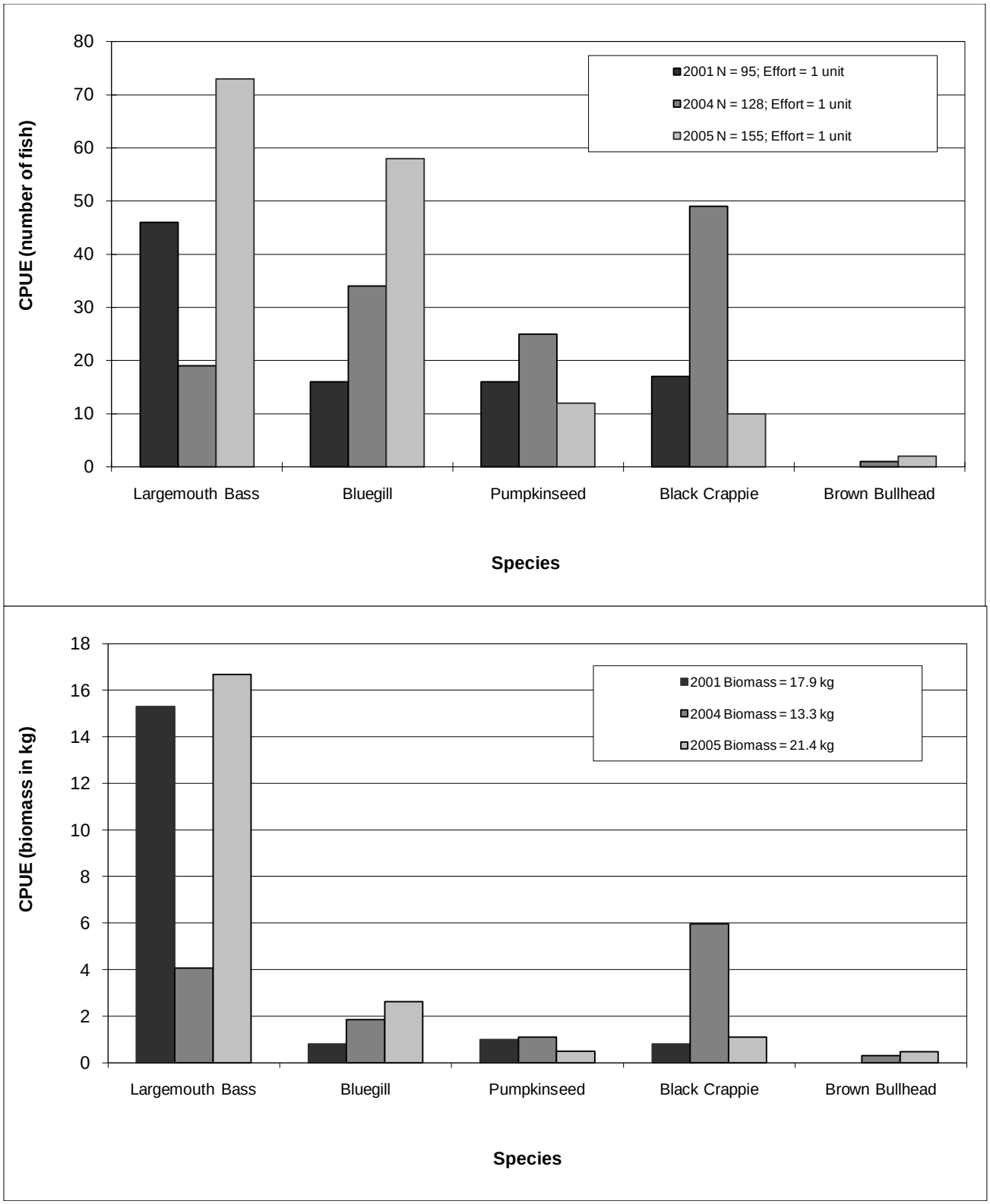


Figure 20. Catch per unit effort (CPUE) of fish collected from standard lake surveys of Moose Creek Reservoir, Idaho, in 2001, 2004, and 2005.

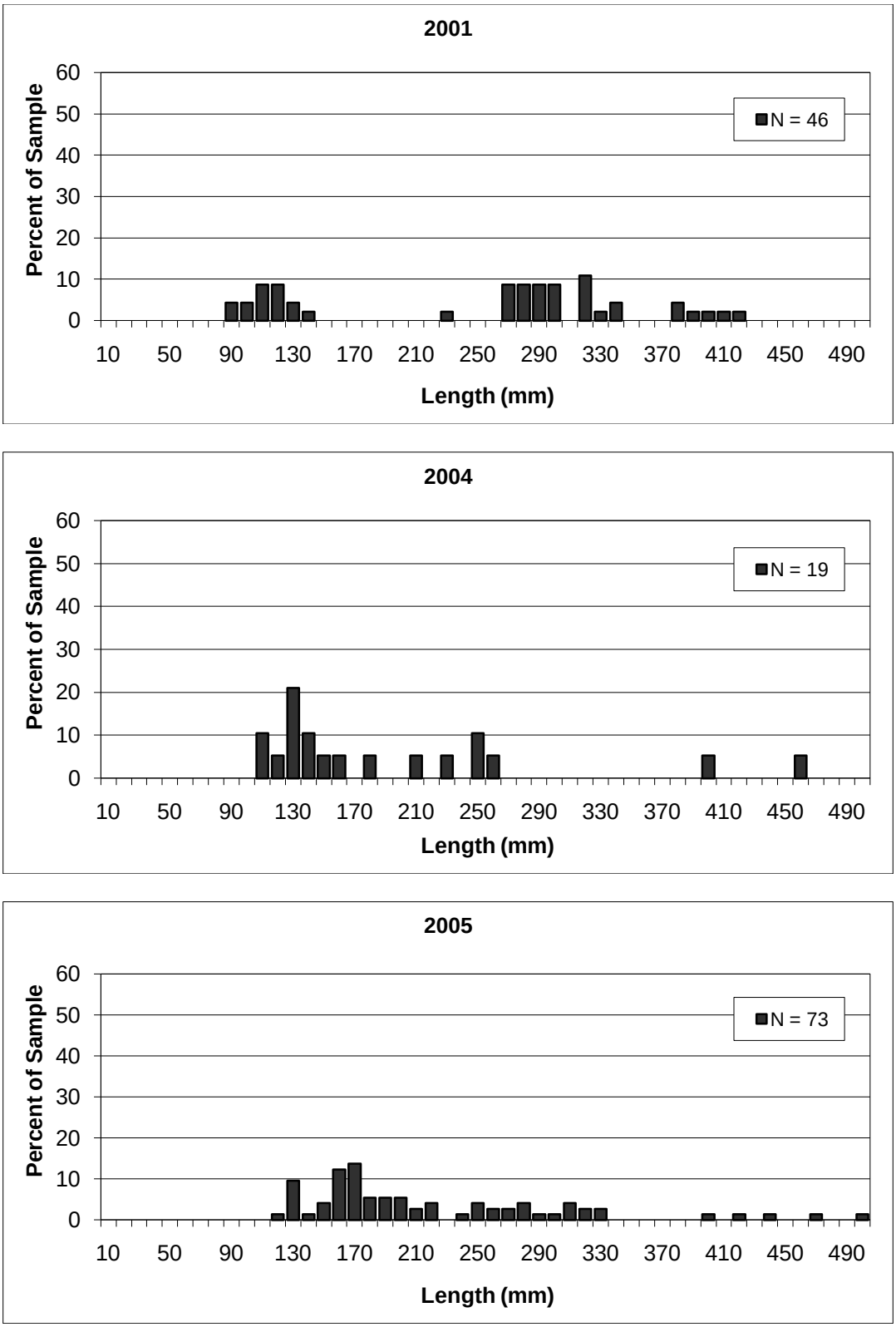


Figure 21. Length frequency distributions of largemouth bass collected from standard lake surveys of Moose Creek Reservoir, Idaho, in 2001, 2004, and 2005.

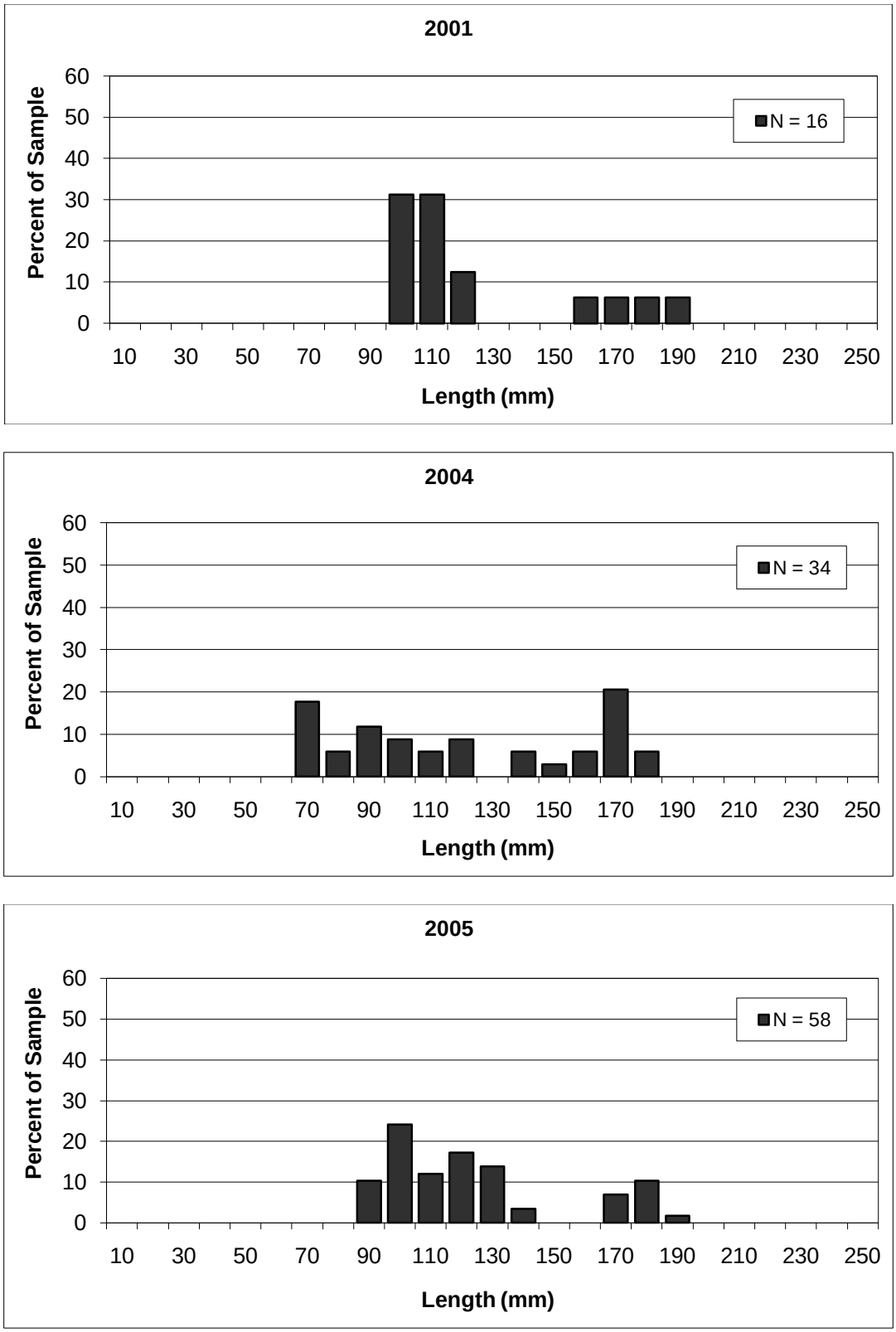


Figure 22. Length frequency distributions of bluegill collected from standard lake surveys of surveys of Moose Creek Reservoir, Idaho, in 2001, 2004, and 2005.

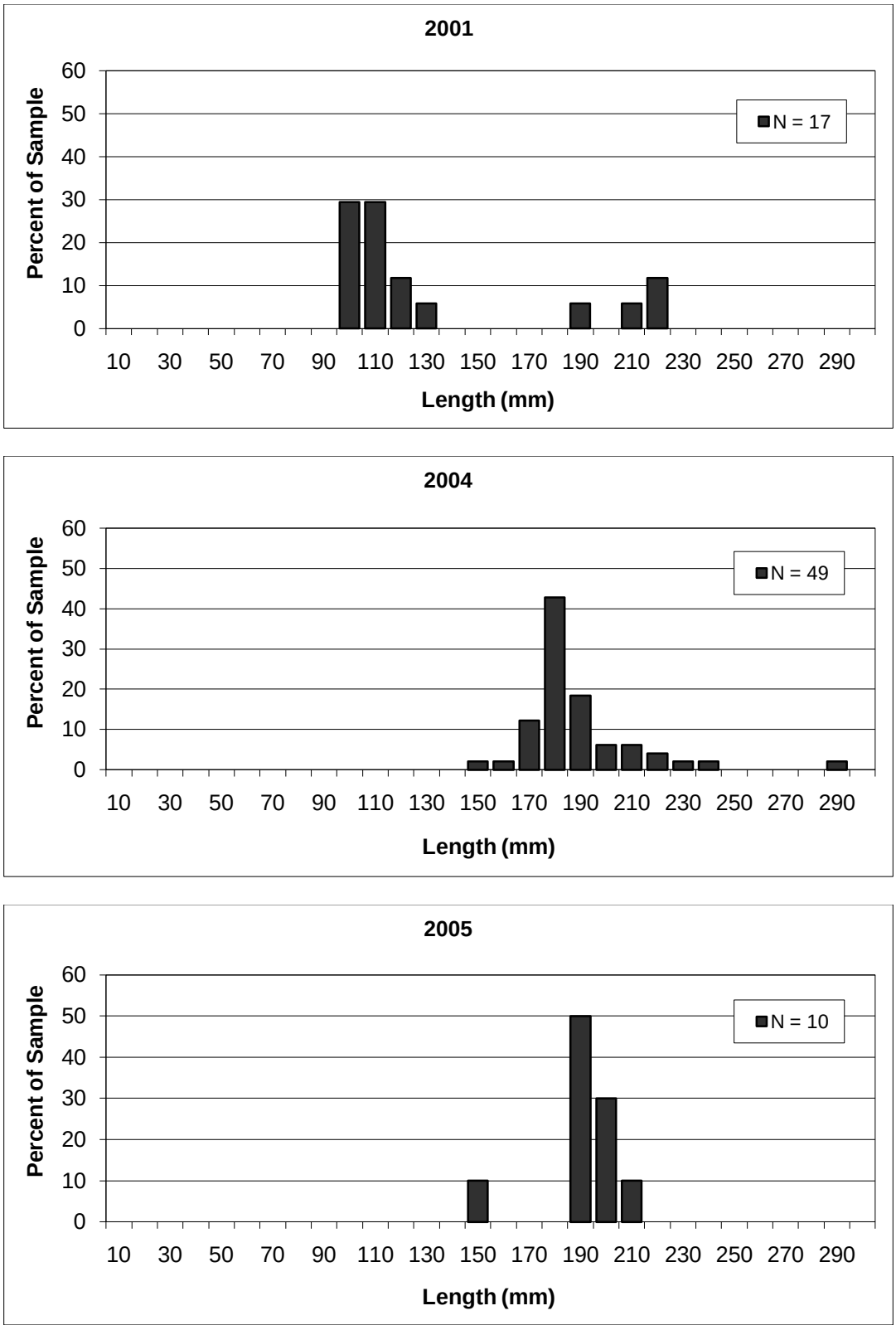


Figure 23. Length frequency distributions of black crappie collected from standard lake surveys of Moose Creek Reservoir, Idaho, in 2001, 2004, and 2005.

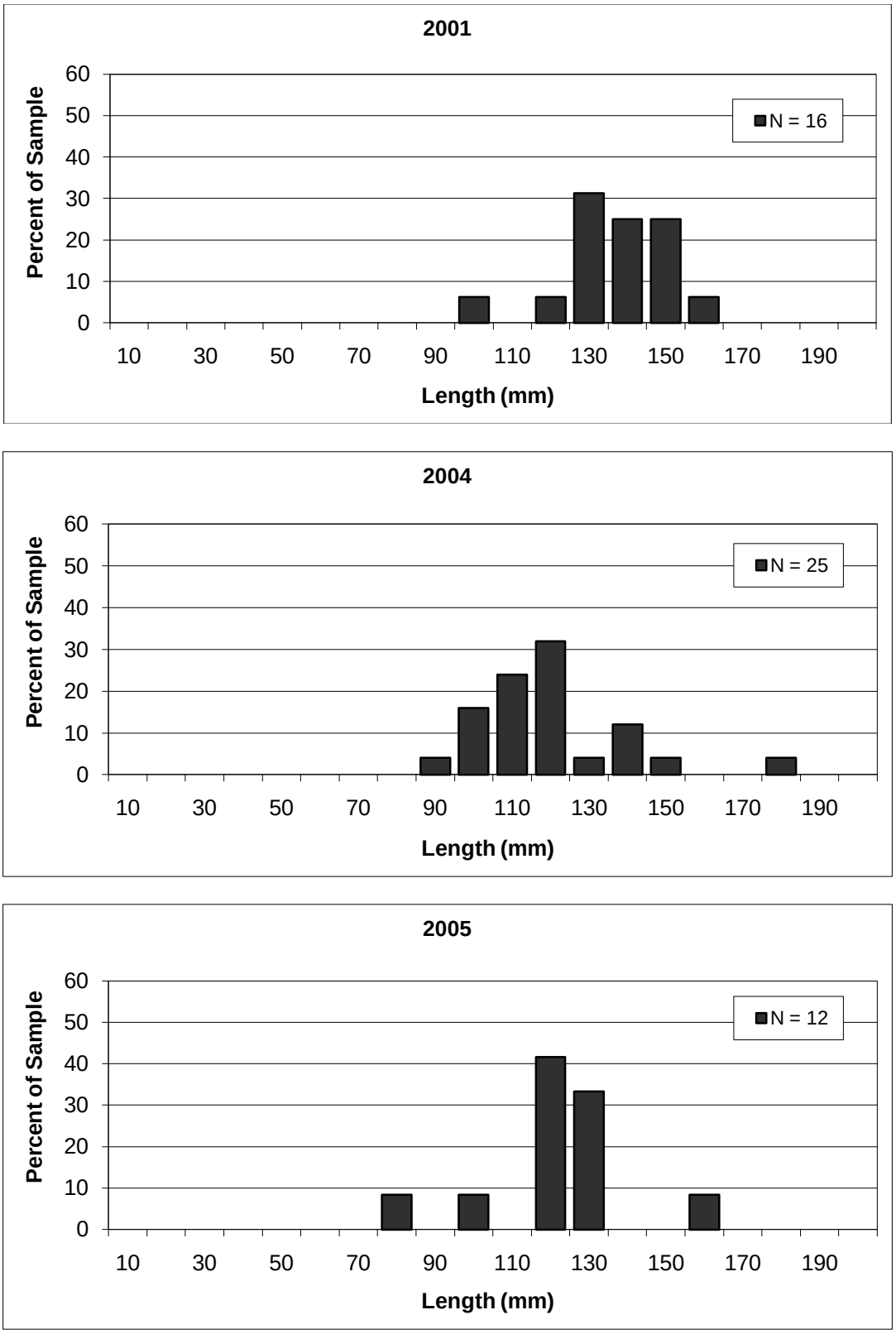
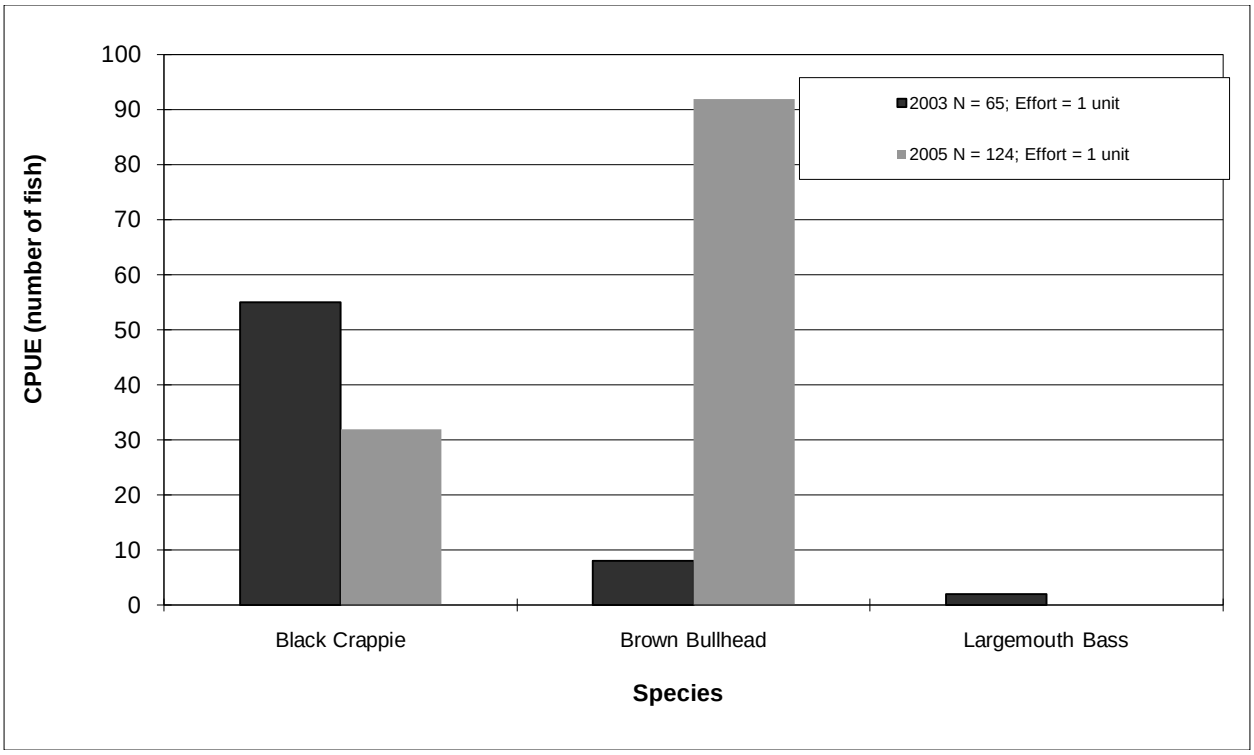


Figure 24. Length frequency distributions of pumpkinseed collected from standard lake surveys of Moose Creek Reservoir, Idaho, in 2001, 2004, and 2005.



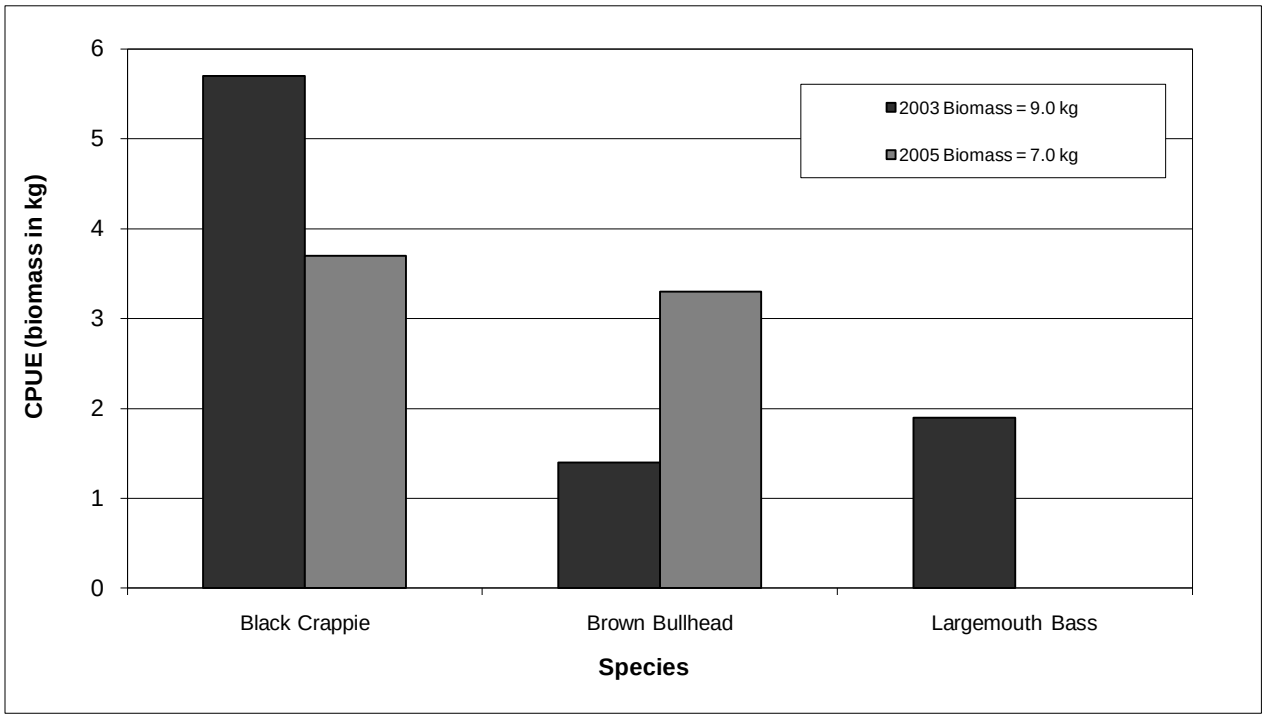
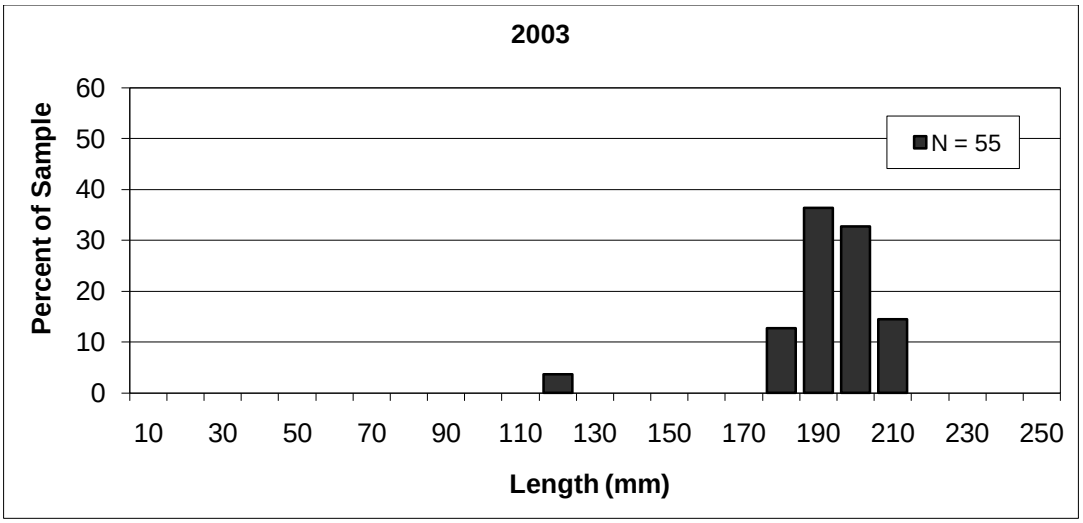


Figure 25. Catch per unit effort (CPUE) of fish collected from standard lake surveys of Soldier's Meadow Reservoir, Idaho, in 2003 and 2005.



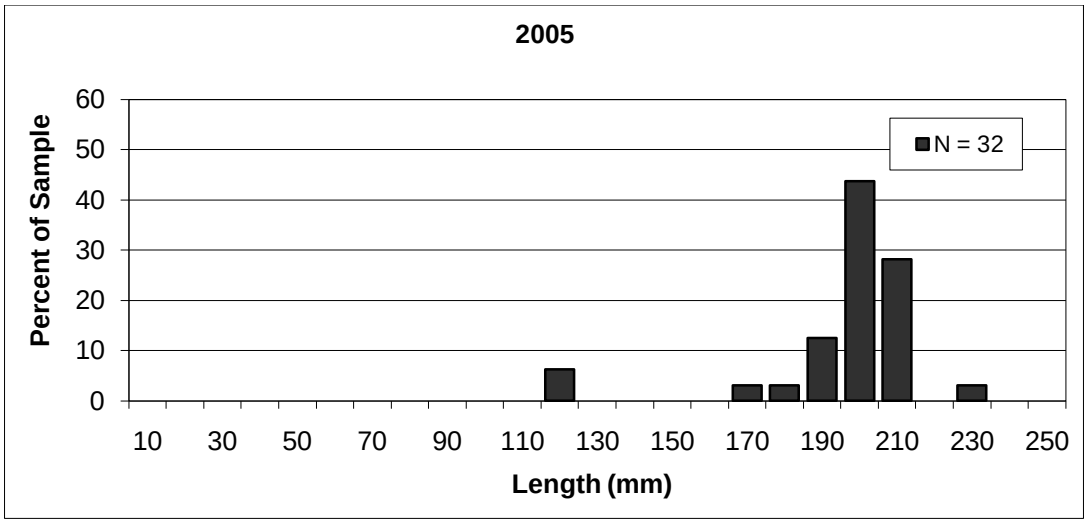


Figure 26. Length frequency distributions of black crappie collected from a standard lake survey of Soldier's Meadow Reservoir, Idaho, in 2003 and 2005.

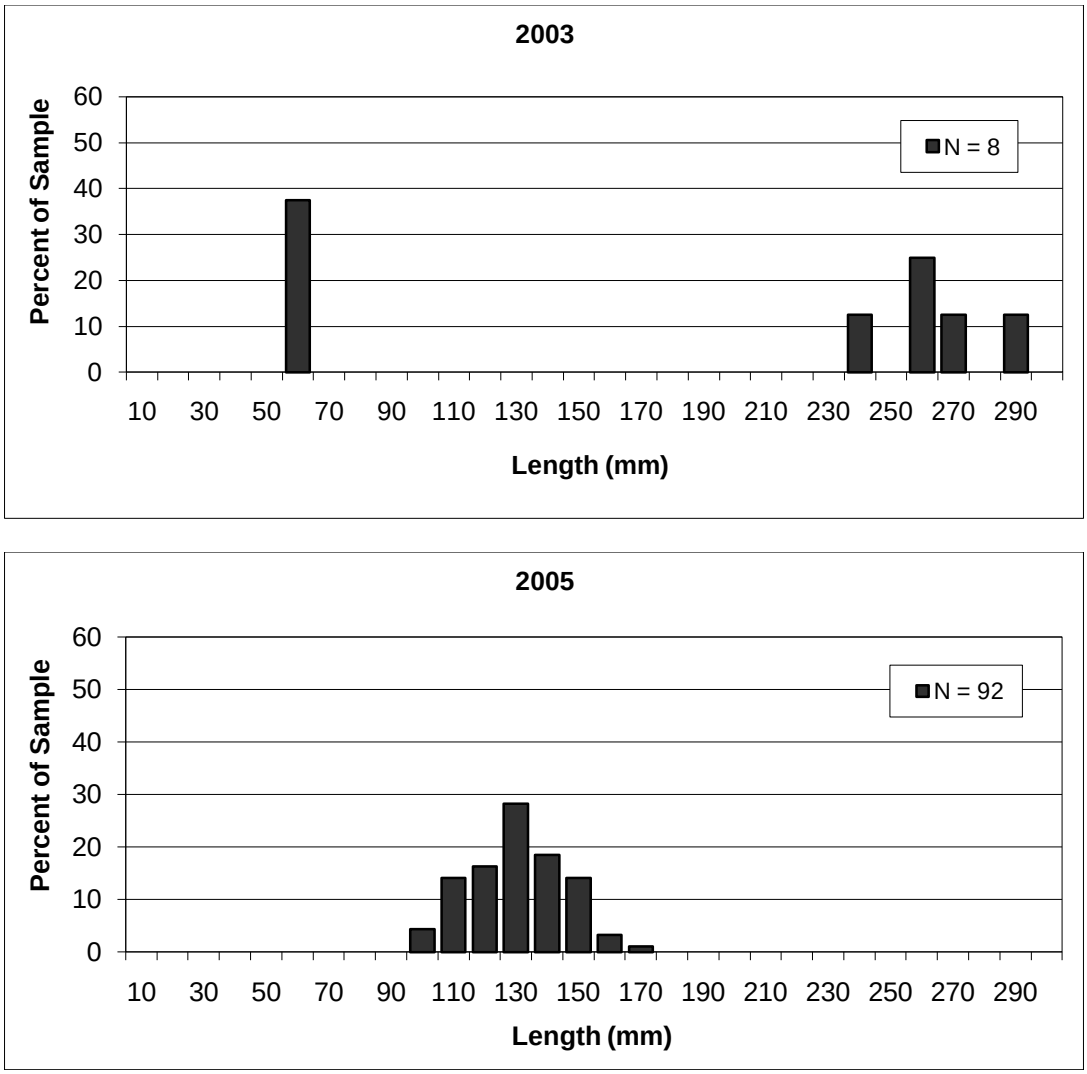


Figure 27. Length frequency distributions of brown bullhead collected from a standard lake survey of Soldier's Meadow Reservoir, Idaho, in 2003 and 2004.

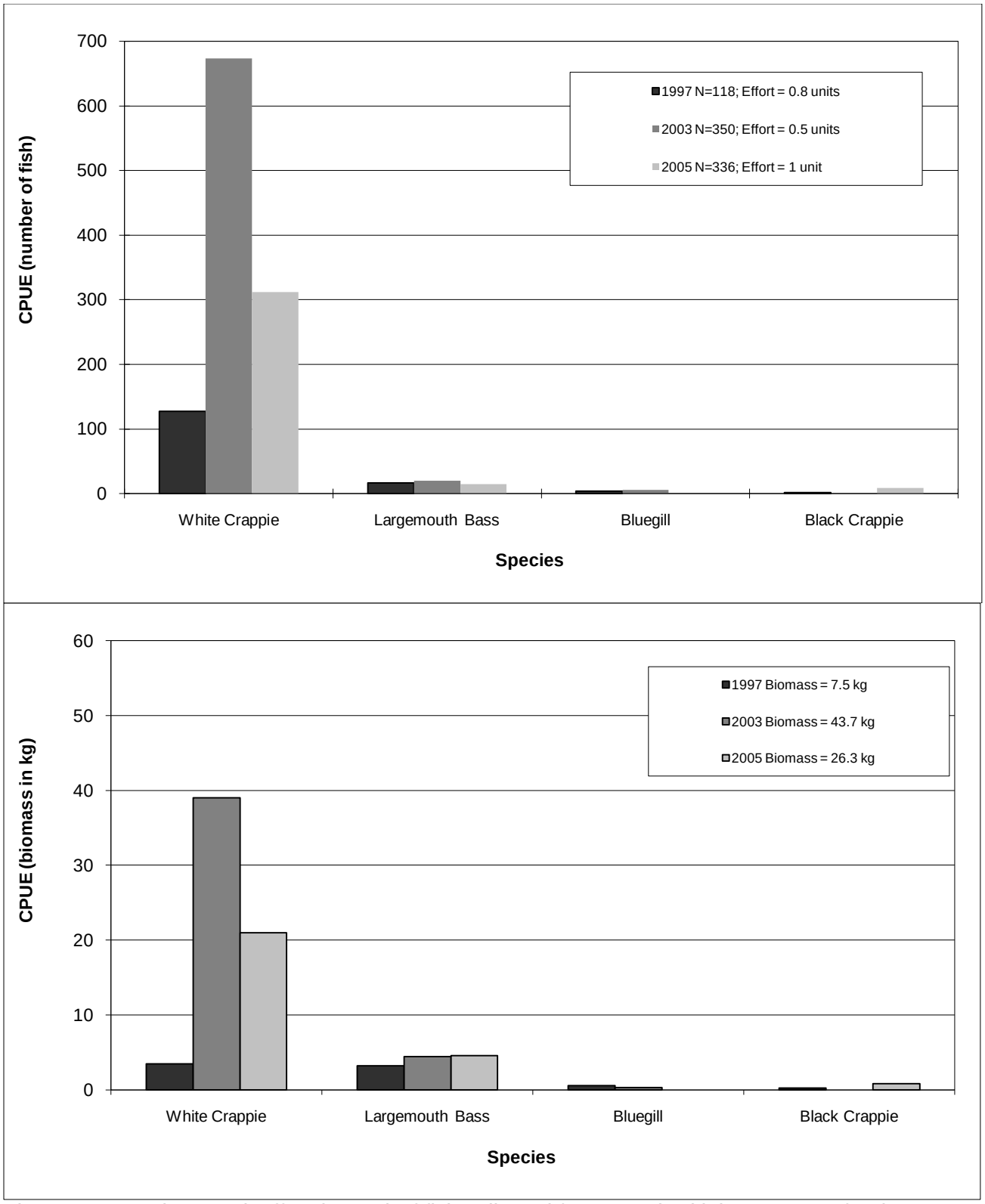


Figure 28. Catch per unit effort (CPUE) of fish collected from standard lake surveys of Tolo Lake, Idaho, in 1997, 2003, and 2005.

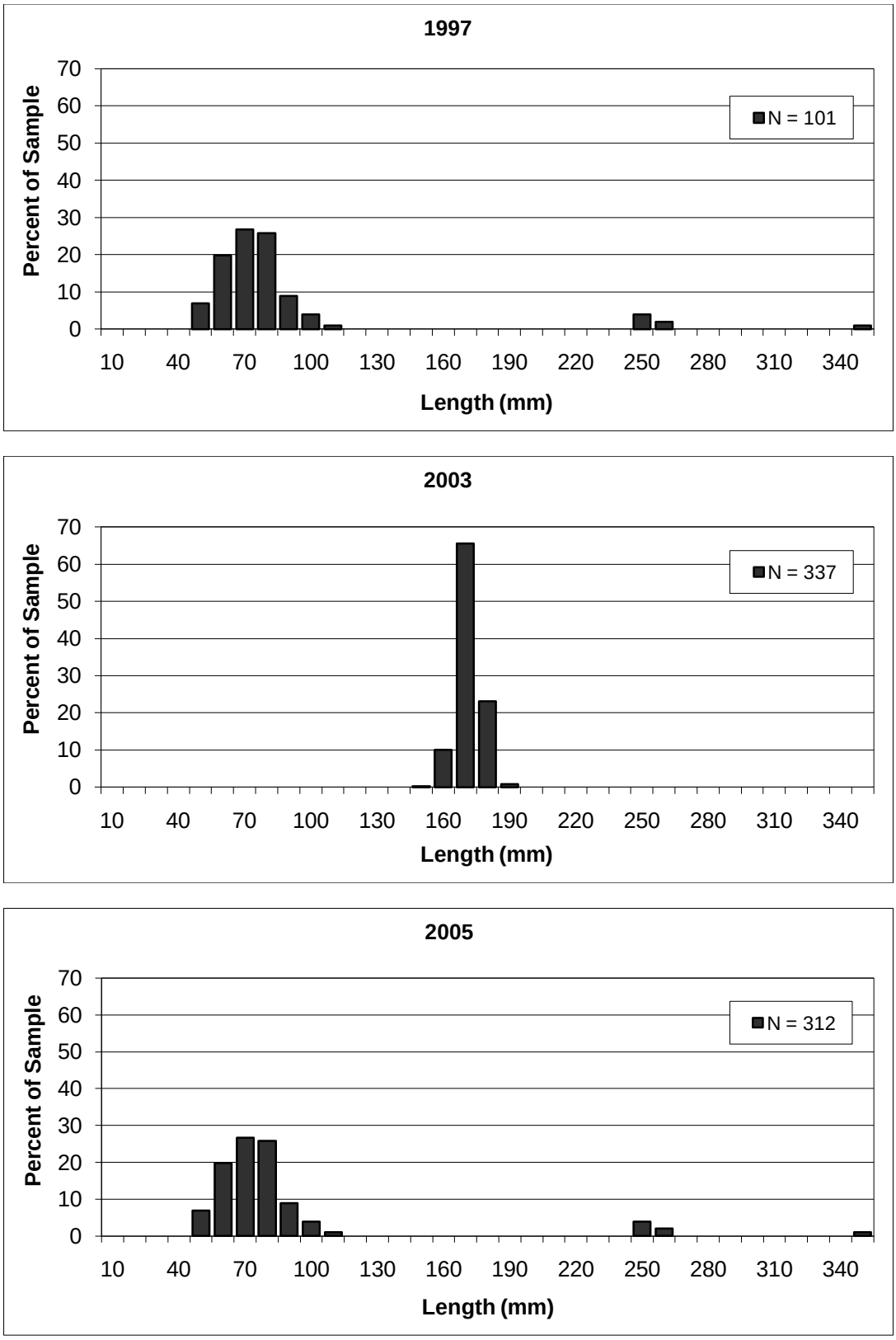


Figure 29. Length frequency distributions of white crappie collected from standard lake surveys of Tolo Lake, Idaho, in 1997, 2003, and 2005.

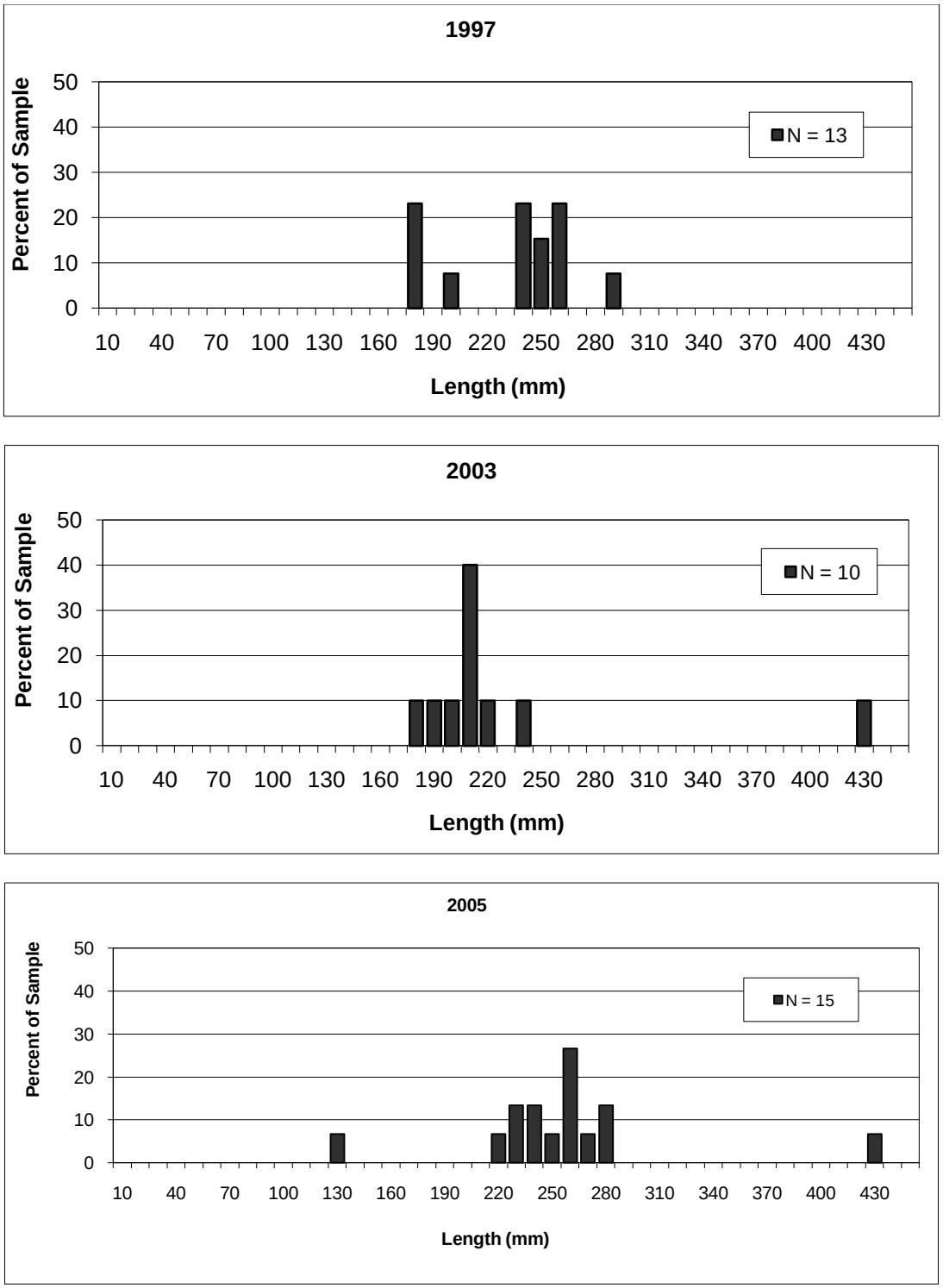


Figure 30. Length frequency distributions of largemouth bass collected from standard lake surveys of Tolo Lake, Idaho, in 1997, 2003, and 2005.

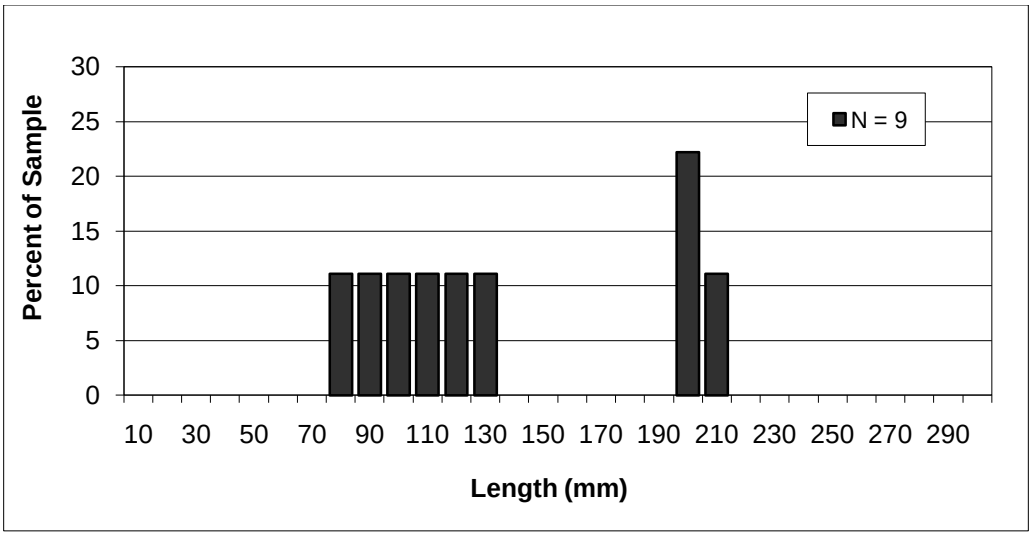


Figure 31. Length Frequency distribution of black crappie collected from a standard lake survey of Tolo Lake, Idaho, in 2005.

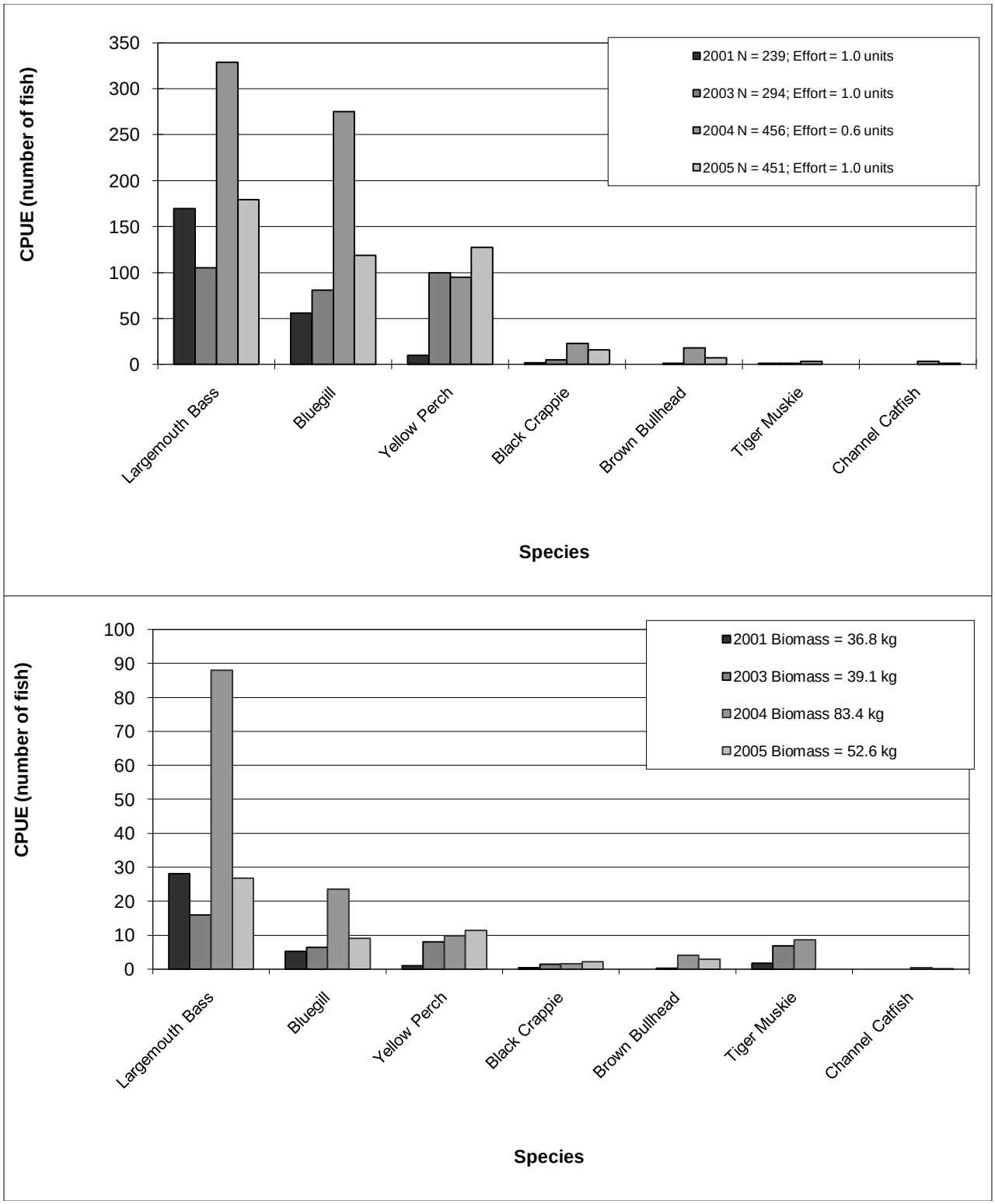


Figure 32. Catch per unit effort (CPUE) of fish collected from standard lake surveys of Winchester Lake, Idaho, in 2001, and from 2003-2005.

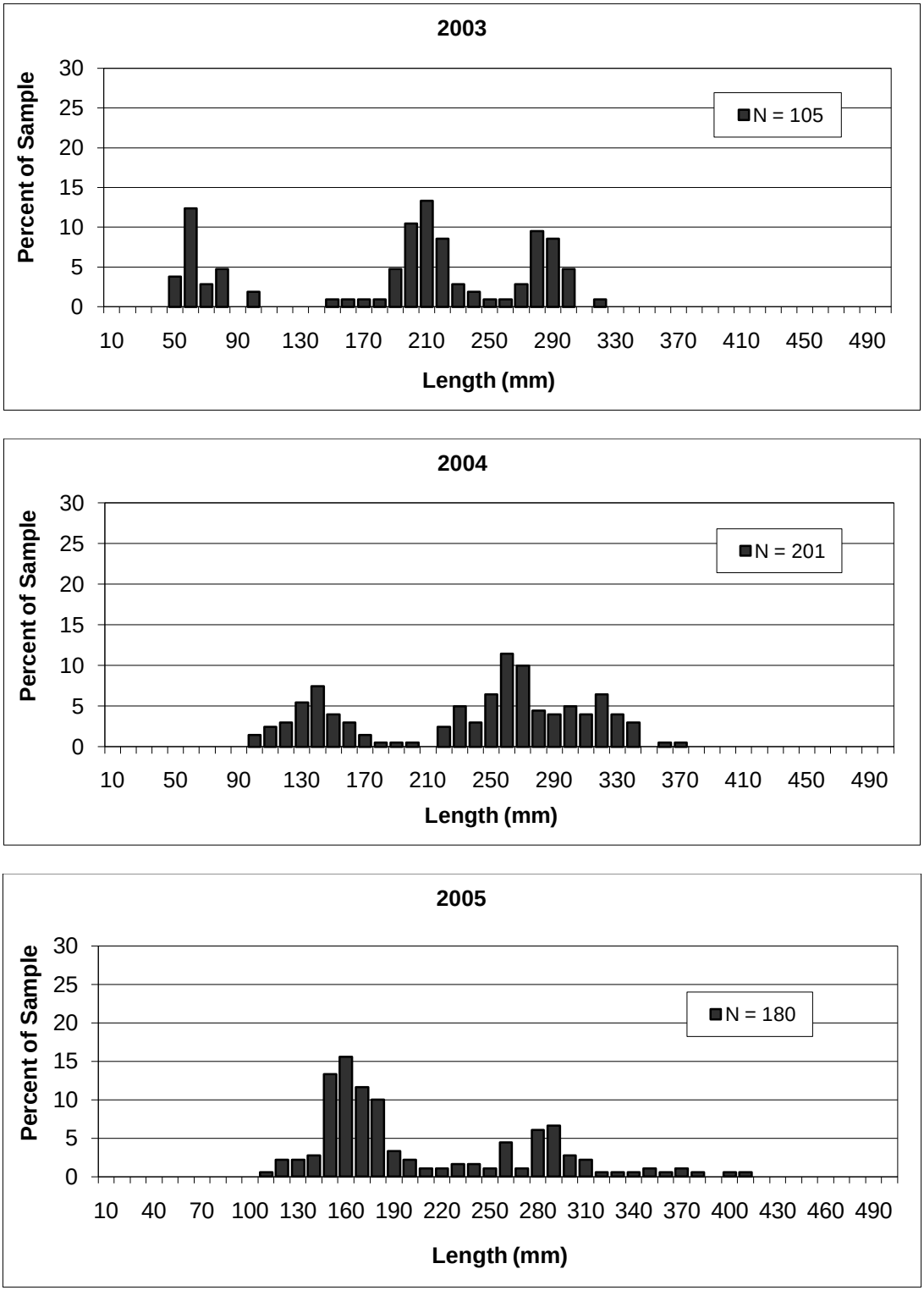


Figure 33. Length frequency distributions of largemouth bass collected from standard lake surveys of Winchester Lake, Idaho, from 2003-2005.

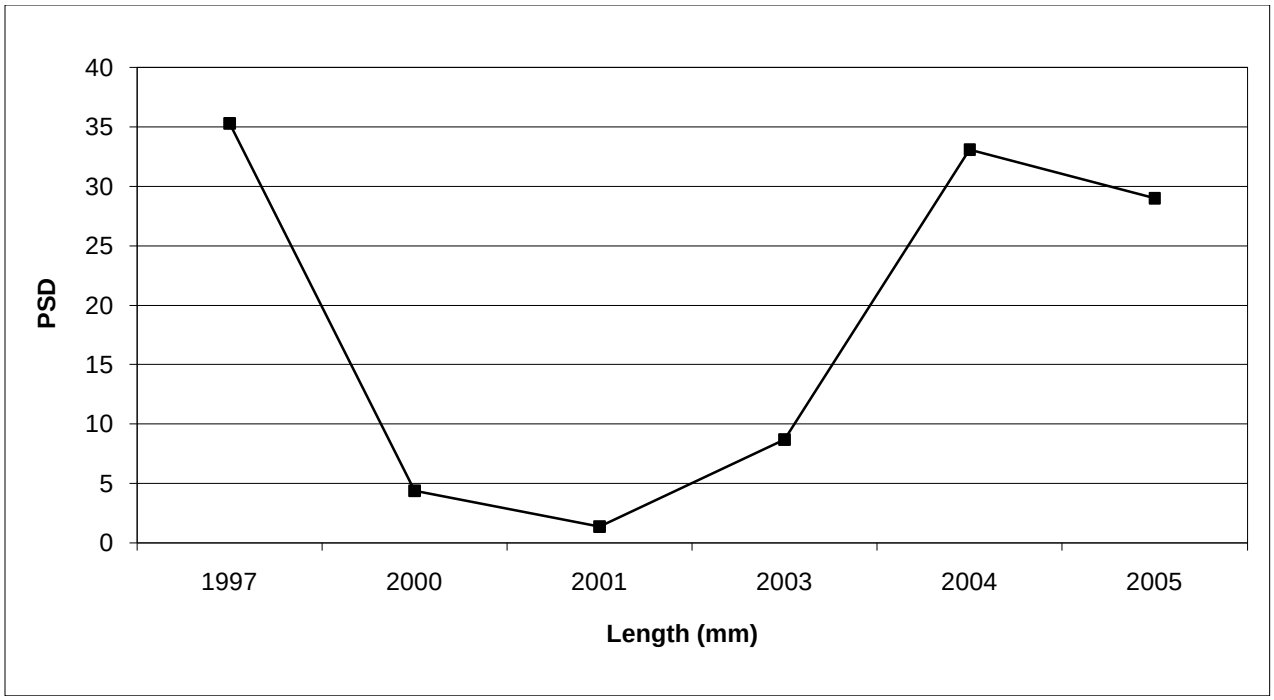
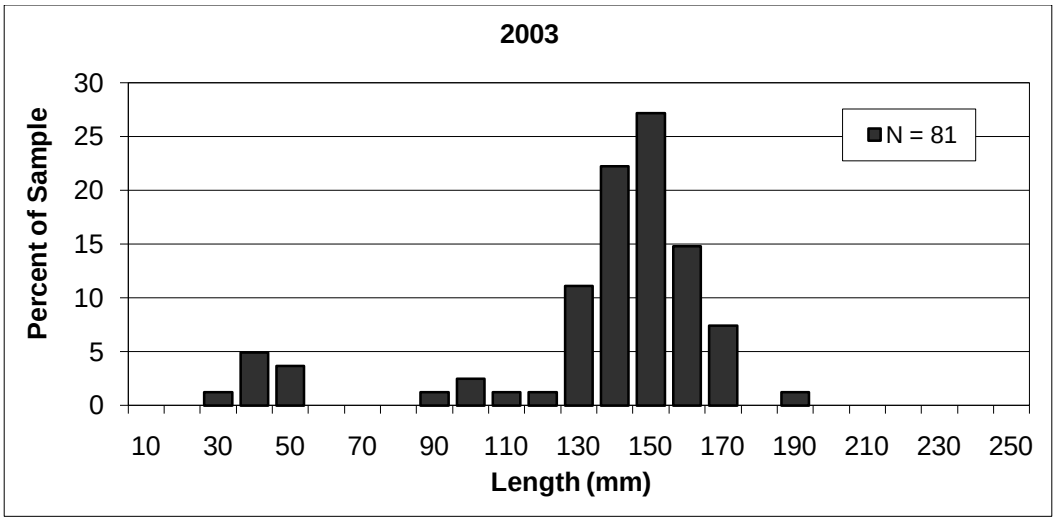
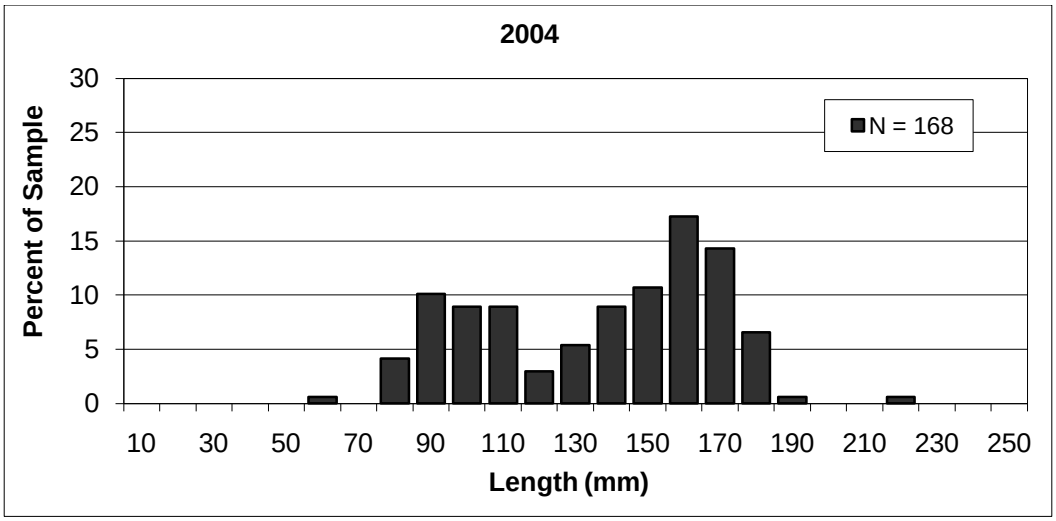


Figure 34. Proportional stock density (PSD) values of largemouth bass collected in Winchester Lake, Idaho, from 1997-2005.





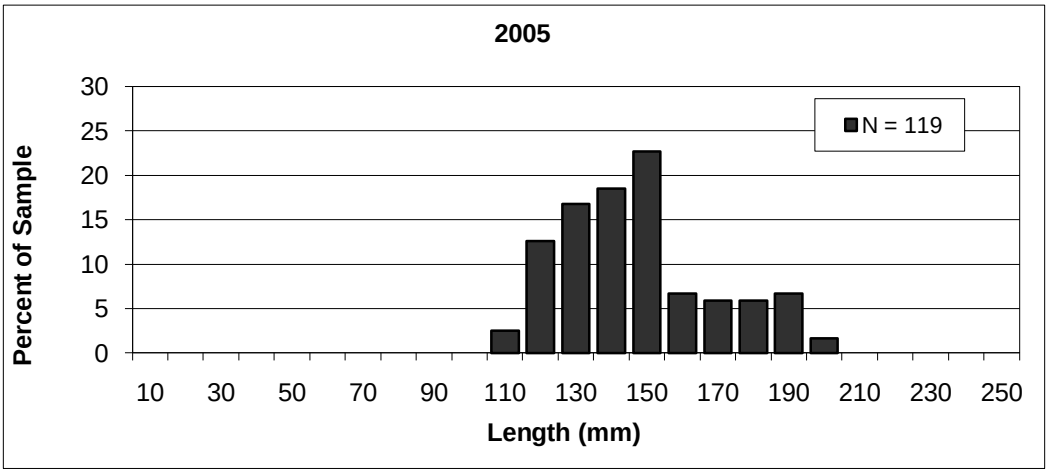


Figure 35. Length frequency distributions of bluegill collected from standard lake surveys of Winchester Lake, Idaho, from 2003-2005.

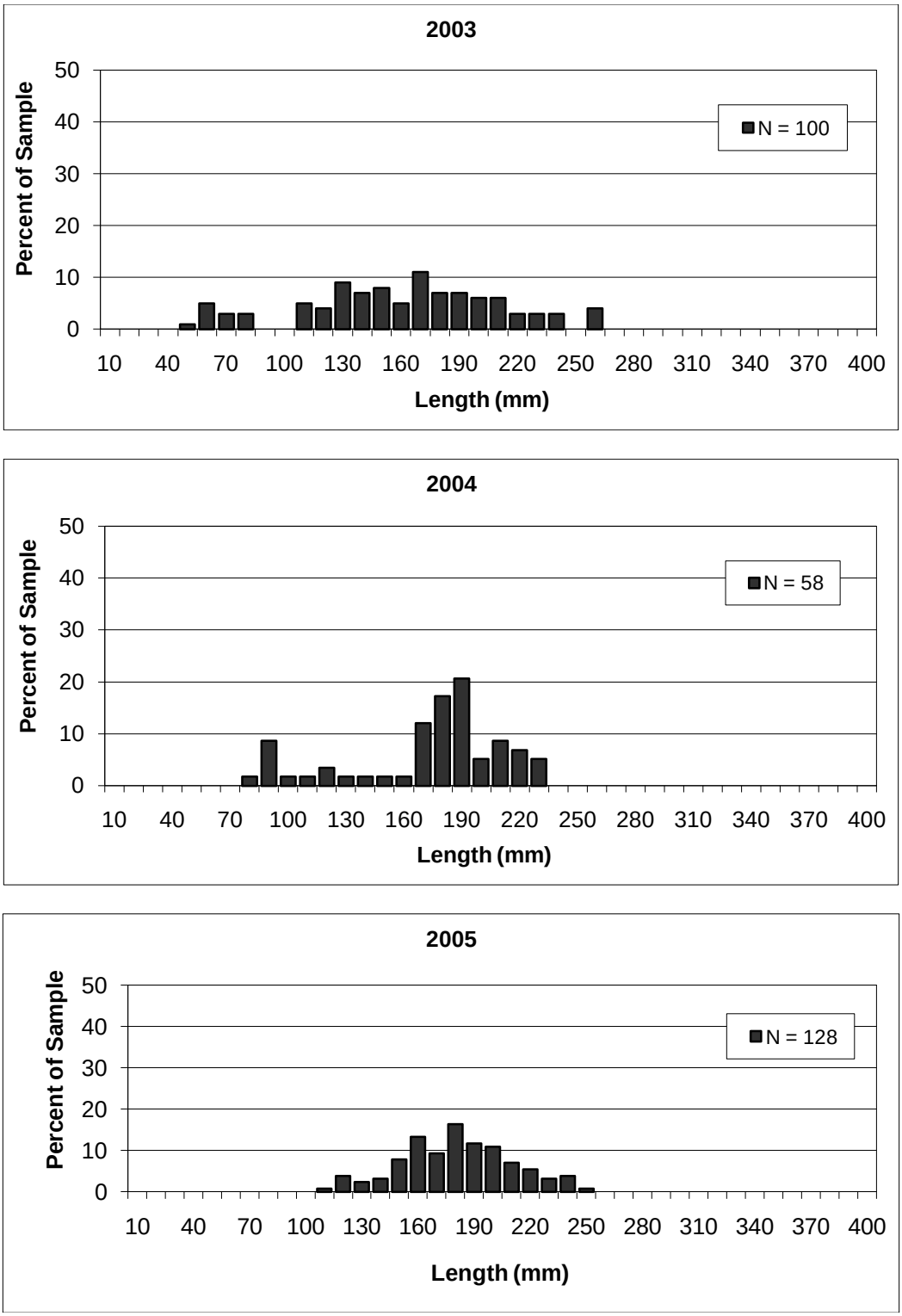
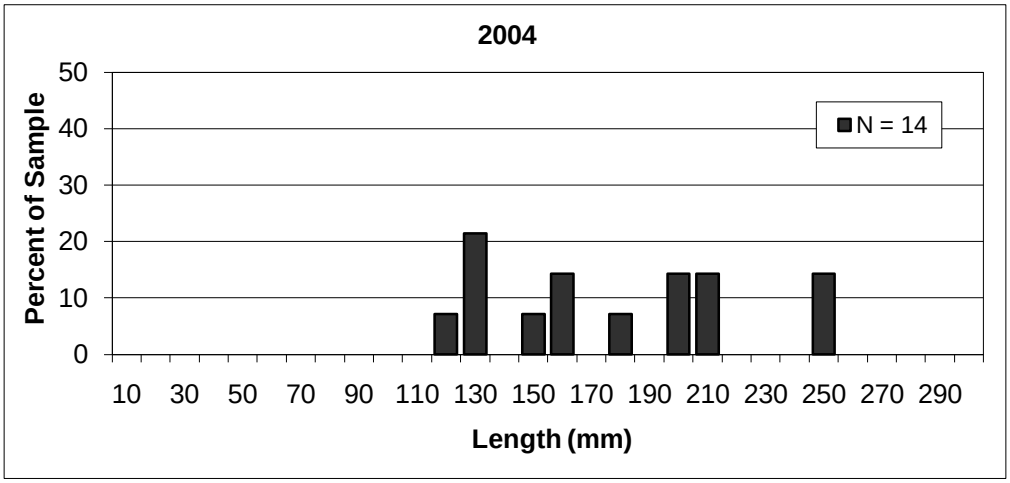


Figure 36. Length frequency distributions of yellow perch collected from standard lake surveys of Winchester Lake, Idaho, from 2003-2005.



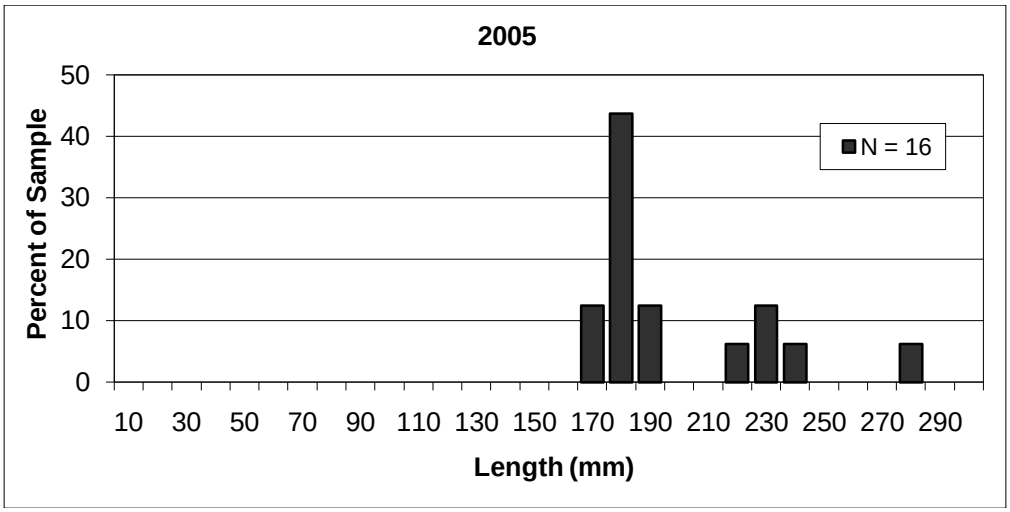


Figure 37. Length frequency distributions of black crappie collected from standard lake surveys of Winchester Lake, Idaho, in 2004 and 2005.

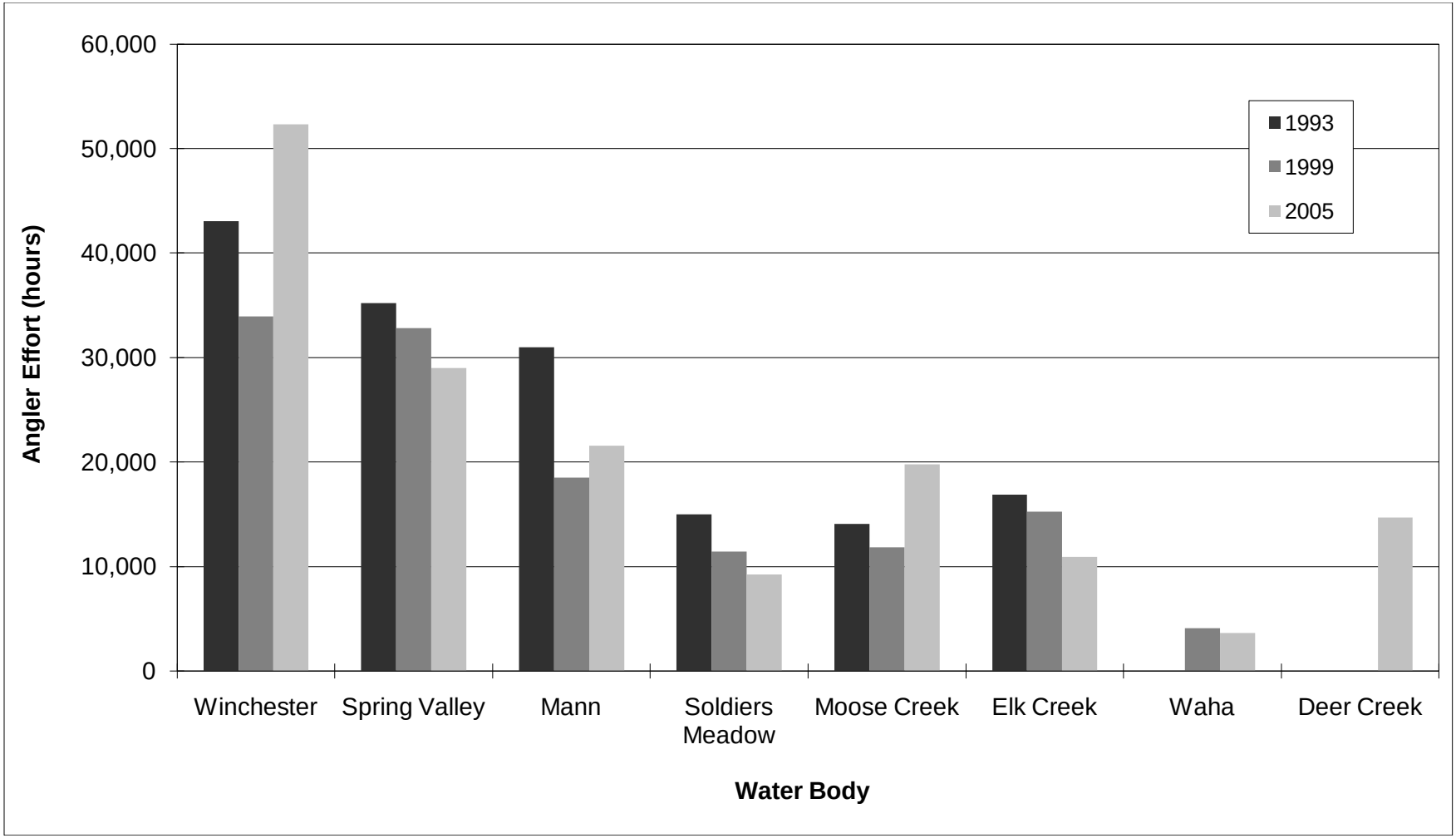


Figure 38. Estimated angler effort (hours) from creel surveys of eight lowland lakes and reservoirs in the Clearwater Region, Idaho, in 1993, 1999, and 2005.

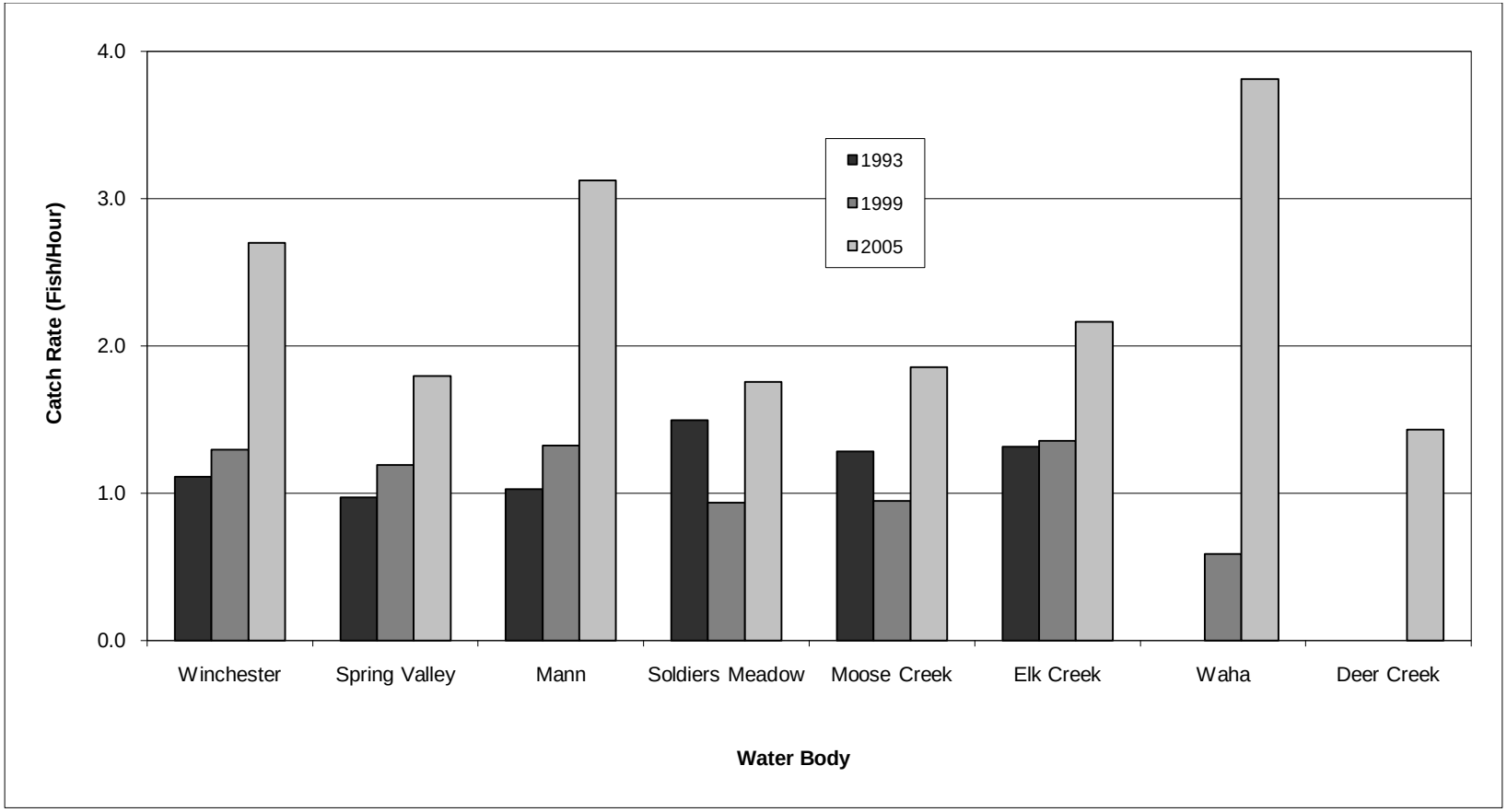


Figure 39. Estimated catch rates (fish/hour; all fish) from creel surveys of eight lowland lakes and reservoirs in the Clearwater Region, Idaho, in 1993, 1999, and 2005.

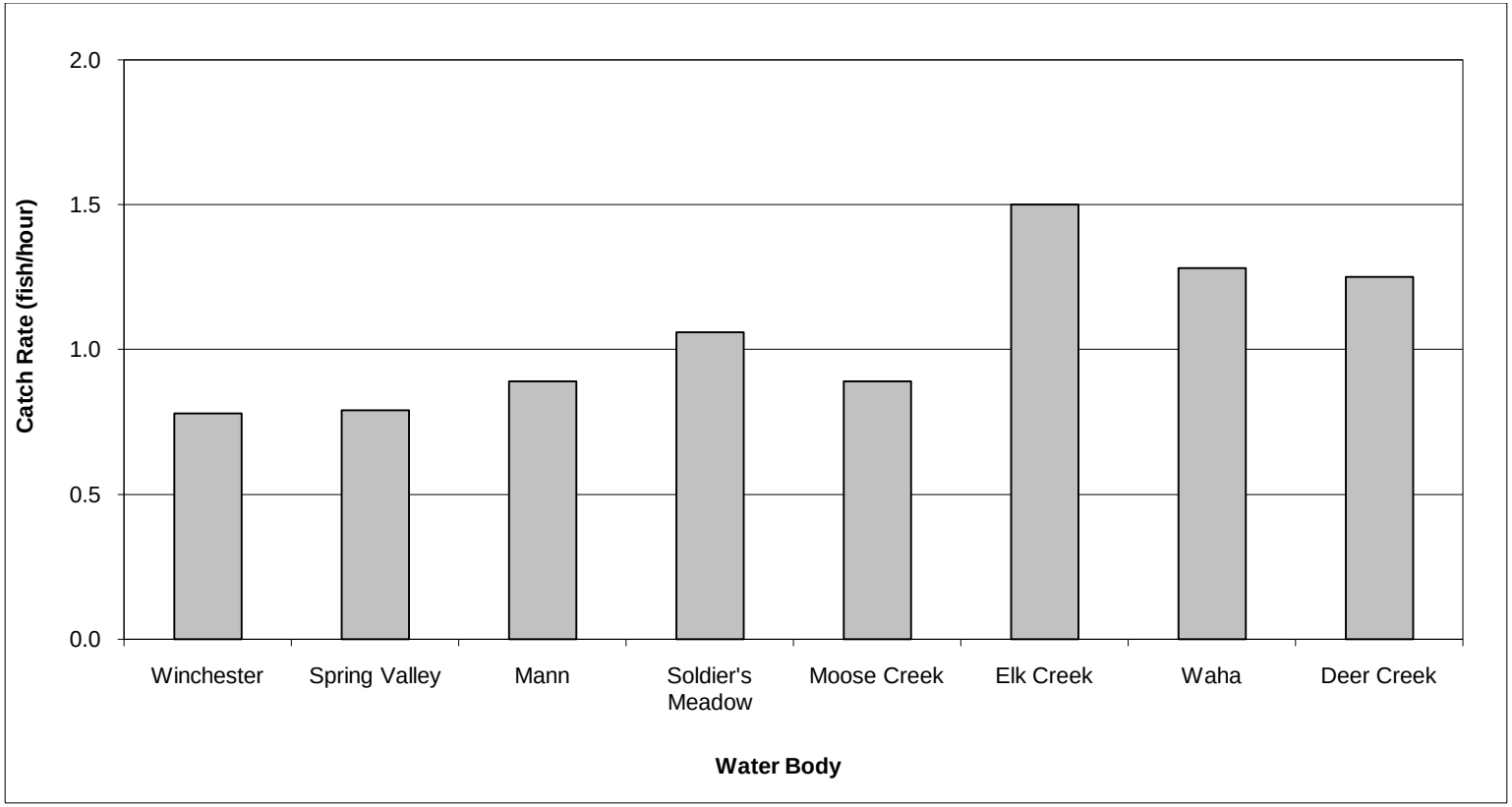


Figure 40. Estimated catch rates (fish/hour) of hatchery rainbow trout from creel surveys of eight lowland lakes and reservoirs in the Clearwater Region, Idaho, in 2005.

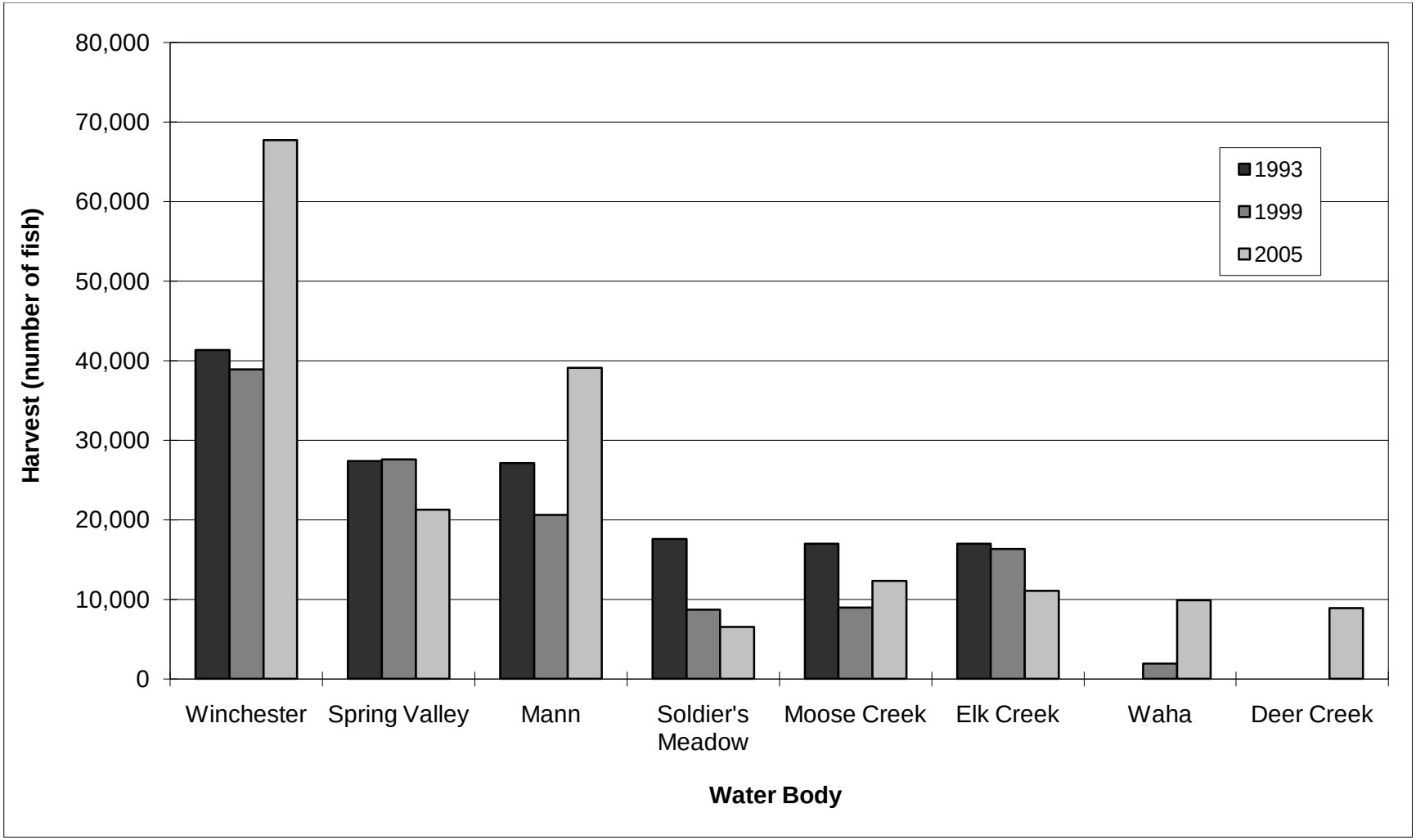


Figure 41. Estimated angler harvest (number of fish; all fish) from creel surveys of eight lowland lakes and reservoirs in the Clearwater Region, Idaho, in 1993, 1999, and 2005.

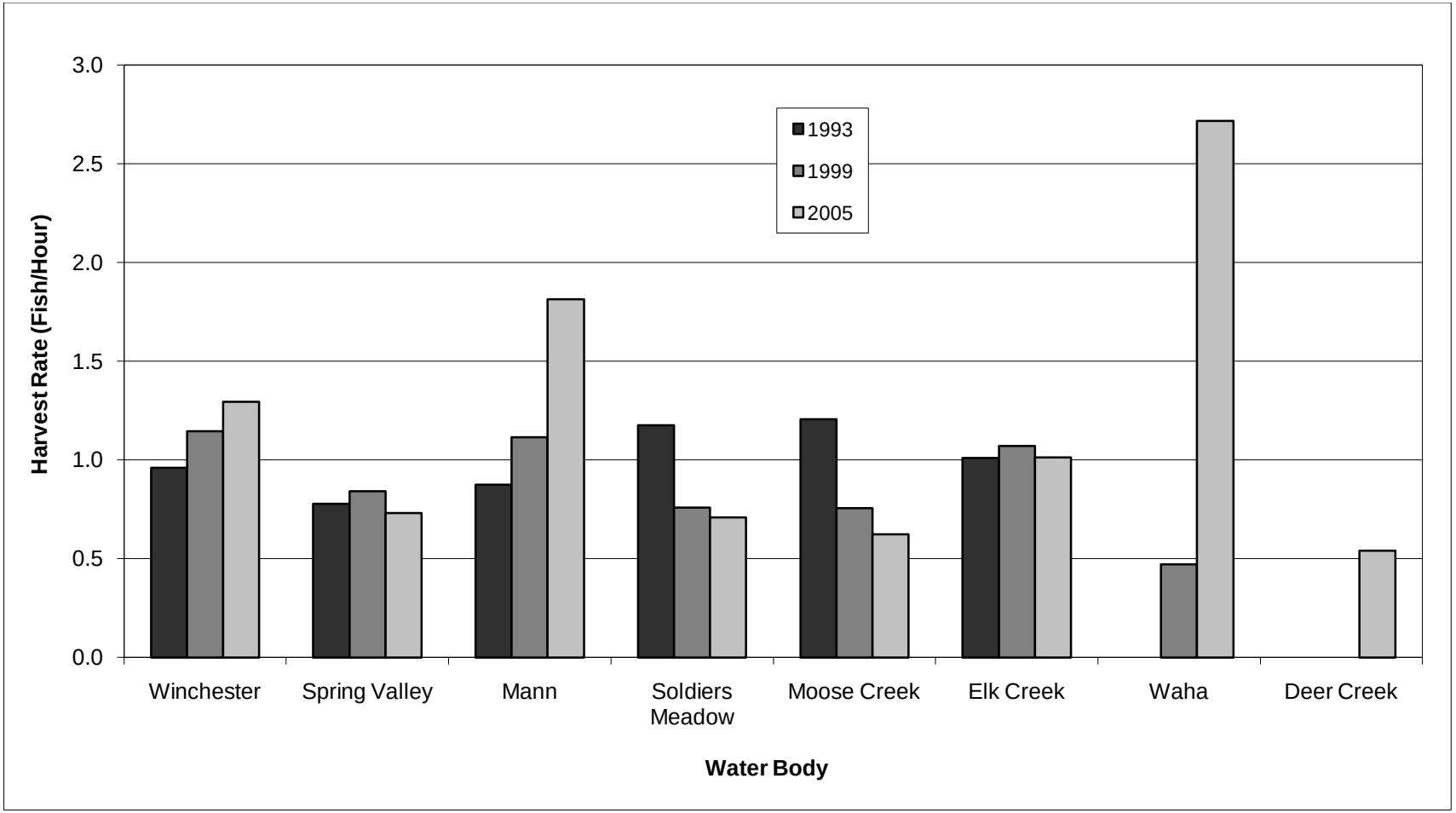


Figure 42. Estimated harvest rates (fish/hour; all fish) from creel surveys of eight lowland lakes and reservoirs in the Clearwater Region, Idaho, in 1993, 1999, and 2005.

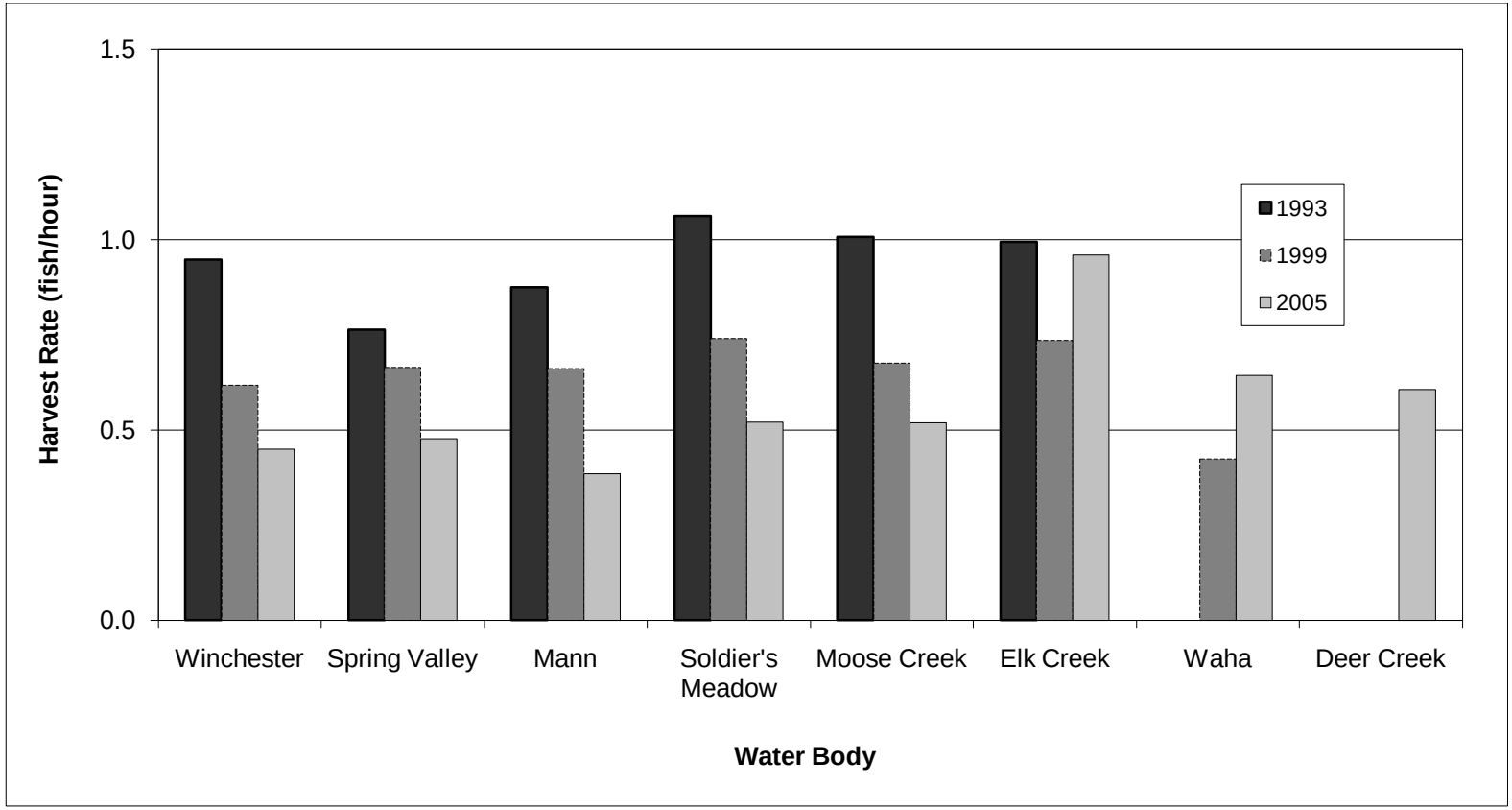


Figure 43. Estimated harvest rates (fish/hour) of hatchery rainbow trout from creel surveys of eight lowland lakes and reservoirs in the Clearwater Region, Idaho, in 1993, 1999, and 2005.

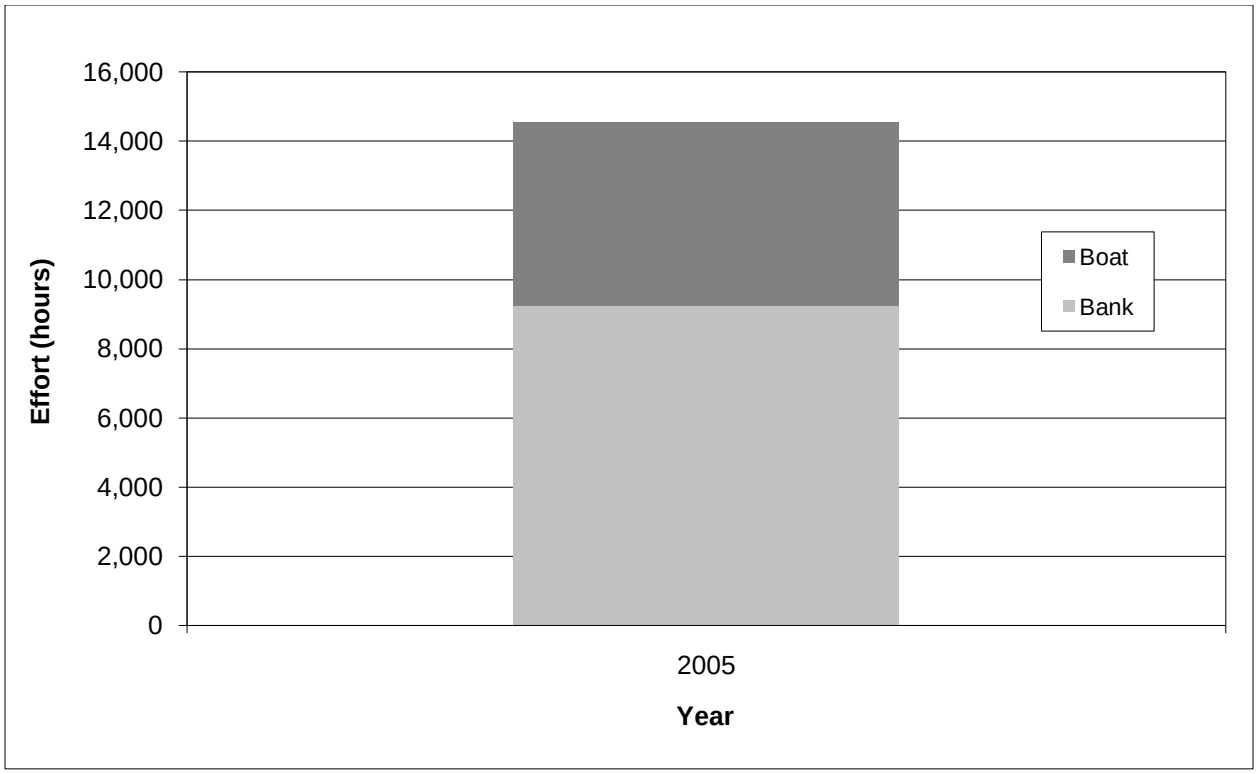


Figure 44. Estimated angler effort, by type, from a creel survey of Deer Creek Reservoir, Idaho, in 2005.

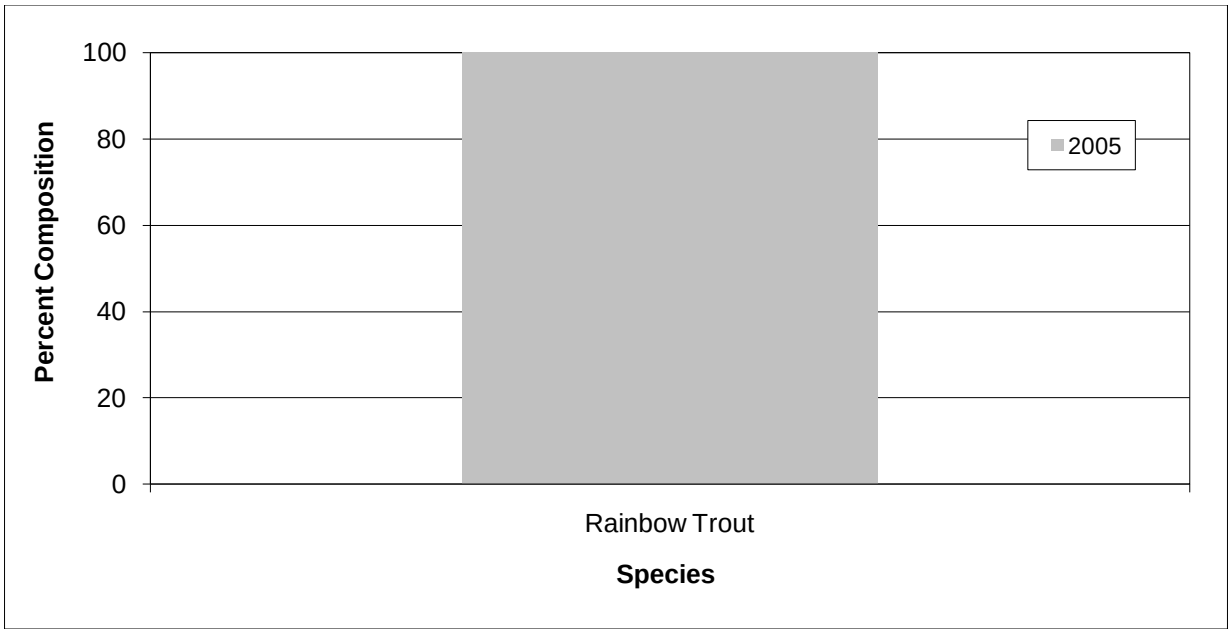


Figure 45. Catch composition of fish harvested from a creel survey of Deer Creek Reservoir, Idaho, in 2005.

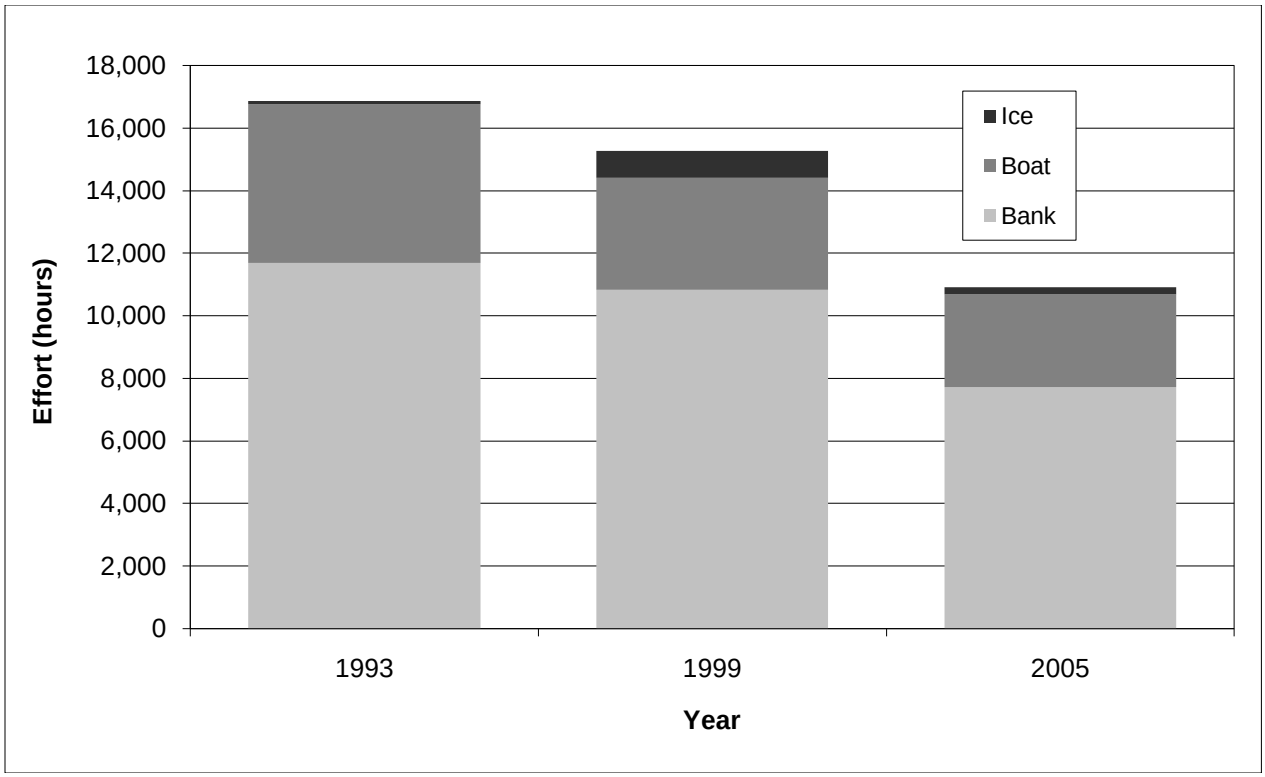


Figure 46. Estimated angler effort, by type, from creel surveys of Elk Creek Reservoir, Idaho, 1993, 1999, and 2005.

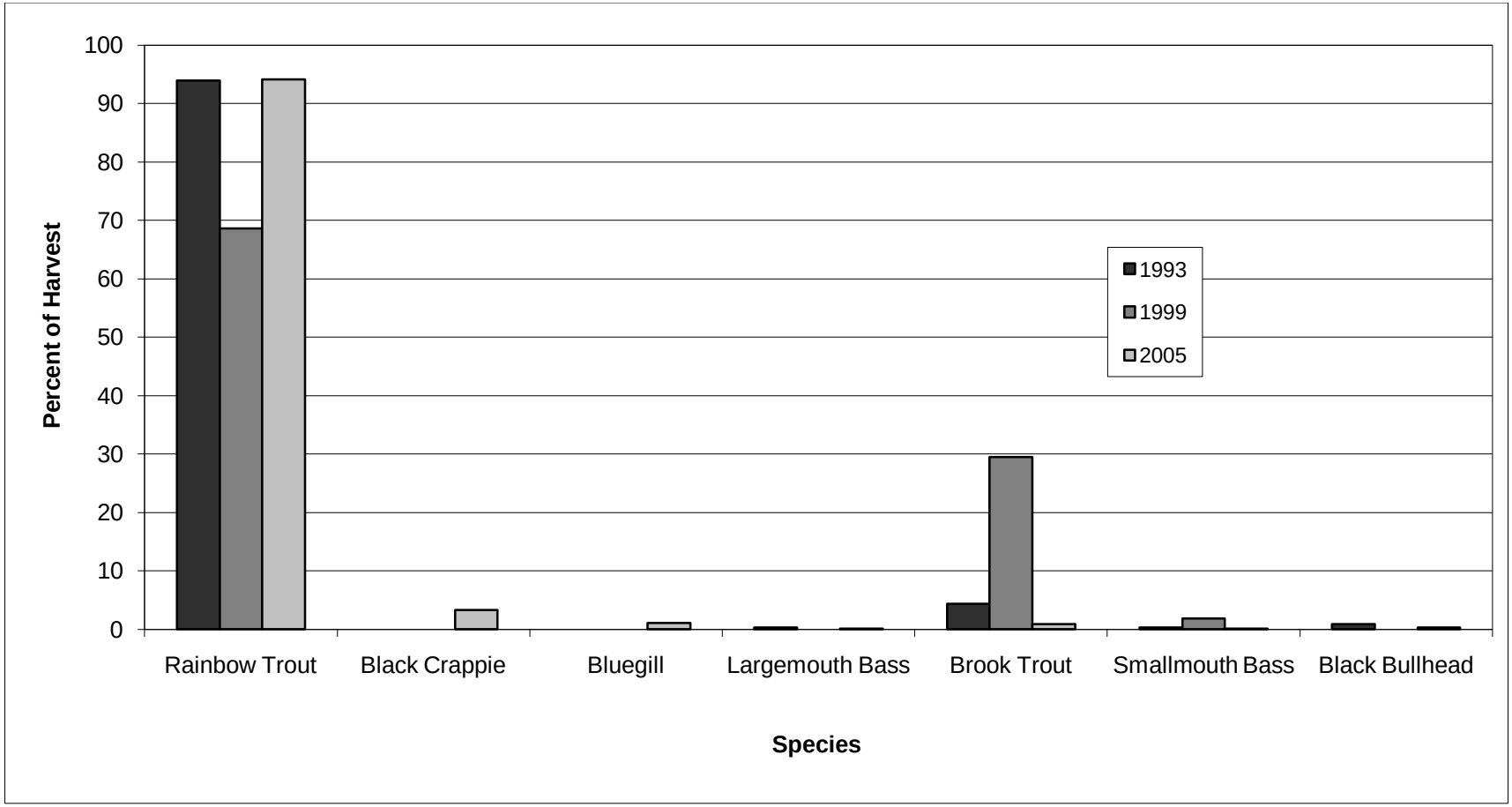


Figure 47. Catch composition of fish harvested during creel surveys of Elk Creek Reservoir, Idaho, in 1993, 1999, and 2005.

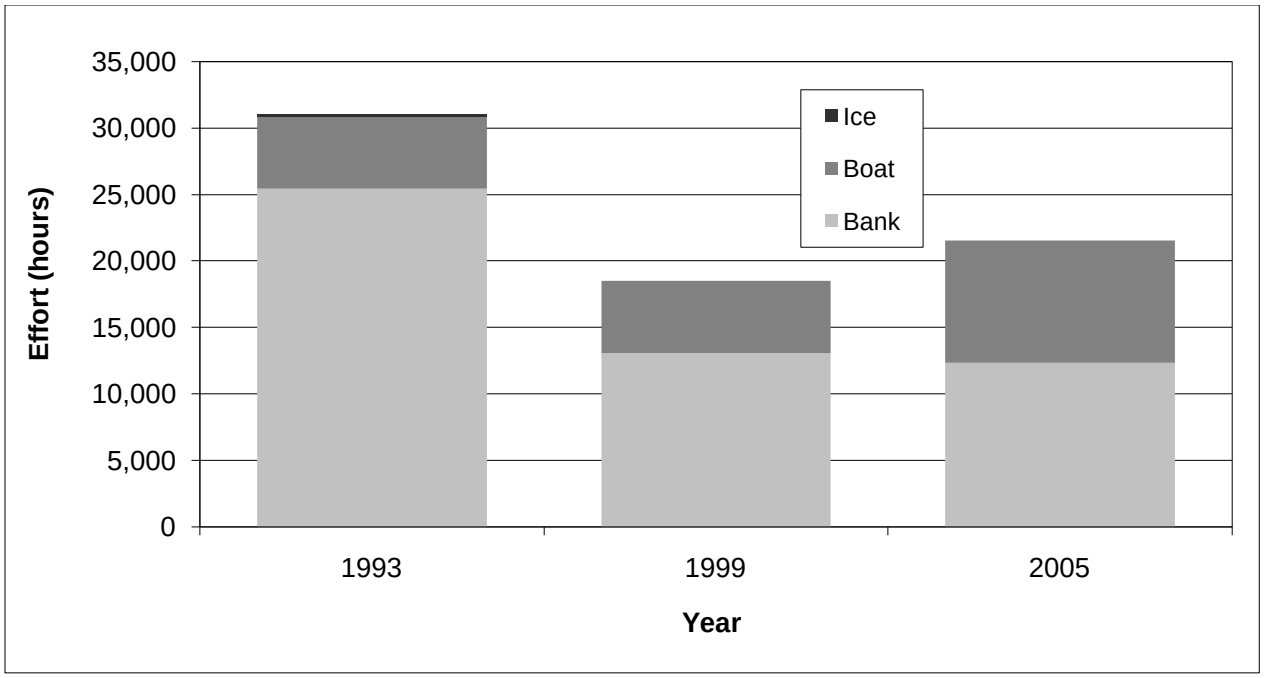


Figure 48. Estimated angler effort, by type, from creel surveys of Mann Lake, Idaho, in 1993, 1999, and 2005.

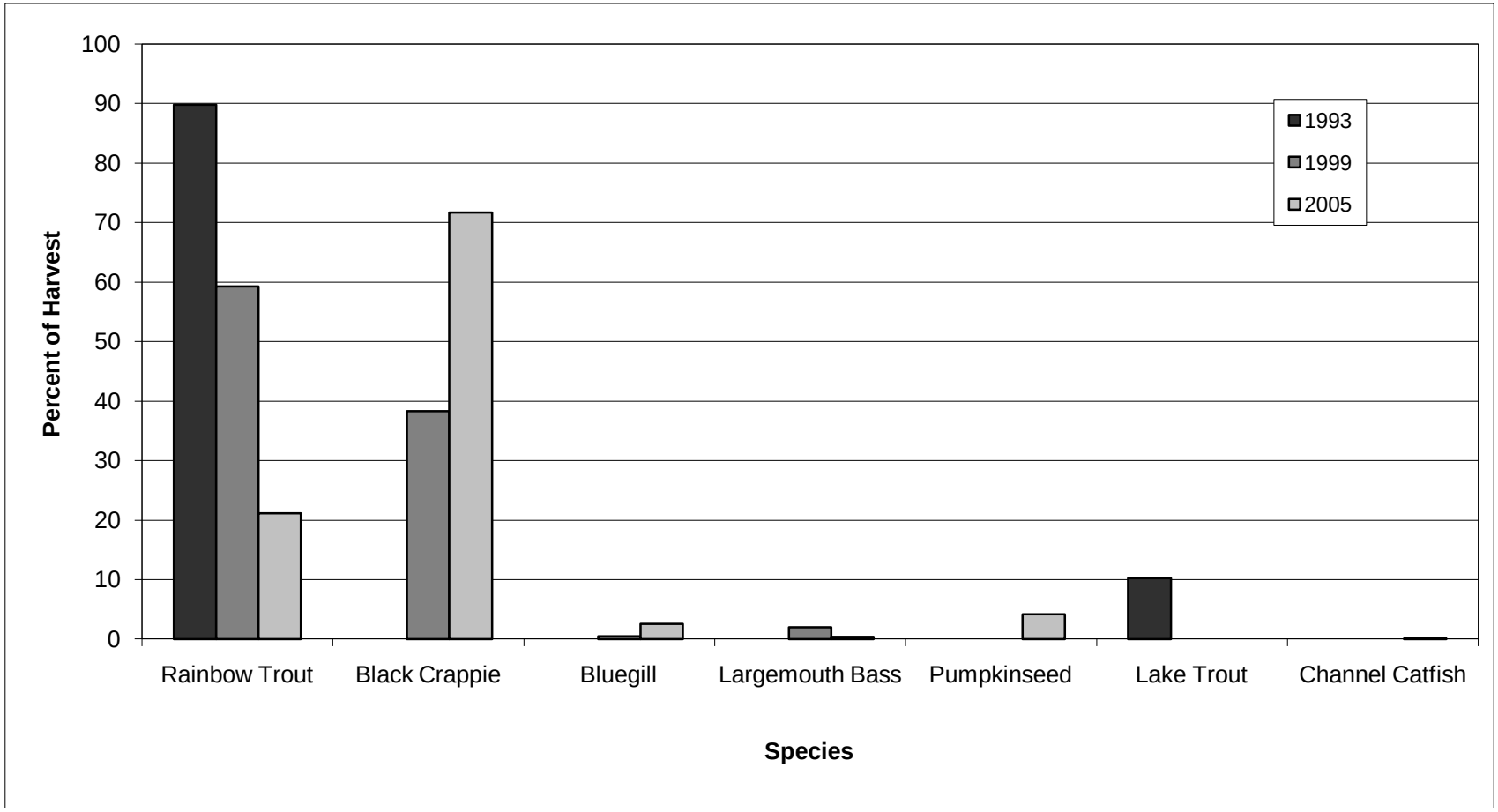


Figure 49. Catch composition of fish harvested during creel surveys of Mann Lake, Idaho, in 1993, 1999, and 2005.

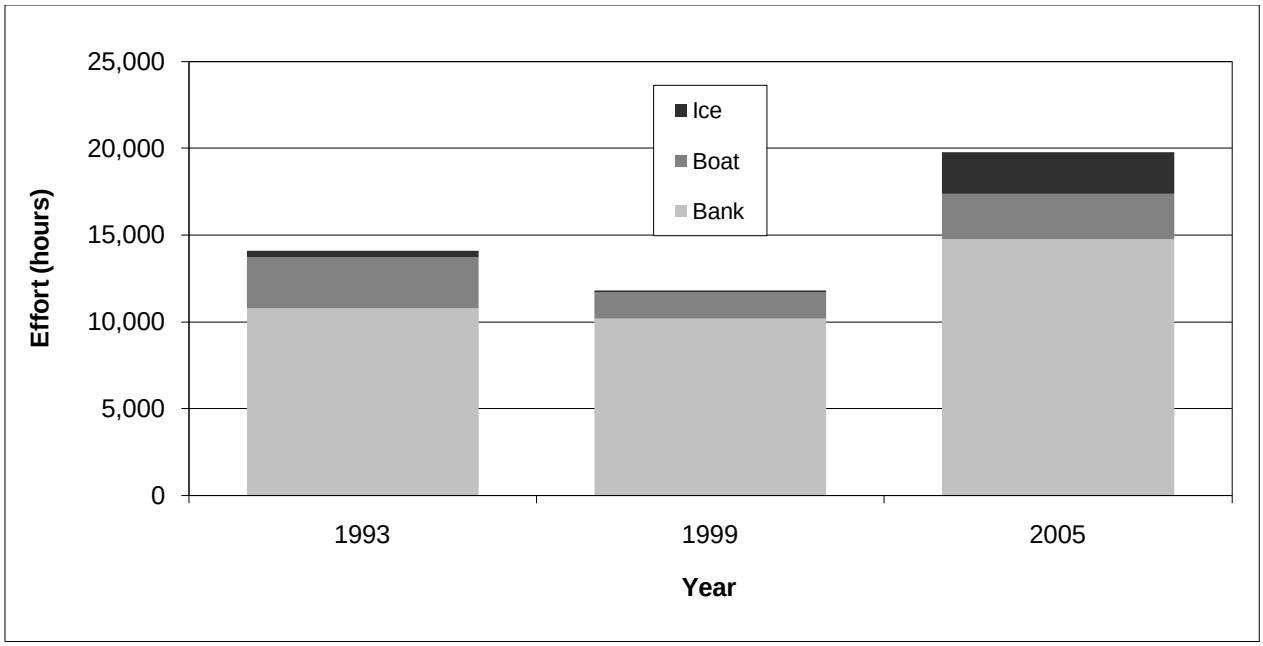


Figure 50. Estimated angler effort, by type, from creel surveys of Moose Creek Reservoir, Idaho, in 1993, 1999, and 2005.

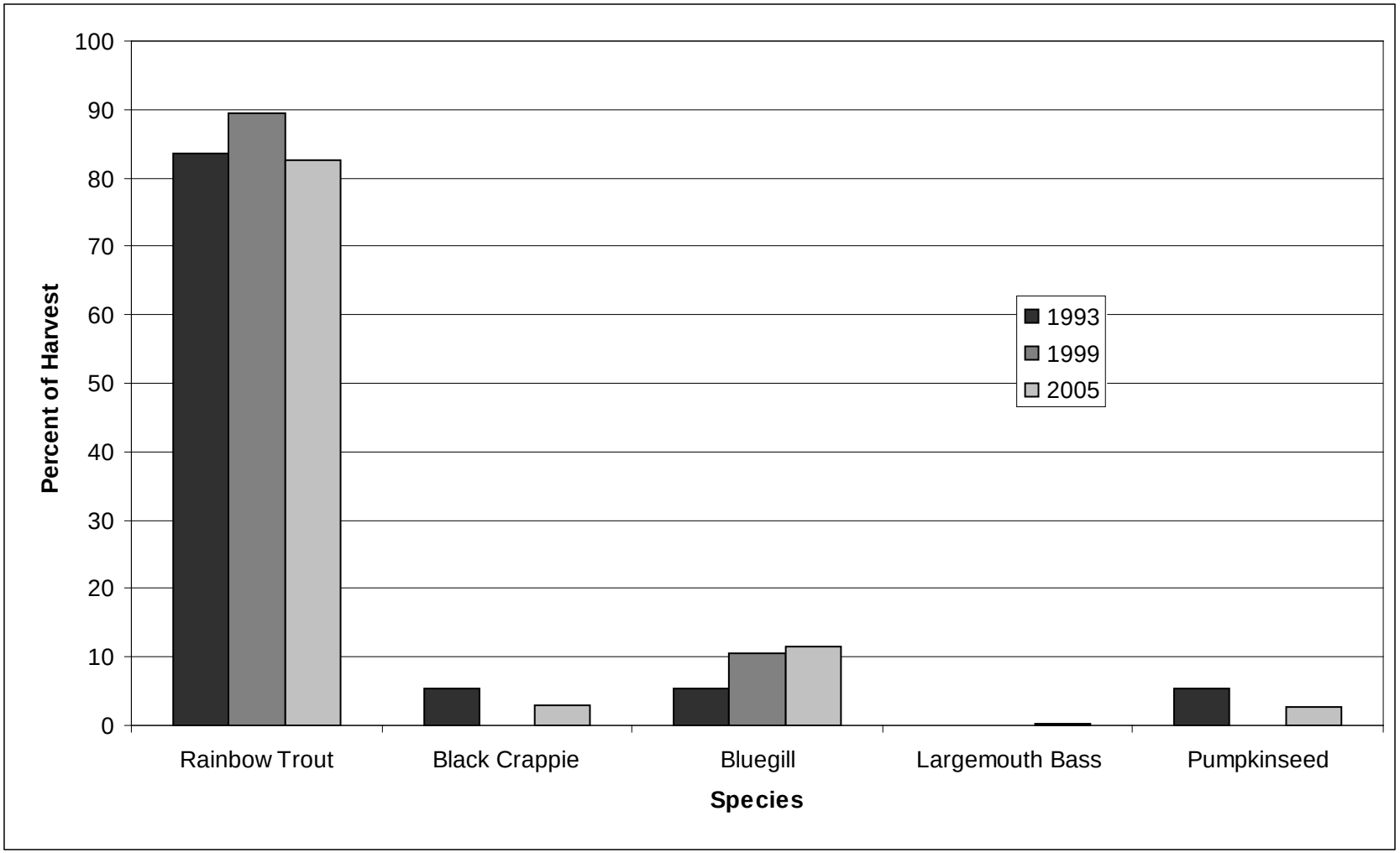


Figure 51. Catch composition of fish harvested during creel surveys of Moose Creek Reservoir, Idaho, in 1993, 1999, and 2005.

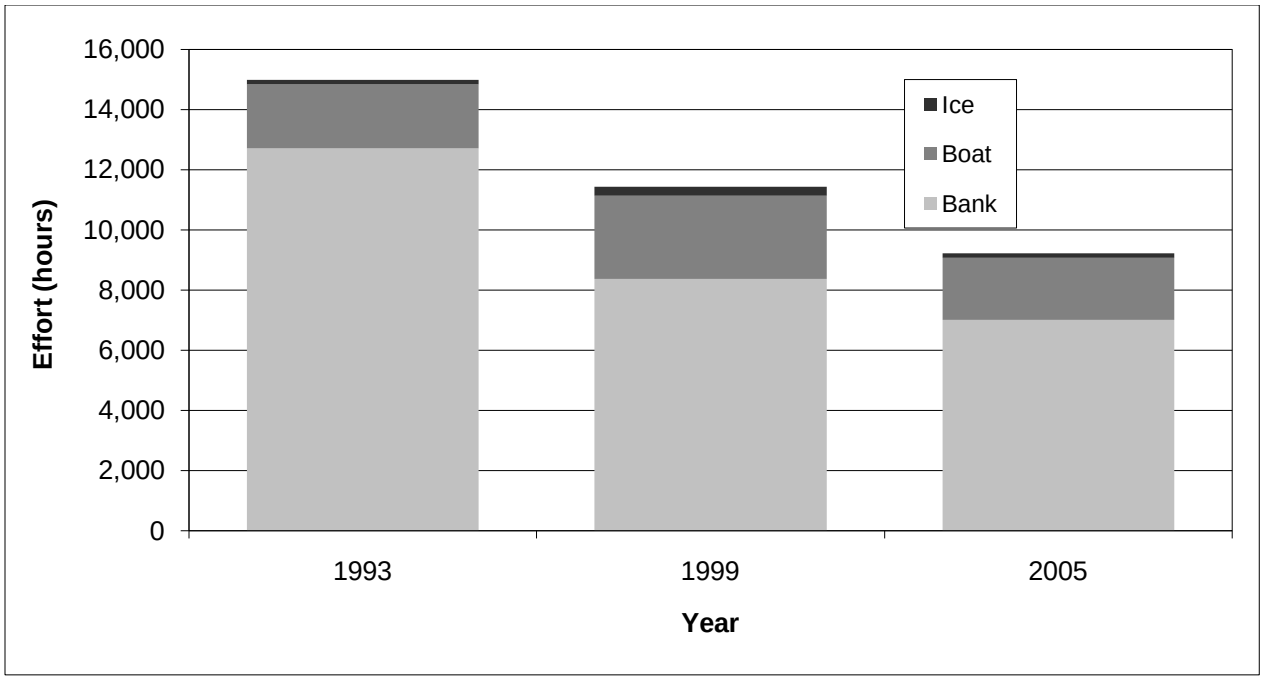


Figure 52. Estimated angler effort, by type, from creel surveys of Soldier's Meadow Reservoir, Idaho, in 1993, 1999, and 2005.

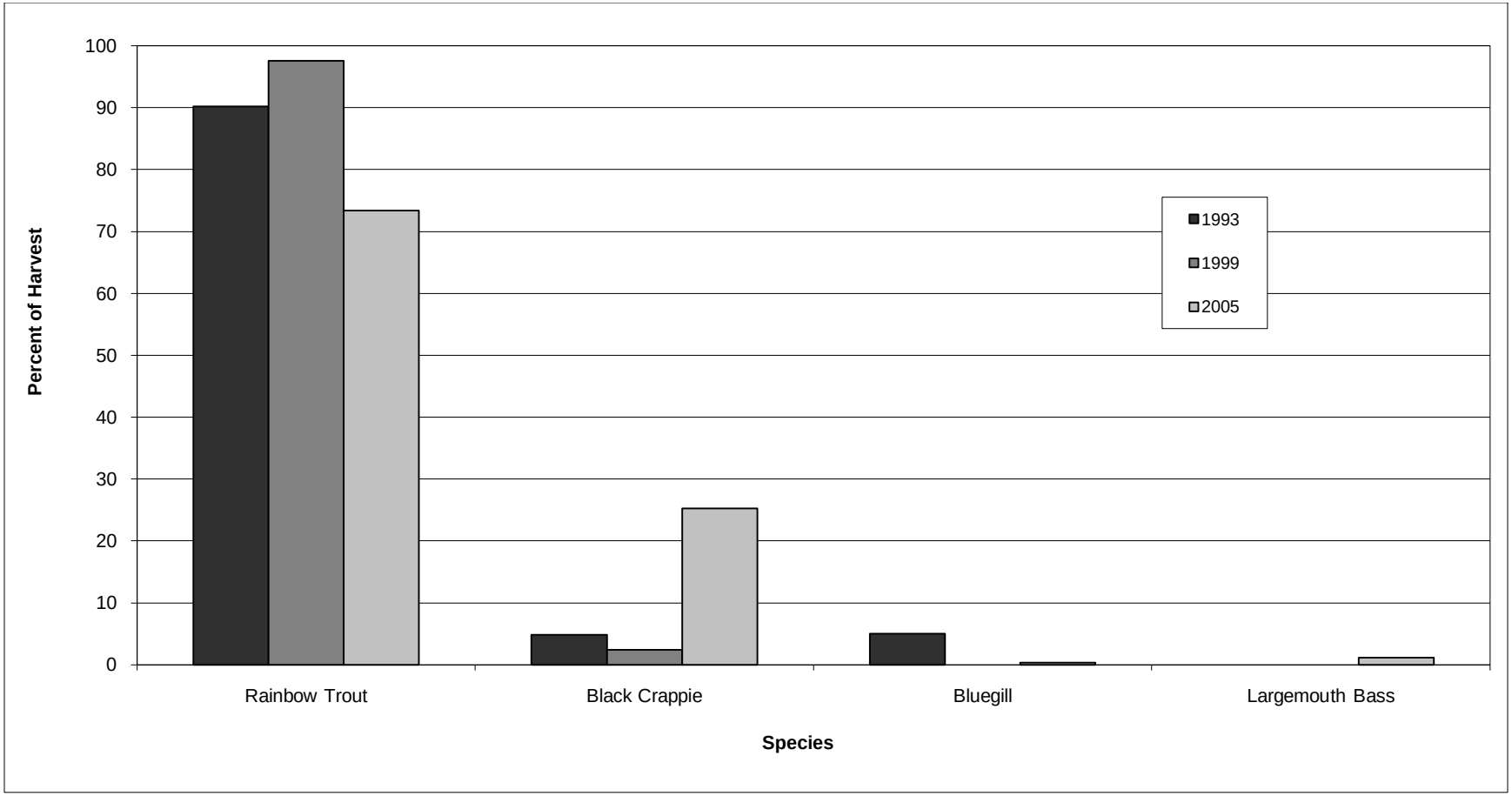


Figure 53. Catch composition of fish harvested during creel surveys of Soldier's Meadow Reservoir, Idaho, in 1993, 1999, and 2005.

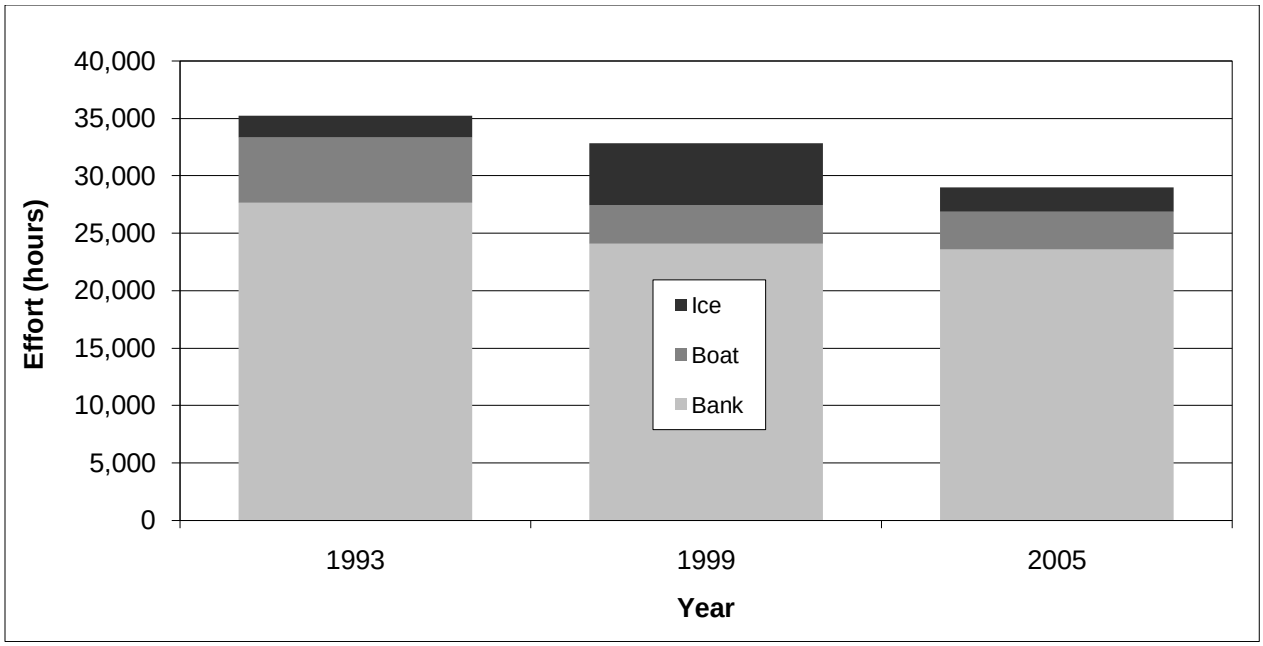


Figure 54. Estimated angler effort, by type, from creel surveys of Spring Valley Reservoir, Idaho, in 1993, 1999, and 2005.

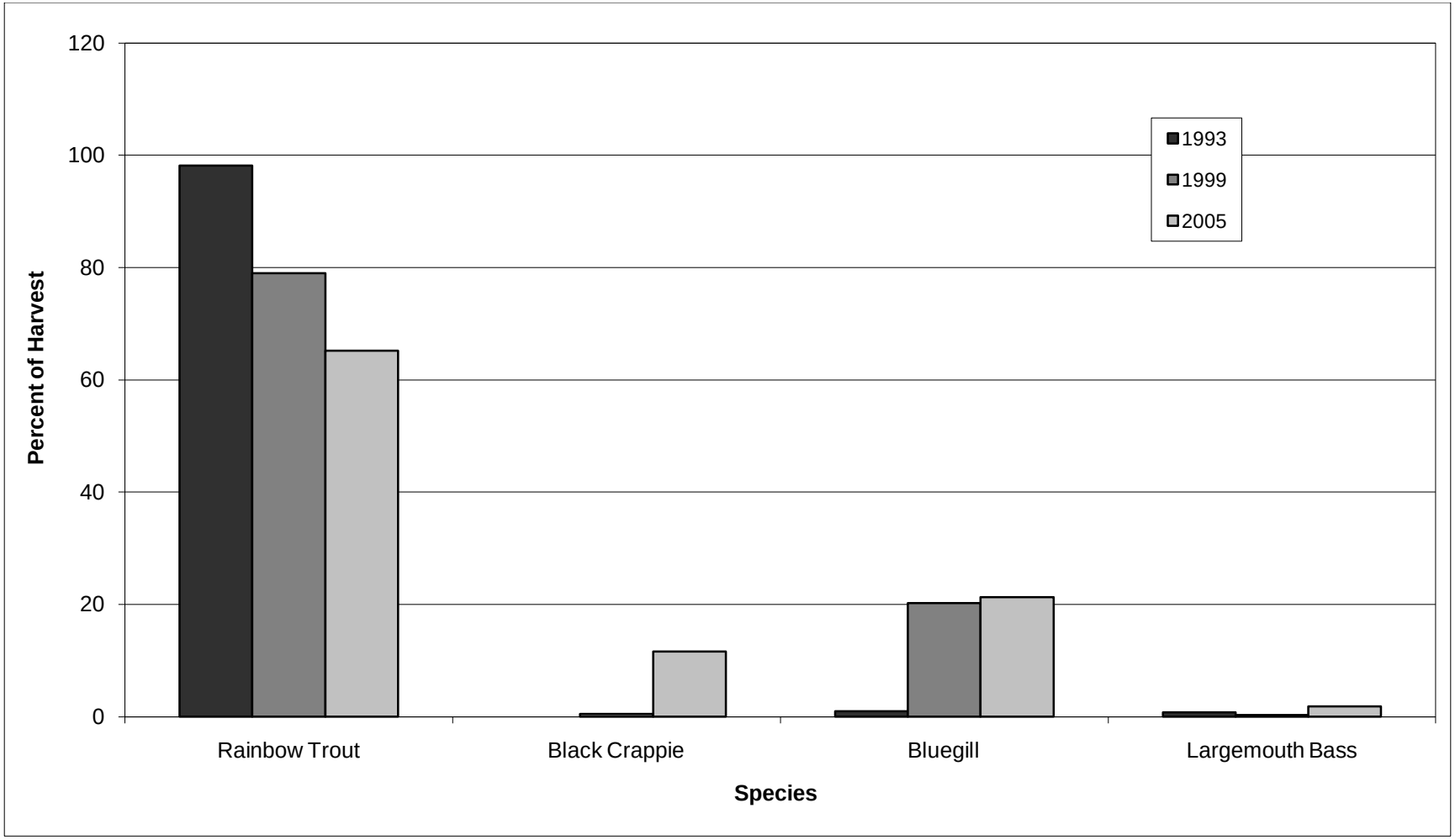


Figure 55. Catch composition of fish harvested during creel surveys of Spring Valley Reservoir, Idaho, in 1993, 1999, and 2005.

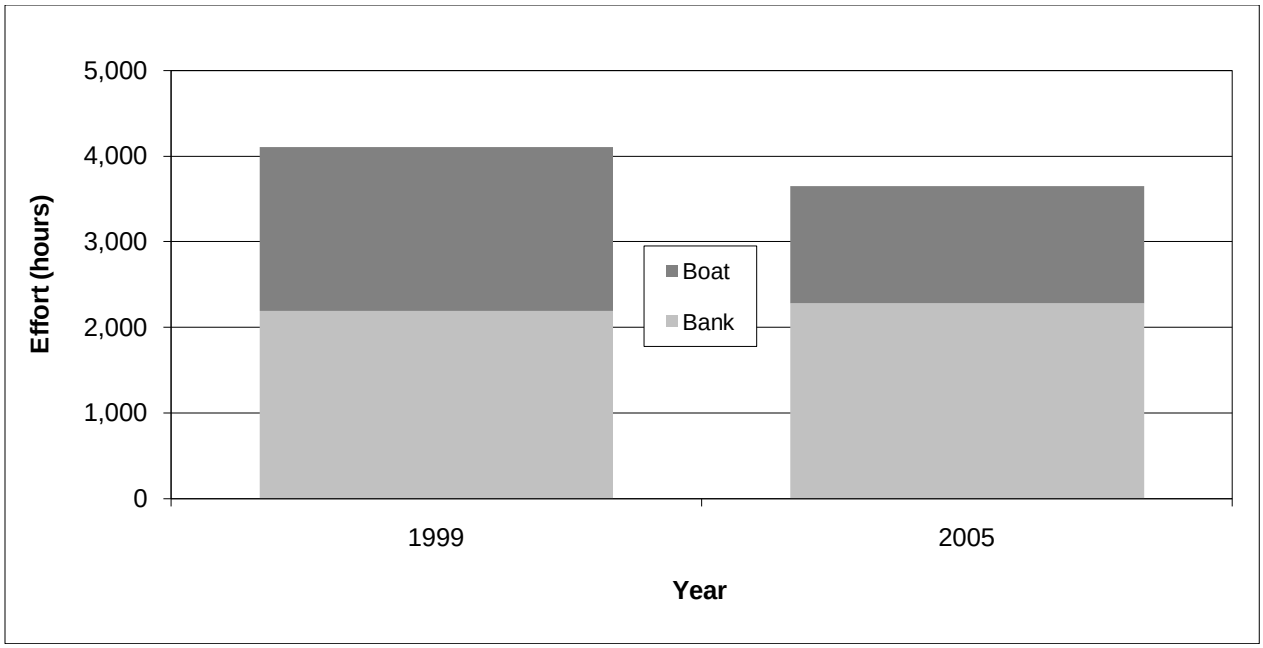


Figure 56. Estimated angler effort, by type, from creel surveys of Waha Lake, Idaho, in 1999 and 2005.

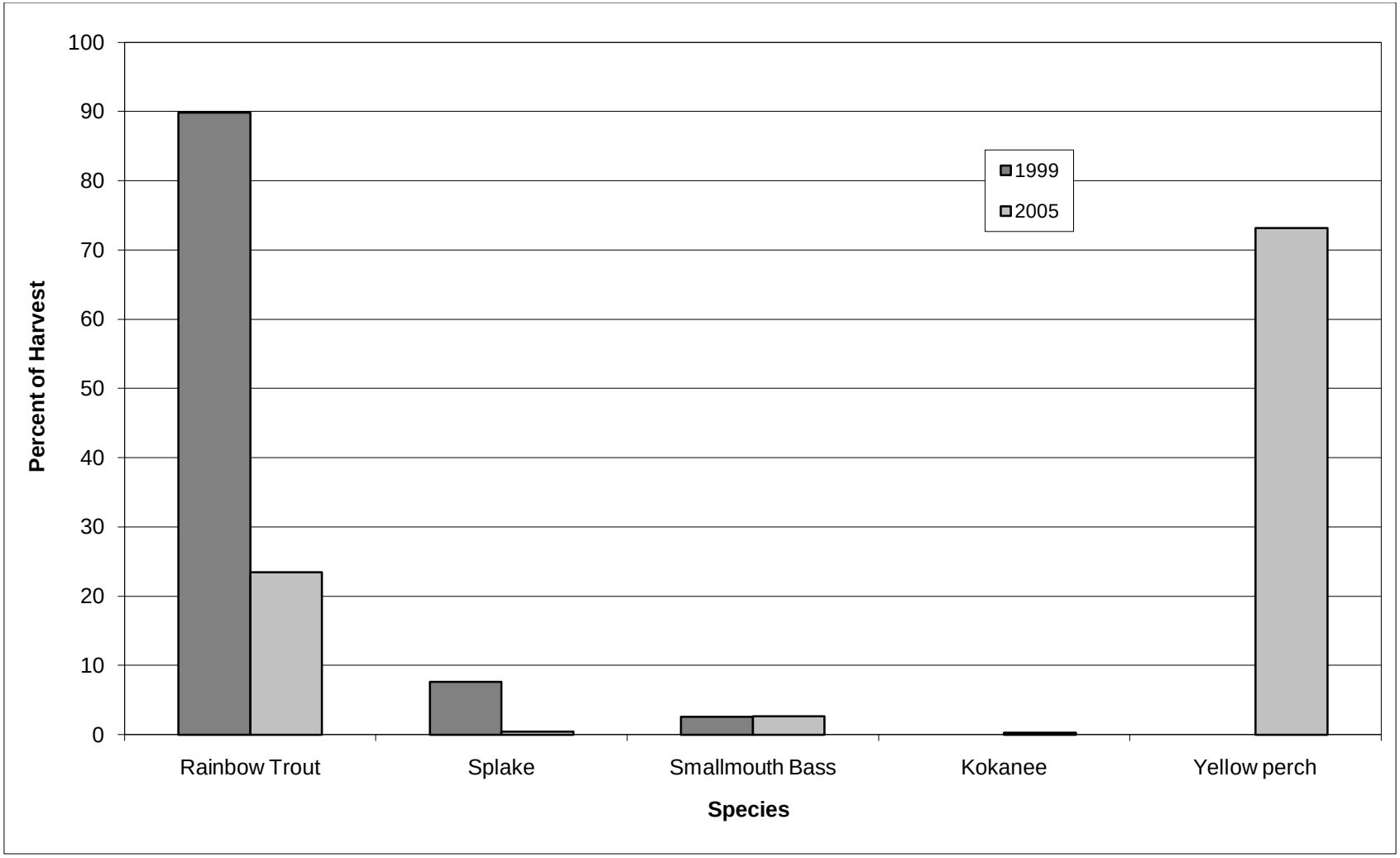


Figure 57. Catch composition of fish harvested during creel surveys of Waha Lake, Idaho, in 1999 and 2005.

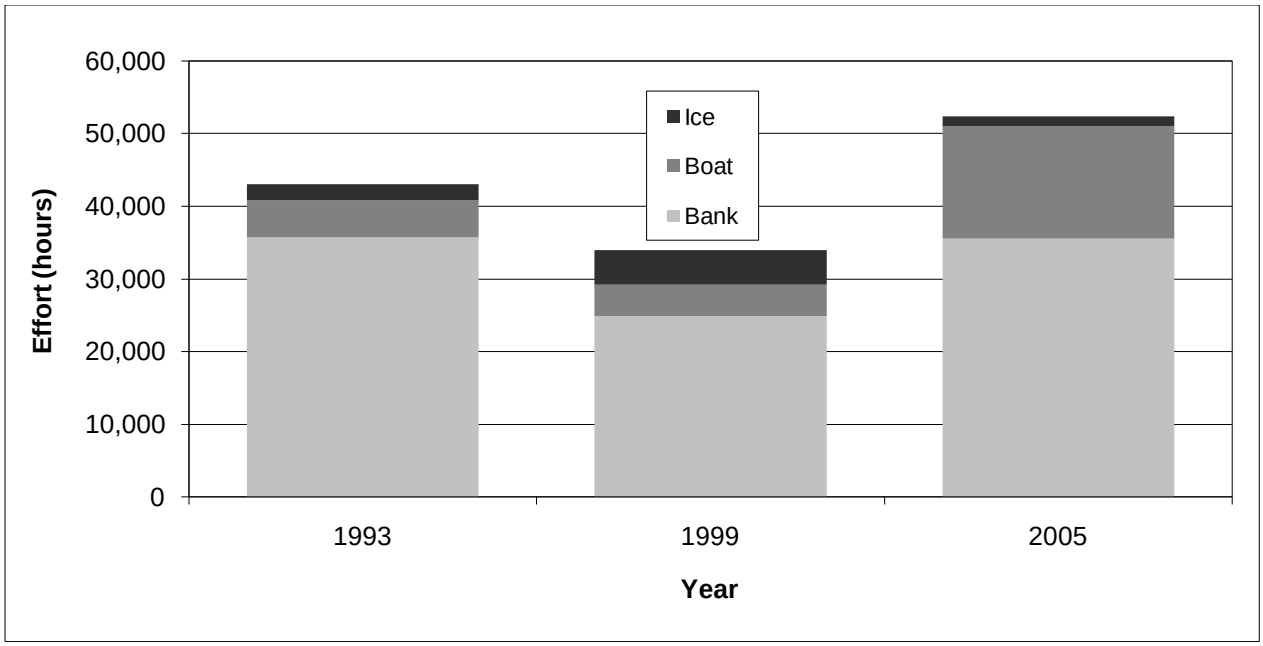


Figure 58. Estimated angler effort, by type, from creel surveys of Winchester Lake, Idaho, in 1993, 1999, and 2005.

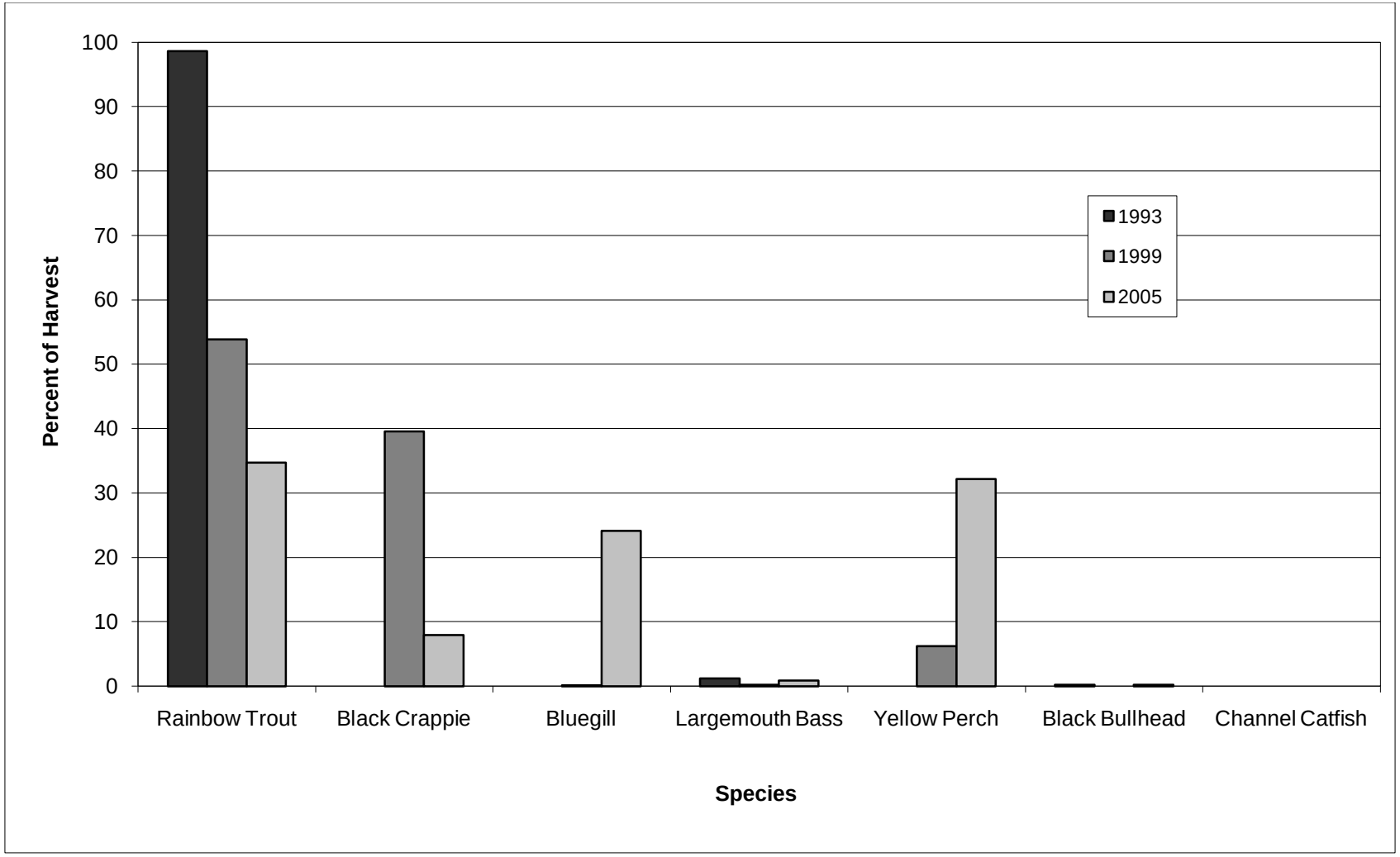


Figure 59. Catch composition of fish harvested during creel surveys of Winchester Lake, Idaho, in 1993, 1999, and 2005.

Job c. Rivers and Streams Investigations

Results and Discussion

Salmon River

The Idaho Department of Fish and Game annually stocks resident rainbow trout into the lower 100 km of the Salmon River. This stocking is funded by the Lower Snake River Compensation Plan (LSRCP) as part of their resident fisheries mitigation program. These fish are sampled annually by hook and line to collect population and food habit information. From August 21-24, 2005, approximately 103 rod hours resulted in no domestic Kamloops being caught.

Additionally, 359 smallmouth bass were collected during this sampling period. These fish ranged in total length from 120-390 mm. The length frequency distribution is similar to that of the samples collected in 2003 and 2004 Figure 60. PSD values for smallmouth bass collected in the lower Salmon River have been declining over the last five years (Figure 61).

Selway River

A hook-and-line survey of westslope cutthroat trout was conducted on the Selway River from July 21-27, in conjunction with an annual snorkel survey of the river and its tributaries. A total of 257 cutthroat trout were collected over six days of sampling. These fish ranged in length from 130 to 395 mm. A comparison of length frequency distributions (Figure 62) shows this sample to be very similar to the sample collected in 2004.

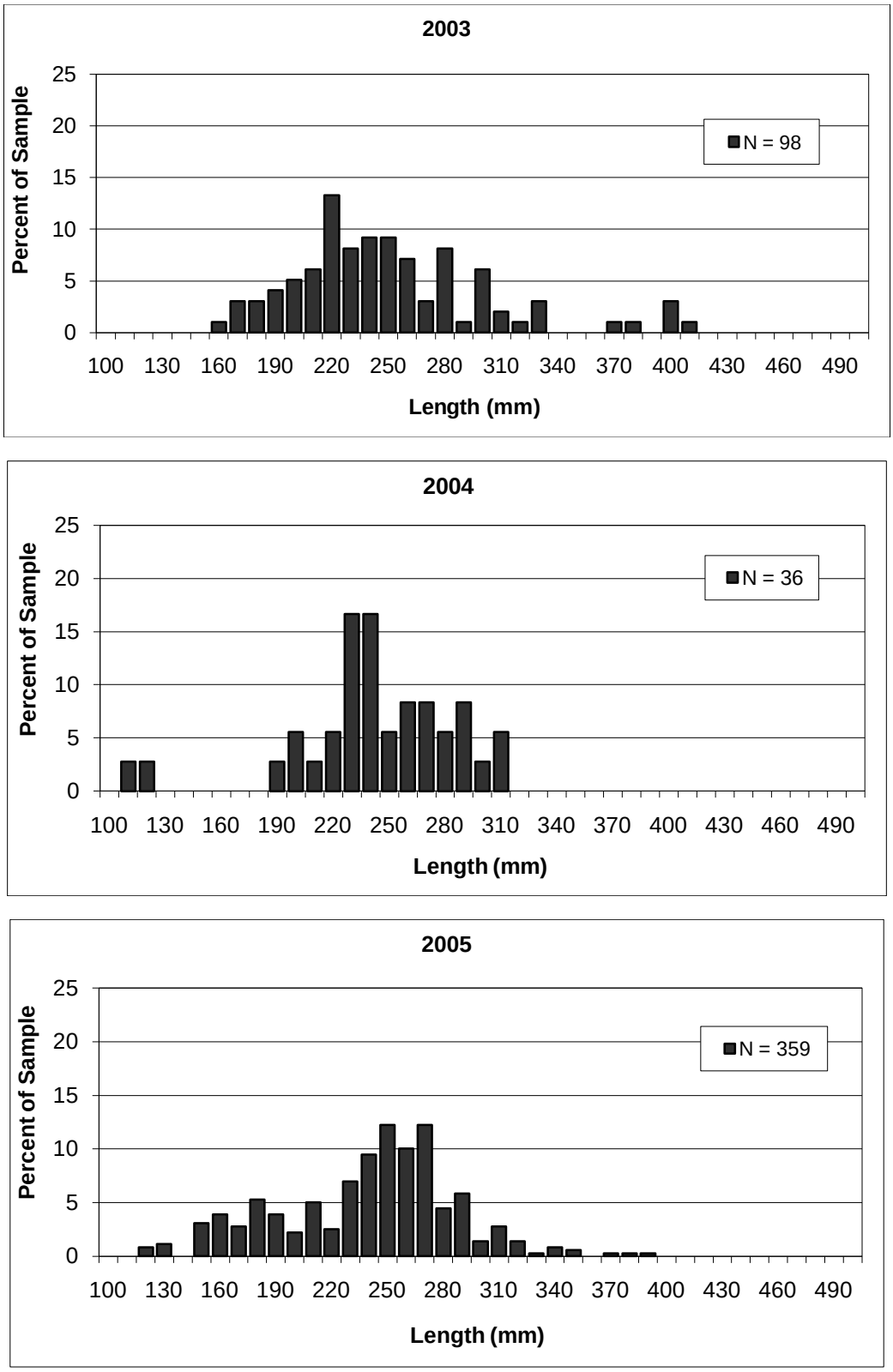


Figure 60. Length frequency distributions of smallmouth bass collected in the lower Salmon River, Idaho, by hook and line sampling, from 2003-2005.

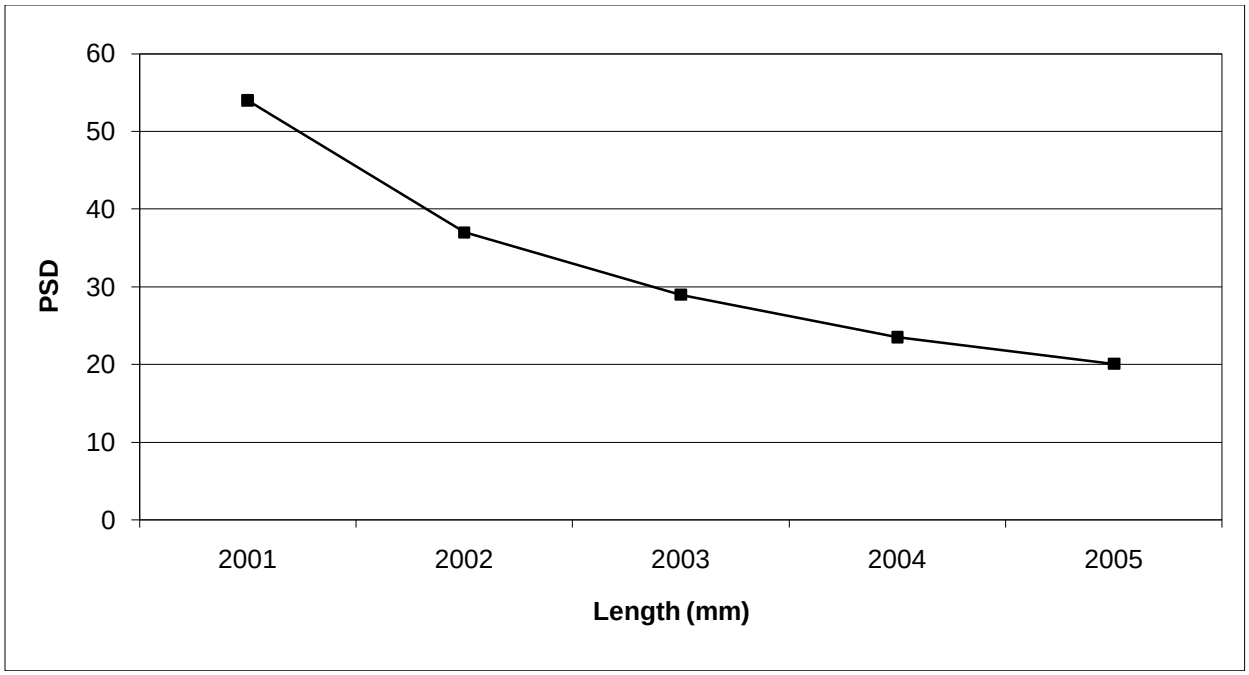
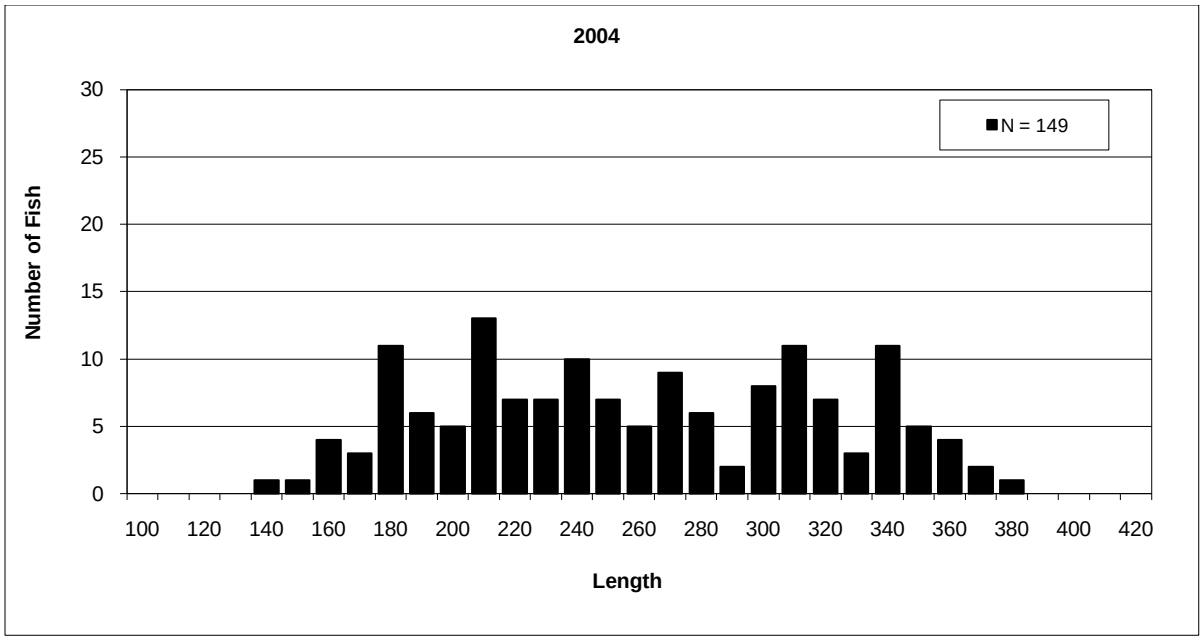


Figure 61. Proportional Stock Density (PSD) values of smallmouth bass collected in the lower Salmon River, Idaho, by hook and line sampling, from 2001-2005.



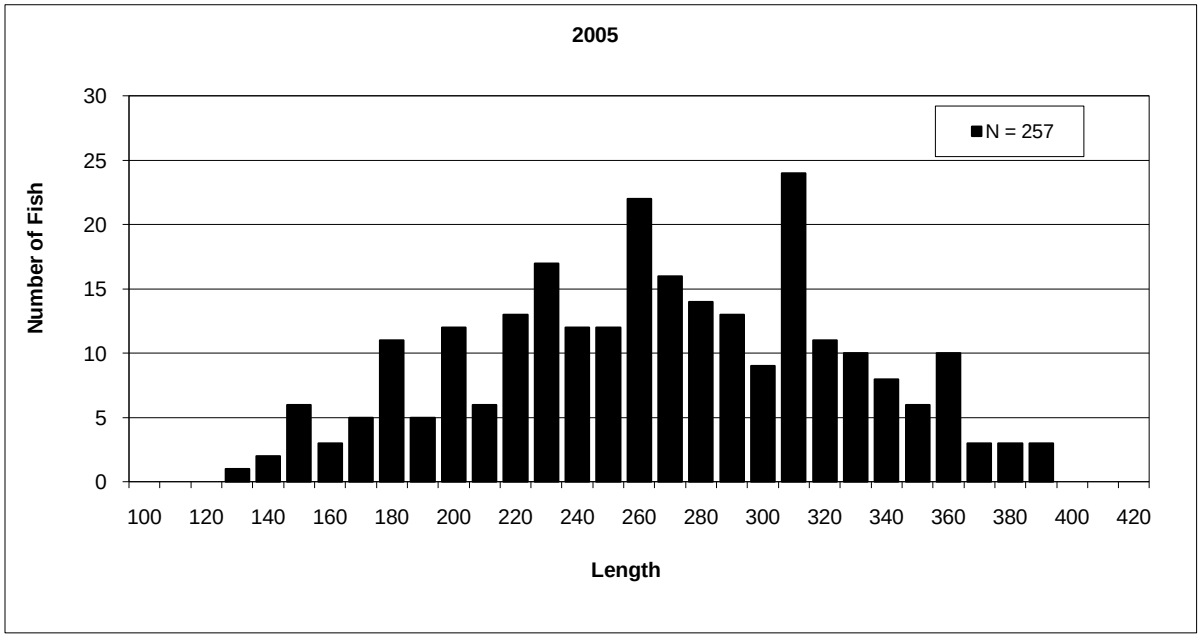


Figure 62. Length frequency distributions for westslope cutthroat trout caught by hook and line sampling in the Selway River, Idaho, in 2004 and 2005.

PROJECT III. Habitat Management

Results and Discussion

Deer Creek Reservoir

Monthly dissolved oxygen profiles are shown in Figure 63. The reservoir is highly stratified, with low oxygen below three meters in the summer months. Generally, this profile is seen in older eutrophic reservoirs. The eutrophic conditions seen in Deer Creek Reservoir are likely due to the large quantities of organic material that was left in the reservoir when it was built. After the harvestable timber was removed, the remaining stumps/timber/branches were pushed into piles. Some of it was burned, but much of the piles and other organic material on the ground was left in the reservoir.

Elk Creek Reservoir

Water quality is being addressed in Elk Creek Reservoir through the application of barley straw as an algaecide. In April 60 bales of barley straw were placed in the upper end of Elk Creek Reservoir. As the straw decomposes, it inhibits algae growth, thus providing a natural way to control nuisance aquatic vegetation. Once the bales had become saturated, they were broken apart and scattered to increase the area of treatment. Overall, the straw treatment was unsuccessful. Algae only appeared to be controlled where larger clumps of straw were located. This would indicate that utilizing a larger quantity of straw could be successful. However, several factors make this unfeasible: 1) the large quantity of water flowing into the reservoir dilutes the reaction that inhibits the algae growth; 2) the high level of organic material in the sediment and the shallow nature of the treatment area promotes rapid regrowth of vegetation; 3) the total area that would need to be treated is extremely large (around 1/3 of the reservoir); and 4) natural water level fluctuations in the spring often either wash the straw downstream or leave it high and dry.

Monthly dissolved oxygen profiles are shown in Figure 64.

Mann Lake

Monthly dissolved oxygen profiles are shown in Figure 65.

Moose Creek Reservoir

Monthly dissolved oxygen profiles are shown in Figure 66.

Soldier's Meadow Reservoir

Monthly dissolved oxygen profiles are shown in Figure 67.

Spring Valley Reservoir

Monthly dissolved oxygen profiles are shown in Figure 68.

Waha Lake

A hypolimnetic aeration system with two units has been installed into Waha Lake. This system will provide similar benefits to the Winchester Lake system. Monthly dissolved oxygen profiles illustrate the annual loss of oxygen in the hypolimnion of Waha Lake during the summer months (Figure 69).

Winchester Lake

Fish habitat and water quality issues continue to be addressed in Winchester Lake through the implementation of a hypolimnetic aeration system. These units draw water from the bottom of the lake, aerate it in a tub at the surface, and return the water to the bottom of the lake to prevent destratification. The increase in oxygen in the hypolimnion will increase habitat available for fish, and reduce the levels of phosphorous in the water by preventing it from being released from the lake substrate. The reduction in phosphorous should reduce the volume of aquatic vegetation and algae that are a nuisance in the summer and fall months. Monthly dissolved oxygen profiles illustrate the annual loss of oxygen in the hypolimnion of Winchester Lake during the summer months (Figure 70).

Management Recommendations

1. Continue to monitor and conduct maintenance on aeration systems.

2. Restore water to Robinson Pond to allow continued stocking of catchable rainbow trout.

3. Utilize aquatic herbicides such as Reward© to control nuisance vegetation in lowland lakes and reservoirs.

4. Discontinue the use of barley straw in Elk Creek Reservoir.

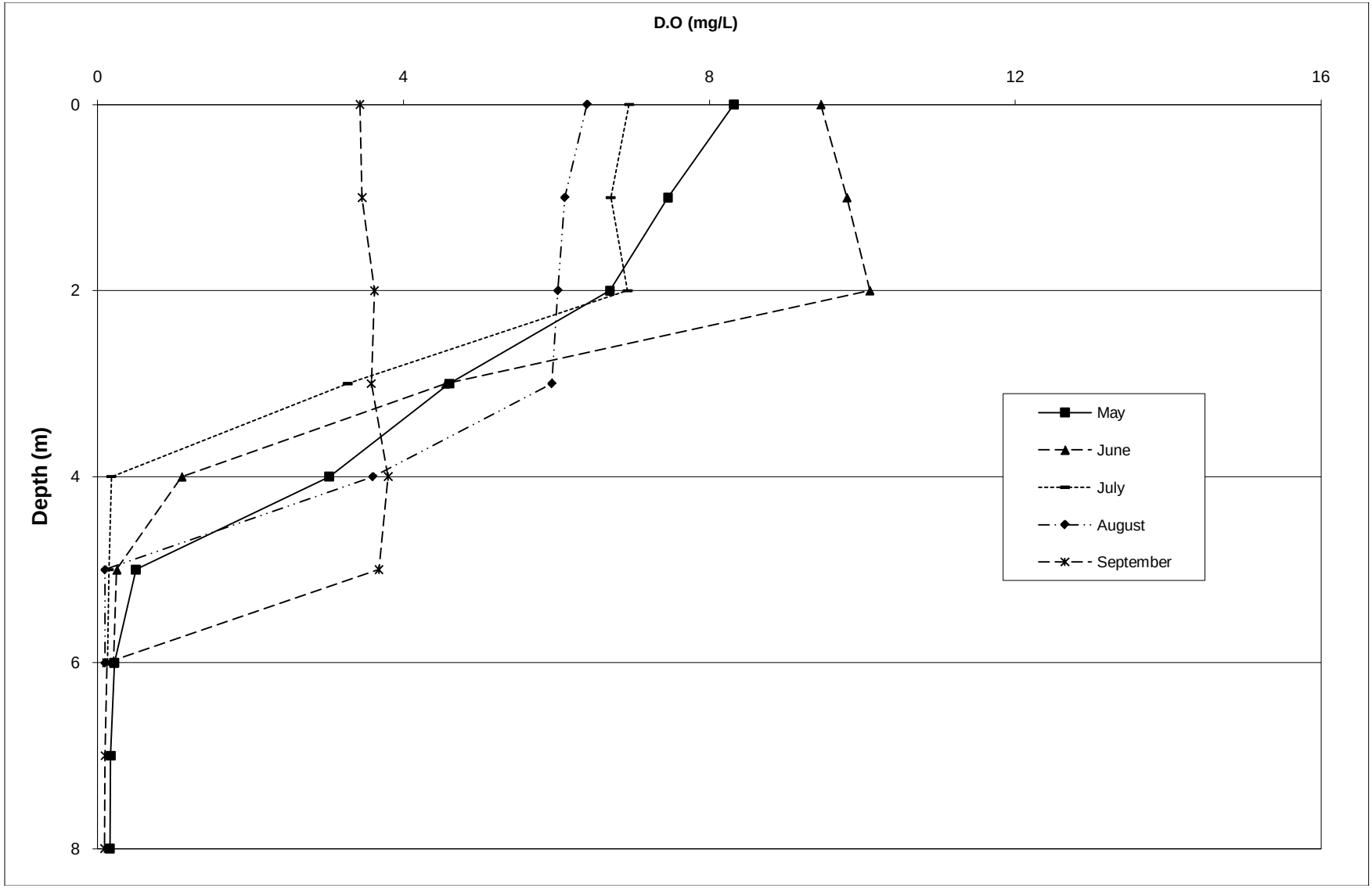


Figure 63. Monthly dissolved oxygen (D.O.) profiles of Deer Creek Reservoir, Idaho, during 2005.

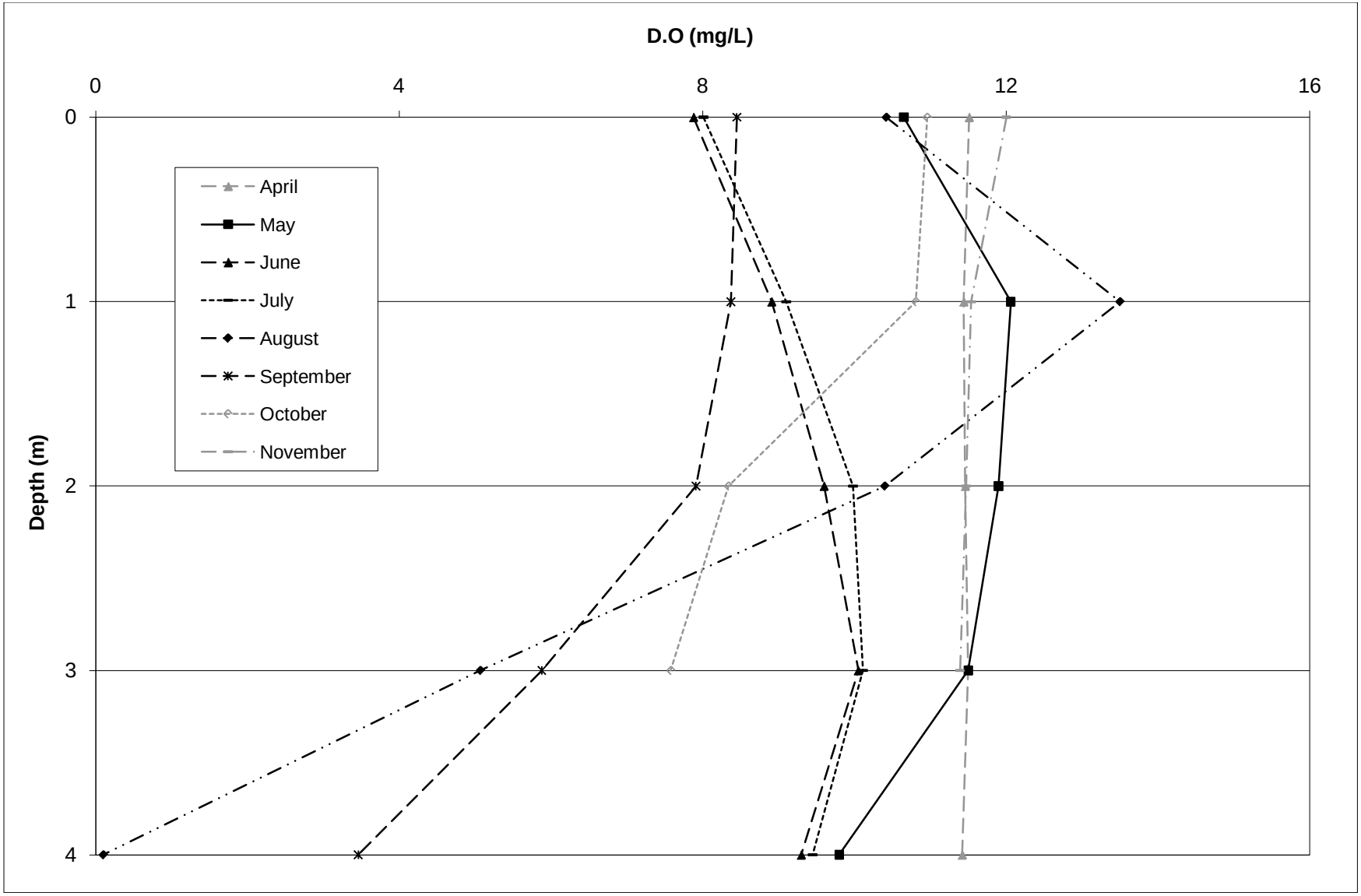


Figure 64. Monthly dissolved oxygen (D.O.) profiles of Elk Creek Reservoir, Idaho, during 2005.

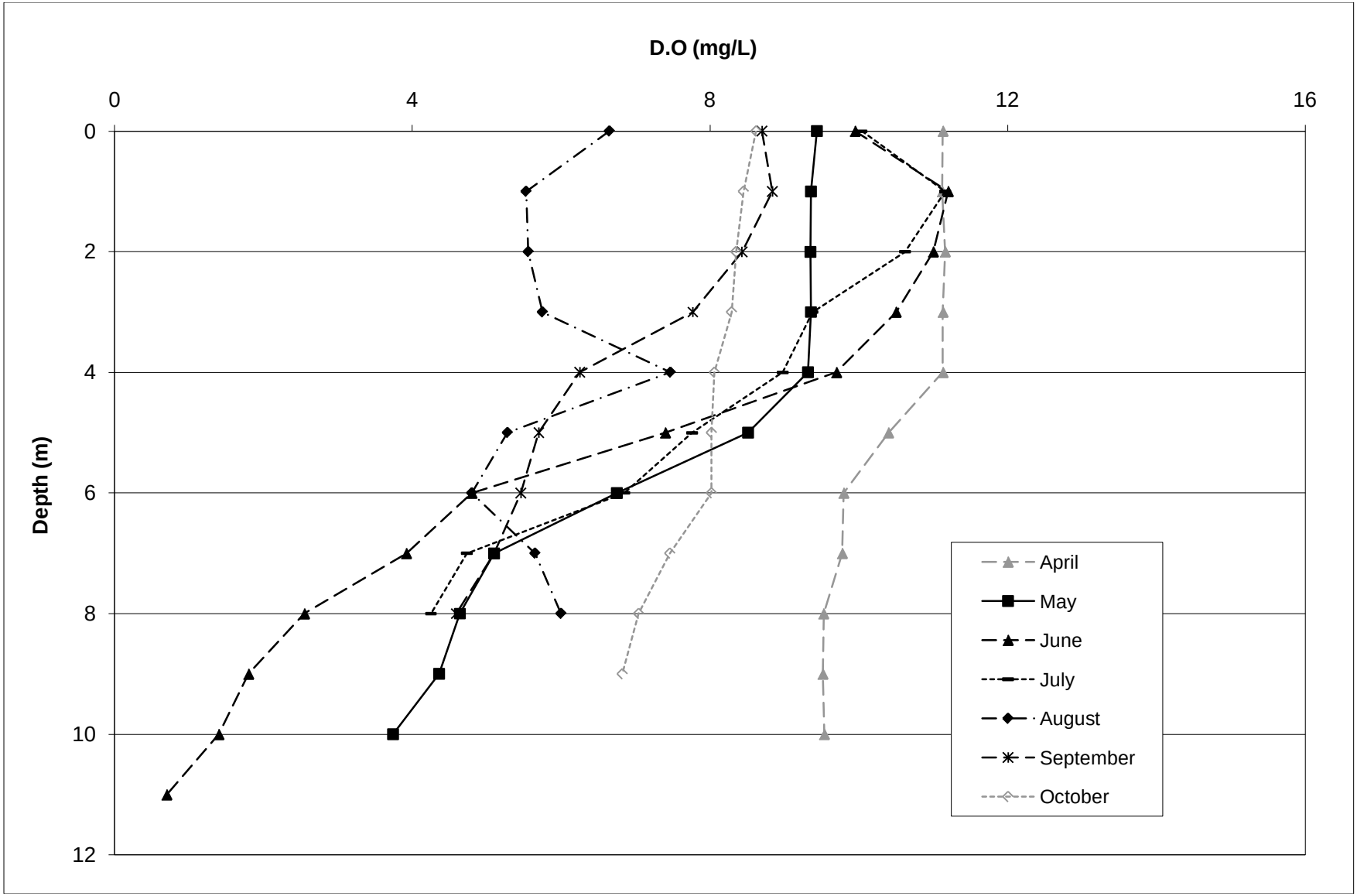


Figure 65. Monthly dissolved oxygen (D.O.) profiles of Mann Lake, Idaho, during 2005.

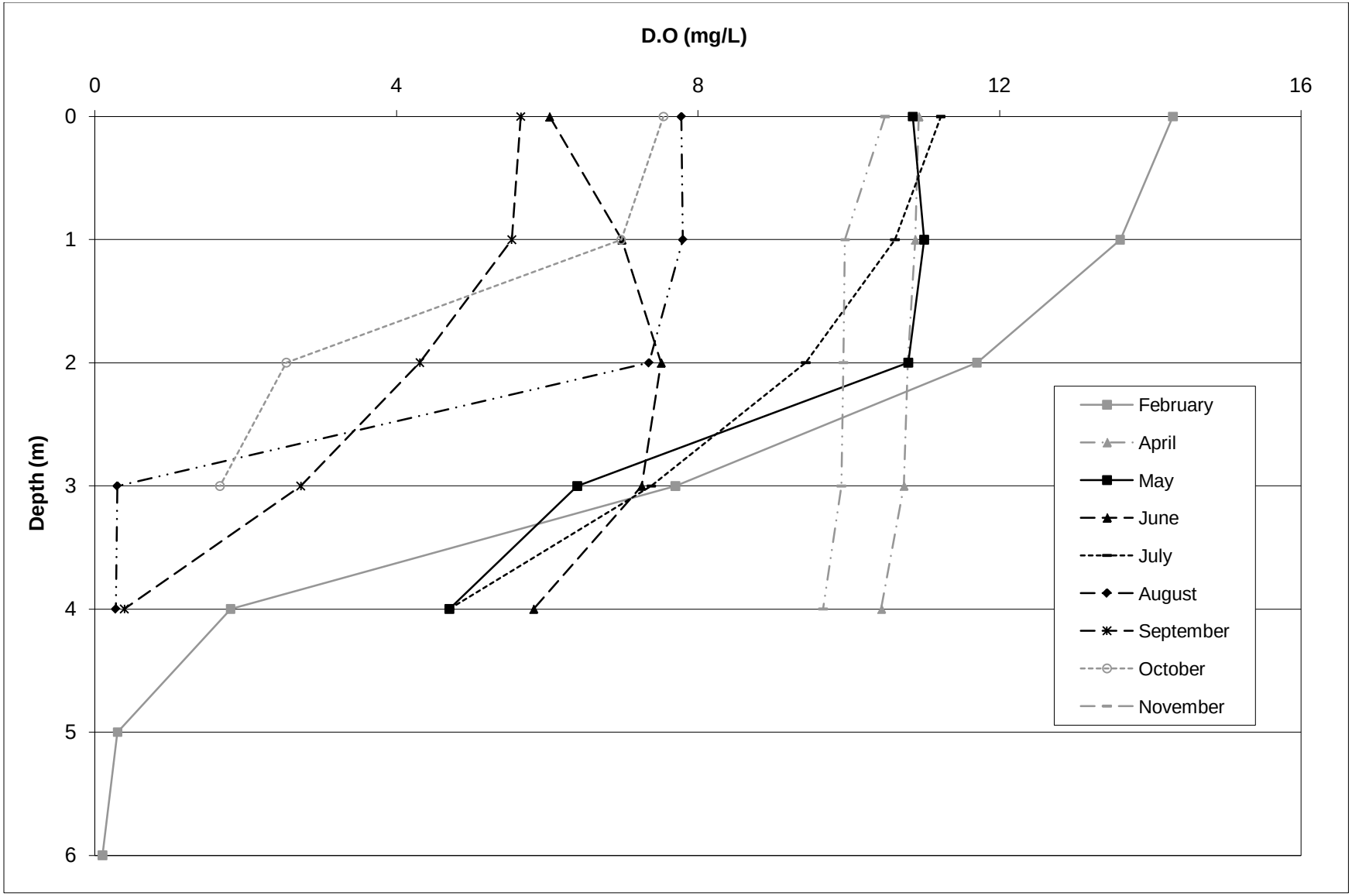


Figure 66. Monthly dissolved oxygen (D.O.) profiles of Moose Creek Reservoir, Idaho, during 2005.

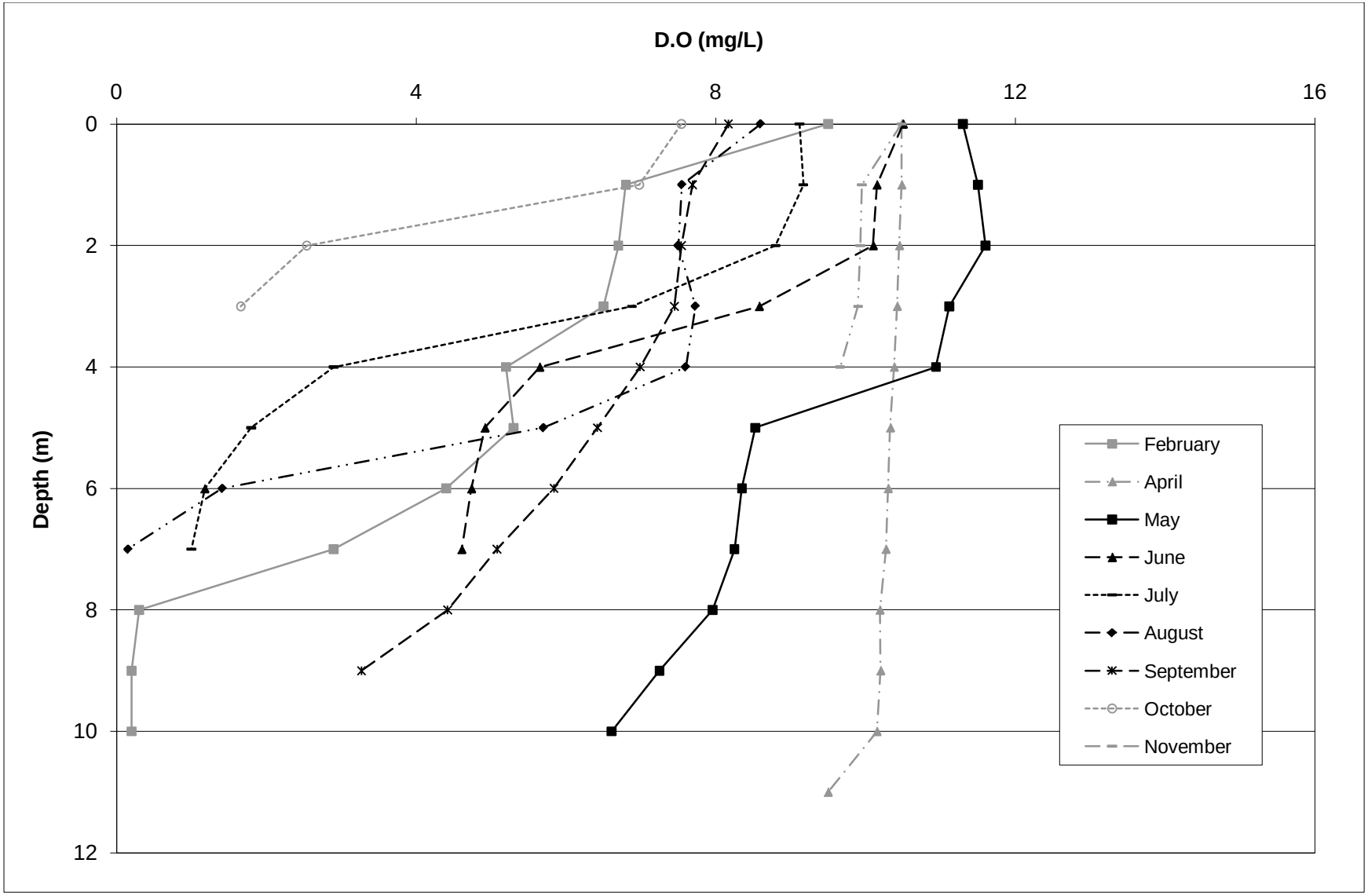


Figure 67. Monthly dissolved oxygen (D.O.) profiles of Soldier's Meadow Reservoir, Idaho, during 2005.

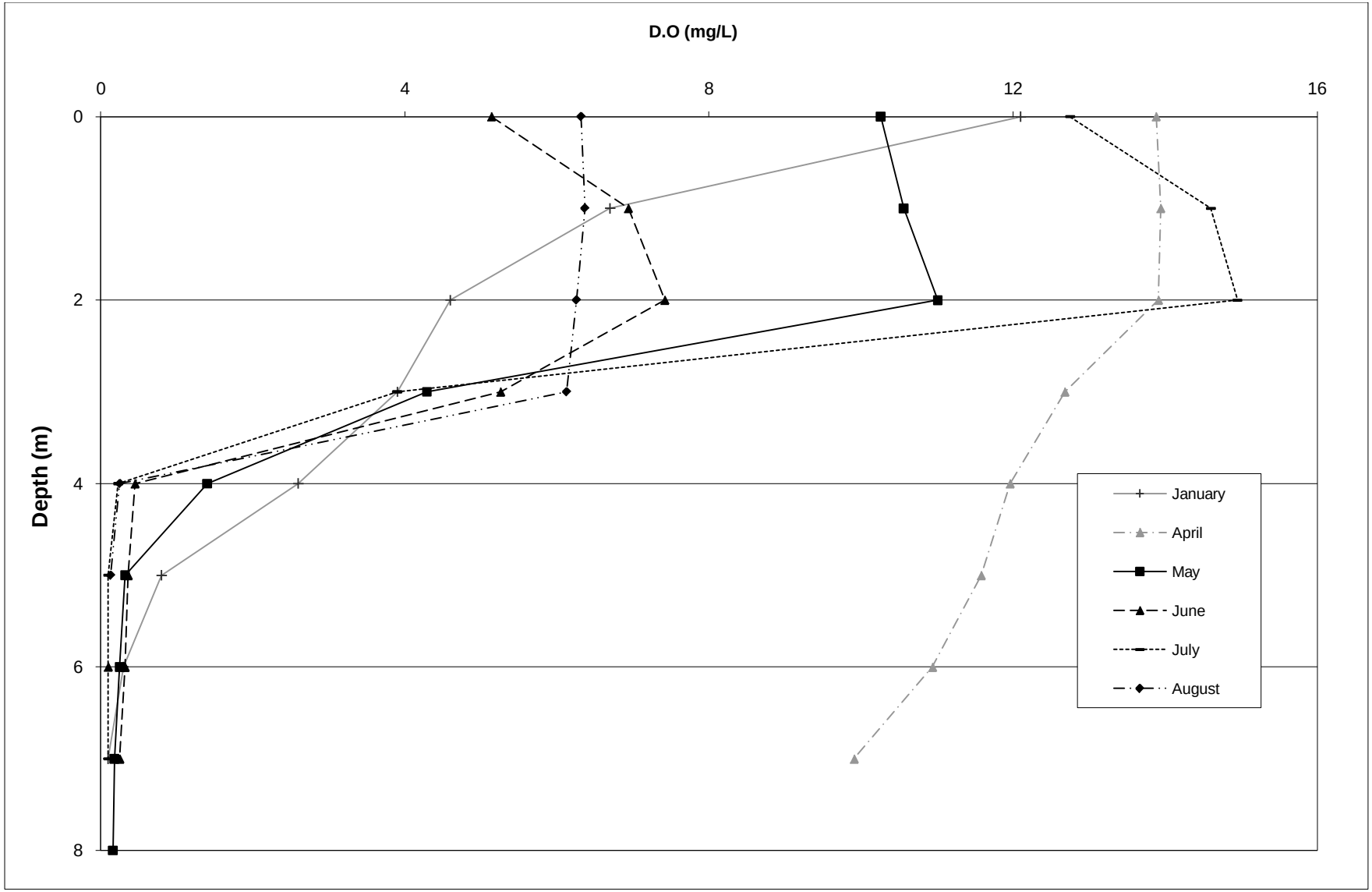


Figure 68. Monthly dissolved oxygen (D.O.) profiles of Spring Valley Reservoir, Idaho, during 2005.

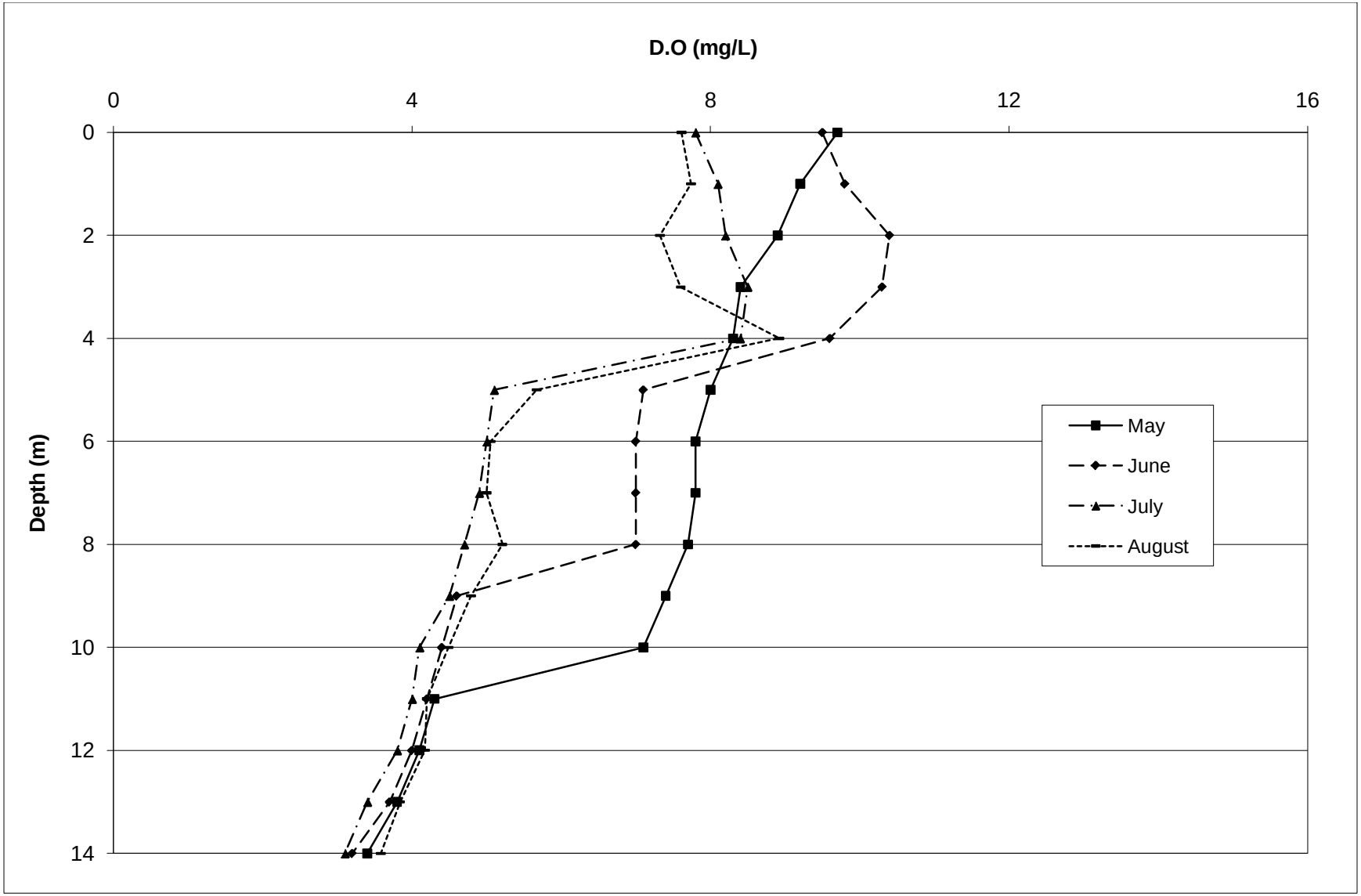


Figure 69. Monthly dissolved oxygen (D.O.) profiles of Waha Lake, Idaho, during 2005.

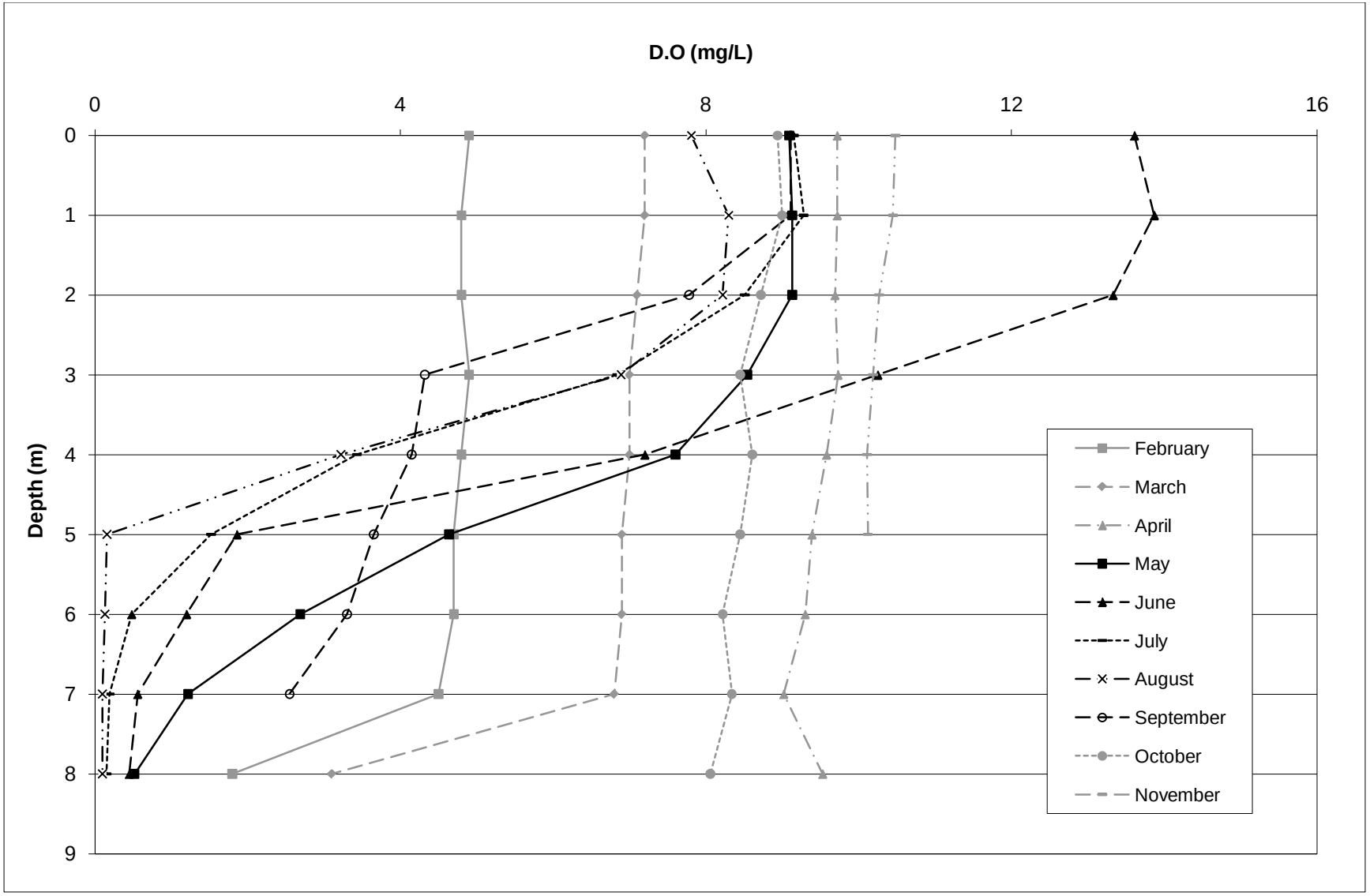


Figure 70. Monthly dissolved oxygen (D.O.) profiles of Winchester Lake, Idaho, during 2005.

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