Lake Conroe Fisheries - Population Trends Following Macrophyte Removal

by

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Introduction

Lake Conroe (located near the town of Conroe, TX) was impounded in 1973 by the San Jacinto River Authority and the City of Houston for water supply. The 21,000-acre reservoir is somewhat clear with Secchi disk readings of 2 to 4 ft. The lower two-thirds of the reservoir is heavily developed with approximately the upper one-third of the reservoir in national forest.

Pressure from lake area landowners and developers demanding relief from the heavy infestation of macrophytes (primarily hydrilla (*Hydrilla verticillata*)) resulted in the stocking of 270,000 diploid grass carp (*Ctenopharyngodon idella*) into Lake Conroe in the early 1980s. The effects of the resulting loss of macrophytes on the fish populations of Lake Conroe were evaluated and documented by Texas A&M University. The Texas A&M project report (Klussmann et al. 1988) noted that by 1983 macrophytes had been almost completely removed from the reservoir with a resulting increase in primary productivity. However, by the conclusion of the investigation in 1986, most nutrients had returned to pretreatment levels. Notable changes occurring in the fish community included overall decreases in sunfishes (*Lepomis* spp.), crappies (*Pomoxis* spp.), and intermediate size largemouth bass (*Micropterus salmoides*) and overall increases in threadfin shad (*Dorosoma pretense*), yellow bass (*Morone mississippiensis*), white bass (*M. chrysops*), and channel catfish (*Ictalurus punctatus*). These changes were attributed to an increase in pelagic habitat and primary productivity and a decrease in littoral habitat. The focus of this paper is on the status of the Lake Conroe fisheries since the termination of the Texas A&M project in 1986.

Methods

Fishes were collected by electrofishing (2 hr at eight stations), gill netting (15 net nights at 15 stations), and frame netting (15 net nights at 15 stations) unless otherwise noted (Figure 1). Catch per unit effort (CPUE) was recorded for electrofishing as the number of fish caught per hour of actual electrofishing and for gill and frame nets as the number of fish caught in one net set overnight. Sampling statistics (CPUE for various length categories) and structural indices (proportional stock density (PSD), relative stock density (RSD), and relative weight (Wr)), were calculated for target fishes according to Anderson and Gutreuter (1983) and Childress (1989). An aquatic vegetation survey was conducted

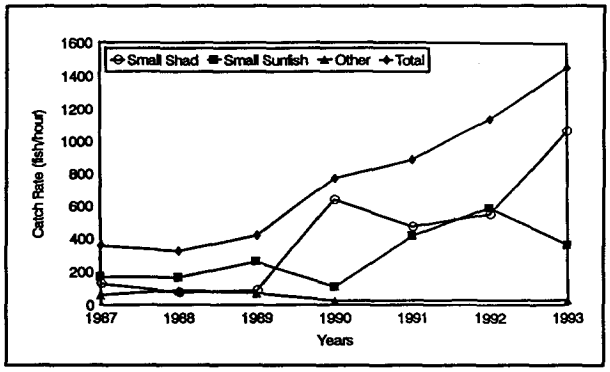

Figure 1. Catch per hour (CPUE) of small forage fishes (≤4 in.) from electrofishing, Lake Conroe, Texas, fall 1987-1993

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in accordance with procedures in Texas Parks and Wildlife Department (1993). Primary productivity data were collected approximating methods given in Klussmann et al. (1988).

Results

Aquatic macrophytes

Aquatic macrophyte density remains insignificant, with only 8.3 acres of floating native vegetation found during a 1993 vegetation survey.

Forage fishes

Forage was dominated by threadfin shad, small gizzard shad (*D. cepedianum*), longear sunfish (*L. megalotis*), and small bluegill (*L. macrochirus*). During 1987-1993, relative abundance in electrofishing increased for all four species (Figure 1), with the most notable increases in threadfin shad from a low of 50.5 per electrofishing hour in 1989 to a high of 1,050.0 per electrofishing hour in 1993. Increased forage production in Lake Conroe is likely due to elevated primary productivity as indicated by 1990 nitrate nitrogen (0.59 mg/L) and total nitrogen concentrations (0.87 mg/L) that were well above values recorded by Texas A&M during 1980-1986 (Klussmann et al. 1988). Increased nitrogen levels could be due to increased development around Lake Conroe's shore leading to increased fertilizer runoff and lateral line seepage.

Largemouth bass

Electrofishing catch rates suggest a decrease in the relative abundance of largemouth bass over time, with catch per unit effort from electrofishing dropping from a high of 202 per hour in 1989 to a low of 53 per hour in 1993 (Figure 2). Although population structure indices (PSD and RSD-14) have shown some increase over time, catch rates of ≥14 in. fish have remained similar, indicating that changes in structural indices are primarily due to a decrease in stock-size subquality fish. The minimum length limit for largemouth bass at Lake Conroe was increased from 14 to 16 in. in 1993 to increase average size of fish caught and fish harvested and to increase overall bag weights for consumption and tournament weigh-ins.

Channel catfish

Lake Conroe supports a high density, high quality channel catfish fishery that is still expanding. Despite removal of 0.5-, 3.5-, and 4.0-in. mesh panels from standard gill nets in 1992, relative abundance estimates of channel catfish have continued to increase (Figure 3). Expansion of the channel catfish population is likely due to increased open-water benthic habitat after macrophytes were removed coupled with increased primary productivity. The minimum length limit for channel catfish at Lake Conroe was raised from 9 to 14 in. in 1992 in order to increase the average size of fish caught and fish harvested, to increase the overall yield to the angler, and to protect the channel catfish population to a level of approximately 50-percent maturity.

White crappie and black crappie

Both white crappie (*P. annularis*) and black crappie (*P. nigromaculatus*) are present in low densities in Lake Conroe. Following removal of macrophytes, catch rates of crappies from frame nets fell to very low levels (Figures 4 and 5). White crappie rebounded somewhat after subadult (approximately 4 in.) fish were stocked and a 10-in. minimum length limit was imposed during 1990.

White bass

The Lake Conroe white bass population is characterized by sporadic year class strength (Figure 6) affected by tributary inflows during spawning runs among other things. The white bass minimum length limit was increased from 10 to 12 in. in 1992 to protect fish to maturity, to increase the average size of fish caught and fish harvested, and to increase yield to the angler from sporadic year classes.

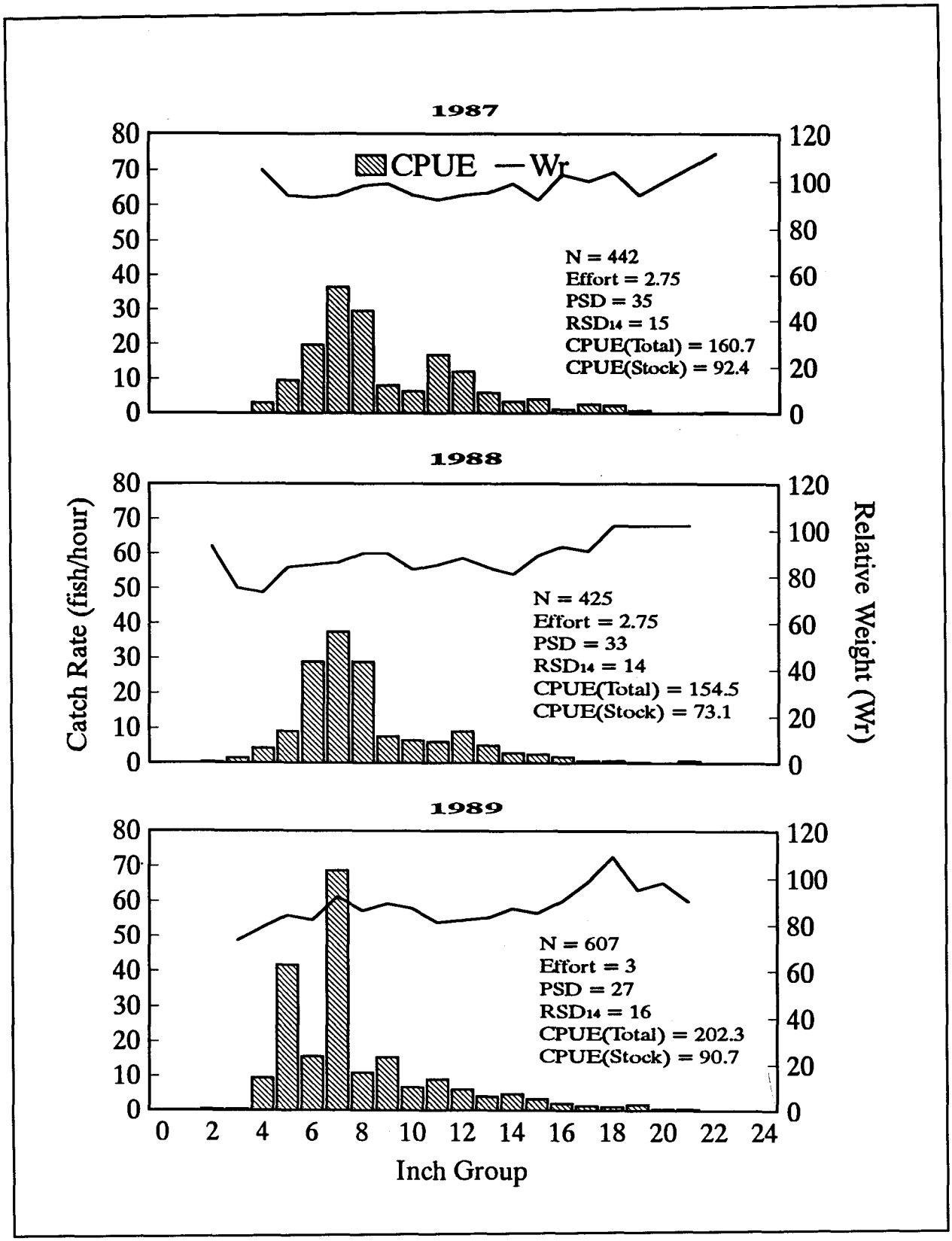
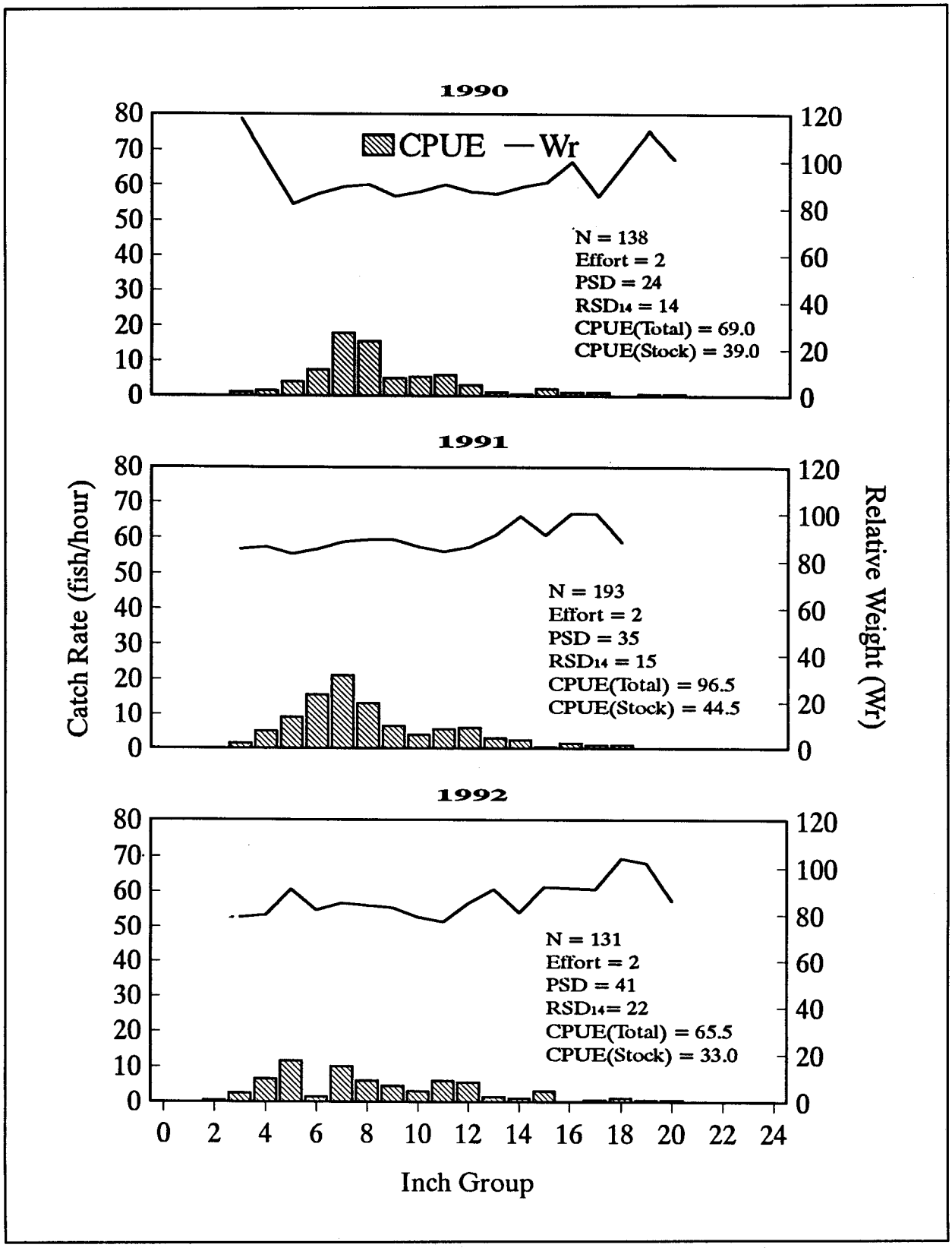


Figure 2. Catch per hour (CPUE) and relative weight (Wr) of largemouth bass collected by electrofishing, Lake Conroe, Texas, fall 1987-1993 (Sheet 1 of 3)



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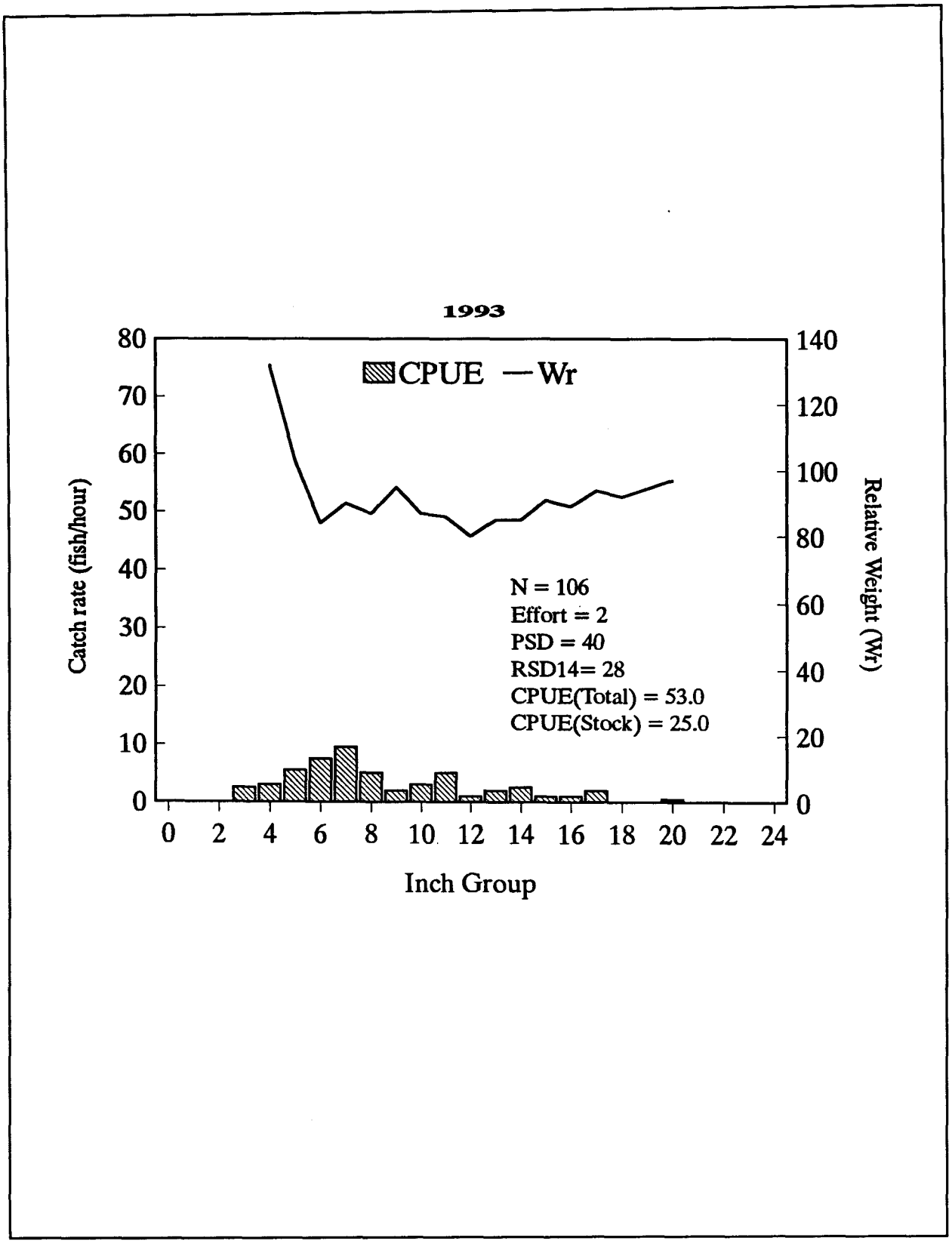

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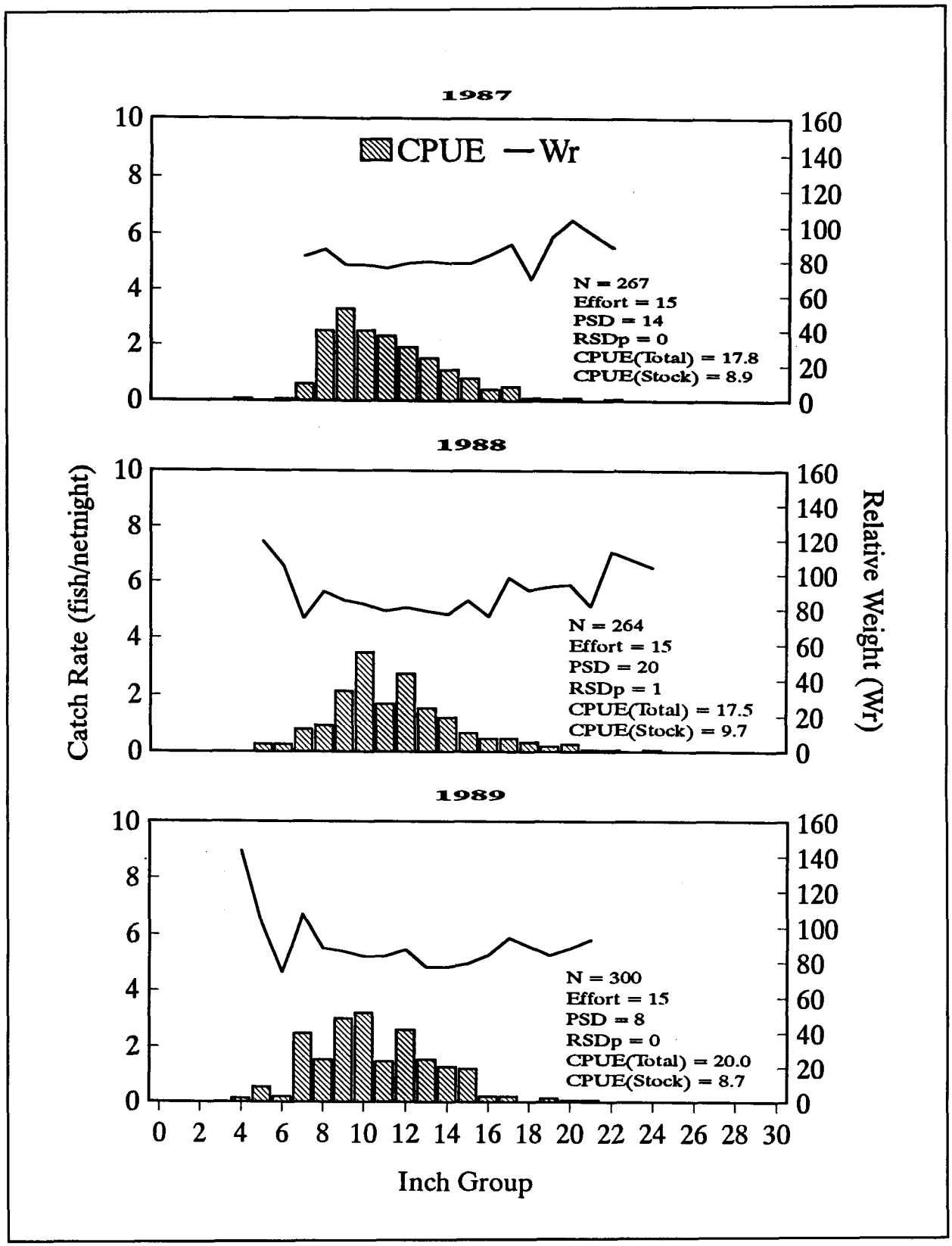
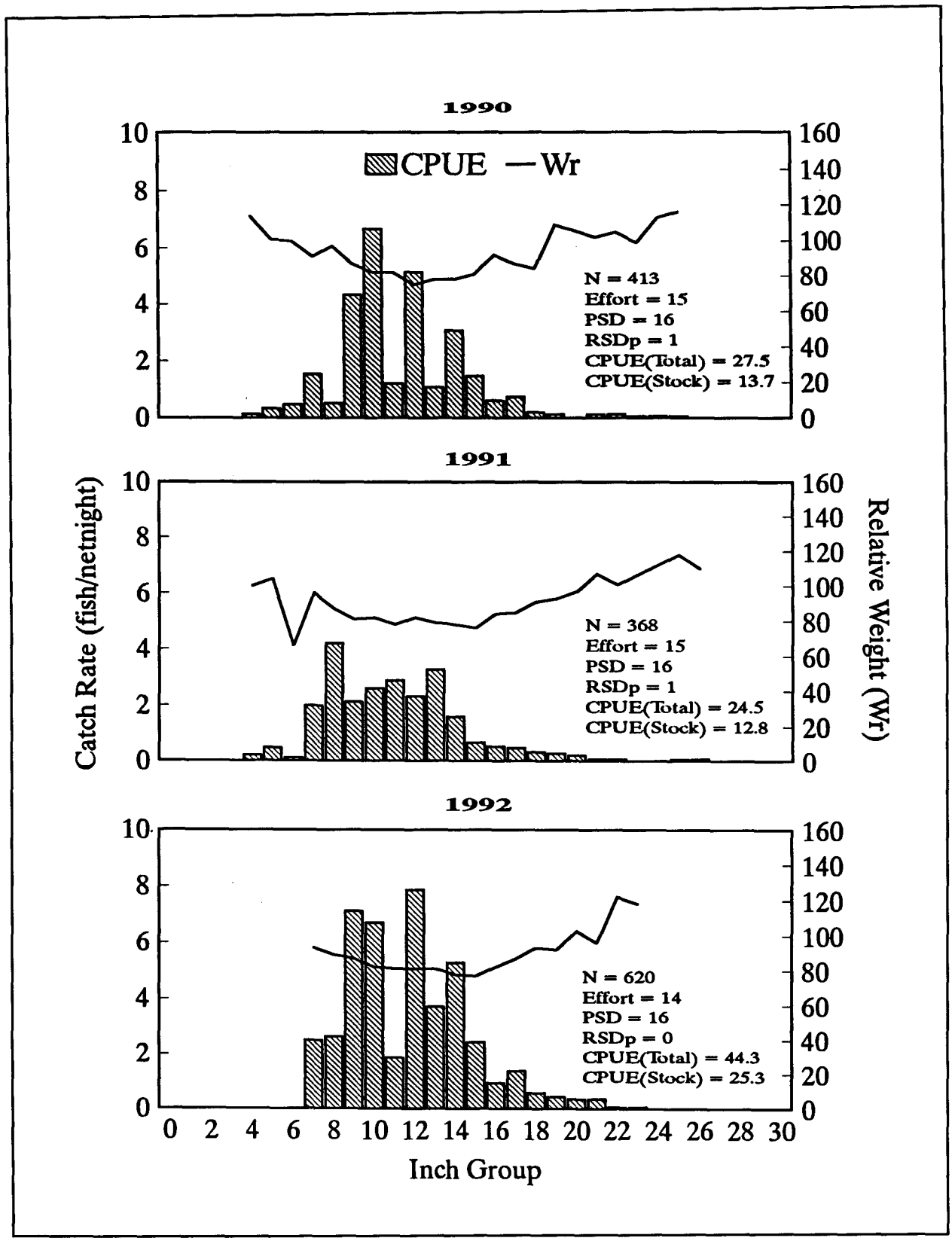


Figure 3. Catch per net night (CPUE) and relative weight (Wr) of channel catfish collected by gill netting, Lake Conroe, Texas, spring 1987-1993 (Sheet 1 of 3)



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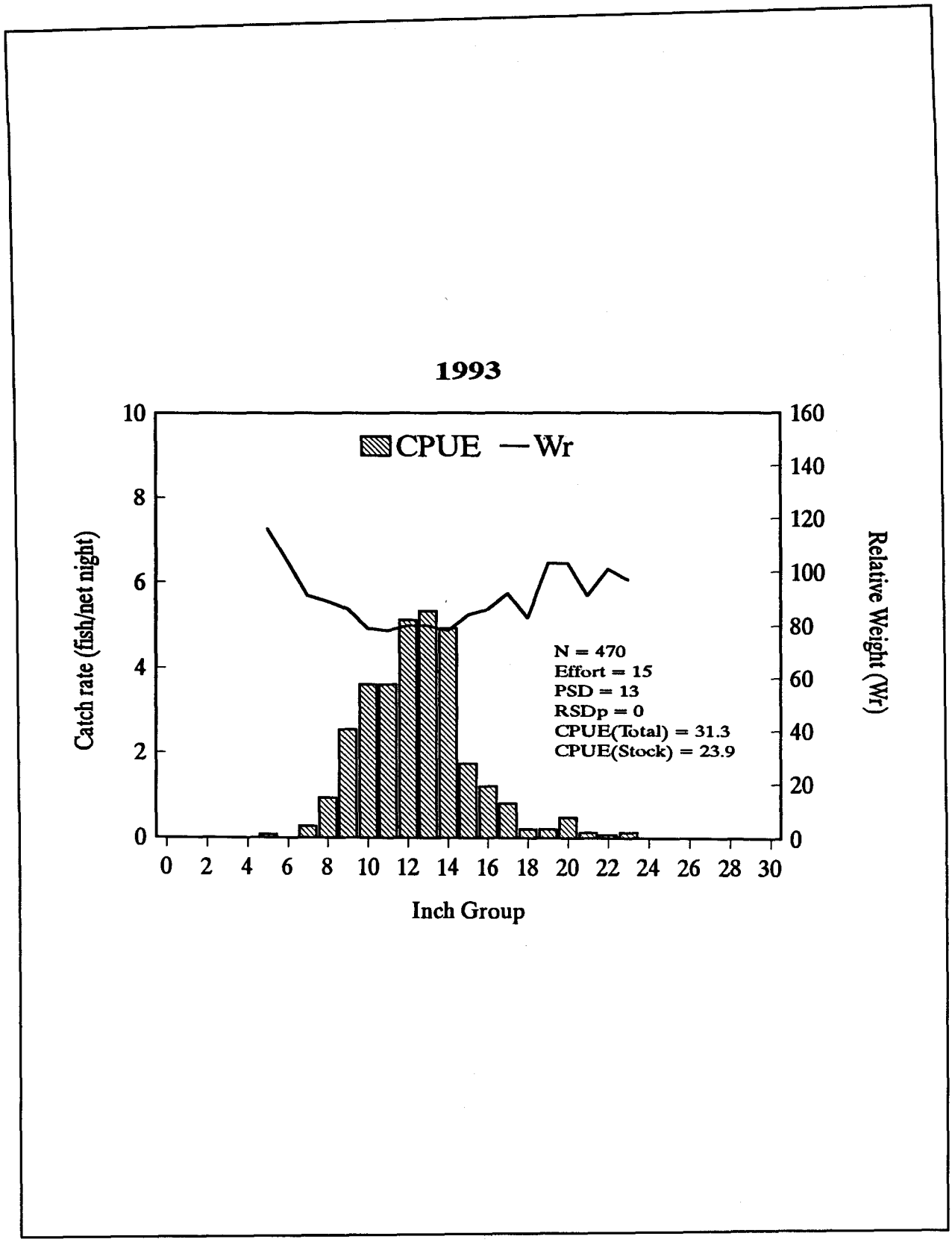

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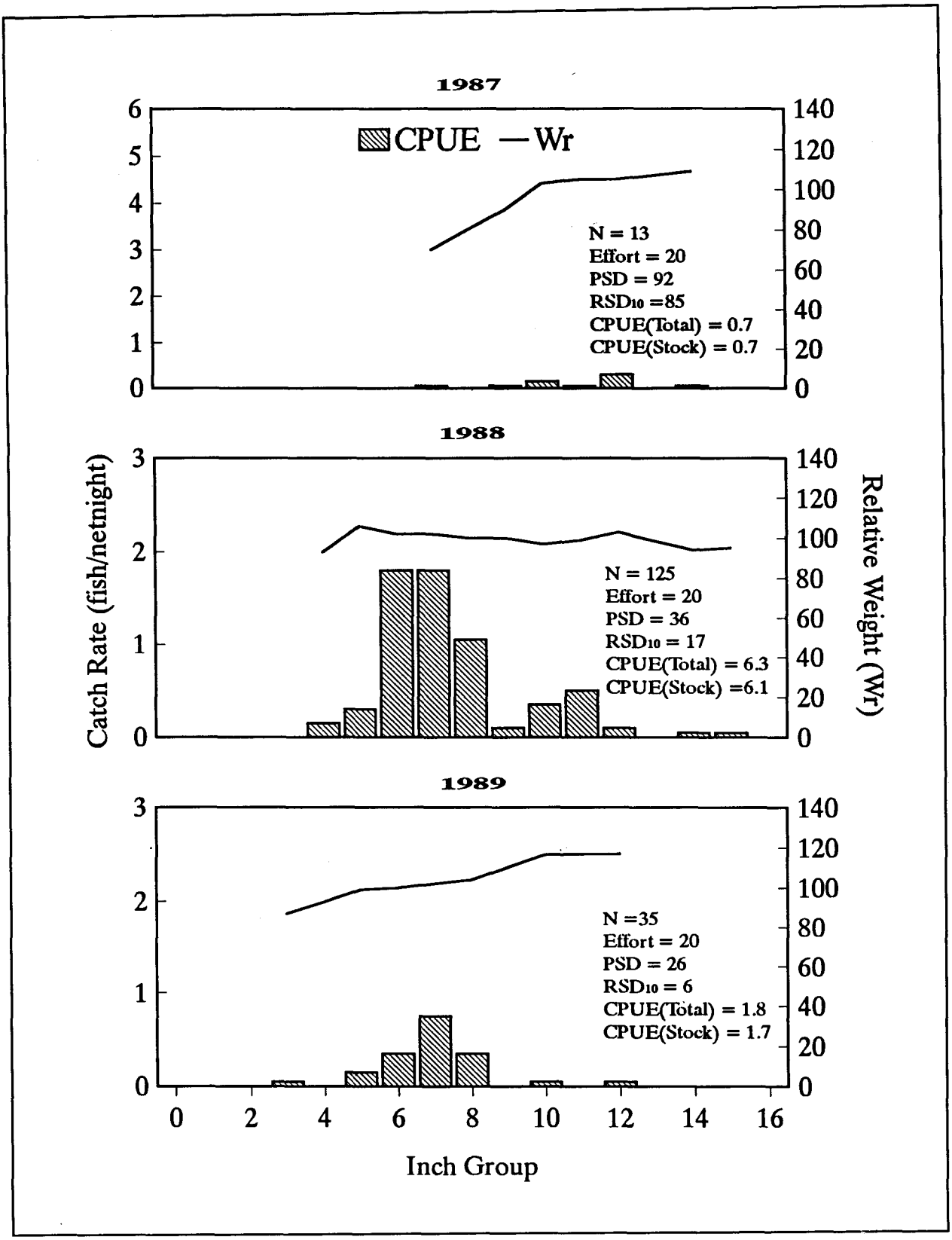
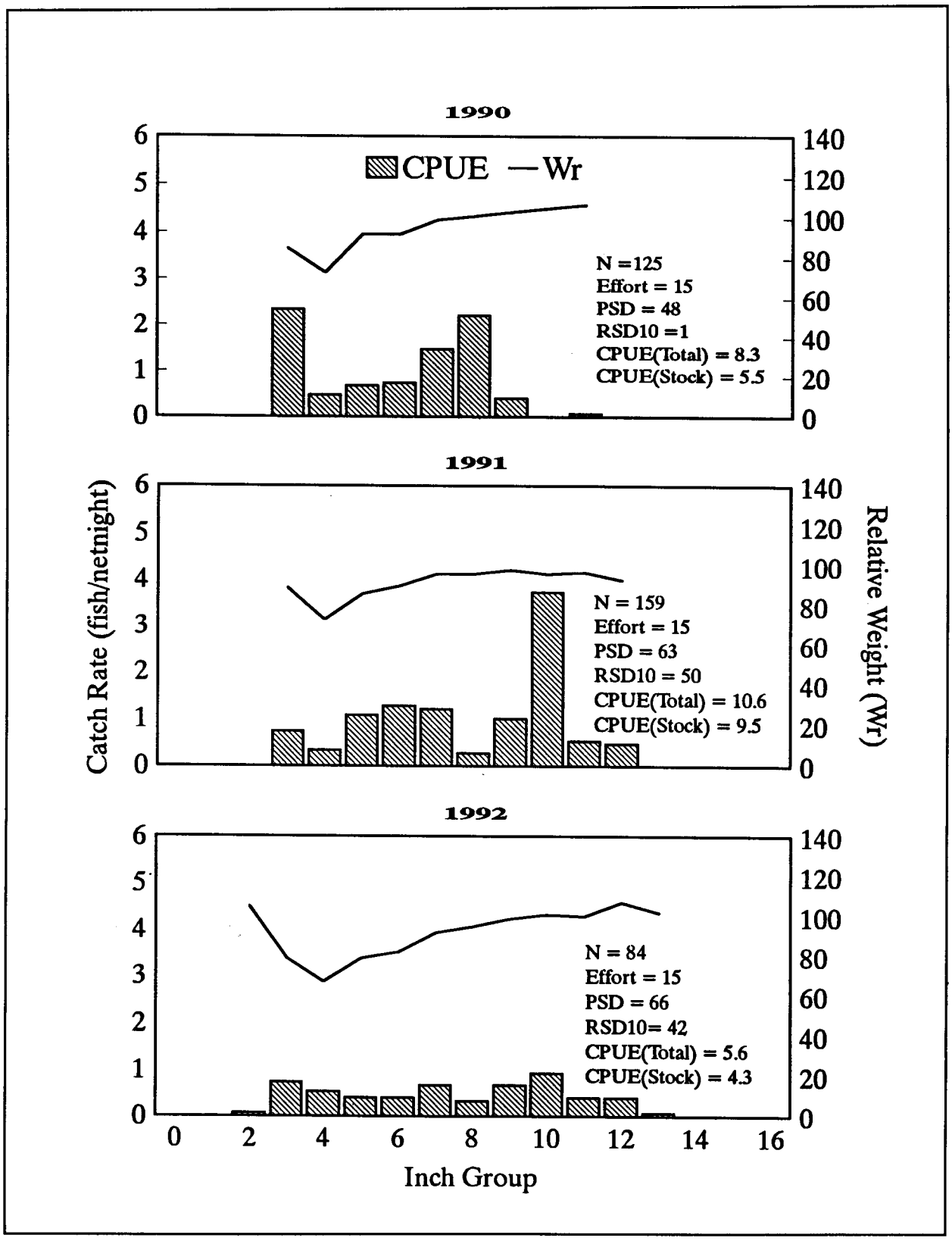


Figure 4. Catch per net night (CPUE) and relative weight (Wr) of white crappie collected by frame netting, Lake Conroe, Texas, fall 1987-1993 (Sheet 1 of 3)



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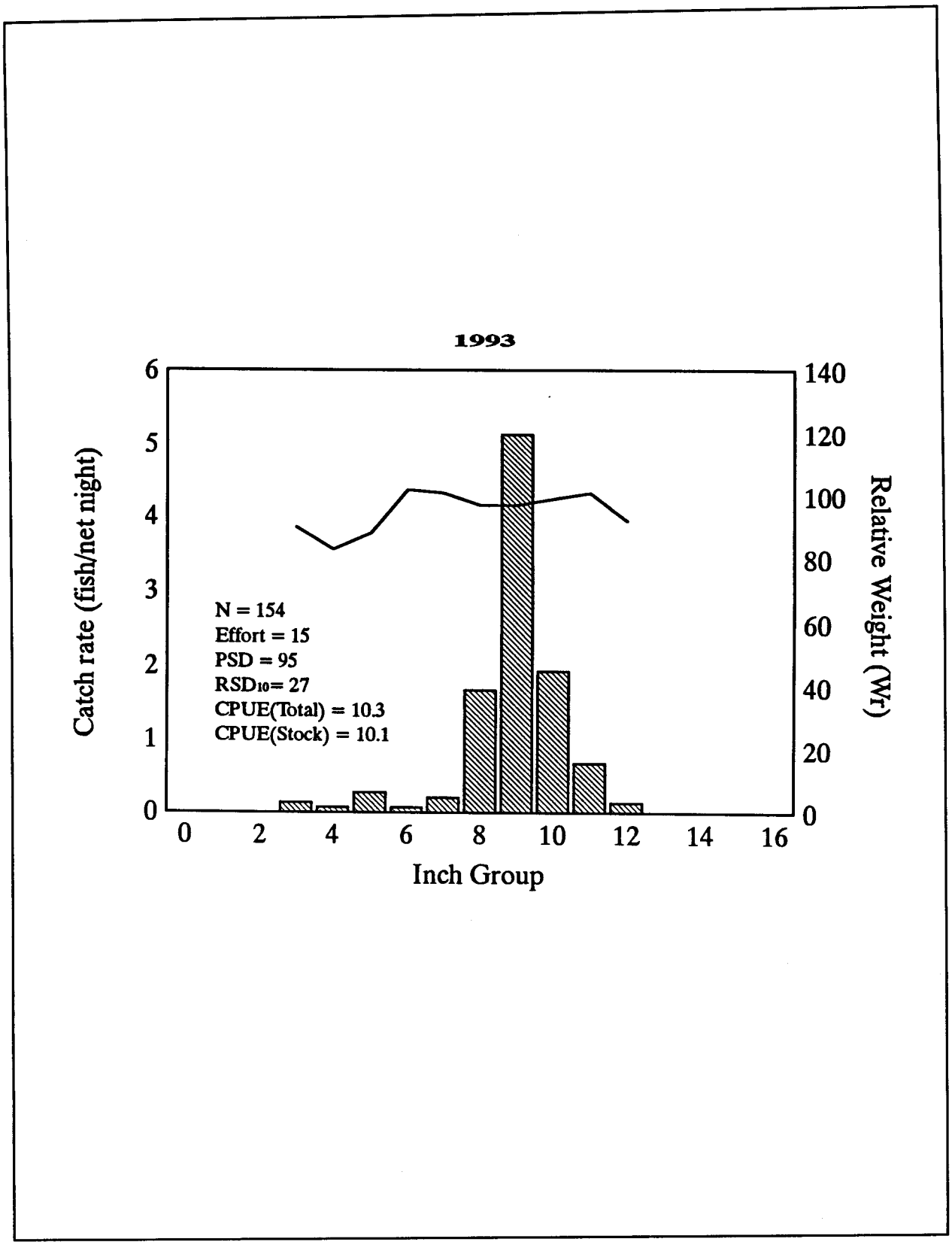

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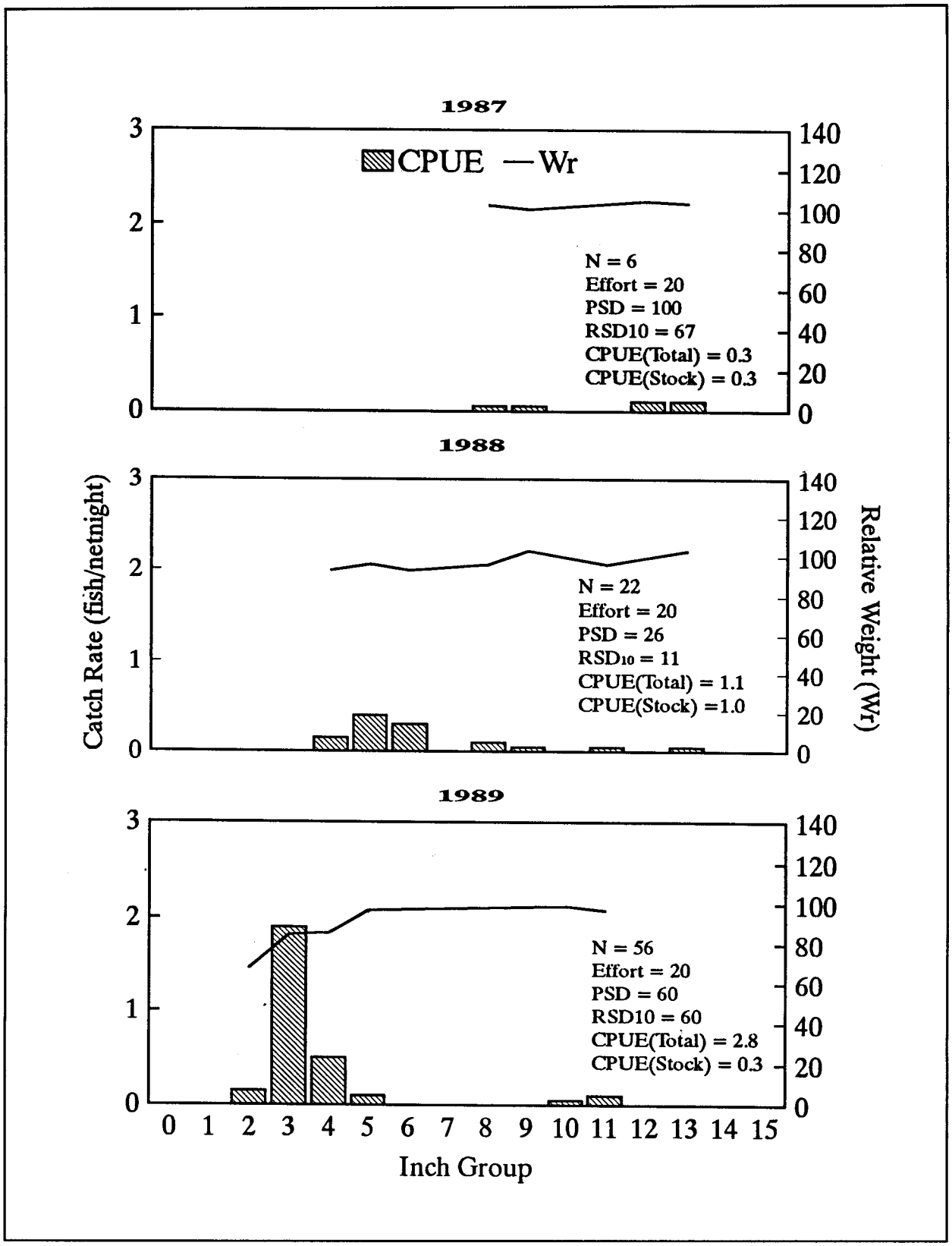
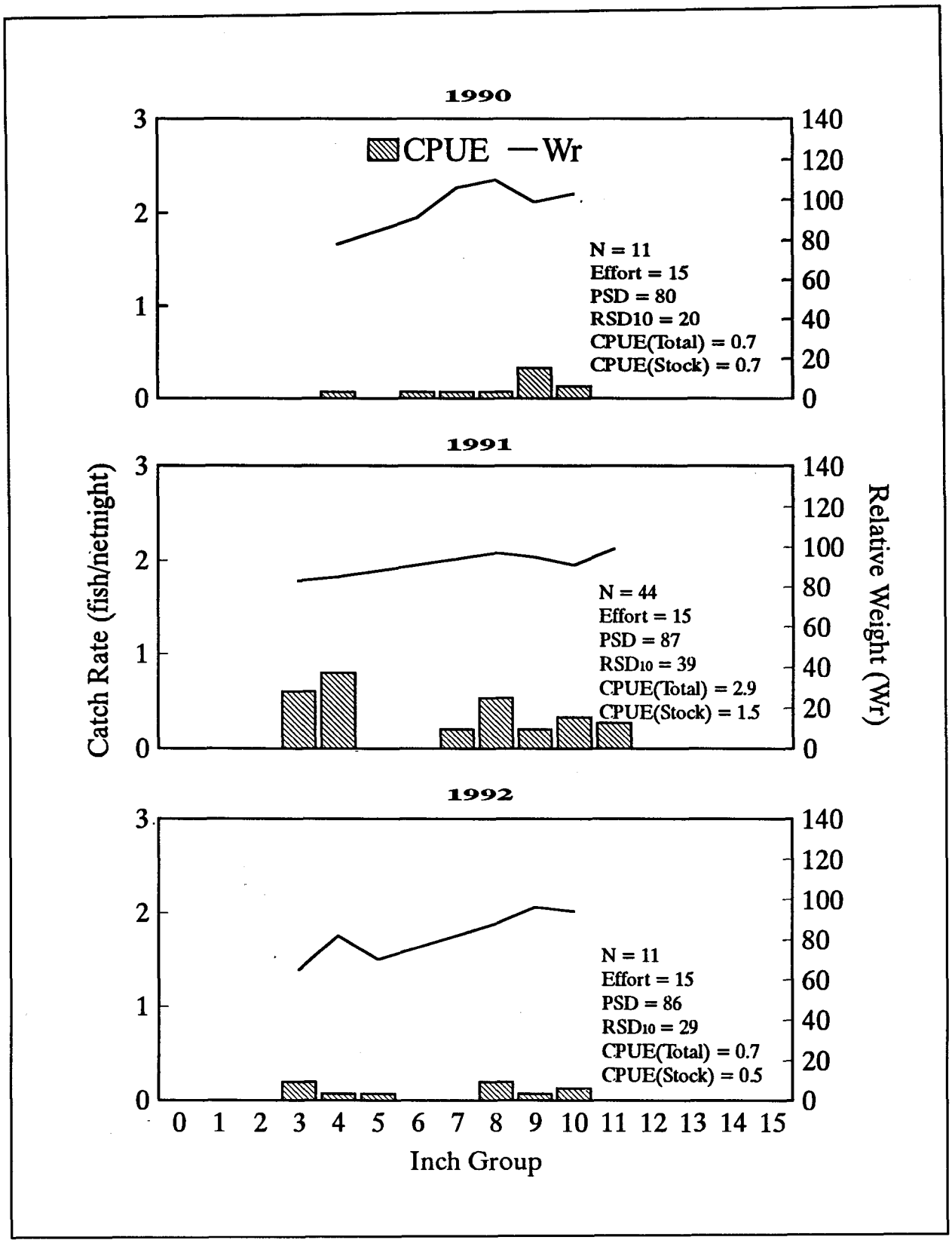


Figure 5. Catch per net night (CPUE) and relative weight (Wr) of black crappie collected by frame netting, Lake Conroe, Texas, fall 1987-1993 (Sheet 1 of 3)



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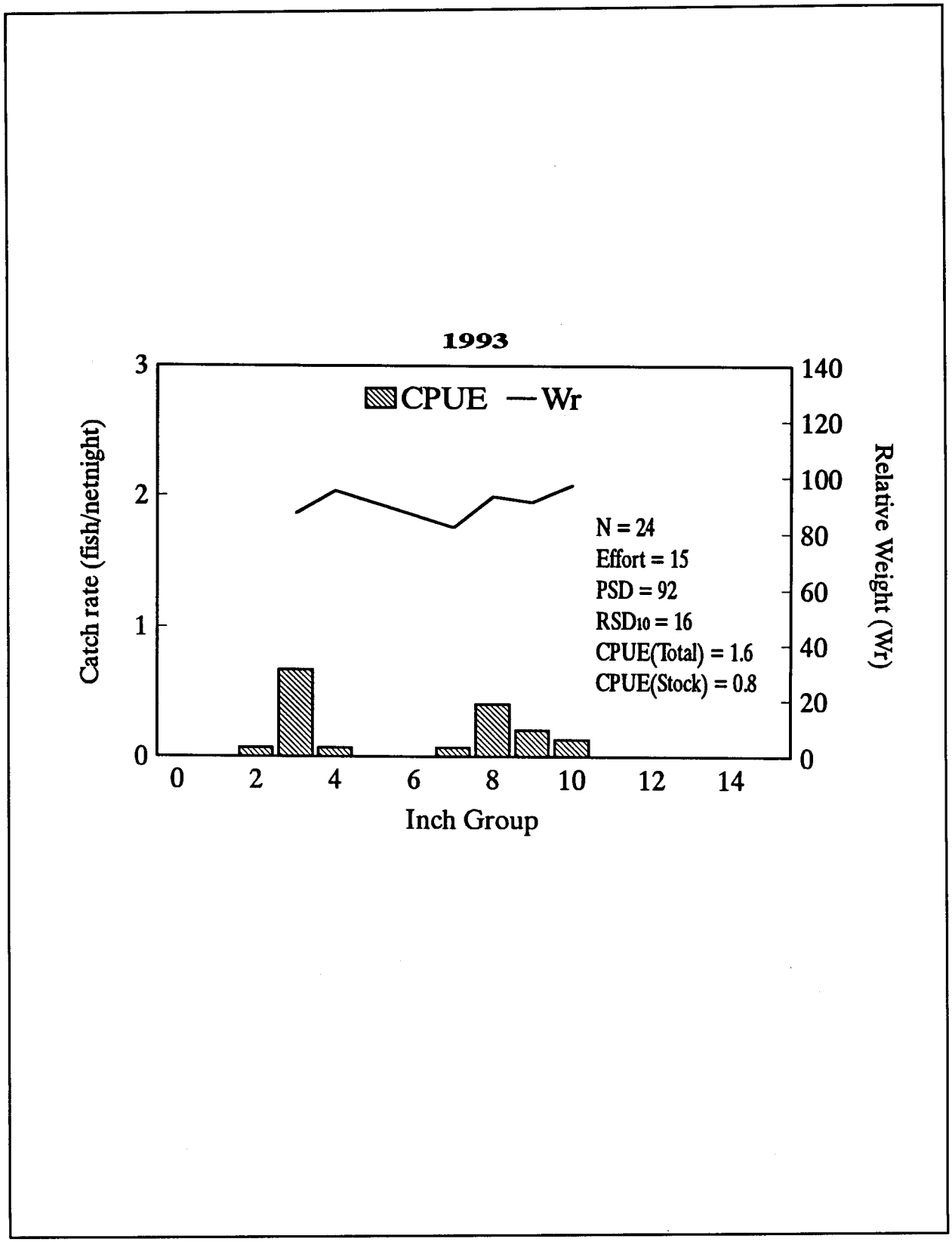

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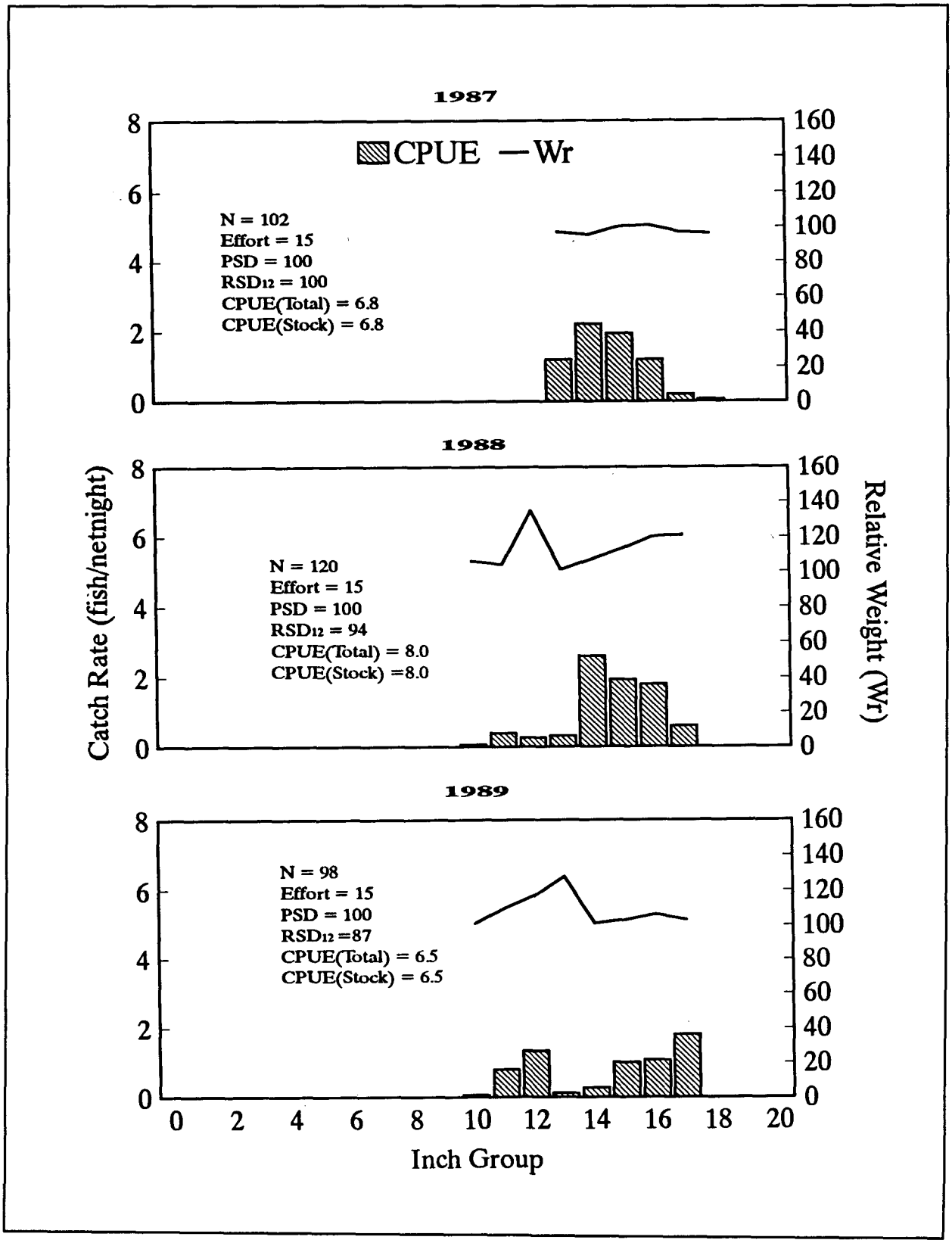
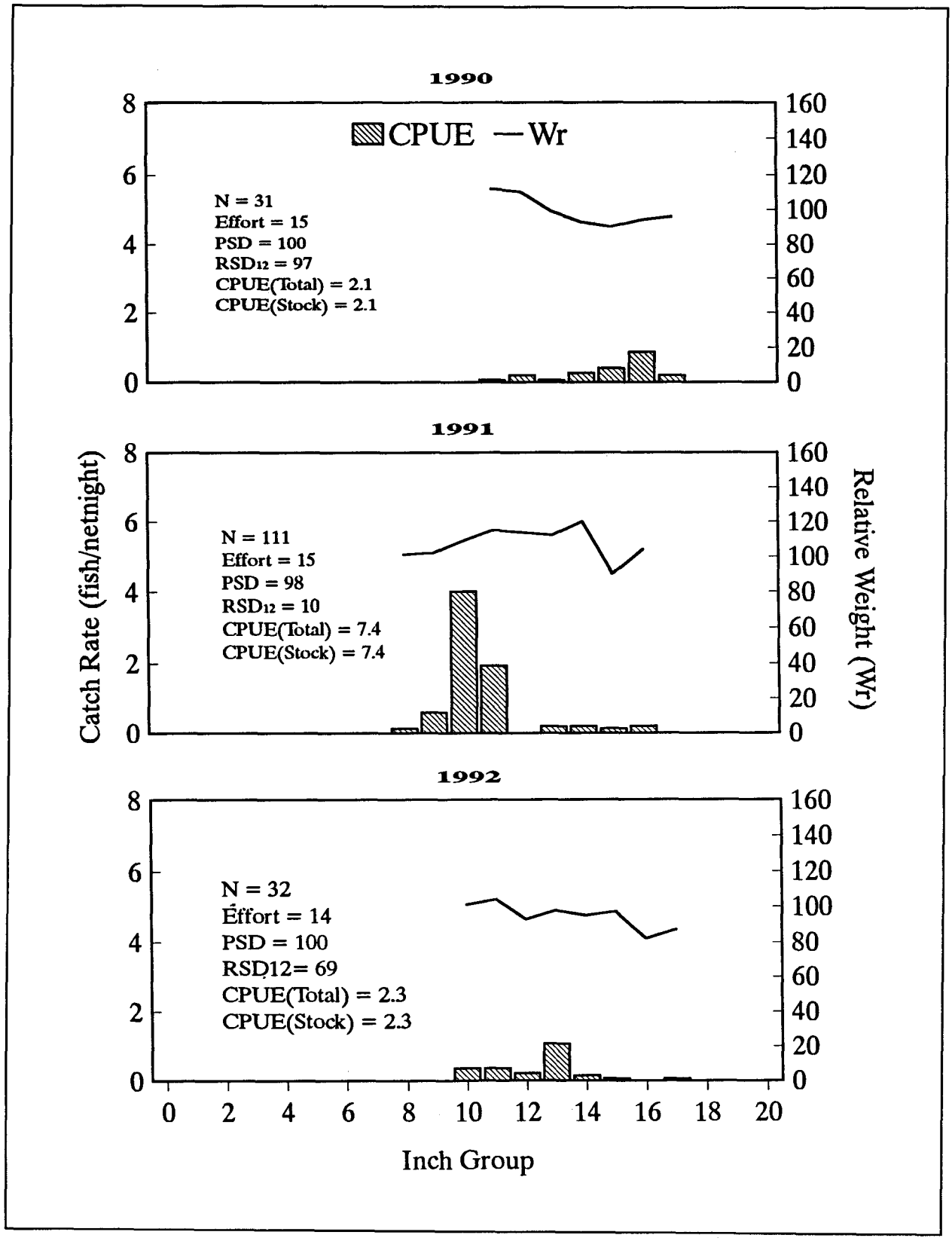


Figure 6. Catch per net night (CPUE) and relative weight (Wr) of white bass collected by gill netting, Lake Conroe, Texas, spring 1987-1993 (Sheet 1 of 3)



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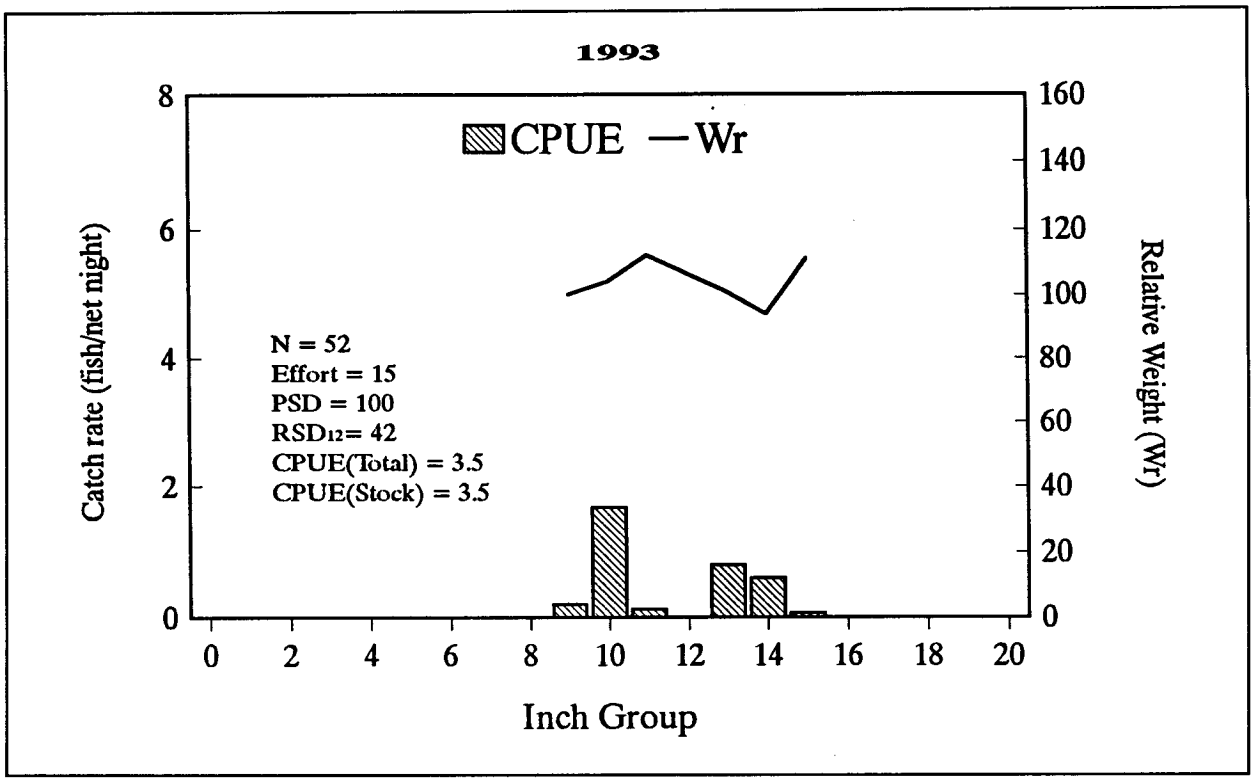

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Discussion

The effects of macrophyte removal on the Lake Conroe fisheries remain controversial. Whether fishing at Lake Conroe is better or worse than it was at the peak of macrophyte coverage is largely a matter of opinion. What is certain is that Lake Conroe is a high profile fishery near a major metropolitan area and that it is managed using every available tool. The Lake Conroe fisheries are still in a state of flux as productivity changes, species expand and decline, shoreline structure is altered by development, and management activities such as length limits and stockings take effect. The population information presented in this manuscript reflects all these factors and cannot be evaluated simply in terms of the effects of macrophyte loss.

References

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