# EVALUATION OF STOCKING SUB-ADULT CHANNEL CATFISH INTO TWO WEST TEXAS RESERVOIRS

by

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## ABSTRACT

Two strains (Imperial=ICC and Wild=WCC) of sub-adult (150-280 mm TL) channel catfish *Ictalurus punctatus* were marked and stocked in two West Texas reservoirs to evaluate their growth, survival, and relative contribution to the channel catfish populations. Mean length of stocked fish from stocking (in November 1998) to the spring gill net surveys in 1999 significantly increased in both reservoirs, but mean length of marked channel catfish did not significantly increase in either reservoir from 1999 to 2000. Growth of marked channel catfish at Hords Creek Reservoir significantly improved in 2001 and 2002. The number of marked fish caught from gill nets in spring of 2000, compared to spring of 1999, dropped by 90% at Abilene Reservoir and by 79% at Hords Creek Reservoir, indicating low survival. In the size range of fish from which stocked fish were collected in the first spring following stocking, marked fish represented 39% and 78% of the fish from Abilene Reservoir and Hords Creek Reservoir, respectively. Contribution of marked fish dropped to 27% and 36% of the fish from Abilene Reservoir and Hords Creek Reservoir, respectively, by the second spring following stocking. Stocking sub-adult channel catfish in larger (> 200 ha) West Texas reservoirs without significant justification of adequate environmental conditions is not recommended. There was no evidence that ICC would outperform WCC under typical West Texas reservoir conditions.

## INTRODUCTION

Channel catfish *Ictalurus punctatus* population characteristics in many West Texas reservoirs are well below levels ordinarily required to provide quality fisheries. Results from general monitoring surveys of West Texas reservoirs indicate slow growth rates and/or small relative abundance of channel catfish; they typically reach 305 mm total length (TL) between 5 and 7 years of age and gill net catch rates exceeding 5 fish/net-night are uncommon. Gill net catch of larger channel catfish (≥407 mm TL) is often low, possibly because of excessive exploitation and slow growth.

Stocking sub-adult (150-280 mm TL) channel catfish has been a management technique commonly used in small impoundments to supplement poor channel catfish populations (Storck and Newman 1988; Santucci et al. 1994; Shaner et al. 1996; Howell and Betsill 1999; Odenkirk 2003). One important benefit of stocking sub-adult fish should be improved survival over stocking fingerling (<150 mm TL) channel catfish (Storck and Newman 1988; Santucci et al. 1994; Shaner et al. 1996; Howell and Betsill 1999; Odenkirk 2003). All of the above evaluations were conducted on reservoirs much smaller than 200 ha. No literature could be found that evaluated stocking of sub-adult channel catfish into larger impoundments.

Studies conducted under hatchery conditions indicated the Imperial strain of channel catfish (ICC) have faster growth characteristics and better food conversion rates than wild strain channel catfish (WCC) (J. Isaac, Jr., Texas Parks and Wildlife Department, pers. commun.). Therefore, stocking ICC may have some positive impacts in larger reservoirs for channel catfish populations with slow-growing or limited-recruitment characteristics.

The objectives of this study were to determine survival and growth of stocked channel catfish, both ICC and WCC, and determine the relative contribution of these fish to the channel catfish populations in two West Texas reservoirs, each greater than 200 ha.

## METHODS

Study impoundments were Abilene Reservoir (259 ha) and Hords Creek Reservoir (206 ha). These reservoirs were chosen to represent opposite extremes in growth and size structure from Abilene-area reservoirs.

Abilene Reservoir was impounded in 1921 on Elm Creek, a tributary of the Brazos River. It is shallow and very turbid with limited rocky habitat and moderate brushy cover. During the study period, water levels at Abilene Reservoir dropped from 3.6 to 6.1 m below conservation pool. The channel catfish population prior to stocking consisted mostly of small, stunted fish with low to moderate relative abundance (gill net catch rates ranged from 2.4 to 9.0 fish/net night from surveys in 1989, 1993, and 1996; fish reached 305 mm by age 7-9) (Dumont and Munger 1997).

Hords Creek Reservoir was impounded in 1948 on Hords Creek, a tributary of the Colorado River. Hords Creek Reservoir had variable water clarity, ranging from 30 to 120 cm, and habitat consisted of significant rocky areas and brushy cover. During the study period, water

levels fluctuated between 2.1 and 4.7 m below conservation pool. The channel catfish population prior to stocking had low relative abundance (gill net catch rates ranged from 1.8 to 4.0 fish/net night from surveys in 1992, 1995, and 1998), good growth (fish reached 305 mm by age 3-5), and good size structure (Jons and Dumont 1999).

Each reservoir was stocked with WCC, obtained from broodfish collected from Texas' public waters and spawned at Texas Parks and Wildlife Department (TPWD) hatcheries, and ICC, a domestic stock originating from the Imperial Valley, California, obtained from the U.S. Fish and Wildlife Service, and spawned at TPWD hatcheries. A few days prior to stocking all fish were marked at the hatchery by complete adipose fin removal. Fish were stocked in November 1998, and mean size and number of stocked fish ranged from 207-250 mm TL and 72-112/ha, respectively (Table 1).

Experimental monofilament gill nets, as described by Dumont and Schlechte (2004), were used to collect channel catfish. Surveys were conducted in early spring (March/April) and late spring (May/June) in 1999 and 2000 in Abilene Reservoir and from 1999 to 2002 in Hords Creek Reservoir. Gill net effort consisted of 15 net nights for each time frame in each reservoir for a total of 30 net nights in 1999 and 2000. Effort was 29 net nights in 2001 at Hords Creek Reservoir and 15 net nights in 2002 (late spring only). Nets were set at fixed, subjectively-selected locations in each reservoir.

All channel catfish were measured to the nearest millimeter, checked for an adipose fin clip, and pectoral spines were removed from 10 fish per 25-mm length group to determine age in 1999 and 2000. A 10-15-mm barbel section was removed from each marked fish, stored in 70% ethyl alcohol, and analyzed with micro-satellite DNA (mDNA) analyses to differentiate ICC from WCC (Pritchard et al. 2000).

Relative contribution of stocked fish was calculated as the number of all collected age-1 and age-2 fish that were marked (stocked) divided by the total number of collected fish in the same size range. Mean lengths were determined for ICC, WCC, and all marked fish combined in 1999 at both reservoirs, all marked fish combined in 2000 at both reservoirs, and for all marked fish combined in 2001 and 2002 at Hords Creek Reservoir. Differences in annual growth were tested by comparing length of marked fish from one year to length of marked fish collected the previous year with a nonparametric permutation test (resampling without replacement; 10,000 simulations of observed data) executed with Resampling Stats in Excel, Version 2. Significance level was $P < 0.05$. Survival of stocked fish was indirectly determined by calculating the change in catch rate from one year to the next. These measures were chosen to evaluate the objective components of contribution, growth, and survival of stocked fish because the data set was very limited, particularly beyond the first year.

## RESULTS

*Abilene Reservoir*

One hundred and nine marked catfish were collected in 1999 from Abilene Reservoir, representing 100% of the age-1 fish collected; they ranged from 165 to 320 mm TL (Fig. 1). Of

all the 153-330-mm fish collected from gill nets in 1999, 39% were stocked. These marked fish consisted of 40 WCC, 53 ICC, and 16 genetically unidentifiable fish. The mean TL of ICC at time of capture was 267.8 mm, compared to 242.9 mm at stocking ($P < 0.001$). The mean TL of WCC at time of capture was 242.7 mm, compared to 207.0 mm at stocking ($P < 0.001$). The growth increment from stocking to the first spring was significantly higher for WCC (35.7 mm) than for ICC (24.9 mm). The mean TL of all stocked fish at the first spring was 252.9 mm, compared to 227.5 mm at stocking ($P < 0.001$).

Catch of marked fish in gill nets dropped from 109 fish in 1999 to only 11 fish in 2000, a 90% decrease. Of the 11 fish collected, six were WCC, two were ICC, and three were unidentifiable. Ninety two percent of the age-2 fish collected were stocked fish, and 27% of the 204-330-mm channel catfish from the 2000 survey were stocked fish. The mean TL of marked fish was 255.5 mm, only a 2.6-mm increase from 1999 ($P = 0.41$).

*Hords Creek Reservoir*

Fifty-three marked catfish were collected in 1999, representing 98% of the age-1 fish. They ranged in TL from 174 to 337 mm (Fig. 2). Of all the 153-355-mm fish collected from gill nets in 1999, 78% were stocked. Marked fish consisted of 17 WCC, 19 ICC, and 17 genetically unidentifiable fish. The mean TL of ICC at time of capture was 261.7 mm, compared to 250.2 mm at stocking ($P = 0.05$). The mean TL of WCC at time of capture was 239.9 mm, compared to 209.5 mm at stocking ($P < 0.001$). The growth increment from stocking to the first spring was significantly higher for WCC (30.4 mm) than for ICC (11.5 mm). The mean TL of all stocked fish at time of capture was 250.7 mm, compared to 229.8 mm at stocking ($P < 0.001$).

Catch of marked fish in gill nets dropped from 53 fish in 1999 to 11 fish in 2000, and six fish each year in 2001 and 2002. This was a 79% decrease in catch from 1999 to 2000 and an 89% decrease from 1999 to 2001. Of the 23 fish collected in 2000 to 2002, 14 were WCC, four were ICC, and five were unidentifiable; 78% of the genetically known fish were WCC. Fifty six percent of the age-2 fish collected in 2000 were stocked fish. In the TL range from which marked fish were collected, 36, 32, and 50% of all channel catfish from 2000, 2001, and 2002 gill net surveys, respectively, were stocked fish. Mean TL of all marked fish did not significantly change from 1999 to 2000 ($P = 0.06$). Mean TL of all marked fish from 2000 to 2001 and from 2001 to 2002 increased significantly ($P < 0.004$).

## DISCUSSION

Stocked sub-adult channel catfish were significant contributors to the channel catfish population the first spring following November stockings in both reservoirs. Of the fish that could be genetically identified, ICC catch rate and mean TL were slightly higher than those of WCC that first spring in both reservoirs. This was not unexpected because more ICC were stocked and they were larger than WCC at stocking.

I theorized that ICC, being larger at stocking, would have a more persistent impact on the channel catfish populations. However, I did not find this to be the case in either reservoir. In fact, by the second spring in both reservoirs, and through 2002 at Hords Creek Reservoir, WCC catch rate was higher than the ICC catch rate. In addition, WCC appeared to respond better than ICC in the initial months following the stocking event despite being smaller at the time of stocking. Both strains, however, had very large declines in relative abundance from the first spring to the second spring, indicating a high mortality rate.

I believe this mortality was not from angler harvest at Abilene Reservoir, as angler effort and harvest was nearly nonexistent. Instead, the mortality at Abilene Reservoir likely resulted from poor environmental conditions as the reservoir lost significant water from 1999 to 2000. By spring of 2001 very little water remained in Abilene Reservoir, and it was renovated that August. At the time of renovation, no marked channel catfish were collected. In fact, very few channel catfish were observed at all.

At Hords Creek Reservoir, mortality from 1999 to 2000 was slightly less than at Abilene Reservoir, but it was still quite high. Although the source of mortality was unknown, anecdotal evidence indicated that there was a high amount of fishing harvest on stocked fish. The persistence of stocked channel catfish throughout the study period, 4.5 years after stocking, indicated that neither harvest or environmental conditions were severe enough to prevent these fish from contributing to the channel catfish population.

In both reservoirs, growth of stocked channel catfish was poor in their first 2 years, and most fish still had not reached legal length (305 mm TL). At Hords Creek Reservoir, as channel catfish approached 300 mm, in their third year following stocking, growth improved greatly. Similar growth patterns have been observed for many channel catfish populations in West Texas. It is likely that many of these reservoirs lack the invertebrate abundance or diversity to allow fast growth of smaller channel catfish. As they reach a larger size, their diet becomes more diverse with increased utilization of forage fish and, as a result, growth rates tend to improve.

Stocked fish made up 98% and 100% of the age-1 fish at Hords Creek Reservoir and Abilene Reservoir, respectively, in 1999. However, this is not a true indicator of the relative year class strength between native and stocked fish. As noted earlier, growth of channel catfish in West Texas is typically poor; it is rare for a channel catfish over 160 mm to be as young as 1 or even 2 years old. In addition, channel catfish typically do not recruit to gill nets unless they are >160 mm and, combined with slow growth, I would not expect to see very many age-1 fish in samples. By the second year, more native 2-year-old fish were collected at Hords Creek Reservoir, as stocked fish made up only 56% of that year class, compared to 98% the year before. Even 56% was likely an inflated value because there was a relatively high probability that not all native age-2 fish had yet recruited to the gill nets, whereas all stocked fish had recruited. Although some channel catfish, mostly WCC, continued to contribute to the channel catfish population at Hords Creek Reservoir 4 years after stocking, overall channel catfish abundance remained low, indicating that environmental conditions were not favorable at either reservoir, regardless of whether fish were stocked or were native to the reservoir. More favorable conditions with relatively stable and constant water levels may result in greater success of stocked sub-adult channel catfish in reservoirs of this size. The bitter, harsh reality of long-

term declining water levels in West Texas was reflected by the results of this study. It would be difficult to recommend stocking sub-adult fish in larger West Texas reservoirs without significant justification of adequate environmental conditions. There was no evidence that ICC would outperform WCC under typical West Texas reservoir conditions.

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Table 1. Summary of total length (TL) data for Imperial strain channel catfish (ICC) and wild strain channel catfish (WCC) from initial stocking (November, 1998) and subsequent gill net surveys at two West Texas Reservoirs. Standard errors are in parentheses. Combined represents both ICC and WCC, as well as any other channel catfish with an adipose fin clip, but which were unable to be genetically identified as ICC or WCC.

| | Abilene | | | Hords Creek | | |
|---|---|---|---|---|---|---|
| Variable | ICC | WCC | Combined | ICC | WCC | Combined |
| Mean TL at stocking | 243(3) | 207(3) | 227(2) | 250(3) | 209(3) | 230(2) |
| Stocking rate (*N*/ha) | 112 | 72 | 184 | 109 | 90 | 199 |
| Mean TL spring 1999 | 268(4) | 243(3) | 253(3) | 262(8) | 240(7) | 251(5) |
| *N* | 53 | 40 | 109 | 19 | 17 | 53 |
| Mean TL spring 2000 | | | 256(10) | | | 268(7) |
| *N* | 2 | 6 | 11 | 3 | 7 | 11 |
| Mean TL spring 2001 | | | | | | 320(12) |
| *N* | | | | 0 | 5 | 6 |
| Mean TL spring 2002 | | | | | | 389(14) |
| *N* | | | | 1 | 2 | 6 |

Figure 1. Catch per unit effort (CPUE; fish/net night) of native and stocked (wild strain, Imperial strain, and unknown genetic strain) channel catfish collected from spring gill nets, Abilene Reservoir. Length is represented by 25.4-mm groups, rounding up to the next mm.

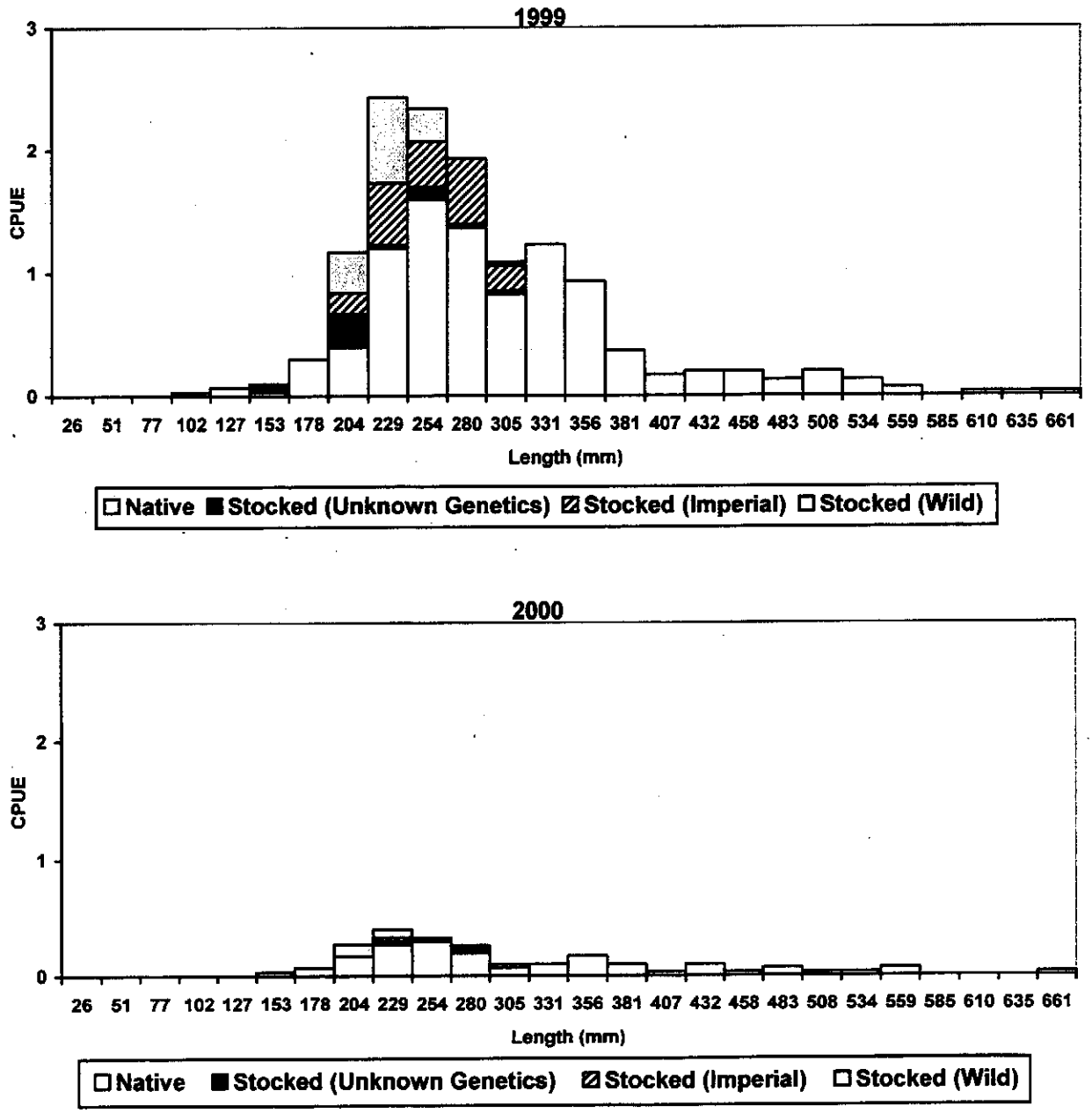

Figure 2. Catch per unit effort (CPUE; fish/net night) of native and stocked (wild strain, Imperial strain, and unknown genetic strain) channel catfish collected from spring gill nets, Hords Creek Reservoir. Length is represented by 25.4-mm groups, rounding up to the next mm.