Evaluation Of Minimum Stone Crab Claw Length Regulations In Texas

by Paul C. Hammerschmidt

Management Data Series Number 135
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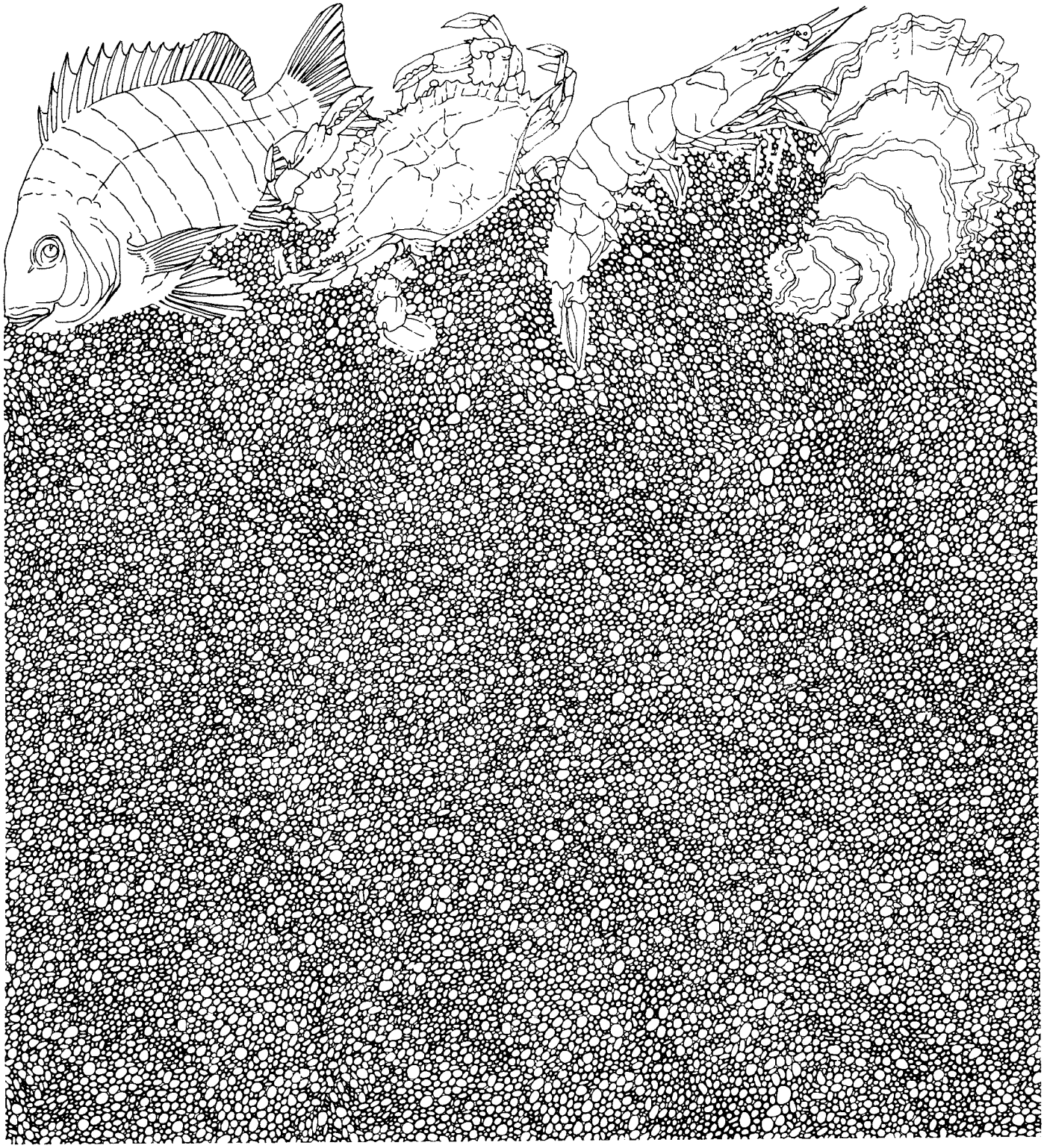

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ABSTRACT

This study indicated that a minimum claw length of 64 mm rather than 70 mm would increase the number of Texas stone crab claws available for legal harvest by 16.3%. Stone crabs were collected during Texas Parks and Wildlife Department routine gill net sampling in the spring and fall of 1983 and 1984. Carapace widths of these crabs were applied to carapace width/claw length regression equations derived for stone crabs in Mississippi. Comparisons of percent occurrence were made by sex and claw type based on claw size limits of 64 mm and 70 mm. This study was conducted in response to concerns voiced at public hearings that a 70-mm claw size limit would be too restrictive for the developing Texas stone crab fishery.

ACKNOWLEDGEMENTS

I would like to thank the members each of Coastal Fisheries resource monitoring team who collected the data. Thanks also go to Larry McEachron, C.E. Bryan and Gary E. Saul for encouraging this study. I also appreciate the review of the manuscript provided by the above persons as well as Gary Matlock, Jerry Clark, Tom Heffernan, Lynn Benefield, Hal Osburn, and Jeff Doerzbacher. Special thanks go to Dr. Gary C. Matlock whose foresight and guidance made this study possible.

INTRODUCTION

The stone crab (Menippe adina) is harvested commercially in Texas. But the harvest has been virtually unregulated. Until 1984 the majority of stone crabs landed were mixed with, and reported as blue crabs (Callinectes sapidus) (Texas Parks and Wildlife Department, unpublished data) despite regulations requiring each species to be reported separately (State of Texas 1981). Since 1984, reported stone crab landings have increased annually from 6,800 to 69,700 kg (Osburn et al. 1987).

The increase in landings prompted the Texas Parks and Wildlife Commission (TPWC) in 1986 to propose harvest regulations to protect the resource while encouraging further development of the fishery. Public hearings were held during spring 1986 to obtain public input on the proposed regulations.

The Texas Parks and Wildlife Department (TPWD) staff had recommended that only one claw be removed per crab and that the minimum claw length be 70 mm. The one claw/crab limit was proposed for two reasons. First, stone crab bodies have little market value and the animal can regenerate a new claw if it is removed properly and the body immediately returned to the water (Davis et al. 1978). Second, laboratory studies indicate that as many as 47% of declawed stone crabs will die when two claws are removed while only 28% will die when one claw is removed (Davis et al. 1978). The 70-mm size limit was recommended based on a law in Florida which was set to ensure that crabs would be two years old and have potentially spawned once before they entered the fishery (Gulf of Mexico Fishery Management Council 1979).

Concern was expressed during state-wide public hearings in Texas, however, that the 70-mm size limit would be too restrictive for the developing Texas fishery. It was argued that the proposed minimum size was inappropriate because claws of Texas stone crabs were generally smaller than those of Florida stone crabs given a similar body size (carapace width).

Perry et al. (1983) found that carapace width/claw length regression equations, were significantly different between Mississippi crabs and Florida crabs by sex and for each claw type. Electrophoretic work indicated that crabs in Texas are similar to those in Mississippi (Bert 1986). In fact, stone crabs found in Texas and other states west of Apalachee Bay, Florida (formerly M. mercenaria), were renamed as the new species M. adina (Williams and Felder 1986).

TPWD conducted a study to evaluate the impact of two minimum claw length limits, 64 mm and 70 mm, on the potential harvest of numbers of stone crab claws in Texas. The TPWC subsequently implemented a 64-mm claw size limit on stone crabs in Texas based on the study. This paper reviews the findings of that study.

MATERIALS AND METHODS

Stone crabs (Figure 1) were collected from eight Texas bay systems using

standard TPWD gill nets during routine sampling in spring and fall of 1983 and 1984. Descriptions of gill net sampling procedures may be found in Rice et al. 1987. All crabs were measured to the nearest 1 mm carapace width (CW). Numbers of crabs caught in several different nights of netting in each bay were combined. It was assumed that size distribution of stone crabs in TPWD gill nets was similar to that of stone crabs caught in commercial crab traps.

Claw length (Figure 2) was estimated for each crab using regression equations (Table 1) for M. adina developed from crabs in Mississippi (Perry et al. 1983). Claw lengths were estimated from carapace widths grouped in 5-mm increments by sex and claw type; right crusher (RC), left pincher (LP), left crusher (LC), and right pincher (RP).

The proportion of crabs with claws $\geq$ 64 mm and $\geq$ 70 mm was then estimated for each claw type by sex (Table 2). Total estimated percent occurrence was adjusted for a sex ratio of 1:2.1 (males to females) and a handedness ratio of 3:1 (RC to LC), based on data reported for M. adina in Mississippi by Perry et al. (1983).

Potential harvest (Table 3) was calculated assuming all crusher claws are larger than pincher claws (on the same crab) and that legal fishermen would take only the largest claw (crusher) from each crab. Claw length/claw weight relationships were not available therefore effect on harvest was based on numbers of crabs with legal size claws rather than claw weight.

RESULTS

Results of this study indicate that implementation of a 64-mm claw size limit would make at least 16.3% more crabs available to the legal harvest of one claw/crab than would a 70-mm limit (Table 3). Availability of male and female crabs would increase by about 11% and 19%, respectively. Numbers of crabs bearing two claws of legal size would increase from almost 23% to 41% (Table 3). The analysis was based upon carapace widths of 243 stone crabs ranging from 63-179 mm, with 75% of all crabs caught having CW > 89 mm (Figure 3).

DISCUSSION

This study was conducted in response to public concerns over the impact of proposed regulations on the harvest of stone crab claws. It resulted in the implementation of a claw size limit that would result in a potential increase in stone crabs available to the legal harvest of one claw/crab. It also, however, increased the potential for illegal harvest by doubling the number of crabs which will have two legal size claws. The law specifies the minimum size claw but not the claw type which may be taken (i.e. crusher, pincher, right, left). Therefore all legal-size claws are, in effect, available for potential harvest.

This analysis overestimates the impact of regulation changes on potential commercial harvest because it is based on the number of claws rather than the weight. Adopting a 64-mm size limit rather than a 70-mm size limit will increase the number of claws available for legal harvest, but the claws will be smaller. Therefore, the increase in harvest weight (the manner by which claws are sold) will be less that the increase in the number of claws harvested (that which is reported here).

Trends in Texas stone crab populations and landings should continue to be monitored to determine effects of harvesting practices on the fishery. Additional research would be required to develop regression equations for Texas stone crabs to determine if there are significant morphometric differences between Texas and Mississippi populations of M. adina. Research would also need to be conducted to determine whether the size distributions of stone crabs in the commercial harvest are similar to the findings of this study. Compliance by commercial fishermen with the present stone crab regulation which requires the removal of only one claw from each stone crab captured may be important to the survival of this fishery given the high mortality of captured stone crabs that will occur if all legal-size claws are removed.

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Table 1. Carapace width/claw length regression equations for stone crabs by claw type (Perry et al. 1983).

Sex	Regression Equation[a]
Male	RC = 22.432 + 1.127 CW
Female	RC = -4.359 + 0.802 CW
Male	LC = -22.783 + 1.100 CW
Female	LC = -0.908 + 0.752 CW
Male	RP = -12.210 + 0.822 CW
Female	RP = 4.196 + 0.561 CW
Male	LP = -12.916 + 0.855 CW
Female	LP = -3.155 + 0.658 CW

[a]RC=right crusher, LC=left crusher, RP=right pincher, LP=left pincher, CW=carapace width.

Table 2. Estimated percent occurrence of stone crabs with claws ≥64 mm and ≥70 mm by claw type, by sex, and by sexes combined.

Claw Type[a]	Males		Females		Both sexes[b]	
	≥64 mm	≥70 mm	≥64 mm	≥70 mm	≥64 mm	≥70 mm
RC	93.4	84.8	75.7	60.5	81.4	68.3
LP	60.5	45.7	34.6	15.2	43.0	25.0
LC	93.4	75.7	75.7	45.7	81.4	55.4
RP	60.5	34.6	24.3	7.0	36.0	15.9
R/L C	93.4	82.5	75.7	56.8	81.4	65.1
R/L P	60.5	42.9	32.2	13.2	41.2	22.7
Total Claws	77.0	62.1	53.9	35.0	61.3	43.9

[a]RC=right crusher, LP=left pincher, LC=left crusher, RP=right pincher, R/L C=right and left crusher, R/L P=right and left pincher.
[b]Sex ratio of 1:2.1 males to females.

Table 3. Estimated percent occurrence of stone crabs available to harvest by claw type, sex, sexes combined, and size limit (mm). This assumes that only legal size claws are taken.

Claw Type[a]	Claw Size Limits					
	Males		Females		Both Sexes[e]	
	≥64mm	≥70mm	≥64mm	≥70mm	≥64mm	≥70mm
C[b]	93.4	82.5	75.7	56.8	81.4	65.1
C & P[c]	60.5	42.9	32.2	13.2	41.2	22.7
C only[d]	32.9	39.6	43.5	43.6	40.2	42.4

[a]Left and right claws of same type combined.
[b]Crusher claws.
[c]Both crusher and pincher are legal size (assuming C always > P).
[d]Only crusher is legal size.
[e]Sex ratio=1:2.1 males to females.

Figure 1. Diagram of basic stone crab morphology (adapted from Bert et al. 1978).

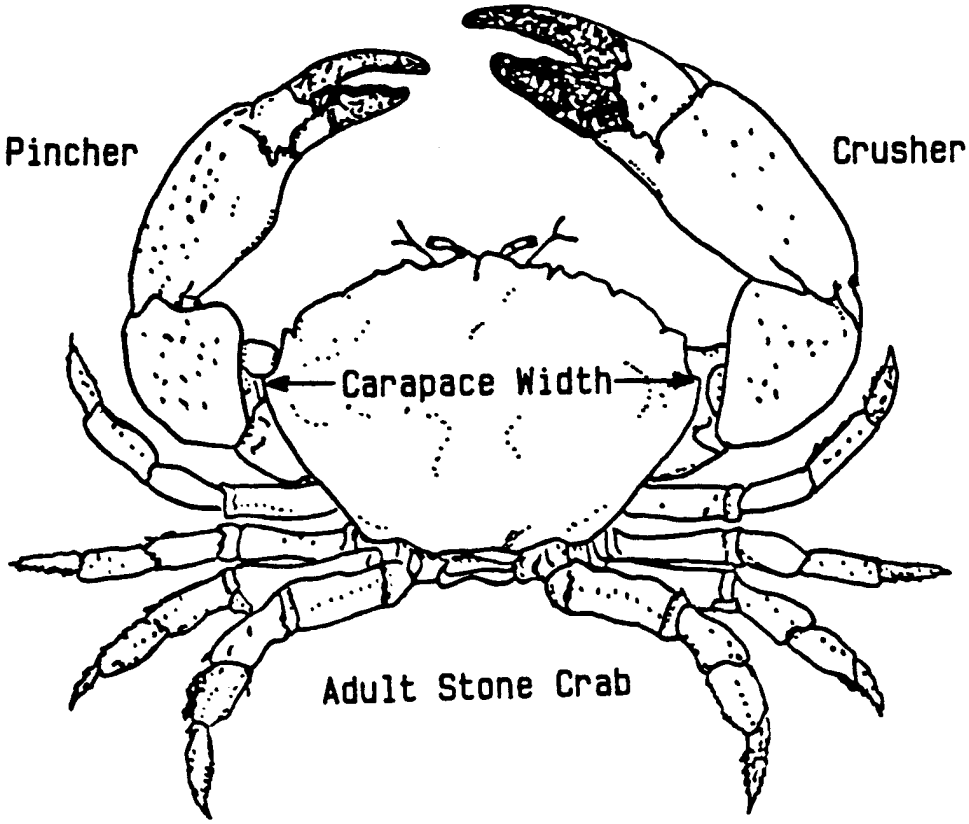

Pincher
Crusher
Carapace Width
Adult Stone Crab

Figure 2. Diagram of stone crab claw length measurement (adapted from Bert et al. 1978).

Stone Crab Claw

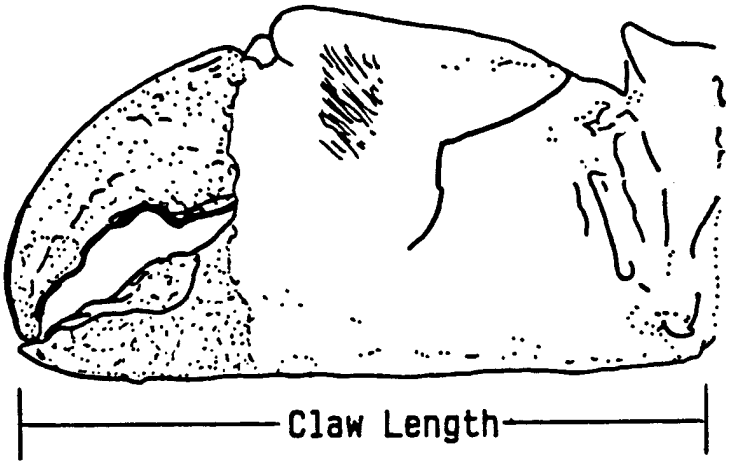
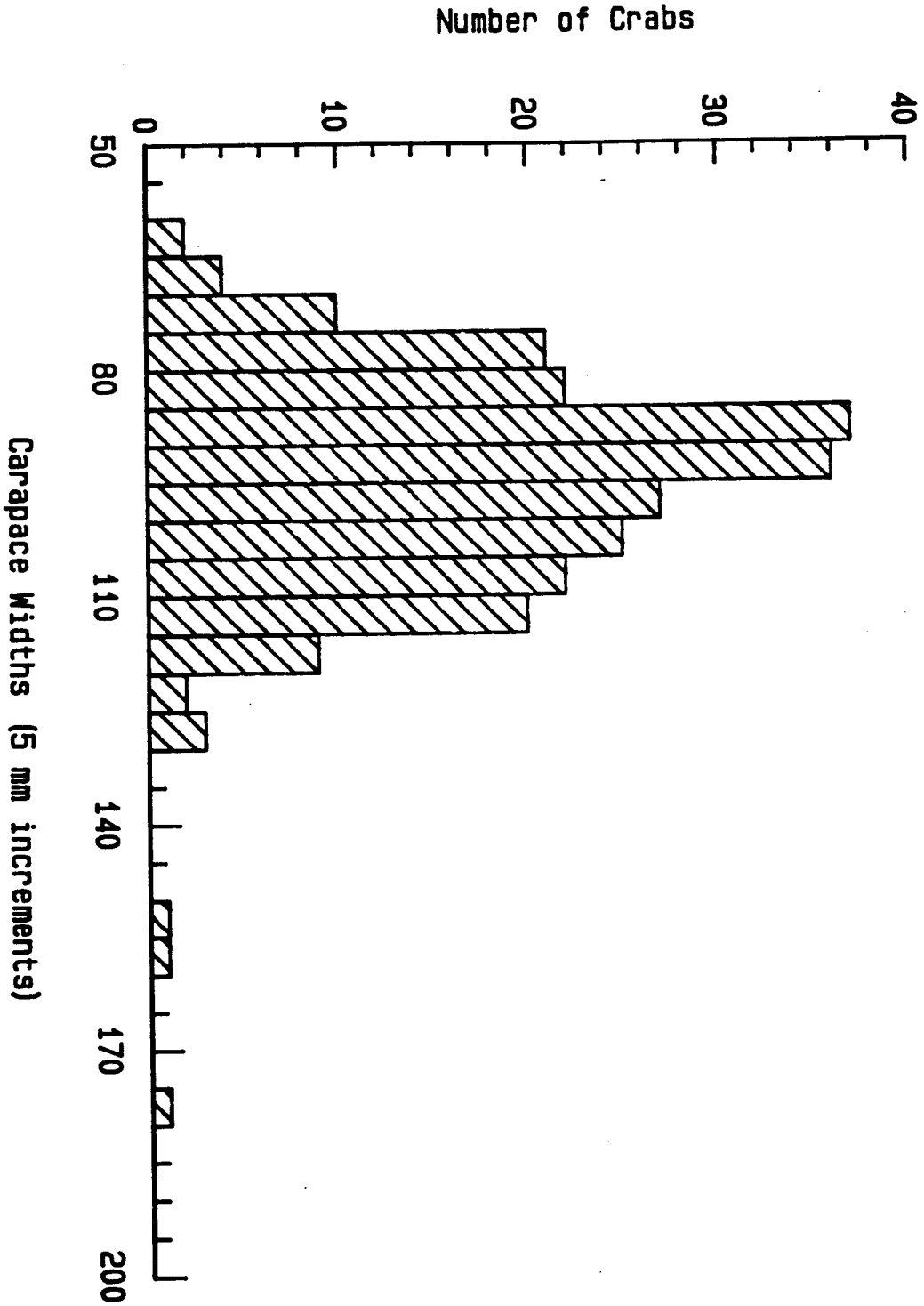


Figure 3. Size frequency distribution of stone crabs caught in TPWD gill nets during spring and fall 1983 and 1984.


Number of Crabs
0
10
20
30
40
50
80
110
140
170
200
Carapace Widths (5 mm increments)

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