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Carapace Width-Total Weight Relation of Blue Crabs from Galveston Bay, Texas[1]

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ABSTRACT

Regression equations were developed between total weight (W) and carapace width (C) of blue crabs, *Callinectes sapidus*, taken from Galveston Bay, Texas. Male crabs (Log W = –3.74149 + 2.77478 Log C) were significantly heavier than females (Log W = –3.54147 + 2.63954 Log C) for a given carapace width.

INTRODUCTION

The blue crab, *Callinectes sapidus* Rathbun, is a valuable commercial species on the Gulf of Mexico and Atlantic coasts of the United States. About 109 million pounds valued at $10.8 million were harvested in the United States in 1968 (Lyles, 1969).

Extensive data on size of blue crabs are available from different localities, but they include either weight or carapace width (lateral distance between tips of longest cephalothorax spines)—not both. Equations are needed to convert carapace width to weight, or weight to width. These equations not only are useful in determining relative condition, growth, and size at sexual maturity of blue crabs, but also permit comparison of data from different localities.

METHODS

Blue crabs were collected, incidentally during a shrimp study, with a small otter trawl twice a month from January through December 1963 from Galveston Bay, Texas. The number of crabs available for observation varied, therefore, between months. The crabs were held alive on ice and measured within 24 hours after capture. Carapace width was measured to the nearest millimeter, and total weight to the nearest 0.05 g (balance precision ± 0.03 g). Crabs recently molted or less than 25 mm in carapace width, gravid females, and those with missing legs, broken shells, or with other organisms attached to the shell, were discarded.

The basic formula Log W = Log a + b Log C was used to express the relation between total weight (W) and carapace width (C). Each crab was treated as a single observation in deriving the formula. The constants (a) and (b) of the formula were derived empirically, and logarithms of width and weight were carried to five decimal places. Symbols and methods used for regression analysis follow Snedecor (1956); methods of comparing regression coefficients follow Steel and Torrie (1960).

No attempt was made to determine the relation of total weight to carapace width by seasons.

REGRESSION EQUATIONS

The regression equations and regression lines fitted to the empirical data are shown in Figure 1. The standard deviation about regression (sy.x), which indicates the closeness of fit of the points to the regression line, was 0.059 for males and 0.067 for females.

Our findings confirm other studies in Virginia (Newcombe, Campbell, and Eckstine 1949) and Florida (Tagatz, 1965) which have shown that male blue crabs were heavier than females. The difference between the regression coefficients of males and females from Galveston Bay was significant at the 1% level (t = 7.23). In a similar comparison by sex, Newcombe, Campbell, and Eckstine (1949) also obtained significant differences at the 1% level.

Crabs of a given carapace width and sex from Virginia and Florida weighed less than those in our samples throughout almost the entire width range studied. Crabs from Virginia are compared to those in our samples

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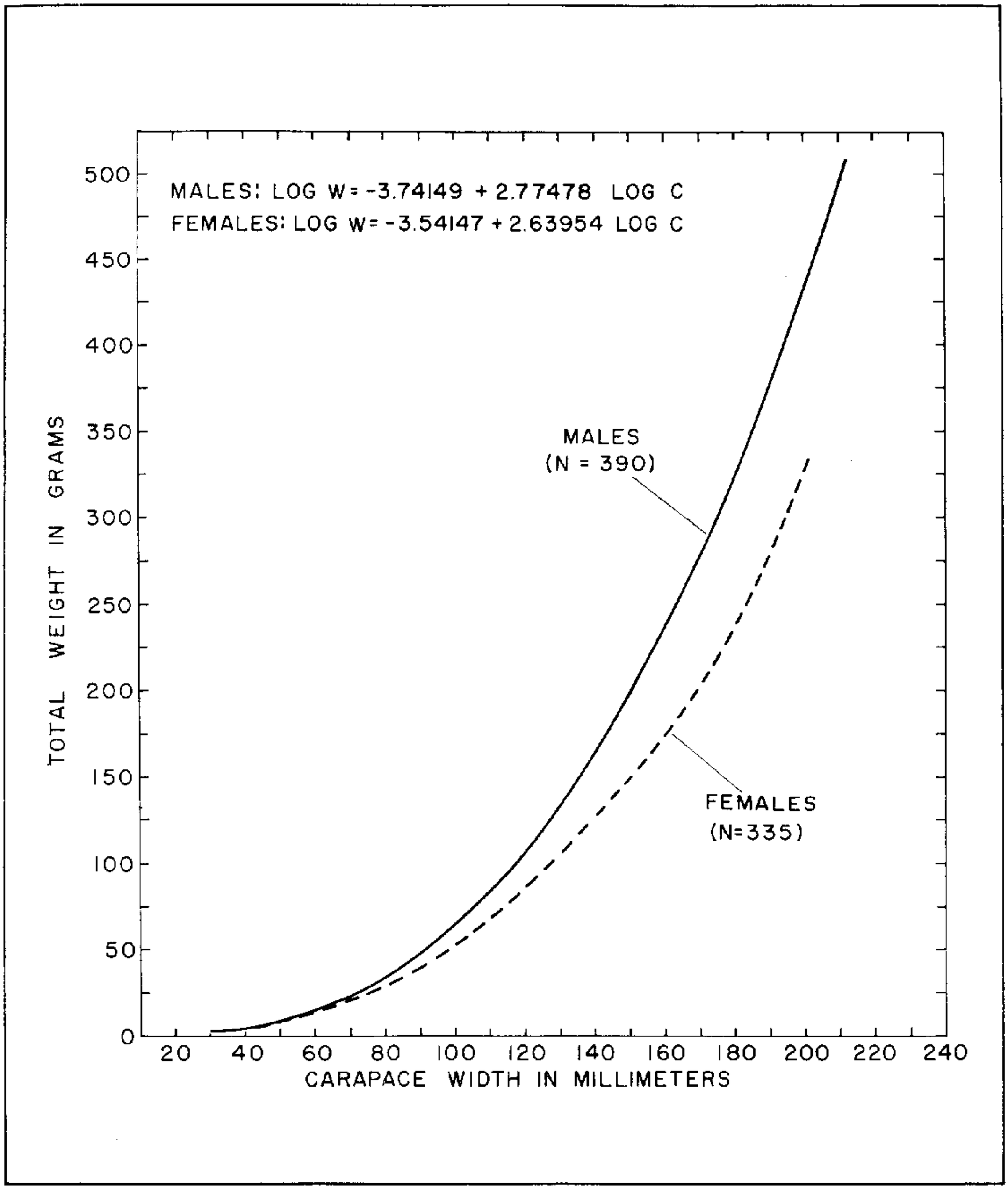

FIGURE 1.—The relation of carapace width to weight for male and female blue crabs from Galveston Bay, Texas.

in Figure 2. Newcombe, Campbell, and Eckstine (1949) stated, however, that three factors weakened the dependability of their curves and should be considered when using their data or in attempting to compare data from other areas with theirs: (1) few observations, (2) lack of observations for the middle size range of crabs, and (3) the many

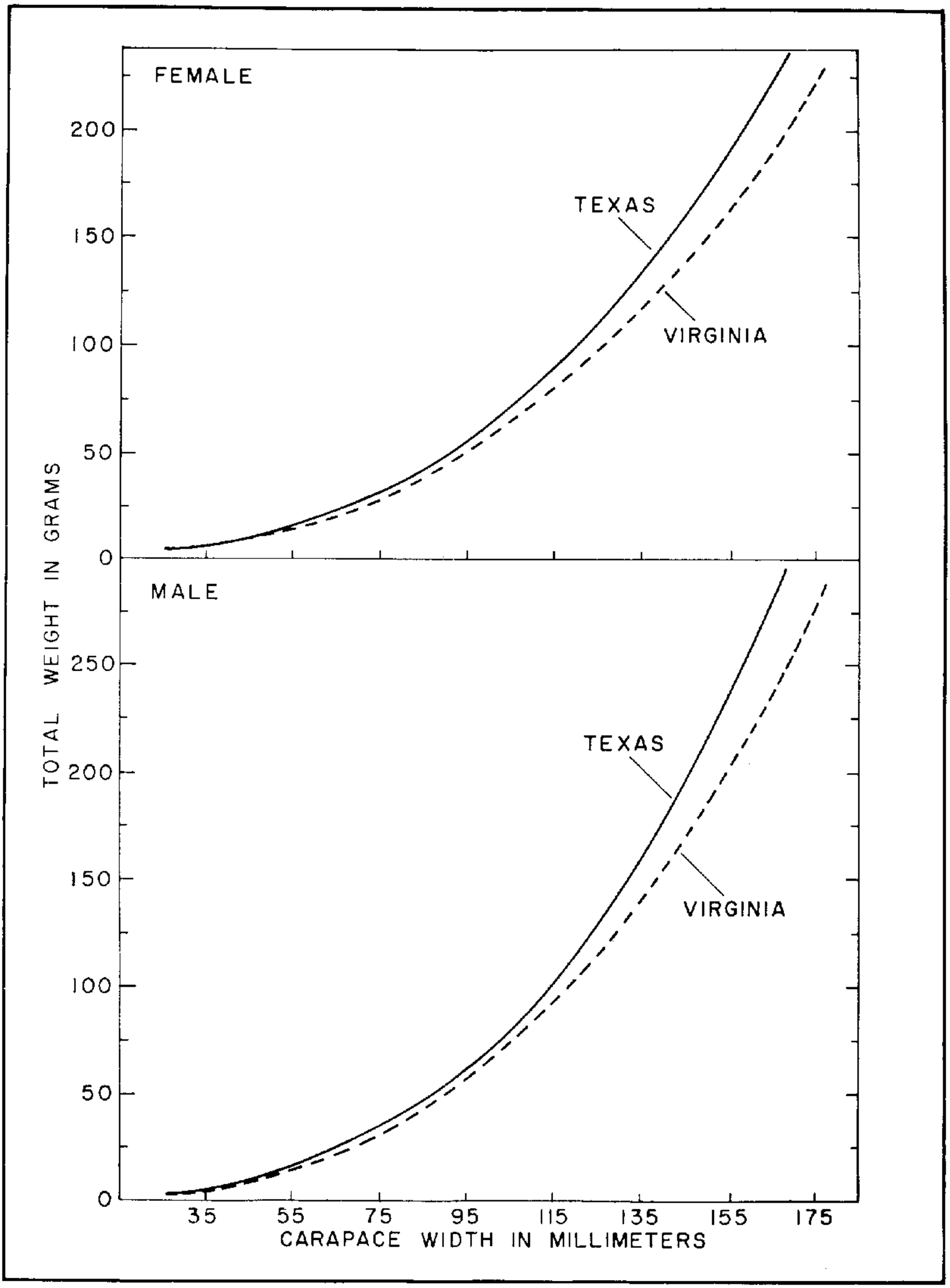

FIGURE 2.—Comparisons of the width-weight relations for male and female blue crabs from Texas and Virginia.

TABLE 1.—*Carapace width and weight distributions by sex of blue crabs collected from Galveston Bay, Texas and the St. Johns River, Florida*

Carapace width[1] (mm)	Galveston Bay		St. Johns River	
	Empirical average weight (grams)		Empirical average weight (grams)	
	Male	Female	Male	Female
28–32	2	2	–[2]	–
33–37	3	3	–	–
38–42	5	5	–	–
43–47	7	7	–	–
48–52	10	9	–	–
53–57	12	11	–	–
58–62	16	16	–	–
63–67	19	18	–	–
68–72	25	23	–	–
73–77	31	27	–	–
78–82	36	32	–	–
83–87	43	40	–	–
88–92	53	43	–	–
93–97	57	53	–	–
98–102	64	62	61	59
103–107	72	66	75	62
108–112	83	77	83	77
113–117	93	84	91	89
118–122	105	96	97	93
123–127	113	95	112	101
128–132	137	109	125	109
133–137	147	117	133	122
138–142	174	139	152	132
143–147	184	146	166	141
148–152	206	140	182	154
153–157	238	171	200	163
158–162	245	184	225	176
163–167	254	192	241	185
168–172	302	222	263	202
173–177	306	226	281	211
178–182	342	239	303	222
183–187	351	257	316	228
188–192	369	271	341	250
193–197	356	293	374	256
198–202	411	319	398	272

[1] Each width was represented by 3 to 20 crabs from Galveston Bay and 9 to 398 crabs for the St. Johns River.
[2] Data not available.

gravid crabs (from which the eggs were removed) among females. Consequently, we do not know whether the differences shown in Figure 2 are real or caused by different techniques used in the two studies.

Tagatz (1965) did not publish a comparable regression equation for his data from Florida, but he did furnish us with his data, grouped by 5-mm width intervals, which we compared to our data grouped similarly (Table 1). The empirical average weights for both the male and female blue crabs from Galveston Bay were greater than crabs of comparable size from the St. Johns River.

LITERATURE CITED

LYLES, C. H. 1969. Fisheries of the United States . . . 1968. U. S. Fish Wildl. Serv., Current Fishery Statistics 5000, 83 pp.

NEWCOMBE, C. L., F. CAMPBELL, AND A. M. ECKSTINE. 1949. A study of the form and growth of the blue crab *Callinectes sapidus* Rathbun. Growth 13: 71–96.

SNEDECOR, G. W. 1956. Statistical methods. The Iowa State Univ. Press, Ames, Iowa, 534 pp.

STEEL, R. G. D., AND J. H. TORRIE. 1960. Principles and procedures of statistics. McGraw-Hill Book Co., New York, 481 pp.

TAGATZ, M. E. 1965. The fishery for blue crabs in the St. Johns River, Florida, with special reference to fluctuation in yield between 1961 and 1962. U. S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 501, 11 pp.