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Texas Parks and Wildlife Department
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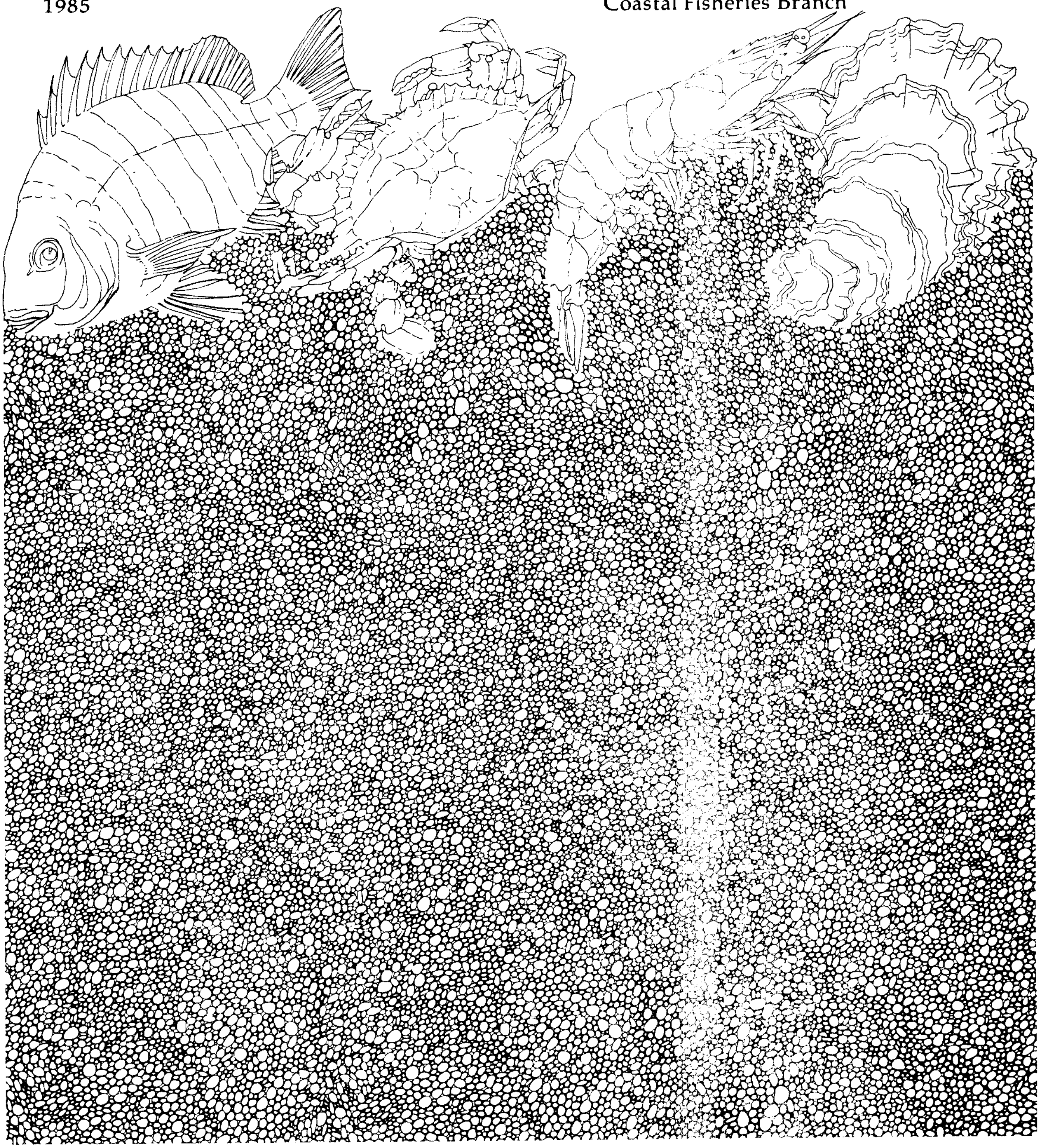

COMPARISON OF RED DRUM WEIGHT-LENGTH RELATIONSHIPS AMONG TEXAS BAYS

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Texas Parks and Wildlife Department
Coastal Fisheries Branch
4200 Smith School Road
Austin, Texas 78744

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ABSTRACT

Weight-length regressions of gill-net caught red drum (Sciaenops ocellatus) vary among bays. However, slopes were not significantly different from a hypothetical value of 3 except for Aransas Bay fish (b = 3.1256). Inter-bay differences in estimated weight for a given length were small. Predicted weights at 500 mm total length varied only from 1260 g (2.78 lb) in San Antonio Bay to 1,389 g (3.06 lb) in Galveston Bay.

INTRODUCTION

Many weight-length equations have been published for red drum (Sciaenops ocellatus). Perret et al. (1980) concluded these equations appear similar, but their slopes, weight at size, and intercepts vary greatly (Table 1). The apparent differences may not be real however, because sample sizes were small (McKee 1980; Thieling and Loyacano 1976), size ranges were limited (Bass and Avault 1975; Luebke 1973; McKee 1980), or the equations have not been compared statistically. Regressions developed for broad geographic areas in Texas (Harrington et al. 1979) and Louisiana (Hein et al. 1980) do not consider possible inter-bay differences. Separate regressions for each bay may be needed in the future to assess growth overfishing if sub-groups are to be managed individually.

The objectives of this study were to compare regressions among Texas bays to evaluate the hypothesis that separate regressions for each bay should be used in stock assessment and to evaluate the hypothesis of isometric growth which some yield models assume.

MATERIALS AND METHODS

Monofilament gill nets (182.9 m long) with equal sections of 7.6-, 10.2-, 12.7-, and 15.3-cm stretched mesh were fished overnight at 2 to 12 stations/bay/month during October 1976 - September 1977 (Matlock and Weaver 1979). No collections were made in June. Within a month the same number of sets were made in all bays except that twice the number were collected in Galveston Bay. Each red drum caught was measured to the nearest 1 mm total length (TL) and weighed to the nearest 5 g wet weight. Standard least squares analysis assuming one Y at each X (Sokal and Rohlf 1969) was used to determine the weight-total length relationship for fish from each bay and all bays pooled. Analysis of covariance and Bartlett's test were used to determine significant differences among regressions and variances, respectively (Snedecor and Cochran 1967). Significantly different regressions were determined by omitting bays that had apparently different slopes and comparing the remaining regressions.

RESULTS

Weight-length regressions vary among bays. Although variances were not homogenous among bays ($X^2 = 139.146$; d.f. = 7; $P < 0.01$), slopes (Table 2) were significantly different ($F = 4.075$; d.f. = 7, 2190; $P < 0.01$). Fish from Aransas Bay had a weight-length relationship different from the other bays because the slopes were not significantly different after deleting Aransas Bay data ($F = 0.114$; d.f. = 6, 1942; $P > 0.01$). The y-intercepts however, showed significant differences even when Aransas Bay data were excluded ($F = 31.474$; d.f. = 5, 1936; $P < 0.01$). Except for Aransas Bay ($t = 6.52$; d.f. = 248; $P < 0.01$), slopes were not significantly different from a hypothetical value of 3.

Inter-bay differences in estimated weight for a given length were small. Predicted weights at 500 mm varied only from 1260 to 1389 g (Table 2), this maximum difference being less than 11%.

DISCUSSION

A regression pooling data from all bays seems best for present management, even though significant differences occur among bays for reasons which are not readily apparent. Inter-bay differences in predicted weight are small and may not be real because the regression analysis used artificially reduces variance. At some lengths there are multiple weights, but the analysis I used assumes one weight at each length. This artificially inflates the degrees of freedom. A pooled regression is comprehensive in length range covered and is based on many fish. Moreover, separate estimates for each bay are not yet available for other yield model parameters. Harrington's et al. (1979) regression probably should be used in current yield modeling because it is the most comprehensive. Minor refinement of Harrington's weight-length regression seems desirable to include adult fish from the gulf throughout the year to broaden the size range covered. Future collections should include data on sex and should be adequately distributed throughout the year to develop regressions by geographic area, sex and season.

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Table 1. Weight-length relationships for red drum. All are standard length except Harrington et al. (1979) is total length. Weight is in g and length in mm, except cm for Thieling and Loyacano (1976).

State	Area	Reference	Number measured	Standard length range	Log a	b	Calculated weight (g) of 200 mm SL fish
South Carolina	Marsh Impoundment	Thieling and Loyacano (1976)	54	Not given	-1.29596	2.7403	186
Louisiana	Coastal marsh near Hopedale	Boothby and Avault (1971)	286	240-940	-4.42161	2.83284	125
Louisiana	Salt marsh near Caminada Pass	Bass and Avault (1975)	568	8-183	-7.2052	4.1913	275
Louisiana	Southeastern coast	Hein et al. (1980)	308	14-1135	-5.1197	3.0523	80
Louisiana	Bays and Gulf	McKee (1980)	23	183-291	-3.435	3.254	257
Texas	Heated ponds in Galveston Bay system	Luebke (1973)	47	283-411	-4.69	2.97	139
Texas	Cooling lake near Corpus Christi; at tagging	McKee (1980)	30	319-720	-3.939	2.71	198
Texas	Bays and Gulf	McKee (1980)	45	312-885	-4.058	2.75	186
Texas	Nine bays	Harrington et al. (1979)	8319	49-814	-5.085	3.041	158

Table 2. Statistics for regressions of red drum $\log_{10}$ weight (W) on $\log_{10}$ total length (TL) by bay, October 1976-September 1977, and estimated weight for 500 mm fish.

Bay system	Number measured	Total length range (mm)	a	b	Standard error of b	r	Residual mean square	Weight at 500 mm (g)
Galveston	370	295-730	-4.8523	2.9623	0.0234	0.989	0.0015234	1389
East Matagorda	97	310-680	-4.8877	2.9665	0.0670	0.977	0.0029890	1315
Matagorda	343	260-730	-4.9523	2.9865	0.0267	0.987	0.0024690	1283
San Antonio	395	270-595	-4.9179	2.9708	0.0247	0.987	0.0018629	1260
Aransas	250	285-745	-5.3082	3.1256	0.0193	0.994	0.0009847	1342
Corpus Christi	156	260-680	-4.9291	2.9812	0.0234	0.995	0.0010673	1309
Upper Laguna Madre	104	270-695	-4.8515	2.9583	0.0450	0.988	0.0023990	1358
Lower Laguna Madre	491	280-750	-4.8938	2.9709	0.0213	0.988	0.0022295	1332
All bays	2206	260-750	-5.0597	3.0318	0.0095	0.989	0.0021223	1328
All Bays (less Aransas)	1956	260-750	-5.0264	3.0193	0.0103	0.989	0.0022194	1326

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