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COMPARISON OF THE POPULATIONS OF THE GIZZARD SHAD, *ANODONTOSTOMA CHACUNDA* (HAMILTON) (PISCES : CLUPEIDAE) FROM GODAVARI AND HOOGHLY ESTUARIES

By

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(With 4 Text-figures and 5 Tables)

INTRODUCTION

Many clupeid and engraulid fishes which constitute the marine component of estuarine fauna are found to breed in the river mouth regions and ascend the rivers, in so far as the salinity is favourable for their survival, for feeding purposes (Babu Rao, 1964, 1965). Thus they complete their life cycles in their respective estuaries without making any large scale migrations in the sea. This has resulted in the establishment of local populations of these species in the particular environment in which they abound. Fishery biologists have distinguished the intraspecific populations by subjecting the biometric data (body measurements and meristic counts) to statistical analysis. In India, the different populations of *Hilsa ilisha* (Ham.) (Clupeidae) occurring in the various rivers and lakes were statistically shown to differ from one another in their body proportions and meristic counts (Pillay, 1952, 1957). Similarly the Godavari estuarine population of *Stolephorus commersonii* Lacépède (Engraulidae) is found to be significantly different from the Waltair coastal population in some of the morphometric and meristic characters (Babu Rao, 1965 b) and the two populations of *Setipinna godavariensis* Babu Rao (Engraulidae) from Godavari and Hooghly estuaries, situated at different latitudes and longitudes were also similarly shown to be distinct from one another (Babu Rao and Joglekar, 1968). It appears that the two estuaries have their distinct populations of species of fishes. Samples of *Anodontostoma chacunda* (Hamilton) (Clupeidae) collected from both the estuaries have been compared in morphometric and meristic characters to see whether they are drawn from the same stock or they belong to distinct populations.

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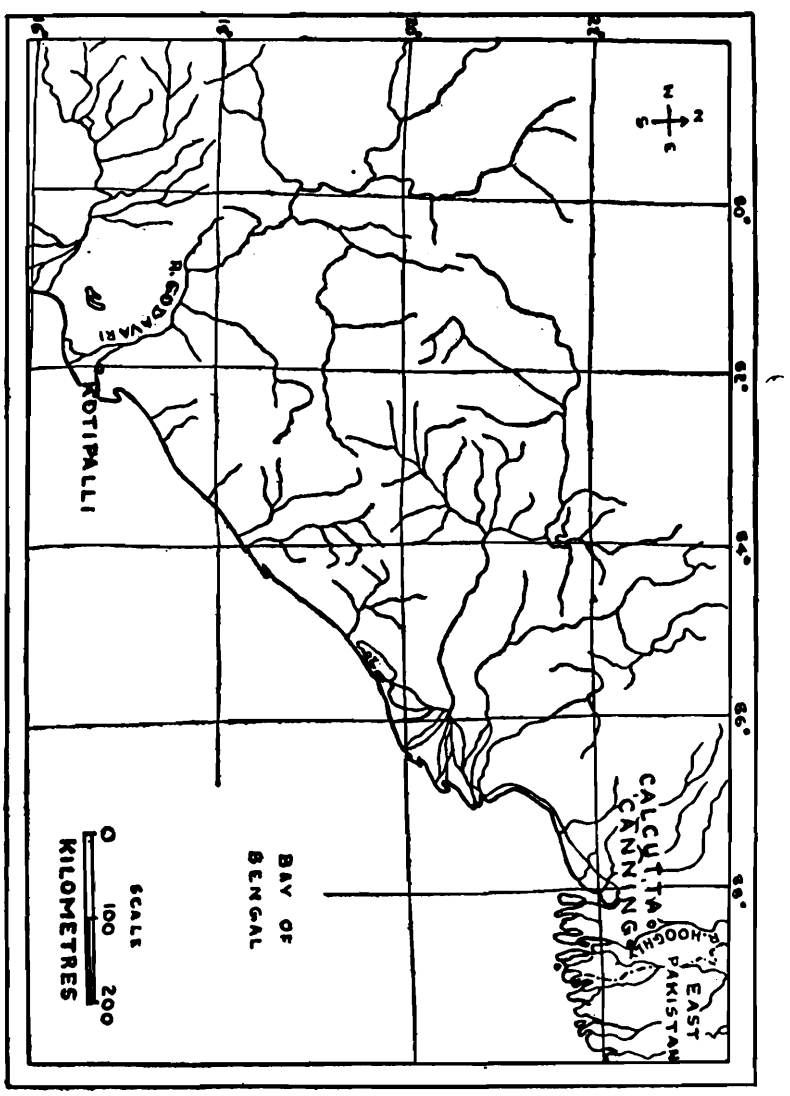
Material and Methods

Two samples of *Anodontostoma chacunda*, one in March, 1960 and the second in May, 1960 from the fishermen's catches near Kotipalli (latitude between 16° and 17° and longitude 82°) at Godavari estuary and one sample in November, 1966 from the fishermen's catches near Canning (latitude between 22° and 23° and longitude between 88° and 89°) at Hooghly estuary (Text-fig. 1) were obtained.



Text-fig. 1.—Northeast coast of India showing Godavari and Hooghly estuaries.

The body measurements were taken in preserved condition. In all cases counts of rays were taken consistently only for the left pectoral fin.

Comparison of countable characters was done by applying the chi-square test (Bailey, 1959). Regression analysis, followed by 't' test (Goulden, 1939) was applied to compare the two populations in the body proportions.

OBSERVATIONS

Counts of pectoral fin rays, dorsal fin rays, anal fin rays, preventral scutes and postventral scutes were taken for about 100 specimens from each locality (Table I). The following body measurements were taken for 70 specimens from each locality : total length, standard length, head length, body depth and eye diameter. The ranges of the body measurements are presented in Table II.

TABLE I.—Frequency distribution of the meristic characters of *Anodontostoma chacunda* from Godavari and Hooghly estuaries.

(A) *Pectoral fin rays*

Locality	14	15	16	17	n
Godavari	5	45	43	7	100
Hooghly	3	63	34		100

(B) *Dorsal fin rays*

Locality	16	17	18	19	20	21	22	n
Godavari			21	51	11	1		84
Hooghly	2	7	22	30	34	4	1	100

(C) *Anal fin rays*

Locality	16	17	18	19	20	21	22	23	n
Godavari			1	11	35	32	7	1	87
Hooghly	1	5	8	9	26	32	19		100

(D) *Preventral scutes*

Locality	16	17	18	n
Godavari	12	86	2	100
Hooghly	9	72	19	100

(E) *Postventral scutes*

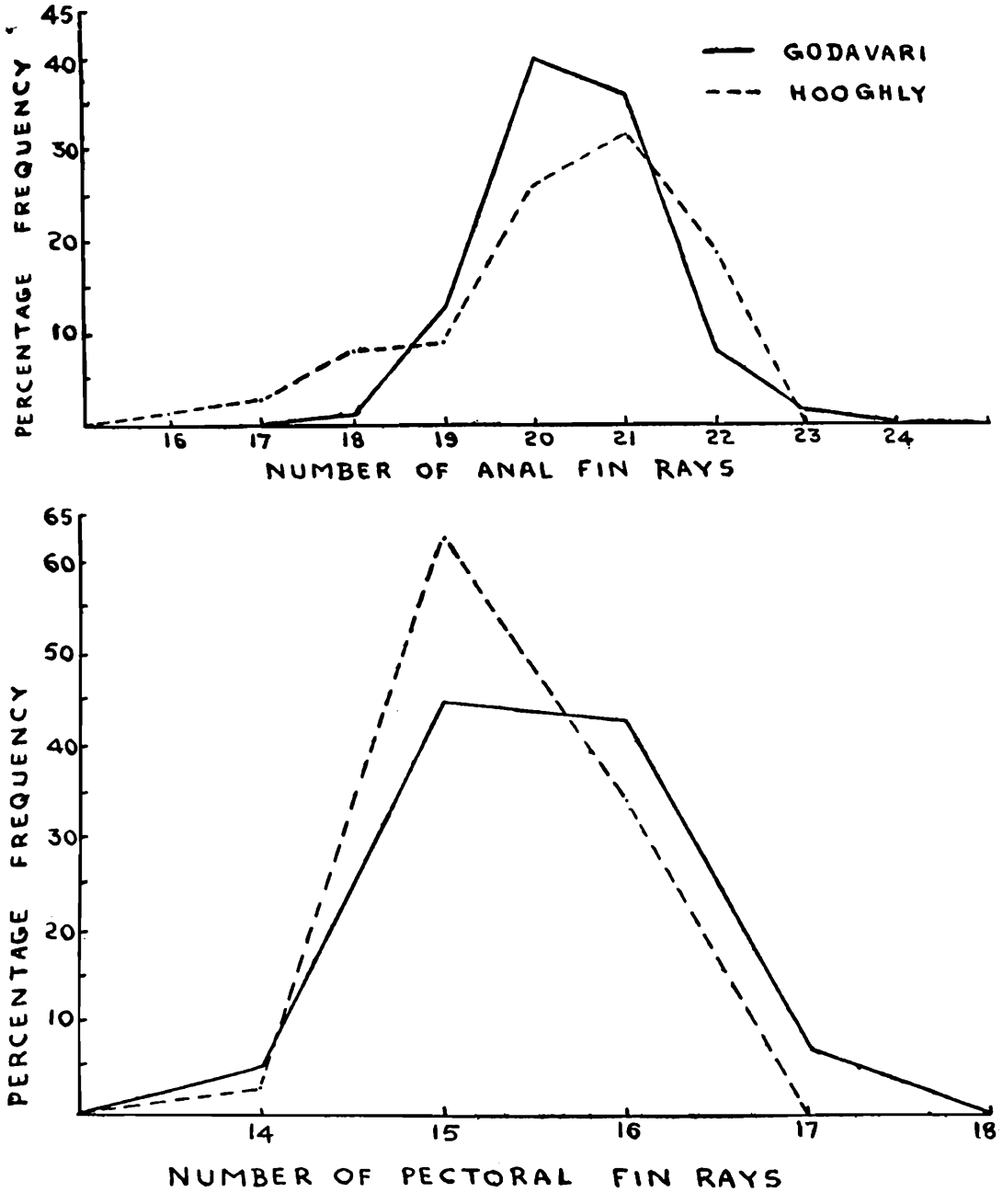
Locality	9	10	11	12	13	14	n
Godavari	1	6	60	33			100
Hooghly		19	62	14	3	2	100

TABLE II.—Ranges of the body measurements of *A. chacunda* from the two localities.

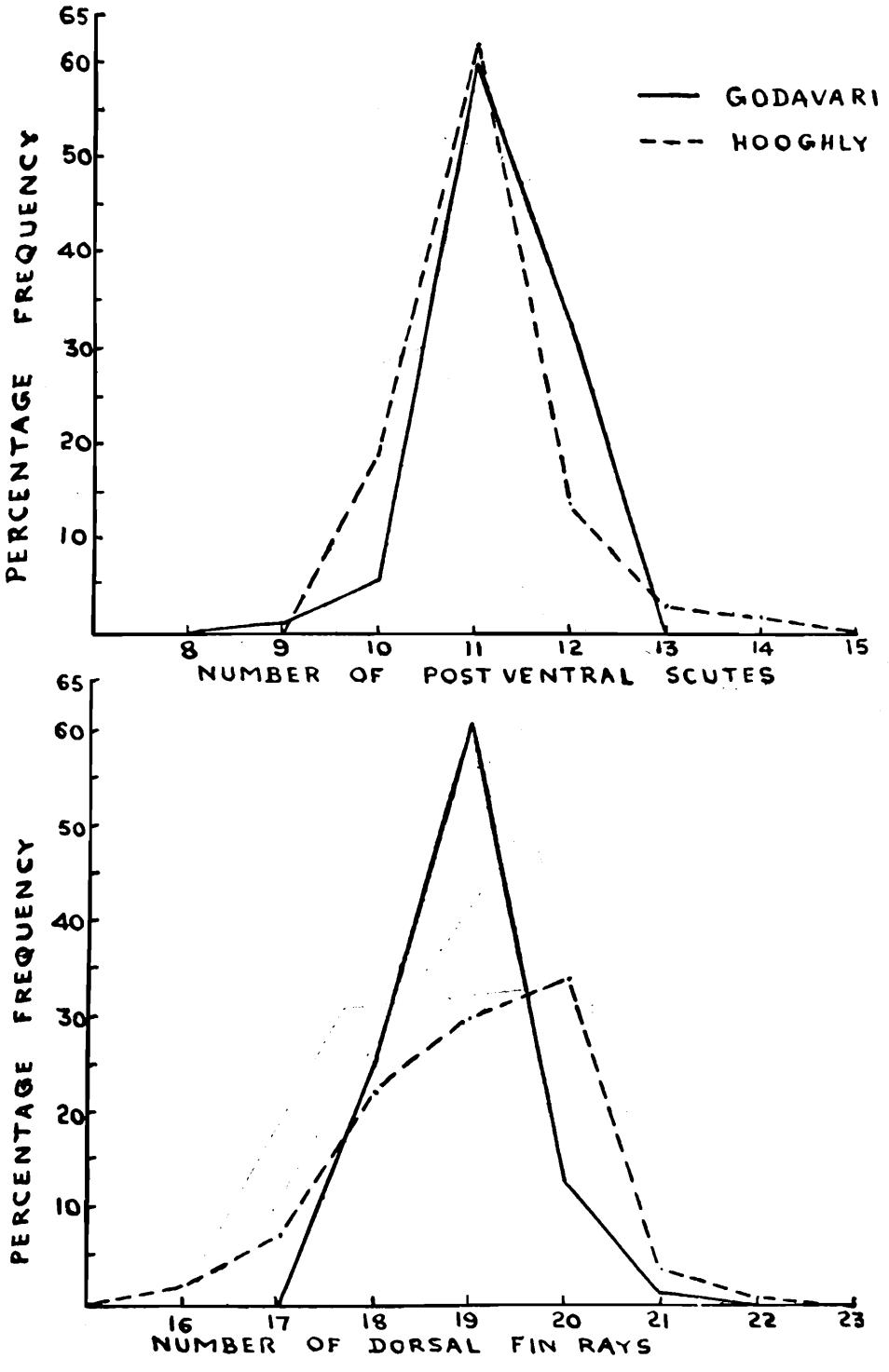
Body measurement	Godavari N—70	Hooghly N—70
1. Standard length	3.60 — 8.15 CM.	3.20 — 5.55 CM.
2. Head length	1.10 — 2.40 CM.	0.95 — 1.65 CM.
3. Depth of the body	1.25 — 3.35 CM.	1.00 — 2.40 CM.
4. Eye diameter	0.32 — 0.70 CM.	0.40 — 0.65 CM.

An application of chi-square test (Table III) for the frequencies of the meristic characters of the two localities, has shown that the two populations differ significantly from one another in the number of pectoral fin rays, dorsal fin rays, anal fin rays, and postventral scutes (Text-figs. 2 & 3). Regression coefficients and standard error of regression coefficients were obtained in the two populations for

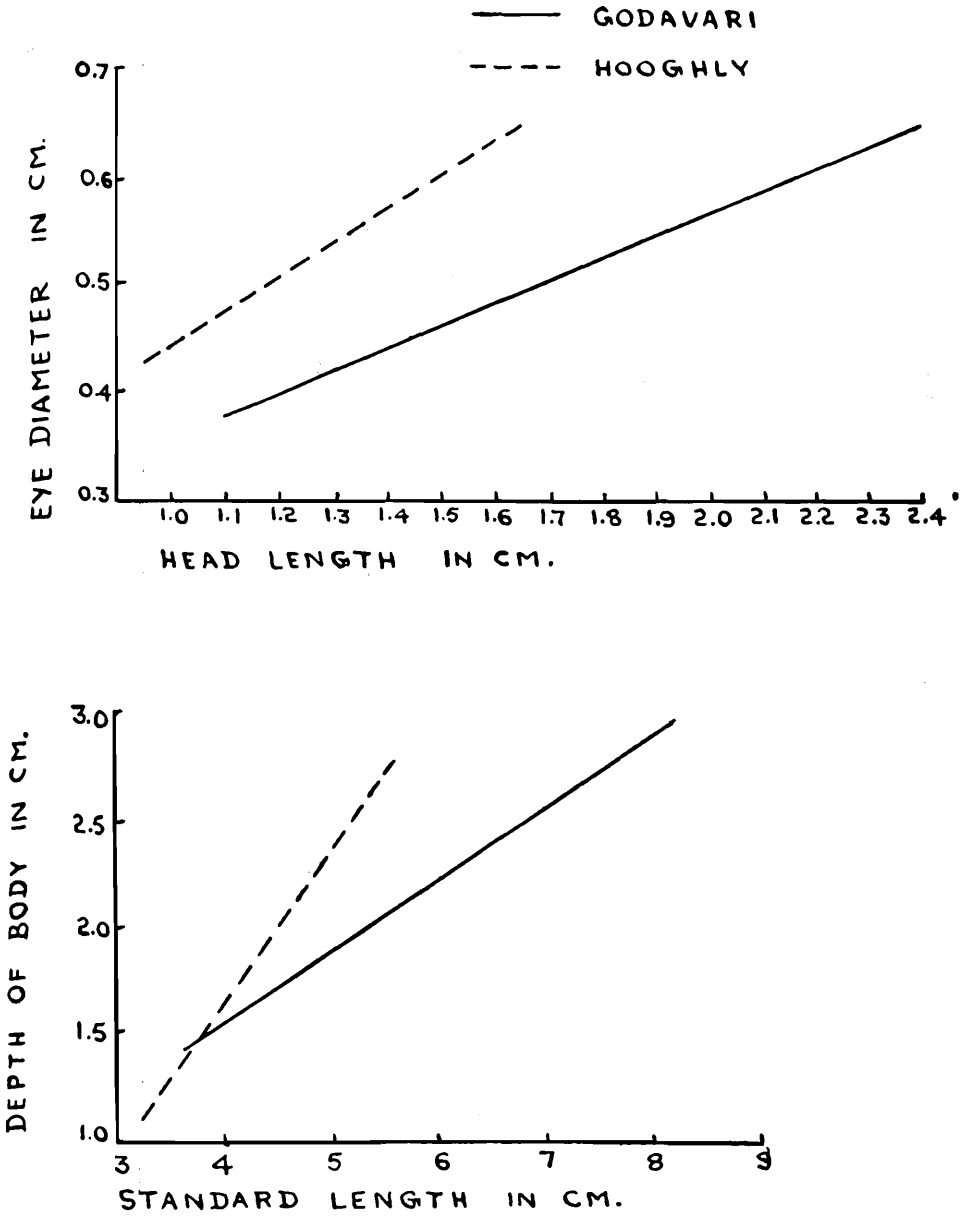
head length in relation to standard length, body depth in relation to standard length and eye diameter in relation to head length. When the difference in the regression coefficients is tested by means of 't' test (Table IV) it was found that the two populations differ significantly in body depth in relation to standard length and eye diameter in relation to head length (Text-fig. 4).



TEXT-FIG. 2.—Percentage frequency polygons of anal fin rays (upper graph) and pectoral fin rays (lower graph) of *A. chacunda* from Godavari (solid line) and Hooghly (broken lines) estuaries.



TEXT-FIG. 3.—Percentage frequency polygons of postventral scutes (upper graph) and dorsal fin rays (lower graph) of *A. chacunda* from Godavari (solid line) and Hooghly (broken line) estuaries.



TEXT-FIG. 4.—Regression lines of eye diameter on head length (upper graph) and depth of body on standard length (lower graph) in the *A. chacunda* populations from Godavari (Straight line) and Hooghly (broken line) estuaries.

TABLE III.—*Chi-square test applied to the meristic data of the samples from the two estuaries*

S. No.	Character	Obs. X^2	d.f.	P.	Significance	Remarks
1.	Pectoral fin rays	4.617	1	<0.05	Significant	Classes 14 and 15 and 16 and 17 are bracketed. 2×2 contigency table formula with Yate's correction is applied.
2.	Dorsal fin rays	20.424	2	<0.01	Significant	Classes 16 to 18 and 20 to 22 are bracketed.
3.	Anal fin rays	8.443	3	<0.05	Significant	Classes 16 to 19 and 22 and 23 are bracketed.
4.	Preventral Scutes	0.2123	1	>0.50	Not Significant	Classes 17 and 18 are bracketed. 2 ×2 contingency table formula with Yates' correction is applied.
5.	Postventral Scutes	9.234	2	<0.01	Significant	Classes 9 and 10 and 12 to 14 are bracketed.

TABLE IV.—Regression analysis of morphometric data of *A. chacunda* from Godavari and Hooghly estuaries .

Regression between	Godavari			Hooghly			Standard error of difference	t	P
	No. of Specimens n_1	Regression Coefficient b_1	Standard error of regression coefficient S_1	No. of Specimens n_2	Regression Coefficient b_2	Standard error of regression coefficient S_2	S_1-2		
1) Standard length and Head Length	70	0.20516	0.01875	70	0.22821	0.20240	0.20320	0.113	>0.50*
2) Standard length and Body depth	70	0.33993	0.03519	70	0.49915	0.02614	0.04382	3.364	<0.01**
3) Head length and Eye diameter	70	0.26969	0.00571	70	0.31825	0.02274	0.02345	2.071	<0.05**

* Not Significant ; ** Significant.

CONCLUSIONS

From the above biometric analysis it is clear that Godavari estuary population of *Anodontostoma chacunda* has a significantly higher number of pectoral fin rays and post-ventral scutes and significantly lower number of anal fin rays and dorsal fin rays than the Hooghly estuary population. The rate of growth of body depth in relation to standard length and the rate of growth of eye diameter in relation to head length are significantly higher in Hooghly estuary population than the Godavari estuary population. Out of the eight morphometric and meristic characters tested, the two populations are found to differ significantly from one another in six characters (Table V).

TABLE V.—Characters of *Anodontostoma chacunda* in which the two populations from Godavari and Hooghly estuaries are tested for homogeneity.

Sl. No.	Character	Significance
1.	Pectoral fin rays	Significant
2.	Dorsal fin rays	Significant
3.	Anal fin rays	Significant
4.	Preventral scutes	Not significant
5.	Postventral scutes	Significant
6.	Head length in standard length	Not significant
7.	Body depth in standard length	Significant
8.	Eye diameter in head length	Significant

It may be concluded that the two populations are drawn from different stocks. These and earlier studies (Babu Rao and Joglekar, *loc. cit.*) contribute to the view that each estuary has its own type of population of fishes, though belonging to the same species.

ACKNOWLEDGEMENTS

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SUMMARY

Populations of the gizzard shad, *Anodontostoma chacunda*, which forms a moderate fishery in two of the east coast estuaries situated in different latitude and longitudes, *viz.*, Godavari and Hooghly, were compared by subjecting the biometric data to statistical analysis. The two populations are found to differ significantly in six of the eight morphometric and meristic characters, indicating that the two populations are drawn from different stocks of the same species.

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