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GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: May 26, 1977

Project Title: *Interrelationship of Freshwater and Saltwater Aquatic Ecosystems in the Tidewater Zone - Phase I*

Project No: *G-32-634*

Project Director: *Dr. D. M. Gillespie/Dr. A. C. Benke*

Sponsor: *Georgia Office of Planning & Budget; 270 Washington St., SW, Atlanta, Georgia 30334*

Agreement Period: From *1/1/77* Until *5/31/77 (Contract term)*

Type Agreement: *Contract dated 4/20/77 (Subcontract under NOAA Grant No. 04-5-158-50023)*

Amount: *$4,904 GOPB Funds (G-32-634)*
1,226 GIT Contribution (G-32-319)
$6,130 Total

Reports Required:
Monthly Performance Reports; Quarterly Performance Reports; Final Reports

Sponsor Contact Person (s):

Technical Matters

Mr. Gary D. Midkiff
Office of Planning & Budget
270 Washington Street, S.W.
Atlanta, Ga. 30334
Phone: 656-3819

Contractual Matters
(thru OCA)

Defense Priority Rating: *none*

Assigned to: *School of Biology* (School/Laboratory)

COPIES TO:

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- Project Code (GTRI)
- Other _____

CA—3 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

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SPONSORED PROJECT TERMINATION

Date: 1/11/79

Project Title: Interrelationship of Freshwater and Saltwater Aquatic Ecosystems in the Tidewater Zone - Phase I

Project No: G-32-634

Project Director: Drs. D. M. Gillespie/A. K. Benke

Sponsor: Ga. Office of Planning & Budget

Effective Termination Date: 5/31/77(Contract Expiration)

Clearance of Accounting Charges: N/A - final invoice submitted 7/27/77.

Grant/Contract Closeout Actions Remaining:

_ Final Invoice and Closing Documents
_ Final Fiscal Report
_ Final Report of Inventions
_ Govt. Property Inventory & Related Certificate
_ Classified Material Certificate
X Other Two Records/Archives copies of Final Report to OCA Reports Coordinator.

Assigned to: Biology (School/Laboratory)

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CA—4 (3/76)

FINAL PERFORMANCE REPORT

THROUGH MAY 31, 1977

RESEARCH CONTRACT

Sponsored Research Project
G-32-634

INTERRELATIONSHIP OF FRESHWATER AND SALTWATER AQUATIC ECOSYSTEMS IN THE TIDEWATER ZONE, PHASE I

Submitted By

D. M. Gillespie
A. C. Benke
F. K. Parrish

June 20, 1977

Georgia Institute of Technology

INTRODUCTION

The objectives of the first phase of the project were to hold meetings with colleagues in order to coordinate projects, to visit and select sites for biological sampling, to conduct initial field sampling for a preliminary species list and preliminary quantitative determination of density and biomass and to look for initial red flags concerning rare and endangered species or special habitat types. These objectives were, in large part, attained, although the project was not begun until several months after the planned initiation date. This report includes a map showing sample sites and salinity distributions, tables showing benthic invertebrate densities and biomass, and initial faunal lists with distributions, plus a brief interpretive section.

We met with colleagues during May 1977, and discussed the project with Dr. Gallagher, of the Marine Laboratory at Sapelo Island, and with Drs. Dunstan, Howard and Tenore of Skidaway Institute of Oceanography. All provided valuable suggestions and input for the improvement of the project. We arranged to coordinate the project with that of Dr. Gallagher, and to work with his group in sampling and analyses of samples. An arrangement was made for personnel from our project to accompany Dr. Gallagher and his people on a sampling trip during the next quarter. We plan to collect water samples from our sites and either send them to Sapelo for analysis, or follow Dr. Gallagher's methods in analyzing them ourselves, and we also plan to follow his methods in mapping vegetation types in our area. This coordination should greatly enhance the value of both projects.

Preliminary field sampling was actually done well before the project initiation date, in October and November of 1976. During these preliminary sampling trips, we selected tentative sites, and tried to determine whether the

objectives of the project could be met. Quantitative sampling was begun in March, 1977, although the intent was still exploratory. More intensive sampling was begun in May, 1977. The data collected are included in the following tables, as well as on the map showing the Satilla tidewater area with salinity distributions. Salinities were determined by conductivity, and the distributions shown on the map applies only for the particular time and date indicated. An idea of the variation in salinity may be obtained by examining the salinity solumns in Table 1. These great fluctuations, influenced primarily by river levels and stages of the tide, profoundly influence the distribution of invertebrates and require that sampling procedures have considerable flexibility. Thus, although we intend to sample most intensively at sites designated on the map as four, eight, and nine, it will be necessary to take at least occasional samples at all the sites shown, and to vary the sampling intensity as required. In view of this, an additional sample site in the freshwater portion of the Satilla River was selected which is just off the map to the west. This range of sample sites is expected to give us adequate coverage to meet the objectives of the project.

The data in Tables 1 and 2 were compiled argely from data collected during an earlier related project. However, since they overlap with the preliminary sampling for the present project, and include information of continued interest, they are included here. Tables 3 and 4 include additional data specifically collected for this project. Table 5 was compiled from data collected for this project, but does not include all species present. We are still in the process of identifying species collected in the tidewater area, and many specimens were sent to specialists for identification, or to confirm our identifications. Data from Little Satilla River and White Oak Creek samples were not available at the time Table 5 was compiled, but continuing analysis has shown that the species

list for the Little Satilla River is approximately the same as that shown for St. Andrew's Sound on the table, and that the White Oak Creek distribution is very similar to that shown for Piney Island in the table. We estimate that the number of species ultimately identified in the tidewater area will be more than twice the number. Table 6 is a list of fish species identified in the tidewater area of the Satilla River, and must also be regarded as very incomplete, especially with regard to estuarine species. For comparison, our list is compared with the lists of freshwater species compiled by other investigators.

Some other tasks were begun during phase 1 of the project, but were not carried far enough for information to be included here. These include mapping of vegetation and habitat type distributions, chemical analyses of waters in the research area and preliminary estimates of invertebrate productivity. As these tasks are continued, data will be included in future reports.

Interpretive Summary

Since the project has been underway only a short time, these preliminary interpretations should be accepted, as we offer them, with a great deal of caution. Although the stable freshwater portion of the Satilla River and the relatively stable estuarine habitats are both relatively high in diversity of animal species, biomass and productivity, these preliminary data suggest that the area of highly unstable salinity associated with the zone where freshwater and saltwater meet and mix is an area where all three of these parameters are greatly reduced. Thus, while the Little Satilla River, which is a tidal creek with relatively high salinity and little freshwater inflow, shows relatively high biomass of benthic invertebrates (Table 3), White Oak Creek and the lower reach of the Satilla River show greatly reduced invertebrate biomass (Tables 1 and 3). All of the sites show reduced species diversity when compared with

the relatively stable area of St. Andrew's Sound (Table 6), or with the freshwater portion of the Upper Satilla. This tidewater zone should be regarded as an area of instability, with high stresses imposed upon the biological communities. Further stresses imposed by human activities in the area would inevitably tend to eliminate species whose lives are already rather precarious. The species lists, although incomplete, shows at least one species considered to be rare by experts in the field. This is the amphipod Synchelidium americanum, which has been collected at several of our sites. Several other species listed as rare in reference books are known from the literature to have been collected from the waters of Georgia or adjacent states, but these have not appeared in our samples. In general, we would advise caution in industrial siting in the tidewater area, especially with regard to controlling the discharge of chemical effluents from potential industrial users. Although this generality would apply to almost any waters, we feel that special caution is required in this heavily stressed area.

Table 1. Salinity and benthic invertebrate biomass at sites in the Satilla River.

DATE	BAILEY POINT		MARSH POINT		CROW HARBOR		CEYLON		PINEY ISLAND		HOPEWELL POINT	
	Biomass (g/m^2)	Salinity (PPT)	Biomass (g/m^2)	Salinity (PPT)	Biomass (g/m^2)	Salinity (PPT)	Biomass (g/m^2)	Salinity (PPT)	Biomass (g/m^2)	Salinity (PPT)	Biomass (g/m^2)	Salinity (PPT)
16 DEC 75	.108	14.6	.543	10.6	.183	8.4	.160	6.1	.033	< .1	.013	< .1
8 FEB 76	.718	10.7	.226	8.2	.888	7.8	.106	.2	.020	< .1	.014	< .1
8 MAR 76	.783	7.2	1.09	4.3	.927	3.4	.238	.6	.160	< .1	.066	< .1
6 APR 76	.149	7.5	.553	5.0	.025	.2	--	--	--	--	--	--
8 MAY 76	.377	7.4	.172	7.4	.269	6.8	.349	2.0	.201	.3	.005	.1
10 JUN 76	.212	1.2	1.25	.2	.465	.1	.023	< .1	.005	< .1	.107	< .1
10 JUL 76	.227	4.0	.969	.3	.214	.1	.059	< .1	.003	< .1	.005	< .1
31 AUG 76	.229	10.2	.111	10.2	.897	4.0	.202	.3	--	--	--	--
18 SEP 76	.353	1.8	1.46	< .1	.696	< .1	.155	< .1	.036	< .1	.019	< .1
16 OCT 76	.037	4.4	.419	.8	.901	.4	.560	< .1	.020	< .1	.024	< .1
19 NOV 76	.297	6.7	.179	2.2	.140	1.2	.025	.1	.010	< .1	.010	< .1
$\bar{X}$	.324	6.88	.634	4.48	.509	2.95	.188	.95	.044	.07		

Table 2. Benthic invertebrate densities (#/m²) at sites in the Sacilla River.

	BAILEY POINT		MARSH POINT		CROW HARBOR		CEYLON		PINEY ISLAND		HOPEWELL POINT	
DATE	Sand	Mud	Sand	Mud	Sand	Mud	Sand	Mud	Sand	Mud	Sand	Mud
16 DEC 75	.108	.090	.543	.071	.183	.034	.160	0	.033	--	.013	.088
8 FEB 76	.718	.096	.226	.125	.888	.008	.106	.002	.020	.031	.014	.272
8 MAR 76	.783	.021	1.085	.065	.927	.161	.238	.124	.160	0	.066	--
6 APR 76	.149	.180	.553	--	.025	--	--	--	--	--	--	--
8 MAY 76	.377	.027	.172	1.204	.269	.116	.349	.224	.109	.201	.005	--
10 JUN 76	.212	.270	1.25	.425	.465	.018	.023	.025	.005	--	.107	.050
10 JUL 76	.227	.449	.969	.190	.214	.347	.059	.017	.003	.055	.005	.301
31 AUG 76	.299	.015	.111	.038	.897	.359	.202	.118	--	--	--	--
18 SEP 76	.353	.046	1.46	.304	.696	.204	.155	--	.036	.004	.019	.003
16 OCT 76	.037	.004	.419	--	.901	0	.560	.153	.020	.002	.024	--
19 NOV 76	.297	.071	.179	0	.140	.057	.025	.074	.010	0	.010	0
$\bar{X}$	.324	.115	.634	.269	.509	.130	.188	.082	.044	.042	.029	.119

Table 3. Total densities and biomass of benthic invertebrates at sites in the Little Satilla River and White Oak Creek.

	L. Satilla Pt.		Colonel's Is.		White Oak Cr.	
Date	Density (N/m^2)	Biomass (g/m^2)	Density (N/m^2)	Biomass (g/m^2)	Density (N/m^2)	Biomass (g/m^2)
20 Mar 77	3612	1.57	3784	1.12	4128	0.22
11 May 77	4486	1.94	4009	1.74	3440	0.16

Table 4. Density and percent contribution of major species in the Little Satilla River, 11 May 77.

L. Satilla Point	Density N/m^2	Percent of Total
Monoculodes edwardsi	2078	46.3
* Corophium sp.	588	13.1
	2665	59.4
Oxyurostylis smithi	1419	31.6
Neomysis americana	372	8.3
Others	29	.6
Total	4486	

Colonel's Island	Density N/m^2	Percent of Total
Monoculodes edwardsi	3171	79.1
* Corophium sp.	193	4.8
* Jassa falcata	161	4.0
* Gammarus sp.	129	3.2
	3654	91.1
Neomysis americana	311	7.8
Others	44	1.1
Total	4009	

	St. Andrews Sound	Bailey Point	Marsh Point	Crow Harbor	Ceylon	Piney Island	Hopewell Point	Upper Satilla
CRUSTACEA								
AMPHIPODA								
Gammarus tigrinus	**	***	**	**	*	*	—	—
Parahaustorius longimerus	***	**	**	**	*	—	—	—
Protohaustorius nr. deichmannae	***	**	**	**	*	—	—	—
Monoculodes edwardsi	***	***	***	***	**	—	—	—
Synchelidium americanum	**	*	*	*	—	—	—	—
Paraphoxus spinosus	**	—	—	—	—	—	—	—
Ampelisca sp.	**	—	—	—	—	—	—	—
Corophium lacustre	***	—	—	—	—	—	—	—
Corophium sp.	***	—	—	—	—	—	—	—
Crangonyx serrata	—	—	—	*	—	—	—	—
Parapleustes aestuarius	***	—	—	—	—	—	—	—
ISOPODA								
Cyathura polita	**	*	*	*	—	—	—	—
Chiridotea coeca	***	***	**	**	*	—	—	—
Edotea montosa	***	—	—	—	—	—	—	—
Ancinus depressus	**	—	—	—	—	—	—	—
Cirolana sp.	**	—	—	—	—	—	—	—
Asellus sp.	—	—	—	—	—	—	—	**
CUMACEA								
Manocuma altera	***	*	*	*	—	—	—	—
Oxyurostylis smithi	**	—	—	—	—	—	—	—
TANAIDACEA	**	*	*	—	—	—	—	—
MYSIDACEA								
Neomysis americana	***	***	**	**	*	—	—	—
Castrosaccus johnsoni	*	—	—	—	—	—	—	—
COPEPODA								
Calanoida	***	***	**	**	*	*	*	**
Cyclopoida	**	**	**	*	*	*	*	*
Harpacticoida	**	**	*	*	—	—	—	—
OSTRACODA	**	—	—	—	—	—	—	—
DECAPODA								
Acetes carolinae	*	—	—	—	—	—	—	—
Palaemonetes pugio	*	*	—	—	—	—	—	—
Palaemonetes intermedius	*	—	—	—	—	—	—	—
Pagurus defensus	*	—	—	—	—	—	—	—
Pagurus sp.	*	—	—	—	—	—	—	—
Rhithropanopeus harrisi	*	—	—	—	—	—	—	—
INSECTA								
DIPTERA								
CHIRONOMIDAE								
Ablabesmyia sp.	—	—	—	—	—	*	*	**
Coelotanypus sp.	—	—	—	—	—	—	*	**
Cryptochironomus sp.	—	—	—	—	*	*	*	**
Parachironomus demerjeri	—	—	—	—	—	*	*	***
Polypedilum sp.	—	—	—	—	—	*	*	***
Xenochironomus sp.	—	—	—	—	*	*	*	**
Procladius sp.	—	—	—	—	—	—	*	**
Paratendipes connectens	—	—	—	—	—	*	*	—
Cladotanytarsus	—	—	—	—	—	*	*	**
Demicryptochironomus	—	—	—	—	—	—	*	**
Corynoneura sp.	—	—	—	—	—	*	*	***
T-Group	—	—	—	—	—	—	*	***
Nilothauma sp.	—	—	—	—	—	—	*	**
ORTHOCLADIINAE	—	—	—	—	—	*	*	***
CERATOPOGONIDAE								
Palpomyia sp.	—	—	—	—	*	*	*	***
SIMULIIDAE	—	—	—	—	—	*	*	***

NOTE: (--) - Absent
(*) - Rare
(**) - Common
(***) - Very Common

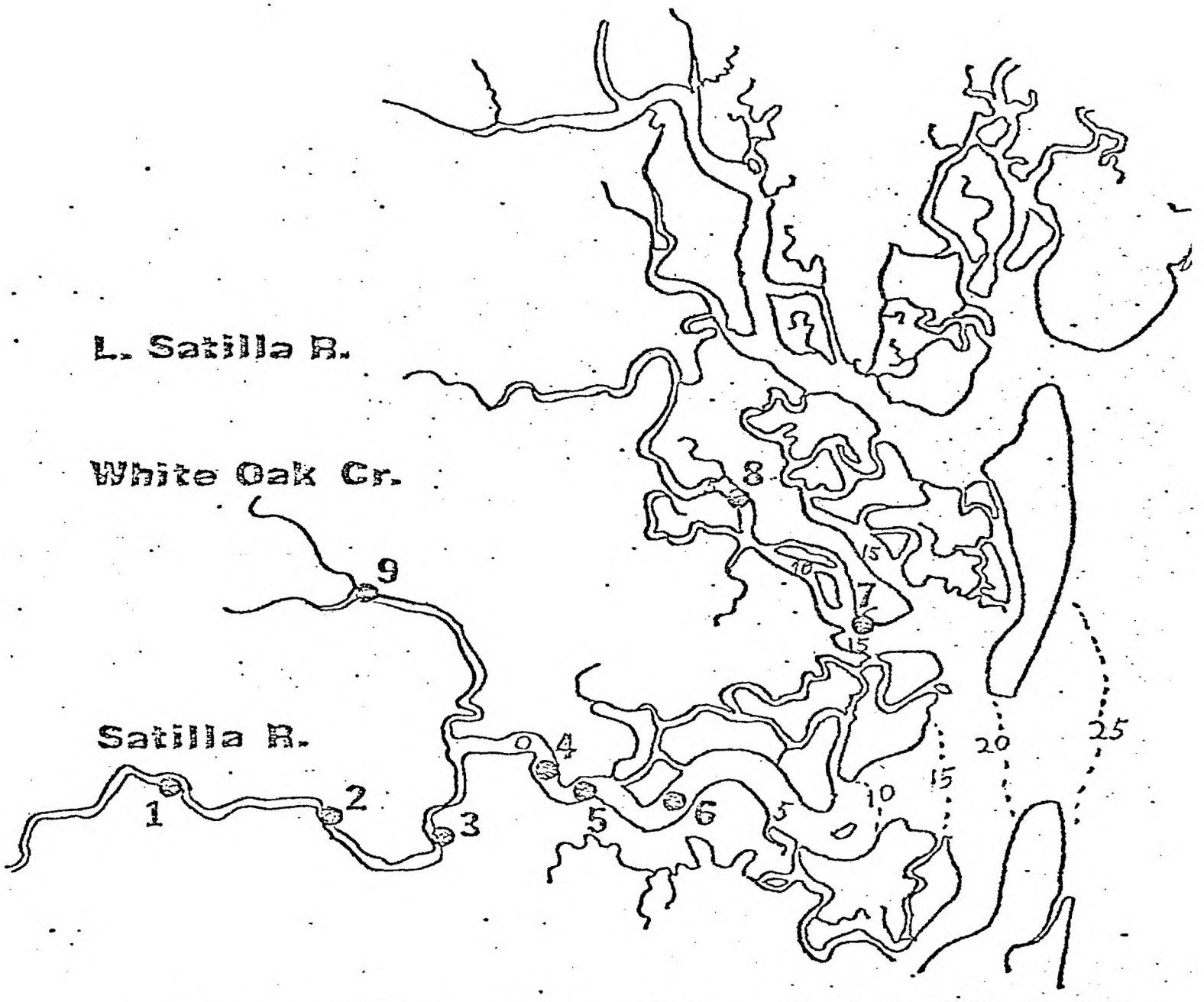
Table 6. Fish species collected in the Satilla River and estuary (GT), compared to data of others.

Fish	GT	GF	DS
Amia calva	x	x	x
Lepisosteus osseus	x	x	x
Lepisosteus platyrhineus		x	
Esox americanus	x	x	x
Esox niger	x	x	x
Notropis spp.	x	x	x
Minytrema melanops	x	x	x
Ictalurus natalis	x	x	x
Ictalurus nebulosus		x	x
Ictalurus punctatus	x	x	x
Aphredoderus sayanus	x	x	x
Gambusia affinis	x	x	x
Labidesthes sicculus	x	x	x
Lepomis auritus	x	x	x
Lepomis gulosus	x	x	x
Lepomis macrochirus	x	x	x
Lepomis punctatus	x	x	x
Lepomis marginatus	x	x	x
Micropterus salmoides	x	x	x
Etheostoma spp.	x	x	x
Fundulus spp.	x	x	x
Dorosoma			x
Notemigonus crysoleucas			x
Erimyzon sucetta		x	x
Noturus gyrinus	x	x	x
Noturus leptacanthus		x	x
Leptolucania ommata			x
Heterandria formosa			x
Morone saxatilis			x
Acantharchus pomotis			x
Centrarchus macropterus		x	x
Elassoma spp.			x
Enneacanthus spp.			x
Lepomis microlophus			x
Pomoxis nigromaculatus	?	x	x
Anguilla rostrata	x		x
Arius felis	x		

GT = Georgia Tech
GF = Game and Fish
DS = Dahlberg and Scott

Satilla Tidewater Area

(WITH SALINITY DISTRIBUTION AT MID-FLOW TIDE, 20 MARCH 1977).



1—Hopewell Point
2—Piney Island
3—Ceylon
4—Crow Harbor
5—Marsh Point
6—Bailey Point
7—L. Satilla Point
8—Colonel's Is.
9—White Oak Cr.

5n. miles