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A Faunal and Seasonal Study of the Aquatic Insects in Two Water Ecosystems in South Arkansas: DeGray Reservoir and the Upper Cadda River

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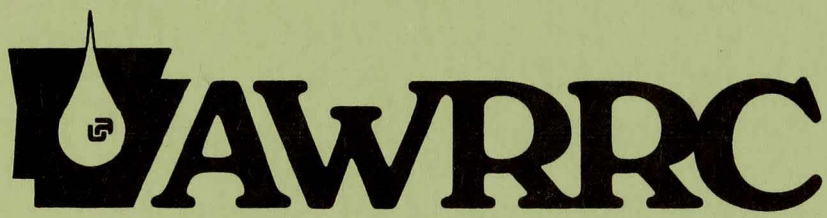
A FAUNAL AND SEASONAL STUDY OF THE AQUATIC INSECTS IN TWO WATER ECOSYSTEMS IN SOUTH ARKANSAS: DeGRAY RESERVOIR AND THE UPPER CADDO RIVER

by
Robert T. Allen



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Principal Investigator	Degree	Discipline
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Abstract

The impounding of the lower Caddo River to create DeGray Reservoir radically changed the water habitats in that portion of the Caddo River. A number of new and different habitats were created by the lake. The objective of this study was to determine what, if any, differences existed between the aquatic insect biotas of DeGray Reservoir and the upper Caddo River.

Four collecting stations along the shore of DeGray Reservoir and four stations along the upper Caddo River were selected as sampling sites. Collections were made at one month (March, April, Oct., Nov.) intervals or at two week intervals (May, June, July, August, Sept.) from March to December of 1979.

The data collected indicates that the upper Caddo River is approximately three times as rich in the diversity of taxa collected and the number of individuals collected as DeGray Reservoir.

Table of Contents

INTRODUCTION

In any ecosystem, aquatic or terrestrial, members of the class Insecta are by far the most numerous in species and often biomass. They are an integral part of any food chain especially those in aquatic environments. They are, however, usually studied only superficially or neglected altogether. This is because many groups are difficult or impossible to identify and the large numbers of individuals are cumbersome to deal with, especially by the general ecologist/biologist. Both of these drawbacks can be largely overcome by careful planning by an entomologist.

Many insect species have rather precise habitat requirements for survival. If a habitat is modified, the insect faunal composition will change. Thus, the insect species present in a habitat are frequently indicators of both levels and kinds of pollution, types of substrate, types of vegetation and stream flow (in aquatic habitats).

The modification of the Caddo River by the formation of DeGray Reservoir created a new habitat. This, no doubt, had an effect on the aquatic fauna. The data collected under the auspices of this study document the differences between the aquatic insect faunas in the Caddo River and in DeGray Reservoir.

OBJECTIVES

The objectives of this project will be the following:

1. A Survey of the aquatic insect fauna in
   (a) The DeGray Reservoir
   (b) The Upper Caddo River
2. To determine the seasonal cycles of activity and abundance of selected taxa at the DeGray Reservoir site.

METHODS

Sampling Sites

With the aid of county highway maps, eight sampling stations were chosen. These stations were selected based on their being longitudinally distributed along the Upper Caddo River - DeGray Reservoir Complex, their accessibility and the likelihood of their being diverse aquatic and semiaquatic insect habitats.

Caddo River Stations

Station 1 - Headwaters area, 7 mi. west of Black Springs, Arkansas at Ark. Hwy. 8 bridge. Montgomery County R27W-T3S.

Station 2 - Caddo Gap, 1 mi. East of Caddo Gap, Arkansas at low water bridge 200 yds. upstream of Ark. Hwy. 240 bridge. Montgomery County R24W-T4S.

Station 3 - Glenwood, Ark. Hwy. 70 bridge at Glenwood, Arkansas. Pike County R24W-T5S.

Station 4 - Amity, 3.0 miles N.E. of Amity, Arkansas, at low water bridge 200 yds. upstream of Ark. Hwy. 84 bridge. Clark County R23W-T5S.

DeGray Reservoir

Station 1 - Hwy. 346 Recreation Area, North side of DeGray Reservoir where Ark. Hwy. 346 ends. Hot Springs County R23W-T5S.

Station 2 - Arlie Moore Recreation Area, primitive camping area 1 mi. S.E. of Arlie Moore Ranger Station. Pike County R20W-T5S.

Station 3 - DeGray State Park Lakeside Vista ½ mi. E. of Ark. Hwy. 7 eastern entrance to DeGray State Park. Clark County R20W-T5S.

Station 4 - Spillway Recreation Area, Cove 150 yds. E. of boat launching ramp. Clark County R20W-T6S.

Sampling Methods

At each station on the Caddo River aquatic kick net samples were taken from both riffle and pool habitats and the shoreline vegetation was swept with an insect net.

At each station on DeGray Reservoir the shoreline vegetation was swept with an insect net and stones in the littoral zone were overturned and inspected for aquatic insects.

During each trip a black light sample was taken at one or more stations on both the Caddo River and DeGray Reservoir. Black lighting appears to be the most successful method of collecting a large diversity of adult aquatic and semiaquatic insects on both the Caddo River and DeGray Reservoir. Lighted parking, picnic, and restroom areas on the shoreline of DeGray Reservoir also provided productive sites for hand collecting adult aquatic and semiaquatic insects in the evening.

Insects collected by all methods were immediately placed in labelled vials filled with 70% Ethanol as a preservative. These were then returned to the lab for sorting and identification as time permitted.

CONCLUSIONS

The two objectives set forth in this proposal were accomplished. Tables I-VIII present a detailed record of all the aquatic insect taxa that were collected and the stations at which they were collected. Tables IX-XVI present a detailed record of all the aquatic insect taxa that were collected and the dates on which they were collected.

The data presented in Tables I-VIII are summarized in Table XVII. From summary Table XVII we may see that 85 insect taxa were collected in the Upper Caddo River while only 27 insect taxa were collected in DeGray Reservoir. Of the 27 taxa occurring in DeGray Reservoir all but 7 taxa also occurred in the Upper Caddo River. It appears that the DeGray Reservoir has a depauperate aquatic insect fauna in relation to the Upper Caddo River.

The data presented in Tables IX-XVI relevant to seasonal occurrence are summarized in Table XVIII. From summary Table XVIII it appears that there were no distinct seasonal cycles. There did seem to be a decrease in the number of specimens and taxa collected during December. Unfortunately we were unable to continue the sampling in the succeeding month and are therefore unable to positively identify this apparent decrease in numbers as a definite trend.

From the data collected we may conclude that there is a distinct quantitative and qualitative difference between the aquatic insect fauna of the Upper Caddo River and DeGray Reservoir. We may also note that no distinct seasonal cycles of abundance and non abundance appeared during the sampling period.

TABLE I OCCURRENCE OF MAYFLIES (EPHEMEROPTERA) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Batisca sp.		1	2					
Baetis sp.	22	3	23	35				
Caenis sp.	9	1	1				1	
Callibaetis sp.							,1A	
Choroterpes sp.	3	7	8	4				
Ephemerella dorothea			1					
Ephemerella serrata			1	1				
Ephemerella serratoides				1				
Ephoron album				3	,20A			
Heptagenia hebe	3							
Heptagenia maculipennis		3						
Heptagenia sp.	54	25	58	10				
Heterocleon sp.	13	15	19	13				
Hexagenia atrocaudata				2				
Hexagenia limbata				12	3			
Hexagenia recurvata							,1A	
Hexagenia rigida					,15A	,2A	,14A	,5A
Isonychia sp.	2	12	139	86				
Leptophlebia sp.	11	5						
Paraleptophlebia praepedita	10							
Paraleptophlebia sp.	8							
Pentagenia vittiger							,19A	,6A
Potamanthus sp.				1				
Pseudocleon dubium				2				
Rhithogena sp.			25	5				
Stenonema area				1				
Stenonema canadensis	16	49	17	15				
Stenonema femoratum			2	5				
Stenonema frontale	1	1	3	6				1
Stenonema heterotarsae								3
Stenonema integrum			,5A	2				
Stenonema nepotellum	9	29	172	67				
Stenonema rubrum		15	46	41				
Stenonema tripunctatum	3	15	15	18		1,1A	35,58A	17,7A
Stenonema sp.		1	2					
Tricorythodes atratus		5		1				

TABLE II OCCURRENCE OF ODONATA (DRAGONFLIES) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Agrion sp.	2	1						
Argia sp.		3,1A	14	,11A			,1A	,2A
Calopteryx maculata	2				,1A			
Dromogomphus spinosus			1	7	2			
Gomphys sp.		2						
Hagenius brevistylus	2	4		2				
Hetaerina americana				,2A				
Ischnura sp.		1	1	25	3			
Lanthus albistilus	4	7	5					
Macromia taeniolata				2				

TABLE III OCCURRENCE OF STONEFLIES (PLECOPTERA) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Acroneura abnormis				,2A				
Acroneura arida	4							
Acroneura sp.	10	2	2,1A	23,5A	,2A			
Hastaperla sp.	10	2		25				
Isoperla sp.	38	18	27	8				
Neoperla clymene	30	50	188	279	15,17A		,5A	
Nemoura sp.	1	12	3					
Neophasganiphora capito			2	9				
Perlest placida			4					
Perlinella drtmo	1							
Taenionema sp.		2		10				
Taeniopteryx sp.			1	2				

TABLE IV OCCURRENCE OF TRUE BUGS (HEMIPTERA) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Gerris marginatus	,2A				,3A		,1A	
Gerris rerigis	,3A							
Ragovelia obesa	,12A			,3A				
Ranatra sp.	,1A							
Trepobates knighti	,3A		,1A	,3A				

TABLE V OCCURRENCE OF DOBSONFLIES AND ALDERFLIES (NEUROPTERA) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Corydalus cornutus	9	8	50	35,1A				
Nigronia sp.		1						
Sialis sp.				4		7	,3A	,1A

TABLE VI OCCURRENCE OF BEETLES (COLEOPTERA) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Bidessus sp.					1			
Dineutus assimilis		,1A		,6A				
Dineutus discolor				,2A				
Dineutus sp.				1				
Enochrus sp.					52			
Gyrinus sp.							1	3
Heterocerus sp.					21			
Helichus lithophilus	,1A		,1A	,4A				
Psephenus sp.	50,5A	4	10	5				
Stenelmis sp.	17,7A	10,18A	3,9A	5,21A				
Tropisternus lateralis	,2A		2A			13	1	

TABLE VII OCCURRENCE OF CADDISFLIES (TRICHOPTERA) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Agapetus sp.	14	1						
Cheumatopsyche sp.	35	8	48	59				
Chimara sp.	4	2	29	21				
Helicopsyche sp.	27	2	4	3				
Hydropsyche sp.	3		39	29				
Leptocelua exquisita	,30A			,50A				
Oecetis cinerarcens				,75A			,26A	
Polycentropus sp.	3		4					
Psychomyia sp.	5							
Pycnopsyche sp.	9	1						
Rhyacophila sp.				1				
Triaenodes tarda							,28A	

TABLE VIII OCCURRENCE OF FLYS (DEPTERA) AT SAMPLING SITES ALONG THE CADDO RIVER AND DEGREY RESERVOIR

	CADDO				DEGREY			
	1	2	3	4	1	2	3	4
Atherix sp.		2	2					
Chironomus sp.	4	2	3	7	12	27	11	
Ericera fultonensis	8			8				
Simulium sp.		2	6	33				
Stratomys sp.							1	
Tabanus sp.		1	3	2				
Tipula abdominalis	9			4				

TABLE IX

SEASONAL OCCURRENCE OF EPHEMEROPTERA ALONG THE CADDO RIVER AND IN DEGREY RESERVOIR

EPHEMEROPTERA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Batisca sp.	2	1														
Baetis sp.		2		15	13			9		6	18	12		4	4	
Caenis sp.		3		6	2				1							
Callibaetis										1A						
Choroterpes sp.				1	3		7	4			2	5				
Ephemerella dorothea		1														
Ephemerella serrata		1		1												
Ephemerella serratoides				1												
Ephoron album								1		2						
Heptagenia hebe				3												
Heptagenia maculipennis					3											
Heptagenia sp.		4		16	21		8	25		8	22	27		15	1	
Heterocleon sp.	17	2		23	1		6	1			5	4		1		
Hexagenia atrocaudata					1		1									
Hexagenia limbata				4			9	1								1
Hexagenia recurvata										1A						
Hexagenia rigida					2A			15A		14A	5A					
Isonychia sp.	18	30		12	1		8	29		20	30	37		24	20	10
Leptophlebia sp.	1	10			5											
Paraleptophlebia praepedita				10	5											
Paraleptophlebia sp.								3								
Pentagenia vittigeri								20A		21A	4A					
Potamanthus sp.					1											
Pseudocleon dubium	2															
Rhithogena sp.		8		15	7											
Stenonema area							1									
Stenonema canadensis	2	1		17	16		17	2		6	8	7		1	2	
Stenonema femoratum												5		1	1	
Stenonema frontale				1	8							3				
Stenonema heterotarsae												3				
Stenonema integrum				1				5A		1						
Stenonema nepotellum	23	24		35	6		5	42		51	36	31		9	25	6
Stenonema rubrum	1	2		15	12		2	4		9	11	32		6		5
Stenonema tripunctatum	7	6		1	1		2	16A 1		50A 2	3	60			18	5
Stenonema sp.				1			2	3		1						

TABLE X

SEASONAL OCCURRENCE OF ODONATA ALONG THE CADDO RIVER AND IN DEGREY RESERVOIR

ODONATA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Agrion sp.				2												
Argia sp.		1		2A	2A 3	3	1A 2				3A 2	1			6	
Calopteryx maculata											1A					
Dromogomphus spinosus		2		2	1		2									2
Gomphus sp.	1				1											
Hagenius brevistylus					6		2									
Hetaerina americana					2A						1A					
Ischnura sp.	1			17	11							1		1		
Lanthus albistylus	2	1	1	3			1A	1		4	2	1				
Macromia taeniolata							2									

TABLE XI

SEASONAL OCCURRENCE OF PLECOPTERA ALONG THE CADDO RIVER AND IN DEGREY RESERVOIR

PLECOPTERA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Acroneuria abnormis							2A									
Acroneuria arida	6			4												
Acroneuria sp.	1	3		5	3A 2		3A 2			1					1	1
Hastaperla sp.	1	2		9												3
Isoperla sp.	7	75		1												8
Neoperla clymene	9	10		69	48		190A 45	67		36	1A 45	64	4A	1A 9	10	8
Nemoura sp.	16															
Neophasganophora capito				11												
Perlesta placida				4												
Perlinella drymo				1												
Taenionema sp.	12															
Taeniopteryx																3

TABLE XII

SEASONAL OCCURRENCE OF HEMIPTERA ALONG THE CADDO RIVER AND IN DEGREY RESERVOIR

HEMIPTERA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Gerris marginatus				6A												
Gerris remigis	2A					1A		1A		1A	1A	1A				
Ragovelia obesa						6A				1A	4A			4A		
Ranata sp.				1												
Trepobates knighti								7A			1A	3A				

TABLE XIII
SEASONAL OCCURRENCE OF NEUROPTERA ALONG THE
CADDO RIVER AND IN DEGREY RESERVOIR

NEUROPTERA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Corydalus cornutus	2		3	16	3	3	10	4		4	12	1A 29		9	8	
Nigronia sp.			1													
Sialis sp.				11A	4											

TABLE XIV
SEASONAL OCCURRENCE OF COLEOPTERA ALONG THE
CADDO RIVER AND IN DEGREY RESERVOIR

COLEOPTERA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Bidessus														1A		
Dineutus assimilis				3A	1A		2A	2A								
Dineutus discolor										2A						
Dineutus sp.				1												
Enochrus sp.														52A		
Gyrinus sp.				4A												
Heterocerus sp.														21A		
Helichus lithophilus				1A	1A					1A	1A	1A	1A			
Psephenus sp.	4	4A 4		15	20		1	1A 9			10			4		1
Stenelmis sp.	14			6A 7	12A 5		1A	9A 4		10A 1	9A	9A 2		1		1
Tropisternus lateralis								1A		1A	13A	3A	2A			

TABLE XV

SEASONAL OCCURRENCE OF TRICHOPTERA ALONG THE CADDO RIVER AND IN DEGREY RESERVOIR

TRICHOPTERA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Agapetus sp.	9			3	3											
Sheumatopsyche sp.	18	1		1	22		12	44		25	22	10		2		3
Chimara sp.	2	3		7	1		2	7		10	5	14		4		1
Helicopsyche sp.	2			2	12			4			6	5				1
Hydropsyche sp.				8			21	13		18	7	9				
Leptocelia exquisita					30A		50A									
Oecetis cinerarcens				26			75A									
Polycentropus sp.				4	1			1			1					
Psychomyia sp.					5											
Pycnopsyche sp.	9	1														
Rhyacophila sp.																1

TABLE XVI

SEASONAL OCCURRENCE OF DIPTERA ALONG THE CADDO RIVER AND IN DEGREY RESERVOIR

DIPTERA	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Atherix sp.	2									2						
Chironomus sp.	2			18	13		2	3	11		2	6				
Eriocera fultonensis				3	1		1	4		1	5	1				
Simulium sp.	9	1					1									30
Stratomys sp.									1							
Tabanus sp.		1		1			1			2		1			1	
Tipula abdominalis	4			5								1				2

TABLE XVII
THE NUMBERS OF AQUATIC INSECT TAXA OCCURRING IN EACH OF TWO STUDY AREAS, THE UPPER CADDO RIVER AND DEGRAY RESERVOIR: E = ENDEMIC, NUMBER OF TAXA OCCURRING ONLY IN ONE STUDY AREA

	CADDO RIVER					DEGRAY RESERVOIR				
	No. Genera	No. E	Add Sp.	No. E.	TOTAL	No. Genera	No. E.	Add Sp.	No. E.	TOTAL
Ephemeroptera	18	15	13	12	31	6	1	4	4	10
Odonata	10	0	0	0	10	4	0	0	0	4
Plecoptera	10	8	2	1	12	2	0	0	0	2
Hemiptera	5	4	0	0	5	1	0	0	0	1
Neuroptera	3	2	0	0	3	1	0	0	0	1
Coleoptera	5	4	2	2	7	1	4	0	0	5
Trichoptera	11	10	0	0	11	2	1	0	0	2
Diptera	6	5	0	0	6	2	1	0	0	2

TABLE XVIII
SEASONAL OCCURRENCE OF ALL AQUATIC INSECT FAUNA COLLECTED IN THE UPPER CADDO RIVER AND IN DEGRAY RESERVOIR

	3/7	4/6	5/7	5/16	5/31	6/1	6/15	6/29	7/7	7/13	7/27	8/16	9/8	9/30	10/26	12/29
Ephemeroptera	83		95	178	2A 106		68	56A 125		87A 105	9A 135	226		61	71	27
Odonata	4	4	1	2A 24	4A 22	3	2A 8	1		4	5A 4	3		1	6	2
Plecoptera	52	40		104	3A 50	0	195A 47	67		37	1A 45	64	4A	1A 9	11	23
Hemiptera	2A			6A 1		7A		8A		2A	6A	4A		4A		
Neuroptera	2		4	11A 16	7	3	10	4		4	12	1A 24		9	8	
Coleoptera	18	4A 4		14A 23	14A 25		3A 1	13A 13		14A 1	23A 10	13A 2	3A	74A 5		2
Trichoptera	40	5		51	30A 44		125A 35	69		48	41	38		6		6
Diptera	17	2		27	14		5	7	12	5	7	9			1	32