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Aquatic Macroinvertebrates of the St. Francis Sunken Lands in Northeast Arkansas

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THE AQUATIC MACROINVERTEBRATES OF THE ST. FRANCIS SUNKEN LANDS IN NORTHEAST ARKANSAS

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ABSTRACT

The primary objective of this study was to survey the aquatic macroinvertebrate diversity of the St. Francis Sunken Lands in northeast Arkansas. Secondary objectives were a determination of their relative abundance and distributional and seasonal patterns. Sixty semi-annual collections were made from 30 stations by sampling each station 2 times for 1½ man-hours with a Turtox Indestructible™ dip net. Totals of 243 taxa and 13,952 organisms were recorded for the sample period (August 1987-July 1988). Each station was assigned to 1 of 4 associations, distinguished by distinct physical factors within the river channels and the immediate watershed. The Old River Channel-Oxbow Association exhibited the most complex and stable community structures; this was attributed to the relative lack of man's alteration of the habitat. The Channelized Ditches-Point Source Pollution Association demonstrated obvious detrimental effects of man's intervention. The relatively simple community structures of the St. Francis Lake-Open Water Association were attributed to the typically homogeneous substrates of this area. The simplest community structures were in the Channelized Ditches-Intense Agriculture Association and were a direct result of man's multiple alterations within the river channels and immediate watershed. Seasonal species diversity indices and numbers of taxa varied inversely with respect to water level. High values occurred during low-water periods, whereas lower values occurred during high-water periods. This inverse relationship was attributed to flooded habitat, which led to population dilution and diminished collecting success.

INTRODUCTION

Along the eastern edge of Crowley's Ridge, within the upper St. Francis River flood plain of Arkansas, lies a rather unique physiographic area known as the Sunken Lands. Beginning at the Arkansas-Missouri state line in eastern Greene County, the Sunken Lands follow the St. Francis River's braided pattern of oxbows, sloughs, channels and ditches. Meandering southward through Craighead County and into Poinsett County, this braided reach of the river consolidates at the lower end of the Sunken Lands, in the vicinity of Marked Tree. Ranging in width from 1.0-7.5 km, the Sunken Lands extend approximately 50.0 km longitudinally (Fig. 1). Surface gradients range from 0-3% and elevation ranges from 71.6-64.0 m above sea level. The soil type of the watershed is fine-grained alluvial silt, sand and clay sediment; the substrates vary from firm mud or sand to deposits of silt and/or organic detritus (Saucier, 1974). Mean annual rainfall is 126.6 cm; mean annual temperature is 15.9° C (U.S. Dept. of Comm. Nat. Oceanic and Atm. Adm., 1987, 1988). Characterized by seasonally-flooded bottomland hardwood and agriculturally inhospitable terrain, the Sunken Lands offer a natural refugium for flora and fauna which were perhaps more broadly distributed in the Mississippi Alluvial Plain before man's alteration of habitat became so severe. Present utilization of the aquatic natural resources is limited primarily to commercial fishing, sport fishing and waterfowl hunting.

The primary purpose of this study was to survey the diversity of the aquatic macroinvertebrates of the St. Francis Sunken Lands. Determination of their relative abundance and distributional and seasonal patterns were secondary objectives. The mussel community of the St. Francis River system has been extensively surveyed (Meek, 1896; van der Schalie and van der Schalie, 1950; Stansbery and Stein, 1982; Bates and Dennis, 1983; Clarke, 1985; Harris, 1986; Ahlstedt and Jenkinson, 1987a, b). Comprehensive investigations of any other aquatic macroinvertebrate communities were lacking.

METHODS AND MATERIALS

Thirty stations were established throughout the Sunken Lands (Fig. 1). Two samples were collected from each station at 6 month intervals for a total of 60 samples (August 1987-July 1988). Each sample consisted of 1½ man hours with a Turtox Indestructible™ dip net, and

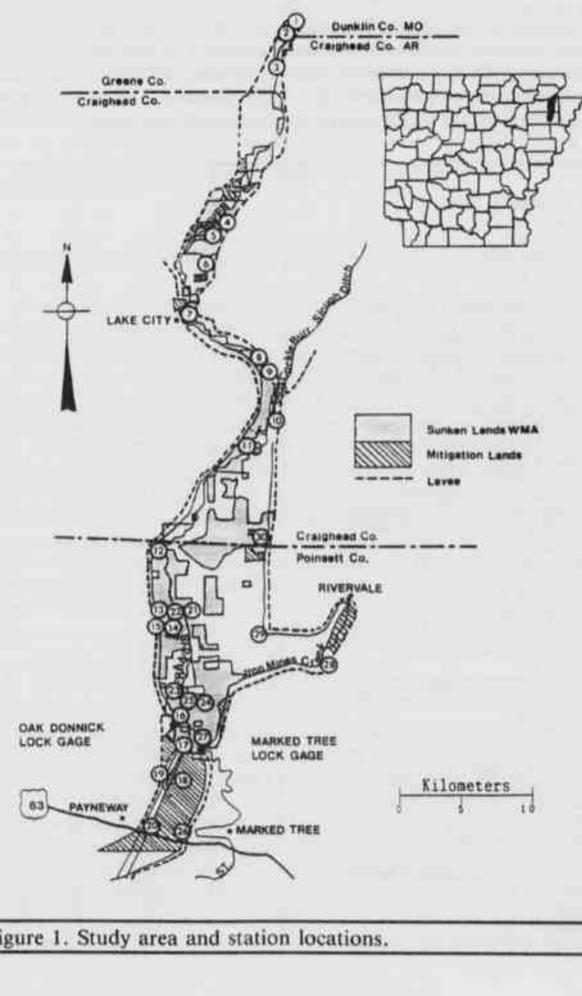

Figure 1. Study area and station locations.

specimens were preserved in 70% ETOH. Mussel relics were collected by hand. The specimens were identified in the laboratory, cataloged and placed in the Aquatic Macroinvertebrate Collection of the Arkansas State University Museum of Zoology (ASUMZ) as voucher specimens. General identifications were made using keys by Pennak (1978) and Merritt and Cummins (1984). Keys used for specific determinations are Hungerford (1923), Drake and Chapman (1953), Young (1954), Wilson (1958), Froeschner (1962), Wooldridge (1966), Zimmerman (1970), Gousoulin (1973 & 1975), Tarter, Watkins and Little (1976), Gunderson (1978), Pennak (1978), Schuster and Etnier (1978), Hilsenhoff (1980), Kittle (1980), Pescador and Berner (1981), Merritt and Cummins (1984), and Young (1985).

Shannon-Wiener Diversity (H '), Simpson Diversity, Simpson Dominance, H 'max and Evenness values were calculated at base 2 logarithm using the AQUATIC ECOLOGY-PC program of Oakleaf Systems, Decorah, IA (Cochran, 1990). Calculated diversity indices maintained strikingly similar longitudinal, as well as seasonal patterns, therefore H ' is used representively in this report. H ' represents the absolute diversity or the average degree of uncertainty of predicting the species of a given individual selected at random from a population (Schemnitz, 1980).

RESULTS AND DISCUSSION

A total of 13,952 organisms constituting 243 taxa was collected. Seventy-eight percent were Insecta, consisting of Coleoptera (33%), Hemiptera (20%), Odonata (12%), Diptera (10%), Ephemeroptera and Trichoptera (9% each), Collembola (4%), and Plecoptera and Megaloptera (1.5% each). Other taxa, listed in order of decreasing abundance, were Mollusca (11% of the total taxa), Crustacea (6%), Annelida (4%) and Turbellaria, Nematoda and Nematomorpha at < 1% each (Table 1).

Table 1. Aquatic macroinvertebrates expressed as number collected/association (OROA, old river channel-oxbow; CDPA, channelized ditches-point source pollution; SFLA, St. Francis' Lake-open water; CDAA, channelized ditches-intense agriculture) and study area total (SAT).

	OROA	CDPA	SFLA	CDAA	SAT
Cura foremanii (Girard)	.	.	.	1	1
Nematoda	4	1	.	1	6
Gordius spp.	.	.	.	2	2
Paragordius spp.	1	1	.	.	2
Ferrissia rivularis (Say)	5	9	1	4	19
Fossaria obrussa (Say)	3	.	.	8	11
Laevapex diaphanus (Haldeman)	.	.	1	1	2
Menetus dilatatus (Gould)	9	3	6	7	25
Physella gyrina (Say)	92	3	42	34	171
Pseudosuccinea columella (Say)	.	1	2	.	3
Corbicula fluminea (Müller)	31	2	1	2	36
Amblema plicata ssp.	.	4	.	.	4
Anodonta grandis Say	1	.	5	.	6
A. imbecillis Say	7	.	.	.	7
A. suborbiculata Say	1	.	3	.	4
Lampsilis ovata (Say)	1	1	.	.	2
L. teres (Rafinesque)	.	.	1	1	2
Lasmigona complanata ssp.	.	1	.	.	1
Leptodea fragilis (Rafinesque)	7	1	.	.	8
Obliquaria reflexa Rafinesque	.	.	1	.	1
Potamilus capax (Green)	.	.	.	1	1
P. purpuratus (Lamarck)	.	.	.	2	2
Quadrula pustulosa ssp.	.	1	1	.	2
Q. quadrula (Rafinesque)	.	2	2	.	4
Toxolasma parva (Barnes)	17	.	4	1	22
Truncilla truncata Rafinesque	.	1	.	.	1
Uniomerus declivis (Say)	.	.	5	.	5
Sphaeriidae	36	.	6	12	54
Musculium transversum (Say)	2	.	.	.	2
Sphaerium striatinum (Lamarck)	2	.	.	.	2
Oligochaeta	33	3	10	81	127
Naididae	.	.	1	.	1
Branchiobdellida	1	.	23	.	24
Helobdella stagnalis (L.)	.	3	1	1	5
H. triserialis (Blanchard)	1	.	.	2	3
Placobdella sp.	.	1	.	.	1
P. ornata (Verrill)	5	.	4	1	10
P. parasitica (Say)	.	.	.	1	1
Argulus sp.	.	.	.	4	4
Taphromysis louisianae Banner	2	20	1	.	23
Caecidotea spp.	160	34	230	44	468
Lirceus spp.	1354	.	290	18	1662
Crangonyx spp.	380	45	138	81	644
Gammarus fasciatus Say	37	35	57	104	233

Table 1. Cont.	OROA	CDPA	SFLA	CDAA	SAT
Hyalella azteca (Saussure)	5	1	8	14	28
Cambarellus (Pandicambarus) shufeldtii (Faxon)	26	.	82	4	112
Cambarus (Lacunicambarus) sp.	1	14	.	4	19
Orconectes (Buannulifictus) palmeri palmeri (Faxon)	27	1	3	3	34
O. (Traqulicambarus) lancifer (Hagen)	5	.	12	1	18
Procambarus (Ortmannicus) acutus acutus (Girard)	9	1	.	4	14
P. (Scapulicambarus) clarkii (Girard)	30	1	5	6	42
Palaemonetes kadiakensis Rathbun	887	93	85	622	1687
Unionicola sp.	1	.	.	.	1
Entomobrya sp.	.	.	.	2	2
Hypogastruridae	1	.	.	.	1
Odontella sp.	.	2050	.	.	2050
Isotomidae	.	.	.	80	80
Isotomurus sp.	1	.	.	.	1
Podura aquatica L.	.	.	.	1	1
Sminthuridae	.	1	.	.	1
Baetidae	1	.	.	1	2
Baetis spp.	23	52	3	22	100
B. intercalaris McDunnough	5	.	.	.	5
Callibaetis fluctuans (Walsh)	1	.	.	.	1
Pseudocloeon sp.	1	1	.	.	2
Baetisca obesa (Say)	7	.	.	5	12
Caenis spp.	101	2	71	25	199
Ephemerellidae	1	.	.	.	1
Hexagenia limbata (Serville)	80	8	23	27	138
Pentagenia vittigera (Walsh)	.	.	.	1	1
Stenacron interpunctatum Say	.	2	.	2	4
Stenonema exiguum Traver	2	.	.	.	2
S. mediopunctatum (McDunnough)	4	.	.	.	4
S. pulchellum (Walsh)	1	.	.	.	1
Isonychia spp.	61	3	.	4	68
Tricorythodes atratus (McDunnough)	3	2	.	.	5
Hetaerina spp.	74	.	.	.	74
Coenagrionidae	.	.	1	1	2
Argia spp.	95	31	5	85	216
A. apicalis (Say)	.	.	.	54	54
Enallagma spp.	64	2	6	27	99
Ischnura spp.	.	.	21	6	27
Dromogomphus spinosus Selys	6	.	.	.	6
D. spoliatus Hagen	56	.	.	5	61
Gomphus sp.	.	1	.	.	1
G. (Arigomphus) lentulus Needham	29	.	8	.	37
G. (A.) submedianus Williamson	1	.	.	.	1
G. (Gomphurus) vastus Walsh	.	.	.	1	1
G. (Stylurus) ivae Williamson	1	.	.	.	1
G. (S.) plagiatus Selys	13	2	.	1	16
Boyeria vinosa Say	3	.	.	.	3
Nasiaeschna pentacantha Rambur	10	.	.	2	12
Macromia spp.	30	.	.	6	36
Epicordulia princeps (Hagen)	46	.	1	.	47
Neurocordulia molesta Walsh	3	1	.	.	4
Tetragoneuria cynosura (Say)	40	.	.	.	40
Libellula spp.	7	.	.	2	9
Perithemis tenera Say	17	.	1	1	19
Plathemis lydia Drury	.	.	.	3	3
Prostoia sp.	8	.	.	8	16
Perlesta spp.	74	22	.	4	100
Isoperla spp.	60	.	.	5	65
Belostoma flumineum Say	.	.	2	.	2
B. lutarium (Stal)	2	.	.	.	2
Corisella inscripta (Uhler)	.	.	.	1	1
Corixidae (nymphs)	24	.	51	101	176
Hesperocorixa nitida (Fieb.)	.	1	.	1	2
Palmacorixa buenoi Abbot	15	1	4	23	43
Trichocorixa kanza Sailer	15	15	123	625	778
Gelastocoris oculatus oculatus (Fab.)	9	4	.	3	16
Gerridae sp. (nymph)	.	.	1	.	1
Limnoporus sp. (nymphs)	2	.	1	3	6
L. canaliculatus (Say)	20	10	6	23	59
Metrobates alacris Drake	3	.	.	.	3
Neogerris hesione (Kirkaldy)	1	.	.	1	2
Rheumatobates sp.	.	.	.	2	2
R. hungerfordi Wiley	.	.	.	2	2
R. palosi Blatchley	.	.	.	2	2
R. tenuipes Meinert	13	.	2	32	47
R. trulliger Bergroth	.	.	.	1	1
Trepobates spp. (nymphs)	.	.	.	4	4
T. knighti Drake and Harris	.	.	.	4	4
T. subnitidus Esaki	2	.	9	54	65
Hebrus burmeisteri Lethierry and Severin	.	.	.	2	2
H. consolidus Uhler	1	.	.	.	1
Hydrometra martini Kirkaldy	41	2	.	6	49
Mesovelia sp.	.	.	.	3	3
M. mulsanti White	1	.	.	4	5
Ranatra australis Hungerford	.	.	.	1	1
R. buenoi Hungerford	1	.	.	2	3
Notonecta indica Linnaeus	.	.	.	1	1
N. irrorata Uhler	2	.	1	.	3

Table 1. Cont.	OROA	CDPA	SFLA	CDAA	SAT
Neoplea striola Fieber	.	.	.	1	1
Saldidae	.	.	.	3	3
Salda sp.	5	.	.	.	5
Saldula sp.	1	.	.	.	1
Microvelia sp.	.	.	.	1	1
M. hinei Drake	1	.	1	.	2
Paravelia sp.	.	.	1	.	1
Rhagovelia spp.	45	.	.	2	47
R. knighti Drake and Harris	25	2	.	.	27
Chauliodes rastricornis Rambur	.	.	.	3	3
Corydalus cornutus Linnaeus	6	.	.	1	7
Sialis Latreille	46	1	2	4	53
Brachycentrus sp.	1	.	.	.	1
B. numerosus (Say)	1	.	.	.	1
Cheumatopsyche spp.	26	1	.	.	27
Hydropsyche spp.	33	.	.	1	34
H. bidens Ross	3	7	.	.	10
H. hageni Banks	2	.	.	.	2
H. incommoda Hagen or *H. simulans* Ross	26	1	.	.	27
Macronema carolina Banks	47	2	.	.	49
M. zebratum (Hagen)	.	3	.	.	3
Hydroptila spp.	1	.	1	.	2
Neotrichia sp.	1	.	.	.	1
Orthotrichia spp.	1	.	7	1	9
Ironoquia spp.	3	.	.	1	4
Ceraclea sp.	1	.	.	.	1
Nectopsyche spp.	21	2	.	20	43
Oecetis spp.	.	.	2	.	2
Ptilostomis sp.	5	.	.	.	5
Neureclipsis spp.	5	.	.	.	5
Chlaenius sp.	.	.	.	1	1
Bagous spp.	.	.	.	29	29
Hyperodes sp.	.	.	.	1	1
Lixus spp.	.	.	.	30	30
Agabus disintegratus (Crotch)	1	.	.	.	1
Bidessonotus inconspicuus (LeConte)	.	.	.	31	31
B. longovalis (Blatchley)	5	.	.	.	5
Copelatus chevrolati renovatus Guignot	2	.	.	.	2
C. glyphicus (Say)	.	.	.	1	1
Coptotomus sp. (larvae)	3	.	.	.	3
C. venustus (Say)	56	3	4	38	101
Hydaticus sp.	2	.	.	.	2
Hydroporus spp. (larvae)	2	.	.	1	3
Hydroporus spp.	216	12	39	111	378
Laccophilus fasciatus rufus Melsheimer	3	.	.	1	4
L. proximus proximus Say	35	2	.	27	64
Liodessus sp.	1	.	.	.	1
Lioporius pilatei (Fall)	136	.	12	4	152
L. triangularis Fall	2	.	.	.	2
Oreodytes spp. (larvae)	17	.	.	2	19
Thermonectus basillaris (Harris)	5	4	1	12	22
Uvarus spp.	65	10	3	38	116
Ancyronyx variegata (Germar)	.	.	.	1	1
Dubiraphia spp. (larvae)	6	2	.	1	9
D. vittata (Melsheimer)	3	.	.	6	9
Macronychus glabratus Say	24	2	.	4	30
Ordobrevia sp. (larva)	.	.	.	2	2
Stenelmis spp. (larvae)	12	1	.	1	14
S. crenata (Say)	10	.	.	.	10
S. decorata Sanderson	.	.	.	8	8
Dineutus spp. (larvae)	.	.	.	3	3
D. assimilis (Kirby)	82	.	4	20	106
D. emarginatus (Say)	.	.	.	3	3
Gyretes spp.	.	1	.	72	73
Gyrinus spp.	158	.	.	11	169
Haliplus spp.	3	2	1	22	28
Peltodytes dunavani Young	2	.	.	4	6
P. sexmaculatus Roberts	20	15	7	124	166
Berosus spp. (larvae)	.	.	1	2	3
Berosus spp.	14	1	9	104	128
Crenitis sp.	.	.	.	1	1
Enochrus blatchleyi (Fall)	1	1	.	5	7
E. ochraceus (Melsheimer)	7	1	.	12	20
E. pygmaeus nebulosus (Say)	2	.	.	1	3
E. sayi Gundersen	.	.	.	1	1
Helochares sp. (larva)	.	.	.	1	1
H. maculicollis Mulsanti	5	.	.	2	7
Helophorus spp.	15	3	1	115	134
Hydrobiomorpha casta (Say)	.	.	.	1	1
Hydrobius sp.	1	.	.	.	1
Hydrochus spp.	3	.	1	5	9
Laccobius sp.	.	.	.	4	4
Paracymus confluens Wooldridge	6	.	.	.	6
P. subcupreus (Say)	3	.	.	1	4
Tropisternus spp. (larvae)	2	1	.	.	3
T. blatchleyi blatchleyi D'Orch.	3	.	.	.	3
T. lateralis nimbatus (Say)	68	5	.	71	144
T. collaris striolatus (LeConte)	3	.	..	.	3
Hydrocanthus atripennis Say	1	.	.	4	5

Table 1. Cont.	OROA	CDPA	SFLA	CDAA	SAT
Suphisellus bicolor bicolor (Say)	.	.	.	3	3
Cyphon spp. (larvae)	4	.	1	9	14
Cyphon spp.	4	.	2	4	10
Ceratopogonidae	7	2	12	6	27
Dasyhelea spp.	6	.	3	10	19
Stilobezzia spp.	7	.	3	1	11
Chaoborus sp.	.	.	.	2	2
Chironomidae	460	10	52	231	753
Tanypodinae	1	.	.	.	1
Tanytarsini	.	.	1	.	1
Culicidae	.	.	.	2	2
Dolichopodidae	.	2	.	.	2
Empididae	1	.	1	2	4
Sciomyzidae	.	.	.	1	1
Sepedon sp.	2	.	1	.	3
Simulium spp.	67	.	.	.	67
Chrysops sp.	1	.	.	.	1
Tabanus sp.	1	.	.	.	1
Tipulidae	4	.	.	2	6
Erioptera sp.	.	3	.	.	3
Limonia sp.	.	.	.	1	1
Tipula spp.	1	5	.	16	22
Total Individuals	6184	2603	1544	3621	13952
Total Taxa	164	78	78	154	243

The mean number and range of taxa/station for the study area were 23 and 5-59, respectively. THe mean number and range of individuals/station were 233 and 62-1115, respectively. The mean and range of H '/station for the study area were 2.962 and 1.751-4.704, respectively.

Because of the multiple variables exerting diverse influences within the Sunken Lands, the patterns of aquatic macroinvertebrate abundance, diversity and distribution were complex. Physical variables of the study area included the old river channels, oxbows, channelized ditches, open water, substrates and current. External influences included diverse soils and vegetation of the watershed, seasonal variation, point-source and non point-source pollution. To properly evaluate each station, the mean number of taxa, individuals, and diversity index for initial and revisit collections were used to predict the soundness or stability of the community status. Similarities that emerged within the study area were longitudinal and were associated with physical characteristics and external influences.

OLD RIVER CHANNEL-OXBOW ASSOCIATION (OROA)

These stations (1-5, 8, 9, 11, 12 and 15) possessed the greatest diversity values, greatest wealth of taxa and the largest mean numbers of individuals per station. They were located in the upper region of the study area where the watershed typically contained climax vegetation of cypress, oaks and willows (Fig. 1). Man's influence was limited for the most part to duck blinds and trotlines. The mean number of taxa/station was 18% greater than that for the entire study area, while the mean number of individuals/station was 25% greater, and the mean H ' value was 4% greater (Table 2). Stations of this association exhibited the greatest heterogeneity of aquatic macroinvertebrates within the study area. The turbidity levels were markedly lower than in any of the other associations and ranged from almost clear to only moderately turbid. Sixty-seven percent of the total individuals and 50% of the pelecypod taxa were collected from these stations. Considered scarce, *Toxolasma parva* was collected almost exclusively in this association. Of the Ephemeroptera occurring within the study area, 53% of the total individuals and 88% of the taxa were collected here. Eighty percent of the plecopterans captured in this study, as well as 66% of the trichopteran individuals, and 89% of the total taxa were found in this association. Odonates were well represented by 73% of the total in-

Table 2. Mean number of taxa, individuals and H ' per station for each association and study area (SA).

	OROA	CDPA	SFLA	CDAA	SA
Taxa	28	30	17	19	23
Individuals	310	1115	155	138	233
H′	3.066	2.939	2.843	2.933	2.962

dividuals and 74% of the total taxa. The anisopteran odonates were more numerous than the zygopterans, and gomphids dominated the taxa. Of the dipterans, 61% of the chironomids were collected in this association and *Simulium* spp. were only taken within these stations (Table 1).

CHANNELIZED DITCHES-POINT SOURCE POLLUTION ASSOCIATION (CDPA)

There were only 2 stations in this association (13 and 16). Furthermore, diversity indices were biased by a large number (2050) of *Odontella* sp. collected on one date (Tables 1 and 2). For these reasons, this association is not discussed further.

ST. FRANCIS LAKE-OPEN WATER ASSOCIATION (SFLA)

These stations (21-25) occurred in relatively undisturbed areas. The mean number of taxa/station was the least for any association, 26% less than the mean for the entire study area and 40% less than that for the OROA. The mean number of individuals/station for this association was 44% and 50% less than the mean for the study area and the OROA, respectively. The mean H '/station was only 4% and 8% less than those for the study area and the OROA, respectively (Table 2). These relatively simple community structures resulted primarily from the homogeneous nature of the substrates, as well as the slower current typical at these stations. Allochthonous organic material typically formed a mat of decomposing litter (mainly leaves) up to 0.5 m deep, effectively deterring many organisms. The presence of *Crangonyx* spp., *Gammarus fasciatus, Caecidotea* spp., *Lirceus* spp. and several odonate taxa indicated relatively unpolluted water. The community structures were dominated by collectors and shredders which constituted 68% of the taxa (Table 1).

CHANNELIZED DITCHES-INTENSE AGRICULTURE ASSOCIATION (CDAA)

These stations (6,7,14,17-20 and 26-30) formed a distinct unit. Although not definable as pollution, habitat alteration can be just as damaging to the biota. Major concerns in this association were drainage of land for agriculture and channelization as a flood control measure. The mean number of taxa/station was only slightly greater than that for the SFLA but was 18% and 36% less than the means for the study area and the OROA, respectively. The mean number of individuals/station was 11%, 41% and 55% less than those of the SFLA, the study area and the OROA, respectively. The mean H '/station was slightly greater than that of the SFLA, and only 1% and 4% less than those of the study area and the OROA, respectively (Table 2). Typical habitat characteristics within this association were dredged channels with a hard-clay bank substrate, high turbidity, a lack of aquatic vegetation and a moderate to fairly swift current. From 50-100% of the watershed was typically involved in agricultural activity. Fifty percent of the taxa and 51% of the individuals collected within this association were Hemiptera and Coleoptera. Very few bivalves, amphipods or isopods were collected, which along with the low numbers of plecopterans, odonates and trichopterans, reflected an obviously disturbed ecological environment (Table 1).

The only obvious seasonal influence was that of rainfall. In a very broad sense, the seasonal patterns exhibited by the aquatic macroinvertebrate communities revealed greater values during the periods of the least rainfall, whereas periods of greater rainfall brought about distinct drops in all parameters measured. Only 35% of the annual precipitation fell between May and October. This was reflected in means of 30 taxa/station and 211 individuals/station and a mean H ' value of 3.592/station. Conversely, from November to April, during which 65% of the annual rainfall occurred, the mean number of taxa/station decreased 50%, the mean number of individuals/station decreased 10%, and the mean H '/station decreased 35%. The lesser values were attributed in large part to water level inereases up to 1.2 m, which resulted in dilution of populations and diminished collecting success.

Our hypothesis that the Sunken Lands may function as a refugium has been supported by this study. *Taphromysis louisianae* previously has been reported only from roadside ditches in Louisiana, although Pennak (1978) stated this opossum shrimp may be widely distributed along the gulf coast. We collected 23 specimens from 4 stations, primarily in the CDPA (Table 1). This population appears to be quite disjunct from the known range of the species. *Baetisca obesa* is also reported as a new record for Arkansas. Its reported range suggested that it should occur in eastern Arkansas (Pescador and Berner, 1981), and our 12 specimens from the OROA and CDAA confirm this (Table 1). Finally, a single specimen of *Corisella inscripta* was collected at station 18 in the CDAA (Table 1). Its U.S. range has previously been reported as extending from Texas and southern Colorado to California and Washington (Hungerford, 1948).

SUMMARY

By every measure, the aquatic macroinvertebrate communities with the most complex structures, and thereby the greatest stability, were found in the OROA. These complex community structures were linked directly to a highly-variable physical environment (one which had not as yet been severely impacted by man's activities).

The SFLA, although reflecting relatively simple community structures, supported several sensitive taxa that indicated a fairly undisturbed association. The simplicity was not attributed to man's activities but rather to the homogeneity of the substrate resulting from the silt load deposited in the near absence of current,which restricted macrohabitat diversity.

Man's alteration of the habitat within the CDAA resulted in the least complex aquatic macroinvertebrate community structures. Their instability was illustrated by the low numbers of taxa, individuals and diversity indices and was a direct result of the restricted physical environment available within the waterways, as well as the activities within the watershed.

Seasonal variations in community structures were primarily related to water level fluctuations, i.e. rainfall. The low-water period was characterized by the greater diversity indices values, while the high-water period inversely produced the lesser values. This inverted relationship was attributed to the dilution of the aquatic macroinvertebrate populations and concomitant adverse collecting conditions.

Our hypothesis that the Sunken Lands may function as a refugium is supported by our finding 3 species of aquatic macroinvertebrates previously unreported for the state; *Taphromysis louisianae, Baetisca obesa* and *Corisella inscripta*.

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