nylon mesh. Each net was fitted with wings about 6 feet long and 3 feet high, constructed of 2-inch mesh nylon. Nets were set in the gridded area used for macrophyte sampling, in water 3-6 ft deep, for 24 hours; the net mouth faced downstream. At each location, two nets were set in submersed aquatic vegetation and two others in nearby non-vegetated areas. A total of 240 net sets were made. Fish caught in each set were sorted to species, weighed to the nearest gram, measured (total length to the nearest millimeter), and released. Age was determined by consulting age-at-length records for fishes of Ohio, including western Lake Erie (Trautman 1981). The fish data set is in Appendix Q.

We used ANOVA techniques based on a factorial model for comparing catches. Because the lack of vegetation in spring 1984 unbalanced the study design for that year, we computed by regression with dummy variables. The factorial model included the effects of location (river); month and year, which were fixed; and the effect of plant density, which was considered random. Because of the relatively large number and levels of effects, we made the analysis by location (Appendix R). Catch data were normalized by using a square root transformation. The analysis was done on total catch, total number of species, and the catch of the two most common species--yellow perch and rock bass. We used Tukey's Studentized Range Test to distinguish among the levels of catch for each main effect. To assess the relation between catch and environmental variables (depth, current velocity, incident light, temperature, bottom type), we used the Pearson Product-Moment Correlation procedure.

At each station we recorded Loran coordinates, water depth, surface and bottom measurements of current velocities, incident light, bottom type, and water temperature. The physical data set for the fish collections is in Appendix S.

RESULTS

MACROZOOBENTHOS

Taxonomic Composition

The diversity of macrozoobenthos in SCDRS was highest in the upper Detroit River, where we identified 101 distinct taxa, and lowest in Lake St. Clair, where we recorded 65. We counted 98 taxa in the upper St. Clair, 95 in the lower St. Clair, and 80 in the lower Detroit River. The taxonomic composition and abundance of macrozoobenthos, by location and year, are summarized in Appendix C where the 21 transects are grouped into five geographic regions (transect numbers in parentheses): upper St. Clair River (I-V), lower St. Clair River (VI-X), Lake St. Clair (XI-XIII), upper Detroit River (XIV-XVII) and lower Detroit River (XVIII-XXI). Many of the 162 taxa listed in Appendix C are higher level designations that include unidentifiable, immature, or damaged specimens; these taxa may include genera or species already listed. However, when counting taxa by location or year, we excluded those for which lower order taxa belonging to the same group were already listed. The list assuredly underestimates the diversity of this system because lack of suitable keys restricted most of the identifications to genus, family, or a higher level. For example, the midges are listed only to family (Chironomidae), although the qualitative work we performed on both larvae and adults of this family indicated that the group included at least 58 genera and 127 species. However, comparisons can be made of relative diversity between areas and years in Appendix C because taxonomic effort was uniform throughout the study.

A few sponges were collected everywhere except in the lower Detroit River, where none were seen (Appendix C). Bryozoa were lacking in Lake St. Clair and were scarce at other locations. Two genera of coelenterates were represented in the samples by Cordylophora lacustris (a single specimen from the upper Detroit River), and Hydra (present throughout the system and one of the most common benthic taxa collected).

The flatworm taxa Rhabdocoela and Tricladida were common at all locations and in both years in SCDRS. Rhabdocoela were more common than Tricladida, particularly in Lake St. Clair. Tricladida occurred most frequently in the Detroit River. The two taxa were combined (as Turbellaria) and analyzed statistically in the next section. A single specimen of a third flatworm taxon, Trematoda, was collected in the Detroit River.

Nemertinea and Nematoda were collected at all locations in both years. Nemertinea usually occurred in over 50% of the samples in both rivers, but in only 1-2% of the samples taken from Lake St. Clair. Nematodes were ubiquitous, occurring in over 95% of the 756 samples collected.

The annelids Oligochaeta and Polychaeta were two of the most abundant taxa in the system. Oligochaetes were partly divided into smaller taxa, including Nais, Stylaria, Branchiura, and Spirosperma, because they could be easily identified. All remaining taxa were combined as Oligochaeta and occurred in every sample from the lower St. Clair River downstream. Nais was common in both rivers, but not in Lake St. Clair. Branchiura sowerbyi was collected only in the upper Detroit River. Spirosperma occurred in at least 50% or more of all samples at all locations, and in over 90% of the samples from the Detroit River. The only polychaete found, Manayunkia speciosa, was uncommon in the upper St. Clair River, but occurred in all of the samples from Lake St. Clair.

The other annelids in the system, leeches, were not abundant, and most specimens could be identified to species. A total of 12 species were identified (Table 1), of which 11 were recorded in the St. Clair River, 5 in Lake St. Clair, and 8 in the Detroit River. The upper and lower portions of the St. Clair River had similar total numbers of species (eight and nine, respectively), but had only five species in common. Of the species found in Lake St. Clair, only Placobdella montifera was unique to the lake. Glossiphonia complanata, Helobdella papillata, and Piscicola milneri were collected only in the St. Clair River. Most species occurred in less than 10% of the samples.

Table 1. Density (mean No./m²) and (in parentheses) percent frequency of occurrence of Hirudinea in Ponar grab samples from SCDRS in 1983-84.[a/]

Taxon	St. Clair River Upper (n = 180)	St. Clair River Lower (n = 180)	Lake St. Clair (n = 108)	Detroit River Upper (n = 144)	Detroit River Lower (n = 144)
Actinobdella inequiannulata	T (2)	0 (0)	0 (0)	T (2)	0 (0)
Batracobdella phalera	0 (0)	T (2)	0 (0)	0 (0)	T (4)
Erpobdellidae	3 (23)	1 (5)	0 (0)	7 (23)	T (2)
Erpobdella punctata	1 (4)	0 (0)	0 (0)	1 (2)	0 (0)
Glossiphoniidae	0 (0)	0 (0)	0 (0)	T (6)	0 (0)
Glossiphonia complanata	0 (0)	1 (7)	T (3)	0 (0)	0 (0)
Glossiphonia heteroclita	0 (0)	1 (5)	0 (0)	1 (10)	T (2)
Helobdella elongata	T (4)	1 (8)	7 (33)	2 (15)	0 (0)
Helobdella papillata	T (2)	T (2)	0 (0)	0 (0)	0 (0)
Helobdella stagnalis	T (4)	1 (5)	3 (31)	1 (10)	0 (0)
Helobdella triserialis	T (2)	T (2)	0 (0)	1 (4)	T (2)
Hirudinea	T (4)	0 (0)	0 (0)	0 (0)	0 (0)
Piscicolidae	1 (4)	T (3)	T (3)	0 (0)	0 (0)
Piscicola	1 (10)	1 (7)	0 (0)	T (2)	0 (0)
Piscicola milneri	T (2)	T (5)	0 (0)	0 (0)	0 (0)
Placobdella montifera	0 (0)	0 (0)	1 (8)	0 (0)	0 (0)
Placobdella papillifera	T (2)	0 (0)	0 (0)	0 (0)	0 (0)

[a/] T = trace (< 0.5/m²).

In Lake St. Clair in 1983, Helobdella elongata was the most frequently collected (44%) and densest ($46/m^2$) of the leeches. Declines in abundance and percent occurrence about equaled increases between 1983 and 1984 for all taxa and locations (Appendix C). Because of the low density of individual species, the group was analyzed in detail as a class.

We identified 36 taxa of Cladocera and Copepoda (Appendix C). Inasmuch as most specimens were too small to be retained by our sieve, their densities reflect their presence rather than their true abundance. Furthermore, many of the taxa represented in our samples are planktonic and were probably entrapped in the Ponar as it descended through the water column. This group includes Diaphanosoma, Holopedium, Leptodora, all Daphnia species, Bosmina, Polyphemus, Limnocalanus, Epischura, Diaptomus, Cyclops, and Mesocyclops. True benthic cladocerans and cyclopoids include Eurycercus, Camptocercus, Alona, Sida, Ilyocryptus, Macrocyclops, Eucyclops, Paracyclops, and the Harpacticoida. Daphnia, Diaptomus, and Bosmina were the most common planktonic taxa and Harpacticoida, Ilyocryptus, Sida, and Macrocyclops the most common benthic taxa.

Other crustaceans common in the system included Ostracoda, Gammarus, Hyalella, Asellus, and Lirceus. Although rare, crayfish and Pontoporeia were taken most frequently in the St. Clair River. Densities of Asellus, and Lirceus are combined and analyzed as Isopoda in the next section.

The terrestrial insects collected with the Ponar included both those that are strictly terrestrial and those that have aquatic early-life stages. They occurred in over 20% of the samples at each location and year and were most common in the St. Clair River. Average densities never exceeded $12/m^2$. Densities of most were higher in 1984 than in 1983.

Chironomids were the most common and abundant aquatic insects collected in SCDRS (Table 2). Some genera were collected only as adults and others only as larvae. Seven genera were collected at all five locations (Ablabesmyia, Chironomus, Coelotanypus, Cryptochironomus, Parakieferiella, Polypedilum, and Procladius); three in only the St. Clair River (Chernovskiia, Cladotanytarsus, and Paratanytarsus); and four in only the Detroit River (Psectrocladius, Paratricocladius, Lauterborniella, and Acricotopus).

Other Diptera identified from the system included the families Ceratopogonidae, Empididae, Tipulidae, and Psychodidae and the genus Chaoborus (Appendix C). Ceratopogonids were collected at all locations and in both years; densities were highest ($> 14/m^2$) in Lake St. Clair and the Detroit River, and were higher in 1984 than in 1983 at most locations. Empidids were common ($20/m^2$) in the upper St. Clair River, not collected in Lake St. Clair, and scarce ($< 7/m^2$) elsewhere. Densities were similar in the two years. Psychodids were occasionally collected in both rivers; tipulids and Chaoborus were rare.

Among mayflies, eight genera were collected as nymphs, and three--Cloen,

Table 2. Distribution of genera of Chironomidae and estimated number of species per genus in SCDRS in 1983-84[a/].

Genus	No. of species in genus	Locality				
		St. Clair River		Lake	Detroit River	
		Upper	Lower	St. Clair	Upper	Lower
Ablabesmyia	6	-	-	-	-	A
Acricotopus	1	A	A	-	-	-
Axarus	1	A,L	A,L	L	A,L	A
Chironomus	8	A,L	A,L	L	A,L	A
Chernovskiia	1	A,L	-	-	-	-
Cladopelma	1	-	-	-	A	-
Cladotanytarsus	2	A,L	A,L	-	A,L	A
Clinotanypus	1	-	-	-	A	-
Coelotanypus	2	L	L	L	A,L	A,L
Conchapelopia	1	A,L	L	L	-	-
Corynoneura	3	L	-	-	A	A
Cricotopus	11	A,L	A,L	-	A,L	A,L
Cryptocladopelma	2	A	A	-	-	-
Cryptochironomus	6	A,L	A,L	L	A,L	A,L
Cryptotendipes	2	A	-	-	A	A
Demicryptochironomus	1	A	A	-	A	-
Dicrotendipes	3	A,L	A	-	A,L	A,L
Einfeldia	1	A	-	-	-	-
Epoicocladius	1	L	A,L	L	L	-
Eukiefferiella	1	-	A	-	A	-
Glyptotendipes	2	A	-	-	-	-
Harnischia	1	A	A	-	L	A
Heterotrissocladius	1	-	-	L	-	-
Hydrobaenus	1	L	A	L	-	-
Labrundinia	1	-	A	-	A	-
Larsia	1	-	A	-	-	-
Lauterborniella	1	-	-	-	A	-
Limnophyes	2	A	A	-	-	A
Lopescladius	1	L	-	-	-	L
Mesosmittia	1	A	-	-	A	-
Micropsectra	3	A	-	-	L	A
Microtendipes	1	-	A	-	-	-
Monodiamesa	1	L	L	-	L	-
Nanocladius	4	A,L	A,L	-	A,L	A,L
Nilothauma	1	-	-	-	L	-
Orthocladius	4	A,L	A,L	-	A	-
Parachironomus	6	A	A	-	A	A
Parakieferriella	1	A,L	A	L	A,L	-
Paralauterborniella	1	A	A	-	A	A
Paratanytarsus	2	A	A	-	-	-
Paratendipes	1	-	-	-	L	-
Paratrichocladius	1	-	-	-	-	A
Pentaneura	1	A,L	A	-	-	A
Phaenopsectra	2	A	A	-	-	-
Polypedilum	7	A,L	A,L	L	A,L	A,L
Potthastia	1	L	L	L	L	-
Procladius	2	A,L	A,L	L	A,L	A,L
Pseudochironomus	3	A,L	L	L	A,L	-
Psectrocladius	1	-	-	-	-	A
Pseudosmittia	1	-	A	-	-	-
Rheotanytarsus	3	A,L	A,L	-	A,L	A,L
Robackia	1	L	-	-	-	-
Smittia	1	-	A	-	A	-
Stempellina	1	A,L	-	-	-	-
Stictochironomus	1	A	-	-	A	-
Tanypus	1	A	-	-	A	-
Tanytarsus	5	A,L	A,L	-	A,L	A
Thienemannimyia	1	A	-	-	-	-
Tribelos	1	A	-	-	A	-
Xenochironomus	1	-	-	L	-	-

[a/] A = adults; L = larvae.

Ephemera and Stenacron--only as adults (Table 3). Each genus in which species identification was feasible was represented by one species. In the genera Caenis and Tricorythodes, species identification was not feasible. Nymphs of Hexagenia and Caenis occurred at all locations and years, and average abundance sometimes exceeded $300/m^2$. The abundance of Ephemerella, Baetisca, and Stenonema averaged $0-46/m^2$; these three taxa were collected at all locations with one exception--Ephemerella was not collected in the lower Detroit River. Ephemerella and Stenonema were most abundant in the St. Clair River, and densities of Ephemerella were markedly lower in 1984 than in 1983, whereas the density of Stenonema was higher in 1983 (Appendix C). Baetisca nymphs were most common in the upper Detroit River and were more abundant in 1984 than in 1983. Average densities of Tricorythodes, Brachycercus, and Baetis were usually less than $1/m^2$.

Coleoptera were represented by two families, a few of which were collected only in the St. Clair River. Dubiraphia (Elmidae) was the most abundant genus. Brychius (Haliplidae) was represented by only two specimens.

Lepidoptera larvae were usually identified only to order, but several individuals of the family Pyralidae were identified. Larvae were collected only at river transects, and average densities never exceeded $5/m^2$ (Appendix C).

Trichoptera of 20 genera were collected as larvae and an additional 8 genera were collected only as adults; one additional taxon, Helicopsyche was recorded as present only by the collection of its unique case (Table 4). Cheumatopsyche and Hydropsyche were the most commonly collected caddisflies in the two rivers and Oecetis was the most abundant caddisfly in Lake St. Clair. Other genera with average densities greater than $13/m^2$ were Brachycentrus and Protoptila, whose distribution was almost exclusively in the St. Clair River, and Polycentropus and Mystacides whose densities were highest in the St. Clair River. Phylocentropus was limited almost exclusively to the upper Detroit River. Of the rarer genera, Micrasema, Phryganea, and Pycnopsyche were collected only in the St. Clair River and Hydroptila, Macrostemum, and Potamyia only in the Detroit River.

Corixidae and Odonata, which are typically found in quiet backwater regions of large rivers, were rarely collected in SCDRS. Damselfly naiads were found only in the lower St. Clair and Detroit rivers (Appendix C). Adult damselflies of the genera Enallagma, Ischnura, and Lestes were collected in both rivers (Table 5); a cursory identification of naiads indicated that most belonged of the genus Enallagma. Dragon fly naiads of the genera Gomphus and Stylurus were collected, along with adults of the genera Anax and Tramea.

Plecoptera were rare, and limited to samples from the St. Clair River (Appendix C). Two distinct taxa were identified as nymphs--specimens in the family Perlodidae and in the genus Isogenoides. Adults of Perlesta were also collected adjacent to the St. Clair River.

Acarina were collected at all locations and in both years. A few tardigrades were collected in both rivers; densities were highest in the lower Detroit River.

Table 3. Density (mean No./m²) and (in parentheses) percent frequency of occurrence of different genera of Ephemeroptera in Ponar grab samples from SCDRS in 1983-84.[a/]

Genus	St. Clair River Upper (n = 180)	St. Clair River Lower (n = 180)	Lake St. Clair (n = 108)	Detroit River Upper (n = 144)	Detroit River Lower (n = 144)
Baetis	T (6)	A	0 (0)	T (2)	A
Baetisca	5 (17)	6 (15)	T (3)	32 (54)	6 (31)
Brachycercus	0 (0)	0 (0)	0 (0)	T (4)	0 (0)
Caenis	96 (50)	349 (87)	1 (14)	29 (38)	14 (21)
Cloeon	0.0	0.0	0.0	A	0.0
Ephemera	0.0	0.0	0.0	A	0.0
Ephemerella	32 (31)	11 (23)	T (3)	1 (6)	0 (0)
Hexagenia	224 (54)	670 (83)	1210 (100)	69 (58)	6 (38)
Stenacron	A	A	0.0	A	A
Stenonema	22 (50)	7 (20)	T (3)	1 (4)	1 (6)
Tricorythodes	0 (0)	T (2)	0 (0)	T (2)	1 (8)

a/ A = adult; T = trace (< 0.5/m²).

Table 4. Density (mean No./m²) and (in parentheses) percent frequency of occurrence of different genera of Trichoptera in Ponar grab samples from SCDRS in 1983-84.[a/]

Genus	No. of species in genus	Locality and number of samples: St. Clair River Upper (n = 180)	St. Clair River Lower (n = 180)	Lake St. Clair (n = 108)	Detroit River Upper (n = 144)	Detroit River Lower (n = 144)
Agraylea	1	0 (0)	0 (0)	0 (0)	0 (0)	A
Branchycentrus	1	7 (31)	23 (33)	0 (0)	T (2)	0 (0)
Ceraclea	4	5 (46)	13 (42)	0 (0)	3 (25)	1 (6)
Cheumatopsyche	2	113 (77)	22 (32)	3 (6)	700 (75)	35 (44)
Helicopsyche	1	0 (0)	S (0)	0 (0)	0 (0)	0 (0)
Hydropsyche	2	108 (85)	22 (33)	0 (0)	208 (56)	33 (48)
Hydroptila	1	T (4)	1 (8)	0 (0)	T (2)	7 (27)
Limnephilus	1	A	0 (0)	0 (0)	0 (0)	0 (0)
Macrostemum	1	0 (0)	0 (0)	0 (0)	0 (0)	T (2)
Micrasema	1	T (2)	1 (5)	0 (0)	0 (0)	0 (0)
Molanna	1	0 (0)	0 (0)	0 (0)	A	0 (0)
Mystacides	1	5 (29)	9 (28)	T (3)	T (2)	0 (0)
Nectopsyche	2	T (6)	2 (15)	0 (0)	T (6)	T (2)
Neotrichia	1	0 (0)	0 (0)	0 (0)	A	0 (0)
Neureclipsis	1	14 (27)	21 (30)	0 (0)	T (4)	31 (31)
Nyctiophylax	1	0 (0)	A	0 (0)	0 (0)	0 (0)
Ochrotrichia	1	0 (0)	0 (0)	0 (0)	A	0 (0)
Oecetis	2	13 (33)	39 (62)	41 (88)	14 (33)	3 (10)
Orthotrichia	1	0 (0)	T (3)	0 (0)	T (2)	1 (8)
Oxyethira	1	A	0 (0)	0 (0)	0 (0)	A
Phylocentropus	1	T (2)	0 (0)	0 (0)	8 (19)	0 (0)
Phryganea	1	T (2)	0 (0)	0 (0)	0 (0)	0 (0)
Polycentropus	2	T (6)	15 (32)	0 (0)	T (4)	6 (21)
Potamyia	1	0 (0)	0 (0)	0 (0)	0 (0)	T (2)
Protoptila	1	17 (19)	0 (0)	0 (0)	T (4)	A
Psychomyia	1	0 (0)	0 (0)	0 (0)	0 (0)	A
Pycnopsyche	1	0 (0)	T (3)	0 (0)	0 (0)	0 (0)
Setodes	1	T (8)	4 (23)	0 (0)	T (4)	0 (0)
Triaenodes	2	2 (10)	3 (28)	0 (0)	T (4)	T (6)

[a/] A = adult; T = trace (< 0.5/m²); S = shell only.

Table 5. Density (mean No./m²) and (in parentheses) percent frequency of occurrence of Odonata in Ponar grab samples from the SCDRS in 1983-84.[a/]

Taxon	No. of species in taxon	Locality and number of samples				
		St. Clair River		Lake St. Clair	Detroit River	
		Upper (n = 180)	Lower (n = 180)	(n = 108)	Upper (n = 144)	Lower (n = 144)
Anax	1	A	0 (0)	0 (0)	0 (0)	A
Coenagrionidae		1 (5)	1 (3)	0 (0)	0 (0)	4 (7)
Enallagma	5	A	0 (0)	0 (0)	A	A
Gomphus	1	A	T (1)	0 (0)	0 (0)	T (1)
Ischnura	1	A	0 (0)	0 (0)	A	A
Lestes	1	0 (0)	0 (0)	0 (0)	0 (0)	A
Stylurus	1	T (1)	0 (0)	0 (0)	0 (0)	0 (0)
Tramea	1	0 (0)	0 (0)	0 (0)	0 (0)	A

a/ A = adult; T = trace (< 0.5/m²).

Gastropods were abundant and diverse in SCDRS. We identified 13 taxa and recorded average densities as high as 578/m^2 (Table 6). Four of the genera--Amnicola, Elimia, Gyraulus, and Physa--were common throughout SCDRS. Of the other taxa, Valvata was common in the upper St. Clair River and Ferrisia in the lower Detroit River, whereas the average densities of all other species were less than 10/m^2.

The pelecypods were also diverse in SCDRS, but only fingernail clams were abundant in our collections (Table 7). A standard Ponar dredge is not large enough to effectively sample unionids, whose densities rarely exceed 1/m^2 and whose distribution is often clumped. Pisidium was the more common taxon (380/m^2) within the Sphaeriidae and occurred more frequently at all locations than Sphaerium (26/m^2), which was most common in Lake St. Clair and the upper Detroit River.

In addition to macrozoobenthos, four species of fish, some fish remains, and fish eggs were collected with the Ponar grab mainly from the upper St. Clair River (Appendix C). The fish densities represent 1 specimen per grab and estimated densities of eggs (rainbow smelt) averaged as high as 46/m^2. Egg densities were substantially lower in 1984 than in 1983, but percent occurrence remained stable.

Major Taxa and Their Distribution

An analysis of variance was done on 24 taxonomic groups (e.g. Hexagenia, Oligochaeta) that were chosen to include one to several representative taxa from the various classes of invertebrates found in SCDRS. The ANOVA table associated with each group is in Appendix H. The main effect means (year, month, transect, station) are given in Tables 8-19. Interaction means (e.g., transect x year) for two combinations (transect x station, and transect x year and month) are plotted in Appendix D for each group. These two combinations were chosen because they contained all four effects, the plots were not too complex, and they were of geographic and biological interest. Since many of the interaction terms were significant (Appendix H) the differences in main effect means in Tables 8-19 must be interpreted in light of plots in Appendix D. For example, there is a significant difference in Hexagenia between years (Table 15) but it does not hold consistently over all transects (Figs. 46-47 of Appendix D).

Densities of most taxa were significantly higher in 1983 than in 1984 or showed no difference between years; were significantly higher in October than in May and at the off-channel than at the near-channel or channel station; and were higher in the St. Clair River than elsewhere in SCDRS (Tables 8-19). These results are summarized in Table 20. Of particular interest are the taxa with significantly higher populations in 1983 than in 1984. If the low densities occurred mainly in spring 1984 in the St. Clair River and no recovery occurred by fall 1984, we might postulate that some long-term damage had been caused by the ice jam in May 1984. The densities of taxa listed under 1983 in Table 20, except Manayunkia, were lower in spring in 1984 than in 1983. However,

Table 6. Density (mean No./m²) and (in parentheses) percent frequency of occurrence of different taxa of Gastropods in Ponar grab samples from SCDRS in 1983-84.[a]

Taxon	St. Clair River Upper (n = 180)	St. Clair River Lower (n = 180)	Lake St. Clair (n = 108)	Detroit River Upper (n = 144)	Detroit River Lower (n = 144)
Amnicola	578 (75)	548 (90)	33 (69)	203 (90)	93 (77)
Bithynia	0 (0)	0 (0)	T (6)	1 (8)	T (2)
Campeloma	T (2)	0 (0)	T (3)	T (2)	T (4)
Elimia livescens	271 (69)	125 (77)	7 (47)	171 (79)	65 (71)
Ferrisia	37 (23)	0 (0)	0 (0)	3 (17)	182 (58)
Gyraulus	51 (42)	124 (70)	28 (50)	52 (35)	28 (31)
Helisoma	0 (0)	0 (0)	0 (0)	T (2)	0 (0)
Lymnaea	7 (31)	T (2)	0 (0)	1 (2)	0 (0)
Physa	122 (67)	110 (80)	T (3)	25 (38)	40 (54)
Pleurocera acuta	3 (8)	T (2)	2 (14)	10 (42)	T (4)
Somatogyrus subglobosus	0 (0)	T (2)	T (3)	0 (0)	0 (0)
Valvata sincera	2 (15)	1 (6)	2 (3)	T (2)	1 (6)
Valvata tricarinata	179 (31)	12 (44)	9 (42)	17 (6)	T (6)

[a] T = trace (< 0.5/m²)

Table 7. Density (mean No./m²) and (in parentheses) percent frequency of occurrence of different taxa of Pelecypoda in Ponar grab samples from SCDRS in 1983-84.[a/]

Taxon	St. Clair River Upper (n = 180)	St. Clair River Lower (n = 180)	Lake St. Clair (n = 108)	Detroit River Upper (n = 144)	Detroit River Lower (n = 144)
Anodonta grandis	0 (0)	0 (0)	T (3)	0 (0)	0 (0)
Elliptio dilitatus	0 (0)	0 (0)	0 (0)	1 (8)	0 (0)
Lampsilis sp.	0 (0)	T (2)	T (3)	1 (6)	0 (0)
Lampsilis radiata siliquoidea	0 (0)	0 (0)	1 (8)	T (6)	T (2)
Lampsilis ventricosa	0 (0)	0 (0)	0 (0)	T (4)	0 (0)
Leptodea fragilis	0 (0)	0 (0)	T (3)	T (2)	0 (0)
Pisidium sp.	259 (77)	300 (90)	671 (100)	368 (98)	285 (75)
Pleurobema cordatum	0 (0)	0 (0)	0 (0)	T (4)	0 (0)
Proptera alata	0 (0)	0 (0)	T (3)	T (2)	0 (0)
Ptychobranchus fasciolaria	0 (0)	0 (0)	0 (0)	T (2)	0 (0)
Sphaerium sp.	7 (21)	30 (47)	30 (89)	62 (75)	1 (6)
Truncilla sp.	0 (0)	0 (0)	0 (0)	T (2)	0 (0)
Truncilla donaciformis	0 (0)	0 (0)	0 (0)	T (2)	0 (0)
Truncilla truncata	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)
Unionidae (juveniles)	T (4)	1 (12)	1 (14)	6 (44)	0 (0)

[a/] T = trace (< 0.5/m²).

Table 8. Mean density (No./m²) of *Hydra* and Turbellaria by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Hydra	12,488 1984	3,528 1983	13,358 October	2,658 May	10,375 Near-channel	8,708 Channel	4,940 Off-channel

Transect

42,431	36,099	34,826	23,282	11,824	5,651	2,064	2,421	2,536	1,546	2,211	1,165	996	482	168	181	188	80	8	5	3
7	2	5	6	4	8	15	16	3	17	10	9	21	20	14	18	19	13	12	11	1

Taxon	Year		Month		Station		
Turbellaria	372 1983	185 1984	339 October	217 May	442 Off-channel	219 Near-channel	173 Channel

Transect

941	951	408	405	376	336	495	355	335	236	266	173	117	91	124	52	61	30	22	64	1
8	18	6	21	16	2	20	10	9	7	19	5	4	17	15	11	14	13	12	3	1

Table 9. Mean density (No./m²) of Nemertinea and Nematoda by year, month, station, and transe : in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Nemertinea	211 1983	262 1984	388 October	85 May	268 Channel	243 Near-channel	198 Off-channel
Nematoda	969 1983	826 1984	1133 May	663 October	1018 Near-channel	952 Off-channel	723 Channel

Nemertinea — Transect

1080	772	587	461	383	315	206	451	160	124	96	125	75	71	21	16	16	3	1	.6	0
19	21	18	20	14	17	15	2	4	16	7	8	5	3	6	9	10	13	1	11	12

Nematoda — Transect

2333	2045	2152	1717	1445	960	1090	813	758	778	597	705	539	641	495	578	402	447	148	160	54
11	17	16	20	7	8	21	4	13	15	12	19	6	18	9	5	10	2	14	3	1

Table 10. Mean density (No./m²) of Hirudinea and Oligochaeta by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Hirudinea	8 1983	6 1984	8 October	6 May	14 Off-channel	4 Channel	4 Near-channel
Oligochaeta	9114 1983	7936 1984	10324 May	6727 October	11306 Off-channel	8482 Near-channel	5788 Channel

Hirudinea – Transect

39	33	14	17	10	10	8	8	8	5	2	2	2	1	.6	.6	.6	.6	0	0	0
16	11	6	17	4	5	12	2	9	8	18	13	7	10	15	14	21	20	1	19	3

Oligochaeta – Transect

76383	11551	11297	7311	8939	6169	7663	7916	5888	4965	5179	4654	5021	3148	4665	2414	2320	1845	896	471	334
18	8	2	11	7	16	19	5	21	6	4	17	9	10	20	12	14	13	15	3	1

Table 11. Mean density (No./m²) of Manayunkia and Harpacticoida by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Manayunkia	1524 1983	841 1984	1384 October	982 May	1418 Off-channel	1137 Near-channel	993 Channel

Transect

7113	3949	3800	2615	2129	1070	1501	937	421	300	269	238	348	118	8	7	6	4	3	2	2
17	19	8	21	14	11	9	12	13	15	20	10	18	16	2	4	7	5	3	6	1

Taxon	Year		Month		Station		
Harpacticoida	229 1983	71 1984	197 May	103 October	241 Off-channel	143 Near-channel	65 Channel

Transect

751	385	312	326	267	240	115	98	166	125	152	78	30	25	18	22	21	10	2	2	.6
17	16	8	2	9	11	13	12	6	4	10	14	19	5	7	20	21	18	15	1	3

Table 12. Mean density (No./m²) of Ostracoda and Isopoda by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Ostracoda	278 1984	101 1983	300 May	79 October	204 Off-channel	273 Channel	91 Near-channel
Isopoda	36 1983	14 1984	27 May	23 October	63 Off-channel	6 Near-channel	5 Channel

Ostracoda — Transect

1047	1707	279	153	134	166	62	83	79	56	71	55	25	30	14	12	5	2	1	1	0
16	14	6	11	12	5	13	15	17	2	4	8	9	10	18	7	1	19	3	21	20

Isopoda — Transect

192	114	117	32	28	12	12	7	3	2	1	.6	.6	0	0	0	0	0	0	0	0
6	8	9	17	16	20	10	7	2	4	3	12	18	13	15	1	14	11	19	5	21

Table 13. Mean density (No./m²) of Gammarus and Hyalella by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Gammarus	512 1983	452 1984	741 October	223 May	838 Off-channel	423 Near-channel	185 Channel

Transect (Gammarus)

1656	1417	1054	1182	1267	720	510	340	548	470	298	206	153	106	69	37	23	20	20	14	11
6	7	8	5	4	9	12	13	10	16	11	2	20	15	18	17	19	21	14	1	3

Taxon	Year		Month		Station		
Hyalella	105 1983	67 1984	85 October	87 May	164 Off-channel	51 Near-channel	43 Channel

Transect (Hyalella)

445	515	243	145	78	83	79	68	44	30	34	16	9	8	6	2	.6	.6	0	0	0
16	9	8	6	2	7	4	20	10	5	18	17	14	3	21	11	1	13	12	19	15

Table 14. Mean density (No./m²) of Chironomidae and <u>Oecetis</u> by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Chironomidae	2174 1983	1322 1984	2137 May	1359 October	2409 Off-channel	1542 Near-channel	1292 Channel

Transect

5261	4867	3439	3445	2593	2514	2876	2566	1745	775	751	1018	853	663	566	1306	583	397	258	175	52
6	8	16	9	2	5	7	10	4	11	12	3	17	13	1	15	14	20	18	21	19

Taxon	Year		Month		Station		
Oecetis	26 1983	17 1984	23 May	20 October	44 Off-channel	14 Near-channel	7 Channel

Transect

118	46	42	36	39	55	29	22	20	12	9	6	6	5	3	2	2	1	0	0	0
6	13	12	11	9	5	16	17	7	10	8	15	21	19	2	4	1	3	18	20	14

Table 15. Mean density (No./m²) of *Caenis* and *Hexagenia* by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Caenis	115 1984	105 1983	122 October	97 May	223 Off-channel	72 Near-channel	34 Channel
Hexagenia	488 1984	290 1983	544 October	235 May	420 Channel	370 Off-channel	378 Near-channel

Caenis — Transect

608	540	266	194	169	135	93	75	121	41	28	14	13	2	1	1	.6	.6	.6	0	0
8	9	7	6	5	10	2	16	4	20	15	17	19	11	21	3	13	12	18	1	14

Hexagenia — Transect

1290	1214	1126	1502	1059	640	222	425	200	142	231	52	21	17	8	8	6	6	5	3	.6
12	13	11	6	8	5	7	10	16	9	4	17	2	14	15	19	21	18	20	3	1

Table 16. Mean density (No./m²) of Cheumatopsyche and Hydropsyche by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Cheumatopsyche	221 1984	124 1983	298 October	46 May	246 Near-channel	192 Channel	79 Off-channel

Transect

1900	460	731	99	136	92	59	29	42	32	16	8	3	3	3	2	2	.6	.6	0	0
15	2	17	7	14	20	5	4	21	16	3	13	9	18	6	8	19	10	11	1	12

Taxon	Year		Month		Station		
Hydropsyche	108 1984	45 1983	131 October	23 May	113 Off-channel	74 Channel	44 Near-channel

Transect

575	212	153	208	115	88	61	78	45	39	15	10	5	5	3	2	1	0	0	0	0
15	2	5	14	3	7	4	20	21	17	6	16	19	18	8	10	9	1	12	13	11

Table 17. Mean density (No./m²) of Acarina and Sphaeriidae by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Acarina	46	38	40	43	55	37	33
	1984	1983	May	October	Off-channel	Near-channel	Channel

Transect

136	115	106	78	88	60	39	37	34	27	26	24	27	18	14	14	11	10	8	4	2
2	4	20	5	19	18	16	17	10	14	8	7	21	9	11	6	12	13	3	15	1

Taxon	Year		Month		Station		
Sphaeriidae	372	365	403	334	438	350	316
	1983	1984	October	May	Off-channel	Near-channel	Channel

Transect

983	584	537	519	473	532	440	460	359	371	345	360	349	278	320	218	142	127	239	57	43
11	12	13	14	15	4	7	8	17	16	9	21	5	10	19	18	2	6	20	1	3

Table 18. Mean density (No./m²) of *Physa* and *Gyraulus* by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Taxon	Year		Month		Station		
Physa	65 1984	58 1983	89 October	35 May	115 Off-channel	52 Near-channel	18 Channel

Transect

280	183	141	115	112	96	90	75	61	52	36	14	16	15	8	2	1	.6	0	0	0
2	8	6	4	7	18	5	16	9	10	20	19	21	14	17	3	15	12	1	13	11

Taxon	Year		Month		Station		
Gyraulus	68 1983	49 1984	81 October	36 May	128 Off-channel	33 Near-channel	13 Channel

Transect

236	162	158	104	140	76	62	69	42	35	38	32	24	10	11	9	7	5	5	1	0
6	16	4	7	8	10	9	18	12	13	5	20	15	17	14	2	11	19	21	3	1

Table 19. Mean density (No./m²) of Amnicola and Elimia by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \le 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of transformed (square root of value + 0.5) data. Differences between mean densities and rank reflect the effect of transformation.

Amnicola

Year	
377 1983	228 1984

Month	
327 October	278 May

Station		
504 Off-channel	253 Near-channel	150 Channel

Transect

Mean density	790	685	937	627	608	577	432	285	336	386	148	103	109	80	81	42	44	40	13	13	10
Transect	2	6	4	7	8	5	10	17	16	9	20	21	15	19	14	12	13	18	11	1	3

Elimia

Year	
129 1984	126 1983

Month	
147 October	108 May

Station		
154 Near-channel	130 Off-channel	99 Channel

Transect

Mean density	376	400	337	249	263	245	181	133	176	57	74	57	44	18	15	22	9	8	6	6	2
Transect	7	2	15	14	4	5	20	6	3	19	17	8	10	21	9	16	13	11	12	18	1

Table 20. Summary of ANOVA results in tables 8-19 of mean density on 24 abundant taxa collected in the SCDRS in 1983 and 1984. Placement indicates significantly higher ($P \le 0.05$) abundance at a particular time or location. Taxa placement in station and location categories were based on overall ranking regardless of significance; in the case of location, the cutoff was arbitrary.

YEAR

1983[1/]	1984[1/]	Nonsignificant
Amnicola	Cheumatopsyche	Acarina
Chironomidae	Hexagenia	Caenis
Gammarus	Hydra	Elimia
Harpacticoida	Hydropsyche	Gyraulus
Hyalella	Ostracoda	Hirudinea
Isopoda		Nemertinea
Manayunkia		Oligochaeta
Nematoda		Physa
Oecetis		Sphaeriidae
Turbellaria		

MONTH

May[1/]	October[1/]	Nonsignificant
Acarina	Amnicola	Oecetis
Chironomidae	Caenis	
Harpacticoida	Cheumatopsyche	
Isopoda	Elimia	
Nematoda	Gammarus	
Oligochaeta	Gyraulus	
Ostracoda	Hexagenia	
	Hirudinea	
	Hyalella	
	Hydra	
	Hydropsyche	
	Manayunkia	
	Nemertinea	
	Physa	
	Sphaeriidae	
	Turbellaria	

STATION

Off-channel	Near-channel	Channel
Acarina	Cheumatopsyche	Cheumatopsyche
Amnicola	Elimia	Hexagenia
Caenis	Hexagenia	Nemertinea
Chironomidae	Hydra	
Gammarus	Nematoda	
Gyraulus		
Harpacticoida		
Hexagenia		
Hirudinea		
Hyalella		
Hydropsyche		
Isopoda		
Manayunkia		
Oecetis		
Oligochaeta		
Ostracoda		
Physa		
Sphaeriidae		
Turbellaria		

LOCATION

St. Clair R. (Transects 1-10)	Lake St. Clair (Transects 11-13)	Detroit River (Transects 14-21)
Acarina	Hexagenia	Acarina
Amnicola	Hirudinea	Cheumatopsyche
Caenis	Nematoda	Elimia
Chironomidae	Oecetis	Harpacticoida
Elimia	Sphaeriidae	Hyalella
Gammarus		Hydropsyche
Gyraulus		Manayunkia
Hirudinea		Nematoda
Hyalella		Nemertinea
Hydra		Oligochaeta
Isopoda		Ostracoda
Oecetis		Turbellaria
Oligochaeta		
Physa		
Turbellaria		

1/ Significantly greater density.

this lower density in spring occurred only in the St. Clair River, and was most obvious in the delta region (transects VII-X). Densities of Nematoda, Isopoda, Gammarus, Hyalella, Chironomidae, and Oecetis in the affected area had recovered by fall 1984 to levels equal to or exceeding those in fall 1983, though densities of Turbellaria, Harpacticoida, and Amnicola were still low in fall 1984 (Figs. 5, 23, 35, and 68 of Appendix D).

Variability in yearly trends of mean density in relation to month can be illustrated by Hydra population densities. Numbers in spring were consistently higher in 1983 than in 1984 (Fig. 1 of Appendix D), but the reverse was true in the fall (Fig. 2 in Appendix D). This difference also occurred in Oligochaeta, Chironomidae, Caenis, Acarina, and Sphaeriidae. Variation in yearly trends by transect and month are shown in Hexagenia densities in Figs. 46 and 47 of Appendix D. Other taxa were more consistent, although all vary somewhat over the 21 transects and two sampling periods.

Densities of most taxa were significantly higher in October than in May (Table 20). The differences in seasonal abundance were fairly consistent over years and transects, because many of the interaction means associated with month were nonsignificant (e.g., Hirudinea, Cheumatopsyche in Appendix H). The exceptions were Hydra, which typically was most common in October, though its density was rather high in the Detroit River in May 1984 (Fig. 1 of Appendix D). Densities of Ostracoda were high in the St. Clair River in October, whereas they are typically highest in May (Fig. 25 of Appendix D). Similarly, departures from seasonal abundance trends resulting from unusually high densities in a particular year or area (transect) occurred also in Hexagenia, Gyraulus, and Elimia.

Densities of most taxa were significantly higher at the off-channel station that at either the near-channel or channel stations (Table 20). Densities of Acarina, Hydropsyche, Cheumatopsyche, and Hexagenia were not significantly different between at least two stations (Tables 15, 16, 17); consequently these taxa were listed at stations where their densities were highest. In addition, the abundance of several taxa at a particular station (depth) was not consistent over all transects. The depth distributions of Hirudinea, Oligochaeta, Chironomidae, Sphaeriidae, and Amnicola differed in lake and riverine situations, and those of Manayunkia, Acarina, and Elimia differed between the lower Detroit River and the rest of the system. Contaminant problems may override depth distribution in this area. These and other minor differences in distribution among stations probably reflect a preference for a sediment type.

Most taxa were most abundant in the St. Clair River (Table 20). Listing a particular taxon in a particular location was somewhat subjective because of ranking between locations overlapped considerably. For example, densities of Hydra were consistently high in the St. Clair River , whereas those of Turbellaria were equally high in the St. Clair and Detroit rivers (Table 8). If distribution differences were not clear cut, a particular taxon was listed in more than one location. Taxa most abundant in the St. Clair River were mostly insects and snails. The number of taxa whose highest densities were in Lake St. Clair were few, and were characteristic of lotic situations. The Detroit River was dominated by lower invertebrate taxa (worms) and net-spinning caddisflies.

Biomass

Mean biomass ranged from 0.03 to 4.84 g/m² over the 21 transects (Table 21). Biomass was higher in 1984 than in 1983 along about half the transects; there were no statistically significant differences between years (Table 22 and Appendix H). Biomass was 25% lower in May, but 60% higher in October, in 1984 than in 1983. This reversal resulted in no statistically significant differences between May and October (Table 22). Biomass in May was lower in 1984 than in 1983 at most St. Clair River transects, but the opposite was true in the Detroit River. However, most biomass values for October were higher in 1984 than in 1983, over all transects (Figs. 73-74 in Appendix D). Differences between stations were significant; and relationships did not vary by month or year and were fairly consistent over transects (Fig. 75 of Appendix D). Biomass was highest in the Russell Island area and Belle Isle (Table 21) and lowest at transect I in Lake Huron.

Clams, crayfish, and fish remains were rarely collected but contributed considerably to biomass estimates. Because of the great variability they introduced, they were not included in the ANOVA (Table 22 and Appendix H). Clams were most common in Lake St. Clair and the Detroit River--particularly at transect XVI, where biomass estimates were as high as 2.6 g/m².

Density and Diversity

Average total densities of macrozoobenthos ranged from 976 to 96,684/m² over the 21 transects in the two years (Table 21). Total densities were higher along about half the transects, and lower along the other half, in 1984 than in 1983. Densities were not necessarily positively correlated with biomass calculated at the same stations (Table 21). Densities were highest at transects XVIII (due mainly to oligochaetes) and VII (which had a diverse community--an average of 36 taxa per sampling period).

The average number of taxa at each transect ranged from 9 to 38 (Table 21). Diversity was consistently higher in 1983 than in 1984 in the St. Clair River but did not differ between years in the Detroit River. On the average, there were four fewer taxa in 1984 than in 1983 in the St. Clair River. The number of taxa was lowest (9-13) in the sandy substrates of transect I (Lake Huron) and high (> 30) at II-VIII and at XVII (Belle Isle). The number of taxa per sample averaged 22 in the lower Detroit River.

Physical Characteristics of the River

The physical environment varied among transects (see Appendix G for summary). Current velocities and substrates differed among segments of SCDRS: upper St.

Table 21. Mean total density, biomass (ash-free dry weight) and average number of taxa (diversity) of macrozoobenthos collected in SCDRS, May and October, 1983-1984.

Transect	Density (no./m²)		Biomass (g/m²)		Diversity (no. of taxa)	
	1983	1984	1983	1984	1983	1984
I	2,504	976	0.24	0.03	13	9
II	24,622	87,430	1.16	2.27	38	37
III	7,837	2,555	0.22	0.12	22	18
IV	15,190	34,659	0.79	1.78	32	32
V	14,361	87,481	1.33	2.47	32	29
VI	34,814	47,042	2.47	2.13	38	32
VII	31,533	90,107	2.82	3.31	36	32
VIII	43,294	23,176	1.56	0.91	34	31
IX	25,470	6,260	1.02	0.21	34	23
X	13,103	10,113	0.55	0.41	26	23
XI	13,956	15,391	1.68	1.08	24	21
XII	8,090	7,474	1.25	1.67	22	22
XIII	7,184	5,514	0.91	1.85	22	22
XIV	9,054	113	0.55	1.75	23	22
XV	11,040	8,020	0.92	1.43	21	23
XVI	20,325	17,802	4.20	4.84	34	32
XVII	22,545	16,313	1.18	0.82	28	30
XVIII	98,684	63,073	1.35	1.37	25	21
XIX	13,661	15,938	0.42	0.89	20	22
XX	11,154	8,983	0.34	0.34	22	25
XXI	11,277	14,608	0.92	0.31	21	22
Mean	20,938	26,811	1.23	1.43	27	25

Table 22. Ash-free dry weight mean biomass (g/m²) of macrozoobenthos by year, month, station, and transect in SCDRS. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$). Ranking and significance are based on an ANOVA and Tukey's Studentized Range test of untransformed data. Large clams, crayfish, and fish remains are not included in the analysis.

	Year		Month		Stations		
Biomass	1.09	1.00	1.07	1.03	1.43	1.00	0.71
	1984	1983	May	October	Off-channel	Near-channel	Channel

Transects

3.07	2.30	1.90	1.41	1.35	1.24	1.19	1.16	1.10	1.10	1.00	0.84	0.81	0.70	0.66	0.61	0.48	0.45	0.34	0.17	0.14
7	6	5	2	11	8	18	15	13	16	4	14	12	17	19	9	10	21	20	3	1

Clair River, sometimes >2 ft/s, mostly gravel; lower St. Clair River, never >2 ft/s, predominantly sand and silt; Lake St. Clair, rarely >0.6 ft/s, cohesive clay and silt; upper Detroit River and portions of the lower river, usually <1 ft/s, unconsolidated clay and silt; and other transects in the lower Detroit River (XX-XXI), with >1 ft/s and mainly gravel and cobble. Sampling depth ranged from 4 to 25 ft in the rivers, but varied little in Lake St. Clair, averaging 22 ft.

Water temperature varied between locations, seasons, and years during the study. Contemporaneous differences of up to 7°F occurred routinely between Port Huron and the lower Detroit River. These differences were greatest in spring and smallest in fall, and averaged about 4°F for the year. Temperatures ranged from 39° to 46°F in early May and from 57° to 59°F in October. Daily temperatures for both years were available from the water plants operated by the City of Port Huron (in the river adjacent to the city) and Detroit (Detroit River at Belle Isle). The average monthly temperatures are plotted in .ig. 5. Both rivers reached maximum temperature in August; temperatures were consistently lower in 1984 than in 1983--particularly in the St. Clair River in March, April, and May, where low temperatures were presumably caused by the large ice jam previously described. Differences between surface and bottom temperatures were always less than 2°F.

Relationships between Macrozoobenthos and Physical Environment

The relation between depth, velocity, bottom type, and temperature and the abundance of 24 taxa was limited mainly to significant correlations with depth and velocity (Table 23). Increasing depth was correlated with increasing current velocity and coarser or firmer substrates. However, it was difficult to determine which of these physical factors most influenced the abundance of macrozoobenthos. The abundance of all of the taxa listed in Table 23 except *Hydropsyche* and *Cheumatopsyche* were negatively correlated ($P \leq 0.05$) with depth and velocity. Most of the taxa listed in Table 23 were significantly denser at the off-channel stations than at others (Table 20). Turbellaria, Hirudinea, Oligochaeta, *Gammarus*, *Hyalella*, Chironomidae, *Caenis*, *Physa*, *Gyraulus*, and *Amnicola* were consistently most abundant in shallow areas with little current. The depth distribution of certain other taxa may have been unique, but the relation was not linear.

Although water velocity was related to bottom type, a linear relation with sediment type was significant for only one taxon--densities of *Hydropsyche* were highest in coarse sediments. Other significant positive relations were shown by *Hydropsyche* and *Cheumatopsyche* (with water velocity) and *Physa* (with temperature). Few correlations with temperature would be expected because temperature differences both vertically and cross channel were small, and the sampling periods were widely separated.

AQUATIC MACROPHYTES

Distribution of Submersed Plants

We collected 20 taxa of submersed macrophytes with the Ponar grab in the

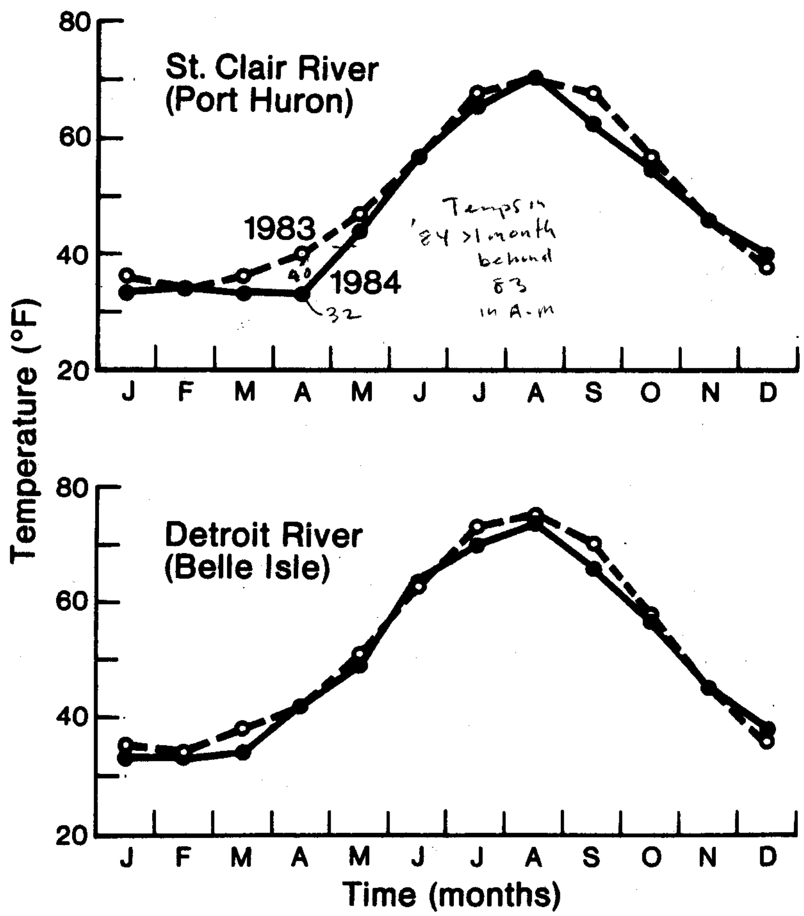

Figure 5. Mean monthly water temperatures (°F) measured in the St. Clair and Detroit rivers at the city of Port Huron water intake (1.5 miles below the Blue Water Bridge) and at the city of Detroit water intake (Belle Isle) in 1983 and 1984.

Table 23. Significant correlation coefficients ($P \leq 0.05$, $n = 756$) for macrozoobenthos density (by taxon) and: water depth, velocity, temperature, and bottom type.

Taxon	Depth	Velocity	Temperature	Bottom type
Turbellaria	-0.253	-0.308	-	-
Hirudinea	-0.255	-0.259	-	-
Oligochaeta	-0.222	-0.329	-	-
Gammarus	-	-0.243	-	-
Hyalella	-	-0.180	-	-
Chironomidae	-0.301	-0.349	-	-
Caenis	-0.261	-0.305	-	-
Hexagenia	-	-0.286	-	-
Cheumatopsyche	-	+0.248	-	-
Hydropsyche	-	+0.243	-	+0.164
Physa	-0.263	-0.265	+0.224	-
Gyraulus	-0.255	-0.230	-	-
Amnicola	-0.311	-0.269	-	-

St. Clair and Detroit rivers in 1983 and 1984 (Table 24). The St. Clair River yielded 18 submersed taxa plus 1 emergent species, Sagittaria sp., that was found in the submersed stage; and the Detroit River collections contained 19 taxa including 2 emergent species that were found in their submersed forms. The most common submersed plants in decreasing order of frequency of occurrence, were Chara spp., Potamogeton spp., Vallisneria americana, Potamogeton gramineus, P. richardsonii, Myriophyllum spicatum, and Elodea canadensis. Other taxa occurred in less than 13% of the samples. The most common taxa collected were Chara in the St. Clair River and V. americana in the Detroit River. The frequency of occurrence of Potamogeton spp. was similar in both rivers; P. richardsonii, E. canadensis, and P. gramineus were more common in the St. Clair River and M. spicatum was more common in the Detroit River. Butomus umbellatus and Ranunculus longirostris were collected only in the Detroit River and Zannichellia palustris only in the St. Clair River. Variation in frequency of occurrence of individual taxa between years was 7% or less in both rivers.

The number of plant taxa generally increased from spring to late summer as Najas flexilis, Nitellopsis obtusa, and P. zosteriformis appeared in July-August (Tables 25-27). One taxon, P. crispus, declined in occurrence as the season progressed. Total number of taxa at each location varied from 7 to 14, the largest number occurring in September. The plant collections were only slightly more diverse at Stag Island and Belle Isle (mean of 11 taxa) than at Point Hennepin, where the diversity was lowest (mean of 8 taxa). Percent occurrence of individual taxa during each sampling period varied less than 10% between years, at each location. Only 11 of 228 comparisons (by year, month, and island) showed changes in occurrence of taxa that exceeded 20%. Changes were about equally divided between the St. Clair and Detroit rivers and occurred most frequently in July. Incidence of variation (> 10%) in percent occurrence between years, was highest in Potamogeton spp., P. richardsonii, E. canadensis, and Vallisneria americana.

The diversity of taxa and distribution of plants were unique at each location. At Stag Island, plants were lacking in blocks 1-4 and sparse in block 5 (Figs. 1-3 and 19-21 of Appendix O). Plants also appeared to be absent in parts of blocks 6-9 and 13, and in shallow areas in blocks 8, 10, and 11. Most plants were located in and near an area with depths up to 20 ft that was centered on grid intersect 17 and along the shipping channel. Chara spp., Potamogeton spp., and P. richardsonii occurred in relatively high concentrations--> 10 g/m² in June, > 20 in July, and > 40 in September--in all blocks below the upstream tip of the island. Chara spp. occurred most often in pure stands, particularly in shallow areas adjacent to Stag Island. Potamogeton richardsonii, Elodea canadensis and P. crispus were the dominant plants composing the dark band around deep water in grids 6-9 and 11-12 (e.g., see Fig. 2 of Appendix O). Myriophyllum spicatum and Najas flexilis dominated the deeper water in both these areas. Potamogeton gramineus was the dominant taxon in the deeper areas near the shipping channel. Potamogeton spp. was interspersed throughout the communities and was the dominant taxon in the lighter areas near the shipping channel. Diversity was greatest in areas where light and dark patches converged. Six to eight taxa were often found in

Table 24. Percent frequency of occurrence and mean dry weight biomass (g/m²) of submersed macrophyte taxa collected with a Ponar grab in SCDRS in 1983 and 1984. Mean biomass is based only on samples in which the taxa occurred.

Taxa	St. Clair River				Detroit River			
	Occurrence		Mean biomass		Occurrence		Mean biomass	
	1983	1984	1983	1984	1983	1984	1983	1984
Butomus umbellatus [a/]	0	0	0	0	0	2	0	27.3
Chara spp.	70	65	85.8	119.8	11	15	30.4	60.8
Elodea canadensis	28	22	44.6	25.5	7	7	78.4	137.0
Heteranthera dubia	T[b/]	0	1.5	0	7	7	58.4	173.9
Myriophyllum exalbescens	T	T	6.0	2.6	0	T	0	3.3
Myriophyllum spicatum	8	7	34.1	41.7	24	17	93.9	104.6
Najas flexilis	3	6	3.3	2.6	3	7	2.3	15.5
Nitella hyalina	3	10	26.1	35.0	9	11	58.6	28.8
Nitellopsis obtusa	1	1	34.0	11.5	9	10	81.7	48.9
Potamogeton crispus	3	3	29.9	17.7	10	13	83.5	69.6
Potamogeton gramineus	46	41	42.8	64.2	4	5	26.1	39.5
Potamogeton spp. [c/]	54	53	50.1	33.6	31	28	23.6	17.2
Potamogeton natans	1	0	72.2	0	0	0	0	0
Potamogeton nodosus	1	0	5.0	0	0	1	0	124.7
Potamogeton richardsonii	32	31	50.6	84.1	21	22	73.0	69.6
Potamogeton zosteriformis	2	3	7.3	20.6	2	8	3.0	3.9
Ranunculus longirostris	0	0	0	0	1	0	102.4	0
Sagittaria sp. [a/]	T	T	16.2	1.0	0	2	0	4.7
Vallisneria americana	2	5	12.7	6.5	70	67	49.0	41.1
Zannichellia palustris	0	1	0	1.4	0	0	0	0

[a/] Emergent species collected only in the submersed stage.

[b/] T = < 1%

[c/] Narrow-leaf forms.

Table 25. Mean dry weight biomass (g/m^2) and (in parentheses) percent frequency of occurrence of submersed macrophytes found at six locations in SCDRS in June 1983 and 1984. Mean biomass is based only on samples in which the taxon occurred.

Taxon	Year	Stag Island	Fawn Island	Russell Island	Belle Isle	Pt. Hennepin	Stony Island
Chara spp.	1983	24 (67)	28 (82)	51 (85)	45 (38)	27 (20)	4 (3)
	1984	63 (70)	102 (71)	40 (80)	32 (31)	18 (10)	0
Elodea canadensis	1983	49 (33)	6 (4)	58 (22)	1 (5)	0	50 (19)
	1984	18 (50)	0	8 (22)	0	1 (2)	157 (33)
Heteranthera dubia	1983	0	0	0	0	0	15 (17)
	1984	0	0	0	0	0	6 (7)
Myriophyllum spicatum	1983	20 (16)	0	81 (2)	34 (10)	124 (6)	12 (19)
	1984	40 (17)	0	0	24 (18)	0	4 (10)
Nitella hyalina	1983	22 (5)	20 (6)	78 (2)	37 (49)	42 (19)	0
	1984	64 (17)	5 (2)	2 (8)	30 (46)	29 (33)	3 (3)
Potamogeton crispus	1983	40 (10)	1 (2)	0	8 (13)	84 (7)	143 (47)
	1984	18 (8)	4 (4)	0	4 (9)	0	150 (42)
Potamogeton gramineus	1983	14 (22)	19 (46)	14 (33)	22 (15)	0	30 (6)
	1984	10 (22)	7 (47)	5 (33)	2 (12)	0	0
Potamogeton[a/] spp.	1983	32 (50)	32 (27)	46 (62)	5 (56)	28 (87)	4 (47)
	1984	19 (57)	4 (40)	14 (53)	2 (50)	20 (65)	2 (30)
Potamogeton richardsonii	1983	14 (12)	32 (20)	32 (17)	11 (23)	2 (2)	44 (11)
	1984	8 (17)	10 (20)	17 (33)	8 (23)	21 (26)	0
Vallisneria americana	1983	0	0	0	4 (77)	4 (50)	9 (39)
	1984	0	1 (2)	0	2 (62)	4 (54)	8 (47)

a/ Narrow-leaf forms.

Table 26. Mean dry weight biomass (g/m²) and (in parentheses) percent frequency of occurrence of submersed macrophytes found at six locations in SCDRS in July-August 1983 and 1984. Mean biomass is based only on samples in which the taxon occurred.

Taxon	Year	Stag Island	Fawn Island	Russell Island	Belle Isle	Point Hennepin	Stony Island
Chara spp.	1983	100 (62)	103 (71)	110 (78)	48 (10)	3 (5)	0
	1984	132 (57)	136 (81)	121 (36)	107 (38)	16 (5)	0
Elodea canadensis	1983	25 (42)	7 (16)	59 (33)	1 (3)	0	169 (24)
	1984	57 (45)	0	13 (12)	0	0	171 (21)
Heteranthera dubia	1983	0	0	2 (3)	0	0	51 (24)
	1984	0	0	0	0	0	124 (21)
Myriophyllum spicatum	1983	20 (20)	5 (2)	1 (3)	80 (36)	161 (12)	92 (48)
	1984	41 (20)	0	1 (3)	66 (19)	0	82 (33)
Najas flexilis	1983	0	0	0	2 (10)	1 (2)	0
	1984	0	1 (19)	1 (6)	3 (31)	1 (2)	0
Nitella hyalina	1983	35 (3)	0	0	4 (3)	0	0
	1984	111 (13)	23 (17)	6 (14)	0	5 (10)	0
Nitellopsis obtusa	1983	0	0	0	71 (51)	1 (2)	0
	1984	0	0	0	36 (38)	0	0
Potamogeton crispus	1983	33 (15)	6 (4)	0	12 (10)	0	3 (9)
	1984	28 (8)	0	0	9 (17)	0	40 (27)
Potamogeton gramineus	1983	36 (37)	31 (49)	24 (56)	0	0	32 (3)
	1984	13 (7)	34 (52)	101 (50)	60 (10)	72 (7)	75 (3)
Potamogeton[a] spp.	1983	39 (48)	35 (64)	36 (58)	5 (5)	37 (42)	20 (18)
	1984	41 (43)	30 (45)	29 (67)	5 (14)	29 (49)	40 (24)
Potamogeton richardsonii	1983	31 (32)	53 (62)	36 (36)	72 (38)	86 (48)	49 (12)
	1984	56 (42)	53 (21)	212 (42)	98 (45)	127 (35)	142 (15)
Potamogeton zosteriformis	1983	9 (7)	5 (9)	0	4 (13)	0	1 (3)
	1984	0	41 (12)	0	4 (33)	0	0
Vallisneria americana	1983	1 (2)	1 (4)	0	25 (72)	50 (70)	37 (67)
	1984	7 (3)	1 (2)	3 (3)	20 (76)	42 (68)	63 (55)

a/ Narrow-leaf forms.

Table 27. Mean dry weight biomass (g/m^2) and (in parentheses) percent frequency of occurrence of submersed macrophytes found at six locations in SCDRS in September 1983 and 1984. Mean biomass is based only on samples in which the taxon occurred.

Taxon	Year	Stag Island	Fawn Island	Russell Island	Belle Isle	Pt. Hennepin	Stony Island
Chara spp.	1983	203 (47)	116 (69)	94 (69)	15 (12)	1 (9)	0
	1984	95 (48)	190 (76)	204 (64)	73 (38)	10 (14)	0
Elodea canadensis	1983	26 (37)	75 (36)	54 (25)	1 (2)	2 (2)	1 (9)
	1984	27 (38)	2 (7)	7 (19)	2 (2)	0	2 (6)
Heteranthera dubia	1983	0	0	0	0	5 (7)	129 (18)
	1984	0	0	0	0	0	231 (39)
Myriophyllum spicatum	1983	69 (23)	2 (2)	1 (6)	72 (34)	125 (7)	145 (45)
	1984	53 (23)	0	8 (3)	91 (26)	101 (11)	225 (36)
Najas flexilis	1983	4 (7)	4 (14)	1 (6)	3 (14)	1 (2)	0
	1984	0	5 (24)	1 (6)	33 (24)	15 (9)	0
Nitella hyalina	1983	25 (7)	23 (2)	6 (3)	167 (14)	0	0
	1984	3 (10)	3 (7)	0	95 (5)	1 (2)	0
Nitellopsis obtusa	1983	4 (7)	0	69 (6)	104 (31)	0	0
	1984	0	12 (5)	0	59 (48)	0	0
Potamogeton crispus	1983	0	0	0	5 (2)	0	6 (3)
	1984	11 (5)	0	0	2 (2)	0	23 (18)
Potamogeton gramineus	1983	47 (38)	88 (64)	65 (69)	28 (10)	0	0
	1984	76 (23)	47 (69)	171 (64)	38 (10)	1 (2)	0
Potamogeton[a/] spp.	1983	95 (65)	30 (48)	81 (64)	8 (5)	107 (16)	1 (3)
	1984	53 (48)	12 (45)	74 (81)	14 (12)	3 (2)	34 (6)
Potamogeton richardsonii	1983	96 (38)	51 (55)	78 (14)	98 (43)	114 (12)	0
	1984	42 (43)	69 (33)	234 (25)	30 (33)	50 (21)	0
Potamogeton zosteriformis	1983	15 (2)	1 (2)	0	0	0	0
	1984	14 (8)	1 (2)	1 (3)	7 (2)	0	0
Vallisneria americana	1983	37 (5)	0	8 (11)	56 (95)	78 (84)	135 (76)
	1984	6 (7)	12 (17)	2 (11)	30 (83)	84 (98)	90 (61)

a/ Narrow-leaf forms.

these areas (Table 1 of Appendix K). The number of taxa per Ponar grab averaged about 2.6 at Stag Island (Table 28) and tended to increase over the season.

At Fawn Island, submersed macrophytes were present in all blocks (Figs. 4-6 and 22-24 of Appendix O). Chara spp. occurred in relatively pure stands over most of the lightly stippled area in the figures. Potamogeton richardsonii, P. gramineus and Potamogeton spp. made up the narrow dark U-shaped band (e.g., Fig. 6 of Appendix O) adjacent to the divided shipping channels and the small patches within the Chara spp. stand. Frequency of occurrence and biomass of Potamogeton spp. were higher on the eastern wing of the wedge and those of P. richardsonii on the west side; P. gramineus was about equally abundant in both wings. Potamogeton spp. and P. gramineus dominated at the tip of the wedge. The only other common taxon, E. canadensis, occurred in deep water adjacent to the main shipping channel, in blocks 3, 5, and 6. A maximum of seven taxa (average four to five) were collected in each block (Table 2 of Appendix K). The number of taxa per Ponar grab averaged 2.6 and increased progressively over the growing season in both years (Table 28).

At Russell Island, the biomass of Chara spp., Potamogeton spp., and P. gramineus was relatively high in all nine blocks of the sampling grid (Figs. 7-9 and 25-27 of Appendix O). Concentrations of Chara spp. were highest in the lightly stippled areas of blocks 2 and 6-9 and in pure stands in blocks 6 and 7. The dark areas in blocks 1, 2, and 6 and the strip in blocks 7-9 adjacent to shore represented P. gramineus. The dark strip in blocks 7-9 also contained high concentrations of Potamogeton spp. and P. gramineus, and the dark areas in blocks 4, and 5 were P. richardsonii. Elodea was common in deeper water adjacent to the shipping channel in blocks 3 and 4. Vallisneria americana was restricted to block 4 and P. nodosus and P. natans to blocks 1, 3, 4, and 7. Taxa were distributed evenly over most of the grid, averaging three to five (maximum, 9) per block (Table 3 of Appendix K). Diversity was greatest at grid intersection 10 and in blocks 3 and 4. The number of taxa per grab averaged 2.6 and increased through the season (Table 28).

At Belle Isle most of the plants were close to shore in blocks 8-10 in an extensive littoral area (Figs. 10-12 and 28-30 of Appendix O). Few plants were found in blocks 1-7 in relatively deep water (> 12 ft). Vallisneria americana was relatively abundant in all blocks; however, its low growth profile and the reduced water clarity in the Detroit River may have decreased its visibility on the aerial photos. The large dark band in block 1 and the smaller bands in blocks 1-6 were mainly P. richardsonii, mixed with P. zosteriformis and Potamogeton spp. The dark areas in blocks 7-10 were mostly small beds of Myriophyllum spicatum, P. richardsonii, and P. gramineus. Blocks 7-10 also included extensive beds of Chara spp., Najas flexilis, and Nitellopsis obtusa which may not have been visible because of their low growth profile. Najas flexilis and P. zosteriformis occurred in all but two blocks but never at high biomass levels. The macrophyte fauna was more diverse off Belle Isle than at any other location. Eleven taxa were found at grid intersection 18 (Table 4) of Appendix K). Diversity was greatest in blocks 7-10 and averaged

Table 28. Mean number of submersed macrophyte taxa per Ponar grab at six locations in SCDRS in 1983 and 1984.

Location	June		July-August		September		Grand mean
	1983	1984	1983	1984	1983	1984	
Stag Island	2.2	2.8	2.8	2.4	2.8	2.8	2.6
Fawn Island	1.9	1.9	2.9	2.7	3.2	2.9	2.6
Russell Island	2.2	2.4	2.7	2.6	3.0	2.8	2.6
Belle Isle	3.1	2.8	2.8	3.3	2.8	3.1	3.0
Pt. Hennepin	2.1	2.6	1.8	1.8	1.4	1.7	1.9
Stony Island	2.3	2.2	2.1	2.1	1.6	1.8	2.0

four to nine taxa over the sampling grid. The average number of species per grab was three and the seasonal range was 2.8-3.3 (Table 28).

On the shoals adjacent to Pt. Hennepin, Potamogeton spp. and V. americana were the dominant taxa. Narrow-leaf forms of Potamogeton spp. were found at relatively high biomass in every block except 7 and 14 in June, but had almost disappeared by September. Vallisneria americana was present in every block over all sampling dates and by September had replaced Potamogeton spp. as the most abundant taxon. Interpretation of plant distribution (Figs. 13-15 and 31-33 of Appendix O) is difficult, because many plants did not occur at densities great enough to be visible on aerial photos; the stippled areas generally represent the distribution of Potamogeton spp. in June and of V. americana in July-August and September. However, the dark bands adjacent to the channel in blocks 1, 2, 5, and 11-14 were mainly P. richardsonii. The dark bands in block 8 were composed mainly of M. spicatum, P. crispus and P. richardsonii. Chara spp. and Najas flexilis were in patches down the middle of the island, in a strip bounded by the corner of grid intersections 10, 11, 33, and 34, and are not visible in our photographs. Diversity was highest along the Fighting Island Channel, where dark and light bands adjoined. The number of species at the grid intersections ranged from two to seven (Table 5 of Appendix K). The average of 1.9 taxa per grab (the lowest for the six locations sampled) declined consistently over the season (Table 28).

The distribution of taxa at Stony Island can be grouped into three areas--the head of the island (blocks 1-5), an inlet area (blocks 6-8), and an intermediate area (blocks 9-11). The darker areas in blocks 2, 3, and 4 indicate the presence of P. richardsonii and M. spicatum (Figs. 16-18 and 34-36 of Appendix O). Potamogeton spp. and V. americana made up the lighter areas in blocks 1-5. Inside the bay the dark areas represented beds of Elodea canadensis, Heteranthra dubia, P. crispus, Ranunculus longirostris, and Myriophyllum spicatum, in pure or mixed stands. Potamogeton crispus was prevalent only in June and was replaced by H. dubia by September. The long strip of plants in blocks 9-11 is composed of H. dubia and M. spicatum. The lighter areas in blocks 9-11 show beds of V. americana. Taxa per grid ranged from zero to five with a maximum of 7 at grid intersection 5 (Table 6 of Appendix K). Taxa per grab averaged 2.0 and declined through the season (Table 28).

Distribution of Emergent Plants

Emergent macrophytes were present in only two of the sampling grids at the six locations. We collected 11 taxa at Fawn Island and Stony Island (Table 29). A small bed of Scirpus acutus was at the tip of Fawn Island in block 7 and extensive beds were in blocks 8, 10, and 11 off Stony Island. Typha latifolia and Sparganium eurycarpum usually occurred in pure stands, whereas the species of Eleocharis, Phalaris, Sagittaria, and Scirpus were usually found together in mixed stands. Because of the great size and diversity of the emergent beds at Stony Island and limited sampling effort, our coverage of the beds was not representative. The beds appeared to be stable and the percent occurrence between years for the most part reflected this stability (Table 29).

Table 29. Percent frequency of occurrence and mean dry weight biomass (g/m²) of emergent macrophytes collected at Stony Island, in the Detroit River, in 1983 and 1984.

Taxon	Occurrence		Biomass	
	1983 (n=33)	1984 (n=39)	1983	1984
Eleocharis spp.[a/]	6	15	37.2	18.4
Phalaris arundinacea	3	5	29.6	42.7
Sagittaria latifolia	12	15	13.4	35.5
Sagittaria rigida	0	26	0	198.0
Scirpus acutus	3	5	2.8	9.6
Scirpus americanus	18	23	178.7	299.4
Scirpus fluviatilis	9	3	965.8	8.2
Scirpus validus	9	23	28.0	44.9
Sparganium eurycarpum	36	33	196.2	357.5
Typha angustifolia	36	26	903.5	865.3

[a/] Two closely related species, E. smallii and E. erythropoda.

Abundance of Submersed Plants

Yearly variation in abundance of taxa of submersed macrophytes by river is shown in Table 24. The biomass of Chara spp., P. gramineus, and M. spicatum increased from 1983 to 1984 in both rivers. Potamogeton crispus and Potamogeton spp. were less abundant in both rivers in 1984 than in 1983, whereas N. flexilis and P. richardsonii were more abundant in the St. Clair River but less abundant in the Detroit River in 1984 than in 1983.

Differences in biomass of dominant taxa between years and sampling periods at each sampling location are shown in Tables 25-27. In the St. Clair River in June, most taxa were less abundant in 1984 than in 1983. However, a paired comparison of all taxa showed only the differences at Russell Island to be significant. Biomass of dominant taxa declined similarly in the Detroit River, but was significant only at Belle Isle. In July, the trend of decline in taxa from 1983 to 1984 did not occur; rather the biomass of most taxa was higher in 1984 than in 1983. At Stony Island the increase in biomass in July from 1983 to 1984 was significant. In September, the change in biomass for most taxa was similar between years. Over all, two taxa--Chara spp. and N. flexilis--increased rather consistently from 1983 to 1984, whereas one taxon, Potamogeton spp., declined over the same time period. The biomass of E. canadensis at Russell Island and V. americana at Belle Isle was consistently lower in 1984 than in 1983.

An analysis of dry weight biomass of all taxa combined, by year, month, and blocks over sampling location, showed several significant differences (Table 30). However, these differences must be interpreted cautiously because most of the combinations (interactions) between year, month, and block were also significant (Appendix P). At Stag Island, biomass values were significantly higher in 1983 than in 1984 (Table 30), but this was not consistent over all months (Fig. 6) or blocks (Fig. 7). Biomass increased significantly from June to July-August to September in 1983 (Table 30), but this trend was not obvious in 1984 (Fig. 6). Biomass was higher in all blocks in September 1983, but was higher in blocks 10-13 in June and July-August 1984. A partial reason for the biomass being higher early in the year in 1984 was the occurrence of several unusually heavy samples of Chara spp. and N. flexilis in our collections in blocks 12 and 13. Collectively, biomass was highest in blocks 6-8, 12, and 13.

At Fawn Island, biomass differences between years were negligible (Table 30). In both 1983 and 1984, biomass increased steadily through the season (Fig. 6). Biomass in blocks 5, 6, and 11 was higher in 1984 than in 1983 (Fig. 8) in most months. The decline from 1983 to 1984 was greatest in blocks 1-3 at the head of the island and the increase was greatest in blocks 5-6, near the center of the grid. As at Stag Island, the high biomass of Chara spp. and N. flexilis at Fawn Island in June and July-August kept the 1984 biomass levels near those of 1983.

Macrophyte biomass at Russell Island was significantly higher in 1984

Table 30. Mean dry weight biomass (g/m²) of submersed aquatic macrophytes by year, month, and blocks (block numbers in parentheses) at six locations in SCDRS. Values jointly underlined were not significantly different ($P \leq 0.05$).

Location	Year		Month			Block														
Stag Island	97 1983	86 1984	127 Sep.	97 July	51 June	184 (12)	215 (6)	177 (7)	142 (8)	146 (13)	136 (11)	86 (9)	99 (10)	77 (15)	57 (14)	57 (5)	0 (1)	0 (2)	0 (3)	0 (4)
Fawn Island	130 1983	131 1984	213 Sep.	154 July	23 June	215 (4)	194 (11)	125 (7)	133 (9)	136 (6)	105 (1)	115 (10)	106 (2)	102 (3)	123 (5)	78 (8)				
Russell Island	204 1984	123 1983	265 Sep.	158 July	68 June	238 (9)	208 (7)	183 (8)	213 (3)	147 (4)	142 (6)	161 (2)	106 (5)	76 (1)						
Belle Isle	106 1983	105 1984	140 Sep.	136 July	41 June	185 (9)	161 (8)	150 (7)	124 (10)	121 (3)	98 (5)	90 (1)	45 (6)	44 (4)	37 (2)					
Point Hennepin	75 1984	71 1983	93 Sep.	91 July	35 June	110 (6)	106 (8)	107 (2)	86 (5)	71 (11)	67 (3)	66 (1)	62 (4)	62 (12)	61 (9)	58 (7)	69 (13)	61 (10)	38 (14)	
Stony Island	180 1984	146 1983	220 Sep.	161 July	107 June	382 (6)	245 (8)	224 (7)	158 (10)	128 (3)	109 (4)	101 (2)	125 (9)	77 (5)	78 (1)					

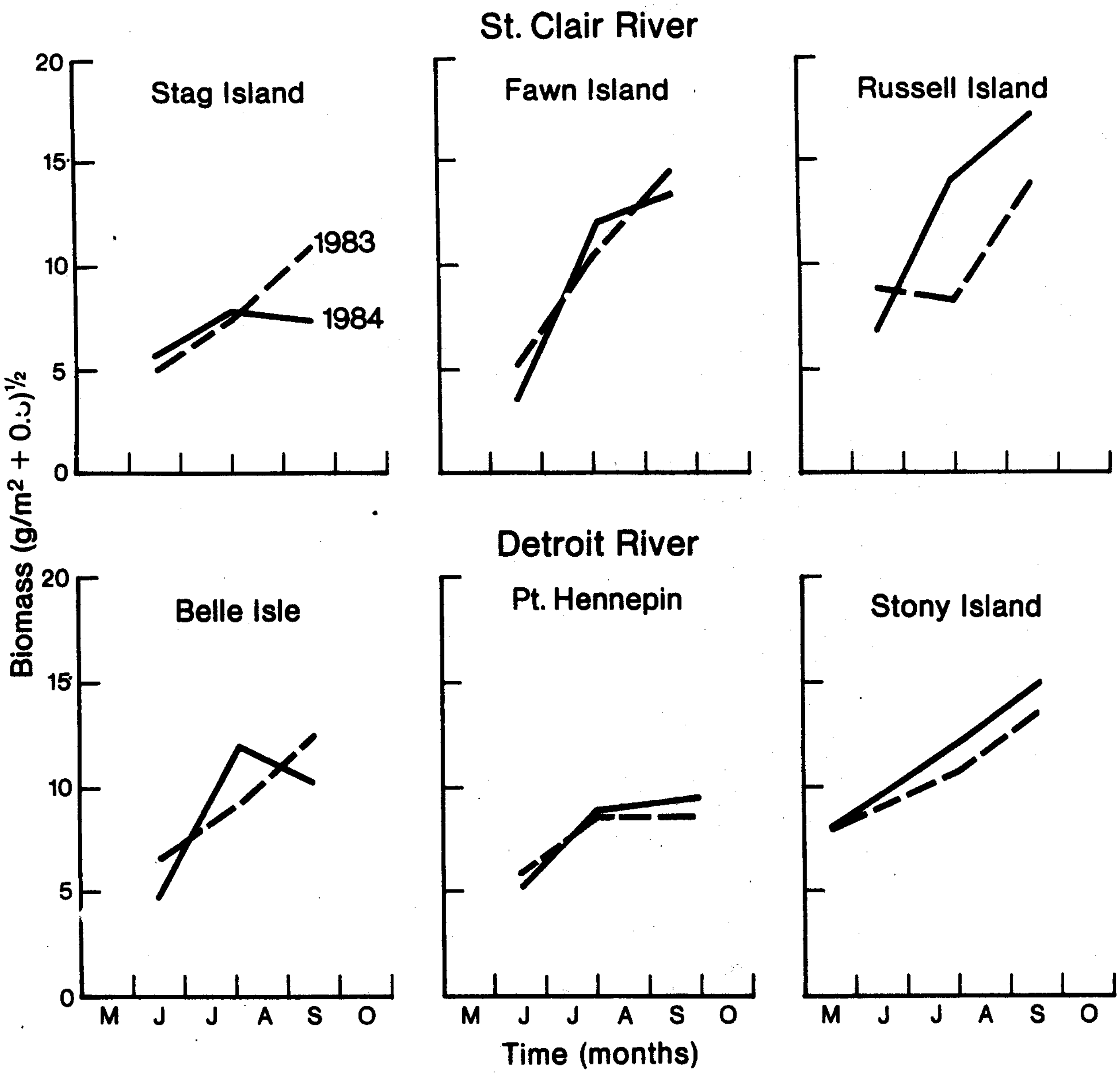

Figure 6. Mean seasonal biomass (square root of dry weight in g/m^2 + 0.5) of submersed macrophytes at six locations in the SCDRS.

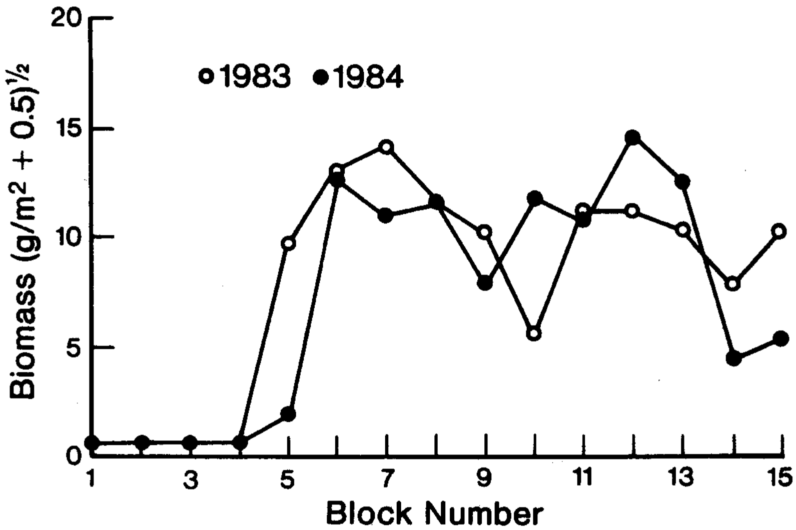

Figure 7. Mean biomass (square root of dry weight in g/m² + 0.5) of submersed macrophytes in blocks composing the sampling grid at Stag Island. (See Appendix I, Fig. 1 for block locations.)

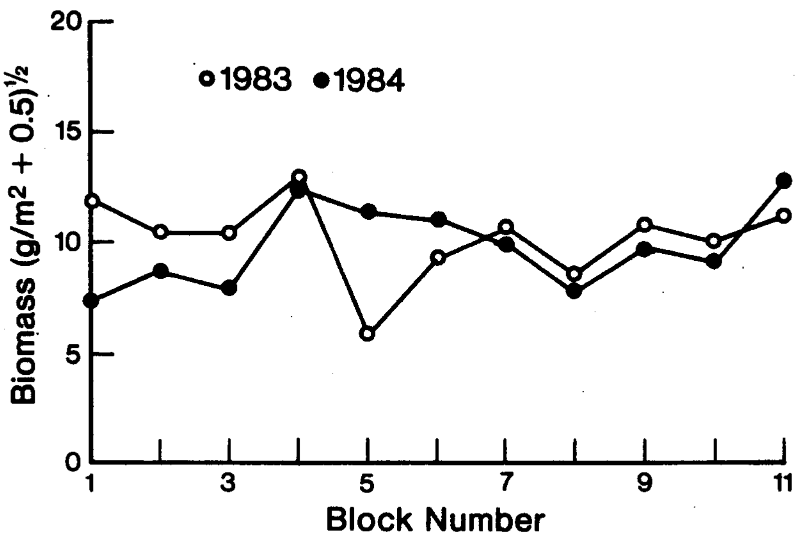

Figure 8. Mean biomass (square root of dry weight in g/m² + 0.5) of submersed macrophytes in blocks composing the sampling grid at Fawn Island. (See Fig. 2 of Appendix I for block locations.)

than in 1983 (Table 30). Although biomass was higher in 1983 than in 1984 during one month and several blocks (Figs. 6 and 9), the differences were not statistically significant. Biomass at this location tended to increase through the growing season. Biomass was highest in blocks 3 and 7-9, which were nearest the shore (Table 30). Large increases in the biomass of *Chara* spp., *P. gramineus*, and *P. richardsonii* accounted for the larger biomass in 1984.

At Belle Isle, yearly differences in dry weight biomass were negligible (Table 30), except for the high density in July-August 1984 (Fig. 6); the seasonal differences between July-August and September were not significant (Table 30). The high July-August biomass resulted mainly from high densities of *Chara* spp. and *P. richardsonii* in blocks 1, 7, and 8. Yearly differences between corresponding grids were small and trends were about the same (Fig. 10). Biomass was highest in blocks 7-10 in the downstream, shallow, protected area (Table 30).

At Point Hennepin, as at Belle Isle, differences in abundance between years and between September and July-August were not significant (Table 30). Monthly trends in biomass were similar between years (Fig. 6). Although differences between years were large in several blocks, no consistent trends were evident (Fig. 11). Biomass was highest in blocks 6 and 8, in the center of the sampling area on the side of the main shipping channel (Table 30).

For all three sampling periods, the standing crop biomass of submersed macrophytes at Stony Island was significantly higher in 1984 than in 1983 (Table 30, Fig. 6). Biomass also differed between years in all blocks except 3 and 4 (Fig. 12). Trends among blocks between years were consistent; biomass was highest in blocks 6, 7, and 8 in inlet areas. At Stony Island, unlike the other Detroit River locations, biomass increased significantly from June through September.

Abundance of Emergent Plants

We did not statistically compare yearly estimates of biomass of emergent macrophytes at Stony Island (Table 29) because sample size was too small (12 or fewer samples per taxon per year). The dry weight biomass of *Scirpus fluviatilus* and *Typha latifolia* was largest and that of *Scirpus acutus* smallest. Maximum dry weight biomasses for individual samples of *Typha* exceeded 2000 g/m^2. All taxa were present during each sampling period, and abundance of most taxa usually peaked in July-August. Differences in taxon biomass between years at Stony Island were mainly small. The few large differences were due to the large area and diversity of taxa in relation to sampling effort. The biomass estimates for the small emergent bed at Fawn Island can be evaluated by month and year. No samples of *S. acutus* were collected in June of either year because the plant bed had not yet broken the water surface. The biomass of this bed averaged 171 g/m^2 in July-August and 306 in September in both 1983 and 1984. However, the biomass in 1984 was 70% lower in July-August and 21% lower in September than in the same months in 1983.

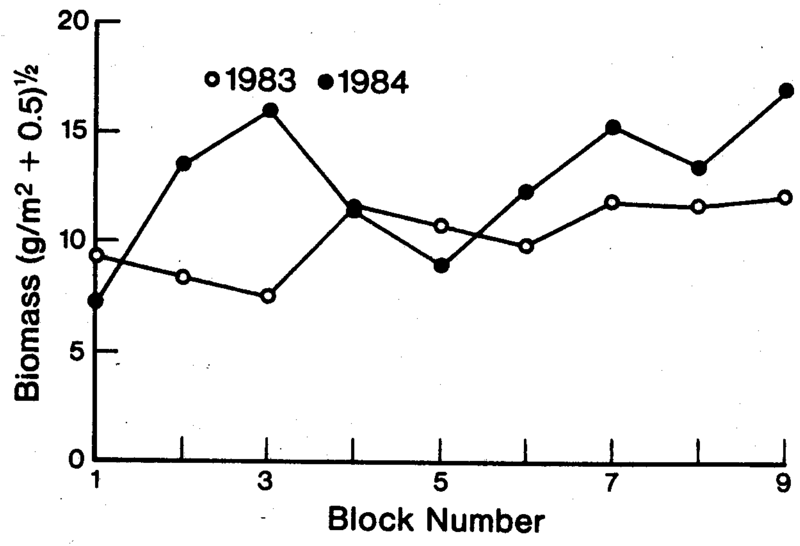

Figure 9. Mean biomass (square root of dry weight in g/m² + 0.5) of submersed macrophytes in blocks composing the sampling grid at Russell Island. (See Fig. 3 of Appendix I for block locations.)

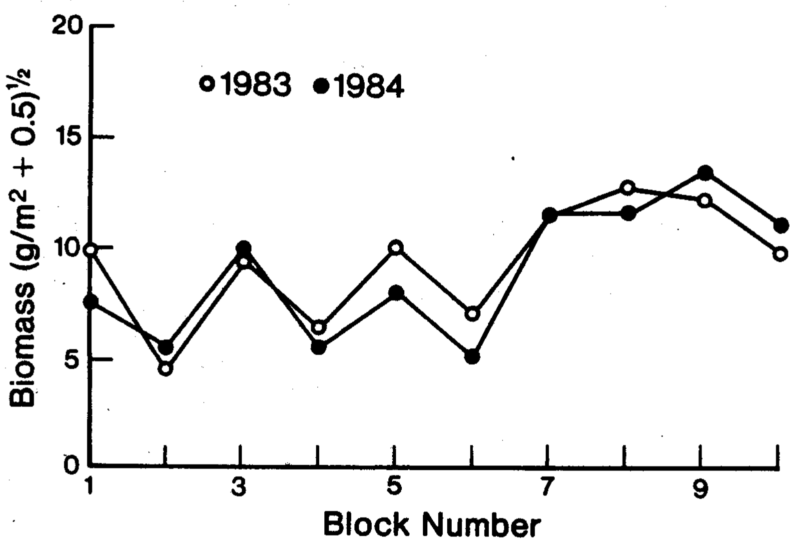

Figure 10. Mean biomass (square root of dry weight in g/m² + 0.5) of submersed macrophytes in blocks composing the sampling grid at Belle Isle. (See Fig. 4 of Appendix I for block locations.)

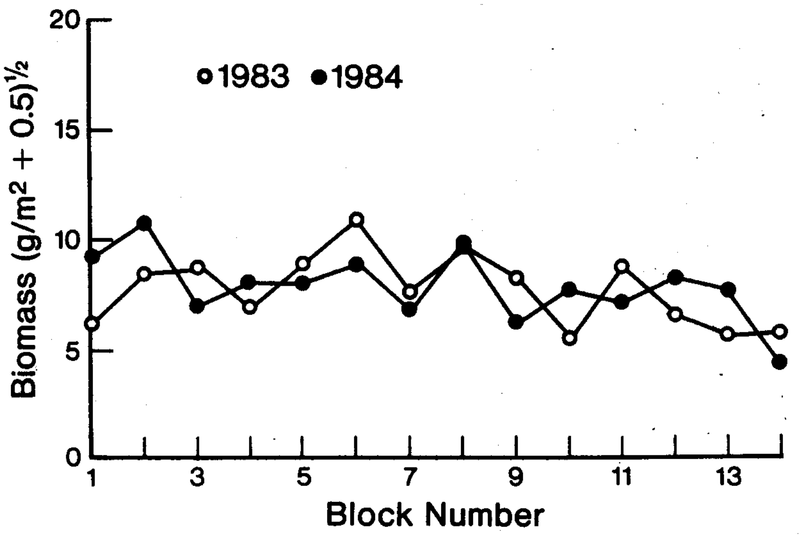

Figure 11. Mean biomass (square root of dry weight in g/m² + 0.5) of submersed macrophytes in blocks composing the sampling grid at Point Hennepin. (See Fig. 5 of Appendix I for block locations.)

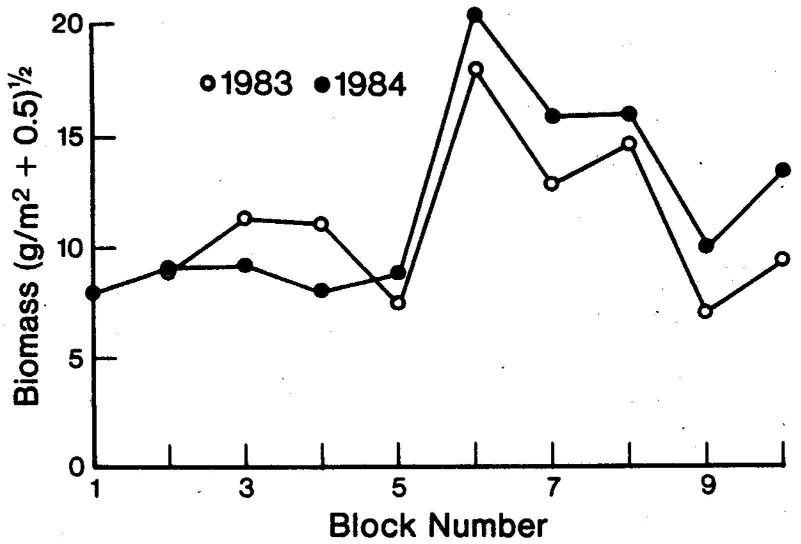

Figure 12. Mean biomass (square root of dry weight in g/m² + 0.5) of submersed macrophytes in blocks composing the grid at Stony Island. (See Fig. 6 of Appendix I for block locations.)

Areal Extent of Submersed Macrophyte Beds

The amount of area covered by plant beds at each location was estimated by overlaying the sampling grid (e.g., Fig. 1 of Appendix P) on each photograph with a grid that divided each 500-ft-square block into 100 equal sections. Each one-hundredth section was scored if half the section was covering plants, and scores were summed over each block and expressed as a percentage. Two independent estimates were obtained of the percent coverage of submersed macrophytes, by block. These estimates are given for each sampling location, month, and year in Tables 31 and 32.

At Stag Island, submersed plant beds in 1983 and 1984 covered an average of 23% of the sampling grid area in September (Table 31). Coverage increased about 7 percentage points from June to September and differences between years were small. The percent coverage by submersed macrophytes was largest in blocks 7-9 and 12.

Plant beds off Fawn Island were not clearly visible in June 1983 and were even less visible in 1984 (Appendix N). Biomass estimates for June 1984 indicated that the abundance of most taxa was reduced--except for *Chara* spp. (Table 25). By July-August and September, differences between years in percent coverage were negligible. Coverage peaked at 68% in September. This represents a difference of only 2-4 percentage points from July-August to September. Bed development was most extensive in blocks 4, 6, 7, 9, and 11.

Plant bed coverage in June at Russell Island differed greatly between 1983 and 1984 (Table 31). By July-August and September, however, the coverage between the two years differed only by 5-6 percentage points. Seasonal differences, once the beds developed, were about 2-3 percentage points. Bed coverage over the sampling area averaged 66%. Coverage of submersed macrophytes was most extensive in blocks 4, 5, and 7-9.

Plant bed coverage at Belle Isle in June and July-August was also substantially less in 1984 than in 1983, but differences in September were negligible (Table 32). Differences in coverage between sampling periods did not exceed 5 percentage points in 1983. The coverage was greatest (26%) in September and was generally highest in blocks 7-9.

Plant bed cover at Point Hennepin and Stony Island differed markedly from that at other locations. Coverage was greater and seasonal differences were larger in 1984. Bed coverage at Point Hennepin averaged 57% in September and was 8-9 percentage points lower in June (Table 32). Plant coverage was greatest in blocks 3, 6, and 9.

Seasonal differences at Stony Island were 41 to 51 percentage points (Table 32). Maximum bed development was in September and averaged 78%; coverage was greatest in blocks 8, 10, and 11. The difference in seasonal development occurred mainly in blocks 1-5 at the upstream end of the island. Water depth of 10-12 ft and low water clarity (mean transmittance was 14% in this area) prevented observation of macrophyte beds until September, when they reached the water surface.

Table 31. Percent coverage of submersed macrophyte beds in the sampling grid at Stag, Fawn, and Russell islands in June, July-August, and September, 1983 and 1984.

Block number	June 1983	June 1984	July-August 1983	July-August 1984	September 1983	September 1984
Stag Island						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	5	0	3	0	1	1
6	1	3	18	8	20	16
7	31	38	55	42	50	39
8	38	38	34	55	70	52
9	38	44	35	33	39	41
10	20	10	20	11	36	30
11	12	25	39	28	31	20
12	60	61	50	59	58	66
13	9	10	14	26	20	38
14	9	12	9	14	15	6
15	10	15	24	27	22	16
Mean	16	17	20	20	24	22
Fawn Island						
1	6	0	6	6	9	7
2	39	0	73	72	72	69
3	16	0	44	55	45	41
4	5	0	100	100	100	100
5	6	0	10	9	16	14
6	6	0	98	92	98	99
7	6	9	100	100	100	100
8	0	0	58	69	75	86
9	0	0	100	100	100	100
10	0	0	11	25	25	34
11	1	0	98	100	100	100
Mean	7	1	63	66	67	68
Russell Island						
1	42	0	50	28	52	30
2	41	16	43	14	42	28
3	4	0	7	9	14	11
4	66	12	85	72	92	78
5	53	25	100	100	100	100
6	16	0	22	36	26	33
7	12	32	88	86	93	88
8	100	10	100	100	100	100
9	100	41	100	100	100	100
Mean	48	25	66	61	69	63

Table 32. Percent coverage of submersed macrophyte beds in the sampling grid at Belle Isle, Point Hennepin, and Stony islands in June, July-August, and September, 1983 and 1984.

Block number	June		July		September	
	1983	1984	1983	1984	1983	1984
			Belle Isle			
1	14	9	16	14	23	11
2	2	1	4	6	1	10
3	15	6	7	9	1	8
4	2	4	2	3	2	3
5	22	4	22	3	20	20
6	6	4	5	6	3	4
7	50	12	63	20	75	34
8	48	12	63	47	69	72
9	38	17	38	36	53	59
10	23	6	17	19	27	30
Mean	22	8	24	16	27	25
			Point Hennepin			
1	58	70	61	81	64	90
2	50	30	48	55	42	92
3	95	100	86	94	79	89
4	9	25	12	21	17	16
5	39	61	51	70	73	82
6	100	100	95	95	92	88
7	11	31	16	26	19	25
8	74	39	67	59	64	78
9	88	41	93	68	100	100
10	1	25	5	24	6	19
11	50	75	59	62	69	53
12	42	77	51	83	59	95
13	0	22	17	15	28	0
14	1	45	19	38	23	39
Mean	44	53	49	56	52	62
			Stony Island			
1	0	0	0	0	42	17
2	0	9	22	26	100	95
3	0	0	90	73	81	84
4	0	6	31	47	36	81
5	0	11	1	28	84	100
6	45	39	45	78	81	86
7	38	42	39	73	92	99
8	100	100	100	100	100	100
9	33	20	23	58	23	63
10	55	63	41	94	94	96
11	81	72	70	64	72	100
Mean	32	33	42	58	73	84

Relationship between Macrophytes and Physical Environment

Water depth, light transmission, and current velocity measurements were taken with each group of three Ponar samples and at each grid line intersection (Tables 1-6 of Appendix K). Water depth at grapnel stations sometimes exceeded 30 ft. Many stations were located in or adjacent to the shipping channel, where a difference in horizontal distance of 25 to 50 ft was accompanied by a change in water depth of up to 18 ft. Light transmission varied from 0 to 98%. Transmission was high in shallow water in beds of Chara spp., and low in deep water or in thick beds of submersed macrophytes. Currents ranged from a maximum of 4.0 ft/s at the head of Stag Island to zero in shallow, protected areas at Belle Isle and Stony Island.

The average depths at which Ponar samples of submersed plants were collected varied little between the sampling locations, ranging only from 8 ft at Stag Island to 6 ft at Point Hennepin and Stony Island (Table 33). Light transmission and current velocity varied more widely. Average light transmission was 72% lower at Stony Island than at Stag Island, and values were typically about 2-3 times higher in the St. Clair River than in the Detroit River. Similarly, current velocities in the St. Clair River were about twice those in the Detroit River. In general, bottom current velocities were about 55% of those at the surface.

In the St. Clair River, light transmission and current velocity decreased markedly from June to September in beds of submersed plants but declined less sharply or not at all in adjacent areas without plants (Table 34). Average reduction in light transmission values was 25-60% in plant beds and 14-35% in adjacent plant-free areas. Reduction of light transmission values in plant-free areas was probably due to changes in sediment turbidity or plankton abundance. Current velocities decreased 10-50% at the surface and 30-70% at the bottom between June and September in plant beds, but did not decrease in areas devoid of plants. Reduction in average current velocity during the season ranged from 50 to 80% (Table 34). Reductions were similar in the Detroit River but were not as obvious because the seasonal ranges of light and current velocities were smaller.

We treated average water depth, light transmission, and current velocity data associated with each of the common macrophyte taxa shown (Table 35), separately by river, but averaged them over months to mask the variation in seasonal changes in light and velocity. The purpose of the table is to provide an average condition under which the taxa occur in the two rivers, and thus enable us to group taxa that occur under similar conditions. The table also includes the result of a correlation analysis between the biomass of each taxon and depth, light, and velocity.

Several taxa in both rivers were associated more frequently than others with various depth levels, light transmissions, and current velocities (Table 36). For example, both P. richardsonii and P. gramineus were more common in areas where current velocities exceeded 0.7 ft/s, but P. richardsonii occurred

Table 33. Mean depth (ft), light transmittance (%), and current velocity (ft/s) at stations where submersed macrophytes were sampled in the St. Clair and Detroit rivers.

Location	Depth	Light transmittance	Current velocity	
			Surface	Bottom
Stag Island	8	50	1.5	1.0
Fawn Island	6	47	1.2	0.7
Russell Island	7	36	1.3	0.6
Belle Isle	7	19	0.6	0.4
Point Hennepin	6	16	0.3	0.1
Stony Island	6	14	0.7	0.4

Table 34. Mean light transmittance (%) and current velocities (ft/s) measured in beds of submersed macrophytes and in areas without submersed macrophyte beds in the St. Clair River in 1983 and 1984[a/].

Taxon	Light transmittance			Current velocity		
	June	July-August	September	June	July-August	September
No plants	64	42	45	2.2[a/]	2.6	2.2
Chara spp.	57	55	43	1.2	0.7	0.6
Elodea canadensis	47	27	20	1.0	0.4	0.3
Myriophyllum spicatum	48	27	19	0.7	0.3	0.2
Nitella flexilis	41	33	28	1.4	1.1	0.4
Potamogeton gramineus	53	50	38	1.5	0.8	0.6
Potamogeton spp.	55	42	33	1.4	0.7	0.6
Potamogeton richardsonii	49	36	24	1.4	0.5	0.3

[a/] Mean of measurements at surface and bottom.

Table 35. Mean depth (ft), light transmittance (%), and current velocity (ft/s) in beds of submersed macrophyte taxon in the St. Clair (S) and Detroit (D) rivers, June 14 - September 20, 1983-1984.

Taxon	Sample size		Depth		Light transmittance		Current velocity	
	S	D	S	D	S	D	S	D
Chara spp.	559	115	6(-)[a]	7(-)	52(+)	24(+)	0.8	0.4
Elodea canadensis	218	48	9	5	31	10	0.6	0.2
Heteranthera dubia	F[b]	47	F	5	F	14	F	0.4
Myriophyllum spicatum	86	150	8(-)	6	31	21	0.4	0.3
Najas flexilis	40	51	4	6	48	25	0.7	0.4
Nitella hyalina	56	89	9	6	34	18	1.0	0.2
Nitellopsis obtusa	F	71	F	6	F	27	F	0.2
Potamogeton crispus	34	80	8	6	44	10	0.4	0.3
Potamogeton gramineus	328	33	6(+)	6	47	26	1.0	0.4
Potamogeton spp.	424	266	7	6(-)	43	19	0.9	0.3(-)
Potamogeton richardsonii	253	179	8	7	36	12	0.7	0.4
Potamogeton zosteriformis	24	47	7	8	53	19	0.5	0.3
Vallisneria americana	32	551	6	7	38	16(-)	0.4	0.3

a/ Significant correlation ($P \leq 0.05$) between taxon biomass and physical variables, sign indicates inverse (-) or positive (+) relationship.

b/ Few or none present.

Table 36. Taxa associations with water depth, light transmission, and current velocity in the St. Clair and Detroit rivers, June-September 1983-1984.

St. Clair River

Mean depth > 7 ft. Mean light transmission < 42%		Mean depth < 7 ft. Mean light transmission > 42%	
Velocity (ft/s)			
> 0.7	< 0.7	> 0.7	< 0.7
P. richardsonii	*Elodea canadensis*	*Chara* spp.	*Potamogeton* spp.
	Myriophyllum spicatum	*P. gramineus*	

Detroit River

Mean Depth > 6 ft.
Velocity ≥ 0.3 ft/s

Mean light transmission > 21%	Mean light transmission < 16%
Chara spp.	*Vallisneria americana*
Myriophyllum spicatum	*P. richardsonii*

more frequently than *P. gramineus* in water deeper than 7 ft. *Vallisneria* and *P. richardsonii* appear to be adapted to the low light transmission in the Detroit River.

Significant correlations of the biomass of macrophyte taxa with physical measurements were few; they are most often with depth and least often with current (Table 35). *Chara* spp. in both rivers was associated negatively with depth and positively with light. Since these two physical variables are inversely related, *Chara* spp. biomass may be limited by low light. The negative correlation between *Potamogeton* spp. and depth may be related to the higher current usually associated with deeper water near the navigation channel in the Detroit River. The biomass of *Potamogeton gramineus* tended to be higher in deeper water in the St. Clair River. Biomass of *Myriophyllum spicatum* in the St. Clair River was higher at depths greater than 8 ft than at lesser depths.

JUVENILE AND ADULT FISH

Composition and Distribution of Catch

We captured 1,775 fish of 36 different species in 1983 and 1,038 fish of 26 species in 1984 (Table 37 and Appendix R). Of the 39 species represented, only 7 were captured commonly (> 50 fish/year): yellow perch, rock bass, hornyhead chub, spottail shiner, striped shiner, rainbow smelt and white sucker, collectively made up 86% of the total for both years combined. Only yellow perch and rock bass were common in both rivers in both years. Thirteen species collected in 1983 were not taken in 1984; of these, 11 were represented by a single individual and the other 2 by 3 and 10 specimens. Three species caught in 1984 but not in 1983 were represented by only one fish each.

A larger number of fish species were collected in the Detroit River than in the St. Clair River, particularly in 1983. Sixteen species were collected only in the Detroit River, of which channel catfish, stonecat, white bass, white perch, and brown bullhead were abundant enough to be considered common (Table 37). Trout-perch, striped shiner, and rainbow trout were collected only in the St. Clair River. Frequency of capture of most species by year, river, or presence of vegetation was erratic (Tables 37, 38, and 39).

In both 1983 and 1984, the numerically dominant species in the catch, yellow perch and rock bass, were collected during every month (Table 40). Two common species, rainbow smelt and spottail shiners, were collected most often in May and June. Catches of other species showed both seasonal and spatial variation. Channel catfish were present only in the Detroit River, where they were captured in all months except July. In the St. Clair River, striped shiners were abundant in June and October and hornyhead chubs from July to October. Some of the large seasonal catches probably reflected migrations or spawning runs. For example, the white suckers captured in May were gravid and the hornyhead chubs captured in July were in spawning coloration and had well-developed breeding tubercles.

Table 37. Total number, percent of total, and mean length (mm) of fish collected in the St. Clair and Detroit rivers during 1983 and 1984.

Common name	Scientific name	1983			1984		
		Number	Percent	Mean length (mm)	Number	Percent	Mean length (mm)
Yellow perch	Perca flavescens	989	56	120	365	35	149
Rock bass	Ambloplites rupestris	296	17	130	246	24	155
Hornyhead chub	Nocomis biguttatus	188	11	110	43	4	117
Spottail shiner	Notropis hudsonius	70	4	101	15		105
Striped shiner	Notropis chrysocephalus	55	3	100	1		95
Rainbow smelt	Osmerus mordax	46	3	116	146	14	115
Smallmouth bass	Micropterus dolomieui	20	1	101	5		247
Channel catfish	Ictalurus punctatus	18	1	419	34	3	441
White sucker	Catostomus commersoni	12	1	178	61	6	434
Stonecat	Noturus flavus	11	1	206	35	3	216
White perch	Morone americana	10	1	143	0		-
Common carp	Cyprinus carpio	9		475	3		519
Bluegill	Lepomis macrochirus	6		145	2		254
White bass	Morone chrysops	6		242	1		83
Black crappie	Pomoxis nigromaculatus	5		228	5		167
Pumpkinseed	Lepomis gibbosus	4		137	6		140
Brown bullhead	Ictalurus nebulosus	3		264	5		279
Yellow bullhead	Ictalurus natalis	3		231	0		-
Black redhorse	Moxostoma duquesnei	3		397	5		459
Northern pike	Esox lucius	2		660	1		775
Alewife	Alosa pseudoharengus	2		120	44	4	80
Golden redhorse	Moxostoma erythrurum	2		420	1		496
Trout-perch	Percopsis omiscomaycus	2		120	2		111
Logperch	Percina caprodes	1		105	0		-
Central stoneroller	Campostoma anomalum	1		126	0		-
Walleye	Stizostedion vitreum vitreum	1		254	8		405
Gizzard shad	Dorosoma cepedianum	1		106	0		-
White crappie	Pomoxis annularis	1		205	0		-
Common shiner	Notropis cornutus	1		106	0		-
Freshwater drum	Aplodinotus grunniens	1		373	1		375
Bigmouth buffalo	Ictiobus cyrinellus	1		370	0		-
Mottled sculpin	Cottus bairdii	1		71	0		-
Largemouth bass	Micropterus salmoides	1		98	0		-
Bowfin	Amia calva	1		532	0		-
Emerald shiner	Notropis atherinoides	1		94	0		-
Goldfish	Carassius auratus	1		161	0		-
W. perch x w. bass hybrid		0		-	1		106
Rainbow trout	Salmo gairdneri	0		-	1		320
American eel	Anguilla rostrata	0		-	1		602
Total		1,775			1038		

Table 38. Numbers and weights (g) of fish collected in the St. Clair and Detroit rivers in 1983 and 1984.

Species	1983				1984			
	St. Clair		Detroit		St. Clair		Detroit	
	No.	Wt(g)	No.	Wt(g)	No.	Wt(g)	No.	Wt(g)
Yellow perch	733	18391	256	6131	250	10186	115	5151
Hornyhead chub	176	2857	12	236	38	631	5	130
Rock bass	153	11108	143	9271	88	12784	158	13339
Striped shiner	55	818	0	0	1	10	0	0
Spottail shiner	38	465	32	357	2	22	13	135
Rainbow smelt	28	368	18	82	146	1260	0	0
Smallmouth bass	15	323	5	51	3	1944	2	38
White sucker	11	1815	1	100	6	6547	55	46030
Black crappie	5	840	1	350	1	352	1	178
Bluegill	2	180	4	99	0	0	1	12
Pumpkinseed	2	74	2	200	3	168	3	236
Alewife	2	31	0	0	31	234	13	36
Trout-perch	2	27	0	0	2	24	0	0
Common carp	1	2700	8	11824	0	0	3	5100
Northern pike	1	1500	1	2000	1	1700	0	0
Bowfin	1	1400	0	0	0	0	0	0
Walleye	1	120	0	0	4	1442	4	3650
Largemouth bass	1	14	0	0	0	0	0	0
Common shiner	1	13	0	0	0	0	0	0
Mottled sculpin	1	6	0	0	0	0	0	0
Channel catfish	0	0	18	16458	0	0	34	29188
Stonecat	0	0	11	1384	0	0	35	3988
White perch	0	0	10	470	0	0	0	0
White bass	0	0	5	1227	0	0	5	490
Black redhorse	0	0	3	1967	3	2722	2	1672
Brown bullhead	0	0	3	663	0	0	5	1462
Yellow bullhead	0	0	3	388	0	0	0	0
Golden redhorse	0	0	2	1582	1	1200	0	0
Bigmouth buffalo	0	0	1	800	0	0	0	0
Freshwater drum	0	0	1	680	1	650	0	0
White crappie	0	0	1	150	0	0	0	0
Goldfish	0	0	1	74	0	0	0	0
Stoneroller	0	0	1	13	0	0	0	0
Logperch	0	0	1	10	0	0	0	0
Gizzard shad	0	0	1	9	0	0	0	0
Emerald shiner	0	0	1	7	0	0	0	0
Rainbow trout	0	0	0	0	1	258	0	0
American eel	0	0	0	0	0	0	1	360
White perch X white bass hybrid	0	0	0	0	0	0	1	16
Total	1229	44768	546	54655	582	42139	456	111211

Table 39. Numbers and weights (g) of fish collected in vegetated or non-vegetated areas in the St. Clair and Detroit rivers in 1983 and 1984.

Species	1983				1984			
	Vegetated		Non-vegetated		Vegetated		Non-vegetated	
	No.	Wt	No.	Wt	No.	Wt	No.	Wt
Yellow perch	714	16282	275	8240	191	7664	174	7673
Rock bass	130	8197	166	12182	107	9029	139	17094
Hornyhead chub	113	1869	75	1224	22	386	21	380
Striped shiner	45	723	10	95	1	10	0	0
Spottail shiner	44	539	26	283	8	80	7	77
Channel catfish	7	7100	11	9358	10	9140	24	20048
Common carp	5	6180	4	8344	3	5100	0	0
Smallmouth bass	5	40	15	334	1	28	4	1954
Rainbow smelt	4	18	42	432	99	836	47	424
Black redhorse	3	1967	0	0	5	4394	0	0
Pumpkinseed	3	140	1	134	2	92	4	312
White sucker	3	139	9	1776	3	3249	58	49328
White perch	3	43	7	427	0	0	0	0
Brown bullhead	2	449	1	214	5	1462	0	0
Stonecat	2	214	9	1170	21	2460	14	1528
Northern pike	1	2000	1	1500	1	1700	0	0
Bowfin	1	1400	0	0	0	0	0	0
Freshwater drum	1	680	0	0	0	0	1	650
Golden redhorse	1	708	1	874	1	1200	0	0
Black crappie	1	214	5	976	1	352	1	178
Yellow bullhead	1	190	2	198	0	0	0	0
White crappie	1	150	0	0	0	0	0	0
Goldfish	1	74	0	0	0	0	0	0
Alewife	1	16	1	15	3	70	41	200
Bluegill	1	14	5	265	1	12	0	0
Largemouth bass	1	14	0	0	0	0	0	0
Common shiner	1	13	0	0	0	0	0	0
Stoneroller	1	13	0	0	0	0	0	0
White bass	0	0	5	1227	4	148	1	342
Trout-perch	0	0	2	27	1	12	1	12
Bigmouth buffalo	0	0	1	800	0	0	0	0
Walleye	0	0	1	120	4	2342	4	2750
Logperch	0	0	1	10	0	0	0	0
Gizzard shad	0	0	1	9	0	0	0	0
Emerald shiner	0	0	1	7	0	0	0	0
Mottled sculpin	0	0	1	6	0	0	0	0
American eel	0	0	0	0	1	360	0	0
Rainbow trout	0	0	0	0	0	0	1	258
White perch X white bass hybrid	0	0	0	0	0	0	1	16
Total	1096	50309	679	49779	495	50126	543	103224

Table 40. Numbers of common species of fish collected in the St. Clair and Detroit rivers, May-October 1983 and 1984.

Month and species	St. Clair River 1983	St. Clair River 1984	Detroit River 1983	Detroit River 1984
May				
Rainbow smelt	20	0	18	0
Spottail shiner	20	0	12	3
White sucker	1	0	0	55
Rock bass	1	3	24	40
Yellow perch	1	5	22	26
Stonecat	0	0	1	2
June				
Yellow perch	67	14	8	10
Striped shiner	18	0	0	0
Hornyhead chub	13	0	0	1
Rainbow smelt	8	146	0	0
Rock bass	6	4	32	43
Trout-perch	1	2	0	0
Spottail shiner	0	1	9	4
White perch	0	0	8	0
White bass	0	0	5	3
Stonecat	0	0	1	21
July				
Yellow perch	186	68	84	18
Hornyhead chub	59	6	7	1
Rock bass	40	45	33	28
Alewife	2	0	0	11
Pumpkinseed	1	0	0	2
Spottail shiner	1	0	8	5
Channel catfish	0	0	4	2
Black redhorse	0	0	1	1
Smallmouth bass	0	3	0	0
Common carp	0	0	0	3
September				
Yellow perch	223	106	40	14
Rock bass	51	20	23	19
Hornyhead chub	41	2	1	2
Smallmouth bass	13	0	0	0
Spottail shiner	13	1	3	0
White sucker	5	0	0	0
Northern pike	1	1	0	0
Black crappie	1	1	0	0
Pumpkinseed	1	2	2	0
Channel catfish	0	0	9	29
Common carp	0	0	3	0
Stonecat	0	0	3	2
Black redhorse	0	3	1	1
Alewife	0	30	0	0
October				
Brown bullhead	0	0	0	5
Yellow perch	256	57	102	47
Hornyhead chub	63	30	3	1
Rock bass	55	16	31	28
Striped shiner	35	0	0	0
Black crappie	4	0	1	1
White sucker	4	6	1	0
Spottail shiner	4	0	0	1
Smallmouth bass	2	0	5	2
Common carp	1	0	3	0
Stonecat	0	0	6	9
Channel catfish	0	0	5	3

An average of 2.4 species were collected per net set in 1983-1984. The average number of species caught was nominally higher in 1983 than 1984 at all locations (Table 41), but was significantly higher only at Stony Island. The number of fish species per net set was highest during July-October at most locations in both years (Fig. 13). Catches were significantly greater in October than in May and July at Russell Island, and in July than in May at Stag Island (Table 41). There were no significant differences in the number of species collected per net set in the vegetated or non-vegetated areas at each location, and catches were not consistently higher in either type of habitat over all locations (Table 41). The number of species collected differed slightly between nets set in vegetated and non-vegetated areas in July and September (Fig. 14).

Abundance

The mean catch for all species combined was larger in 1983 than in 1984, increased from May to October, was larger in the St. Clair River than in the Detroit River, and was larger in nets set in vegetated than in non-vegetated areas (Table 42). To determine if these differences were significant, we analyzed the variance of total catch and the abundance of yellow perch and rock bass, the two most abundant species, against year, month, river, locations, and presence or absence of vegetation (Appendix T). Computationally, this is a lengthy analysis, and to simplify it, we analyzed each location separately. We found few significant differences in catch between years, among months, or between vegetated and non-vegetated areas.

The mean catch of all species combined was not significantly different between 1983 and 1984 at any of the locations (Table 43). The catch in 1984 was 69% lower than in 1983 at Stag Island and 29% higher than in 1983 at Stony Island. Differences in catch between years at each island declined progressively from upstream to downstream locations (Fig. 15). Thus, there was a 53% decline in the St. Clair River from 1983 to 1984 and a 16% decline in the Detroit River. Catches in July, August, and September, were 54, 44, and 65% lower, respectively, in 1984 than in 1983 (Fig. 16). Fluctuations between years were substantially lower in the Detroit than in the St. Clair river. Monthly trends in catch at each location changed little between years. Nets set in vegetated areas at Fawn Island contained significantly more fish than did those set in non-vegetated areas. At all other islands, catches in nets set in vegetated and non-vegetated areas did not differ significantly (Table 43). For all islands, catches were 50% less in 1984 than in 1983 in vegetated areas and 27% less in non-vegetated areas (Table 44). More fish were caught in nets set in vegetation in both rivers in 1983 and in the St. Clair River in 1984, but not in the Detroit River in 1984. Seasonal differences between catches in vegetated and non-vegetated areas were small in May and October and largest in June, July, and September (Fig. 17).

The mean catch of yellow perch was consistently higher in 1983 than in 1984, but this difference was significant only at Russell Island and Belle Isle (Table 45). Catches were higher in July, September, and October at most

Table 41. Mean numbers of fish species collected by year, month and in vegetated (V) and non-vegetated (N) areas in the St. Clair and Detroit rivers. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$).

Location	Years		Months					Area	
Stag Island	2.5	2.0	3.6	3.0	1.9	1.6	1.1	2.3	2.2
	1983	1984	Oct.	Sep.	June	May	July	(N)	(V)
Fawn Island	2.1	1.9	2.5	2.5	2.0	2.0	1.0	2.4	1.7
	1983	1984	Sep.	July	Oct.	June	May	(V)	(N)
Russell Island	2.8	2.2	2.9	2.8	2.8	2.8	1.3	2.7	2.2
	1983	1984	July	Sep.	Oct.	June	May	(V)	(N)
Belle Isle	2.4	2.1	2.9	2.5	2.3	2.1	1.5	2.4	2.1
	1983	1984	Oct.	July	Sept.	May	June	(N)	(V)
Point Hennepin	2.2	1.8	2.6	2.3	1.9	1.6	1.5	2.1	1.9
	1983	1984	Oct.	July	May	June	Sep.	(V)	(N)
Stony Island	3.7	2.7	4.1	3.5	3.1	2.9	2.4	3.4	3.0
	1983	1984	Sep.	Oct.	June	July	May	(V)	(N)

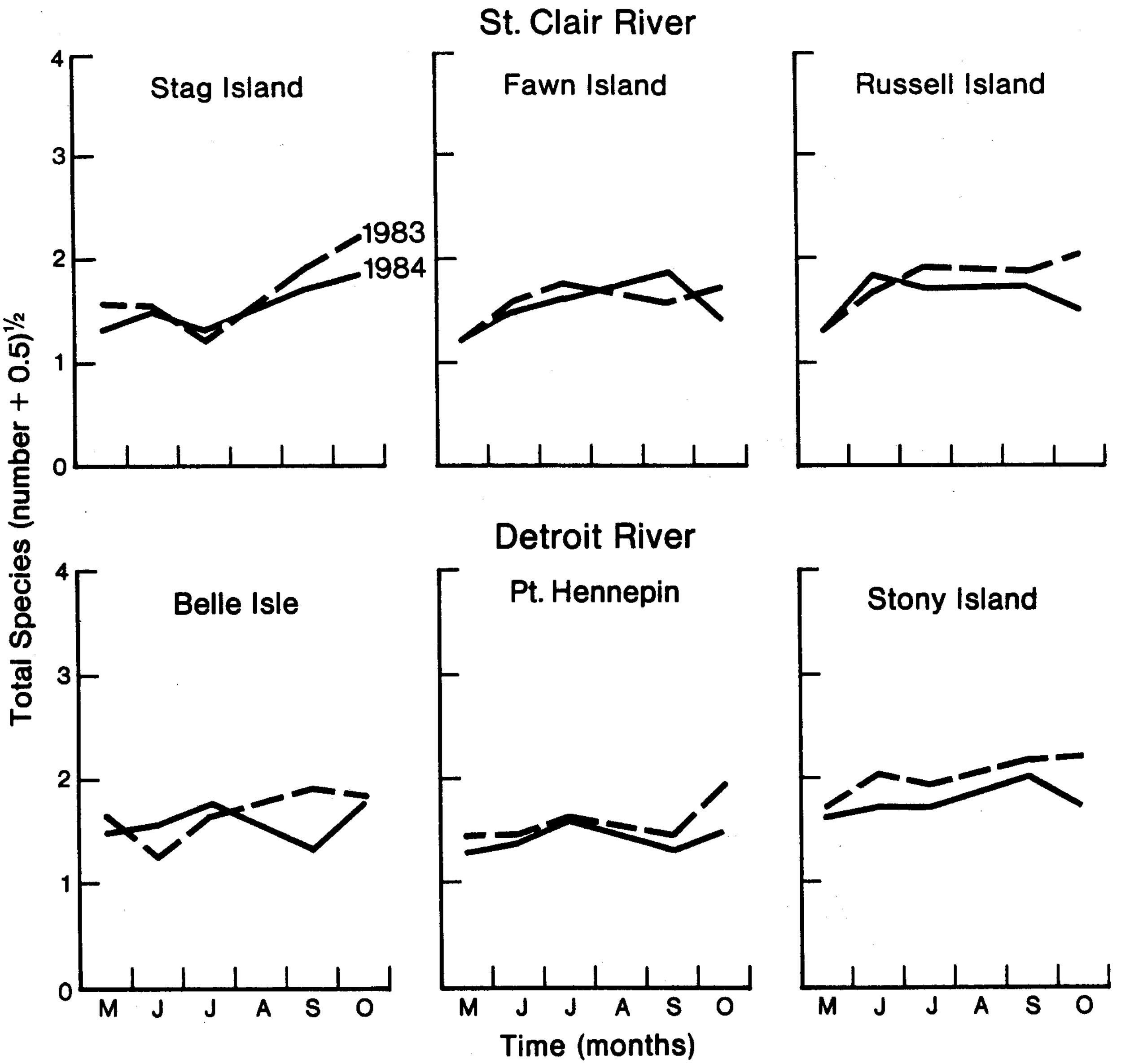

Figure 13. Seasonal diversity (square root of total number of species captured per net set + 0.5) of fish at six locations in the SCDRS.

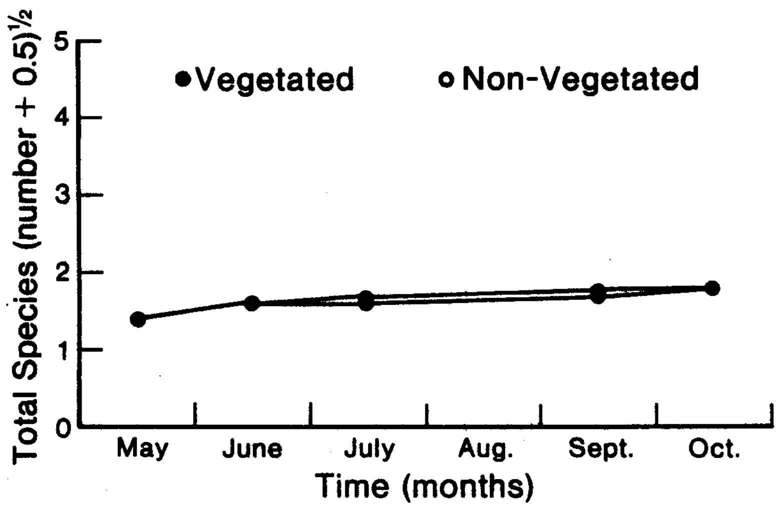

Figure 14. Seasonal diversity (square root of total number of species captured per net set + 0.5) of fishes in vegetated and non-vegetated areas.

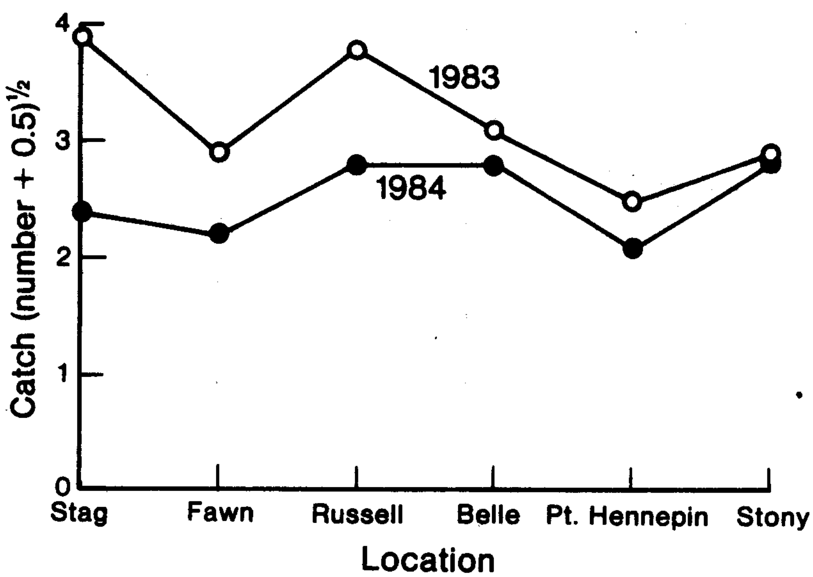

Figure 15. Mean catch (square root of mean catch + 0.5) of fish at six locations in the SCDRS.

Table 42. Mean total catch of fish by year, month, river, location, and vegetated and non-vegetated areas in the St. Clair and Detroit rivers.

Effect	N	Mean
Year		
1983	120	14.8
1984	120	8.6
Month		
May	48	5.5
June	48	9.1
July	48	13.1
September	48	14.2
October	48	16.6
River		
St. Clair	120	15.1
Detroit	120	8.4
Location		
Stag Island	40	18.5
Fawn Island	40	11.0
Russell Island	40	15.8
Belle Isle	40	9.3
Pt. Hennepin	40	6.6
Stony Island	40	9.2
Plants		
Non-vegetated	126	9.7
Vegetated	114	14.0

Table 43. Total catch of adult and juvenile fish by year, month, and in vegetated (V) and non-vegetated (N) areas in the St. Clair and Detroit rivers. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$).

Location	Years		Months					Area	
Stag Island	28.2 1983	8.8 1984	47.5 Oct.	35.2 Sep.	3.6 May	3.5 June	2.5 July	21.0 (N)	16.0 (V)
Fawn Island	14.0 1983	8.1 1984	18.8 July	16.9 Sep.	10.2 June	9.2 Oct.	0.1 May	20.4 (V)	4.2 (N)
Russell Island	19.2 1983	12.2 1984	30.2 July	22.1 June	12.8 Sep.	10.2 Oct.	3.4 May	17.8 (V)	13.5 (N)
Belle Isle	11.0 1983	7.6 1984	15.0 Oct.	10.4 July	7.6 May	7.0 June	6.5 Sep.	9.6 (N)	8.9 (V)
Point Hennepin	8.2 1983	5.0 1984	10.5 Oct.	10.2 July	5.2 May	3.8 Sep.	3.2 June	7.4 (V)	5.9 (N)
Stony Island	10.3 1984	8.0 1983	13.2 May	10.2 Sep.	8.5 June	7.4 Oct.	6.4 July	10.2 (N)	7.9 (V)

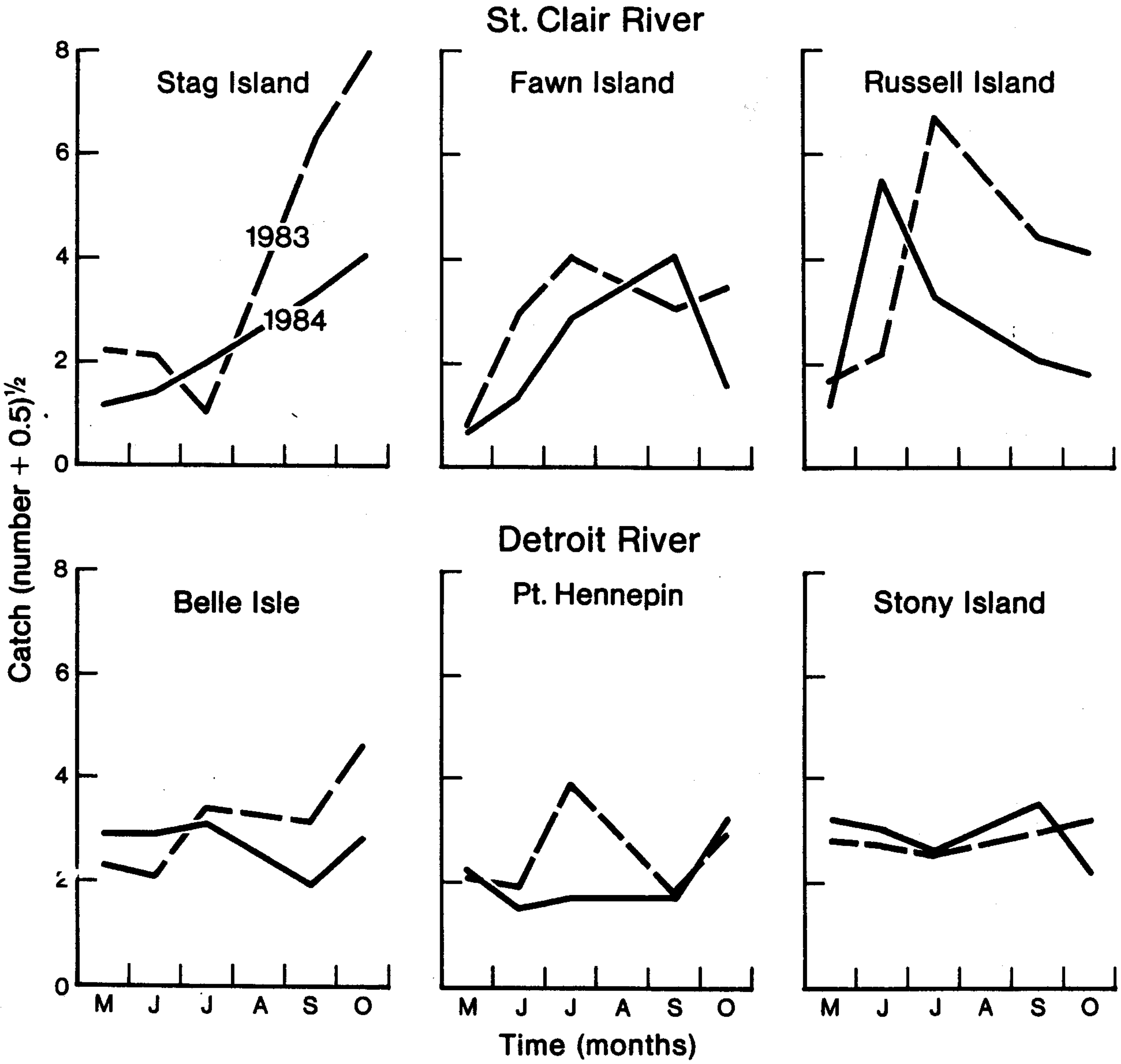

Figure 16. Mean seasonal catch (square root of mean catch + 0.5) of fish at six locations in the SCDRS.

Table 44. Number of fish caught by month in vegetated and non-vegetated areas in the St. Clair and Detroit rivers in 1983 and 1984.

Month	St. Clair River				Detroit River			
	Vegetated		Non-vegetated		Vegetated		Non-vegetated	
	1983	1984	1983	1984	1983	1984	1983	1984
May	24	7	23	3	32	8	50	120
June	86	109	32	60	18	56	50	26
July	179	78	111	44	80	28	61	47
September	232	88	116	82	53	30	37	44
October	295	40	130	71	96	51	66	46
Total	816	322	412	260	279	173	264	283

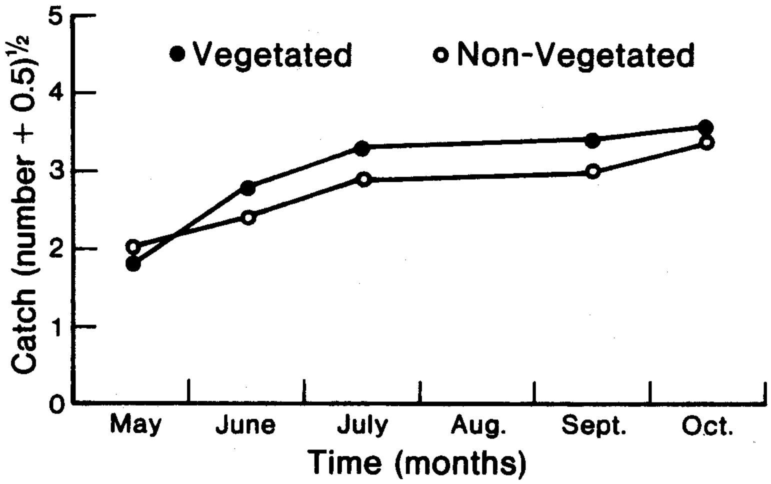

Figure 17. Mean monthly catch (square root of mean catch + 0.5) of fishes in vegetated and non-vegetated areas.

Table 45. Mean number of yellow perch collected by year, month, and in vegetated (V) and non-vegetated (N) in the St. Clair and Detroit rivers. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$).

Location	Years		Months					Area	
Stag Island	17.5 1983	3.5 1984	28.1 Oct.	24.3 Sep.	0.4 July	0.0 May	0.0 June	13.7 (V)	7.4 (N)
Fawn Island	9.9 1983	6.0 1984	14.4 July	11.5 Sep.	7.9 June	6.3 Oct.	0.0 May	15.8 (V)	2.3 (N)
Russell Island	9.1 1983	2.9 1984	17.0 July	5.4 Sep.	4.8 Oct.	2.3 June	0.8 May	7.2 (V)	4.7 (N)
Belle Isle	6.2 1983	1.8 1984	9.8 Oct.	4.9 July	2.9 Sep.	1.9 May	0.8 June	4.4 (V)	3.7 (N)
Point Hennepin	5.3 1983	3.5 1984	8.5 Oct.	7.3 July	3.0 Sep.	2.4 May	1.0 June	5.5 (V)	3.4 (N)
Stony Island	1.3 1983	0.3 1984	1.8 May	0.9 Sep.	0.6 July	0.5 June	0.4 Oct.	1.3 (V)	0.5 (N)

locations, but the differences were significant only at Stag Island, Russell Island and Belle Isle (Fig. 18). Significantly more yellow perch were caught in nets set in vegetation than in non-vegetated areas at Fawn Island (Table 45); differences were greatest in June, July, and September (Fig. 19).

Rock bass densities were higher in 1983 than 1984, but were significantly higher only at Russell Island and Belle Isle (Table 46). Monthly differences were significant only at Stag and Russell islands, and catches were dominant in either July, September, or October (Table 46). Monthly trends at each location did not differ by year (Fig. 20). Catches of rock bass over all locations did not differ significantly between vegetated and non-vegetated areas (Fig. 21). The total combined catch of the remaining species was higher in 1983 than in 1984 (Table 37); however, more rainbow smelt, channel catfish, white suckers, stonecats, alewives, and walleyes were caught in 1984 than in 1983. Catches of all species were greater in the St. Clair than in the Detroit River except for common carp in 1983 and rock bass, spottail shiners, and white suckers in 1984 (Table 38). Few consistent trends relating abundance of these species to the presence or absence of plants were evident (Table 39), although channel catfish, smallmouth bass, and white suckers were more abundant in both years in non-vegetated areas.

Most of the fish that we caught were adults rather than juveniles, as evidenced by their mean length (Table 37). The only juveniles we captured frequently were yellow perch and rock bass. Although fewer fish were caught in 1984 than in 1983, most were larger in 1984 than in 1983. Total fish biomass was also greater in 1984 than in 1983 (Table 38). Several large white suckers and channel catfish captured in the Detroit River caused the total biomass there to be larger than in the St. Clair River, even though more fish were captured in the St. Clair River.

Total biomass of all species, except rock bass and white sucker, was lower in 1984 than in 1983 (Table 38). The relation between total biomass of most species and their presence in vegetation was strong in 1983 but weak in 1984 (Table 39). Weights of yellow perch, hornyhead chubs, striped shiners, and spottail shiners were higher in vegetated than in non-vegetated areas in 1983, but were about equal in the two types of areas in 1984. A consistent trend over both years was that of the catch of rock bass, channel catfish, smallmouth bass and white suckers being greater in non-vegetated than in vegetated areas. Total weights of fish caught increased from May to October (Table 47). Large monthly differences in biomass between years and rivers resulted from the catch of a few large species such as white sucker, channel catfish and common carp.

Relationship between Fish and Physical Environment

A correlation analysis between fish catch data and environmental variables (water depth, temperature, current velocity, and light transmission) over various combinations of bottom type (silt-clay, sand, rubble), in vegetated and non-vegetated areas resulted in few significant correlations. Yellow perch numbers correlated positively with temperature in two instances, and

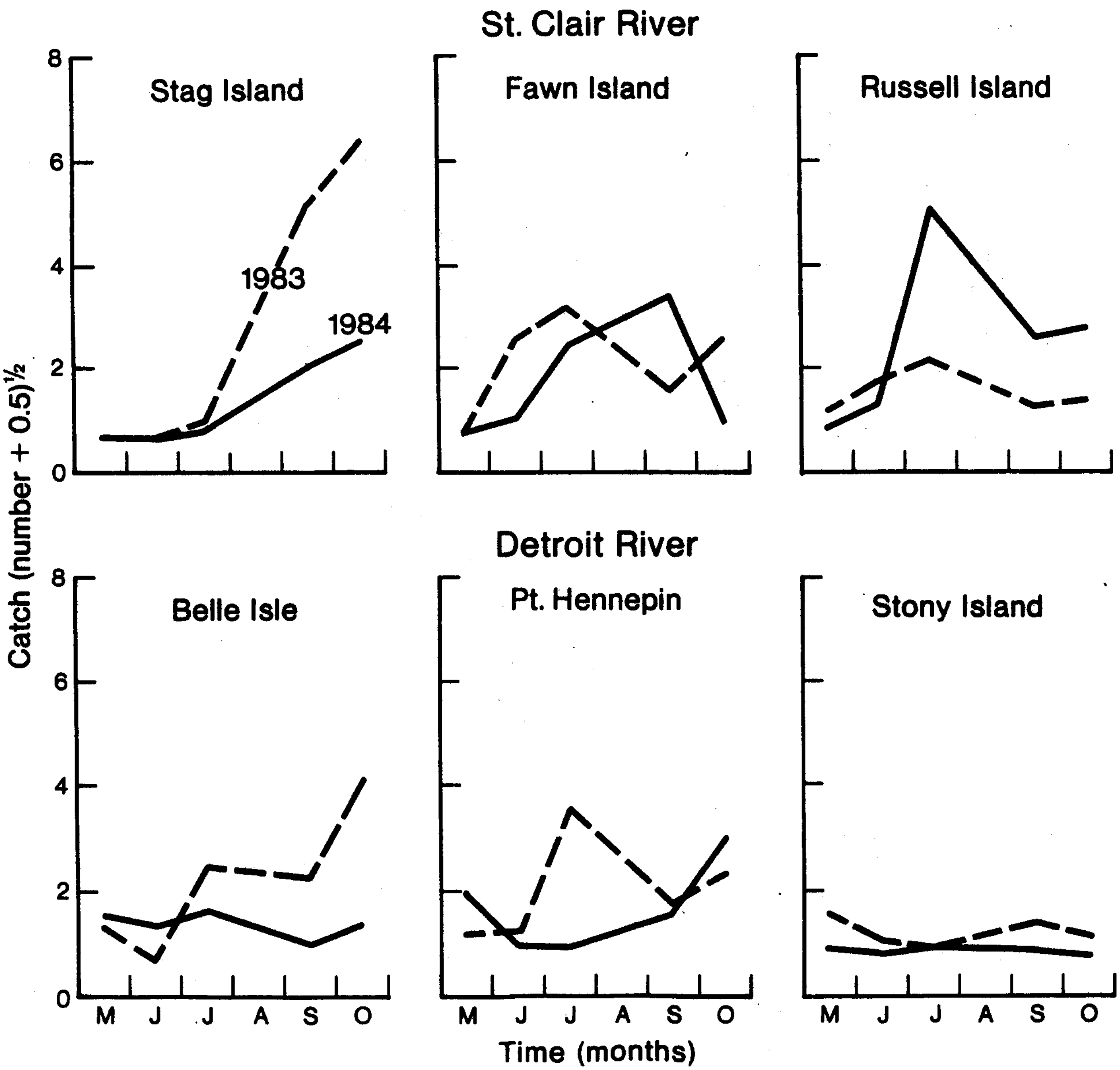

Figure 18. Mean seasonal catch (square root of mean catch + 0.5) of yellow perch at six locations in the SCDRS.

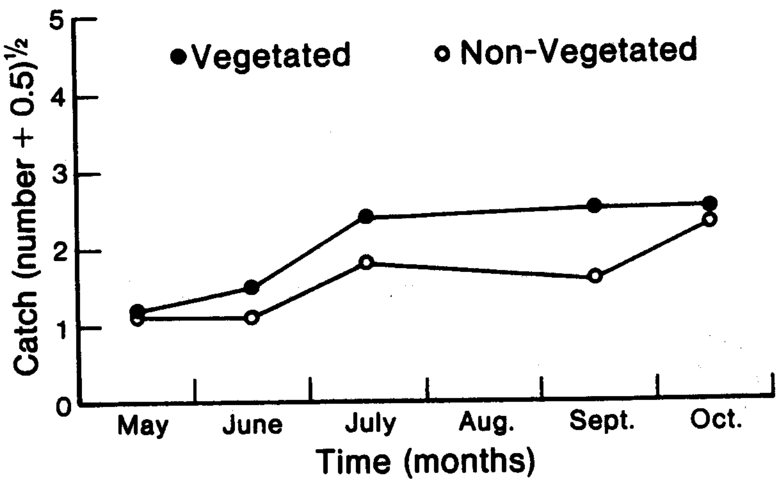

Figure 19. Mean monthly catch (square root of mean catch + 0.5) of yellow perch in vegetated and non-vegetated areas.

Table 46. Mean number of rock bass collected by year, month, and in vegetated (V) and non-vegetated (N) areas in the St. Clair and Detroit rivers. Adjacent values that are jointly underlined are not significantly different ($P \leq 0.05$).

Location	Years		Months					Area	
Stag Island	1.6 1983	1.5 1984	4.1 Oct.	2.0 July	1.0 Sep.	0.4 June	0.4 May	1.8 (N)	1.3 (V)
Fawn Island	2.1 1983	1.2 1984	3.6 Sep.	2.6 July	2.1 Oct.	0.0 May	0.0 June	2.6 (V)	1.0 (N)
Russell Island	3.8 1983	1.7 1984	6.0 July	4.3 Sep.	2.6 Oct.	0.9 June	0.1 May	4.1 (N)	1.6 (V)
Belle Isle	5.3 1984	3.3 1983	6.1 June	4.8 July	4.3 Oct.	3.0 Sep.	3.5 May	4.6 (N)	4.0 (V)
Point Hennepin	1.1 1983	0.6 1984	1.8 May	0.9 July	0.8 Oct.	0.8 June	0.4 Sep.	0.9 (V)	0.9 (N)
Stony Island	2.6 1983	1.9 1984	2.8 May	2.5 June	2.4 Oct.	2.0 July	1.9 Sep.	2.4 (N)	2.2 (V)

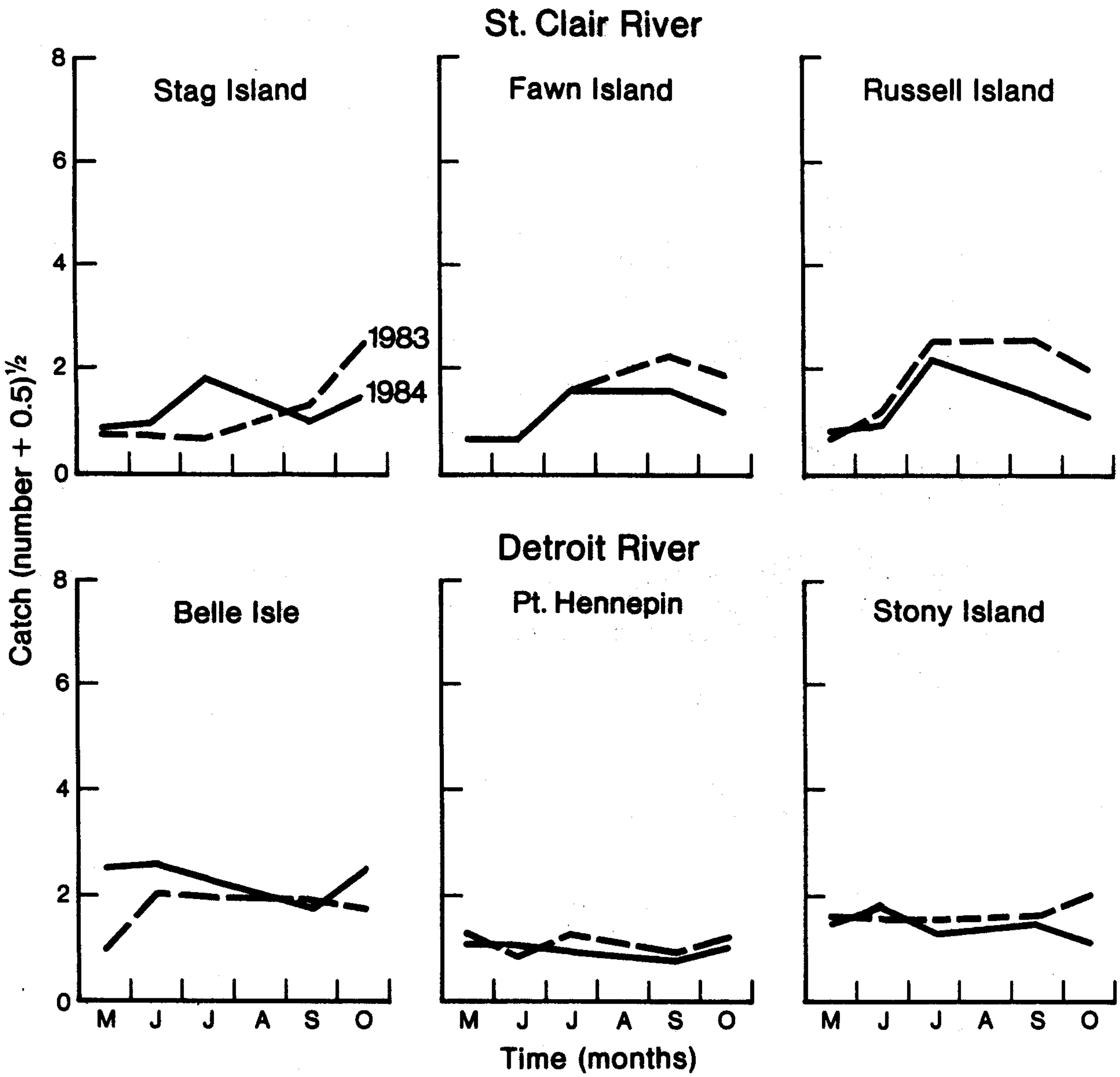

Figure 20. Mean seasonal catch (square root of mean catch + 0.5) of rock bass at six locations in the SCDRS.

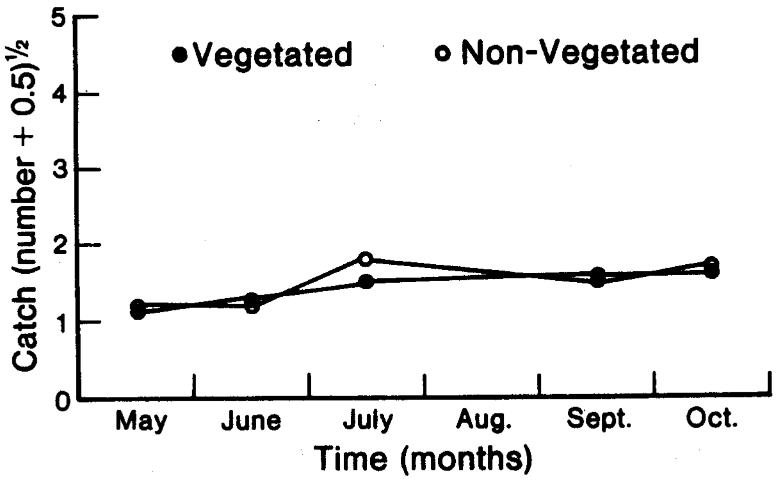

Figure 21. Mean monthly catch (square root of mean catch + 0.5) of rock bass in vegetated and non-vegetated areas.

Table 47. Total weights of common fishes collected in the St. Clair and Detroit rivers in May-October, 1983 and 1984.

Month and species	St. Clair River 1983	St. Clair River 1984	Detroit River 1983	Detroit River 1984
May				
Rainbow smelt	296	0	82	0
Spottail shiner	200	0	145	32
White sucker	840	0	0	46030
Rock bass	6	848	1618	4477
Yellow perch	6	82	750	827
Stonecat	0	0	220	298
Walleye	0	0	0	1660
Golden redhorse	0	1200	0	0
June				
Yellow perch	736	719	226	521
Striped shiner	197	0	0	0
Hornyhead chub	233	0	0	40
Rainbow smelt	72	1260	0	0
Rock bass	478	872	1910	3744
Trout-perch	10	24	0	0
Spottail shiner	0	14	102	49
White perch	0	0	435	0
White bass	0	0	1227	470
Walleye	0	762	0	0
Stonecat	0	0	54	2428
Bowfin	1400	0	0	0
White sucker	840	0	0	0
Common carp	0	0	4700	0
Black redhorse	0	0	900	0
Bigmouth buffalo	0	0	800	0
Freshwater drum	0	0	680	0
July				
Yellow perch	5516	2685	2187	939
Hornyhead chub	944	149	144	12
Rock bass	3596	6647	2838	1271
Alewife	31	0	0	16
Pumpkinseed	60	0	0	224
Spottail shiner	9	0	77	46
Channel catfish	0	0	1770	1582
Black redhorse	0	0	530	652
Smallmouth bass	0	1944	0	0
Common carp	0	0	0	5100
Walleye	0	0	0	890
September				
Yellow perch	4594	3660	1041	543
Rock bass	3887	2510	1049	2246
Hornyhead chub	616	41	12	46
Smallmouth bass	309	0	0	0
Spottail shiner	206	8	33	0
White sucker	84	0	0	0
Northern pike	1500	1700	0	0
Black crappie	120	352	0	0
Pumpkinseed	14	100	200	0
Channel catfish	0	0	7704	25484
Common carp	0	0	3024	0
Stonecat	0	0	268	250
Black redhorse	0	2722	537	1020
Alewife	0	174	0	0
Walleye	0	680	0	0
Golden redhorse	0	0	1582	0
Freshwater drum	0	630	0	0
Brown bullhead	0	0	0	1462
Rainbow trout	0	258	0	0
October				
Brown bullhead	0	0	468	0
Yellow perch	7539	3040	1927	2321
Hornyhead chub	1064	446	62	32
Rock bass	3141	1907	1856	1601
Striped shiner	608	0	0	0
Black crappie	720	0	350	12
White sucker	51	6547	100	0
Spottail shiner	50	0	0	8
Smallmouth bass	14	0	51	38
Common carp	2700	0	4100	0
Stonecat	0	0	842	912
Channel catfish	0	0	6984	2122
Northern pike	0	0	2000	0
Walleye	0	0	0	1100
American eel	0	0	0	300

rock bass numbers correlated negatively with current velocities in four instances and positively with temperature in two instances. Total number of species and total weight had several positive associations with temperature. Associations with temperature were most common and those with current velocities the least common. The substrate with which the four species were most commonly associated was sandy, with or without vegetation.

For a summary analysis, we determined mean catch and weight of all species combined, total number of species collected, mean catch of yellow perch, rock bass, hornyhead chubs, and spottail shiners associated with six sediment-vegetation combinations. The highest and lowest catches and diversity (number of species) were then listed with the various sediment-vegetation combinations (Table 48). For example, the highest mean catch of hornyhead chubs per net set was highest in sandy areas in vegetation and lowest in non-vegetated rubble areas. We also found that low current velocities were associated with fine sediments and faster currents with coarse material. Vegetation tended to be in areas with slower currents. Yellow perch were collected most often in vegetation, regardless of sediment type; rock bass were taken over rubble without regard to vegetative cover; and hornyhead chubs and spottail shiners were most often caught over fine sediments in vegetated areas.

DISCUSSION

DISTRIBUTION AND ABUNDANCE OF MACROZOOBENTHOS

The number of taxa of macrozoobenthos listed in this study (160) exceeded that in any work on SCDRS, including that of Hiltunen (1980), Hiltunen and Manny (1982), Ontario Ministry of the Environment (1979), Thornley and Hamdy (1984), and Thornley (1985). The number of such taxa reported for any aquatic system depends primarily on the level of taxonomic treatment and the timing and extent of the sampling program. In the present study, we attempted to identify most specimens at least to genus (which potentially lengthened our list relative to those in the other published works), but we also limited our sampling to near-channel areas and to spring and fall (which potentially shortened the list). Our list (Appendix C) was also made somewhat longer than those in earlier works by the inclusion of Copepoda and Cladocera. However, our list might have exceeded 300 species, if we had identified all specimens to species, particularly within the Chironomidae, Ephemeroptera, Trichoptera, Odonata, and Oligochaeta, and added the other remaining taxa.

Our collections contained all of the major taxa listed in past studies in SCDRS but did not include several less abundant taxa such as *Crangonyx*, Dolichopodidae (Hiltunen 1980), and *Pseudocleon* (Ontario Ministry of the Environment 1979). In addition, we collected several common chironomid genera (*Robackia*, *Chernovskiia*, and *Lopescladius*) that had not been reported from the system. These chironomids were common in the less productive sand-gravel sediments and their abundance may have been underestimated because their thin body form and small size allowed them to escape through the sieve (this is a common problem