THE STREAM DRIFT OF AQUATIC INVERTEBRATES IN THE MAPLE RIVER, EMMET COUNTY, MICHIGAN

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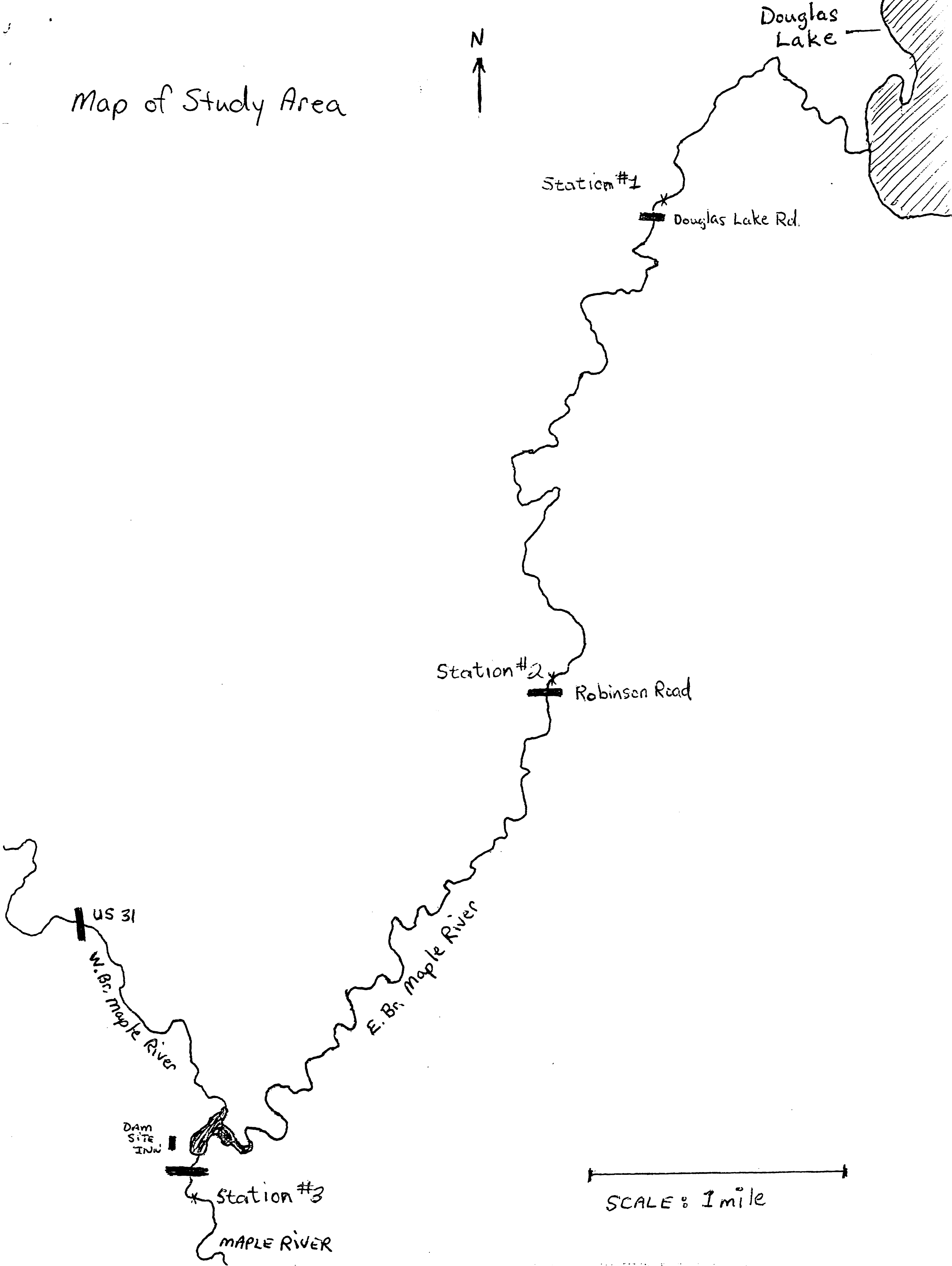
Map of Study Area



Introduction

The drift of stream insects and other invertebrates refers to their downstream transport in stream currents (Waters, 1972). There is thought to be three different causes of drift. "Catastrophic" drift (Minckley 1964), results from the physical disturbance of the bottom funa, usually by flood and consequent bottom scouring, but also by factors such as drought, high temperature (Wojtalik and Waters, 1970), anchor ice (O'Donnell and Churchill, 1954), pollution and insecticides (Coutant. 1964). "Behavioral" drift is the drift occurring at night, or other consistent period of the day, resulting from the behavioral pattern characteristics of certain species (Waters, 1972). The continuous stream of representatives of all species, in low numbers and occurring at all times, is termed "constant" drift (Waters, 1965).

This paper will deal mainly with the drift of the Caddisfly larvae *H. aerata*, but will also show the total number of invertebrates found drifting in a 24 hour period.

The East Branch of the Maple River, located in Cheboygan and Emmet Counties in Northern Michigan (the lower peninsula), was used as the test stream. The river starts at the west side of Douglas Lake and flows predominantly south-southwest where it joins with the west branch about five miles downstream.

Materials and Methods

The study area consisted of three stations. Station No. 1 was located about 30 meters upstream from the Douglas Lake road crossing. The site is about 1.25 miles from Douglas Lake and the river width at the site is about 5 meters. The drift net was placed in the middle of a riffle which was characterized by small stones, 10-20 mm. in diameter and a fairly dense patch of potamageton. Water depth was about 18 cm.

Station No. 2 was located about 30 meters upstream from the Robinson Road crossing. Width of the river is about 7 m. here and depth on the riffle used was again about 18 cm. The stones on the riffle were somewhat larger, around 20 to 40 mm. Station No. 2 is about 1.5 miles downstream from Station No. 1.

Station No. 3 was located about 40 meters downstream of the dam. Above the dam is where the east and west branch of the Maple join to form a small lake. Below the dam are fairly large rocks with diameters of 100 to 200 mm. and larger. The riffle used was located just after the river makes its first big turn to the left. The riffle was again made of stones 20 to 40 mm. in diameter.

The three sites were chosen because of their similarity and because they were easily accessible.

The samples were collected in drift nets, 1 feet square at the opening and about 3 feet long. The material of the nets was Nitex with a mesh size of 471 microns, 39 meshes to the inch. The nets were placed in the water such that they were just above the water line and did not impede the current. The nets were large enough and the stream shallow enough to allow sampling through the entire water column.

Temperature was recorded at each 4 hour time interval with a field thermometer. The thermometer was kept in the water for a minimum of five minutes before reading. Flow of the water was also measured at each 4 hour interval with a Gurley Current meter equipped with a 6 volt battery and a set of headphones.

Drift nets were picked up and immediately replaced at 4 hour intervals. Contents of the filled drift nets were emptied into a large white enamel pan. Organisms that were visible with the naked eye were then placed into bottles containing 70% ethyl-alcohol. The organisms were then counted and identified the following day in the laboratory.

Results

Data is contained in Table No. 1 and illustrated on Graphs 1-4. Most of the organisms collected were Simuliidae (blackfly) larvae and Culicidae (mosquito) pupae and larvae. Other organisms collected were the mayfly Baetis and the one that showed a definite pattern at all the stations, the caddisfly larva, H. aerata. H. aerata was most abundant just before dawn. At Station No. 1, for example, 10 out of the 14 organisms collected between 2:00 a.m. and 6:00 a.m. were H. aerata.

TABLE 1 - RESULTS
July 25-26, 1976

Station No. 1

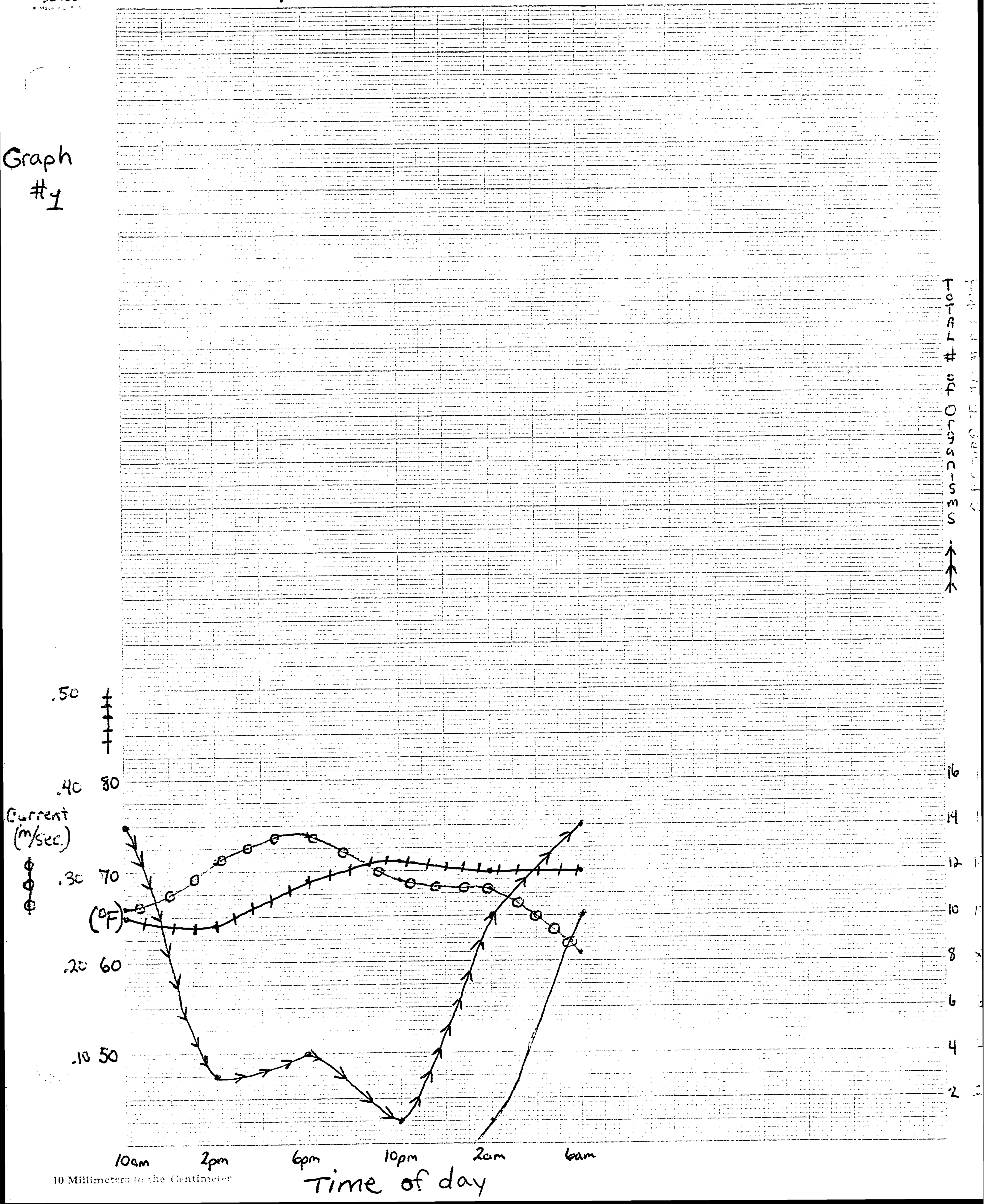
Time	Current (m/sec)	# of H. aerata	Total # of organisms	°F
10 a.m.	.26	-	14	65
2 p.m.	.31	-	3	64
6 p.m.	.34	-	4	69
10 p.m.	.29	-	1	71
2 a.m.	.28	1	10	70
6 a.m.	.21	10	14	70

Station No. 2

Time	Current (m/sec)	# of H. aerata	Total # of organisms	°F
9 a.m.	.47	-	7	58
1 p.m.	.36	1	14	62
5 p.m.	.36	-	16	65
9 p.m.	.35	-	10	64
1 a.m.	.28	-	6	60
5 a.m.	.25	6	10	62

Station #1

Graph #1



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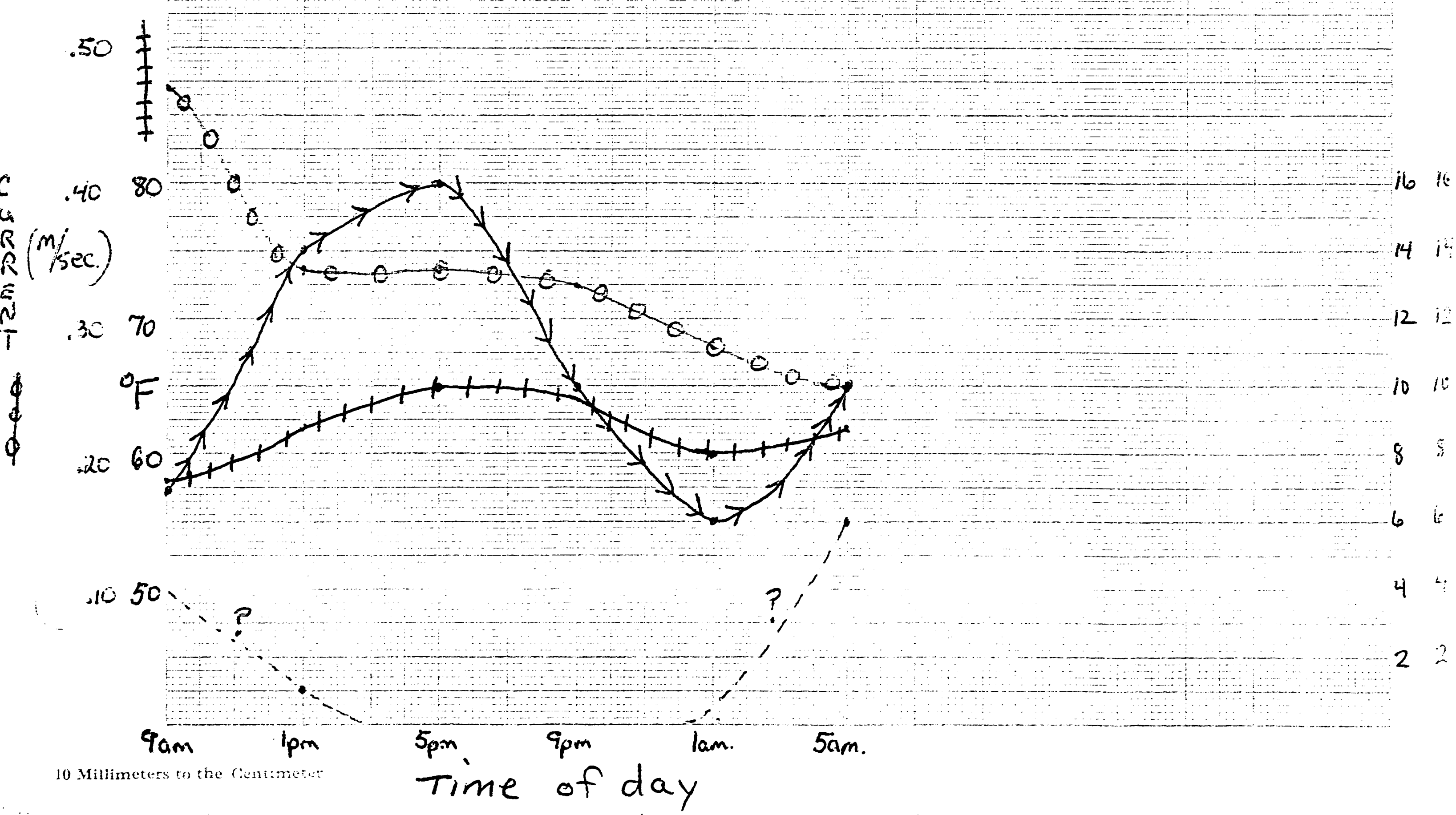
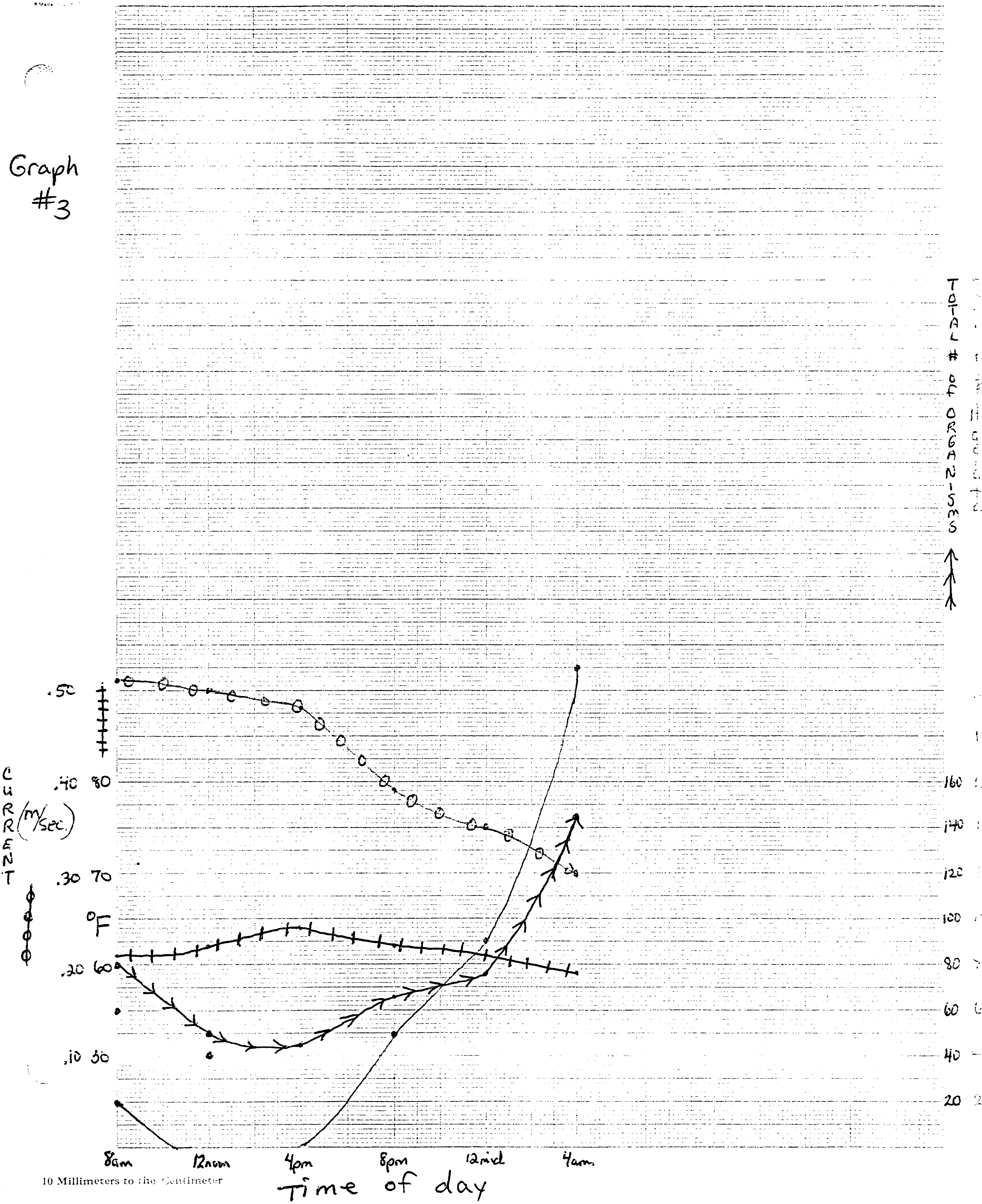
Station #2

Graph #2

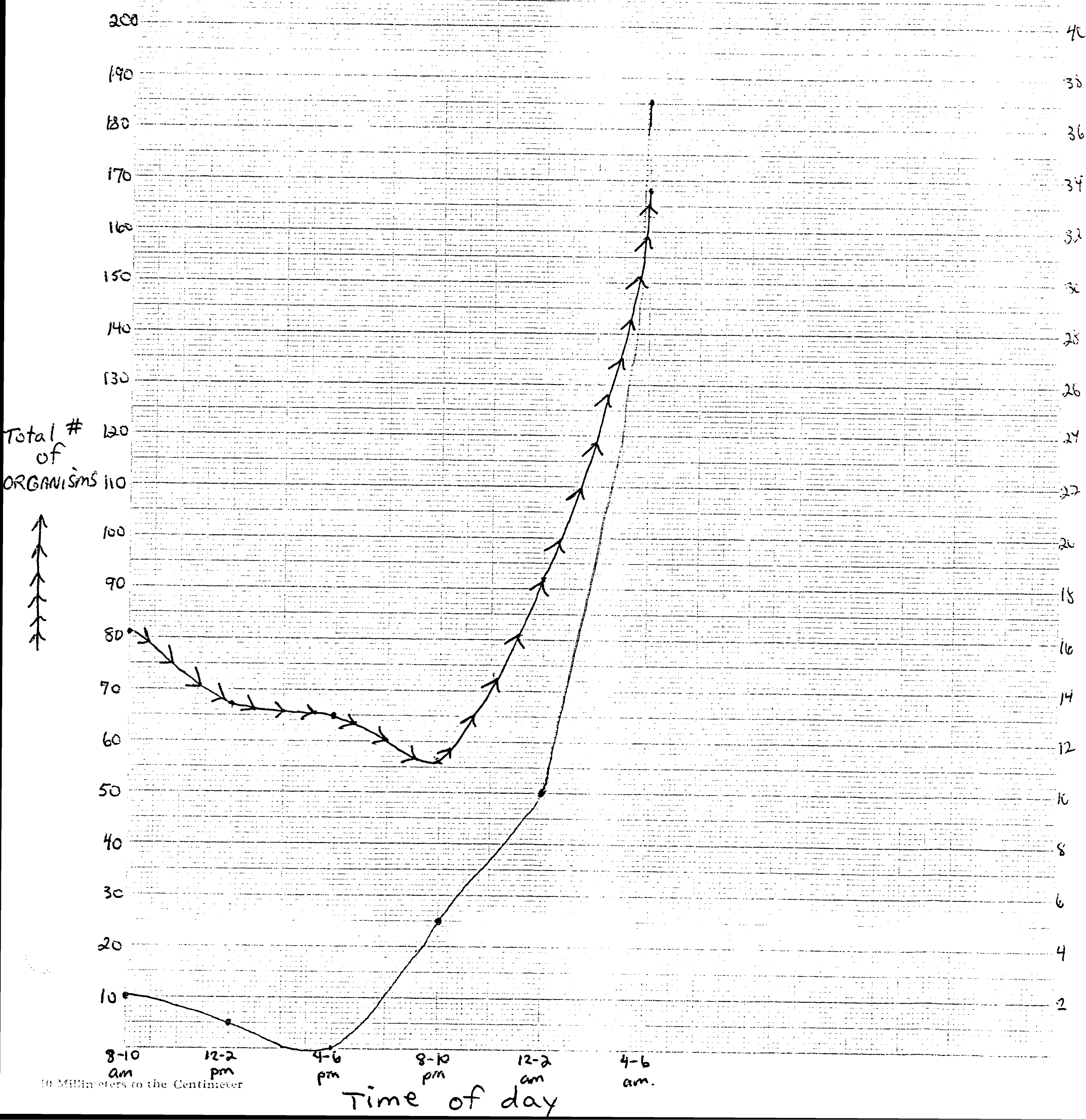


10 Millimeters to the Centimeter

Station #3


Graph #3
CURRENT (m/sec)
.50
.40 80
.30 70
°F
.20 60
.10 50
TOTAL # OF ORGANISMS
160
140
120
100
80
60
40
20
8am
12noon
4pm
8pm
12mid
4am
Time of day
10 Millimeters to the Centimeter

Graph #4


Total # of ORGANISMS
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
8-10 am
12-2 pm
4-6 pm
8-10 pm
12-2 am
4-6 am.
Time of day

Station No. 3

Time	Current (m/sec)	# of H. aerata	Total # of organisms	°F
8 a.m.	.51	2	60	61
12 noon	.50	-	50	62
4 p.m.	.48	-	45	64
8 p.m.	.39	5	66	62
12 mid.	.35	9	76	61
4 a.m.	.30	21	144	59

Total Time	# of H. ærata	Total # of organisms
8-10 a.m.	2	81
12-2 p.m.	1	67
4-6 p.m.	-	65
8-10 p.m.	5	56
12-2 a.m.	10	92
4-6 a.m.	37	168

Discussion

There are no real definite conclusions that can come out of these results except for the fact that more drift occurs at night. This fact has already been widely reported (Bishop 1969, Waters 1972, etc.). However, there are some interesting possibilities as to what might be happening at the various stations on the Maple River.

Station No. 1 is very close to Douglas Lake. The water pouring out of the lake and into the Maple is relatively warm and uniform in temperature during the summer months. This is caused by the shallowness of this area of the lake. Bottom samples taken near the outflow showed very little benthic organisms. The Maple flows very slowly in the area just downstream from the lake, but gradually picks up speed as it gets further downstream.

Station No. 1 was also the only place where an increase in flow was seen during the middle of the day, which then tapered off. This can possibly be explained by the well reported seiches of Douglas Lake (Gannon 1970).

Station No. 2 was unique in that it showed an increase in invertebrate drift during the day instead of at night. These results can possibly be explained by the randomness of the site where the net was placed. Also, the difference in numbers of the peak during the day and the peak at night was not very large (16 and 10 respectively). *H. aerata* possibly showed the expected pattern here, although the number of specimens collected was not significant.

Station No. 3 was where the most significant results were obtained. It is essentially a completely different river there than the other two sites. This is because above the dam there is a small lake. Any organism drifting down the east or west branch of the Maple is liable to get trapped in the lake. And by the time it did flow out of the lake, it would probably be dead.

The area just below the dam is very productive. There are many different types of habitat there and thus many different types of organisms. The water temperature there is cooler than the other two stations and this also makes it favorable for more invertebrate life.

The number of organisms drifting in this area was increased by a power of ten over the other two stations. Drifting by *H. aerata* also showed a definite pattern at the dam site.

Only one other reason for drift could possibly be ascertained from my results. At all three stations, when the current reached its minimum, drift was at its maximum. The stream invertebrates could be waiting for the current to get below a critical point before they attempt to drift. This would assure them of being able to stop drifting when they found a favorable habitat. If the river were flowing too fast, either during the day or at night, they might not even attempt to drift. More data needs to be collected, though, before a firm conclusion can be made on current speed being the cause for drift.

Conclusion

Stream drift definitely occurs in the Maple River, with more invertebrate drift at night than during the day. The caddisfly larvae *H. aerata* is a good example of this.

The Maple River would be a good river for further study of drift, providing it is studied downstream of the dam. The river is much more suited for larger numbers and greater diversity of invertebrate life. downstream from the dam.

References

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