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## **RELATIVE ABUNDANCE OF EMERGENT MIDGES**

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## **Acknowledgments**

The idea of employing emergent insect traps in the Wood River Lakes came from Mr. Dell Siler. Many students and staff contributed to the collection of data from 1969 to 1998. This work was supported by the National Marine Fisheries Service and several Bristol Bay salmon processors (Wards Cove Packing, Peter Pan, Trident Seafoods, Icicle Seafoods, UniSea, Ocean Beauty, Nelbro, NorQuest, Yardarm Knot, and SnoPac). Marcus Duke prepared the final manuscript.

## **Key Words**

chironomids, midges, water temperature, Wood River Lakes

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## Introduction

The Wood River Lakes in the Nushagak District support one of the major runs of sockeye salmon (*Oncorhynchus nerka*) in Bristol Bay.

Studies on these sockeye salmon stocks by the Fisheries Research Institute began in 1946 with surveys of the spawning grounds. By the late 1960s, the freshwater life history of juvenile sockeye in the lake system had been described from net sampling of fry and smolt, combined with stomach content analyses of juvenile sockeye, their competitors, and predators (Burgner 1962, 1964; Nelson 1966; Pella 1968; Rogers 1967, 1968).

Midges (family Chironomidae) were the most important food source for juvenile sockeye salmon in the early summer while they resided inshore and zooplankton density offshore was low. In 1969, we began a study of the aquatic insects in Lake Aleknagik. The initial objectives were to (1) measure the year-to-year and within-year variation in insect abundance; (2) relate the variation in insect abundance to fish abundance, growth, and distribution; (3) obtain a taxonomic list of important aquatic insects present; and (4) estimate the sampling variability with respect to time and location (Siler and Rogers 1970). The purpose of this report is to describe the insect sampling and present the data collected through 1998.

## Methods

Emergent insect traps were initially set at four locations on the lower end of Lake Aleknagik; however, one site was discontinued after 1969 (Fig. 1). The site in Hansen Bay is about 50 m west of the mouth of Hansen Creek and towards the mouth of Happy Creek. The site in Bear Bay is in the southwest corner of the bay, about 50 m south of the mouth of Bear Creek. The trap in Whitefish Bay was located about mid-way between Yako Creek and Whitefish Creek off the south shore of the bay. The traps were all located near sockeye salmon spawning grounds.

The clear plastic traps were described by Sublette and

Dendy (1959). The conical trap was fastened to a metal hoop with a diameter of 78 cm, was 1 m high, and had the rim of a mason jar lid attached to the upper end by a hose clamp. A jar with a small-screened plastic funnel inserted was filled half with water and then screwed into the lid rim while the trap was held under the water surface. This was to ensure a water-air surface while the trap was submerged. The trap was suspended from a float where the lake depth was about 3 m (Fig. 2). The bottom of the trap was 1 m above the lake bottom and the line from the float to the top of the trap was also 1 m. A second line from the float to an anchor was about 4 m long to allow the trap to move over a small area and adjust for a possible rise in the lake level.

The traps were first set as soon as possible after the arrival of the field crew, usually between June 5 and 15. The traps were checked every other day in the early evening (about 8 PM) unless some catches were very large (>100)—then they were checked every day. A second set of jars with labeled lids was used to recover the catch, and a pocket thermometer was used to measure the water temperature at the surface. By mid-July, the traps were examined for any buildup of algae and brushed clean when needed; also the length of the float line was adjusted during the summer to maintain the trap at about 1 m off the bottom. In some years when the lake level became too low, the traps were moved out to deeper water to maintain a depth of about 3 m.

The date, time, location, and temperature were recorded at each site in a field notebook. When the catch was counted in the lab, this was also recorded in the field log. All information was then recorded on a form that was kept in the annual project field log. After the first year, it was evident that adult and pupal midges contributed over 90% of the insect catch with the remainder comprising midge larvae, water mites, and miscellaneous insects. The midge adults and pupa were counted separately but combined for the emergent midge catch. The midge catch was then spread over each date and water temperature was recorded for

each date by interpolating for the missed dates (average of the day before and after). Five-day averages of the catches and water temperatures were then calculated beginning June 1-5. These data were presented in annual quarterly reports to NMFS from 1969 to 1982 and then in annual project reports to Bristol Bay processors from 1989 to 1998.

## Results

Our attempt to identify the species of midges in the catch failed, as preserved specimens that were sent to experts in 1970 were unidentified (i.e., the species had not been described). Variation in body color (green, gray and black) and length (2-5 mm) of adults indicated at least 3 species, but several more were likely present. Lake-dwelling midges in northern latitudes usually live 2 years as larvae on the bottom or on attached vegetation. When the larvae pupate, they rise to the surface and emerge as adults from the lake surface. At this time, they are especially vulnerable to predation. Chironomid larvae and oligochaetes were about equally abundant and numerically dominant in benthic sampling of the Wood River Lakes (Reeves 1968, Rogers et al 1980).

Two traps were employed in Bear Bay and Hansen Bay during 1969-74. The variation in catches within a location was significantly less than the variation between location or by date (Tables 1 and 2). Therefore, beginning in 1975 we used one site in each of the three locations, and catches for the two sites used in 1969-74 were averaged to calculate the 5-day averages that constitute our present basic data set (Table 3).

The average date that Lake Aleknagik was free of ice was May 31; however, ice breakup has occurred as early as May 1 and as late as June 16. Years with early ice-out prohibit a complete picture of the seasonal emergence pattern. In some years there was a peak emergence soon after the ice was out (e.g., 1975; Fig. 3); however, in most years when traps were installed soon after ice breakup, there was not a peak emergence until late July or early August (Table 4).

Midge catches were usually lowest from June 21 to July 5 and highest during late July to early August, which is the time that sockeye salmon fry move to the pelagic region and begin feeding on zooplankton. This is also the time when water temperatures reach the summer maximum (Table 5). Emergence was notably low during rainy or windy days and relatively high following an extended stormy period. Examples of the variation in emergence

and temperature among sites are shown in Figure 4 for years with ice-out in June and in Figure 5 for years with ice-out in May.

To date there have been relatively few analyses of the insect trap data set; however, they were used in a comparison with insect trap catches in Little Togiak Lake (Table 6) to evaluate the effects of lake fertilization on Little Togiak Lake during the 1970s (Rogers et al 1980). Work (1992) also used the Lake Aleknagik insect catches in her examination of factors affecting sockeye fry growth although the emphasis of her study was on zooplankton. Future analyses could be done to relate emergence to the timing of the off-shore movement of sockeye fry (beach seine catches) and to daily variation in solar radiation (sunlight)

## References

- Burgner, R.L. 1962. Sampling red salmon fry by lake trap in the Wood River Lakes, Alaska. Pages 315-348 in T. Koo (ed.), Studies of Alaska Red Salmon. Univ. Wash. Publ. Fish., New Ser. 1. Univ. Washington Press.
- Burgner, R.L. 1964. Factors influencing production of sockeye salmon (*Oncorhynchus nerka*) in lakes of southwestern Alaska. Verh. Int. Verein. Limnol. 15:504-513.
- Nelson, M.O. 1966. Food and distribution of Arctic char in Lake Aleknagik, Alaska during the summer of 1962. M.S. thesis. Univ. Washington, Seattle.
- Pella, J.J. 1968. Distribution and growth of sockeye salmon fry in Lake Aleknagik, Alaska during the summer of 1962. Pages 345-103 in T. Koo (ed.), Studies of Alaska Red Salmon. Univ. Wash. Publ. Fish., New Ser. 1. Univ. Washington Press.
- Reeves, J.E. 1968. Some results of a survey of the bottom fauna in the Nushagak District lakes. Pages 14-16 in J. Matches and F. Taub (eds.), 1967 Research In Fisheries. Univ. Washington College of Fisheries. Seattle.
- Rogers, D.E. 1967. Estimation of pelagic fish populations in the Wood River Lakes, Alaska, from tow net catches and echogram marks. Ph.D. thesis. Univ. Washington, Seattle.
- Rogers, D.E. 1968. A comparison of the food of sockeye salmon fry and threespine stickleback in the Wood River Lakes. Pages 1-43 in R. Burgner (ed.), Further Studies of Alaska Sockeye Salmon. Univ. Wash. Publ. Fish., New Ser. 3. Seattle.
- Rogers, D.E., B.J. Rogers, and F.J. Hardy. 1980. Effects of fertilization of Little Togiak Lake in the food supply and growth of sockeye salmon. Pages 125-142 in Proc. North Pac. Aquaculture Symp. Univ. Alaska, Fairbanks.
- Siler, D.H. and D.E. Rogers. 1970. Alaska salmon studies, Part A. The study of red salmon in the Nushagak District. Periodic Report No. 1. to NMFS, NOAA. Univ. Washington, School of Fisheries, Fish. Res. Inst. Seattle.
- Sublette, J.E. and J.S. Dendy. 1959. Plastic materials for simplified tent and tunnel traps. S. West. Nat. 3:220-223.
- Work, K. 1992. Selective predation on zooplankton and the factors that affect sockeye salmon growth in Lake Aleknagik, Alaska. M.S. thesis. Univ. Washington, Seattle.

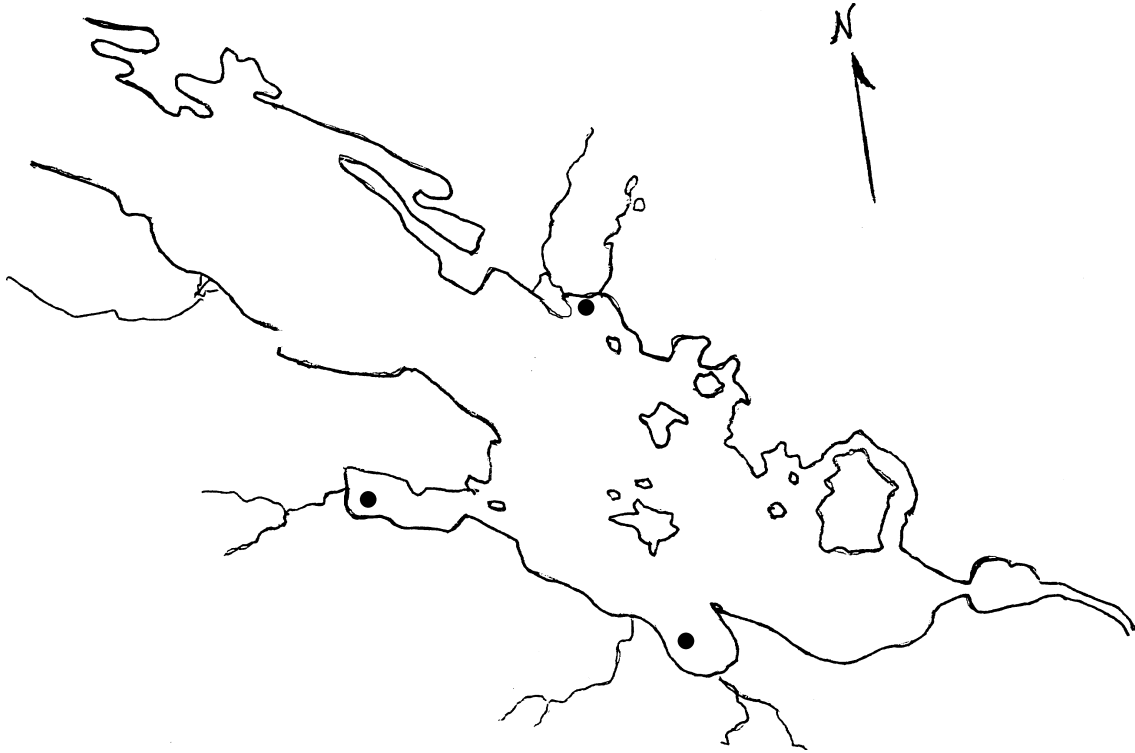


FIGURE 1. Insect trap locations (●) on lower end of Lake Aleknagik.

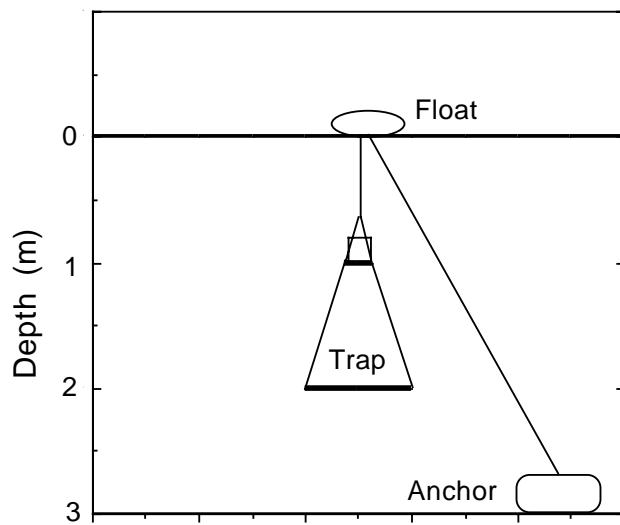


FIGURE 2. Emergent insect trap.

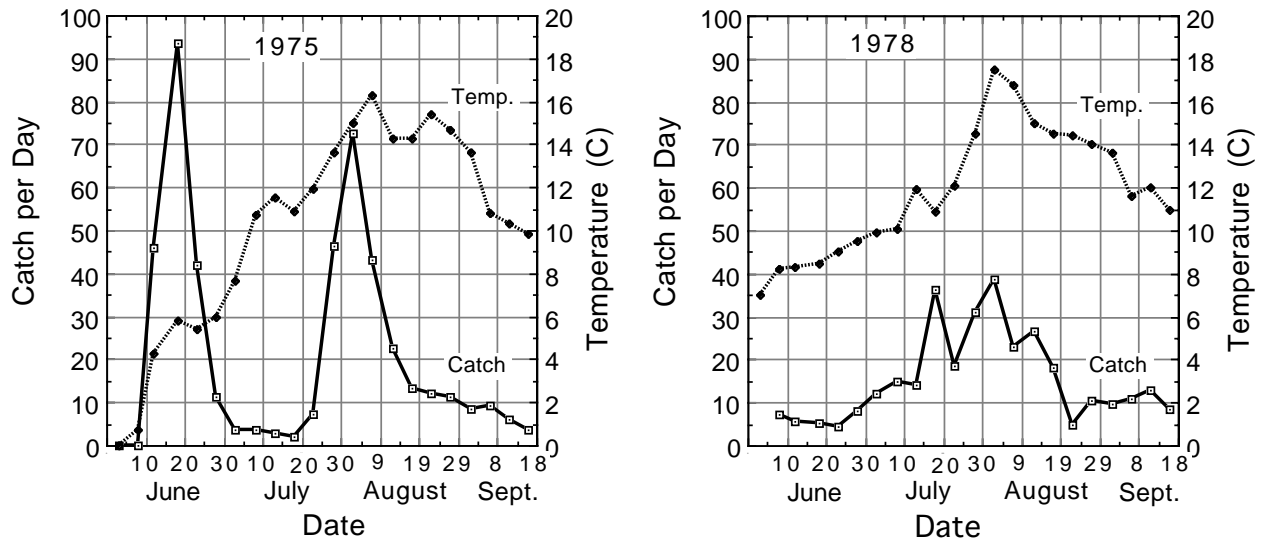


FIGURE 3. Average midge catches and temperatures in 1975 (ice-out 6/8) and 1978 (ice-out 5/22).

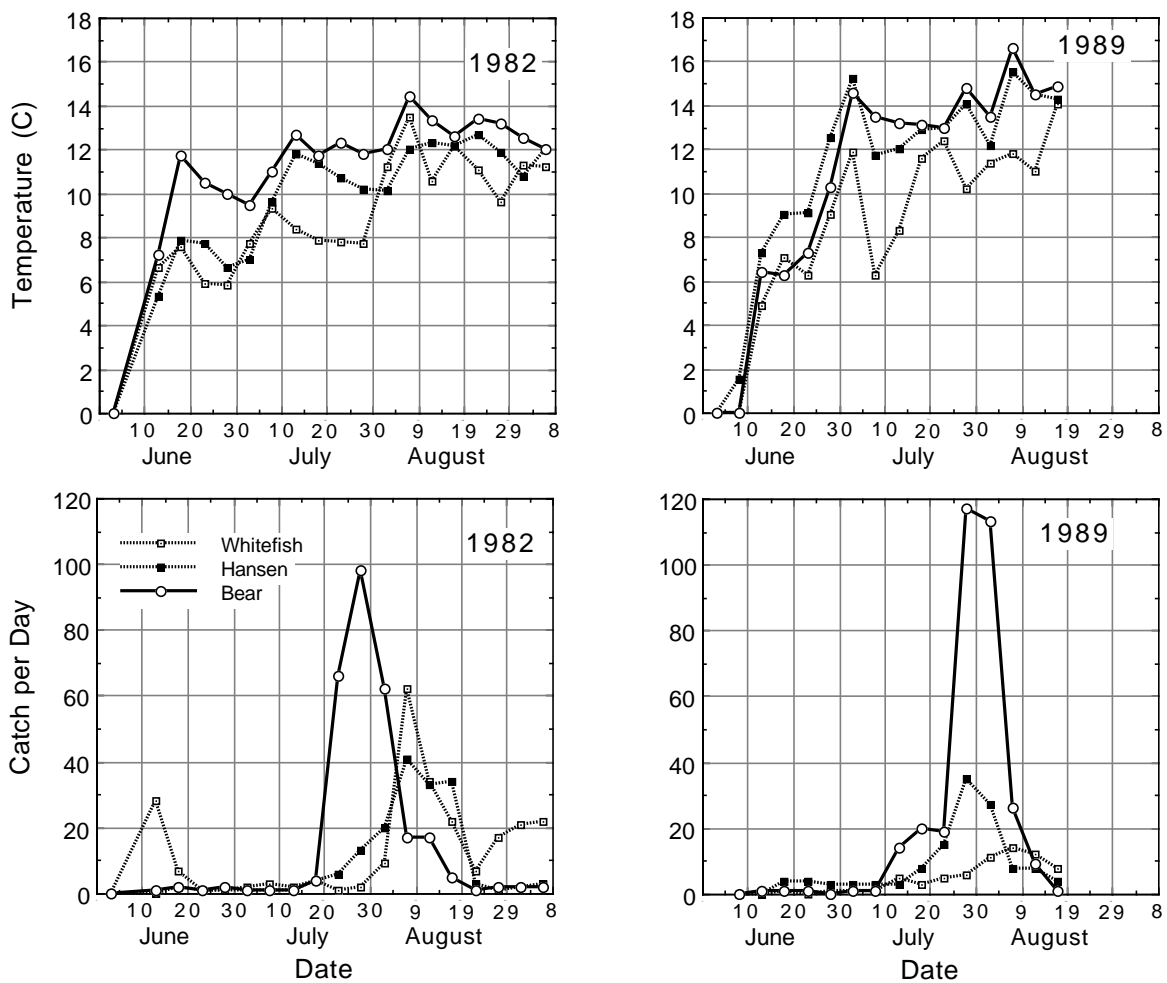


FIGURE 4. Midge catches and temperatures for 2 years with late ice-out (6/6/82 and 6/9/89).

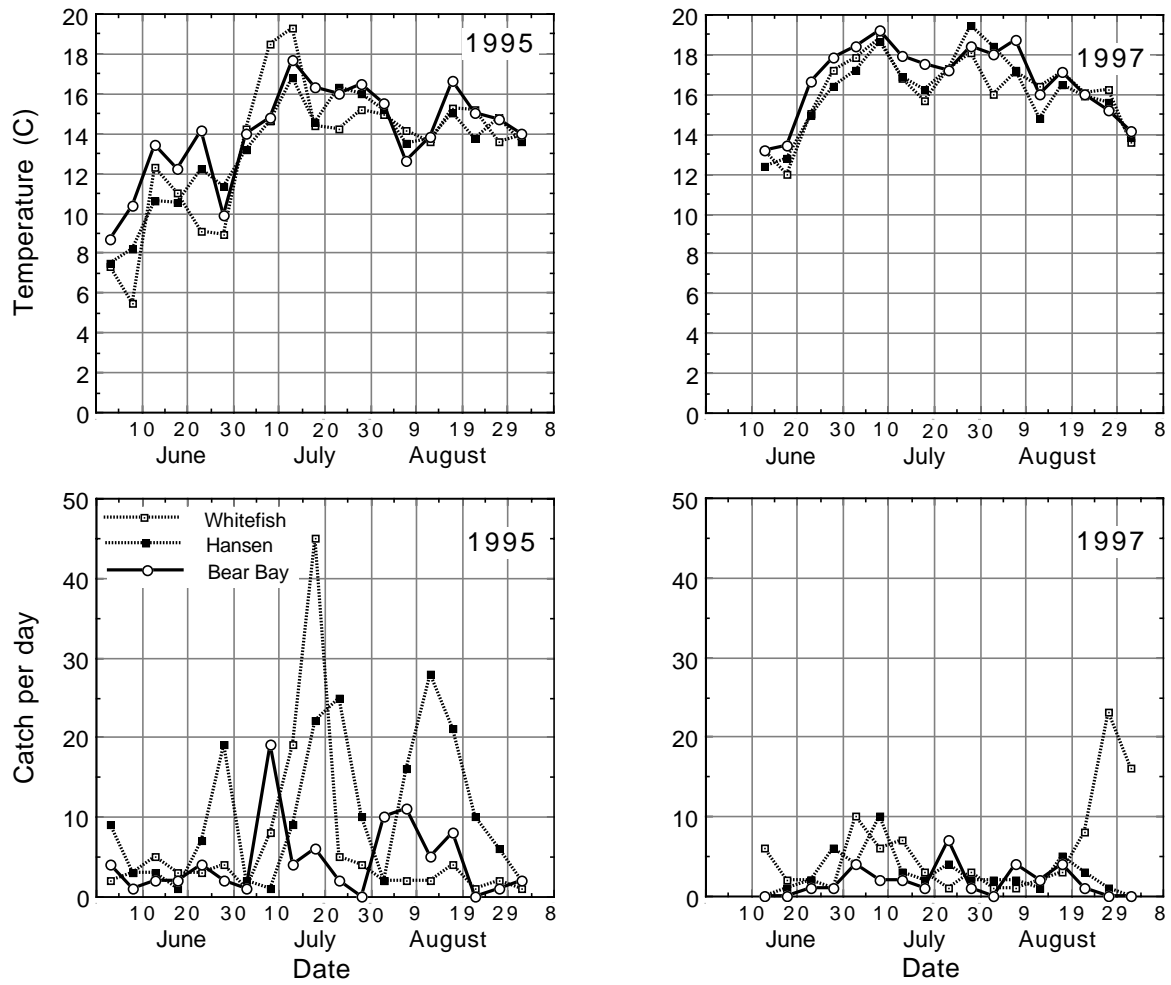


FIGURE 5. Midge catches and temperatures for 2 years with early ice-out (5/20/95 and 5/21/97).

TABLE 1. Emergent midge catches for paired traps, 1969-71.

1969						1970				1971					
Mo	Date	Bear Bay		Hansen Bay		Mo.	Date	Hansen Bay		Mo.	Date	Bear Bay		Hansen Bay	
		1	2	1	2			1	2			1	2	1	2
6	17	4			3	6	6	364	117	6	18	4	5	3	3
	19	1	11	3	6		8	132	74		21	4	10	11	1
	21	2	0	1	4		13	133	164		23	2	9	1	22
	23	2	3	0	3		14	8	9		25	1	8	4	12
	25	3	1	2	2		18	9	6		27	0	0	3	11
	27	2	1	0	0		20	3	4		29	1	8	7	21
	29	2	1	1	0		22	4	1		7	1	1	21	23
7	1	2	4	0	0	24	2	2	3	12		17	11	9	
	3	3	1	0	3	27	3	0	5	30	11	7	8		
	5	4	1	1	0	29	6	0	8	34	6	5	5		
	7	1	0	2	3	7	2	3	1	10	39	6	12	16	
	10	0	2	0	1		4	6	3	12	50	10	34	30	
	12	2	3	1	2	6	5	2	14	1	15	14	22		
	14	1	1	1	3	16	16	12	16	3	28	18	12		
	16	1	1	6	12	18	20		18	4	17	21	15		
	18	1	0	8	11	21	56		20	5	14	20			
	20	1	1	8	12	24	57	53	22	9	17	16	33		
	23	2	2	35	28	26	106	36	25	3	19	10	4		
	25	6	4	105	85	30	91		27	21	27	19	13		
	27	4	14	134	114	8	1	30	18	29	11	14	5	23	
	29	31	51	57	112		3	19		31	22	95	15	13	
31	58	94	51	105	5	23	16	8	2	41	25	20	42		
8	2	62	243	38		7	17		8	4	27	43	21	59	
	4	83	154	55	35	9	35	19	6	31	123	25	40		
	6		92	31	29	11	18	15	8	14	121	56	39		
	10		36	13	18	13	13	2	11	18	157	20	41		
									14	32	201	32	53		
									15	40	260	41	62		
									16	314	106	28	23		
									17	46	111	48	31		
								21	33	81		20			
								24	25	22		14			
								9	5		1		6		
									9	64	1		16		
									11	127	5		14		

TABLE 2. Emergent midge catches for paired traps, 1972-74.

1972					1973					1974							
Mo.	Date	Bear Bay		Hansen Bay		Mo.	Date	Bear Bay		Hansen Bay		Mo.	Date	Bear Bay		Hansen Bay	
		1	2	1	2			1	2	1	2			1	2		
6	17	0	3			6	7			8	8	6	8	10	13	43	24
	19	12	16	9	0		10			18	7		11	3	10	19	20
	22	6	14	16	2		12	8	14	11	4		14	19	21	11	9
	24	3	2	24	0		14	8	6	15	12		17	5	10	7	11
	27	1	4	12	1		16	4	8				20		5	5	12
	29	0	1	15	4		17			37	10		23	7	3	2	19
7	2	6	4	5	3		19	15	8	40	27		26	3	5	6	13
	5	6	19	12	7		22	8	10	19	21		29	3	5	3	15
	7	4	9	4	3		24	6	4	33	19	7	1	3	2	25	12
	9	27	12	20	8		26	4	4	24	29		3	24	9	20	2
	12	14	15	27	3		29	1	4	24	15		6	4	15	7	7
	14	18	18	7	9	7	1	3	3	20	15		8	83	33	18	5
	16	17	11	27	14		3		3				9	21	20	17	15
	18	10	28	34	11		4	4		28	31		12	35	62		65
	20	6	4	56	10		7	2	1	34			14	17	24	38	55
	22	5	12	42	7		10	2	2	131	81		16	17	26	11	46
	24	24	2	17	3		12	2	1	69	38		18	2		23	24
	26	13	6	18	4		14	6	0	69	73		20	32		23	35
	29	20	10	78	141		16	1	1	43	34		22	10	9	12	21
	29	31		165	275		18	4	0	110	80		25	23	9	2	
	30	5		194	217		20	2	0	66			27	16	3	5	
	31	22		82	134		22	7	5	37	26		29	8		3	
8	1	13	3	161	204		25	9	9	106	78		31	1	8	4	10
	2	6	170	168	254		27	11	6	74	48	8	2	15	6	6	9
	3	9	34	144	225		29	93	58	196	157		4	7	3	5	6
	4	149	153	203	223		30	34	93		91		7	0	2		
	5	93	85	119	107		31	70	102	165	60		9	3	2		
	6	93	133	188	131								10	3			7
	7	2	91	91	114								14	1	1		
	8	32	103	105	142								16	3	4		
	9	58	102	114	97								23		0		4
	10	44	148	73	95								29			6	
	11	27	85	31	82							9	1		8	6	
	12	31	67	29	29								3			1	
	13	5	67	61	47								5		2		
	17	4	9	6	11								8		16	5	











TABLE 3—cont.

	1984										1985										1986																																																											
	Days (5/17)					Catch per day					Temperature (C)					Days (6/8)					Catch per day					Temperature (C)																																																						
	W	H	B	Mean	W	H	B	Mean	W	H	B	Mean	W	H	B	Mean	W	H	B	Mean	W	H	B	Mean	W	H	B	Mean																																																				
June																																																																																
1-5																																																																																
6-10	32	1.0	3.6	16.0	6.9	9.5	14.2	14.5	12.7	0	0.0	3.0	0.0	0.0	1.5	0.0	0.0	0.5	18	9.0	8.0	8.5	7.0	5.5	9.5	7.3	23	4.0	1.0	0.4	1.8	8.0	6.0	12.0	8.7	28	2.8	1.0	1.0	1.6	7.0	5.0	10.0	7.3	33	2.4	2.6	0.8	1.9	7.8	7.5	10.7	8.7	42	2.2	10.0	0.2	4.1	9.6	10.8	13.4	11.3																		
11-15																																																																																
16-20																																																																																
21-25																																																																																
26-30																																																																																
July																																																																																
1-5	47	2.6	13.2	30.4	15.4	12.7	12.1	14.2	13.0	25	5.0	1.0	0.0	0.0	7.6	8.2	9.9	8.6	38	4.0	2.6	2.5	9.2	10.7	13.9	11.3	43	6.8	35.0	31.0	24.3	14.1	13.6	13.5	13.7	48	5.0	5.2	14.0	8.1	11.1	11.4	11.4	10.4	53	4.0	8.8	20.4	11.1	12.0	11.8	12.6	12.1	58	3.0	5.4	52.4	20.3	10.4	12.6	12.8	11.9	63	4.4	18.0	47.8	23.4	13.9	15.0	15.8	14.9	68	4.4	34.4	38.4	25.7	8.5	12.0	13.0	11.2
6-10	52	6.8	40.0	24.0	33.0	32.3	14.6	14.2	15.2	14.7	30	11.8	0.2	0.2	4.1	11.5	11.5	14.5	12.5	35	17.6	0.8	0.0	6.1	12.3	11.6	16.0	13.3	40	19.8	1.2	0.4	7.1	9.3	12.8	9.5	10.5	45	3.0	3.0	37.8	14.6	10.2	11.3	13.8	11.8	50	2.2	39.0	134.2	58.5	11.2	14.8	15.6	13.9	55	9.9	24.0	67.0	33.6	13.6	15.3	15.8	14.9																
11-15																																																																																
16-20																																																																																
21-25																																																																																
26-30																																																																																
31-4																																																																																
August																																																																																
5-9	82	4.4	1.4	5.6	3.8	17.7	16.0	17.7	17.1	60	8.4	26.0	15.0	16.5	8.7	11.5	12.0	10.7	73	4.4	7.0	23.6	11.7	10.4	11.0	12.4	11.3	78	5.9	2.8	21.4	10.0	9.6	10.9	11.0	10.5	83	9.8	5.5	26.1	13.8	11.7	13.1	12.7	12.5																																			
10-14																																																																																
15-19																																																																																
20-24																																																																																
25-29																																																																																
30-3																																																																																









TABLE 4. Five-day averages of emergent midge catches in Lake Aleknagik.

Year	June						July						August						September		
	3	8	13	18	23	28	3	8	13	18	23	28	2	7	12	17	22	27	1	6	
69				8	10	6	3	4	2	7	50	59	77	66	28						
70		70	53	10	7	6	8	12	21	24	40	39	39	15	17	13					
71				5	6	7	13	19	15	12	10	14	27	40	54	70	29			4	
72				2	7	4	3	7	11	13	12	45	71	86	52	9					
73		5	8	12	12	12	11	23	26	27	23	56	76	80	34	33					
74		35	14	7	7	5	8	13	27	16	19	17	6	3	3	3	2	3		5	6
75			46	94	42	11	4	4	3	2	7	46	73	43	22	13	12	11		8	9
76			5	35	10	4	4	4	3	5	13	35	24	15	9	8	8	1		1	1
77	1	3	31	168	5	2	1	2	2	4	13	35	23	15	18	13	13	5		9	6
78		7	6	5	5	8	12	15	14	36	19	31	39	23	27	18	5	10		10	11
79		2	13	7	18	8	8	3	13	22	31	32	21	24	8	6	4	4		2	8
80										5	10	11	9	4	2	2	1	1		1	1
81				7	5	2	3	8	12	5	11	13	10	24	37	23	7	3		3	
82			10	3	1	2	1	1	1	4	24	38	30	40	28	20	4	6		8	9
83				10	4	8	6	21	17	32	23	21	37	6	8	8	5	8		13	
84				7	3	4	15	24	32	17	14	8	4	4	3						
85		1	5	4	2	3	2	4	6	7	15	58	34	16	12						
86			8	2	2	2	2	9	8	11	20	23	26	12	10	14					
87			3	2	2	1	3	2	3	2	2	20	20	4	3						
88			5	5	4	4	5	16	18	25	16	15	10	13	19						
89		0	1	2	2	1	1	2	7	10	13	52	50	16	10	4					
90	3	4	1	1	1	2	1	10	34	17	19	12	8	12	6	3					
91	0	1	2	1	0	0	2	3	18	18	24	12	12	14	8	4	2				
92	0	1	7	7	1	1	1	2	7	22	74	45	19	14	9	6	3				
93	3	2	2	2	8	7	12	27	17	19	16	10	4	6	1	1	0				
94		3	3	2	2	2	15	61	28	7	5	7	9	5	5	2	1				
95	3	2	3	2	5	8	1	9	11	24	11	5	5	10	12	11	4	3		2	
96		6	5	2	2	3	11	14	16	36	24	9	5	4	8	5	1				
97			2	1	1	3	6	6	4	2	4	2	1	2	2	4	4	8		6	
98			49	16	6	2	1	0	1	2	10	12	20	5	4	2	2	2		0	
Mean	2	9	12	15	6	4	6	11	13	14	19	26	26	21	15	12	6	5		5	6
S.D.	2	19	16	34	8	3	5	12	10	10	15	18	23	22	14	14	7	3		4	4
COV	90	198	131	232	128	71	83	109	74	72	76	68	87	108	93	122	119	67		78	58
min	0	0	1	1	0	0	1	0	1	2	2	2	1	2	1	1	0	1		0	1
max	3	70	53	168	42	12	15	61	34	36	74	59	77	86	54	70	29	11		13	11

TABLE 5. Five-day averages of water temperatures in Lake Aleknagik.

Year	June						July						August					September			
	3	8	13	18	23	28	3	8	13	18	23	28	2	7	12	17	22	27	1	6	
69									12.6	11.1	11.2	11.6	12.4	12.6							
70		9.2	6.8	7.1	8.8	10.9	12.9	11.1	9.2	11.2	10.7	10.7	11.5	11.6							
71	0.0	0.0	0.0	3.9	5.5	7.9	10.0	12.0	11.0	8.5	7.9	8.9	10.2	10.7	12.0	11.0					
72	0.0	1.0	3.0	3.9	4.8	6.1	9.4	12.6	10.9	9.5	12.1	13.5	12.7	14.0	14.0	13.0					
73		4.0	5.9	6.9	8.1	9.0	9.0	10.8	10.6	12.8	12.3	9.3	11.5	10.4	11.8	13.5					
74		8.2	7.7	8.7	10.1	15.2	14.4	14.1	12.7	11.7	13.9	14.1	16.4	14.5	14.2			14.7	14.6	14.0	
75	0.0	0.7	4.3	5.8	5.4	6.0	7.7	10.7	11.5	10.9	11.9	13.6	15.0	16.3	14.3	14.3	15.4	14.7	13.6	10.8	
76	0.0	0.0	5.6	6.2	8.4	10.2	8.8	11.7	12.8	12.7	12.0	11.6	14.3	13.7	14.1	13.2	13.4	11.3			
77	1.3	5.0	6.1	8.5	10.9	9.8	8.6	9.7	9.3	11.1	12.5	10.7	11.2	11.8	12.0	11.8	12.5	13.2	14.2	12.7	
78		8.2	8.3				9.9	10.1	11.9	10.9	12.1	14.5	17.5	16.8	15.0	14.5	14.4	14.0	13.6	11.6	
79				8.7	9.2	8.8	8.9	9.3	11.6					14.8	15.2						
80																					
81				12.6	12.8	13.0	13.9	13.8	13.0	12.6	11.7	14.3	14.7	15.2	14.2	13.3	13.4	13.4	13.5		
82				9.1	8.0	7.5	8.1	10.0	11.0	10.3	10.3	9.9	11.1	13.3	12.1	12.3	12.4	11.6	11.5	11.7	
83				10.7	9.9	9.3	12.5	11.1	13.2	12.8	12.0	14.2	16.1	14.6	13.8	13.8	14.8	14.4	13.8		
84				12.7	10.3	11.3	13.0	13.7	14.7	15.6	15.3	15.3	15.1	17.1	18.8						
85		0.5	3.9	5.2	7.2	10.6	8.6	12.5	13.3	10.5	11.8	13.9	14.9	10.7	9.5						
86			7.3	8.7	7.3	8.7	11.3	10.4	11.3	12.1	11.9	14.9	11.2	11.3	10.5	12.5					
87			7.4	7.6	7.5	7.2	7.9	10.4	11.4	9.7	10.5	15.2	13.3	10.7	11.7						
88			7.5	9.9	10.4	10.7	12.1	12.5	15.5	16.4	16.0	15.7	14.1	13.8	13.5						
89		0.5	6.2	7.5	7.6	10.6	13.9	10.5	11.2	12.5	12.8	13.0	12.4	14.6	13.3	14.4					
90	9.8	10.4	9.0	9.6	11.1	13.8	14.3	14.4	15.9	17.0	15.2	13.8	14.0	14.5	15.2	15.7					
91	5.0	8.3	8.0	7.3	8.0	13.0	15.5	15.8	12.0	10.5	15.0	14.6	14.2	15.0	13.6	13.7	14.8				
92	3.1	5.8	7.0	7.6	9.0	8.6	10.2	9.6	11.8	13.0	12.8	13.4	13.0	14.0	12.9	11.7	9.7				
93	8.8	8.5	8.5	10.4	12.7	9.8	8.5	12.5	14.6	16.6	16.0	16.1	15.9	16.2	16.2	13.7	12.1				
94		8.0	9.0	11.6	10.5	12.2	11.7	12.5	12.3	10.9	12.0	15.1	13.8	13.5	15.1	16.2	14.6				
95	7.8	8.0	12.1	11.2	11.8	6.7	13.8	16.0	17.9	15.1	15.5	15.9	15.2	13.4	13.7	15.6	14.6	14.4	13.8		
96		7.6	9.6	9.4	8.8	10.3	13.5	12.7	11.3	13.5	15.2	11.7	11.9	12.8	13.6	14.6	14.0				
97			12.9	12.7	15.5	17.1	17.8	18.9	17.2	16.5	17.3	18.6	17.5	17.7	15.7	16.9	16.0	15.7	13.8		
98		7.2	7.9	9.8	9.5	13.8	13.7	12.2	12.8	12.6	12.9	12.6	12.2	12.2	12.5	12.3	13.2	13.0	10.6		
Mean	3.6	5.3	7.1	8.6	9.2	10.3	11.4	12.2	12.6	12.5	13.0	13.5	13.7	13.7	13.6	13.6	13.6	13.6	13.1	12.0	
S.D.	4.0	3.7	2.8	2.5	2.4	2.8	2.7	2.2	2.1	2.3	2.2	2.2	2.0	2.0	1.9	1.6	1.6	1.3	1.4	1.2	
COV	111	69.29	38.81	28.48	25.99	26.78	23.8	18.21	16.68	18.44	17.11	16.49	14.3	14.59	13.59	11.49	11.66	9.826	11	10.16	
min	0.0	0.0	0.0	3.9	4.8	6.0	7.7	9.3	9.2	8.5	7.9	8.9	10.2	10.4	9.5	11.0	9.7	11.3	10.6	10.8	
max	9.8	10.4	12.9	12.7	15.5	17.1	17.8	18.9	17.9	17.0	17.3	18.6	17.5	17.7	18.8	16.9	16.0	15.7	14.6	14.0	

