A STUDY OF THE SEASONAL SUCCESSION OF THE BITING MIDGE *CULICOIDES ARAKAWAI* (DIPTERA; CERATOPOGONIDAE) IN THE TAIPEI AREA*

By

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The biting midge ***Culicoides arakawai*** (Arakawa) is widely distributed in East and Southeast Asia, reported from Siberia, Manchuria, North China, Korea, Japan, Ryukyu Islands, Taiwan, Indonesia and New Guinea. (1) It bites mainly domestic fowl and occasionally man. It is reported to transmit ***Leucocytozoon caulleryi*** among chickens (2) and to carry certain arboviruses. (3)

A collection of ***C. arakawai*** was made in the suburban area of Taipei from 29th of May, 1962 through 5th of July, 1963 in order to study the seasonal distribution and its relation to the climatic conditions such as temperature and rainfall. The materials and methods for this study follow the author's previous work in 1962 and are briefly listed as follows: (4)

1) Operated five New Jersey light traps around Taipei area.
2) Collected the specimens four times a week and brought them back to the laboratory for identification.
3) Recorded and analyzed the climatic data of the year (Fig. 1. and Table I).
4) Plotted graphs of specimens and/or of climatic records by using moving means of four weeks.

The collection of ***C. arakawai*** and its seasonal distribution for the year are presented in Fig. 2. and Table II

The succession curve of ***C. arakawai***(Fig. 2)shows two peaks during the year. The Autumn Eminence began in mid-October and lasted about nine weeks with a fairly blunt crest and the Spring Eminence began in early March and gradually reached its peak during the second week of May and was maintained about 12 weeks. There were also two marked depressions between these eminences. This figure is similar to the

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author's observation on the seasonal succession of Ceratopogonidae in 1961—1962 (4) in that the number of specimens collected was low in both hot and cold seasons but was high during spring and autumn. The Spring Eminence of *C. arakawai* from the present observation is much more dominant and longer lasting than the Autumn Eminence. This is the reverse of the ceratopogonid curve reported in the author's previous paper.

In addition to the effect of temperature changes, rainfall also seems to affect the seasonal succession of the midges. The peak rainfall during August-September may be correlated with the deep depression of numbers of *C. arakawai* collected in those months. Furthermore, during the spring from February till May the mean amount of rainfall maintained a fairly even depression and the number of *C. arakawai* collected during the same period of time increased and finally reached its peak. Then, the crest of the rainfall went upward again from June while the curve of insect collection began to decrease.

The author believes that there is also a similar association existing between the mean amount of rainfall and the seasonal succession of Ceratopogonidae reported in 1962. (4) The peak rainfall correlated with the Summer Depression of the Ceratopogonidae in July-August 1961 and the deep depression of rainfall with the Autumn Eminence of the Ceratopogonidae in November-December 1961. This observation is presented as a supplement to the previous work on the seasonal succession of Ceratopogonidae.

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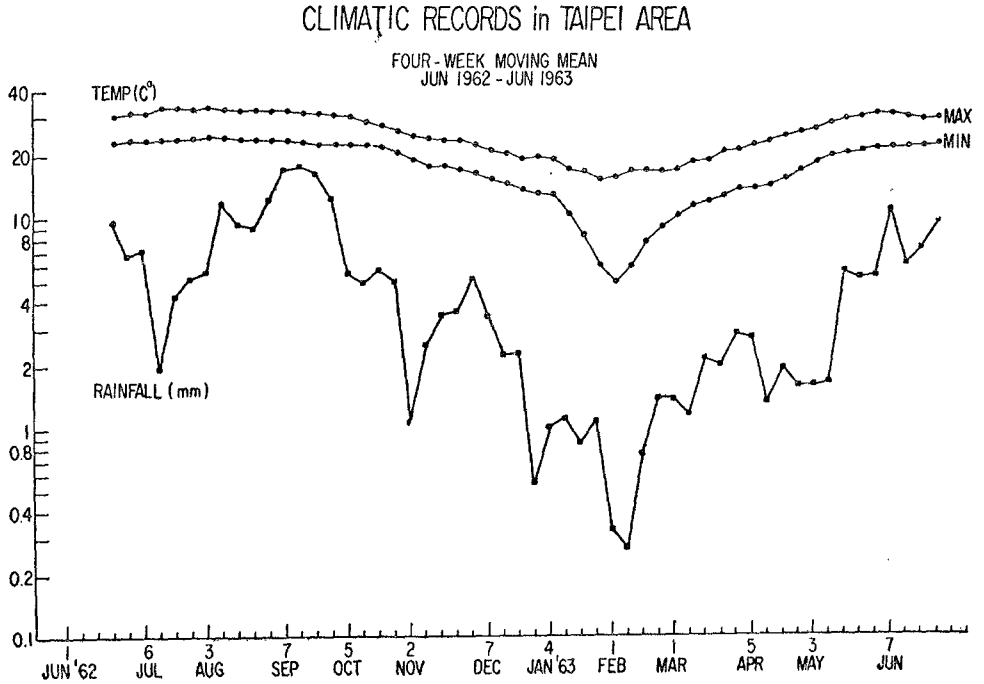

Fig. 1. Climatic Records in Taipei Area

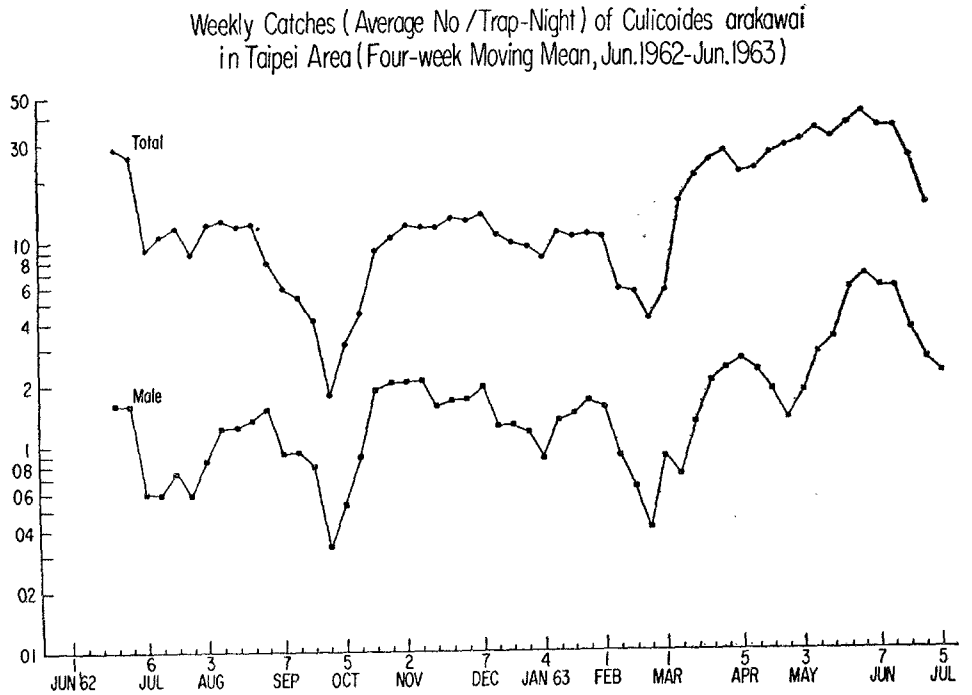

Fig. 2. Seasonal Distribution of ***Culicoides arakawai***

Table I. Weekly Records (Four-week moving mean) of the Climatic Factors in the Tapei Area from June, 1962—June, 1963

Week Ending	Temperature (°C)		Rainfall (mm)
	Maximum	Minimum	
1962 June 1			
8			
15			
22	30.83	23.25	9.90
29	31.35	23.45	6.69
July 6	32.08	23.48	7.02
13	33.30	24.10	1.89
20	33.88	24.30	4.28
27	33.60	24.38	5.14
Aug. 3	33.68	24.88	5.55
10	33.13	24.78	11.81
17	32.80	24.53	9.36
24	33.10	24.43	8.90
31	32.83	24.15	12.25
Sept. 7	32.38	24.08	17.28
14	32.03	23.80	17.59
21	31.83	23.53	16.30
28	31.50	23.25	12.33
Oct. 5	30.95	23.00	5.45
12	29.68	22.98	4.89
19	28.28	22.40	5.64
26	26.48	21.20	4.99
Nov. 2	25.68	19.55	1.06
9	24.85	18.28	2.49
16	24.35	18.10	3.40
23	24.23	17.78	3.55
30	22.90	17.30	5.07
Dec. 7	21.65	15.85	3.43
14	21.28	14.80	2.22
21	19.60	13.93	2.26
28	20.48	13.40	0.52

Week Ending	Temperature (°C)		Rainfall (mm)
	Maximum	Minimum	
1963 Jan. 4	19.80	13.08	1.00
11	17.50	10.78	1.09
18	17.03	8.33	0.83
25	15.68	6.88	1.07
Feb. 1	16.15	5.23	0.31
8	16.95	6.18	0.25
15	17.43	7.93	0.73
22	16.98	9.18	1.33
Mar. 1	17.60	10.38	1.33
8	19.08	11.68	1.13
15	19.45	12.20	2.08
22	21.25	12.88	1.97
29	21.93	14.18	2.77
Apr. 5	22.55	14.03	2.70
12	24.98	14.48	1.29
19	24.28	15.73	1.83
26	26.28	17.30	1.54
May. 3	27.18	18.80	1.54
10	29.20	20.40	1.59
17	30.00	20.98	5.38
24	31.05	21.55	5.09
31	31.78	21.18	5.10
June 7	31.55	22.30	10.06
14	30.80	22.28	5.95
21	30.56	22.60	6.98
28	30.50	22.83	9.32

Table II. Weekly Catches of *Culicoides arakawai* in Taipei Area from June 1962—June 1963

Week Ending		Specimen			TN*	A T N **		Moving Mean	
		Male	Femble	Total		Total	Male	Total	Male
1962 Jun	1	12	271	283	10	28.30	1.20		
	8	84	1,315	1,399	20	69.95	4.20		
	15	16	198	214	20	10.70	0.80		
	22	3	92	95	20	4.75	0.15	28.42	1.59
	29	24	320	344	20	17.20	1.20	25.66	1.59
Jul	6	2	34	36	10	3.60	0.20	9.06	0.59
	13	15	321	336	20	16.80	0.75	10.59	0.58
	20	15	135	150	20	7.50	0.75	11.50	0.72
	27	12	118	130	20	6.50	0.60	8.60	0.58
Aug.	3	24	314	338	20	16.90	1.20	11.90	0.83
	10	35	232	267	15	17.80	2.34	12.20	1.22
	17	15	99	114	20	5.70	0.75	11.70	1.22
	24	19	137	156	20	7.80	0.95	12.10	1.31
	31	39	117	156	20	7.80	1.95	7.80	1.50
Sept.	7	0	9	9	5	1.80	0.00	5.80	0.91
	14	15	57	72	20	3.60	0.75	5.25	0.91
	21	8	52	60	20	3.00	0.40	4.05	0.78
	28	2	22	24	15	1.60	0.13	1.75	0.32
Oct.	5	16	66	82	20	4.10	0.80	3.10	0.52
	12	21	67	88	10	8.80	2.10	4.40	0.86
	19	89	337	426	20	21.30	4.45	8.95	1.87
	26	7	55	62	10	6.20	0.70	10.10	2.01
Nov.	2	16	190	206	20	10.30	0.80	11.65	2.01
	9	17	159	176	20	8.80	0.85	11.65	2.02
	16	58	254	312	15	20.80	3.86	11.50	1.55
	23	10	105	115	10	11.50	1.00	12.85	1.63
	30	18	154	172	20	8.60	0.90	12.40	1.65
Dec.	7	36	188	224	20	11.20	1.80	13.02	1.89
	14	24	190	214	20	10.70	1.20	10.50	1.22
	21	21	139	160	20	8.00	1.05	9.60	1.24
	28	5	63	68	10	6.80	0.50	9.20	1.14

Week Ending		Specimen			TN*	A T N **		Moving Mean	
		Male	Femble	Total		Total	Male	Total	Male
1963 Jan.	4	3	34	37	5	7.40	0.60	8.20	0.84
	11	61	370	431	20	21.55	3.05	10.94	1.30
	18	28	82	110	20	5.50	1.40	10.31	1.39
	25	21	108	129	15	8.60	1.40	10.76	1.61
Feb.	1	1	111	112	20	5.60	0.05	10.31	1.49
	8	12	43	55	20	2.75	0.60	5.61	0.86
	15	7	76	83	16	5.19	0.44	5.54	0.62
	22	7	32	39	15	2.60	0.46	4.04	0.39
Mar.	1	38	197	235	20	11.75	1.90	5.57	0.85
	8	0	972	972	20	48.60	0.00	17.04	0.70
	15	52	287	339	20	16.95	2.60	20.00	1.24
	22	65	306	371	20	18.55	3.25	23.96	1.94
	29	49	292	341	15	22.73	3.27	26.71	2.28
Apr.	5	20	465	485	20	24.25	1.00	20.62	2.53
	12	30	392	422	20	21.10	1.50	21.66	2.26
	19	28	681	709	20	35.45	1.40	25.88	1.79
	26	26	582	608	20	30.40	1.30	27.80	1.30
May	3	57	585	642	20	32.10	2.85	29.76	1.76
	10	105	639	744	20	37.20	5.25	33.79	2.70
	17	68	402	470	20	23.50	3.40	30.80	3.20
	24	223	733	956	20	47.80	11.15	35.15	5.66
	31	61	443	504	10	50.40	6.10	39.72	6.48
Jun.	7	46	282	328	20	16.40	2.30	34.53	5.74
	14	59	415	474	20	23.70	2.95	34.58	5.63
	21	54	112	166	20	8.30	2.70	24.70	3.51
	28	41	121	162	20	8.10	2.05	14.13	2.50
Jul.	5	4	87	91	10	9.10	0.40	12.30	2.15
Sum.		1,844	14,659	16,503	553				

* TN=Number of trap-nights of the week.

**ATN=Average number of *Culicoides arakawai* per trap-night of the week.

臺北市附近荒川氏糠蚊季節消長之研究

一、本文係就一年來（五十一年六月至五十二年六月）在臺北市附近由誘虫燈（新澤西式）所捕獲之荒川式糠蚊（*Culicoicles arakawai* (Arakawa)），作一分析之研究，以求瞭解其季節消長模樣及其與溫度，雨量等氣候因子之關係。

二、本研究所用之材料及方法，仍依照著者五十一年「臺北市附近糠蚊類蚊類季節消長之研究」一文中所載者（見『東海學報』四卷二期）。

三、荒川氏糠蚊一年來之採集，取樣總數535次，採得標本16,503本，其中雌體14,659，雄體1,844。

四，荒川氏糠蚊之季節消長與溫度，雨量之關係，文中曾加討論。

五、五十年至五十一年間糠蚊類之季節消長，和雨量變化之可能關聯，本文有一補充說明。