

## Preliminary survey of the change in insect pests of public health importance with urbanization of kawasaki City<sup>1)</sup>

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There is a large number of literature dealing with floral and faunal changes brought by urbanization, but very few papers have been published concerning insects important for public health, although these organisms are no exceptions to the impact of urbanization. This report presents the results of our investigation on some of the medically important insects in Kawasaki City during 1974.

Kawasaki City is a belt zone, about 30 km long and 3-4 km wide, with Tokyo in the north and Tokyo Bay in the east. Administratively, the city is divided into 5 districts (Fig. 1), namely: forest, agricultural, as well as residential areas of Tama and Takatsu Wards, residential areas of Nakahara and Saiwai Wards, and commercial-industrial areas of Kawasaki Ward. Thus, urbanization is clearly shown from west to east. Our studies were made in each of these districts to find out the relationship between urbanization and insects important for public health.

### Methods and Results

#### (1) Flies

A fly station, each consisting of 5 traps, was set up in Tama, Nakahara and Kawasaki Wards respectively. The traps were placed in forests, crop fields, residential areas, parks, markets and vacant yards as

the species composition was influenced more by local, rather than by regional environmental conditions. The traps were of cylindrical metallic cages (20 cm diam., 22 cm long) each containing a fresh fish bait. Collections were made once a month from 9.00 am to 4.00 pm in July-September, 1974.

The results are shown in Table 1 and 2. No regional differences were observed in the total numbers of flies captured. The species composition in Tama and Nakahara was almost identical, but Kawasaki differed from these two areas in the percentages of Lucilini and Sarcophagidae. The numerical decrease in the latter was due to the fact the old style latrine pits, breeding places for sarcophagid flies, have given way to flush toilets. There was no significant difference in the species composition due to trap localities, although sarcophagids were rather abundant in crop fields and vacant lots. The total number of flies collected decreased in the descending order of crop fields, vacant lots, parks, forests, residential areas, markets, and industrial zones, showing that these flies tend to "disappear" with urbanization. Due mainly to the outdoor traps using fish baits, the dipteran populations captured were limited to exophilic flies only; caliphorids and sarcophagids were abundant, while muscoids were few. Further investigations using different types of traps are desired.

#### (2) Mosquitoes

A light trap (Fujihira type) each was set at 10 stations as shown in Fig. 1. Collections were made once a week at night from April to December, 1974.

The presence of faunal succession from

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Table 1. Flies collected in Kawasaki City

	Lucilini	Sarcophagidae	<i>Ophyra</i>	<i>Muscina</i>	Calliphoridae	Others	Total
Agro-forest zone (Tama W.)	942 55.3%	523 30.7	90 5.2	65 3.8	4 0.2	80 4.7	1,704
Residential zone (Nakahara W.)	853 53.5%	414 25.9	64 4.0	64 4.0	43 2.7	155 9.7	1,593
City zone (Kawasaki W.)	1,033 70.2%	211 14.3	75 5.1	71 4.8	52 5.3	30 2.1	1,472

Table 2. Flies collected in different trap sites in Kawasaki City

Trap sites	Times of trapping	Lucilini	Sarcophagidae	<i>Ophyra</i>	<i>Muscina</i>	Calliphoridae	Others	Total	No./trap
Agricultural fields	6	545	285	58	16	8	32	944	157.3
Vacant yards	6	471	237	14	25	12	97	856	142.7
Parks	9	771	250	62	47	19	53	1,202	134.0
Forests	3	166	55	19	29	0	11	280	93.3
Residences	9	474	173	45	31	36	39	798	88.7
Markets	9	326	122	22	49	16	23	558	62.0
Factories	3	75	26	9	3	8	10	131	47.0

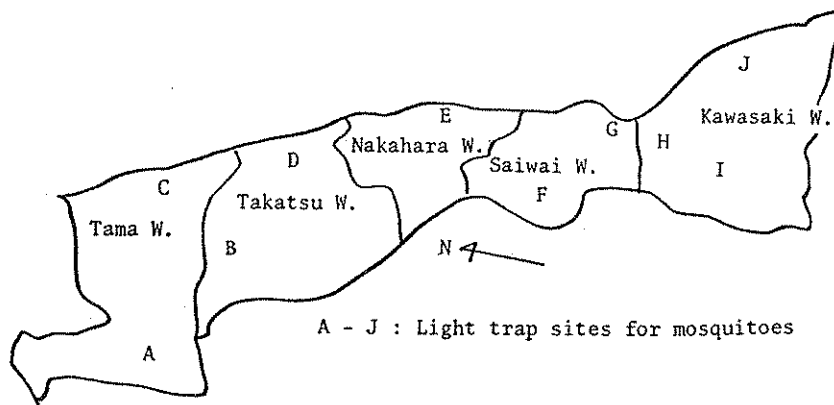


Fig. 1 Map of Kawasaki City

rural to urban areas was well illustrated in mosquitoes. In the agro-forest area, *Culex pipiens* breeding in ditches was dominant (84.5%). In addition, agricultural types such as *Armigeres subalbatus* breeding in night soil fertilizer tanks and *Culex tritaeniorhynchus* and *Anopheles sinensis* both breeding in paddy fields were present in small numbers. It should be emphasized that the number of mosquitoes caught was very large at C-G stations of the residential area, namely: 851.8 individuals in comparison with 164 at A-B stations, and 116.7 at H-J stations. The great majority of these mosquitoes was *Culex pipiens*, but a small number each of *Aedes albopictus*, *A. vexans*, and *C. tritaeniorhynchus* was also taken. The large number of the suburban type mosquitoes in this area seems to be due to the rather poor sewerage system.

At H-J stations (City zone), although *C. pipiens* was the dominant type, the number caught was rather small because of the well-developed sewerage system in this area. On the other hand, an autogenic species such as *C. pipiens molestus* may flourish with the increase of underground sewer tanks. However, due to the difficulty in distinguishing this type from *C. pipiens pallens*, we have treated these 2 as one species.

### (3) Cockroaches

From August 2 to 9, 1974, we set a total of 80 cockroach traps (Hoihoi type) as follows: one trap each in 20 farm houses (Tama and Takatsu Wards), 20 residences (Takatsu and Kawasaki Wards), 20 restaurants and

stores (Kawasaki Ward), 10 apartment houses (Saiwai Ward), and 10 offices (Kawasaki Ward).

The results are shown in Table 4. *Blattella germanica* was dominant over *Periplaneta fuliginosa* in offices, apartments, restaurants and stores, while the reverse was true in residences. In farm houses, on the other hand, *P. fuliginosa* was most abundant followed by *P. japonica*.

### (4) Black flies

Investigations of black fly distribution were made in August and September 1974 in streams and rivers in the north western part of Kawasaki City.

Black fly larvae were absent in most of the streams as they were polluted by sewer from residences, but in 2 irrigation ditches among paddy fields, the larvae and pupae of *Simulium arakawae*, a serious blood sucker, and *S. uchidai* were found breeding in small numbers.

## Discussion

From the standpoint of insect pests, Kawasaki City may be roughly divided into 4 zones: *Simulium* zone in the forest-agricultural area, *Armigeres*-*P. japonica* zone in the agricultural area, *C. pipiens*-*Sarcophagidae*-*P. fuliginosa* zone in the residential area, and *C. pipiens molestus*-*B. germanica*-*Lucilini* zone in the industrial area. However, for more precise zonation of these insects, detailed observations and analysis are required. The crucial question is the

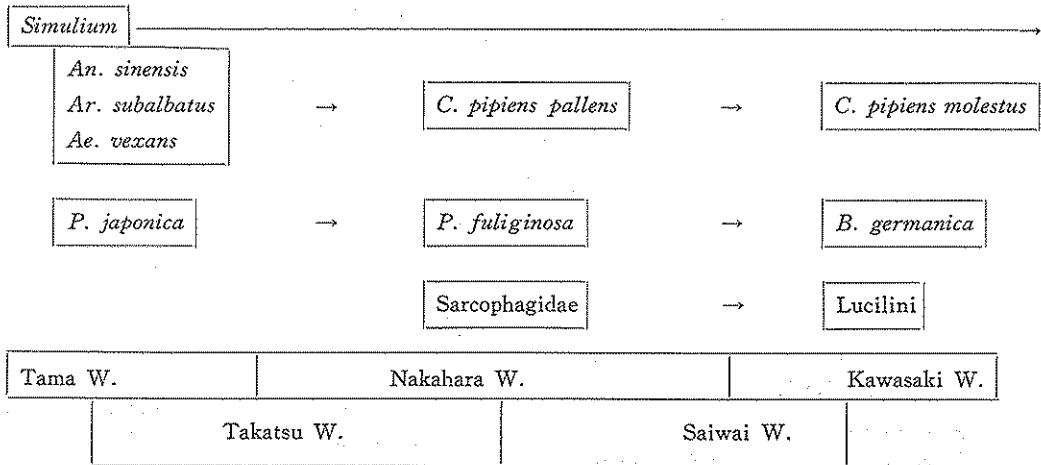
Table 3. Mosquitoes collected by light traps in Kawasaki City

Trap sites	<i>Culex pipiens</i>	<i>C. tritaeniorhynchus</i>	<i>Aedes albopictus</i>	<i>Armigeres subalbatus</i>	<i>Aedes vexans</i>	<i>Anopheles sinensis</i>	<i>Culex vorax</i>	Total
A	226	6	5	31	2	1	0	
B	102	5	5	2	1	2	0	
total	328	11	10	33	3	3	0	388
average	164	5.5	5.0	16.5	1.5	1.5	0	
%	84.5	2.8	2.6	8.5	0.8	0.8	0	
Agro-forest zone								
C	167	1	0	1	0	1	0	
D	1,307	12	3	0	1	1	0	
E	741	21	5	0	1	0	0	
F	1,172	45	5	1	3	0	0	
G	872	11	31	0	3	0	0	
total	4,259	90	44	2	8	2	0	4,405
average	851.8	18.0	8.8	0.4	1.6	0.4	0	
%	96.6	2.0	1.0	0.1	0.2	0.1	0	
Residential zone								
H	91	6	4	0	1	0	0	
I	109	3	3	0	0	0	1	
J	150	7	1	0	0	0	0	
total	350	16	8	0	1	0	1	376
average	116.7	5.3	2.7	0	0.3	0	0.3	
%	93.1	4.2	2.2	0	0.2	0	0.2	
City zone								

Table 4. Cockroaches collected in houses in Kawasaki City

	Offices	Apartments	Restaurants & stores	Residences	Farm houses	Total
<i>B. germanica</i>	64	106	616	31	0	817
<i>P. fuliginosa</i>	33	36	79	158	38	344
<i>P. japonica</i>	0	0	1	0	11	12

Table 5. Schema of insect pests changing with urbanization



methods of sampling; light or cage traps, for instance, capture some of the species present in the trap sites, but these may not represent the actual insect pest fauna of the area. The problem is further complicated by insects like cockroaches, the habitat segregation of which depends on the architectural differences of the buildings they inhabit. All these and many other problems must be taken into consideration for future investigations of this type.

Reference

- 1) K. Ogata: What is pest control. The life and Environment, 17(6): 19-28, 1972.
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都市化に伴う衛生害虫相の変化  
—川崎市の場合—

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都市化に伴って生物相が変化を受けるとい報告は多

いが、衛生動物相における実証的データは少ない。1974年、西部から東部への段階的な都市化がみられる川崎市において、ハエ、カ、ゴキブリ、ブユを対象に調査を実施した。その結果、川崎市は衛生動物相によって、次の4つに区分されるように思われた。

ブユ区：多くは森林や畑地から成り、汚染のほとんどない流水にブユが発生する。

オオクロヤブカーヤマトゴキブリ区：農家などを主体にした地区で、野生性の強いオオクロヤブカやヤマトゴキブリが多くみられる。

アカイエカーニクバエークロゴキブリ区：いわゆる一般住宅地で、側溝などをもち、あまり環境整備は進んでいない。

チカイエカーチャバネゴキブリ—キンバエ区：最も都市化された地区で、とくにビル生息性のチャバネゴキブリやチカイエカが多くみられる。

しかし、以上のような区分については、方法論的に問題が残る、各種についての、もっと細かな検討が必要であると思われた。