

Reprinted from the Annual Report of
Korean Culture Research Institute,
Ewha Womans University, Seoul Korea,
Vol. I, December 1959.

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Intertypic Variations of 6 kinds of Bristles on male genitalia in

Drosophila auraria Peng

by Y.J. Chung, S.H. Oh and B.J. Rho

Introduction

Since *D. auraria* Peng was described by F.T. Peng¹⁾ in China, 1937, Kikkawa & Peng(1948) and Ten, Hsu & Sheng(1949)²⁾ reported that this species was collected at several localities of China. In Japan, since the species was collected and reported by Kikkawa & Peng(1938), there have been many collection records of it in various localities. In Korea, it has been collected and reported by drosophilid investigators at various localities.³⁾ Now *D. auraria* Peng is the most dominant species of Korean drosophilidfauna in the field collections.

However, Kurokawa(1952) and Okada(1954, 1956) reported that the species can be divided into 3 types by pubescency of hexasternum, forms of phallic organs, periphallic organs, egg-guides, costal index, that is, (1) male hexasternum is pubescent in Type-A, bare in Type-B, and Type-C shows pubescent hexasternum but it is less pronounced than in Type-A(Kurokawa, 1952), (2) as to male periphallic organs, caudal flap of genital arch is less sharply pointed in Type-A, is entirely pale yellow and obtusely pointed in Type-B, in Type-C, it is sharply pointed (Okada, 1956, see Fig. 1), (3) in phallic organs of male, novasternum is without submedian spines and anterior paramer has sensilla medially, aedeagus has lateral claws in Type-A, or hasn't in Type-C, but novasternum has submedian spines in Type-B(Okada, 1954, see Fig. 2), (4) in egg-guides, apical portion of the lobe is quadrate in Type-A, but it is triangular and this portion, very large

1) Nan Chang, Sanhu, Ningpo.

2) Formosa, Taiho, Ishan, Liuchow, Tsunyi, Meitan, Hangchow.

3) Quelpart Is., Kwang-Neung, Mt. Oh-Dai, Dagelet Is., Kang-Wha Is., Mt. Mootung, I-Ri, Hong-Neung (Seoul), Mt. Soree, Mt. Chiree, Mt. Hanra, Mt. Taipaik, Kong-Ju, Mt. Sok-Li, Mt. Tobong, Mt. Boolam, Sekum-Jung (Seoul), So-Se, An-Yang, Mt. Yong-Moon, Chung-Neung (Seoul).

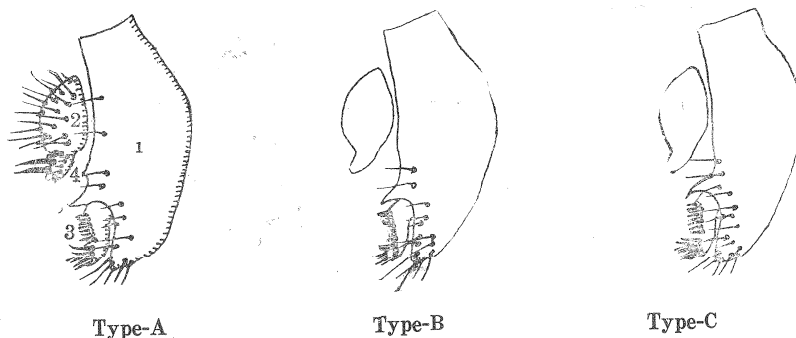


Fig. 1. Diagram showing intertypic differences of male genitalia (periphallal organ): 1. genital arch, 2. anal plate, 3. primary clasper, 4. secondary clasper, 5. caudal flap.

in Type-C or smaller in Type-B (Okada, 1956, see Fig. 3), (5) costal index in both sexes of Type-B is larger than of Type-A (Kurokawa, 1952).

In addition, although ecological and geographical differences were not sufficiently surveyed, in general, Type-A is found abundantly near human habitation but Type-B, at remote localities far from human habitation and Type-C, at overlapping areas of Type-A and -B. Takada (1954) surveyed the differences in distribu-

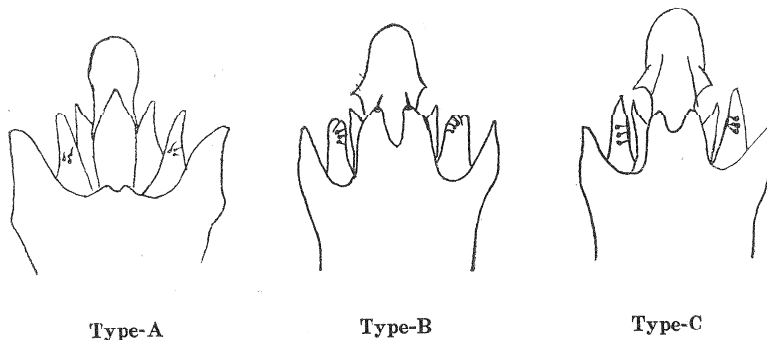


Fig. 2. Diagrams showing intertypic differences of phallic organs.

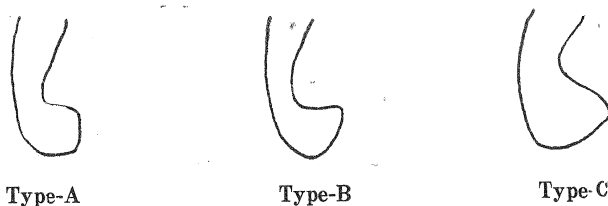


Fig. 3. Diagrams showing intertypic differences of egg-guides.

tion by altitude of Type-A and Type-B and the result was that Type-A were abundant around the places of low altitude, and tended to decrease in number with elevation, while an inverse relation occurred in Type-B. Karyotypes of the species were investigated by Kikkawa & Peng(1938).⁴⁾ No intertypic differences were found in them. Kurokawa(1956) also investigated about population genetical problems in 3 types of the species by examining numbers of egg-laying and crossing tests and so on. Now *D. auraria* Peng is significant species in a stand point of taxonomy and population genetics.

Accompanying the development of taxonomical, genetical and evolutionary knowledge in the Family Drosophilidae, the criteria for classification of drosophilid flies have been extended to numerous characters, including the external and internal morphology of the imagines, eggs, puparia, karyotypes, and behavior of larvae and adults. Of these characters, studies of the genitalia the family have been carried out largely in relation to genetical works. However, only a few scattered workers⁵⁾ called attention to the importance of the genitalia in relation to systematics until the surveys of the external male genitalia of more than 170 species of the family were done from a comparative point of view by Hsu, 1949 and Okada and others have emphasized it as well as other characters. Now male genitalia in drosophilids is a good character for classification. In description of genitalia, shapes and bristle-numbers of genital arch, forms and teeth-numbers of anal plate and claspers are taken as criterias. Male genitalia of *D. auraria* Peng consists of genital arch which has a distinct caudal flap, comparatively small anal plate, with tip teeth, primary and secondary claspers.

Statistical studies of the quantitative characters of the Family Drosophilidae were done by Moriwaki & Okada(1952) Okada(1959) and Antonio Prevosti(1955 a, 1955 b) as far as the authors have literatures as to drosophilid survey in hands. Although the quantitative characters are apt to be less highly estimated than the qualitative ones as the criteria for taxonomy, the quantitative one and their statistical studies will be significant in population systematics.

Here the present authors intend not only to examine statistically the significant differences of kinds of bristles or teeth on male genitalia in 3 types of *D. auraria* Peng, but also to discuss whether they will be possible to be the criteria for classifying 3 types of the species or not.

4) V-shaped: 2pairs, rod-shaped:1, dot's: 1; 2n=8

5) Kikkawa & Peng (1938), Stalker & Spencer (1939), Buzzati-Traverso('43), Pomini ('40) Streinger ('40), King ('47) and Salls ('47)etc.

The authors desire to express their sincere thanks to Professors H.S. Kim⁶⁾ and S.Y. Park⁷⁾ for kind helps given upon the present works.

Materials and Methods

The materials were chosen mostly from the alcoholic specimens collected in nature during a period ranging from May 1957 till September 1959 at 8 localities⁸⁾ by the authors and some were taken from the living stocks maintained in the genetical laboratory, Dept of Biology, Ewha Womans University. 173 males were used in the present works. After flies were divided into 3 types mainly by their phallic organs, they were dissected in phenol solution on a hole-slide glass and internal apparatus was torn off and the genitalia saved for study. The genitalia was cut into two halves by the use of fine hand-made knife and then these halves were boiled in NaOH solution(10%) on a slide glass resulting in a elimination of muscles attached to the genitalia and were passed through creosote and transferred into the mounting medium(Canada balsam). Consequently 173 slide preparations involving Type-A, 47, Type-B, 26 and Type-C, 100 were made. The number of 6 kinds of bristles or teeth on male genitalia of 3 types of the species bristles and tip teeth on anal plate, bristles of genital arch, primary teeth and marginal teeth on primary clasper, teeth of secondary clasper were counted under the magnifications: 15 X 10. or 15 X 40. In statistical management, F-tests were done at first and t-tests were followed.

Observations and Results

The results of observations are shown in Tables 1—3. Mean values, variations (Distributions), modes and their frequencies(%) of bristles or teeth in each of 3 types were calculated and t-values on every 2 types in 3 types (AB, BC, CA) were computed, finally significance tests were done among types. The results were summarized in Table 4 and Figs. 4—9.

6) When collections of the species for materials of the present works were made, he was acting director of Dept. of Biology, Ewha Womans University. Now he is in United States.

7) Associate Professor of Korea University.

8) Kwang-Neung, Quelpart Is., Mt. Oh-Dai, Dagelet Is., Kang-wha Is., I-Ri, Hong-Neung (Seoul) and Huk-San Is

Table 1. Bristle- or teeth-numbers in Type-A

Items No.	Bristles of anal plate	Tip teeth of anal plate	Bristles of geni- tal arch	Primary teeth of primary clasper	Marginal teeth of primary clasper	Teeth of secondary clasper	Localities collected
1.	16	1	18	7	7	3	Sam-Sung- Hyun (Quelpart Is.)
2.	18	2	18	7	8	3	
3.	18	4	19	6	7	3	
4.	20	4	20	7	8	3	
5.	18	2	16	6	7	2	
6.	20	3	19	6	7	2	//
7.	21	3	21	6	7	3	//
8.	18	4	19	6	7	3	//
9.	20	3	19	6	7	3	//
10.	20	2	16	6	9	3	//
11.	20	4	20	6	8	2	//
11.	20	2	20	7	8	2	//
13.	18	3	23	7	10	2	//
14.	21	2	20	7	8	3	Hong- Neung (Seoul)
15.	16	1	20	5	7	2	
16.	18	2	23	7	7	2	//
17.	19	3	25	8	7	3	//
18.	19	2	19	7	7	3	//
19.	16	2	20	8	7	3	I-Ri Kwang- Neung Ye-Ri (Huk-San Is.)
20.	16	2	20	9	8	3	
21.	17	1	22	6	7	3	//
22.	16	2	21	7	8	2	//
23.	17	2	23	6	8	3	//
24.	18	2	20	7	7	2	//
25.	18	1	18	9	7	3	//
26.	18	2	19	7	7	3	//
27.	17	1	22	8	7	3	//
28.	16	1	19	7	7	3	//
29.	16	2	19	6	7	3	//
30.	17	2	20	7	6	3	//
31.	16	2	19	7	7	2	//
32.	17	2	23	9	8	2	//
33.	17	2	21	6	7	3	//
34.	18	1	18	8	7	3	//
35.	18	2	21	6	7	2	//
36.	18	1	23	7	7	3	//
37.	17	2	20	6	7	3	//
38.	17	2	20	6	7	3	//
39.	17	1	19	7	7	3	//
40.	18	2	20	7	7	3	//
41.	19	2	18	7	7	2	//
42.	16	1	18	8	7	3	//
43.	17	2	24	7	7	3	//
44.	17	2	20	7	7	3	//
45.	19	2	21	7	7	3	//
46.	18	2	23	7	7	3	//
47.	17	2	21	7	7	3	//
Total.....	836	97	947	323	335	128	
\bar{x}	17.79	2.06	20.15	6.87	7.13	2.72	

6 Intertypic Variations of 6 kinds of Bristles on Male genitalia in *Drosophila auraria* Peng

Table 2. Bristles- or teeth-numbers in Type-B

Items No.	Bristles of anal plate	Tip teeth of anal plate	Bristles of genital arch	Primary teeth of primary clasper	Marginal teeth of primary clasper	Teeth of secondary clasper	Localities collected
1.	20	2	10	7	8	3	Kwang-Neung
2.	16	2	23	6	9	3	"
3.	18	2	19	7	7	3	"
4.	18	2	22	8	9	3	"
5.	18	2	21	7	7	3	"
6.	17	3	17	6	11	3	"
7.	17	3	18	7	7	3	"
8.	17	1	18	7	8	3	"
9.	15	2	18	7	8	3	"
10.	16	1	19	8	7	3	"
11.	18	1	14	6	7	3	"
12.	17	2	20	7	8	3	"
13.	15	1	18	8	6	3	"
14.	17	1	18	7	7	3	"
15.	16	1	17	6	8	3	"
16.	17	2	19	6	6	3	"
17.	17	2	17	6	6	3	"
18.	16	2	20	7	8	3	"
19.	15	1	25	6	8	2	Mt. Sung-In (Dagelet Is.)
20.	18	2	23	7	6	2	Chun-Boo
21.	16	3	18	6	6	2	(—)
22.	19	2	25	8	7	2	"
23.	17	1	19	6	8	3	Kwang-Neung
24.	16	1	19	6	7	2	"
25.	14	2	14	9	8	3	"
26.	14	2	12	6	6	3	"
Total.....	435	46	483	178	193	73	
\bar{x}	16.74	1.77	18.58	6.85	7.46	2.81	

Table 3. Bristle or teeth-numbers in Type-C

Items No.	Bristles of anal plate	Tip teeth of anal plate	Bristles of genital arch	Primary teeth of primary clasper	Marginal teeth of primary clasper	Teeth of secondary clasper	Localities collected
1.	17	2	20	7	7	2	Kang-Wha Is.
2.	14	2	17	7	8	2	"
3.	15	2	19	7	8	2	"
4.	18	2	23	8	7	2	"
5.	16	2	19	7	6	2	"
6.	17	2	19	8	7	2	"
7.	17	2	21	6	6	2	"
8.	17	3	21	7	7	2	"
9.	17	2	23	7	7	2	Hong-Neung (Seoul)
10.	18	1	23	7	7	2	"
11.	18	2	25	8	7	3	"
12.	16	2	25	8	8	2	"
13.	17	2	24	6	9	3	"
14.	16	2	23	7	8	3	"
15.	17	2	21	7	8	3	"

Items No.	Bristles of anal plate	Tip teeth of genital arch	Bristles of geni- tal arch	Primary teeth of primary clasper	Marginal teeth of primary clasper	Teeth of secondary clasper	Localities collected
16.	21	2	25	6	5	3	//
17.	17	2	21	6	9	2	//
18.	20	2	23	9	8	3	//
19.	18	2	22	7	8	2	//
20.	18	2	25	6	8	3	//
21.	17	2	20	7	6	2	//
22.	16	2	17	7	8	3	//
23.	18	2	23	7	8	2	//
24.	16	2	17	7	5	3	//
25.	17	2	26	8	7	3	//
26.	16	2	19	9	8	3	//
27.	17	2	21	6	7	3	//
28.	16	2	20	6	7	2	//
29.	19	3	21	7	6	2	Kwang-Neung
30.	17	2	22	7	9	3	//
31.	17	2	20	7	7	2	Kwan-Em
32.	15	3	21	8	6	2	Temple
33.	16	3	19	7	7	2	(Quelpart
34.	16	2	16	7	7	2	Is.)
35.	15	2	23	8	7	2	//
36.	17	2	17	7	6	2	Sam-Sung-
37.	16	3	20	7	7	3	Hyul
38.	19	3	21	8	7	2	(Quelpart
39.	18	3	22	8	8	3	Is.)
40.	19	3	20	7	6	3	//
41.	17	3	20	6	6	3	//
42.	20	2	22	7	6	2	//
43.	18	1	21	6	7	2	//
44.	17	2	21	6	6	2	//
45.	17	3	20	6	5	3	//
46.	17	1	21	6	7	3	//
47.	16	3	15	7	6	3	//
48.	18	3	19	7	7	2	Chun-Boo
49.	21	3	20	7	7	2	(Dagelet Is.)
50.	14	2	16	6	6	2	//
51.	19	2	25	8	7	2	Mt. Sung-In
52.	17	2	25	9	8	3	(Dagelet Is.)
53.	16	2	21	8	8	2	//
54.	16	2	11	7	6	3	//
55.	17	2	23	7	7	2	//
56.	18	4	21	7	7	2	//
57.	17	3	19	8	8	3	//
58.	20	2	22	7	7	3	//
59.	17	3	21	8	8	3	//
60.	20	3	19	6	7	3	//
61.	20	3	22	7	7	3	//
72.	17	1	21	7	7	3	//
63.	19	1	22	8	7	3	//
64.	20	1	21	6	7	2	//
65.	18	1	22	6	7	2	//
66.	20	3	20	8	6	3	//
67.	17	2	25	8	6	3	//

8 Intertypic Variations of 6 kinds of Bristles on male genitalia in *Drosophila auraria* Peng

Items No.	Bristles of anal plate	Tip teeth of anal plate	Bristles of genital arch	Primary teeth of primary clasper	Marginal teeth of primary clasper	Teeth of secondary clasper	Localities collected
68.	20	2	23	6	7	2	//
68.	16	3	20	7	6	2	//
70.	18	2	17	7	7	2	//
71.	17	1	22	6	7	3	//
72.	18	2	21	6	7	2	//
73.	19	2	22	7	7	2	//
74.	16	2	19	7	7	2	//
75.	16	2	19	7	7	3	//
79.	18	3	19	6	6	3	//
77.	17	1	19	8	6	2	//
78.	17	1	18	5	6	3	//
79.	18	3	23	7	8	3	//
80.	17	2	23	8	7	3	//
81.	15	2	21	6	6	2	//
82.	17	1	21	6	7	3	//
83.	16	3	20	8	6	3	//
84.	18	3	21	7	6	3	//
85.	15	1	20	6	6	2	//
86.	18	3	21	7	6	3	//
87.	16	2	24	8	8	1	//
88.	17	2	22	8	5	3	//
89.	18	3	20	8	7	3	//
90.	15	2	22	6	6	2	//
91.	11	2	16	5	6	2	//
92.	14	2	13	6	6	2	//
93.	16	2	20	7	6	3	Tai-Ha (Dagelet Is.)
94.	17	2	17	6	6	2	//
95.	16	1	20	7	6	2	//
96.	16	2	18	7	6	2	//
97.	17	2	18	5	6	3	//
98.	16	1	16	7	6	2	Mt. Nan (Dagelet Is.)
99.	16	2	18	7	5	2	//
100.	15	2	21	8	7	2	//
Total	1713	213	2055	700	682	240	
\bar{x}	17.13	2.13	20.68	6.93	6.82	2.46	

Table 4. Mean values, variations, mode values and significance of differences of 6 kinds of bristles or teeth in 3 types.

Items	Type	A	B	C	t-value
	N	47	26	100	Total—173
Anal plates	Bristles	\bar{x} 17.79±1.42 Variation 16-21 Mode(%) 17-18(55.3)	16.74±1.46 14-20 16-18(73.7)	17.13±1.27 11-21 17-(32.0)	AB,2.98(P<0.01)## BC,1.35(P>0.1) # CA,3.04(P<0.1)##
	Tip teeth	\bar{x} 2.06±0.82 Variations 1-4 Mode(%) 2(59.5)	1.77±0.84 1-3 2(53.84)	2.13±0.60 1-4 2(60.0)	AB,1.38(P>0.1) BC,0.55(P>0.5) CA,0.6(P>0.5)
Genital arch	Bristles	\bar{x} 19.47±2.06 Variations 16-25 Mode(%) 19-20(48.9)	18.56±3.53 10-25 18-19(42.3)	20.68±2.12 15-26 20-21(38)	AB,1.1(P>0.2) BC,1.33(P>0.1) CA,3.28(P<0.01)##

Type		A	B	C	t-value
N		47	26	100	Total—173
Primary clasper	Primary teeth	\bar{x} 6.02±1.23 Variations 5-9 Mode(%)	6.85±0.83 6-9 7(48.9)	6.93±0.86 5-9 9-8(95)	AB, 2.95(P<0.01)## BC, 5.19(P<0.01)## CA, 0.43(P>0.7)
	Marginal teeth	\bar{x} 7.28±0.65 Variations 6-10 Mode(%) 7(74.4)	7.46±1.17 6-11 7-8(65.4)	6.82±0.89 5-9 6-7(74)	AB, 0.63(P>0.5) BC, 2.84(P<0.01)## CA, 2.9(P<0.01)##
Secondary clasper	teeth	\bar{x} 2.72±0.45 Variations 2-3 Mode(%) 3(72.3)	2.81±0.65 2-3 3(80.76)	2.46±0.51 2-3 2(54), 3(46)	AB, 0.06(P>0.9) BC, 2.89(P<0.01)## CA, 2.9(P<0.01)##

Judging from t-values, intertypic differences of bristles on anal plate are significant between Types A and B, C and A; bristles on genital arch, between C and A; primary teeth on primary clasper, between A and B, B and C; marginal teeth on primary clasper, between C and A, B and C; teeth on secondary clasper, between B and C, C and A. But others are not significant, especially in the case of tip teeth on anal plate, intertypic differences are not significant at all. Distributions of teeth on secondary clasper are in accordance with each other among 3 types but others show a little difference, though not distinct. Modes of tip teeth on anal plate show the accordance intertypically, others do not and as to teeth on secondary clasper, "3" teeth occur most frequently in Type-A(72.3%) and B(80.76%), but in Type-C, "2" and "3" teeth occur in the rate "1:1"(46%)

In brief, significant differences of all kinds of bristles or teeth are not distinct intertypically, though there occurred significant differences between some two types, not among 3 types.

Discussions

In Hsu's, descriptions(1949) on the genitalia in *D. auraria* Peng, number of tip teeth on anal plate, bristles of genital arch, primary teeth and marginal teeth on primary calasper, teeth on secondary clasper were described as 2, 26, 8, 7-8 and 2-3 respectively.(See Table 5.) There are slight differences between his descriptions and the results of the present observations, no matter what types in the species he referred to. As the Table 5 shows there occur considerable differences between his and the present one in the number of bristles on genital arch and primary teeth on primary clasper, though the number of tip teeth on anal plate, marginal teeth on primary clasper and teeth on secondary clasper in his descriptions are in accordance with the present results.

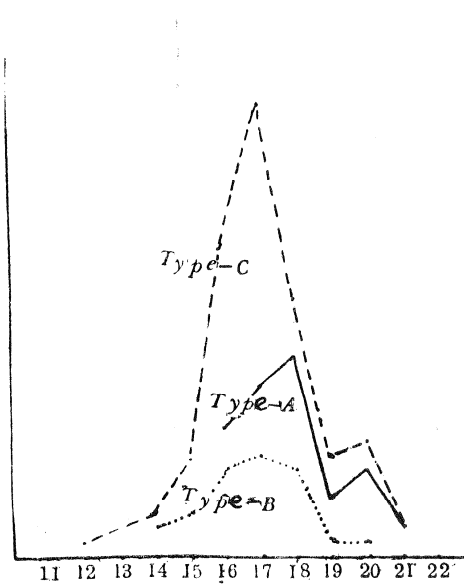
Table 5. Comparisons of Hsu's descriptions and the present results in the number of bristles or teeth on genitalia in *D. auraria* Peng

	Bristles of anal plate	Tip teeth of anal plate	Bristles of genital arch	Primary teeth of primary clasper	Marginal teeth of primary clasper	Teeth of secondary clasper
Hsu's description	*	2	26	8	7-8	2-3
Present results (\bar{x})	A. 17.79	2.06	19.47	6.02	7.28	2.72
	B. 16.74	1.77	18.58	6.85	7.46	2.91
	C. 17.13	2.13	20.68	6.93	6.82	2.46

*In Hsu's descriptions, the number of bristles of anal plate were not concerned.

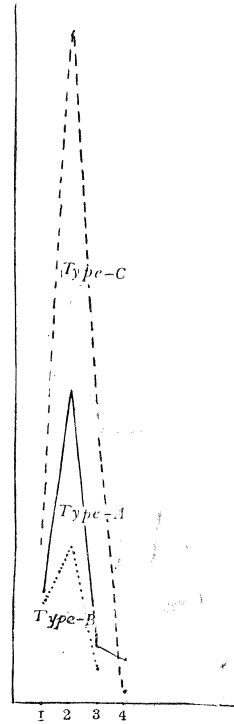
According to Suzuki's works, two conditions should be necessary in what a certain character is able to be the criteria for classification: 1) the observation of the criteria should be easy, 2) the criteria should be stable in a certain limited range. The process of making slides preparations of genitalia for counting of bristles or teeth is rather complicated, but the counting of bristles or teeth are able to be done under the comparatively low magnifications: 150 X or 600 X. This fact satisfies the first condition mentioned above, although not so sufficiently. Secondary, significant differences of all kinds of bristles or teeth that were dealt in the present works are not distinct among types in the species as mentioned above, then these quantitative characters can not be regarded as clear-cut criteria for classification of the types in *D. auraria* Peng as might have been expected. Therefore, this fact does not satisfy the 2nd condition. By the way, such investigation as the present work has significant in the view-point of population systematics and population genetics.

Authors recognize the present work to be not so satisfactory, namely, 100 members of Type-C were taken as materials in the present observations, in other hand, only 47 members of Type-A and 26 of Type-B were used by the reason of members of flies for the the materials were poorly collected by the authors so far. Significance in the geographical differences was not dealt. Finally further genetical problems were not traced. Accordingly, the present works should be supplemented perfectly sometime.



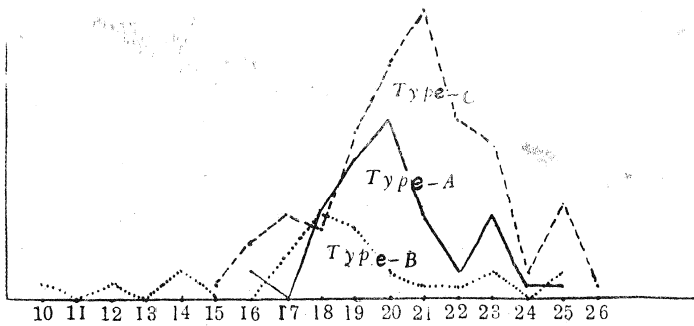
—Numbers of bristles—

Fig. 4. Variations of bristles on anal plate in 3 types of *D.auraria* Peng.



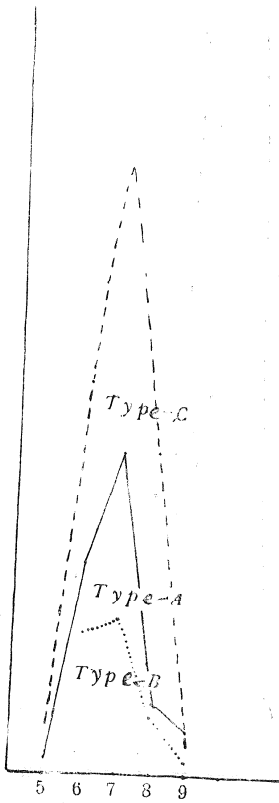
—Numbers of teeth—

Fig. 5. Variations of tip teeth on anal plate in 3 types of *D. auraria* Peng.

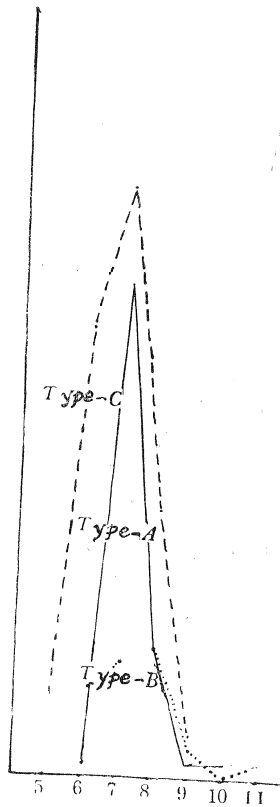


—numbers of bristles—

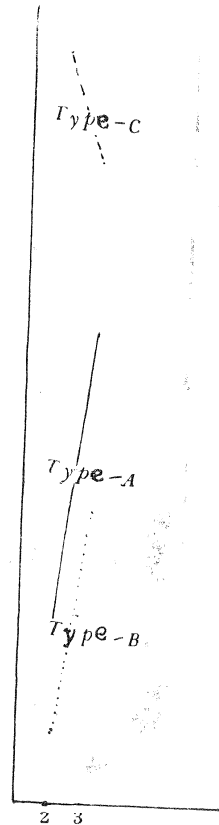
Fig. 6. Variations of bristles on genital arch in 3 types of *D.auraria* Peng.



—numbers of teeth—
 Fig. 7. Variations of primary teeth on primary clasper in 3 types of *D. auraria* Peng.



—numbers of teeth—
 Fig. 8. Variations of marginal teeth on primary clasper in 3 types of *D. auraria* Peng.



—numbers of teeth—
 Fig. 9. Variations of teeth on secondary clasper in 3 types of *D. auraria* Peng.

Summary

D. auraria Peng is divided into 3 types and is a significant species in surveys of population systematics and population genetics.

Male genitalia of this species is an important criteria for taxonomy.

The authors observed 6 kinds of bristles or teeth: bristles on anal plate, tip teeth on anal plate, bristles on genital arch, primary teeth and marginal teeth on primary clasper and teeth on secondary clasper of 47 members of Type-A, 26 of -B and 100 of -C of the species chosen from the alcoholic specimens collected in nature during a period ranging from May 1957 to September 1959 or from the stocks maintained in the

genetic laboratory, Dept. of Biology, Ewha Womans University to examine statistically the significant differences of them among 3 types and also to discuss whether they will be possible to be the criteria for intertypical classification or not.

As the results of observations, intertypic differences of tip teeth on anal plate are not significant at all. In others, even though there occurred significant differences between some 2 types, they are also insignificant among 3 types. In brief, significant differences of bristles or teeth concerned in the present works are not distinct intertypically, consequently these quantitative characters are not to be regarded as a clear-cut criteria for classification of the types of *D. auraria* Peng.

By the way, there are slight differences between Hsu's descriptions (1949) of the bristles or teeth concerned here and the present results.

摘 要

1. *D. auraria* Peng 은 A,B,C 3型으로 나눌수 있는데 本種은 分類學的 및 集團遺傳學的研究의 좋은 材料이다.
2. Drosophilidae의 male genitalia는 分類學的研究의 重要한 標徵으로 되어 있다.
3. 著者들은 1957年 5月부터 1959年 9月까지 南韓 8個處에서 採集된 drosophilid fly 中の 本種 3型의 genitalia slide preparation 173枚를 作成하여 그 6種의 剛毛 即 1) anal plate bristle, 2) 그 tip teeth, 3) genital arch의 bristle, 4) primary clasper의 primary teeth, 및 5) marginal teeth, 와 6) secondary clasper의 teeth 數를 觀察하여 이들의 3型間에 있어서의 有意의 差를 檢定調査하고 이들이 3型을 區別하는 좋은 criteria가 될는지의 如否를 檢討하였다.
4. anal plate의 tip teeth는 三型間에 서로 有意의 差는 完全히 不數 없었고, 그 他에 있어서 A,B,C, 中 어느 2型間에서는 그 有意의 差를 認定할 수 있으나 3型間의 全體의인 有意의 差는 不數 없었으니 要는 本研究에서 取扱되는 6種의 形質의 3型間에 있어서의 뚜렷한 有意의 差는 不數 없으며 따라서 이들이 3型을 分類하는 좋은 criteria는 不된다고 본다.

本研究結果에서 나타난 剛毛數는 Hsu(1949)의 記錄과 若干의 差異를 나타내고 있다.

5. 本研究는 다음과 같은 未備한 點이 있으니 即 本研究에서 取扱된 A型(47)과 B型(26)이 C型에 比하여 훨씬 적었다는 것(採集個體不足으로 因하여). 採集地에 따르는 有意性檢定을 不했다는 點, 그리고 交雜實驗等으로 集團遺傳學의 問題를 追究하지 않았다는 點 等인데 이런 問題를 檢討補充하는 研究가 계속될 것이 要望된다.

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