

No. 6441  
28  
T. OKADA

謹呈 岡田豊日先生

渡部

*Drosophila curvispina*, a New Species of the *quinaria*  
Species-Group (Diptera, Drosophilidae)

Hide-aki WATABE<sup>1)</sup> and Masanori J. TODA<sup>2)</sup>

<sup>1)</sup>Biological Laboratory, Sapporo College, Hokkaido University  
of Education, Sapporo, 064 Japan. <sup>2)</sup>Institute of Low  
Temperature Science, Hokkaido University,  
Sapporo, 060 Japan

**Abstract** A new species, *Drosophila curvispina*, is described from Hokkaido and Honshû in comparison with its close relative, *D. unispina* Okada.

Since several years ago, we have been aware that two different forms are included in *Drosophila unispina* OKADA, 1956. These two forms, which are named here tentatively C and U, are clearly distinguishable from each other by the differences in male and female genitalia. WAKAHAMA (1956) described "the C-type of Japanese *D. transversa*" and figured male genitalia of the C form. Then, OKADA (1956) described this type as a new species, *D. unispina*. However, his figure of male genitalia seems like the U form.

Recently Dr. OKADA kindly examined the holotype (♂) of *D. unispina* in comparison to the two forms, and informed us that the holotype belongs to the U form. This paper resolves the taxonomic confusion concerning *D. unispina* by describing the C form as a new species.

*Drosophila curvispina* n. sp.

(Japanese name: Ezohoshi-shôjôbae)

♂, ♀. Body length: ♂ about 2.8 mm, ♀ about 3.1 mm. Body generally yellowish brown.

Head: Eye red, with pile yellow and sparse. Antenna with 2nd segment yellowish brown, bearing 2 long bristles, 3rd grayish, about 1.9 times as long as wide. Arista with 8 branches, upper 5 and lower 3 besides a terminal fork. Frons brown, medially lighter, about half as broad as head. Palpus yellowish brown, with 2 or 3 relatively long bristles. Cheek pale brown, very narrow, about 1/7 as broad as the greatest diameter of eye. Carina broad, high, wider below. Anterior reclinate orbitals (Orb2) minute, about 1/5 as long as posterior reclinate orbital (Orb1). Proclinate orbital (Orb3) about 7/10 as long as Orb1. 2nd oral bristle (Or2) thin, short, about half as long as 1st oral (Or1).

Thorax: Mesoscutum and scutellum yellowish brown. Thoracic pluera brown. Humerals 2, equal in length. Acrostichal hairs in 6 rows. Cross distance of dorsocentrals about half the length distance. Anterior dorsocentrals about

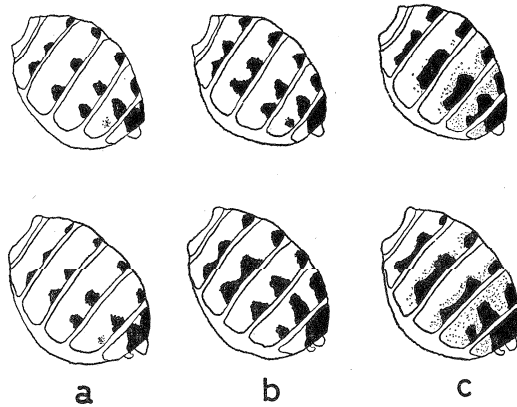


Fig. 1. Abdominal color patterns in *D. curvispina*. Upper, Males; lower, females.

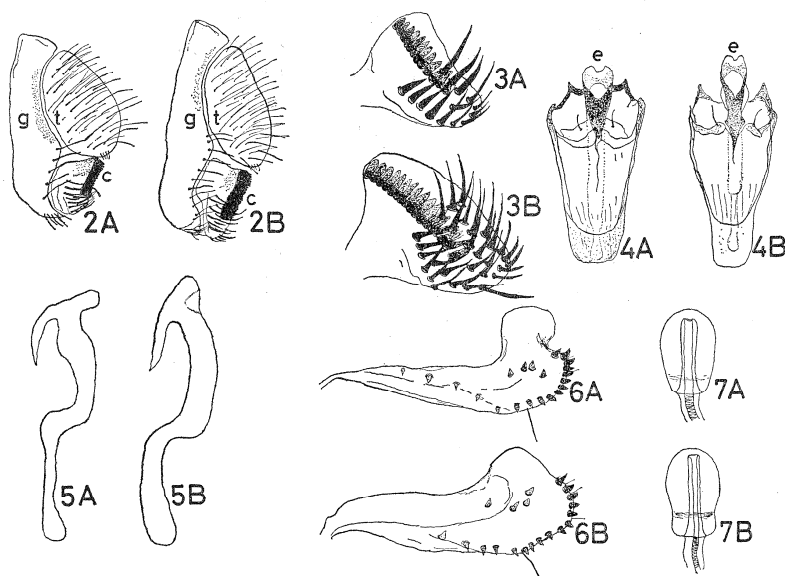
1.7 times of the length distance. Anterior scutellars parallel. Sterno index about 0.6. Legs light brown, with preapicals on all tibiae, and apicals on fore and middle. Fore femur with 9 long hairs. Wing hyaline, but slightly brownish, with anterior and posterior cross-veins fuscous.  $C_1$  bristles 2, unequal in thickness. Number of small bristles on  $C_3$  about 15. Wing indices: C about 3.3, 4C about 0.7, 4th vein about 1.5, 5x about 1.2,  $C_3$  fringe about 0.4. Halteres whitish yellow.

Abdomen: Whitish yellow. Tergites brownish yellow, darker marginally, with two dark brown or black patches on each side of 2nd to 5th tergites, and with a single large patch on the median part of 6th. However, the abdominal color pattern is quite variable, owing to the intensity of melanization (Fig. 1): the lighter patterns with spot-patches (Fig. 1a, b) frequent in summer population, the darker patterns with band-patches (Fig. 1c) frequent in overwintering population.

Periphallalic organs (Fig. 2A): Cercus pale yellow, oval, with about 44 long hairs including several dense hairs along its lower margins. Epandrium dark brown, apically darker and slightly tapering, with about 11 long hairs; upper half portion bare. Surstylus (Fig. 3A) semi-circular; primary teeth apically blunt, black, about 12 in number; secondary teeth apically pointed, black, about 14 in number. Decasternum pale yellow, quadrate, distally broaden and concave, apically divergent.

Phallic organs (Fig. 4A): Aedeagus yellowish brown, apically with a large darker recurved spur; anterior part of the spur appearing triangular in ventral view (Fig. 4A), and strongly curved in lateral view (Fig. 5A); aedeagal longitudinal stalk swollen submedially, and attaching to the spur at submedian portion of the spur (Fig. 5A). Anterior paramere with a few sensilla, fused to novasternum. Posterior paramere obscure. Novasternum semicircular, with a submedian spine. Hypandrium oblong, with round tip.

Ovipositor (Fig. 6A) brown, dorsodistally darker, proximally pale, approximately right-angled at the caudo-dorsal tip, strongly expanded rectangularly at dorso-



Figs. 2-7. Male and female genitalia of *D. curvispina* (A) and *D. unispina* (B). — 2, Periphallal organs; 3, surstylus; 4, phallic organs (ventral view); 5, aedeagus (lateral view); 6, ovipositor; 7, spermatheca; g, epandrium; c, surstylus; t, cercus; e, aedeagus.

distal portion, and bearing about 17 marginal and 4 discal teeth. Spermatheca (Fig. 7A) yellowish brown, sclerotized, elongated dome-shaped, basally narrow, not constricted at the submedian part.

Holotype: ♂, Botanical Garden of Hokkaido Univ. (UBG), Sapporo, Hokkaido, 31X 1977, (H. WATABE). Paratypes: 5 ♂, 5 ♀, same data as holotype; 8 ♂, 5 ♀, Rebus Isl., Hokkaido, 28 IX 1982, (N. ICHIO). The holotype and paratypes are deposited in the Entomological Institute, Faculty of Agriculture, Hokkaido University, Sapporo.

*Distribution and ecology.* *D. curvispina* has been recorded from both Hokkaido and Honshū, namely Rebus Isl., Rishiri Isl., Kitamoshiri, Asahikawa, Akkeshi, Nukabira, Koryū-kōzan at Eniwa, Nopporo, Sapporo, Tomakomai and Hobetsu in Hokkaido, Minmaya and Hirosaki in Aomori Pref., Morioka in Iwate Pref. and Karuizawa in Nagano Pref. in Honshū. Its distribution is shifted northward, in comparison to that of a close relative, *D. unispina*. This species inhabits forest floor, breeds mainly on fungi, has a multi-voltine life cycle and hibernates as adults in cliff shelters and tree holes. Adults are usually collected by fruit traps and on various fungi. It can be cultured with usual *Drosophila* medium in the laboratory.

*Relationships.* This species belongs to the *quinaria* species-group of the subgenus *Drosophila*, and is closely related to *D. unispina*.

The diagnostic differences between *D. curvispina* (C) and *D. unispina* (U) are

Table 1. Intra- and inter-specific variations of quantitative characters in *D. curvispina* and *D. unispina*.

Quantitative character	<i>D. curvispina</i> <sup>1)</sup>			<i>D. unispina</i> <sup>1)</sup>			Interspecific difference (t-test)
	Mean ± S.D.	Range	(n)	Mean ± S.D.	Range	(n)	
1. Body length (mm)	♂ 2.78 ± 0.26 ♀ 3.08 ± 0.25	2.27 ~ 3.33 2.39 ~ 3.61	(50) (50)	2.97 ± 0.22 3.16 ± 0.30	2.39 ~ 3.41 2.63 ~ 3.76	(50) (50)	+p < 0.01 +p > 0.05
2. Thorax length (mm)	♂ 1.18 ± 0.10 ♀ 1.28 ± 0.11	0.95 ~ 1.40 1.03 ~ 1.48	(50) (50)	1.24 ± 0.10 1.27 ± 0.12	1.00 ~ 1.43 1.00 ~ 1.50	(50) (50)	+p < 0.01 +p > 0.05
3. Wing length (mm)	♂ 3.17 ± 0.22 ♀ 3.44 ± 0.25	2.67 ~ 3.57 2.90 ~ 3.80	(50) (50)	3.24 ± 0.19 3.40 ± 0.28	2.82 ~ 3.57 2.71 ~ 4.04	(50) (50)	+p > 0.05 +p > 0.05
Arista							
4. No. of upper branches	♂ 4.86 ± 0.40 ♀ 4.80 ± 0.45	4 ~ 6 4 ~ 6	(50) (50)	4.96 ± 0.35 5.04 ± 0.45	4 ~ 6 4 ~ 6	(50) (50)	+p > 0.05 +p < 0.01
5. No. of lower branches	♂ 2.78 ± 0.46 ♀ 2.76 ± 0.43	2 ~ 4 2 ~ 3	(50) (50)	3.06 ± 0.24 2.98 ± 0.32	3 ~ 4 2 ~ 3	(50) (50)	+p < 0.01** +p < 0.01
6. Cheek width/eye diameter	0.14 ± 0.02	0.09 ~ 0.19	(50)	0.13 ± 0.02	0.10 ~ 0.17	(50)	+p > 0.05
7. Length/width of 3rd antennal joints	1.89 ± 0.27	1.50 ~ 2.67	(50)	2.12 ± 0.25	1.60 ~ 2.77	(50)	+p < 0.01
8. Or2/Or1	0.47 ± 0.11	0.27 ~ 0.71	(50)	0.47 ± 0.09	0.27 ~ 0.71	(50)	+p > 0.05
9. Orb2/Orb1	0.22 ± 0.04	0.13 ~ 0.31	(50)	0.26 ± 0.07	0.15 ~ 0.55	(50)	+p < 0.01*
10. Orb3/Orb1	0.71 ± 0.11	0.50 ~ 1.00	(50)	0.73 ± 0.13	0.55 ~ 1.27	(50)	+p < 0.01
11. Sterno index	0.60 ± 0.06	0.44 ~ 0.76	(50)	0.60 ± 0.06	0.47 ~ 0.79	(50)	+p > 0.05
Wing							
12. No. of small bristles on C3	14.81 ± 2.44	11 ~ 22	(52)	16.23 ± 2.52	11 ~ 22	(52)	+p < 0.01
13. C index	3.31 ± 0.31	2.70 ~ 4.00	(52)	3.18 ± 0.26	2.59 ~ 4.00	(52)	= 0.01 < p < 0.05
14. 4C index	0.73 ± 0.08	0.59 ~ 0.89	(52)	0.76 ± 0.06	0.65 ~ 0.90	(52)	+p < 0.01
15. 4th vein index	1.52 ± 0.12	1.33 ~ 1.79	(52)	1.51 ± 0.11	1.29 ~ 1.79	(52)	+p > 0.05
16. 5X index	1.19 ± 0.15	0.80 ~ 1.56	(52)	1.11 ± 0.09	0.96 ~ 1.33	(52)	+p < 0.01*
17. C3 fringe	0.39 ± 0.06	0.24 ~ 0.52	(52)	0.42 ± 0.05	0.30 ~ 0.52	(52)	+p < 0.01
Epandrium							
18. No. of long hairs	10.43 ± 1.16	8 ~ 13	(21)	13.78 ± 0.88	12 ~ 15	(18)	+p < 0.01
Surstylus							
19. No. of primary teeth	13.31 ± 1.32	11 ~ 16	(26)	16.21 ± 1.58	13 ~ 22	(33)	+p < 0.01
20. No. of secondary teeth	14.30 ± 1.66	11 ~ 17	(27)	23.59 ± 2.10	18 ~ 27	(29)	+p < 0.01
Cercus							
21. No. of long hairs	43.54 ± 1.94	39 ~ 46	(13)	50.33 ± 4.23	44 ~ 59	(12)	+p < 0.01*
Ovipositor							
22. No. of discal teeth	3.75 ± 0.79	3 ~ 6	(24)	3.53 ± 0.76	2 ~ 5	(32)	+p > 0.05
23. No. of marginal teeth	16.79 ± 1.35	14 ~ 19	(24)	18.38 ± 1.93	16 ~ 24	(32)	+p < 0.01

1) All samples used for this analysis were caught a: UBG from September to November, 1977. 2) Asterisk indicates that "Aspin-Welch" method (cf. Ishii, 1975) was adopted in the case of unequal variance.

summarized below:

A) Anterior part of apical spur on aedeagus. C: triangular (Fig. 4A) in ventral view, curved ventrally (Fig. 5A) in lateral view. U: elongated narrowly, with a pair of small triangular extensions on lateral sides near tip (Fig. 4B) in ventral view, nearly straight (Fig. 5B) in lateral view.

B) Longitudinal stalk of aedeagus. C: swollen submedially, attaching to submedian portion of spur, without an apico-caudal transparent portion (Fig. 5A). U: not swollen, attaching to caudal portion of spur, with an apico-caudal transparent portion (Fig. 5B).

C) Ovipositor. C: approximately right-angled at caudo-dorsal tip, strongly expanded rectangularly at dorsodistal portion (Fig. 6A). U: distally rounded, moderately expanded triangularly at dorsodistal portion (Fig. 6B).

D) Spermathecae. C: not constricted at submedian part (Fig. 7A). U: constricted there (Fig. 7B).

In addition to the above diagnostic characters, 23 quantitative characters were subjected to the comparison between the two species (Table 1). As for the characters of Nos. 1 to 5, the comparison was made for each sex. The ranges of all these characters, except for No. 20 (number of secondary teeth on surstylus), overlapped interspecifically, though the interspecific difference was statistically significant ( $p < 0.01$ ) in 17 cases of the comparisons (Nos. 1 ♂, 2 ♂, 4 ♀, 5 ♂, 5 ♀, 7, 9, 10, 12, 14, 16–21, 23). This means close resemblance of the two species in the external morphology, so that a given specimen of either species cannot be identified, unless the above-mentioned diagnostic characters of the genitalia are examined.

**Acknowledgements** We are much obliged to Emeritus Prof. Toyohi OKADA, Tokyo Metropolitan University, for his invaluable suggestions, and to Dr. Masahito T. KIMURA, Hokkaido University, for his ecological information.

#### References

- ISHII, S., 1975. *Seibutsu-Tôkeigaku-Nyûmon*. 288 pp. Baifukan, Tokyo. (In Japanese.)  
OKADA, T., 1956. *Systematic Study of Drosophilidae and Allied Families of Japan*. 183 pp. Gihôdo, Tokyo.  
WAKAHAMA, K., 1956. *Drosophila Survey of Hokkaido, III. Some flies new to Drosophila fauna of Hokkaido*. *Annot. Zool. Japon.*, 29: 116–120.