

analyzed with P-M hybrid dysgenesis. The occupied sites of P elements were detected by *in situ* hybridization on the salivary gland chromosome sampled from each five M' and Q strains of TP and TY populations. These were investigated with copy numbers of P elements on 3L chromosome location with In(3L)P. Q strains have more copy numbers of P elements than M' strains, concentrated highly at loci 61C-D, 64B, 71C, and 79C on 3L chromosome locations with In(3L)P, and M' strains distributed highly at loci 61C, 64A, and 72C (Figures 2 and 3). Distribution for copy numbers of P elements in Q strains 96/97 located mainly at loci 61, 64, 71, and 79 on 3L chromosome with In(3L)P, M' strains distributed highly at loci 61, 64, and 72 (Tables 4 and 5).

Discussion: TP 291 and TY 307 isofemale lines were tested in the cross A°. The mean sterility frequencies of both populations were 22.78 and 23.99%, respectively. Kim(1994) reported the mean sterility frequencies of both populations, 261 TP and 280 TY isofemale lines, were 39.36% and 35.61%, respectively, in the cross A°. These differences were from the mean sterility frequencies of both TP and TY populations. The mean frequencies of M' and Q strains of flies with In(3L)P were 0.0299 and 0.0738, respectively. True M strain frequency was observed with 0.0016 on the flies with In(3L)P in all populations. P activity of flies with In(3L)P was investigated to be concentrated completely to M' and Q strains. Q strain frequency of the flies with In(3L)P was tested more than M strain in all populations. Kim(1994) reported sterility frequency of flies with In(3L)P was observed to be concentrated completely in M' and Q strains. The Q strain with In(3L)P was observed with higher frequency than M' strain in these populations except for TP (Kim, 1994). Copy numbers of P elements on 3L chromosome with In(3L)P and 3L standard chromosome were tabled (Figure 1). The mean copy numbers for all TEs (P element) pooled are higher on the whole arm of In(3L)P chromosomes, compared with 3L standard chromosomes. The total copy number of the P elements was determined by using each five lines of M' and Q strains randomly from both TP and TY populations (96/97). Paul D. Sniegowski and Brian Charlesworth (1994) reported five of the 10 TE families are more abundant on inversion chromosomes. The occupied sites of P elements were detected by *in situ* hybridization on the salivary gland chromosome sampled from each five M' and Q strains of TP and TY populations. Koryakov and Zhimulev (1996) reported the most active in chromosome rearrangement formation are the following regions: 61C, 62A, 64CDE, 66ABC, 67DE, 70C, 75C, and 80AC in the 3L. Q strains have more copy numbers of P elements than M' strain, concentrated highly at loci 61C,D, 64B, 71C and 79C on 3L chromosome location with In(3L)P, and M' strains distributed highly at loci 61C, 64A, and 72C (Figures 2 and 3).

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Sexual dimorphism apparent in size-related wing asymmetry.

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Abstract: Sexual dimorphism in size-related wing asymmetry was examined in *Drosophila buzzatii*. Wing asymmetry in laboratory-reared flies was negatively correlated with distal wing length in females but not in males. These results are consistent with previous studies where distal wing length was uncorrelated with the level of asymmetry in wild-reared males, but suggest a relationship between wing size and asymmetry in females.

Introduction: In bilaterally symmetrical organisms, the absolute value of side-wise random deviations from perfect bilateral symmetry may be, at least for many size-related traits, negatively correlated with trait size (Moller, 1996; Rowe *et al.*, 1997).

Moreover, several fitness components may be negatively correlated with such deviations from symmetry, but male's mating success is the one more often studied. The relatively common finding that

asymmetry increases as trait size (or other measure of individual condition) decreases, has led to the view that fluctuating asymmetry (FA) plays a significant role in the evolution of sexual signals (but see Rowe *et al.*, 1997). However, the evidence that mating success is biased towards more symmetrical males remains unclear in *Drosophila* (Markov and Ricker, 1992). In a recent study in the cactophilic fly *D. buzzatii*, we observed an apparent negative correlation between the level of asymmetry in distal wing length and male's mating success in a caged experiment with wild-reared flies (Norry *et al.*, 1998). However, there was no evidence of correlations between the level of asymmetry and trait size in wild males (Norry *et al.*, 1998). Here, we report data about an apparent sexual dimorphism in the correlation between distal wing length and its level of asymmetry.

Material and Methods: A population breeding on *Opuntia vulgaris* at Arroyo Escobar (34°4' S; 58°7' W), Buenos Aires (Argentina), was sampled in mid-March 1993. Wild females collected over banana baits were individually kept in 95 × 20-mm shell vials containing 5 ml of David's (1962) yeast-killed medium (YKM). A total of 70 isofemale lines derived from wild-inseminated females were thus obtained. Seven mating groups were established. Each group was obtained by releasing one male and one virgin female from the G₁ of each isofemale line (140 flies) into a plastic chamber (100 × 200 × 300 mm) containing two 75-mm-diameter petri dishes with an egg-laying medium (15 g agar, 75 ml 95% ethanol, 15 ml glacial acetic acid in 1,500 ml water). After 48-72 hr, samples of 30 eggs were collected from each chamber and transferred to 95 × 20-mm shell vials with 5 ml of YKM.

The offspring eclosing from these vials were collected, and 105 randomly chosen flies of each sex were scored for distal wing length (the distance from anterior crossvein to distal tip of vein III; see Figure 1 in Norry *et al.*, 1997). Both wings were measured on a microscope slide at 1× magnification, using a Wild M-20 compound microscope. The unsigned left-minus-right values were used as asymmetry scores.

Results and Conclusions: Summary statistics for wing length and its asymmetry are given for each sex in Table 1. No sexual dimorphism in absolute asymmetry was detected (MEAN RANK_{males} = 127, MEAN RANK_{females} = 123; $P = 0.90$, Mann-Whitney test). However, the correlation between wing length and its asymmetry was negative in females but positive and nonsignificant in males (Table 1). These results suggest sexual dimorphism in size-related asymmetry, at least in laboratory conditions.

Sexual selection against wing asymmetry was apparent in a recent study with wild-reared males from the same population examined here (Norry *et al.*, 1998). In that study, wing asymmetry was uncorrelated with body size in wild males, which were collected on their natural substrates immediately after their ecdysis (Norry *et al.*, 1998). Thus, the present results in laboratory-reared flies are consistent with those in wild flies in that wing asymmetry and size are uncorrelated in males from the Arroyo Escobar population, but suggest a relationship in females.

X-linked effects in the apparent relationship between developmental stability and size might be an important factor influencing the evolution of sexual dimorphism in body size. However, the genetic basis of developmental stability (as indexed in terms of fluctuating asymmetry) is often population specific (Clarke 1998). Therefore, the present results should not be trusted as evidence that a X-linked effect is the cause of an apparent sexual dimorphism in size-related wing asymmetry. This apparent dimorphism might be population specific. Clearly, a comparative study of different populations is necessary to clarify this point.

References: David, J., 1962, *Dros. Inf. Serv.* 36: 128; Clarke, G.M., 1998, *Heredity* 80: 553-561; Markow, T.A., and J.P. Ricker 1992, *Heredity* 69: 122-127; Moller, A.P., 1996, *Evolution* 50: 746-752; Norry, F.M., J.C. Vilardi, and E. Hasson 1998, *Hereditas* (in press); Rowe, L., R.R. Repasky, and A.R. Palmer 1997, *Evolution* 1401-1408.

Table 1. Means and SDs of distal wing length and its level of asymmetry (FA) are given for each sex in laboratory-reared *D. buzzatii* derived from the Arroyo Escobar population. FA values are in mm × 10³; wing length (WL) is in mm. Spearman rank-correlation between FA and WL is listed as R_s. N is the sample size.

Statistics	Males	Females
FA		
N	105	105
Mean	4.02	4.09
SD	6.92	6.07
Wing length		
N	105	105
Mean	1.47	1.61
SD	0.04	0.05
Correlation		
R _s	0.07	-.33*

* $P < 0.05$.