Supplementary Text: Calculating the maximal contribution of ancestral polymorphism to the faster X effect seen in *D. pseudoobscura - D. persimilis*

First, we find a rough correction for the between species divergence for within-species diversity by reducing the divergence values according to the mean diversity levels. For the *D. pseudoobscura -D. persimilis* divergence (abbreviated to *pse* - *per*), the mean K_A for the AA, XX, and XA genes are 0.0080, 0.012 and 0.014, respectively (for consistency with the polymorphism data below, we use means rather than medians). The corresponding mean K_S values are 0.038, 0.042 and 0.051. To estimate the contribution of polymorphism to the *pse* values, we can combine the polymorphism data from the current study with that of Haddrill *et al.* (2010), giving mean π_S values of 0.0221 and 0.0165 for AA and XX synonymous sites. The contribution of polymorphism from *D. persimilis* is probably lower than this: from (Machado *et al.* 2002), we find that the autosomal silent diversity in *D. persimilis* averages about 0.648 times that for *D. pseudoobscura* (although these values come from only 9 autosomal introns, the genomic data of (McGaugh and Noor 2012) for XL and chromosome 2 also support a substantially reduced level of diversity in *D. persimilis* compared with *D. pseudoobscura*). Using the estimate of 0.648 for the relative diversity level in *per*, the correction for the within-species diversity contribution to K_S is 0.5 x (1 + 0.648) = 0.824 times the *pse* diversity value, *i.e.* 0.0186 for AA and 0.0147 for XX and XA combined (hereafter X). Averaging the K_S values for XX and AX, we obtain corrected K_S values of 0.0194 and 0.0318 for A and X, respectively.

The ratio of the corrected value of K_S to π_S provides an estimate of the time separating the species in units of $2N_e$ generations (as net divergence is an estimate of $2u$ x the speciation time, and π_S of $4N_eu$). Using mean π_S values for *pse*, this is about 0.88 for A and 1.80 for X, with the higher value for X-linked loci due to scaling by its lower N_e. These values of the divergence time are shorter than the average time to neutral fixation ($4N_e$ generations), and well within the range where a high fraction of neutral fixations involve ancestral polymorphisms. For example, a divergence time of 1 yields around 98% of fixations within a single lineage are due to such events; for a value of 2, it is 80% (Charlesworth *et al.* 2005, equations 14 and 15).

Using this estimate of the divergence time, we can now ask whether the higher K_A values for the X-linked *vs.* autosomal loci can be explained solely by genetic drift fixing ancestral polymorphisms. The expected divergence between two independently evolving lineages resulting from fixation of ancestral polymorphism is simply equal to the ancestral pairwise diversity, π-anc, for neutral mutations, and lower for slightly deleterious mutations (Charlesworth *et al.* 2005). The upper limit to the expected contribution to the K_A values from ancestral polymorphisms for the X-linked loci is thus provided by the relevant π_A values. We can take the *pse* values as a probable overestimate of these, since *pse* shows signs of a recent population expansion (Machado *et al.* 2002). Unfortunately, the results for the slowly-evolving genes obtained by Haddrill et al. (Haddrill *et al.* 2010), and for the fast-evolving genes in Table 2, are rather different: a mean 0.00066 for slowly-evolving XL genes, and a mean of 0.00136 for fast-evolving XR genes, respectively. However, if we are again conservative and use the higher value, we obtain a maximum contribution of ancestral polymorphism to K_A of 0.00136; this is only about 10% of the estimate for K_A for the X-linked loci combined. It therefore seems impossible to account for the high X values of K_A by fixations of ancestral polymorphisms. The magnitude of this discrepancy is so large that it has a very low probability of arising by chance— even ignoring the contribution of ancestral polymorphism to K_S, the adjusted K_A values still result in significantly higher K_A/K_S for X-linked loci (mean adjusted K_A to unadjusted K_S values for X-linked loci is 0.168, autosomal is 0.121; Mann-Whitney U test, p = 2e-13).

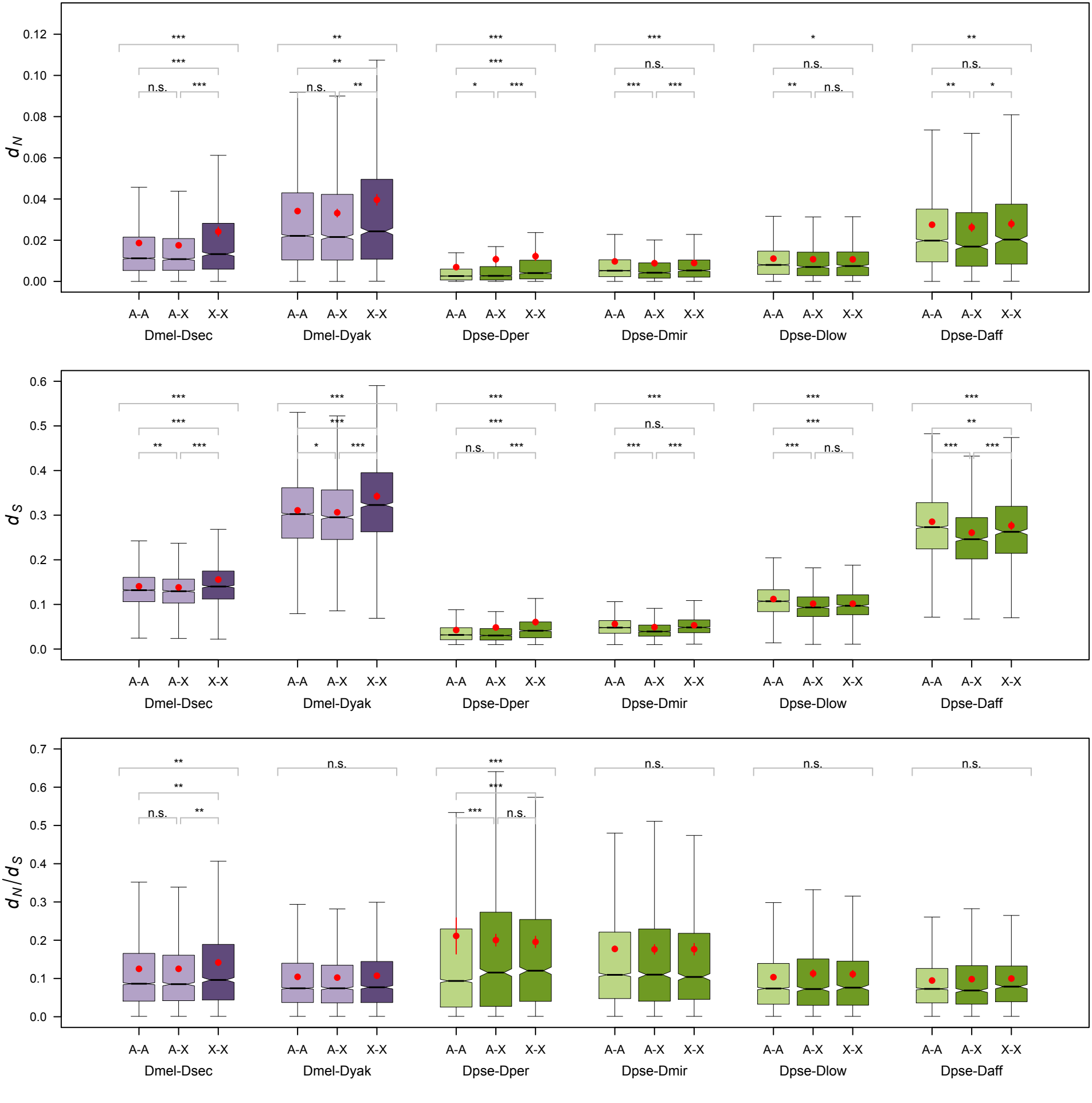
References

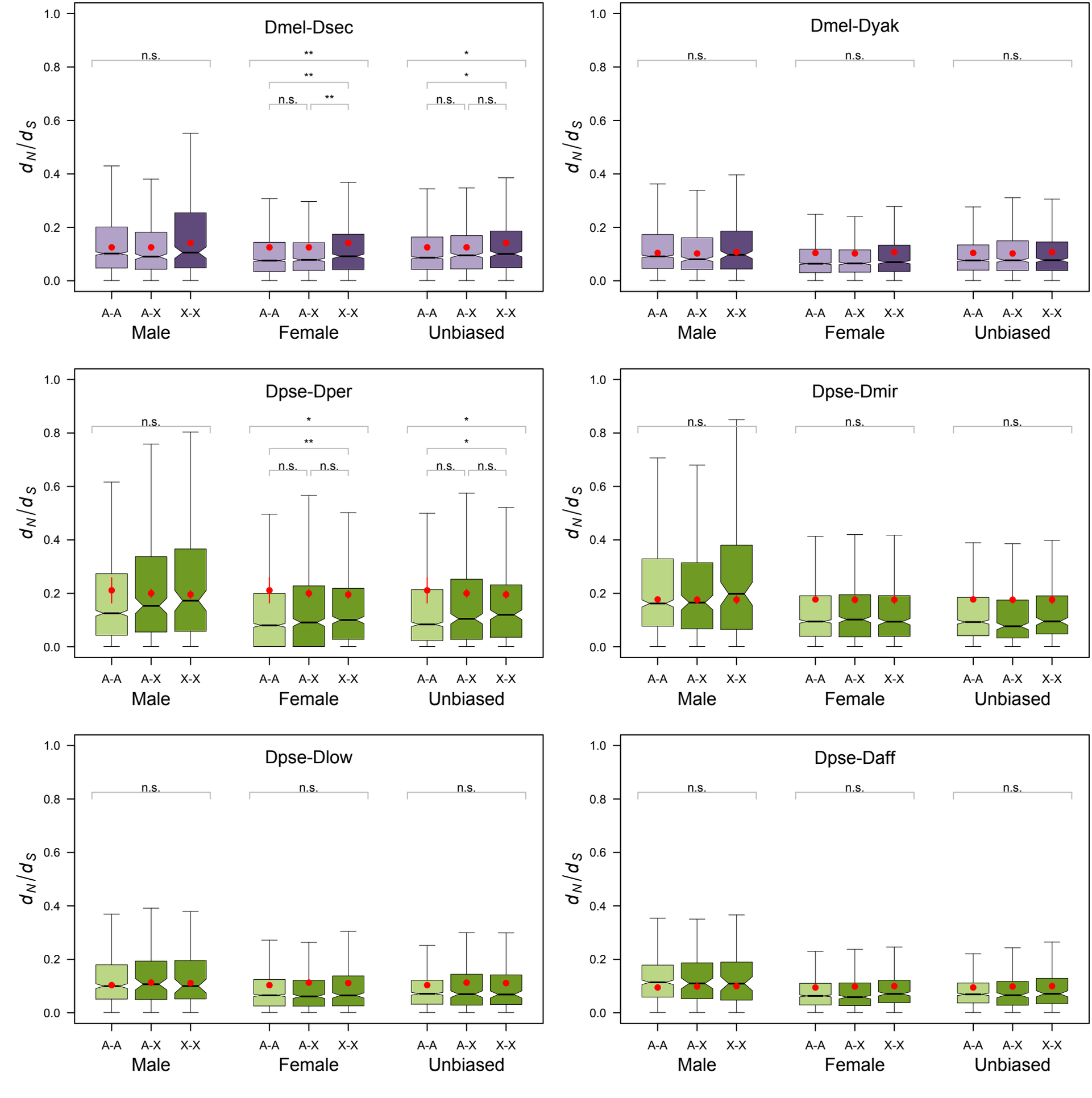
Haddrill PR, Loewe L, Charlesworth B. 2010. Estimating the parameters of selection on nonsynonymous mutations in *Drosophila pseudoobscura* and *D. miranda*. Genetics. 185:1381-1396.

Machado CA, Kliman RM, Markert JA, Hey J. 2002. Inferring the history of speciation from multilocus DNA sequence data: the case of *Drosophila pseudoobscura* and close relatives. Molecular biology and evolution. 19:472-488.

McGaugh SE, Noor MAF. 2012. Genomic impacts of chromosomal inversions in parapatric Drosophila species. Philosophical Transactions of the Royal Society B: Biological Sciences. 367:422-429.

Charlesworth B, Bartolomé C, Noël V. 2005. Estimating the incidence of ancestral polymorphisms. *Genet Res*. 86:149-157.


d_N
d_S
d_N/d_S
A-A
A-X
X-X
Dmel-Dsec
Dmel-Dyak
Dpse-Dper
Dpse-Dmir
Dpse-Dlow
Dpse-Daff
n.s.


Dmel-Dsec
Dmel-Dyak
Dpse-Dper
Dpse-Dmir
Dpse-Dlow
Dpse-Daff
d_N/d_S
1.0
0.8
0.6
0.4
0.2
0.0
n.s.
**
*
A-A
A-X
X-X
Male
Female
Unbiased

Supplementary Table S1. X-autosome comparison of rates of evolution, using pairwise Ka, Ks, and Ka/Ks rates as calculated by Gestimator. Medians and 95% confidence intervals are given for each species pair. Significance from Kruskal-Wallis and Mann-Whitney U tests is indicated by *** P < 0.001; ** P < 0.01; * P < 0.05; '--' indicates that the Kruskal-Wallis test was not significant and Mann-Whitney U tests were thus not performed. X-autosome comparisons are highlighted in gray.

			A-A	X-X	A-X	Kruskal-Wallis tests	Mann-Whitney U tests		
							A-A *vs.* X-X	A-X *vs.* X-X	A-X *vs.* A-A
All genes	*Dmel-Dsec*	*N*	5800	1318	1826				
		Ka	0.01166 (0.01126 - 0.01202)	0.01365 (0.01286 - 0.01474)	0.01102 (0.01044 - 0.01179)	6.77e-09***	3.78e-08***	3.78e-08***	0.2827
		Ks	0.11520 (0.11410 - 0.11630)	0.11335 (0.11100 - 0.11620)	0.11405 (0.11230 - 0.11600)	0.5117	--	--	--
		Ka/Ks	0.10295 (0.10030 - 0.10595)	0.12175 (0.11520 - 0.13280)	0.10045 (0.09420 - 0.10640)	6.96e-10***	2.24e-09***	1.50e-08***	0.4607
	Dmel-Dyak	*N*	6081	1487	1900				
		Ka	0.02315 (0.02230 - 0.02378)	0.02571 (0.02380 - 0.02735)	0.02181 (0.02049 - 0.02332)	0.0002***	0.0005***	0.0003***	0.2269
		Ks	0.25950 (0.25750 - 0.26170)	0.25330 (0.25020 - 0.25780)	0.25490 (0.25105 - 0.25880)	0.3514	--	--	--
		Ka/Ks	0.09283 (0.08971 - 0.09471)	0.10650 (0.10070 - 0.11110)	0.08883 (0.08514 - 0.09465)	5.01e-06***	1.22e-05***	1.22e-05***	0.2657
	Dpse-Dper	*N*	4791	1127	1368				
		Ka	0.00300 (0.00287 - 0.00313)	0.00488 (0.00432 - 0.00531)	0.00312 (0.00290 - 0.00352)	2.89e-19***	4.48e-20***	2.34e-07***	0.0087**
		Ks	0.02815 (0.02767 - 0.02867)	0.03425 (0.03310 - 0.03568)	0.02585 (0.02509 - 0.02680)	8.79e-20***	1.63e-15***	1.42e-17***	0.0006***
		Ka/Ks	0.10830 (0.10380 - 0.11320)	0.15130 (0.13890 - 0.16640)	0.13080 (0.12395 - 0.14205)	1.11e-14***	8.49e-13***	0.0344*	2.45e-06***
	Dpse-Dmir	*N*	4756	1300	1616				
		Ka	0.00554 (0.00535 - 0.00573)	0.00573 (0.00538 - 0.00626)	0.00451 (0.00425 - 0.00484)	6.50e-09***	0.5891	1.13e-06***	1.72e-08***
		Ks	0.04219 (0.04161 - 0.04272)	0.04016 (0.03910 - 0.04113)	0.03402 (0.03310 - 0.03478)	4.57e-52***	0.0021**	2.01e-21***	2.44e-52***
		Ka/Ks	0.13645 (0.13185 - 0.14180)	0.14515 (0.13255 - 0.15415)	0.13575 (0.12830 - 0.14480)	0.2987	--	--	--
	Dpse-Dlow	*N*	3012	703	969				
		Ka	0.00830 (0.00789 - 0.00868)	0.00770 (0.00723 - 0.00857)	0.00726 (0.00673 - 0.00772)	0.0209*	0.3129	0.3129	0.0197*
		Ks	0.09119 (0.09018 - 0.09237)	0.07855 (0.07616 - 0.08100)	0.07840 (0.07680 - 0.08065)	2.17e-43***	4.88e-25***	0.9791	8.49e-30***
		Ka/Ks	0.09048 (0.08688 - 0.09424)	0.10300 (0.09239 - 0.11630)	0.09247 (0.08566 - 0.09928)	0.1046	--	--	--
	Dpse-Daff	*N*	3022	706	973				
		Ka	0.02051 (0.01969 - 0.02136)	0.02129 (0.01964 - 0.02336)	0.01790 (0.01661 - 0.01903)	0.0044**	0.7436	0.0197*	0.0045**
		Ks	0.23035 (0.22795 - 0.23310)	0.20820 (0.20400 - 0.21536)	0.20500 (0.20020 - 0.20910)	3.48e-30***	8.64e-13***	0.0545	3.54e-25***
		Ka/Ks	0.09162 (0.08799 - 0.09539)	0.10480 (0.09593 - 0.11330)	0.09110 (0.08366 - 0.09730)	0.0393*	0.0386*	0.0581	0.8062
Common genes	*Dmel-Dsec*	*N*	1960	464	623				
		Ka	0.00956 (0.00912 - 0.01005)	0.01120 (0.01007 - 0.01283)	0.01033 (0.00968 - 0.01137)	0.0002***	0.0002***	0.0637	0.0524
		Ks	0.11570 (0.11370 - 0.11735)	0.11030 (0.10690 - 0.11320)	0.11560 (0.11290 - 0.11880)	0.054	--	--	--
		Ka/Ks	0.08430 (0.08030 - 0.08877)	0.10430 (0.09274 - 0.11290)	0.09123 (0.08435 - 0.09945)	1.06e-05***	1.31e-05***	0.0263*	0.0263*
	Dmel-Dyak	*N*	1960	464	623				
		Ka	0.01903 (0.01825 - 0.02018)	0.02243 (0.01978 - 0.02463)	0.01940 (0.01729 - 0.02169)	0.0153*	0.0129*	0.1303	0.3237
		Ks	0.25860 (0.25495 - 0.26240)	0.25170 (0.24520 - 0.25830)	0.25550 (0.25080 - 0.26182)	0.3832	--	--	--
		Ka/Ks	0.07858 (0.07500 - 0.08222)	0.09136 (0.08108 - 0.10045)	0.07881 (0.07039 - 0.08658)	0.0010***	0.0006***	0.0273*	0.2916
	Dpse-Dper	*N*	1960	464	623				
		Ka	0.00209 (0.00195 - 0.00225)	0.00335 (0.00273 - 0.00409)	0.00244 (0.00205 - 0.00270)	5.52e-09***	5.35e-09***	0.0060**	0.0060**
		Ks	0.02699 (0.02624 - 0.02770)	0.03114 (0.02803 - 0.03307)	0.02507 (0.02350 - 0.02620)	9.69e-06***	0.0002***	1.61e-05***	0.0365*
		Ka/Ks	0.07930 (0.07317 - 0.08530)	0.11240 (0.09617 - 0.12721)	0.10150 (0.08841 - 0.11610)	5.94e-08***	2.80e-06***	0.2902	8.41e-05***
	Dpse-Dmir	*N*	1960	464	623				
		Ka	0.00451 (0.00427 - 0.00476)	0.00438 (0.00387 - 0.00509)	0.00381 (0.00333 - 0.00410)	0.0095**	0.7606	0.0232*	0.0111*
		Ks	0.04276 (0.04198 - 0.04364)	0.03977 (0.03817 - 0.04125)	0.03490 (0.03383 - 0.03619)	1.31e-22***	0.0077**	1.14e-07***	4.44e-23***
		Ka/Ks	0.10585 (0.10030 - 0.11310)	0.10885 (0.09747 - 0.12630)	0.11110 (0.09884 - 0.12320)	0.7181	--	--	--
	Dpse-Dlow	*N*	1960	464	623				
		Ka	0.00902 (0.00842 - 0.00935)	0.00804 (0.00730 - 0.00965)	0.00778 (0.00724 - 0.00882)	0.2988	--	--	--
		Ks	0.09436 (0.09269 - 0.09607)	0.08013 (0.07782 - 0.08274)	0.08267 (0.08073 - 0.08448)	1.94e-32***	2.26e-22***	0.0974	4.99e-19***
		Ka/Ks	0.09241 (0.08718 - 0.09615)	0.10255 (0.08970 - 0.11740)	0.09836 (0.09126 - 0.10790)	0.1416	--	--	--
	Dpse-Daff	*N*	1960	464	623				
		Ka	0.02187 (0.02084 - 0.02314)	0.02218 (0.02000 - 0.02520)	0.01973 (0.01849 - 0.02199)	0.2291	--	--	--
		Ks	0.23710 (0.23469 - 0.24000)	0.21035 (0.20610 - 0.21830)	0.21380 (0.20900 - 0.21870)	1.14e-23***	1.02e-14***	0.6401	6.02e-16***
		Ka/Ks	0.09390 (0.08895 - 0.09812)	0.10915 (0.09914 - 0.12075)	0.09904 (0.08884 - 0.10680)	0.0537	--	--	--

Supplementary Table S2. X-autosome comparison of rates of evolution, using pairwise dN, dS and dN/dS rates as calculated by PAML. Medians and 95% confidence intervals are given for each species pair. Significance from Kruskal-Wallis and Mann-Whitney U tests is indicated by *** P < 0.001; ** P < 0.01; * P < 0.05; '--' indicates that the Kruskal-Wallis test was not significant and Mann-Whitney U tests were thus not performed. X-autosome comparisons are highlighted in gray.

			A-A	X-X	A-X	Kruskal-Wallis tests	Mann-Whitney U tests		
							A-A *vs.* X-X	A-X *vs.* X-X	A-X *vs.* A-A
All genes	*Dmel-Dsec*	*N*	5710	1300	1778				
		dN	0.01120 (0.01090 - 0.01160)	0.01325 (0.01220 - 0.01420)	0.01080 (0.01030 - 0.01140)	9.08e-08***	3.22e-07***	3.22e-07***	0.2905
		dS	0.13190 (0.13055 - 0.13340)	0.14015 (0.13750 - 0.14230)	0.12960 (0.12740 - 0.13230)	9.12e-13***	4.54e-10***	2.36e-12***	0.0088**
		dN/dS	0.08625 (0.08410 - 0.08890)	0.09615 (0.08990 - 0.10275)	0.08515 (0.08130 - 0.09135)	0.0041**	0.0042**	0.0067**	0.8613
	Dmel-Dyak	*N*	5977	1463	1848				
		dN	0.02210 (0.02140 - 0.02300)	0.02430 (0.02250 - 0.02590)	0.02155 (0.02000 - 0.02265)	0.0038**	0.0064**	0.0042**	0.2763
		dS	0.30240 (0.29940 - 0.30480)	0.32280 (0.31590 - 0.33050)	0.29530 (0.29005 - 0.29920)	1.43e-17***	9.00e-15***	1.06e-15***	0.0138*
		dN/dS	0.07430 (0.07190 - 0.07640)	0.07700 (0.07210 - 0.08170)	0.07430 (0.06935 - 0.07750)	0.5668	--	--	--
	Dpse-Dper	*N*	5438	1233	1552				
		dN	0.00260 (0.00250 - 0.00270)	0.00405 (0.00370 - 0.00460)	0.00270 (0.00250 - 0.00290)	5.15e-20***	5.85e-21***	6.15e-09***	0.0342*
		dS	0.03170 (0.03110 - 0.03250)	0.04110 (0.03930 - 0.04265)	0.03040 (0.02890 - 0.03130)	8.84e-27***	2.79e-25***	4.52e-20***	0.1802
		dN/dS	0.09355 (0.08980 - 0.09780)	0.12030 (0.10940 - 0.13380)	0.11545 (0.10390 - 0.12550)	8.04e-07***	9.44e-06***	0.3164	0.0008***
	Dpse-Dmir	*N*	3831	999	1336				
		dN	0.00520 (0.00500 - 0.00530)	0.00530 (0.00470 - 0.00570)	0.00420 (0.00390 - 0.00440)	4.43e-07***	0.6884	0.0004***	2.61e-07***
		dS	0.04810 (0.04710 - 0.04880)	0.04850 (0.04640 - 0.05040)	0.03935 (0.03825 - 0.04085)	2.09e-35***	0.2362	6.41e-24***	1.82e-32***
		dN/dS	0.10950 (0.10470 - 0.11460)	0.10400 (0.09509 - 0.11490)	0.10995 (0.10048 - 0.11740)	0.6006	--	--	--
	Dpse-Dlow	*N*	2968	694	949				
		dN	0.00800 (0.00750 - 0.00830)	0.00745 (0.00690 - 0.00810)	0.00700 (0.00650 - 0.00750)	0.0209*	0.2716	0.3848	0.0229*
		dS	0.10715 (0.10580 - 0.10875)	0.09695 (0.09460 - 0.10025)	0.09325 (0.09160 - 0.09590)	1.05e-24***	2.26e-10***	0.0735	6.04e-21***
		dN/dS	0.07380 (0.07045 - 0.07655)	0.07600 (0.06785 - 0.08615)	0.07240 (0.06620 - 0.07980)	0.7701	--	--	--
	Dpse-Daff	*N*	2969	694	949				
		dN	0.01980 (0.01880 - 0.02040)	0.02030 (0.01870 - 0.02215)	0.01690 (0.01590 - 0.01850)	0.0042**	0.7361	0.0187*	0.0042**
		dS	0.27310 (0.26999 - 0.27630)	0.26270 (0.25510 - 0.26926)	0.24610 (0.24060 - 0.25121)	4.14e-17***	0.0056**	9.11e-05***	1.48e-17***
		dN/dS	0.07280 (0.06960 - 0.07630)	0.07870 (0.07120 - 0.08440)	0.06860 (0.06240 - 0.07440)	0.3901	--	--	--
Common genes	*Dmel-Dsec*	*N*	1714	390	560				
		dN	0.00910 (0.00850 - 0.00990)	0.01020 (0.00920 - 0.01180)	0.00980 (0.00890 - 0.01070)	0.0351*	0.0393*	0.2275	0.2275
		dS	0.13650 (0.13440 - 0.13915)	0.14100 (0.13755 - 0.14650)	0.13390 (0.12870 - 0.13726)	0.0023**	6.88E-02	0.0025**	0.0161*
		dN/dS	0.06705 (0.06310 - 0.07160)	0.07390 (0.06430 - 0.07915)	0.07685 (0.06810 - 0.08150)	0.0771	--	--	--
	Dmel-Dyak	*N*	1714	390	560				
		dN	0.01820 (0.01735 - 0.01900)	0.01885 (0.01670 - 0.02200)	0.01840 (0.01655 - 0.02080)	0.4887	--	--	--
		dS	0.30860 (0.30455 - 0.31190)	0.33015 (0.31850 - 0.34100)	0.29970 (0.29195 - 0.30890)	7.29e-06***	4.41e-05***	1.67e-05***	0.0853
		dN/dS	0.06000 (0.05720 - 0.06360)	0.05915 (0.05105 - 0.06630)	0.06185 (0.05765 - 0.06721)	0.4025	--	--	--
	Dpse-Dper	*N*	1714	390	560				
		dN	0.00200 (0.00180 - 0.00210)	0.00260 (0.00210 - 0.00310)	0.00220 (0.00190 - 0.00250)	0.0001***	0.0001***	0.0884	0.0418*
		dS	0.03015 (0.02935 - 0.03120)	0.03690 (0.03390 - 0.03940)	0.02965 (0.02765 - 0.03125)	4.06e-07***	8.08e-07***	2.83e-06***	0.4746
		dN/dS	0.06530 (0.06050 - 0.07170)	0.07625 (0.06590 - 0.08842)	0.07910 (0.07014 - 0.09161)	0.0028**	0.0374*	0.7277	0.0077**
	Dpse-Dmir	*N*	1714	390	560				
		dN	0.00420 (0.00400 - 0.00450)	0.00365 (0.00310 - 0.00430)	0.00340 (0.00305 - 0.00385)	0.0137*	0.2570	0.2570	0.0122*
		dS	0.04865 (0.04750 - 0.05020)	0.04850 (0.04465 - 0.05100)	0.04105 (0.03935 - 0.04210)	1.71e-17***	0.9794	2.54e-10***	3.19e-17***
		dN/dS	0.08440 (0.07835 - 0.09145)	0.07715 (0.06730 - 0.08480)	0.08400 (0.07340 - 0.09736)	0.4546	--	--	--
	Dpse-Dlow	*N*	1714	390	560				
		dN	0.00820 (0.00780 - 0.00870)	0.00710 (0.00610 - 0.00780)	0.00740 (0.00680 - 0.00835)	0.0337*	0.0276*	0.1738	0.4254
		dS	0.11165 (0.10920 - 0.11350)	0.09760 (0.09465 - 0.10145)	0.09650 (0.09370 - 0.10010)	2.55e-18***	7.32e-10***	0.6729	4.72e-14***
		dN/dS	0.07115 (0.06835 - 0.07540)	0.06980 (0.06015 - 0.08090)	0.07530 (0.06800 - 0.08580)	0.2607	--	--	--
	Dpse-Daff	*N*	1714	390	560				
		dN	0.02070 (0.01955 - 0.02220)	0.01970 (0.01650 - 0.02190)	0.01880 (0.01675 - 0.02070)	0.2053	--	--	--
		dS	0.28270 (0.27860 - 0.28760)	0.26640 (0.25909 - 0.27535)	0.25520 (0.24740 - 0.26270)	8.07e-13***	0.0002***	0.0662	4.23e-12***
		dN/dS	0.07175 (0.06805 - 0.07640)	0.07430 (0.06535 - 0.08140)	0.07420 (0.06310 - 0.08050)	0.9303	--	--	--

Supplementary Table 3. Comparisons of Ka/Ks between X-linked and autosomal genes, divided by sex-biased expression.

			A-A	X-X	A-X	Kruskal-Wallis tests	Mann-Whitney U tests		
							A-A *vs.* X-X	A-X *vs.* X-X	A-X *vs.* A-A
Male-biased genes	*Dmel-Dsec*	*N*	1591	431	228	0.0068**	0.0245*	0.0065**	0.0903
		Ka/Ks	0.1208	0.1091	0.14155				
		CI	(0.1143-0.1287)	(0.0906-0.1236)	(0.1165-0.1703)				
	Dmel-Dyak	*N*	1657	446	251	0.0060**	0.0403*	0.0060**	0.0499*
		Ka/Ks	0.113	0.10405	0.1357				
		CI	(0.1066-0.121)	(0.0906-0.1184)	(0.118-0.1515)				
	Dpse-Dper	*N*	1055	213	142	0.0074**	0.0181*	0.2648	0.0946
		Ka/Ks	0.1508	0.1821	0.2242				
		CI	(0.139-0.163)	(0.1521-0.2081)	(0.1675-0.2834)				
	Dpse-Dmir	*N*	1060	247	173	0.5515	--	--	--
		Ka/Ks	0.21565	0.2149	0.2501				
		CI	(0.2023-0.2288)	(0.1966-0.2513)	(0.2112-0.304)				
	Dpse-Dlow	*N*	534	118	73	0.5157	--	--	--
		Ka/Ks	0.13055	0.14225	0.1487				
		CI	(0.1185-0.1371)	(0.114-0.18)	(0.1091-0.1774)				
	Dpse-Daff	*N*	535	119	75	0.6617	--	--	--
		Ka/Ks	0.1378	0.152	0.148				
		CI	(0.1276-0.1549)	(0.1173-0.1854)	(0.1253-0.1878)				
Female-biased genes	*Dmel-Dsec*	*N*	2295	751	646	3.14e-08***	6.68e-08***	7.79e-07***	0.7343
		Ka/Ks	0.09248	0.0906	0.11755				
		CI	(0.0878-0.0967)	(0.0844-0.095)	(0.1075-0.1255)				
	Dmel-Dyak	*N*	2404	773	737	2.63e-07***	2.86e-07***	1.70e-05***	0.8728
		Ka/Ks	0.07911	0.07873	0.09791				
		CI	(0.0758-0.082)	(0.0717-0.0851)	(0.0916-0.1058)				
	Dpse-Dper	*N*	1706	538	477	1.17e-05***	1.47e-05***	0.1211	0.0198*
		Ka/Ks	0.08904	0.10465	0.1191				
		CI	(0.0813-0.097)	(0.0949-0.1203)	(0.1057-0.1364)				
	Dpse-Dmir	*N*	1747	621	516	0.1517	--	--	--
		Ka/Ks	0.1129	0.1256	0.1252				
		CI	(0.1071-0.1214)	(0.1118-0.1397)	(0.109-0.1405)				
	Dpse-Dlow	*N*	1265	438	330	0.1667	--	--	--
		Ka/Ks	0.07623	0.0745	0.08551				
		CI	(0.0726-0.0814)	(0.0647-0.0841)	(0.0677-0.098)				
	Dpse-Daff	*N*	1270	439	331	0.0133*	0.0153*	0.0176*	0.7365
		Ka/Ks	0.07546	0.07262	0.08976				
		CI	(0.0708-0.0795)	(0.0662-0.0804)	(0.0811-0.1027)				
Unbiased genes	*Dmel-Dsec*	*N*	1769	583	420	0.0005***	0.0003***	0.0070**	0.5611
		Ka/Ks	0.1032	0.1098	0.1313				
		CI	(0.0988-0.1084)	(0.0985-0.1177)	(0.1138-0.1459)				
	Dmel-Dyak	*N*	1871	616	473	0.102	--	--	--
		Ka/Ks	0.09415	0.094335	0.1064				
		CI	(0.0898-0.0977)	(0.0857-0.1022)	(0.097-0.1149)				
	Dpse-Dper	*N*	1125	317	265	2.14e-05***	0.0001***	0.48	0.0041**
		Ka/Ks	0.09595	0.1249	0.1517				
		CI	(0.0891-0.1045)	(0.1036-0.1541)	(0.1243-0.1843)				
	Dpse-Dmir	*N*	1090	372	309	0.0073**	0.0518	0.0064**	0.0709
		Ka/Ks	0.11815	0.1043	0.1358				
		CI	(0.1111-0.1267)	(0.0877-0.1196)	(0.1207-0.1566)				
	Dpse-Dlow	*N*	745	232	175	0.3134	--	--	--
		Ka/Ks	0.08777	0.08791	0.1021				
		CI	(0.0808-0.0959)	(0.0776-0.108)	(0.0835-0.1197)				
	Dpse-Daff	*N*	747	232	175	0.1827	--	--	--
		Ka/Ks	0.09078	0.08599	0.09632				
		CI	(0.0845-0.0968)	(0.0694-0.0967)	(0.077-0.1179)				

Supplementary Table 4. Comparisons of dN/dS between X-linked and autosomal genes, divided by sex-biased expression.

			A-A	X-X	A-X	Kruskal-Wallis tests	Mann-Whitney U tests		
							A-A *vs.* X-X	A-X *vs.* X-X	A-X *vs.* A-A
Male-biased genes	*Dmel-Dsec*	*N*	1562	418	227	0.0714	--	--	--
		dN/dS	0.102	0.0904	0.1055				
		CI	(0.0947-0.1094)	(0.0787-0.1017)	(0.0865-0.1329)				
	Dmel-Dyak	*N*	1623	433	249	0.1432	--	--	--
		dN/dS	0.0913	0.0808	0.0971				
		CI	(0.0854-0.0968)	(0.0745-0.0936)	(0.0829-0.1139)				
	Dpse-Dper	*N*	1184	234	158	0.0523	--	--	--
		dN/dS	0.12535	0.15305	0.17255				
		CI	(0.1152-0.138)	(0.131-0.1818)	(0.125-0.2151)				
	Dpse-Dmir	*N*	865	203	135	0.7818	--	--	--
		dN/dS	0.1622	0.1653	0.1983				
		CI	(0.1535-0.1803)	(0.1442-0.2045)	(0.1599-0.2547)				
	Dpse-Dlow	*N*	523	114	75	0.8937	--	--	--
		dN/dS	0.0998	0.1068	0.1				
		CI	(0.0914-0.1109)	(0.0868-0.127)	(0.0766-0.1383)				
	Dpse-Daff	*N*	523	114	75	0.9545	--	--	--
		dN/dS	0.1139	0.10985	0.1091				
		CI	(0.1017-0.124)	(0.0908-0.1293)	(0.0832-0.1323)				
Female-biased genes	*Dmel-Dsec*	*N*	2263	731	632	0.0030**	0.0030**	0.0078**	0.9409
		dN/dS	0.0756	0.0782	0.0917				
		CI	(0.0717-0.0801)	(0.0711-0.0833)	(0.0815-0.0993)				
	Dmel-Dyak	*N*	2368	752	722	0.0667	--	--	--
		dN/dS	0.06405	0.06505	0.06975				
		CI	(0.0611-0.0676)	(0.0603-0.0719)	(0.0642-0.0768)				
	Dpse-Dper	*N*	1993	625	523	0.0124*	0.0098**	0.2359	0.2484
		dN/dS	0.0802	0.0909	0.1002				
		CI	(0.073-0.0881)	(0.0798-0.1052)	(0.0884-0.1129)				
	Dpse-Dmir	*N*	1432	515	413	0.9881	--	--	--
		dN/dS	0.0946	0.1017	0.0939				
		CI	(0.088-0.1008)	(0.0846-0.1124)	(0.084-0.1098)				
	Dpse-Dlow	*N*	1243	427	324	0.3678	--	--	--
		dN/dS	0.0653	0.0613	0.0649				
		CI	(0.0604-0.0693)	(0.0498-0.0678)	(0.0558-0.0789)				
	Dpse-Daff	*N*	1244	427	324	0.0729	--	--	--
		dN/dS	0.0632	0.0585	0.0708				
		CI	(0.0602-0.067)	(0.0525-0.0639)	(0.0633-0.0839)				
Unbiased genes	*Dmel-Dsec*	*N*	1751	578	417	0.0230*	0.0240*	0.2005	0.2005
		dN/dS	0.0863	0.09515	0.1005				
		CI	(0.0814-0.09)	(0.0861-0.1027)	(0.0884-0.1133)				
	Dmel-Dyak	*N*	1850	609	467	0.7527	--	--	--
		dN/dS	0.0762	0.0766	0.0772				
		CI	(0.071-0.0802)	(0.0692-0.0872)	(0.0702-0.0845)				
	Dpse-Dper	*N*	1271	355	296	0.0140*	0.0175*	0.3914	0.1721
		dN/dS	0.0839	0.1046	0.11985				
		CI	(0.0773-0.0905)	(0.0842-0.125)	(0.1003-0.1449)				
	Dpse-Dmir	*N*	863	309	247	0.1303	--	--	--
		dN/dS	0.0926	0.0767	0.0951				
		CI	(0.0842-0.1009)	(0.0617-0.0948)	(0.0794-0.1071)				
	Dpse-Dlow	*N*	739	226	171	0.9225	--	--	--
		dN/dS	0.0712	0.0697	0.0685				
		CI	(0.0668-0.0762)	(0.0595-0.0845)	(0.0568-0.0853)				
	Dpse-Daff	*N*	739	226	171	0.5885	--	--	--
		dN/dS	0.069	0.0657	0.0711				
		CI	(0.0635-0.0745)	(0.0565-0.0733)	(0.0539-0.0824)				

Supplementary Table S5. To assess the quantitative effect of sex bias on the faster-X effect in both clades simultaneously, we took only the genes that could be aligned in all species (n = 2974), and estimated a standardized rate of protein evolution, omega, for each clade, using PAML's codeml (using the M0 codon model, with the transition-transversion rate estimated from the data and the codon frequencies estimated from the base frequencies, and using the tree with the best likelihood under the codon model for each gene). We then fit a linear model to the log-transformation of this omega estimate, with the clade, X- or autosomal linkage, and the level of sex bias as factors. Sex bias is quantified as the log of the male to female expression ratio, with the source of the expression values as given in the main text. Note that the factors with negative coefficients are inferred to lower the rate of evolution in this model.

	coefficients	std error	t-value	Pr(>|t|)	
	-3.24335	0.02921	-111.052	< 2.00E-16	***
Pseudo clade	0.41061	0.04464	9.198	< 2.00E-16	***
X-linkage	-0.03127	0.08538	-0.366	0.7142	
sex bias	0.16071	0.03635	4.422	9.97E-06	***
Pseudo clade: X-linkage	-0.02884	0.10461	-0.276	0.7828	
Pseudo clade:sex bias	0.57728	0.09223	6.259	4.15E-10	***
X-linkage:sex bias	-0.27485	0.10489	-2.62	0.0088	**
Pseudo clade: X-linkage:sex bias	-0.28443	0.18652	-1.525	0.1273	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 1.449 on 5940 degrees of freedom
Multiple R-squared: 0.03052, Adjusted R-squared: 0.02938
F-statistic: 26.71 on 7 and 5940 DF, p-value: < 2.20E-16

Supplementary Table S6. Polymorphism and divergence statistics for alleles from a Mesa Verda population of *D. pseudoobscura*.

fbgn	location	category	n	div_sitesR	div_sitesS	gaps	raw_divR	raw_divS	kR	kS	kR_JC	kS_JC	pm_sites_R	pm_sites_S	S_R	S_S	pi_R	pi_S	theta_R	theta_S	TD_R	TD_S
FBgn0012714	A	Female-biased	13	160.297	55.7023	1030	19.2307	16	0.11996	0.28724	0.13072	0.36214	160.282	55.7179	2	13	0.00271	0.0635	0.00402	0.07518	-0.9092	-0.6397
FBgn0070142	XR	Unbiased	8	345.277	125.722	131	17.5	34.875	0.05068	0.27739	0.05247	0.34636	345.062	125.937	6	16	0.00683	0.04225	0.0067	0.04899	0.0868	-0.7072
FBgn0070201	A	Unbiased	15	386.479	135.52	232	15.8	34.8	0.04088	0.25678	0.04203	0.31434	386.466	135.533	5	4	0.00354	0.00843	0.00397	0.00907	-0.3648	-0.2275
FBgn0070404	XR	Unbiased	12	335.82	111.179	751	1	17.5833	0.00297	0.15815	0.00298	0.17761	335.833	111.166	0	14	0	0.03502	0	0.0417	-	-0.6828
FBgn0070491	XR	Unbiased	14	52.6666	16.3333	673	0	2.07142	0	0.12682	0	0.13893	52.6666	16.3333	0	3	0	0.02623	0	0.05775	-	-1.6705
FBgn0070582	XR	Unbiased	15	369.197	122.802	104	11.0666	28.4	0.02997	0.23126	0.03059	0.27651	369	123	1	4	0.00036	0.00603	0.00083	0.01	-1.1594	-1.2699
FBgn0070672	A	Female-biased	15	366.291	92.7083	111	32.2	22.5333	0.0879	0.24305	0.0935	0.29375	366.588	92.4111	3	6	0.0014	0.01236	0.00251	0.01996	-1.3165	-1.3325
FBgn0070683	A	Female-biased	15	381.979	119.02	470	33	37	0.08639	0.31086	0.09178	0.40145	381.833	119.166	0	0	0	0	0	0	-	-
FBgn0070820	XR	Unbiased	15	389.333	132.666	264	6.06666	21.6	0.01558	0.16281	0.01574	0.18354	389.3	132.7	1	9	0.00034	0.02138	0.00078	0.02085	-1.1594	0.09509
FBgn0070835	A	Unbiased	15	361.583	124.416	407	18.2666	30.8666	0.05051	0.24809	0.0523	0.30123	363.7	125.3	6	14	0.00219	0.01968	0.00507	0.03436	-1.983	-1.693
FBgn0070971	XR	Unbiased	15	378.093	116.906	212	10.4	22.0666	0.0275	0.18875	0.02802	0.21743	377.944	117.055	2	2	0.00161	0.00227	0.00162	0.00525	-0.0238	-1.4905
FBgn0071002	XR	Unbiased	15	342.427	131.572	364	5.93333	31.8	0.01732	0.24169	0.01753	0.29173	342.455	131.544	10	25	0.00522	0.04162	0.00898	0.05844	-1.5902	-1.1977
FBgn0071009	A	Female-biased	15	359.02	111.979	882	20	27	0.0557	0.24111	0.05788	0.29088	359	112	0	0	0	0	0	0	-	-
FBgn0071154	XR	Unbiased	15	357.604	110.395	905	14.4666	17.2666	0.04045	0.1564	0.04158	0.1754	382.622	115.377	3	7	0.00209	0.0099	0.00241	0.01865	-0.3953	-1.6894
FBgn0071272	A	Unbiased	10	383.242	105.757	284	35	24.3	0.09132	0.22977	0.09738	0.27435	383.2	105.8	4	6	0.00278	0.01533	0.00368	0.02004	-0.9429	-0.9727
FBgn0071337	A	Unbiased	12	349.128	103.871	365	8.66666	32.4166	0.02482	0.31208	0.02524	0.40353	369.944	110.055	6	10	0.00372	0.02849	0.00537	0.03008	-1.1671	-0.2174
FBgn0071361	A	Female-biased	15	359.072	111.927	190	27.0666	33.0666	0.07537	0.29543	0.07944	0.37554	359.166	111.833	1	1	0.00037	0.00119	0.00085	0.00275	-1.1594	-1.1594
FBgn0071374	A	Unbiased	11	258.916	80.0833	362	19.1818	22.2727	0.07408	0.27811	0.078	0.3475	262.696	82.303	6	15	0.00705	0.05567	0.00779	0.06222	-0.3748	-0.467
FBgn0071380	XR	Unbiased	15	386.541	117.458	290	13.8666	16.2	0.03587	0.13792	0.03675	0.1524	395.822	120.177	3	9	0.00173	0.01695	0.00233	0.02303	-0.7638	-0.9886
FBgn0071384	A	Unbiased	15	394.072	118.927	337	23.4	26.7333	0.05937	0.22478	0.06186	0.2672	394.044	118.955	7	3	0.00265	0.00768	0.00546	0.00775	-1.8487	-0.0269
FBgn0071404	XR	Unbiased	15	344.02	120.979	334	4.93333	27.5333	0.01434	0.22758	0.01447	0.27121	344.066	120.933	1	16	0.00038	0.03197	0.00089	0.04068	-1.1594	-0.8605
FBgn0071482	XR	Unbiased	14	336.288	134.711	187	1.14285	42.9285	0.00339	0.31867	0.0034	0.4149	336.119	134.88	2	8	0.00085	0.01319	0.00187	0.01865	-1.4807	-1.1023
FBgn0071518	XR	Unbiased	15	339.187	104.812	485	4	14.7333	0.01179	0.14056	0.01188	0.15565	339.244	104.755	0	7	0	0.02127	0	0.02055	-	0.12673
FBgn0071610	XR	Unbiased	15	386.875	120.125	974	3.06666	28.3333	0.00792	0.23586	0.00796	0.28319	386.833	120.166	1	2	0.00034	0.00459	0.00079	0.00511	-1.1594	-0.2682
FBgn0071696	XR	Unbiased	12	252.346	71.6538	422	19	18.0833	0.07529	0.25237	0.07934	0.30766	252.166	71.8333	0	1	0	0.00232	0	0.0046	-	-1.1405
FBgn0071717	XR	Unbiased	15	328.687	103.312	601	12.7333	16.6	0.03873	0.16067	0.03977	0.18082	331.466	103.533	5	10	0.00379	0.02391	0.00463	0.0297	-0.6155	-0.7416
FBgn0071874	A	Unbiased	14	368.566	108.433	224	6.28571	16.8571	0.01705	0.15546	0.01725	0.17421	368.583	108.416	5	15	0.00193	0.03496	0.00426	0.0435	-1.8893	-0.8001
FBgn0071997	XR	Unbiased	14	224.5	75.5	265	13	16.5	0.0579	0.21854	0.06026	0.25833	224.5	75.5	0	3	0	0.01353	0	0.01249	-	0.25513
FBgn0072029	XR	Unbiased	15	406.041	133.958	210	23.8666	28.0666	0.05877	0.20951	0.0612	0.2457	406.088	133.911	11	20	0.00576	0.0426	0.00833	0.04593	-1.185	-0.297
FBgn0072036	XR	Unbiased	15	377.625	138.375	101	6.33333	33.6	0.01677	0.24281	0.01696	0.2934	386.855	141.144	1	11	0.00123	0.01201	0.00079	0.02396	1.1224	-1.9228
FBgn0072103	A	Female-biased	11	292.541	91.4583	144	14.3636	18.4545	0.04909	0.20178	0.05078	0.23504	292.303	91.6969	12	7	0.00895	0.02141	0.01401	0.02606	-1.5674	-0.7238
FBgn0072104	A	Female-biased	14	356.944	132.055	292	6.14285	19.5714	0.0172	0.1482	0.01741	0.16511	358.952	133.047	2	9	0.00079	0.01387	0.00175	0.02127	-1.4807	-1.3342
FBgn0072240	XR	Unbiased	12	206.192	63.8076	242	10.9166	11.4166	0.05294	0.17892	0.0549	0.20441	206.277	63.7222	4	4	0.00683	0.02496	0.00642	0.02078	0.22445	0.70723
FBgn0072309	A	Unbiased	12	417.307	143.692	322	17	19.8333	0.04073	0.13802	0.04188	0.15253	420.833	146.166	0	9	0	0.01554	0	0.02038	-	-0.9636
FBgn0072361	XR	Unbiased	15	341.718	108.281	391	3.06666	12.2	0.00897	0.11266	0.00902	0.12208	341.866	108.133	1	12	0.00039	0.02325	0.00089	0.03412	-1.1594	-1.2416
FBgn0072444	A	Unbiased	15	362.26	135.739	532	14.0666	22.6666	0.03883	0.16698	0.03987	0.18889	362.211	135.788	2	9	0.00073	0.01395	0.00169	0.02038	-1.4905	-1.1822
FBgn0072533	XR	Unbiased	15	403.197	112.802	439	21.6666	33.4666	0.05373	0.29668	0.05575	0.37761	403.311	112.688	4	8	0.00259	0.01352	0.00305	0.02183	-0.4757	-1.4017
FBgn0072536	XR	Unbiased	14	309.933	92.0666	720	15.7142	13.2142	0.0507	0.14352	0.05249	0.15931	410.666	120.333	7	4	0.00422	0.01086	0.00535	0.01045	-0.7793	0.13064
FBgn0072572	A	Unbiased	13	231.333	68.6666	711	18.3846	20.4615	0.07947	0.29798	0.084	0.37976	231.192	68.8076	3	5	0.00299	0.01639	0.00418	0.02341	-0.8975	-1.0688
FBgn0072647	XR	Unbiased	11	205.611	64.3888	349	12	17	0.05836	0.26402	0.06075	0.32542	205.666	64.3333	0	5	0	0.01413	0	0.02653	-	-1.791
FBgn0072681	XR	Unbiased	13	292.511	109.488	558	10.2307	23	0.03497	0.21006	0.03581	0.24647	292.487	109.512	5	6	0.00306	0.01451	0.0055	0.01765	-1.5794	-0.6564
FBgn0072682	XR	Unbiased	15	234.562	74.4375	83	3.06666	7.2	0.01307	0.09672	0.01318	0.10355	251.211	81.7888	1	2	0.00053	0.01164	0.00122	0.00752	-1.1594	1.44289
FBgn0072738	A	Unbiased	13	261.976	83.0238	198	32.0769	18.3846	0.12244	0.22143	0.13367	0.26243	262.064	82.9358	2	4	0.00117	0.00896	0.00245	0.01554	-1.468	-1.4371
FBgn0072931	A	Female-biased	14	350.244	111.755	1575	47.8571	37.9285	0.13663	0.33938	0.15083	0.45181	375.642	119.357	3	7	0.00146	0.01795	0.00251	0.01844	-1.2782	-0.0977
FBgn0073401	A	Unbiased	15	378.906	125.093	278	5.13333	22.7333	0.01354	0.18173	0.01367	0.2081	378.822	125.177	1	10	0.00065	0.01962	0.00081	0.02456	-0.3988	-0.7652
FBgn0073468	XR	Unbiased	15	416.114	117.885	433	0	17.7333	0	0.15042	0	0.16789	416.066	117.933	0	13	0	0.02729	0	0.0339	-	-0.7661
FBgn0073720	A	Unbiased	8	204.074	59.9259	309	10	10.25	0.049	0.17104	0.05067	0.19413	204.375	59.625	6	6	0.00873	0.03653	0.01132	0.03881	-1.0642	-0.2729
FBgn0073870	A	Unbiased	9	183.85	56.15	320	32.8888	13.1111	0.17888	0.2335	0.20436	0.27974	191.759	57.2407	3	3	0.00492	0.01164	0.00575	0.01928	-0.5515	-1.5129
FBgn0074039	A	Unbiased	15	313.447	115.552	245	6	24.1333	0.01914	0.20885	0.01939	0.24478	313.5	115.5	0	5	0	0.01245	0	0.01331	-	-0.2185
FBgn0074272	A	Female-biased	15	309.697	98.302	102	22.8	28.4666	0.07362	0.28958	0.07748	0.36595	309.655	98.3444	5	9	0.00326	0.01336	0.00496	0.02814	-1.1587	-1.9692
FBgn0074397	XR	Unbiased	15	378.02	125.979	122	8.93333	24.2666	0.02363	0.19262	0.02401	0.22262	378.022	125.977	4	7	0.00352	0.0201	0.00325	0.01708	0.26881	0.63654
FBgn0074452	A	Unbiased	14	363.966	128.033	555	6.07142	25.2857	0.01668	0.19749	0.01686	0.2292	363.809	128.19	1	7	0.00039	0.01748	0.00086	0.01717	-1.1552	0.06804
FBgn0074467	A	Unbiased	15	404.281	129.718	290	51.4	38.4666	0.12713	0.29653	0.13931	0.37737	404.244	129.755	25	28	0.01399	0.05321	0.01901	0.06636	-1.0997	-0.8307
FBgn0074691	A	Unbiased	15	350.666	117.333	380	5.33333	22.4	0.0152	0.1909	0.01536	0.22032	357.377	119.622	4	8	0.00207	0.00891	0.00344	0.02056	-1.2699	-2.086
FBgn0074880	A	Unbiased	15	288.01	104.989	417	8.2	18.7333	0.02847	0.17843	0.02902	0.20376	287.777	105.222	2	13	0.00132	0.02443	0.00213	0.03799	-1.0016	-1.4031
FBgn0075094	A	Unbiased	15	375.781	125.218	231	17.6666	35.9333	0.04701	0.28696	0.04855	0.3617	380.166	126.833	6	5	0.00606	0.01261	0.00485	0.01212	0.87174	0.13661
FBgn0075115	XR	Female-biased	15	427.854	124.145	771	3.4	18.3333	0.00794	0.14767	0.00798	0.16445	427.833	124.166	2	7	0.00142	0.01902	0.00143	0.01733	-0.0238	0.34977
FBgn0075541	A	Female-biased	15	367.677	136.322	2376	4.33333	31.1333	0.01178	0.22837	0.01187	0.27234	371.6	138.4	3	27	0.00164	0.04466	0.00248	0.05999	-1.0094	-1.0692
FBgn0076113	A	Unbiased	15	475.104	142.895	645	24.3333	31.1333	0.05121	0.21787	0.05304	0.25739	505.822	151.177	4	12	0.00169	0.0165	0.00243	0.02441	-0.9721	-1.2617
FBgn0076178	A	Female-biased	15	286.479	91.5208	337	5.06666	26.0666	0.01768	0.28481	0.01789	0.35823	286.5	91.5	1	1	0.00046	0.00145	0.00107	0.00336	-1.1594	-1.1594
FBgn0076206	A	Unbiased	9	123.866	38.1333	62	5.11111	6.11111	0.04126	0.16025	0.04244	0.18028	123.87	38.1296	1	1	0.00179	0.00582	0.00297	0.00964	-1.0882	-1.0882
FBgn0076258	A	Unbiased	7	193.208	61.7916	419	14.2857	18.5714	0.07393	0.30054	0.07784	0.38403	192.976	62.0238	4	7	0.00888	0.03378	0.00846	0.04606	0.23902	-1.3805
FBgn0076345	A	Female-biased	15	400.552	136.447	1259	26.1333	33.2666	0.06524	0.2438	0.06825	0.29486	400.355	136.644	2	2	0.00066	0.00348	0.00153	0.0045	-1.4905	-0.5941
FBgn0076751	XR	Unbiased	9	378.433	122.566	68	3	27	0.00792	0.22028	0.00796	0.2608	387	126	0	0	0	0	0	0	-	-
FBgn0076770	XR	Unbiased	14	55.6222	16.3777	444	0	2	0	0.12211	0	0.13328	55.6666	16.3333	0	0	0	0	0	0	-	-
FBgn0076805	XR	Unbiased	12	249.615	74.3846	361	8.58333	18.6666	0.03438	0.25094	0.03519	0.30552	249.611	74.3888	3	6	0.00345	0.03381	0.00397	0.0267	-0.4285	1.0141
FBgn0078120	XR	Unbiased	15	322.072	94.927	432	0.86666	15.1333	0.00269	0.15942	0.00269	0.17922	322.111	94.8888	2	11	0.00206	0.02358	0.0019	0.03565	0.22064	-1.3044
FBgn0078422	A	Female-biased	14	136.122	34.8777	650	25.0714	11.1428	0.18418	0.31948	0.21135	0.41631	138.714	35.2857	3	3	0.00308	0.01557	0.0068	0.02673	-1.6705	-1.2782
FBgn0078711	A	Female-biased	15	386.187	135.812	388	13.2666	38.9333	0.03435	0.28666	0.03516	0.36122	386.355	135.644	4	6	0.00138	0.01123	0.00318	0.0136	-1.8159	-0.6098
FBgn0078776	XR	Female-biased	15	253.635	85.3645	215	24	20.1333	0.09462	0.23585	0.10114	0.28316	264.722	89.2777	0	7	0	0.01045	0	0.02411	-	-2.0399
FBgn0078951	XR	Unbiased	12	178.192	49.8076	842	15.8333	11	0.08885	0.22084	0.09457	0.26159	178.361	49.6388	2	0	0.00322	0	0.00371	0	-0.3817	-
FBgn0078999	XR	Unbiased	11	163.333	49.6666	366	0	5	0	0.10067	0	0.1081	163.333	49.6666	0	0	0	0	0	0	-	-
FBgn0079065	XR	Unbiased	12	344.974	117.025	1592	6.25	28.0833	0.01811	0.23997	0.01833	0.28921	345	117	3	1	0.00144	0.00142	0.00287	0.00283	-1.6292	-1.1405
FBgn0079303	XR	Unbiased	15	198.843	68.1562	91	0	8.66666	0	0.12715	0	0.13933	198.833	68.1666	0	2	0	0.0081	0	0.00902	-	-0.2682
FBgn0079443	XR	Unbiased	15	323.27	93.7291	97	6	12.6	0.01856	0.13442	0.01879	0.14814	323.333	93.6666	0	6	0	0.01281	0	0.0197	-	-1.2241
FBgn0079470	XR	Unbiased	15	215.187	54.8125	139	0	7.53333	0	0.13743	0	0.15181	215.166	54.8333	0	2	0	0.01215	0	0.01121	-	0.22064
FBgn0079894	XR	Unbiased	14	305.344	99.6555	796	0	17.6428	0	0.17703	0	0.20194	305.404	99.5952	0	7	0	0.01776	0	0.0221	-	-0.724
FBgn0080172	XR	Unbiased	14	354.355	116.644	194	2.07142	22	0.00584	0.1886	0.00586	0.21723	354.333	116.666	1	0	4.00E-04	0	0.00088	0	-1.1552	-
FBgn0080191	A	Female-biased	15	283.781	85.2187	435	12.1333	20.3333	0.04275	0.2386	0.04402	0.28719	283.755	85.2444	2	4	0.00093	0.00759	0.00216	0.01443	-1.4905	-1.5181

Supplementary Table S6. Polymorphism and divergence statistics for alleles from a Mesa Verda population of *D. pseudoobscura*.

fbgn	location	category	n	div_sitesR	div_sitesS	gaps	raw_divR	raw_divS	kR	kS	kR_JC	kS_JC	pm_sites_R	pm_sites_S	S_R	S_S	pi_R	pi_S	theta_R	theta_S	TD_R	TD_S
FBgn0080425	XR	Unbiased	15	270.729	92.2708	99	5.26666	14.7333	0.01945	0.15967	0.01971	0.17954	270.777	92.2222	8	9	0.0059	0.01962	0.00908	0.03001	-1.2877	-1.2983
FBgn0080442	XR	Unbiased	15	358.197	118.802	683	2	22.6	0.00558	0.19023	0.0056	0.21941	358.211	118.788	0	11	0	0.02228	0	0.02847	-	-0.8378
FBgn0080491	XR	Unbiased	15	216.52	74.4791	200	0	15.0666	0	0.20229	0	0.23574	216.5	74.5	0	1	0	0.00178	0	0.00412	-	-1.1594
FBgn0080502	XR	Unbiased	15	381.666	113.333	264	7	24.3333	0.01834	0.2147	0.01856	0.25294	393.666	116.333	1	2	0.00033	0.00507	0.00078	0.00528	-1.1594	-0.1052
FBgn0080686	XR	Unbiased	15	276.062	89.9375	356	12.3333	33	0.04467	0.36692	0.04606	0.50387	289.055	94.9444	12	36	0.01159	0.10071	0.01276	0.11661	-0.3569	-0.5792
FBgn0080703	XR	Unbiased	12	257.5	81.5	43	3	23.3333	0.01165	0.28629	0.01174	0.36062	257.5	81.5	0	4	0	0.00985	0	0.01625	-	-1.3847
FBgn0080821	XR	Unbiased	15	365.197	120.802	1073	0	13.2	0	0.10926	0	0.11809	365.088	120.911	0	6	0	0.00756	0	0.01526	-	-1.7662
FBgn0080923	XR	Unbiased	15	313.52	97.4791	439	0	19.5333	0	0.20038	0	0.23314	313.444	97.5555	0	11	0	0.03241	0	0.03467	-	-0.2518
FBgn0080991	XR	Unbiased	15	386.187	123.812	645	0	26.1333	0	0.21107	0	0.24786	386.166	123.833	0	2	0	0.00215	0	0.00496	-	-1.4905
FBgn0081203	XR	Unbiased	13	216.404	80.5952	892	0.07692	10	0.00035	0.12407	0.00035	0.13563	222.358	83.641	2	6	0.00196	0.0141	0.00289	0.02311	-0.9092	-1.44
FBgn0081662	XR	Unbiased	15	392.062	114.937	255	4.26666	20	0.01088	0.174	0.01096	0.19798	411.1	119.9	3	11	0.00148	0.02446	0.00224	0.02821	-1.0094	-0.5123
FBgn0081676	A	Unbiased	14	64.7333	19.2666	181	5.71428	3.64285	0.08827	0.18907	0.09391	0.21786	64.7142	19.2857	2	4	0.00781	0.04957	0.00971	0.06521	-0.5324	-0.7903
FBgn0081984	XR	Unbiased	11	289.916	103.083	572	5	15.5454	0.01724	0.1508	0.01744	0.16836	289.924	103.075	0	5	0	0.01023	0	0.01656	-	-1.4646
FBgn0082012	A	Unbiased	11	83.1666	33.8333	439	0	2.0909	0	0.0618	0	0.06449	83.1666	33.8333	0	1	0	0.00537	0	0.01009	-	-1.1285
FBgn0082034	A	Female-biased	15	144.833	44.1666	1082	4.06666	6.13333	0.02807	0.13886	0.02861	0.15356	144.766	44.2333	1	2	0.00092	0.00602	0.00212	0.0139	-1.1594	-1.4905
FBgn0082078	A	Unbiased	14	381.188	131.811	221	43.6428	51.8571	0.11449	0.39342	0.12423	0.55763	380.809	132.19	7	23	0.00429	0.03674	0.00578	0.05471	-0.9451	-1.3867
FBgn0082108	A	Female-biased	15	420.562	131.437	755	57.8666	39	0.13759	0.29671	0.152	0.37766	420.522	131.477	13	6	0.00543	0.01216	0.0095	0.01403	-1.6841	-0.4653
FBgn0244147	XL	Unbiased	15	396.885	116.114	286	46.6	31.4	0.11741	0.27042	0.12769	0.33537	403.522	118.477	10	9	0.00457	0.01543	0.00762	0.02336	-1.5195	-1.2725
FBgn0244218	XL	Unbiased	15	412.583	127.416	138	27.8666	34.2	0.06754	0.26841	0.07077	0.33223	412.555	127.444	4	2	0.0018	0.00209	0.00298	0.00482	-1.2699	-1.4905
FBgn0244765	XR	Female-biased	15	183.27	50.7291	195	4.13333	16.1333	0.02255	0.31802	0.02289	0.41378	183.288	50.7111	1	13	0.00135	0.06084	0.00167	0.07884	-0.3988	-0.8973
FBgn0244843	XR	Unbiased	15	189.552	65.4479	809	0	14.3333	0	0.219	0	0.25898	189.477	65.5222	0	4	0	0.00988	0	0.01877	-	-1.5181
FBgn0244862	XR	Female-biased	14	355.344	109.655	783	64.4285	17.5714	0.18131	0.16024	0.20755	0.18027	393.892	122.107	28	4	0.01855	0.00557	0.02235	0.0103	-0.7267	-1.5097
FBgn0244919	XR	Female-biased	15	256.583	67.4166	646	13	8.73333	0.05066	0.12954	0.05245	0.14221	268	71	0	8	0	0.02441	0	0.03465	-	-1.0881
FBgn0245136	XR	Unbiased	15	299.406	105.593	136	4.2	21.3333	0.01402	0.20203	0.01416	0.23539	299.355	105.644	2	7	0.00127	0.01099	0.00205	0.02037	-1.0016	-1.6576
FBgn0245216	XR	Unbiased	15	302.697	96.302	324	1	21.6666	0.0033	0.22498	0.00331	0.26748	302.666	96.3333	0	6	0	0.01265	0	0.01915	-	-1.188
FBgn0246788	A	Unbiased	9	467.816	147.183	339	38	60	0.08122	0.40765	0.08597	0.58818	467.833	147.166	0	0	0	0	0	0	-	-
FBgn0246854	A	Unbiased	15	203.218	60.7812	339	4.8	18.3333	0.02361	0.30162	0.02399	0.38583	203.2	60.8	6	13	0.00712	0.04401	0.00908	0.06575	-0.7544	-1.3
FBgn0247266	A	Unbiased	7	398.937	126.062	648	38.5714	34.4285	0.09668	0.2731	0.10351	0.33958	402.595	128.404	10	5	0.00756	0.01557	0.01013	0.01589	-1.3593	-0.099
FBgn0247718	A	Unbiased	15	368.041	123.958	335	26.6666	30.4	0.07245	0.24524	0.07619	0.29699	368.2	123.8	6	15	0.00341	0.02907	0.00501	0.03726	-1.1157	-0.8767
FBgn0247974	A	Female-biased	14	361.077	100.922	1069	32.2857	26.4285	0.08941	0.26187	0.09521	0.32211	361.047	100.952	6	8	0.0027	0.01665	0.00522	0.02491	-1.7289	-1.2506
FBgn0248238	A	Unbiased	13	347.952	99.0476	245	13.1538	22.6153	0.0378	0.22832	0.03878	0.27227	376.128	109.871	2	5	0.00081	0.0098	0.00171	0.01466	-1.468	-1.1822
FBgn0248273	A	Female-biased	15	401.875	120.125	108	7	39.5333	0.01741	0.3291	0.01762	0.43325	401.833	120.166	0	6	0	0.00951	0	0.01535	-	-1.3325
FBgn0249640	XR	Unbiased	15	156.291	44.7083	669	0	11.0666	0	0.24753	0	0.3004	156.333	44.6666	0	1	0	0.00298	0	0.00688	-	-1.1594
FBgn0249878	XR	Female-biased	15	371.979	108.02	925	29.1333	29.2666	0.07831	0.27093	0.08271	0.33617	387.855	113.144	3	3	0.00103	0.0074	0.00237	0.00815	-1.685	-0.2725
FBgn0261117	A	Female-biased	15	361.927	82.0729	1926	27.9333	19.5333	0.07717	0.23799	0.08144	0.28631	363.833	83.1666	1	2	0.00036	0.01007	0.00084	0.00739	-1.1594	0.95399

Supplementary Table S7. Correlates of diversity and divergence

Variables	Covariates	Partial correlations (lower and upper one percentiles in brackets)			
		Fast-evolving		Female-biased	
		XR	A	X	A
π_S, K_S	K_A, *Fop*	0.005 (-0.305/0.246)	0.170 (-0.346/0.622)	0.401(-1.000/1.000)	-0.092 (-0.783/0.498)
π_S, *Fop*	K_A, K_S	0.099 (-0.307/0.401)	0.371* (-0.053/0.680)	0.370 (-1.000/1.000)	0.392* (-0.210/0.819)
π_S, K_A	K_S, *Fop*	0.094 (-0.285/0.426)	0.046 (-0.365/0.554)	-0.483(-1.000/1.000)	0.062 (-0.587/0.746)
K_A, K_S	π_S, *Fop*	0.296** (0.027/0.540)	0.417** (0.079/0.759)	0.057 (-1.000/1.000)	0.672** (0.189/0.905)
Fop, K_S	π_S, K_A	-0.080 (-0.353/0.232)	-0.132 (-0.614/0.759)	-0.322 (-1.000/1.000)	-0.087 (-0.665/0.589)
π_A, K_S	K_A, *Fop*	-0.024 (-0.218/0.781)	0.179 (-0.365/0.728)	-0.273 (-1.000/1.000)	-0.269 (-0.761/0.531)
π_A, *Fop*	K_A, K_S	0.093 (-0.198/0.381)	0.176 (-0.353/0.523)	0.326 (-1.000/1.000)	0.153 (-0.368/0.776)
π_A, K_A	K_S, *Fop*	0.517** (0.179/0.781)	0.351* (-0.033/0.726)	0.848 (-1.000/1.000)	0.372 (-0.023/0.777)
K_A, K_S	π_A, *Fop*	0.267** (0.003/0.530)	0.335* (-0.095/0.751)	0.145 (-1.000/1.000)	0.699** (0.001/0.902)
π_A, K_A	*Fop*, *Exp*	0.536** (0.201/0.782)	0.455** (0.040/0.688)	0.799 (-1.000/1.000)	0.183 (-0.164/0.702)
π_S, π_A	K_A, K_S	0.520** (0.204/0.663)	0.727** (0.301/0.877)	-0.278 (-1.000/1.000)	0.414*** (0.069/0.887)

* $p < 0.05$ (one-tailed test)

** $p < 0.01$ (one-tailed test)