Har-P weaponizes P-transposase to severely impact Drosophila gonad development.

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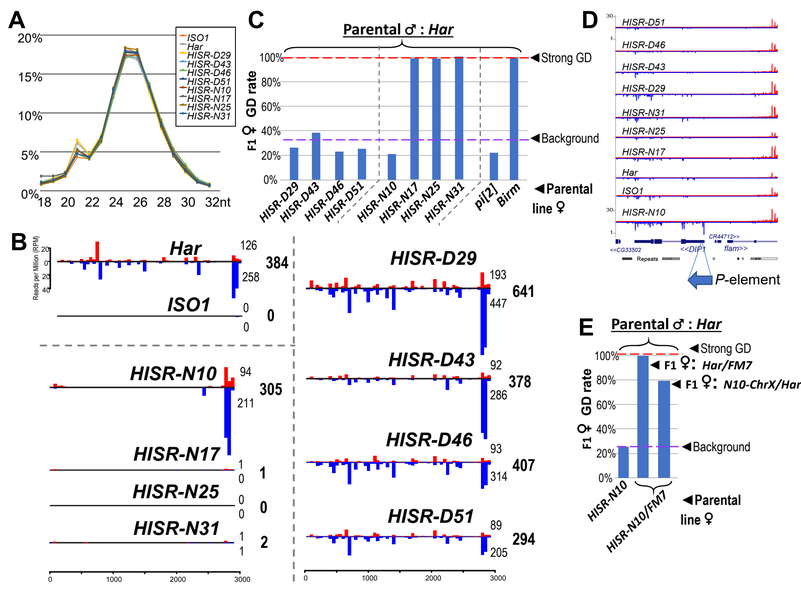
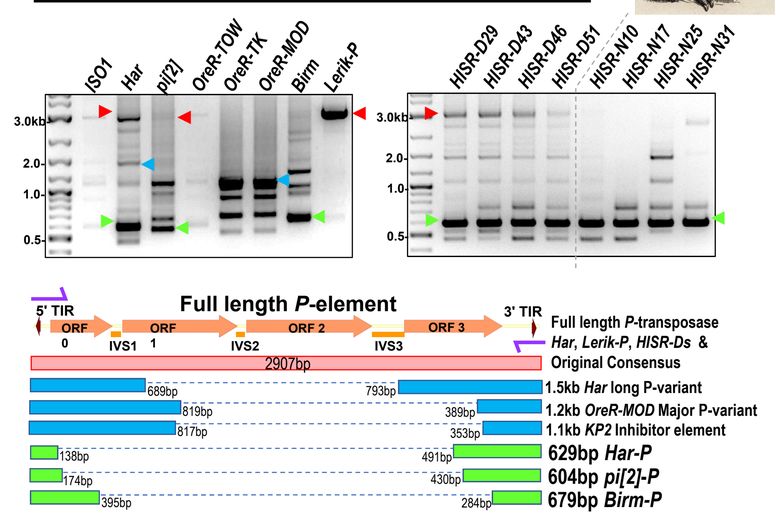
Abstract

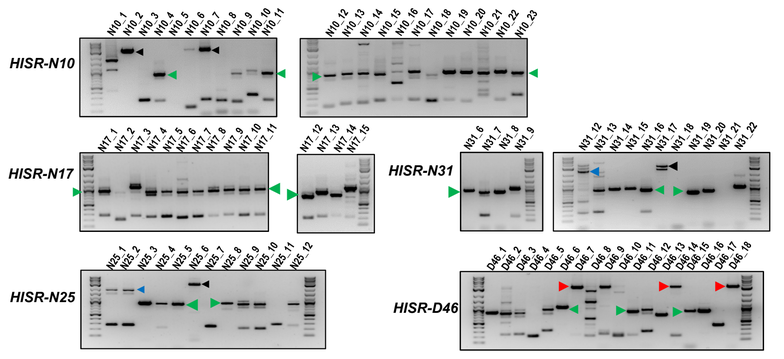
When *Drosophila* mothers lacking *P*-element-piRNAs (i.e. *ISO1*) mate with certain fathers harboring active *P*-elements (i.e. *Harwich*, *Har*), hybrid daughters suffer from gonadal dysgenesis (GD), where ovaries collapse from uncontrolled *P*-element transposition. To discover the *P*-element driving GD, we selected hybrid *D. melanogaster* lines with portions of *Har* DNA within the *ISO1* genome. We generated *HISR-D* and *HISR-N* lines retaining or losing GD induction, respectively. Despite greatly-reduced numbers of *P*-elements, *HISR-D* lines produced as many *P*-element piRNAs as parental *Har*. In these lines, we discovered a highly-truncated *P*-element variant: "*Har-P*", which mobilized *de novo* in all *HISR* lines. Crossing *P*-transposase with *Har-Ps* in *HISR-N* lines restored GD and revealed a paternal *P*-element-piRNA-directed imprint on *Har-Ps* to suppress lethal somatic transposition. *Har-P* may weaponize *P*-transposase during catastrophic transposition.

Altered *P-element* piRNA patterns in *HISR* hybrids

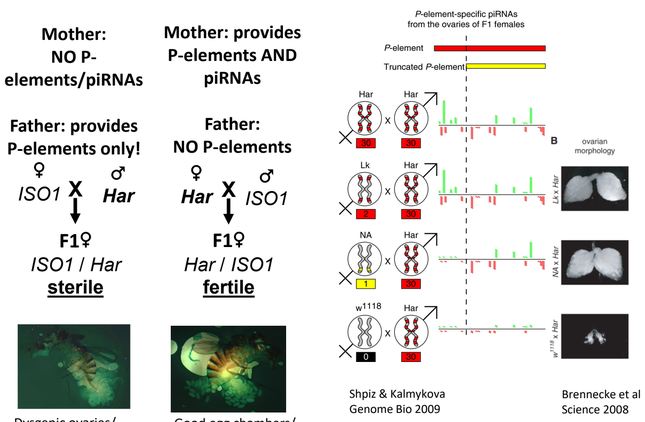


PCR and cloning in *HISRs* uncovers *Har-P* as a highly mobile short *P*-element variant

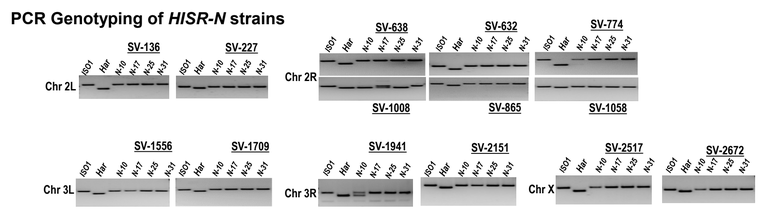


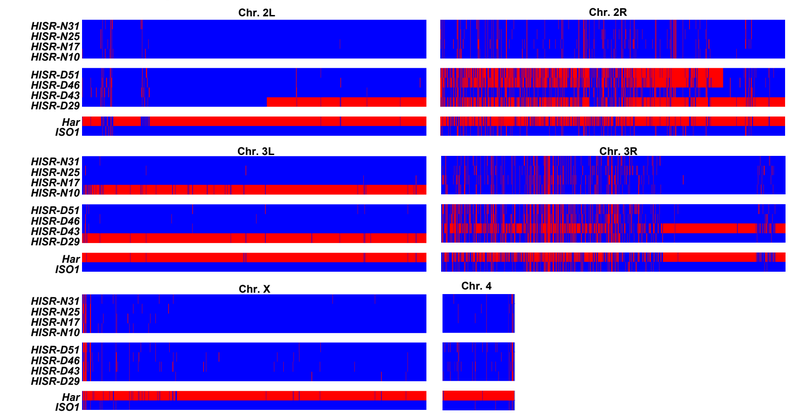


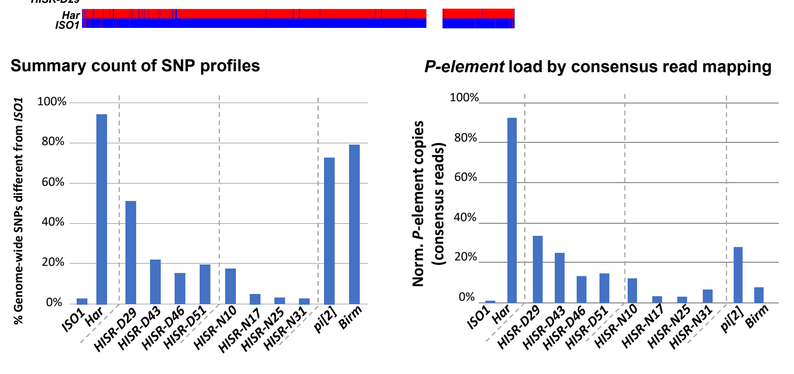
Hybrid dysgenesis is a fertility disease from missing *P-elements* & piRNAs



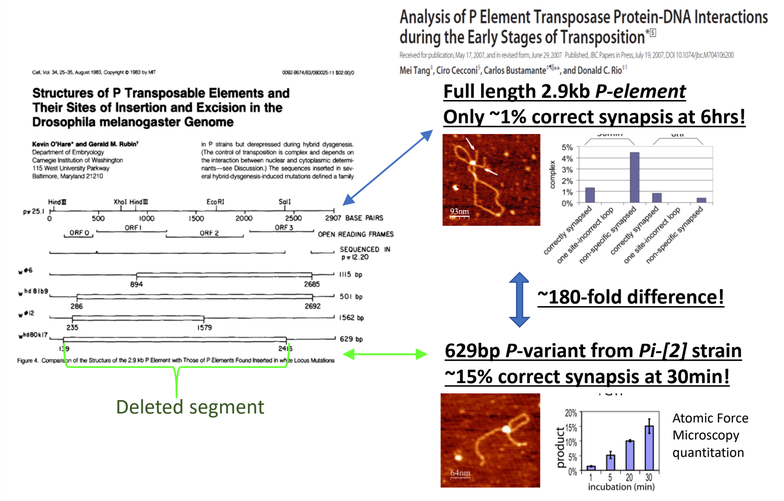
Whole genome sequencing of *HISR* hybrids



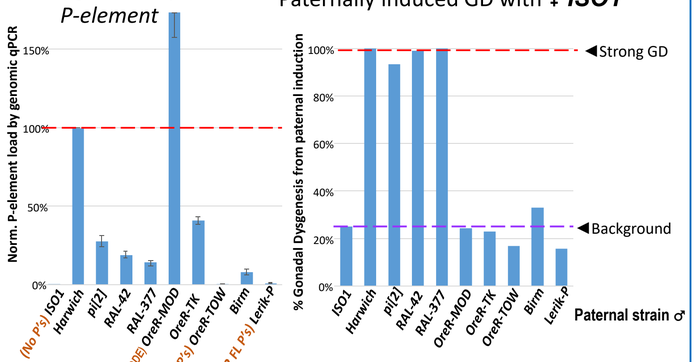




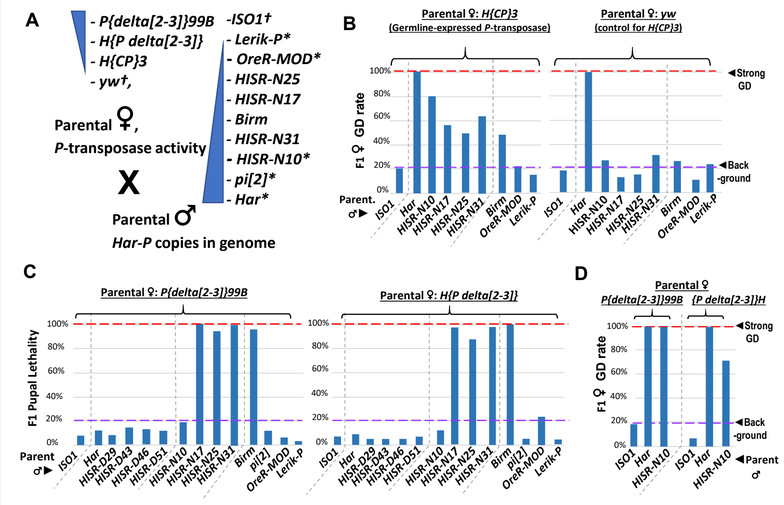
Earlier studies of naturally short *P-element* variants



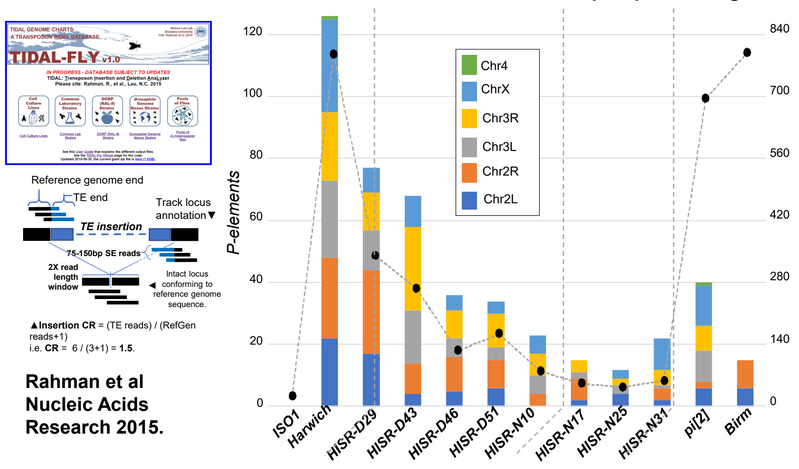
Diversity in *P-element* copy numbers and hybrid dysgenesis severity



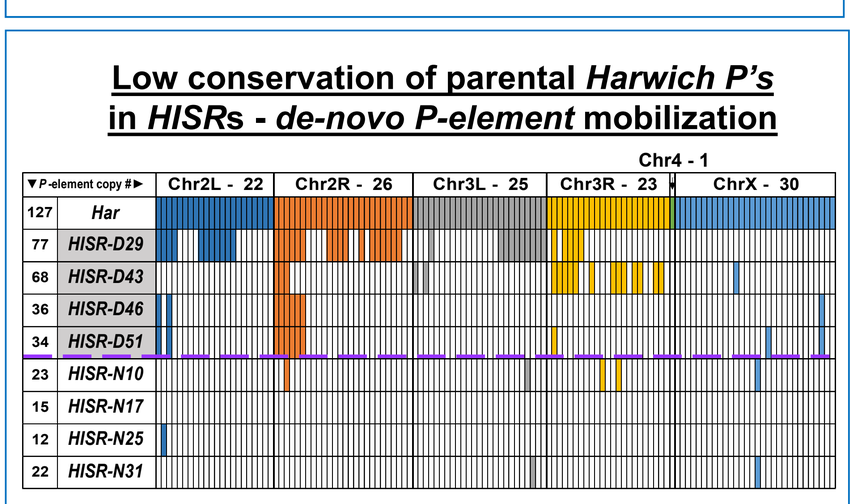
Crossing back a Full-length *P*-transposase into *HISR-N* strains "restores" strong GD…



TIDAL-Fly analysis of TE landscape in *HISR* hybrids



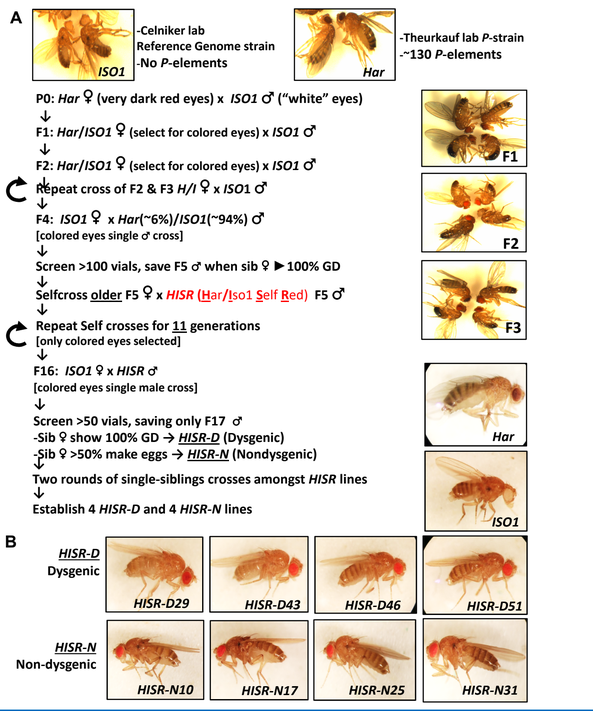
Low conservation of parental *Harwich P's* in *HISRs* - *de-novo P-element* mobilization



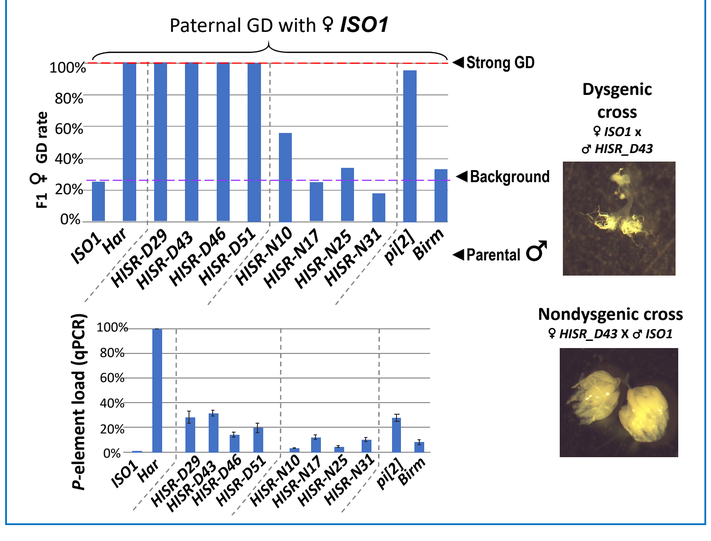
▼P-element copy #►		Chr2L - 22	Chr2R - 26	Chr3L - 25	Chr3R - 23	Chr4 - 1 ChrX - 30
127	Har					
77	HISR-D29					
68	HISR-D43					
36	HISR-D46					
34	HISR-D51					
23	HISR-N10					
15	HISR-N17					
12	HISR-N25					
22	HISR-N31					

▼ P-element copy #►		127	77	68	36	34	23	15	12
		Har	HISR-D29	HISR-D43	HISR-D46	HISR-D51	HISR-N10	HISR-N17	HISR-N25
77	HISR-D29	42							
68	HISR-D43	19	9						
36	HISR-D46	9	9	7					
34	HISR-D51	11	11	7	27				
23	HISR-N10	5	3	4	1	1			
15	HISR-N17	0	1	1	1	0	2		
12	HISR-N25	1	1	0	0	0	0	0	
22	HISR-N31	2	3	1	0	1	2	1	0

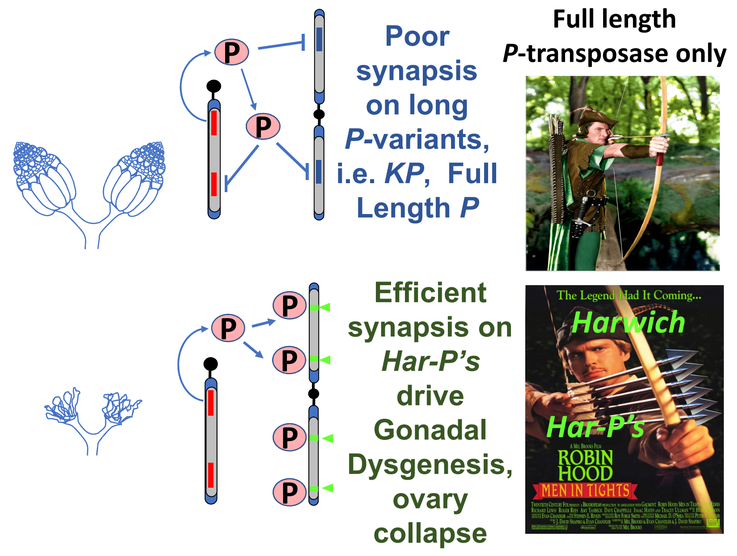
Can we genetically isolate a "Super" *P-element* from *Harwich* ?



HISR hybrids with reduced *P* copies Strong GD (*HISR-D*) versus Low GD (*HISR-N*)



Full Length *P*-transposase is the bow; *Har-P's* are arrows that drive strong GD



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Thank you for visiting.
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