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Forensic Performance of Insertion-Deletion Marker Systems



athology and Immunology **P-024** of the University of Porto, Portugal.

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An introduction to InDels

- InDels (insertion-deletion) are a type of short length polymorphism, consisting of the presence or absence of a short (typically 1-50 bp) sequence.
- Closely related to SNPs, as another class of short biallelic polymorphisms. They share most of SNP properties useful for forensic identification applications:
- Low mutation rate
- Short amplicon PCR to increase survival in degraded samples
- High multiplexing capacity
- Relatively common throughout the genome, their total number has been estimated to be nearly 2,000,000. Up to 15% of known polymorphisms in the human genome are InDels [1].
- As length polymorphisms, InDels can be typed with a simple direct PCR-to-CE genotyping strategy, using a single multiplexed PCR with dyed-linked primers immediately followed by capillary electrophoresis.

Since InDel polymorphisms have been found to be relatively common in the human genome [1-2] selecting a high enough number of these biallelic polymorphisms that are selectively neutral, unlinked, and with the highest heterozygosity possible in most populations while keeping short amplicon PCR design, can be considered relatively straightforward.

Regardless of the limited individual informativeness of biallelic markers [3], it is known that the analysis of an affordable number of such polymorphisms may prove applicable [3-4]. In order to assess the informativeness of InDels and their applicability for the forensic community, we have conducted comprehensive genotyping of several U.S. representative population groups with two InDel assays typing in single multiplexes each: 30 and 38 InDel markers, herein: DIPplex and 38plex.

DIPplex Investigator Markers

D70	110		Chr	location	Public database ID	Profile position		Chr	location	Public database ID	Profile positio
+ agca		D40	1	54490780	rS2307956	Red 4	D125	22	24080816	rS16388	Yellow
	in/Dei	D39	1	92010480	rS17878444	Red 6	D124	22	34031900	rS6481	Yellow
		D128	1	193144970	rS2307924	Red 5	D136	22	35739831	rS16363	Red 1
		D92	11	101984628	rS17174476	Green 2	D56	4	108109222	rS2308292	Blue 9
	<u> </u>	D93	12	93200037	rS2307570	Green 3	D64	5	66250256	rS1610935	Yellow
		D97	13	30226384	rS17238892	Red 3	D58	5	76780823	rS1610937	Blue 8
	Dal	D99	14	57119834	rS2308163	Green 4	D67	5	155594834	rS1305056	Green
	Dei	D101	15	87665320	rS2307433	Green 6	D70	6	97564842	rS2307652	Blue 5
		D6	16	54249331	rS1610905	Blue 7	D81	7	94885086	rS17879936	Yellow
		D114	17	3916882	rS2307581	Yellow 2	D77	7	110727223	rS1611048	Blue 2
		D111	17	16025713	rS1305047	Blue 6	D131	7	154035495	rS1611001	Blue 4
	In	D133	2	41111225	rS2067235	Red 2	D83	8	19134059	rS2308072	Yellow
		D48	2	99447993	rS28369942	Yellow 3	D84	8	120016982	rS3081400	Red 7
	_	D45	2	169898519	rS2307959	Blue 3	D88	9	98037732	rS8190570	Green
D70- D70+	to tootooo	D118	20	25226470	rS16438	Green 1	Amel	Х	p22.1-22.3	M55418	Blue 1
eletion – ggtaacto	to agea taatoaa	D122	21	33582626	r\$8177524	Yellow 5	Amel	Y	p11.2	M55419	Blue 1
Ser tion - ggradett	it agea ladieda			Note: D125.	D124 and D1	36 are with	in 12 M	1b froi	m one anothe	on Chr 22	

DIPplex 9947a profile



HID-38plex Markers

R6

Y8

	Chr	location	Public database ID	Profile position		Chr	location	Public database ID	Profile position
B7	1	161077452	rs3047269	Blue 7	B9	20	11643625	rs33917182	Blue 9
Y5	1	245878706	rs2307579	Yellow 5	B1	20	30165066	rs34541393	Blue 1
B6	10	6027167	rs140809	Blue 6	R10	21	14556736	rs35605984	red 10
R3	10	54112392	rs1160886	Red 3	Y2	21	30294208	rs10629077	Yellow 2
Y3	11	258180	rs10688868	Yellow 3	B5	22	25120901	rs2307700	Blue 5



Materials & Methods

The two InDel genotyping assays studied comprised: Qiagen Investigator DIPplex commercial kit and HID InDel 38plex developed by R. Pereira et al. [6] following the protocols and conditions listed below.

We used the guidelines included on the DIPplex investigator kit for PCR and capillary electrophoresis [5]. 1 ng of DNA was used for the PCR reaction. In order to achieve best profile quality with the ABI Prism 3130xl capillary sequencer, we diluted the DIPplex PCR samples to 1:25 before mixing 1 μ L of the dilution to the electrophoresis loading mix. POP-4 was used as the electrophoresis polymer in a 36 cm capillary array. A set of bins and panels was developed for the DIPplex results analysis, which were performed using GeneMapper ID-X.

We used, for the HID-38plex, the published guidelines for PCR and CE [6]. 0.60 ng of DNA were used for the PCR reaction. In order to achieve best profile quality with the ABI Prism 3130xl capillary sequencer, we diluted the PCR samples 1:10 before mixing 1 μ L of the dilution to the electrophoresis loading mix. POP-4 was used as the electrophoresis polymer in a 36 cm capillary array. A set of bins and panels was made for 38plex results analysis, which were performed using GeneMapper ID-X.

G5 3 8591709 rs2308242 Green 5 Red 6 30134266 rs34811743 rs33972805 Blue 8 **R4** 4 rs2308026 **B8** 11 125794082 119404855 Red 4 rs1610919 | Yellow 8 | **R5** rs2307526 5178112 14801263 Red 5 rs2067238 Green 2 G7 5 **G2** 12 113772931 65414216 rs1160956 | Green 7 **R9** 13 **G1** 5 | rs1610871 | Green 1 171020572 43778155 rs2308171 Red 9 **G4** 6 rs2307710 Green 4 rs2308189 Red 7 47929222 **R7** 14 28106508 Y6 rs2307839 Yellow 9 rs2308020 Y9 51268809 Yellow 6 117600251 15 **Y4** 16 rs2067208 Yellow 4 **R1** rs2308137 Red 1 149655891 83139788 I **G9** I 83121850 rs2307978 Green 9 **Y1** 17 rs3051300 Yellow 1 10076666 **Y7** 18 rs3080855 Yellow 7 **B4** 76681235 rs35769550 Blue 4 21507205 Green 8 |/ rs589447 **G8** rs34511541 R8 34677042 138489776 18 Red 8 **R2** 19 **B10** 9 rs16402 | Blue 10 rs36040336 Red 2 38396788 1353662 **G3** 9 **B3** 19 rs2067294 Green 3 rs2307689 Blue 3 70504241 48896180 104626014 rs2307580 Green 6 **B2** 2 234681130 rs16624 Blue 2 **G6** 9



InDels less than 10 Mb from a core STR locus

	CHR	STR	DIPplex	Physical Distance		CHR	STR	DIPplex	Physical Distance
	5	CSF1PO	rS1305056	6,158,834		7	D7S820	rs2307978	311,150
	6	SE33	rS2307652	8,521,842	ă	11	TH01	rs10688868	1,890,820
4	8	D8S1179	rS3081400	5,959,018	ā	12	D12S391	rs1610919	2,352,263
	15	PentaE	rS2307433	7,509,680	38	12	vWA	rs1610919	8,838,263
Ĺ	22	D22S1045	rS6481	1,747,100	6	16	D16S539	rs2067208	1,804,212
١	22	D22S1045	rS16363	39,169	Ī	21	D21S11	rs35605984	4,919,264
					•				
		Ke	SU	Its					

Left: When contemplating the possibility of combining the information contained in these InDel markers systems with each other or with core STR loci, we should keep in mind that the proximity between some of these markers could lead to a linkage disequilibrium state. The table on the left identifies 6 loci from each InDel assay that are less than 10 Mb from a core STR locus.

Allele frequency analysis

We performed population allele frequency analysis with both InDel multiplexes typing the NIST collection of population samples consisting of a total of 712 male DNA samples plus two female samples.

Comprising:

- 262 African Americans
- 260 U.S. Caucasians
- 140 U.S. Hispanics
- 50 U.S. Asians

The results of the frequency analysis are shown in the tables on the right.

Several markers in each of the assays have shown a deviation from HWE (marked in red), however the number of such markers

DIPplex U.S. population data

	Cauc	Asian	Hisp /	Af-Am	Cauc	Asian H	isp Af-	Am	Cauc	Asian	Hisp	Af-Am	Cauc	Asian	Hisp	Af-Am	Cauc	Asian	Hisp	Af-Am	Cauc	Asian	Hisp	Af-Am	Cauc	Asian	Hisp	Af-Am	Cauc	Asian	Hisp	Af-Am	Cauc	Asian	Hisp	Af-Am	Cauc	Asian	Hisp	Af-Am
		D1	L11			D131				D4	45	_		D	56			D5	8			D6				D	70			D	77			D	101			D	118	
Het (expected	0.496	0.182	0.501	0.47	0.496	0.485 0.	502 0.	.36	0.499	0.485	0.482	0.487	0.449	0.503	0.443	0.498	0.501	0.485	0.443	0.279	0.501	0.5	0.5	0.482	0.501	0.424	0.459	0.225	0.5	0.505	0.494	0.472	0.494	0.498	0.501	0.358	0.493	0.149	0.474	0.416
Het (observed	0.542	0.2	0.45	0.488	0.462	0.52 0.	507 0.3	346	0.515	0.4	0.543	0.508	0.443	0.58	0.4	0.473	0.462	0.48	0.4	0.288	0.427	0.5 ().414	0.462	0.55	0.44	0.464	0.242	0.477	0.5	0.493	0.465	0.454	0.56	0.507	0.35	0.473	0.12	0.536	0.419
1 (deletion)	0.450	0.900	0.518	0.625	0.448	0.600 0.	496 0.2	235	0.471	0.400	0.400	0.585	0.340	0.530	0.329	0.46	0.502	0.600	0.671	0.833	0.511	0.550 ().529	0.596	0.496	0.300	0.354	0.129	0.483	0.510	0.561	0.621	0.559	0.560	0.475	0.233	0.565	0.080	0.618	0.706
2 (insertion)	0.550	0.100	0.482	0.375	0.552	0.400 0.	504 0.7	765	0.529	0.600	0.600	0.415	0.660	0.470	0.671	0.54	0.498	0.400	0.329	0.167	0.489	0.450 ().471	0.404	0.504	0.700	0.646	0.871	0.517	0.490	0.439	0.379	0.441	0.440	0.525	0.767	0.435	0.920	0.382	0.294
3 (variant)																																								
P-value	0 14	1	0 242	0 596	0 3 1 9	0 768	1 06	605	0.621	0 248	0 158	0 5 2 2	0.891	0 392	0.256	0 454	0 218	1	0 255	0.823	0.019	1 (045	0 521	0 1 3 8	1	1	0 273	0.458	1	1	0 894	0.212	0 405	1	0.73	0 532	0.261	0 153	1
i value	0.11	-	0.212	0.550	0.010	0.700	1 0.0		0.021	0.2 10	0.150	0.522	0.051	0.002	0.200	0.101	0.210	-	0.235	0.023	0.015	-		0.521	0.130	-	-	0.275	0.150	-	-	0.001	0.212	0.105		0.75	0.332	0.201	0.133	-
		П	67			580					22			П	03				0			D12	2			D'	133			ח1	36			ſ	130			ſ	 040	
Het (expected)	0.467	0.416	0 / 87	0 / 28	0 / 0 8	0.502 0	187 0	11	0 /08	0 503	0/18	0.424	0.495	0.465		0 501	0 / 92	0.228	0 502	0.485	0.5	0 407 0	5 0 501	0.451	0 / 98	0.5		0.44	0.501	0 / 81	0 / 87	0 3/15	0.444	0 208		0 / 9/	0 / 87	0 453		0.421
Het (expected)	0.407	0.410	0.407	0.420	0.490	0.502 0.		1E	0.498	0.303	0.40	0.424	0.495	0.405	0.477	0.301	0.492	0.220	0.502	0.405	0.5	0.407	0.001	0.431	0.490	0.5	0.5	0.44	0.501	0.401	0.407	0.345	0.444	0.298	0.404	0.494	0.407	0.455	0.490	0.421
	0.489	0.42	0.529	0.427	0.515	0.56 0.	529 U.	.45	0.462	0.54	0.564	0.438	0.525	0.32	0.507	0.415	0.42	0.20	0.514	0.438	0.458	0.44	0.5	0.477	0.489	0.5	0.5	0.442	0.519	0.5	0.471	0.35	0.427	0.32	0.443	0.465	0.492	0.6		0.365
1 (deletion)	0.370	0.290	0.414	0.31	0.460	0.540 0.	414 0.3	325	0.540	0.530	0.604	0.696	0.445	0.360	0.389	0.508	0.431	0.130	0.457	0.394	0.519	0.720 0).514	0.342	0.462	0.550	0.529	0.675	0.504	0.390	0.414	0.221	0.668	0.820	0.593	0.44	0.582	0.340	0.554	0.7
2 (insertion)	0.630	0./10	0.586	0.69	0.540	0.460 0.	586 0.6	6/5	0.460	0.470	0.396	0.304	0.555	0.640	0.611	0.492	0.569	0.870	0.539	0.591	0.481	0.280).486	0.658	0.538	0.450	0.4/1	0.325	0.496	0.610	0.586	0.779	0.332	0.180	0.407	0.56	0.418	0.660	0.446	0.3
3 (variant)																			0.004	0.015																				
P-value	0.508	1	0.378	1	0.62	0.568 0.	385 0.7	779	0.259	0.775	0.051	0.658	0.381	0.034	0.481	0.007	0.024	0.581	0.663	0.177	0.174	0.729	1	0.413	0.804	1	1	1	0.62	1	0.73	1	0.579	1	0.381	0.377	0.9	0.027	0.302	0.185
		D	84			D97				D1:	14	1		D1	L 22			D1	24			D12	5			D	48			D	54)81	1		C)83	
Het (expected)	0.496	0.432	0.494	0.409	0.498	0.368 0.	497 0.4	485	0.494	0.358	0.501	0.349	0.493	0.335	0.39	0.464	0.464	0.489	0.495	0.345	0.493	0.46	0.47	0.401	0.5	0.398	0.407	0.406	0.497	0.243	0.413	0.349	0.489	0.198	0.489	0.5	0.5	0.453	0.487	0.476
Het (observed	0.485	0.34	0.4	0.385	0.462	0.36 0.	414 0.3	381	0.473	0.42	0.464	0.35	0.496	0.34	0.386	0.419	0.416	0.46	0.529	0.288	0.504	0.34	0.45	0.423	0.508	0.3	0.421	0.412	0.481	0.28	0.436	0.35	0.469	0.1	0.486	0.531	0.489	0.44	0.486	0.477
1 (deletion)	0.452	0.310	0.436	0.389	0.464	0.760 0.	550 0.	.59	0.557	0.770	0.525	0.225	0.561	0.790	0.736	0.637	0.365	0.410	0.443	0.779	0.439	0.650 ().625	0.722	0.483	0.730	0.282	0.278	0.458	0.140	0.289	0.223	0.578	0.110	0.421	0.481	0.481	0.660	0.586	0.392
2 (insertion)	0.548	0.690	0.564	0.602	0.536	0.240 0.	450 0.4	.41	0.443	0.230	0.475	0.775	0.439	0.210	0.264	0.363	0.635	0.590	0.557	0.221	0.561	0.350).375	0.278	0.517	0.270	0.718	0.722	0.542	0.860	0.711	0.777	0.422	0.890	0.579	0.519	0.519	0.340	0.414	0.608
3 (variant)				0.009																																				
P-value	0.711	0.184	0.026	0.066	0.266	1 0	.06 <mark>8E</mark>	-04	0.53	0.417	0.405	1	1	1	1	0.142	0.108	0.772	0.492	0.012	0.801	0.113 (0.717	0.439	0.902	0.144	0.834	0.879	0.618	0.573	0.542	1	0.526	0.007	1	0.384	0.712	1	1	1
HID-38	lex	US	nor	nula	tion	data																																		
	Cours	Acion		Af Am	Cauc	Acian L	lion Af	A	Cours	Acion	Llion	۵۴ ۵ ۲۰۰	Cours	Acion	Llion	Δf Δ 100	Cours	Acion	Llien	۸ ۴ ۸ ۲۰۰۵	Cours	Acian	Llien	Af Am	Cours	Acion	Llion	Af Am	Cours	Acion	Llion	۸۴ ۸۰۰۰	Cours	Acier	- Llion	Af Am		Acior	- Hien	Af Am
		Asidii	пізр		Cauc	Asiali I	lish Hi-	-AIII	Cauc	Asidii	пізр	AI-AIII	Cauc	Asidii	пізр	AI-AIII	Cauc	Asidii	пізр	AI-AIII	Cauc	Asidii	пізр	AI-AIII		Asidii	пізр	AI-AIII		Asidii	пізр	AI-AIII	Cauc	Asiai		AFAI		Asiai		AFAIII
			D1			D 2							1				1	D	C			DC			1		07				00				DO					
Hat (avpacted)	0.401	0.416	B1	0 477	0 211	B2	407 0	10	0 422	0 242	33	0.406	0.466	0.491	34	0 274	0.405	B	5	0.407	0 474	B6	0 272	0.404	0.401	0.405	B7	0.465		0.250	38 0 E 0 1	0 471	0.501	0.405	B9	0 100	0 412	0 / 01	0 1 10	0.424
Het (expected)	0.491	0.416	B1 0.474	0.477	0.311	B2 0.217 0	497 0.4	458	0.423	B 0.243	0.481	0.496	0.466	0.481	34 0.499	0.274	0.495	0.44	5 0.489	0.407	0.474	0.46	0.373	0.494	0.491	0.495	0.5	0.465	0.5	0.258	0.501	0.471	0.501	0.495	B9 5 0.435	0.498	0.412	0.481	0.448	0.424
Het (expected) Het (observed)	0.491	0.416	B1 0.474 0.507	0.477	0.311	B2 0.217 0 0.204 0	497 0.4 482 0.4	458 416	0.423	B 0.243 0.24	0.481	0.496	0.466	0.481	0.499 0.496	0.274	0.495	0.44 0.32	5 0.489 0.482	0.407	0.474	B6 0.46 0.58	0.373	0.494	0.491	0.495	0.5 0.413	0.465	0.5	0.258 0.3	0.501 0.5 0.5	0.471	0.501	0.495	B9 5 0.435 0.393	0.498	0.412	0.481	L 0.448	0.424
Het (expected) Het (observed) 1 (deletion)	0.491 0.441 0.431	0.416 0.46 0.71	B1 0.474 0.507 0.382	0.477 0.485 0.39	0.311 0.292 0.808	B2 0.217 0 0.204 0 0.122 0	497 0.4 482 0.4 .55 0.3	458 416 353	0.423 0.421 0.303	B 0.243 0.24 0.14	0.481 0.511 0.399	0.496 0.527 0.45	0.466 0.498 0.368	0.481 0.5 0.61	34 0.499 0.496 0.464	0.274 0.233 0.163	0.495 0.487 0.554	0.44 0.32 0.32	5 0.489 0.482 0.421	0.407 0.388 0.283	0.474 0.456 0.385	B6 0.46 0.58 0.35	0.373 0.364 0.246	0.494 0.55 0.442	0.491 0.502 0.431	0.495 0.38 0.57	B7 0.5 0.413 0.536	0.465 0.477 0.634	0.5 0.471 0.473	0.258 0.3 0.15	38 0.501 0.5 0.479	0.471 0.508 0.378	0.501 0.513 0.498	0.495 0.5 0.43	B9 5 0.435 0.393 0.682	0.498 0.461 0.537	0.412 0.425 0.289	0.481	1 0.448 0.514 0.336	0.424 0.407 0.304
Het (expected) Het (observed) 1 (deletion) 2 (insertion)	0.491 0.441 0.431 0.569	0.416 0.46 0.71 0.29	B1 0.474 0.507 0.382 0.618	0.477 0.485 0.39 0.61	0.311 0.292 0.808 0.192	B2 0.217 0 0.204 0 0.122 0 0.878 0	497 0.4 482 0.4 .55 0.3 .45 0.6	458 416 353 647	0.423 0.421 0.303 0.697	B 0.243 0.24 0.14 0.86	0.481 0.511 0.399 0.601	0.496 0.527 0.45 0.55	0.466 0.498 0.368 0.632	0.481 0.5 0.61 0.39	0.499 0.496 0.464 0.536	0.274 0.233 0.163 0.837	0.495 0.487 0.554 0.446	0.44 0.32 0.32 0.68	5 0.489 0.482 0.421 0.579	0.407 0.388 0.283 0.717	0.474 0.456 0.385 0.615	B6 0.46 0.58 0.35 0.65	0.373 0.364 0.246 0.754	0.494 0.55 0.442 0.558	0.491 0.502 0.431 0.569	0.495 0.38 0.57 0.43	B7 0.5 0.413 0.536 0.464	0.465 0.477 0.634 0.366	0.5 0.471 0.473 0.527	0.258 0.3 0.15 0.85	38 0.501 0.5 0.479 0.521	0.471 0.508 0.378 0.622	0.501 0.513 0.498 0.502	0.495 0.5 0.43 0.57	B9 5 0.435 0.393 0.682 0.318 0.248	0.498 0.461 0.537 0.463	0.412 0.425 0.289 0.711	0.481 0.46 0.39 0.61	1 0.448 0.514 0.336 0.664	0.424 0.407 0.304 0.696
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1	0.416 0.46 0.71 0.29 0.512	0.474 0.507 0.382 0.618 0.475	0.477 0.485 0.39 0.61 0.796	0.311 0.292 0.808 0.192 0.324	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3	458 416 353 647 167	0.423 0.421 0.303 0.697 1	B 0.243 0.24 0.14 0.86 1	0.481 0.511 0.399 0.601 0.488	0.496 0.527 0.45 0.55 0.316	0.466 0.498 0.368 0.632 0.288	0.481 0.5 0.61 0.39 1	0.499 0.496 0.464 0.536 1	0.274 0.233 0.163 0.837 0.023	0.495 0.487 0.554 0.446 0.803	B 0.44 0.32 0.32 0.68 0.1	5 0.489 0.482 0.421 0.579 0.865	0.407 0.388 0.283 0.717 0.446	0.474 0.456 0.385 0.615 0.599	B6 0.46 0.58 0.35 0.65 0.071	0.373 0.364 0.246 0.754 0.821	0.494 0.55 0.442 0.558 0.078	0.491 0.502 0.431 0.569 0.802	0.495 0.38 0.57 0.43 0.148	B7 0.5 0.413 0.536 0.464 0.059	0.465 0.477 0.634 0.366 0.788	0.5 0.471 0.473 0.527 0.384	0.258 0.3 0.15 0.85 0.577	38 0.501 0.5 0.479 0.521 1	0.471 0.508 0.378 0.622 0.236	0.501 0.513 0.498 0.502 0.711	0.495 0.5 0.43 0.57 1	B9 5 0.435 0.393 0.682 0.318 0.248	0.498 0.461 0.537 0.463 0.263	 0.412 0.425 0.289 0.711 0.653 	0.481 0.46 0.39 0.61 0.774	1 0.448 0.514 0.336 0.664 0.088	0.424 0.407 0.304 0.696 0.558
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1	0.416 0.46 0.71 0.29 0.512	B1 0.474 0.507 0.382 0.618 0.475	0.477 0.485 0.39 0.61 0.796	0.311 0.292 0.808 0.192 0.324	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3	458 416 353 647 167	0.423 0.421 0.303 0.697 1	B 0.243 0.24 0.14 0.86 1	0.481 0.511 0.399 0.601 0.488	0.496 0.527 0.45 0.55 0.316	0.466 0.498 0.368 0.632 0.288	0.481 0.5 0.61 0.39 1	34 0.499 0.496 0.464 0.536 1	0.274 0.233 0.163 0.837 0.023	0.495 0.487 0.554 0.446 0.803	B 0.44 0.32 0.32 0.68 0.1	5 0.489 0.482 0.421 0.579 0.865	0.407 0.388 0.283 0.717 0.446	0.474 0.456 0.385 0.615 0.599	B6 0.46 0.58 0.35 0.65 0.071	0.373 0.364 0.246 0.754 0.821	0.494 0.55 0.442 0.558 0.078	0.491 0.502 0.431 0.569 0.802	0.495 0.38 0.57 0.43 0.148	B7 0.5 0.413 0.536 0.464 0.059	0.465 0.477 0.634 0.366 0.788	0.5 0.471 0.473 0.527 0.384	0.258 0.3 0.15 0.85 0.577	38 0.501 0.5 0.479 0.521 1	0.471 0.508 0.378 0.622 0.236	0.501 0.513 0.498 0.502 0.711	0.495 0.5 0.43 0.57 1	B9 5 0.435 0.393 0.682 0.318 0.248 C9	0.498 0.461 0.537 0.463 0.263	0.412 0.425 0.289 0.711 0.653	0.481 0.46 0.39 0.61 0.774	1 0.448 0.514 0.336 0.664 0.088	0.424 0.407 0.304 0.696 0.558
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1	0.416 0.46 0.71 0.29 0.512	B1 0.474 0.507 0.382 0.618 0.475 G1	0.477 0.485 0.39 0.61 0.796	0.311 0.292 0.808 0.192 0.324	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 G2 0.46 0	497 0.4 482 0.4 .55 0.3 .45 0.4 734 0.3	458 416 353 647 167	0.423 0.421 0.303 0.697 1	B 0.243 0.24 0.14 0.86 1 G 0.272	0.481 0.511 0.399 0.601 0.488	0.496 0.527 0.45 0.55 0.316	0.466 0.498 0.368 0.632 0.288	0.481 0.5 0.61 0.39 1	34 0.499 0.496 0.464 0.536 1 54	0.274 0.233 0.163 0.837 0.023	0.495 0.487 0.554 0.446 0.803	B 0.44 0.32 0.32 0.68 0.1 G 0.279	5 0.489 0.482 0.421 0.579 0.865 5	0.407 0.388 0.283 0.717 0.446	0.474 0.456 0.385 0.615 0.599	B6 0.46 0.58 0.35 0.65 0.071 G6	0.373 0.364 0.246 0.754 0.821	0.494 0.55 0.442 0.558 0.078	0.491 0.502 0.431 0.569 0.802	0.495 0.38 0.57 0.43 0.148	B7 0.5 0.413 0.536 0.464 0.059 G7	0.465 0.477 0.634 0.366 0.788	0.5 0.471 0.473 0.527 0.384	E 0.258 0.3 0.15 0.85 0.577 C	38 0.501 0.5 0.479 0.521 1 58	0.471 0.508 0.378 0.622 0.236	0.501 0.513 0.498 0.502 0.711	0.495 0.5 0.43 0.57 1	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383	0.498 0.461 0.537 0.463 0.263	0.412 0.425 0.289 0.711 0.653	0.481 0.46 0.39 0.61 0.774	1 0.448 0.514 0.336 0.664 0.088 Y1	0.424 0.407 0.304 0.696 0.558
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected)	0.491 0.441 0.431 0.569 0.1 0.498	0.416 0.46 0.71 0.29 0.512 0.492 0.492	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493	0.477 0.485 0.39 0.61 0.796 0.499	0.311 0.292 0.808 0.192 0.324 0.435	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 G2 0.46 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.6	458 416 353 647 167 365 346	0.423 0.421 0.303 0.697 1 0.453	B 0.243 0.24 0.14 0.86 1 0.272 0.272	0.481 0.511 0.399 0.601 0.488 53 0.433	0.496 0.527 0.45 0.55 0.316	0.466 0.498 0.368 0.632 0.288 0.288 0.464	0.481 0.5 0.61 0.39 1 0.421 0.421	34 0.499 0.496 0.464 0.536 1 54 0.39	0.274 0.233 0.163 0.837 0.023 0.023	0.495 0.487 0.554 0.446 0.803 0.32	B 0.44 0.32 0.32 0.68 0.1 G 0.379	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.338	0.407 0.388 0.283 0.717 0.446 0.447	0.474 0.456 0.385 0.615 0.599 0.501	B6 0.46 0.58 0.35 0.65 0.071 66 0.424	0.373 0.364 0.246 0.754 0.821 0.501	0.494 0.55 0.442 0.558 0.078 0.41	0.491 0.502 0.431 0.569 0.802 0.802 0.221	0.495 0.38 0.57 0.43 0.148 0.503	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435	0.465 0.477 0.634 0.366 0.788 0.788	0.5 0.471 0.473 0.527 0.384 0.48 0.48	E 0.258 0.3 0.15 0.85 0.577 0.577 0.481	38 0.501 0.5 0.479 0.521 1 58 0.497	0.471 0.508 0.378 0.622 0.236	0.501 0.513 0.498 0.502 0.711 0.322 0.318	0.495 0.5 0.43 0.57 1 0.503	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 0.0435 0.445	0.498 0.461 0.537 0.463 0.263	0.412 0.425 0.289 0.711 0.653	0.481 0.46 0.39 0.61 0.774	1 0.448 0.514 0.336 0.664 1 0.088 Y1 <u>' 0.46</u> 0.453	0.424 0.407 0.304 0.696 0.558
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion)	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49	0.416 0.46 0.71 0.29 0.512 0.492 0.48 0.42	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.489	0.477 0.485 0.39 0.61 0.796 0.499 0.407	0.311 0.292 0.808 0.192 0.324 0.435 0.435 0.462	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 G2 0.46 0 0.35 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3	458 416 353 647 167 365 346 238	0.423 0.421 0.303 0.697 1 0.453 0.453 0.46	B 0.243 0.24 0.14 0.86 1 1 G 0.272 0.28	3 0.481 0.511 0.399 0.601 0.488 53 0.433 0.4	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165	0.466 0.498 0.368 0.632 0.288 0.288 0.464 0.473 0.362	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322	B 0.44 0.32 0.32 0.68 0.1 G 0.379 0.3 0.25	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335	0.474 0.456 0.385 0.615 0.599 0.501 0.501 0.494	B6 0.46 0.58 0.35 0.65 0.071 0.424 0.32 0.7	0.373 0.364 0.246 0.754 0.821 0.501 0.475	0.494 0.55 0.442 0.558 0.078 0.41 0.395	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.223 0.238	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398	E 0.258 0.3 0.15 0.85 0.577 0.481 0.481 0.46 0.39	38 0.501 0.5 0.479 0.521 1 58 0.497 0.496 0.546	0.471 0.508 0.378 0.622 0.236 0.48 0.48	0.501 0.513 0.498 0.502 0.711 0.318 0.318	0.495 0.5 0.43 0.57 1 0.503 0.367	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 0.4 0.257	0.498 0.461 0.537 0.463 0.263 0.263	0.412 0.425 0.289 0.711 0.653 0.653 0.494 0.456	0.481 0.46 0.39 0.61 0.774 0.407 0.36	1 0.448 0.514 0.336 0.664 0.664 1 0.088 Y1 0.46 0.453 0.357	0.424 0.407 0.304 0.696 0.558 0.383 0.384 0.258
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion)	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.48 0.42 0.58	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.489 0.511	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 G2 0.46 0 0.35 0 0.65 0	497 0.4 482 0.4 .55 0.3 .45 0.4 734 0.3 491 0.3 453 0.3 568 0.3	458 416 353 647 167 365 346 238 762	0.423 0.421 0.303 0.697 1 0.453 0.453 0.46 0.345	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.272 0.28 0.16	3 0.481 0.511 0.399 0.601 0.488 3 0.433 0.4 0.314 0.686	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523 0.413	0.495 0.487 0.554 0.446 0.803 0.803 0.32 0.322 0.199	B 0.44 0.32 0.68 0.1 6 0.379 0.3 0.25 0.75	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5	B6 0.46 0.58 0.65 0.071 0.071 0.424 0.32 0.7 0.7	0.373 0.364 0.246 0.754 0.821 0.821 0.501 0.475 0.475	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.712	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506	0.5 0.471 0.473 0.527 0.384 0.384 0.48 0.48 0.456 0.398 0.602	E 0.258 0.3 0.15 0.85 0.577 0.577 0.481 0.46 0.39 0.61	38 0.501 0.479 0.521 1 58 0.497 0.496 0.546 0.454	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.48 0.391	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799	0.495 0.5 0.43 0.57 1 0.50 0.367 0.367 0.469	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 ' 0.4 ' 0.257 0.743	0.498 0.461 0.537 0.463 0.263 0.263 0.47 0.47 0.469 0.376	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.456 0.443 0.557 	0.481 0.46 0.39 0.61 0.774 0.407 0.36 0.28	1 0.448 0.514 0.336 0.664 1 0.088 Y1 ' 0.46 0.453 0.357	0.424 0.407 0.304 0.696 0.558 0.383 0.383 0.384 0.258 0.742
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) R value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.48 0.42 0.58 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.489 0.511 0.867	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.321	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.35 0 0.655 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3 568 0.3 288 0.4	458 416 353 647 167 365 346 238 762	0.423 0.303 0.697 1 0.453 0.453 0.46 0.345 0.655	B 0.243 0.24 0.86 1 1 0.272 0.272 0.28 0.16 0.84 1	3 0.481 0.511 0.399 0.601 0.488 3 0.433 0.4 0.314 0.686 0.422	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.721	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523 0.413 0.587 0.249	0.495 0.487 0.554 0.446 0.803 	B 0.44 0.32 0.68 0.1 6 0.379 0.3 0.25 0.75 0.149	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.5	B6 0.46 0.58 0.35 0.65 0.071 0.071 0.32 0.7 0.3 0.097	0.373 0.364 0.246 0.754 0.821 0.821 0.501 0.475 0.475 0.525 0.611	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.294	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.426	E 0.258 0.3 0.15 0.85 0.577 0.577 0.481 0.481 0.46 0.39 0.61	38 0.501 0.5 0.479 0.521 1 58 0.497 0.496 0.546 0.454	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.48 0.391 0.609	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 ' 0.4) 0.257 . 0.743 0.662	0.498 0.461 0.537 0.463 0.263 0.263 0.263 0.263 0.263 0.47 0.469 0.376 0.624	 0.412 0.425 0.289 0.711 0.653 0.653 0.494 0.494 0.456 0.443 0.557 0.212 	0.481 0.46 0.39 0.61 0.774 0.407 0.36 0.28 0.72	1 0.448 1 0.514 0.336 0.664 1 0.088 Y1 0.46 0.453 0.357 0.643 0.855	0.424 0.407 0.304 0.696 0.558 0.558 0.383 0.384 0.258 0.742
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805	0.416 0.46 0.71 0.29 0.512 0.492 0.48 0.42 0.58 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.489 0.511 0.867	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471 0.004	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.35 0 0.655 0 1 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3 568 0.3 388 0.4	458 416 353 647 167 365 346 238 762 494	0.423 0.303 0.697 1 0.453 0.453 0.345 0.345 0.655 0.891	0.243 0.24 0.14 0.86 1 0.86 0.272 0.288 0.166 0.844 1	3 0.481 0.511 0.399 0.601 0.488 3 0.433 0.4 0.314 0.686 0.433	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731	34 0.499 0.496 0.464 0.536 1 34 0.39 0.343 0.264 0.736 0.19	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523 0.413 0.587 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1	B 0.44 0.32 0.68 0.1 6 0.379 0.3 0.25 0.75 0.149	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.5 0.903	B6 0.46 0.58 0.35 0.65 0.071 0.071 0.32 0.7 0.3 0.097	0.373 0.364 0.246 0.754 0.821 0.821 0.501 0.475 0.475 0.525 0.611	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.318 0.682 0.318 0.25	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436	E 0.258 0.3 0.15 0.85 0.577 0.577 0.481 0.481 0.46 0.39 0.61 0.774	38 0.501 0.5 0.479 0.521 1 38 0.497 0.496 0.546 0.454 1	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.48 0.391 0.609 1	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 0.4 0.257 0.743 0.662	0.498 0.461 0.537 0.463 0.263 0.263 0.263 0.263 0.263 0.47 0.469 0.376 0.624 1	 0.412 0.425 0.289 0.711 0.653 0.653 0.494 0.494 0.456 0.443 0.557 0.213 	0.481 0.46 0.39 0.61 0.774 0.407 0.36 0.28 0.72 0.486	1 0.448 1 0.514 0.336 0.664 1 0.088 Y1 7 0.46 0.357 0.643 0.355	0.424 0.407 0.304 0.696 0.558 0.558 0.383 0.384 0.258 0.742 1
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805	0.416 0.46 0.71 0.29 0.512 0.492 0.48 0.42 0.48 0.42 0.58 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.489 0.511 0.867 V2	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471 0.004	0.311 0.292 0.808 0.192 0.324 0.324 0.462 0.678 0.322 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 G2 0.46 0 0.35 0 0.655 0 1 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3 568 0.3 388 0.4	458 416 353 647 167 167 365 346 238 762 494	0.423 0.303 0.697 1 0.453 0.46 0.345 0.655 0.891	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.16 0.84 1	3 0.481 0.511 0.399 0.601 0.488 0.488 0.433 0.4 0.314 0.686 0.433	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523 0.413 0.587 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1	B 0.44 0.32 0.68 0.1 0.1 0.379 0.3 0.25 0.75 0.149	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.5 0.903	B6 0.46 0.58 0.35 0.65 0.071 0.32 0.7 0.3 0.3 0.097	0.373 0.364 0.246 0.754 0.821 0.821 0.501 0.475 0.475 0.525 0.611	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.238 0.874 0.126 0.394	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458	0.5 0.471 0.473 0.527 0.384 0.384 0.48 0.456 0.398 0.602 0.436	E 0.258 0.3 0.15 0.85 0.577 0.577 0.481 0.46 0.39 0.61 0.774	38 0.501 0.479 0.521 1 58 0.497 0.496 0.546 0.454 1	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.391 0.609 1	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848	0.495 0.5 0.43 0.57 1 1 0.503 0.367 0.469 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 3 0.383 7 0.4 9 0.257 . 0.743 ↓ 0.662 B1	0.498 0.461 0.537 0.463 0.263 0.263 0.469 0.376 0.624 1	 0.412 0.425 0.289 0.711 0.653 0.653 0.494 0.494 0.456 0.443 0.557 0.213 	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486	1 0.448 1 0.336 0.336 0.664 1 0.088 Y1 0.46 0.453 0.357 0.643 0.855	0.424 0.407 0.304 0.696 0.558 0.383 0.384 0.258 0.742 1
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.499 0.536 0.464 0.805	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.48 0.42 0.58 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.489 0.511 0.867 Y2 0.38	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471 0.004	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.35 0 0.655 0 1 0 Y3 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3 568 0.3 388 0.4	458 416 353 647 167 365 346 238 762 494 494	0.423 0.303 0.697 1 0.453 0.453 0.345 0.345 0.891 0.891	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.16 0.84 1 1 Y 0.311	3 0.481 0.511 0.399 0.601 0.488 0.488 0.433 0.4 0.314 0.686 0.433 0.433 0.4 3 0.433	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731	34 0.499 0.496 0.464 0.536 1 34 0.39 0.343 0.264 0.736 0.19 75	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523 0.413 0.587 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1	B 0.44 0.32 0.68 0.1 0.1 0.379 0.3 0.25 0.75 0.149 V 0.505	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.488	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.5 0.903	B6 0.46 0.58 0.35 0.65 0.071 0.071 0.32 0.7 0.3 0.097 0.3 0.097	0.373 0.364 0.246 0.754 0.821 0.821 0.501 0.475 0.525 0.611	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436	E 0.258 0.3 0.15 0.85 0.577 0.481 0.481 0.46 0.39 0.61 0.774	38 0.501 0.479 0.521 1 58 0.497 0.496 0.546 0.454 1 79 0.354	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.48 0.391 0.609 1	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848	0.495 0.5 0.43 0.57 1 0.503 0.367 0.367 0.469 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 3 0.383 7 0.4 9 0.257 . 0.743 ↓ 0.662 R1 0.429	0.498 0.461 0.537 0.463 0.263 0.263 0.469 0.376 0.624 1	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.456 0.443 0.557 0.213 0.283 	0.481 0.46 0.39 0.61 0.774 0.407 0.36 0.28 0.72 0.486	1 0.448 1 0.514 0.336 0.664 1 0.488 Y1 7 0.46 0.453 0.357 0.643 0.855	0.424 0.407 0.304 0.696 0.558 0.558 0.383 0.384 0.258 0.742 1
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed)	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.48 0.42 0.48 0.42 0.58 1 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.489 0.511 0.867 Y2 0.38 0.379	0.477 0.485 0.39 0.61 0.796 0.407 0.407 0.529 0.407 0.529 0.471 0.004	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.489 0 0.489 0 0.58 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3 568 0.3 388 0.4 416 0.3	458 416 353 647 167 365 346 238 762 494 494 362 395	0.423 0.303 0.697 1 0.453 0.453 0.345 0.345 0.891 0.891	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.2	3 0.481 0.511 0.399 0.601 0.488 3 0.433 0.4 0.314 0.686 0.433 7 4 0.383 0.429	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366 0.366	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789 0.789	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.358 0.358	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523 0.413 0.587 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.322 0.199 0.801 1 1 0.406 0.456	B 0.44 0.32 0.68 0.1 0.25 0.379 0.3 0.25 0.75 0.149 V 0.505 0.38	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.488	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.5 0.903 0.903	B6 0.46 0.58 0.35 0.65 0.071 0.071 0.32 0.7 0.3 0.097 0.3 0.097 V7 0.465 0.48	0.373 0.364 0.246 0.754 0.821 0.821 0.501 0.475 0.475 0.611 0.457	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645 0.645	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.5 0.5	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579 0.579	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.47	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436 0.436	E 0.258 0.3 0.15 0.85 0.577 0.481 0.481 0.46 0.39 0.61 0.774 0.485 0.52	38 0.501 0.5 0.479 0.521 1 58 0.497 0.496 0.546 0.454 1 1 79 0.354 0.354	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.48 0.391 0.609 1 1 0.36 0.36	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848 0.848	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.248 3 0.383 7 0.4 9 0.257 1 0.662 R1 0.429 0.429 0.46	0.498 0.461 0.537 0.463 0.263 0.263 0.47 0.469 0.376 0.624 1 1 0.468 0.376	 0.412 0.425 0.289 0.711 0.653 0.653 0.494 0.494 0.456 0.443 0.557 0.213 0.283 0.283 0.278 	0.481 0.46 0.39 0.61 0.774 0.407 0.36 0.28 0.72 0.486	1 0.448 0.514 0.336 0.664 0.664 1 0.453 0.453 0.357 0.643 0.355 R2 0.429 0.429 0.417	0.424 0.407 0.304 0.696 0.558 0.558 0.383 0.384 0.258 0.742 1 1 0.498 0.498
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion)	0.491 0.441 0.431 0.569 0.1 0.498 0.49 0.536 0.464 0.805 0.296 0.291 0.291	0.416 0.46 0.71 0.29 0.512 0.492 0.48 0.42 0.48 0.42 0.58 1 0.232 0.224 0.224	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.489 0.511 0.867 Y2 0.38 0.379 0.254	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471 0.529 0.471 0.308 0.338 0.306	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.58 0 0.58 0 0.41 0	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 293 0.7	458 416 353 647 167 365 346 238 762 494 494 362 395 395	0.423 0.421 0.303 0.697 1 0.453 0.45 0.345 0.655 0.891 0.891 0.412 0.425	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.272 0.28 0.16 0.84 1 1 0.311 0.3	3 0.481 0.511 0.399 0.601 0.488 0.488 0.433 0.4 0.314 0.686 0.433 0.433 74 0.383 0.429 0.257	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366 0.366 0.281 0.281	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789 0.5 0.487	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731	34 0.499 0.496 0.464 0.536 1 34 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429 0.436	0.274 0.233 0.163 0.837 0.023 0.23 0.486 0.523 0.413 0.587 0.249 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1 1 0.801 1 0.406 0.456 0.456	B 0.44 0.32 0.68 0.1 0.68 0.1 0.25 0.379 0.3 0.25 0.75 0.149 V 0.505 0.38 0.51	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.801 6 0.488 0.507	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.903 0.903 0.418 0.425 0.301	B6 0.46 0.58 0.35 0.65 0.071 0.7 0.32 0.7 0.3 0.32 0.097 0.3 0.097 V7 0.465 0.48 0.36	0.373 0.364 0.246 0.754 0.821 0.821 0.501 0.475 0.475 0.475 0.611 0.457 0.457 0.457	0.494 0.55 0.442 0.558 0.078 0.078 0.395 0.287 0.713 0.645 0.645	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.394	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.46 0.53 0.47 0.579 0.579	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.464 0.625	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.496 0.496	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436 0.436 0.436	E 0.258 0.3 0.15 0.85 0.577 0.577 0.481 0.46 0.39 0.61 0.774 0.485 0.52	38 0.501 0.479 0.521 1 58 0.497 0.496 0.496 0.454 1 79 0.354 0.3 0.229	0.471 0.508 0.378 0.622 0.236 0.236 0.48 0.48 0.391 0.609 1 1 0.609 1 0.36 0.283	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848 0.848 0.201 0.799 0.848 0.201 0.799 0.848	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 3 0.383 7 0.4 9 0.257 2 0.743 ↓ 0.662 R1 2 0.429 0.46 0.307	0.498 0.461 0.537 0.463 0.263 0.263 0.469 0.376 0.624 1 1 0.468 0.376 0.376	0.412 0.425 0.289 0.711 0.653 0.653 0.494 0.494 0.494 0.456 0.457 0.494 0.456 0.494 0.456 0.494 0.456 0.493 0.494 0.494 0.494 0.494 0.494 0.494 0.494 0.494 0.494 0.494 0.494 0.494 0.213 0.213 0.283 0.283 0.278	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486	1 0.448 1 0.448 0.514 0.336 0.664 1 1 0.46 0.453 0.357 0.643 0.643 0.643 0.855 R2 0.417 0.689	0.424 0.407 0.304 0.696 0.558 0.558 0.383 0.384 0.258 0.742 1 1 0.498 0.492 0.492 0.463
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion)	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805 0.296 0.291 0.296 0.291 0.18	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.492 0.48 0.42 0.58 1 0.232 0.232 0.224 0.133	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.511 0.867 Y2 0.38 0.379 0.254 0.746	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471 0.529 0.471 0.306 0.338 0.306 0.215	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.35 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.55 0 0.46 0 0.58 0 0.489 0 0.58 0 0.411 0	497 0.4 482 0.4 455 0.3 .45 0.4 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 293 0.3 707 0.4	458 416 353 647 167 365 346 238 762 494 494 362 395 236 395	0.423 0.303 0.697 1 0.453 0.453 0.45 0.345 0.345 0.891 0.891 0.412 0.425 0.289 0.289	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.16 0.84 1 0.84 1 0.311 0.311 0.3 0.19 0.81	3 0.481 0.511 0.399 0.601 0.488 0.488 0.433 0.4 0.314 0.686 0.433 0.433 0.433 0.429 0.257 0.742	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366 0.366 0.281 0.281 0.283 0.169	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789 0.789 0.789 0.789	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731 0.358 0.3 0.23 0.23	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429 0.436 0.564	0.274 0.233 0.163 0.837 0.023 0.486 0.523 0.413 0.587 0.249 0.249 0.249 0.517	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1 1 0.801 1 0.406 0.456 0.718	B 0.44 0.32 0.68 0.1 0.25 0.379 0.3 0.25 0.75 0.75 0.149 V 0.505 0.38 0.51 0.49	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.801 6 0.488 0.507 0.582	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.403 0.403 0.725	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.5 0.903 0.903 0.418 0.425 0.301 0.699	0.46 0.58 0.35 0.65 0.071 0 0.424 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.33 0.097 0.465 0.48 0.36 0.48 0.36	0.373 0.364 0.246 0.754 0.821 0.821 0.475 0.475 0.475 0.525 0.611 0.457 0.457 0.35 0.35	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645 0.287 0.713 0.645	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.394 0.523 0.448	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579 0.47 0.579	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.625 0.375	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.494 0.458	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436	E 0.258 0.3 0.15 0.85 0.577 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.4 0.485	38 0.501 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.546 0.454 1 79 0.354 0.3 0.229 0.771	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.48 0.391 0.609 1 1 0.609 1 0.609 1 0.36 0.283 0.283 0.234	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848 0.201 0.799 0.848 0.201 0.799 0.848	0.495 0.5 0.43 0.57 1 0.50 0.367 0.367 0.367 0.469 0.531 0.084 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 2 0.383 7 0.4 9 0.257 1 0.743 1 0.662 R1 2 0.429 0.46 0.307	0.498 0.461 0.537 0.463 0.263 0.263 0.469 0.376 0.624 1 0.468 0.376 0.627 0.272	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.494 0.456 0.443 0.557 0.213 0.283 0.278 0.832 0.168 	0.481 0.46 0.39 0.61 0.774 0.407 0.36 0.28 0.72 0.486 0.72 0.486 0.358 0.358 0.358 0.38	1 0.448 1 0.448 0.514 0.336 0.664 1 0.46 0.453 0.453 0.453 0.453 0.357 0.643 0.855 R2 0.429 0.417 0.689 0.211	0.424 0.407 0.304 0.696 0.558 0.558 0.383 0.384 0.258 0.742 1 1 0.498 0.492 0.463 0.537
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) R value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805 0.464 0.805 0.291 0.296 0.291 0.291 0.18 0.82	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.492 0.48 0.42 0.48 0.42 0.58 1 0.232 0.232 0.224 0.232 0.224 0.133 0.867	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.489 0.511 0.867 V2 0.38 0.379 0.254 0.746 1	0.477 0.485 0.39 0.61 0.796 0.407 0.407 0.407 0.529 0.407 0.308 0.306 0.338 0.306 0.215 0.785	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391 0.391 0.43 0.446 0.31 0.43 0.446 0.31	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.53 0 0.46 0 0.59 0 0.411 0 0.242 0	497 0.4 482 0.4 455 0.3 457 0.6 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 293 0.3 707 0.3	458 416 353 647 167 365 346 238 762 494 494 362 395 395 236 764	0.423 0.303 0.697 1 0.453 0.453 0.455 0.345 0.345 0.891 0.891 0.412 0.425 0.289 0.289 0.711	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.28 0.28 0.28 0.28 0.23 0.23 0.23 0.23 0.23 0.19 0.311 0.3 0.19 0.81 0.81	 0.481 0.511 0.399 0.601 0.488 0.433 0.4 0.314 0.686 0.433 0.433 0.429 0.257 0.743 0.187 	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366 0.366 0.281 0.283 0.283 0.283 0.283	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789 0.5 0.487 0.481 0.519 0.519	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731 0.358 0.3 0.3 0.3 0.23 0.77	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429 0.436 0.564 0.125	0.274 0.233 0.163 0.837 0.023 0.486 0.523 0.413 0.587 0.249 0.249 0.517 0.453 0.517 0.483 0.517	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322	B 0.44 0.32 0.68 0.1 0.25 0.379 0.3 0.25 0.75 0.149 0.505 0.38 0.505 0.38 0.51 0.49	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.801 6 0.488 0.507 0.582 0.418	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.403 0.403 0.725 0.275	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.903 0.903 0.903 0.903 0.903	0.46 0.58 0.35 0.65 0.071 0 0.424 0.32 0.424 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.33 0.097 0.465 0.465 0.36 0.36 0.36 0.48	0.373 0.364 0.246 0.754 0.821 0.475 0.475 0.475 0.611 0.457 0.457 0.35 0.65 1	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645 0.287 0.713 0.645 0.287 0.38 0.283 0.283	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.394 0.523 0.448 0.523 0.477 0.106	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.46 0.53 0.47 0.579 0.579 0.424 0.36 0.3 0.3 0.7	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.625 0.375 1	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.458 0.494 0.458 0.458	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436 0.436 0.436	E 0.258 0.3 0.15 0.85 0.577 0.481 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.485 0.52 0.4 0.485	38 0.501 0.5 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.496 0.454 1 79 0.354 0.3 0.229 0.771 0.00	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.391 0.609 1 1 0.609 1 0.36 0.283 0.283 0.234 0.766	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848 0.201 0.799 0.848 0.201 0.799 0.848 0.201 0.799 0.848	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084 0.531 0.084 0.492 0.492 0.492	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.248 3 0.383 7 0.4 9 0.257 1 0.743 1 0.662 R1 2 0.429 0.46 0.307 0.693 0.42	0.498 0.461 0.537 0.463 0.263 0.263 0.47 0.469 0.376 0.624 1 0.468 0.376 0.627 0.373	0.412 0.425 0.289 0.711 0.653 0.653 0.494 0.494 0.494 0.456 0.494 0.456 0.457 0.456 0.434 0.557 0.213 0.283 0.283 0.283 0.278 0.278 0.168 0.168	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486 0.72 0.486	1 0.448 0.514 0.336 0.664 1 0.46 0.453 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.311	0.424 0.407 0.304 0.696 0.558 0.383 0.384 0.258 0.742 1 0.742 1 0.498 0.492 0.463 0.537 0.901
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805 0.464 0.805 0.291 0.296 0.291 0.291 0.18 0.82 0.834	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.48 0.42 0.48 0.42 0.58 1 0.232 0.224 0.232 0.224 0.133 0.867 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.489 0.511 0.867 V2 0.38 0.379 0.254 0.746 1	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.471 0.529 0.471 0.338 0.306 0.215 0.215 0.785 0.139	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391 0.391 0.391 0.391 0.391 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.35 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.535 0 0.54 0 0.58 0 0.489 0 0.58 0 0.411 0 0.59 0 0.243 1	497 0.4 482 0.4 .55 0.3 .45 0.6 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 414 0.3 707 0.3 1 0.3	458 416 353 647 167 365 346 238 762 494 494 362 395 362 395 236 764 166	0.423 0.303 0.697 1 0.453 0.453 0.46 0.345	B 0.243 0.24 0.14 0.86 1 0.86 0.14 0.86 1 0.272 0.28 0.16 0.84 1 0.311 0.311 0.311 0.311 0.311 1	 0.481 0.511 0.399 0.601 0.488 0.433 0.4 0.314 0.686 0.433 0.4 0.383 0.429 0.257 0.743 0.187 	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.26 0.165 0.835 0.366 0.366 0.281 0.283 0.283 0.283 0.169 0.831 1	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789 0.789 0.789 0.519 0.709	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731 0.358 0.3 0.23 0.23 0.23	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429 0.429 0.436 0.564 0.564 0.125	0.274 0.233 0.163 0.837 0.23 0.23 0.486 0.523 0.413 0.587 0.249 0.249 0.5 0.453 0.517 0.453 0.517 0.483 0.138	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.322 0.199 0.801 1 1 0.801 1 0.406 0.406 0.456 0.718 0.282 0.049	B 0.44 0.32 0.68 0.1 0.68 0.1 0.25 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.38 0.51 0.38 0.51 0.49 0.094	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.488 0.507 0.582 0.418 0.73	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.403 0.725 0.275 1	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.903 0.903 0.903 0.903 0.903 0.903	B6 0.46 0.58 0.35 0.65 0.071 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.373 0.364 0.246 0.754 0.821 0.821 0.475 0.475 0.475 0.611 0.457 0.457 0.35 0.65 1	0.494 0.55 0.442 0.558 0.078 0.078 0.395 0.287 0.713 0.645 0.407 0.38 0.283 0.283 0.717 0.285	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.394 0.523 0.448 0.523 0.477 0.106	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.46 0.53 0.47 0.579 0.579 0.47 0.579	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.625 0.375 1	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.494 0.458 0.496 0.496 0.574 0.426 0.899	0.5 0.471 0.473 0.527 0.384 0.384 0.48 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436 0.436 0.435 0.28 0.28 0.28 0.72 0.351	E 0.258 0.3 0.15 0.85 0.577 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.485 0.52 0.485 0.52	38 0.501 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.546 0.454 1 79 0.354 0.354 0.354 0.354 0.329 0.771 0.09	0.471 0.508 0.378 0.622 0.236 0.236 0.48 0.48 0.391 0.609 1 1 0.609 1 0.609 1 0.36 0.283 0.283 0.234 0.766 0.001	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848 0.201 0.799 0.848 0.201 0.799 0.848 0.684 0.666	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084 0.531 0.084 0.531 0.084 0.531 0.084 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.248 3 0.383 7 0.4 9 0.257 1 0.743 4 0.662 R1 2 0.429 0.46 0.307 0.693 0.43	0.498 0.461 0.537 0.463 0.263 0.263 0.469 0.376 0.624 1 1 0.468 0.376 0.627 0.373 0.002	 0.412 0.425 0.289 0.711 0.653 0.711 0.653 0.494 0.494 0.456 0.443 0.557 0.213 0.213 0.283 0.283 0.278 0.832 0.825 	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486 0.38 0.77 0.23 1	1 0.448 0.514 0.336 0.664 1 0.46 0.453 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.311 0.842	0.424 0.407 0.304 0.696 0.558 0.383 0.383 0.384 0.258 0.742 1 1 0.498 0.492 0.463 0.537 0.901
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1 0.498 0.49 0.536 0.494 0.536 0.464 0.805 0.464 0.805 0.291 0.296 0.291 0.291 0.18 0.82 0.834	0.416 0.46 0.71 0.29 0.512 0.493 0.492	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.493 0.493 0.489 0.511 0.867 V2 0.38 0.379 0.254 0.746 1 83	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.407 0.529 0.471 0.306 0.338 0.306 0.215 0.785 0.139	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391 0.391 0.391 0.391 0.391 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.53 0 0.46 0 0.53 0 0.46 0 0.53 0 0.489 0 0.59 0 0.243 0	497 0.4 482 0.4 .55 0.3 .45 0.4 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 293 0.3 1 0.3	458 416 353 647 167 365 346 238 762 494 494 362 395 236 395 236 764 166	0.423 0.303 0.697 1 0.453 0.46 0.345 0.345 0.655 0.891 0.412 0.425 0.289 0.289 0.711 0.654	B 0.243 0.24 0.14 0.86 1 0.86 0.86 0.272 0.28 0.28 0.16 0.84 1 0.311 0.311 0.311 0.311 0.311 0.311 0.311 0.311	 0.481 0.511 0.399 0.601 0.488 0.433 0.4 0.314 0.686 0.433 0.433 0.429 0.257 0.743 0.187 85 	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.26 0.165 0.835 0.366 0.366 0.366 0.383 0.366 0.281 0.281 0.283 0.169 0.831 1	0.466 0.498 0.368 0.632 0.288 0.464 0.473 0.362 0.362 0.362 0.454 0.473 0.464 0.473 0.362 0.463 0.789 0.789 0.5 0.487 0.481 0.519 0.709	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731 0.358 0.3 0.3 0.23 0.77 0.254	34 0.499 0.496 0.464 0.536 1 34 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429 0.429 0.436 0.564 0.564 0.125 86	0.274 0.233 0.163 0.837 0.23 0.23 0.486 0.523 0.413 0.587 0.249 0.249 0.249 0.249 0.249 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1 0.801 1 0.406 0.406 0.456 0.718 0.282 0.049	B 0.44 0.32 0.32 0.68 0.1 0.68 0.1 0.25 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.38 0.51 0.38 0.51 0.38 0.51 0.49 0.094	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.801 6 0.488 0.507 0.582 0.418 0.73 1 0.73	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.207 0.207 1	0.474 0.456 0.385 0.615 0.599 0.599 0.494 0.5 0.494 0.5 0.903 0.903 0.903 0.903 0.903 0.903	B6 0.46 0.58 0.65 0.071 0.071 0.32 0.32 0.32 0.3 0.3 0.097 0.3 0.097 0.465 0.48 0.36 0.48 0.36 1 0.36 1 0.48 0.36	0.373 0.364 0.246 0.754 0.821 0.821 0.475 0.475 0.475 0.611 0.457 0.457 0.35 0.65 1	0.494 0.55 0.442 0.558 0.078 0.078 0.395 0.287 0.713 0.645 0.407 0.38 0.283 0.283 0.717 0.285	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.394 0.394 0.523 0.448 0.523 0.477 0.106	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.46 0.53 0.47 0.579 0.579 0.579 0.321	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.625 0.375 1	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.494 0.458 0.496 0.496 0.574 0.426 0.899	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.435 0.28 0.28 0.72 0.351	E 0.258 0.3 0.15 0.85 0.577 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.485 0.52 0.4 0.485 0.52 0.4 0.485	38 0.501 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.454 1 79 0.354 0.354 0.3 0.229 0.771 0.09	0.471 0.508 0.378 0.622 0.236 0.236 0.48 0.48 0.391 0.609 1 1 0.609 1 0.609 1 0.36 0.283 0.234 0.766 0.001	0.501 0.513 0.498 0.502 0.711 0.711 0.318 0.201 0.799 0.848 0.201 0.799 0.848 0.201 0.799 0.848 0.684 0.666	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084 0.531 0.084 0.492 0.44 0.42 0.44 0.42 0.58 0.562	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 7 0.4 9 0.257 1 0.743 4 0.662 R1 2 0.429 0.46 0.307 0.693 0.43	0.498 0.461 0.537 0.463 0.263 0.263 0.263 0.263 0.469 0.376 0.624 1 1 0.468 0.376 0.627 0.373 0.002	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.494 0.456 0.443 0.557 0.213 	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486 0.358 0.77 0.23 1	1 0.448 0.514 0.336 0.664 4 0.088 Y1 7 0.46 0.357 0.643 0.357 0.643 0.357 0.643 0.453 0.453 0.453 0.453 0.453 0.453 0.453 0.643 0.643 0.643 0.643 0.643 0.311 0.842	0.424 0.407 0.304 0.696 0.558 0.383 0.384 0.258 0.742 1 0.742 1 0.498 0.492 0.463 0.537 0.901
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805 0.464 0.805 0.296 0.291 0.296 0.291 0.291 0.18 0.82 0.834	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.492 0.492 0.48 0.42 0.58 1 0.232 0.224 0.133 0.867 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.493 0.493 0.493 0.493 0.511 0.867 V2 0.38 0.379 0.254 0.379 0.254 0.746 1 R3 0.461	0.477 0.485 0.39 0.61 0.796 0.407 0.407 0.407 0.407 0.407 0.407 0.407 0.328 0.306 0.215 0.338 0.306 0.215 0.785 0.139	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391 0.391 0.391 0.391 0.391 0.43 0.446 0.31 0.69 0.566	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.46 0 0.35 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.41 0 0.58 0 0.58 0 0.489 0 0.58 0 0.489 0 0.58 0 0.489 0 0.58 0 0.489 0 0.58 0 0.58 0 0.58 0 0.58 0 0.58 0 0.58 0 0.59 0 0.258 0	497 0.4 482 0.4 455 0.3 .45 0.4 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 707 0.3 1 0.3 465 0.4	458 416 353 647 167 365 346 238 762 494 762 494 362 395 236 395 236 764 166 166	0.423 0.303 0.697 1 0.453 0.453 0.45 0.345 0.345 0.345 0.345 0.655 0.891 0.412 0.425 0.289 0.711 0.654 0.654	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.28 0.28 0.28 0.28 0.272 0.28 0.272 0.28 0.28 0.272 0.28 0.272 0.28 0.28 0.28 0.24 0.24 0.28 0.272 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.2	3 0.481 0.511 0.399 0.601 0.488 3 0.433 0.429 0.743 0.187 0.187 0.187	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.165 0.835 0.366 0.366 0.281 0.283 0.281 0.283 0.369 0.283 1	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789 0.789 0.789 0.481 0.519 0.709	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731 0.358 0.3 0.358 0.3 0.23 0.77 0.254	34 0.499 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429 0.429 0.436 0.564 0.564 0.125 R6 0.44	0.274 0.233 0.163 0.837 0.023 0.023 0.486 0.523 0.413 0.587 0.249 0.249 0.249 0.249 0.249 0.249 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1 0.406 0.406 0.456 0.456 0.718 0.282 0.049	B 0.44 0.32 0.68 0.1 0.68 0.1 0.25 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.38 0.515 0.38 0.511 0.49 0.094 0.094	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.329 0.214 0.786 0.801 6 0.488 0.507 0.582 0.418 0.507 0.582 0.418 0.73	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.207 0.207 1	0.474 0.456 0.385 0.615 0.599 0.599 0.501 0.494 0.5 0.5 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903	B6 0.46 0.58 0.35 0.65 0.071 0.32 0.7 0.3 0.32 0.3 0.097 0.3 0.097 0.465 0.48 0.48 0.48 0.48 0.48 0.48 0.48 0.48	0.373 0.364 0.246 0.754 0.821 0.821 0.475 0.475 0.475 0.611 0.457 0.457 0.35 0.65 1 0.434	0.494 0.55 0.442 0.558 0.078 0.078 0.395 0.287 0.713 0.645 0.287 0.713 0.645 0.283 0.717 0.285	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.523 0.448 0.523 0.448 0.523 0.477 0.106	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579 0.47 0.579 0.424 0.36 0.3 0.3 0.7 0.321	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.25 Y8 0.47 0.464 0.625 0.375 1 R9 0.327	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.494 0.458 0.496 0.496 0.496 0.574 0.426 0.899	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436	E 0.258 0.3 0.15 0.85 0.577 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.485 0.52 0.485 0.52 0.485 0.52 0.485 0.52 0.485 0.52 0.485 0.52	38 0.501 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.546 0.454 1 79 0.354 0.3 0.229 0.771 0.09 10 0.502	0.471 0.508 0.378 0.622 0.236 0.236 0.48 0.48 0.391 0.609 1 0.609 1 0.609 1 0.36 0.283 0.283 0.283 0.234 0.766 0.001	0.501 0.513 0.498 0.502 0.711 0.711 0.322 0.318 0.201 0.799 0.848 0.201 0.799 0.848 0.201 0.799 0.848 0.684 0.666	0.495 0.5 0.43 0.57 1 0.57 0.367 0.367 0.367 0.367 0.367 0.469 0.531 0.084 0.531 0.084 0.531 0.084 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.383 2 0.383 7 0.4 9 0.257 1 0.743 1 0.662 R1 2 0.429 0.46 0.307 0.693 0.43	0.498 0.461 0.537 0.463 0.263 0.263 0.263 0.469 0.376 0.624 1 0.468 0.376 0.627 0.373 0.002	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.456 0.443 0.557 0.213 0.283 0.283 0.278 0.832 0.825 	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486 0.358 0.77 0.23 1	1 0.448 1 0.448 0 0.514 0 0.336 0 0.664 4 0.088 Y1 0.46 7 0.46 0.357 0.643 3 0.357 0.643 0.855 R2 0.429 0.417 0.689 0.311 0.842	0.424 0.407 0.304 0.696 0.558 0.558 0.383 0.384 0.258 0.742 1 0.498 0.492 0.463 0.537 0.901
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed)	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805 0.464 0.805 0.291 0.296 0.291 0.296 0.291 0.296 0.291 0.296 0.291 0.296	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.492 0.48 0.42 0.48 0.42 0.58 1 0.42 0.232 0.224 0.232 0.224 0.133 0.867 1 1 0.867 1 0.495	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.489 0.511 0.867 V2 0.38 0.379 0.254 0.379 0.254 0.379 0.254 0.746 1 R3 0.461 0.471	0.477 0.485 0.39 0.61 0.796 0.407 0.407 0.407 0.407 0.407 0.329 0.471 0.004 0.338 0.306 0.215 0.306 0.215 0.785 0.139	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391 0.391 0.43 0.446 0.31 0.446 0.31 0.446 0.31 0.494 0.566	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.53 0 0.46 0 0.59 0 0.489 0 0.489 0 0.411 0 0.253 0 0.243 0	497 0.4 482 0.4 455 0.3 445 0.4 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 293 0.3 707 0.3 1 0.3 465 0.3	458 416 353 647 167 365 346 238 762 494 494 362 395 395 236 764 166 166 166 166	0.423 0.303 0.697 1 0.453 0.453 0.453 0.345 0.345 0.345 0.345 0.345 0.289 0.412 0.425 0.289 0.711 0.654 0.289 0.711 0.654	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.2	 0.481 0.511 0.399 0.601 0.488 0.433 0.4 0.314 0.686 0.433 0.429 0.257 0.743 0.187 25 0.407 0.364 	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.26 0.165 0.835 0.366 0.366 0.366 0.281 0.281 0.283 0.169 0.283 0.169 0.831 1	0.466 0.498 0.368 0.632 0.288 0.288 0.288 0.288 0.288 0.288 0.288 0.464 0.473 0.362 0.638 0.789 0.789 0.789 0.789 0.487 0.481 0.519 0.709 0.709	0.481 0.5 0.61 0.39 1 0.421 0.421 0.388 0.296 0.704 0.704 0.731 0.254 0.358 0.3 0.23 0.77 0.254	34 0.499 0.496 0.496 0.464 0.536 1 54 0.39 0.343 0.264 0.736 0.19 // 0.494	0.274 0.233 0.163 0.837 0.23 0.23 0.486 0.523 0.413 0.587 0.249 0.249 0.249 0.249 0.453 0.517 0.453 0.517 0.453 0.517 0.453 0.517	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.322 0.406 0.406 0.456 0.718 0.282 0.049	B 0.44 0.32 0.68 0.1 0.25 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.38 0.51 0.49 0.505 0.38 0.51 0.49 0.094 R 0.407	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.329 0.214 0.786 0.801 6 0.488 0.507 0.582 0.418 0.73 7 0.502 0.471	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.403 0.207 1 0.403 0.725 0.275 12 0.275 1	0.474 0.456 0.385 0.615 0.599 0.501 0.494 0.5 0.5 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903	0.46 0.58 0.35 0.65 0.071 0 0.424 0.32 0.424 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.32 0.7 0.33 0.097 0.465 0.465 0.465 0.465 0.465 0.465 0.48 0.36 0.483 0.483 0.437 0.4337	0.373 0.364 0.246 0.754 0.821 0.821 0.475 0.475 0.475 0.475 0.475 0.457 0.457 0.457 0.35 0.65 1 0.434 0.434 0.432	0.494 0.55 0.442 0.558 0.078 0.078 0.41 0.395 0.287 0.713 0.645 0.287 0.713 0.645 0.285 0.283 0.717 0.285	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.394 0.523 0.448 0.523 0.448 0.523 0.447 0.106	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.46 0.53 0.47 0.579 0.47 0.579 0.424 0.36 0.3 0.3 0.7 0.321	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.625 0.375 1 R9 0.327 0.276	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.494 0.458 0.494 0.458 0.496 0.574 0.426 0.899	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.28 0.72 0.351	E 0.258 0.3 0.15 0.85 0.577 0.481 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.42 0.485 0.52 0.4 0.485 0.52 0.4 0.485 0.52 0.4 0.485 0.52 0.4 0.4 0.4 0.5 0.768	38 0.501 0.521 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.546 0.454 1 0.546 0.454 1 0.354 0.354 0.3 0.229 0.771 0.09 10 0.502 0.443	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.391 0.609 1 0.609 1 0.36 0.283 0.283 0.283 0.234 0.766 0.283 0.234	0.501 0.513 0.498 0.502 0.711 0.322 0.318 0.201 0.799 0.848 0.492 0.432 0.419 0.316 0.684 0.666	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084 0.531 0.084 0.531 0.084 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.248 3 0.383 7 0.4 9 0.257 1 0.743 1 0.662 R1 2 0.429 0.46 0.307 0.693 0.43	0.498 0.461 0.537 0.463 0.263 0.263 0.469 0.376 0.624 1 0.624 1 0.468 0.376 0.627 0.373 0.002	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.494 0.456 0.443 0.557 0.213 0.213 0.2832 0.278 0.832 0.825 	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486 0.38 0.77 0.23 1	1 0.448 1 0.448 0.514 0.336 0.664 0.453 1 0.46 0.453 0.357 0.643 0.357 0.643 0.355 R2 0.429 0.417 0.689 0.311 0.842	0.424 0.407 0.304 0.696 0.558 0.383 0.384 0.258 0.742 1 0.742 1 0.498 0.492 0.463 0.537 0.901
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805 0.464 0.805 0.464 0.805 0.291 0.296 0.291 0.296 0.291 0.296 0.291 0.296 0.291 0.296 0.291 0.296 0.291 0.472 0.458 0.328	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.492 0.48 0.42 0.58 1 0.42 0.58 1 0.232 0.224 0.133 0.867 1 0.867 1 0.867 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.511 0.867 V2 0.38 0.379 0.254 0.746 1 0.746 1 0.471 0.357	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.407 0.529 0.471 0.004 0.338 0.306 0.215 0.306 0.215 0.785 0.139	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.535 0 0.46 0 0 0.46 0 0 0.46 0 0 0.46 0 0 0 0 0 0 0 0 0 0 0 0 0 0	497 0.4 482 0.4 482 0.4 .55 0.3 .45 0.4 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 293 0.3 707 0.3 1 0.3 465 0.3 429 0.3	458 416 353 647 167 365 346 238 762 494 762 494 362 395 236 395 236 764 166 166 166 166	0.423 0.303 0.697 1 0.453 0.45 0.46 0.345 0.655 0.891 0.412 0.425 0.289 0.711 0.425 0.289 0.711 0.46 0.421 0.421 0.421 0.458	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.2	63 0.481 0.511 0.399 0.601 0.488 63 0.433 0.4 0.314 0.686 0.433 0.4 0.314 0.686 0.433 0.4 0.383 0.429 0.257 0.743 0.187 0.743 0.187 0.364 0.364 0.282	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.26 0.165 0.835 0.366 0.366 0.366 0.366 0.366 0.383 0.366 0.383 0.366 0.383 0.366 0.378	0.466 0.498 0.368 0.632 0.288 0.464 0.473 0.463 0.464 0.473 0.362 0.362 0.463 0.473 0.464 0.473 0.463 0.789 0.519 0.709 0.709 0.441 0.437	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731 0.731 0.358 0.3 0.77 0.254 0.368 0.28 0.368 0.28	34 0.499 0.496 0.496 0.496 1 34 0.536 1 34 0.39 0.343 0.264 0.736 0.19 75 0.494 0.429 0.436 0.429 0.436 0.564 0.564 0.125 86 0.44 0.464 0.464 0.675	0.274 0.233 0.163 0.837 0.23 0.23 0.486 0.523 0.413 0.587 0.249 0.249 0.249 0.249 0.249 0.249 0.249 0.249 0.249	0.495 0.487 0.554 0.446 0.803 0.803 0.322 0.322 0.199 0.801 1 0.406 0.406 0.456 0.718 0.282 0.049 0.282 0.049	B 0.44 0.32 0.68 0.1 0.68 0.1 0.25 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.379 0.38 0.51 0.49 0.505 0.38 0.51 0.49 0.094 0.407 0.407	5 0.489 0.482 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.329 0.214 0.786 0.801 6 0.488 0.507 0.582 0.418 0.507 0.582 0.418 0.73 7 0.502 0.471 0.493	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.207 0.207 1 0.403 0.725 0.275 1 1 0.275 1	0.474 0.456 0.385 0.615 0.599 0.599 0.494 0.5 0.494 0.5 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903	0.46 0.58 0.35 0.65 0.071 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.33 0.3465 0.465 0.465 0.465 0.465 0.465 0.465 0.465 0.465 0.465 0.483 0.364 1 0.465 0.465 0.465 0.465 0.465 0.465 0.465 0.465 0.465 0.51 0.4337 0.516	0.373 0.364 0.246 0.754 0.821 0.821 0.475 0.475 0.475 0.611 0.457 0.457 0.35 0.65 1 0.457 0.35 0.65 1 0.434 0.432 0.314	0.494 0.55 0.442 0.558 0.078 0.078 0.395 0.287 0.713 0.645 0.407 0.38 0.283 0.717 0.285 0.283 0.717 0.285	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.394 0.394 0.523 0.477 0.106 0.448 0.523 0.477 0.106	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579 0.579 0.579 0.579 0.321 0.321	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.25 Y8 0.47 0.464 0.625 0.375 1 R9 0.327 0.276 0.276	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.458 0.494 0.458 0.496 0.496 0.574 0.426 0.899	0.5 0.471 0.473 0.527 0.384 0.384 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.436 0.28 0.72 0.351	E 0.258 0.3 0.15 0.85 0.577 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.42 0.485 0.52 0.4 0.485 0.52 0.4 0.485 0.52 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	38 0.501 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.496 0.454 1 79 0.354 0.354 0.3 0.229 0.771 0.09 10 0.502 0.443 0.493	0.471 0.508 0.378 0.622 0.236 0.236 0.48 0.48 0.391 0.609 1 0.609 1 0.609 1 0.609 1 0.234 0.234 0.234 0.234 0.234 0.234 0.234 0.234	0.501 0.513 0.498 0.502 0.711 0.322 0.318 0.201 0.799 0.848 0.1322 0.318 0.201 0.799 0.848 0.316 0.432 0.419 0.316 0.666	0.495 0.5 0.43 0.57 1 0.503 0.367 0.469 0.531 0.084 0.531 0.084 0.42 0.44 0.42 0.44 0.42	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.248 3 0.383 7 0.4 9 0.257 1 0.743 1 0.662 R1 2 2 0.429 0.46 0.307 0.693 0.43	0.498 0.461 0.537 0.463 0.263 0.263 0.263 0.263 0.469 0.376 0.624 1 1 0.468 0.376 0.627 0.373 0.002	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.494 0.456 0.443 0.557 0.213 0.213 0.283 	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486 0.72 0.486 0.72 0.486 1 0.358 0.77 0.23 1	1 0.448 1 0.448 0 0.514 0 0.336 0 0.664 4 0.088 Y1 7 7 0.46 0.357 0.643 0.643 0.357 0.643 0.855 R2 0.429 0.417 0.689 0.311 0.842	0.424 0.407 0.304 0.696 0.558 0.383 0.384 0.258 0.742 1 0.742 1 0.498 0.492 0.463 0.537 0.901
Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion) P-value Het (observed) 1 (deletion) 2 (insertion) P-value Het (expected) Het (observed) 1 (deletion) 2 (insertion)	0.491 0.441 0.431 0.569 0.1 0.498 0.498 0.49 0.536 0.464 0.805 0.464 0.805 0.291 0.296 0.291 0.291 0.296 0.291 0.291 0.291 0.291 0.291 0.291 0.291 0.295 0.291 0.291 0.295 0.291 0.291 0.295 0.295 0.291 0.295 0.295 0.291 0.295 0.2	0.416 0.46 0.71 0.29 0.512 0.492 0.492 0.492 0.48 0.42 0.48 0.42 0.58 1 0.232 0.224 0.232 0.224 0.133 0.867 1 0.867 1 0.867 1	B1 0.474 0.507 0.382 0.618 0.475 G1 0.502 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.493 0.511 0.867	0.477 0.485 0.39 0.61 0.796 0.499 0.407 0.529 0.407 0.529 0.471 0.304 0.338 0.306 0.215 0.215 0.215 0.215 0.215 0.215 0.215 0.215 0.215 0.215 0.215 0.215 0.215	0.311 0.292 0.808 0.192 0.324 0.324 0.435 0.462 0.678 0.322 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391 0.391	B2 0.217 0 0.204 0 0.122 0 0.878 0 0.535 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.46 0 0.489 0 0.489 0 0.489 0 0.243 0 0.243 0 0.158 0 0.158 0 0.18 0 0.18 0 0.258 0	497 0.4 482 0.4 455 0.3 .45 0.4 734 0.3 491 0.3 453 0.3 568 0.3 432 0.3 388 0.4 416 0.3 293 0.3 707 0.3 1 0.3 465 0.3 364 0.3	458 416 353 647 167 365 346 238 762 494 762 494 362 395 236 395 236 764 166 166 166 166 198 198 191	0.423 0.303 0.697 1 0.453 0.453 0.45 0.345 0.345 0.345 0.891 0.412 0.425 0.289 0.711 0.425 0.289 0.711 0.425 0.289 0.711 0.425 0.289 0.711 0.45 0.425 0.289 0.711 0.654 0.654 0.654 0.655 0.755 0	B 0.243 0.24 0.14 0.86 1 0.86 0.272 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.2	3 0.481 0.511 0.399 0.601 0.488 3 0.433 0.429 0.743 0.187 0.364 0.364 0.2822 0.719	0.496 0.527 0.45 0.55 0.316 0.276 0.26 0.26 0.165 0.835 0.366 0.366 0.366 0.366 0.366 0.281 0.281 0.283 0.366 0.369 0.281 0.283 0.369 0.378 0.471	0.466 0.498 0.368 0.632 0.288 0.464 0.473 0.463 0.463 0.463 0.473 0.463 0.463 0.473 0.463 0.463 0.473 0.463 0.789 0.487 0.481 0.519 0.709 0.709 0.437 0.674 0.326	0.481 0.5 0.61 0.39 1 0.421 0.388 0.296 0.704 0.731 0.731 0.731 0.731 0.731 0.731 0.731 0.731 0.731 0.731	34 0.499 0.496 0.496 0.496 0.496 1 54 0.39 0.343 0.264 0.736 0.19 75 0.494 0.494 0.494 0.494 0.494 0.494 0.494 0.429 0.436 0.564 0.125 R6 0.464 0.675 0.325	0.274 0.233 0.163 0.837 0.23 0.23 0.486 0.523 0.413 0.587 0.249 0.249 0.249 0.249 0.249 0.249 0.249 0.249 0.249 0.249 0.249 0.453 0.138	0.495 0.487 0.554 0.446 0.803 0.322 0.322 0.199 0.801 1 0.406 0.406 0.456 0.456 0.718 0.282 0.049 0.049	B 0.44 0.32 0.68 0.1 0.68 0.1 0.25 0.379 0.379 0.379 0.379 0.379 0.379 0.38 0.75 0.149 0.505 0.38 0.505 0.38 0.51 0.49 0.505 0.38 0.51 0.49 0.094 B 0.407 0.407 0.407 0.407	5 0.489 0.421 0.579 0.865 5 0.338 0.329 0.214 0.786 0.801 6 0.488 0.507 0.582 0.418 0.73 7 0.502 0.471 0.493 0.507	0.407 0.388 0.283 0.717 0.446 0.447 0.485 0.335 0.665 0.207 0.207 0.207 0.207 1 0.403 0.725 0.275 1 0.275 1 0.275 1	0.474 0.456 0.385 0.615 0.599 0.599 0.494 0.5 0.5 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903 0.903	0.46 0.58 0.35 0.65 0.071 0 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.33 0.097 0.465 0.465 0.48 0.36 0.48 0.36 0.48 0.36 0.485 0.485 0.485 0.485 0.485 0.485 0.51 0.4337 0.511 0.316	0.373 0.364 0.246 0.754 0.821 0.821 0.475 0.475 0.475 0.475 0.611 0.457 0.457 0.35 0.65 1 0.457 0.35 0.65 1 0.434 0.432 0.314 0.686	0.494 0.55 0.442 0.558 0.078 0.078 0.395 0.287 0.713 0.645 0.287 0.713 0.645 0.283 0.717 0.285 0.283 0.717 0.285	0.491 0.502 0.431 0.569 0.802 0.802 0.221 0.238 0.874 0.126 0.394 0.126 0.394 0.126 0.394 0.126 0.394 0.126 0.394 0.126 0.394 0.106 0.448 0.523 0.477 0.106 0.106 0.288 0.241	0.495 0.38 0.57 0.43 0.148 0.148 0.503 0.46 0.53 0.47 0.579 0.47 0.579 0.47 0.579 0.424 0.36 0.3 0.3 0.7 0.321	B7 0.5 0.413 0.536 0.464 0.059 G7 0.435 0.393 0.682 0.318 0.25 Y8 0.47 0.464 0.25 Y8 0.47 0.464 0.625 0.375 1 R9 0.327 0.205 0.205 0.205	0.465 0.477 0.634 0.366 0.788 0.788 0.501 0.477 0.506 0.494 0.494 0.458 0.494 0.458 0.496 0.496 0.496 0.496 0.574 0.426 0.899	0.5 0.471 0.473 0.527 0.384 0.527 0.384 0.473 0.473 0.527 0.384 0.473 0.384 0.48 0.48 0.456 0.398 0.602 0.436 0.436 0.436 0.436 0.436 0.375 0.28 0.72 0.351 0.496 0.513 0.448 0.552	E 0.258 0.3 0.15 0.85 0.577 0.481 0.46 0.39 0.61 0.774 0.485 0.52 0.42 0.485 0.52 0.4 0.485 0.52 0.42 0.485 0.52 0.42 0.495 0.495	38 0.501 0.479 0.521 1 58 0.497 0.496 0.496 0.496 0.496 0.496 0.496 0.496 0.497 0.496 0.497 0.496 0.496 0.496 0.496 0.496 0.497 0.496 0.493 0.771 0.09 10 0.502 0.443 0.493 0.493	0.471 0.508 0.378 0.622 0.236 0.48 0.48 0.48 0.391 0.609 1 0.609 1 0.609 1 0.283 0.283 0.283 0.283 0.283 0.234 0.766 0.283 0.234 0.766 0.283 0.234	0.501 0.513 0.498 0.502 0.711 0.322 0.318 0.201 0.799 0.848 0.316 0.419 0.316 0.6666	0.495 0.5 0.43 0.57 1 0.57 0.367 0.367 0.367 0.367 0.367 0.367 0.469 0.531 0.084 0.531 0.084 0.531 0.084	B9 5 0.435 0.393 0.682 0.318 0.248 G9 0.248 3 0.383 7 0.4 9 0.257 1 0.743 1 0.662 R1 2 0.429 0.46 0.307 0.693 0.43	0.498 0.461 0.537 0.463 0.263 0.263 0.469 0.376 0.624 1 0.468 0.376 0.627 0.373 0.002	 0.412 0.425 0.289 0.711 0.653 0.494 0.494 0.456 0.443 0.4557 0.213 0.213 0.283 0.278 0.278 0.832 0.825 	0.481 0.46 0.39 0.61 0.774 0.36 0.28 0.72 0.486 0.72 0.486 0.358 0.77 0.23 1	1 0.448 0.514 0.336 0.664 0.664 1 0.453 0.453 0.357 0.643 0.357 0.643 0.357 0.643 0.357 0.643 0.311 0.429 0.417 0.689 0.311 0.842 0.842	0.424 0.407 0.304 0.696 0.558 0.383 0.384 0.258 0.742 1 0.498 0.492 0.463 0.537 0.901

falls into the expected error of the calculation.

There are a number of systems (marked in yellow), that have shown a reduced heterozygosity in certain populations. However, all systems remain polymorphic in all populations. Most of these reduced heterozygosity systems are still contained within the limit 0.2 frequency [4] values and remain informative enough in all populations.

The allele frequencies displayed by these markers in U.S. populations allow us to assess the power of the assays, with Random Match Probability (RMP) values nearing those of the combined current STR markers (as shown in the table below).

	U.S. Cauc	U.S. Asian	U.S. Hisp	Af-Am
Mean DIPplex RMP	1.86E-13	4.67E-11	4.88E-13	5.88E-12
Mean HID-38plex RMP	3.67E-15	5.11E-14	1.47E-15	4.74E-15
Mean Combined RMP*	6.79E-28	2.43E-24	7.20E-28	2.54E-26

* Assuming all markers are completely independent

Artificially degraded DNA assay

We conducted several experiments to examine degraded DNA samples in a controlled way [8]. Our objective was to compare the short-amplicon InDel typing reaction performance to established short amplicon STRs kits.

We selected the COVARIS DNA shearing system to perform the fragmentation since this approach enables precise control of the process in isothermal conditions. The system uses a process called Adaptive Focused Acoustics (AFA) that works by creating shock waves from a conical shaped transducer focused to converge on a small localized area [9].

Results from COVARIS DNA fragmentation



assay conditions until we achieved the desired DNA fragmentation between 100 and 200 bp. A highly characterized DNA extract from NIST was used as the degradation target. The same degraded DNA aliquot (S) was used with all

> expected 16

Alleles

43

Alleles

Observe

Sequencing of previously unreported variation

Sequencing was performed following the published guidelines of M.C. Kline et al. [7]

Two DIPplex markers (D97 and D83) showed a higher degree of allele imbalance in heterozygotes than expected. This suggested the presence of a SNP within the primer binding site potentially disrupting primer annealing in samples carrying the minor allele



A second observed feature was the presence of a third off-ladder allele for two DIPplex markers (D99 and D84). Two explanations can account for these features: A different size deletion/insertion allele at the locus or an additional neighboring InDel site with a rare minor allele within the amplicon range.

RMP 1.03x 10⁻¹⁴ RMP 4.77x 10⁻¹⁴ Only short amplicon systems were successfully typed with our artificially degraded sample. The high number of very short amplicon markers packed on the InDel multiplexes assures a high RMP value on degraded DNA extracts even if marker drop-out is observed.

References:

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D97: Samples have been found to be carrying a neighboring allele on a clustering SNP (A/G), located 61 bp downstream from the main InDel site. This is a SNP referenced in the dbSNP database as rs17245568. The A allele of this SNP corresponds to the samples carrying the observed imbalance. Although we do not have access to Qiagen's primer designs, it seems reasonable to assume that this is the cause of the peak imbalance. Frequency: U.S. Cauc: 0.044 Af-Am: 0.22 U.S. Hisp: 0.062 U.S. Asian: 0.06

D83: Insufficient data, sequencing will continue. Frequency: U.S. Cauc: 0 Af-Am: 0.08 U.S. Hisp: 0.015 U.S. Asian: 0

D99: A locus with an off-ladder allele observed. This allele was determined to be a regular **Insertion** allele with a neighboring single-base deletion of an A residue, located 4 bp upstream from the InDel site. This is a referenced InDel on dbSNP database as rs11346981. No official allele frequency data were available on dbSNP for this marker. Frequency: U.S. Cauc: 0 Af-Am: 0.0766 U.S. Hisp: 0.0156 U.S. Asian: 0

D84: A locus with an off-ladder allele in African American samples. This allele was determined to be a regular **Insertion** allele with a neighboring 4 bp (ATTA) deletion located 10 bases downstream the main InDel site. This is a referenced InDel on dbSNP database as rs11573892. Frequency: U.S. Cauc: 0 Af-Am: 0.0443 U.S. Hisp: 0 U.S. Asian: 0

Conclusions:

- InDel genotyping constitutes a robust, sensitive and very informative identification system highly applicable to routine forensic casework. Population frequency data for U.S. representative human populations have been determined.
- A number of non-standard allelic variants were observed in the Qiagen DIPplex InDel set. These have been analyzed and show stable mobility variants for two of the markers that have been sequence characterized and their population frequencies estimated. The characterization of such rarer mobility variants can further contribute to the informative power of InDel typing.
- A successful protocol for artificial DNA fragmentation mimicking challenging DNA has been devised using COVARIS DNA shearing technology. InDel assays appear to be much better performers for these samples than any of the other assays compared in the study.

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