Genetic Diversity and Population Structure Analysis of Citrus Germplasm with Single Nucleotide Polymorphism Markers

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ABSTRACT. Citrus (*Citrus* sp.) germplasm collections are a valuable resource for citrus genetic breeding studies, and further utilization of the resource requires knowledge of their genotypic and phylogenetic relationships. Diverse citrus accessions, including citron (*Citrus medica*), mandarin (*Citrus reticulata*), pummelo (*Citrus maxima*), papeda (*Papeda* sp.), trifoliate orange (*Poncirus trifoliata*), kumquat (*Fortunella* sp.), and related species, have been housed at the Florida Citrus Arboretum, Winter Haven, FL, but the accessions in the collection have not been genotyped. In this study, a collection of 80 citrus accessions were genotyped using 1536 sweet orange–derived single nucleotide polymorphism (SNP) markers, to determine their SNP fingerprints and to assess genetic diversity, population structure, and phylogenetic relationships, and thereby to test the efficiency of using the single genotype-derived SNP chip with relatively low cost for these analyses. Phylogenetic relationships among the 80 accessions were determined by multivariate analysis. A model-based clustering program detected five basic groups and revealed that *C. maxima* introgressions varied among mandarin cultivars and segregated in mandarin F₁ progeny. In addition, reciprocal differences in *C. maxima* contributions were observed among citranges (*Citrus sinensis* × *P. trifoliata* vs. *P. trifoliata* × *C. sinensis*) and may be caused by the influence of cytoplasmic DNA and its effect on selection of cultivars. Inferred admixture structures of many secondary citrus species and important cultivars were confirmed or revealed, including ‘Bergamot’ sour orange (*Citrus aurantium*), ‘Kinkoji’ (*C. reticulata* × *Citrus paradisi*), ‘Hyuganatsu’ orange (*Citrus tamurana*), and palestine sweet lime (*Citrus aurantifolia*). The relatively inexpensive SNP array used in this study generated informative genotyping data and led to good consensus and correlations with previously published observations based on whole genome sequencing (WGS) data. The genotyping data and the phylogenetic results may facilitate further exploitation of interesting genotypes in the collection and additional understanding of phylogenetic relationships in citrus.

Citrus is suggested to have originated from the tropical and subtropical areas of southeast Asia and was then spread to other regions in the world (Webber, 1967). The genus *Citrus*, including important commercial cultivars, has been grown in tropical and temperate areas over several thousands of years. *Citrus* taxonomy and phylogeny are complicated, partly because of the long history of cultivation, wide distribution, apomixis, high frequency of bud mutations, and sexual compatibility between *Citrus* and related genera. Two morphological characteristic-based citrus classifications, defined by Swingle (Swingle and Reece, 1967) and Tanaka (1977), have been widely used. However, the two classification systems differ greatly in species classification: 16 species were included in the *Citrus* genus in the classification of Swingle, whereas Tanaka described 162 species. The subsequent phylogenetic studies suggested that there were three true cultivated *Citrus* species,

mandarin, citron, and pummelo, and that hybridization between them has generated other genotypes (Barrett and Rhodes, 1976; Scora, 1975, 1988). Molecular analyses have been widely used in *Citrus* taxonomy studies. The three cultivated *Citrus* species concept was supported by multiple subsequent studies using isozymes (Herrero et al., 1996; Torres et al., 1978).

Phylogenetic analysis using nuclear gene sequence may be more informative for investigating the relationships between different *Citrus* genotypes. There are many types of molecular markers, among them are simple sequence repeat markers (SSRs) which are codominant, highly polymorphic, locus-specific, abundant, and distributed randomly throughout the genome (Tautz and Schlötterer, 1994). Thus, SSRs have been widely used in *Citrus* phylogeny studies (Barkley et al., 2006; Bretó et al., 2001; Fang and Roose, 1997; Fang et al., 1998; Garcia-Lor et al., 2012; Gulsen and Roose, 2001). In addition, random amplification of polymorphic DNA [RAPD (Bretó et al., 2001; Coletta et al., 1998; Federici et al., 1998; Nicolosi et al., 2000)], restriction fragment length polymorphism (Federici et al., 1998), and amplified fragment length polymorphism (Bretó et al., 2001) all have been used as markers in *Citrus*. Barkley et al. (2009) have noted that homoplasy in microsatellite

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Table 1. List of 80 *Citrus* and *Citrus* relatives analyzed by a 1536-single nucleotide polymorphism genotyping assay.

Group	Common name	Swingle system ^z	Tanaka system ^y
Mandarin	Sunki mandarin	<i>Citrus reticulata</i>	<i>C. sunki</i>
Mandarin	Willowleaf mandarin	<i>C. reticulata</i>	<i>C. deliciosa</i>
Mandarin	Zaoju mandarin	<i>C. reticulata</i>	<i>C. subcompressa</i>
Mandarin	Pimpled mandarin	<i>C. reticulata</i>	<i>C. reticulata</i>
Mandarin	Ponkan mandarin	<i>C. reticulata</i>	<i>C. reticulata</i>
Pummelo	Low acid pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Liang Ping Yau pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Siamese pink pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Nakon pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Kao Phuang pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Hirado low seeded pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Sha Tian You pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Hirado Buntan pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Red Shaddock pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Pummelo	Siamese sweet pummelo	<i>C. maxima</i>	<i>C. maxima</i>
Citron	Etrog citron	<i>C. medica</i>	<i>C. medica</i>
Citron	Buddha's hand citron	<i>C. medica</i>	<i>C. medica</i>
Citron	Unknown citron	<i>C. medica</i>	<i>C. medica</i>
Trifoliolate orange	Trifoliolate orange seedling	<i>Poncirus trifoliata</i>	<i>P. trifoliata</i>
Trifoliolate orange	Argentina trifoliolate orange	<i>P. trifoliata</i>	<i>P. trifoliata</i>
Trifoliolate orange	Flying Dragon trifoliolate orange	<i>P. trifoliata</i>	<i>P. trifoliata</i>
Kumquat	Meiwa kumquat	<i>Fortunella crassifolia</i>	<i>F. crassifolia</i>
Kumquat	Nagami kumquat	<i>F. margarita</i>	<i>F. margarita</i>
Kumquat	Marumi kumquat	<i>F. japonica</i>	<i>F. japonica</i>
Kumquat	Fortunella polyandra	<i>F. polyandra</i>	<i>F. polyandra</i>
Sweet orange	Cara Cara navel	<i>C. sinensis</i>	<i>C. sinensis</i>
Sweet orange	Moro blood orange	<i>C. sinensis</i>	<i>C. sinensis</i>
Sweet orange	Sanford sweet orange	<i>C. sinensis</i>	<i>C. sinensis</i>
Sweet orange	Ridge Pineapple sweet orange	<i>C. sinensis</i>	<i>C. sinensis</i>
Sweet orange	Valencia sweet orange	<i>C. sinensis</i>	<i>C. sinensis</i>
Sour orange	Willowleaf sour orange	<i>C. aurantium</i>	<i>C. aurantium</i>
Sour orange	Bittersweet sour orange	<i>C. aurantium</i>	<i>C. aurantium</i>
Sour orange	Unknown sour orange	<i>C. aurantium</i>	<i>C. aurantium</i>
Sour orange	Bouquet de Fleurs	<i>C. aurantium</i>	<i>C. aurantium</i>
Citrange	Kuharske citrange	<i>C. sinensis</i> × <i>P. trifoliata</i>	<i>C. sinensis</i> × <i>P. trifoliata</i>
Citrange	Citrange 093	<i>C. sinensis</i> × <i>P. trifoliata</i>	<i>C. sinensis</i> × <i>P. trifoliata</i>
Citrange	Citrange 103	<i>C. sinensis</i> × <i>P. trifoliata</i>	<i>C. sinensis</i> × <i>P. trifoliata</i>
Citrange	Citrange 125	<i>C. sinensis</i> × <i>P. trifoliata</i>	<i>C. sinensis</i> × <i>P. trifoliata</i>
Citrange	Citrange 206	<i>P. trifoliata</i> × <i>C. sinensis</i>	<i>P. trifoliata</i> × <i>C. sinensis</i>
Citrange	Citrange 187	<i>P. trifoliata</i> × <i>C. sinensis</i>	<i>P. trifoliata</i> × <i>C. sinensis</i>
Citrange	Citrange 207	<i>P. trifoliata</i> × <i>C. sinensis</i>	<i>P. trifoliata</i> × <i>C. sinensis</i>
Lemon	Rangpur lime	<i>C. limon</i>	<i>C. limonia</i>
Lemon	Eureka lemon	<i>C. limon</i>	<i>C. limon</i>
Lemon	Lisbon lemon	<i>C. limon</i>	<i>C. limon</i>
Lemon	Red rough lemon	<i>C. limon</i>	<i>C. jambhiri</i>
Lemon	Vangasay lemon	<i>C. limon</i>	<i>C. jambhiri</i>
Lemon	Volkamer lemon	<i>C. limon</i>	<i>C. limonia</i>
Lime	Key lime	<i>C. aurantifolia</i>	<i>C. aurantifolia</i>
Lime	Palestine sweet lime	<i>C. aurantifolia</i>	<i>C. limettoides</i>
Lime	Persian lime	<i>C. aurantifolia</i>	<i>C. latifolia</i>
Microcitrus	<i>Microcitrus inodora</i>	<i>C. inodora</i>	<i>C. inodora</i>
Microcitrus	Australian round lime	<i>Microcitrus australis</i>	<i>Microcitrus australis</i>
Microcitrus	Australian finger lime	<i>Microcitrus australasica</i>	<i>Microcitrus australasica</i>
Papeda	Kaffir lime	<i>C. hystrix</i>	<i>C. hystrix</i>
Papeda	Ichang papeda	<i>C. ichangensis</i>	<i>C. ichangensis</i>
Papeda	Melanesian papeda	<i>C. macroptera</i>	<i>C. macroptera</i>
Tangor	Iyokan	<i>C. reticulata</i> × <i>C. sinensis</i>	<i>C. iyo</i>
Tangor	King tangor	<i>C. reticulata</i> × <i>C. sinensis</i>	<i>C. nobilis</i>

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Table 1. Continued.

Group	Common name	Swingle system ^z	Tanaka system ^y
Tangor	Murcott tangor	<i>C. reticulata</i> × <i>C. sinensis</i>	<i>C. reticulata</i>
Other true citrus	Shekwasha mandarin	<i>C. reticulata</i>	<i>C. depressa</i>
Other true citrus	Owari Satsuma	<i>C. reticulata</i>	<i>C. unshiu</i>
Other true citrus	Cleopatra mandarin	<i>C. reticulata</i>	<i>C. reshni</i>
Other true citrus	Calamandarin	<i>C. reticulata</i> × <i>C. madurensis</i>	<i>C. reticulata</i> × <i>C. madurensis</i>
Other true citrus	Yuzu	<i>C. ichangensis</i> × <i>C. reticulata</i>	<i>C. junos</i>
Other true citrus	Calamondin	<i>C. reticulata</i> × <i>F. japonica</i>	<i>C. madurensis</i>
Other true citrus	Kinkoji	<i>C. reticulata</i> × <i>C. paradisi</i>	<i>C. obovoidea</i>
Other true citrus	Nules clementine	<i>C. reticulata</i>	<i>C. clementina</i>
Other true citrus	Fortune mandarin	Clementine × 'Orlando' tangelo	Clementine × 'Orlando' tangelo
Other true citrus	Mandarin hybrid 005	'Fortune' × 'Murcott'	'Fortune' × 'Murcott'
Other true citrus	Mandarin hybrid 028	'Fortune' × 'Murcott'	'Fortune' × 'Murcott'
Other true citrus	Mandarin hybrid 101	'Fortune' × 'Murcott'	'Fortune' × 'Murcott'
Other true citrus	Hyuganatsu orange	<i>C. tamurana</i>	<i>C. tamurana</i>
Other true citrus	Chinotto	<i>C. aurantium</i>	<i>C. myrtifolia</i>
Other true citrus	Zhu Luan	<i>C. maxima</i> × <i>C. aurantium</i>	<i>C. maxima</i> × <i>C. aurantium</i>
Other true citrus	Bergamot	<i>C. aurantium</i>	<i>C. bergamia</i>
Other true citrus	<i>C. neoaurantium</i>	<i>C. neoaurantium</i>	<i>C. neoaurantium</i>
Other true citrus	Gou Tou	<i>C. maxima</i> × <i>C. aurantium</i>	<i>C. maxima</i> × <i>C. aurantium</i>
Other true citrus	Sanbokan	<i>C. aurantium</i>	<i>C. sulcata</i>
Other true citrus	Nansho Daidai orange	<i>C. aurantium</i>	<i>C. taiwanica</i>
Other true citrus	Natsumikan	<i>C. maxima</i> × <i>C. aurantium</i>	<i>C. natsudaidai</i>

^zClassification based on the Swingle system (Swingle and Reece, 1967).

^yClassification based on the Tanaka system (Tanaka, 1977).

alleles might cause incorrect conclusions in phylogenetic studies. Insertion/deletions (INDELs) were found to be more suitable than SSRs for tracing the genetic contributions of the basic taxa in cultivated *Citrus* (Garcia-Lor et al., 2012), but the low frequency of INDELs limits their usefulness. Although SNPs show lower polymorphism information content (PIC) relative to SSRs, high levels of reproducibility and high frequency of SNP occurrence throughout the genome make them ideal markers for population genetic studies (Helyar et al., 2011). High-throughput next-generation sequencing technology has resulted in the development of automated high-throughput SNP genotyping assays that are available for most crops and are useful tools to evaluate genome-wide allelic variation. In *Citrus*, SNPs were able to differentiate the basic taxa; therefore, several phylogenetic studies have been accomplished using SNPs, ranging in number from 67 to 1457 (Curk et al., 2014, 2015, 2016; Garcia-Lor et al., 2013, 2015; Ollitrault et al., 2012). In addition to molecular markers, primary and secondary metabolite analyses indicated that metabolite diversity was associated with phylogeny among tested basic taxa in cultivated *Citrus* (Fanciullino et al., 2006; Goldenberg et al., 2014, 2015; Luro et al., 2011).

It is now generally accepted that all cultivated *Citrus* are derived from interspecific hybridization between four ancestral taxa, mandarin, citron, pummelo, and *Citrus micrantha* (Nicolosi et al., 2000), but opinions differ on the origin of some specific species and cultivars. Most of the secondary species including sweet orange (*C. sinensis*), sour orange, grapefruit (*C. paradisi*), lemon (*Citrus limon*), and lime, generally, are propagated vegetatively and many come true to type from seed, thereby limiting further interspecific recombination and resulting in minimal intragroup genetic diversity (Ollitrault and Navarro, 2011). Natural biodiversity that exists in the citrus gene pool is essential for innovative citrus breeding. The understanding of

phylogenetic origin and genomic structure of those secondary species and important cultivars can facilitate the utilization of the natural phenotypic variability (Krueger and Navarro, 2007). The recent WGS projects have made important contributions in elucidating the phylogenetic history of citrus domestication and deciphering the genetic relationships between *C. sinensis*, *C. aurantium*, and *Citrus clementina* with *C. maxima* and *C. reticulata* (Wu et al., 2014, 2018; Xu et al., 2013). The phylogenetic origin of some secondary species and important citrus cultivars resulting from sexual crosses remains unknown or controversial. This study aimed to genotype the citrus collection at the Florida Citrus Arboretum (maintained by the Bureau of Citrus Budwood Registration in the Division of Plant Industry, Florida Department of Agriculture and Consumer Services) in Winter Haven, FL, using the previously used 1536-SNP genotyping assay (Yu et al., 2016, 2017, 2018), and to determine their SNP fingerprints and to assess genetic diversity, population structure, and phylogenetic relationships. Use of this sweet orange-derived SNP assay may not be ideal for genotyping distantly related accessions but was much less expensive than genome sequencing, and the efficiency of using the relatively inexpensive approach for these analyses could be tested in this study. Our hypothesis was that genotyping using this SNP chip would nonetheless prove informative.

Materials and Methods

PLANT MATERIALS, DNA EXTRACTION, AND GENOTYPING. The 80 accessions were chosen from *Citrus* and *Citrus* relatives (Table 1) and included representatives of the major known cultivar groups. Leaves of the 80 accessions were sampled from the Florida Citrus Arboretum. The Swingle (1967) and Tanaka (1977) botanical classifications were used for scientific names.

Table 2. The number, polymorphism information content (PIC), observed heterozygosity (H_o), expected heterozygosity (H_e), and inbreeding coefficient (IC) of 1366 single nucleotide polymorphisms (SNPs) on different scaffolds of the clementine genome assembly.

Scaffold no.	SNPs (no.)	PIC	H_o	H_e	IC
		(mean $\pm$ SD)			
1	144	0.29 $\pm$ 0.06	0.31 $\pm$ 0.11	0.36 $\pm$ 0.09	0.13 $\pm$ 0.23
2	163	0.29 $\pm$ 0.09	0.31 $\pm$ 0.12	0.36 $\pm$ 0.13	0.13 $\pm$ 0.22
3	236	0.3 $\pm$ 0.07	0.34 $\pm$ 0.12	0.38 $\pm$ 0.11	0.12 $\pm$ 0.22
4	138	0.32 $\pm$ 0.06	0.35 $\pm$ 0.11	0.41 $\pm$ 0.09	0.16 $\pm$ 0.22
5	181	0.32 $\pm$ 0.06	0.34 $\pm$ 0.11	0.41 $\pm$ 0.09	0.16 $\pm$ 0.22
6	126	0.32 $\pm$ 0.07	0.35 $\pm$ 0.12	0.4 $\pm$ 0.11	0.14 $\pm$ 0.2
7	105	0.31 $\pm$ 0.07	0.35 $\pm$ 0.13	0.4 $\pm$ 0.11	0.13 $\pm$ 0.25
8	123	0.31 $\pm$ 0.07	0.35 $\pm$ 0.13	0.4 $\pm$ 0.11	0.11 $\pm$ 0.24
9	142	0.31 $\pm$ 0.07	0.37 $\pm$ 0.14	0.39 $\pm$ 0.1	0.06 $\pm$ 0.22
Minors	8	0.29 $\pm$ 0.11	0.42 $\pm$ 0.23	0.37 $\pm$ 0.16	-0.11 $\pm$ 0.26
Total	1,366	0.31 $\pm$ 0.07	0.34 $\pm$ 0.12	0.39 $\pm$ 0.11	0.13 $\pm$ 0.23

Genomic DNA extraction was performed using the CTAB method according to Aldrich and Cullis (1993), and all the individuals were genotyped using a GoldenGate 1536-SNP array platform in the University of Florida's Interdisciplinary Center for Biotechnology Research. The 1536 SNPs were well characterized and evenly distributed based on sweet orange bacterial artificial chromosome (BAC) end sequences. Genotyping data were collected and analyzed by the software Genome Studio (Illumina, San Diego, CA). All SNPs were blasted against the clementine (*C. clementina*) genome V1.0 (Wu et al., 2014), and the physical locations of SNPs on corresponding chromosomes of the clementine genome were obtained.

DIVERSITY AND PHYLOGENETIC STATISTICS. The software PowerMarker 3.25 (Liu and Muse, 2005) was applied to calculate allele frequency, PIC, expected and observed heterozygosity (H_e and H_o), and inbreeding coefficient, and to test the Hardy–Weinberg equilibrium. Any SNP was excluded from the subsequent analysis if it had more than 10% missing calls or had less than 5% minor allele frequency (MAF). The software JMP Genomics (version 7; SAS Institute, Cary, NC) was used to calculate the genetic relationship matrix of the 80 accessions based on the identity by state (IBS) values from the genotypic data of SNPs. IBS computes the probability of two individuals sharing the same copy of an allele. The cluster analysis was performed using a matrix of IBS pairwise distances, and groups were determined by a permutation test. Principal component analysis (PCA) and principal coordinate analysis (PCoA) were performed using the software GenAlEx 6.5 (Peakall and Smouse, 2006) based on allele frequencies.

POPULATION STRUCTURE. The population structure of the 80 accessions was determined using the software STRUCTURE 2.3.4 (Pritchard et al., 2000). No prior population information was defined. The parameters were set for an admixture model and allele frequencies correlated. For estimating K , 10 independent STRUCTURE runs were performed at each of $K = 1$ –10 with 10,000 steps of burn-in and 50,000 repetitions of Markov chain Monte Carlo. The results generated by STRUCTURE were entered into the website program Structure Harvester (Earl and Vonholdt, 2012) for visualizing likelihood values of multiple K and detecting the number of genetic groups that best fits the data.

Results and Discussion

GENETIC DIVERSITY AND ALLELE FREQUENCIES. A total of 1366 SNPs (missing calls $\leq 10\%$ and MAF $\geq 5\%$) were selected to

Table 3. Polymorphism information content (PIC) and observed heterozygosity (H_o) of citrus genotype groups analyzed by 1366 genome-wide single nucleotide polymorphism (SNP) markers.

Group	Genotypes (no.)	PIC	H_o
		(mean $\pm$ SD)	
Mandarin	5	0.14 $\pm$ 0.1	0.24 $\pm$ 0.09
Pummelo	10	0.18 $\pm$ 0.1	0.1 $\pm$ 0.01
Citron	3	0.07 $\pm$ 0.02	0.09 $\pm$ 0.08
Trifoliolate orange	3	0.27 $\pm$ 0.1	0.07 $\pm$ 0.01
Kumquat	4	0.18 $\pm$ 0.1	0.05 $\pm$ 0.01
Sweet orange	5	0.16 $\pm$ 0.05	0.89 $\pm$ 0.04
Sour orange	4	0.06 $\pm$ 0.05	0.65 $\pm$ 0
Citrange	7	0.12 $\pm$ 0.05	0.37 $\pm$ 0.03
Lemon	6	0.11 $\pm$ 0.07	0.4 $\pm$ 0.03
Lime	3	0.1 $\pm$ 0.04	0.27 $\pm$ 0.14
<i>Microcitrus</i>	3	0.17 $\pm$ 0.11	0.06 $\pm$ 0.02
Papeda	3	0.07 $\pm$ 0.03	0.15 $\pm$ 0.15
Tangor	3	0.15 $\pm$ 0.01	0.3 $\pm$ 0.13
Other citrus genotypes	21	0.14 $\pm$ 0.09	0.46 $\pm$ 0.16

study the genetic diversity and population structure of the 80 accessions. The number of SNPs used for analysis of each accession ranged from 1088 for *Microcitrus inodora* to 1366 for 18 genotypes. Molecular marker properties were computed for each SNP, with PIC and H_o being 0.31 $\pm$ 0.07 and 0.34 $\pm$ 0.12, respectively (Supplemental Table 1). All the SNPs were evenly distributed throughout the chromosomes, varying from 105 on scaffold 7 to 236 on scaffold 3, and no significant differences were observed for PIC, H_o , and H_e between chromosomes (Table 2). Within the genus *Citrus*, the progenitor species mandarin, pummelo, and citron displayed low heterozygosity relative to other secondary species (Table 3; Supplemental Table 2). H_o ranged from 0.09 in citron to 0.89 in sweet orange, whereas PIC values varied from 0.06 in sour orange to 0.16 in sweet orange and 0.18 in pummelo. For *Citrus* accessions, H_o varied from 0.04 in Buddha's hand citron to 0.94 in Cara Cara navel orange (*C. sinensis*), and PIC ranged from 0.04 in Nules clementine to 0.35 in Sha Tian You pummelo. With respect to the accessions not in *Citrus*, kumquat displayed a low H_o value of 0.05, and trifoliolate orange exhibited a high PIC value of 0.27.

PHYLOGENETIC ANALYSIS. The 80 accessions were grouped into five main clusters according to the IBS values calculated from the genotypic data of 1366 SNPs (Fig. 1). The first main

Fig. 1. Dendrogram of 80 *Citrus* and *Citrus* relatives based on identity by state (IBS) calculated from the data of 1366 genome-wide single nucleotide polymorphism markers. IBS is the allelic similarity between two individuals at the given loci regardless of their common ancestry, via computing the probability of two individuals sharing the same copy of an allele. The cluster analysis is performed using a matrix of IBS pairwise distances, and groups are determined by a permutation test.

cluster included all kumquats, all citrons, all trifoliate oranges, all *Microcitrus*, two papedas, and two limes. The next major cluster consisted of all pummelos, which were clustered together. The third main group comprised all mandarin-type accessions. The mandarin group was divided into four sub-clusters. The calamandarin (*C. reticulata* × *C. madurensis*) and

Iyokan (*C. reticulata* × *C. sinensis*) were clustered closely together in the subcluster formed with Sunki and Shekwasha mandarins. The fourth major group included most of the sour oranges, one papeda, one lime, four lemons, and all citranges. Eureka and Lisbon lemons were grouped closely together with palestine sweet lime. 'Bergamot' and all other *C. aurantium* were clustered together. 'Kinkoji' and 'Hyuganatsu' were clustered closely together in the subcluster formed with all citranges. The last main cluster comprised all sweet oranges.

MULTIVARIATE ANALYSIS. PCA was performed for the 80 accessions with genotypic data of the 1366 SNPs. The first three components (46.7%, 25.2%, and 5.4%) explained 77.3% of the total diversity, revealing a strong structuration. The principal component 1 (PC1) mainly distinguished mandarins and their hybrids from other species (Fig. 2A). The PC2 separated sour oranges and their hybrids from *C. sinensis*. The PC3 differentiated *C. maxima* from *C. medica* (Fig. 2B). The calamandarin was located in the mandarin cluster, whereas the calamondin was positioned between the mandarin and *Fortunella* clusters however, closer to the mandarin cluster (Fig. 2B; Supplemental Fig. 1A). 'Kinkoji' was close to the sour orange cluster (Fig. 2; Supplemental Fig. 1A). Multivariate PCoA was used to investigate the genetic distances among the 80 accessions by using the 1366 SNPs. The first three axes (48.69%, 19.21%, and 7.88%) explained 75.78% of the total diversity. The first axis mainly differentiated mandarins and their hybrids and *C. maxima* from other species (Supplemental Fig. 1A). The second axis separated *C. sinensis* from sour oranges and their hybrids. The third axis distinguished *C. limon* from sour oranges and their hybrids (Supplemental Fig. 1B).

POPULATION STRUCTURE. Five groups ($K = 5$) including pummelos, mandarins, citrons, trifoliate oranges, and kumquats were indicated by the structure analysis, but no K was defined for the papeda group which probably resulted from the absence of pure *C. micrantha* being included in the dataset (Fig. 3). A similar observation has been previously reported and even sweet oranges did not show most *C. maxima* contribution (Barkley et al., 2006). It might be difficult to infer a correct value for K in a dataset that consists of a large number of individuals with admixture and a small number of individuals with no admixture, as the whole dataset is likely treated as a panmictic population (Ramadugu et al., 2013). In addition, small introgressions of *Fortunella* and *Poncirus* were found in some secondary species, lower than 5%, and therefore were not considered significant. Based on previous publications, <5% genetic contribution could be an error in STRUCTURE run from limited markers such as 1536 SNPs (Barkley et al., 2009; Garcia-Lor et al., 2015).

Interspecific introgressions were found in several mandarins and their hybrids, and pummelo was a common genetic contributor to mandarin, but contribution varied greatly. Three of the mandarin hybrids ('King', 'Nules', and 'Fortune') showed genetic contributions from *C. maxima* (12% to 13%). In addition, Sunki mandarin, mostly used as a rootstock, was detected without any interspecific introgression. Curk et al. (2015) observed three mandarins ('Sunki', 'Cleopatra', and *Citrus daoianensis*) with 100% *C. reticulata*, and they all shared the acidic mandarin mitotype (Froelicher et al., 2011). The proportions of *C. maxima* were found in sour orange (38%), sweet orange (35%), 'Clementine' (12%), and 'Murcott' (9%), which is well correlated ($r = 0.997$) with the previous study using the WGS data that inferred values of 49%, 44%, 21%, and

Fig. 2. Principal component analysis differentiating the 80 accessions of *Citrus* and *Citrus* relatives into different groups using the 1366 genome-wide single nucleotide polymorphisms. The percentage of total variance explained by each principal component (PC) is reported. (A) PC1/PC2, (B) PC1/PC3.

15% for the same cultivars, respectively (Wu et al., 2014). The good agreement between our observations and the WGS data-based findings reveals the relatively high efficiency of using such an inexpensive SNP array for a genetic diversity study. 'Fortune' and 'Murcott' are heterozygote admixed, and the proportion of *C. maxima* in their hybrids is inherited in a segregating but not an additive manner. Because of inheritance of large pieces of parental linkage groups, the *C. maxima* introgression ranged from 3% to 11% in the three 'Fortune' × 'Murcott' hybrids, when compared with their parents 'Fortune' (13%) and 'Murcott' (9%).

'Kinkoji' was considered to result from hybridization between a mandarin and a grapefruit (Hodgson, 1967), or a pummelo and a mandarin (Bayer et al., 2009). In the IBS-based phylogenetic tree (Fig. 1), 'Kinkoji' and citranges were clustered together with another subgroup mainly including *C. aurantium*. In PCA (Fig. 2B) and PCoA (Supplemental Fig. 1A), 'Kinkoji' was close to the sour orange cluster including the other three genotypes. 'Kinkoji' displayed an admixture of *C. maxima* (50%) and *C. reticulata* (39%), which supports the hypothesis of a pummelo-mandarin origin for 'Kinkoji'. 'Hyuganatsu' contained higher contribution from *C. maxima* (60%), compared with the contribution to sweet oranges, sour oranges, and their hybrids from *C. maxima* (33% to 41%). 'Natsumikan', 'Sanbokan', and 'Nansho Daidai' showed a similar

pattern to 'Kinkoji' as reported by Barkley et al. (2006). 'Hyuganatsu' was believed to be either a mutated 'Yuzu' or a hybrid of 'Yuzu' and a pummelo (Hodgson, 1967). Here, 'Hyuganatsu' exhibited a similar pattern to 'Kinkoji', but contained high contribution from *C. maxima* (60%). However, nearly no *C. maxima* contribution was observed in 'Yuzu'. In both PCA and PCoA, 'Hyuganatsu' was clustered distantly from 'Yuzu'. Therefore, we suggest that 'Hyuganatsu' cannot be a mutated 'Yuzu'.

The hybrids of *C. sinensis* × *P. trifoliata* displayed higher introgression (27% to 42%) from *C. maxima* when compared with the seedlings of the reciprocal cross (*C. maxima* introgression: 14% to 23%). The difference may arise from preferential selection of traits associated with the sweet orange cytoplasmic DNA, even though no cytoplasmic SNPs were included here. Reciprocal differences persist in plants because of the unequal contributions of cytoplasmic determinants from the female and male gametes. Cytoplasmic and maternal effects are the major components of extranuclear effects for plant seeds (Mosjidis and Yermanos, 1984), and the characterization of extranuclear effects on quantitative traits is important for plant breeding and seed quality improvement. In addition, the citranges contained low contribution (22% to 30%) from one of its parents, *P. trifoliata*, which might be caused by the absence of trifoliate orange-derived SNPs in the genotyping

Fig. 2. continued

assay used here; nonetheless, the citrange group was properly placed (Fig. 2).

Hodgson (1967) considered 'Bergamot' as a sour orange hybrid based on morphological characteristics, and *C. aurantium* has been widely suggested as one of its parents, by hybridization with a lime, lemon, or citron (Federici et al., 1998). Nicolosi et al. (2000) clustered 'Bergamot' within the citron group using RAPD, sequence-characterized amplified region, and cpDNA markers, and this observation was supported by a later study using SSRs (Barkley et al., 2006). In the phylogenetic analysis presented here, 'Bergamot' and all other *C. aurantium* accessions were not able to distinguish 'Bergamot' from other *C. aurantium*. The structure analysis results are consistent with the three specific origins (*C. medica*, *C. maxima*, and *C. reticulata*) provided by Curk et al. (2016), but here *C. reticulata* (49%) predominates.

All lime and lemon accessions show partial apomixis, and this results in conflicting classifications (Scora, 1975). Several lime and lemon cultivars were suggested to have originated from a single clonal parent through sporadic mutations, transposable elements, or deletion of genomic fragments (Carvalho et al., 2005; Curk et al., 2015, 2016; Gulsen and Roose, 2001; Snoussi et al., 2012). Tanaka (1977) classified key lime and palestine sweet lime into *C. aurantifolia* and *Citrus lime-tioides*, respectively, whereas Swingle (1967) considered both

of them as *C. aurantifolia*. Here, palestine sweet lime always showed a close relationship to *C. limon* accessions. *Citrus aurantifolia* has been considered as one of palestine sweet lime's parents, by hybridization with *C. medica* or *C. limetta* Tan (Webber, 1967), *C. sinensis* (Barrett and Rhodes, 1976), and *C. medica* (Carvalho et al., 2005). Curk et al. (2016) excluded *C. aurantifolia* as one of its parents and proposed a (*C. maxima* × *C. reticulata*) × *C. medica* model by cytogenetic and nuclear analysis. Our structure analysis agrees with the model, as palestine sweet lime mainly contained genetic contributions from *C. maxima*, *C. reticulata*, and *C. medica*, which was a very similar pattern to 'Eureka' and 'Lisbon'.

It was reported that the SNP chip data may be affected by ascertainment biases, which were caused by the procedure used to develop SNPs, and the degree of the ascertainment bias was dependent on the number of individuals selected as SNP discovery panels (Helyar et al., 2011; Nielsen et al., 2004). Here, the SNPs used for genetic diversity analysis of the *Citrus* and *Citrus* relatives were mined from sweet orange BAC end sequences, and as a result, the inferred admixture of the genotyped germplasm may suffer from the ascertainment biases due to the size of the ascertainment panel. In this article, some observations were different from the common knowledge, such as the inferred admixture for citranges, and the subsequent study with WGS data may support our results. Interestingly, good consensus and correlations were found

Fig. 3. Population genetic structure among 80 *Citrus* and *Citrus* relatives using the 1366 genome-wide single nucleotide polymorphisms. Each genotype is represented by a vertical bar partitioned into $K = 5$ segments representing the estimated membership fraction in five population groups. The five groups are depicted using the following color codes: red, *Citrus maxima*; green, *Citrus reticulata*; blue, *Citrus medica*; yellow, *Poncirus trifoliata*; and purple, *Fortunella*.

between our population structure analysis with the limited and inexpensive set of SNPs and the published observations based on the SNPs, SSRs, and WGS data. We consider that the estimations of the inferred admixture structure based on the single genotype-derived SNP chip, which is much less expensive than genome sequencing, may reveal the true phylogenomic structures of some genotyped germplasms and be capable of conducting such genetic diversity studies on more distantly related accessions.

In summary, we present a detailed phylogeny of some *Citrus* and *Citrus* relatives using a 1536-SNP genotyping assay with much lower cost compared with genome sequencing. The SNPs solely mined from sweet orange BAC end sequences were used for analysis of the admixture structure of 80 genotypes including actual cultivars and rootstocks. The contribution of the ancestral species inferred with the set of SNP markers and the published results from WGS data were in good agreement. *Citrus maxima* contribution was detected in several recently selected mandarin cultivars, which indicates that *C. maxima* introgressions play an important role in mandarin domestication. Many secondary citrus species and important cultivars

were studied and their inferred admixture structures were confirmed or revealed. Further study on interspecific admixture and the inferred phylogenetic origins of the main subgroup in *Citrus* will be critical for a better utilization of citrus biodiversity to breed new citrus cultivars and rootstocks.

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Supplemental Fig. 1. Principal coordinate analysis (PCoA) distribution of 80 *Citrus* and *Citrus* relative accessions from the 1366-single nucleotide polymorphism marker genotyping. The percentage of total variance explained by each coordinate (Coord) is reported. (A) Coord.1/Coord.2, (B) Coord.1/Coord.3.

Supplemental Table 1. Summary statistics of 1366 genome-wide single nucleotide polymorphisms (SNPs) for genotyping 80 Citrus and Citrus relatives.

Marker	Chromosome	Individuals	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^y	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1	8	77	3	2	0.3398	0.3766	0.4339	0.31818182	0.138389366692729	1.34109491415614	0.246840970183521
m2	9	78	3	2	0.368	0.4487	0.4861	0.4166666667	0.0833333333333333	0.461538461538462	0.496905847565428
m3	8	80	3	2	0.3605	0.4875	0.4718	0.38125	-0.027	0.088624141786781	0.765933615436691
m4	2	74	2	2	0.2763	0.1486	0.3312	0.2094594595	0.555862831858407	22.4782344589703	2.12538266941564E-06
m5	8	79	3	2	0.2309	0.1899	0.2664	0.1582278481	0.293051359516616	6.51704222963424	0.010684555331228
m6	3	80	2	2	0.1555	0.1875	0.1699	0.09375	-0.0972222222222222	0.856123662306778	0.354825735577312
m7	3	80	3	2	0.3515	0.45	0.455	0.35	0.017277125086386	0.00966069001328	0.921703048995417
m8	4	80	3	2	0.3661	0.3875	0.4824	0.40625	0.202799479166667	3.09719549574653	0.078427293499158
m9	5	79	3	2	0.3529	0.3038	0.4576	0.3544303797	0.341772151898734	8.92592331050067	0.002811511903943
m10	5	73	3	2	0.2981	0.0959	0.3645	0.2397260274	0.740072202166065	39.6445515786056	3.04653413607525E-10
m12	6	80	3	2	0.3515	0.475	0.455	0.35	-0.037677151745593	0.15457074021254	0.694205144719804
m13	7	80	3	2	0.3226	0.3875	0.4043	0.28125	0.047822706065319	0.138084902798198	0.71019234954494
m15	8	80	3	2	0.3346	0.5875	0.4249	0.30625	-0.377225519287834	11.7110552474196	0.00062129877175
m17	3	79	3	2	0.3416	0.3671	0.4372	0.3227848101	0.166543846720708	2.0311186305421	0.154107143205917
m18	8	80	3	2	0.3683	0.3875	0.4868	0.41875	0.21	3.32863047944358	0.068083544034617
m19	5	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m20	8	80	3	2	0.3605	0.4625	0.4718	0.38125	0.02599133622126	0.031063747725121	0.860098242751596
m21	9	76	3	2	0.375	0.4868	0.4999	0.4934210526	0.032764029278494	0.051959326099586	0.819688311156877
m22	9	80	3	2	0.3515	0.425	0.455	0.35	0.072193436960276	0.34778408404782	0.555370194594839
m23	3	74	2	2	0.1474	0.1757	0.1602	0.0878378378	-0.08955223880597	0.686200274348422	0.407459823112994
m24	1	79	3	2	0.2854	0.3671	0.3449	0.2215189873	-0.05799812909261	0.327069703947413	0.567389668393118
m25	9	73	3	2	0.3712	0.3836	0.4924	0.4383561644	0.227586206896552	3.56657356112433	0.05895384016741
m27	9	80	3	2	0.3374	0.375	0.4297	0.3125	0.13345521023766	1.29586776859504	0.254969404998204
m28	5	79	2	2	0.2178	0.2911	0.2488	0.1455696203	-0.164179104477612	2.29305898491084	0.129953577687791
m29	5	80	3	2	0.2225	0.25	0.255	0.15	0.025893958076449	0.030757400999616	0.860782719951011
m30	5	74	2	2	0.3337	0.6081	0.4232	0.3040540541	-0.431372549019608	14.1247996983693	0.000171073443966
m31	3	79	3	2	0.367	0.3924	0.4843	0.4113924051	0.195876288659794	2.84420775805391	0.091703785353518
m32	5	77	3	2	0.3653	0.3636	0.481	0.4025974026	0.250176180408739	4.58574775409201	0.032238901719569
m35	9	79	3	2	0.2491	0.1772	0.2916	0.1772151899	0.397683397683398	12.1585207100592	0.000488641171481
m36	2	79	3	2	0.3306	0.3418	0.418	0.2974683544	0.188439306358381	2.62510362515256	0.105185637862945
m37	2	76	3	2	0.1621	0.1184	0.1779	0.0986842105	0.340175953079179	8.49382705525068	0.003563534348513
m38	4	76	3	2	0.3622	0.3553	0.475	0.3881578947	0.258241758241758	4.82823091071764	0.027997344838308
m39	4	80	3	2	0.2412	0.3125	0.2805	0.16875	-0.107683679192372	1.03778118522582	0.308338071563197
m40	5	79	3	2	0.3441	0.3797	0.4416	0.3291139241	0.146296971908063	1.54968444623263	0.213182031198616
m41	6	80	3	2	0.2879	0.325	0.3487	0.225	0.074357818837314	0.371012705386622	0.542452773804118
m43	5	80	2	2	0.2289	0.3125	0.2637	0.15625	-0.17910447761194	2.74348422496571	0.097651638416429
m44	8	79	3	2	0.3487	0.4557	0.4499	0.3417721519	-0.006451612903226	0.012984878369494	0.909276469821433
m45	4	80	3	2	0.3226	0.3125	0.4043	0.28125	0.233009708737864	4.12425027421877	0.042272747701611
m46	2	80	3	2	0.3122	0.4	0.3872	0.2625	-0.0268074735987	0.087602215069692	0.767247864842882
m47	5	79	3	2	0.3617	0.3671	0.474	0.3860759494	0.231657608695652	4.02148528704884	0.044924133686654
m48	8	79	3	2	0.3585	0.4684	0.468	0.3734177215	0.005513439007581	5.78885521387214E-05	0.993929391647237
m49	5	80	2	2	0.2688	0.4	0.32	0.2	-0.244094488188977	5	0.025347318677467

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m50	3	79	3	2	0.3441	0.5316	0.4416	0.3291139241	-0.197806215722121	3.28504479473207	0.069913720571276
m51	3	72	3	2	0.3528	0.3472	0.4575	0.3541666667	0.247562526494277	4.18137104875616	0.040870624591356
m52	4	79	3	2	0.3211	0.3797	0.4019	0.2784810127	0.061371841155235	0.239182939951009	0.62479862310756
m53	8	76	3	2	0.3664	0.4474	0.483	0.4078947368	0.080418319509557	0.414323556994386	0.519783155834094
m54	2	80	3	2	0.362	0.425	0.4747	0.3875	0.110890433631248	0.876533841041778	0.349152793096358
m55	3	80	3	2	0.3589	0.475	0.4688	0.375	-0.007044615900704	0.014222222222222	0.905071781978791
m57	8	80	3	2	0.362	0.375	0.4747	0.3875	0.216010585511082	3.52822120162385	0.060332482694725
m58	5	79	3	2	0.3363	0.443	0.4279	0.3101265823	-0.029023746701847	0.098924882637172	0.753123651354519
m59	6	79	3	2	0.2709	0.3291	0.323	0.2025316456	-0.012481278082876	0.028068113819602	0.86694878758351
m60	4	80	3	2	0.3258	0.325	0.4097	0.2875	0.212725182062093	3.41840240504422	0.064473378741751
m61	4	80	3	2	0.3318	0.375	0.42	0.3	0.113355780022447	0.918367346938775	0.337904019103655
m62	9	76	3	2	0.3488	0.4474	0.4501	0.3421052632	0.012775842044135	0.002878106508876	0.957215623439095
m63	8	77	3	2	0.3743	0.4026	0.4987	0.474025974	0.198911934716083	2.85708009385426	0.090972498057721
m64	5	79	2	2	0.1485	0.1772	0.1615	0.0886075949	-0.09090909090909	0.746720679012346	0.387516473454504
m65	4	80	3	2	0.3554	0.325	0.4622	0.3625	0.302546689303905	7.04827238768955	0.007934173841632
m66	3	80	3	2	0.3589	0.4	0.4688	0.375	0.152815013404826	1.72088888888889	0.189578665656045
m67	1	79	3	2	0.2039	0.2405	0.2305	0.1329113924	-0.037088873337998	0.149130815769574	0.699367369395516
m68	8	80	3	2	0.3318	0.475	0.42	0.3	-0.124765829898838	1.3718820861678	0.241488778334724
m69	4	80	3	2	0.3718	0.2875	0.4937	0.44375	0.422808132147395	13.9531433709308	0.000187424003182
m70	2	79	3	2	0.3736	0.4177	0.4971	0.4620253165	0.165910563836682	2.01507320718845	0.155743758035093
m71	4	80	3	2	0.2225	0.225	0.255	0.15	0.123844731977819	1.10726643598616	0.292676937489583
m72	1	80	3	2	0.3589	0.425	0.4688	0.375	0.099564197116996	0.69688888888889	0.403831051413438
m73	1	78	3	2	0.3353	0.2821	0.426	0.3076923077	0.343665246028671	8.909079218107	0.002837563054877
m74	1	80	2	2	0.1291	0.15	0.1387	0.075	-0.07482993197279	0.525931336742147	0.468322450833322
m75	8	77	3	2	0.2005	0.2338	0.226	0.1298701299	-0.027798647633358	0.09073958565382	0.763239022832119
m76	5	75	3	2	0.3457	0.4	0.4444	0.3333333333	0.106639839034205	0.75	0.386476230773269
m77	4	79	3	2	0.3658	0.3797	0.482	0.4050632911	0.21817574340127	3.55396204094047	0.059403449312054
m78	2	79	3	2	0.3441	0.3038	0.4416	0.3291139241	0.317784256559767	7.69246367984142	0.005545181890638
m79	3	80	3	2	0.3346	0.3875	0.4249	0.30625	0.094304733727811	0.620473011931525	0.430871566094063
m80	-	77	3	2	0.3746	0.6494	0.4992	0.4805194805	-0.294718909710392	6.96125136961286	0.008329375679152
m81	5	79	3	2	0.3617	0.3165	0.474	0.3860759494	0.338085539714867	8.73037045703124	0.003129529053905
m82	5	75	3	2	0.3618	0.4	0.4743	0.3866666667	0.163211458725971	1.84095077648582	0.174839551311585
m83	8	77	3	2	0.3746	0.3117	0.4992	0.4805194805	0.381275440976934	10.8671804236669	0.000978834396802
m84	4	79	3	2	0.3177	0.4177	0.3962	0.2721518987	-0.048045602605863	0.233775534928705	0.628738348338845
m85	8	79	3	2	0.3736	0.4177	0.4971	0.4620253165	0.165910563836682	2.01507320718845	0.155743758035093
m86	9	80	2	2	0.1469	0.175	0.1597	0.0875	-0.089655172413793	0.735597673109402	0.391074760219135
m88	9	79	3	2	0.29	0.3797	0.3519	0.2278481013	-0.072902338376891	0.495976290722327	0.4812734607565
m89	9	79	3	2	0.3567	0.4304	0.4647	0.3670886076	0.080124869927159	0.430188347205708	0.511896543618112
m90	6	78	3	2	0.368	0.4231	0.4861	0.4166666667	0.136008160489629	1.31152276295133	0.252119135839436
m91	7	79	3	2	0.3529	0.3291	0.4576	0.3544303797	0.286669011607457	6.22958938477352	0.012563286543125
m92	3	79	3	2	0.3645	0.3671	0.4795	0.3987341772	0.240429818670249	4.34124327806428	0.037199749751153
m93	9	80	3	2	0.3494	0.4875	0.4512	0.34375	-0.074267782426778	0.518667093945016	0.471409172631786

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Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m94	1	80	3	2	0.375	0.375	0.5	0.5	0.255886970172684	5	0.025347318677467
m95	4	77	3	2	0.3698	0.4156	0.4898	0.4285714286	0.157894736842105	1.76767676767677	0.183669858857931
m96	9	80	3	2	0.3535	0.4125	0.4587	0.35625	0.1068591983556	0.810663814683033	0.367924066448295
m97	6	80	3	2	0.3047	0.375	0.375	0.25	0.006289308176101	0	1
m99	8	80	3	2	0.3346	0.3375	0.4249	0.30625	0.211751662971175	3.38619561060661	0.065744480011735
m100	3	80	3	2	0.2583	0.25	0.3047	0.1875	0.185567010309278	2.57725180802104	0.108409732936006
m101	4	80	3	2	0.3258	0.325	0.4097	0.2875	0.212725182062093	3.41840240504422	0.064473378741751
m102	4	79	3	2	0.3617	0.443	0.474	0.3860759494	0.071744304658279	0.337944889088649	0.561017879685063
m103	6	80	3	2	0.362	0.45	0.4747	0.3875	0.058278145695364	0.216385732444988	0.64180771666454
m104	2	80	3	2	0.3318	0.325	0.42	0.3	0.23214953271028	4.09297052154195	0.043061898229547
m105	5	80	3	2	0.3226	0.4125	0.4043	0.28125	-0.014002333722287	0.032934257508927	0.855992414971802
m106	2	80	3	2	0.3258	0.3	0.4097	0.2875	0.273563218390805	5.73454330283973	0.016634393117323
m107	3	79	3	2	0.2657	0.2911	0.3154	0.1962025316	0.083290751149719	0.46793067779684	0.493940696978846
m109	3	73	3	2	0.3324	0.5753	0.4211	0.301369863	-0.360323886639676	9.79536875518316	0.001749519240534
m110	1	79	3	2	0.3363	0.3924	0.4279	0.3101265823	0.089265536723164	0.543487284585047	0.460991065193363
m111	1	76	3	2	0.344	0.5263	0.4415	0.3289473684	-0.185770750988142	2.80624375240292	0.09389800079721
m112	5	78	3	2	0.373	0.4744	0.496	0.4551282051	0.050016672224075	0.148132908764052	0.700326040981982
m113	3	80	2	2	0.2159	0.2875	0.2462	0.14375	-0.161764705882352	2.25478182108796	0.133202227881747
m114	2	80	3	2	0.3572	0.4125	0.4655	0.36875	0.120148498143773	1.03868238072879	0.308128113394696
m115	7	76	3	2	0.3722	0.1842	0.4945	0.4473684211	0.631449631449631	29.920799692426	4.50058861289904E-08
m116	3	80	3	2	0.3425	0.425	0.4388	0.325	0.037620924399857	0.078570790821503	0.779243654902169
m117	4	74	3	2	0.3473	0.2432	0.4474	0.3378378378	0.461696026218763	15.409308788005	8.65608299618348E-05
m118	4	79	3	2	0.3363	0.3671	0.4279	0.3101265823	0.148343373493976	1.59538493643809	0.206558460654519
m119	3	76	3	2	0.3697	0.3816	0.4895	0.4276315789	0.22680412371134	3.69556870479947	0.05457180624365
m120	3	77	3	2	0.3723	0.4026	0.4946	0.4480519481	0.19232087613987	2.66442925470718	0.102614628613774
m121	2	76	3	2	0.3746	0.2237	0.4992	0.4802631579	0.556521739130435	23.1519175264849	1.49693856155153E-06
m122	5	80	3	2	0.2834	0.2375	0.3418	0.21875	0.310835629017447	7.44897306122449	0.006347265305297
m123	1	78	3	2	0.3502	0.3846	0.4527	0.3461538462	0.156626506024096	1.76265538895297	0.184293650665543
m127	1	77	3	2	0.3424	0.3896	0.4385	0.3246753247	0.117988394584139	0.957943786982249	0.327705483450274
m128	5	80	3	2	0.34	0.3875	0.4343	0.31875	0.113965267727931	0.928860048486075	0.335159316051195
m129	4	80	3	2	0.3258	0.325	0.4097	0.2875	0.212725182062093	3.41840240504422	0.064473378741751
m130	8	80	3	2	0.3007	0.3625	0.3687	0.24375	0.023027718550107	0.022420444312602	0.8809740251898
m131	5	77	3	2	0.364	0.3766	0.4784	0.3961038961	0.218993621545004	3.4856172662221	0.061904270672745
m133	2	80	3	2	0.2225	0.275	0.255	0.15	-0.072177668106107	0.492118415993849	0.82983846414845
m134	1	80	3	2	0.3258	0.4	0.4097	0.2875	0.029930928626247	0.044730936551075	0.832499554928507
m136	8	78	3	2	0.3432	0.3974	0.4401	0.3269230769	0.103305785123967	0.732673304615964	0.392018036504668
m137	1	80	3	2	0.2688	0.175	0.32	0.2	0.458108770210681	16.42578125	5.05924246779754E-05
m140	6	80	3	2	0.3589	0.45	0.4688	0.375	0.046277665995976	0.128	0.720514787136342
m141	2	77	3	2	0.3106	0.3117	0.3846	0.2597402597	0.195767195767196	2.76432132963989	0.096387557384317
m142	7	79	3	2	0.3441	0.6076	0.4416	0.3291139241	-0.370424597364568	11.1631863768403	0.000834364946461
m143	9	79	3	2	0.3066	0.4051	0.3781	0.253164557	-0.064846416382252	0.4003323757541	0.526917209297663
m144	9	79	2	2	0.2548	0.3671	0.2997	0.1835443038	-0.21875	3.99248843218557	0.045703519100058

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m145	5	80	3	2	0.3572	0.4125	0.4655	0.36875	0.120148498143773	1.03868238072879	0.308128113394696
m147	9	80	3	2	0.3449	0.3125	0.443	0.33125	0.300389656393907	6.94582108386564	0.00840152652402
m148	4	79	2	2	0.3211	0.557	0.4019	0.2784810127	-0.380530973451327	11.7685441674361	0.000602400739743
m149	5	80	3	2	0.3007	0.4125	0.3687	0.24375	-0.112676056338028	1.13061763411414	0.287643634768911
m150	1	77	3	2	0.3449	0.4026	0.443	0.3311688312	0.097663730371505	0.640246112842827	0.423621690201511
m151	3	78	3	2	0.3086	0.2821	0.3813	0.2564102564	0.266349068860979	5.28679548156956	0.021487724843999
m154	3	79	3	2	0.371	0.3924	0.492	0.4367088608	0.208510638297872	3.23661582937218	0.072009236483263
m155	3	79	3	2	0.3276	0.3544	0.4128	0.2911392405	0.147540983606557	1.57738657844991	0.209137537723933
m156	3	80	3	2	0.375	0.4125	0.4999	0.49375	0.180961357210179	2.44639139070824	0.117795393505531
m157	8	76	3	2	0.3047	0.1053	0.375	0.25	0.722479185938945	39.3216374269006	3.59436147512326E-10
m158	6	80	3	2	0.3648	0.45	0.48	0.4	0.068762278978389	0.3125	0.576150122030614
m159	3	75	3	2	0.2938	0.2533	0.3578	0.2333333333	0.298052920619071	6.3915358203773	0.011466577710832
m160	5	80	3	2	0.1719	0.1875	0.1899	0.10625	0.019039735099338	0.013008986319413	0.909192653669833
m162	2	77	3	2	0.2218	0.1948	0.2541	0.1493506494	0.23949299533022	4.19182469504588	0.040619355030277
m163	4	80	3	2	0.2879	0.25	0.3487	0.225	0.288928892889289	6.41410053827674	0.011321766135152
m164	4	79	3	2	0.2245	0.1266	0.2577	0.1518987342	0.5134123518403	20.443799349026	6.14081865935034E-06
m165	6	78	3	2	0.2624	0.3077	0.3107	0.1923076923	0.015974440894569	0.007074829931973	0.93296737727562
m166	3	74	3	2	0.363	0.4324	0.4766	0.3918918919	0.099460292983809	0.63618208775561	0.425096709412395
m167	2	80	2	2	0.1797	0.225	0.1997	0.1125	-0.120567375886524	1.28545923427891	0.25688644530235
m168	4	80	3	2	0.3346	0.3375	0.4249	0.30625	0.211751662971175	3.38619561060661	0.065744480011735
m169	9	80	3	2	0.3318	0.425	0.42	0.3	-0.005615874204418	0.011337868480726	0.915201977082605
m170	3	80	3	2	0.2159	0.2625	0.2462	0.14375	-0.060063897763578	0.351953876404613	0.553009166540426
m171	8	80	3	2	0.2159	0.2375	0.2462	0.14375	0.041507024265646	0.099274826839615	0.752701611678748
m172	3	74	2	2	0.2348	0	0.2717	0.1621621622	1	74	0
m173	2	80	3	2	0.2412	0.2125	0.2805	0.16875	0.248461108002238	4.70647208075574	0.030049257050137
m174	3	78	3	2	0.2512	0.2564	0.2945	0.1794871795	0.135802469135803	1.3073580994898	0.252873543455289
m175	5	80	3	2	0.3661	0.4125	0.4824	0.40625	0.151090849886031	1.68059138815585	0.194845889478845
m176	5	79	3	2	0.3465	0.3924	0.4458	0.335443038	0.126129382002168	1.13487602611948	0.28673765845042
m177	3	80	3	2	0.3192	0.375	0.3988	0.275	0.065825778478518	0.283802242509409	0.594219853028098
m178	1	79	3	2	0.2372	0.3038	0.275	0.164556962	-0.098591549295775	0.869235659445449	0.35116699733148
m179	3	80	3	2	0.3226	0.2875	0.4043	0.28125	0.294642857142857	6.67654320987654	0.009768989503858
m180	8	78	3	2	0.358	0.359	0.4671	0.3717948718	0.237623762376238	4.18117401538499	0.04087537623456
m181	3	76	3	2	0.2611	0.25	0.3088	0.1907894737	0.196730552423901	2.75389211245437	0.097018000865222
m182	3	80	3	2	0.3449	0.3875	0.443	0.33125	0.131560283687943	1.25750550190218	0.262123793706038
m184	8	80	3	2	0.3572	0.4875	0.4655	0.36875	-0.040878378378378	0.177891769852846	0.6731913153555784
m186	6	78	3	2	0.1833	0.2051	0.2041	0.1153846154	0.00162074554295	0.001820345865714	0.965968172412564
m187	1	80	3	2	0.2351	0.3	0.2722	0.1625	-0.095953757225434	0.835283091739044	0.36074930301538
m188	7	79	3	2	0.339	0.481	0.4326	0.3164556962	-0.105557627750839	0.988356104252399	0.320144489139851
m189	1	80	3	2	0.3226	0.2625	0.4043	0.28125	0.356228172293364	9.84062171812644	0.001706997939959
m190	1	73	3	2	0.2677	0.2055	0.3184	0.198630137	0.36056838365897	9.17669706940722	0.002451159747679
m191	3	79	3	2	0.3585	0.443	0.468	0.3734177215	0.059593523940751	0.223961546056381	0.636037856654531
m192	4	79	3	2	0.3529	0.3797	0.4576	0.3544303797	0.176346356916579	2.28761651719511	0.13041005161022

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m193	3	80	3	2	0.3605	0.3875	0.4718	0.38125	0.184753661784288	2.55389370208619	0.110022805832663
m194	2	79	3	2	0.3363	0.5443	0.4279	0.3101265823	-0.266138165345413	5.84673168577425	0.015606008653691
m195	1	77	3	2	0.2645	0.2338	0.3137	0.1948051948	0.260940032414911	5.00059313215401	0.02533863312878
m196	1	80	3	2	0.3007	0.2125	0.3687	0.24375	0.428753721820502	14.3554106543184	0.00015134414031
m197	2	80	3	2	0.374	0.5125	0.498	0.46875	-0.022734449005368	0.067371011149558	0.795203762718521
m198	3	80	3	2	0.3472	0.45	0.4472	0.3375	-2.14705577898677E-17	0.003164431786717	0.955140035066349
m199	5	80	3	2	0.3693	0.3	0.4888	0.425	0.391527599486521	11.9313714588471	0.000551965283257
m200	9	80	3	2	0.3725	0.5	0.495	0.45	-0.003811944091487	0.008162432404857	0.928012123115991
m201	7	78	3	2	0.3643	0.3333	0.479	0.3974358974	0.30989314029645	7.21079172376368	0.007246652114296
m202	3	80	3	2	0.3718	0.4625	0.4937	0.44375	0.06940464820121	0.318962089455031	0.57223205976077
m203	1	80	3	2	0.34	0.3625	0.4343	0.31875	0.171428571428571	2.18639014776839	0.139235299380591
m204	5	80	3	2	0.3425	0.35	0.4388	0.325	0.208303507516106	3.27335005397683	0.070413696825074
m205	6	79	3	2	0.2372	0.0759	0.275	0.164556962	0.726795096322242	41.3843097461979	1.25057186828315E-10
m206	3	77	3	2	0.2218	0.1948	0.2541	0.1493506494	0.23949299533022	4.19182469504588	0.040619355030277
m207	3	79	3	2	0.3509	0.443	0.4539	0.3481012658	0.030195381882771	0.044863670250349	0.83225490908589
m209	1	80	3	2	0.3085	0.3625	0.3812	0.25625	0.055257731958763	0.19196592798858	0.66128540489927
m210	8	79	3	2	0.3736	0.4177	0.4971	0.4620253165	0.165910563836682	2.01507320718845	0.155743758035093
m211	8	80	2	2	0.2225	0.3	0.255	0.15	-0.17037037037037	2.49134948096886	0.114473532783952
m212	1	80	3	2	0.3288	0.4125	0.4149	0.29375	0.012125805229253	0.002725591535436	0.958363597487706
m215	9	79	3	2	0.2548	0.2405	0.2997	0.1835443038	0.203653949489522	3.0827659375462	0.079125857619737
m217	2	80	2	2	0.2923	0.4625	0.3555	0.23125	-0.295081967213115	7.23907726882147	0.007133363073883
m218	4	79	3	2	0.3244	0.2911	0.4074	0.2848101266	0.291189253259581	6.43250306249027	0.011205056111683
m219	5	79	3	2	0.3701	0.4051	0.4903	0.4303797468	0.180026281208935	2.38785253534965	0.122281503677446
m220	4	79	3	2	0.3529	0.4304	0.4576	0.3544303797	0.065868263473054	0.279903628117914	0.596764389220651
m221	3	79	3	2	0.3601	0.4051	0.4711	0.3797468354	0.146374829001368	1.55141098616317	0.212927261945388
m222	8	80	3	2	0.3494	0.4375	0.4512	0.34375	0.036585365853659	0.07346189164371	0.786361388537604
m223	7	80	3	2	0.3711	0.35	0.4922	0.4375	0.294642857142857	6.67654320987654	0.009768989503858
m225	3	80	3	2	0.3736	0.5	0.4972	0.4625	0.000632511068944	0.002559968648285	0.95964734450634
m226	3	80	2	2	0.0905	0.1	0.095	0.05	-0.046357615894039	0.221606648199446	0.63781845047436
m227	5	80	3	2	0.3725	0.525	0.495	0.45	-0.054337464251668	0.293847566574839	0.587765403577513
m228	3	79	3	2	0.3177	0.443	0.3962	0.2721518987	-0.112016293279022	1.10562087921638	0.293035857077474
m229	1	79	3	2	0.3363	0.4177	0.4279	0.3101265823	0.030143180105501	0.044667266651408	0.832617041593475
m230	4	80	3	2	0.3672	0.375	0.4847	0.4125	0.232264334305151	4.09713830348424	0.042955861681795
m231	3	80	3	2	0.374	0.4125	0.498	0.46875	0.177861873226112	2.3602491349481	0.124462310718846
m232	3	78	3	2	0.3324	0.3462	0.421	0.3012820513	0.184065934065934	2.46650866147391	0.116295991641418
m233	6	80	3	2	0.1719	0.1875	0.1899	0.10625	0.019039735099338	0.013008986319413	0.909192653669833
m234	6	80	3	2	0.2688	0.225	0.32	0.2	0.302599313388916	7.05078125	0.007923068762715
m235	7	79	3	2	0.339	0.3797	0.4326	0.3164556962	0.128491620111732	1.18012345679012	0.277330863643365
m236	8	79	3	2	0.2986	0.4051	0.3653	0.2405063291	-0.102473498233216	0.934675284702985	0.333650994833058
m237	9	80	3	2	0.3535	0.4875	0.4587	0.35625	-0.056584362139918	0.316022903252844	0.574007594860175
m238	3	79	3	2	0.3717	0.3544	0.4935	0.4430379747	0.287671232876712	6.27429752066115	0.012250167511468
m239	1	79	3	2	0.3585	0.4177	0.468	0.3734177215	0.113636363636364	0.910306744549779	0.340033043468051

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m240	8	79	3	2	0.3717	0.6582	0.4935	0.4430379747	-0.328094302554027	8.8005920053972	0.003011328152549
m241	5	80	3	2	0.3744	0.45	0.4988	0.475	0.103969754253308	0.764316807055231	0.381980956077786
m242	6	79	3	2	0.2432	0.2911	0.2834	0.1708860759	-0.021058625252248	0.059415593576816	0.807422014085649
m243	2	80	2	2	0.1005	0.1125	0.1062	0.05625	-0.053333333333333	0.284198061488531	0.593962767531613
m244	8	80	3	2	0.3746	0.2875	0.4993	0.48125	0.429334170854271	14.3949906476652	0.000148196016229
m245	7	80	3	2	0.3748	0.375	0.4997	0.4875	0.255419415045617	4.98125587403947	0.025623375823561
m246	4	79	3	2	0.374	0.4051	0.498	0.4683544304	0.192755498059508	2.75119300215825	0.097181892476239
m247	1	79	3	2	0.1485	0.1013	0.1615	0.0886075949	0.378486055776893	10.9921264802217	0.00091499766404
m248	9	80	3	2	0.3605	0.4875	0.4718	0.38125	-0.027	0.088624141786781	0.765933615436691
m250	3	79	3	2	0.2245	0.1519	0.2577	0.1518987342	0.415730337078652	13.3089218088661	0.000264146212281
m251	5	78	3	2	0.3324	0.4487	0.421	0.3012820513	-0.05935534591195	0.337524803173952	0.561261448726264
m252	1	80	2	2	0.2159	0.2875	0.2462	0.14375	-0.161764705882352	2.25478182108796	0.133202227881747
m253	5	79	3	2	0.3509	0.3418	0.4539	0.3481012658	0.252926569705569	4.81795447339659	0.028164750177751
m254	4	76	3	2	0.3589	0.25	0.4688	0.375	0.471830985915493	16.5511111111111	4.73562301208052E-05
m255	3	78	3	2	0.191	0.1154	0.2139	0.1217948718	0.465690053970702	16.5494906804687	4.73967143060916E-05
m257	6	73	3	2	0.2785	0.2877	0.3345	0.2123287671	0.146726862202483	1.43022670540493	0.231727443614877
m258	8	78	3	2	0.3643	0.4615	0.479	0.3974358974	0.042817679558011	0.103211297647643	0.748009462749406
m261	3	78	3	2	0.3432	0.3718	0.4401	0.3269230769	0.161472024033045	1.87835510674858	0.170521218403595
m262	9	80	3	2	0.2688	0.2	0.32	0.2	0.380392156862745	11.25	0.000796230157591
m263	7	80	3	2	0.3192	0.275	0.3988	0.275	0.316017316017316	7.705112960761	0.005506462715021
m264	7	79	3	2	0.3276	0.2785	0.4128	0.2911392405	0.330994152046784	8.36032982427376	0.003835009529658
m265	9	79	3	2	0.3744	0.3671	0.4987	0.4746835443	0.269851517107811	5.50330403703166	0.018980578178759
m266	7	79	3	2	0.2986	0.4557	0.3653	0.2405063291	-0.241379310344828	4.83409972299169	0.02790205449836
m267	3	80	3	2	0.375	0.3625	0.4999	0.49375	0.280690737933595	6.04501587300192	0.013945607655138
m268	2	80	3	2	0.3494	0.3875	0.4512	0.34375	0.147284122562674	1.59331346803814	0.206853369680221
m269	7	77	3	2	0.3593	0.3377	0.4696	0.3766233766	0.286900036088055	6.07527259628088	0.013708714383939
m270	5	77	3	2	0.3576	0.4026	0.4663	0.3701298701	0.142961076755183	1.43579173342773	0.230821545255184
m271	6	79	3	2	0.3632	0.3797	0.4768	0.3924050633	0.209726443768997	3.27571783949012	0.070312160436508
m272	6	80	3	2	0.3683	0.4875	0.4868	0.41875	0.00484496124031	0.000166901216965	0.989692239582871
m273	2	80	3	2	0.3226	0.4875	0.4043	0.28125	-0.199766355140187	3.38819575719387	0.065664766565758
m274	2	80	3	2	0.3661	0.3875	0.4824	0.40625	0.202799479166667	3.09719549574653	0.078427293499158
m275	3	80	3	2	0.3494	0.4375	0.4512	0.34375	0.036585365853659	0.07346189164371	0.786361388537604
m276	5	76	3	2	0.2772	0.2368	0.3324	0.2105263158	0.293563579277865	6.281875	0.012197897518726
m277	1	78	3	2	0.2129	0.2051	0.2423	0.141025641	0.159618008185539	1.83365030036692	0.175696997999558
m278	2	80	3	2	0.375	0.325	0.5	0.5	0.3550674615626	9.8	0.001745118699529
m279	1	80	3	2	0.2091	0.2	0.2372	0.1375	0.162913907284768	1.96652901241318	0.160816770193232
m280	9	80	3	2	0.3672	0.325	0.4847	0.4125	0.335059889932017	8.68376759071849	0.003210566016841
m281	4	80	3	2	0.3648	0.475	0.48	0.4	0.016704880445463	0.008680555555556	0.925768905186136
m282	1	79	3	2	0.3441	0.3291	0.4416	0.3291139241	0.260663507109005	5.12557849768601	0.023575710894324
m283	9	75	2	2	0.2044	0.2667	0.2311	0.1333333333	-0.147286821705427	1.77514792899408	0.182746263331576
m284	6	80	3	2	0.3605	0.4375	0.4718	0.38125	0.078947368421053	0.422755209754469	0.515565440080576
m285	4	80	3	2	0.3494	0.4875	0.4512	0.34375	-0.074267782426778	0.518667093945016	0.471409172631785

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Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m286	6	80	3	2	0.3635	0.4375	0.4774	0.39375	0.089861751152074	0.559380367365629	0.45451000973463
m287	4	78	3	2	0.3047	0.2436	0.375	0.25	0.356073943661972	9.57834757834758	0.001968855295731
m288	9	79	3	2	0.3509	0.4177	0.4539	0.3481012658	0.0859375	0.500703176548213	0.47919131537513
m289	9	79	3	2	0.3658	0.4051	0.482	0.4050632911	0.165775401069519	2.01165685830693	0.156094764004438
m290	4	80	3	2	0.3661	0.3375	0.4824	0.40625	0.306115810019518	7.21944631119999	0.007211794958259
m291	3	77	3	2	0.3495	0.4805	0.4514	0.3441558442	-0.057938299473288	0.319841216468876	0.571703083658856
m292	7	78	3	2	0.1671	0.1795	0.1841	0.1025641026	0.031446540880503	0.04875	0.825252818740487
m293	9	79	3	2	0.3692	0.8228	0.4885	0.4240506329	-0.68103448275862	37.0076468101163	1.17666876242595E-09
m294	3	79	3	2	0.3617	0.519	0.474	0.3860759494	-0.088495575221239	0.710149319544556	0.399394245886093
m295	7	79	3	2	0.3724	0.3418	0.4949	0.4493670886	0.315121951219512	7.56124417116152	0.005963680658654
m296	8	79	3	2	0.3585	0.4177	0.468	0.3734177215	0.113636363636364	0.910306744549778	0.340033043468051
m298	3	72	3	2	0.2181	0.1528	0.2491	0.1458333333	0.392690513219285	10.7699741407568	0.001031599508532
m299	6	79	3	2	0.3645	0.443	0.4795	0.3987341772	0.082352941176471	0.456584932115864	0.499224349581653
m300	9	77	3	2	0.275	0.2857	0.3292	0.2077922078	0.138588356517259	1.34514936341037	0.246127905014353
m301	2	79	3	2	0.3585	0.3924	0.468	0.3734177215	0.167641996557659	2.05909348403233	0.151300156386472
m302	9	78	3	2	0.3597	0.5256	0.4703	0.3782051282	-0.111228440689898	1.07864178279617	0.299001597233637
m304	7	80	3	2	0.3702	0.4625	0.4905	0.43125	0.06344120474207	0.261515791127956	0.60908069356055
m305	4	80	3	2	0.2923	0.4125	0.3555	0.23125	-0.154050464807437	2.05272784078836	0.15193375673207
m306	1	79	3	2	0.374	0.2785	0.498	0.4683544304	0.445915402001937	15.3499231443247	8.93245614435045E-05
m307	7	79	3	2	0.3105	0.4177	0.3843	0.2594936709	-0.080604534005038	0.596979976149884	0.439732627452087
m308	1	80	3	2	0.34	0.3125	0.4343	0.31875	0.286230574629563	6.29200225056364	0.012128396482303
m309	3	80	3	2	0.3494	0.4125	0.4512	0.34375	0.091954022988506	0.587755102040816	0.443288522116632
m311	5	79	2	2	0.1115	0.1266	0.1186	0.0632911392	-0.061224489795918	0.360664718772827	0.548137299309861
m312	3	79	3	2	0.2309	0.2152	0.2664	0.1582278481	0.198307134220072	2.91773273785969	0.087610885428481
m313	5	80	3	2	0.3494	0.3625	0.4512	0.34375	0.202575704838148	3.09013699143569	0.078768176522758
m314	4	79	3	2	0.3211	0.3291	0.4019	0.2784810127	0.187174348697395	2.5887119749497	0.107627827452629
m315	1	80	3	2	0.34	0.4375	0.4343	0.31875	-0.001086169442433	0.004351754152037	0.94740344025817
m316	2	79	3	2	0.3658	0.3797	0.482	0.4050632911	0.21817574340127	3.55396204094047	0.059403449312054
m317	7	80	2	2	0.2159	0.2875	0.2462	0.14375	-0.161764705882352	2.25478182108796	0.133202227881747
m318	8	75	3	2	0.3432	0.3867	0.4399	0.3266666667	0.127642276422764	1.09870221623257	0.294551090074873
m320	5	75	3	2	0.2516	0.3067	0.2952	0.18	-0.032140691328077	0.113162604074099	0.736571889730658
m321	5	79	3	2	0.2432	0.1392	0.2834	0.1708860759	0.51332955190017	20.4371013357	6.16234765016266E-06
m322	5	80	3	2	0.3535	0.3875	0.4587	0.35625	0.161301369863014	1.92620532965022	0.165174199485812
m323	2	80	2	2	0.1719	0.2125	0.1899	0.10625	-0.112676056338028	1.13061763411414	0.287643634768911
m324	6	78	3	2	0.3716	0.3974	0.4933	0.4423076923	0.20060281312793	2.94781095209517	0.085993967517742
m325	3	79	3	2	0.373	0.3797	0.4961	0.4556962025	0.240506329113924	4.3440861426597	0.037137692792144
m326	3	80	3	2	0.2528	0.2875	0.2968	0.18125	0.03760593220339	0.078495601667387	0.779346571488943
m327	9	78	3	2	0.2058	0.141	0.233	0.1346153846	0.40014164305949	12.1520248593264	0.000490345997346
m328	3	79	3	2	0.2245	0.2278	0.2577	0.1518987342	0.121951219512195	1.05701436845623	0.303897127336592
m330	2	80	2	2	0.1948	0.25	0.2188	0.125	-0.136690647482014	1.63265306122449	0.201336485288745
m332	3	80	3	2	0.2289	0.2625	0.2637	0.15625	0.010733452593918	0.00158024691358	0.96829058960458
m334	1	80	3	2	0.202	0.2125	0.228	0.13125	0.074431426602343	0.371815893343173	0.542016110762689

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m338	2	79	3	2	0.3141	0.1772	0.3903	0.2658227848	0.550432276657061	23.5491808693354	1.21761251414831E-06
m339	2	79	3	2	0.3681	0.4304	0.4865	0.417721519	0.121563431599808	1.0499283086927	0.305253598591423
m341	1	80	2	2	0.1719	0.2125	0.1899	0.10625	-0.112676056338028	1.13061763411414	0.287643634768911
m343	1	80	3	2	0.3346	0.4375	0.4249	0.30625	-0.023316062176166	0.070097676275283	0.791194616700009
m344	5	80	3	2	0.2091	0.225	0.2372	0.1375	0.057654075546719	0.211220297145714	0.645812624413293
m346	9	80	3	2	0.3589	0.45	0.4688	0.375	0.046277665995976	0.128	0.720514787136342
m347	4	80	3	2	0.2636	0.3625	0.3124	0.19375	-0.154156171284635	2.05543258782938	0.151664175124926
m348	4	79	3	2	0.3141	0.2785	0.3903	0.2658227848	0.292371134020618	6.48609594452129	0.010872148785695
m349	3	79	3	2	0.3027	0.2405	0.3718	0.246835443	0.358719169190827	9.85284978360761	0.001695688762628
m351	3	80	3	2	0.3122	0.375	0.3872	0.2625	0.037758830694275	0.079264110125521	0.778297153562111
m352	5	80	3	2	0.34	0.3625	0.4343	0.31875	0.171428571428571	2.18639014776839	0.139235299380591
m353	3	80	3	2	0.2412	0.2375	0.2805	0.16875	0.159574468085106	1.88348590464993	0.169938480319038
m354	3	79	3	2	0.3692	0.3671	0.4885	0.4240506329	0.254449571522742	4.87775482200193	0.027204983555751
m355	6	79	3	2	0.3748	0.443	0.4997	0.4873417722	0.119638826185102	1.01511309629529	0.31368100775514
m356	3	80	3	2	0.3589	0.425	0.4688	0.375	0.099564197116996	0.696888888888889	0.403831051413438
m357	3	79	3	2	0.3487	0.3291	0.4499	0.3417721519	0.274418604651163	5.69607338820302	0.017002910238535
m358	4	80	3	2	0.3258	0.325	0.4097	0.2875	0.212725182062093	3.41840240504422	0.064473378741751
m359	2	80	3	2	0.3007	0.4375	0.3687	0.24375	-0.180614859094791	2.78831509022805	0.094954018679257
m360	7	77	3	2	0.3249	0.2597	0.4082	0.2857142857	0.369294605809129	10.1818181818182	0.001418322554605
m361	4	79	3	2	0.3416	0.3418	0.4372	0.3227848101	0.224309392265194	3.76307354928325	0.052396182250155
m362	2	80	3	2	0.1797	0.2	0.1997	0.1125	0.004724409448819	0.00019592428506	0.988832138597865
m363	1	75	3	2	0.2983	0.2133	0.3648	0.24	0.420743639921722	12.9296193700626	0.000323423540298
m364	9	74	3	2	0.3615	0.5	0.4736	0.3851351351	-0.048932038834952	0.229717937976438	0.63173305212368
m365	7	78	3	2	0.37	0.5513	0.4901	0.4294871795	-0.118581081081081	1.21752399622143	0.269847116615683
m366	9	75	3	2	0.3377	0.3867	0.4303	0.3133333333	0.108063175394846	0.77153224661569	0.379743456590363
m367	5	80	3	2	0.3472	0.375	0.4472	0.3375	0.16754478398314	2.08465734038298	0.148785605301237
m368	4	77	3	2	0.3746	0.3377	0.4992	0.4805194805	0.329487614523244	8.06563047845142	0.004511277497704
m369	2	80	3	2	0.3702	0.3875	0.4905	0.43125	0.21606914212548	3.53019432102919	0.0602607252366
m370	7	80	3	2	0.2471	0.25	0.2888	0.175	0.140369967355822	1.44075260958378	0.230017590688888
m371	9	76	3	2	0.3637	0.3947	0.4778	0.3947368421	0.180327868852459	2.29867674858223	0.129484268494339
m372	6	79	3	2	0.0915	0.0759	0.0961	0.0506329114	0.216080402010051	3.4839	0.061968532880794
m373	1	80	3	2	0.2688	0.275	0.32	0.2	0.146784486990672	1.58203125	0.20846835080068
m374	-	80	3	2	0.375	0.6375	0.4999	0.49375	-0.26937618147448	6.05877017088421	0.01383740143989
m375	5	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m376	6	79	3	2	0.3441	0.4051	0.4416	0.3291139241	0.089051094890511	0.540677576934662	0.462152052206738
m377	6	80	3	2	0.3683	0.3375	0.4868	0.41875	0.312379110251451	7.52481554517935	0.006085478539699
m378	3	79	3	2	0.2944	0.2405	0.3587	0.2341772152	0.335127860026918	8.57505557030401	0.003407995556994
m379	8	80	2	2	0.3318	0.6	0.42	0.3	-0.423423423423423	14.6938775510204	0.000126456486403
m380	2	77	3	2	0.1239	0.0649	0.1327	0.0714285714	0.515306122448979	20.0661646046261	7.48085311630398E-06
m381	5	79	3	2	0.3748	0.2911	0.4997	0.4873417722	0.422594142259414	13.7601744352319	0.000207692817349
m382	1	80	3	2	0.3346	0.3875	0.4249	0.30625	0.094304733727811	0.620473011931525	0.430871566094063
m383	2	79	2	2	0.1892	0.2405	0.2116	0.1202531646	-0.130434782608696	1.47606231561513	0.224391627278254

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m385	8	80	3	2	0.1948	0.225	0.2188	0.125	-0.022286125089864	0.06530612244898	0.798297847328536
m386	1	78	2	2	0.2265	0.3077	0.2604	0.1538461538	-0.17557251908397	2.57851239669422	0.108322420778906
m388	9	80	3	2	0.3374	0.425	0.4297	0.3125	0.01719721917307	0.009520661157025	0.922270669919804
m389	3	77	3	2	0.3538	0.3506	0.4592	0.3571428571	0.242524916943521	4.30181818181818	0.038071650330057
m390	9	78	3	2	0.2265	0.2564	0.2604	0.1538461538	0.021601016518424	0.017906336088154	0.893549214654443
m392	8	80	2	2	0.1469	0.175	0.1597	0.0875	-0.089655172413793	0.735597673109401	0.391074760219135
m393	5	80	3	2	0.375	0.3625	0.4999	0.49375	0.280690737833595	6.04501587300192	0.013945607655138
m394	3	80	3	2	0.2351	0.3	0.2722	0.1625	-0.095953757225434	0.835283091739044	0.36074930301538
m395	9	80	3	2	0.1719	0.1875	0.1899	0.10625	0.019039735099338	0.013008986319413	0.909192653669833
m396	2	76	3	2	0.3234	0.2237	0.4057	0.2828947368	0.453961456102784	15.300380476684	9.169804005932E-05
m397	3	76	3	2	0.3359	0.3553	0.4272	0.3092105263	0.174816625916871	2.15497048253435	0.142109174338947
m399	4	80	3	2	0.2834	0.3625	0.3418	0.21875	-0.054302807179015	0.293511836734694	0.587978802061158
m400	5	79	3	2	0.2491	0.3038	0.2916	0.1772151899	-0.035398230088496	0.137756309624442	0.710521811316779
m401	3	80	3	2	0.202	0.2375	0.228	0.13125	-0.035172413793104	0.137465127002788	0.710814137465998
m402	9	80	3	2	0.3648	0.575	0.48	0.4	-0.191866185634634	3.13368055555555	0.076690418564276
m403	1	80	3	2	0.2091	0.25	0.2372	0.1375	-0.047745358090186	0.23343934807327	0.628985213541061
m404	5	79	3	2	0.3567	0.3797	0.4647	0.3670886076	0.188908145580589	2.63865636147444	0.10429171435886
m405	3	79	3	2	0.2854	0.3924	0.3449	0.2215189873	-0.131492746841367	1.49896042335237	0.220831387068767
m406	3	80	3	2	0.3288	0.3125	0.4149	0.29375	0.25274309496784	4.87464246553153	0.027254086291482
m407	8	80	3	2	0.3635	0.4625	0.4774	0.39375	0.037537043134673	0.078150570738721	0.779819522145373
m408	2	74	3	2	0.363	0.4054	0.4766	0.3918918919	0.15606936416185	1.65226582111243	0.198650821097524
m409	1	80	3	2	0.3374	0.45	0.4297	0.3125	-0.04099560761347	0.178776859504132	0.672426502035245
m410	5	80	3	2	0.2583	0.3	0.3047	0.1875	0.021671826625387	0.018934911242604	0.890553249243309
m411	-	80	2	2	0.1719	0.2125	0.1899	0.10625	-0.112676056338028	1.13061763411414	0.287643634768911
m412	2	79	3	2	0.2245	0.1772	0.2577	0.1518987342	0.317926296060496	7.69949486538452	0.005523617140219
m413	4	80	3	2	0.3554	0.35	0.4622	0.3625	0.248641304347826	4.71348941525737	0.029926847950967
m414	9	79	3	2	0.3465	0.519	0.4458	0.335443038	-0.157856625633599	2.12636741797704	0.144783517312707
m415	3	72	3	2	0.3089	0.2361	0.3818	0.2569444444	0.387620497209538	10.4879454928297	0.001201559080078
m416	3	80	3	2	0.3725	0.4	0.495	0.45	0.197969543147208	2.94663809815325	0.086056407924687
m417	8	80	3	2	0.3711	0.25	0.4922	0.4375	0.496815286624204	19.3701184177375	1.07678814187384E-05
m418	9	79	3	2	0.2759	0.3924	0.3305	0.2088607595	-0.18124084025403	2.77420259320477	0.095794335661394
m419	4	80	3	2	0.3374	0.4	0.4297	0.3125	0.075347476225311	0.381884297520661	0.536596513501969
m420	5	78	3	2	0.2198	0.1667	0.2514	0.1474358974	0.342744583059751	8.86039287710015	0.002914248432882
m422	8	80	3	2	0.3494	0.4875	0.4512	0.34375	-0.074267782426778	0.51867093945016	0.471409172631785
m423	2	79	3	2	0.2309	0.2152	0.2664	0.1582278481	0.198307134220072	2.91773273785969	0.087610885428481
m424	2	80	3	2	0.34	0.3625	0.4343	0.31875	0.171428571428571	2.18639014776839	0.139235299380591
m425	6	79	2	2	0.0915	0.1013	0.0961	0.0506329114	-0.046979865771811	0.224711111111111	0.635473497265115
m426	3	75	3	2	0.3648	0.5333	0.48	0.4	-0.104477611940299	0.925925925925926	0.335923813152445
m427	3	80	3	2	0.3589	0.425	0.4688	0.375	0.099564197116996	0.696888888888889	0.403831051413438
m428	1	79	3	2	0.3724	0.3418	0.4949	0.4493670886	0.315121951219512	7.56124417116152	0.005963680658654
m429	6	80	3	2	0.3346	0.3125	0.4249	0.30625	0.270410048023642	5.59981213357622	0.017962403563457
m431	2	79	2	2	0.1115	0.1266	0.1186	0.0632911392	-0.061224489795918	0.360664718772827	0.548137299309861

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m432	1	80	2	2	0.2225	0.3	0.255	0.15	-0.17037037037037	2.49134948096886	0.114473532783952
m434	2	79	2	2	0.1396	0.1646	0.151	0.082278481	-0.0833333333333333	0.635005945303211	0.425525023813751
m435	9	76	3	2	0.3687	0.4211	0.4875	0.4210526316	0.142857142857143	1.413222314049587	0.234522069682852
m436	9	78	3	2	0.369	0.4615	0.4882	0.4230769231	0.060975609756098	0.232066115702479	0.62999604883744
m437	7	80	2	2	0.1103	0.125	0.1172	0.0625	-0.060402684563758	0.355555555555556	0.550984987585169
m438	5	79	3	2	0.3363	0.2911	0.4279	0.3101265823	0.325310267017676	8.06954369551362	0.004501545141723
m439	3	80	2	2	0.1103	0.125	0.1172	0.0625	-0.060402684563758	0.355555555555556	0.550984987585169
m440	2	80	2	2	0.2688	0.4	0.32	0.2	-0.244094488188977	5	0.025347318677467
m441	4	80	3	2	0.2412	0.3125	0.2805	0.16875	-0.107683679192372	1.03778118522582	0.308338071563197
m442	3	80	3	2	0.3047	0.425	0.375	0.25	-0.127150650440621	1.42222222222222	0.23303798278211
m444	8	79	3	2	0.3416	0.2658	0.4372	0.3227848101	0.397350993377484	12.137821680079	0.000494094542512
m445	3	78	3	2	0.191	0.141	0.2139	0.1217948718	0.346450617283951	9.05719057873617	0.002616637203433
m446	5	80	3	2	0.3374	0.325	0.4297	0.3125	0.249543295579101	4.74869421487603	0.02932053553474
m447	2	80	3	2	0.2528	0.2625	0.2968	0.18125	0.121757543673902	1.06826854381333	0.301336868465724
m448	2	80	3	2	0.3374	0.4	0.4297	0.3125	0.07534746225311	0.381884297520661	0.536596513501969
m450	6	80	3	2	0.3158	0.2625	0.393	0.26875	0.337724550898204	8.82539702858378	0.002970667529229
m451	5	80	3	2	0.3085	0.3375	0.3812	0.25625	0.120774938169827	1.05015152297403	0.305472192347853
m452	1	77	3	2	0.2896	0.2727	0.3512	0.2272727273	0.22972972972973	3.84733564013841	0.04982508046932
m453	7	76	2	2	0.1252	0.1447	0.1343	0.0723684211	-0.071428571428573	0.462552185503747	0.496433615239278
m454	8	80	3	2	0.2159	0.1875	0.2462	0.14375	0.244260204081633	4.54436341306468	0.033027300798198
m455	2	80	3	2	0.2787	0.325	0.3347	0.2125	0.035227806481917	0.067024631203244	0.795719221290637
m456	5	80	3	2	0.3589	0.425	0.4688	0.375	0.099564197116996	0.696888888888889	0.403831051413438
m457	8	80	3	2	0.3258	0.525	0.4097	0.2875	-0.275663206459054	6.33778257204049	0.011819254733482
m459	5	80	3	2	0.3744	0.4	0.4988	0.475	0.204030226700252	3.13616120501756	0.076573838898253
m460	6	79	3	2	0.3744	0.4177	0.4987	0.4746835443	0.168604651162791	2.0837743649296	0.148871666152221
m461	3	79	3	2	0.3363	0.443	0.4279	0.3101265823	-0.029023746701847	0.098924882637172	0.753123651354519
m462	5	80	3	2	0.3672	0.425	0.4847	0.4125	0.129335494327391	1.2132020231119	0.270698895343867
m463	7	79	3	2	0.3363	0.3671	0.4279	0.3101265823	0.148343373493976	1.59538493643809	0.206558460654519
m464	3	78	3	2	0.3432	0.4231	0.4401	0.3269230769	0.045095828635851	0.116551091024645	0.732805637869104
m465	2	79	3	2	0.3617	0.443	0.474	0.3860759494	0.071744304658279	0.337944889088649	0.561017879685063
m466	6	77	3	2	0.3249	0.5195	0.4082	0.2857142857	-0.266666666666667	5.72727272727273	0.016703403847161
m467	9	80	3	2	0.2091	0.225	0.2372	0.1375	0.057654075546719	0.211220297145714	0.645812624413293
m468	1	80	3	2	0.2351	0.275	0.2722	0.1625	-0.004043905257077	0.008541589500172	0.926363777636871
m469	4	80	3	2	0.3374	0.325	0.4297	0.3125	0.249543295579101	4.74869421487603	0.02932053553474
m470	1	79	3	2	0.29	0.3544	0.3519	0.2278481013	-0.000916590284143	0.004193748527709	0.948365760456047
m471	7	74	2	2	0.1908	0.2432	0.2137	0.1216216216	-0.131782945736434	1.41869822485207	0.233617787741608
m472	6	79	3	2	0.367	0.4177	0.4843	0.4113924051	0.143712574850299	1.49291997364678	0.221763961582426
m473	1	80	3	2	0.2091	0.175	0.2372	0.1375	0.268034414295169	5.49936554060974	0.019023374546946
m474	3	79	2	2	0.1115	0.1266	0.1186	0.0632911392	-0.061224489795918	0.360664718772827	0.548137299309861
m475	5	79	3	2	0.3645	0.3924	0.4795	0.3987341772	0.187772925764192	2.60590074462123	0.106466650736919
m476	4	80	3	2	0.2351	0.225	0.2722	0.1625	0.179457587997692	2.40440471843731	0.120994142272877
m477	4	80	3	2	0.3258	0.3	0.4097	0.2875	0.273563218390805	5.73454330283973	0.016634393117323

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m478	6	80	3	2	0.3693	0.375	0.4888	0.425	0.238676517828461	4.33330498884754	0.0373737610640949
m479	8	75	3	2	0.3566	0.36	0.4644	0.3666666667	0.231242785686803	3.79283899178132	0.0514727275505584
m480	3	80	3	2	0.3449	0.3875	0.443	0.33125	0.131560283687943	1.25750550190218	0.262123793706038
m481	6	80	3	2	0.2636	0.3125	0.3124	0.19375	0.006039255158531	5.0025009378126E-06	0.998215431229167
m482	5	78	3	2	0.3643	0.3846	0.479	0.3974358974	0.203173508106244	3.02649034387279	0.08191502911337
m483	1	80	3	2	0.3226	0.3875	0.4043	0.28125	0.047822706065319	0.138084902798198	0.71019234954494
m484	2	80	3	2	0.3192	0.375	0.3988	0.275	0.065825778478518	0.283802242509409	0.594219853028098
m485	6	78	3	2	0.3668	0.3846	0.4839	0.4102564103	0.211334926596108	3.2831662039225	0.069993777567494
m486	6	80	3	2	0.362	0.45	0.4747	0.3875	0.058278145695364	0.216385732444988	0.64180771666454
m487	1	77	3	2	0.375	0.5325	0.5	0.5	-0.0584223913043478	0.324675324675325	0.56881140041338
m488	1	79	3	2	0.2309	0.2405	0.2664	0.1582278481	0.103448275862069	0.745502040816326	0.387904058545948
m489	3	75	3	2	0.3026	0.2	0.3716	0.2466666667	0.467114738358137	15.9979920210567	6.34097015808077E-05
m490	6	78	2	2	0.0926	0.1026	0.0973	0.0512820513	-0.047619047619047	0.227903579254931	0.633082668612263
m491	9	80	3	2	0.3711	0.45	0.4922	0.4375	0.091954022988506	0.587755102040816	0.443288522116632
m492	6	76	3	2	0.3697	0.2763	0.4895	0.4276315789	0.440894568690096	14.4170763179928	0.00014646810844
m493	4	80	3	2	0.3672	0.375	0.4847	0.4125	0.232264334305151	4.09713830348424	0.042955861681795
m494	9	79	3	2	0.2432	0.2911	0.2834	0.1708860759	-0.021058622652248	0.059415593576816	0.807422014085649
m495	3	79	3	2	0.3441	0.3291	0.4416	0.3291139241	0.260663507109005	5.12557849768601	0.023575710894324
m497	3	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m499	1	78	3	2	0.1986	0.1795	0.2235	0.1282051282	0.203252032520325	3.02891003460208	0.081792945660886
m500	2	78	3	2	0.37	0.3205	0.4901	0.4294871795	0.351633546648703	9.33605582527271	0.002246885975189
m501	8	80	3	2	0.3554	0.3	0.4622	0.3625	0.356415478615071	9.85118227188757	0.001697226486382
m502	4	77	3	2	0.375	0.3247	0.5	0.5	0.356368563685637	9.46753246753247	0.002091405046196
m503	3	79	3	2	0.3645	0.3924	0.4795	0.3987341772	0.18772925764192	2.60590074462123	0.106466650736919
m505	4	74	3	2	0.3128	0.2027	0.3881	0.2635135135	0.48300283286119	16.8915443034949	3.95774967596463E-05
m506	1	80	2	2	0.1005	0.1125	0.1062	0.05625	-0.0533333333333333	0.284198061488531	0.593962767531613
m507	5	80	3	2	0.3693	0.5	0.4888	0.425	-0.016731016731017	0.042385907993799	0.836885912719039
m508	8	79	2	2	0.1815	0.2278	0.2019	0.1139240506	-0.122302158273381	1.30591836734694	0.253134988995759
m509	5	80	3	2	0.2923	0.0625	0.3555	0.23125	0.82622085349758	54.3463578696789	1.68087765928249E-13
m510	9	80	3	2	0.3693	0.55	0.4888	0.425	-0.119124275595621	1.25640203818656	0.262333236031887
m511	5	78	3	2	0.3161	0.3846	0.3935	0.2692307692	0.029003783102144	0.039685680366329	0.842096403597751
m512	2	80	3	2	0.202	0.2125	0.228	0.13125	0.074431426602343	0.371815893343173	0.542016110762689
m513	4	80	3	2	0.3661	0.3625	0.4824	0.40625	0.254474454930036	4.94348047009458	0.026189250133864
m514	7	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m515	6	79	3	2	0.3529	0.481	0.4576	0.3544303797	-0.044765597462108	0.206450717541919	0.64956363344944
m517	8	80	3	2	0.3318	0.3	0.42	0.3	0.291479820627803	6.53061224489796	0.010603345382122
m518	9	79	3	2	0.3276	0.4557	0.4128	0.2911392405	-0.09773260359656	0.855076482388796	0.355120180999328
m519	1	80	3	2	0.3718	0.3375	0.4937	0.44375	0.321996185632549	8.00606044198461	0.004662105253079
m520	7	79	3	2	0.2944	0.2658	0.3587	0.2341772152	0.264811490125674	5.29443687286805	0.02139364706325
m521	1	77	3	2	0.3281	0.4026	0.4136	0.2922077922	0.033237587197374	0.05492313175617	0.814707956887514
m522	5	80	3	2	0.3158	0.2625	0.393	0.26875	0.337724550898204	8.82539702858378	0.002970667529229
m524	8	80	3	2	0.3374	0.35	0.4297	0.3125	0.191520467836257	2.75147107438017	0.097164993826296

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m525	6	80	3	2	0.3711	0.35	0.4922	0.4375	0.294642857142857	6.67654320987654	0.009768989503858
m526	3	80	3	2	0.3683	0.5625	0.4868	0.41875	-0.149369544131911	1.934737345163632	0.164241074461571
m527	74	74	3	2	0.3721	0.3243	0.4942	0.4459459459	0.349665924276169	8.74061582784745	0.003111994028398
m528	2	79	2	2	0.1115	0.1266	0.1186	0.0632911392	-0.061224489795918	0.360664718772827	0.548137299309861
m529	3	77	2	2	0.2285	0.3117	0.2631	0.1558441558	-0.178229457364341	2.62437869822485	0.105233689231409
m530	6	78	3	2	0.373	0.4744	0.496	0.4551282051	0.050016672224075	0.148132908764052	0.700326040981982
m531	6	80	3	2	0.2738	0.2625	0.3274	0.20625	0.20431654676259	3.14526116655539	0.07614780948855
m532	4	80	3	2	0.3672	0.35	0.4847	0.4125	0.283678756476684	6.17761632124363	0.012937645525261
m533	9	76	3	2	0.3697	0.4079	0.4895	0.4276315789	0.173186344238976	2.11335161093873	0.146019202905724
m534	2	80	3	2	0.3258	0.325	0.4097	0.2875	0.212725182062093	3.41840240504422	0.064473378741751
m535	3	80	2	2	0.1797	0.225	0.1997	0.1125	-0.120567375886524	1.28545923427891	0.25688644530235
m536	9	80	3	2	0.362	0.6	0.4747	0.3875	-0.258128732581288	5.57523508458364	0.018216219421818
m537	4	78	2	2	0.1986	0	0.2235	0.1282051282	1	78	0
m538	4	80	3	2	0.2351	0.3	0.2722	0.1625	-0.095953757225434	0.835283091739044	0.36074930301538
m539	3	78	3	2	0.2678	0.3462	0.3185	0.1987179487	-0.080561330561331	0.58994427471384	0.442440668148554
m540	8	79	3	2	0.3276	0.3038	0.4128	0.2911392405	0.269890795631825	5.50494772578219	0.018962747012943
m541	8	80	3	2	0.3718	0.3375	0.4937	0.44375	0.321996185632549	8.00606044198461	0.004662105253079
m542	5	80	3	2	0.1719	0.1875	0.1899	0.10625	0.019039735099338	0.013008986319413	0.909192653669832
m543	6	80	3	2	0.3589	0.425	0.4688	0.375	0.099564197116996	0.69688888888889	0.403831051413438
m544	3	79	3	2	0.2709	0.2532	0.323	0.2025316456	0.222333000997009	3.6950388951877	0.05457450987576
m545	5	80	3	2	0.3346	0.3625	0.4249	0.30625	0.153049907578558	1.72641590339171	0.188869267750165
m546	2	79	3	2	0.3549	0.3924	0.4612	0.3607594937	0.155431365700314	1.75881823666857	0.184771986530216
m547	3	78	3	2	0.374	0.3462	0.4979	0.4679487179	0.310676392572944	7.24813858640026	0.007097454763614
m548	9	78	3	2	0.3746	0.7308	0.4993	0.4807692308	-0.458624127617149	16.7716477366255	4.21585262870838E-05
m549	5	78	3	2	0.374	0.4487	0.4979	0.4679487179	0.105245683930943	0.7623335848014413	0.382598512141898
m550	1	78	2	2	0.2392	0.3333	0.2778	0.1666666667	-0.193798449612404	3.12	0.077336783606101
m552	-	77	3	2	0.3342	0.3247	0.4241	0.3051948052	0.240607513988809	4.23209164930498	0.039666528623255
m553	6	80	3	2	0.3605	0.2875	0.4718	0.38125	0.39594414893617	12.2071929598417	0.000476056094947
m554	5	80	3	2	0.3425	0.375	0.4388	0.325	0.151450053705693	1.68894732997297	0.193739792382872
m555	4	77	3	2	0.3473	0.3117	0.4473	0.3376623377	0.309090909090909	7.07710734833439	0.007807494500777
m556	3	75	3	2	0.3714	0.4533	0.4928	0.44	0.086751361161524	0.481039523247316	0.48795183226064
m557	3	80	3	2	0.3648	0.475	0.48	0.4	0.016704880445463	0.008680555555556	0.925768905186137
m558	2	79	3	2	0.1892	0.2152	0.2116	0.1202531646	-0.010670731707317	0.022935875178372	0.879623946130259
m559	5	80	3	2	0.3258	0.275	0.4097	0.2875	0.334354653389506	8.6464760714508	0.003276945444378
m560	4	75	3	2	0.3457	0.3467	0.4444	0.3333333333	0.22637716123844	3.63	0.056746816489379
m561	3	80	3	2	0.3007	0.2625	0.3687	0.24375	0.293742017879949	6.63481695441471	0.010000447116526
m562	3	79	3	2	0.2986	0.4304	0.3653	0.2405063291	-0.171895713654441	2.50501000307787	0.11348476431054
m564	3	80	3	2	0.3374	0.45	0.4297	0.3125	-0.04099560761347	0.178776859504132	0.672426502035245
m565	7	78	3	2	0.2678	0.2949	0.3185	0.1987179487	0.080477673935618	0.427873098855359	0.513034435888622
m566	1	80	2	2	0.2528	0.3625	0.2968	0.18125	-0.215384615384615	3.92051745236292	0.047700196056958
m567	3	79	3	2	0.3066	0.3797	0.3781	0.253164557	0.002132196162047	0.001418414248779	0.969957301066301
m569	8	79	2	2	0.1655	0.2025	0.182	0.1012658228	-0.106382978723405	1.00297560007935	0.316591569394589

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^y	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m570	3	80	2	2	0.2159	0.2875	0.2462	0.14375	-0.161764705882352	2.25478182108796	0.133202227881747
m571	8	79	2	2	0.1815	0.2278	0.2019	0.1139240506	-0.122302158273381	1.30591836734694	0.253134988995759
m572	3	75	3	2	0.1638	0.1467	0.18	0.1	0.191658391261172	2.57201646090535	0.108769004929443
m573	2	78	2	2	0.1833	0.2308	0.2041	0.11153846154	-0.124087591240875	1.32703213610586	0.249333890881223
m574	3	80	3	2	0.3515	0.55	0.455	0.35	-0.202768166089965	3.48750150947953	0.061833841630926
m575	5	79	3	2	0.3585	0.4177	0.468	0.3734177215	0.1113636363636364	0.910306744549779	0.340033043468051
m576	2	79	3	2	0.2039	0.2152	0.2305	0.1329113924	0.0727272727272727	0.348188242565749	0.555140518073229
m577	8	79	3	2	0.3441	0.4557	0.4416	0.3291139241	-0.025566106647188	0.080544151196176	0.7765613444028844
m578	5	79	3	2	0.3549	0.3924	0.4612	0.3607594937	0.155431365700314	1.75881823666857	0.184771986530216
m579	6	78	3	2	0.3709	0.4103	0.4918	0.4358974359	0.172043010752688	2.14355572078126	0.143169714438106
m580	3	78	3	2	0.3613	0.3077	0.4734	0.3846153846	0.355648535564854	9.555	0.001994055129071
m581	7	80	3	2	0.3589	0.45	0.4688	0.375	0.046277665995976	0.128	0.720514787136342
m582	9	76	3	2	0.272	0.3289	0.3247	0.2039473684	-0.006441223832528	0.012969153307097	0.909331183652201
m583	4	79	3	2	0.34	0.3375	0.4343	0.31875	0.228850325379609	3.97410421512758	0.046205023417584
m584	2	79	3	2	0.2432	0.2152	0.2834	0.1708860759	0.246590909090909	4.57315679497543	0.032476666660666
m585	2	79	3	2	0.2039	0.2405	0.2305	0.1329113924	-0.037088873337998	0.149130815769574	0.69936736935516
m586	7	79	3	2	0.2603	0.3038	0.3076	0.1898734177	0.018867924528302	0.01234375	0.911535121640963
m587	6	80	3	2	0.2289	0.2875	0.2637	0.15625	-0.084128878281623	0.653344307270233	0.418919534044428
m588	6	79	3	2	0.3465	0.443	0.4458	0.335443038	0.012658227848101	0.003124876389383	0.95542099771754
m589	1	78	3	2	0.3047	0.1923	0.375	0.25	0.492084432717678	18.5128205128205	1.68765258694581E-05
m590	3	80	2	2	0.1469	0.175	0.1597	0.0875	-0.089655172413793	0.735597673109401	0.391074760219135
m591	5	80	3	2	0.3736	0.475	0.4972	0.4625	0.05090104331331	0.159318542666736	0.689784694268322
m594	9	80	3	2	0.3472	0.45	0.4472	0.3375	-2.14705577898677E-17	0.0031644431786717	0.95514003506635
m595	1	78	3	2	0.3407	0.4615	0.4356	0.3205128205	-0.053191489361702	0.277279031683873	0.598490206936446
m596	3	77	3	2	0.2474	0.3247	0.2892	0.1753246753	-0.116333725029377	1.16069989890323	0.281320434855369
m597	2	79	3	2	0.3567	0.3291	0.4647	0.3670886076	0.29754069688258	6.72313483947682	0.009517020202604
m598	4	80	3	2	0.3047	0.35	0.375	0.25	0.072925398155909	0.355555555555556	0.550984987585169
m599	5	79	3	2	0.3465	0.3671	0.4458	0.335443038	0.182803468208093	2.46492545422109	0.116413225372415
m600	7	80	3	2	0.1948	0.2	0.2188	0.125	0.091954022988506	0.587755102040816	0.443288522116632
m601	1	80	2	2	0.2351	0.325	0.2722	0.1625	-0.18796992481203	3.011806663844954	0.082660113855673
m602	6	77	3	2	0.3576	0.3247	0.4663	0.3701298701	0.309593023255814	7.1006635919369	0.007705541838749
m603	5	79	3	2	0.375	0.7595	0.4999	0.4936708861	-0.514563106796117	21.2984467455621	3.93049847102755E-06
m604	6	80	3	2	0.3661	0.4625	0.4824	0.40625	0.047572499185402	0.13642577324657	0.711860454228987
m607	1	79	3	2	0.3601	0.4304	0.4711	0.3797468354	0.092712966130688	0.589657550094867	0.442551572527477
m608	9	80	3	2	0.2412	0.3125	0.2805	0.16875	-0.107683679192372	1.03778118522582	0.308338071563197
m609	2	80	2	2	0.0905	0.1	0.095	0.05	-0.046357615894039	0.221606648199446	0.63781845047436
m610	8	80	2	2	0.1469	0.175	0.1597	0.0875	-0.089655172413793	0.735597673109401	0.391074760219135
m611	9	73	3	2	0.3259	0.3288	0.4098	0.2876712329	0.204419889502762	2.85617679024272	0.091023608302092
m613	3	78	3	2	0.37	0.4487	0.4901	0.4294871795	0.090755735492578	0.555010186496082	0.456277730153629
m614	8	80	3	2	0.3572	0.3125	0.4655	0.36875	0.334344455679137	8.64593742759897	0.003277914389155
m615	6	79	3	2	0.2491	0.3291	0.2916	0.1772151899	-0.122302158273382	1.30591836734694	0.253134988995759
m616	4	80	3	2	0.3572	0.3625	0.4655	0.36875	0.227318718381113	3.91951929953975	0.047728525751164

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m617	4	79	3	2	0.3617	0.3924	0.474	0.3860759494	0.178389398572885	2.34300017346032	0.125846971627399
m618	3	78	3	2	0.2512	0.2564	0.2945	0.1794871795	0.135802469135803	1.3073580994898	0.252873543455289
m619	3	79	3	2	0.371	0.3671	0.492	0.4367088608	0.259816753926702	5.09144582313462	0.024044137753016
m620	5	78	3	2	0.3161	0.3077	0.3935	0.2692307692	0.224181360201511	3.70840635423144	0.054139058608601
m621	4	79	3	2	0.3681	0.3797	0.4865	0.417721519	0.225422045680233	3.80164898686122	0.051202134175628
m622	7	80	3	2	0.3449	0.2375	0.443	0.33125	0.468860580325549	17.2191769334067	3.33057330177411E-05
m623	8	80	3	2	0.3374	0.375	0.4297	0.3125	0.13345521023766	1.29586776859504	0.254969404998204
m624	7	78	3	2	0.2453	0.2949	0.2862	0.1730769231	-0.023699421965318	0.070886943671031	0.790049742071991
m625	3	80	3	2	0.3672	0.35	0.4847	0.4125	0.283678756476684	6.17761632124363	0.012937645525261
m626	2	79	3	2	0.3363	0.3671	0.4279	0.3101265823	0.148343373493976	1.59538493643809	0.206558460654519
m627	7	76	3	2	0.3715	0.4868	0.493	0.4407894737	0.019088016967126	0.011812527508612	0.913451980998671
m628	9	80	2	2	0.1719	0.2125	0.1899	0.10625	-0.112676056338028	1.13061763411414	0.287643634768911
m629	7	80	2	2	0.1103	0.125	0.1172	0.0625	-0.060402684563758	0.355555555555556	0.550984987585169
m630	7	79	3	2	0.3632	0.5063	0.4768	0.3924050633	-0.055480378890392	0.301993004971673	0.58263567502273
m631	6	80	3	2	0.3449	0.4625	0.443	0.33125	-0.037628682996095	0.154230187516318	0.694525178926802
m633	5	80	3	2	0.3007	0.0625	0.3687	0.24375	0.832414085702164	55.1747735334397	1.10245146345278E-13
m634	6	80	3	2	0.2738	0.3375	0.3274	0.20625	-0.024495677233429	0.075793870596006	0.78308048973313
m635	5	80	3	2	0.3535	0.3625	0.4587	0.35625	0.215679561793906	3.51707745019596	0.060739463765971
m637	8	79	3	2	0.3585	0.4684	0.468	0.3734177215	0.005513439007581	5.78885521387214E-05	0.993929391647237
m638	9	79	3	2	0.1736	0.1646	0.192	0.1075949367	0.149328859060403	1.61763026338896	0.203422530351005
m639	5	78	3	2	0.3628	0.3718	0.4762	0.391025641	0.225459590704128	3.75213817511005	0.052740005546358
m640	3	77	3	2	0.3748	0.5325	0.4997	0.487012987	-0.059143439836846	0.331904559454504	0.564539760757874
m641	6	78	3	2	0.3724	0.359	0.4947	0.4487179487	0.280373831775701	5.87383450513791	0.015367543085572
m642	5	80	3	2	0.3494	0.3375	0.4512	0.34375	0.257828810020877	5.07822567043346	0.02422815190022
m643	8	80	3	2	0.3472	0.375	0.4472	0.3375	0.16754478398314	2.08465734038298	0.148785605301237
m644	9	79	3	2	0.373	0.4304	0.4961	0.4556962025	0.138681390061708	1.38545651970702	0.239173885707845
m645	2	80	3	2	0.34	0.3125	0.4343	0.31875	0.286230574629563	6.29200225056364	0.012128396482303
m646	1	79	3	2	0.3692	0.3671	0.4885	0.4240506329	0.254449571522742	4.87775482200193	0.027204983555751
m647	7	79	3	2	0.3645	0.4177	0.4795	0.3987341772	0.13508064516129	1.31101462930509	0.252211033360694
m648	8	79	3	2	0.367	0.443	0.4843	0.4113924051	0.091514143094842	0.573388447958207	0.448915570431547
m649	1	79	3	2	0.2309	0.0127	0.2664	0.1582278481	0.953068592057762	71.6704149245294	0
m650	2	79	3	2	0.2309	0.2911	0.2664	0.1582278481	-0.086614173228347	0.682277030923173	0.408803737809609
m651	5	79	3	2	0.3567	0.3544	0.4647	0.3670886076	0.243243243243243	4.44639429250892	0.034975019320535
m652	3	75	3	2	0.2259	0.2267	0.2596	0.1533333333	0.133608815426997	1.20989022696382	0.271353863251275
m653	9	77	3	2	0.2941	0.3117	0.3582	0.2337662338	0.136363636363636	1.30016917233234	0.254182324648631
m654	6	80	3	2	0.3288	0.3875	0.4149	0.29375	0.072348484848485	0.34942310380565	0.55443987879259
m656	9	79	3	2	0.3748	0.519	0.4997	0.4873417722	-0.032278889606197	0.117953189355039	0.731265111022153
m657	6	78	3	2	0.3262	0.3205	0.4105	0.2884615385	0.225352112676056	3.74845115385656	0.052856468279833
m658	5	77	3	2	0.3678	0.3377	0.4857	0.4155844156	0.310777816532961	7.15640287422839	0.007469684793541
m659	3	79	3	2	0.3529	0.6329	0.4576	0.3544303797	-0.377605086541858	11.5916518568212	0.000662485400938
m660	2	80	3	2	0.374	0.4125	0.498	0.46875	0.177861873226112	2.3602491349481	0.124462310718846
m661	9	80	3	2	0.3589	0.5	0.4688	0.375	-0.060402684563758	0.355555555555556	0.550984987585169

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m662	7	80	3	2	0.362	0.25	0.4747	0.3875	0.478203434610304	17.9238879395118	2.29917146093994E-05
m663	6	80	3	2	0.2412	0.2625	0.2805	0.16875	0.070588235294117	0.331042030026333	0.565046146324851
m664	7	80	3	2	0.3258	0.375	0.4097	0.2875	0.090909090909091	0.573496221899889	0.448872946104391
m665	9	80	3	2	0.3007	0.3875	0.3687	0.24375	-0.044795221843003	0.20865275214232	0.647825418442647
m666	3	79	3	2	0.2245	0.0759	0.2577	0.1518987342	0.708411214953271	39.2899170193807	3.65322994078099E-10
m667	3	80	2	2	0.2738	0.4125	0.3274	0.20625	-0.253968253968254	5.40145080290161	0.020120019859665
m668	5	80	3	2	0.3288	0.4125	0.4149	0.29375	0.012125805229253	0.002725591535436	0.958363597487706
m669	7	80	3	2	0.3226	0.2875	0.4043	0.28125	0.294642857142857	6.67654320987654	0.009768989503858
m670	7	79	3	2	0.3141	0.2785	0.3903	0.2658227848	0.292371134020618	6.48609594452129	0.010872148785695
m671	5	77	3	2	0.2941	0.3377	0.3582	0.2337662338	0.063950734249171	0.254039565755548	0.614244948805627
m673	9	80	2	2	0.1103	0.125	0.1172	0.0625	-0.060402684563758	0.355555555555556	0.550984987585169
m674	1	78	3	2	0.2875	0.2692	0.348	0.2243589744	0.232558139534884	3.99967761764907	0.045508967640543
m676	2	80	3	2	0.3572	0.4125	0.4655	0.36875	0.120148498143773	1.03868238072879	0.308128113394696
m677	1	80	3	2	0.3085	0.4125	0.3812	0.25625	-0.075938918695832	0.540402184599213	0.462266095908459
m678	8	80	2	2	0.1382	0.1625	0.1493	0.08125	-0.082191780821917	0.625665232079226	0.428949807798235
m680	1	79	3	2	0.3306	0.4177	0.418	0.2974683544	0.006944444444445	2.61232933470572E-05	0.99592195386863
m681	8	80	3	2	0.3318	0.4	0.42	0.3	0.053892215568862	0.18140589569161	0.670167809612976
m682	5	80	3	2	0.3472	0.325	0.4472	0.3375	0.279045279045279	5.97261106154478	0.014529751017654
m683	9	79	3	2	0.3306	0.3165	0.418	0.2974683544	0.24884437596302	4.65949282820069	0.030882312286036
m684	4	72	3	2	0.2755	0.2778	0.3299	0.2083333333	0.164705882352941	1.79501385041551	0.1803164668142
m685	3	79	3	2	0.3736	0.8481	0.4971	0.4620253165	-0.702834799608993	39.3812979706912	3.48620021739521E-10
m686	3	80	3	2	0.3693	0.425	0.4888	0.425	0.136612021857924	1.36105860113421	0.24335410102664
m688	7	76	3	2	0.3234	0.4342	0.4057	0.2828947368	-0.063601203266008	0.374468663898788	0.540578482517601
m689	8	80	3	2	0.3718	0.3875	0.4937	0.44375	0.221055979643766	3.70025956328664	0.05440400406518
m690	1	80	3	2	0.362	0.45	0.4747	0.3875	0.058278145695364	0.216385732444988	0.64180771666454
m692	7	80	3	2	0.362	0.475	0.4747	0.3875	0.00563100364359	3.46716443590779E-05	0.995301872794066
m693	6	80	3	2	0.3494	0.4625	0.4512	0.34375	-0.018821889159986	0.050433837446825	0.822310076633922
m694	3	79	3	2	0.3724	0.443	0.4949	0.4493670886	0.111038749592966	0.866723256402795	0.351864049875458
m695	5	80	3	2	0.2787	0.225	0.3347	0.2125	0.333333333333334	8.59261351599463	0.003375292459673
m696	5	78	3	2	0.3006	0.359	0.3685	0.2435897436	0.032315978456014	0.052201066175622	0.819276580081536
m697	8	75	3	2	0.3734	0.3867	0.4968	0.46	0.228057553956835	3.68583302432401	0.054876552890694
m698	1	80	3	2	0.3635	0.4125	0.4774	0.39375	0.142152023692004	1.47933818370938	0.223878098309781
m699	4	79	3	2	0.3141	0.4557	0.3903	0.2658227848	-0.161290322580645	2.21611783833629	0.13657610531114
m700	1	78	3	2	0.2964	0.2436	0.3619	0.2371794872	0.33257299270073	8.33141599354476	0.003896527414141
m701	8	80	3	2	0.3554	0.475	0.4622	0.3625	-0.021435862538278	0.061478229584249	0.80417461119101
m702	3	80	3	2	0.3554	0.4	0.4622	0.3625	0.140720598232495	1.448304025059058	0.228800252057945
m703	4	80	3	2	0.2583	0.275	0.3047	0.1875	0.10366168127901	0.759500328731098	0.383484938731565
m704	5	80	3	2	0.3425	0.425	0.4388	0.325	0.037620924399857	0.078570790821503	0.779243654902169
m705	7	80	3	2	0.1469	0.075	0.1597	0.0875	0.534838076545633	22.5002202044263	2.10119507260131E-06
m706	5	80	3	2	0.3702	0.3625	0.4905	0.43125	0.26688	5.45088385051824	0.019558429230193
m707	3	79	3	2	0.3509	0.3924	0.4539	0.3481012658	0.141640042598509	1.44816481250521	0.22882262265112
m708	5	80	3	2	0.3605	0.3875	0.4718	0.38125	0.184753661784288	2.55389370208619	0.110022805832663

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m709	3	79	3	2	0.3509	0.6709	0.4539	0.3481012658	-0.473271560940841	18.0653039482304	2.13455923380179E-05
m710	6	80	3	2	0.3718	0.3875	0.4937	0.44375	0.221055979643766	3.70025956328664	0.05440400406518
m711	5	80	3	2	0.3648	0.375	0.48	0.4	0.224730127576055	3.828125	0.05039928287148
m714	5	80	3	2	0.3047	0.35	0.375	0.25	0.072925398155909	0.355555555555556	0.550984987585169
m715	7	79	3	2	0.1571	0.1646	0.1718	0.0949367089	0.048780487804878	0.1421854912764	0.706117932775276
m716	5	80	3	2	0.3725	0.3	0.495	0.45	0.399239543726236	12.415059687787	0.000425885400683
m717	9	80	3	2	0.3122	0.425	0.3872	0.2625	-0.091426249492076	0.762988715547504	0.382394827159398
m718	9	79	3	2	0.2709	0.3797	0.323	0.2025316456	-0.169415292353823	2.43586132369615	0.118588740868795
m719	2	80	3	2	0.1469	0.05	0.1597	0.0875	0.690196078431372	37.7452598603712	8.06123612306919E-10
m720	6	78	3	2	0.3124	0.3974	0.3875	0.2628205128	-0.019214346712212	0.05136909909373	0.820697836736981
m721	4	80	3	2	0.375	0.3625	0.4999	0.49375	0.280690737833595	6.04501587300192	0.013945607655138
m722	1	79	3	2	0.3736	0.3418	0.4971	0.4620253165	0.318225963094853	7.71434642723337	0.005478368995634
m723	5	80	3	2	0.3683	0.3875	0.4868	0.41875	0.21	3.32863047944358	0.068083544034617
m724	2	78	2	2	0.2198	0.2949	0.2514	0.1474358974	-0.166666666666666	2.33263610153203	0.126687177151011
m725	6	80	3	2	0.3672	0.375	0.4847	0.4125	0.232264334305151	4.09713830348424	0.042955861681795
m726	6	80	3	2	0.2159	0.2375	0.2462	0.14375	0.041507024265646	0.099274826839615	0.752701611678748
m727	3	79	3	2	0.2039	0.1899	0.2305	0.1329113924	0.182389937106919	2.45337133201621	0.117272750861839
m728	5	73	3	2	0.3693	0.3836	0.4886	0.4246575342	0.221621621621622	3.37611284541565	0.066147892900435
m729	6	79	3	2	0.3509	0.4684	0.4539	0.3481012658	-0.025586353944563	0.080646293611615	0.776423476962828
m730	1	80	3	2	0.362	0.275	0.4747	0.3875	0.425834159233564	14.1571604963419	0.000168155881262
m731	4	80	3	2	0.2528	0.3125	0.2968	0.18125	-0.046634870164282	0.223946105710339	0.636049494079577
m733	4	80	2	2	0.1469	0.175	0.1597	0.0875	-0.089655172413793	0.735597673109401	0.391074760219135
m734	7	80	3	2	0.3226	0.2875	0.4043	0.28125	0.294642857142857	6.67654320987654	0.009768989503858
m735	2	79	3	2	0.3211	0.2785	0.4019	0.2784810127	0.312775330396476	7.44652200677131	0.00635591484029
m736	6	80	3	2	0.2834	0.2875	0.3418	0.21875	0.164981617647059	2.01884734693878	0.155357033089379
m737	6	76	3	2	0.3715	0.25	0.493	0.4407894737	0.497885835095137	18.4633694821868	1.73201476580953E-05
m738	9	80	3	2	0.362	0.575	0.4747	0.3875	-0.20530679933665	3.57260090640346	0.058740240086501
m739	7	79	3	2	0.3441	0.3797	0.4416	0.3291139241	0.146296971908063	1.54968444623263	0.213182031198616
m740	6	80	3	2	0.3672	0.425	0.4847	0.4125	0.129335494327391	1.2132020231119	0.270698895343867
m741	7	80	3	2	0.34	0.3125	0.4343	0.31875	0.286230574629563	6.29200225056364	0.012128396482303
m742	2	80	3	2	0.2923	0.3625	0.3555	0.23125	-0.013268465280849	0.030595413652474	0.861146072323357
m743	1	76	2	2	0.2611	0.3816	0.3088	0.1907894737	-0.229508196721312	4.22473395465662	0.039838864367805
m744	6	79	3	2	0.3692	0.443	0.4885	0.4240506329	0.099307159353349	0.683220390145009	0.408479995274086
m745	3	79	3	2	0.3717	0.4051	0.4935	0.4430379747	0.185378590078329	2.53748692865576	0.111171603569147
m747	3	80	3	2	0.2834	0.2875	0.3418	0.21875	0.164981617647059	2.01884734693878	0.155357033089379
m748	3	80	2	2	0.2091	0.275	0.2372	0.1375	-0.153284671532847	2.0331830539803	0.153897665447181
m750	3	79	3	2	0.3509	0.4177	0.4539	0.3481012658	0.0859375	0.500703176548213	0.47919131537513
m751	3	79	3	2	0.3244	0.3671	0.4074	0.2848101266	0.105221518987341	0.773002942117725	0.379289668356297
m753	4	79	3	2	0.3701	0.3797	0.4903	0.4303797468	0.231527093596059	4.01682045367166	0.045048565419175
m754	4	80	3	2	0.3661	0.3875	0.4824	0.40625	0.202799479166667	3.09719549574653	0.078427293499158
m755	5	79	3	2	0.3335	0.3797	0.423	0.3037974684	0.108571428571429	0.826317148760331	0.363339630233028
m756	4	79	3	2	0.3658	0.3291	0.482	0.4050632911	0.322871452420701	7.94635891169647	0.004818422267332

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m757	8	79	3	2	0.3681	0.4304	0.4865	0.417721519	0.121563431599868	1.049923086927	0.305523598591423
m758	1	80	3	2	0.3425	0.45	0.4388	0.335	-0.019354838709678	0.052596975673899	0.818604429002021
m759	7	80	3	2	0.362	0.5	0.4747	0.3875	-0.047051027170312	0.227480658639892	0.633398207042676
m760	3	79	3	2	0.3658	0.3291	0.482	0.4050632911	0.322871452420701	7.94635891169647	0.004818422267332
m761	5	73	3	2	0.3746	0.2466	0.4992	0.4794520548	0.511127876273104	18.6917389338007	1.53646715259637E-05
m762	9	78	3	2	0.3628	0.4744	0.4762	0.391025641	0.010420284821119	0.001228693028488	0.972037703912336
m763	3	80	3	2	0.3648	0.375	0.48	0.4	0.224730127576055	3.828125	0.05039928287148
m764	4	76	3	2	0.3637	0.3158	0.4778	0.3947368421	0.344978165938865	8.74071833648393	0.003111819089457
m765	3	79	2	2	0.2432	0.3418	0.2834	0.1708860759	-0.2	3.35592331449216	0.066963648307955
m766	1	75	3	2	0.2793	0.24	0.3356	0.2133333333	0.291112293773284	6.09006369398161	0.013594418602808
m768	3	80	3	2	0.3158	0.3875	0.393	0.26875	0.0204	0.015933018110217	0.899552983803291
m770	5	80	3	2	0.2834	0.3875	0.3418	0.21875	-0.12753228360958	1.43036081632653	0.23170556210697
m771	3	74	3	2	0.3694	0.3108	0.489	0.4256756757	0.370217554388597	9.8226192089036	0.001723786873411
m772	7	79	3	2	0.3632	0.481	0.4768	0.3924050633	-0.00236726411904	0.006029869782634	0.93810468931276
m773	9	80	3	2	0.3007	0.4125	0.3687	0.24375	-0.112676056338028	1.13061763411414	0.287643634768911
m774	2	80	3	2	0.3718	0.4125	0.4937	0.44375	0.170537702831689	2.16283989278073	0.14138317557339
m775	9	76	3	2	0.2098	0.25	0.2381	0.1381578947	-0.043191800878477	0.18848359031665	0.664181720101857
m776	8	78	3	2	0.1587	0.1667	0.1738	0.0961538462	0.047573739295909	0.131981288667572	0.716386551461653
m777	2	80	3	2	0.34	0.3875	0.4343	0.31875	0.113965267727931	0.928860048486075	0.335159316051195
m778	5	79	3	2	0.3441	0.4051	0.4416	0.3291139241	0.089051094890511	0.540677576934663	0.462152052206738
m779	3	80	3	2	0.2688	0.275	0.32	0.2	0.146784486990672	1.58203125	0.20846835080068
m780	9	79	3	2	0.3549	0.4684	0.4612	0.3607594937	-0.009090909090909	0.01888055018716	0.890709482179137
m781	3	80	3	2	0.3226	0.3625	0.4043	0.28125	0.109599689078896	0.855021120679596	0.355135756880176
m782	6	78	3	2	0.191	0.2179	0.2139	0.1217948718	-0.012374323279195	0.027640024682652	0.867957935387879
m783	1	80	3	2	0.2834	0.2125	0.3418	0.21875	0.383662230380909	11.4480065306122	0.00071570738707
m784	9	79	3	2	0.3549	0.3418	0.4612	0.3607594937	0.264921465968587	5.2989511918472	0.021338269032634
m785	5	80	3	2	0.3683	0.3875	0.4868	0.41875	0.21	3.32863047944358	0.068083544034617
m786	4	80	2	2	0.1198	0.1375	0.128	0.06875	-0.067567567567568	0.436016395657853	0.509051464982414
m787	5	75	3	2	0.3618	0.3467	0.4743	0.3866666667	0.27532956854991	5.431734095471	0.019774034216986
m788	9	80	3	2	0.3554	0.5	0.4622	0.3625	-0.075561606355058	0.535456727747172	0.464321728959058
m789	2	78	2	2	0.1128	0.1282	0.12	0.0641025641	-0.062068965517241	0.365922311878401	0.54523539099686
m790	1	80	2	2	0.2289	0.3125	0.2637	0.15625	-0.17910447761194	2.74348422496571	0.097651638416429
m791	1	77	3	2	0.2849	0.3377	0.3441	0.2207792208	0.025160335471139	0.026717608612072	0.870160028968301
m792	7	79	3	2	0.1736	0.1899	0.192	0.1075949367	0.017632241813602	0.010023480539661	0.920251174041698
m793	5	79	3	2	0.3645	0.3165	0.4795	0.3987341772	0.345637583892617	9.1332975993311	0.00250989044389
m794	2	77	3	2	0.337	0.3896	0.4291	0.3116883117	0.098457888493476	0.651460706657174	0.419590922473699
m795	5	80	3	2	0.3672	0.425	0.4847	0.4125	0.129335494327391	1.2132020231119	0.270698895343867
m796	6	79	3	2	0.2944	0.2152	0.3587	0.2341772152	0.405381165919283	12.64282234768438	0.000377010143569
m797	3	80	3	2	0.3725	0.525	0.495	0.45	-0.054337464251668	0.293847566574839	0.587765403577513
m798	2	77	3	2	0.3538	0.4026	0.4592	0.3571428571	0.12966383450314	1.16933782267116	0.279537341890836
m799	2	79	3	2	0.2548	0.2911	0.2997	0.1835443038	0.034965034965035	0.064627778860301	0.799325645168829
m801	4	80	3	2	0.3748	0.35	0.4997	0.4875	0.305276381909548	7.17900219845033	0.007376171836097

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m802	8	79	3	2	0.29	0.4051	0.3519	0.2278481013	-0.144954128440367	1.80567085046168	0.179028425864529
m803	8	79	3	2	0.373	0.557	0.4961	0.4556962025	-0.116460637605726	1.190124583325	0.275304453007301
m804	5	79	3	2	0.3066	0.2532	0.3781	0.253164557	0.336170212765957	8.62963228957196	0.003307383276161
m805	1	78	3	2	0.3324	0.2692	0.421	0.3012820513	0.366130929047433	10.138639516689	0.001451932840786
m806	1	80	3	2	0.2636	0.3375	0.3124	0.19375	-0.074018126888218	0.515462699133148	0.472783609319355
m807	9	78	3	2	0.2129	0.2051	0.2423	0.141025641	0.159618008185539	1.83365030036692	0.175696997999558
m808	2	78	3	2	0.1753	0.1923	0.1942	0.108974359	0.016183986371379	0.007389632343315	0.931495853270556
m809	4	78	3	2	0.3124	0.3974	0.3875	0.2628205128	-0.019214346712212	0.051369090909373	0.820697836736981
m815	2	79	3	2	0.2986	0.2025	0.3653	0.2405063291	0.450704225352112	15.6871775931056	7.47290638045683E-05
m816	5	77	3	2	0.3707	0.4026	0.4916	0.4350649351	0.187305967575026	2.52236268977814	0.112242298958962
m817	6	80	3	2	0.3683	0.3875	0.4868	0.41875	0.21	3.32863047944358	0.068083544034617
m818	4	80	3	2	0.2966	0.45	0.3622	0.2375	-0.236521739130435	4.70257526161689	0.030117457660024
m819	2	80	3	2	0.374	0.3875	0.498	0.46875	0.227931904161412	3.94132718185313	0.047113593879851
m820	9	79	3	2	0.3601	0.4557	0.4711	0.3797468354	0.039014373716632	0.084231570179092	0.771642767989363
m821	3	79	3	2	0.3465	0.3924	0.4458	0.335443038	0.126129382002168	1.13487602611948	0.28673765845042
m822	5	80	2	2	0.2289	0.3125	0.2637	0.15625	-0.17910447761194	2.74348422496571	0.097651638416429
m823	3	79	3	2	0.367	0.443	0.4843	0.4113924051	0.091514143094842	0.573388447958207	0.448915570431547
m824	4	77	3	2	0.3144	0.4805	0.3907	0.2662337662	-0.223672758920801	4.06879060768129	0.043682539048695
m825	9	79	3	2	0.1815	0.2025	0.2019	0.1139240506	0.003194888178914	0.00079617031998	0.977489485172038
m826	-	79	3	2	0.2039	0.2405	0.2305	0.1329113924	-0.037088873337998	0.149130815769574	0.699367369395516
m827	2	79	3	2	0.3306	0.3418	0.418	0.2974683544	0.188439306358381	2.62510362515256	0.105185637862945
m828	5	80	3	2	0.3472	0.425	0.4472	0.3375	0.055887521968366	0.196937044899283	0.657204617800687
m829	3	80	3	2	0.3605	0.3125	0.4718	0.38125	0.343199201862321	9.11999036126633	0.002522312943144
m830	6	79	3	2	0.3681	0.4304	0.4865	0.417721519	0.121563431599868	1.0499283086927	0.305523598591423
m831	1	80	3	2	0.3683	0.4125	0.4868	0.41875	0.158760890609874	1.86352626573131	0.172218369730053
m834	4	80	3	2	0.362	0.425	0.4747	0.3875	0.110890433631248	0.876533841041778	0.349152793096358
m835	5	75	3	2	0.1968	0.2267	0.2212	0.1266666667	-0.017799352750809	0.045047546286828	0.831916625046177
m836	1	80	2	2	0.2289	0.3125	0.2637	0.15625	-0.17910447761194	2.74348422496571	0.097651638416429
m837	3	78	2	2	0.1587	0.1923	0.1738	0.0961538462	-0.1	0.882752376641014	0.347448932281627
m838	3	80	3	2	0.3494	0.3375	0.4512	0.34375	0.257828810020877	5.07822567043346	0.02422815190022
m839	6	79	3	2	0.373	0.4557	0.4961	0.4556962025	0.087719298245614	0.523391022174149	0.469398742134131
m840	6	80	3	2	0.3346	0.2875	0.4249	0.30625	0.329025110782866	8.36726547230053	0.003820400544484
m841	6	80	3	2	0.3258	0.125	0.4097	0.2875	0.698127627053879	38.6297019702442	5.12332953839234E-10
m842	2	77	3	2	0.3538	0.3506	0.4592	0.3571428571	0.242524916943521	4.30181818181818	0.038071650330057
m843	3	80	3	2	0.362	0.375	0.4747	0.3875	0.216010585511082	3.52822120162385	0.060332462694725
m844	9	80	2	2	0.1291	0.15	0.1387	0.075	-0.07482993197279	0.525931336742148	0.468322450833321
m845	1	79	3	2	0.3487	0.4051	0.4499	0.3417721519	0.106017191977077	0.78550498778419	0.37546278871749
m846	2	80	3	2	0.3226	0.3125	0.4043	0.28125	0.233009708737864	4.12425027421877	0.042272747701611
m847	4	79	3	2	0.2491	0.3291	0.2916	0.1772151899	-0.122302158273382	1.30591836734694	0.253134988995759
m848	6	75	3	2	0.3674	0.4533	0.485	0.4133333333	0.071929177425304	0.319310011953802	0.572022597805326
m849	4	80	3	2	0.2159	0.1875	0.2462	0.14375	0.244260204081633	4.54436341306468	0.033027300798198
m851	8	80	3	2	0.3605	0.4625	0.4718	0.38125	0.02599133622126	0.031063747725121	0.860098242751596

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m852	2	80	2	2	0.1874	0.2375	0.2093	0.11875	-0.128571428571429	1.45264322720185	0.22810429748034
m853	4	78	3	2	0.1128	0.1026	0.12	0.0641025641	0.151515151515151	1.64460123850629	0.199695327109208
m854	3	80	3	2	0.3589	0.4	0.4688	0.375	0.152815013404826	1.72088888888889	0.189578665656045
m855	8	78	3	2	0.3324	0.3205	0.421	0.3012820513	0.244801883091408	4.44527675973702	0.034997917066268
m856	5	80	3	2	0.3346	0.5375	0.4249	0.30625	-0.259080800593032	5.61538879401932	0.017803430877546
m857	1	80	3	2	0.3288	0.4125	0.4149	0.29375	0.012125805229253	0.002725591535436	0.958363597487706
m858	6	80	2	2	0.1719	0.2125	0.1899	0.10625	-0.112676056338028	1.13061763411414	0.287643634768911
m859	6	76	3	2	0.2434	0.2368	0.2836	0.1710526316	0.171270718232044	2.06496799903393	0.150718092511028
m860	7	80	3	2	0.3346	0.3125	0.4249	0.30625	0.270410048023642	5.59981213357622	0.017962403563457
m861	9	77	3	2	0.3215	0.1169	0.4025	0.2792207792	0.712846347607053	38.7737896345763	4.75875006067383E-10
m862	8	79	2	2	0.1305	0.1519	0.1404	0.0759493671	-0.075862068965518	0.533683617939576	0.465062293843206
m863	5	79	3	2	0.2491	0.2785	0.2916	0.1772151899	0.051409618573797	0.160365897838425	0.688819866824221
m864	8	80	3	2	0.3085	0.3625	0.3812	0.25625	0.055257731958763	0.19196592798858	0.66128540489927
m865	9	80	3	2	0.3515	0.3	0.455	0.35	0.346206896551724	9.28390291027653	0.002311763360504
m866	4	76	3	2	0.344	0.4211	0.4415	0.3289473684	0.052880820836622	0.16274109577086	0.686645289960609
m867	5	80	3	2	0.3425	0.375	0.4388	0.325	0.151450053705693	1.68894732997297	0.193739792382872
m868	2	80	3	2	0.2738	0.3125	0.3274	0.20625	0.051848295727316	0.166158054997469	0.683549084440133
m869	8	80	3	2	0.3258	0.3	0.4097	0.2875	0.273563218390805	5.73454330283973	0.016634393117323
m870	1	80	3	2	0.3725	0.375	0.495	0.45	0.248334919124643	4.70156106519743	0.03013523417231
m871	9	77	3	2	0.3593	0.3896	0.4696	0.3766233766	0.176598049837486	2.23207583977408	0.135172134387522
m872	4	78	3	2	0.3709	0.359	0.4918	0.4358974359	0.276024177300201	5.68845262947182	0.017076906021728
m873	7	80	3	2	0.3572	0.4125	0.4655	0.36875	0.120148498143773	1.03868238072879	0.308128113394696
m874	8	79	3	2	0.3529	0.4557	0.4576	0.3544303797	0.010570824524313	0.001394675517266	0.970209642879327
m875	7	80	3	2	0.3472	0.65	0.4472	0.3375	-0.44851904090268	16.455084357989	4.98163975471977E-05
m876	3	80	3	2	0.3515	0.425	0.455	0.35	0.072193436960276	0.34778408404782	0.555370194594839
m877	7	80	3	2	0.2583	0.275	0.3047	0.1875	0.10366168127901	0.759500328731098	0.383484938731565
m878	-	80	3	2	0.3648	0.375	0.48	0.4	0.224730127576055	3.828125	0.05039928287148
m879	6	80	3	2	0.3648	0.425	0.48	0.4	0.120785597381342	1.05034722222222	0.305427132029569
m880	3	80	3	2	0.3494	0.3125	0.4512	0.34375	0.31304347826087	7.55757950563145	0.005975819998278
m881	9	75	3	2	0.3377	0.3067	0.4303	0.3133333333	0.293482772934828	6.19220546150055	0.012831417757353
m882	4	79	3	2	0.2603	0.3038	0.3076	0.1898734177	0.018867924528302	0.01234375	0.911535121640963
m883	5	80	3	2	0.3683	0.3875	0.4868	0.41875	0.21	3.32863047944358	0.068083544034617
m884	1	80	3	2	0.1874	0.1375	0.2093	0.11875	0.348575712143928	9.41403009959118	0.002153314307491
m885	3	79	3	2	0.3717	0.3544	0.4935	0.4430379747	0.287671232876712	6.27429752066115	0.012250167511468
m886	1	79	3	2	0.2709	0.3038	0.323	0.2025316456	0.065868263473054	0.279903628117914	0.596764389220651
m887	2	80	3	2	0.2091	0.25	0.2372	0.1375	-0.047745358090186	0.233439394807327	0.628985213541061
m888	8	80	2	2	0.1797	0.225	0.1997	0.1125	-0.120567375886524	1.28545923427891	0.25688644530235
m889	7	80	3	2	0.1719	0.1875	0.1899	0.10625	0.019039735099338	0.013008986319413	0.9091926353669833
m890	3	80	3	2	0.3318	0.325	0.42	0.3	0.23214953271028	4.09297052154195	0.043061898229547
m891	5	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m892	5	80	3	2	0.3589	0.4	0.4688	0.375	0.152815013404826	1.72088888888889	0.189578665656045
m893	1	78	3	2	0.3457	0.4359	0.4444	0.3333333333	0.025679196129513	0.028846153846154	0.865134745405453

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m894	6	74	3	2	0.3694	0.3649	0.489	0.4256756757	0.260135135135135	4.76597415436763	0.029027628008686
m895	3	80	3	2	0.3494	0.3875	0.4512	0.34375	0.1472841225262674	1.5933134683814	0.206853369680221
m896	5	74	3	2	0.3645	0.3378	0.4795	0.3986486486	0.301569077688481	6.45611531367224	0.011057111618977
m897	5	77	3	2	0.28	0.2727	0.3367	0.2142857143	0.196374622356496	2.78211870773854	0.095321992551509
m898	3	79	3	2	0.2245	0.1772	0.2577	0.1518987342	0.31792629606496	7.69949846538452	0.005523617140219
m899	5	79	2	2	0.211	0.2785	0.2397	0.1392405063	-0.155555555555556	2.06725778546713	0.150491900444116
m900	9	79	3	2	0.3244	0.0886	0.4074	0.2848101266	0.784954706577393	48.3718898296318	3.52584628160457E-12
m901	2	78	3	2	0.3735	0.4103	0.497	0.4615384615	0.180851063829787	2.37792894935752	0.123060597108825
m902	1	80	3	2	0.3346	0.4375	0.4249	0.30625	-0.023316062176166	0.070097676275283	0.791194616700009
m903	9	80	3	2	0.3425	0.4	0.4388	0.325	0.094555873925501	0.624020908921193	0.429557003874891
m905	8	78	3	2	0.323	0.5385	0.405	0.2820512821	-0.32378223495702	8.47081611570248	0.003608894801346
m906	7	80	3	2	0.3007	0.4625	0.3687	0.24375	-0.248611704399829	5.18174512048407	0.022825387654345
m907	8	80	3	2	0.3725	0.4	0.495	0.45	0.197969543147208	2.94663809815325	0.086056407924687
m908	1	79	2	2	0.2245	0.3038	0.2577	0.1518987342	-0.172932330827067	2.53419469815104	0.111403710752364
m909	3	80	3	2	0.3318	0.425	0.42	0.3	-0.005615874204418	0.011337868480726	0.915201977082605
m910	1	79	3	2	0.2178	0.2152	0.2488	0.1455696203	0.141191709844559	1.43857307703278	0.230370387211247
m911	3	80	3	2	0.3736	0.425	0.4972	0.4625	0.151342812006319	1.6864504572981	0.194069538668735
m912	3	79	2	2	0.2491	0.3544	0.2916	0.1772151899	-0.209302325581396	3.66485207100592	0.0555715762413
m913	4	79	3	2	0.3306	0.3418	0.418	0.2974683544	0.188439306358381	2.62510362515256	0.105185637862945
m914	3	78	3	2	0.3562	0.3974	0.4638	0.3653846154	0.149322879543835	1.59522362040619	0.206581408922314
m915	9	80	3	2	0.3449	0.4375	0.443	0.33125	0.018807665010646	0.012539707025206	0.910838603790238
m916	3	78	3	2	0.3613	0.359	0.4734	0.3846153846	0.247732030704815	4.55541666666667	0.032814778474024
m917	7	80	2	2	0.202	0.2625	0.228	0.13125	-0.144927536231884	1.82599244345531	0.1766601632393844
m918	3	80	3	2	0.34	0.5375	0.4343	0.31875	-0.231689630166788	4.51754278240637	0.033548982339501
m920	5	78	3	2	0.3262	0.3462	0.4105	0.2884615385	0.163043478260869	1.91666910153397	0.166224322029612
m922	9	79	3	2	0.2245	0.2785	0.2577	0.1518987342	-0.074514715090795	0.516347058241133	0.472404096336388
m923	4	80	3	2	0.2225	0.25	0.255	0.15	0.025893958076449	0.030757400999616	0.860782719951011
m924	3	80	2	2	0.2091	0.275	0.2372	0.1375	-0.153284671532847	2.03318630539803	0.153897665447181
m925	9	73	3	2	0.3109	0.2466	0.3851	0.2602739726	0.365638766519824	9.44236688211758	0.002120296861149
m926	3	77	3	2	0.275	0.1818	0.3292	0.2077922078	0.452956298200514	15.4366822174819	8.53160348830428E-05
m927	5	80	2	2	0.1874	0.2375	0.2093	0.11875	-0.128571428571429	1.45264322720185	0.22810429748034
m929	3	80	3	2	0.1469	0.075	0.1597	0.0875	0.534838076545633	22.5002202044263	2.10119507260131E-06
m930	1	79	2	2	0.2178	0.2911	0.2488	0.1455696203	-0.164179104477612	2.29305898491084	0.129953577687792
m931	2	72	3	2	0.3746	0.2917	0.4991	0.4791666667	0.421420256111758	12.439204536862	0.000420414803153
m932	4	80	3	2	0.3047	0.275	0.375	0.25	0.272498953537045	5.68888888888889	0.017072661093788
m933	6	80	3	2	0.1874	0.2125	0.2093	0.11875	-0.009015777610819	0.018737527067213	0.891121626650158
m934	3	79	3	2	0.3066	0.4304	0.3781	0.253164557	-0.131882202304737	1.50743392703246	0.219531064256215
m936	9	76	3	2	0.3532	0.4737	0.4581	0.3552631579	-0.027397260273973	0.087926326993382	0.766830141613881
m938	5	80	3	2	0.3711	0.475	0.4922	0.4375	0.041200894282977	0.097556059460821	0.754782406817825
m939	6	78	3	2	0.3628	0.3974	0.4762	0.391025641	0.17175572519084	2.13611650875729	0.143865680217471
m940	1	79	3	2	0.3335	0.5823	0.423	0.3037974684	-0.371035536874284	11.1993290863177	0.000818269119848
m941	1	78	3	2	0.1671	0.1538	0.1841	0.1025641026	0.170556552962298	2.10520408163265	0.146798756582434

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals	(no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^y	He ^x	MAF ^w	IC ^v	HWEu	
											X ²	p value
m942	8	76	3	2	2	0.3697	0.4079	0.4895	0.4276315789	0.173186344238976	2.11335161093873	0.146019202905724
m943	3	80	2	2	2	0.1469	0.175	0.1597	0.0875	-0.089655172413793	0.735597673109402	0.391074760219135
m944	3	80	3	3	2	0.3554	0.375	0.4622	0.3625	0.194699286442406	2.84683335459105	0.091554106544169
m945	1	77	3	3	2	0.3026	0.3636	0.3717	0.2467532468	0.028310502283105	0.036521618835248	0.848442310002259
m946	5	79	3	3	2	0.3306	0.3418	0.418	0.2974683544	0.188439306358381	2.62510362515256	0.105185637862945
m948	3	79	3	3	2	0.2432	0.1392	0.2834	0.1708860759	0.51332955190017	20.4371013357	6.16234765016266E-06
m950	1	79	3	3	2	0.2039	0.1899	0.2305	0.1329113924	0.182389937106919	2.45337133201621	0.117272750861839
m952	7	76	3	3	2	0.3651	0.4605	0.4805	0.4013157895	0.048223350253807	0.13161188138965	0.716766604567847
m953	2	78	3	3	2	0.1986	0.1538	0.2235	0.1282051282	0.317577548005908	7.58138408304498	0.005897414096253
m954	8	80	2	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m955	1	79	2	2	2	0.2372	0.3291	0.275	0.164556962	-0.190839694656488	3.06496786042241	0.079996744454449
m956	7	80	2	2	2	0.3746	0.9625	0.4993	0.48125	-0.926829268292683	68.8517927130208	1.11022302462516E-16
m957	3	79	3	3	2	0.3585	0.4177	0.468	0.3734177215	0.113636363636364	0.910306744549778	0.340033043468051
m958	5	80	3	3	2	0.375	0.4375	0.4999	0.49375	0.131049654305468	1.24726669351588	0.264075166812376
m959	4	78	3	3	2	0.3294	0.3333	0.4158	0.2948717949	0.204608661104489	3.07086690934087	0.079706956220706
m960	1	80	3	3	2	0.3122	0.45	0.3872	0.2625	-0.15609756097561	2.10542361155896	0.146777690572657
m961	2	79	3	3	2	0.1396	0.0886	0.151	0.082278481	0.4185303514377	13.4920921135025	0.000239570938548
m962	5	79	3	3	2	0.373	0.3797	0.4961	0.4556962025	0.240506329113924	4.3440861426597	0.037137692792144
m963	5	79	3	3	2	0.3416	0.2658	0.4372	0.3227848101	0.397350993377484	12.137821680079	0.000494094542512
m964	8	79	3	3	2	0.3692	0.4177	0.4885	0.4240506329	0.151055408970976	1.65697558165838	0.19801216997814
m965	8	80	2	2	2	0.2159	0.2875	0.2462	0.14375	-0.161764705882352	2.25478182108796	0.133202227881747
m966	4	80	3	3	2	0.3605	0.4125	0.4718	0.38125	0.131868131868132	1.26369852787482	0.260952169068773
m967	4	80	3	3	2	0.3648	0.375	0.48	0.4	0.224730127576055	3.828125	0.05039928287148
m968	4	78	3	3	2	0.3668	0.3846	0.4839	0.4102564103	0.211334926596108	3.2831662039225	0.069993777567494
m969	4	77	3	3	2	0.3593	0.3636	0.4696	0.3766233766	0.231768953068592	3.9180642257894	0.047769855634165
m970	4	80	3	3	2	0.3683	0.3875	0.4868	0.41875	0.21	3.32863047944358	0.068083544034617
m971	4	80	3	3	2	0.3047	0.35	0.375	0.25	0.072925398155909	0.355555555555556	0.550984987585169
m972	3	76	3	3	2	0.272	0.2237	0.3247	0.2039473684	0.317086234600964	7.35632954112796	0.006682707433499
m973	2	80	2	2	2	0.2738	0.4125	0.3274	0.20625	-0.253968253968254	5.40145080290161	0.020120019859665
m974	6	79	2	2	2	0.1115	0.1266	0.1186	0.0632911392	-0.061224489795918	0.360664718772827	0.548137299309861
m975	7	80	3	3	2	0.3554	0.375	0.4622	0.3625	0.194699286442406	2.84683335459105	0.091554106544169
m978	8	79	3	3	2	0.1815	0.2025	0.2019	0.1139240506	0.003194888178914	0.00079617031998	0.977489485172038
m979	2	80	3	3	2	0.1103	0.05	0.1172	0.0625	0.577540106951871	26.2968888888889	2.92759898212758E-07
m980	9	79	3	3	2	0.3529	0.4557	0.4576	0.3544303797	0.010570824524313	0.001394675517266	0.970209642879327
m981	6	79	3	3	2	0.3585	0.2911	0.468	0.3734177215	0.383293227913372	11.2786558518541	0.000784033032482
m982	8	79	3	3	2	0.2178	0.2658	0.2488	0.1455696203	-0.062256809338522	0.371760367803216	0.542046277082407
m983	9	79	2	2	2	0.1892	0.2405	0.2116	0.1202531646	-0.130434782608696	1.47606231561513	0.224391627278254
m984	6	79	2	2	2	0.1017	0.1139	0.1074	0.0569620253	-0.054054054054055	0.288230259898203	0.591356859603502
m985	3	80	3	3	2	0.3693	0.5	0.4888	0.425	-0.016731016731017	0.042385907993799	0.836885912719039
m987	3	77	3	3	2	0.3517	0.6494	0.4554	0.3506493506	-0.420560747663551	13.968792866941	0.000185870299377
m988	4	80	3	3	2	0.3374	0.4	0.4297	0.3125	0.075347476225311	0.381884297520661	0.536596513501969
m989	3	78	3	3	2	0.2129	0.1795	0.2423	0.141025641	0.265167007498296	5.23873416929169	0.022089340874672

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m990	2	80	3	2	0.202	0.2375	0.228	0.13125	-0.035172413793104	0.137465127002788	0.710814137465998
m991	8	80	3	2	0.3693	0.425	0.4888	0.425	0.136612021857924	1.36105860113422	0.24335410102664
m992	6	78	3	2	0.1411	0.141	0.1528	0.0833333333333333	0.0833333333333333	0.461538461538462	0.496905847565428
m993	9	76	3	2	0.2554	0.1842	0.3006	0.1842105263	0.392712550607288	11.3881373569199	0.000739146088729
m994	1	78	3	2	0.2265	0.2051	0.2604	0.1538461538	0.218274111675127	3.50964187327824	0.06101264290209
m995	8	80	3	2	0.3718	0.3125	0.4937	0.44375	0.372418176040674	10.7744416501767	0.00102911255274
m996	2	79	3	2	0.3306	0.3418	0.418	0.2974683544	0.188439306358381	2.62510362515256	0.105185637862945
m997	2	80	3	2	0.3736	0.55	0.4972	0.4625	-0.1	0.902657587205846	0.342070112478456
m998	9	80	2	2	0.2688	0.4	0.32	0.2	-0.244044488188977	5	0.025347318677467
m999	3	80	2	2	0.1555	0.1875	0.1699	0.09375	-0.0972222222222222	0.856123662306778	0.354825735577312
m1000	2	79	3	2	0.3465	0.4177	0.4458	0.335443038	0.06941431670282	0.314275833508911	0.575068139102606
m1001	3	79	3	2	0.371	0.443	0.492	0.4367088608	0.105797576154602	0.782044231630875	0.376516669374142
m1002	4	78	3	2	0.3668	0.4359	0.4839	0.4102564103	0.105568841817561	0.767334445888469	0.381042928048031
m1003	9	80	3	2	0.3258	0.3	0.4097	0.2875	0.273563218390805	5.73454330283973	0.016634393117323
m1004	9	77	3	2	0.2285	0.1558	0.2631	0.1558441558	0.413127413127413	12.7984023668639	0.00034691548255
m1005	9	79	3	2	0.3416	0.4684	0.4372	0.3227848101	-0.064944649446494	0.401437913198056	0.526347591486343
m1006	4	77	3	2	0.3517	0.3117	0.4554	0.3506493506	0.321428571428571	7.6672987654321	0.005623057468054
m1007	6	80	3	2	0.3535	0.4625	0.4587	0.35625	-0.002056907781968	0.005572601484346	0.940493302824503
m1008	6	76	3	2	0.3552	0.6974	0.4618	0.3618421053	-0.505111700113594	19.7697796289644	8.73529694667141E-06
m1009	6	76	3	2	0.3734	0.3158	0.4969	0.4605263158	0.370188943317005	10.095159101181	0.001486593255952
m1010	2	80	3	2	0.3535	0.4625	0.4587	0.35625	-0.002056907781968	0.005572601484346	0.940493302824503
m1011	5	78	3	2	0.3743	0.641	0.4987	0.4743589744	-0.279494848786972	6.35476117949549	0.011706670083812
m1012	9	80	3	2	0.3472	0.475	0.4472	0.3375	-0.055926837847344	0.309450175093675	0.578017775973423
m1013	5	80	3	2	0.3494	0.4125	0.4512	0.34375	0.091954022988506	0.587755102040816	0.443288522116632
m1015	-	80	2	2	0.1198	0.1375	0.128	0.06875	-0.067567567567568	0.436016395657853	0.509051464982414
m1016	9	80	3	2	0.3318	0.4	0.42	0.3	0.053892215568862	0.18140589569161	0.670167809612976
m1017	2	80	3	2	0.3122	0.3	0.3872	0.2625	0.231143552311435	4.05654016849486	0.044000563677273
m1019	4	79	3	2	0.3692	0.3418	0.4885	0.4240506329	0.306095551894564	7.1247788708321	0.00760257907382
m1021	2	80	3	2	0.2091	0.25	0.2372	0.1375	-0.047745358090186	0.233439394807327	0.628985213541061
m1022	8	75	3	2	0.3705	0.3333	0.4911	0.4333333333333333	0.327272727272727	7.7409348702934	0.005398284608875
m1023	6	80	3	2	0.2966	0.4	0.3622	0.2375	-0.098175499565595	0.8719545464979331	0.350414770209307
m1024	1	79	3	2	0.2854	0.2658	0.3449	0.2215189873	0.235294117647059	4.15255205234979	0.041571823413684
m1025	6	79	3	2	0.3717	0.3544	0.4935	0.4430379747	0.287671232876712	6.27429752066115	0.012250167511468
m1026	4	80	3	2	0.3711	0.4	0.4922	0.4375	0.193363114231015	2.80655076845553	0.093880028131683
m1027	8	76	3	2	0.3715	0.3816	0.493	0.4407894737	0.232262619131663	3.88135377443208	0.048825172954006
m1028	3	77	3	2	0.3707	0.2468	0.4916	0.4350649351	0.502925989672978	19.0983868584268	1.24149778015781E-05
m1029	7	80	3	2	0.3661	0.4375	0.4824	0.40625	0.099348534201954	0.693668147322526	0.404919503207802
m1030	9	80	3	2	0.3449	0.4375	0.443	0.33125	0.018807665010646	0.012539707025206	0.910838603790238
m1031	9	78	3	2	0.3716	0.3205	0.4933	0.4423076923	0.355971896955503	9.57274436245146	0.001974873437827
m1032	5	80	3	2	0.34	0.3625	0.4343	0.31875	0.171428571428571	2.18639014776839	0.139235299380591
m1033	2	78	3	2	0.37	0.3718	0.4901	0.4294871795	0.247387933940007	4.54241251651662	0.033064959926281
m1034	9	79	3	2	0.2944	0.3671	0.3587	0.2341772152	-0.017086330935252	0.043454174162644	0.834872428817935

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Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1035	2	80	3	2	0.3425	0.325	0.4388	0.325	0.265116279069767	5.37722908093278	0.020401255855335
m1036	6	75	3	2	0.3705	0.4133	0.4911	0.4333333333	0.164907171459774	1.881103990499979	0.170208725060562
m1037	6	80	3	2	0.34	0.4875	0.4343	0.31875	-0.116304347826087	1.20057933212547	0.273205919214084
m1038	1	80	3	2	0.3318	0.425	0.42	0.3	-0.005615874204418	0.011337868480726	0.915201977082604
m1039	4	80	3	2	0.3635	0.3875	0.4774	0.39375	0.194407894736842	2.83802401976997	0.092057356302689
m1040	1	80	3	2	0.2091	0.225	0.2372	0.1375	0.057654075546719	0.211220297145714	0.645812624413293
m1041	1	72	3	2	0.3403	0.1944	0.4348	0.3194444444	0.557632398753894	22.0019289379268	2.72376586607503E-06
m1042	7	80	3	2	0.1874	0.2125	0.2093	0.11875	-0.009015777610819	0.018737527067213	0.891121626650158
m1043	3	77	3	2	0.3625	0.3896	0.4756	0.3896103896	0.18716577540107	2.51844726120416	0.112521331836714
m1044	8	80	3	2	0.3572	0.4625	0.4655	0.36875	0.012833502195204	0.003426671166097	0.953320273533219
m1045	6	73	3	2	0.2935	0.1644	0.3573	0.2328767123	0.544783983140148	21.2801753054163	3.96814184600025E-06
m1046	4	80	3	2	0.3374	0.375	0.4297	0.3125	0.13345521023766	1.29586776859504	0.254969404998204
m1047	8	78	3	2	0.2875	0.2436	0.348	0.2243589744	0.305977229601518	7.02552647095311	0.008035584287092
m1048	6	80	3	2	0.3648	0.4	0.48	0.4	0.172774869109948	2.22222222222222	0.136037128119059
m1049	5	75	3	2	0.3146	0.5067	0.3911	0.2666666667	-0.289316827143512	6.54700413222314	0.010506091433628
m1050	4	79	3	2	0.1396	0.1392	0.151	0.082278481	0.084311632870864	0.480439882078956	0.488223135663933
m1051	3	80	3	2	0.3472	0.35	0.4472	0.3375	0.223314606741573	3.77860502275412	0.051911922619137
m1052	5	80	3	2	0.3085	0.3875	0.3812	0.25625	-0.010313531353135	0.022049481863642	0.881955541188169
m1053	1	80	2	2	0.2412	0.3375	0.2805	0.16875	-0.196969696969697	3.2969642150489	0.069408047734537
m1054	6	80	3	2	0.3693	0.4	0.4888	0.425	0.187660668380463	2.63786866909557	0.10434344123908
m1055	7	80	3	2	0.3661	0.4125	0.4824	0.40625	0.151090849886031	1.68059138815585	0.194845889478845
m1056	5	80	3	2	0.1719	0.1625	0.1899	0.10625	0.150537634408602	1.6677628756899	0.196558446928444
m1057	2	80	3	2	0.3683	0.3375	0.4868	0.41875	0.312379110251451	7.52481554517935	0.006085478539699
m1058	7	80	3	2	0.2471	0.25	0.2888	0.175	0.140369967355822	1.4407526098378	0.230017590688888
m1059	2	79	3	2	0.375	0.3924	0.5	0.5	0.221256038647343	3.65822784810127	0.055792946955536
m1061	4	80	3	2	0.3702	0.3875	0.4905	0.43125	0.21606914212548	3.53019432102919	0.06026072522366
m1062	6	79	3	2	0.3701	0.5316	0.4903	0.4303797468	-0.077986179664363	0.561595540176855	0.453618088636278
m1063	3	79	2	2	0.3335	0.6076	0.423	0.3037974684	-0.431192660550459	15.0426446280992	0.000105109076911
m1064	5	79	3	2	0.3487	0.4304	0.4499	0.3417721519	0.049802938015049	0.149125717323723	0.699372258002238
m1065	2	80	3	2	0.3635	0.3625	0.4774	0.39375	0.246629398224268	4.6354378755474	0.031318151518568
m1066	3	76	3	2	0.3722	0.3421	0.4945	0.4473684211	0.314104818853324	7.21543519368531	0.007227928755284
m1067	7	76	3	2	0.3552	0.3026	0.4618	0.3618421053	0.350527108433735	9.03042527420115	0.002655227021168
m1068	5	78	3	2	0.3724	0.4103	0.4947	0.4487179487	0.177020708082832	2.27450999437092	0.131516686105094
m1069	2	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m1070	1	80	3	2	0.2966	0.25	0.3622	0.2375	0.315424610051993	7.67559430975351	0.005597265571335
m1071	9	73	3	2	0.3627	0.2877	0.476	0.3904109589	0.401425178147268	11.4258332193849	0.0007242993649
m1072	5	80	3	2	0.3374	0.375	0.4297	0.3125	0.13345521023766	1.29586776859504	0.254969404998204
m1073	3	76	3	2	0.3676	0.3553	0.4854	0.4144736842	0.274193548387097	5.46097817993502	0.019445757902095
m1074	4	80	3	2	0.2688	0.325	0.32	0.2	-0.00933660933661	0.01953125	0.888854162768201
m1075	2	80	3	2	0.3494	0.3125	0.4512	0.34375	0.31304347826087	7.55757950563145	0.005975819998278
m1076	2	80	3	2	0.3449	0.4125	0.443	0.33125	0.075203973040085	0.380298145153825	0.537443717303885
m1077	1	79	3	2	0.3211	0.2785	0.4019	0.2784810127	0.312775330396476	7.44652200677131	0.00635591484029

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1078	2	80	3	2	0.3661	0.4125	0.4824	0.40625	0.151090849886031	1.68059138815585	0.194845889478845
m1079	9	80	3	2	0.3572	0.4875	0.4655	0.36875	-0.040878378378378	0.177891769852846	0.673191315355784
m1080	9	79	3	2	0.3066	0.3544	0.3781	0.253164557	0.069053708439898	0.310689457052571	0.577257414837341
m1081	3	76	3	2	0.3739	0.3553	0.4978	0.4671052632	0.292452830188679	6.23324296325685	0.01253739246922
m1082	9	80	2	2	0.1382	0.1625	0.1493	0.08125	-0.082191780821917	0.625665232079226	0.428949807798235
m1083	7	80	3	2	0.3605	0.4875	0.4718	0.38125	-0.027	0.088624141786781	0.765933615436691
m1084	7	79	3	2	0.3416	0.3165	0.4372	0.3227848101	0.282032400589102	6.02484236378646	0.01410589152727
m1086	3	80	3	2	0.1638	0.175	0.18	0.1	0.034061135371179	0.061728395061728	0.803784706253189
m1087	8	80	3	2	0.2471	0.05	0.2888	0.175	0.828819068255688	54.6931279398812	1.40887301824932E-13
m1088	1	79	3	2	0.3617	0.1899	0.474	0.3860759494	0.60352422907489	28.3887538816852	9.92401353316907E-08
m1090	8	80	3	2	0.1291	0.125	0.1387	0.075	0.105322763306908	0.785650515380245	0.375418563009603
m1091	5	80	3	2	0.2834	0.1875	0.3418	0.21875	0.456422018348624	16.3030204081633	5.39778454082818E-05
m1092	2	80	3	2	0.3725	0.45	0.495	0.45	0.097142857142857	0.661157024793388	0.416151766986887
m1093	8	80	3	2	0.3748	0.7	0.4997	0.4875	-0.395583596214511	12.856096348523	0.000336381570628
m1094	1	74	3	2	0.3305	0.3243	0.4178	0.2972972973	0.230228471001757	3.70560907623845	0.054229875684429
m1095	5	80	3	2	0.3648	0.375	0.48	0.4	0.224730127576055	3.828125	0.05039928287148
m1096	3	78	3	2	0.3668	0.3077	0.4839	0.4102564103	0.369713506139154	10.3420959357278	0.001300302796167
m1097	9	79	2	2	0.3632	0.7848	0.4768	0.3924050633	-0.642105263157895	32.9509548611111	9.45133149521382E-09
m1098	3	80	3	2	0.1948	0.2	0.2188	0.125	0.091954022988506	0.587755102040816	0.443288522116632
m1099	5	77	3	2	0.3678	0.3117	0.4857	0.4155844156	0.364016736401674	9.88701388888889	0.001664492606381
m1100	8	78	3	2	0.2392	0.1026	0.2778	0.1666666667	0.634638196915777	31.0338461538462	2.53567902230856E-08
m1101	2	80	3	2	0.3572	0.7125	0.4655	0.36875	-0.525923415791257	22.5108662620765	2.08958224245936E-06
m1102	6	80	3	2	0.2688	0.225	0.32	0.2	0.302599313388916	7.05078125	0.007923068762715
m1105	9	80	3	2	0.3494	0.4125	0.4512	0.34375	0.091954022988506	0.587755102040816	0.443288522116632
m1106	7	80	3	2	0.3554	0.475	0.4622	0.3625	-0.021435862538278	0.061478229584249	0.80417461119101
m1107	2	80	2	2	0.1198	0.1375	0.128	0.06875	-0.067567567567568	0.436016395657853	0.509051464982414
m1108	2	79	3	2	0.3736	0.7722	0.4971	0.4620253165	-0.548828125	24.1819392876089	8.76504019586832E-07
m1109	1	80	3	2	0.2471	0.25	0.2888	0.175	0.140369967355822	1.44075260958378	0.230017590688888
m1110	8	80	3	2	0.1638	0.175	0.18	0.1	0.034061135371179	0.061728395061728	0.803784706253189
m1111	3	77	3	2	0.2078	0.2468	0.2355	0.1363636364	-0.041095890410959	0.174603174603174	0.676052808564367
m1112	5	79	3	2	0.3244	0.3924	0.4074	0.2848101266	0.043134151167392	0.106838649545726	0.743772399316169
m1113	5	79	3	2	0.2709	0.3544	0.323	0.2025316456	-0.090909090909091	0.746720679012346	0.387516473454504
m1114	5	77	2	2	0.2984	0.4805	0.3651	0.2402597403	-0.310344827586207	7.70056249543429	0.005520361942522
m1115	5	80	3	2	0.3648	0.325	0.48	0.4	0.328538738149722	8.34201388888889	0.00387386332758
m1117	5	77	3	2	0.2896	0.0649	0.3512	0.272727273	0.817307692307692	51.1611468116658	8.5087492607272E-13
m1118	2	80	3	2	0.3494	0.4125	0.4512	0.34375	0.091954022988506	0.587755102040816	0.443288522116632
m1119	4	75	3	2	0.3739	0.32	0.4978	0.4666666667	0.362984218077475	9.56632653061225	0.00198178943781
m1121	2	79	2	2	0.1305	0.1519	0.1404	0.0759493671	-0.075862068965518	0.533683617939576	0.465062293843206
m1122	2	79	3	2	0.3276	0.3291	0.4128	0.2911392405	0.208739758095981	3.2439666438409	0.071686882035071
m1123	5	80	3	2	0.3554	0.35	0.4622	0.3625	0.248641304347826	4.71348941525737	0.029926847950967
m1125	9	80	2	2	0.1948	0.25	0.2188	0.125	-0.136690647482014	1.63265306122449	0.201336485288745
m1126	6	78	3	2	0.1833	0.1026	0.2041	0.1153846154	0.502423263327949	19.312042989365	1.11003640230756E-05

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Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1127	2	80	3	2	0.3554	0.375	0.4622	0.3625	0.194699286442406	2.84683335459105	0.091554106544169
m1128	4	80	3	2	0.3318	0.375	0.42	0.3	0.113355780022447	0.918367346938775	0.337904019103655
m1129	2	80	3	2	0.3554	0.425	0.4622	0.3625	0.086705202312139	0.517901968555952	0.471738017151037
m1130	4	80	3	2	0.3748	0.375	0.4997	0.4875	0.255419415645617	4.98125587403947	0.025623375823561
m1131	5	80	3	2	0.3589	0.425	0.4688	0.375	0.099564197116996	0.69688888888889	0.403831051413438
m1132	1	79	3	2	0.3681	0.4051	0.4865	0.417721519	0.173509933774835	2.21182611473039	0.136956468127302
m1133	4	80	3	2	0.3374	0.425	0.4297	0.3125	0.01719721917307	0.009520661157025	0.92270669919804
m1134	3	79	3	2	0.3601	0.481	0.4711	0.3797468354	-0.014720985963711	0.035133046415845	0.851317141810177
m1135	4	80	3	2	0.2787	0.2	0.3347	0.2125	0.407685098406748	12.955840288185	0.000318925010606
m1136	3	76	2	2	0.1442	0.1711	0.1564	0.0855263158	-0.08695652173913	0.66476890430102	0.414881372071191
m1138	5	74	3	2	0.3694	0.2838	0.489	0.425196850393701	0.425196850393701	13.0292349096501	0.000306665809478
m1139	3	80	3	2	0.3693	0.475	0.4888	0.425	0.034416211000322	0.06331722058333	0.80132773812595
m1140	1	80	3	2	0.3258	0.275	0.4097	0.2875	0.334354653389506	8.6464760714508	0.003276945444378
m1141	2	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m1142	7	80	3	2	0.3672	0.45	0.4847	0.4125	0.077821011673152	0.409743760498936	0.522099591051098
m1143	8	79	3	2	0.375	0.3165	0.5	0.5	0.372586872586873	10.6455696202532	0.001103348941306
m1144	3	80	3	2	0.3702	0.3875	0.4905	0.43125	0.21606914212548	3.53019432102919	0.06026072522366
m1145	8	78	3	2	0.3613	0.4615	0.4734	0.3846153846	0.031446540880503	0.04875	0.825252818740486
m1146	8	77	3	2	0.3473	0.3896	0.4473	0.3376623377	0.135381114903299	1.28054810507565	0.257797149309264
m1147	4	80	3	2	0.3648	0.425	0.48	0.4	0.120785597381342	1.05034722222222	0.305427132029569
m1149	9	79	3	2	0.3746	0.4304	0.4993	0.4810126582	0.144240077444337	1.50442002105988	0.219992520016165
m1150	2	79	3	2	0.3465	0.3418	0.4458	0.335443038	0.23943661971831	4.30442411781373	0.038013363399074
m1151	3	79	3	2	0.1892	0.1646	0.2116	0.1202531646	0.228310502283105	3.90271188856125	0.048208231343418
m1152	5	80	3	2	0.362	0.475	0.4747	0.3875	0.00563100364359	3.46716443590779E-05	0.995301872794066
m1153	8	79	3	2	0.3717	0.3291	0.4935	0.4430379747	0.338767525268993	8.76638176758306	0.003068335317442
m1154	5	79	3	2	0.3465	0.3165	0.4458	0.335443038	0.296028880866426	6.65337201689742	0.009896835146069
m1155	4	78	3	2	0.3643	0.2564	0.479	0.3974358974	0.46969696969697	16.8404168172112	4.06581115734994E-05
m1156	2	80	2	2	0.2351	0.325	0.2722	0.1625	-0.18796992481203	3.01180663844954	0.082660113855673
m1157	2	80	3	2	0.2787	0.2	0.3347	0.2125	0.407685098406748	12.955840288185	0.000318925010606
m1158	4	80	3	2	0.2636	0.3125	0.3124	0.19375	0.006039255158531	5.0025009378126E-06	0.998215431229167
m1159	6	80	3	2	0.3494	0.4375	0.4512	0.34375	0.036585365853659	0.07346189164371	0.786361388537604
m1160	8	78	3	2	0.3668	0.7436	0.4839	0.4102564103	-0.532075471698113	22.4663833589319	2.13853630182115E-06
m1161	6	80	3	2	0.3672	0.4	0.4847	0.4125	0.180816591056384	2.44233353744033	0.118100419751307
m1163	8	80	3	2	0.3693	0.425	0.4888	0.425	0.136612021857924	1.36105860113421	0.2435410102664
m1164	7	80	3	2	0.2879	0.2	0.3487	0.225	0.431654676258993	14.5537698642104	0.0001362158333819
m1165	2	80	3	2	0.3318	0.2	0.42	0.3	0.528358208955224	21.9501133786848	2.79830368632439E-06
m1166	1	80	3	2	0.2159	0.1875	0.2462	0.14375	0.24426024081633	4.54436341306468	0.033027300798198
m1168	5	79	3	2	0.3736	0.3924	0.4971	0.4620253165	0.216715257531584	3.50505385106367	0.061181856561804
m1169	3	79	3	2	0.3335	0.3038	0.423	0.3037974684	0.287671232876712	6.27429752066116	0.012250167511468
m1170	8	76	3	2	0.3734	0.5	0.4969	0.4605263158	0.000350754121361	0.002989474195389	0.956396522811103
m1171	3	76	3	2	0.3087	0.25	0.3815	0.2565789474	0.350501367365542	9.02907039458905	0.002657195760166
m1173	6	79	3	2	0.371	0.5443	0.492	0.4367088608	-0.10003279763857	0.893254595282585	0.34459686477929

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1174	8	80	3	2	0.3748	0.425	0.4997	0.4875	0.155611442942471	1.78726463264055	0.181259795718724
m1175	3	79	3	2	0.3416	0.3671	0.4372	0.3327848101	0.1665438446720708	2.0311186305421	0.1541071432050917
m1176	2	80	3	2	0.3748	0.7	0.4997	0.4875	-0.395583596214511	12.856096348523	0.000336381570628
m1177	6	77	2	2	0.1689	0	0.1862	0.1038961039	1	77	0
m1178	7	78	3	2	0.373	0.5	0.496	0.4551282051	-0.001667778519013	0.00514200167622	0.942834486957847
m1180	5	80	3	2	0.362	0.425	0.4747	0.3875	0.110890433631248	0.876533841041778	0.349152793096358
m1181	9	73	3	2	0.2008	0.2329	0.2264	0.1301369863	-0.02170283806344	0.059690662317613	0.806985530897765
m1182	9	79	3	2	0.3509	0.4177	0.4539	0.3481012658	0.0859375	0.500703176548213	0.47919131537513
m1183	9	77	3	2	0.275	0.2857	0.3292	0.2077922078	0.138588356517259	1.34514936341037	0.246127905014353
m1185	5	80	3	2	0.1874	0.1625	0.2093	0.11875	0.229557389347337	3.99943096326188	0.045515628050072
m1186	8	76	3	2	0.2822	0.1447	0.3399	0.2171052632	0.578651685393258	25.060220166498	5.55674492419556E-07
m1187	3	77	3	2	0.318	0.3636	0.3967	0.2727272727	0.089820359281437	0.534722222222222	0.46462827715342
m1188	1	80	3	2	0.2412	0.2625	0.2805	0.16875	0.070588235294117	0.331042030026333	0.565046146324851
m1189	6	78	3	2	0.37	0.4231	0.4901	0.4294871795	0.143001686340641	1.45706927866345	0.227397005396759
m1190	4	76	3	2	0.375	0.2237	0.4999	0.4934210526	0.557137895102466	23.2040195948352	1.4569248506513E-06
m1191	3	78	3	2	0.3523	0.4231	0.4565	0.3525641026	0.079681274900398	0.418711890991079	0.51758048635417
m1192	2	80	3	2	0.3718	0.2875	0.4937	0.44375	0.422808132147395	13.9531433709308	0.000187424003182
m1193	1	80	3	2	0.3425	0.35	0.4388	0.325	0.208303507516106	3.27335005397683	0.070413696825074
m1195	7	80	3	2	0.3635	0.4375	0.4774	0.39375	0.089861751152074	0.55938036736563	0.454510009734629
m1196	4	80	3	2	0.2738	0.3125	0.3274	0.20625	0.051848295727316	0.166158054997469	0.683549084440133
m1197	7	80	3	2	0.3192	0.45	0.3988	0.275	-0.122336227308603	1.32152789379035	0.250318025535922
m1198	4	79	3	2	0.3744	0.3418	0.4987	0.4746835443	0.320425943852856	7.82379120336769	0.005156292086228
m1199	9	77	3	2	0.3593	0.3377	0.4696	0.3766233766	0.286900036088055	6.07527259628088	0.013708714383939
m1201	8	79	2	2	0.3066	0	0.3781	0.253164557	1	79	0
m1202	1	78	3	2	0.368	0.3205	0.4861	0.4166666667	0.346349745331069	9.051805333751962	0.002624355544299
m1203	7	80	3	2	0.3192	0.275	0.3988	0.275	0.316017316017316	7.705112960761	0.005506462715021
m1204	2	78	2	2	0.1833	0.2308	0.2041	0.1153846154	-0.124087591240875	1.32703213610586	0.249333890881223
m1205	6	80	3	2	0.3494	0.4375	0.4512	0.34375	0.036585365853659	0.07346189164371	0.786361388537604
m1206	3	80	3	2	0.3374	0.25	0.4297	0.3125	0.423357664233577	13.9900826446281	0.00018377742878
m1207	3	79	3	2	0.2372	0.1772	0.275	0.164556962	0.361029842012873	9.98279595307567	0.0015800957391
m1209	3	80	3	2	0.2351	0.2	0.2722	0.1625	0.271049596309112	5.62700934961332	0.01768577991285
m1210	1	79	3	2	0.3244	0.2911	0.4074	0.2848101266	0.291189253259581	6.43250306249027	0.011205056111683
m1211	1	80	3	2	0.3605	0.4125	0.4718	0.38125	0.131868131868132	1.26369852787482	0.260952169068773
m1213	4	80	3	2	0.3535	0.6625	0.4587	0.35625	-0.439326228944655	15.798431971832	7.04608783173022E-05
m1214	5	80	3	2	0.3554	0.425	0.4622	0.3625	0.086705202312139	0.517901968555953	0.471738017151036
m1215	6	80	3	2	0.3661	0.4125	0.4824	0.40625	0.151090849886031	1.68059138815585	0.194845889478845
m1216	2	78	3	2	0.3724	0.3846	0.4947	0.4487179487	0.228714524207012	3.86465933047096	0.049313203927191
m1217	3	79	3	2	0.3567	0.0759	0.4647	0.3670886076	0.838453572661374	55.2856841854935	1.04249942012302E-13
m1218	5	80	3	2	0.362	0.35	0.4747	0.3875	0.268518518518518	5.51976045360912	0.018802833367234
m1220	7	80	3	2	0.3554	0.25	0.4622	0.3625	0.4640434192673	16.8613827755812	4.02114392084041E-05
m1221	2	77	3	2	0.3746	0.3636	0.4992	0.4805194805	0.277664630006789	5.68092951059167	0.017150279641466
m1223	3	80	3	2	0.2583	0.225	0.3047	0.1875	0.267387944358578	5.47218934911243	0.01932140663349

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1224	5	80	3	2	0.1948	0.175	0.2188	0.125	0.206030150753769	3.2	0.073638270120299
m1225	2	80	3	2	0.34	0.4125	0.4343	0.31875	0.056460369163952	0.201513917280622	0.653501620696376
m1226	8	73	3	2	0.3642	0.2192	0.4789	0.397260274	0.547169811320755	21.4700818584723	3.59392362736521E-06
m1227	3	80	3	2	0.2225	0.275	0.255	0.15	-0.072177668106107	0.492118415993849	0.482983846414845
m1228	9	79	2	2	0.1967	0.2532	0.2211	0.1265822785	-0.138686131386861	1.65931526990128	0.197695800099989
m1229	5	78	3	2	0.2058	0.141	0.233	0.1346153846	0.40014164305949	12.1520248593264	0.000490345997346
m1230	2	78	3	2	0.368	0.3462	0.4861	0.4166666667	0.293817934782609	6.46568288854003	0.010997737167025
m1231	7	80	3	2	0.3661	0.3875	0.4824	0.40625	0.202799479166667	3.09719549574653	0.078427293499158
m1232	5	77	3	2	0.3144	0.3506	0.3907	0.2662337662	0.108988276161528	0.809381631385389	0.368303134724596
m1233	3	79	3	2	0.0915	0.0506	0.0961	0.0506329114	0.478260869565218	17.6995111111111	2.58693080592565E-05
m1234	8	80	3	2	0.3746	0.3875	0.4993	0.48125	0.229874213836478	4.010803566252598	0.045209542442043
m1235	2	79	3	2	0.1967	0.1519	0.2211	0.1265822785	0.318777292576419	7.74170132325142	0.005395993834843
m1236	6	80	3	2	0.3748	0.325	0.4997	0.4875	0.355102040816327	9.77724899200211	0.001766844709069
m1237	6	80	3	2	0.3346	0.3875	0.4249	0.30625	0.094304733727811	0.620473011931527	0.430871566094062
m1238	6	79	3	2	0.3632	0.4557	0.4768	0.3924050633	0.050709939148073	0.155420785639959	0.693407968455962
m1239	9	80	3	2	0.3158	0.3125	0.393	0.26875	0.210946863763484	3.35968594791798	0.06681080853948
m1240	7	78	3	2	0.3743	0.359	0.4987	0.4743589744	0.286092715231788	6.12211243351009	0.013350117260114
m1241	3	76	2	2	0.2306	0.3158	0.2659	0.1578947368	-0.18110232204724	2.671875	0.102135632909047
m1242	4	80	3	2	0.3702	0.4125	0.4905	0.43125	0.165225744476465	2.02506980130113	0.154721814190976
m1244	5	79	3	2	0.3632	0.4051	0.4768	0.3924050633	0.156756756756757	1.7902647704937	0.180893906617806
m1246	9	79	3	2	0.2039	0.1139	0.2305	0.1329113924	0.510460251046025	20.2056745762933	6.9546327644554E-06
m1247	1	80	3	2	0.2583	0.35	0.3047	0.1875	-0.142561983471075	1.76936226166995	0.183461023874018
m1248	9	80	3	2	0.3515	0.425	0.455	0.35	0.072193436960276	0.34778408404782	0.555370194594839
m1249	3	77	3	2	0.1334	0.1299	0.1437	0.0779220779	0.10271546635183	0.713245828649518	0.398368376801998
m1250	1	79	3	2	0.2039	0.2405	0.2305	0.1329113924	-0.037088873337998	0.149130815769574	0.699367369395516
m1251	6	80	3	2	0.3515	0.4	0.455	0.35	0.12707182320442	1.16894094916073	0.279618953820078
m1252	9	79	3	2	0.3441	0.3797	0.4416	0.3291139241	0.146296971908063	1.54968444623263	0.213182031198617
m1253	1	78	3	2	0.3656	0.5	0.4815	0.4038461538	-0.031958762886598	0.11503040420473	0.734488203579768
m1254	8	78	3	2	0.191	0.2179	0.2139	0.1217948718	-0.012374323279195	0.027640024682652	0.867957935387879
m1256	9	79	3	2	0.2309	0.038	0.2664	0.1582278481	0.859121011438892	58.0815538696365	2.52020626589911E-14
m1257	2	78	3	2	0.3457	0.3846	0.4444	0.3333333333	0.140944589066568	1.41346153846154	0.234482607097188
m1258	6	80	3	2	0.3494	0.4375	0.4512	0.34375	0.036585365853659	0.07346189164371	0.786361388537604
m1259	3	78	3	2	0.2058	0.1923	0.233	0.1346153846	0.180851063829787	2.37792894935752	0.123060597108825
m1260	7	74	3	2	0.2414	0.1486	0.2808	0.1689189189	0.475848563968669	16.3862109590852	5.1659682247629E-05
m1261	5	80	3	2	0.3515	0.4	0.455	0.35	0.12707182320442	1.16894094916073	0.279618953820078
m1263	7	79	3	2	0.3177	0.3165	0.3962	0.2721518987	0.207317073170732	3.19845806398186	0.073707732557335
m1264	1	77	3	2	0.2849	0.2078	0.3441	0.2207792208	0.401574803149606	12.0796155324875	0.000509761085099
m1265	8	79	3	2	0.3509	0.3924	0.4539	0.3481012658	0.141640042598509	1.44816481250521	0.228822652265112
m1267	2	80	3	2	0.1469	0.125	0.1597	0.0875	0.223205506391347	3.77480172027528	0.05203006722319
m1268	9	80	3	2	0.34	0.4625	0.4343	0.31875	-0.058674393335748	0.33737355910032	0.561349190838996
m1269	8	80	3	2	0.2351	0.15	0.2722	0.1625	0.453917050691244	16.1215647453802	5.94037579692008E-05
m1270	7	78	3	2	0.2329	0.2692	0.2691	0.1602564103	0.006146281499693	7.27230347881944E-06	0.997848330656804

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1271	1	74	3	2	0.2538	0.2297	0.2983	0.1824324324	0.236307692307693	3.91032923403461	0.04799019497078
m1272	9	77	3	2	0.3593	0.4675	0.4696	0.3766233766	0.010845986984816	0.001430588585018	0.9698287085368
m1274	7	80	3	2	0.3661	0.3625	0.4824	0.40625	0.254474454930036	4.94348047009458	0.026189250133864
m1275	3	79	3	2	0.3601	0.4051	0.4711	0.3797468354	0.146374829001368	1.55141098616317	0.212927261945388
m1276	1	80	3	2	0.2966	0.2	0.3622	0.2375	0.452813852813853	16.0419748362405	6.19536498571716E-05
m1277	4	80	3	2	0.3718	0.3625	0.4937	0.44375	0.27154213036566	5.6479997463546	0.017475294700172
m1278	2	80	3	2	0.3693	0.3	0.4888	0.425	0.391527599486521	11.9313714588471	0.000551965283257
m1279	3	80	3	2	0.3718	0.3625	0.4937	0.44375	0.27154213036566	5.64799974635461	0.017475294700172
m1280	5	80	3	2	0.2471	0.325	0.2888	0.175	-0.119346049046321	1.26084593617061	0.261491027147532
m1282	7	77	3	2	0.3723	0.4026	0.4946	0.4480519481	0.192320877613987	2.66442925470718	0.102614628613774
m1283	5	80	3	2	0.3648	0.7	0.48	0.4	-0.453350854139291	16.80555555555556	4.14118884265458E-05
m1285	9	79	2	2	0.211	0.2785	0.2397	0.1392405063	-0.155555555555556	2.06725778546713	0.150491900444116
m1286	6	80	3	2	0.3693	0.45	0.4888	0.425	0.085530546623794	0.502874784963468	0.478239682821176
m1287	5	79	3	2	0.3717	0.557	0.4935	0.4430379747	-0.122302158273381	1.30591836734694	0.253134988995759
m1288	3	80	3	2	0.3449	0.3375	0.443	0.33125	0.244153082919915	4.54026697125808	0.033106428241072
m1290	2	80	2	2	0.1291	0.15	0.1387	0.075	-0.07482993197279	0.525931336742147	0.468322450833322
m1291	5	80	3	2	0.3535	0.3375	0.4587	0.35625	0.270020533880903	5.58328017632027	0.018132729725109
m1292	2	73	3	2	0.2302	0.0959	0.2654	0.1575342466	0.642806520198441	29.78333311529667	4.83128088646367E-08
m1293	5	80	3	2	0.3425	0.375	0.4388	0.325	0.151450053705693	1.68894732997297	0.193739792382872
m1294	2	78	3	2	0.37	0.3462	0.4901	0.4294871795	0.299528301886792	6.72569666220243	0.009503360426702
m1295	4	80	3	2	0.3746	0.3875	0.4993	0.48125	0.229874213836478	4.01080566252598	0.045209542442043
m1296	8	75	3	2	0.3253	0.3067	0.409	0.2866666667	0.256443861948449	4.6936147944365	0.030274892923378
m1297	5	78	3	2	0.37	0.3462	0.4901	0.4294871795	0.299528301886792	6.72569666220243	0.009503360426702
m1298	2	80	3	2	0.3711	0.3	0.4922	0.4375	0.395793499043977	12.1977324263039	0.000478476406779
m1299	1	72	3	2	0.317	0.1528	0.395	0.2708333333	0.617531831537708	27.0718608863664	1.96030752075416E-07
m1300	8	80	3	2	0.3158	0.3375	0.393	0.26875	0.147482014388489	1.59779314582327	0.206216234716021
m1302	6	79	3	2	0.3744	0.3671	0.4987	0.4746835443	0.269851517107811	5.50330403703166	0.018980578178759
m1303	7	77	2	2	0.2149	0	0.2449	0.1428571429	1	77	0
m1305	9	80	3	2	0.3258	0.325	0.4097	0.2875	0.212725182062093	3.41840240504422	0.064473378741751
m1306	1	80	3	2	0.202	0.2375	0.228	0.13125	-0.035172413793104	0.137465127002788	0.710814137465998
m1307	1	79	3	2	0.2854	0.2911	0.3449	0.2215189873	0.162073797290986	1.91922468134587	0.165942156190127
m1308	2	78	3	2	0.3597	0.6282	0.4703	0.3782051282	-0.329925978145929	8.788238622803	0.003031788373775
m1309	2	78	3	2	0.2569	0.2949	0.3027	0.1858974359	0.03224043715847	0.051896536611147	0.819795418812389
m1310	7	80	3	2	0.3589	0.475	0.4688	0.375	-0.007044615900704	0.014222222222222	0.905071781978791
m1311	7	79	3	2	0.367	0.4177	0.4843	0.413924051	0.143712574850299	1.49291997364678	0.221763961582426
m1312	1	77	3	2	0.2941	0.3377	0.3582	0.2337662338	0.063950734249171	0.254039565755548	0.614244948805627
m1313	2	78	3	2	0.3613	0.3077	0.4734	0.3846153846	0.355648535564854	9.555	0.001994055129071
m1314	9	78	3	2	0.3643	0.4359	0.479	0.3974358974	0.096306523990335	0.630547909097865	0.427154408176787
m1315	2	79	3	2	0.3601	0.4051	0.4711	0.3797468354	0.146374829001368	1.55141098616317	0.212927261945388
m1316	-	79	3	2	0.3717	0.7595	0.4935	0.4430379747	-0.534426229508196	22.947841119919	1.66457044992185E-06
m1318	7	80	3	2	0.3226	0.3625	0.4043	0.28125	0.10959969078896	0.855021120679596	0.355135756880176
m1319	7	80	3	2	0.3425	0.3	0.4388	0.325	0.321888412017167	8.00058441084082	0.004676225477884

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1320	9	79	3	2	0.3746	0.557	0.4993	0.4810126582	-0.109243697478992	1.05447720243029	0.304478195596211
m1321	8	80	3	2	0.3672	0.375	0.4847	0.4125	0.232264334305151	4.09713830348424	0.042955861681795
m1322	8	80	3	2	0.3711	0.4	0.4922	0.4375	0.193363114231015	2.80655076845553	0.093880028131683
m1324	2	79	3	2	0.3509	0.3671	0.4539	0.3481012658	0.197303051809794	2.88724857812134	0.089283283425632
m1325	6	80	3	2	0.3258	0.325	0.4097	0.2875	0.212725182062093	3.41840240504422	0.064473378741751
m1326	2	80	2	2	0.1103	0.125	0.1172	0.0625	-0.060402684563758	0.355555555555556	0.50984987585169
m1327	9	80	3	2	0.3494	0.4625	0.4512	0.34375	-0.018821889159986	0.050433837446825	0.822310076633922
m1328	9	73	3	2	0.1761	0.137	0.1952	0.1095890411	0.304347826086956	6.48603920118343	0.010872495844073
m1329	5	80	3	2	0.1382	0.0625	0.1493	0.08125	0.585519412381952	27.0393800961193	1.99352446772494E-07
m1330	1	80	3	2	0.3318	0.45	0.42	0.3	-0.065168539325843	0.408163265306123	0.522903234512895
m1331	3	80	3	2	0.2923	0.2875	0.3555	0.23125	0.197438162544169	2.93030364963095	0.086931140806418
m1332	1	80	3	2	0.2351	0.25	0.2722	0.1625	0.087759815242494	0.531582131732928	0.465942456974341
m1333	3	76	3	2	0.2772	0.2368	0.3324	0.2105263158	0.293563579277865	6.281875	0.012197897518726
m1334	2	79	3	2	0.3617	0.3671	0.474	0.3860759494	0.231657608695652	4.02148528704884	0.044924133686654
m1335	4	80	3	2	0.3648	0.425	0.48	0.4	0.120785597381342	1.050347222222222	0.305427132029569
m1336	8	80	3	2	0.2966	0.325	0.3622	0.2375	0.108893709327549	0.843367843362632	0.358435339018072
m1337	3	74	3	2	0.2348	0.0811	0.2717	0.1621621622	0.705050505050505	36.4272892819979	1.58468871358508E-09
m1338	1	80	3	2	0.2471	0.325	0.2888	0.175	-0.119346049046321	1.26084593617061	0.261491027147532
m1339	5	79	3	2	0.1967	0.1519	0.2211	0.1265822785	0.318777292576419	7.74170132325142	0.005395993834843
m1340	7	78	3	2	0.3735	0.3333	0.497	0.4615384615	0.335104616406509	8.46154572940288	0.00362733462626
m1341	3	79	3	2	0.2807	0.2785	0.3378	0.2151898734	0.181688125894135	2.43382487964887	0.11874284973996
m1342	7	80	3	2	0.3648	0.4	0.48	0.4	0.172774869109948	2.222222222222222	0.136037128119059
m1343	7	80	3	2	0.375	0.3875	0.4999	0.49375	0.230841708542714	4.04564111720359	0.04428555427152
m1344	5	79	3	2	0.3306	0.3418	0.418	0.2974683544	0.188439306358381	2.62510362515256	0.105185637862945
m1345	1	79	3	2	0.3105	0.4177	0.3843	0.2594936709	-0.080604534005038	0.596979976149884	0.439732627452087
m1346	3	80	3	2	0.3661	0.4375	0.4824	0.40625	0.099348534201954	0.693668147322526	0.404919503207802
m1347	3	80	3	2	0.202	0.2125	0.228	0.13125	0.074431426602343	0.371815893343173	0.542016110762689
m1348	4	72	3	2	0.3667	0.3472	0.4837	0.4097222222	0.288577154308617	5.73196462457095	0.016658835660984
m1349	7	80	3	2	0.3494	0.4125	0.4512	0.34375	0.091954022988506	0.587755102040816	0.443288522116632
m1351	3	79	3	2	0.3567	0.4557	0.4647	0.3670886076	0.025676613462873	0.029458263971463	0.863725198035728
m1353	5	78	3	2	0.3502	0.3077	0.4527	0.3461538462	0.326039387308534	8.000256311675	0.004677072880073
m1354	8	76	3	2	0.3722	0.4211	0.4945	0.4473684211	0.154929577464789	1.67505433545967	0.195582913283715
m1355	6	79	3	2	0.2432	0.2658	0.2834	0.1708860759	0.068259385665529	0.30286228967347	0.582093561593191
m1356	3	79	2	2	0.0915	0.1013	0.0961	0.0506329114	-0.046979865771811	0.224711111111111	0.635473497265115
m1357	7	79	3	2	0.3105	0.038	0.3843	0.2594936709	0.902377972465582	64.159079646793	1.11022302462516E-15
m1358	3	79	3	2	0.3692	0.3418	0.4885	0.4240506329	0.306095551894564	7.12477839321	0.00760257907382
m1359	2	79	3	2	0.3632	0.3797	0.4768	0.3924050633	0.209726443768997	3.27571783949012	0.070312160436508
m1360	4	80	3	2	0.3748	0.925	0.4997	0.4875	-0.849414742170199	57.957455429656	2.67563748934663E-14
m1361	5	80	3	2	0.3748	0.3	0.4997	0.4875	0.404896421845574	12.7759962546948	0.000351095580636
m1362	3	80	2	2	0.2289	0.3125	0.2637	0.15625	-0.17910447761194	2.74348422496571	0.097651638416429
m1364	7	74	3	2	0.3694	0.3378	0.489	0.4256756757	0.315196998123827	7.06819895714277	0.007846409007445
m1365	8	80	3	2	0.3047	0.375	0.375	0.25	0.006289308176101	0	1

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1366	5	79	3	2	0.374	0.3544	0.498	0.4683544304	0.294117647058824	6.56570083597111	0.010396278805208
m1368	3	80	3	2	0.3746	0.4875	0.4993	0.48125	0.029911838790932	0.04465871745348	0.832632823631512
m1369	4	80	3	2	0.2289	0.2375	0.2637	0.15625	0.105482717520858	0.788192043895748	0.374647372159504
m1370	9	75	3	2	0.3457	0.4533	0.4444	0.3333333333	-0.013290374546919	0.03	0.862490230135928
m1371	3	76	3	2	0.3697	0.3553	0.4895	0.4276315789	0.280383795309169	5.71704972243525	0.016800938231326
m1372	1	80	3	2	0.2834	0.2375	0.3418	0.21875	0.310835629017447	7.44897306122449	0.006347265305297
m1373	6	78	3	2	0.368	0.4231	0.4861	0.4166666667	0.136008160489629	1.31152276295133	0.252119135839436
m1374	4	78	3	2	0.3294	0.4103	0.4158	0.2948717949	0.019888623707239	0.014086769048103	0.905522785256197
m1375	4	76	3	2	0.3637	0.3684	0.4778	0.3947368421	0.235251274581209	3.98501155219492	0.045906785894989
m1376	8	79	3	2	0.3567	0.3797	0.4647	0.3670886076	0.188908145580589	2.63865636147444	0.10429171435886
m1377	6	80	3	2	0.2688	0.325	0.32	0.2	-0.00933660933661	0.01953125	0.888854162768201
m1378	4	80	3	2	0.1719	0.1875	0.1899	0.10625	0.019039735099338	0.013008986319413	0.90919265369832
m1379	2	80	3	2	0.3122	0.3	0.3872	0.2625	0.231143552311435	4.05654016849486	0.044000563677273
m1380	7	80	3	2	0.2159	0.2375	0.2462	0.14375	0.041507024265646	0.099274826839615	0.752701611678748
m1381	5	80	3	2	0.3736	0.3	0.4972	0.4625	0.401892744479495	12.5836997156776	0.000389125664232
m1382	7	78	2	2	0.1225	0.141	0.1311	0.0705128205	-0.069444444444445	0.448894173602854	0.502860561979023
m1383	7	78	3	2	0.348	0.3718	0.4486	0.3397435897	0.177532228360958	2.28818764242334	0.130362065994354
m1384	9	77	3	2	0.3398	0.3247	0.4339	0.31818182	0.2578125	4.87819889860706	0.027197984992743
m1385	1	79	3	2	0.2245	0.2278	0.2577	0.1518987342	0.121951219512195	1.05701436845623	0.303897127336592
m1386	2	80	3	2	0.3731	0.3625	0.4962	0.45625	0.275229357798165	5.80638435395426	0.015968091868847
m1387	4	80	3	2	0.34	0.3375	0.4343	0.31875	0.228850325379609	3.97410421512758	0.046205023417584
m1388	7	79	3	2	0.375	0.4684	0.5	0.5	0.06963249516441	0.316455696202532	0.573745467795903
m1389	1	76	3	2	0.3087	0.2237	0.3815	0.2565789474	0.419134396355353	13.0047146872029	0.000310707680609
m1390	4	79	3	2	0.3748	0.7722	0.4997	0.4873417722	-0.54080310880829	23.4903164302448	1.25544068163563E-06
m1391	9	80	3	2	0.3494	0.4125	0.4512	0.34375	0.091954022988506	0.587755102040816	0.443288522116632
m1392	6	80	3	2	0.3007	0.4375	0.3687	0.24375	-0.180614859094791	2.78831509022805	0.094954018679257
m1395	4	79	3	2	0.3658	0.3038	0.482	0.4050632911	0.375166889185581	10.7964505998189	0.001016948925252
m1397	9	80	2	2	0.2289	0.3125	0.2637	0.15625	-0.17910447761194	2.74348422496571	0.097651638416429
m1399	2	80	2	2	0.1797	0.225	0.1997	0.1125	-0.120567375886524	1.28545923427891	0.25688644530235
m1400	3	80	3	2	0.3748	0.375	0.4997	0.4875	0.255419415645617	4.98125587403947	0.025623375823561
m1401	8	79	3	2	0.3617	0.4684	0.474	0.3860759494	0.018367346938776	0.011374718305496	0.9150648063851
m1402	2	80	3	2	0.3472	0.35	0.4472	0.3375	0.223314606741573	3.77860502275412	0.051911922619137
m1403	3	80	3	2	0.3535	0.5125	0.4587	0.35625	-0.11114922813036	1.1018038105999	0.293870583844045
m1404	6	80	3	2	0.3158	0.2875	0.393	0.26875	0.274361022364217	5.76888724217148	0.016312360354705
m1405	9	80	3	2	0.2289	0.2625	0.2637	0.15625	0.01733452593918	0.00158024691358	0.96829058960458
m1406	4	80	3	2	0.3672	0.375	0.4847	0.4125	0.232264334305151	4.09713830348424	0.042955861681795
m1408	4	80	3	2	0.202	0.2375	0.228	0.13125	-0.035172413793104	0.137465127002788	0.710814137465998
m1409	5	79	3	2	0.3549	0.3671	0.4612	0.3607594937	0.210195530726257	3.29086726450545	0.069666215548397
m1410	7	79	3	2	0.371	0.3671	0.492	0.4367088608	0.259816753926702	5.09144582313462	0.024044137753016
m1411	2	80	3	2	0.2412	0.2875	0.2805	0.16875	-0.018497757847534	0.04914045684964	0.824565749442456
m1412	7	80	3	2	0.3515	0.475	0.455	0.35	-0.037677151745593	0.154570704021254	0.694205144719804
m1413	5	80	3	2	0.34	0.3375	0.4343	0.31875	0.228850325379609	3.97410421512758	0.046205023417584

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1414	5	79	3	2	0.3141	0.2532	0.3903	0.2658227848	0.356966199505359	9.75483780511809	0.001788514215925
m1415	3	77	3	2	0.3748	0.3766	0.4997	0.487012987	0.252374491180461	4.66900780145632	0.030711665439293
m1416	9	79	3	2	0.1967	0.1772	0.2211	0.1265822785	0.204661325564457	3.11436883007771	0.0776045399287
m1417	3	80	3	2	0.3554	0.4	0.4622	0.3625	0.140720598232495	1.44830420569058	0.228800252057945
m1418	9	79	3	2	0.3724	0.4684	0.4949	0.4493670886	0.059934853420195	0.226844302666084	0.633873667395688
m1419	2	80	3	2	0.362	0.4	0.4747	0.3875	0.163467902051621	1.98047899743473	0.1593399544886
m1420	5	79	3	2	0.1655	0.1772	0.182	0.1012658228	0.032772364924712	0.055095095219203	0.814423390247749
m1423	6	80	3	2	0.202	0.1875	0.228	0.13125	0.183884297520661	2.529004474247646	0.111767860786815
m1424	7	78	3	2	0.2875	0.4231	0.348	0.2243589744	-0.209424083769634	3.62517793894417	0.056911485920685
m1425	8	78	3	2	0.3643	0.6923	0.479	0.3974358974	-0.44024939383443	15.4762199289728	8.35497975005817E-05
m1426	6	79	3	2	0.2603	0.3038	0.3076	0.1898734177	0.018867924528302	0.01234375	0.911535121640963
m1427	4	79	3	2	0.3244	0.3165	0.4074	0.2848101266	0.229249011857707	3.93583514859	0.047267665100639
m1428	3	80	3	2	0.3693	0.425	0.4888	0.425	0.136612021857924	1.36105860113421	0.24335410102664
m1429	9	80	3	2	0.3472	0.475	0.4472	0.3375	-0.055926837847344	0.309450175093675	0.578017775973423
m1430	4	80	3	2	0.3346	0.2875	0.4249	0.30625	0.329025110782866	8.36726547230054	0.003820400544484
m1431	3	80	3	2	0.3589	0.375	0.4688	0.375	0.206030150753769	3.2	0.073638270120299
m1432	8	79	2	2	0.1115	0.1266	0.1186	0.0632911392	-0.061224489795918	0.360664718772827	0.548137299309861
m1433	8	80	3	2	0.2636	0.2375	0.3124	0.19375	0.24572864321608	4.60070506498843	0.031958810293456
m1434	2	80	3	2	0.1874	0.2125	0.2093	0.11875	-0.009015777610819	0.018737527067213	0.891121626650158
m1435	2	79	3	2	0.3509	0.4177	0.4539	0.3481012658	0.0859375	0.500703176548214	0.479191315375129
m1436	1	78	3	2	0.1753	0.1923	0.1942	0.108974359	0.016183986371379	0.007389632343315	0.931495853270556
m1438	3	80	2	2	0.1198	0.1375	0.128	0.06875	-0.067567567567568	0.436016395657853	0.509051464982414
m1439	5	79	3	2	0.29	0.2278	0.3519	0.2278481013	0.358024691358025	9.81396130072561	0.00173192062467
m1441	2	79	3	2	0.3529	0.4051	0.4576	0.3544303797	0.12112676056338	1.04197757534386	0.307361985855615
m1442	9	80	3	2	0.3744	0.525	0.4988	0.475	-0.04635761589404	0.221606648199446	0.63781845047436
m1443	3	80	3	2	0.2351	0.25	0.2722	0.1625	0.087759815242494	0.531582131732928	0.465942456974341
m1444	3	80	3	2	0.3007	0.4625	0.3687	0.24375	-0.248611704399829	5.18174512048407	0.022825387654346
m1445	6	80	3	2	0.3672	0.375	0.4847	0.4125	0.232264334305151	4.09713830348424	0.042955861681795
m1446	4	78	3	2	0.3523	0.4744	0.4565	0.3525641026	-0.032620514679232	0.119027125034736	0.73009205542306
m1449	5	80	3	2	0.3374	0.05	0.4297	0.3125	0.885007278020378	62.4650578512397	2.66453525910038E-15
m1451	8	79	3	2	0.2548	0.2152	0.2997	0.1835443038	0.287862513426423	6.28284859515997	0.012191198217971
m1452	1	79	3	2	0.2491	0.2785	0.2916	0.1772151899	0.051409618573797	0.160365897838425	0.688819866824221
m1453	6	77	3	2	0.3424	0.4416	0.4385	0.3246753247	-0.00038714672861	0.003690532544379	0.951558507297217
m1454	9	76	3	2	0.32	0.2895	0.3999	0.2763157895	0.2822966650717703	5.79736961451247	0.016050168199782
m1455	3	78	2	2	0.2678	0.3974	0.3185	0.1987179487	-0.241935483870968	4.797312	0.02850417595556
m1456	7	80	3	2	0.3572	0.3875	0.4655	0.36875	0.173751686909582	2.24840318897824	0.13375235883269
m1458	1	80	3	2	0.3683	0.0375	0.4868	0.41875	0.923892100192678	68.1492718123084	1.11022302462516E-16
m1459	9	80	3	2	0.1005	0.0625	0.1062	0.05625	0.416543574593796	13.5355120335311	0.000234091508282
m1460	2	80	3	2	0.3288	0.1625	0.4149	0.29375	0.612306530766327	29.6081519011019	5.28820697232035E-08
m1462	9	74	3	2	0.2655	0.1757	0.3151	0.1959459459	0.447934845840605	14.4883815735149	0.000141026679311
m1463	3	80	3	2	0.3718	0.3875	0.4937	0.44375	0.221055979643766	3.70025956328664	0.05440400406518
m1464	7	78	3	2	0.375	0.4487	0.4999	0.4935897436	0.108796296296296	0.818154009542336	0.365720443431119

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^a	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1466	1	78	3	2	0.3407	0.5385	0.4356	0.3205128205	-0.230125523012553	4.35262769668921	0.036951890446494
m1467	7	77	3	2	0.3666	0.3766	0.4835	0.4090909091	0.227208976157083	3.76079855567035	0.052467515260052
m1468	3	79	2	2	0.1815	0.2278	0.2019	0.1139240506	-0.122302158273381	1.30591836734694	0.253134988995759
m1470	5	79	3	2	0.3617	0.3671	0.474	0.3860759494	0.231657608695652	4.02148528704884	0.044924133686654
m1471	3	77	3	2	0.364	0.3506	0.4784	0.3961038961	0.273113708820404	5.49149286567422	0.019109219486241
m1472	6	79	3	2	0.3585	0.3671	0.468	0.3734177215	0.221610461114935	3.67032176450404	0.055389490177286
m1473	9	80	3	2	0.2834	0.2375	0.3418	0.21875	0.310835629017447	7.44897306122449	0.006347265305297
m1474	4	79	3	2	0.3509	0.2658	0.4539	0.3481012658	0.419560595322466	13.5598049371771	0.000231081110957
m1476	1	80	3	2	0.3374	0.35	0.4297	0.3125	0.191520467836257	2.75147107438017	0.097164993826296
m1477	2	80	3	2	0.3725	0.425	0.495	0.45	0.147572199301809	1.5998367513519	0.205926346978692
m1478	8	79	3	2	0.2039	0.1392	0.2305	0.1329113924	0.40125610607118	12.38211449888	0.000433465986847
m1479	3	80	3	2	0.3494	0.2125	0.4512	0.34375	0.533518582841264	22.3876464084256	2.22802521421261E-06
m1480	5	80	3	2	0.3702	0.3375	0.4905	0.43125	0.317658349328215	7.78713838976827	0.005261947264828
m1481	9	79	3	2	0.3529	0.4304	0.4576	0.3544303797	0.065868263473054	0.279903628117914	0.596764389220651
m1482	8	79	3	2	0.2548	0.3418	0.2997	0.1835443038	-0.134087237479806	1.555859162222993	0.212272549988418
m1483	3	80	3	2	0.3318	0.35	0.42	0.3	0.172774869109948	2.22222222222222	0.136037128119059
m1484	1	80	3	2	0.2787	0.375	0.3347	0.2125	-0.114245416078984	1.16062111118957	0.281336764688023
m1485	5	80	3	2	0.3589	0.375	0.4688	0.375	0.206030150753769	3.2	0.073638270120299
m1486	1	80	3	2	0.34	0.5375	0.4343	0.31875	-0.231689630166788	4.51754278240637	0.033548982339501
m1487	1	79	3	2	0.3177	0.1646	0.3962	0.2721518987	0.58880778588078	27.0016735761731	2.03279381549848E-07
m1488	8	80	3	2	0.3494	0.4875	0.4512	0.34375	-0.074267782426778	0.51867093945016	0.471409172631785
m1489	1	78	3	2	0.3262	0.0641	0.4105	0.2884615385	0.845691382765531	55.541649757866	9.14823772291129E-14
m1490	8	80	3	2	0.3425	0.375	0.4388	0.325	0.151450053705693	1.68894732997297	0.193739792382872
m1492	2	80	3	2	0.3226	0.3375	0.4043	0.28125	0.171328671328671	2.18374291115312	0.139474900811313
m1493	1	80	3	2	0.2966	0.4	0.3622	0.2375	-0.098175499565595	0.871954564979331	0.350414770209307
m1494	1	79	3	2	0.3549	0.3165	0.4612	0.3607594937	0.319609211444522	7.78307001869382	0.005273809993796
m1495	5	79	3	2	0.2986	0.1519	0.3653	0.2405063291	0.588390501319261	26.9628531855956	2.07403338170487E-07
m1496	5	80	3	2	0.3736	0.375	0.4972	0.4625	0.251657720239975	4.83173539405542	0.027940493089609
m1497	3	77	3	2	0.3689	0.3506	0.4879	0.4220779221	0.287252518235498	6.09058634488951	0.013590397878762
m1498	9	79	3	2	0.2548	0.2911	0.2997	0.1835443038	0.034965034965035	0.064627778860301	0.799325645168829
m1499	2	78	3	2	0.1587	0.1667	0.1738	0.0961538462	0.047573739295909	0.131981288667572	0.716386551461653
m1500	7	80	3	2	0.3635	0.4875	0.4774	0.39375	-0.014822134387352	0.035648793828652	0.850242610418246
m1501	7	76	3	2	0.3739	0.2763	0.4978	0.4671052632	0.450261780104712	15.0476066079819	0.00010483310825
m1502	6	80	3	2	0.3718	0.3875	0.4937	0.44375	0.221055979643766	3.70025956328664	0.05440400406518
m1503	4	80	3	2	0.3683	0.4125	0.4868	0.41875	0.158760890609874	1.86352626573131	0.172218369730053
m1504	5	79	3	2	0.3441	0.5823	0.4416	0.3291139241	-0.312843029637761	8.01784574518507	0.004631863362859
m1505	8	80	3	2	0.3725	0.375	0.495	0.45	0.248334919124643	4.70156106519743	0.03013523417231
m1506	9	79	3	2	0.3487	0.481	0.4499	0.3417721519	-0.062746504123342	0.377082470921502	0.539168799262408
m1508	5	80	3	2	0.2834	0.1875	0.3418	0.21875	0.456422018348624	16.3030204081633	5.39778454082818E-05
m1509	4	80	3	2	0.3192	0.075	0.3988	0.275	0.81404472342095	52.7361169799825	3.81472631261204E-13
m1510	3	80	3	2	0.3589	0.5	0.4688	0.375	-0.060402684563758	0.355555555555556	0.550984987585169
m1512	2	80	3	2	0.3374	0.3	0.4297	0.3125	0.307523739956172	7.28753719008265	0.006943459739312

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Supplemental Table 1. Continued.

Marker	Chromosome	Individuals (no.)	Genotypes (no.)	Alleles (no.)	PIC ^z	Ho ^y	He ^x	MAF ^w	IC ^v	HWEu	
										X ²	p value
m1513	2	80	3	2	0.1638	0.175	0.18	0.1	0.034061135371179	0.061728395061728	0.803784706253189
m1514	4	79	3	2	0.371	0.4177	0.492	0.4367088608	0.157170923379175	1.80014863220427	0.179694527013605
m1515	6	80	3	2	0.3346	0.3125	0.4249	0.30625	0.270410048023642	5.59981213357622	0.017962403563457
m1516	9	78	2	2	0.2828	0.4359	0.3409	0.2179487179	-0.272727272727273	6.05804891158291	0.01384305413115
m1517	9	80	3	2	0.3736	0.475	0.4972	0.4625	0.05090104331331	0.159318542666736	0.689784694268322
m1518	6	80	3	2	0.2159	0.0375	0.2462	0.14375	0.849428208386277	57.4832026545804	3.40838468559923E-14
m1519	4	76	3	2	0.3706	0.3684	0.4913	0.4342105263	0.256373937677054	4.75669721453683	0.029184498083
m1520	5	80	3	2	0.3693	0.475	0.4888	0.425	0.034416211000322	0.063317220583329	0.801327738125951
m1521	4	80	3	2	0.3346	0.3125	0.4249	0.30625	0.270410048023642	5.59981213357622	0.017962403563457
m1522	1	78	3	2	0.3597	0.4231	0.4703	0.3782051282	0.106854130052724	0.787377137337168	0.374894401712776
m1523	3	80	2	2	0.1638	0.2	0.18	0.1	-0.104895104895105	0.987654320987654	0.320316355493487
m1524	6	80	3	2	0.3258	0.475	0.4097	0.2875	-0.153284671532847	2.03318630539803	0.15389766544718
m1525	6	80	3	2	0.3693	0.4	0.4888	0.425	0.187660668380463	2.63786866909557	0.10434344123908
m1526	5	77	3	2	0.3689	0.3247	0.4879	0.4220779221	0.340277777777778	8.61481463774298	0.003334397285293
m1527	3	80	3	2	0.2636	0.3625	0.3124	0.19375	-0.154156171284635	2.05543258782938	0.151664175124926
m1529	2	76	3	2	0.3488	0.4211	0.4501	0.3421052632	0.071207430340557	0.31731124260355	0.573227987766164
m1530	3	80	3	2	0.2159	0.2375	0.2462	0.14375	0.041507024265646	0.099274826839615	0.752701611678748
m1532	2	75	3	2	0.3584	0.4267	0.4679	0.3733333333	0.09480122324159	0.58272743230384	0.445245235955965
m1533	3	79	3	2	0.29	0.0506	0.3519	0.2278481013	0.857793983591613	57.8999406106815	2.75335310107039E-14
m1534	2	80	2	2	0.1874	0.2375	0.2093	0.11875	-0.128571428571429	1.45264322720185	0.22810429748034
m1535	2	80	3	2	0.3605	0.3875	0.4718	0.38125	0.184753661784288	2.55389370208619	0.110022805832663
m1536	8	80	3	2	0.2879	0.3	0.3487	0.225	0.145945945945946	1.56318649554862	0.211199265333959

^z Polymorphism information content.^y Observed heterozygosity.^x Expected heterozygosity.^w Minor Allele Frequency.^v Inbreeding coefficient.^u Hardy-Weinberg Equilibrium test.

Supplemental Table 2. Polymorphism information content (PIC) and observed heterozygosity (Ho) of citrus genotypes analyzed by 1366 genome-wide single nucleotide polymorphism (SNP) markers.

Group	Common name	SNPs (no.)	PIC	Ho
Mandarin	Sunki mandarin	1358	0.296669106881406	0.113402062
Mandarin	Willowleaf mandarin	1361	0.077598828696925	0.209404849
Mandarin	Zaoju mandarin	1364	0.153733528550512	0.237536657
Mandarin	Pimpled mandarin	1366	0.039531478770132	0.338945827
Mandarin	Ponkan mandarin	1366	0.151445827232796	0.303806735
Pummelo	Low acid pummelo	1358	0.243685944363104	0.083210604
Pummelo	Liang Ping Yau pummelo	1358	0.243685944363104	0.088365243
Pummelo	Siamese pink pummelo	1358	0.242953879941435	0.092783505
Pummelo	Nakon pummelo	1362	0.071284773060029	0.095447871
Pummelo	Kao Phuang pummelo	1360	0.062591508052709	0.094117647
Pummelo	Hirado low seeded pummelo	1360	0.142386530014641	0.106617647
Pummelo	Sha Tian You pummelo	1359	0.353038067349927	0.101545254
Pummelo	Hirado Buntan pummelo	1362	0.090409956076135	0.104258443
Pummelo	Red Shaddock pummelo	1357	0.242679355783309	0.095799558
Pummelo	Siamese sweet pummelo	1360	0.078147877013177	0.104411765
Citron	Etrog citron	1281	0.090135431918009	0.043715847
Citron	Buddha's hand citron	1287	0.043374816983895	0.038073038
Citron	Unknown citron	1350	0.077415812591508	0.179259259
Trifoliolate orange	Trifoliolate orange seedling	1185	0.152269399707174	0.060759494
Trifoliolate orange	Argentina trifoliolate orange	1267	0.322474377745242	0.071823204
Trifoliolate orange	Flying dragon trifoliolate orange	1274	0.323114934114202	0.073783359
Kumquat	Meiwa kumquat	1335	0.321833821376281	0.041198502
Kumquat	Nagami kumquat	1337	0.161054172767204	0.047868362
Kumquat	Marumi kumquat	1335	0.162243777452416	0.041198502
Kumquat	Fortunella polyandra	1335	0.081899707174231	0.057677903
Sweet orange	Cara cara navel	1366	0.242679355783309	0.941434846
Sweet orange	Moro blood orange	1366	0.171028550512445	0.93704246
Sweet orange	Sanford sweet orange	1363	0.121339677891654	0.857666911
Sweet orange	Ridge Pineapple sweet orange	1365	0.127104685212299	0.858608059
Sweet orange	Valencia sweet orange	1364	0.113927525622255	0.855571848
Sour orange	Willowleaf sour orange	1366	0.135340409956076	0.648609078
Sour orange	Bittersweet sour orange	1365	0.037792825768668	0.648351648
Sour orange	Unknown sour orange	1366	0.037792825768668	0.648609078
Sour orange	Bouquet de Fleurs	1366	0.046486090775988	0.647877013
Citrange	Kuharske citrange	1364	0.051702049780381	0.416422287
Citrange	Citrange 093	1366	0.153092972181552	0.375549048
Citrange	Citrange 103	1365	0.16059663250366	0.373626374
Citrange	Citrange 125	1364	0.042276720351391	0.380498534
Citrange	Citrange 206	1364	0.140830893118594	0.32771261
Citrange	Citrange 187	1359	0.140739385065886	0.367917586
Citrange	Citrange 207	1361	0.143942166910688	0.360764144
Lemon	Rangpur lime	1365	0.093155197657394	0.406593407
Lemon	Eureka lemon	1363	0.144857247437775	0.363169479
Lemon	Lisbon lemon	1363	0.126098096632504	0.355832722
Lemon	Red rough lemon	1366	0.237188872620791	0.428257687
Lemon	Vangasay lemon	1365	0.041910688140556	0.427838828
Lemon	Volkamer lemon	1366	0.044198389458272	0.432650073
Lime	Key lime	1352	0.069088579795022	0.111686391
Lime	Palestine sweet lime	1363	0.093155197657394	0.376375642
Lime	Persian lime	1360	0.142386530014641	0.313235294
Microcitrus	Microcitrus inodora	1088	0.21907027818448	0.078125
Microcitrus	Australian round lime	1282	0.040446559297218	0.04524181
Microcitrus	Australian finger lime	1296	0.243228404099561	0.050154321
Papeda	Kaffir lime	1347	0.0974560761347	0.070527097
Papeda	Ichang papeda	1360	0.062042459736457	0.322058824
Papeda	Melanesian papeda	1331	0.048133235724744	0.057099925
Tangor	Iyokan	1360	0.138085651537335	0.154411765

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Supplmental Table 2. Continued.

Group	Common name	SNPs (no.)	PIC	Ho
Tangor	King tangor	1365	0.157393850658858	0.402197802
Tangor	Murcott tangor	1365	0.143027086383602	0.32967033
Other true citrus	Shekwasha mandarin	1361	0.124176427525622	0.231447465
Other true citrus	Owari Satsuma	1363	0.039989019033675	0.381511372
Other true citrus	Cleopatra mandarin	1185	0.04300878477306	0.50464135
Other true citrus	Calamandarin	1360	0.236090775988287	0.155882353
Other true citrus	Yuzu	1362	0.13845168374817	0.287077827
Other true citrus	Calamondin	1365	0.043832357247438	0.378021978
Other true citrus	Kinkoji	1366	0.157119326500732	0.566617862
Other true citrus	Nules clementine	1366	0.036877745241581	0.456076135
Other true citrus	Fortune mandarin	1366	0.144948755490483	0.409956076
Other true citrus	Mandarin hybrid 005	1364	0.243228404099561	0.244868035
Other true citrus	Mandarin hybrid 028	1365	0.110267203513909	0.384615385
Other true citrus	Mandarin hybrid 101	1364	0.228312591508053	0.332844575
Other true citrus	Hyuganatsu orange	1364	0.124633967789165	0.41568915
Other true citrus	Chinotto	1366	0.124267935578331	0.647144949
Other true citrus	Zhu Luan	1365	0.212481698389458	0.607326007
Other true citrus	Bergamot	1365	0.038799414348463	0.648351648
Other true citrus	<i>C. neoaurantium</i>	1366	0.226848462664715	0.629575403
Other true citrus	Gou Tou	1366	0.351390922401171	0.63250366
Other true citrus	Sanbokan	1366	0.232704978038067	0.584187408
Other true citrus	Nansho Daidai orange	1365	0.038616398243045	0.619047619
Other true citrus	Natsumikan	1366	0.038799414348463	0.647144949