Evaluating Genetic Diversity Between Natural-Origin and Hatchery-Origin Chinook Salmon in the Coquille River

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Research Question

Are there differences in genetic diversity between natural-origin (NOR; adipose fin intact) and hatchery-origin (HOR; adipose fin removed) Chinook salmon in the Coquille River?

Objective

Use a previously developed single nucleotide polymorphism (SNP) panel to evaluate genetic diversity between NOR and HOR Chinook salmon sampled at Bandon Hatchery on the Coquille River, Oregon.

Background

The Bandon Hatchery on the Coquille River, Oregon maintains an integrated fall Chinook salmon broodstock program. In past years (2014 – 2017), the number of adult returns contributing to the broodstock approached or surpassed the target of 150 salmon per year with the broodstock primarily consisting of NOR salmon in 2014 and 2015 and primarily comprised of HOR salmon in 2016 and 2017 (Table 1; ODFW 2024). In more recent years (2018 – 2021), the total number of individuals contributing to the broodstock has been severely reduced, ranging from three in 2020 to 42 in 2021 due to few adult returns collected at the hatchery (ODFW 2024). Here, we evaluate differences in genetic diversity, effective population size, and genetic differentiation between NOR and HOR Chinook salmon used for broodstock at the Bandon Hatchery in 2023.

Table 1. Number and origin of Chinook salmon (*Oncorhynchus tshawytscha*) incorporated into the Coquille River (44H) broodstock in 2014 – 2021. Adopted from ODFW (2024).

Brood Year	Hatchery Brood	Natural Origin Brood	% Natural Origin Brood	Viable Eggs	Ponded Fry	% Marked	Total Released
2014	24	144	86%	389,103	238,864	100%	209,071
2015	0	169	100%	299,335	207,444	100%	167,468
2016	142	0	0%	297,027	195,455	100%	129,588
2017	137	27	16%	295,700	206,574	100%	177,151
2018	6	16	73%	76,513	66,187	100%	65,952
2019	20	1	5%	70,480	67,473	100%	66,116
2020	2	1	33%	10,244	8,954	100%	9,371
2021	42	0	0%	92,522	85,912	100%	78,808
Average	47	45	39%			100%	112,941
Target	Total ≥ 150 fish					100%	175,000

Methods

We received 312 tissue samples collected from adult Chinook salmon (*Oncorhynchus tshawytscha*) returning to the Bandon Hatchery on the Coquille River, Oregon in October through December of 2023. Chinook salmon were sampled with a caudal fin punch, phenotypically sexed, and assessed for presumed origin via the presence or absence of an adipose fin. In total, we evaluated 44 presumed NOR, 267 HOR, and one unknown origin Chinook salmon. Details on sampling dates, phenotypic and genotypic sex, and origin are available as an appendix (Table A1). Tissue samples were preserved in 95% ethanol and genomic DNA was extracted from tissue samples following the methods of Ivanova et al. (2006).

To evaluate genetic diversity and differentiation between presumed NOR and HOR Chinook salmon, samples were genotyped at a panel of SNPs using the Genotyping-in-Thousands by sequencing method (GT-seq) (Campbell et al. 2015). The GT-seq SNP panel used in this study was composed of 353 markers originally developed by the Columbia River Inter-Tribal Fish Commission (Hess et al. 2015). Broadly, markers in the GT-seq panel can be categorized into one of two types, those that amplify SNPs located on chromosome 28 within the *greb1l – rock1* region associated with adult migration timing, and those that target SNPs outside this region in genomic locations not associated with adult migration timing.

Sample and marker filtering

We filtered samples and markers to remove potential artifacts introduced via library preparation, sequencing, and/or bioinformatic processing (O'Leary et al. 2018). Samples and

markers were filtered iteratively to remove those with poor quality based on genotyping call rates and a measure of cross contamination (i.e., the 'individual fuzziness index'; IFI). Quality filtering followed the stepwise scheme detailed in Dayan et al. (2023), and after the final iteration, all samples had an IFI score ≤ 2.5, were genotyped at ≥ 90% of markers, and all markers were genotyped in ≥ 80% of samples. We removed putative paralogous sequence variants and markers that were monomorphic across all samples. We then identified and removed any duplicate tissue samples using pairwise estimates of relatedness in the program Coancestry (Wang 2011).

Genetic diversity, effective population size, and genetic differentiation

Given differences in sample size between the 2023 NOR and HOR adult returns and the potential genetic bottleneck due to reduced broodstock numbers in the parent years 2018 – 2020, we used a subsampling approach to evaluate patterns in genetic diversity and estimated the effective population size. First, we iteratively subsampled the genotypes of 20 NOR and 20 HOR individuals and estimated genetic diversity with Nei's (1987) estimate of gene diversity (i.e., expected heterozygosity or He) with the R (version 4.3.1) package *pegas* (Paradis 2010; R Core Team 2023). Subsampling and estimation were repeated 1000 times and mean genetic diversity was compared between NOR and HOR Chinook salmon. Next, we estimated the effective population size (Ne) and the Ne/N ratio (i.e., effective population size / census size) of both origin types using the linkage disequilibrium method in the program NeEstimator V2 (Do et al. 2014) to test for evidence of a recent genetic bottleneck in the 2023 HOR adult returns. In short, measures of effective population size use the genetic characteristics of a cohort to estimate ancestral genetic diversity in the cohort's past (Do et al. 2014). Variation in effective population size can be used to detect recent genetic bottlenecks and quantify differences in the demographic history between cohorts of interest (Frankham 1995). Sudden reductions in population size and/or in the diversity of breeders may lead to reduced genetic diversity and inbreeding in subsequent generations, making estimates of effective population size and the Ne/N ratio a key metric in applied conservation efforts (Waples 2024). To evaluate if potential reductions in effective population size resulted in inbreeding, we quantified the inbreeding coefficient (F_{IS}) of NOR and HOR salmon with the *dartR* package (Gruber et al. 2018).

Genetic differentiation between the 2023 NOR and HOR adult returns was evaluated with principal components analysis (PCA) and Weir & Cockerham's (1984) pairwise estimate of the fixation index (F_{ST}). PCA among individual genotypes was conducted in the R package *adegenet* (Jombart 2008), and missing calls were replaced with mean allele frequency prior to ordination. Genetic differentiation (F_{ST}) between NOR and HOR salmon was quantified with the *pegas* R package (Paradis 2010).

Estimates of genetic diversity, PCA, and F_{ST}, were evaluated separately using markers that target SNPs outside of the *greb1l – rock1* region and markers that amplify SNPs located within this region in distinct analyses. In analyses incorporating adult migration timing markers, we used all 31 markers that passed quality filtering. As an appendix, we've included results from a subset of 19 markers located in the core of the *greb1l – rock1* region (Table A2).

Results

Genotyping

Quality filtering of the 2023 samples and markers resulted in 301 Chinook salmon of presumed NOR (n = 43), HOR (n =257), and unknown origin (n = 1) genotyped at 326 markers. Of the 326 markers which passed quality filtering, 295 amplified SNPs that are not associated with adult migration timing, 31 targeted SNPs within the chromosome 28 *greb1l – rock1* region associated with adult migration timing, and a single marker was used to evaluate sex. We found high concordance between phenotypic and genotypic assessments of sex. However, in three instances (OtsAC23COQR_0107; OtsAC23COQR_0281; OtsAC23COQR_0282), samples identified phenotypically as male were identified as females genetically (i.e., XX; Table A1).

Genetic diversity, effective population size, and differentiation based on 295 non adult migration timing markers

We did not detect apparent differences in genetic diversity between the 2023 NOR and HOR adult returns based on variation at the 295 non adult migration timing markers. Subsampled estimates of genetic diversity were similar in NOR (He = 0.32) and HOR (He = 0.31) Chinook salmon. However, estimates of the Ne/N ratio indicated NOR salmon had a greater effective population size per capita (Ne = 144.2; N = 43; Ne/N = 3.35) than HOR salmon (Ne = 38.1; N = 257; Ne/N = 0.15). We tested if reduced Ne/N ratio resulted in inbreeding within the 2023 HOR cohort, but recent inbreeding was not detected in either NOR (F_{IS} = 0.001) or HOR (F_{IS} = -0.013) salmon.

We did not find evidence of genetic differentiation as the NOR and HOR individuals largely overlapped in PCA (Fig. 1a), and PC1 (3.7%) and PC2 (3.4%) explained little of the total variation among genotypes. We did not detect clustering associated with origin or sex (Fig. 1). Accordingly, mean F_{ST} between NOR and HOR salmon was not significantly different from zero (0.007 ± 0.02; mean ± SD) and ranged from -0.018 to 0.200 (Fig. 3a).

Genetic diversity and differentiation based on 31 adult migration timing markers

Assessments of genetic diversity and differentiation based on variation at the 31 adult migration timing markers resulted in no apparent differences between NOR and HOR Chinook salmon. Subsampled estimates of genetic diversity were similar in both NOR (He = 0.18) and HOR (He = 0.15) salmon. NOR and HOR salmon overlapped in PCA (Fig. 2a), and PC1 (4.7%) and PC2 (1.4%) explained little of the total variation among genotypes. Mean F_{ST} between NOR and HOR salmon at adult migration timing markers was not significantly different from zero (0.024 ± 0.03) and ranged from -0.013 to 0.110 (Fig. 3b).

However, we identified 17 samples with one early- and one late-migration timing allele (i.e., heterozygous) at the adult migration timing markers (Fig. 2b; Table A2). The remaining 284 samples predominantly had two late-migration alleles (i.e., homozygous) which is consistent with fall Chinook salmon.

Conclusions

We did not detect apparent differences in genetic diversity or significant genetic differentiation between 2023 adult returns of presumed natural-origin and hatchery-origin in the Coquille River. However, reduced Ne/N ratio in the 2023 HOR cohort supports the notion of a genetic bottleneck in these Chinook salmon owing to reduced numbers of parents in the 2018 – 2020 broodstock. Continued mating among individuals originating from within the 2023 HOR broodstock may lead to reduced genetic diversity and inbreeding in future generations of HOR adult returns. Nonetheless, we did not detect recent inbreeding in either NOR or HOR Chinook salmon in the 2023 adult samples.

Broadly, these results are consistent with previous studies that have not detected differences in genetic diversity or genome-wide genetic differentiation between NOR and HOR salmon across multiple study systems and species (Koch et al. 2023 and references within) despite evidence for reduced reproductive success of HOR salmonids (Araki et al. 2007; Thériault et al. 2011; Christie et al. 2014; O'Sullivan et al. 2020). Taken together, our results and

those of previous studies suggest factors other than genetic diversity, such as maternal effects and/or epigenetics may be responsible for the reduced reproductive success of HOR salmon spawning in the wild.

Summary

- In 301 Chinook salmon sampled in 2023 at the Bandon Hatchery on the Coquille River and genotyped at 295 non adult migration timing markers, we detected no apparent differences in genetic diversity or significant genetic differentiation between adult returns with presumed natural or hatchery origin.
- The 2023 HOR cohort exhibited reduced Ne/N ratio, indicating these Chinook salmon were the product of a genetic bottleneck likely due to low broodstock numbers 2018 – 2020.
- We did not detect evidence of recent inbreeding in either NOR or HOR 2023 adult returns. This pattern suggests that even though the number of breeders in the 2018 – 2020 parent years was low (i.e., 3 – 22), there was adequate diversity among these breeders to avoid inbreeding in the 2023 HOR cohort. However, continued mating among the descendants of the 2023 HOR samples may lead to reduced genetic diversity and inbreeding in future generations.
- At 31 adult migration timing markers, most samples (n = 284) had two late-migration timing alleles (i.e., homozygous) which is consistent with fall Chinook salmon. However, 17 samples had one early-migration allele and one late-migration timing allele (i.e., heterozygous) at most of the 31 markers in the chromosome 28 *greb1l – rock1* region.
- Given the lack of apparent genetic differentiation between NOR and HOR Chinook salmon in the Coquille River and in other study systems with integrated broodstocks (Waters et al. 2015), other factors likely contribute to the previously documented reduced reproductive success of HOR salmonids when spawning in the wild (Araki et al. 2007; Thériault et al. 2011; Christie et al. 2014; O'Sullivan et al. 2020).
- It is possible that other approaches, such as whole genome sequencing, may reveal differences in genetic diversity or differentiation between NOR and HOR individuals not detected with the methods implemented in this study.
- The results detailed in this summary will be incorporated into a broader genetic analysis of adult Chinook salmon returning to rivers in Oregon and Northern California.

Figures

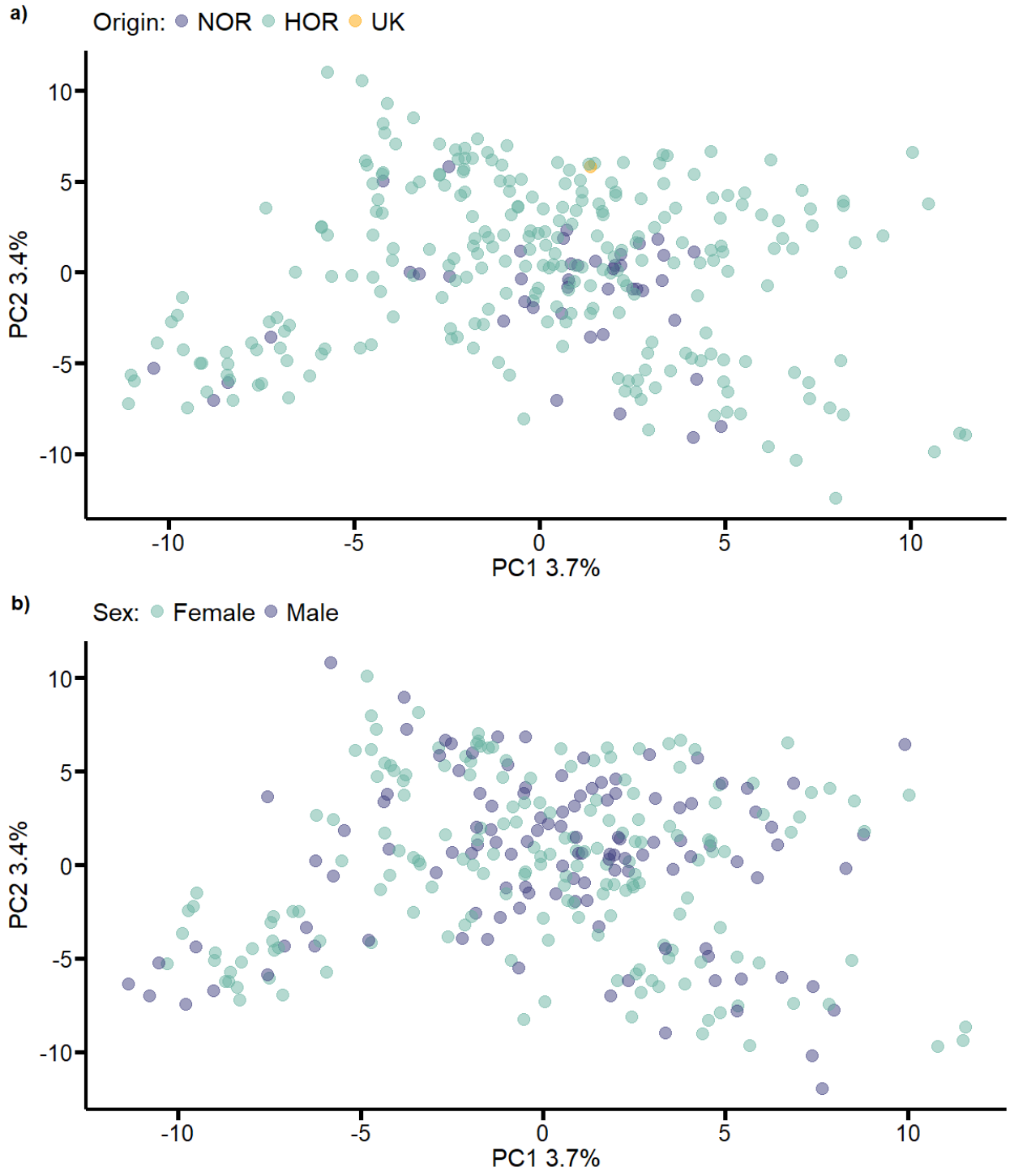

Figure 1. Principal components analysis (PCA) of 301 *O. tshawytscha* genotyped at 295 non adult migration timing markers. Color of data points indicates **a)** Natural-origin (NOR), hatchery-origin (HOR), or unknown (UK) origin, and **b)** Female or male genotypic sex. Note, minor random variation was applied to data points to reduce overlap.

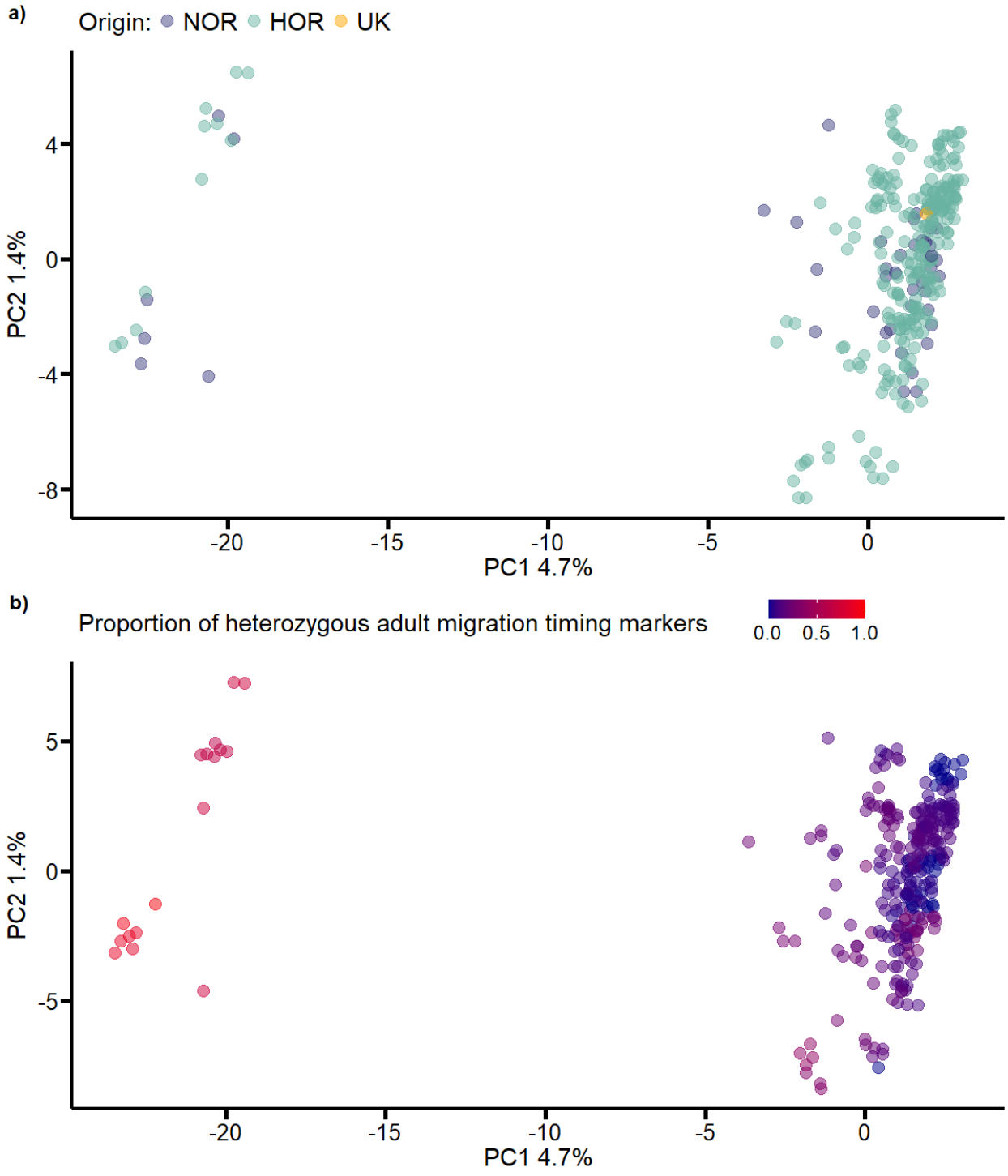

Figure 2. Principal components analysis (PCA) of 301 *O. tshawytscha* genotyped at 31 adult migration timing markers. Color of data points indicates **a)** Natural-origin (NOR), hatchery-origin (HOR), or unknown (UK) origin, and **b)** the proportion of heterozygous adult migration timing markers. Note, minor random variation was applied to data points to reduce overlap.

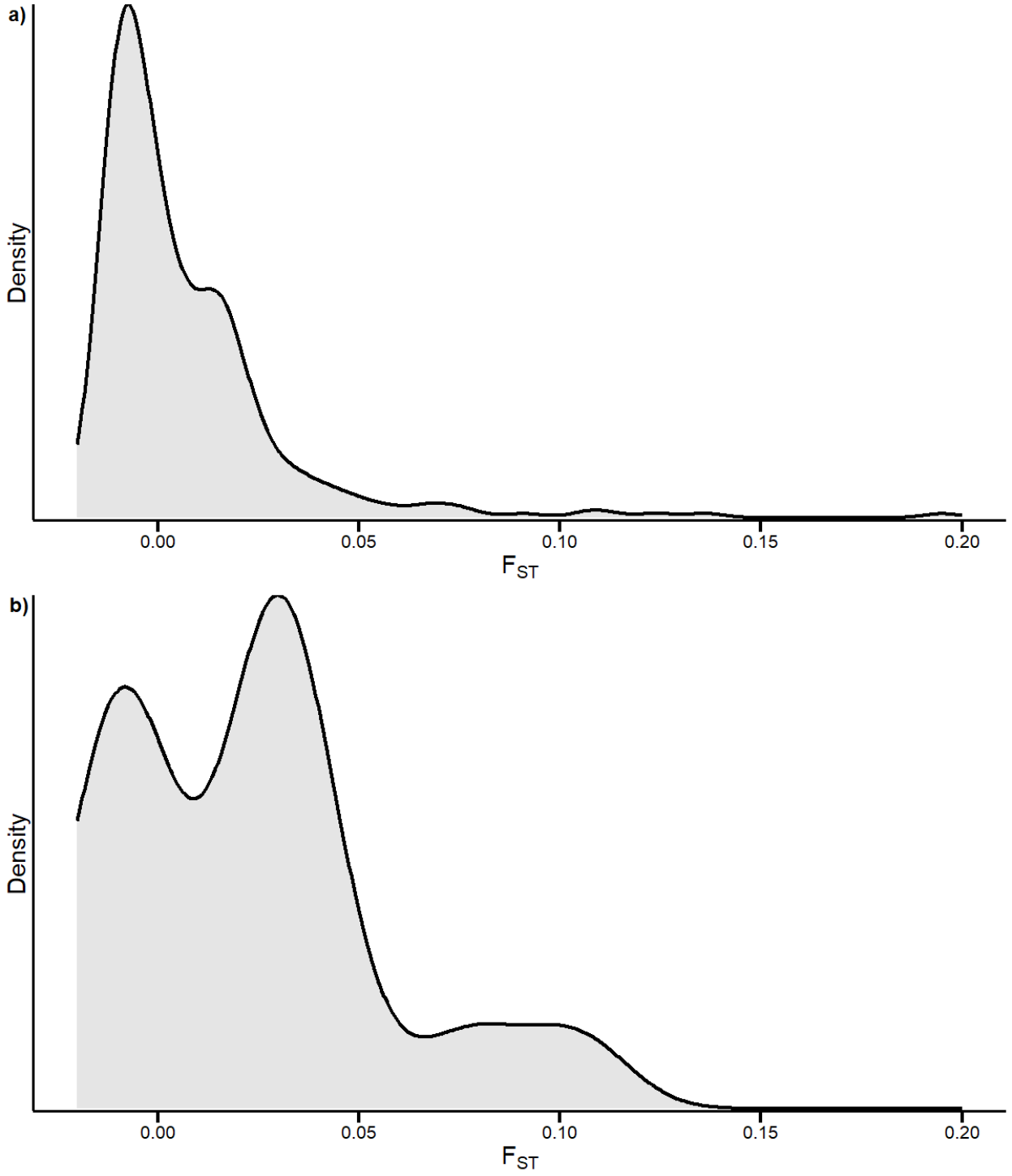

Figure 3. Density of F_{ST} estimates quantifying genetic differentiation between natural-origin (NOR) and hatchery-origin (HOR) *O. tshawytscha* in the Coquille River (n = 301), genotyped at **a)** 295 non adult migration timing markers, and **b)** 31 adult migration timing markers.

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Appendix

Table A1. Sample name, field ID, date sampled, phenotypic sex, genotypic sex, and origin. Origin was determined by the presence (i.e., natural-origin; NOR), or absence (i.e., hatchery-origin; HOR) of an adipose fin. Individuals of unknown origin were designated UK. Samples that did not pass quality control filtering are listed. Samples with mismatches in phenotypic and genotypic sex are highlighted in yellow.

Sample Name	Field ID	Date	Phenotypic Sex	Genotypic Sex	Origin	Passed Filtering
OtsAC23COQR_0001	44WB-F1	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0002	44WB-F2	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0003	44WB-F3	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0004	44WB-F4	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0005	44WB-F5	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0006	44WB-F6	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0007	44WB-F7	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0008	44WB-F8	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0009	44WB-F9	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0010	44WB-F10	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0011	44WB-F11	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0012	44WB-F12	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0013	44HB-M13	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0014	44HB-M14	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0015	44HB-M15	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0016	44HB-M16	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0017	44HB-M17	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0018	44HB-M18	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0019	44HB-M19	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0020	44HB-M20	11/1/2023	M	M	HOR	YES

OtsAC23COQR_0021	44HB-M21	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0022	44HB-M22	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0023	44HB-M23	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0024	44HB-M24	11/1/2023	M	M	HOR	YES
OtsAC23COQR_0025	44HB-F25	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0026	44HB-F26	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0027	44HB-F27	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0028	44HB-F28	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0029	44HB-F29	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0030	44HB-F30	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0031	44WB-F31	10/26/2023	F	F	NOR	YES
OtsAC23COQR_0032	44WB-F32	10/26/2023	F	F	NOR	YES
OtsAC23COQR_0033	44WB-F33	10/26/2023	F	F	NOR	YES
OtsAC23COQR_0034	44WB-F34	10/26/2023	F	F	NOR	YES
OtsAC23COQR_0035	44WB-F35	10/26/2023	F	F	NOR	YES
OtsAC23COQR_0036	44WB-M36	10/26/2023	M	M	NOR	YES
OtsAC23COQR_0037	44WB-M37	10/26/2023	M	M	NOR	YES
OtsAC23COQR_0038	44WB-M38	10/26/2023	M	M	NOR	YES
OtsAC23COQR_0039	44WB-M39	10/26/2023	M	M	NOR	YES
OtsAC23COQR_0040	44WB-M40	10/26/2023	M	M	NOR	YES
OtsAC23COQR_0041	44WB-M41	10/26/2023	M	M	NOR	YES
OtsAC23COQR_0042	44WB-F42	10/26/2023	F	F	NOR	YES
OtsAC23COQR_0043	44WB-F43	10/26/2023	F	F	NOR	YES
OtsAC23COQR_0044	44WB-F44	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0045	44WB-F45	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0046	44WB-F46	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0048	44WB-F48	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0049	44WB-M49	11/1/2023	M	M	NOR	YES
OtsAC23COQR_0050	44WB-M50	11/1/2023	M	M	NOR	YES
OtsAC23COQR_0051	44WB-M51	11/1/2023	M	M	NOR	YES
OtsAC23COQR_0052	44WB-M52	11/1/2023	M	M	NOR	YES
OtsAC23COQR_0053	44WB-M53	11/1/2023	M	M	NOR	YES
OtsAC23COQR_0054	44WB-M54	11/1/2023	M	M	NOR	YES
OtsAC23COQR_0055	44WB-M55	11/1/2023	M	M	NOR	NO
OtsAC23COQR_0056	44WB-F56	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0057	44WB-F57	11/1/2023	F	F	NOR	YES

OtsAC23COQR_0058	44WB-F58	11/1/2023	F	F	NOR	YES
OtsAC23COQR_0059	44WB-F59	11/6/2023	F	F	NOR	YES
OtsAC23COQR_0060	44WB-F60	11/6/2023	F	F	NOR	YES
OtsAC23COQR_0101	44HB-F101	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0102	44HB-F102	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0103	44HB-F103	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0104	44HB-F104	11/6/2023	F	F	HOR	NO
OtsAC23COQR_0105	44HB-F105	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0106	44HB-F106	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0107	44HB-M107	11/6/2023	M	F	HOR	YES
OtsAC23COQR_0108	44HB-M108	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0109	44HB-M109	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0110	44HB-M110	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0111	44HB-M111	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0112	44HB-M112	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0113	44HB-M113	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0114	44HB-M114	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0115	44HB-M115	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0116	44HB-M116	11/6/2023	M	M	HOR	NO
OtsAC23COQR_0117	44HB-M117	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0118	44HB-M118	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0119	44HB-F119	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0120	44HB-F120	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0121	44HB-F121	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0122	44HB-F122	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0123	44HB-F123	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0124	44HB-F124	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0125	44HB-F125	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0126	44HB-F126	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0127	44HB-F127	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0128	44HB-M128	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0129	44HB-M129	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0130	44HB-M130	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0131	44HB-M131	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0132	44HB-M132	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0133	44HB-M133	11/6/2023	M	M	HOR	YES

OtsAC23COQR_0134	44HB-M134	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0135	44HB-M135	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0136	44HB-M136	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0137	44HB-M137	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0138	44HB-M138	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0139	44HB-M139	11/6/2023	M	M	HOR	NO
OtsAC23COQR_0140	44HB-F140	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0141	44HB-F141	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0142	44HB-F142	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0143	44HB-F143	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0144	44HB-F144	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0145	44HB-F145	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0146	44HB-F146	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0147	44HB-F147	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0148	44HB-F148	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0149	44HB-F149	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0150	44HB-M150	11/6/2023	M	M	HOR	NO
OtsAC23COQR_0151	44HB-M151	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0152	44HB-M152	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0153	44HB-M153	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0154	44HB-M154	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0155	44HB-M155	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0156	44HB-M156	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0157	44HB-M157	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0158	44HB-M158	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0159	44HB-M159	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0160	44HB-M160	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0161	44HB-F161	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0162	44HB-F162	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0163	44HB-F163	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0164	44HB-F164	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0165	44HB-F165	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0166	44HB-F166	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0167	44HB-F167	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0168	44HB-F168	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0169	44HB-F169	11/6/2023	F	F	HOR	YES

OtsAC23COQR_0170	44HB-F170	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0171	44HB-F171	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0172	44HB-F172	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0173	44HB-F173	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0174	44HB-F174	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0175	44HB-M175	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0176	44HB-M176	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0177	44HB-M177	11/6/2023	M	M	HOR	NO
OtsAC23COQR_0178	44HB-M178	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0179	44HB-M179	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0180	44HB-M180	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0181	44HB-M181	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0182	44HB-M182	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0183	44HB-M183	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0184	44HB-M184	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0185	44HB-M185	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0186	44HB-M186	11/6/2023	M	M	HOR	NO
OtsAC23COQR_0187	44HB-F187	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0188	44HB-F188	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0189	44HB-F189	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0190	44HB-F190	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0191	44HB-F191	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0192	44HB-F192	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0193	44HB-F193	11/6/2023	F	F	HOR	NO
OtsAC23COQR_0194	44HB-F194	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0195	44HB-F195	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0196	44HB-F196	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0197	44HB-M197	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0198	44HB-M198	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0199	44HB-M199	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0200	44HB-M200	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0201	44HB-M201	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0202	44HB-M202	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0203	44HB-M203	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0204	44HB-M204	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0205	44HB-M205	11/6/2023	M	M	HOR	YES

OtsAC23COQR_0206	44HB-M206	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0207	44HB-M207	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0208	44HB-M208	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0209	44HB-F209	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0210	44HB-F210	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0211	44HB-F211	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0212	44HB-F212	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0213	44HB-F213	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0214	44HB-F214	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0215	44HB-F215	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0216	44HB-F216	11/6/2023	F	F	HOR	YES
OtsAC23COQR_0217	44HB-M217	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0218	44HB-M218	11/6/2023	M	M	HOR	YES
OtsAC23COQR_0219	44HB-F219	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0220	44HB-F220	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0221	44HB-F221	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0222	44HB-F222	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0223	44HB-F223	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0224	44HB-F224	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0225	44HB-F225	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0226	44HB-F226	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0227	44HB-F227	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0228	44HB-F228	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0229	44HB-F229	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0230	44HB-F230	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0231	44HB-M231	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0232	44HB-M232	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0233	44HB-M233	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0234	44HB-M234	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0235	44HB-M235	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0236	44HB-M236	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0237	44HB-M237	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0238	44HB-M238	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0239	44HB-M239	11/7/2023	M	M	HOR	NO
OtsAC23COQR_0240	44HB-M240	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0241	44HB-F241	11/7/2023	F	F	HOR	YES

OtsAC23COQR_0242	44HB-F242	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0243	44HB-F243	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0244	44HB-F244	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0245	44HB-F245	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0246	44HB-F246	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0247	44HB-F247	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0248	44HB-F248	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0249	44HB-F249	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0250	44HB-F250	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0251	44HB-F251	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0252	44HB-F252	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0253	44HB-M253	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0254	44HB-M254	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0255	44HB-M255	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0256	44HB-M256	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0257	44HB-M257	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0258	44HB-M258	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0259	44HB-M259	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0260	44HB-M260	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0261	44HB-M261	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0262	44HB-F262	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0263	44HB-F263	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0264	44HB-F264	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0265	44HB-F265	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0266	44HB-F266	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0267	44HB-F267	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0268	44HB-F268	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0269	44HB-F269	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0270	44HB-F270	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0271	44HB-F271	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0272	44HB-F272	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0273	44HB-F273	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0274	44HB-F274	11/7/2023	F	F	HOR	YES
OtsAC23COQR_0275	44HB-M275	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0276	44HB-M276	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0277	44HB-M277	11/7/2023	M	M	HOR	YES

OtsAC23COQR_0278	44HB-M278	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0279	44HB-M279	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0280	44HB-M280	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0281	44HB-M281	11/7/2023	M	F	HOR	YES
OtsAC23COQR_0282	44HB-M282	11/7/2023	M	F	HOR	YES
OtsAC23COQR_0283	44WB-M283	11/7/2023	M	M	NOR	YES
OtsAC23COQR_0284	44WB-M284	11/7/2023	M	M	NOR	YES
OtsAC23COQR_0285	44WB-F285	11/7/2023	F	F	NOR	YES
OtsAC23COQR_0286	44HB-M?286	11/7/2023	M	M	UK	YES
OtsAC23COQR_0296	44HB-M296	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0297	44HB-M297	11/7/2023	M	M	HOR	YES
OtsAC23COQR_0298	44HB-M298	11/7/2023	M	M	HOR	YES
OtsAC23COQR_1201	44HB-F0201	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1202	44HB-F0202	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1203	44HB-F0203	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1204	44HB-F0204	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1205	44HB-F0205	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1206	44HB-F0206	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1207	44HB-F0207	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1208	44HB-F0208	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1209	44HB-F0209	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1210	44HB-F0210	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1211	44HB-F0211	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1212	44HB-F0212	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1213	44HB-M0213	11/20/2023	M	M	HOR	YES
OtsAC23COQR_1214	44HB-M0214	11/20/2023	M	M	HOR	NO
OtsAC23COQR_1215	44HB-M0215	11/20/2023	M	M	HOR	NO
OtsAC23COQR_1216	44HB-M0216	11/20/2023	M	M	HOR	YES
OtsAC23COQR_1217	44HB-M0217	11/20/2023	M	M	HOR	YES
OtsAC23COQR_1218	44HB-F218	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1219	44HB-F219	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1220	44HB-F220	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1221	44HB-F221	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1222	44HB-F222	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1223	44HB-F223	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1224	44HB-F224	11/20/2023	F	F	HOR	YES

OtsAC23COQR_1225	44HB-F225	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1226	44HB-F226	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1227	44HB-F227	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1228	44HB-F228	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1229	44HB-F229	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1230	44HB-M230	11/20/2023	M	M	HOR	YES
OtsAC23COQR_1231	44HB-F231	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1232	44HB-F232	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1233	44HB-F233	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1234	44HB-F234	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1235	44HB-F235	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1236	44HB-F236	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1237	44HB-F237	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1238	44HB-F238	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1239	44HB-F239	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1240	44HB-F240	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1241	44HB-F241	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1242	44HB-F242	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1243	44HB-M243	11/20/2023	M	M	HOR	YES
OtsAC23COQR_1244	44HB-M244	11/20/2023	M	M	HOR	YES
OtsAC23COQR_1245	44HB-F245	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1246	44HB-F246	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1247	44HB-F247	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1248	44HB-F248	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1249	44HB-F249	11/20/2023	F	F	HOR	YES
OtsAC23COQR_1250	44HB-F250	11/21/2023	F	F	HOR	YES
OtsAC23COQR_1251	44HB-M251	11/22/2023	M	M	HOR	YES
OtsAC23COQR_1252	44HB-M252	11/23/2023	M	M	HOR	YES
OtsAC23COQR_1253	44HB-F253	11/27/2023	F	F	HOR	YES
OtsAC23COQR_1254	44HB-F254	11/27/2023	F	F	HOR	YES
OtsAC23COQR_1255	44HB-F255	11/27/2023	F	F	HOR	YES
OtsAC23COQR_1256	44HB-F256	11/27/2023	F	F	HOR	YES
OtsAC23COQR_1257	44HB-F257	11/27/2023	F	F	HOR	YES
OtsAC23COQR_1258	44HB-F258	11/27/2023	F	F	HOR	YES
OtsAC23COQR_1259	44HB-F259	11/27/2023	F	F	HOR	YES
OtsAC23COQR_1260	44HB-F260	11/27/2023	F	F	HOR	YES

OtsAC23COQR_1261	44HB-F261	12/5/2023	F	F	HOR	YES
OtsAC23COQR_1262	44HB-F262	12/5/2023	F	F	HOR	YES
OtsAC23COQR_1263	44HB-M263	12/5/2023	M	M	HOR	YES
OtsAC23COQR_1264	44HB-M264	12/5/2023	M	M	HOR	YES

Table A2. Adult migration timing genotypes of the 301 *O. tshawytscha* that passed quality filtering in this study. Analyses incorporated all 31 adult migration timing markers in the panel that passed quality filtering, below we report a subset of 19 markers located in the core of the *greb1l – rock1* region. We detected 17 individuals with heterozygous early- and late- migration alleles (highlighted in yellow). The remaining 284 samples harbored predominantly homozygous late-migration alleles consistent with fall Chinook salmon. Missing genotype indicated by 0.

Sample	Ots28_11023212	Ots28_11025336	Ots28_11033282	Ots28_11070757	Ots28_11071377	Ots28_11072994	Ots28_11073102	Ots37124-12277401	Ots28_11073668	Ots28_11075348	Ots28_11075712	Ots28_11077016	Ots28_11077172	Ots28_11077576	Ots28_11095755	Ots37124-12310649	Ots28_11160599	Ots28_11164637	Ots28_11201129
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0001	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0002	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0003	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0004	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0005	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0006	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0007	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0008	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0009	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0010	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0011	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0012	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0013	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	A	G	C	T
R_0014	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0015	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0016	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0017	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	A	G	C	T
R_0018	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0019	G	A	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	A	G	C	T
R_0020	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0021	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0022	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0023	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0024	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0025	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0026	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0027	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0028	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0029	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0030	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0031	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	0	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0032	G	0	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0033	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0034	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0035	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0036	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0037	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0038	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	A	G	C	T
R_0039	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0040	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	A	G	C	T
R_0041	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0042	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0043	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0044	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0045	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0046	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	A	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0048	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0049	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0050	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
R_0051	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	A	G	C	T
R_0052	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0053	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0054	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0056	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0057	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	G
OtsAC23COQ	A	A	G	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0058	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0059	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0060	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0101	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0102	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0103	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0105	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0106	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0107	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0108	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	G
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0109	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0110	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
R_0111	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0112	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0113	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0114	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
R_0115	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0117	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0118	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0119	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0120	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0121	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0122	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0123	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0124	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0125	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0126	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0127	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0128	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0129	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0130	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0131	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0132	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0133	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0134	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0135	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0136	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0137	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0138	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0140	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0141	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0142	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0143	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0144	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0145	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0146	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0147	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0148	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0149	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0151	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0152	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0153	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0154	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0155	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0156	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0157	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0158	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0159	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0160	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0161	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0162	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0163	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0164	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0165	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0166	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0167	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0168	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0169	G	A	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0170	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0171	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0172	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0173	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0174	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0175	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0176	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0178	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0179	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0180	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0181	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0182	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0183	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0184	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0185	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0187	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0188	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0189	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0190	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0191	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0192	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0194	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0195	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0196	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0197	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0198	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0199	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0200	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0201	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	A	G	C	T
R_0202	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0203	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0204	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0205	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0206	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0207	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0208	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0209	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0210	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0211	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0212	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0213	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0214	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0215	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0216	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0217	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0218	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0219	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0220	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0221	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0222	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0223	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0224	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0225	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0226	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
R_0227	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0228	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0229	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0230	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0231	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0232	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0233	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0234	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0235	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0236	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	A	G	C	T
R_0237	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	A	G	C	T
R_0238	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0240	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0241	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0242	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0243	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0244	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0245	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
R_0246	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0247	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0248	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0249	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0250	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0251	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0252	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	A	G	C	T
R_0253	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	A	G	C	T
R_0254	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0255	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0256	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0257	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0258	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0259	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0260	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0261	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0262	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0263	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0264	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0265	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0266	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
R_0267	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0268	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0269	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0270	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0271	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0272	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0273	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0274	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0275	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	A	G	C	T
R_0276	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	A	G	C	T
R_0277	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0278	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0279	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	A	G	C	T
R_0280	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0281	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0282	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0283	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_0284	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0285	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0286	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0296	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0297	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_0298	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1201	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1202	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1203	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1204	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1205	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1206	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1207	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1208	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1209	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1210	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1211	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1212	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1213	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1216	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1217	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1218	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	G
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1219	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1220	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1221	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1222	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1223	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1224	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1225	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1226	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1227	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1228	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1229	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G

OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1230	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1231	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1232	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1233	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1234	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1235	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1236	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1237	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1238	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1239	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1240	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1241	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	A	A	G	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1242	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1243	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1244	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1245	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	A	A	G	A	T	C	T	T	T	G	C	C	G	A	A	T	G	C	T
R_1246	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
R_1247	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1248	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1249	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1250	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1251	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1252	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T

OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1253	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
R_1254	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	A	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1255	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1256	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	T	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1257	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1258	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	A	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1259	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1260	G	C	A	G	C	T	A	A	A	A	T	T	A	G	T	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1261	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1262	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1263	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	G
OtsAC23COQ	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T
R_1264	G	C	A	G	C	T	A	A	A	A	T	T	A	G	A	T	G	C	T