

***In Silico* Chromosome Mapping of the Male-Specific/Linked Loci in the Jade Perch (*Scortum barcoo*) Suggests Chromosome 19 as the Putative Y Sex Chromosome**

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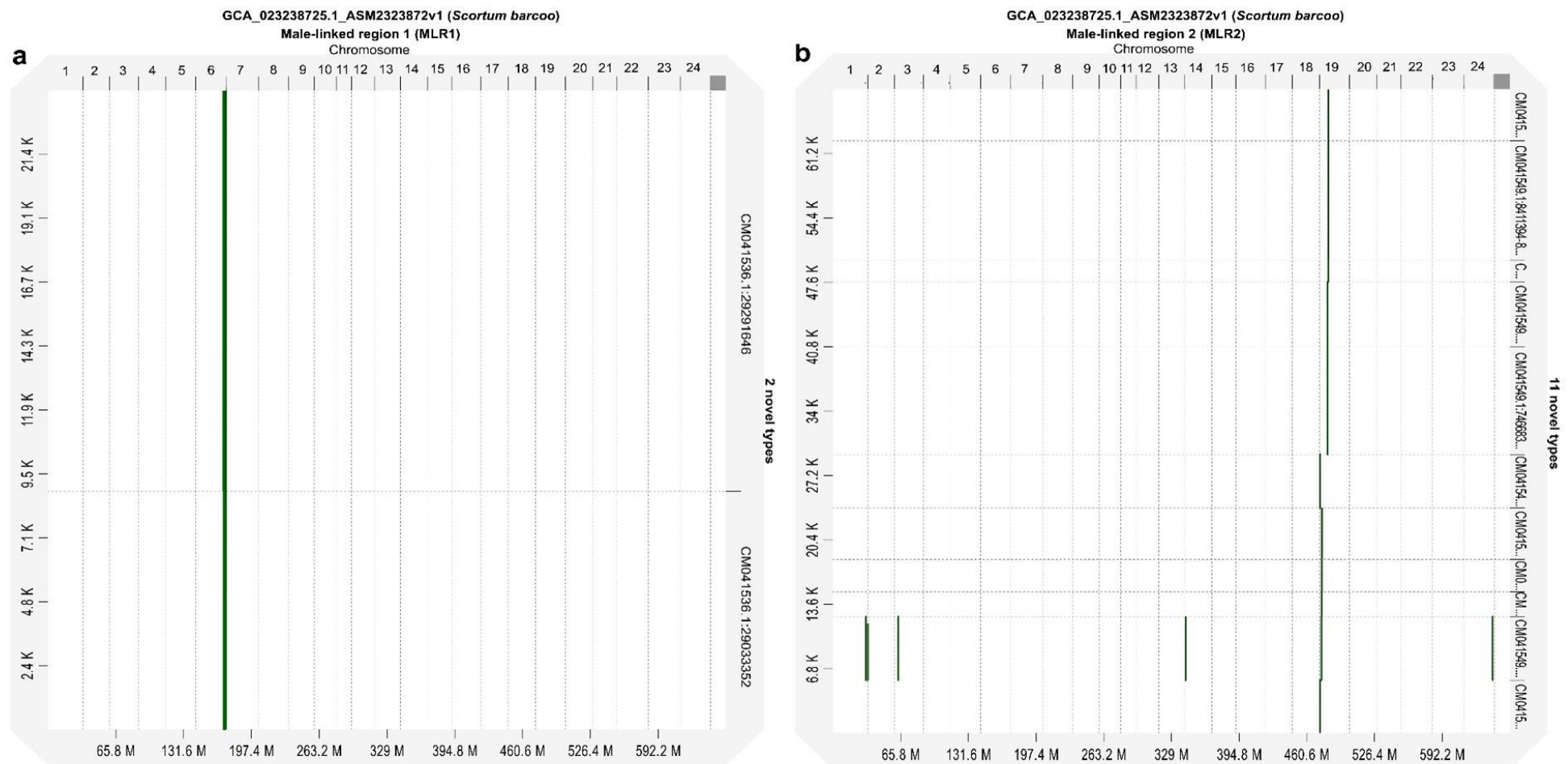


Figure S1. (a) The 2 novel repetitive element types from the MLR1 were located on chromosome 6 of jade perch (*Scortum barcoo* (McCulloch and Waite, 1917)). (b) The 11 novel repetitive element types from the MLR2 were predominantly located on chromosome 19 of jade perch and a few copy numbers on chromosome 1, 3, 14 and 24.

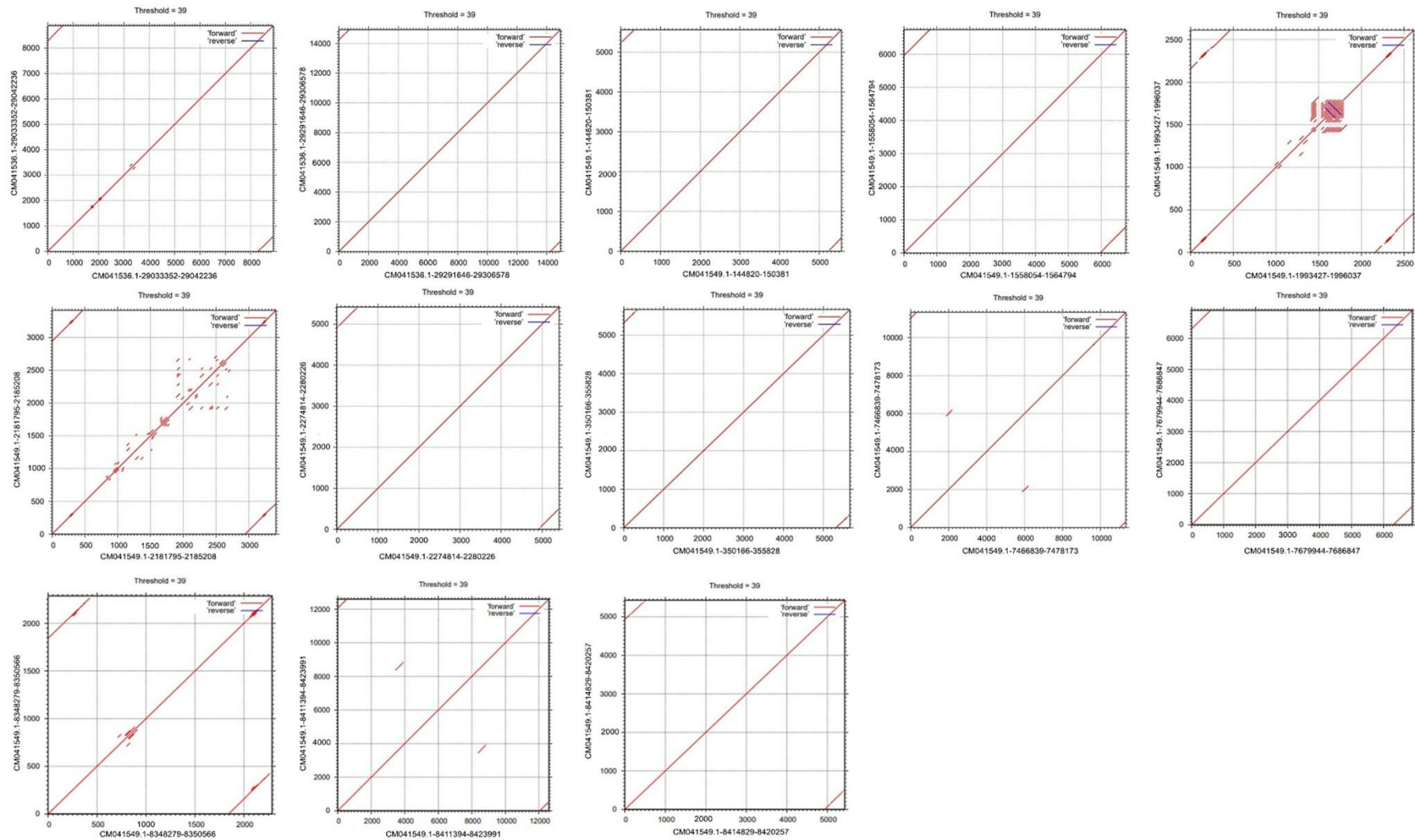


Figure S2. Dot matrix analysis showing that only 1 (ID: CM041549.1:1993427–1996037) of the 13 novel repetitive element types was tentatively composed of tandem-arrayed repetitive sequences.

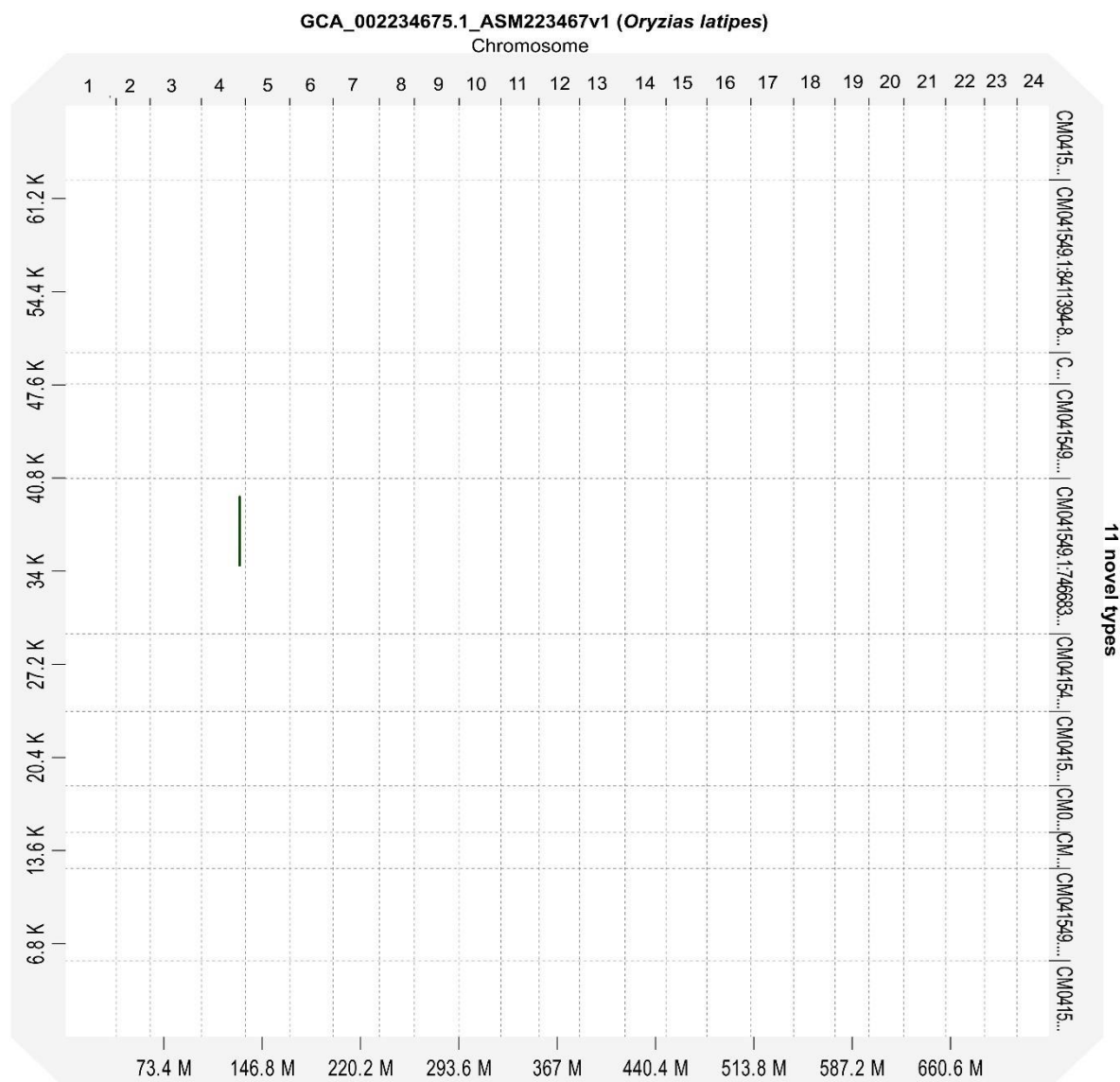


Figure S3. The novel repetitive element (ID: CM041549.1:7466839–7478173) from the MLR2 on chromosome 19 of jade perch (*Scortum barcoo* (McCulloch and Waite, 1917)) was distributed in the medaka genome with low copy numbers.

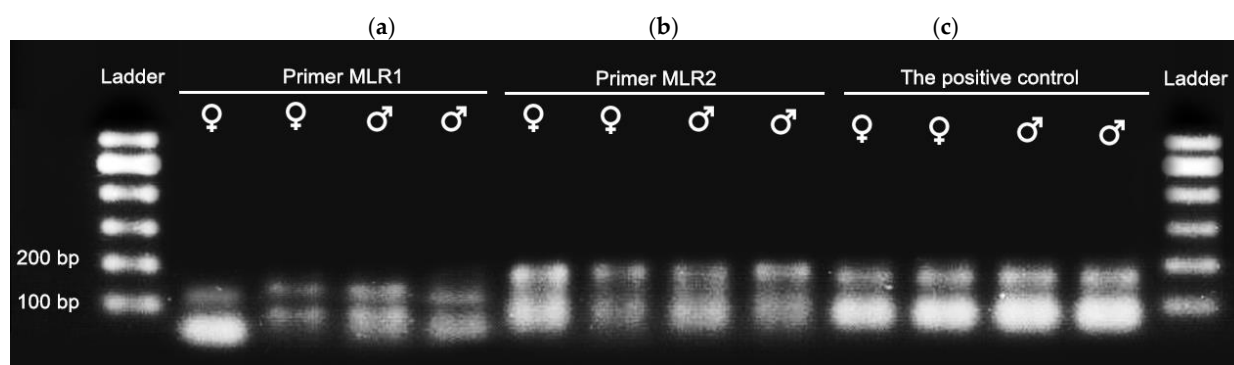


Figure S4. Agarose gel electrophoresis of PCR products in the validation test in male and female individuals of jade perch (*Scortum barcoo* (McCulloch and Waite, 1917)). (a) Primer MLR1 (136 bp) (b) Primer MLR2 (138 bp) and (c) The positive control (141 bp).

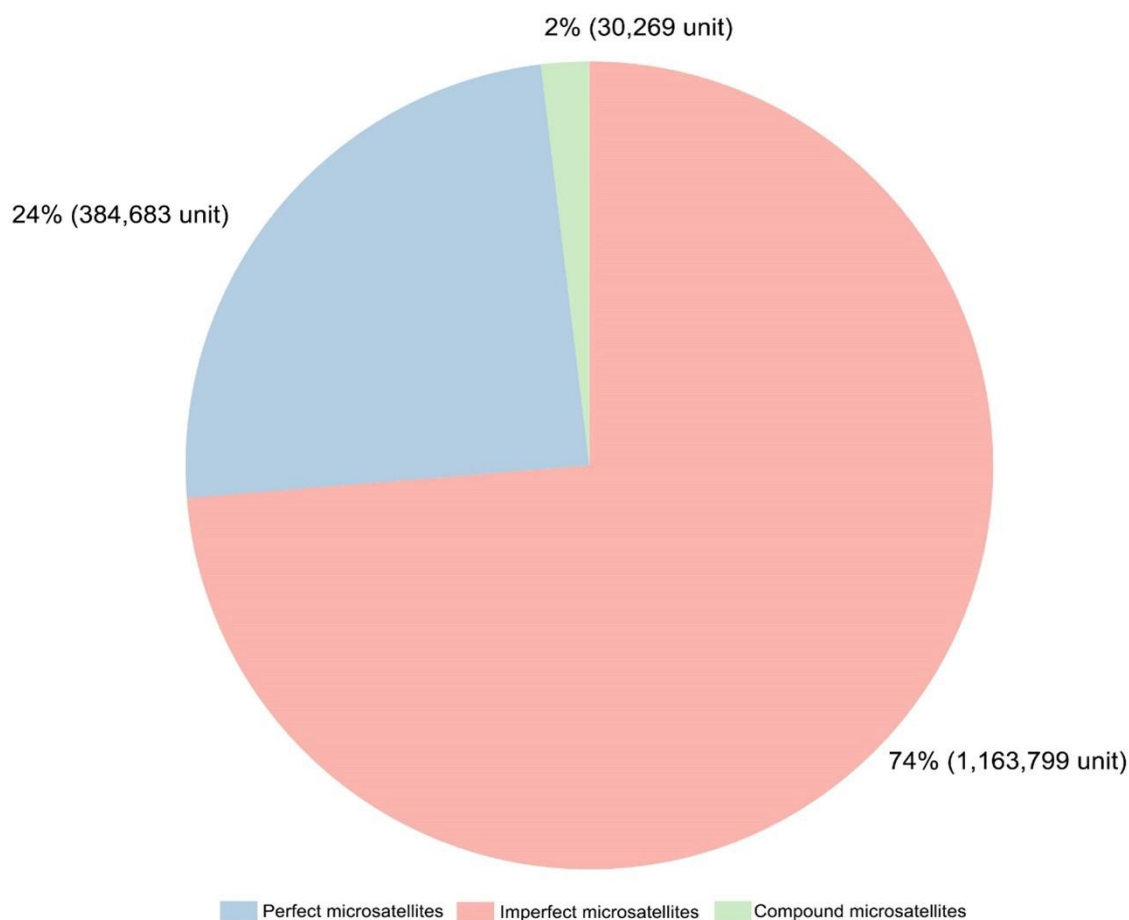


Figure S5. Pie diagram showing the portion of each microsatellite type in the jade perch (*Scortum barcoo* (McCulloch and Waite, 1917)).

Table S1. List of gonadal genes implicated in sex determination/differentiation of teleosts. [111].

| Gene Name | Gene Description |
|-----------------------|--|
| <i>cyp19a1</i> | Aromatase a (gonad isoform) |
| <i>hsd11b3</i> | 11 β -Hydroxysteroid dehydrogenase type 3 |
| <i>hsd17b1</i> | 17 β -Hydroxysteroid dehydrogenase type 1 |
| <i>srd5a2</i> | 5 α -reductase 2 |
| <i>srd5a3</i> | 5 α -reductase 3 |
| <i>arb</i> | Androgen receptor beta |
| <i>ara/ar</i> | Androgen receptor/Androgen receptor alpha |
| <i>amh</i> | Anti-Müllerian hormone or Müllerian-inhibiting substance |
| <i>amhr2</i> | Anti-Müllerian hormone receptor 2 |
| <i>ctnnb1</i> | Catenin (cadherin-associated protein), beta 1 |
| <i>cyp11a2</i> | Cytochrome P450, family 11, subfamily A, polypeptide 2/11alpha-hydroxylase |
| <i>cyp11c1/cyp11b</i> | Cytochrome P450, family 11, subfamily C, polypeptide 1/11beta-hydroxylase |
| <i>cyp26a1</i> | Cytochrome P450, family 26, subfamily a, polypeptide 1 |
| <i>ddx11</i> | DEAD/H box helicase 11 |
| <i>dhh</i> | Desert hedgehog |
| <i>dnmt1</i> | DNA methyltransferase 1 |
| <i>dnmt3aa</i> | DNA methyltransferase 3aa |

| | |
|---------------------|--|
| <i>dnmt3abc1</i> | DNA methyltransferase 3ab_contig 1 |
| <i>dax1</i> | Dosage-sensitive sex reversal, adrenal hypoplasia critical region, on chromosome X, gene 1 |
| <i>dmrt3/dmrt3a</i> | Double sex and mab-3 related transcription factor 3(a) |
| <i>dmrt1</i> | Doublesex- and mab-3-related transcription factor 1 |
| <i>dmrt2/dmrt2a</i> | Doublesex- and mab-3-related transcription factor 2(a) |
| <i>esr1/er</i> | Estrogen receptor |
| <i>esr2b/esrrb2</i> | Estrogen receptor 2b |
| <i>esrrb</i> | Estrogen related receptor beta |
| <i>esrra1</i> | Estrogen-related receptor alpha |
| <i>figla</i> | Factor in the germline alpha |
| <i>fgf20b</i> | Fibroblast growth factor 20-like/b |
| <i>fgf9</i> | Fibroblast growth factor 9 |
| <i>fst/fsta</i> | Follistatin |
| <i>fstl5</i> | Follistatin-like 5 |
| <i>foxl2</i> | Forkhead box L2 |
| <i>gata-4</i> | Gata-binding protein 4 |
| <i>nr3c1</i> | Glucocorticoid receptor |
| <i>gsdf</i> | Gonadal soma derived factor |
| <i>gdf9</i> | Growth and differentiation factor 9 |
| <i>ep300a</i> | Histone acetyltransferase—E1A binding protein 300a |
| <i>kat2b</i> | Histone acetyltransferase—K(lysine) acetyltransferase 2b |
| <i>hdac10</i> | Histone deacetylase 10 |
| <i>hdac11</i> | Histone deacetylase 11 |
| <i>hdac2</i> | Histone deacetylase 2 |
| <i>hdac7</i> | Histone deacetylase 7 |
| <i>hdac8</i> | Histone deacetylase 8 |
| <i>lhr</i> | Luteinizing hormone receptor |
| <i>lhb</i> | Luteinizing hormone, beta polypeptide |
| <i>nr3c2</i> | Mineralocorticoid receptor |
| <i>pdgfaa1</i> | Platelet-derived growth factor alpha a |
| <i>pdgfab</i> | Platelet-derived growth factor alpha b |
| <i>pdgfb</i> | Platelet-derived growth factor beta a |
| <i>pdgfra</i> | Platelet-derived growth factor receptor, alpha |
| <i>pdgfrb2</i> | Platelet-derived growth factor receptor, beta 2 |
| <i>raraa</i> | Retinoid acid receptor alpha a |
| <i>rarab</i> | Retinoid acid receptor alpha b |
| <i>rarb</i> | Retinoid acid receptor beta |
| <i>sox10</i> | SRY-related HMG box 10 |
| <i>sox3</i> | SRY-related HMG box 3 |
| <i>sox9</i> | SRY-related HMG box 9 |
| <i>srd5a1</i> | Steroid-5-alpha-reductase, alpha polypeptide 1 |
| <i>star-like</i> | Steroidogenic acute regulatory protein |
| <i>sf1/ftz-f11</i> | Steroidogenic factor-1/fushi tarazu factor-1 |
| <i>stra6</i> | Stimulated by retinoic acid gene 6 |
| <i>tdrd1</i> | Tudor domain containing 1 |
| <i>tdrd7</i> | Tudor domain containing 7 |
| <i>wt1</i> | Wilms tumor protein 1a |
| <i>wt1b</i> | Wilms tumor protein 1b |
| <i>wnt4a</i> | Wingless-type MMTV integration site family, member 4a |

Table S2. Summary of perfect, imperfect, and compound microsatellites detected in the genome of jade perch (*Scortum barcoo* (McCulloch and Waite, 1917)) [112].

| Item | Description | Perfect Microsatellite | Compound Microsatellite | Imperfect Microsatellite |
|---|---|---------------------------|----------------------------|-----------------------------|
| Total number of microsatellites | Counts | 384683 | 30269 | 1163799 |
| Total length of microsatellites | Bp | 8420473 | 2078486 | 38147048 |
| The average length of microsatellites | Total microsatellite length/total microsatellite count (bp) | 21.89 | 68.67 | 32.78 |
| Microsatellites per sequence | Total microsatellite counts/sequence counts | 306 | 24.1 | 925 |
| The percentage of sequence covered by microsatellites | Total microsatellite length/total sequence length (%) | 1.28 | 0.32 | 5.80 |
| Relative abundace | Total microsatellites/total valid length (loci/Mb) | 584.88 | 46.02 | 1769.48 |
| Relative density | Total microsatellite length/total valid length (bp/Mb) | 12802.75 | 3160.19 | 57999.96 |

Table S3. Details of perfect microsatellites in each chromosome of jade perch (*Scortum barcoo* (McCulloch and Waite, 1917)) [112].

| Chromosome | Length | Type | Mono | Di | Tri | Tetra | Penta | Hexa | Total |
|---------------|---------------|---------------|---------|----------|---------|---------|--------|-------|----------|
| Chromosome 1 | 34,089,642 bp | Counts | 4639.00 | 10407.00 | 1689.00 | 1514.00 | 267.00 | 78.00 | 18594.00 |
| | | RA* (loci/Mb) | 136.15 | 305.43 | 49.57 | 44.43 | 7.84 | 2.29 | 545.71 |
| | | RD** (bp/Mb) | 2041.67 | 7438.23 | 1022.83 | 1239.92 | 217.47 | 59.87 | 12019.99 |
| Chromosome 2 | 25,388,734 bp | Counts | 3745.00 | 9685.00 | 2051.00 | 1577.00 | 272.00 | 78.00 | 17408.00 |
| | | RA* (loci/Mb) | 147.67 | 381.88 | 80.87 | 62.18 | 10.73 | 3.08 | 686.41 |
| | | RD** (bp/Mb) | 2184.99 | 9402.38 | 1516.25 | 1556.55 | 297.11 | 79.25 | 15036.53 |
| Chromosome 3 | 28,580,765 bp | Counts | 3925.00 | 7402.00 | 1661.00 | 1382.00 | 245.00 | 78.00 | 14693.00 |
| | | RA* (loci/Mb) | 137.44 | 259.19 | 58.16 | 48.39 | 8.58 | 2.73 | 514.49 |
| | | RD** (bp/Mb) | 2038.04 | 6284.11 | 1155.34 | 1232.17 | 227.96 | 67.44 | 11005.06 |
| Chromosome 4 | 26,020,793 bp | Counts | 4003.00 | 7254.00 | 1252.00 | 1231.00 | 204.00 | 54.00 | 13998.00 |
| | | RA* (loci/Mb) | 153.86 | 278.81 | 48.12 | 47.31 | 7.84 | 2.08 | 538.02 |
| | | RD** (bp/Mb) | 2293.97 | 6703.49 | 927.17 | 1259.75 | 211.20 | 57.88 | 11453.46 |
| Chromosome 5 | 29,404,732 bp | Counts | 4129.00 | 9878.00 | 1484.00 | 1403.00 | 241.00 | 56.00 | 17191.00 |
| | | RA* (loci/Mb) | 140.45 | 336.01 | 50.48 | 47.72 | 8.20 | 1.90 | 584.76 |
| | | RD** (bp/Mb) | 2105.20 | 8123.69 | 1001.91 | 1278.87 | 217.87 | 48.78 | 12776.32 |
| Chromosome 6 | 29,333,790 bp | Counts | 4016.00 | 8390.00 | 1403.00 | 1361.00 | 245.00 | 64.00 | 15479.00 |
| | | RA* (loci/Mb) | 136.95 | 286.11 | 47.84 | 46.41 | 8.35 | 2.18 | 527.84 |
| | | RD** (bp/Mb) | 2049.22 | 7212.53 | 967.88 | 1219.04 | 231.72 | 61.18 | 11741.57 |
| Chromosome 7 | 31,353,791 bp | Counts | 4477.00 | 8920.00 | 1657.00 | 1505.00 | 266.00 | 69.00 | 16894.00 |
| | | RA* (loci/Mb) | 142.82 | 284.55 | 52.86 | 48.01 | 8.49 | 2.20 | 538.93 |
| | | RD** (bp/Mb) | 2127.07 | 6912.58 | 1109.74 | 1245.77 | 241.96 | 56.65 | 11693.77 |
| Chromosome 8 | 28,981,091 bp | Counts | 4086.00 | 9514.00 | 1443.00 | 1382.00 | 299.00 | 60.00 | 16784.00 |
| | | RA* (loci/Mb) | 141.01 | 328.34 | 49.80 | 47.69 | 10.32 | 2.07 | 579.23 |
| | | RD** (bp/Mb) | 2099.28 | 8157.69 | 994.75 | 1245.85 | 269.36 | 51.35 | 12818.28 |
| Chromosome 9 | 25,371,961 bp | Counts | 3854.00 | 7572.00 | 1338.00 | 1303.00 | 186.00 | 50.00 | 14303.00 |
| | | RA* (loci/Mb) | 151.94 | 298.53 | 52.75 | 51.37 | 7.33 | 1.97 | 563.89 |
| | | RD** (bp/Mb) | 2273.93 | 7373.15 | 1044.37 | 1300.24 | 189.04 | 49.91 | 12230.64 |
| Chromosome 10 | 21,204,719 bp | Counts | 3643.00 | 7586.00 | 1094.00 | 975.00 | 182.00 | 48.00 | 13528.00 |
| | | RA* (loci/Mb) | 171.85 | 357.84 | 51.61 | 45.99 | 8.59 | 2.26 | 638.14 |
| | | RD** (bp/Mb) | 2580.99 | 8529.56 | 1032.77 | 1122.49 | 247.41 | 56.04 | 13569.26 |

| | | | | | | | | | |
|---------------|---------------|---------------|---------|----------|---------|---------|--------|--------|----------|
| Chromosome 11 | 14,856,011 bp | Counts | 2714.00 | 4866.00 | 922.00 | 683.00 | 116.00 | 48.00 | 9349.00 |
| | | RA* (loci/Mb) | 182.72 | 327.60 | 62.07 | 45.98 | 7.81 | 3.23 | 629.41 |
| | | RD** (bp/Mb) | 2716.13 | 7860.09 | 1232.44 | 1107.89 | 207.70 | 86.44 | 13210.69 |
| Chromosome 12 | 22,123,342 bp | Counts | 3435.00 | 7619.00 | 1171.00 | 1017.00 | 167.00 | 47.00 | 13456.00 |
| | | RA* (loci/Mb) | 155.29 | 344.44 | 52.94 | 45.98 | 7.55 | 2.12 | 608.32 |
| | | RD** (bp/Mb) | 2318.42 | 8450.06 | 1028.85 | 1163.30 | 212.70 | 57.78 | 13231.11 |
| Chromosome 13 | 25,320,191 bp | Counts | 3613.00 | 8210.00 | 1401.00 | 1219.00 | 228.00 | 100.00 | 14771.00 |
| | | RA* (loci/Mb) | 142.76 | 324.40 | 55.36 | 48.17 | 9.01 | 3.95 | 583.65 |
| | | RD** (bp/Mb) | 2117.26 | 7990.22 | 1111.18 | 1273.74 | 244.58 | 108.82 | 12845.80 |
| Chromosome 14 | 26,191,718 bp | Counts | 3956.00 | 9425.00 | 1310.00 | 1148.00 | 197.00 | 70.00 | 16106.00 |
| | | RA* (loci/Mb) | 151.06 | 359.89 | 50.02 | 43.84 | 7.52 | 2.67 | 615.00 |
| | | RD** (bp/Mb) | 2248.41 | 8840.83 | 993.18 | 1111.01 | 222.42 | 68.50 | 13484.35 |
| Chromosome 15 | 23,334,781 bp | Counts | 3717.00 | 7032.00 | 1295.00 | 1133.00 | 179.00 | 39.00 | 13395.00 |
| | | RA* (loci/Mb) | 159.32 | 301.40 | 55.51 | 48.56 | 7.67 | 1.67 | 574.13 |
| | | RD** (bp/Mb) | 2386.59 | 7265.34 | 1083.46 | 1261.68 | 199.74 | 42.95 | 12239.76 |
| Chromosome 16 | 28,737,736 bp | Counts | 4052.00 | 9540.00 | 1741.00 | 1320.00 | 211.00 | 54.00 | 16918.00 |
| | | RA* (loci/Mb) | 141.04 | 332.05 | 60.60 | 45.94 | 7.34 | 1.88 | 588.85 |
| | | RD** (bp/Mb) | 2082.72 | 8133.94 | 1249.38 | 1219.62 | 207.97 | 50.96 | 12944.59 |
| Chromosome 17 | 26,059,279 bp | Counts | 3796.00 | 8267.00 | 1527.00 | 1203.00 | 232.00 | 62.00 | 15087.00 |
| | | RA* (loci/Mb) | 145.78 | 317.48 | 58.64 | 46.20 | 8.91 | 2.38 | 579.39 |
| | | RD** (bp/Mb) | 2168.53 | 7750.60 | 1224.78 | 1243.79 | 257.49 | 60.37 | 12705.56 |
| Chromosome 18 | 26,786,799 bp | Counts | 3880.00 | 8516.00 | 1639.00 | 1297.00 | 257.00 | 56.00 | 15645.00 |
| | | RA* (loci/Mb) | 144.96 | 318.17 | 61.24 | 48.46 | 9.60 | 2.09 | 584.52 |
| | | RD** (bp/Mb) | 2171.43 | 7777.98 | 1235.52 | 1191.09 | 265.64 | 54.47 | 12696.13 |
| Chromosome 19 | 28,821,003 bp | Counts | 4257.00 | 11169.00 | 1668.00 | 1662.00 | 383.00 | 87.00 | 19226.00 |
| | | RA* (loci/Mb) | 147.79 | 387.75 | 57.91 | 57.70 | 13.30 | 3.02 | 667.47 |
| | | RD** (bp/Mb) | 2202.46 | 9533.55 | 1196.46 | 1457.52 | 340.91 | 82.28 | 14813.18 |
| Chromosome 20 | 26,975,690 bp | Counts | 3737.00 | 8478.00 | 1454.00 | 1229.00 | 248.00 | 54.00 | 15200.00 |
| | | RA* (loci/Mb) | 138.58 | 314.39 | 53.92 | 45.58 | 9.20 | 2.00 | 563.67 |
| | | RD** (bp/Mb) | 2059.36 | 7714.25 | 1094.48 | 1246.60 | 258.29 | 53.62 | 12426.60 |
| Chromosome 21 | 23,337,218 bp | Counts | 3693.00 | 7754.00 | 1247.00 | 1186.00 | 231.00 | 44.00 | 14155.00 |
| | | RA* (loci/Mb) | 158.28 | 332.32 | 53.44 | 50.83 | 9.90 | 1.89 | 606.66 |
| | | RD** (bp/Mb) | 2349.83 | 8075.18 | 1071.16 | 1242.20 | 257.15 | 49.37 | 13044.89 |
| Chromosome 22 | 30,119,946 bp | Counts | 4216.00 | 9784.00 | 1352.00 | 1500.00 | 232.00 | 75.00 | 17159.00 |
| | | RA* (loci/Mb) | 140.00 | 324.90 | 44.90 | 49.81 | 7.70 | 2.49 | 569.80 |
| | | RD** (bp/Mb) | 2100.12 | 7985.60 | 899.10 | 1352.49 | 227.14 | 66.75 | 12631.20 |
| Chromosome 23 | 31,126,834 bp | Counts | 4180.00 | 11016.00 | 1877.00 | 1514.00 | 272.00 | 68.00 | 18927.00 |
| | | RA* (loci/Mb) | 134.31 | 353.97 | 60.31 | 48.65 | 8.74 | 2.18 | 608.16 |
| | | RD** (bp/Mb) | 1996.64 | 8668.52 | 1202.74 | 1271.54 | 249.99 | 56.87 | 13446.30 |
| Chromosome 24 | 29,328,985 bp | Counts | 4084.00 | 8535.00 | 1537.00 | 1336.00 | 202.00 | 45.00 | 15739.00 |
| | | RA* (loci/Mb) | 139.32 | 291.17 | 52.43 | 45.58 | 6.89 | 1.54 | 536.93 |
| | | RD** (bp/Mb) | 2086.89 | 7120.80 | 1032.34 | 1249.69 | 186.61 | 39.50 | 11715.83 |

Note: Relative abundance (RA*), Relative density (RD**).

References

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