Supplementary Material

Table S1: Table showing key temporal kinematic, linear kinematic, biomechanical, and angular variables for the different horse gaits (i.e. walk, flat walk, running walk, fox walk, broken trot, trot, rack, broken pace, hard pace, canter, and gallop) [Sources of data given in references below].

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gait | Walk | Lateral Flat Walk (Flat-Foot(ed) Walk) | Running Walk | Diagonal Flat Walk (Fox Walk; Dog Walk) | Fox Trot (Broken Trot) | Trot  (Flying Trot) | Rack (Tölt; Singlefoot) | Stepping Pace  (Amble; Broken Pace) | Pace  (Flying Pace; Hard Pace) |
| Beats  (audible) | Four | Four | Four | Four | Four | Two | Four | Four | Two |
| Sequence (temporal) | Lateral | Lateral | Lateral | Lateral | Lateral | Diagonal | Lateral | Lateral | Lateral |
| Couplets  (temporal) | None  Isolated(single-foot) | Lateral to Isolated (single-foot) [Ideal] | Lateral to Isolated (single-foot) [Ideal] | Diagonal to Isolated (single-foot) [Ideal] | Diagonal | Diagonal | Lateral to Isolated (single-foot) [Ideal] |  |  |
| Chronicity  Audible Step Time Ratio | Even  (0.80-0.93) | Uneven to Even (Ideal)  (0.63-0.67) | Uneven  to Even (Ideal)  (0.62-0.88) | Uneven to Even [Ideal]  (0.94) | Uneven [Shuffled]  (0.17-0.48) | Even  (0.84-  0.97) | Uneven to Even  (0.70-0.92) | Uneven [Shuffled]  (0.36-0.54; | Even  (0.74-0.89) |
| Biomechanics | Inverted Pendulum | Inverted Pendulum; Hind Leg Outstretch and Push | Inverted Pendulum; Hind Leg Outstretch and Push | Inverted Pendulum; Hind Leg Outstretch and Push | Spring-Mass | Spring-Mass | Spring-Mass | Spring-Mass | Spring-Mass |
| Velocity (meters/  second) | 1.40-1.80 | 1.80-  2.20 | 2.20-  4.00 | 1.80 | 3.20-3.70 | 2.50-6.50  (8.5-12.0 racing) | 2.50-5.98  (10.6 racing) | 2.90-6.20 | 3.50-8.10  (10.5-14.0 racing) |
| Stride Duration (seconds) | 1.30-1.00 | 1.10-  0.95 | 0.85-0.65 | 1.15-1.20 | 0.67-0.58 | 0.80-0.56  (0.55-0.46 racing) | 0.70-0.42 | 0.61-0.45 | 0.60-0.30 |
| Front Stance/  Stride Duration (%) | 0.68-  0.59 | 0.61-  0.57 | 0.51-  0.46 | 0.57 | 0.57-0.48 | 0.66-  0.27 | 0.59-0.34 | 0.54-0.38 | 0.44-0.28 |
| Hind Stance/  Stride Duration [Duty Factor] (%) | 0.69-  0.57 | 0.59-  0.61 | 0.58-  0.52 | --- | 0.59-0.55 | 0.58-  0.27 | 0.66-0.32 | 0.55-0.41 | 0.46-0.28 |
| Overlap of Ipsilateral Limbs in Swing Phase (%) | 0.33-  0.39 | 0.32-  0.35 | 0.52-  0.70 | --- | 0.20-0.40 | 0.04-  0.13 | 0.50-  0.70 | 0.68-0.89 | 0.76-0.99 |
| Lateral Advanced Placement [Limb Phasing Value]  (% of stride duration) | 0.25-  0.22 | 0.20-  0.18 | 0.23-  0.17 | 0.30 | 0.41-0.32 | 0.49-  0.44 | 0.24-  0.18 | 0.18-  0.13 | 0.10-0.05 |
| Lateral Advanced Liftoff  (% of stride duration) | 0.25- 0.24 | 0.23-  0.21 | 0.19-  0.10 | ---- | 0.36-0.33 | 0.49-  0.46 | 0.22-0.10 | 0.16-0.10 | 0.12-0.07 |
| Diagonal Advanced Placement  (% of stride duration) | 0.28-  0.25 | 0.30-  0.29 | 0.35-  0.27 | 0.32 | 0.20-0.07 | 0.06-  0.01 | 0.34-0.24 | 0.37-0.33 | 0.45-0.40 |
| Diagonal Advanced Liftoff  (% of stride duration) | 0.27-  0.25 | 0.31-0.27 | 0.48-  0.31 | --- | 0.19-0.14 | 0.04-  0.01 | 0.35-  0.26 | 0.44-0.34 | 0.50-0.34 |
| Stride Length (meters) | 1.40-  1.90 | 1.80-  2.40 | 2.10-  2.90 | 1.95 | 2.00-  2.50 | 2.00-3.80  (4.50-6.00 racing) | 1.80-3.20  (4.15-4.60 racing) | 2.00-3.10 | 2.10-3.50  (5.40-6.30 racing) |
| Overstep Length (cm) | -4 to 25 | 28-45 | 36-72 | --- | 13-17 | -21 to 39  (193 racing) | 26-101 | 67-90 | 71-77  (153 racing) |
| Average Interior Straddle  (Range) (cm) | 2.6  (0,0-  6.4) | -0.2  (-1.0 to 1.0) | 0.1  (-0.7 to 2.5) | --- | ca. 8.3  (3.8-11.4) | 1.9  (0.0-  6.4) | -2.9  (-8.9 to 5.8) | -2.5  (-3.9 to 2.0) | 1.4  (-2.3 to 5.0 |
| Overstep Length/Stride Length (ratio) | -0.03 to 0.14 | 0.14-0.23 | 0.18-  0.28 | --- | 0.05-0.09 | -0.11 to  0.11  (0.30-0.35 racing) | 0.16-0.45 | 0.31-0.41 | 0.26-0.37 |
| Head Vertical Displacement (Nod) (cm) | 2.0-10.5 | 11.0-18.5 | 10.0-  24.0 | 15.0 | 12.0 | 6.0-  8.0 | 5.5-  7.5 | ca. 6.0 | 5.0 |
| Shoulders (Withers; Sternum) Vertical Displacement (cm) | 2.7-3.6 | 8.2-10.7 cm | --- | --- | --- | 4.7-9.2 | 5.4-7.0 | ca. 4.0-4.7 | ca. 4.0-4.7 |
| Center of Mass (Saddle; Loin) Vertical Displacement (cm) | ca. 3.0-5.9 | 7.5-9.3 | --- | --- | --- | 5.3-10.3 | 1.2-5.2 | --- | --- |
| Croup (Sacrum) Vertical Displacement  (cm) | 3.0-  7.0 | 8.0-  11.0 | ca. 3.0-  6.0 | --- | ca. 4.0-8.0 | 5.0-  13.0 | 3.0-  6.5 | ca. 4.0 | 4.0-  4.5 |
| Front Leg Protraction/Retraction Angles (degrees from perpendicular line at scapula) | 64.6-72.3/  102.4-116.1 | **---/---** | ca. 65.0-75.0/  ca. 110.0-120.0 | 68.0/  125.0 | 62.0/  126.0 | 63.7-  72.7/  101.0-  115.0 | 68.2-71.2/  112.0-120.2 | ca. 70.0/  115.0 | ca. 50.0-57.0/  ca. 125.0-130.0 |
| Hind Leg Protraction/Retraction Angles (degrees) | 66.9-71.2/  107.5-113.6 | ca. 60.0-70.0/  ca. 110.0-115.0 | ca. 55.0-65.0/  ca. 120.0 | ---/--- | 66.9-  68.6/  106.5-108.1 | 65.5-  80.0/  106.9-  120.0 | 64.9-67.2/  105.4-106.7 | ca. 64.0-68.0/  ca. 110.0-113.0 | ca. 50.0-55.0/  ca. 118.0-130.0 |
| Shoulder Angle Midstance/  Elevated (degrees) | 113.1-119.2/  119.2-126.2 | 101.3-101.5/  108.5-108.8 | ---/--- | 103.0/110.0 | 100.0-104.0/  113.0-120.0 | 122.7-125.4/  110.1-  115.0 | ---/--- | ---/--- | ---/--- |
| Hip Angle Midstance/Elevated (degrees) | 111.1-111.3/  86.3-107.7 | 100.9-111.5/  80.1-  88.2 | ---/--- | ---/--- | ---/--- | 100.0-112.2/  71.3-88.9 | ---/--- | ---/--- | ---/--- |
| Elbow Angle Midstance/Elevated (degrees) | 145.3-156.6/  104.8-109.0 | 151.3-154.3/  97.0-  108.5 | ca. 140.0-150.0/  ca. 105.0-115.0 | 151.0/99.0 | 140.0-149.0/  97.0-115.0 | 155.5-166.1/  79.3-  95.3 | ca. 145.0/  88.8-90.3 | ca. 140.0-150.0/  ca. 90.0-115.0 | ca. 150.0/  ca. 90.0 |
| Stifle Angle Midstance/Elevated (degrees) | 159.7-173.0/  130.6-141.0 | 152.8-157.3/  115.7-124.0 | ca. 140.0-150.0/ca. 125.0-130.0 | ---/--- | ca. 135.0- 140.0-/ca. 115.0-120.0 | 150.0-169.0/  105.0-121.7 | ca. 147.0-155.0-/105.4-112.6 | ca. 135.0-140.0/  ca. 105.0-125.0 | ca. 135.0-/  ca. 115.0 |
| Knee (Carpal) Midstance/Elevated (degrees) | 170.0-180.5/  104.8-112.2 | 184.0-184.9/  128.4-131.4 | ca. 178.0-189.0  /ca. 120.0-127.0 | 185.0/147.0 | 180.0-184.0/  130.0-140.0 | 176.5-194.8/  92.1-  112.9 | ca. 172.0-180.0/  119.4-  122.4 | ca. 180.0-190.0/  ca. 90.0-120.0 | ca. 175.0-185.0/ca. 85.0-100.0 |
| Hock (Tarsus) Midstance/Elevated (degrees) | 154.0-169.6/  127.5-134.0 | 163.1-167.0/  121.8-127.0 | ca. 130.0-144.0/  ca. 95.0-120.0 | ---/--- | 144.7-145.6/  86.8-  90.8 | 151.6-169.7/  96.7-  114.3 | ca. 135.0-145.0/  93.0 | ca. 135.0-155.0/  ca. 107.0-110.0 | ca. 145.0/  ca. 80.0-95.0 |
| Front Fetlock Midstance/Elevated (degrees) | 220.0-221.1/  160.0-177.9 | 221.8-222.2/  165.5-175.4 | 240.0-242.0/  176.0-177.0 | 224.0/155.0 | 229.0-230.0/  139.7-160.0 | 215.0-243.7/  134.1  -158.7 | 235.9-236.6/  133.4-144.5 | ca. 215.0-240.0/  ca. 125.0-145.0 | ca. 260.0/ca. 135.0-160.0 |
| Hind Fetlock Midstance/Elevated (degrees) | 202.0-222.9/  143.0-147.7 | 214.8-216.2/  151.2-156.0 | ca. 225.0-242.0/  ca. 140.0-155.0 | ---/--- | 240.9-241.4/  151.6-154.9 | 210-233.0/  114.3-128.6 | 236.1-236.3/  151.1-153.0 | ca. 240.0-245.0/  ca. 140.0-145.0 | ca. 265.0/  ca. 140.0 |
| Quadrupedal Support  (%) | 0 | 0 | 0 | 0 | 0-7 | 0 | 0 | 0 | 0 |
| Tripedal Support  (2F/2H)  (%) | 19-53  (9-25/  10-28) | 38-68  (18-33/  20-35) | 5-23  (0-7/  5-16) | --- | 10-29  (5-15/  5-14) | 0 | 4-37  (2-16/  2-21) | 4  (2/2) | 5-10  (2-4/  3-6) |
| Lateral Bipedal Support | 10-27 | 23-43 | 50-67 | -- | 11-33 | 0-4 | 22-  60 | 62-72 | 74-  90 |
| Diagonal Bipedal Support | 9-20 | 9-19 | 16-35 | --- | 52-71 | 57-75 | 8-39 | 6-  32 | 0-  21 |
| Single Leg Support  (Front/  Hind) | 0 | 0 | 2-8  (0/2-8) | 0 | 0 | 8-20  (0/8-20) | 0-  64  (0-26/  0-38) | 0-27  (0/0-27) | 0-  13  (0-7/  0-6) |
| Four-legged  Suspension (%) | 0 | 0 | 0 | 0 | 0 | 6-22 | 0 | 0 | 7-25 |

Table S2: Demographics of North American Gaited Horses

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NORTH AMERICA | | | | | | | | | | |
| Breed | Country | Region | Zone | Year Breed Originated  [Registry Founded] | Gait(s) | A-allele [AA+CA genotypes] | AA genotype | CA genotype | CC genotype | Reference |
| American Paso Fino [PU]  [Cross of Puerto Rican Paso Fino + Columbian Paso Fino] | United States | South Carolina, Texas | Riding Horse | [1964] | rack [saddlerack, named classic fino; paso corto; paso largo; broken trot [paso corto; paso largo]; broken pace [andadura, not ideal] | 0.96  [1.00] | 0.91 | 0.09 | 0.00 | Promerová et al., 2014 |
| American Saddlebred [SB] [American Saddle Horse; Kentucky Saddler; Golden American Saddlebred; National Saddle Horse] | United States | Kentucky; Montana (1979) | Bluegrass Hills; Riding Horse | ca. 1839  [1891; 1957] | [some]  rack [saddlerack (medium) or hard rack (fast)]; broken pace  [slow gait (slow)] | 0.28  [0.48]  0.25  [0.41] | 0.07  0.10 | 0.41  0.31 | 0.52  0.59 | Promerová et al., 2014; Regatieri et al., 2015;  Gaspar et al., 2021 |
| American Walking Pony [WP] [American Gaited Pony]  [Cross of Tennessee Walking Horse + Welsh Pony] | United States | Georgia | Riding Horse | 1968 | running walk [pleasure walk (slow); merry walk (fast)  [some]  rack [saddlerack to hard rack]; broken pace [slow gait] | --- | --- | --- | --- | --- |
| Appalachian Singlefoot Horse [AS] | United States | North Carolina, Appalachians | Appalachian Mountains; Riding Horse | 1981 | broken trot  [singlefoot] | --- | --- | --- | --- | --- |
| Appaloosa [AP] [Cayuse; Nez Perce; Palouse] | United States; Canada | Oregon and Washington States, Columbia Plateau; Porterville, California; British Columbia | Columbia Plateau, Riding Horse | ca. 1710  [1938; 1961] | [some]  broken pace [Indian shuffle; Appaloosa shuffle] | 0.13  [0.20]  0.09  [0.16] | 0.05  0.01 | 0.15  0.15 | 0.80  0.84 | Promerová et al., 2014  Gaspar et al., 2021 |
| Canadian Pacer [CP] [Dutch Horse; Old Canadian Horse] | Canada | Quebec | Taiga and Boreal Shields; Riding Horse | 1665; 1812-1886  [Extinct] | pace | --- | --- | --- | --- | --- |
| Canadian Pony of the Americas [PA] [Kanata Pony]  [Cross of Appaloosa + Shetland Pony] | United States; Canada | Indiana and Iowa, Mason City; British Columbia | Riding Horse | 1954  [1975] | [some]  running walk [flat walk (slow); hard running walk (fast)] | 0.18  [0.30] | 0.06 | 0.24 | 0.70 | Gaspar et al., 2021 |
| Carolina Marsh Tacky [MT] | United States | South Carolina, Lowcountry, Beaufort, Berkeley, Charleston,  Colleton, Dorchester, Georgetown, Hampton, Jasper, and Williamsburg Counties | Coastal  Marshes | 1565  [2007] | broken trot [rocking chair trot; swamp trot] | --- | --- | --- | --- | --- |
| Florida Cracker Horse [FC]  [Chickasaw Pony; Cherokee Pony; Choctaw Pony; Florida Cow Pony; Florida Horse; Grass Gut;  Indian Pony; Prairie Pony; Seminole Pony] | United States | Florida,  Alachua, Paynes Prairie ; Mississippi ; Kiamichi Mountains, Oklahoma | Savanna; Riding Horse | 1521  [1989] | running walk [flat walk (slow); hard running walk (fast)]; rack [saddlerack (coon rack)]; broken pace [Indian shuffle]; pace | 0.67  [0.71] | 0.63 | 0.08 | 0.29 | Promerová et al., 2014 |
| Kentucky Natural Gaited Horse [KN; see KS for location on map]  [Kentucky Country Saddle Horse] | United States | Kentucky | Riding Horse | ca. 1850  [2000] | rack [saddlerack to hard rack] | --- | --- | --- | --- | --- |
| Kentucky Mountain Saddle Horse [KS] [Spotted Mountain Horse] | United States | Kentucky, Appalachians | Appalachian Mountains; Riding Horse | ca. 1850  [1989; 2002] | rack  [mountain pleasure rack, saddlerack to hard rack]  [some]  running walk [flat walk (slow); hard running walk (fast)]  [some]  broken trot [fox trot] | 0.92  [1.00]  0.94  [1.00] | 0.84  0.88 | 0.16  0.12 | 0.00  0.00 | Promerová et al., 2014  Gaspar et al., 2021 |
| McCurdy Plantation Horse [MP] [McCurdy Walker] | United States | Alabama, Dallas and Lowndes Counties | Riding Horse | ca. 1890 | running walk [flat walk (slow); hard running walk (fast)]; rack [saddle rack to singlefoot rack (McCurdy lick or plantation gait or saddle gait)]; broken pace | --- | --- | --- | --- | --- |
| Missouri Fox Trotter [FT]  [American Fox Trotter] | United States | Missouri, Ozarks | Ozark Mountains ; Riding Horse | 1821  [1948 ;  1986] | broken trot [fox walk or flatfoot walk or flat walk (slow); fox trot (fast)] | 1.00  [1.00] | 1.00 | 0.00 | 0.00 | Promerová et al., 2014; Gaspar et al., 2021 |
| Montana Travler [TR] | United States | Montana | Mountains; Riding Horse | 1973  [1979] | running walk [flat walk (slow); hard running walk (fast)] | --- | --- | --- | --- | --- |
| Morgan [MO] [Gaited Morgan] | United States | Massachusetts, Springfield; Vermont | Riding Horse; | 1789 | [some]  running walk [flat walk (slow); hard running walk (fast)]; rack [saddlerack to singlefoot rack (pleasure gait )]; broken pace; pace;  broken trot [fox walk, park walk (slow) to fox trot (fast)] | 0.14  [0.26]  0.24  [0.42]  0.35  [0.51] | 0.02  0.05  0.18 | 0.24  0.37  0.33 | 0.74  0.58  0.49 | Promerová et al., 2014;  Jäderkvist Fegraeus et al., 2014;  Gaspar et al., 2021 |
| Mountain Pleasure Horse [OK; see RM for location] [Old Kentucky Saddler; Kentucky Mountain Horse; Kentucky Saddle Horse] | United States | Kentucky, Appalachians | Appalachian Mountains; Riding Horse | ca. 1820  [1989] | rack [saddlerack (pleasure rack, trail rack)] | --- | --- | --- | --- | --- |
| Narragansett Pacer [NP] | United States | Rhode Island, Narragansette Bay | Riding Horse;  Racing Horse | 1724-1880  [Extinct] | rack; broken pace; pace | --- | --- | --- | --- | --- |
| National Show Horse [NS]  [Cross of Arabian + Saddlebred] | United States | Arizona, Kentucky, Ohio, Dayton | Show Horse | [1981] | [some]  rack  [saddlerack to speed  rack]; broken pace [slow gait] | --- | --- | --- | --- | --- |
| National Spotted Saddle Horse [SS] | United States | Tennessee, Central Region | Riding Horse | ca. 1970  [1979; 1985] | running walk [flat walk (slow); hard running walk (fast)]; rack [saddlerack to hard rack]; broken pace [not ideal]; broken trot  [fox trot] | 1.00  [1.00] | 1.00 | 0.00 | 0.00 | Gaspar et al., 2021 |
| Newfoundland Pony [NF] | Canada | Newfoundland | Riding Horse; Working Horse | 1612 | Newfoundland Pony | Canada | Newfoundland | Riding Horse; Working Horse | 1612 | Newfoundland Pony |
| Nokota [NK] | United States | North Dakota, Theodore Roosevelt National Park | Feral | ca. 1830; 1850  [1989] | [some]  broken pace [Indian shuffle] | 0.00  [0.00] | 0.00 | 0.00 | 1.00 | Gaspar et al., 2021 |
| North American Curly [NC] [American Bashkir Curly] [crossbred with Appaloosa, Missouri Fox Trotter, and Tennessee Walker] | United States | Nevada, Lander County | Peter Hanson Mountains; Riding Horse | ca. 1820; 1898  [1971] | [some]  running walk [flat walk (slow); hard running walk (fast)];  saddle rack [curly rack];  broken pace [curly shuffle; Indian shuffle]; broken trot [fox walk to fox trot] | 0.17  [0.33]  0.70  [0.85]  0.26  [0.36] | 0.00  0.55  0.17 | 0.33  0.30  0.19 | 0.67  0.15  0.64 | Promerová et al., 2014;  Jäderkvist Fegraeus et al., 2014  Gaspar et al., 2021 |
| North American Single-Footing [SF] [North American Singlefooter] | United States | Georgia, Alabama | Riding Horse | [1981;  1991] | rack [saddle rack (country or trail rack) to hard rack (road gait; singlefoot)] | --- | --- | --- | --- | --- |
| Paint [PT] [American Paint Horse] | United States | Great Plains; Rocky Mountains; Oklahoma; Texas | Show Horse; Riding Horse | [1965] | [some]  broken pace  [Indian shuffle] | 0.08  [0.16]  0.06  [0.12] | 0.00  0.00 | 0.16  0.12 | 0.84  0.88 | Promerová et al., 2014  Gaspar et al., 2021 |
| Racking Horse [RH]  [Racker] | United States | Alabama, Decatur | Riding Horse | [1981] | rack [hard rack (style rack; speed rack; singlefoot)] | --- | --- | --- | --- | --- |
| Rocky Mountain Horse [RM] [Mountain Pleasure Horse] | United States | Kentucky, Appalachians | Appalachian Mountains; Riding Horse | 1890  [1986; 1989] | rack  [saddle rack (show gait, trail rack, mountain rack); hard rack (pleasure gait)] | 1.00  [1.00]  0.92  [1.00] | 1.00  0.84 | 0.00  0.16 | 0.00  0.00 | Promerová et al., 2014;  Gaspar et al., 2021 |
| Sable Island Horse [SI] | Canada | Nova Scotia, Sable Island | Sable Island; Feral | 1760; 1801  [2008] | [some]  running walk [prance]; rack [saddlerack to hard rack]; broken pace [Indian shuffle]; pace | --- | --- | --- | --- | --- |
| Sierra Tarahumara [ST] | Mexico | Chihuahua, Sierra Madre Occidental States | Sierra Tarahumara Mountains; Cart Horse | 1567 | [some] | Sierra Tarahumara [ST] | Mexico | Chihuahua, Sierra Madre Occidental States | Sierra Tarahumara Mountains; Cart Horse | 1567 |
| Smokey Valley Horse [VS; same location as KS] | United States | Kentucky, Appalachian Mountains, Smokey Valley Farm | Appalachian Mountains; Riding Horse | [1979] | running walk [flat walk (slow); hard running walk (fast)]; rack [traveling gait, saddle rack to hard rack] | --- | --- | --- | --- | --- |
| Spanish Mustang [SM]  [Cerbat; Sulphur] | United States | Utah, Needles and Ogden, Home Mountains; Arizona, Kingman, Marble Canyon,  Cerbat Mountains | Feral; Cerbat Mountains; Home Mountains | ca. 1687  [1957; 1990] | [some]  running walk [flat walk (slow); hard running walk (fast)]; rack [saddlerack to hard rack];  broken pace | 10.0  [0.20]  0.15  [0.25] | 0.00  0.03 | 0.20  0.22 | 0.80  0.75 | Promerová et al., 2014;  Gaspar et al., 2021 |
| Spanish Colonial Horse [SC] [Baca-Chica; Belsky; Brislawn; Havapai; Huasteca [Nahua]; Holbrook; Jones; Kiger; Mt. Taylor; Pryor; Romero/McKinley; Santa Cruz; Wilbur-Cruce; Yates] | United States | Pryor Mountains, Montana; Little Bookcliffs, Utah; Kiger Gorge, Steens Mountain, Oregon; Belen, Cebolla, and Mount Taylor, New Mexico; Santa Cruz Island, California; Huasteca, Veracruz; Arivaca and Grand Canyon, Arizona; Lubbock and Marathon, Texas; Sand Hills, Nebraska | Feral; Riding Horse | ca. 1683; 1890; 1930  [1990; 1998; 2001; 2013] | [some]  running walk [flat walk (slow); hard running walk (fast)]; rack [saddlerack to hard rack];  broken pace; pace | --- | --- | --- | --- | --- |
| Standardbred [SA] | United States (also Sweden; Norway) | New York | Harness Racing | ca. 1849  [1879] | [some]  pace | 1.00  [1.00]  0.65  [0.90] | 1.00  0.40 | 0.00  0.50 | 0.00  0.10 | Promerová et al., 2014;  Gaspar et al., 2021 |
| Tennessee Walking Horse [TW] | United States | Tennessee | Rocky Bluegrass Hills; Plantations | ca. 1790  [1900] | running walk [flat walk (slow; trail gait); hard running walk (fast; big lick; pleasure gait)]  [some]  rack  [saddlerack to hard rack]; broken pace; pace [not ideal]; broken trot [fox trot] | 1.00  [0.99-1.00] | 0.99-1.00 | 0.00-0.01 | 0.00  0.01 | Promerová et al., 2014; Staiger et al., 2016; Gaspar et al., 2021 |
| Tennuvian [TU]  [Cross of Peruvian Paso + Tennessee Walking Horse] | United States | Tennessee; Parker, Colorado | Riding Horse | [1991] | running walk [soft prance] | --- | --- | --- | ---- | --- |
| Tiger Horse [TH]  [Caballo Tigre; Soulon] | United States | Pacific Northwest | Riding Horse | 1938  [1994; 2011] | running walk [flat walk (slow); hard running walk (fast)]; broken pace [glider gait, Indian shuffle, amble]; broken trot | --- | --- | --- | --- | --- |
| Trottingbred [TB] | United States | New York; New England | Harness Racing | 1960  [1977] | [some]  pace | --- | --- | --- | --- | --- |
| Utah Walkony [UW]  [Cross of Tennessee Walker + Various Ponies] | United States | Utah, Cache County, Logan | Riding Horse; Handicapped Riders | ca. 1990 | running walk [flat walk (slow); hard running walk (fast)] | --- | --- | --- | --- | --- |
| Virginia Highlander [VH] [Virginia Pocket Horse; Virginian Singlefooter; Virginia Speed Racker]  [Cross of Welsh Pony + Arabian, Tennessee Walker, Morgan, and American Saddlebred] | Virginia | Smyth County, Blue Ridge Mountains | Mountains; Riding Horse | 1960  [1991] | rack [hard rack] | --- | --- | --- | --- | --- |
| Walkaloosa [WL]  [Cross of Tennessee Walker (or Missouri Fox Trotter or Peruvian Paso + Appaloosa] | United States | Oregon, California | Riding Horse | ca. 1710; 1938  [1983] | running walk [flat walk (slow); hard running walk (fast)]; rack; broken pace [Indian shuffle; Appaloosa shuffle]; pace [not ideal]; broken trot [fox trot] | 0.80  [1.00] | 0.60 | 0.40 | 0.00 | Gaspar et al., 2021 |

The rack, broken pace, or pace also shows up on occasion in other horse breeds of North America including the Azteca [AZ] of Texcoco, Mexico, the Banker [Corolla] [BH] of the Shackleford Banks in North Carolina in the United States (which may also show the running walk), the Morab of Clovis, California in the United States (which may also exhibit the broken trot), the Galiceño [GC] of Yucatan, Mexico and Texas (which has also been said to possess a running walk), and possibly in the Canadian and Lac La Croix Ponies of Canada.

Table S3: Demographics for Central and South American Gaited Horses

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CENTRAL AND SOUTH AMERICA | | | | | | | | | | |
| Breed | Country | Region | Zone | Year | Gait | A-allele [AA+CA geno-types] | AA geno-type | CA geno-type | CC geno-type | Reference |
| Abaco Barb [AB] [Spanish Barb] | Bahamas | Great Abaco Island | Feral; Abaco Island | ca. 1800-2015  [Extinct] | [some]  running walk; broken pace; pace | --- | --- | --- | --- | --- |
| Andean [AN] [Andino; Morochuco; Peruvian Criollo] | Peru | Ayacucho Department, Cangallo Province | Andes Mountains; Riding Horse | 1531 | running walk [paso llano]; broken pace [sobreandando]; pace [huachano, not ideal]; broken trot [pasitrote, not ideal] | --- | --- | --- | --- | --- |
| Campeiro [CO]  [Marchador das Araucárias] | Brazil | Santa Catarina State, Concórdia, Curitibanos, and Lages; Caxias do Sul | Mountains and Araucária Moist Forest; Riding Horse | 1620  [1912; 1976] | rack [marcha de centro]; broken pace [marcha picada]; broken trot [marcha batida]; pace [andadura, not ideal] | --- | --- | --- | --- | --- |
| Campolina [CA] [Campolino]  [Cross of Mangalarga Marchador and Saddlebred] | Brazil | Minas Gerais State, Entre Rios and Passa Tempo Municipalities | Mountains and Hills; Riding Horse | 1870  [1938] | rack [marcha de centro]; broken pace [marcha picada]; broken trot [marcha batida]; pace [andadura, not ideal] | 0.89  [0.90]  [1.00]  [1.00]  [1.00]  0.50  [1.00] | 0.79  0.29  0.44  0.12  0.00 | 0.11  0.71  0.56  0.88  1.00 | 0.10  0.00  0.00  0.00  0.00 | Promerová et al., 2014  Manso Filho et al., 2015  m. batida  m. picada  Gaspar et al., 2021 |
| Columbian Paso Fino [PC] [Columbian Criollo; Columbian Walking] | Columbia | Cundinamarca, Antioquia, Quindío, Caldas, Cauca | Riding Horse | 1524  [1947] | rack  [paso fino, classic fino, fino clásico, show gait, saddlerack]; pace (not ideal, andadura saltada] | 0.94  [0.95]  1.00  [1.00] | 0.94  1.00 | 0.01  0.00 | 0.05  0.00 | Promerová et al., 2014  Novoa Bravo et al., 2018 |
| Columbian Trocha Pura [TC] | Columbia | Cundinamarca, Antioquia, Quindío, Caldas, Cauca | Riding Horse | 1524  [1947] | [some]  rack [paso fino, saddlerack]  broken trot [trocha] | 0.10  [0.18]  0.01  [0.02] | 0.03  0.00 | 0.15  0.02 | 0.82  0.98 | Promerová et al., 2014  Novoa Bravo et al., 2018 |
| Columbian Trocha y Galope [TG; same location as TC] | Columbia | Cundinamarca, Antioquia, Quindío, Caldas, Cauca | Riding Horse | 1524  [1947] | [some]  broken trot [trocha] | 0.25  [0.50]  0.04  [0.07] | 0.00  0.00 | 0.50  0.07 | 0.50  0.93 | Promerová et al., 2014  Novoa Bravo et al., 2018 |
| Cuban Paso [CU] [Cuban Criollo; Cubano de Paso] | Cuba | Granma and Pinar, Provinces | Riding Horse | 1511  [1961] | rack [marcha fina y gualdrapeada; paso del gualdrapeo] | --- | --- | --- | --- | --- |
| Mangalarga Marchador [MM]  [Sublime] | Brazil | Rio de Janeiro State, Paty do Alferes and Sul de Minas Municipalities; Minas Gerais State | Tropical Forest ; Riding Horse | 1740  [1949] | rack [marcha de centro];  broken pace [marcha picada];  broken trot [marcha batida]; pace [andadura, not ideal] | 0.46  [0.68]  m. batida  m. picada  [0.49]  m. batida  m. picada  [0.40]  m. batida  m. picada  m. batida  m. picada  0.49  [0.71] | 0.23  0.15  0.31  0.26  0.00  0.57  0.20  0.00  0.52  0.06  0.87  0.27 | 0.45  0.00  0.65  0.23  0.07  0.43  0.20  0.06  0.43  0.34  0.13  0.44 | 0.32  0.85  0.04  0.21  0.93  0.00  0.60  0,94  0.05  0.60  0.00  0.29 | Promerová et al., 2014  Manso Filhlo et al., 2015  Patterson et al., 2015  Fonseca et al., 2017  Bussiman et al., 2019  Gaspar et al., 2021 |
| Mangalarga Paulista [Brazilian Saddle Horse; Mangalarga ; Sela Brasileiro] | Brazil | São Paulo | Riding Horse | 1740 | [some]  broken pace [marcha picada]; broken trot [marcha batida]; pace [andadura, passo esquipado] | 0.07  [0.14]  0.11  [0.22] | 0.00  0.00 | 0.14  0.22 | 0.86  0.88 | Promerová et al., 2014  Gaspar et al., 2021 |
| Mangolina [MA] [cross of Mangalarga Marchador + Campolina] | Brazil | Minas Gerais State | Mountains and Hills; Riding Horse | ca. 1993 | rack [marcha de centro]; broken pace [marcha picada]; broken trot [marcha batida]; pace [andadura, passo esquipado, not ideal] | --- | --- | --- | --- | --- |
| Nordestino [ND]  [Crioulo Nordestino;Mourão; Pé Duro; Sertanejo do Nordeste] | Brazil | Sertão, Bahia, Ceará, Paraíba, Pernambuco, Piauí, and Rio Grande do Norte States | Semiarid Desert and Scrubland;  Cart Horse; Riding Horse | 1549  [1987-2017] | [some]  broken pace [marcha picada]; broken trot [marcha batida]; pace [andadura, not ideal] | --- | --- | --- | --- | --- |
| Pampa [PM}  [Brazilian Criollo; Brazilian Crioulo] | Brazil | Rio Grande do Sul State | Pampas Grasslands ; Riding Horse | 1536  [1980] | [some]  broken pace [marcha picada]; broken trot [marcha batida; trocha]; pace [andadura, not ideal] | 0.02  [0.05]  0.00  [0.00 | 0.00  0.00 | 0.05  0.00 | 0.95  1.00 | Promerová et al., 2014  Gaspar et al., 2021 |
| Paso Fino [PR]  (Puerto Rican Paso Fino; Pura Raza Paso Fino) | Puerto Rico; United States | Widespread | Mountains; Riding Horse | 1511  [1943; 1964; 1966] | rack [paso fino, classic fino, fino clásico, or show gait (slow), paso corto, pleasure gait or trail gait (some, medium), paso largo (some, fast)];  broken trot [paso corto, pleasure gait or trail gait, most, medium], paso largo, most, fast]; broken pace [sobre paso, not ideal]; pace [andadura, not ideal] | 0.99  [1.00]  0.97  [1.00]  [1.00] | 0.99  0.95  1.00 | 0.01  0.05  0.00 | 0.00  0.00  0.00 | Promerová et al., 2014;  Gaspar et al., 2021;  Wolbsberger et al., 2022 |
| Paso Higueyano [PH]  [Cross of Criollo + Tennessee Walking Horse and Morgan] | Dominican Republic | Widespread | Riding Horse | 1508; 1916  [2002] | stepping pace [paso higueyano]; pace; fox trot [some, paso higueyano] | --- | --- | --- | --- | --- |
| Peruvian Paso [PP] [Costeño; Costeño de Paso Aclimatado a la Altura; Peruvian National Horse; Peruvian Stepping Horse] | Peru | Cajamarca, Callejon de Huaylas, Huancayo | Coastal Mountains; Riding Horse | 1531  [1992] | running walk [paso llano, ambladura rota]; broken pace [sobreandando (fast) aguilillo (slow), not ideal)]; pace [huachano, paso portante, ambladura (fast), entrepaso (medium), neither ideal]; broken trot [pasitrote, not ideal] | 1.00  [1.00]  0.83  [1.00] | 1.00  0.67 | 0.00  0.33 | 0.00  0.00 | Promerová et al., 2014  Gaspar et al., 2021 |
| Piquira [PQ] [cross between Brazilian Criollo and Shetland Ponies] | Brazil, Bahia State | Widespread | Riding Horse | 1970 | broken pace [marcha picada]; broken trot [marcha batida]; pace [andadura, not ideal] | --- | --- | --- | --- | --- |
| Puerto Rican Criollo [RC] [same location as PR] | Puerto Rico | Widespread | Riding Horse | 1511 | rack [paso fino, classic fino, fino clásico (slow);paso corto (some, medium), paso largo (some, fast);  broken trot [paso corto, most, medium], paso largo [most, fast]; broken pace [sobre paso, not ideal]; pace [andadura, not ideal] | 0.87  [0.99] | 0.76 | 0.23 | 0.01 | Wolfsbergter et al., 2022 |

Some of the Marajoara Island Horses [MJ] of Brazil have broken paces or broken trots. Alternative gaits of the broken pace may also be found on occasion in the Bolivian Paso of Altiplano [Sunicho], and perhaps the Costa Rican Saddle Horse. And the Venezuelan Criollo [VC] [Llanero] of Apura, Aragua, and Merida States sometimes has a rack or broken pace gait.

Table S4: Demographics of European Gaited Breeds (and Central Africa)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUROPE | | | | | | | | | | |
| Breed | Country | Region | Zone | Year Founded | Gait(s) | A-allele [AA+CA genotypes] | AA genotype | CA genotype | CC genotype | Reference |
| Aegidienberger [AD]  [Cross of Icelandic + Peruvian Paso] | Germany | North Rhine-Westphalia, Aegidienberg | Riding Horse | 1994 | rack [tölt, saddle rack to hard rack] | --- | --- | --- | --- | --- |
| Albanian [AL]  [Myzeqeja; Myzequea] | Albania | Albanian Alps; Myzeqeja Lowlands; Shkodra | Mountains and Plains; Pack Horse; Harness Horse | ca. 1386; 1904  [1990] | [some]  broken pace | --- | --- | --- | --- | --- |
| Arravani [AR]  [Macedonian Pacer] | Greece | Western Macedonia | Mountains; Riding Horse | ca. 1460 | broken pace [arravani] | 0.99  [1.00] | 0.98 | 0.02 | 0.00 | Giantsis et al., 2018; Antikas, 2015 |
| Bidet Breton [BB] [Bidet d’allure; Roncin; Roussin] | France | Brittany; Normandy, Western Region | Armorican Massifs [Mountains]; Riding Horse | ca. 1096-ca. 1700  [Extinct] | broken pace; pace; broken trot [?] | --- | --- | --- | --- | --- |
| Castilian [CS] [Caballo Castellano] | Spain | Castile | Meseta Central Plateau and Mountains; Riding Horse | Ca. 800 BCE-1700 CE  [Extinct] | running walk [flat walk; hard running walk; paso castellano] | --- | --- | --- | --- | --- |
| Celtic Asturcón [CT; same location as SJ] [Asturian; Haubini] | Spain | Asturia | Asturian Mountains; Riding Horse | ca. 800 BCE- 1300 CE  [Extinct] | rack; broken pace; pace | --- | --- | --- | --- | --- |
| Cretan [CR] [Messara] | Greece | Crete, Messara | Mountains and Plains; Riding Horse; Sport Horse | 1646 | broken pace [arravani] | 0.98  [1.00] | 0.95 | 0.05 | 0.00 | Promerová et al., 2014; Antikas, 2015 |
| Dongola [DN] [Bandiagara, Djerma; Dongolawa; Fulani; Ganston; Hauossa; Hausa; Kréda; Mossi; North Sudan Pony; Songhai; Yagha] | Cameroon, Far North; Chad, Bahr-el-Ghazal; Nigeria, Borno | Dongola | Semi-Arid Sahel Desert; Riding Horse | ca. 1250 | [some]  broken pace [takama]; pace | 0.00  [0.00] | 0.00 | 0.00 | 0.00 | Promerová et al., 2014 [North Sudan Pony] |
| Faeroe Island Pony [FI] [Faeroese] | Denmark | Faeroe Islands | Island | ca. 700 | [some]  rack [tölt, saddle rack to hard rack or singlefoot]; broken pace [not ideal]; pace | 0.14  [0.29] | 0.00 | 0.29 | 0.71 | Promerová et al., 2014 |
| Galician [GA]  [Andadura Gallega; Galiciana; Gallego de Andadura; Pura Raza Gallega] | Spain | Galicia | Galician Mountains; Feral; Riding Horse; Racing Horse | ca. 800 BCE  [1997] | broken pace [andadura chapeada; singlefoot]; pace [andadura serrada] | 0.50  [0.66] | 0.33 | 0.33 | 0.33 | Promerová et al., 2014 |
| Galloway Pony [GW] | England | Scotland, Galloway; Yorkshire, Swaledale | Scottish Highlands; Riding Horse | ca. 1600-1800  [Extinct] | rack | --- | --- | --- | --- | --- |
| Garrano [GR] [Marrano; Minho] | Portugal | Minho, Tràs-os- Montes, Peneda-Géres National Park | Mountains; Riding Horse; Racing Horse; Pack Horse | ca. 700 BCE  [2011] | rack [hard rack or passo travado]; broken pace; pace [andadura] | --- | --- | --- | --- | --- |
| Hobby Pony [HB] [Hobin; Ubinus] | Ireland | Connacht, County Kildare | Bogs; Riding Horse | ca. 1250-1800  [Extinct] | rack | --- | --- | --- | --- | --- |
| Icelandic [IC] | Iceland | Vesturland, Norðurland vestra, Suðurland | Mountainous Island; Riding Horse | 874  [1959] | rack [tölt, saddle rack to hard rack]; broken pace [skeiðtölt, skeiðborið tölt, fjórtakta skeið, not ideal]; pace [flying pace; flugskeið]; broken trot [brokktölt, not ideal] | 0.75  [0.95]  0.73  [0.93] | 0.53  0.53 | 0.42  0.40 | 0.05  0.07 | Promerová et al., 2014;  Gaspar et al., 2021;  Wutke et al,. 2016 |
| Mérens [ME] [Ariègeois; Castillon; Mérengais; Méringais] | France | Pyreneesand Midi-Pyrenees, Ariege | Ariègeois and Pyrenees Mountains; Feral; Riding Horse; Cart Horse | ca. 1250  [1933] | [some]  broken pace; pace | --- | --- | --- | --- | --- |
| Palfrey [PF] [Haquenée; Palfredus; Palefroi] | England, France, Italy | Canterbury, Devonshire, Durham, Ellesmere; Auvergne and Loire; Padua and Pavia | Riding Horse; War Horse | ca. 1200-1600  [Extinct] | running walk [?];  rack; broken pace; pace | --- | --- | --- | --- | --- |
| Peneia [PE] [Georgalídiko; Pinia; Ravani] | Greece | Peloponnesus, Elis | Mountains; Riding Horse | ca. 1940  [1995] | broken pace [arravani] | 0.97  [1.00] | 0.94 | 0.06 | 0.00 | Promerová et al., 2014; Antikas, 2015 |
| Pindos [PI] | Greece | Epirus | Pindus Mountains | ca. 300 BCE | [some]  broken pace [arravani] | 0.23  [0.40] | 0.07 | 0.33 | 0.60 | Promerová et al., 2014 ; Antikas, 2015 |
| Rhodian [RO] [Rhodes] | Greece | Rhodes | Island | ca. 300 BCE  [2001] | [some]  broken pace | 0.42  [0.67] | 0.17 | 0.50 | 0.33 | Promerová et al., 2014 |
| Spanish Jennet [SJ] [Genet; Genete; Ginecti] | Spain | Asturia | Riding Horse | ca. 800-1700  [Extinct] | running walk [?]; rack; broken pace; pace;  broken trot [?] | --- | --- | --- | --- | --- |
| Thessalian [TH] | Greece | Thessaly | Riding Horse | ca. 350 BCE | stepping pace [?] | 0.25  [0.40] | 0.10 | 0.30 | 0.60 | Promerová et al., 2014 |
| Welsh Mountain Pony [WM] [Section A] | England | Wales | Cambria Mountains | ca. 1485  [1902] | [some]  pace | 0.09  [0.19] | 0.00 | 0.19 | 0.81 | Promerová et al., 2014 |
| Welsh Pony [Same location as WM] [Merlins; Welsh Pony of Cob Type; Welsh Pony of Riding Type; Sections B and C] | England | Wales | Riding Horse | ca. 1485  [1902] | [some]  pace | 0.07  [0.15]  0.07  [0.13] | 0.00  0.00 | 0.15  0.13 | 0.85  0.87 | Promerová et al., 2014;  Gaspar et al., 2021 |
| York [same location as PF] | England | York, Coppergate [Jorvik] | Riding Horse | 750-800  [Extinct] | [?]  likely rack; broken pace; pace | 1.00  [1.00] | 1.00 | 0.00 | 0.00 | Wutke et al., 2016 |
| HARNESS RACERS |  |  |  |  |  |  |  |  |  |  |
| Bulgarian Trotter [BT] | Bulgaria | Pazardzhik, Pleven, St.  Zagora | Harness Racing | 1962 | [some]  pace | 0.98  [1.00] | 0.96 | 0.04 | 0.00 | Lukanova et al., 2021 |
| Dutch Harness [DH]  [Tuigpaard] | Netherlands | Friesland, Groningen | Harness Racing | 1945  [1969] | [some]  pace | 0.25  [0.25] | 0.25 | 0.00 | 0.75 | Gaspar et al., 2021 |
| Finnhorse [FH] [Finnish Horse; Finnish Universal] | Finland | Espoo, Kouvola, Lahti, Mikkeli, Turku | Harness Racing | ca. 1500  [1907] | [some]  pace | 0.63  [0.89]  0.54  [0.87] | 0.37  0.20 | 0.52  0.67 | 0.11  0.14 | Jäderkvist Fegraeus et al., 2015;  Kvist et al., 2021 |
| French Trotter [NT] [Norman Trotter] | France | Normandy | Harness Racing | 1836  [1922] | [some]  pace | 0.78  [0.95]  0.17  [0.33]  0.80  [1.00]  0.77  [0.96] | 0.61  0.00  0.60  0.59 | 0.34  0.33  0.40  0.37 | 0.05  0.67  0.00  0.04 | Promerová et al., 2014 ;  Gaspar et al., 2021  Lukanova et al., 2021  Ricard et al., 2021 ; Khrabrova et al., 2020 |
| German Trotter [GT] | Germany | Gelsenkirchen | Harness Racing | ca. 1875 | [some]  pace | 0.56  [0.66]  1.00  [1.00] | 0.44  1.00 | 0.22  0.00 | 0.34  0.00 | Promerová et al., 2014  Lukanova et al., 2021 |
| Italian Trotter [IT] [Trottatore Italiano] | Italy | Padova, Ferrara | Harness Racing | 1862 | [some]  pace | 0.87  [0.97] | 0.76 | 0.21 | 0.02 | Dall’Olio et al., 2021 |
| Spanish Trotter [Trotador Español] | Spain | Ballearic Islands, Mallorca and Menorca | Harness Racing | ca. 1890  [1970] | [some]  pace | 0.87  [0.97] | 0.76 | 0.21 | 0.03 | Negro Rama et al., 2016 |
| Swedish Standardbred (Swedish Trotter) | Sweden; United States | Boden, Gothenburg, Malmö. Mantorp, Stockholm | Harness Racing | ca. 1900 | [some]  pace | 0.94  [0.97]  1.00  [1.00] | 0.94  1.00 | 0.06  0.00 | 0.00  0.00 | Promerová et al., 2014  Lukanova et al., 2021 |
| Nordic Trotter [NT] [Norsk Kaldblodstraver; Svensk Kallblodstravare; Scandanavian Coldblood Trotter; Swedish-Norwegian Coldblooded Trotter] | Denmark; Norway; Sweden | Copenhagen; Bergen, Drammen, Eidsberg, Oslo, Stavanger, Tønsberg; Trondheim; Boden, Gothenburg, Malmö. Mantorp, Stockholm | Harness Racing | 1924 ; 1939  [1964] | [some]  pace | 0.45  [0.74]  0.35  [0.60] | 0.16  0.09 | 0.58  0.51 | 0.26  0.40 | Promerová et al., 2014;  Jäderkvist Fegraeus et al., 2017 |

A rack is also occasionally found in the Alter Real [RE] of Alter do Chão, Portugal, and the stepping pace or pace in the Andalusian [Pura Raza Española] and modern Asturcón of Spain [same location as SJ], the Arabian, the Gotland of Sweden, the Lewitzer of Germany, and possibly the Retuertas of Spain. A pace also occurs in the Andalusian donkey.

Table S5: Demographics for Asian and South African Gaited Horses

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ASIA AND SOUTH AFRICA | | | | | | | | | | |
| Breed | Country | Region | Zone | Year Founded | Gait(s) | A-allele [AA+CA genotypes] | AA genotype | CA genotype | CC genotype | Reference |
| Anadolu Yerli [AY] [Anatolian Native; Turkish Pony] | Turkey | Eastern Anatolia, Ağrı, Kars, and Van Provinces | Anti-Taurus Mountains and Steppes; Riding Horse; Racing Horse; Harness Horse; Sport Horse | ca. 1000 | broken pace [yorga]; pace [rahvan] | 0.91  [0.96] | 0.86 | 0.10 | 0.04 | Özbeyaz, et al., 2016 |
| Buryat [BY] [Buryatskaya; Byryatskaya] | Russia | Siberia, Buryatia Republic | Baikal Mountains and Taiga; Riding Horse | ca. 1207 | [some]  broken trot [tropota] | --- | --- | --- | --- | --- |
| Canik [CN] | Turkey | Amasya, Samsun, and Tokat Provinces | Pontic Mountains; Riding Horse | ca. 1000; 1800 | broken pace [yorga]; pace [rahvan] | --- | --- | --- | --- | --- |
| Chakouyi [CK] | China | Gansu Province, Lanzhou, Tianzhu, Wuwei Districts | Gobi Desert; Qilian Mountains; Riding Horse; Racing Horse | ca. 100 BCE | pace | 0.96  [1.00]  0.82  [0.96] | 0.92  0.67 | 0.08  0.29 | 0.00  0.04 | Han et al., 2015  Li et al., 2022 |
| Cheju [Jeju] [CH] | South Korea | Jeju Province | Mountainous Island; Riding Horse; Racing Horse | 1276 | [some]  pace | 0.14  [0.29]  0.50  [0.75] | 0.00  0.25 | 0.29  0.50 | 0.71  0.25 | Promerová et al., 2014;  Srikanth et al., 2020 |
| Datong [DT] | China | Qinghai Province, Datong River Basin | Riding Horse | ca. 100 BCE | pace | 0.54  [0.85] | 0.22 | 0.63 | 0.15 | Han et al., 2015 |
| Ferghana [FG] [Dayuan; Turkoman] | Uzbekistan | Fergana Valley | Riding Horse | ca. 104 BCE-1000 CE  [Extinct] | broken pace; pace | --- | --- | --- | --- | --- |
| Gansu [Heavenly Horse ; Soulon; Tiger Horse; Wusun] | China | Gansu Province, Wuwei; Sichuan Province | Riding Horse | 618-1000  [Extinct] | broken pace; pace | --- | --- | --- | --- | --- |
| Hokkaido [HK] [Dosanko] | Japan | Hokkaido Island | Mountainous Island; Riding Horse; Racing Horse | ca. 1600  [1979] | [some]  pace | 0.72  [0.85]  0.18  [0.34]  pacers | 0.58  0.02  1.00 | 0.27  0.32  0.00 | 0.15  0.66  0.00 | Promerová et al., 2014;  Chandra et al., 2020  Amano et al., 2018 |
| Kabarda [KD] [Kabardian; Kabardin; Kabardinskaya] | Russia; Georgia | Stavropol Krai, Kabardino-Balkaria Republic | Caucasus Mountains and Steppes; Riding Horse | ca. 1500 | [some]  broken trot [tropota]; broken pace; pace | 0.00  [0.00 | 0.00 | 0.00 | 1.00 | Promerová et al., 2014 |
| Kalmyk [KM] [Astrakhan; Kalmutskaya; Kalmyskaya] | Russia | Volga River Basin, Astrakhan and Volgograd | Steppes; Riding Horse | ca. 1635 | [some]  broken pace; pace | --- | --- | --- | --- | --- |
| Karachai [KC]  [Karachayevskaya; Karachay; Karachey] | Russia | North Caucasus, Karachay-Cherkessia Republic | Caucasus Mountains; Riding Horse | ca. 1500  [1935] | [some]  broken trot [tropota]; broken pace; pace | --- | --- | --- | --- | --- |
| Kathiawari [KW] [Kathi; Kutchi] | India | Gujarat, Kachchh, Kathiawar, and Surat Districts | Thar Desert; Riding Horse | ca. 1526 | [some]  broken trot  [revaal rewal, aphcal] | --- | --- | --- | --- | --- |
| Kazakh [KZ] [Adaev; Deliboz; Delibozskaya; Dilbaz; Diliboz; Dzhab; Gazakh; Jabe; Kazakhskaya; Qazaq; Wusun] | Kazakhstan; China | Central Aktobe Region, Aghstafa, Qazax, Shaki, Tovuz, and Zagastala Districts | Steppes; Riding Horse | ca. 450 BCE; 1800  [1943] | [some]  broken pace; pace | 0.38  [0.63] | 0.13 | 0.50 | 0.37 | Han et al., 2015 |
| Kyrgyz [KG] [Kirgis; Kirgiz; Kirgizskaya] | Kirghizstan | Widespread | Tian Shan Mountains; Riding Horse; Racing Horse; Sports Horse | ca. 201 BCE | [some]  broken pace; pace | 0.40  [0.58]  0.46 | 0.23  --- | 0.35  --- | 0.42  --- | Promerová et al., 2014;  Kalinkova et al., 2020 |
| Marwari [MW] [Malani] | India | Marwar, Rajasthan | Thar Desert; Riding Horse; Show Horse | ca. 1193; 1526 | broken trot  [revaal, rewal, aphcal] | 0.00  [0.00]  0.15 | 0.00  --- | 0.00  ---- [some in Jun, Staiger] | 0.00  ---- | Promerová et al., 2014  Staiger et al., 2017; Jun et al., 2014 |
| Mongolian [WU] [Chinese Mongolian [Ujumqin; Wushen]; Mongolian [Darkhad; Galshar; Tes] | China; Mongolia | Inner Mongolia; Khövsgöl, and Töv Provinces | Gobi and Maowusu Deserts; Steppes; Khangai and Khentii Mountain; Riding Horse; Racing Horse | ca. 600 | [some]  broken pace; pace [joroo] | 0.05  [0.07] | 0.01 | 0.06 | 0.93 | Promerová et al., 2014; Kalinkova et al., 2022; Han et al., 2023; |
| Mytilene [MI] [Ayvacik Midillisi; Ege Midillisi; Lesvos] | Turkey | Anatolia, Canakkale Province, Midillisi Island; Lesvos Island, Greece | Island Horse; Riding Horse | ca. 1299 | broken pace [yorga]; pace [rahvan] | --- | --- | --- | --- | --- |
| Nisean [same location as TM] | Iran, [Bactria] | Hamadan Province | Nisean Plains; Zagros Mountains; Riding Horse | 522 BCE-1204 CE | broken pace; pace  [Extinct] | --- | --- | --- | --- | --- |
| Orlov Trotter [OT] | Russia | Voronezh Governorate | Harness Racing | ca. 1800 | [some]  pace | 0.20  [0.40] | 0.00 | 0.40 | 0.60 | Promovera et al., 2014; Kalinkova et al., 2022 |
| Shan [SH] [Burmese; Burmin; Burman; Kachin] | Myanmar | Shan | Shan Mountains; Riding Horse; Sport Horse | ca. 950 | [some]  broken pace [ahthacha]; pace | 0.02  [0.05] | 0.00 | 0.05 | 0.95 | Okuda et al., 2017 |
| Sindhi [SI] [Kachchhi-Sindhi; Makra; Samoundi, Sindhi-Katchi; Sindhi-Kathiawari] | Pakistan; India | Sindh Province, Rajasthan, Jaisalmer-Barmer District | Thar Desert; Riding Horse; Racing Horse | ca. 1526 | broken trot [revaal, rewal, aphcal] | --- | --- | --- | --- | --- |
| Spiti [SI] [Chamurthi; Chamurti; Chummarti] | India | Himachal Pradesh, Kangra, Kinnaur, Kullu, Mandi, and Shimla Districts, Kangra, Pin, and Spiti Valleys; Ladach, Changtha Plateau; Pin Valley, Lahoul | Himalayan Mountains; Riding Horse | ca. 618 | broken pace; pace | --- | --- | --- | --- | --- |
| Tibetan [TI]  [Ganzi; Maiwa; Nangchen; Rdochurta; Tibetanan-Sikang Pony; Yushu; Zhongdian] | China | Qinghai (Yushu), Sichuan (Aba Tibet), Tibet (Chamdo) | Himalayan Mountains | ca. 800 | broken pace; pace | 0.39  [0.75] | 0.04 | 0.71 | 0.25 | Han et al., 2015 |
| Transbaikal [TL] [Zabaikal; Zabaykalskaya] | Russia | Siberia, Transbaikal, Zabaykalsky Krai (Dauria) | Baikal Mountains; Taiga; Riding Horse | ca. 1300 | broken trot [tropota] | 0.00  [0.00] | 0.00 | 0.00 | 0.00 | Khrabrova et al., 2020 |
| Turkmene [TK] [Turkmen; Turkmenian] | Turkmenistan; Iran | Karakum Desert | Karakum Desert; Riding Horse | ca. 700-1826  [Extinct] | broken pace; pace | --- | --- | --- | --- | --- |
| Tushin [TN] (Tushiri Cxeni; Tushetian) | Georgia | Tusheti | Caucasus Mountains; Riding Horse | ca. 300 BCE | [some]  broken pace; pace | 0.47  [0.67] | 0.27 | 0.40 | 0.33 | Promerová et al., 2014 |
| Tuva [TV] [Tuvinskaya] | Russia | Tuva | Sayan and Tannu-Ola Mountains; Riding Horse | ca. 1200. 1830  [1951] | [some]  pace | 0.17  [0.33] | 0.00 | 0.33 | 0.67 | Khrabrova et al., 2020 |
| West Black Sea [WB] [Chernomor; Chernomoreskaya; Nogai; Rahvan] | Russia | Black Sea, Krasnodar Krai and Rostov Oblast Districts | Riding Horse; Racing Horse | ca. 1790  [1921] | broken pace [yorga]; pace  [rahvan] | --- | --- | --- | --- | --- |
| Yanqi [YQ] [Yanji] | China | Bayingolin Mongol, and Xinjiang Regions, Bohu, Hejing, Hoxud, and Yanqi Hui Counties | Steppes; Riding Horse | ca. 1200; 1800 | pace | 0.33  [0.44] | 0.13 | 0.41 | 0.46 | Han et al., 2015 |
| Yili [YL] | China | Ili Kazakh and Xinjiang | Steppes; Riding Horse | 1956 | pace | 0.39  [0.71] | 0.06 | 0.65 | 0.29 | He et al., 2017 |
| Yakut [YK]  [Yakutian; Yakutskaya] | Russia | Siberia, Sakha Republic (Yakutia) | Mountains; Taiga; Riding Horse | ca. 1300 | [some]  broken trot [tropota] | 0.00  [0.00]  0.04  [0.09] | 0.00  0.00 | 0.00  0.09 | 1.00  0.91 | Khrabrova et al., 2020;  Kalinkova et al., 2022 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SOUTH AFRICAN HORSES |  |  |  |  |  |  |  |  |  |  |
| AfrikanSaalperd [SP] [South African Saddlebred] | South Africa | Colesberg | Show Horse; Riding Horse | 1918  [1949] | [some]  rack [saddlerack or trippel to hard rack]; broken pace [slow gait or kortgang] | --- | --- | --- | --- | --- |
| Basuto [BS] | Lesotho | Widespread | Maloti Mountains | 1652  [1977] | [some]  rack [saddle rack or trippel]; broken pace [kortgang]; pace [passgang, not ideal] | 0.07  [0.13] | 0.00 | 0.13 | 0.87 | Promerová et al., 2014 |
| Cape Boer [CB] [Boer Pony; Kaapse Boerperd] | South Africa | Transvaal, Orange Free State, Sandveld Preserve | Riding Horse | 1652  [1957] | [some]  rack [saddle rack or trippel]; broken pace [slow gait or kortgang] | 0.15  [0.30] | 0.00 | 0.30 | 0.70 | Promerová et al., 2014 |
| Nooitgedacht [NG] [Nooitgedacht Transkei] | South Africa | Transvaal, Ermelo | Riding Horse | 1652  [1952 ; 1967] | [some]  rack [saddle rack or trippel]; broken pace [strykstap]; pace [passgang; not ideal] | 0.21  [0.36] | 0.07 | 0.29 | 0.64 | Promerová et al., 2014 |

An alternative gait shows up on occasion in a few other Asian breeds as well. The pace or broken pace is sometimes found in the Akhal Teke and Yamud [YM] [Iomud] of Turkmenstein [Velayats of Balkan and Daşoguz], the Vyatka [VY] in the Kirov Oblast of Russia, the Bhutia [BU] [Yuta] of Bhutan and Sikkim India, and Zaniskari [ZA] of Zanskar Valley, Ladakh, and Jammu-Kashmir, India, the Kurdi [KU] [Jaf] [Provinces of Kurdistan and Kermanshah] and Turkoman [TM] of Iran near the Alborz Mountains and Steppes, the Karabiar [KR] of Tajikistan and Uzbekistan, the Karabakh [KK] in the Karabakh Mountains of Azerbaijan. It might also occur in the Altai [AT] of the Altai Mountains and the Mezen of Russia and the Kushum [KS] of the Urals Mountains in Kazakhstan. Some of the Indonesian and Polynesian horses have also been described as gaited, though the evidence for this is unclear, such as the Sandalwood [SW] and Timor [MR] of Indonesia, as well as the fact that the former Java [JV] horse seems to have led to gaited South African horses. The New Zealand Kaimanawa [KA] in the Kaimanawa Mountains and Nati [NA] horses on the East Coast of North Island seem to be able to fox trot on occasion, and perhaps also can perform the broken pace as the Tongan Singlefooter [TS] from Tonga likely does.

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