

Supporting Information

Gongora *et al.* 10.1073/pnas.0801991105

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11222222222233334
69111223445611354
79027257366105057

Ref      TTCATACATTTCCCTCTC

140-CH   ...GC..GCCCTTC..T
9-CH     ...GC...CCTTC..T
5-CH     .C.GC...CCCTTC..T
8-CH     ...GC...CCCTTC..T
11-CH    .....
141-CH   .....C.
17-CH    C.TG..T..C...C...
128-CH   ...GCG..CCCTTCT.T
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Fig. S1. Haplotypes identified among Chilean chickens. Numbers indicate the site position of the variable sites. Dots indicate identity with the reference sequence (GenBank accession no. AB098668) (1), and different base letters denote substitution.

1. Komiyama T, Ikeo K, Gojobori T (2003) Where is the origin of the Japanese gamecocks? *Gene* 317:195–202.

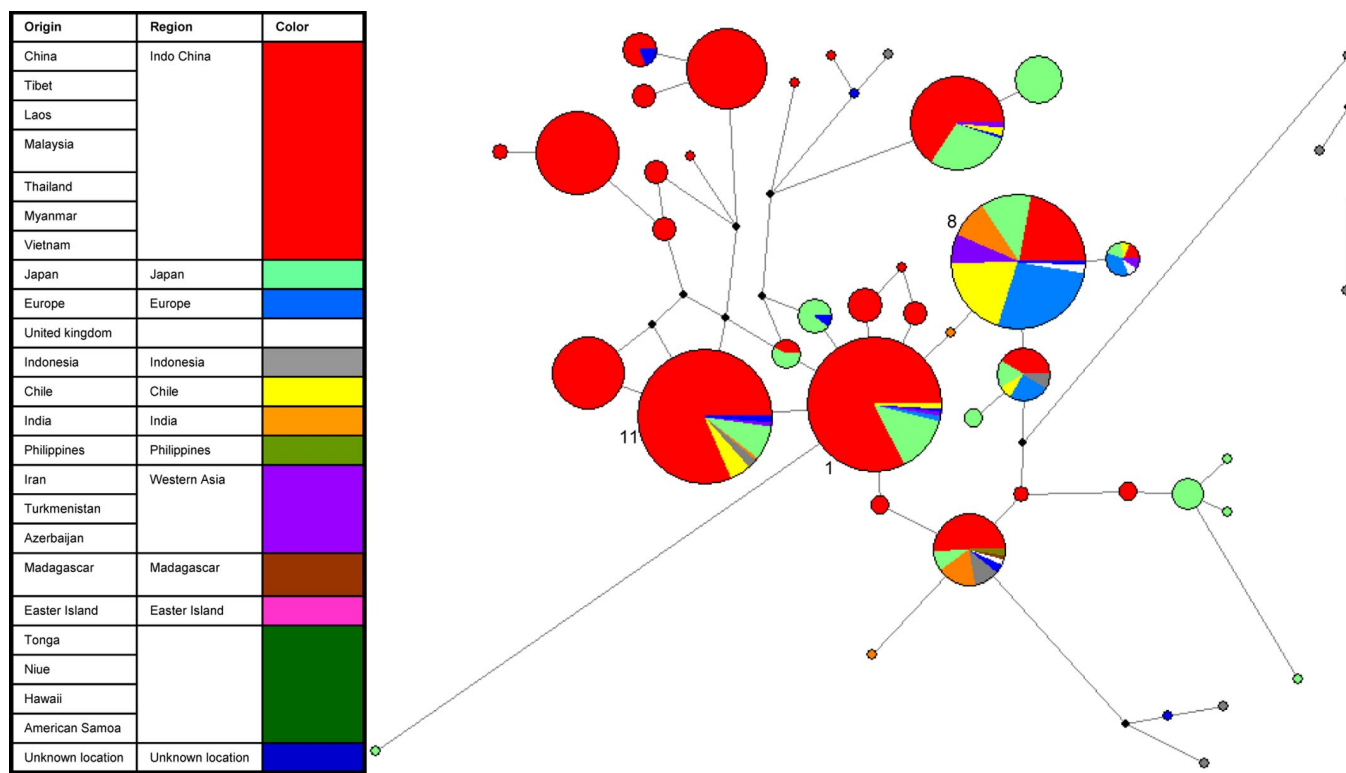


Fig. S4. Median-joining network start showing the position of 41 Chilean modern chickens (yellow) among native and wild junglefowl from Asia, Africa, and Europe. Only major and relevant networks are presented here by using 534 bp of the mtDNA CR. Circle size is proportional to the frequency of the corresponding haplotypes, and the geographical origin of the haplotypes are distinguished by use of color codes described in the table next to the figure. Most of the Chilean chickens cluster with Indian subcontinental/European/Chinese chickens, whereas other Chilean chickens cluster with haplogroups predominant of South and eastern Chinese/Japanese/Indonesian chickens.

Origin	Region	Color	
China	Indo China	Red	
Tibet			
Laos			
Malaysia			
Thailand			
Myanmar			
Vietnam			
Japan	Japan		Green
Europe	Europe		Blue
United kingdom			
Indonesia	Indonesia	Grey	
Chile	Chile	Yellow	
India	India	Orange	
Philippines	Philippines	Light Green	
Iran	Western Asia	Purple	
Turkmenistan			
Azerbaijan			
Madagascar	Madagascar	Brown	
Easter Island	Easter Island	Pink	
Tonga		Dark Green	
Niue			
Hawaii			
American Samoa			
Unknown location			Unknown location

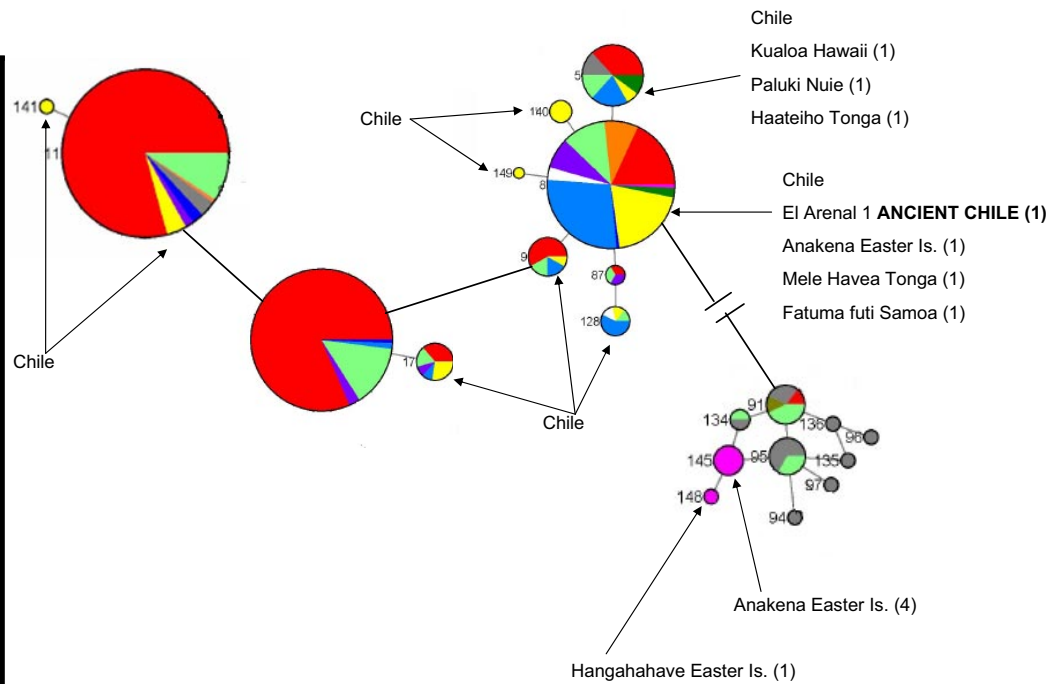


Fig. S5. Simplified median-joining networks showing the relationships and clustering of 205 bp of the mtDNA control region from worldwide, Chilean Araucana, pre-Columbian, and ancient Pacific/Polynesian chickens. The numbers next to the circles correspond to the haplotype clade number. The area of each circle is proportional to the frequency of the corresponding haplotypes, and the geographical origins of the haplotypes are distinguished by use of color codes described in the table next to the figure. Most of the Chilean chickens cluster with Indian subcontinental/European/Chinese chickens, more specifically with haplotype numbers 5, 8, 9, 128, and 140. The other Chilean chickens cluster with haplotypes predominant in South and eastern Chinese/Japanese/Indonesian chickens (haplotypes numbers 11, 17, and 141). Pre-Columbian sequence clusters with haplotype number 8. A more complete description of this MJN is presented in Fig. 1. Certain closely related haplotypes described in this and other figures have collapsed into others because of ambiguities and different length sequences.

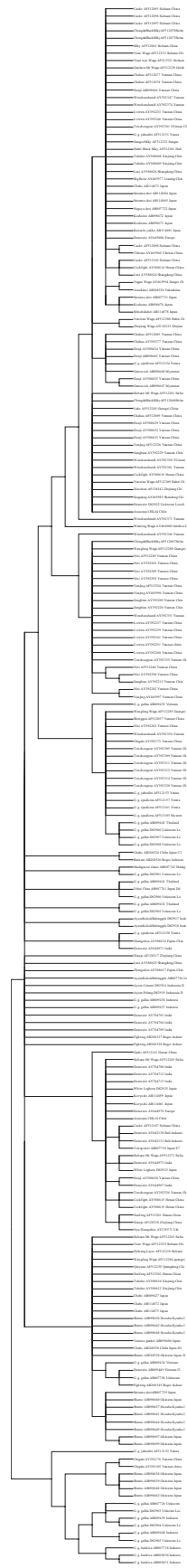


Fig. S6. Strict consensus MP tree. It was constructed from 30,276 trees left as described in *Materials and Methods*.

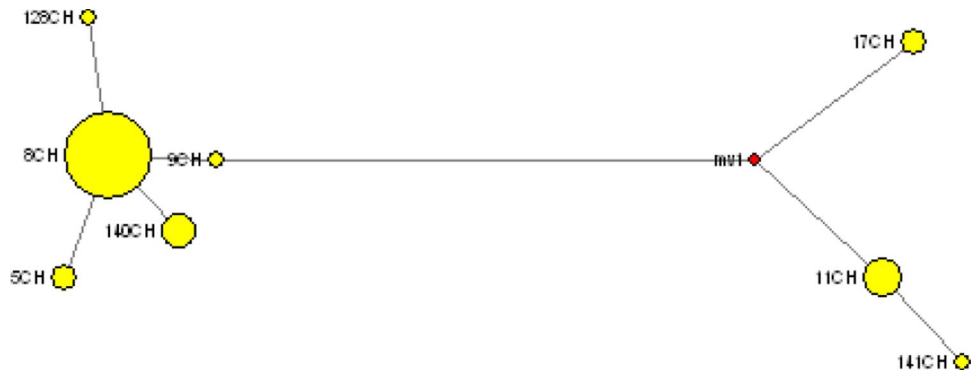


Fig. S7. MJN showing eight haplotypes of 41 modern Chilean chickens based by using 530 bp of the mtDNA CR sequences. The area of each circle is proportional to the frequency of the corresponding haplotypes described in [supporting information \(SI\) Table S1](#). Clustering of these sequences among native chickens and wild junglefowl from Asia, Africa, and Europe is shown in yellow in Fig. 1 and [Figs. S4 and S5](#).

Table S1. Voucher information of modern Chilean chicken samples collected from latitudes 33° to 40° S

Sample ID	Breed or type	Flock	Sex (♀/♂)	Chilean haplotype name	Haplotype no. as indicated in network analyses
CHL1	Ketro	A Pirque 1, Santiago (Lat 33° 40' S, Long 70° 28' W)	♂	11-CH	11
CHL2	Kollonca	♂	8-CH	8	
CHL3	Kollonca	♀			
CHL4	Kollonca	♀			
CHL5	Creole/naked neck	♂	17-CH	17	
CHL6	Kollonca	♀	11-CH	11	
CHL7	Creole	B Pirque 2, Santiago (Lat 33° 39' S, Long 70° 27' W)	♂	8-CH	8
CHL8	Kollonca	C Antiquina, Arauco (Lat 38° 11' S, Long 73° 25' W)	♂	8-CH	8
CHL9	Kollonca	♂	8-CH	8	
CHL10	Ketro	♀	140-CH	140	
CHL11	Kollonca de Aretes	♀	8-CH	8	
CHL12	Kollonca	♀	8-CH	8	
CHL13	Kollonca	♂	8-CH	8	
CHL14	Creole	D Malihue, Valdivia (Lat 39° 44' S, Long 72° 38' W)	♀	8-CH	8
CHL15	Creole	♀	8-CH	8	
CHL16	Kollonca	G Cañete, Arauco (Lat 37° 47' S, Long 73° 23' W)	♂		
CHL17	Ketro	♂	11-CH	11	
CHL18	Kollonca	♂	8-CH	8	
CHL19	Creole	E Ninhue, Chillán (Lat 36° 21' S, Long 72° 23' W)	♀	8-CH	8
CHL20	Creole	F Yumbel, Chillán (Lat 37° 02' S, Long 72° 32' W)	♀	140-CH	140
CHL21	Kollonca	G Cañete, Arauco (Lat 37° 47' S, Long 73° 23' W)	♂	8-CH	8
CHL22	Ketro	♀	140-CH	140	
CHL23	Ketro	♀	5-CH	5	
CHL24	Kollonca	♀	9-CH	9	
CHL25	Ketro	♀	8-CH	8	
CHL26	Kollonca	♀	5-CH	5	
CHL27	Kollonca	♀	8-CH	8	
CHL28	Ketro	♂	8-CH	8	
CHL29	Ketro	♀	140-CH	140	
CHL30	Kollonca	♀	8-CH	8	
CHL31	Kollonca	B Pirque 2, Santiago (Lat 33° 39' S, Long 70° 27' W)	♂	17-CH	17
CHL32	Kollonca	♀	128-CH	128	
CHL33	Ketro	♀	8-CH	8	
CHL34	Japanese Long Tail ancestry	♂	8-CH	8	
CCHL35	Kollonca	♂	8-CH	8	
CHL36	Kollonca	♀	11-CH	11	
CHL37	Ketro	♂	11-CH	11	
CHL38	Creole	♀	8-CH	8	
CHL39	Passion fowl	♀	8-CH	8	
CHL41	Passion fowl	H Viña del Mar, Valparaíso (Lat 32° 59' S, Long 71° 33' W)	♂	8-CH	8
CHL40	Passion fowl	♂	8-CH	8	
CHL42	Passion fowl	♀	8-CH	8	
CHL43	Ketro	J Melipilla, Santiago (Lat 33° 42' S, Long 71° 13' W)	♂	8-CH	8
CHL44	Passion fowl/Sebright ancestro	I El Monte, Santiago (Lat 33° 42' S, Long 70° 58' W)	♀	141-CH	141

Creole translates from "criollo" and stands for an unselected smallholder chicken typical of the countryside. DNA extraction procedures failed for samples 3, 4, and 16.

Table S2. Calibration of one direct date on chicken bone with increasing proportion of marine-derived carbon

ΔR	Marine C, %	Calibration dataset	Radiocarbon on chicken bones from the El Arenal-1, Chile ($n = 622 \pm 35$)
0 ± 0	0	SHCal04	AD1304–1424
154 ± 131	10	Mixed marine SoHem	AD1387–1449
154 ± 131	20	Mixed marine SoHem	AD1395–1492
154 ± 131	30	Mixed marine SoHem	AD1412–1620
154 ± 131	40	Mixed marine SoHem	AD1440–1644
154 ± 131	50	Mixed marine SoHem	AD1439–1796

ΔR of 137 ± 114 based on Ingram and Southon's (1) single bivalve determination from Valparaiso, Chile combined with Taylor and Berger's (2) gastropod date from approximately the same location. Given the problems inherent with the use of gastropods for characterizing marine reservoir effects, the derived ΔR value is used simply for illustrative purposes. All calibrated dates are reported at 2σ . Bold type denotes pre-Columbian values.

- Ingram BL, Southon JR (1996) Reservoir ages in Eastern Pacific coastal and estuarine waters. *Radiocarbon* 38:573–582.
- Taylor RE, Berger R (1967) Radiocarbon content of marine shells from the Pacific coasts of Central and South America. *Science* 158:1180–1182.

Table S3. Frequency of modern Chilean chicken haplotypes

Haplotype	Frequency
17-CH	2
11-CH	5
141-CH	1
140-CH	4
5-CH	2
9-CH	1
8-CH	25
128-CH	1
Total	41

Table S4. ΔR values for the west coast of South America (after Reimer and Reimer 2008)

Longitude	Latitude	ΔR	Location	Ref	Collection Reservoir		^{14}C age	Lab no.	Taxa	Diet
					year	age				
-80.00	-3.00	-216 ± 37	Guayaquil, Ecuador*	10	1927	85 ± 38	235 ± 37	UCIA-1249A	Cerithidea valida	Deposit feeder
-80.00	-3.00	84 ± 45	Guayaquil, Ecuador*	10	1927	386 ± 46	536 ± 45	UCLA-1249B	Thais biserialis	Carnivore
-80.00	-10.00	243 ± 49	Northern Peru*	10	1935 [†]	544 ± 50	700 ± 49	UCLA-1282	Strombus peruvianus	Herbivore/omnivore
-78.00	-14.00	670 ± 44	Peru*	10	1935 [†]	971 ± 45	1127 ± 44	UCLA-1279	Oliva peruviana	Unknown
-70.00	-24.00	175 ± 34	Antofagasta, Chile*	10	1925	477 ± 35	626 ± 34	UCLA-1277	Concholepas concholepas	Carnivore
-72.00	-33.00	313 ± 76	Valparaiso, Chile*	10	1935 [†]	614 ± 77	770 ± 76	UCLA-1278	Tequila aler	Unknown
-71.80	-33.10	61 ± 50	Valparaiso, Chile	6	1939 [‡]	370 ± 51	520 ± 50	CAMS-17919/1	Mytilus californianus	Suspension feeder
-72.65	-51.70	221 ± 40	Puerto Natales, Chile	6	1939 [‡]	530 ± 41	680 ± 40	CAMS-17918	Mytilus californianus	Suspension feeder

Marine reservoir effects for Chile are poorly resolved. There are eight ΔR values published for the west coast of South America between the equator and Cape Horn. All but one of these values can be shown to be problematic. Six of these values were published by Taylor and Berger (10) on the basis of dating of gastropods. Over the last 20 years, several studies have indicated that detrital feeders are potentially problematic because ingested organic carbon from diverse sources can become incorporated into shell structures through metabolic action (5, 9). These effects have been found to be particularly problematic in limestone-dominated areas (1, 4). It is for this reason that the use of suspension feeders, herbivores, and omnivores is recommended in ΔR research. Taylor and Berger's sample contains two carnivores, a deposit feeder, and two other gastropods for which dietary information is lacking. Only the determination on *Strombus peruvianus* from northern Peru is unproblematic as a herbivore/omnivore, resulting in $\Delta R = 243 \pm 49$. In Ingram and Southon's (6) more recent study focused on California included two samples of the suspension-feeding bivalve *Mytilus californianus* from Chile. The sample from Puerto Natales is an estuarine reservoir value, potentially influenced by terrestrial runoff and incomplete exchange with the open ocean and therefore may not reflect open water reservoir conditions (11). This leaves the determination from Valparaiso in central Chile, resulting in $\Delta R = 61 \pm 50$. This single ΔR value provides the single reliable estimate for marine reservoir effect in near-shore open waters in southern South America. However, this value is likely to underestimate ΔR in the region because of heavily depleted Antarctic source waters brought to the Chilean coastline by the Antarctic circumpolar current. Seven values are reported in the Marine Reservoir Database for northern Antarctica (7) giving a combined $\Delta R = 871 \pm 176$ (see refs. 2, 3, 8). We believe, therefore, that the $\Delta R = 61 \pm 50$ from Valparaiso should be treated as a conservative estimate of open water marine reservoir effect in Chile.

*Approximate location.

[†]Mid-point. Collected between 1930–1940 (10).

[‡]Ingram and Southon (1996:574) state that "n most cases, it is uncertain whether these specimens were collected live or not."

1. Anderson AT, Higham FG, Wallace R (2001) The radiocarbon chronology of the Norfolk Island archaeological sites. *Rec Australian Mus* 27(Supplement):33–42.
2. Berkman PA, Forman SL (1996) Pre-bomb radiocarbon and the reservoir correction for calcareous marine species in the Southern Ocean. *Geophys Res Lett* 23:363–366.
3. Bjorck S, Hjort C, Ingolfsson O, Skog G (1991) Radiocarbon dates from the Antarctic peninsula region—problems and potential. *Radiocarbon Dating: Recent Applications and Future Potential*, ed Lowe JJ (Quaternary Research Association, Cambridge, UK), Quaternary Proceedings 1, pp 55–65.
4. Dye T (1994) Apparent ages of marine shells: Implications for archaeological dating in Hawaii. *Radiocarbon* 36:51–57.
5. Hogg AG, Higham TFG, Dahm J (1998) ^{14}C dating of modern marine and estuarine shellfish. *Radiocarbon* 40:975–984.
6. Ingram BL, Southon JR (1996) Reservoir ages in Eastern Pacific coastal and estuarine waters. *Radiocarbon* 38:573–582.
7. Reimer P, Reimer R (2008) Marine reservoir correction database. <http://calib.qub.ac.uk/marine>, accessed February 10, 2008.
8. Peck LS, Brey T (1996) Bomb signals in old Antarctic brachiopods. *Nature* 380:207–208.
9. Tanaka N, Monaghan MC, Rye DM (1986) Contribution of metabolic carbon to mollusk and barnacle shell carbonate. *Nature* 320:520–523.
10. Taylor RE, Berger R (1967) Radiocarbon content of marine shells from the Pacific coasts of Central and South America. *Science* 158:1180–1182.
11. Ulm S (2002) Marine and estuarine reservoir effects in central Queensland, Australia: Determination of ΔR values. *Geoarchaeology* 17:319–348.
12. Taylor RE, Berger R (1967) Radiocarbon content of marine shells from the Pacific coasts of Central and South America. *Science* 158:1180–1182.

Other Supporting Information Files

[Table S5 \(XLS\)](#)

[Table S6 \(XLS\)](#)