

Table S1 Descriptive statistics of buffalo mammary gland morphology.

Trait	Average (cm)	SD	Max (cm)	Min (cm)	CV
ATL	6.03	0.96	8.1	4	15.9%
PTL	6.62	0.96	8.8	4.5	14.5%
AAD	18.25	3.56	26	9.5	19.5%
APD	10.43	2.22	16	5.1	21.3%
PPD	10.70	2.69	17.2	5.1	25.2%

SD, standard deviation; CV, coefficient variance; ATL, anterior teat length; PTL, posterior teat length; AAD, distance between anterior teats; APD, distance between anterior and posterior teat; PPD, distance between posterior teats.

Table S2 Suggestive SNPs for buffalo udder traits with P value<0.0001.

Traits*	Probeset_id	Chromosome	Position	P _value
PTL	AX-85094752	10	30514113	7.40E-06
	AX-85153767	5	32770918	2.97E-05
	AX-85113918	5	109249039	4.20E-05
	AX-85057352	11	10976261	4.24E-05
	AX-85072127	17	10852525	4.89E-05
	AX-85115248	20	7484473	6.28E-05
	AX-85058547	1	61639227	6.90E-05
	AX-85126106	14	66650653	7.22E-05
	AX-85111713	10	94674106	7.29E-05
	AX-85054093	28	33901591	7.64E-05
	AX-85181564	18	41098367	7.88E-05
	AX-85059701	19	14888292	7.88E-05
	AX-85088659	X	66645154	8.17E-05
	AX-85102697	24	32500133	9.50E-05
	AX-85062637	3	80431667	9.82E-05
	AX-85185033	24	28675555	9.93E-05
	AX-85106419	1	134430237	9.96E-05
	AX-85078980	15	5726242	9.96E-05

PPD	AX-85109615	29	33849019	1.47E-05	
	AX-85081263	10	77621680	1.50E-05	
	AX-85076927	17	32593484	2.80E-05	
	AX-85110109	13	66161716	3.54E-05	
	AX-85127689	6	78557828	3.71E-05	
	AX-85073849	29	29417913	5.06E-05	
	AX-85062876	X	126414999	6.43E-05	
	AX-85129835	1	24726569	6.51E-05	
	AX-85129784	3	59006101	7.44E-05	
	AX-85065627	11	39639151	9.68E-05	
	AX-85134148	26	13107503	9.90E-05	
	ATL	AX-85117983	1	89176003	7.08E-07
		AX-85067449	18	40076704	1.23E-05
		AX-85128721	4	10181604	2.17E-05
AX-85131060		18	39683311	3.00E-05	
AX-85084935		10	51916182	3.11E-05	
AX-85068709		8	73833511	3.70E-05	
AX-85086474		14	69215634	3.98E-05	
AX-85145646		15	42067465	5.47E-05	
AX-85065634		11	60894187	6.32E-05	
AX-85093519		17	43217028	7.28E-05	
AX-85042118		19	61888431	7.92E-05	
AX-85107937		5	69758039	8.48E-05	
AX-85134773		29	2554461	8.73E-05	
AX-85117785		6	24409838	8.73E-05	
AX-85129726		25	32853461	9.39E-05	
AX-85054029		21	9382191	9.46E-05	
AX-85058459		9	92359385	9.93E-05	
APD		AX-85117518	20	16600652	1.01E-05
	AX-85087645	5	47847587	1.26E-05	
	AX-85083446	5	21619875	1.94E-05	
	AX-85052245	10	60625299	2.75E-05	
	AX-85060393	11	58485120	3.14E-05	
	AX-85082932	27	36655346	3.95E-05	
	AX-85106856	23	3045738	4.03E-05	
	AX-85079357	1	6922535	4.57E-05	
	AX-85091682	5	78954425	4.75E-05	
	AX-85158163	1	67605444	4.82E-05	
	AX-85120353	28	1507324	4.91E-05	
	AX-85127479	25	8311187	6.09E-05	
	AX-85100114	16	76321590	7.10E-05	
	AX-85051771	11	59707792	8.06E-05	
AX-85151576	23	43151198	8.94E-05		
AX-85127582	11	64415360	9.70E-05		

	AX-85046610	13	54768553	9.70E-05
AAD	AX-85066300	8	76037788	1.29E-05
	AX-85112873	21	32049399	1.59E-05
	AX-85111967	2	75196070	2.26E-05
	AX-85052440	20	3433638	2.28E-05
	AX-85065141	24	31100087	2.43E-05
	AX-85126276	5	99395280	2.48E-05
	AX-85124136	5	7946337	2.75E-05
	AX-85087482	10	4943510	3.81E-05
	AX-85102393	10	33911439	4.26E-05
	AX-85070670	2	26837363	5.58E-05
	AX-85135634	5	4445551	5.83E-05
	AX-85043862	25	22407732	5.90E-05
	AX-85095839	17	61012939	6.65E-05
	AX-85182579	12	46189207	7.08E-05
	AX-85077296	9	35837802	7.48E-05
	AX-85130121	24	12500428	8.87E-05

Traits*: ATL, anterior teat length; PTL, posterior teat length; AAD, distance between anterior teats; APD, distance between anterior and posterior teat; PPD, distance between posterior teats

Table S3 Candidate genes in the block_2 and block_3 genomic regions.

Regions ¹	Within gene	Description
block_2	<i>GJD2</i>	Gap Junction Protein Delta 2
	<i>ACTC1</i>	Actin, Alpha, Cardiac Muscle 1
	<i>AQR</i>	Aquarius Intron-Binding Spliceosomal Factor
	<i>ZNF770</i>	Zinc Finger Protein 770
block_3	<i>IPO11</i>	Importin 11
	<i>DIMT1</i>	DIM1 Dimethyladenosine Transferase 1 Homolog

¹block_2, the region on BTA10 spanning 30.2 to 30.7 Mb; block_3, the region on BTA 20 spanning 16.3 to 16.8 Mb.

Supplementary Figure S1 Manhattan plots of genome-wide association analysis for deviation of average udder conformation in Italian buffalo. ATL, anterior teat length; PTL, posterior teat length; AAD, distance between anterior teats; APD, distance between anterior and posterior teat; PPD, distance between posterior teats; x-axis, physical positions of SNPs by chromosome based on *Bos taurus* UMD3.1 genome assembly; y-axis, $-\log_{10}(P\text{-values})$.

