

Supplementary Table 2

Choice	№ Region**	Chrom	Window Start	Window End	№ Markers	Markers	Dean et al. (2008)	Dean et al. (2011)	Dorus et al. (2010)*	White et al. (2011)
CZ&BV	1	1	2218496	4218496	1	1-3218496	-	-	-	-
CZ&BV	2	1	27291770	29291770	1	1-28291770	-	-	-	-
CZ&BV	3	1	78219888	80219888	1	1-79219888	Serpine2	Serpine2	-	-
CZ&BV	4	2	9053633	11053633	1	2-10053633	-	-	-	-
CZ&BV	5	2	33033588	35033588	1	2-34033588	-	Hspa5	Hc	-
CZ&BV	6	2	73558017	75558017	1	2-74558017	-	-	-	Relative testis weight (52.2-105.9-128.5 Mb),Relative testis weight (52.2-96-123.9 Mb)
CZ&BV	7	2	117591908	119591908	1	2-118591908	-	-	-	Relative testis weight (52.2-96-123.9 Mb),Relative testis weight (52.2-105.9-128.5 Mb)
CZ&BV	8	2	145686258	147686258	1	2-146686258	-	-	-	-
CZ&BV	9	2	173674207	179792933	2	2-174674207,2-178792933	-	-	-	-
CZ&BV	10	3	73249497	75249497	1	3-74249497	-	-	-	Distal bent tail (30-51.4-75.9 Mb)
CZ&BV	11	4	102390028	104156313	1	4-103390028	-	-	-	Relative testis weight (98.8-108.9-115.3 Mb),Relative testis weight (98.8-108.9-115.3 Mb)
CZ&BV	12	4	116552547	118127746	1	4-117127746	-	-	-	-
CZ&BV	13	5	19496322	21496322	1	5-20496322	-	-	-	-
CZ&BV	14	5	50550602	52550602	1	5-51550602	-	-	-	-
CZ&BV	15	5	70595790	74538258	2	5-71595790,5-73538258	-	-	-	-
CZ&BV	16	5	107510292	111571863	2	5-108510292,5-110571863	-	-	-	-
CZ&BV	17	5	138601762	140481724	1	5-139601762	-	-	-	Distal bent tail (133-146.4-148.4 Mb),Total abnormal sperm (122.4-138.2-148.4 Mb),Distal bent tail (132.2-139.6-148.4 Mb)

Supplementary Table 2

CZ&BV	18	6	4782646	6782646	1	6-5782646	-	-	-	-
CZ&BV	19	6	15485595	17261037	1	6-16485595	-	-	-	-
CZ&BV	20	6	48605478	50605478	1	6-49605478	Svs1	Svs1	-	-
CZ&BV	21	6	69810385	73554423	2	6-70810385,6-72554423	-	-	-	-
CZ&BV	22	6	77506201	79506201	1	6-78506201	-	-	-	-
CZ&BV	23	6	81657845	83657845	1	6-82657845	-	-	-	-
CZ&BV	24	6	97793902	99656333	1	6-98793902	-	-	-	-
CZ&BV	25	7	15643634	17643634	1	7-16643634	-	-	-	Sperm head PC1 (13.7-23.4-44.3 Mb)
CZ&BV	26	8	76982361	78982361	1	8-77982361	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ&BV	27	8	94400455	97505302	2	8-95400455,8-96505302	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ&BV	28	9	28019307	30019307	1	9-29019307	-	-	-	-
CZ&BV	29	9	94750430	96750430	1	9-95750430	-	-	Atp1b3(membrane)	-
CZ&BV	30	10	14492552	16492552	1	10-15492552	-	-	-	-
CZ&BV	31	10	102600049	104600049	1	10-103600049	-	-	-	-
CZ&BV	32	11	3550977	5443394	1	11-4550977	Tcn2	-	-	-
CZ&BV	33	11	8117435	10117435	1	11-9117435	-	-	-	-
CZ&BV	34	11	12072486	14072486	1	11-13072486	-	-	-	-
CZ&BV	35	11	22356000	24356000	1	11-23356000	-	-	-	-
CZ&BV	36	11	25179507	26557146	1	11-25557146	-	-	-	-
CZ&BV	37	11	28441766	30441766	1	11-29441766	-	-	Spnb2	-
CZ&BV	38	11	46198420	47639287	1	11-46639287	-	-	-	Sperm head PC1 (44.6-57.3-73.2 Mb)
CZ&BV	39	11	73612361	75532119	1	11-74612361	-	-	-	-
CZ&BV	40	11	76431151	80528556	2	11-77431151,11-79528556	-	-	-	-
CZ&BV	41	11	81647709	84521834	2	11-82647709,11-83521834	-	-	-	-
CZ&BV	42	12	69849999	71849999	1	12-70849999	-	-	Atp5s	-
CZ&BV	43	12	73069953	75069953	1	12-74069953	-	-	-	-
CZ&BV	44	13	27900057	29900057	1	13-28900057	-	-	-	-

Supplementary Table 2

CZ&BV	45	13	92983877	94983877	1	13-93983877	-	-	-	-
CZ&BV	46	14	82308345	83828913	1	14-83308345	-	-	-	-
CZ&BV	47	14	93730826	96297758	2	14-94730826,14-95297758	-	-	-	-
CZ&BV	48	15	41990323	43990323	1	15-42990323	-	-	-	Total abnormal sperm (16.5-27.1-77.2 Mb),Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb),Headless/tailless (16.5-16.5-48.2 Mb)
CZ&BV	49	16	2700097	4338117	1	16-3700097	-	-	-	-
CZ&BV	50	16	9673724	11673724	1	16-10673724	-	-	-	-
CZ&BV	51	16	15416923	17556714	2	16-16416923,16-16556714	-	-	Ube2v2,Ccdc116	-
CZ&BV	52	16	41542464	43542464	1	16-42542464	-	-	-	-
CZ&BV	53	16	73152290	75152290	1	16-74152290	-	-	-	Seminiferous tubule area (66.8-88.2-97.2 Mb)
CZ&BV	54	17	13320574	15320574	1	17-14320574	-	-	-	Sperm density (3.1-30-65.2 Mb),Relative testis weight (3.1-57.9-73.2 Mb),Sperm density (3.1-30-64.5 Mb)
CZ&BV	55	17	65669344	66932862	1	17-65932862	-	-	-	Relative testis weight (3.1-57.9-73.2 Mb)
CZ&BV	56	18	21349665	23349665	1	18-22349665	-	-	-	-
CZ&BV	57	18	42779798	44779798	1	18-43779798	Spink3,Spinkl	Spinkl,Spink5,Spink3	-	-
CZ&BV	58	19	39111518	41084697	1	19-40111518	-	-	-	-
CZ&BV	59	19	43454439	47038714	2	19-44454439,19-46038714	-	-	Cwf1911,Cutc	-

Supplementary Table 2

BV	1	1	2218496	9343394	4	1-3218496,1-4679964,1-6622316,1-8343394	-	-	-	-
BV	2	1	27291770	29291770	1	1-28291770	-	-	-	-
BV	3	1	53443478	55252496	1	1-54443478	-	-	-	-
BV	4	1	64111919	66111919	1	1-65111919	-	-	-	-
BV	5	1	78219888	80219888	1	1-79219888	Serpine2	Serpine2	-	-
BV	6	1	86570192	88355483	1	1-87570192	-	-	-	-
BV	7	1	90291189	92291189	1	1-91291189	-	-	-	-
BV	8	1	93210207	95210207	1	1-94210207	-	-	-	-
BV	9	1	97298198	101323618	2	1-98298198,1-100323618	-	-	-	-
BV	10	1	107247355	109247355	1	1-108247355	-	-	-	-
BV	11	1	132092315	135468242	2	1-133092315,1-134468242	-	-	Zp3r(membrane)	-
BV	12	1	138211342	140211342	1	1-139211342	-	-	-	-
BV	13	1	151195296	153195296	1	1-152195296	-	-	-	-
BV	14	1	166194243	168022444	1	1-167022444	-	-	-	-
BV	15	2	2087705	7140329	3	2-3087705,2-4133690,2-6140329	-	-	-	-
BV	16	2	9053633	13035156	2	2-10053633,2-12035156	-	-	-	-
BV	17	2	19519378	24730329	3	2-20519378,2-22485996,2-23730329	-	-	-	-
BV	18	2	33033588	35033588	1	2-34033588	-	Hspa5	Hc	-
BV	19	2	73558017	75558017	1	2-74558017	-	-	-	Relative testis weight (52.2-105.9-128.5 Mb),Relative testis weight (52.2-96-123.9 Mb)
BV	20	2	91341483	97387284	3	2-92341483,2-94364908,2-96387284	-	-	-	Relative testis weight (52.2-96-123.9 Mb),Relative testis weight (52.2-105.9-128.5 Mb)

Supplementary Table 2

BV	21	2	102555546	108838203	3	2-103555546,2-105684606,2-107838203	-	-	Pdhx	Relative testis weight (52.2-96-123.9 Mb),Relative testis weight (52.2-105.9-128.5 Mb)
BV	22	2	114464056	119591908	3	2-115464056,2-117139112,2-118591908	-	-	-	Relative testis weight (52.2-96-123.9 Mb),Relative testis weight (52.2-105.9-128.5 Mb)
BV	23	2	133892537	135892537	1	2-134892537	-	-	-	-
BV	24	2	137841360	139841360	1	2-138841360	-	-	-	-
BV	25	2	143088224	147686258	2	2-144088224,2-146686258	-	-	-	-
BV	26	2	173674207	179792933	2	2-174674207,2-178792933	-	-	-	-
BV	27	3	33351627	35351627	1	3-34351627	-	-	-	Distal bent tail (30-51.4-75.9 Mb),Distal bent tail (28.2-54.7-72.1 Mb)
BV	28	3	60184383	62184383	1	3-61184383	-	-	-	Distal bent tail (28.2-54.7-72.1 Mb),Distal bent tail (30-51.4-75.9 Mb)
BV	29	3	73249497	75249497	1	3-74249497	-	-	-	Distal bent tail (30-51.4-75.9 Mb)
BV	30	3	82423612	88303631	3	3-83423612,3-85417026,3-87303631	-	-	-	-
BV	31	3	108059185	111509431	2	3-109059185,3-110509431	-	Sort1	-	-
BV	32	3	119839910	121839910	1	3-120839910	-	-	-	Relative testis weight (108.5-129.8-143.7 Mb)
BV	33	3	127450949	129450949	1	3-128450949	-	-	-	Relative testis weight (108.5-129.8-143.7 Mb)
BV	34	3	149119991	151119991	1	3-150119991	-	-	-	-
BV	35	4	39288027	41142659	1	4-40288027	-	-	Aqp7(membrane)	-
BV	36	4	58941702	60941702	1	4-59941702	-	-	-	-

Supplementary Table 2

BV	37	4	87581941	89581941	1	4-88581941	-	-	-	-
BV	38	4	95465024	97409681	1	4-96409681	-	-	-	-
BV	39	4	102390028	104156313	1	4-103390028	-	-	-	Relative testis weight (98.8-108.9-115.3 Mb),Relative testis weight (98.8-108.9-115.3 Mb)
BV	40	4	116552547	120106544	2	4-117127746,4-119106544	-	-	-	-
BV	41	4	125511510	127511510	1	4-126511510	-	-	Col8a2	Relative testis weight (121.8-134.5-148 Mb)
BV	42	4	132547607	134547607	1	4-133547607	-	-	-	Relative testis weight (121.8-134.5-148 Mb)
BV	43	4	140319248	144281847	2	4-141319248,4-143281847	-	-	-	Relative testis weight (121.8-134.5-148 Mb)
BV	44	5	19496322	23530300	2	5-20496322,5-22530300	-	-	-	-
BV	45	5	33270952	35270952	1	5-34270952	-	-	-	-
BV	46	5	45045814	54296162	5	5-46045814,5-47506887,5-49517525,5-51550602,5-53504443	-	-	-	-
BV	47	5	56099806	58099806	1	5-57099806	-	-	-	-
BV	48	5	70595790	74538258	2	5-71595790,5-73538258	-	-	-	-
BV	49	5	107510292	111571863	2	5-108510292,5-110571863	-	-	-	-
BV	50	5	123549994	127503490	2	5-124549994,5-126503490	-	-	-	Total abnormal sperm (122.4-138.2-148.4 Mb)
BV	51	5	133554863	137494041	2	5-134554863,5-136494041	-	-	-	Distal bent tail (133-146.4-148.4 Mb),Total abnormal sperm (122.4-138.2-148.4 Mb),Distal bent tail (132.2-139.6-148.4 Mb)

Supplementary Table 2

BV	52	5	138601762	141481724	2	5-139601762,5-140481724	-	-	-	Distal bent tail (132.2-139.6-148.4 Mb),Distal bent tail (133-146.4-148.4 Mb),Total abnormal sperm (122.4-138.2-148.4 Mb)
BV	53	5	147521012	149521012	1	5-148521012	-	-	-	-
BV	54	6	4782646	6782646	1	6-5782646	-	-	-	-
BV	55	6	15485595	17261037	1	6-16485595	-	-	-	-
BV	56	6	48605478	52626987	2	6-49605478,6-51626987	Svs1	Svs1	-	-
BV	57	6	58248718	60248718	1	6-59248718	-	-	Abcg2(membrane)	-
BV	58	6	63129873	66318447	2	6-64129873,6-65318447	-	-	-	-
BV	59	6	69810385	73554423	2	6-70810385,6-72554423	-	-	-	-
BV	60	6	75560933	79506201	2	6-76560933,6-78506201	-	-	-	-
BV	61	6	81657845	83657845	1	6-82657845	-	-	-	-
BV	62	6	88357069	90357069	1	6-89357069	-	-	-	-
BV	63	6	95866919	102642387	4	6-96866919,6-98793902,6-99656333,6-101642387	-	-	-	-
BV	64	6	112085013	115361266	2	6-113085013,6-114361266	-	-	-	-
BV	65	7	3949736	5949736	1	7-4949736	-	-	-	-
BV	66	7	15643634	17643634	1	7-16643634	-	-	-	Sperm head PC1 (13.7-23.4-44.3 Mb)
BV	67	7	25013888	27013888	1	7-26013888	Ceacam10	Ceacam10	Irgc1	Sperm head PC1 (13.7-23.4-44.3 Mb)
BV	68	7	45946267	58000026	7	7-46946267,7-48313230,7-50878487,7-52514458,7-54401984,7-56331327,7-57000026	-	Ldha	Izumo1(membrane),Ldhe	-
BV	69	7	62720387	64242187	1	7-63720387	-	-	-	-

Supplementary Table 2

BV	70	7	71376346	73376346	1	7-72376346	-	-	-	-
BV	71	7	84220899	86220899	1	7-85220899	-	-	-	-
BV	72	7	101127176	103127176	1	7-102127176	-	-	-	-
BV	73	7	124557564	126557564	1	7-125557564	-	-	-	-
BV	74	7	145596358	147596358	1	7-146596358	-	-	Inpp5a	-
BV	75	8	18221075	23869624	2	8-19221075,8-22869624	-	-	-	-
BV	76	8	59032680	61032680	1	8-60032680	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
BV	77	8	69543328	71543328	1	8-70543328	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
BV	78	8	76982361	78982361	1	8-77982361	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
BV	79	8	94400455	97505302	2	8-95400455,8-96505302	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
BV	80	8	103379071	105539507	2	8-104379071,8-104539507	-	-	-	-
BV	81	8	109224009	111224009	1	8-110224009	-	-	-	-
BV	82	9	7922218	9922218	1	9-8922218	-	-	-	-
BV	83	9	20630492	22630492	1	9-21630492	-	-	-	-
BV	84	9	26442920	35771574	5	9-27333744,9-29019307,9-30525379,9-32550236,9-34771574	D730048I06Rik	Pate4,D730048I06Rik	-	-
BV	85	9	36667119	38413337	1	9-37413337	-	-	-	-
BV	86	9	46545966	48545966	1	9-47545966	-	-	-	-
BV	87	9	52503741	56473020	2	9-53503741,9-55473020	-	-	-	-
BV	88	9	80504278	82504278	1	9-81504278	-	-	-	-
BV	89	9	92449909	96750430	3	9-93449909,9-93958617,9-95750430	-	-	Atp1b3(membrane)	-
BV	90	9	102141047	104141047	1	9-103141047	-	-	Trf	-
BV	91	10	8392633	10392633	1	10-9392633	-	-	-	-

Supplementary Table 2

BV	92	10	12528165	16492552	2	10-13528165,10-15492552	-	-	-	-
BV	93	10	60567285	64325189	2	10-61567285,10-63447082	-	-	Hk1	Relative testis weight (51.3-72.2-82.7 Mb),Proximal bent tail (34.5-51.3-87.4 Mb),Relative testis weight (55.1-69.3-87.4 Mb),Proximal bent tail (32.6-47.6-84.3 Mb)
BV	94	10	65015642	66517763	1	10-66015642	-	-	-	Proximal bent tail (34.5-51.3-87.4 Mb),Relative testis weight (55.1-69.3-87.4 Mb),Proximal bent tail (32.6-47.6-84.3 Mb),Relative testis weight (51.3-72.2-82.7 Mb)
BV	95	10	79265834	81265834	1	10-80265834	-	-	BC005764	Relative testis weight (55.1-69.3-87.4 Mb),Proximal bent tail (32.6-47.6-84.3 Mb),Relative testis weight (51.3-72.2-82.7 Mb),Proximal bent tail (34.5-51.3-87.4 Mb)
BV	96	10	84145548	89003532	2	10-84461800,10-88003532	-	-	-	-
BV	97	10	95534734	97534734	1	10-96534734	-	-	-	-
BV	98	10	102600049	104600049	1	10-103600049	-	-	-	-
BV	99	10	119494102	121237791	1	10-120494102	-	-	-	-
BV	100	10	122052771	124052771	1	10-123052771	-	-	-	-
BV	101	10	128370924	129936701	1	10-129370924	-	-	-	-
BV	102	11	3550977	5443394	1	11-4550977	Tcn2	-	-	-
BV	103	11	8117435	10117435	1	11-9117435	-	-	-	-
BV	104	11	12072486	14072486	1	11-13072486	-	-	-	-
BV	105	11	17557462	19557462	1	11-18557462	-	-	-	-

Supplementary Table 2

BV	106	11	20494884	24356000	2	11-21018456,11-23356000	-	Mdh1	-	-
BV	107	11	25179507	26557146	1	11-25557146	-	-	-	-
BV	108	11	28441766	30441766	1	11-29441766	-	-	Spnb2	-
BV	109	11	43548099	45548099	1	11-44548099	-	-	-	-
BV	110	11	46198420	47639287	1	11-46639287	-	-	-	Sperm head PC1 (44.6-57.3-73.2 Mb)
BV	111	11	65359051	67359051	1	11-66359051	-	-	-	Sperm head PC1 (44.6-57.3-73.2 Mb)
BV	112	11	71600158	80528556	5	11-72600158,11-74612361,11-75532119,11-77431151,11-79528556	-	-	-	-
BV	113	11	81647709	84521834	2	11-82647709,11-83521834	-	-	-	-
BV	114	11	113138441	114735409	1	11-114138441	-	-	D11Wsu47e	-
BV	115	12	52481717	54481717	1	12-53481717	-	-	-	-
BV	116	12	57123595	60624457	2	12-57869231,12-59624457	-	-	-	-
BV	117	12	69849999	71849999	1	12-70849999	-	-	Atp5s	-
BV	118	12	73069953	75069953	1	12-74069953	-	-	-	-
BV	119	12	76963781	78963781	1	12-77963781	-	-	-	-
BV	120	12	87371194	89371194	1	12-88371194	-	-	-	-
BV	121	13	27900057	29900057	1	13-28900057	-	-	-	-
BV	122	13	43636064	48731379	2	13-44636064,13-47731379	-	-	-	-
BV	123	13	58009782	63310410	3	13-59009782,13-60981019,13-62310410	-	-	-	-
BV	124	13	92983877	94983877	1	13-93983877	-	-	-	-
BV	125	13	98735240	100735240	1	13-99735240	-	-	-	-
BV	126	13	103456553	105456553	1	13-104456553	-	-	-	-

Supplementary Table 2

BV	127	13	109112000	112651504	2	13-110112000,13-111651504	-	-	-	-
BV	128	14	9740076	11315439	1	14-10740076	-	-	-	-
BV	129	14	12212702	14212702	1	14-13212702	-	-	-	-
BV	130	14	22505529	29500123	4	14-23505529,14-25420869,14-27478740,14-28585923	-	-	Vdac2	-
BV	131	14	40516626	42516626	1	14-41516626	-	-	-	Seminiferous tubule area (25.6-61.6-63.2 Mb)
BV	132	14	46551836	48311055	1	14-47551836	-	-	-	Seminiferous tubule area (25.6-61.6-63.2 Mb)
BV	133	14	54715750	56715750	1	14-55715750	-	-	-	Seminiferous tubule area (25.6-61.6-63.2 Mb)
BV	134	14	57920809	59920809	1	14-58920809	-	-	-	Seminiferous tubule area (25.6-61.6-63.2 Mb)
BV	135	14	61231548	63231548	1	14-62231548	-	-	-	-
BV	136	14	82308345	83828913	1	14-83308345	-	-	-	-
BV	137	14	93730826	96297758	2	14-94730826,14-95297758	-	-	-	-
BV	138	15	4014503	5570988	1	15-5014503	-	-	-	-
BV	139	15	41990323	43990323	1	15-42990323	-	-	-	Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-27.1-77.2 Mb),Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb)
BV	140	15	49516612	51516612	1	15-50516612	-	-	-	Total abnormal sperm (16.5-27.1-77.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb)

Supplementary Table 2

BV	141	16	2700097	5338117	2	16-3700097,16-4338117	-	-	-	-
BV	142	16	9673724	11673724	1	16-10673724	-	-	-	-
BV	143	16	15416923	17556714	2	16-16416923,16-16556714	-	-	Ube2v2,Ccdc116	-
BV	144	16	41542464	46334403	3	16-42542464,16-44238674,16-46185073	-	-	-	-
BV	145	16	57680765	59680765	1	16-58680765	-	-	-	-
BV	146	16	73152290	75152290	1	16-74152290	-	-	-	Seminiferous tubule area (66.8-88.2-97.2 Mb)
BV	147	16	76126395	77358628	1	16-76358628	-	-	-	Seminiferous tubule area (66.8-88.2-97.2 Mb)
BV	148	17	13320574	15320574	1	17-14320574	-	-	-	Relative testis weight (3.1-57.9-73.2 Mb),Sperm density (3.1-30-64.5 Mb),Sperm density (3.1-30-65.2 Mb)
BV	149	17	29215665	31215665	1	17-30215665	-	-	-	Sperm density (3.1-30-65.2 Mb),Relative testis weight (3.1-57.9-73.2 Mb),Sperm density (3.1-30-64.5 Mb)
BV	150	17	55326632	57326632	1	17-56326632	-	-	-	Sperm density (3.1-30-65.2 Mb),Relative testis weight (3.1-57.9-73.2 Mb),Sperm density (3.1-30-64.5 Mb)
BV	151	17	62922798	64922798	1	17-63922798	-	-	-	Sperm density (3.1-30-65.2 Mb),Relative testis weight (3.1-57.9-73.2 Mb)

Supplementary Table 2

BV	152	17	65669344	66932862	1	17-65932862	-	-	-	Relative testis weight (3.1-57.9-73.2 Mb)
BV	153	18	21349665	23349665	1	18-22349665	-	-	-	-
BV	154	18	27026161	29026161	1	18-28026161	-	-	-	-
BV	155	18	31000740	35513358	3	18-32000740,18-32504903,18-34513358	-	-	-	-
BV	156	18	42779798	44779798	1	18-43779798	Spink3,Spinkl	Spink3,Spinkl,Spink5	-	-
BV	157	18	54016148	56016148	1	18-55016148	-	-	-	-
BV	158	18	60012852	62012852	1	18-61012852	-	-	-	Seminiferous tubule area (58-68.5-78.1 Mb)
BV	159	18	71148938	74890844	2	18-72063177,18-73890844	-	-	Ccdc11	Seminiferous tubule area (60.3-69.6-80 Mb),Seminiferous tubule area (58-68.5-78.1 Mb)
BV	160	19	24023055	26023055	1	19-25023055	-	-	-	-
BV	161	19	30060431	32060431	1	19-31060431	-	-	-	-
BV	162	19	39111518	41084697	1	19-40111518	-	-	-	-
BV	163	19	43454439	47038714	2	19-44454439,19-46038714	-	-	Cwf1911,Cutc	-
CZ	1	1	2218496	4218496	1	1-3218496	-	-	-	-
CZ	2	1	26043291	29291770	2	1-27043291,1-28291770	-	-	-	-
CZ	3	1	37523662	41488424	2	1-38523662,1-40488424	-	-	-	-
CZ	4	1	78219888	80219888	1	1-79219888	Serpine2	Serpine2	-	-
CZ	5	1	114414966	116414966	1	1-115414966	-	-	-	-
CZ	6	1	128191266	130191266	1	1-129191266	-	-	-	-
CZ	7	1	135251828	137251828	1	1-136251828	-	-	-	-
CZ	8	1	148168925	150168925	1	1-149168925	-	-	-	-
CZ	9	1	159226965	161226965	1	1-160226965	-	-	-	-

Supplementary Table 2

CZ	10	1	177487255	186387697	5	1-178487255,1-180238329,1-182194280,1-184117310,1-185387697	-	-	Enah,Wdr64	-
CZ	11	2	7025133	11053633	2	2-8025133,2-10053633	-	-	-	-
CZ	12	2	13070846	18265394	3	2-14070846,2-16043636,2-17265394	-	-	-	-
CZ	13	2	25561347	29258366	2	2-26252845,2-28258366	-	-	-	-
CZ	14	2	33033588	35033588	1	2-34033588	-	Hspa5	Hc	-
CZ	15	2	37309370	39309370	1	2-38309370	-	-	-	-
CZ	16	2	45329597	47329597	1	2-46329597	-	-	-	-
CZ	17	2	65805958	67805958	1	2-66805958	-	-	-	Relative testis weight (52.2-105.9-128.5 Mb),Relative testis weight (52.2-96-123.9 Mb)
CZ	18	2	71575844	75558017	2	2-72575844,2-74558017	-	-	-	Relative testis weight (52.2-96-123.9 Mb),Relative testis weight (52.2-105.9-128.5 Mb)
CZ	19	2	101017952	103017952	1	2-102017952	-	-	Pdhx	Relative testis weight (52.2-96-123.9 Mb),Relative testis weight (52.2-105.9-128.5 Mb)
CZ	20	2	117591908	121593238	2	2-118591908,2-120593238	-	-	-	Relative testis weight (52.2-96-123.9 Mb),Relative testis weight (52.2-105.9-128.5 Mb)
CZ	21	2	123615974	125615974	1	2-124615974	-	-	-	Relative testis weight (52.2-105.9-128.5 Mb)
CZ	22	2	127899009	129899009	1	2-128899009	-	-	-	-
CZ	23	2	132609716	134429022	1	2-133429022	-	-	-	-
CZ	24	2	145686258	147686258	1	2-146686258	-	-	-	-
CZ	25	2	163257865	165257865	1	2-164257865	Svs6,Svs3a,Svs5,Svs2,Svs3b,Svs4	Svs4,Svs6,Svs3a,Svs5,Svs2,Svs3b,Wfdc3	-	-

Supplementary Table 2

CZ	26	2	173674207	179792933	2	2-174674207,2-178792933	-	-	-	-
CZ	27	3	5367208	8984156	2	3-6008035,3-7984156	-	-	-	-
CZ	28	3	47314708	49314708	1	3-48314708	-	-	-	Distal bent tail (30-51.4-75.9 Mb),Distal bent tail (28.2-54.7-72.1 Mb)
CZ	29	3	73249497	75249497	1	3-74249497	-	-	-	Distal bent tail (30-51.4-75.9 Mb)
CZ	30	3	88085477	90085477	1	3-89085477	-	-	Tpm3	-
CZ	31	3	94264590	97370325	2	3-95264590,3-96370325	-	-	-	-
CZ	32	3	115449736	120018491	3	3-116449736,3-118409193,3-119018491	-	-	-	Relative testis weight (108.5-129.8-143.7 Mb)
CZ	33	3	135819286	137819286	1	3-136819286	-	-	-	Relative testis weight (108.5-129.8-143.7 Mb)
CZ	34	3	151076095	153076095	1	3-152076095	-	-	-	-
CZ	35	3	155139240	157139240	1	3-156139240	-	-	-	-
CZ	36	4	10129686	13006792	2	4-11129686,4-12006792	-	-	-	-
CZ	37	4	30381321	35455525	2	4-31381321,4-34455525	-	-	Spaca1(membrane)	-
CZ	38	4	35988631	37988631	1	4-36988631	-	-	-	-
CZ	39	4	45588937	47358721	1	4-46358721	-	-	-	-
CZ	40	4	67501467	69501467	1	4-68501467	-	-	-	-
CZ	41	4	78705798	80705798	1	4-79705798	-	-	-	-
CZ	42	4	86359241	88359241	1	4-87359241	-	-	-	-
CZ	43	4	88968152	90968152	1	4-89968152	-	-	-	-
CZ	44	4	92815070	96409681	2	4-93815070,4-95465024	-	-	-	-
CZ	45	4	96553412	98553412	1	4-97553412	-	-	-	-
CZ	46	4	102390028	104156313	1	4-103390028	-	-	-	Relative testis weight (98.8-108.9-115.3 Mb),Relative testis weight (98.8-108.9-115.3 Mb)

Supplementary Table 2

CZ	47	4	106325908	110154216	2	4-107325908,4-109154216	-	-	-	Relative testis weight (98.8-108.9-115.3 Mb),Relative testis weight (98.8-108.9-115.3 Mb)
CZ	48	4	113215469	118127746	4	4-114215469,4-114754817,4-116552547,4-117127746	-	Prdx1	-	-
CZ	49	4	129261463	133025536	2	4-130261463,4-132025536	-	-	Mecr	Relative testis weight (121.8-134.5-148 Mb)
CZ	50	4	134586011	136586011	1	4-135586011	-	-	-	Relative testis weight (121.8-134.5-148 Mb)
CZ	51	4	147148701	149148701	1	4-148148701	-	-	-	-
CZ	52	5	9676168	15510561	3	5-10676168,5-12551988,5-14510561	-	-	-	-
CZ	53	5	19496322	21496322	1	5-20496322	-	-	-	-
CZ	54	5	39571420	41571420	1	5-40571420	-	-	-	-
CZ	55	5	50550602	52550602	1	5-51550602	-	-	-	-
CZ	56	5	65329275	67329275	1	5-66329275	-	-	-	-
CZ	57	5	68791826	74538258	3	5-69791826,5-71595790,5-73538258	-	-	-	-
CZ	58	5	76511043	78511043	1	5-77511043	-	-	1700023E05Rik	-
CZ	59	5	81774405	83774405	1	5-82774405	-	-	-	-
CZ	60	5	84036252	92942191	5	5-85036252,5-87516106,5-89553700,5-90191248,5-91942191	-	Smr2,Alb	-	-
CZ	61	5	95311622	97164116	1	5-96311622	-	-	-	-
CZ	62	5	97606521	99606521	1	5-98606521	-	-	-	-
CZ	63	5	107510292	111571863	2	5-108510292,5-110571863	-	-	-	-
CZ	64	5	117509093	121545466	2	5-118509093,5-120545466	-	-	-	-

Supplementary Table 2

CZ	65	5	138601762	140481724	1	5-139601762	-	-	-	Total abnormal sperm (122.4-138.2-148.4 Mb),Distal bent tail (132.2-139.6-148.4 Mb),Distal bent tail (133-146.4-148.4 Mb)
CZ	66	5	141522384	143522384	1	5-142522384	-	-	-	Distal bent tail (133-146.4-148.4 Mb),Total abnormal sperm (122.4-138.2-148.4 Mb),Distal bent tail (132.2-139.6-148.4 Mb)
CZ	67	6	4782646	9911899	2	6-5782646,6-8911899	-	-	-	-
CZ	68	6	15485595	17261037	1	6-16485595	-	-	-	-
CZ	69	6	27407372	29407372	1	6-28407372	-	-	-	-
CZ	70	6	30144816	32144816	1	6-31144816	-	-	-	-
CZ	71	6	42500404	44500404	1	6-43500404	-	Fam115e	-	-
CZ	72	6	48605478	50605478	1	6-49605478	Svs1	Svs1	-	-
CZ	73	6	61118351	63118351	1	6-62118351	-	-	-	-
CZ	74	6	66319392	75564086	4	6-67319392,6-70810385,6-72554423,6-74564086	-	-	-	-
CZ	75	6	77506201	79506201	1	6-78506201	-	-	-	-
CZ	76	6	81657845	86479596	3	6-82657845,6-84399217,6-85479596	-	-	-	-
CZ	77	6	97793902	99656333	1	6-98793902	-	-	-	-
CZ	78	6	106506062	108487826	1	6-107506062	-	-	-	-
CZ	79	6	119675321	121675321	1	6-120675321	-	-	-	-
CZ	80	6	139586186	143349146	2	6-140586186,6-142510257	-	-	-	-
CZ	81	6	146621604	148621604	1	6-147621604	-	-	-	-
CZ	82	7	12536085	14536085	1	7-13536085	-	-	-	-
CZ	83	7	15643634	17643634	1	7-16643634	-	-	-	Sperm head PC1 (13.7-23.4-44.3 Mb)

Supplementary Table 2

CZ	84	7	26171639	29099419	2	7-27171639,7-28099419	-	Fcgbp,9530053A07Rik	BC089491	Sperm head PC1 (13.7-23.4-44.3 Mb)
CZ	85	7	29506574	31506574	1	7-30506574	-	-	-	Sperm head PC1 (13.7-23.4-44.3 Mb)
CZ	86	7	63720387	69479053	3	7-64242187,7-65971622,7-68479053	-	-	-	-
CZ	87	7	77430322	79430322	1	7-78430322	-	-	-	-
CZ	88	7	81671859	83287792	1	7-82671859	-	-	-	-
CZ	89	7	87488422	91747215	3	7-88488422,7-89104160,7-90747215	-	-	-	-
CZ	90	7	95067954	97067954	1	7-96067954	-	-	-	-
CZ	91	7	99739166	101739166	1	7-100739166	-	-	Prpc(membrane)	-
CZ	92	7	104339628	107735324	2	7-105339628,7-106735324	-	-	Ndufc2	-
CZ	93	7	118929024	120929024	1	7-119929024	-	-	-	-
CZ	94	8	2269498	4269498	1	8-3269498	-	-	-	-
CZ	95	8	23509920	27510733	2	8-24509920,8-26510733	-	-	-	-
CZ	96	8	31772567	35514059	2	8-32772567,8-34514059	-	-	-	-
CZ	97	8	37455948	39455948	1	8-38455948	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ	98	8	43526091	45526091	1	8-44526091	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ	99	8	50765380	53571355	2	8-51765380,8-52571355	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ	100	8	55103008	59204429	2	8-56103008,8-58204429	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ	101	8	75665926	78982361	2	8-76665926,8-77982361	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ	102	8	80514333	86491405	3	8-81514333,8-83519574,8-85491405	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)

Supplementary Table 2

CZ	103	8	94400455	97505302	2	8-95400455,8-96505302	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ	104	8	99375992	101803910	2	8-100375992,8-100803910	-	-	-	Seminiferous tubule area (35.5-87.1-102.7 Mb)
CZ	105	8	113503485	115503485	1	8-114503485	-	-	-	-
CZ	106	8	117510594	119510594	1	8-118510594	-	-	-	-
CZ	107	8	128579589	130579589	1	8-129579589	-	-	-	-
CZ	108	9	9686501	11686501	1	9-10686501	-	-	-	-
CZ	109	9	23421212	25922838	2	9-24421212,9-24922838	-	-	-	-
CZ	110	9	28019307	30019307	1	9-29019307	-	-	-	-
CZ	111	9	61502750	63502750	1	9-62502750	-	-	-	-
CZ	112	9	67092672	73019668	4	9-68092672,9-68511431,9-70486191,9-72019668	-	-	-	-
CZ	113	9	90474245	92474245	1	9-91474245	-	-	-	-
CZ	114	9	94750430	96750430	1	9-95750430	-	-	Atp1b3(membrane)	-
CZ	115	10	3943931	6236376	2	10-4943931,10-5236376	-	-	-	-
CZ	116	10	11131902	12888659	1	10-11888659	-	-	-	-
CZ	117	10	14492552	18316397	2	10-15492552,10-17316397	-	-	-	-
CZ	118	10	29508837	35051817	3	10-30508837,10-32189392,10-34051817	-	-	-	-
CZ	119	10	51599256	55554213	2	10-52599256,10-54554213	-	Man1a	-	Proximal bent tail (32.6-47.6-84.3 Mb),Relative testis weight (51.3-72.2-82.7 Mb),Proximal bent tail (34.5-51.3-87.4 Mb)
CZ	120	10	83145548	84461800	1	10-84145548	-	-	-	Relative testis weight (55.1-69.3-87.4 Mb),Proximal bent tail (34.5-51.3-87.4 Mb)

Supplementary Table 2

CZ	121	10	97162271	99162271	1	10-98162271	-	-	-	-
CZ	122	10	102600049	107657845	3	10-103600049,10-105552272,10-106657845	-	-	-	-
CZ	123	11	3550977	6443394	2	11-4550977,11-5443394	Tcn2	-	-	-
CZ	124	11	8117435	10117435	1	11-9117435	-	-	-	-
CZ	125	11	12072486	15414578	2	11-13072486,11-14733247	-	-	-	-
CZ	126	11	22356000	32432438	6	11-23356000,11-25179507,11-25557146,11-27452304,11-29441766,11-31432438	-	-	Spnb2	-
CZ	127	11	39245735	40504800	1	11-40245735	-	-	-	-
CZ	128	11	46198420	47639287	1	11-46639287	-	-	-	Sperm head PC1 (44.6-57.3-73.2 Mb)
CZ	129	11	55443569	58202752	2	11-56443569,11-57202752	-	-	-	Sperm head PC1 (44.6-57.3-73.2 Mb)
CZ	130	11	59602248	61602248	1	11-60602248	-	-	-	Sperm head PC1 (44.6-57.3-73.2 Mb)
CZ	131	11	63314971	65314971	1	11-64314971	-	-	-	Sperm head PC1 (44.6-57.3-73.2 Mb)
CZ	132	11	66405625	71640403	2	11-67405625,11-70640403	-	-	Rangrf,Acadvl	Sperm head PC1 (44.6-57.3-73.2 Mb)
CZ	133	11	73612361	75532119	1	11-74612361	-	-	-	-
CZ	134	11	76431151	80528556	2	11-77431151,11-79528556	-	-	-	-
CZ	135	11	81647709	88224080	4	11-82647709,11-83521834,11-85500652,11-87224080	-	-	Car4(membrane)	-

Supplementary Table 2

CZ	136	11	109425235	111425235	1	11-110425235	-	-	-	-
CZ	137	12	2154165	8683489	4	12-3154165,12-4456556,12-5851781,12-7683489	-	-	Rab10	-
CZ	138	12	26681656	28681656	1	12-27681656	-	-	-	-
CZ	139	12	39541611	45709574	4	12-40380208,12-41684357,12-42875001,12-44709574	-	-	-	-
CZ	140	12	56123595	57869231	1	12-57123595	-	-	-	-
CZ	141	12	62205880	64205880	1	12-63205880	-	-	-	-
CZ	142	12	68639964	71849999	2	12-69639964,12-70849999	-	-	Atp5s	-
CZ	143	12	73069953	77040630	2	12-74069953,12-76040630	-	-	-	-
CZ	144	12	93186183	95186183	1	12-94186183	-	-	-	-
CZ	145	13	2251086	8692944	4	13-3251086,13-5233278,13-6260828,13-7692944	-	-	-	-
CZ	146	13	20486398	24445323	2	13-21486398,13-23445323	-	-	-	-
CZ	147	13	25944890	29900057	2	13-26944890,13-28900057	-	-	-	-
CZ	148	13	31845130	33845130	1	13-32845130	-	-	-	-
CZ	149	13	35754987	38373843	2	13-36754987,13-37373843	-	-	-	-
CZ	150	13	54218108	58019276	2	13-55218108,13-57019276	-	-	-	-
CZ	151	13	76259262	78259262	1	13-77259262	-	-	-	-
CZ	152	13	81275745	86661595	3	13-82275745,13-84143461,13-85661595	-	-	-	-

Supplementary Table 2

CZ	153	13	88380364	91327990	2	13-89380364,13-90327990	-	-	-	-
CZ	154	13	92983877	94983877	1	13-93983877	-	-	-	-
CZ	155	13	96891571	98891571	1	13-97891571	-	-	-	-
CZ	156	14	15599040	17599040	1	14-16599040	-	-	-	-
CZ	157	14	20535572	22535572	1	14-21535572	Plau	Plau	-	-
CZ	158	14	28585923	30500123	1	14-29500123	-	-	-	Seminiferous tubule area (25.6-61.6-63.2 Mb)
CZ	159	14	47551836	49311055	1	14-48311055	-	-	-	Seminiferous tubule area (25.6-61.6-63.2 Mb)
CZ	160	14	70435422	73613286	2	14-71435422,14-72670562	-	-	-	-
CZ	161	14	82308345	83828913	1	14-83308345	-	-	-	-
CZ	162	14	86799808	88799808	1	14-87799808	-	-	-	-
CZ	163	14	93730826	97619203	3	14-94730826,14-95297758,14-97274720	-	-	-	-
CZ	164	14	102211020	104211020	1	14-103211020	-	-	-	-
CZ	165	14	106243075	110288073	2	14-107243075,14-109288073	-	-	-	-
CZ	166	15	12529494	14529494	1	15-13529494	-	-	-	-
CZ	167	15	29894947	31894947	1	15-30894947	-	-	-	Total abnormal sperm (16.5-27.1-77.2 Mb),Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb),Headless/tailless (16.5-16.5-48.2 Mb)

Supplementary Table 2

CZ	168	15	33949082	35949082	1	15-34949082	-	-	-	Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb),Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-27.1-77.2 Mb)
CZ	169	15	36369198	38148565	1	15-37148565	-	-	-	Total abnormal sperm (16.5-32.3-68.7 Mb),Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-27.1-77.2 Mb),Headless/tailless (16.5-16.5-48.2 Mb)
CZ	170	15	41990323	43990323	1	15-42990323	-	-	-	Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-27.1-77.2 Mb),Headless/tailless (16.5-16.5-48.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb)
CZ	171	15	47720601	49720601	1	15-48720601	-	-	-	Total abnormal sperm (16.5-27.1-77.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb)
CZ	172	15	51076151	54991323	2	15-52076151,15-53991323	-	-	-	Total abnormal sperm (16.5-27.1-77.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb)

Supplementary Table 2

CZ	173	15	58164077	61560216	2	15-58585843,15-60560216	-	-	-	Total abnormal sperm (16.5-32.3-68.7 Mb),Total abnormal sperm (16.5-27.1-77.2 Mb)
CZ	174	15	63480133	65480133	1	15-64480133	-	-	-	Total abnormal sperm (16.5-27.1-77.2 Mb),Total abnormal sperm (16.5-32.3-68.7 Mb)
CZ	175	15	85277322	87277322	1	15-86277322	-	-	-	-
CZ	176	16	2700097	4338117	1	16-3700097	-	-	-	-
CZ	177	16	6505067	13564128	4	16-7505067,16-8698500,16-10673724,16-12564128	-	-	-	-
CZ	178	16	15416923	17556714	2	16-16416923,16-16556714	-	-	Ube2v2,Ccdc116	-
CZ	179	16	18983977	22478833	2	16-19983977,16-21985197	-	-	-	-
CZ	180	16	23314023	33479955	5	16-24314023,16-24483552,16-26430126,16-28426143,16-32479955	-	-	-	-
CZ	181	16	34369703	35568135	1	16-34568135	-	-	-	-
CZ	182	16	37511344	39511344	1	16-38511344	-	-	-	-
CZ	183	16	41542464	43542464	1	16-42542464	-	-	-	-
CZ	184	16	73152290	75152290	1	16-74152290	-	-	-	Seminiferous tubule area (66.8-88.2-97.2 Mb)
CZ	185	17	13320574	15320574	1	17-14320574	-	-	-	Relative testis weight (3.1-57.9-73.2 Mb),Sperm density (3.1-30-64.5 Mb),Sperm density (3.1-30-65.2 Mb)

Supplementary Table 2

CZ	186	17	22649616	24649616	1	17-23649616	-	Sbpl,Sbp	-	Sperm density (3.1-30-65.2 Mb),Relative testis weight (3.1-57.9-73.2 Mb),Sperm density (3.1-30-64.5 Mb)
CZ	187	17	46076641	48076641	1	17-47076641	-	-	-	Sperm density (3.1-30-65.2 Mb),Relative testis weight (3.1-57.9-73.2 Mb),Sperm density (3.1-30-64.5 Mb)
CZ	188	17	65669344	66932862	1	17-65932862	-	-	-	Relative testis weight (3.1-57.9-73.2 Mb)
CZ	189	17	73983870	77243167	2	17-74397535,17-76243167	-	-	-	-
CZ	190	18	2862702	4862702	1	18-3862702	-	-	-	-
CZ	191	18	8290218	10290218	1	18-9290218	-	-	-	-
CZ	192	18	11307327	17843344	4	18-12307327,18-14214601,18-16202912,18-16843344	-	-	Cabyr	-
CZ	193	18	21349665	25038568	2	18-22349665,18-24038568	-	-	-	-
CZ	194	18	42779798	44779798	1	18-43779798	Spink3,Spinkl	Spink3,Spinkl,Spink5	-	-
CZ	195	18	62057278	64057278	1	18-63057278	-	-	-	Seminiferous tubule area (58-68.5-78.1 Mb),Seminiferous tubule area (60.3-69.6-80 Mb)
CZ	196	18	64975671	66125790	1	18-65125790	-	-	-	Seminiferous tubule area (60.3-69.6-80 Mb),Seminiferous tubule area (58-68.5-78.1 Mb)

Supplementary Table 2

CZ	197	18	68003125	70003125	1	18-69003125	-	-	-	Seminiferous tubule area (60.3-69.6-80 Mb),Seminiferous tubule area (58-68.5-78.1 Mb)
CZ	198	18	83003003	85003003	1	18-84003003	-	-	-	-
CZ	199	19	6781659	13123831	4	19-7781659,19-8666958,19-10618811,19-12123831	-	-	Kcnk4	-
CZ	200	19	15098801	17098801	1	19-16098801	-	-	-	-
CZ	201	19	25700822	28863723	2	19-26700822,19-27863723	-	-	-	-
CZ	202	19	36043620	38043620	1	19-37043620	-	-	-	-
CZ	203	19	39111518	47038714	4	19-40111518,19-41084697,19-44454439,19-46038714	-	-	Cwf1911,Cutc	-

* membrane: extracellular side of a sperm

** The region numbers for BV and CZ correspond to those in supplementary figure 3a, b