International genetic evaluation of calving traits in beef cattle

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Session 6: Maternal traits & genetic variability

Outline/agenda

- Acknowledgements
- Introduction of the project
- Selective indicators relevant for connectedness
- Countries which provided data
- Scope of the project and selective descriptive statistics
- Basic statistical description
- Available records for sires

Acknowledgement - countries (organisations) which provided data for the research on the international genetic evaluation of calving traits in the Czech Republic

Czech Republic	Czech Moravian Breeders´ Corporation, Inc. Czech Beef Breeders Association Institute of Animal Science
France	France Génétique Elevage
Denmark	Knowledge Centre for Agriculture
Ireland	Irish Cattle Breeding Federation Society Limited
Sweden	Swedish Dairy Association
Spain	INIA, FECL
Great Britain	Edinburgh Genetic Evaluation Service, a unit of Scottish Agricultural College

Basic information about the project

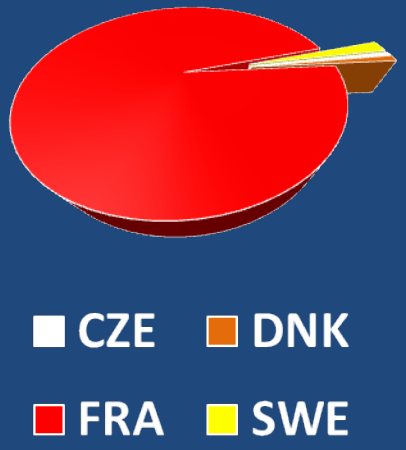
Czech Moravian Breeders´ Corporation, Inc.	ICAR, Interbeef and Interbull member	Responsible for the management and coordination for the Czech Republic
Institute of Animal Science	Responsible for the research and scientific matters	
Czech Beef Breeders Association	Responsible for data preparation from the Czech Republic	
Interbull Centre	Routine implementation, preparation of files, routine evaluation and other relevant operations	
Countries involved in the project	Data, collaboration and discussion of the results, approval of results, etc.	

Raw data was used in Interbeef and not breeding values as in the case of dairy cattle in Interbull

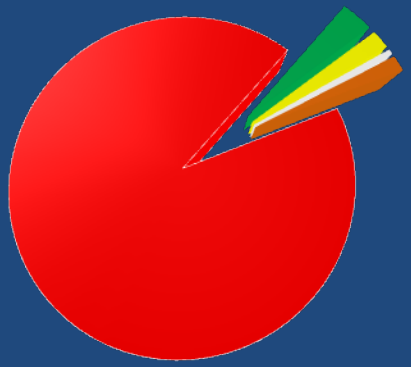
Actually, Interbeef works with purebreed Charolais and Limousine

Charolaise - number of animals with performance

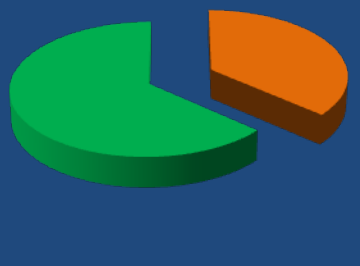
Birth weights (BWT)
(6,488,618)



Calving ease (CAE)
(6,775,318)



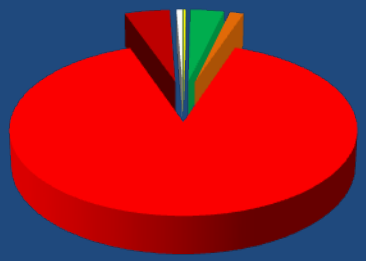
Stillbirth (STB)
(364,635)



	CZE	DNK	FRA	IRL	SWE
BWT	40,113 *0.62%*	63,470 *0.98%*	**6,256,877** ***96.43%***		128,158 *1.98%*
CAE	40,113 *0.59%*	114,093 *1.68%*	**6,251,815** ***92.27%***	231,866 *3.42%*	137,431 *2.03%*
STB		132,769 *36.41%*		231,866 *63.59%*	

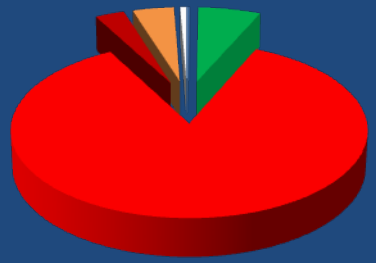
Limousine - Number of animals with performance

Birth weights (BWT)
(3,910,394)



CZE DNK ESP
FRA GBR IRL
SWE

Calving ease (CAE)
(4,055,484)



CZE DNK FRA
GBR IRL SWE

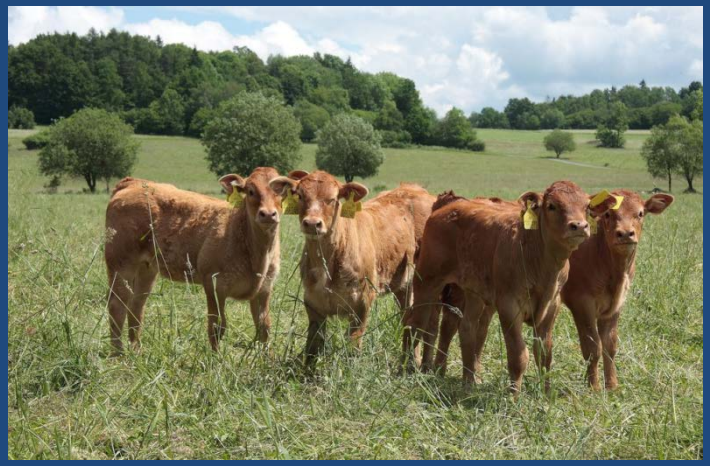
Stillbirth (STB)
(481,562)

DNK IRL

	CZE	DNK	ESP	FRA	GBR	IRL	SWE
BWT	9,554 *0.24%*	139,180 *3.56%*	56,814 *1.45%*	**3,493,022** ***89.33%***	186,814 *4.78%*		25,010 *0.64%*
CAE	9,554 *0.24%*	258,448 *6.37%*		**3,468,851** ***85.53%***	121,406 *2.99%*	170,856 *4.21%*	26,369 *0.65%*
STB		310,706 *64.52%*				170,856 *35.48%*	

Number of animals with performance (seven countries and three traits)

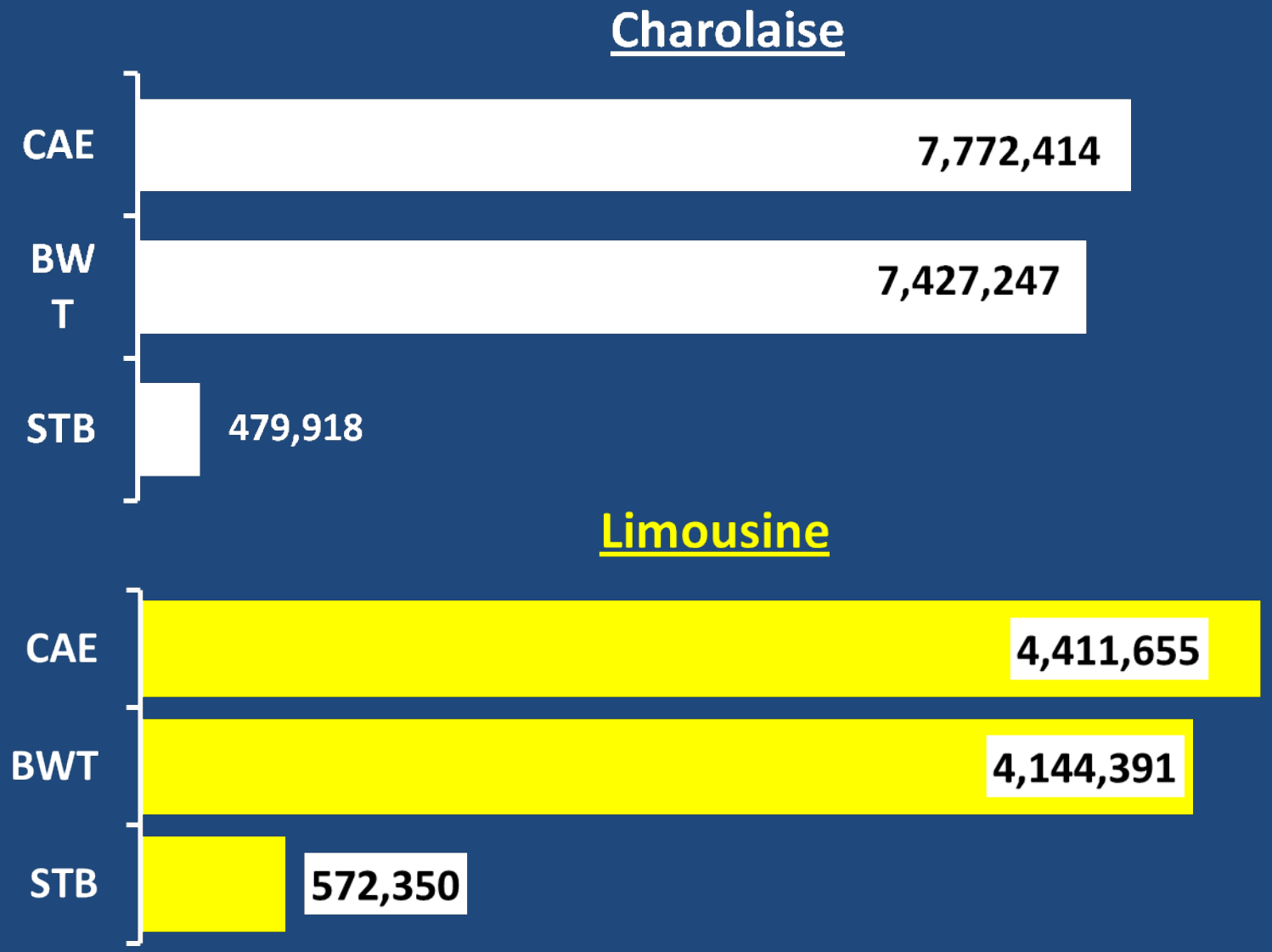
- **Animals are mostly from France**
- It will be necessary to take this imbalance into account during the estimation of genetic parameters
- We expected that connectedness would be mostly through the French bulls, so the best approach for the estimation of genetic correlation would be to include three countries, one of which would be France
- **France will maintain connectedness**



Stillbirth

- There are data available for stillbirth from only two countries – Denmark and Ireland
- This may be a potential problem with the connectedness between these two countries
- One of the solutions could be estimation of genetic parameters together with other correlated traits (for example CAE)

Total number of animals in pedigrees



Description of national genetic evaluations
Analysis on the basis of the 603 file – Parameter file

- **Heritability for a direct genetic effect** in the countries which provide data for the research on calving traits in the national genetic evaluation

	BWT		CAE		STB	
	CHA	LIM	CHA	LIM	CHA	LIM
CZE	7	7	9	9	.	.
DNK	7	7	10	10	4	4
ESP	.	21	.	.	.	.
FRA	41	48	10	5	.	.
GBR	.	25	.	12	.	.
IRL	.	.	9	9	4	4
SWE	38	38	16	16	.	.

Connectedness among countries

- We started with the number of common bulls with progenies in the different countries and connectedness was defined through the sire of progenies with performance and the sire of dams of progenies with performance
- These are preliminary results and we are planning to continue with more sophisticated methods and with the sharing of progenies of common bulls in relevant countries

Number of common bulls for birth weight-Charolaise

	CZE	DNK	FRA	SWE
CZE	1,058	55 (5.2%)	240 (22.7%)	36 (3.4%)
DNK	55 (2.2%)	2,535	102 (4.0%)	48 (1.9)
FRA	240 (0.17%)	102 (0.07%)	140,988	48 (0.03%)
SWE	36 (0.7%)	48 (1.0%)	48 (1.0%)	4,967

Bulls in a particular country on the diagonal
Common bulls above the diagonal

Number of common bulls for calving ease-Charolaise

	CZE	DNK	FRA	IRL	SWE
CZE	1,058	55 (5.2%)	240 (22.7%)	50 (4.7%)	36 (3.4%)
DNK	55 (1.7%)	3,115	103 (3.3%)	62 (2.0%)	50 (1.6%)
FRA	240 (0.17%)	103 (0.07%)	140,946	263 (0.2%)	48 (0.03%
IRL	50 (0.3%)	62 (0.4 %)	263 (1.8%)	14,958	27 (0.2%)
SWE	36 (0.7%)	50 (1.0)	48 (0.9%)	27 (0.5%)	5,212

Number of common bulls for stillbirth-Charolaise

	DNK	IRL
DNK	3,153	62 (2.0%)
IRL	62 (0.4%)	14,958

Number of common bulls for birth weight-Limousine

	CZE	DNK	ESP	FRA	GBR	SWE
CZE	404	42 (10.4%)	50 (12.4%)	135 (33.4%)	40 (9.9%)	23 (5.7%)
DNK	42 (0.9%)	4,720	64 (1.4%)	108 (2.3%)	68 (1.4%)	66 (1.4%)
ESP	50 (3.6%)	64 (4.6%)	1,402	372 (26.5%)	95 (6.8%)	31 (2.2%)
FRA	135 (0.2%)	108 (0.2%)	572 (0.6%)	61,821	377 (0.6%)	41 (0.07%)
GBR	40 (0.4%)	68 (0.7%)	95 (1.0%)	377 (4.0%)	9,474	27 (0.3%)
SWE	23 (2.2%)	66 (6.4%)	31 (3.0%)	41 (4.0%)	27 (2.6%)	1,032

Number of common bulls for calving ease-Limousine

	CZE	DNK	FRA	GBR	IRL	SWE
CZE	404	41 (10.1%)	135 (33.4%)	42 (10.4%)	38 (9.4%)	23 (5.7%)
DNK	41 (0.7%)	6,161	107 (1.7%)	65 (1.1%)	62 (1.0%)	66 (1.1%)
FRA	135 (0.2%)	107 (0.2%)	61,286	290 (0.5%)	185 (0.3%)	41 (0.06%)
GBR	42 (0.6%)	65 (1.0%)	290 (4.3%)	6,723	226 (3.4%)	27 (0.4%)
IRL	38 (0.4%)	62 (0.6%)	185 (1.8%)	226 (2.2%)	10,247	21 (0.2%)
SWE	23 (2.2%)	66 (6.2%)	41 (3.9%)	27 (2.5%)	21 (2.0%)	1,066

Number of common bulls for stillbirth-Limousine

	DNK	IRL
DNK	6,390	63 (1.0%)
IRL	63 (0.6%)	10,247

Number of maternal grand sire common bulls for birth weight-Charolaise

	CZE	DNK	FRA	SWE
CZE	665	36 (5.4%)	170 (25.6%)	30 (4.5%)
DNK	36 (1.7%)	2,158	104 (4.8%)	57 (2.6%)
FRA	170 (0.2%)	104 (0.09%)	117,009	41 (0.04%)
SWE	30 (0.7%)	57 (1.4%)	41 (1.0%)	4,063

Number of maternal grand sire common bulls for calving ease- Charolaise

	CZE	DNK	FRA	IRL	SWE
CZE	665	36 (5.4%)	170 (25.6%)	35 (5.3%)	31 (4.7%)
DNK	36 (1.4%)	2,550	111 (4.6%)	63 (2.5%)	58 (2.3%)
FRA	179 (0.1%)	111 (0.09%)	117,059	308 (0.3%)	42 (0.035%)
IRL	35 (0.7%)	63 (1.2%)	308 (5.8%)	5,300	26 (0.5%)
SWE	31 (0.7)	58 (1.4%)	42 (1.0%)	26 (0.6%)	4,258

Number of maternal grand sire common bulls for stillbirth-Charolaise

	DNK	IRL
DNK	2,580	64 (2.5%)
IRL	64 (1.2%)	5,300

Number of maternal grand sire common bulls for birth weight-Limousine

	CZE	DNK	ESP	FRA	GBR	SWE
CZE	322	33 (10.3%)	43 (13.4%)	175 (54.3%)	26 (8.1%)	17 (5.3%)
DNK	33 (0.9%)	3,582	57 (1.6%)	106 (3.0%)	48 (1.3%)	67 (1.9%)
ESP	43 (3.2%)	57 (4.2%)	1,360	335 (24.6%)	67 (4.9%)	28 (2.1%)
FRA	175 (0.4%)	106 (0.2%)	335 (0.7%)	46,215	203 (0.4%)	35 (0.1%)
GBR	26 (0.4%)	48 (0.8%)	67 (1.1%)	203 (3.4%)	5,917	21 (0.4%)
SWE	17 (2.2%)	67 (8.8%)	28 (5.7%)	35 (4.6%)	21 (2.8%)	760

Number of maternal grand sire common bulls for calving ease-Limousine

	CZE	DNK	FRA	GBR	IRL	SWE
CZE	322	33 (10.3%)	174 (54.0%)	28 (8.7%)	32 (9.9%)	17 (5.3%)
DNK	33 (0.7%)	4,560	108 (2.4%)	51 (1.1%)	52 (1.1%)	67 (1.5%)
FRA	174 (0.4%)	108 (0.3%)	46,015	218 (0.5%)	228 (0.5%)	35 (0.08%)
GBR	28 (0.5%)	51 (0.8%)	218 (3.6%)	6,074	178 (2.9%)	22 (0.4%)
IRL	32 (0.8%)	52 (1.3%)	228 (5.5%)	178 (4.3%)	4,139	22 (0.5%)
SWE	17 (2.2%)	67 (8.7%)	35 (4.5%)	22 (2.9%)	22 (2.9%)	772

Number of maternal grand sire common bulls for stillbirth-Limousine

	DNK	IRL
DNK	4,706	52 (1.1%)
IRL	52 (1.3%)	4,123

Basic statistical description of birth weights

		N	MIN	MAX	MEAN	STD
CHA	CZE	40,113	1	99	40.8	6.2
	DNK	63,470	20	80	46.6	7.1
	FRA	6,256,877	26	80	46.6	6.0
	SWE	128,158	15	79	46.7	5.7
LIM	CZE	9,554	10	70	38.7	5.4
	DNK	139,180	20	60	40.3	4.3
	ESP	56,814	25	55	40.3	4.4
	FRA	3,493,022	23	70	40.1	4.6
	GBR	186,814	10	80	37.4	4.8
	SWE	25,010	15	66	41.2	4.4

There is a need for data editing and exclusion of extreme or incorrect values

Relative distribution (%) of calving ease in different countries and beef breeds

	Y	CZE	DNK	ESP	FRA	GBR	IRL	SWE
CHA	1	82.95	80.73		60.35		85.85	87.33
	2	13.17	11.28		30.95		10.59	12.02
	3	3.11	2.94		4.64		2.02	0.65
	4	0.77	3.03		4.01		1.53	
	5		2.03		0.04			
LIM	1	92.23	90.21		92.19	83.32	90.46	90.49
	2	5.53	5.79		5.96	14.29	7.56	9.05
	3	1.67	1.91		1.51	1.06	1.32	0.46
	4	0.57	1.78		0.31	0.66	0.66	
	5		0.31		0.03	0.68		

Calving ease in participants' countries

	1	2	3	4	5
CZE	Spontaneous calving without any help from a breeder	Calving with help from one or two breeders	Calving requiring help from three or more people or help from a vet	Caesarean section or dystocia requiring postpartum treatment from a vet	
DNK	Easy	Easy with help	Difficult without vet	Difficult with vet	Caesarean
FRA	Spontaneous calving without any help from a breeder	Easy calving with the assistance of one person maximum	Hard calving with the assistance of many people or with a vet or with mechanical assistance	Caesarean	Embryotomy

Calving ease in participants' countries

GRB	Easy unassisted calving	Easy pull	Hard pull	Vet assistance	Caesarean section
IRL	Easy unassisted calving	Easy pull	Hard pull	Vet assistance	Caesarean section
SWE	Easy			Difficult	

Relative distribution (%) of stillbirth in Denmark and Ireland

	Trait	CZE	DNK	ESP	FRA	GBR	IRL	SWE
CHA	1		94.3				97.9	
	2		5.7				2.2	
LIM	1		96.2				98.2	
	2		3.8				1.8	

Charolaise birth weights sire

Number of sires	Number of records (progenies) MIN	MAX	MEAN	STD	Countries
1,058	1	761	37.7	58.8	CZE
2,535	1	553	21.9	39.2	DNK
141,035	1	34,501	41.8	341.0	FRA
4,967	1	801	25.7	42.1	SWE

Charolaise calving ease sire

Number of sires	Number of records (progenies) MIN	MAX	MEAN	STD	Countries
1,058	1	761	37.7	58.8	CZE
3,115	1	872	23.8	45.2	DNK
141,000	1	34,471	41.8	341.0	FRA
14,132	1	2,591	9.8	43.7	IRL
5,212	1	850	26.4	43.4	SWE

Charolaise stillbirth sire

Number of sires	Number of records (progenies)				
	MIN	MAX	MEAN	STD	Countries
3,153	1	1,035	24.4	48.2	DNK
14,132	1	2,591	9.8	43.7	IRL

Limousine birth weights sire

Number of sires	Number of records (progenies) MIN	MAX	MEAN	STD	Countries
404	1	210	23.4	34.8	CZE
4,720	1	2,162	26.0	62.0	DNK
1,402	1	820	36.2	53.3	ESP
61,839	**1**	**57,709**	**52.2**	**352.2**	**FRA**
9,475	1	1,685	19.6	55.3	GBR
1,032	1	248	23.7	32.7	SWE

Limousine calving ease sire

Number of sires	Number of records (progenies) MIN	MAX	MEAN	STD	Countries
404	1	210	23.4	34.8	CZE
6,161	1	3,365	27.2	77.1	DNK
61,302	1	57,609	52.3	353.0	FRA
6,723	1	1,497	17.9	45.3	GBR
9,680	1	2,763	10.3	38.7	IRL
1,066	1	250	24.7	34.1	SWE

Limousine stillbirth sire

Number of sires	Number of records (progenies) MIN	MAX	MEAN	STD	Countries
6,390	1	3,839	28.5	84.1	DNK
9,680	1	2,763	10.3	38.7	IRL

How to continue with the research?

- Define connectedness between countries with sire and maternal grand sire
- Clean data of extreme and error values. This is particularly important in birth weights in some countries which sent unedited data
- Create files for estimation of genetic parameters, in such a way as to create appropriate connectedness through sire and maternal grand sire among countries in the research (focus on data from France, which will ensure the connectedness of files)
- Create files for estimation of genetic parameters with a focus on ideal structure (contemporary, number of offspring of sire, number of offspring of dam, maternal grand sire and number of animals with effects)

How to continue with the research?

- Single trait for the estimation of genetic parameters birth weight and calving ease 3 x 3 country with connectedness through France
- Test of possibilities to include the effect of the permanent environment on dam and maternal genetic effect
- Matrix of genetic correlation among all countries on the basis of 3 x 3 countries bending of data with the goal to receive positive definite matrix
- Test of possibilities to use multi-trait for more traits (calving traits) together

Thank you for your attention!