

Wageningen
15 June 2011

Identification of British Breeds at Risk

Lawrence Alderson
lawrence@clltd.demon.co.uk
www.lawrencealderson.com

Overview of British Breeds

Number of breeds (5 species large livestock) listed in Country Report:

- **Cattle** 72 (35 native – 48.6%) incl. 5 orig. pop.; 2 feral
- **Sheep** 86 (57 native – 66.3%)
- **Goats** 9 (3 native – 33.3%) incl. 1 feral
- **Horses** 44 (17 native – 38.6%)
- **Pigs** 15 (11 native – 73.3%)

- **Total 226 (123 native – 54.4%)**

Definition of a breed

Many definitions, but from conservation perspective it is:

- a closed population which provides the opportunity (and responsibility) to conserve distinctive traits and gene combinations

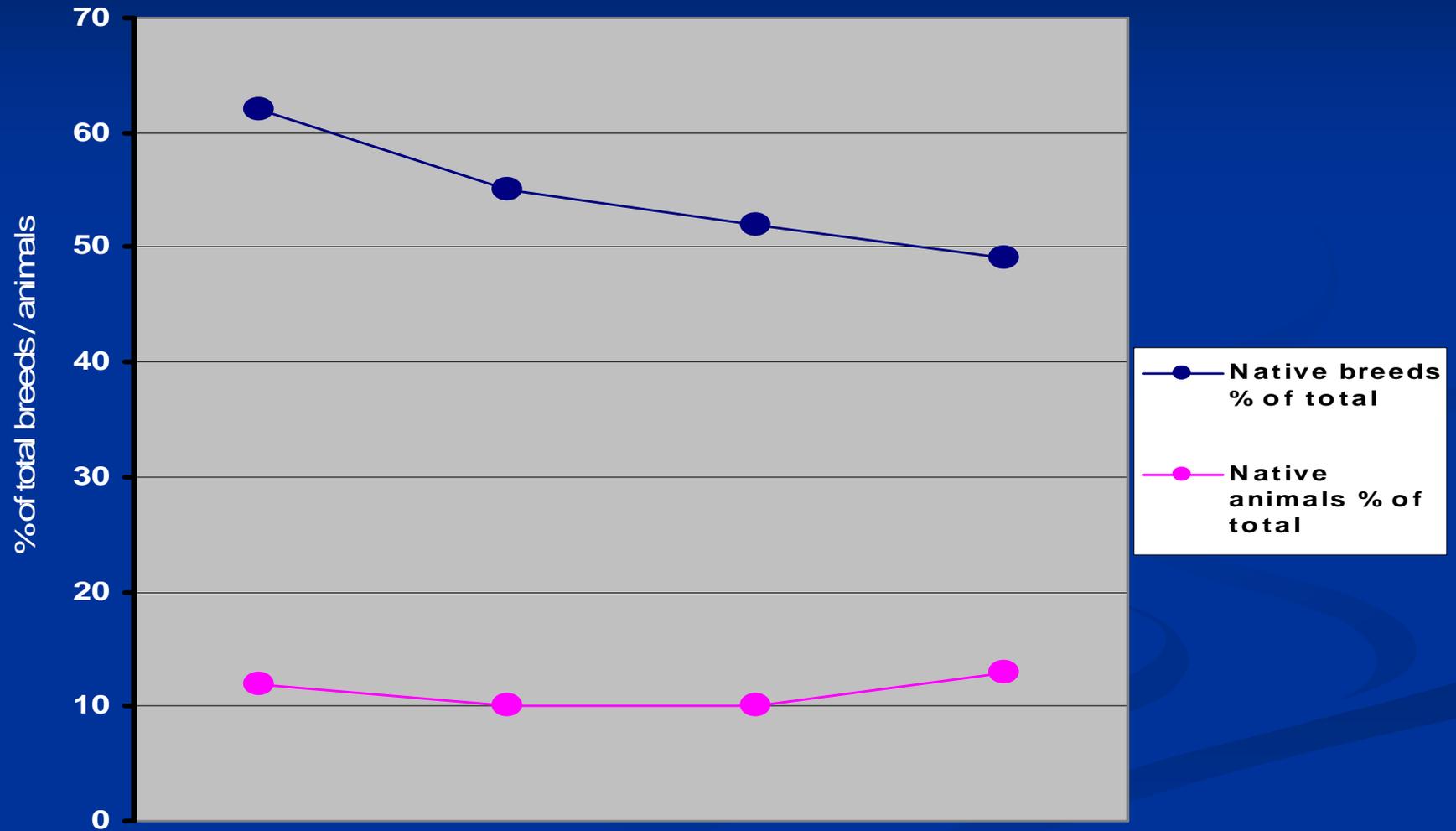
Responsibilities of 'breed society' are to:

- prevent introgression
- promote distinctive qualities

Definition of native breed

- Basic definition
- **Breed in country of origin** e.g. Dexter breed of cattle is an Irish native breed (in UK it is locally adapted which is a sub-group of exotic)
- **Transboundary origin:** a small number of breeds have more than one country of origin: e.g. Irish Moiled originated in both Republic of Ireland and UK.

Native Cattle in UK



Which UK breeds do not qualify?

- Dairy Shorthorn: threshold of introgression $>12.5\%$
- Blue Albion, Oxford Sandy & Black: recent recreations of extinct breeds <40 yrs + 6 generations
- Meatlinc: new 'open' breed <40 yrs + 6 generations
- Swona: recent feral <40 yrs + 6 generations

Status of breed amalgamations:

- British Saddleback pigs, Luing cattle, Devon & Cornwall Longwool

Original population – Jersey Island

Indicators of Endangerment

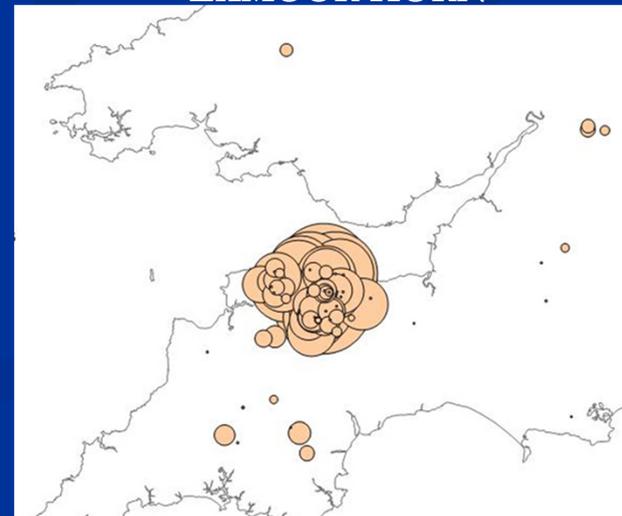
Three primary indicators –

- Numerical
- size of population
- Genetic
- inbreeding
- Geographical
- range or distribution

NDS



EXMOOR HORN



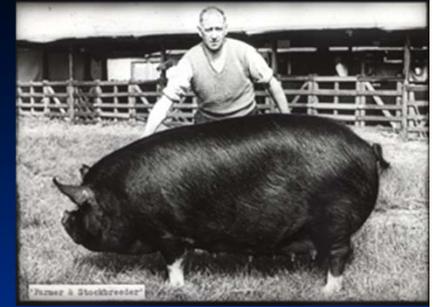
Numerical

Qualifications:

- Population in country of origin
- Registered animals

Options:

- No. of breeding females – commonly used
- No. of female replacements – best measure of health of breed (ideally with 3-year rolling average)



Numerical

- No. of breeding females – commonly used

Starting point: FAO criteria (100 / 1000), plus:

- **modify** with extra 'vulnerable' threshold (2000)
- **vary** according to species (2000 or 6000) to allow for differences in:
 - ~ reproductive rate
 - ~ generation interval
 - ~ mating ratio / number of breeding units

Numerical

- Thresholds for standardisation – developed from FAO criteria

number of females of breeding age

<u>Category</u>	<u>Cattle</u>	<u>Sheep</u>	<u>Goats</u>	<u>Equines</u>	<u>Pigs</u>	<u>Poultry</u>
Critical	300	300	300	300	100	100
Endangered	3000	3000	3000	3000	1000	1000
Vulnerable	6000	6000	6000	6000	2000	2000

Numerical

Critical breeds in UK:

- **Cattle** 5 (Angus orig., Chillingham semi-feral, Northern Dairy Shorthorn, Whitebred Shorthorn, Vaynol)
- **Sheep** 2 (Boreray, White Face Dartmoor)
- **Goats** none
- **Horses** 3 (Cleveland Bay, Eriskay Pony, Suffolk)
- **Pigs** none

Genetic

Genetic erosion – most severe in small populations and those with an acute hierarchical breed structure

Small populations

- Traditional Hereford loss of 18% alleles from 1960s to 1990s
- Vaynol cattle: (N_e 3.8); homozygous 11/16 markers



Inbred populations –

- TB horses (CGI 28.15)
- Holstein cattle (N_e <100), O-Man effect



Genetic thresholds

Inbreeding:

- 1) rate of inbreeding of 0.5-1.0% per generation
= N_e 50 (note 0.7 correction for non-random breeding)
- 2) endangered 1.0-3.0%; 3) critical >3%
- take current level of inbreeding into account?
e.g. WP (F current 13, F_{Δ} 0.25, F 25 yr 14)
NDS (F current 6, F_{Δ} 2.53, F 25 yr 16)

Introggression:

- introggression of 2.5% in any generation (12.5% critical threshold – effectively a new breed)

Geographical

Local breeds: native adaptation

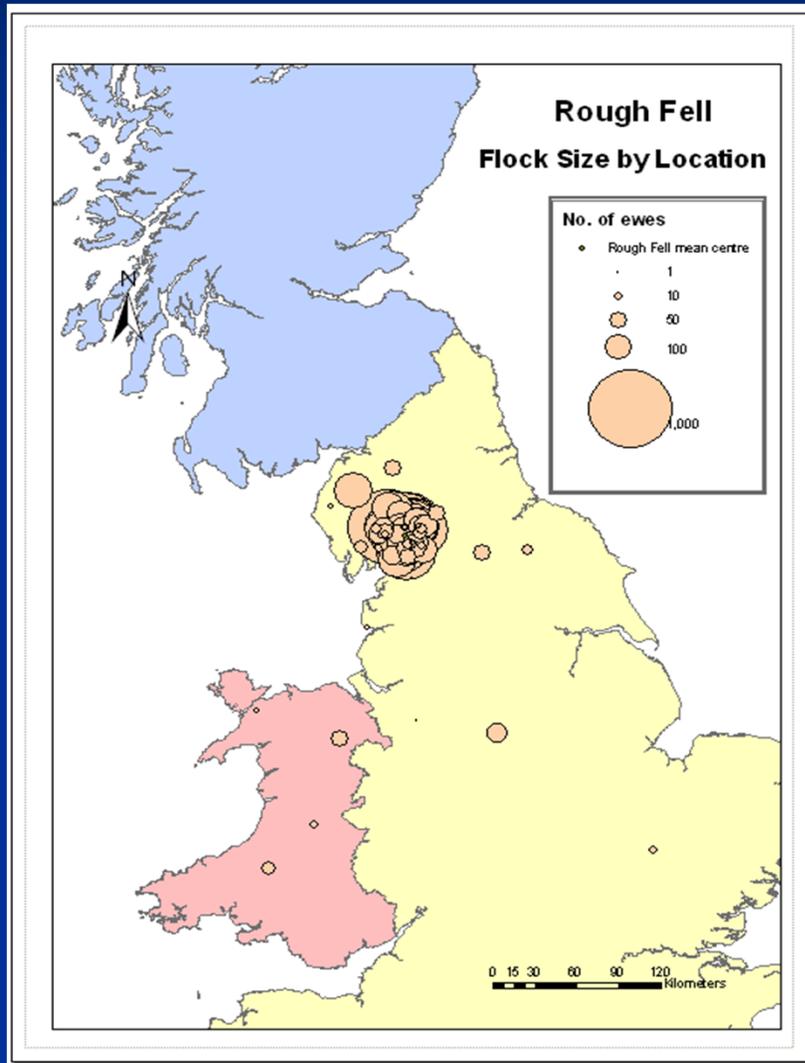
to their area of origin, but are at risk from disease outbreaks



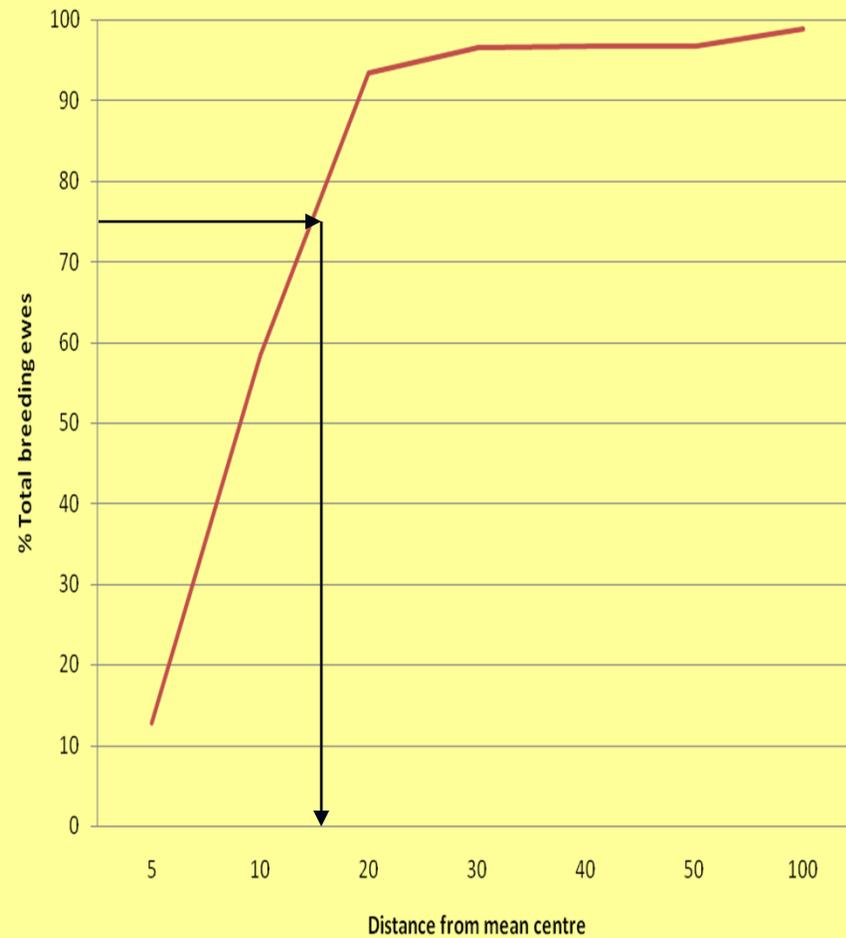
Procedure:

- developed in the UK by the Univ. of Worcs. and CLL; based on GIS and herd/flock data
- criterion for geographical concentration indicator: >75% population found within 50 km of the mean weighted centre (MWC) of the breed

Rough Fell sheep



Geographical concentration of Rough Fell sheep



Example Breeds – UK sheep

Boreray

- 255 breeding ewes; 180 km radius
- Numerically at risk (1)
- Not threatened geographically



Rough Fell

- 14100 breeding ewes; 15 km radius
- Not threatened numerically
- Geographically at risk (2)



Risk – geographical concentration

Breeds at risk in UK (population within 50 km radius) – only sheep:

■ White Face Dartmoor	99%
■ Dalesbred	99%
■ Herdwick	98%
■ Brecknock Hill Cheviot	96%
■ South Wales Mountain	96%
■ Exmoor Horn	95%
■ Devon Closewool	95%
■ Rough Fell	92%
■ South Country Cheviot	85%
■ Lonk	76%

Most critical indicator

	Boreray	Norfolk Horn	Soay	White Face Dartmoor	Rough Fell
breeding females	255	1196	1338	1578	>6000
N_e (0.7=)	84	314	536	165	1072
F	12.16	5.33	9.58	3.0e	0.5e
F_{Δ}	3.57	0.95	0.56	1.92	<0.50
F 25 yr	15.73	6.28	10.14	4.92	0.69
geog conc	>50	>50	>50	12.1	15.0

British Breeds at Risk

- Cattle 23 (65.7% of native breeds)
incl. 4 orig. pop. and 1 feral
- Sheep 35 (61.4% of native breeds)
- Goats 2 (66.7% of native breeds)
- Horses 12 (70.6% of native breeds)
- Pigs 8 (72.7% of native breeds)
- Total 80 (65.0% of native breeds)

Thank you for your interest

Lawrence Alderson

lawrence@cltd.demon.co.uk

www.lawrencealderson.com