Identification of
British Breeds at Risk

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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.
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
**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

<table>
<thead>
<tr>
<th>Category</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Goats</th>
<th>Equines</th>
<th>Pigs</th>
<th>Poultry</th>
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<tbody>
<tr>
<td>Critical</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>100</td>
<td>100</td>
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<tr>
<td>Endangered</td>
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<td>3000</td>
<td>3000</td>
<td>3000</td>
<td>1000</td>
<td>1000</td>
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<tr>
<td>Vulnerable</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>2000</td>
<td>2000</td>
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</tbody>
</table>
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 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
  \[ = N_e 50 \text{ (note 0.7 correction for non-random breeding)} \]
- 2) endangered 1.0-3.0%; 3) critical \( \geq 3\% \)
- take current level of inbreeding into account?
  e.g. WP (F current 13, \( F_\Delta 0.25 \), F 25 yr 14)
  NDS (F current 6, \( F_\Delta 2.53 \), F 25 yr 16)

Introgression:

- introgression 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

Rough Fell
Flock Size by Location

Geographical concentration of Rough Fell sheep

% Total breeding ewes vs Distance from mean centre
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

<table>
<thead>
<tr>
<th></th>
<th>Boreray</th>
<th>Norfolk Horn</th>
<th>Soay</th>
<th>White Face Dartmoor</th>
<th>Rough Fell</th>
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<tr>
<td>breeding females</td>
<td>255</td>
<td>1196</td>
<td>1338</td>
<td>1578</td>
<td>&gt;6000</td>
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<tr>
<td>$N_e (0.7=)$</td>
<td>84</td>
<td>314</td>
<td>536</td>
<td>165</td>
<td>1072</td>
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<tr>
<td>$F$</td>
<td>12.16</td>
<td>5.33</td>
<td>9.58</td>
<td>3.0e</td>
<td>0.5e</td>
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<tr>
<td>$F_\Lambda$</td>
<td>3.57</td>
<td>0.95</td>
<td>0.56</td>
<td>1.92</td>
<td>&lt;0.50</td>
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<tr>
<td>$F_{25 \text{ yr}}$</td>
<td>15.73</td>
<td>6.28</td>
<td>10.14</td>
<td>4.92</td>
<td>0.69</td>
</tr>
<tr>
<td>geog conc</td>
<td>&gt;50</td>
<td>&gt;50</td>
<td>&gt;50</td>
<td>12.1</td>
<td>15.0</td>
</tr>
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</table>
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

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