Including Xbred records in Interbeef GE
Interbeef WG - May 2014

ICBF genetic team / InterBeef
Background

- TC Prague: presentation first analysis of Xbred data in Interbeef context
  - Importance of Xbred records in IRL
  - Challenges in accounting for breed composition in GE
    - Using fake ancestors to re-build breed composition
- TC Uppsala: update on uploading pedigree to IDEAtest
Xbred specificities

- Genetic evaluation
  - Account for breed composition
  - Account for non-transmissible effects: HET & REC
  - Pre-process necessary

100% CHA
HET = 0
REC = 0

100% CHA

100% CHA

75% CHA
12.5%AAN
12.5% BFR
HET = 0.50
REC = 0.31

100% CHA

50% AAN
50% BFR

50% CHA
25%AAN
25% BFR
HET = 1.00
REC = 0.25
Deriving breed composition

- On a very small pedigree...

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</table>
Deriving breed composition

- Best case scenario

Animal with record

75%CHA 12.5%SIM 6.25%AAN 6.25%HOL
HET = 0.500
REC = 0.328

S = sire
D = dam
Deriving breed composition

- Incomplete pedigree

```
0 0 0 0 0 0 0 0 0
CHA  CHA  CHA  CHA  CHA  CHA  CHA
```

```
Gen  5  4  3  2  1  0
100% AAN 100% HOL
```

Bring in the fake ancestors

```
Animal with record
75%CHA 12.5%SIM 6.25%AAN 6.25%HOL
HET = 0.500
REC = 0.328
```

S = sire
D = dam

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Testing fake ancestry

- 691,000 animals with WWT record
  - Born after 2008
  - From CHA or LIM comp. (88% Xbred)
- 6 random samples taken
  - 5,000; 10,000; 15,000; 20,000, & 25,000 animals
Basic rules

- Fake ancestors are created for Xbred founders
- Fake tags = BBBCCCSFAKEdddddddd
- Fake tags are unique
- No fake tag = purebred animal
More rules

- Max .4 breeds/animals were considered
- Xbred animals candidate for fake ancestry were divided in 3 categories
  - Mostly purebred: 75%+ = 1 breed
  - Mostly half-bred: 50% to 75% = 1 breed
  - The rest (-50%)
- Rest of rules => See document
5.1. Overall correlations

Table 3. Correlation for heterosis \( r_{(HET)} \) and recombination \( r_{(REC)} \) coefficients between ICBF and InterBeef calculations in animals with records [perf.] and animals in pedigree file [pedigree]

<table>
<thead>
<tr>
<th></th>
<th>sample1</th>
<th>sample2</th>
<th>sample3</th>
<th>sample4</th>
<th>sample5</th>
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</thead>
<tbody>
<tr>
<td>Animals with N</td>
<td>5,000</td>
<td>10,000</td>
<td>15,000</td>
<td>20,000</td>
<td>25,000</td>
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<tr>
<td>performance ( r_{(HET)} )</td>
<td>0.90</td>
<td>0.89</td>
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<tr>
<td>( r_{(REC)} )</td>
<td>0.80</td>
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</tbody>
</table>

Table 5. Example illustrating the relative robustness of HET calculations compared to REC

<table>
<thead>
<tr>
<th>ICBF database</th>
<th>100%CHA</th>
<th>X</th>
<th>( \text{HET} = 1 )</th>
<th>40%LIM 30%HER 10%SIM 10%HOL 10%BFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct breed composition</td>
<td></td>
<td></td>
<td>REC = 0.360</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>InterBeef: 5th breed was dropped and the most prevalent breeds were kept to build back-ancestry =&gt; HET not impacted =&gt; reduction of REC</th>
<th>100%CHA</th>
<th>HET = 1</th>
<th>50%LIM 50%HER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REC = 0.250</td>
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</table>
Results

DISTRIBUTION OF HETEROSES CALCULATED FROM INTERBEEF & ICBF PEDIGREE ANIMALS WITH PERF. – FULL PEDIGREE

N = 25000  Current average = 0.66  r = 0.9  New average = 0.69
Results

DISTRIBUTION OF REC. LOSS CALCULATED FROM INTERBEEF & ICBF PEDIGREE
ANIMALS WITH PERF. — FULL PEDIGREE

N=20000  Current average=0.21  r=0.8  New average=0.2
Pedigree upload

- + 300,000 LIM or CHA animals with records
- + 1,200,000 lines in pedigree
- Uploaded April 2014 in IDEAtest
Variance components

- Research to start Summer 2014
Conclusion

• ‘FAKE’ ancestors method applicable at Interbeef level in order to include Xbred data in GE
  – Applicable for any member country with Xbred data
  – Requires new steps at Interbeef level
    • breed composition calculation
    • HET & REC calculations
    • Changes in GE model

• Strong correlations between Interbeef & ICBF HET & REC coefficients
  – Some differences will remain due to construction hypothesis and/or national pedigree weirdness