MULTISTAGE OPTIMAL CONTRIBUTION SELECTION (OCS) IS NECESSARY IN PRACTICAL BREEDING SCHEMES

B. Ask*, T. Ostersen, P. Berg, and M. Henryon

*bas@seges.dk

The 66th EAAP – Warsaw, Poland, 1st Sep. 2015

PROBLEM:

- Practical breeding schemes cannot implement "full" OCS

- OCS with truncation pre-selection realizes most of ΔG

- BUT: If pre-selection is too strict, then the full potential of OCS cannot be achieved

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PROBLEM:

- Some breeding programs actually have strict pre-selection

- With maternal traits, even more difficult?

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HYPOTHESIS:

Multistage OCS realises most of the genetic gain realised by full OCS

- when pre-selected proportion is low

- when maternal traits are included.

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SIMULATION STUDY

- *fullOCS*: reference selection scheme <u>*without*</u> pre-selection.
    - Sires are selected by OCS.
    - Dams are truncation selected.

- Three alternative selection schemes <u>*with*</u> pre-selection of <u>*sires*</u>:
    1. *trunc*:   Pre-selection is by truncation selection.
    2. $trunc_{FS}$: Pre-selection is by truncation selection with fullsib restrictions (limited no. of fullsibs selected per family)
    3. pre_{OCS}: Pre-selection is by OCS

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OCS:

$$C = \text{merit} - \omega * \text{relationship}$$

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SIMULATION STUDY

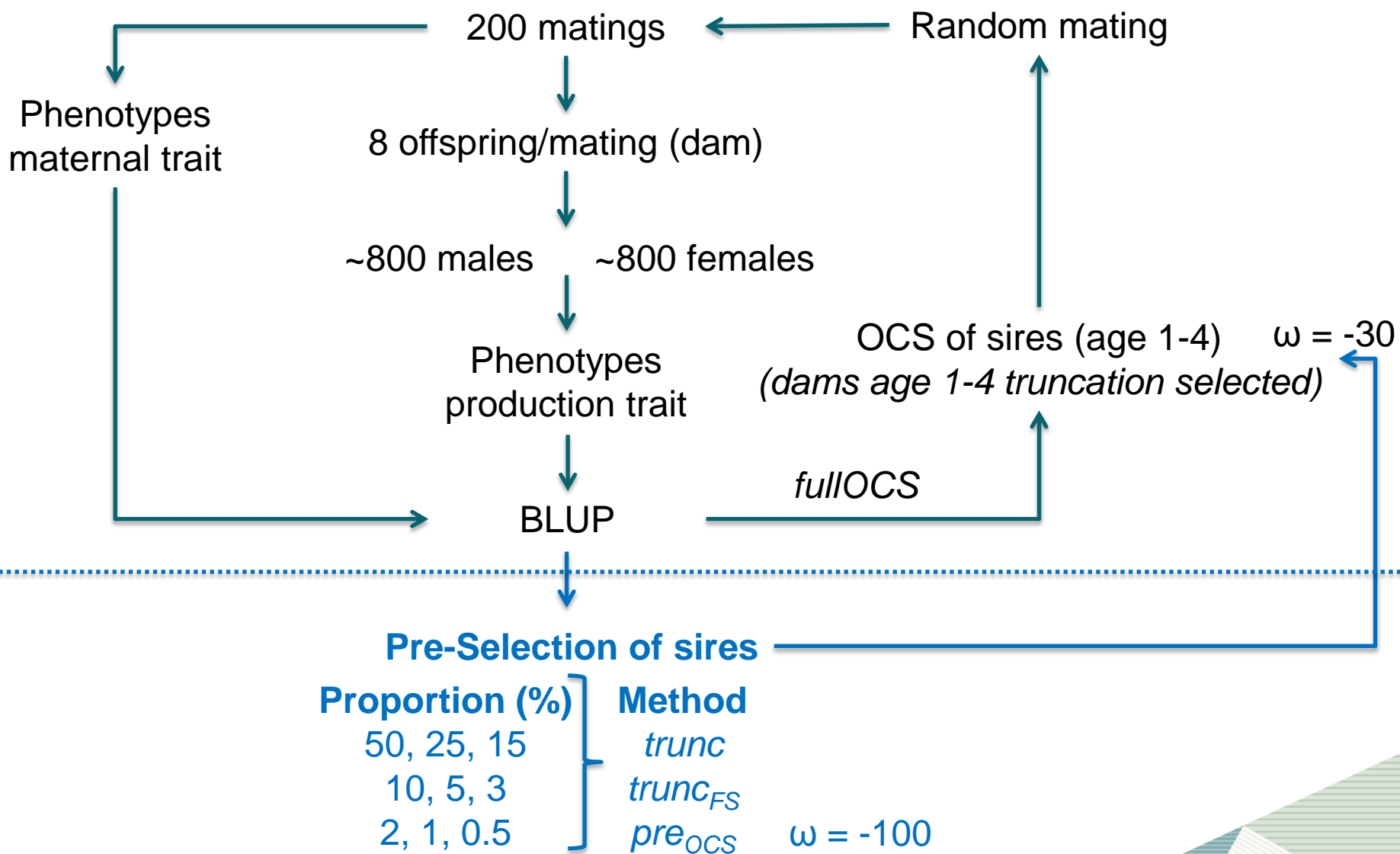- Two traits: a production trait and a maternal trait

$$h^2_{prod} = h^2_{mat} = 0.3$$

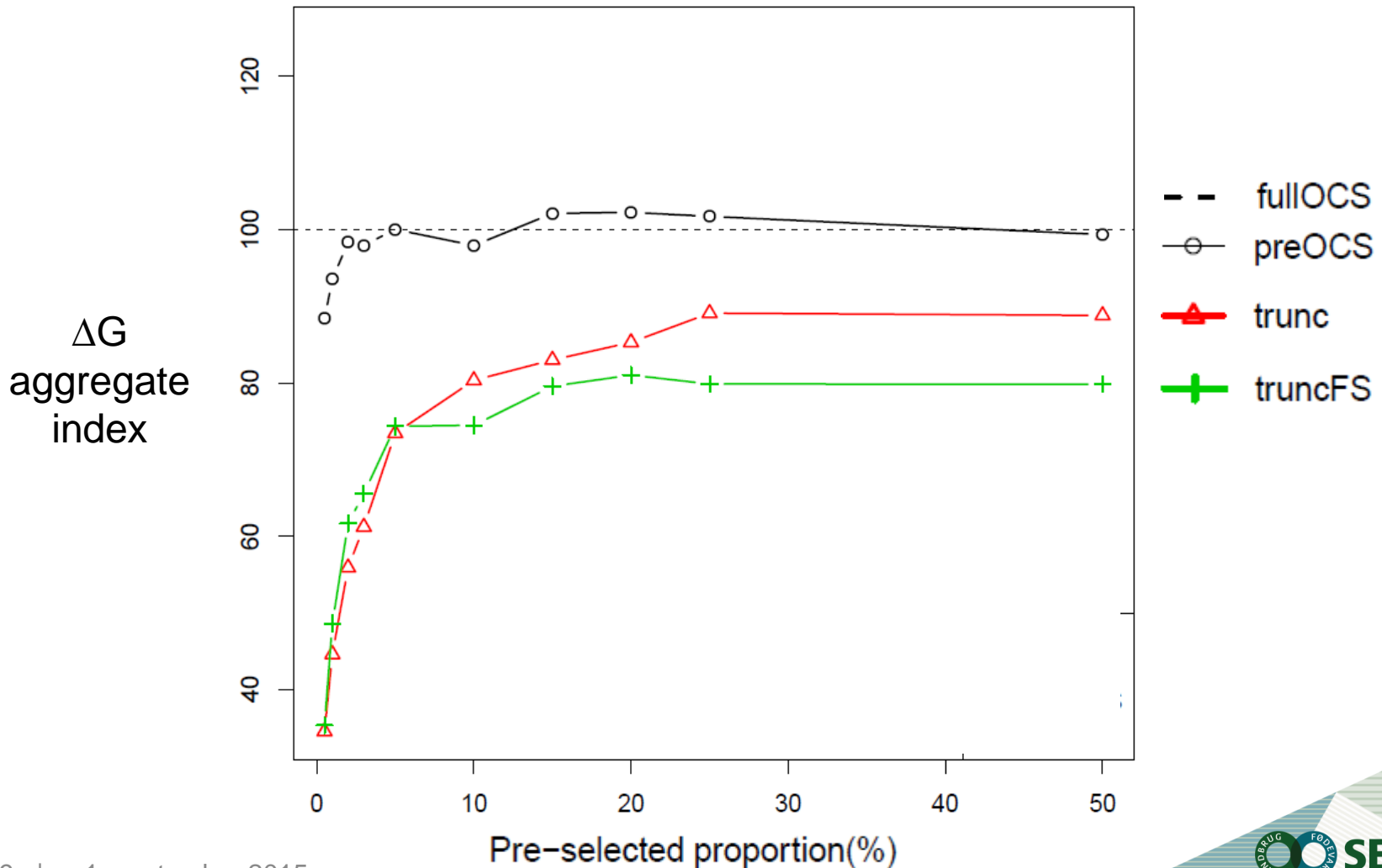$$r^2_{g_{prod,mat}} = -0.2 \quad ; \quad r^2_{e_{prod,mat}} = 0$$

$$v_{prod} = 1 \qquad \quad ; \quad v_{mat} = 2$$

- Long-term ΔG and ΔF: ~20 to ~25th generation

- 50 replicates per selection scheme

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SIMULATION STUDY

200 matings ← Random mating

Phenotypes
maternal trait

8 offspring/mating (dam)

~800 males   ~800 females

Phenotypes
production trait

OCS of sires (age 1-4) $\omega = -30$
(dams age 1-4 truncation selected)

BLUP   *fullOCS*

Pre-Selection of sires

Proportion (%)	**Method**
50, 25, 15	*trunc*
10, 5, 3	$trunc_{FS}$
2, 1, 0.5	pre_{OCS} $\omega = -100$

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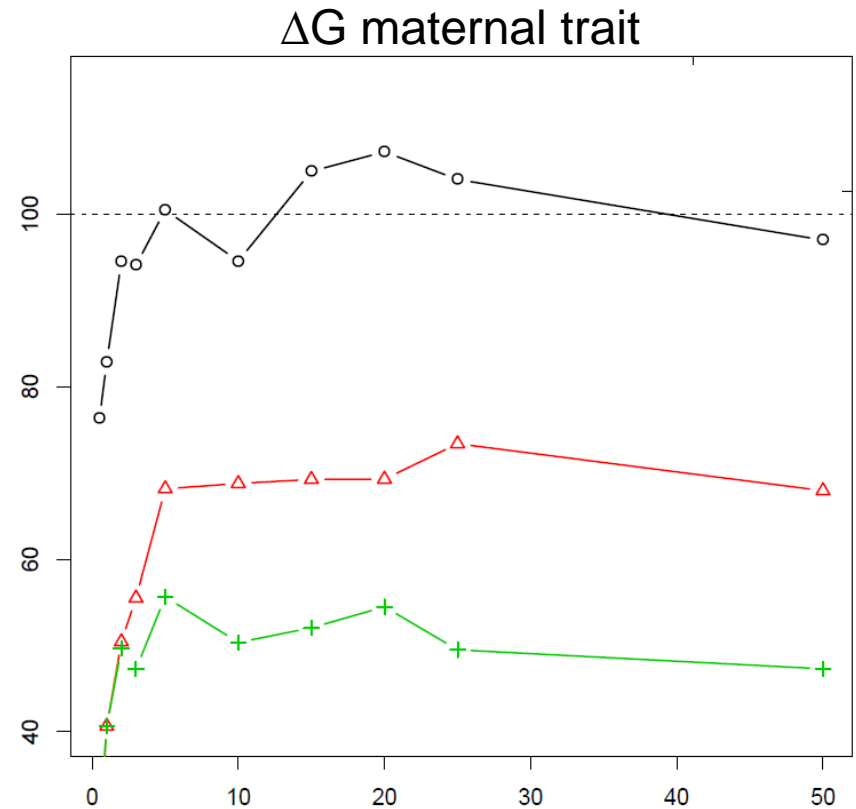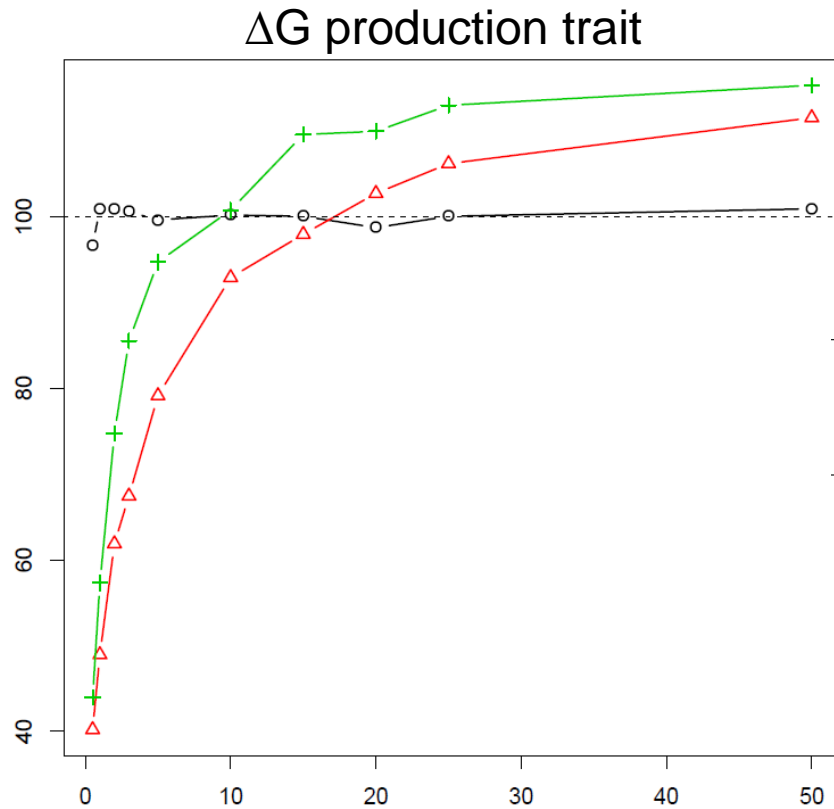
MULTIPLE STAGE OCS REALISES MOST OF THE ΔG REALISED BY FULL OCS

MULTISTAGE OCS PUTS MORE SELECTION PRESSURE ON THE MATERNAL TRAIT

ΔG production trait

ΔG maternal trait

Pre-selected proportion(%)

trunc — fullOCS

truncFS — preOCS

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CONCLUSION

Multistage OCS is necessary to maximize ΔG for practical breeding schemes

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