


Presentation to Conservation Services Programme Technical Working Group


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**Pupping rate estimation
(POP2006/01)**

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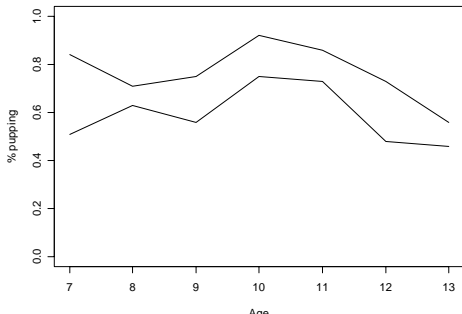
1



Current pupping rate estimates 1

1993 tagged cohort
min and max pupping rate estimates

Pupping rate



Age	Min pupping rate	Max pupping rate
7	0.50	0.85
8	0.65	0.70
9	0.55	0.75
10	0.75	0.95
11	0.70	0.85
12	0.50	0.75
13	0.45	0.55

2

Current pupping rate estimates 2

Problem:

identifying which cows have pupped

Daily observations:

births, suckling, calling, pup in tow, no pup, not seen

- Cows often seen with no pup are identified as non-breeders
- Cows often seen with pup or seen giving birth, suckling or calling are identified as breeders
- Those remaining are uncertain

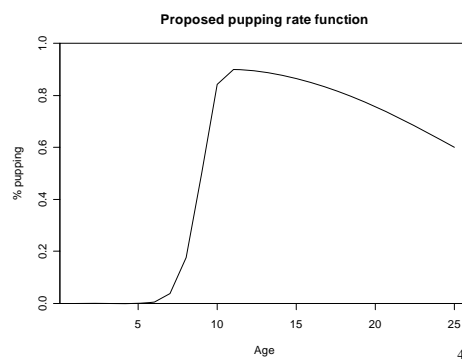
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Proposed pupping rate function

•This function is defined by four parameters to be estimated

•Pupping rate =

Cows that breed/Total cows in population



Model-based estimation 1

Along with pupping rate function we need to estimate daily sighting probabilities for a breeder for:

giving birth, suckling, calling, with pup, without pup, non-sighting.

We also need the same probabilities for a non-breeder (some are zero).

These are mostly nuisance parameters, but they allow us to estimate the pupping rate function.

Model-based estimation 2

- The method does not necessarily estimate exactly which cows were breeders in any year.
- It will estimate what proportion of breeders and of non-breeders are never seen in a given year.
- We may need to estimate tag loss rates and mortality rates.
- We may be able to test whether there are systematic variations in pupping rates between years.