Power Analysis

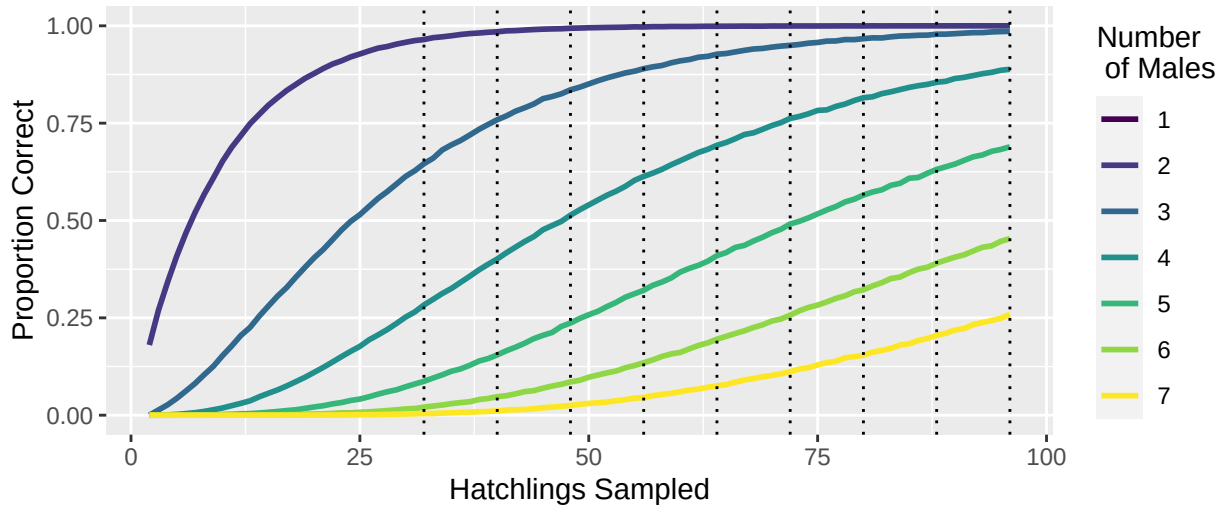
Question 1: How many hatchlings should be sampled from a nest to robustly estimate the number of males that contributed to it?

Assuming one dominant sire that fertilizes 90% of eggs

```
source('hatchlings_to_sample.R')

hatchlings_to_sample(n_hatchlings = 100,
                max_hatchlings = 96,
                max_males = 7,
                breeding = 'dominant',
                n_sims = n_sims,
                dom = 0.9,
                n_sizes = c(32, 40, 48, 56, 64, 72, 80, 88, 96))
```

```
## [[1]]
```



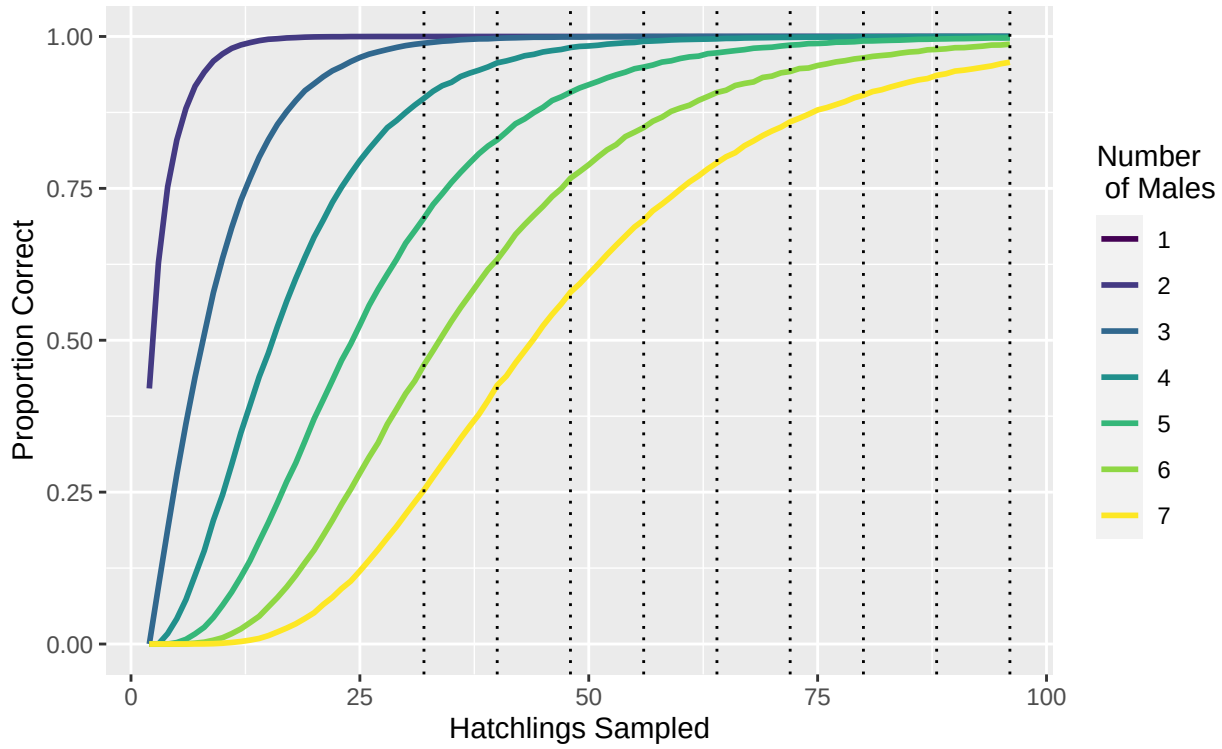

```
##
## [[2]]
##   Males      32      40      48      56      64      72      80      88      96
## 1     1      NA      NA      NA      NA      NA      NA      NA      NA      NA
## 2     2 0.96470 0.98461 0.99376 0.99702 0.99886 0.99955 0.99971 0.99994 0.99998
## 3     3 0.64598 0.75877 0.83551 0.88990 0.92708 0.94980 0.96702 0.97855 0.98583
## 4     4 0.28308 0.40114 0.51363 0.61325 0.69315 0.76220 0.81520 0.85498 0.88844
## 5     5 0.08692 0.15477 0.23677 0.32079 0.40963 0.49103 0.56534 0.63127 0.68930
## 6     6 0.02077 0.04752 0.08545 0.13467 0.19518 0.25679 0.32200 0.39042 0.45326
## 7     7 0.00416 0.01095 0.02492 0.04538 0.07543 0.11177 0.15426 0.20522 0.25903
```

Assuming one dominant sire that fertilizes 70% of eggs

```
source('hatchlings_to_sample.R')

hatchlings_to_sample(n_hatchlings = 100,
                max_hatchlings = 96,
                max_males = 7,
                breeding = 'dominant',
                n_sims = n_sims,
                dom = 0.7,
                n_sizes = c(32, 40, 48, 56, 64, 72, 80, 88, 96))
```

```
## [[1]]
```



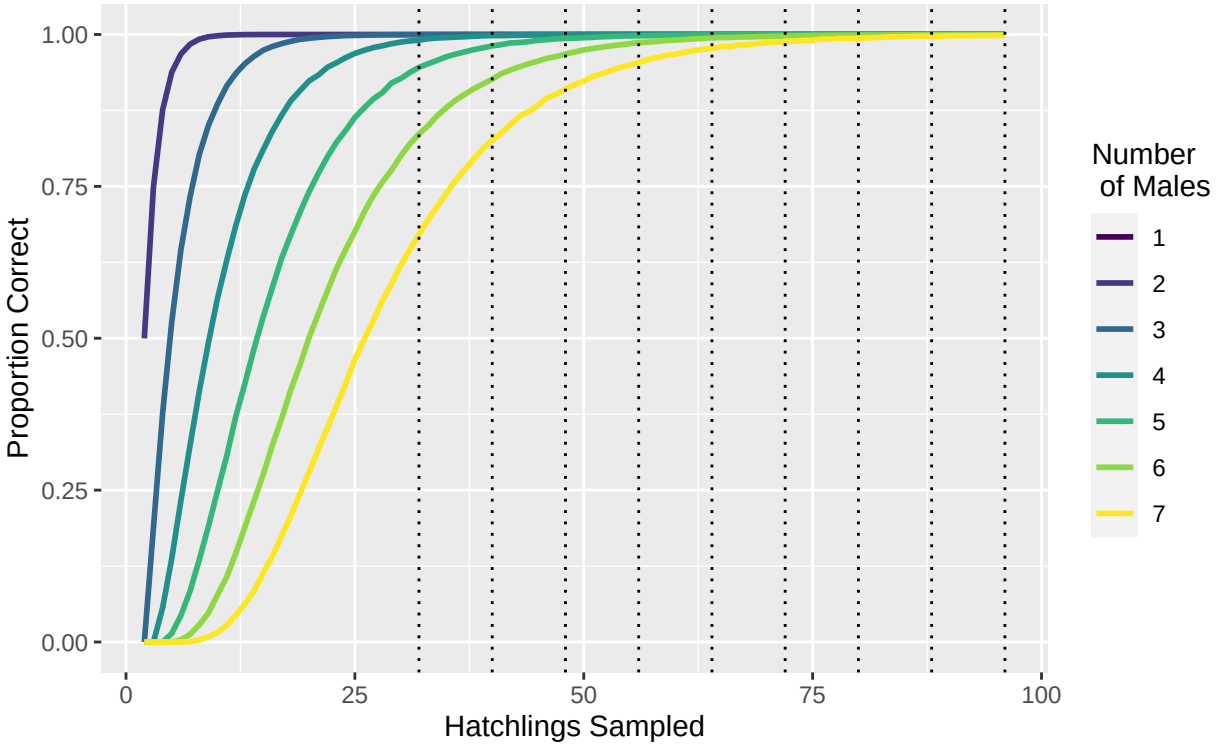

```
##
## [[2]]
##   Males      32      40      48      56      64      72      80      88      96
## 1     1      NA      NA      NA      NA      NA      NA      NA      NA      NA
## 2     2 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000
## 3     3 0.98894 0.99708 0.99920 0.99984 0.99995 1.00000 1.00000 1.00000 1.00000
## 4     4 0.89823 0.95661 0.98184 0.99203 0.99608 0.99846 0.99942 0.99977 0.99987
## 5     5 0.70113 0.82977 0.90824 0.94966 0.97307 0.98580 0.99260 0.99583 0.99758
## 6     6 0.45948 0.63282 0.76663 0.85011 0.90784 0.94235 0.96473 0.97873 0.98727
## 7     7 0.25334 0.42586 0.57904 0.69776 0.79202 0.85948 0.90332 0.93602 0.95766
```

Assuming one dominant sire that fertilizes 50% of eggs

```
source('hatchlings_to_sample.R')

hatchlings_to_sample(n_hatchlings = 100,
                max_hatchlings = 96,
                max_males = 7,
                breeding = 'dominant',
                n_sims = n_sims,
                dom = 0.5,
                n_sizes = c(32, 40, 48, 56, 64, 72, 80, 88, 96))
```

```
## [[1]]
```




```
##
## [[2]]
##   Males      32      40      48      56      64      72      80      88      96
## 1     1      NA      NA      NA      NA      NA      NA      NA      NA      NA
## 2     2 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000
## 3     3 0.99976 0.99998 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000
## 4     4 0.99062 0.99816 0.99954 0.99988 0.99999 0.99999 1.00000 1.00000 1.00000
## 5     5 0.94585 0.98121 0.99357 0.99778 0.99923 0.99977 0.99991 0.99999 0.99999
## 6     6 0.83626 0.92642 0.96770 0.98678 0.99438 0.99742 0.99877 0.99953 0.99977
## 7     7 0.67073 0.82598 0.91037 0.95399 0.97721 0.98882 0.99386 0.99703 0.99850
```

Assuming one dominant sire where fertilization is flexible, and dependent on the total number of sires

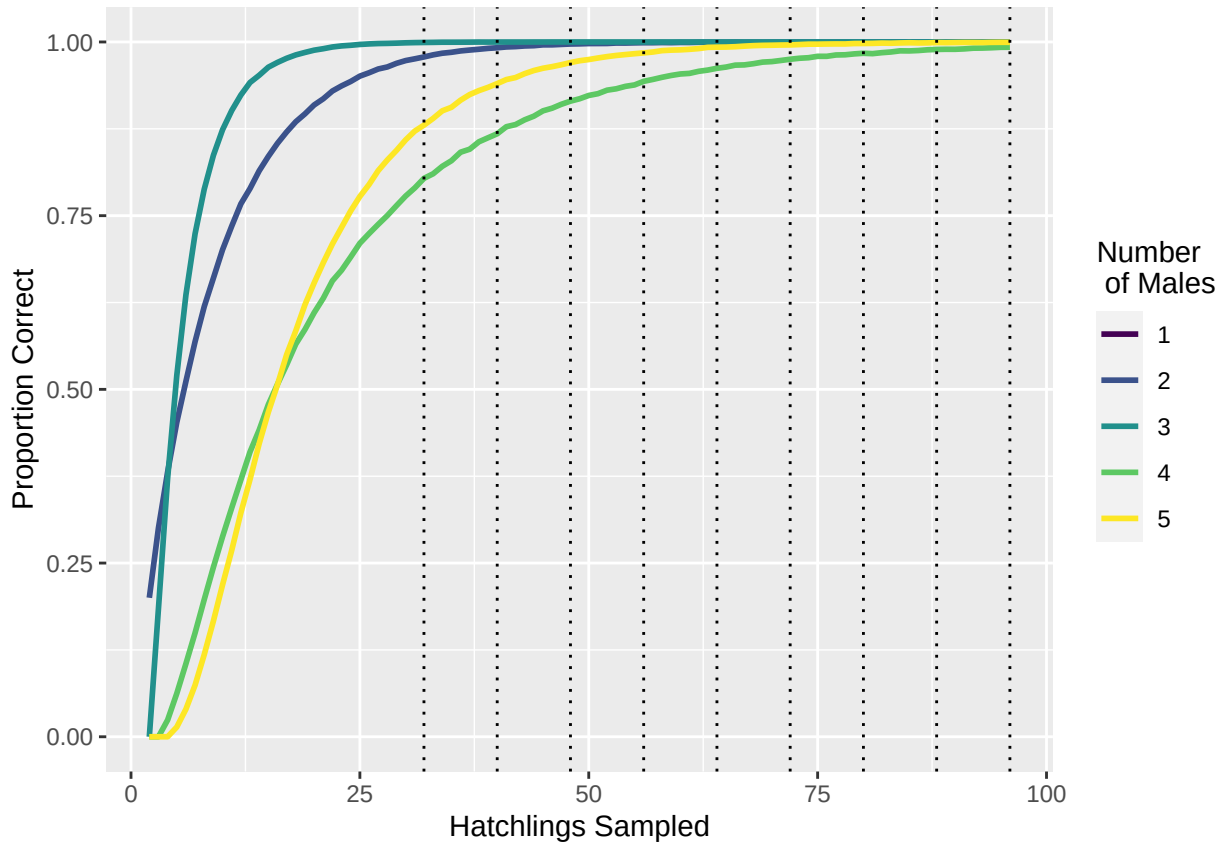
Proportion fertilized by each sire is calculated as the average contribution for each sire based on Alfaro-Nunez et al. 2015:

```
##          Sire1  Sire2  Sire3  Sire4  Sire5
## 1 Sire  1.0000 0.0000 0.0000 0.0000 0.0000
## 2 Sires 0.8868 0.1132 0.0000 0.0000 0.0000
## 3 Sires 0.4744 0.3241 0.2015 0.0000 0.0000
## 4 Sires 0.5485 0.2508 0.1509 0.0499 0.0000
## 5 Sires 0.4744 0.1982 0.1523 0.0997 0.0755
```

```
source('hatchlings_to_sample.R')

hatchlings_to_sample(n_hatchlings = 100,
                max_hatchlings = 96,
                max_males = 5,
                breeding = 'flexible_dominant',
                n_sims = n_sims,
                dom = NULL,
                n_sizes = c(32, 40, 48, 56, 64, 72, 80, 88, 96))
```

```
## [[1]]
```



```
##
## [[2]]
##   Males      32      40      48      56      64      72      80      88      96
## 1     1      NA      NA      NA      NA      NA      NA      NA      NA      NA
## 2     2 0.97843 0.99161 0.99702 0.99891 0.99958 0.99987 0.99984 0.99996 0.99999
## 3     3 0.99925 0.99990 0.99997 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000
## 4     4 0.80371 0.86786 0.91482 0.94333 0.96209 0.97512 0.98373 0.98924 0.99241
## 5     5 0.88029 0.94008 0.97036 0.98425 0.99251 0.99573 0.99782 0.99913 0.99952
```