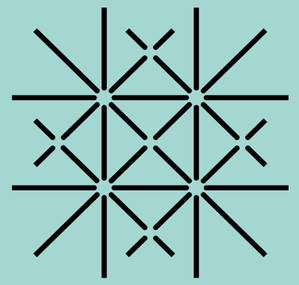


University
of Basel

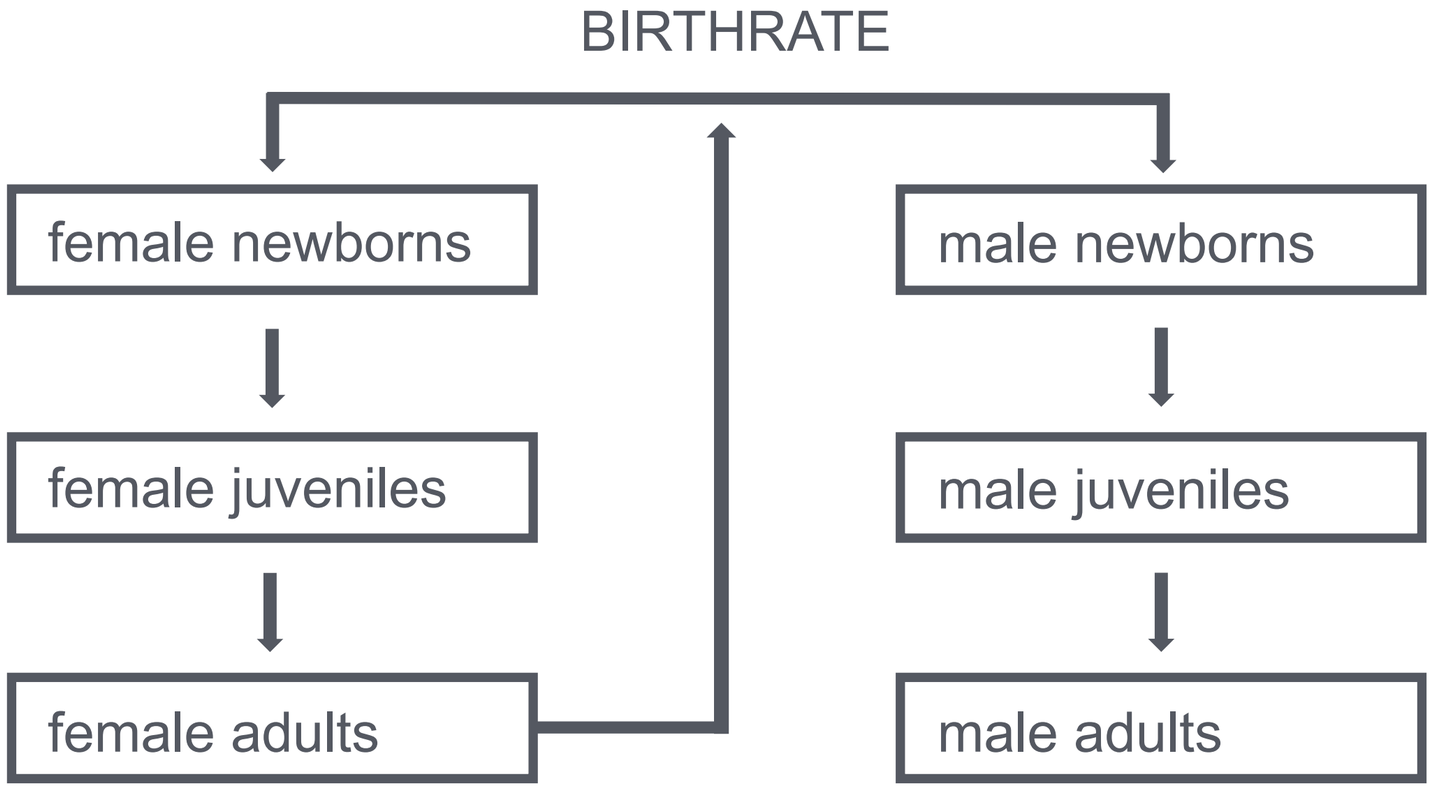
In association with:

Swiss TPH

Swiss Tropical and Public Health Institute
Schweizerisches Tropen- und Public Health-Institut
Institut Tropical et de Santé Publique Suisse

Solving the formula
(part one)

Schematic representation of a demographic model of an animal population



N = young / calves
subadult / heifers
adult / cows

$$P = \begin{matrix} 0 & 0 & \text{birth rate} \\ \text{survival young} & \text{persistence subadult} & 0 \\ 0 & \text{survival subadult} & \text{persistence adult} \end{matrix}$$

$$\mathbf{P = \begin{pmatrix} 0 & 0 & b \\ sy & ps & 0 \\ 0 & ss & pa \end{pmatrix}}$$

$$N_{t+1} = P^n \times N_t$$

$$P = \begin{pmatrix} 0 & 0 & b \\ sy & ps & 0 \\ 0 & ss & pa \end{pmatrix} \times N = \begin{pmatrix} Y \\ S \\ A \end{pmatrix}$$

$$N_{t+1} = P^n \times N_t$$

Result after 20 – 30 iterations

$$P^n = \begin{pmatrix} \lambda^n & 0 & 0 \\ 0 & \lambda^n & 0 \\ 0 & 0 & \lambda^n \end{pmatrix}$$

$$P^n = \lambda^n$$

Y = 50'000

S = 20'000

A = 40'000

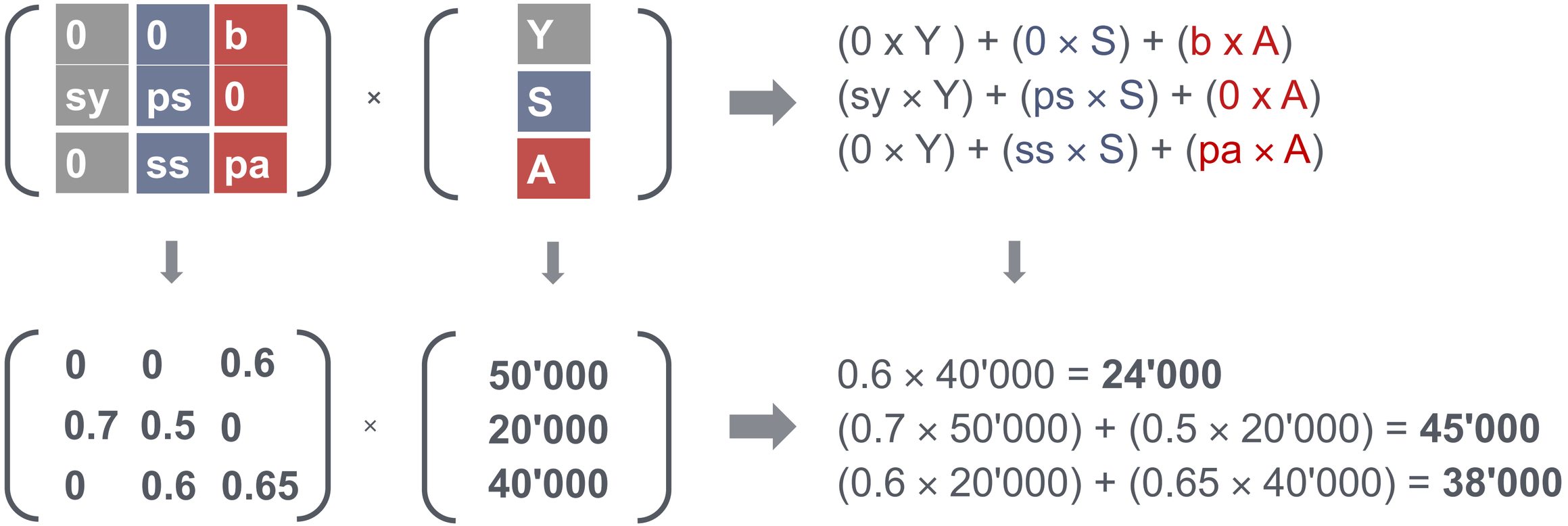
b = 60% = 0.6

sy = 70% = 0.7

ps = 50% = 0.5

ss = 60% = 0.6

pa = 65% = 0.65


0 0 b
sy ps 0
0 ss pa
×
Y
S
A
(0 x Y) + (0 × S) + (b x A)
(sy × Y) + (ps × S) + (0 x A)
(0 × Y) + (ss × S) + (pa × A)
0 0 0.6
0.7 0.5 0
0 0.6 0.65
×
50'000
20'000
40'000
0.6 × 40'000 = 24'000
(0.7 × 50'000) + (0.5 × 20'000) = 45'000
(0.6 × 20'000) + (0.65 × 40'000) = 38'000