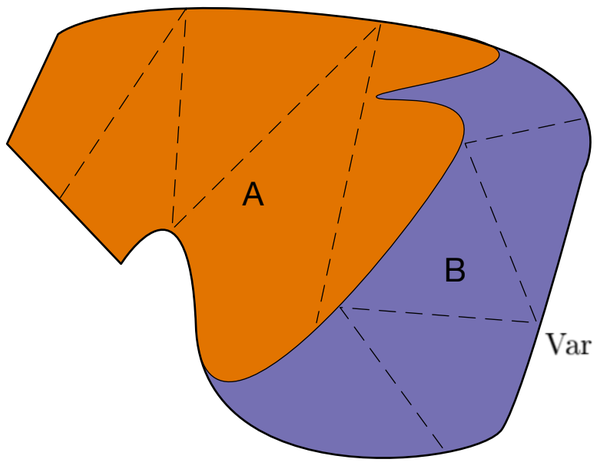
Stratification in `dht2`

There are four stratification options in dht2, this cheatsheet shows how abundance and variance are calculated and gives examples of when to use them

Geographical (`stratification="geographical"`)

Each stratum represents a different geographical area, we want the total over all the areas



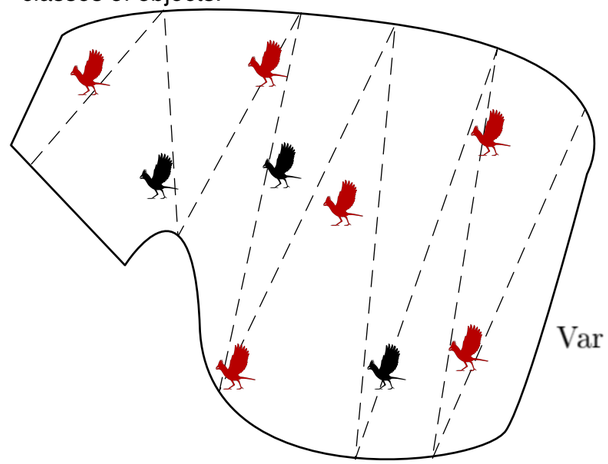
$$\hat{N} = \sum_{m=1}^{M} \hat{N}_m$$

$$\text{Var}\left(\hat{N}\right) = \sum_{m=1}^{M} \text{Var}\left(\hat{N}_m\right)$$

Example: estimates are required for areas "A" and "B", above as well as an estimate of total abundance and its variance.

Object (`stratification="object"`)

Objects are of different "classes", for example sex, species or life stage. Post-stratification is then required to obtain the total number of individuals across all the classes of objects.



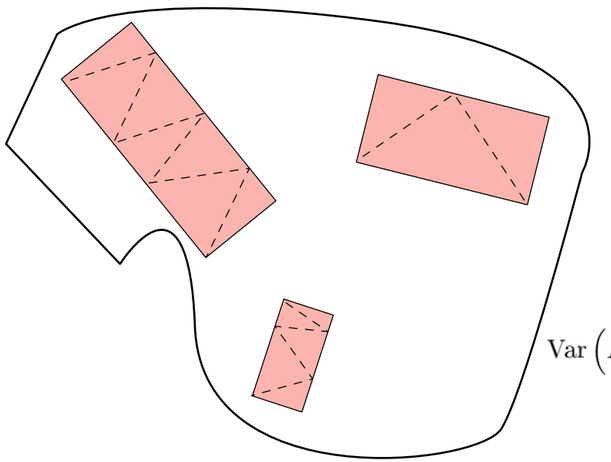
$$\hat{N} = \sum_{m=1}^{M} \hat{N}_m$$

$$\text{Var}\left(\hat{N}\right) = \sum_{m=1}^{M} \text{Var}\left(\hat{N}_m\right)$$

Example: if you have stratified by colour (red/black), but also want a total number of animals.

Effort-weighted sum (`stratification="effort_sum"`)

Strata are from surveys (perhaps using different designs) but you don't have many replicates and/or want an estimate of "average variance" and average abundance.



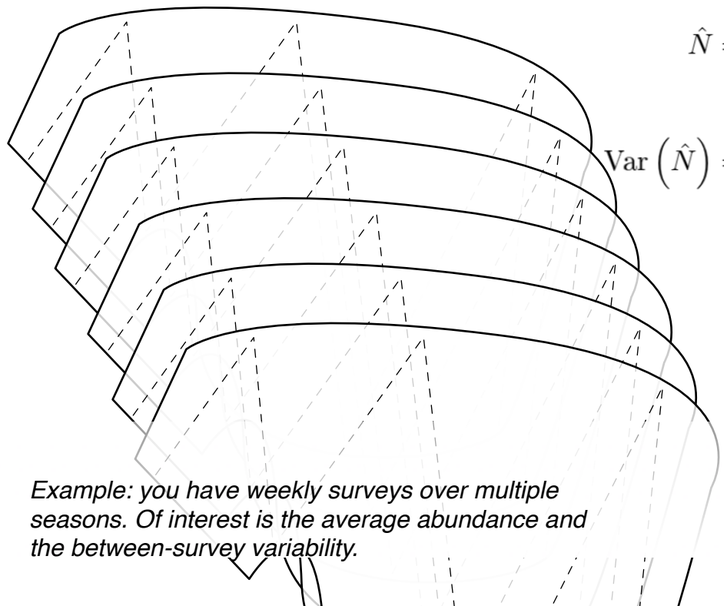
$$\hat{N} = \sum_{m=1}^{M} \frac{A_{\text{total}}}{A_m} \frac{L_m}{\sum_{k=1}^{M} L_k} \hat{N}_m$$

$$\text{Var}\left(\hat{N}\right) = \sum_{m=1}^{M} \left(\frac{L_m}{\sum_{k=1}^{M} L_k}\right)^2 \text{Var}\left(\hat{N}_m\right)$$

Example: surveys (red) were made and are believed to be representative of the larger study area with area A_{total} so they can be summed (weighted by the amount of effort) to obtain an average abundance.

Replicate (`stratification="replicate"`)

Many replicate surveys have been conducted and the average abundance weighted by amount of effort is required, along with variance between the surveys



$$\hat{N} = \sum_{m=1}^{M} \frac{L_m}{\sum_{k=1}^{M} L_k} \hat{N}_m$$

$$\text{Var}\left(\hat{N}\right) = \sum_{m=1}^{M} \frac{\left(\hat{N}_m - \bar{N}\right)^2}{M-1}$$

Example: you have weekly surveys over multiple seasons. Of interest is the average abundance and the between-survey variability.