

$Z_i = 0$  (true absence) with probability  $1 - \psi$   
 $Z_i = 1$  (true presence) with probability  $\psi$

If  $Z_i = 0$

If  $Z_i = 1$

*Paranthropus* sampling  
probability at site  $i$  is zero  
( $p_i = 0$ )

# recovered *Paranthropus*  
specimens at site  $i$  is zero  
( $X_i = 0$ )

*Paranthropus* was truly  
absent from site  $i$

*Paranthropus* sampling probability at site  $i$  distributed following  
monotonic, one-parameter beta distribution w/ shape parameter  $\lambda$   
(mean  $p_i > 0$ )

Observed total # mammal  
fossil specimens at site  $i$   
( $n_i$ )

# recovered *Paranthropus*  
specimens at site  $i \geq$  zero  
( $X_i \geq 0$ )

*Paranthropus* was present at site  $i$   
but may not have been sampled yet