Sobs Model Formulas

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###Observation level model

$$n_{observed} \sim \text{Binom}(N_{true},\ p_d)$$

Abondance level model

$$N_{true} \sim \text{Pois}(\lambda)$$

$$\log(\lambda) = \alpha + \beta_1 x_1 + \beta_2 x_2 + ...\beta_j x_j$$

$$p_d \propto \sigma$$

$$\log(\sigma) = \sigma_0 + \beta_1 x_1 + \beta_2 x_2 + ...\beta_j x_j$$

###Fake data

```
#Add packages
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(tidyr)
library(ggplot2)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

```r
#Generate geometric data
min_dat <- tibble(x = seq(from = 1, to = 6, by = 0.01)) %>%
  mutate(y = x^3)

#Plot these data
min_graph <- min_dat %>%
  ggplot(aes(x = x, y = y/max(y))) +
  geom_point() +
  theme_bw() +
  labs(x = "Minute",
       y = "Probability of detection")

#simulate a half normal detection function
#Generate geometric data
dist_dat <- tibble(x = runif(n =10000, min = 0, max = 150),
                   y = exp(-0.02 * x ))

#Plot these data
dist_graph <- dist_dat %>%
  ggplot(aes(x = x, y = y/max(y))) +
  geom_point() +
  theme_bw() +
  xlim(0, 150) +
  labs(x = "Distance (m)",
       y = "Probability of detection")
dist_graph
```