Bycatch Estimation and Expansion in STAN

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Load library

```
require(devtools)
devtools::install_github("eric-ward/bycatch")
library(bycatch)
```

Load data

```
# replace this with your own data frame
d = data.frame("Year"= 2002:2014,
  "Takes" = c(0, 0, 0, 0, 0, 0, 0, 0, 1, 3, 0, 0, 0),
  "expansionRate" = c(24, 22, 14, 32, 28, 25, 30,  7, 26, 21, 22, 23, 27),
  "Sets" = c(391, 340, 330, 660, 470, 500, 330, 287, 756, 673, 532, 351, 486))
```

Fit model

```
fit = bycatch_expansion(time = d[,"Year"], events = d[,"Takes"],
  effort = d[,"Sets"], coverage = d[,"expansionRate"])
```

Make plots

```
plot_expanded(fit, xlab="Year", ylab = "Fleet-level bycatch")
```

Make table of expanded bycatch estimates

```
df = data.frame("time" = d[,"Year"],
  "mean" = apply(fit$expanded_estimates, 2, mean),
  "median" = apply(fit$expanded_estimates, 2, quantile, 0.5),
  "lower95" = apply(fit$expanded_estimates, 2, quantile, 0.025),
  "upper95" = apply(fit$expanded_estimates, 2, quantile, 0.975))

write.table(df, "estimated_bycatch.csv", row.names=F, col.names=T, sep=",")
```
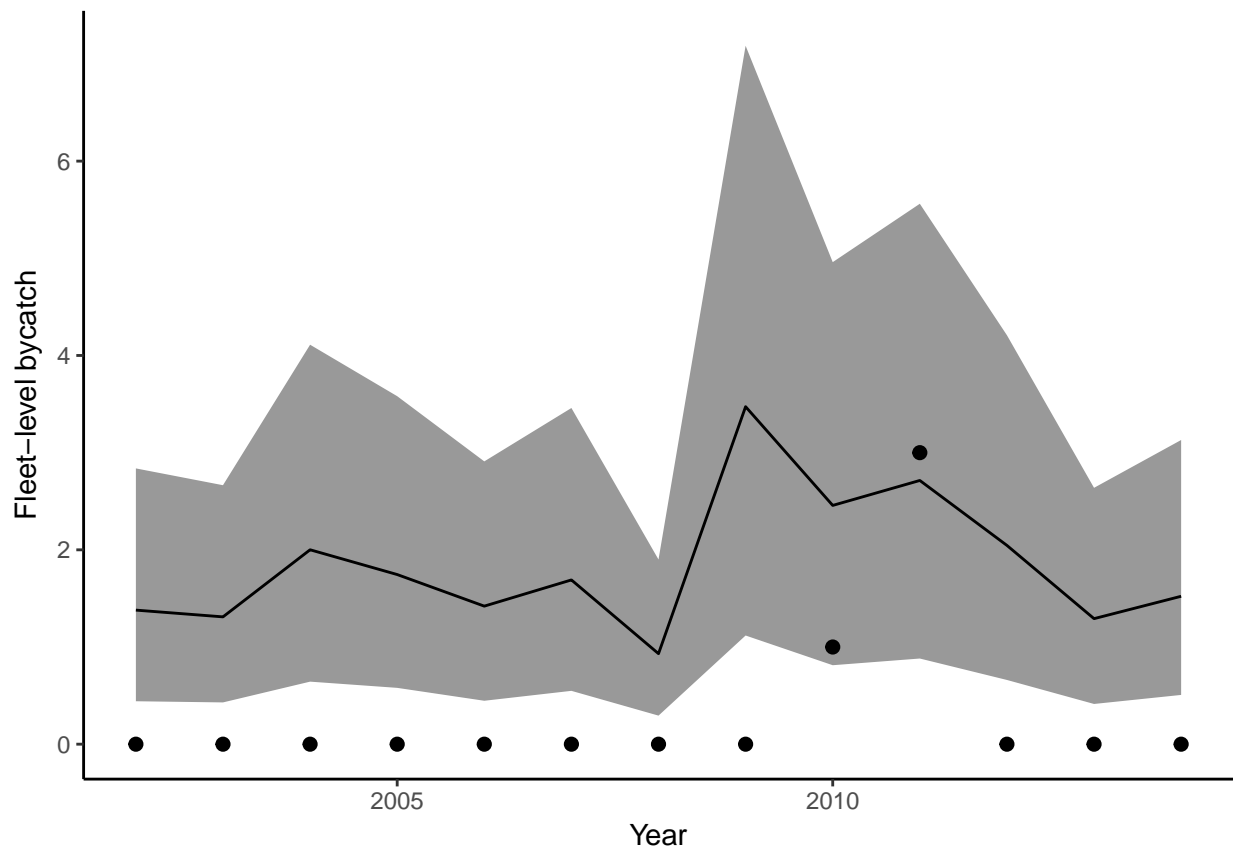
Figure 1: Estimated fleet-level expanded bycatch, incorporating data on takes, effort, and observer coverage. Dots represent observed bycatch events.