Haddock S-R models

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Thoughts

So our first thought was a simple stock-recruitment model using the linearization of the Ricker SR model, so

$$log\left(\frac{Rec}{SSB}\right) = SSB + \epsilon_i$$

Of course our starting place is the largest Haddock Stock in the world and might as well include it's wingman the not largest Cod Stock in the world as our starting place. First, we need to align the data properly. For both stocks the recruits are age 3, so the recruits in year t came from the SSB in t-3. I've gone with the recruits in year t are age 0 (say 1950), so they are 3 years old in 1953, thus the 1950 SSB year class results in recruits we see in 1953.

```
# First up, we need to offset the Recruits to line up with SSB.  For both Haddock and Cod
had$rec <- c(had$rec[4:nrow(had)],NA,NA,NA)
cod$rec <- c(cod$rec[4:nrow(cod)],NA,NA,NA)
had$ssb.prop <- had$ssb/max(had$ssb)
cod$ssb.prop <- cod$ssb/max(cod$ssb)

# Now combine the two so we can make some simple plots and maybe fancy models later
dat <- bind_rows(had,cod)
# Get the Rec/SSB value
dat$rec.ssb <- dat$rec/dat$ssb
dat$log.r.ssb <- log(dat$rec.ssb)
dat <- dat[!is.na(dat$rec),]
# Now we can plot the Rec vs SSB
theme_set(theme_bw())
```

See Figure @ref(fig:cars-plot).

The Recruit-SSB relationship looks as awful here as it always does (Figure @ref(fig:r-ssb-plot)).

```
## `geom_smooth()` using formula 'y ~ x'
```

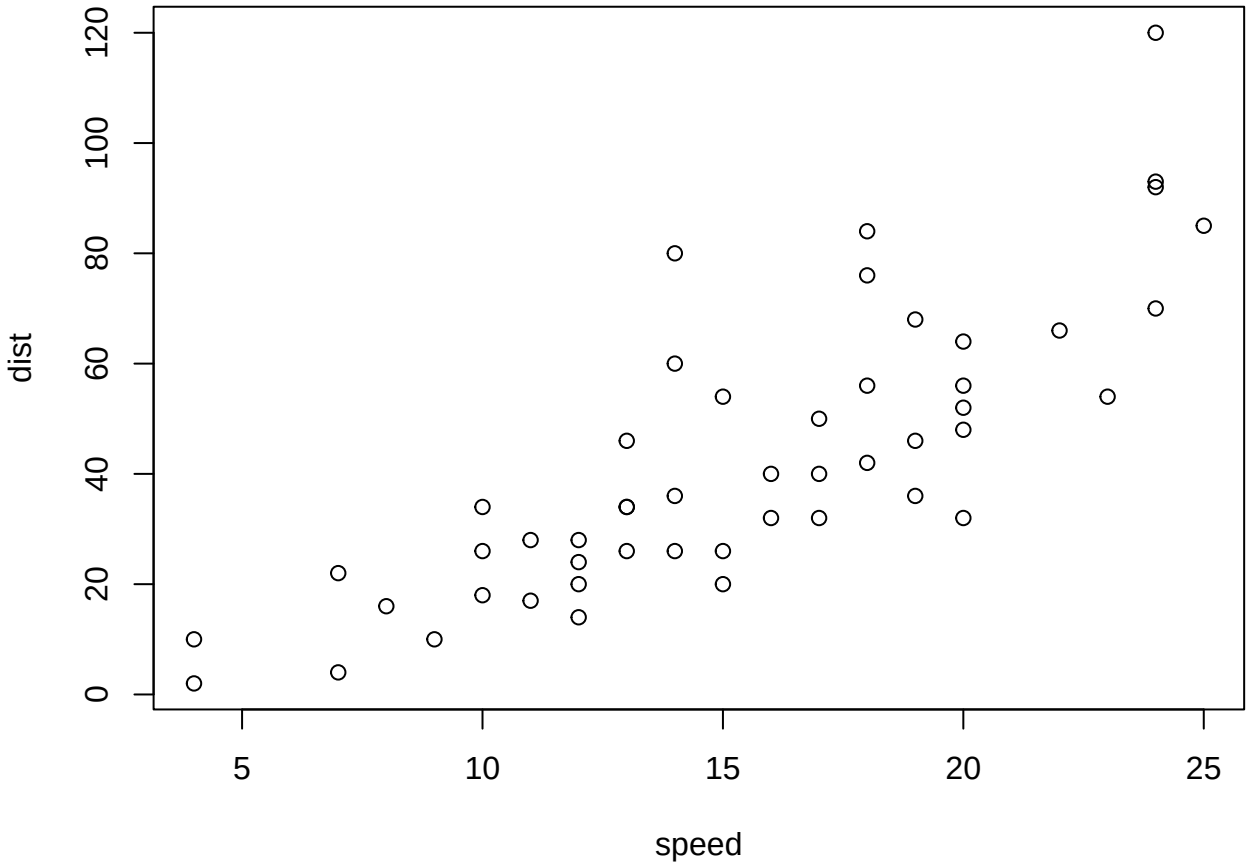


Figure 1: The cars data.

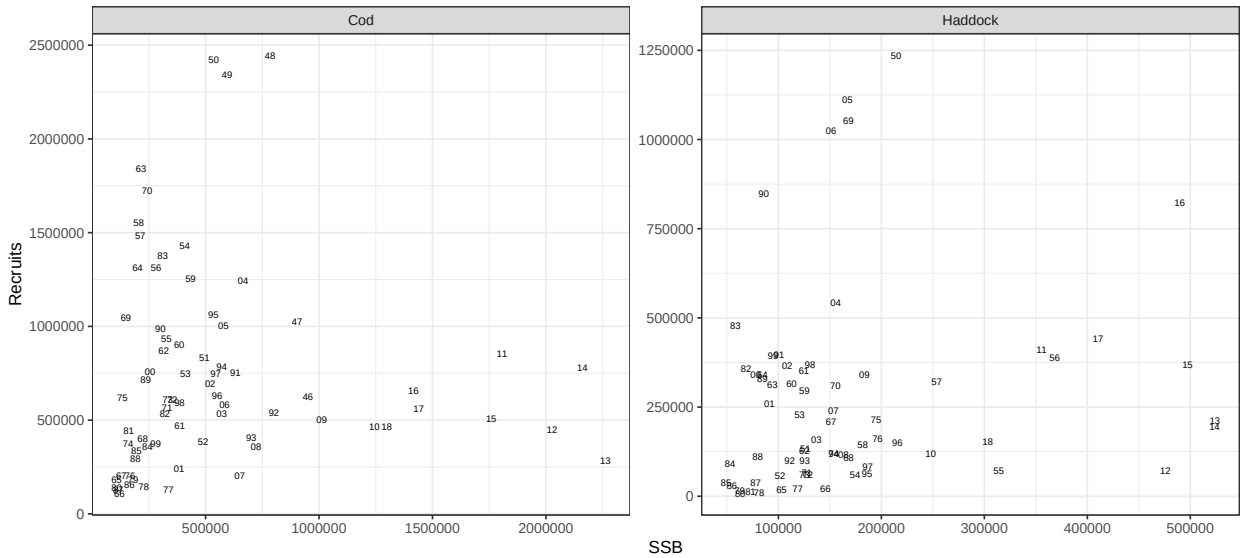
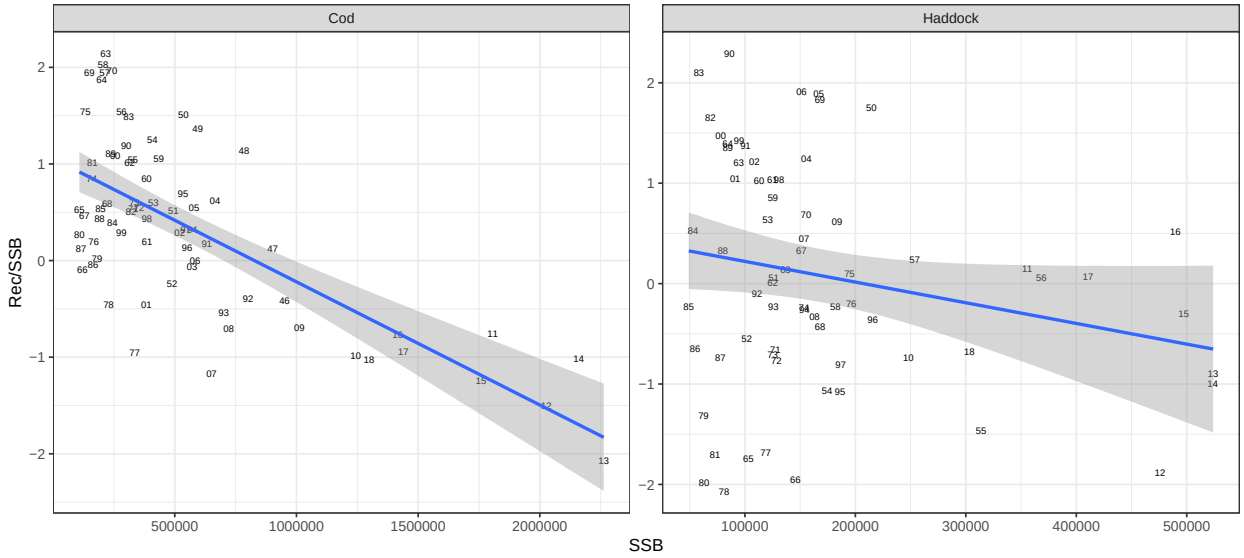
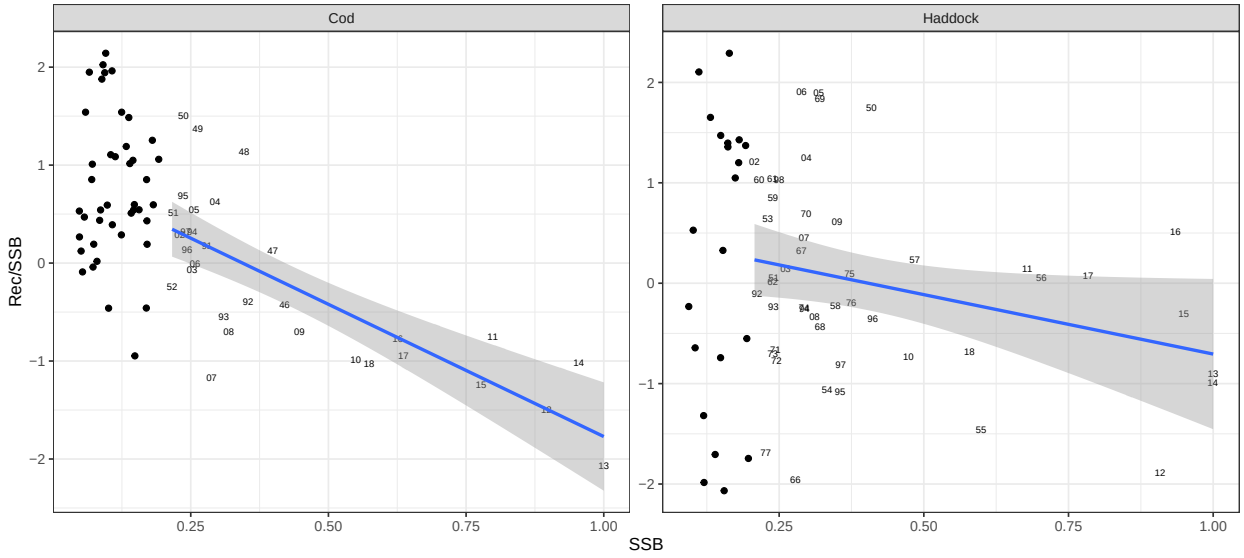


Figure 2: Recruits vs SSB for the world largest Haddock stock and a Cod stock also found in the Barents Sea.

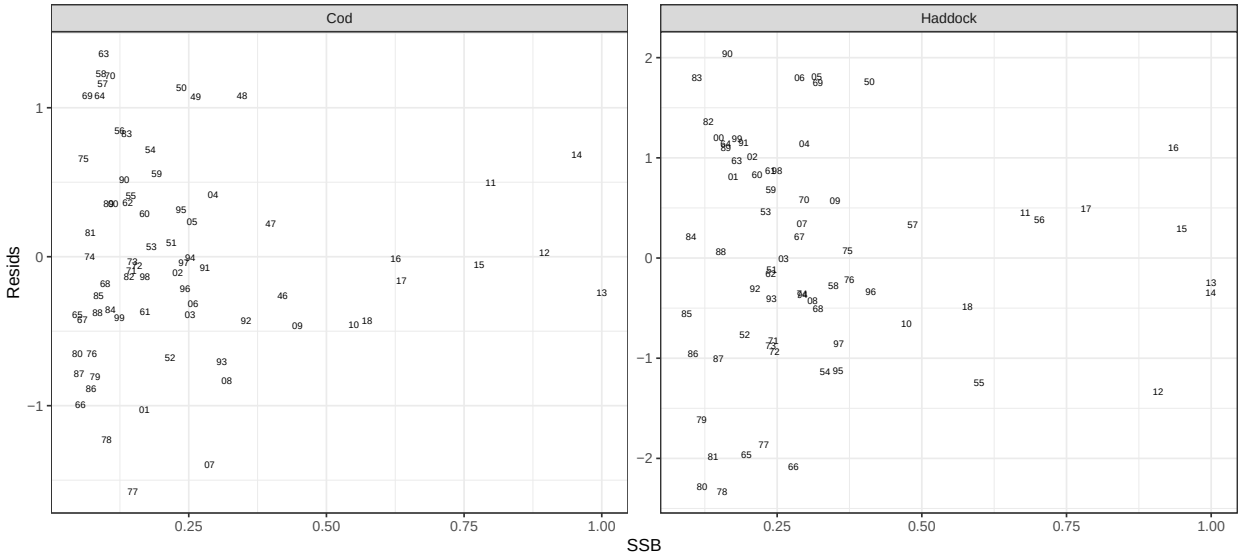



```
## `geom_smooth()` using formula 'y ~ x'
```




```
# The cod model
cod.mod <- lm(log.r.ssb ~ ssb,data= dat %>% dplyr::filter(stock == 'Cod'))
cod.resids <- residuals(cod.mod)
# The Haddock model
had.mod <- lm(log.r.ssb ~ ssb,data= dat %>% dplyr::filter(stock == 'Haddock'))
had.resids <- residuals(had.mod)
dat$resids <- c(had.resids,cod.resids)

p4 <- ggplot(dat,aes(y=resids, x= ssb.prop)) + geom_text(aes(label=substr(year,3,4)),size=2) +
      facet_wrap(~stock,scales = 'free') + xlab("SSB") + ylab("Resids")
p4
```


Cod
Haddock
Resids
SSB
1
0
−1
2
−2
0.25
0.50
0.75
1.00