

FLife: Operating Model Conditioning

Turbot

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Life history parameters

Life history parameters from Fish Base for the Von Bertalanffy growth model were L_{∞} (58.7), k (0.286), and t_0 (-0.416), for the length/weight relationship $W = aL^b$ were a (0.0204) and b (2.93), and age at maturity (a_{50}) was (4.41).

The values for the empirical Gislason natural mortality relationship m_1 and m_2 were (174.5) and (-1.61) respectively.

The fishery was assumed to only catch mature fish and so selection pattern is modelled by a double normal equivalent to the maturity ogive, parameters were a_1 , s_l and s_r were (5.41, 1, 5000) respectively.

The stock recruitment relationship is assumed to be of a Beverton and Holt functional form with a steepness and virgin biomass of 0.8 and 1000 units respectively.

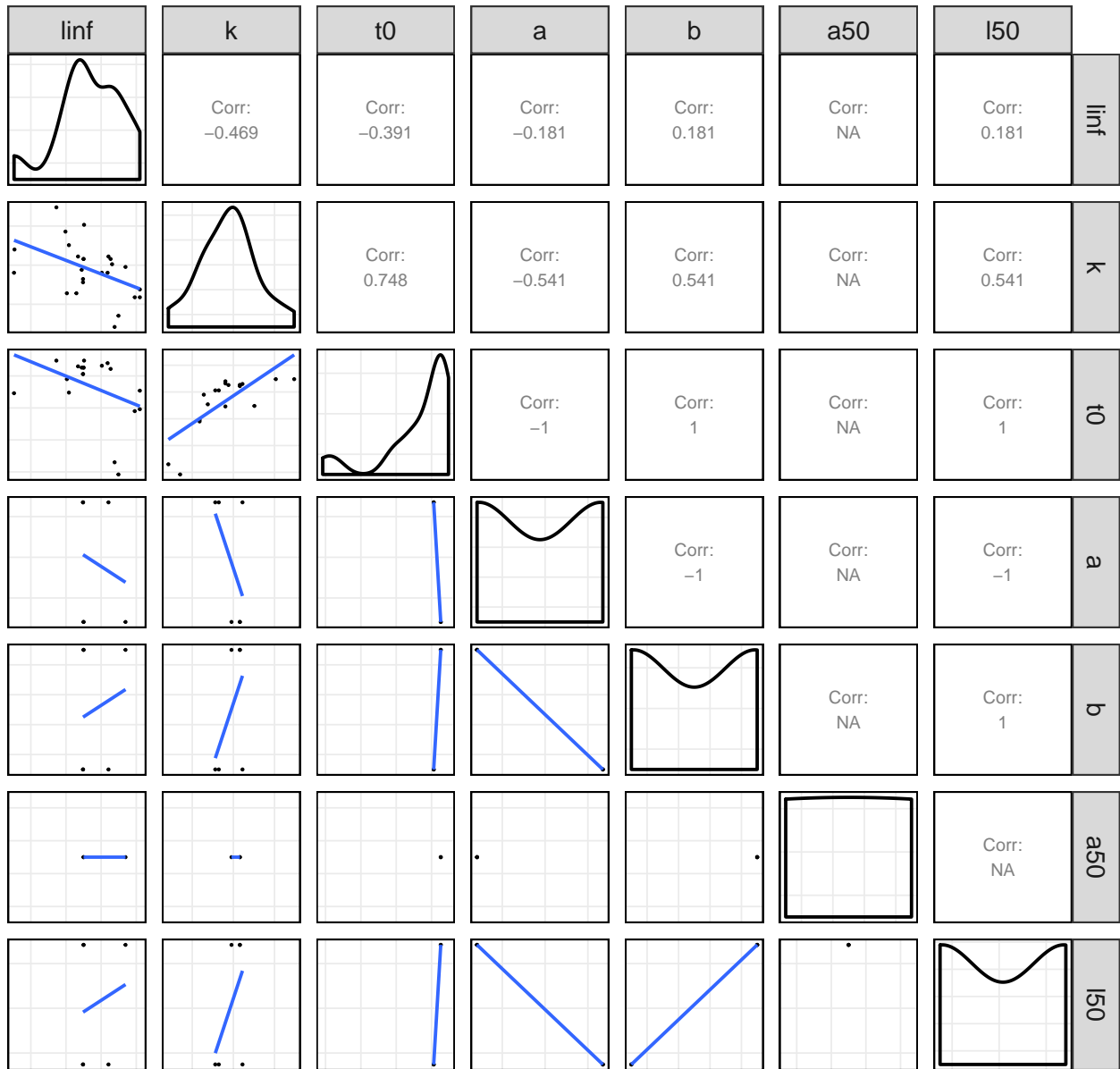


Figure 1 Pairwise scatter plots of life history parameters.

Equilibrium dynamics

The parameters are then used by `1hEq1` to simulate the equilibrium dynamics by combining the spawner/yield per recruit relationships with a stock recruitment relationship.

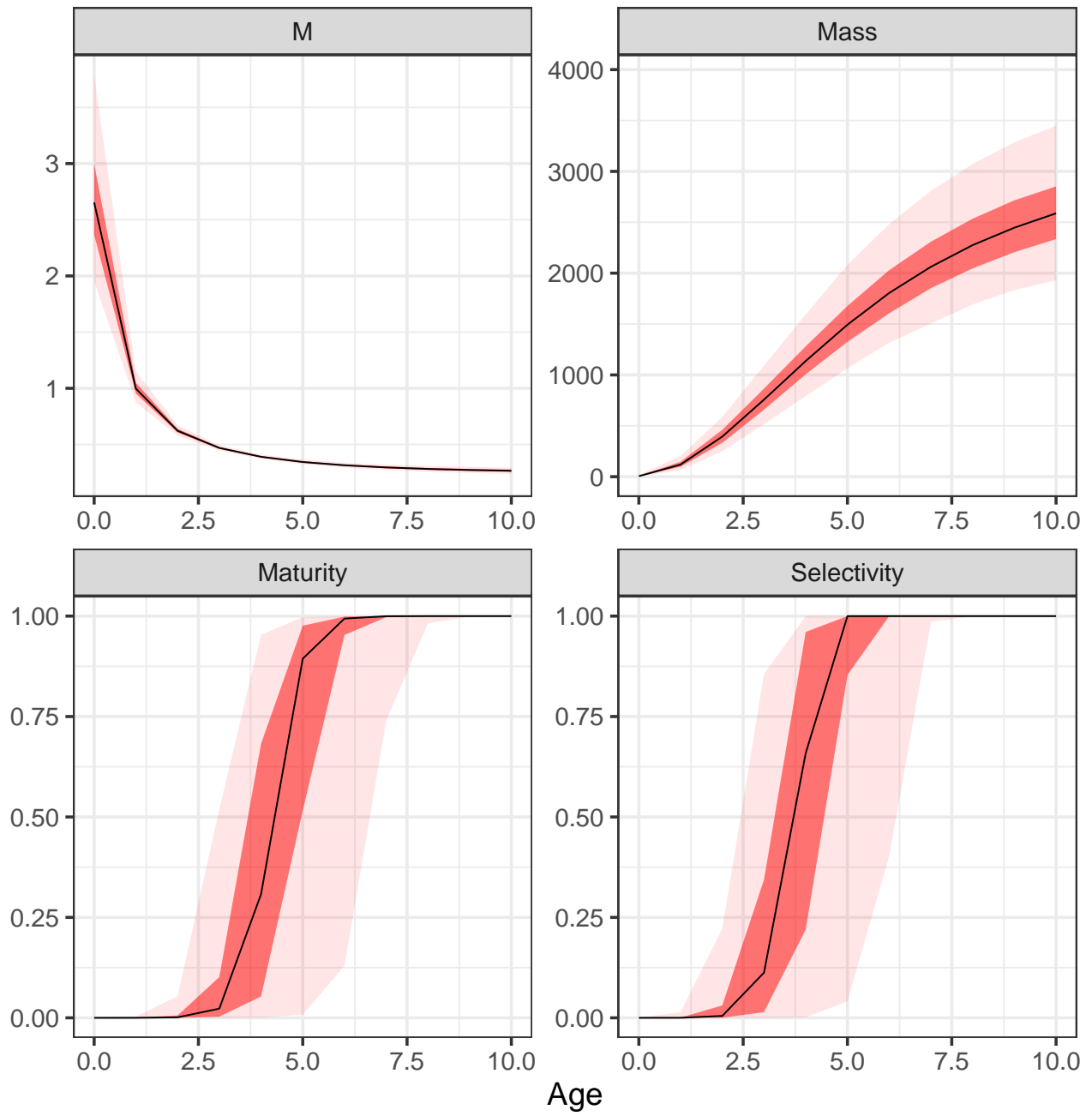


Figure 2 Vectors.

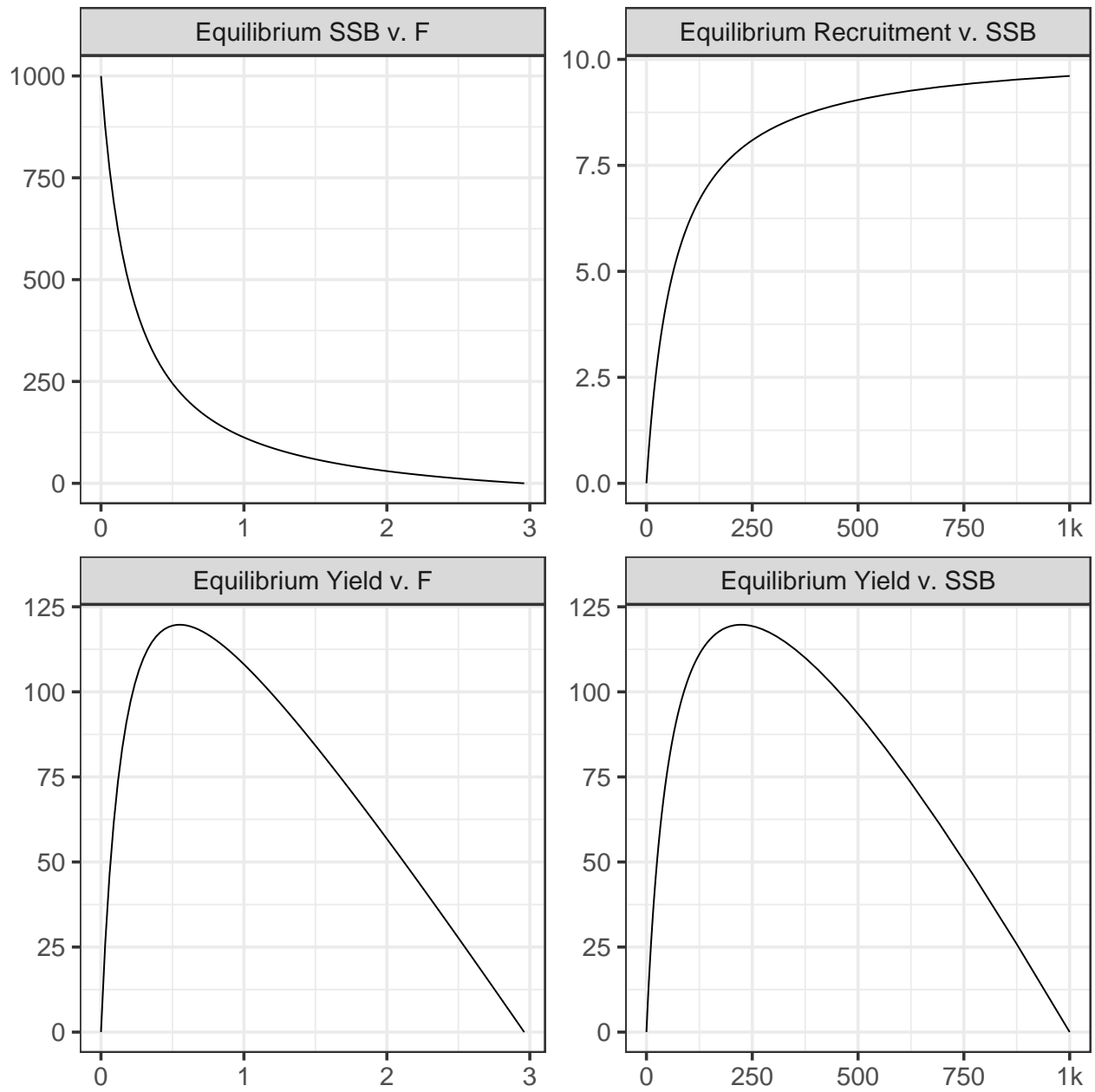


Figure 3 Example equilibrium Curve.

Population dynamics

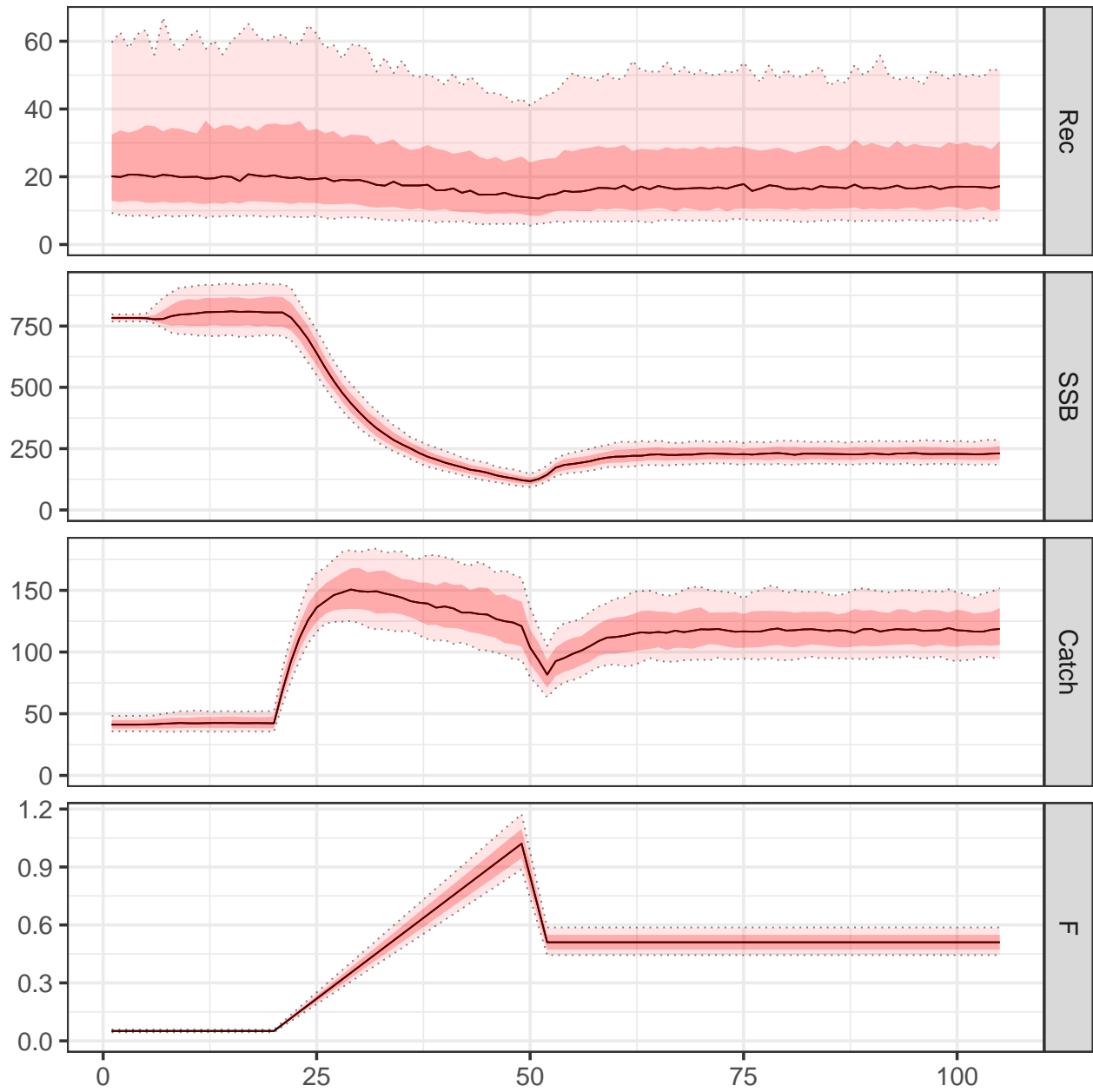


Figure 4 Time series.

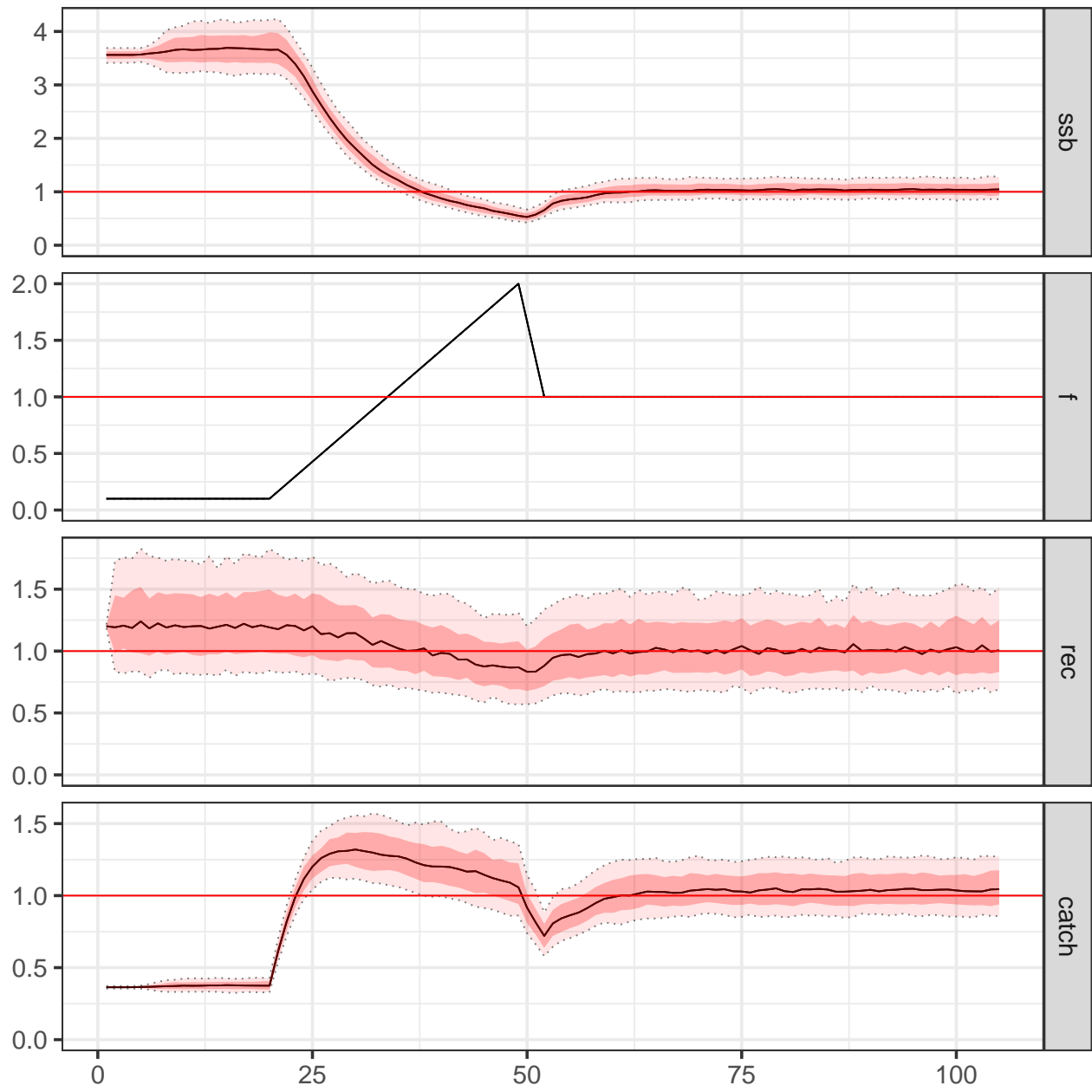


Figure 5 Time series relative to MSY benchmarks.

Software Versions

- R version 3.4.1 (2017-06-30)
- FLCore: 2.6.9
- FLBRP: 2.5.3
- FLasher: 0.5.0
- FLife: 3.2.1.9001
- ggplotFL: 2.6.4
- **Compiled:** Tue Aug 14 13:11:47 2018

Author information

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References

Session Info

R version 3.4.1 (2017-06-30)
Platform: x86_64-pc-linux-gnu (64-bit)
Running under: Ubuntu 16.04.2 LTS

Matrix products: default
BLAS: /usr/lib/libblas/libblas.so.3.6.0
LAPACK: /usr/lib/lapack/liblapack.so.3.6.0

locale:

```
[1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C
[3] LC_TIME=en_GB.UTF-8       LC_COLLATE=en_US.UTF-8
[5] LC_MONETARY=en_GB.UTF-8   LC_MESSAGES=en_US.UTF-8
[7] LC_PAPER=en_GB.UTF-8      LC_NAME=C
[9] LC_ADDRESS=C              LC_TELEPHONE=C
[11] LC_MEASUREMENT=en_GB.UTF-8 LC_IDENTIFICATION=C
```

attached base packages:

```
[1] stats      graphics  grDevices  utils      datasets  methods    base
```

other attached packages:

```
[1] FLife_3.2.1.9001 ggplotFL_2.6.4  Flasher_0.5.0   FLFishery_0.1.5
[5] FLBRP_2.5.3      FLCore_2.6.9    lattice_0.20-35 GGally_1.4.0
[9] reshape_0.8.7    dplyr_0.7.6     plyr_1.8.4      ggplot2_3.0.0
[13] knitr_1.20
```

loaded via a namespace (and not attached):

```
[1] Rcpp_0.12.18      RColorBrewer_1.1-2 compiler_3.4.1
[4] pillar_1.1.0      bindr_0.1.1       tools_3.4.1
[7] digest_0.6.15     evaluate_0.10.1   tibble_1.4.2
[10] gtable_0.2.0      pkgconfig_2.0.1   rlang_0.2.1
[13] Matrix_1.2-10     yaml_2.1.18       bindrcpp_0.2.2
[16] gridExtra_2.3     withr_2.1.2       stringr_1.3.1
[19] stats4_3.4.1      rprojroot_1.3-2   grid_3.4.1
[22] tidyselect_0.2.4  glue_1.2.0        R6_2.2.2
[25] rmarkdown_1.9     reshape2_1.4.3    purrr_0.2.5
[28] magrittr_1.5      codetools_0.2-15  backports_1.1.2
[31] scales_0.5.0      htmltools_0.3.6   MASS_7.3-47
[34] assertthat_0.2.0  colorspace_1.3-2  labeling_0.3
[37] stringi_1.2.3     lazyeval_0.2.1    munsell_0.5.0
```