

# Extended Survivors Analysis

Laurence Kell

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## Introduction

Shepherd (1999) Kell et al. (2007) LT Kell, Pastoors, et al. (2005) LT Kell, Pilling, et al. (2005)

```
library(FLCore)
```

```
library(FLXSA)
```

```
data(ple4)
```

```
data(ple4.indices)
```

```
is(ple4)
```

```
getSlots(is(ple4))
```

```
is(ple4.indices)
```

```
getSlots(is(ple4.indices[[1]]))
```

## Plotting

PLOTS are important for examining objects, exploring data, summarising results, checking outputs, and diagnosing problems. FLXSA uses the ggplot2 and ggplotFL packages.

```
library(ggplotFL)
```

```
plot(ple4)
```

```
plot(ple4.indices[["SNS"]][@index]+
```

```
  geom_point()+
```

```
  geom_smooth(se=FALSE))
```

Warning: Removed 5 rows containing non-finite values (stat\_smooth).

Warning: Removed 5 rows containing missing values (geom\_point).

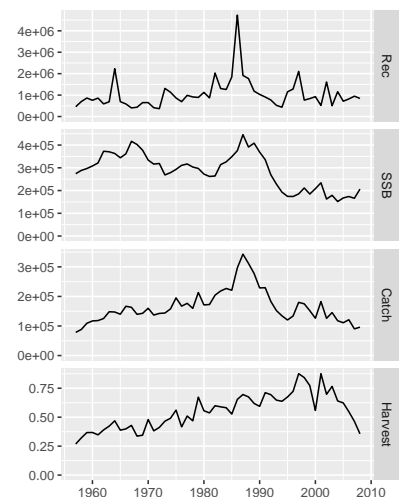


Figure 1: Time series

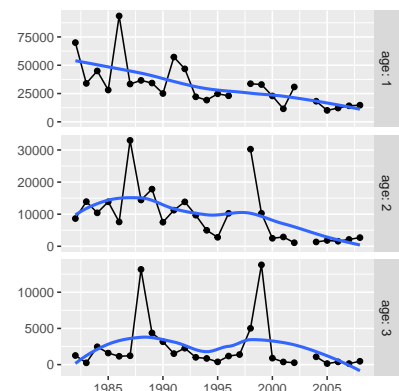


Figure 2: CPUE Time series

## *FLXSA Class*

### *Fitting*

```
ctl      =FLXSA.control()
ple4.xsa=FLXSA(ple4,ple4.indices)
ple4     =ple4+ple4.xsa
```

**Figure 1.** XSA fits.

**Figure 2.** XSA plots, weights for terminal year Ns for each CPUE observation and shrinkage

### *Diagnostics*

```
library(diags)
```

```
dgs=diags(ple4.xsa)
```

**Figure 3.** XSA diagnostics, residuals against fitted value.

**Figure 4.** XSA diagnostics, residuals against year.

**Figure 5.** XSA diagnostics, Calibration regression plots for age 4.

**Figure 6.** XSA diagnostics, AR plots of lagged residuals

**Figure 7.** XSA diagnostics, QQ plots to check for normality

### *Uncertainty*

```
xsa =FLXSA(ple4,ple4.indices)
ple4=FLXSA:::rand(100,ple4,xsa)
```

### *Parameters*

### *Retrospectives*

**Figure 8.** Retrospective XSA time series estimates.

### *Crossvalidation*

Kell, Kimoto, and Kitakado (2016)

### *Reference Points*

```
library(FLBRP)
```

**Figure 9.** Stock Recruitment Relationship

## Projection

**Figure 10.** Equilibrium Analysis with reference points.

**Figure 11.** Equilibrium Analysis with observations.

**Figure 12.** Kobe Phase Plot.

## Harvest Control Rules

### Advice

**library**(kobe)

### MSE

### Tables

Table 1a. XSA Control options from continuity run.

Table 2a. XSA diagnostics from continuity run.

## References

- Kell, L.T., I. Mosqueira, P. Grosjean, J.M. Fromentin, D. Garcia, R. Hillary, E. Jardim, et al. 2007. "FLR: An Open-Source Framework for the Evaluation and Development of Management Strategies." *ICES J. Mar. Sci.* 64 (4): 640.
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- Shepherd, JG. 1999. "Extended Survivors Analysis: An Improved Method for the Analysis of Catch-at-Age Data and Abundance Indices." *ICES J. Mar. Sci.* 56 (5). Oxford University Press: 584–91.