# Assessments of 48 simulated and 159 real stocks with a Monte Carlo and Bayesian Implementation of a Surplus Production Model

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**Available from http://oceanrep.geomar.de/33076/**

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# Introduction

This Supplement details the results of applying a Monte Carlo algorithm (CMSY) and a Bayesian state-space implementation of the Schaefer surplus production model (BSM) to 48 simulated and 159 real stocks. The respective R-code and the data files are available as online material. The selection of the real stocks, the generation of the simulated stocks, and the settings used in the CMSY analysis are detailed below. The graphical output of the CMSY and BSM analyses is explained in general before the results are presented in summary tables and in detail in Appendices I to IV.

# Material and Methods

Table S1 contains the names and a short description of the content of the files that were used in the context of this study. All files are available for download at http://oceanrep.geomar.de/33076/.

**Table S1. List of files that were used in the context of this study, with indication of file name and description of content.**

| File name | Content |
|---|---|
| AllStocks_ID20.csv | Stock descriptions, priors, official reference points |
| AllStocks_Catch16.csv | Time series of catch and biomass or CPUE |
| AllStocksResults_6.xlsx | Spreadsheet behind the results in Table S5 and S6 |
| CMSY_45y.R | R-code implementing CMSY and BSM for simulated stocks |
| CMSY_46e.R | R-code implementing CMSY and BSM for real stocks |
| CMSY_46eFig1.R | R-code used to create Figure 1 in the main text |
| CMSY_46eFig2.R | R-code used to create Figure 2 in the main text |
| CMSY_46eFig3.R | R-code used to create Figure 3 in the main text |
| CMSY_46eFig4.R | R-code used to create Figure 4 in the main text |
| CMSY_46eFig5-6.R | R-code used to create Figures 5 and 6 in the main text |
| CPUEStocks_Results_6.xlsx | Spreadsheet behind the results in Table S9 and S10 |
| SimCatch_6.csv | Time series of simulated catch and biomass |
| SimCatchResults_6.xlsx | Spreadsheet behind the results in Table S3 and S4 |
| SimCatchCPUE_6.csv | Time series of simulated catch and CPUE |
| SimCatchCPUE_Results_6.xlsx | Spreadsheet behind the results in Table S7 and S8 |
| SimSpec_6.csv | Priors and “true” parameters for simulated stocks with biomass |
| SimSpecCPUE_6.csv | Priors, “true” parameters for simulated stocks with biomass and CPUE |
| SimCatchGenerator_6.xlsx | Spreadsheet with algorithm to create simulated stocks with biomass |
| SimCatchCPUEGenerator_6.xlsx | Spreadsheet with algorithm to create simulated stocks with CPUE |

## Selection of real stocks

Altogether 128 fully assessed stocks with biomass estimates, 29 data-limited stocks with CPUE data, and two stocks without abundance data were used for the evaluation of the CMSY method. Catch and biomass data were extracted from stock assessment documents that are available online or were provided by the respective assessment bodies. Sixty-two fully assessed stocks from the Northeast Atlantic were obtained from the ICES Stock Summary database and from ICES Advice reports published in 2015 at http://ices.dk. U.S.-managed stocks from the East Pacific and West Atlantic had assessment reports with catch and total biomass estimates available online and were included in the analysis (AFSC 2011; 2012; www.st.nmfs.noaa.gov/sisPortal/sisPortalMain.jsp). Data for six stocks were obtained from working group reports for the Mediterranean and Black Sea (FAO-GFCM, ICES 2014c; JRC 2012). Data for fifteen stocks from the Pacific Ocean were found (BillfishWG–ISC, ISC 2015; www.st.nmfs.noaa.gov/sisPortal/sisPortalMain.jsp) and nine stocks from South Africa (Winker *et al.,* 2012; ICCAT 2015) were made available and included in the analysis. Catch and CPUE for data-limited stocks from the Northeast Atlantic were obtained from ICES advice reports and from the WKLIFE IV workshop held on 27-31 October 2014 in Lisbon, Portugal (ICES 2014a). Files containing the time series data for these stocks and the respective meta-data and priors are available as part of the online material (see Table S1).

## Generation of simulated stocks

In order to compare parameter estimates of CMSY and BSM with "true" values, stocks with catch and biomass or catch and CPUE were simulated with a time range of 50 years and a fixed *k* value of 1000. The values for *r* were drawn randomly from a normal distribution with mean and standard deviation as shown in Table S2. A parameter estimate was considered as "good" if it contained the respective "true" value within its confidence limits (Hedderich and Sachs 2015).

**Table S2. Means and standard deviations used for generating normal distributions from which *r* values were selected randomly for use in simulations.**

| **Resilience** | ***r* range** | **mean** | **sd** |
|---|---|---|---|
| **H**igh | 0.6 – 1.5 | 1.05 | 0.15 |
| **M**edium | 0.2 – 0.8 | 0.5 | 0.1 |
| **L**ow | 0.05 – 0.5 | 0.275 | 0.075 |
| **V**ery **L**ow | 0.015 – 0.1 | 0.0575 | 0.0142 |

The goal was to create a range of biomass scenarios, including strongly as well as lightly depleted stocks, with monotone stable or monotone changing (i.e., steadily decreasing or increasing) or with alternating biomass trajectories: patterns of high-high (HH), high-low (HL), high-low-high (HLH), low-low (LL), low-high (LH), and low-high-low (LHL) biomass trends. Simulated stocks have names that indicate the combination of biomass trajectory and intrinsic growth rate, e.g., HH_L signifies a stock

with monotone high biomass and low resilience. Resilience categories were translated into *r* ranges as shown in Table S2. The biomass trajectories were created by using the fixed *k* value, a randomly selected *r* value (see Table S2), and an initial biomass. The biomass in subsequent years was then generated from a Schaefer model according to Equation S1.

$$B_{t+1} = B_t + r\left(1 - \frac{B_t}{k}\right) B_t\, e^{s_1} - C_t\, e^{s_2} \quad \text{(S1)}$$

where $B_{t+1}$ is the exploited biomass in the year *t+1*, $B_t$ is the biomass in the current year *t*, $C_t$ is the catch in year *t*, and $e^{s1}$ and $e^{s2}$ are bias-corrected lognormal errors. Note that the error term $s_1$ was assigned to the estimation of the surplus production, i.e., to the interaction process of $B_t$, *r* and *k*, and the second error term $s_2$ was assigned to the catch, representing observation error for the purpose of creating simulated data and for the purpose of CMSY analysis, where abundance is not observed.

If biomass falls below 0.25 *k*, a linear decline in recruitment towards zero at zero *k* is assumed and a respective multiplier 4 $B_t/k$ resulting in 1 at 0.25 *k* to zero at zero *k* is applied to the surplus production term as shown in Equation S2.

$$B_{t+1} = B_t + 4\frac{B_t}{k}\, r\left(1 - \frac{B_t}{k}\right) B_t\, e^{s_1} - C_t\, e^{s_2} \quad \text{(S2)}$$

This consideration of reduced recruitment at low biomass is visible in the indented equilibrium curve at low biomass in Figure 1. It makes the simulated data more realistic and also fixes a bias in CMSY, which otherwise would assume average productivity at severely depleted stock sizes with reduced recruitment and would consequently overestimate surplus production in such cases.

The desired simulated biomass patterns were achieved by manually setting a time series of $F/F_{msy}$ values, with error terms set initially to zero. Once the desired pattern was achieved, the standard deviation of the process error was set to 0.2 and of the observation error to 0.1. To avoid subjectivity, the first time series of catch and biomass produced by the random process and observation errors was selected for analysis, even if it was not a good representation of the intended biomass pattern. The time series and the corresponding parameters were then stored for processing by CMSY and BSM.

For the generation of simulated data for data-limited stocks where only catch and CPUE are available, the simulated catch and biomass data described above were used as a starting point to

generate the corresponding CPUE data. A random catchability coefficient *q* was drawn from a normal distribution with a mean of $10^{-5}$ and a standard deviation of $2*10^{-6}$ (CV = 20%). A simulated value of CPUE was then obtained by multiplying the simulated biomass with the random deviate for *q*. Biomass predictions of CMSY and BSM were compared against the "true" simulated biomass. The routines for generating the simulated data are part of the supplementary material (see file names in Table S1).

## Default rules for biomass priors

The priors for biomass as needed by CMSY and BSM are best set by experts. However, for the purpose of comparing CMSY with BSM predictions, we needed to analyze stocks for which no such expert knowledge was available to us. We therefore established generic rules for the setting of biomass priors, based on general knowledge about fisheries. These rules worked reasonably well for North Atlantic stocks but less satisfactory for Alaska with many very lightly exploited stocks. The rules are explained in detail below.

### General settings

The rules for setting prior biomass ranges are mostly derived from patterns in the catch, i.e., the timing and ratio of minimum catch to maximum catch, following the approach of Froese and Kesner-Reyes 2002 (see also Froese et al. 2012, 2013). To reduce the influence of extremes, catch data are smoothed by applying a 3-years moving average.

### Rules for the initial prior biomass range

If the time series of catch data starts before 1960, high initial biomass (0.5 – 0.9 k) is assumed, because most fisheries were either still recovering or starting anew after World War II. In all other cases medium initial biomass (0.2 – 0.6 k) is assumed.

### Rules for the intermediate prior biomass range

For the setting of the intermediate biomass range, the years and amounts of minimum and maximum catch are determined. Cases where minimum or maximum catch fall within 3 years of the beginning or the end of the time series are ignored, as it is deemed to make little sense to set intermediate prior biomass so close to start or end biomass. Instead, the next closest values were used for minimum and maximum catch.

The following rules for the intermediate prior biomass range are applied in priority of sequence.

1. If overall contrast in catch data is low (overall min catch / overall max catch > 0.6), the intermediate year is set to the mid of the time series and biomass is assumed to be the same as the initial prior biomass.

2. If the minimum catch occurs after the maximum catch, the year before the minimum catch is used to set the intermediate prior biomass.
    a. If initial prior biomass is high and the minimum catch occurs in the first half of the time series and the difference between min and max catch is moderate (min catch / max catch > 0.3) then the intermediate prior biomass range is set to medium.
    b. Else the intermediate prior biomass range is set to low (0.01 – 0.4 k).
3. If the minimum catch occurs before the maximum catch, the year before the maximum catch is used as intermediate year.
    a. If initial prior biomass is high and the maximum catch occurs in the first half of the time series then the intermediate prior biomass range is set to high.
    b. If there is a steep increase in catches ((max catch - min catch) / max catch / (max year – min year) > 0.04), a developing or recovering fishery is assumed and the intermediate prior biomass range is set to high.
    c. Else the intermediate prior biomass range is set to medium.

### Rules for the final prior biomass range

1. If the last catch is high relative to overall maximum catch (last catch / overall max catch > 0.7) the final prior biomass range is set to high.
2. If the last catch is low relative to overall maximum catch (last catch / overall max catch < 0.3) then the final prior biomass range is set to low.
3. Else, the final prior biomass range is set to medium.

## CMSY analysis

CMSY input data are read from two files, one file containing the time series of catch and abundance (optional), with four columns with mandatory labels for stock identifier (stock), year (yr), catch (ct) and abundance (TB) and the second file containing information about the stock and the priors to be used for *r, k*, initial relative biomass, intermediate year and relative biomass, and final relative biomass. The variable “btype” is used to indicate the type of abundance data, e.g., “observed” or “simulated” biomass, or “CPUE”. Note that biomass or CPUE are used only by BSM, so that results of CMSY can be compared with those of a full Bayesian Schaefer model; biomass and CPUE are not used by CMSY and can be completely omitted from the analysis, e.g. by setting “btype” to “None”, in which case BSM analysis is omitted. For the real stocks, catch data and biomass or CPUE data are smoothed by applying a 3-year moving average. This is done to reduce the influence of extreme catches, which may be caused by extreme recruitment events, while surplus production models such as CMSY and BSM assume average productivity.

Prior ranges for *r* (see Table S2) and *k* are determined as described in the main text. To provide prior estimates of relative biomass at the beginning and end of the time series, and optionally also in an intermediate year, one of the possible three broad biomass ranges shown in Table 3 in the main text are chosen, depending on the assumed depletion level. Automatic selection of low, medium or high prior biomass ranges is based on the simple default rules described in the previous section. Obvious strong deviations from the rule-based priors are corrected manually in some of the real stocks. The use of default or expert corrected priors is indicated in the CMSY output. For the two sets of simulated stocks, with biomass or with biomass and CPUE, the prior ranges for first and final biomass are set according to the simulated scenario of low or high biomass at the beginning or the end of the simulated time series. The intermediate prior biomass range is fixed to year 25 and is set to high for HH, to medium for LHL, and set to low for all other scenarios.

The procedures for finding viable *r-k* pairs and the most probable values of *r*, *k*, *MSY* and predicted biomass are described in the main text.

## BSM analysis

For the purpose of comparing CMSY results with the results of a regular surplus production model rather than against fisheries reference points derived with a variety of methods and often without indication of uncertainty, a Bayesian implementation of a state-space Schaefer model (BSM) was developed and applied to all simulated and real stocks. Other than CMSY, BSM fits a Schaefer model to catch and abundance data, i.e., to biomass or CPUE. Non-overlapping confidence limits between CMSY and BSM indicate significantly different estimates at the 95% level (Knezevic 2008; Hedderich and Sachs 2015). The respective source code is available as part of the online material (see Table S1).

## Explanation of graphical CMSY and BSM output

The subsequent appendices show the results from CMSY and BSM runs against 48 simulated stocks and 159 real stocks. The graphical output produced by the R-code for simulated data is shown in Figure 1 for a case of high-low-high biomass of a simulated stock with medium resilience. The six individual panels of the graph are explained below.

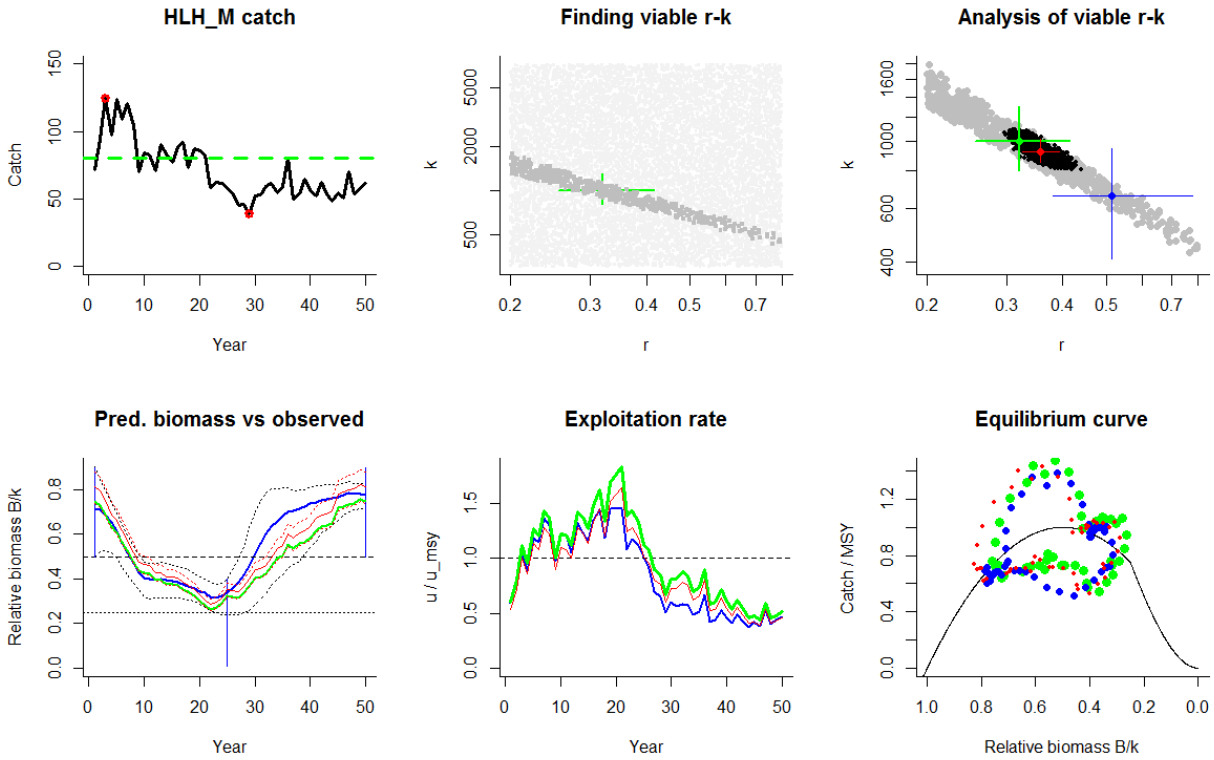


**Figure 1. Example of the graphical CMSY-BSM output for a simulated stock with high-low-high biomass and medium resilience (HLH-M). See text for explanation of the panels.**

The "HLH_M catch" panel indicates the name of the stock and shows the time series of catch data. The red circles indicated the highest and the lowest catch, respectively, and the dashed green line indicates the "true" value of MSY used in the simulation.

The "Finding viable *r-k*" panel shows the analyzed log-*r*-*k*-space, with viable *r-k* pairs in dark gray and a green cross indicating the "true" *r-k* pair with approximate confidence limits based on process and observation error as assumed in the simulation. While CMSY is executed, this graph shows progress by adding dots as viable *r-k* pairs are found.

The "Analysis of viable *r-k*" panel shows the result of the CMSY-analysis, with viable pairs in gray and the predicted most probable *r-k* pair in blue, with approximate 95% confidence limits. The black dots are viable pairs identified by the Bayesian implementation of the full Schaefer model (BSM), with the red dot showing the predicted most probably *r-k* pair, with 95% confidence limits. The green dot shows the true values of *r* and *k* as used in the simulation. Good performance of CMSY and BSM is indicated by the green confidence limits overlapping with the blue (CMSY) and red (BSM) ones, respectively.

The "Pred. biomass vs observed" panel shows in blue the median biomass trajectory predicted by CMSY, with 2.5$^{th}$ and 97.5$^{th}$ percentiles as dotted black lines. The green curve shows the simulated

"true" biomass trajectory, scaled by the "true" value of *k*. The red curves indicate biomass scaled by the BSM estimate of *k*, with approximate 95% confidence limits as dotted red curves. The Y-axis gives biomass relative to *k*, so the broken line at 0.5 *k* indicates $B_{msy}$ and the dotted line at 0.25 *k* indicates the border to stock sizes that may result in reduced recruitment. The blue vertical lines show the prior biomass ranges set by the user or by prior rules. In the example of Figure 1, it was assumed that the user knew that the stock was in good status at the beginning and the end of the time series, and in bad status in-between, around year 25. Good performance of CMSY and BSM is indicated by the "true" green curve falling within the confidence limits of the black (CMSY) and the red (BSM) curves, respectively.

The "Exploitation rate" graph shows the time series of the catch/biomass ratio (*u*) relative to the ratio corresponding to *MSY*. The blue curve is the relative exploitation rate resulting from catch versus biomass predicted by CMSY. The red curve is the relative exploitation rate resulting from catch versus biomass scaled by the *r*-estimate of BSM. The "true" green curve relates simulated catch to simulated biomass. The dashed horizontal line indicates the maximum sustainable exploitation rate. Good performance of CMSY and BSM is indicated by close proximity of the blue and the red curves, respectively, to the "true" green curve.

The "Equilibrium curve" panel shows the Schaefer parabola with catch expressed relative to MSY on the Y-axis and decreasing biomass relative to *k* on the X-axis. The right side of the parabola is indented because below 0.25 *k*, a linear decline of surplus production due to reduced recruitment is assumed. Green dots show the "true" data points of simulated catch and biomass. Blue dots are predicted by the CMSY method and red dots are predicted by BSM. Dots falling on the parabola indicate catches that will maintain the respective biomass. Dots above the parabola will shrink future biomass; dots below the parabola allow future biomass to increase. Good performance of CMSY and BSM is indicated by the blue and red dots being close to the "true" green dots, respectively.

For real stocks, true parameter values are unknown and the parameter estimates of the Bayesian Schaefer model (BSM) are used instead as bench mark for CMSY. If observed biomass or CPUE are available, the graphical output looks as shown in Figure 2 for sole (*Solea solea*) in the Irish Sea. Note the better interpretation of yield at depleted biomass in Panel F, where the indented equilibrium curve suggests ongoing overfishing (red dots above curve). In this case CMSY still slightly overestimates surplus production in the final years, due mostly to the too optimistic final biomass prior. That reduced recruitment is occurring in the final years is indicated by the declining biomass (red curve), despite the exploitation rate being below the MSY level.

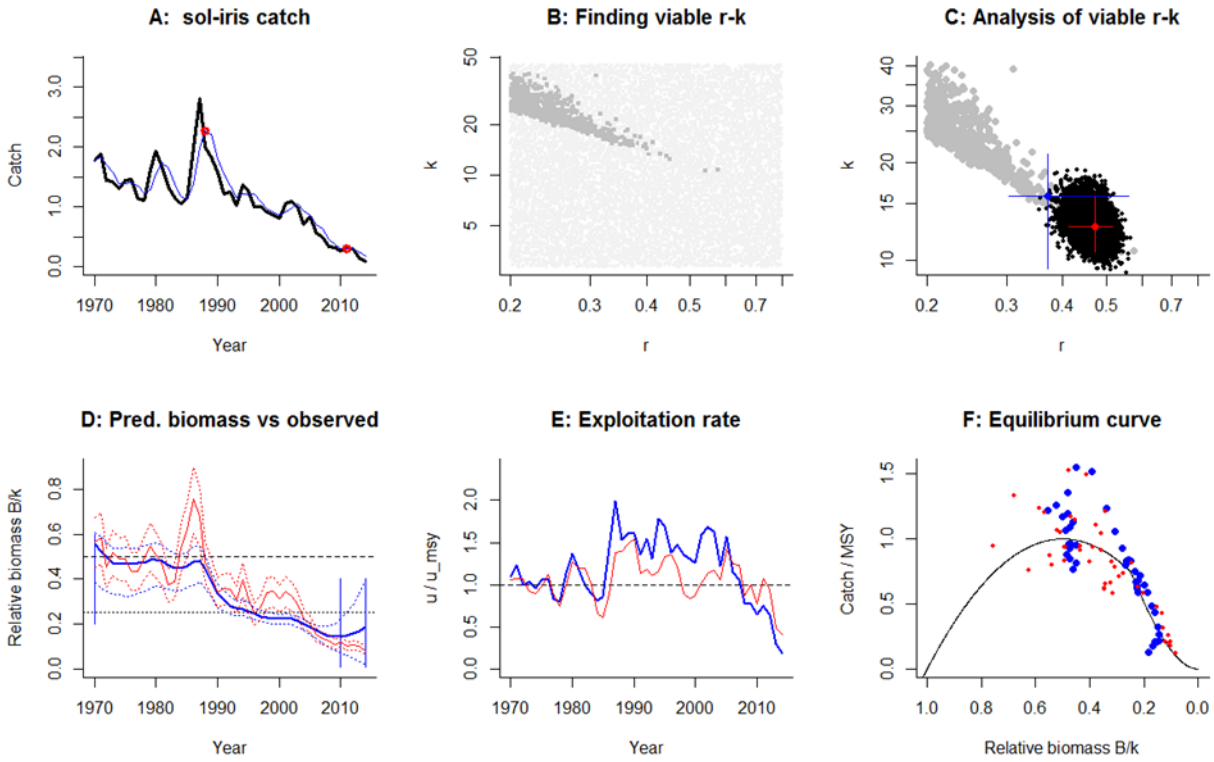


**Figure 2. R-code graphical output for stocks for which biomass or CPUE data are available. The thin blue line in Panel A indicates mean catches of the past three years.**

For data-limited stocks, an additional graphical output can be generated to support management decisions, as shown below for Baltic dab (*Limanda limanda*, dab-2232) (Figure 3).

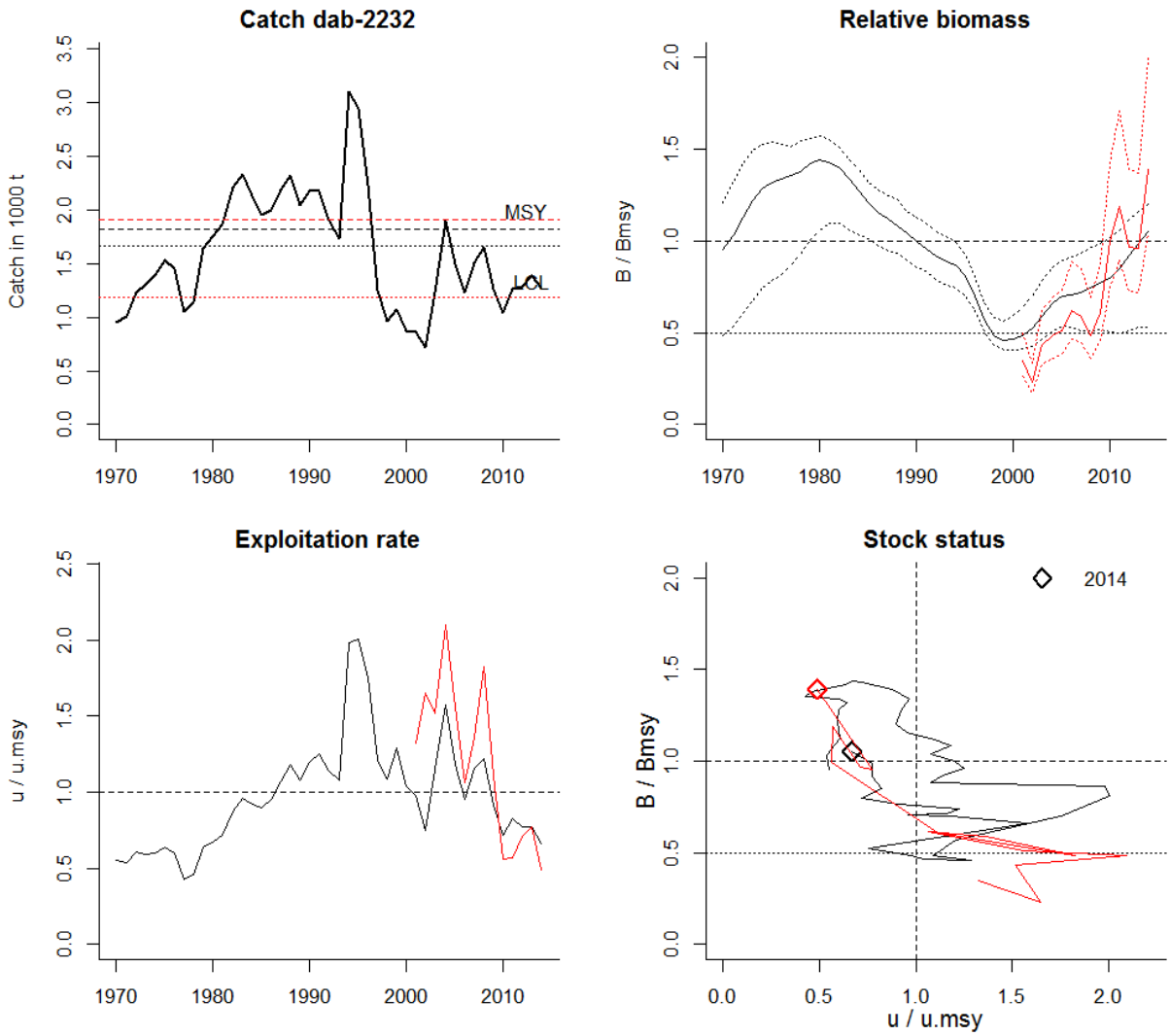


**Figure 3. Summary of information relevant for management of Baltic dab (dab-2232), with black curves indicating CMSY results and red curves BSM results. The horizontal dashed lines in the Catch graph indicate *MSY* and the fine dotted line indicates the lower confidence limit of *MSY*. The solid curves in the Relative biomass graph indicate predicted biomass relative to $B_{msy}$, with confidence limits (dotted curves). Note that abundance time series data (here CPUE scaled to biomass, in red) can start later than the time series of catches. The Exploitation rate graph shows catch over predicted biomass (black curve) and catch over CPUE scaled by catchability *q* as estimated by BSM (red curve), with the dotted line indicating exploitation compatible with *MSY*. The Stock status graph shows the development of biomass and exploitation relative to $B_{msy}$ (horizontal dashed line) and $u_{msy}$ (vertical dashed line), respectively. The fine dotted line indicates the biomass (0.5 $B_{msy}$) below which recruitment may be impaired, and the rhomb indicates the final year in the time series.**

In Appendix IV, the effect of analyzing landings instead of catches is explored with a simulated stock (07_HLH_M) and North Sea haddock (had-346a-land), a stock with very high rates of discards. The results can be compared with the respective analysis of catches for HLH_M in Appendix I and with had-346a in Appendix II in the ICES area.

# Results

## CMSY and BSM results compared with "true" values from simulated data

Catch and biomass data were simulated over a period of 50 years to create scenarios of heavily as well as lightly depleted stocks, with monotone stable or monotone changing biomass (i.e., steadily decreasing or increasing) or with alternating biomass trajectories: patterns of high-high (HH), high-low (HL), high-low-high (HLH), low-low (LL), low-high (LH), and low-high-low (LHL) biomass trends. Simulated stocks have names that indicate the combination of biomass trajectory and intrinsic growth rate (High, Medium, Low, Very Low), e.g., HH_L signifies a stock with monotone high biomass and low resilience. See Material and Methods and main text for further description of the simulations. The "true" parameter values of the Schaefer model used in the simulations to generate the time series of biomass given the catches were $k$ = 1,000,000 in all cases, and $r$ drawn randomly from a normal distribution within the ranges associated with the resilience classes (Table S2). Table S3 shows the CMSY estimates of *MSY*, $r$, $k$, and biomass in the last year compared with the "true" values from the simulations. True values were not included in the confidence limits in eight of the 24 simulated stocks.

**Table S3. Results of estimating the parameters of the Schaefer model with the CMSY method, for 24 simulated stocks. LCL and UCL indicate the lower and upper 95% confidence limits, respectively. Cases where the confidence limits do not include the "true" parameter values are indicated in bold. [SimCatchResults_6.xlsx]**

| Stock | *MSY* | (LCL | UCL) | *r* | (LCL | UCL) | *k* | (LCL | UCL) | true *B/k* | *B/k* | (2.5th | 97.5th) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HH_H | 381 | 191 | 764 | 1.19 | 0.96 | 1.48 | 1281 | 722 | 2271 | 0.74 | 0.83 | 0.61 | 0.90 |
| HH_L | 89 | 46 | 172 | 0.28 | 0.16 | 0.49 | 1256 | 519 | 3038 | 0.73 | 0.80 | 0.54 | 0.89 |
| HH_M | 111 | 57 | 213 | **0.57** | **0.41** | **0.78** | 783 | 404 | 1518 | 0.74 | 0.82 | 0.57 | 0.90 |
| HH_VL | 19 | 5 | 75 | 0.06 | 0.04 | 0.10 | 1250 | 402 | 3887 | 0.73 | 0.81 | 0.53 | 0.90 |
| HL_H | 230 | 207 | 254 | 1.09 | 0.88 | 1.44 | 842 | 607 | 1096 | 0.30 | 0.33 | 0.10 | 0.39 |
| HL_L | 69 | 61 | 78 | 0.23 | 0.14 | 0.39 | 1207 | 669 | 2071 | 0.06 | 0.23 | 0.02 | 0.40 |
| HL_M | 115 | 106 | 124 | 0.41 | 0.32 | 0.61 | 1125 | 728 | 1473 | 0.00 | **0.11** | **0.01** | **0.38** |
| HL_VL | 18 | 12 | 27 | 0.06 | 0.04 | 0.10 | 1163 | 603 | 2244 | 0.06 | 0.26 | 0.02 | 0.40 |
| HLH_H | 264 | 244 | 285 | 1.15 | 0.94 | 1.47 | 917 | 690 | 1170 | 0.74 | 0.77 | 0.71 | 0.82 |
| HLH_L | 65 | 53.2 | 79 | 0.28 | 0.16 | 0.49 | 930 | 481 | 1797 | 0.66 | 0.81 | 0.59 | 0.87 |
| HLH_M | 85 | 75 | 96 | **0.51** | **0.38** | **0.78** | **662** | **411** | **947** | 0.75 | 0.77 | 0.71 | 0.82 |
| HLH_VL | 21 | 12 | 37 | 0.06 | 0.04 | 0.10 | 1318 | 657 | 2648 | 0.72 | 0.65 | 0.51 | 0.83 |
| LH_H | 197 | 181 | 214 | **1.19** | **0.96** | **1.48** | **661** | **509** | **859** | 0.72 | 0.73 | 0.65 | 0.80 |
| LH_L | 150 | 39 | 584 | 0.26 | 0.16 | 0.46 | 2299 | 660 | 7745 | 0.72 | 0.84 | 0.52 | 0.89 |
| LH_M | 168 | 109 | 259 | 0.57 | 0.40 | 0.79 | 1176 | 686 | 2110 | 0.80 | 0.66 | 0.52 | 0.83 |
| LH_VL | 5 | 1 | 19 | **0.07** | **0.05** | **0.10** | **280** | **96** | **812** | 0.60 | 0.62 | 0.50 | 0.82 |
| LHL_H | 311 | 284 | 340 | 1.19 | 0.96 | 1.48 | 1043 | 801 | 1358 | 0.30 | 0.27 | 0.03 | 0.39 |
| LHL_L | 81 | 55 | 117 | 0.18 | 0.12 | 0.39 | 1819 | 691 | 3285 | 0.14 | 0.28 | 0.02 | 0.39 |
| LHL_M | 122 | 97 | 153 | **0.29** | **0.26** | **0.37** | **1698** | **1184** | **2138** | 0.40 | **0.29** | **0.02** | **0.39** |
| LHL_VL | 11 | 3 | 46 | **0.06** | **0.04** | **0.10** | 710 | 218 | 2308 | 0.35 | 0.28 | 0.02 | 0.40 |
| LL_H | 236 | 211 | 264 | 1.03 | 0.84 | 1.43 | 921 | 623 | 1192 | 0.27 | 0.30 | 0.03 | 0.39 |
| LL_L | 29 | 11 | 74 | 0.20 | 0.13 | 0.32 | 565 | 226 | 1415 | 0.04 | 0.25 | 0.02 | 0.39 |
| LL_M | **133** | **125** | **142** | 0.55 | 0.40 | 0.79 | 964 | 656 | 1374 | 0.25 | 0.32 | 0.04 | 0.40 |
| LL_VL | 11 | 4 | 32 | 0.06 | 0.04 | 0.10 | 693 | 254 | 1891 | 0.22 | 0.25 | 0.02 | 0.40 |

Table S4 shows the BSM estimates of *r*, *k*, and *MSY* compared with the "true" values from the simulations. True values of eight simulated stocks were not included in the respective BSM confidence limits. Five of the "missed" stocks were identical with the ones where also CMSY did not include all of the "true" values in its respective confidence limits.

**Table S4. Results of estimating the parameters of the Schaefer model with the BSM method, for 24 simulated stocks. LCL and UCL indicate the lower and upper 95% confidence limits, respectively. The cases where the confidence limits do not include the "true" parameter value are indicated in bold. [SimCatchResults_6.xlsx]**

| Stock | *MSY* | (LCL | UCL) | *r* | (LCL | UCL) | *k* | (LCL | UCL) |
|---|---|---|---|---|---|---|---|---|---|
| HH_H | 266 | 253 | 283 | 1.05 | 0.97 | 1.15 | 1009 | 976 | 1046 |
| HH_L | 69 | 61 | 77 | 0.27 | 0.23 | 0.32 | 1010 | 952 | 1090 |
| HH_M | **113** | **102** | **125** | **0.50** | **0.43** | **0.57** | **909** | **881** | **943** |
| HH_VL | 13 | 7 | 18 | 0.05 | 0.02 | 0.08 | 1022 | 877 | 1274 |
| HL_H | **225** | **217** | **234** | **0.94** | **0.88** | **1.01** | 955 | 900 | 1010 |
| HL_L | 73 | 68 | 79 | 0.29 | 0.27 | 0.31 | 995 | 923 | 1072 |
| HL_M | **77** | **64** | **95** | 0.50 | 0.45 | 0.58 | **611** | **522** | **718** |
| HL_VL | 18 | 14 | 23 | 0.07 | 0.06 | 0.08 | 1055 | 894 | 1202 |
| HLH_H | 259 | 248 | 272 | 1.06 | 1.02 | 1.13 | 973 | 914 | 1030 |
| HLH_L | 60 | 54 | 66 | 0.24 | 0.23 | 0.27 | 981 | 890 | 1082 |
| HLH_M | 82 | 78 | 88 | **0.36** | **0.33** | **0.39** | 920 | 851 | 1015 |
| HLH_VL | **19** | **15** | **24** | 0.07 | 0.06 | 0.09 | 1052 | 900 | 1197 |
| LH_H | 205 | 196 | 216 | **0.88** | **0.824** | **0.94** | **934** | **890** | **980** |
| LH_L | 62 | 54 | 299 | 0.25 | 0.22 | 0.29 | 991 | 885 | 4314 |
| LH_M | **165** | **156** | **173** | **0.66** | **0.61** | **0.70** | 997 | 949 | 1056 |
| LH_VL | 10 | 7 | 16 | 0.05 | 0.03 | 0.06 | 906 | 568 | 1424 |
| LHL_H | 296 | 282 | 312 | 1.11 | 1.04 | 1.21 | 1065 | 971 | 1171 |
| LHL_L | 84 | 78 | 90 | 0.35 | 0.33 | 0.37 | 946 | 897 | 1006 |
| LHL_M | 129 | 119 | 140 | 0.54 | 0.51 | 0.58 | 955 | 884 | 1033 |
| LHL_VL | **36** | **13** | **68** | 0.04 | 0.02 | 0.06 | **3308** | **1883** | **4608** |
| LL_H | 230 | 211 | 258 | 1.04 | 0.94 | 1.12 | 884 | 780 | 1073 |
| LL_L | 91 | 46 | 129 | 0.27 | 0.21 | 0.32 | 1325 | 900 | 1632 |
| LL_M | 144 | 129 | 162 | 0.60 | 0.56 | 0.64 | 961 | 843 | 1093 |
| LL_VL | 12 | 8 | 59 | 0.07 | 0.05 | 0.13 | 771 | 610 | 1797 |

## Comparison of CMSY and BSM parameter estimates for 128 fully assessed stocks

Table S5 shows a comparison of CMSY parameter estimates of *r* and *k* with those derived from a full Schaefer model (BSM). Significant deviations in estimates of *r* occurred in 14 of the 128 stocks (11%). Significant deviations in the estimates *k* occurred in 20 stocks (16%). These cases are marked bold.

Table S6 shows a comparison of CMSY and BSM estimates of *MSY*. Significant deviations occurred in 6 of the 128 stocks (5%). Table S6 also shows a comparison of last year's observed biomass relative to k estimated by BSM and observed exploitation rate (catch/biomass) and compares these observations with the respective CMSY estimates. The relative biomass estimate was significantly different in 13 of the stocks (10%) and the BSM exploitation rate relative to the MSY level differed more than +/-50% from the CMSY estimate in 40 stocks (31%).

**Table S5. Comparison of estimates of *r* and *k* by CMSY and BSM fitted to 112 real stocks, where LCL and UCL indicate lower and upper 95% confidence limits, respectively. Cases where the BSM estimate is not included in the CMSY confidence limits are marked in bold. Similarly, cases where the confidence limits of both methods do not overlap are marked in bold. [AllStocks_Results_6.xlsx]**

| Stock | $r_{BSM}$ | (LCL | UCL) | $r_{CMSY}$ | (LCL | UCL) | $k_{BSM}$ | (LCL | UCL) | $k_{CMSY}$ | (LCL | UCL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Alaska** | | | | | | | | | | | | |
| AKSablefish | 0.059 | 0.040 | 0.083 | 0.062 | 0.040 | 0.097 | 1,421 | 983 | 1,848 | 1,944 | 778 | 4,861 |
| BSAIatka | 0.266 | 0.214 | 0.300 | 0.282 | 0.163 | 0.487 | 1,138 | 1,001 | 1,361 | 762 | 385 | 1,508 |
| BSAIatf | 0.178 | 0.148 | 0.217 | 0.282 | 0.163 | 0.487 | **912** | 815 | 1,061 | 367 | 154 | 872 |
| BSAIhalibut | 0.221 | 0.169 | 0.279 | 0.270 | 0.159 | 0.465 | **225** | **167** | **350** | 81 | 40 | 162 |
| BSAInorthern | 0.071 | 0.046 | 0.125 | 0.062 | 0.040 | 0.097 | 331 | 264 | 459 | 240 | 93 | 615 |
| BSAIplaice | **0.032** | 0.017 | 0.054 | 0.062 | 0.040 | 0.097 | 1,797 | 1,386 | 2,419 | 2,273 | 682 | 7,571 |
| BSAIpop | 0.202 | 0.165 | 0.253 | 0.282 | 0.163 | 0.487 | 672 | 605 | 754 | 317 | 127 | 790 |
| BSAIrocksole | 0.280 | 0.254 | 0.320 | 0.282 | 0.163 | 0.487 | 1,845 | 1,702 | 2,002 | 1,124 | 450 | 2,808 |
| BSAIshortraker | **0.017** | **0.007** | **0.035** | 0.062 | 0.040 | 0.097 | 67.3 | 51.6 | 90.9 | 28.2 | 9.6 | 82.9 |
| BSAIyfin | 0.314 | 0.270 | 0.370 | 0.282 | 0.163 | 0.487 | 3,042 | 2,866 | 3,262 | 2,894 | 1,190 | 7,039 |
| EBSPcod | 0.290 | 0.258 | 0.355 | 0.282 | 0.163 | 0.487 | 2,315 | 1,997 | 2,766 | 4,037 | 1,631 | 9,994 |
| EBSpollock | 0.332 | 0.267 | 0.438 | 0.282 | 0.163 | 0.487 | 12,871 | 10,586 | 15,500 | 16,877 | 9,077 | 31,379 |
| GOAatf | 0.188 | 0.158 | 0.225 | 0.282 | 0.163 | 0.487 | **1,930** | **1,767** | **2,114** | 490 | 198 | 1,218 |
| GOAdusky | 0.202 | 0.164 | 0.256 | 0.282 | 0.163 | 0.487 | 95.1 | 84.8 | 108.0 | 65.1 | 26.4 | 161 |
| GOAflathead | 0.247 | 0.195 | 0.285 | 0.282 | 0.163 | 0.487 | **237** | **224** | **255** | 60.8 | 23.8 | 155 |
| GOAnorthern | 0.050 | 0.029 | 0.069 | 0.062 | 0.040 | 0.097 | 333 | 246 | 453 | 428 | 151 | 1,209 |
| GOAPcod | 0.271 | 0.222 | 0.307 | 0.317 | 0.129 | 0.490 | 1,013 | 938 | 1,137 | 736 | 445 | 1,927 |
| GOApollock | 0.272 | 0.228 | 0.309 | 0.236 | 0.145 | 0.400 | 2,086 | 1,684 | 2,670 | 1,719 | 932 | 3,047 |
| GOApop | 0.250 | 0.205 | 0.283 | 0.183 | 0.121 | 0.388 | 2,352 | 1,936 | 3,060 | 2,550 | 866 | 5,316 |
| GOArex | 0.064 | 0.044 | 0.104 | 0.062 | 0.040 | 0.097 | 212 | 148 | 290 | 172 | 71.1 | 419 |
| **Pacific** | | | | | | | | | | | | |
| Aurora_PC | **0.028** | 0.012 | 0.055 | 0.062 | 0.040 | 0.097 | 12.4 | 8.3 | 16.9 | 8.6 | 2.5 | 29.9 |
| BFTuna_P | 0.503 | 0.472 | 0.544 | 0.399 | 0.320 | 0.527 | 189 | 175 | 207 | 231 | 169 | 299 |
| BMarlin_NP | 0.503 | 0.459 | 0.565 | 0.567 | 0.405 | 0.785 | 154 | 144 | 165 | 146 | 99 | 219 |
| Boca_PC | 0.254 | 0.216 | 0.282 | 0.243 | 0.148 | 0.433 | 55 | 49 | 63 | 57 | 29 | 104 |
| BrownRF_PC | 0.214 | 0.194 | 0.236 | 0.215 | 0.136 | 0.364 | 3.45 | 3.22 | 3.75 | 3.20 | 1.76 | 5.46 |
| ChinaRF_PC | 0.185 | 0.151 | 0.231 | 0.270 | 0.159 | 0.488 | 1.25 | 1.14 | 1.38 | 0.68 | 0.35 | 1.25 |

| Stock | $r_{BSM}$ | (LCL | UCL) | $r_{CMSY}$ | (LCL | UCL) | $k_{BSM}$ | (LCL | UCL) | $k_{CMSY}$ | (LCL | UCL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CopperRF_PC | 0.184 | 0.163 | 0.208 | 0.200 | 0.129 | 0.340 | 5.35 | 4.97 | 5.77 | 4.41 | 2.37 | 7.47 |
| Cowcod_PC | 0.275 | 0.241 | 0.314 | 0.254 | 0.152 | 0.469 | 2.05 | 1.74 | 2.70 | 2.00 | 0.97 | 3.74 |
| DarkblotchedRF_PC | 0.093 | 0.065 | 0.118 | 0.062 | 0.040 | 0.097 | 37.9 | 33.0 | 45.7 | 37.6 | 20.4 | 69.6 |
| LongspinTH_PC | 0.059 | 0.043 | 0.083 | 0.062 | 0.040 | 0.097 | 184 | 138 | 241 | 114 | 64 | 203 |
| PetraleSole_PC | 0.446 | 0.416 | 0.481 | 0.381 | 0.311 | 0.503 | 23.8 | 22.1 | 25.8 | 27.1 | 19.8 | 34.5 |
| Phake_PC | 0.495 | 0.428 | 0.547 | 0.566 | 0.407 | 0.785 | **3,340** | 2,818 | 4,213 | 1,945 | 1,293 | 2,926 |
| Rougheye_PC | **0.035** | 0.019 | 0.054 | 0.062 | 0.040 | 0.097 | 29.4 | 21.1 | 38.3 | 23.5 | 8.5 | 64.6 |
| Sardine_P | 0.501 | 0.443 | 0.567 | 0.566 | 0.407 | 0.785 | 1,409 | 1,247 | 1,626 | 946 | 598 | 1,495 |
| ShortspinTH_PC | **0.016** | **0.007** | **0.033** | 0.062 | 0.040 | 0.097 | **589** | **422** | **851** | 164 | 69 | 394 |
| **Northwest Atlantic** | | | | | | | | | | | | |
| Ahalibut_NWAC | 0.270 | 0.248 | 0.287 | 0.254 | 0.152 | 0.448 | 2.17 | 1.95 | 2.41 | 2.28 | 1.20 | 4.12 |
| Albacore_NA | 0.376 | 0.338 | 0.425 | 0.346 | 0.289 | 0.413 | 451 | 417 | 487 | 497 | 406 | 610 |
| BETuna_A | 0.451 | 0.424 | 0.480 | 0.568 | 0.411 | 0.785 | 850 | 831 | 870 | 661 | 451 | 968 |
| Bluefish_AC | 0.474 | 0.402 | 0.524 | 0.399 | 0.320 | 0.542 | **209** | **160** | **350** | 451 | 222 | 840 |
| BSbass_MAC | 0.522 | 0.481 | 0.599 | 0.564 | 0.409 | 0.785 | 23 | 20 | 26 | 21 | 14 | 30 |
| Cod_GB | 0.517 | 0.473 | 0.596 | 0.387 | 0.314 | 0.592 | 202 | 167 | 266 | 363 | 182 | 586 |
| Cod_GUM | **0.694** | 0.570 | 0.799 | 0.413 | 0.329 | 0.672 | **61** | 52 | 77 | 147 | 67 | 248 |
| Haddock_GB | **0.310** | 0.263 | 0.407 | 0.183 | 0.122 | 0.288 | **417** | 317 | 607 | 1,137 | 507 | 2,423 |
| Haddock_GoM | 0.500 | 0.436 | 0.568 | 0.407 | 0.325 | 0.656 | 23.8 | 15.8 | 77.0 | 30.7 | 17.3 | 42.3 |
| Herring_A | 0.520 | 0.473 | 0.611 | 0.533 | 0.391 | 0.743 | 1,687 | 1,470 | 2,004 | 1,901 | 1,263 | 2,794 |
| Swordfish_NA | 0.449 | 0.423 | 0.477 | 0.573 | 0.422 | 0.778 | 127 | 123 | 131 | 97 | 69 | 137 |
| Whake_GUMGB | 0.396 | 0.351 | 0.437 | 0.262 | 0.155 | 0.475 | 46.2 | 42.2 | 51.8 | 70.2 | 34.6 | 133 |
| YTFlo_MA | 0.506 | 0.453 | 0.597 | 0.436 | 0.341 | 0.573 | 107 | 43 | 230 | 97 | 54 | 171 |
| **Caribbean** | | | | | | | | | | | | |
| GAGGM | **0.512** | **0.470** | **0.594** | 0.309 | 0.268 | 0.356 | **18.0** | **14.8** | **21.8** | 29.9 | 24.4 | 36.7 |
| RGROUPGM | **0.767** | **0.633** | **0.885** | 0.375 | 0.307 | 0.500 | **5.48** | **4.65** | **6.69** | 17 | 8.68 | 31.2 |
| VSNAPSATLC | 0.220 | 0.177 | 0.274 | 0.282 | 0.163 | 0.487 | 8.84 | 7.83 | 10.2 | 4.95 | 2.54 | 9.6 |
| **Mediterranean** | | | | | | | | | | | | |
| Encr_engr_GSA17 | 0.493 | 0.429 | 0.538 | 0.561 | 0.405 | 0.777 | 312 | 259 | 404 | 235 | 160 | 345 |
| mul-gsa6 | 0.537 | 0.491 | 0.621 | 0.566 | 0.407 | 0.785 | 9.8 | 7.7 | 11.6 | 8.6 | 5.5 | 13.5 |
| mullsur_gsa1516 | 1.067 | 1.009 | 1.189 | 1.165 | 0.943 | 1.453 | 7.0 | 5.7 | 8.1 | 7.0 | 4.6 | 10.5 |

| Stock | $r_{BSM}$ | (LCL | UCL) | $r_{CMSY}$ | (LCL | UCL) | $k_{BSM}$ | (LCL | UCL) | $k_{CMSY}$ | (LCL | UCL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Black Sea** | | | | | | | | | | | | |
| BS_anch | 0.501 | 0.447 | 0.575 | 0.566 | 0.407 | 0.785 | 3,550 | 2,802 | 4,678 | 2,454 | 1,617 | 3,724 |
| Spr_BS | 0.502 | 0.449 | 0.568 | 0.566 | 0.407 | 0.785 | 577 | 493 | 694 | 616 | 308 | 1,231 |
| Tur_BS | **0.498** | **0.459** | **0.534** | 0.309 | 0.268 | 0.356 | **23.8** | **21.4** | **26.7** | 40.3 | 32.3 | 50.4 |
| **South Africa** | | | | | | | | | | | | |
| CRPN_S | 0.227 | 0.170 | 0.280 | 0.278 | 0.162 | 0.487 | 6.2 | 5.3 | 9.0 | 6.2 | 1.9 | 19.4 |
| CRPN_SE | 0.215 | 0.177 | 0.264 | 0.282 | 0.163 | 0.487 | 10.1 | 8.6 | 12.8 | 8.4 | 2.7 | 26.7 |
| HTTN_SW | **0.479** | **0.389** | **0.531** | 0.266 | 0.242 | 0.292 | **1.5** | **1.3** | **1.8** | 2.8 | 2.4 | 3.2 |
| HTTN_W | **0.480** | **0.391** | **0.531** | 0.276 | 0.248 | 0.307 | **4.0** | **3.7** | **4.8** | 6.0 | 5.1 | 7.0 |
| KKLI_S | 0.170 | 0.143 | 0.203 | 0.278 | 0.162 | 0.478 | 54.5 | 50.4 | 59.7 | 29.2 | 15.2 | 56.0 |
| KOB_S | 0.343 | 0.303 | 0.403 | 0.278 | 0.162 | 0.478 | 6.9 | 5.4 | 8.1 | 9.5 | 4.0 | 22.2 |
| KOB_SE | 0.356 | 0.307 | 0.416 | 0.274 | 0.160 | 0.468 | 3.6 | 2.9 | 4.4 | 5.0 | 2.1 | 11.6 |
| SLNG | 0.494 | 0.439 | 0.533 | 0.541 | 0.395 | 0.773 | 1.9 | 1.7 | 2.2 | 1.5 | 1.0 | 2.3 |
| SA-BSH | 0.307 | 0.261 | 0.388 | 0.287 | 0.114 | 0.482 | 274 | 240 | 324 | 267 | 136 | 779 |
| **Northeast Atlantic** | | | | | | | | | | | | |
| anp-8c9a | **0.703** | **0.580** | **0.822** | 0.359 | 0.298 | 0.544 | **20.5** | **17.8** | **24.7** | 59.0 | 30.6 | 90.2 |
| Bss-47 | 0.259 | 0.211 | 0.292 | 0.282 | 0.163 | 0.487 | 40.9 | 32.7 | 53.8 | 38.2 | 19.3 | 75.7 |
| cod-2224 | **0.859** | **0.702** | **0.989** | 0.346 | 0.289 | 0.413 | **214** | **180** | **263** | 626 | 474 | 825 |
| cod-347d | **0.519** | **0.477** | **0.603** | 0.359 | 0.297 | 0.434 | **1,653** | **1,371** | **2,121** | 2,944 | 2,222 | 3,899 |
| cod-7e-k | 0.616 | 0.514 | 0.714 | 0.462 | 0.355 | 0.731 | 52.2 | 43.0 | 64.9 | 83.4 | 50.3 | 114 |
| cod-arct | 0.608 | 0.541 | 0.674 | 0.455 | 0.351 | 0.650 | 4,813 | 4,326 | 5,454 | 6,583 | 4,441 | 8,845 |
| cod-farp | 0.528 | 0.481 | 0.613 | 0.417 | 0.330 | 0.607 | 172 | 149 | 203 | 244 | 160 | 323 |
| cod-iceg | **0.510** | **0.480** | **0.560** | 0.333 | 0.282 | 0.464 | **2,783** | 2,408 | 3,276 | 4,330 | 2,985 | 5,325 |
| cod-scow | 0.509 | 0.464 | 0.593 | 0.436 | 0.341 | 0.621 | 114 | 83 | 165 | 212 | 103 | 392 |
| dgs-nea | 0.106 | 0.088 | 0.132 | 0.183 | 0.122 | 0.290 | **1,740** | **1,463** | **2,095** | 804 | 470 | 1,299 |
| ghl-arct | 0.315 | 0.272 | 0.365 | 0.236 | 0.145 | 0.431 | 417 | 342 | 509 | 654 | 267 | 1,427 |
| had-346a | **0.494** | **0.427** | **0.545** | 0.318 | 0.275 | 0.385 | 2,113 | 1,690 | 2,934 | 2,778 | 2,106 | 3,505 |
| had-7b-k | **0.505** | 0.458 | 0.584 | 0.399 | 0.320 | 0.500 | **111** | 89 | 151 | 179 | 130 | 244 |
| had-arct | 0.542 | 0.486 | 0.639 | 0.472 | 0.360 | 0.699 | 1,091 | 946 | 1,285 | 1,337 | 843 | 1,876 |
| had-faro | **0.493** | 0.429 | 0.540 | 0.387 | 0.312 | 0.479 | 146 | 126 | 170 | 180 | 137 | 236 |
| had-iceg | 0.606 | 0.523 | 0.682 | 0.566 | 0.407 | 0.785 | 405 | 359 | 465 | 513 | 329 | 799 |

| Stock | $r_{BSM}$ | (LCL | UCL) | $r_{CMSY}$ | (LCL | UCL) | $k_{BSM}$ | (LCL | UCL) | $k_{CMSY}$ | (LCL | UCL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| had-rock | 0.497 | 0.434 | 0.556 | 0.494 | 0.372 | 0.779 | 99 | 72 | 157 | 140 | 64 | 259 |
| her-2532-gor | 0.361 | 0.306 | 0.438 | 0.364 | 0.301 | 0.571 | 2,839 | 2,456 | 3,324 | 2,529 | 1,519 | 3,247 |
| her-30 | 0.410 | 0.342 | 0.497 | 0.566 | 0.407 | 0.785 | **862** | **754** | **994** | 470 | 320 | 689 |
| her-3a22 | 0.523 | 0.489 | 0.571 | 0.455 | 0.351 | 0.717 | 1,036 | 891 | 1,187 | 1,647 | 708 | 3,148 |
| her-47d3 | 0.485 | 0.416 | 0.526 | 0.463 | 0.349 | 0.732 | 6,369 | 5,763 | 7,265 | 5,592 | 3,376 | 7,762 |
| her-67bc | **0.390** | 0.329 | 0.471 | 0.297 | 0.261 | 0.339 | 1,302 | 1,177 | 1,463 | 1,375 | 1,115 | 1,695 |
| her-irls | 0.462 | 0.384 | 0.515 | 0.387 | 0.312 | 0.479 | 249 | 218 | 301 | 212 | 165 | 272 |
| her-nirs | **0.422** | 0.369 | 0.490 | 0.321 | 0.275 | 0.393 | **123** | 105 | 145 | 182 | 135 | 234 |
| her-noss | 0.475 | 0.400 | 0.523 | 0.566 | 0.407 | 0.785 | 11,174 | 10,180 | 12,366 | 7,654 | 4,922 | 11,904 |
| her-riga | 0.495 | 0.437 | 0.542 | 0.566 | 0.407 | 0.785 | 232 | 205 | 270 | 221 | 148 | 331 |
| her-vian | **0.432** | 0.360 | 0.503 | 0.333 | 0.282 | 0.410 | 938 | 786 | 1,158 | 1,103 | 832 | 1,404 |
| hke-nrtn | **0.906** | 0.733 | 1.039 | 0.566 | 0.407 | 0.785 | **278** | **247** | **315** | 715 | 383 | 1,333 |
| hke-soth | **0.884** | 0.663 | 1.053 | 0.465 | 0.357 | 0.725 | **64** | **55** | **75** | 134 | 78 | 193 |
| hom-west | 0.447 | 0.368 | 0.511 | 0.498 | 0.373 | 0.752 | **4,013** | **3,438** | **4,927** | 2,395 | 1,486 | 3,409 |
| lin-icel | 0.510 | 0.482 | 0.551 | 0.566 | 0.407 | 0.785 | 129 | 115 | 142 | 99 | 49 | 198 |
| mac-nea | 0.438 | 0.367 | 0.504 | 0.566 | 0.407 | 0.785 | 7,017 | 6,248 | 8,400 | 6,724 | 3,719 | 12,157 |
| mgw-8c9a | 0.315 | 0.268 | 0.377 | 0.262 | 0.155 | 0.465 | 6.40 | 5.09 | 8.20 | 11 | 4.03 | 26 |
| nep-8ab | 0.507 | 0.476 | 0.566 | 0.546 | 0.395 | 0.785 | 44.3 | 37.9 | 50.6 | 39.9 | 26.1 | 58.8 |
| nop-34-june | 0.498 | 0.436 | 0.552 | 0.430 | 0.337 | 0.605 | 1,909 | 1,367 | 2,780 | 3,714 | 1,673 | 7,462 |
| ple-celt | 0.525 | 0.485 | 0.587 | 0.525 | 0.387 | 0.763 | 2.23 | 1.85 | 2.62 | 3.04 | 1.48 | 5.82 |
| ple-eche | 0.589 | 0.503 | 0.673 | 0.537 | 0.393 | 0.742 | 31.4 | 26.4 | 37.7 | 36.6 | 24.9 | 53.2 |
| ple-echw | 0.500 | 0.460 | 0.550 | 0.498 | 0.373 | 0.705 | 14.8 | 12.6 | 17.3 | 15.3 | 10.1 | 21.8 |
| ple-nsea | **0.578** | **0.530** | **0.635** | 0.309 | 0.268 | 0.356 | **1,325** | **1,153** | **1,480** | 2,873 | 2,282 | 3,618 |
| sai-3a46 | **0.504** | **0.468** | **0.557** | 0.313 | 0.269 | 0.392 | **1,253** | **1,081** | **1,471** | 2,395 | 1,667 | 3,208 |
| sai-arct | 0.551 | 0.503 | 0.599 | 0.529 | 0.389 | 0.778 | 1,280 | 1,188 | 1,391 | 1,353 | 882 | 1,916 |
| sai-faro | 0.493 | 0.438 | 0.534 | 0.566 | 0.407 | 0.785 | 344 | 314 | 385 | 320 | 213 | 480 |
| sai-icel | 0.477 | 0.414 | 0.522 | 0.533 | 0.391 | 0.770 | 550 | 478 | 665 | 503 | 323 | 738 |
| san-ns1 | 1.056 | 0.984 | 1.169 | 0.995 | 0.829 | 1.420 | 1,406 | 1,264 | 1,593 | 1,482 | 967 | 1,910 |
| san-ns2 | **1.042** | 0.940 | 1.121 | 0.896 | 0.755 | 1.019 | 434 | 380 | 494 | 380 | 309 | 488 |
| san-ns3 | 1.050 | 0.978 | 1.134 | 1.049 | 0.851 | 1.380 | 1,210 | 1,114 | 1,307 | 1,262 | 890 | 1,675 |
| sar-soth | 0.509 | 0.465 | 0.591 | 0.399 | 0.320 | 0.565 | 1,028 | 842 | 1,275 | 1,673 | 980 | 2,505 |

| Stock | $r_{BSM}$ | (LCL | UCL) | $r_{CMSY}$ | (LCL | UCL) | $k_{BSM}$ | (LCL | UCL) | $k_{CMSY}$ | (LCL | UCL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| smn-con | 0.273 | 0.236 | 0.308 | 0.282 | 0.163 | 0.487 | 307 | 241 | 411 | 420 | 156 | 1,134 |
| sol-bisc | 0.507 | 0.466 | 0.576 | 0.546 | 0.395 | 0.785 | 42.5 | 35.6 | 50.7 | 40.6 | 26.3 | 60.3 |
| sol-celt | 0.487 | 0.421 | 0.531 | 0.505 | 0.377 | 0.712 | 9.7 | 8.5 | 11.8 | 9.4 | 6.3 | 13.3 |
| sol-eche | 0.517 | 0.476 | 0.600 | 0.566 | 0.407 | 0.785 | 33.5 | 28.8 | 39.4 | 31.6 | 21.0 | 47.5 |
| sol-echw | 0.479 | 0.413 | 0.522 | 0.537 | 0.393 | 0.773 | 8.6 | 7.8 | 10.0 | 8.0 | 5.4 | 11.5 |
| sol-iris | 0.473 | 0.412 | 0.516 | 0.370 | 0.304 | 0.559 | 12.6 | 10.6 | 15.8 | 15.8 | 9.4 | 21.3 |
| sol-kask | 0.505 | 0.460 | 0.580 | 0.517 | 0.383 | 0.758 | 6.1 | 5.3 | 7.2 | 6.6 | 4.2 | 9.4 |
| sol-nsea | 0.507 | 0.472 | 0.568 | 0.456 | 0.349 | 0.673 | 198 | 168 | 235 | 227 | 148 | 309 |
| spr-2232 | 0.490 | 0.417 | 0.537 | 0.561 | 0.405 | 0.777 | 2,756 | 2,296 | 3,593 | 2,466 | 1,650 | 3,684 |
| spr-nsea | 0.499 | 0.438 | 0.563 | 0.456 | 0.351 | 0.637 | 3,787 | 2,082 | 9,737 | 2,794 | 1,739 | 4,177 |
| usk-icel | 0.330 | 0.299 | 0.372 | 0.385 | 0.301 | 0.493 | 85 | 70 | 100 | 65 | 49 | 88 |
| whb-comb | 0.465 | 0.398 | 0.515 | 0.557 | 0.403 | 0.785 | 10,973 | 9,227 | 13,398 | 9,833 | 6,425 | 14,751 |
| whg-47d | 0.494 | 0.425 | 0.549 | 0.452 | 0.349 | 0.664 | 930 | 776 | 1,162 | 699 | 424 | 1,012 |
| whg-7e-k | 0.565 | 0.494 | 0.661 | 0.566 | 0.407 | 0.785 | 101 | 87 | 123 | 109 | 73 | 161 |
| whg-scow | 0.491 | 0.419 | 0.538 | 0.458 | 0.351 | 0.685 | 126 | 101 | 167 | 116 | 73 | 163 |

**Table S6. Comparison of parameter estimates of CMSY and BSM fitted to 128 real stocks, where subscript B stands for estimates by BSM and subscript C stands for estimates by CMSY. rel*B* is the *B*/k ratio and rel*u* is the relative exploitation rate ($u/u_{msy}$) in the last year. LCL and UCL indicate lower and upper 95% confidence limits, respectively. Cases where the BSM estimate of *MSY* or observed *B/k* are not included in the CMSY confidence limits or percentile range are marked in bold. Similarly, cases where the confidence limits do not overlap are marked in bold. Cases where the last relative exploitation rate estimated by CMSY (rel$u_C$) differs more than 50% from the observed rate are marked bold. [AllStocks_Results_6.xlsx]**

| Stock | $MSY_B$ | (LCL | UCL) | $MSY_C$ | (LCL | UCL) | rel$B_B$ | (LCL | UCL) | rel$B_C$ | ($2.5^{th}$ $97.5^{th}$) | | rel$u_B$ | rel$u_C$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Alaska** | | | | | | | | | | | | | | |
| AKSablefish | 20.8 | 12.8 | 32.7 | 30.2 | 12.0 | 75.7 | 0.16 | 0.12 | 0.23 | 0.24 | 0.02 | 0.40 | 1.99 | **0.92** |
| BSAIatka | 75.1 | 61.4 | 89.5 | 53.8 | 41.2 | 70.2 | 0.56 | 0.47 | 0.63 | 0.48 | 0.21 | 0.60 | 0.49 | **0.79** |
| BSAIatf | **40.7** | 34.6 | 48.6 | 25.9 | 13.8 | 48.4 | **0.97** | 0.83 | 1.08 | 0.72 | 0.51 | 0.83 | 0.27 | **0.57** |
| BSAIhalibut | 12.5 | 9.0 | 20.0 | 5.5 | 4.0 | 7.5 | 0.36 | 0.23 | 0.48 | 0.46 | 0.23 | 0.59 | 0.38 | **0.67** |
| BSAInorthern | **6.06** | **4.06** | **8.93** | 3.72 | 1.41 | 9.82 | **0.67** | 0.48 | 0.84 | 0.50 | 0.24 | 0.60 | 0.31 | **0.65** |
| BSAIplaice | 14.6 | 7.5 | 24.3 | 35.3 | 8.0 | 155.4 | 0.28 | 0.21 | 0.36 | 0.36 | 0.21 | 0.51 | 2.61 | **0.84** |
| BSAIpop | 34.0 | 28.2 | 41.4 | 22.3 | 10.9 | 45.9 | **0.92** | 0.82 | 1.02 | 0.74 | 0.51 | 0.86 | 0.43 | **0.80** |
| BSAIrocksole | 130 | 115 | 148 | 79 | 38 | 164 | 0.88 | 0.81 | 0.96 | 0.81 | 0.53 | 0.90 | 0.28 | **0.49** |
| BSAIshortraker | 0.29 | 0.12 | 0.60 | 0.44 | 0.13 | 1.51 | 0.25 | 0.19 | 0.33 | 0.25 | 0.02 | 0.40 | 2.20 | 1.45 |
| BSAIyfin | 239 | 206 | 276 | 204 | 104 | 400 | 0.76 | 0.71 | 0.81 | 0.83 | 0.57 | 0.90 | 0.42 | 0.46 |
| EBSPcod | 171 | 142 | 205 | 285 | 141 | 577 | 0.59 | 0.50 | 0.69 | 0.82 | 0.53 | 0.90 | 1.14 | **0.48** |
| EBSpollock | 1,074 | 780 | 1,442 | 1,191 | 1,030 | 1,377 | **0.74** | **0.62** | **0.90** | 0.51 | 0.23 | 0.60 | 0.77 | 1.02 |
| GOAatf | 90.5 | 76.3 | 108.3 | 34.6 | 17.0 | 70.5 | **1.03** | **0.94** | **1.13** | 0.77 | 0.52 | 0.88 | 0.13 | **0.46** |
| GOAdusky | **4.81** | **3.94** | **5.91** | 4.59 | 2.28 | 9.24 | 0.76 | 0.67 | 0.86 | 0.78 | 0.52 | 0.88 | 0.44 | 0.45 |
| GOAflathead | 14.65 | 11.81 | 16.94 | 4.29 | 1.99 | 9.24 | **1.06** | **0.98** | **1.12** | 0.78 | 0.52 | 0.88 | 0.08 | **0.39** |
| GOAnorthern | **4.09** | **2.49** | **5.91** | 6.63 | 2.07 | 21.20 | 0.33 | 0.24 | 0.44 | 0.40 | 0.21 | 0.59 | 1.63 | 0.84 |
| GOAPcod | 68.2 | 58.7 | 76.9 | 58.2 | 51.2 | 66.3 | **0.66** | 0.59 | 0.72 | 0.53 | 0.50 | 0.61 | 0.85 | 1.25 |
| GOApollock | **141** | 107 | 186 | 101 | 86 | 119 | **0.63** | 0.49 | 0.78 | 0.50 | 0.27 | 0.60 | 0.52 | **0.92** |
| GOApop | **147** | 107 | 204 | 116 | 61 | 221 | 0.18 | 0.14 | 0.21 | 0.09 | 0.01 | 0.38 | 0.27 | **0.66** |
| GOArex | 3.50 | 2.20 | 5.13 | 2.67 | 1.13 | 6.34 | 0.55 | 0.40 | 0.79 | 0.48 | 0.22 | 0.60 | 0.98 | 1.41 |
| **Pacific** | | | | | | | | | | | | | | |
| Aurora_PC | 0.08 | 0.04 | 0.16 | 0.13 | 0.03 | 0.64 | 0.35 | 0.26 | 0.52 | 0.27 | 0.02 | 0.40 | 0.63 | 0.53 |
| BFTuna_P | 23.9 | 21.9 | 26.3 | 23.0 | 21.4 | 24.8 | 0.26 | 0.24 | 0.28 | 0.32 | 0.05 | 0.40 | 1.70 | 1.40 |
| BMarlin_NP | 19.5 | 18.3 | 20.8 | 20.8 | 18.2 | 23.7 | 0.51 | 0.48 | 0.54 | 0.56 | 0.50 | 0.67 | 0.91 | 0.78 |

| **Stock** | $MSY_B$ | **(LCL** | **UCL)** | $MSY_C$ | **(LCL** | **UCL)** | **rel$B_B$** | **(LCL** | **UCL)** | **rel$B_C$** | **(2.5th** | **97.5th)** | **rel$u_B$** | **rel$u_C$** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boca_PC | 3.50 | 2.91 | 4.11 | 3.45 | 2.80 | 4.26 | 0.30 | 0.26 | 0.33 | 0.11 | 0.01 | 0.38 | 0.06 | **0.17** |
| BrownRF_PC | 0.18 | 0.17 | 0.20 | 0.17 | 0.15 | 0.20 | 0.41 | 0.37 | 0.44 | 0.51 | 0.27 | 0.60 | 0.68 | 0.57 |
| ChinaRF_PC | **0.06** | 0.05 | 0.07 | 0.05 | 0.04 | 0.05 | **0.62** | 0.56 | 0.68 | 0.47 | 0.24 | 0.59 | 0.44 | **0.73** |
| CopperRF_PC | 0.25 | 0.22 | 0.27 | 0.22 | 0.18 | 0.26 | **0.61** | 0.56 | 0.65 | 0.52 | 0.24 | 0.60 | 0.26 | 0.34 |
| Cowcod_PC | 0.14 | 0.12 | 0.18 | 0.13 | 0.10 | 0.16 | 0.50 | 0.38 | 0.58 | 0.42 | 0.21 | 0.59 | 0.00 | 0.01 |
| DarkblotchedRF_PC | **0.88** | 0.66 | 1.10 | 0.58 | 0.42 | 0.81 | **0.41** | 0.343 | 0.48 | 0.25 | 0.02 | 0.40 | 0.26 | **0.64** |
| LongspinTH_PC | **2.76** | 1.96 | 3.80 | 1.77 | 1.38 | 2.28 | 0.37 | 0.283 | 0.49 | 0.35 | 0.17 | 0.40 | 0.57 | **0.93** |
| PetraleSole_PC | 2.65 | 2.49 | 2.84 | 2.59 | 2.40 | 2.78 | **0.63** | 0.582 | 0.68 | 0.53 | 0.29 | 0.60 | 0.29 | 0.34 |
| Phake_PC | **411** | **334** | **517** | 275 | 235 | 322 | **0.65** | 0.512 | 0.77 | 0.51 | 0.26 | 0.60 | 0.45 | **0.84** |
| Rougheye_PC | 0.25 | 0.14 | 0.40 | 0.36 | 0.12 | 1.10 | 0.29 | 0.222 | 0.4 | 0.26 | 0.02 | 0.40 | 1.40 | 1.09 |
| Sardine_P | **177** | 151 | 207 | 134 | 104 | 173 | 0.54 | 0.467 | 0.61 | 0.49 | 0.26 | 0.60 | 0.74 | 1.06 |
| ShortspinTH_PC | 2.39 | 1.02 | 4.50 | 2.55 | 1.10 | 5.90 | **0.40** | 0.287 | 0.58 | 0.25 | 0.02 | 0.40 | 0.60 | 0.86 |
| **Northwest Atlantic** | | | | | | | | | | | | | | |
| Ahalibut_NWAC | 0.15 | 0.13 | 0.16 | 0.14 | 0.12 | 0.17 | 0.77 | 0.69 | 0.85 | 0.72 | 0.53 | 0.85 | 0.37 | 0.40 |
| Albacore_NA | 42.5 | 38.7 | 46.9 | 43.0 | 40.9 | 45.1 | **0.41** | 0.38 | 0.45 | 0.29 | 0.02 | 0.40 | 0.52 | 0.72 |
| BETuna_A | 95.7 | 90.9 | 100.9 | 93.9 | 83.6 | 105.4 | 0.50 | 0.49 | 0.51 | 0.42 | 0.22 | 0.59 | 0.83 | 1.01 |
| Bluefish_AC | 24.6 | 19.5 | 41.2 | 44.9 | 20.4 | 99.1 | 0.39 | 0.23 | 0.51 | 0.18 | 0.01 | 0.39 | 0.55 | 0.65 |
| BSbass_MAC | 3.05 | 2.72 | 3.42 | 2.89 | 2.64 | 3.17 | 0.55 | 0.48 | 0.62 | 0.50 | 0.25 | 0.60 | 0.61 | 0.69 |
| Cod_GB | 26.5 | 21.3 | 34.9 | 35.1 | 20.7 | 59.5 | 0.14 | 0.11 | 0.17 | 0.11 | 0.02 | 0.38 | 0.46 | 0.43 |
| Cod_GUM | 10.6 | 8.3 | 13.8 | 15.1 | 8.4 | 27.1 | 0.24 | 0.19 | 0.28 | 0.20 | 0.01 | 0.40 | 1.49 | 1.25 |
| Haddock_GB | 33.1 | 23.4 | 49.2 | 51.9 | 26.0 | 103.7 | 0.45 | 0.31 | 0.59 | 0.46 | 0.22 | 0.60 | 0.81 | 0.49 |
| Haddock_GoM | 3.04 | 1.97 | 9.54 | 3.12 | 2.58 | 3.77 | 0.15 | 0.05 | 0.23 | 0.21 | 0.02 | 0.39 | 1.27 | 0.88 |
| Herring_A | 223 | 188 | 269 | 253 | 218 | 294 | **0.78** | 0.66 | 0.90 | 0.88 | 0.85 | 0.90 | 0.26 | 0.20 |
| Swordfish_NA | 14.3 | 13.6 | 15.0 | 13.8 | 12.8 | 14.9 | 0.58 | 0.56 | 0.60 | 0.48 | 0.24 | 0.59 | 0.73 | 0.91 |
| Whake_GUMGB | 4.58 | 4.11 | 5.05 | 4.60 | 3.69 | 5.73 | **0.68** | **0.60** | **0.739** | 0.51 | 0.25 | 0.60 | 0.35 | 0.46 |
| YTFlo_MA | 13.7 | 5.5 | 29.1 | 10.6 | 5.7 | 19.7 | 0.05 | 0.02 | 0.12 | 0.12 | 0.01 | 0.38 | 0.28 | 0.15 |
| **Caribbean/Gulf of Mexico** | | | | | | | | | | | | | | |
| GAGGM | 2.33 | 1.95 | 2.81 | 2.31 | 2.05 | 2.60 | **0.62** | **0.51** | **0.75** | 0.12 | 0.02 | 0.36 | 0.34 | **1.71** |
| RGROUPGM | 1.06 | 0.84 | 1.27 | 1.61 | 0.74 | 3.51 | 0.55 | 0.45 | 0.64 | 0.53 | 0.26 | 0.60 | 1.02 | 0.69 |
| VSNAPSATLC | 0.49 | 0.40 | 0.60 | 0.35 | 0.28 | 0.44 | 0.34 | 0.29 | 0.38 | 0.27 | 0.02 | 0.40 | 1.36 | **2.39** |

| Stock | $MSY_B$ | (LCL | UCL) | $MSY_C$ | (LCL | UCL) | rel$B_B$ | (LCL | UCL) | rel$B_C$ | (2.5th | 97.5th) | rel$u_B$ | rel$u_C$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mediterranean** | | | | | | | | | | | | | | |
| Encr_engr_GSA17 | **38.3** | 31.5 | 49.4 | 33.0 | 29.5 | 36.9 | **0.71** | 0.55 | 0.85 | 0.53 | 0.50 | 0.60 | 0.77 | **1.20** |
| mul-gsa6 | 1.31 | 1.13 | 1.50 | 1.22 | 0.96 | 1.55 | 0.30 | 0.25 | 0.38 | 0.28 | 0.03 | 0.40 | 1.45 | 1.65 |
| mullsur_gsa1516 | 1.87 | 1.56 | 2.15 | 2.04 | 1.41 | 2.95 | **0.42** | 0.36 | 0.51 | 0.25 | 0.02 | 0.40 | 0.64 | **0.98** |
| **Black Sea** | | | | | | | | | | | | | | |
| BS_anch | **447** | 337 | 611 | 347 | 291 | 413 | 0.19 | 0.14 | 0.24 | 0.25 | 0.03 | 0.39 | 1.68 | 1.64 |
| Spr_BS | 72.8 | 60.3 | 88.4 | 87.0 | 42.6 | 178.0 | 0.72 | 0.60 | 0.84 | 0.75 | 0.51 | 0.86 | 0.97 | 0.77 |
| Tur_BS | 2.96 | 2.62 | 3.34 | 3.11 | 2.66 | 3.64 | 0.07 | 0.06 | 0.08 | 0.33 | 0.03 | 0.39 | 3.11 | **0.60** |
| **South Africa** | | | | | | | | | | | | | | |
| CRPN_S | 0.36 | 0.29 | 0.44 | 0.43 | 0.13 | 1.40 | **0.97** | 0.665 | 1.14 | 0.87 | 0.77 | 0.9 | 0.149 | 0.13 |
| CRPN_SE | 0.55 | 0.46 | 0.65 | 0.59 | 0.18 | 1.95 | **0.90** | 0.728 | 1.09 | 0.83 | 0.55 | 0.9 | 0.2 | 0.21 |
| HTTN_SW | 0.17 | 0.15 | 0.21 | 0.18 | 0.16 | 0.21 | **0.83** | 0.679 | 0.95 | 0.9 | 0.88 | 0.9 | 0.191 | 0.17 |
| HTTN_W | **0.48** | 0.41 | 0.56 | 0.41 | 0.37 | 0.46 | **0.95** | 0.803 | 1.06 | 0.89 | 0.88 | 0.9 | 0.134 | 0.17 |
| KKLI_S | 2.32 | 2.00 | 2.71 | 2.03 | 1.64 | 2.51 | 0.49 | 0.449 | 0.53 | 0.49 | 0.23 | 0.6 | 0.517 | 0.59 |
| KOB_S | 0.59 | 0.52 | 0.67 | 0.66 | 0.36 | 1.22 | 0.47 | 0.403 | 0.60 | 0.40 | 0.22 | 0.57 | 0.793 | 0.84 |
| KOB_SE | 0.32 | 0.27 | 0.37 | 0.34 | 0.18 | 0.63 | 0.50 | 0.418 | 0.64 | 0.43 | 0.22 | 0.58 | 0.604 | 0.67 |
| SLNG | 0.24 | 0.22 | 0.26 | 0.21 | 0.17 | 0.25 | **0.80** | **0.697** | **0.88** | 0.51 | 0.25 | 0.59 | 0.508 | **0.92** |
| SA-BSH | 21.4 | 18.6 | 24.5 | 19.1 | 14.2 | 25.7 | **0.53** | **0.451** | **0.61** | 0.24 | 0.20 | 0.36 | 1.284 | **3.14** |
| **Northeast Atlantic** | | | | | | | | | | | | | | |
| anp-8c9a | 3.62 | 2.90 | 4.38 | 5.29 | 3.31 | 8.47 | 0.46 | 0.38 | 0.53 | 0.49 | 0.23 | 0.60 | 0.50 | 0.31 |
| Bss-47 | 2.62 | 2.10 | 3.32 | 2.70 | 2.07 | 3.52 | 0.28 | 0.21 | 0.35 | 0.29 | 0.03 | 0.40 | 2.44 | 2.33 |
| cod-2224 | **45.1** | 34.7 | 61.5 | 54.0 | 44.6 | 65.5 | 0.19 | 0.16 | 0.23 | 0.16 | 0.02 | 0.39 | 1.08 | 1.08 |
| cod-347d | **218** | 176 | 277 | 264 | 221 | 316 | 0.20 | 0.16 | 0.24 | 0.12 | 0.01 | 0.38 | 0.50 | 0.70 |
| cod-7e-k | **8.01** | 6.37 | 10.04 | 9.63 | 8.80 | 10.53 | 0.23 | 0.19 | 0.28 | 0.25 | 0.03 | 0.40 | 1.79 | 1.39 |
| cod-arct | 732 | 644 | 827 | 749 | 697 | 804 | 0.65 | 0.58 | 0.73 | 0.69 | 0.60 | 0.74 | 0.93 | 0.86 |
| cod-farp | **22.9** | 19.3 | 27.7 | 25.5 | 23.2 | 27.9 | 0.16 | 0.14 | 0.19 | 0.15 | 0.02 | 0.39 | 0.83 | 0.79 |
| cod-iceg | 356 | 314 | 415 | 360 | 333 | 390 | 0.42 | 0.36 | 0.49 | 0.52 | 0.21 | 0.59 | 0.71 | 0.57 |
| cod-scow | 14.7 | 10.6 | 21.8 | 23.1 | 11.2 | 47.6 | 0.04 | 0.03 | 0.06 | 0.10 | 0.01 | 0.37 | 1.35 | **0.36** |
| dgs-nea | **46.3** | 36.2 | 60.7 | 36.7 | 31.7 | 42.6 | 0.13 | 0.11 | 0.15 | 0.17 | 0.01 | 0.39 | 0.20 | 0.19 |
| ghl-arct | 32.8 | 25.6 | 42.1 | 38.5 | 21.7 | 68.2 | 0.74 | 0.61 | 0.90 | 0.74 | 0.54 | 0.87 | 0.30 | 0.26 |

| Stock | $MSY_B$ | (LCL | UCL) | $MSY_C$ | (LCL | UCL) | rel$B_B$ | (LCL | UCL) | rel$B_C$ | (2.5th | 97.5th) | rel$u_B$ | rel$u_C$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| had-346a | 260 | 200 | 365 | 221 | 187 | 261 | 0.22 | 0.16 | 0.27 | 0.14 | 0.02 | 0.37 | 0.40 | **0.73** |
| had-7b-k | **14.1** | 11.1 | 19.3 | 17.8 | 14.8 | 21.4 | 0.67 | 0.49 | 0.84 | 0.54 | 0.50 | 0.62 | 1.25 | 1.24 |
| had-arct | 149 | 122 | 185 | 158 | 138 | 180 | 1.06 | 0.90 | 1.22 | 0.53 | 0.50 | 0.61 | 0.73 | **1.37** |
| had-faro | 17.8 | 15.0 | 21.1 | 17.4 | 15.5 | 19.5 | 0.14 | 0.12 | 0.17 | 0.21 | 0.01 | 0.40 | 0.57 | 0.41 |
| had-iceg | 61.4 | 52.7 | 71.1 | 72.5 | 57.8 | 91.0 | 0.31 | 0.27 | 0.35 | 0.49 | 0.23 | 0.60 | 1.23 | 0.66 |
| had-rock | 12.3 | 8.9 | 19.6 | 17.3 | 9.1 | 33.0 | 0.18 | 0.11 | 0.24 | 0.12 | 0.02 | 0.38 | 0.36 | 0.38 |
| her-2532-gor | 257 | 221 | 306 | 230 | 205 | 259 | 0.52 | 0.45 | 0.60 | 0.51 | 0.28 | 0.60 | 0.42 | 0.47 |
| her-30 | **88.6** | 73.4 | 107.5 | 66.5 | 59.6 | 74.1 | 1.06 | 0.92 | 1.21 | 0.52 | 0.50 | 0.57 | 0.57 | **1.56** |
| her-3a22 | 136 | 114 | 163 | 187 | 87 | 401 | 0.18 | 0.16 | 0.21 | 0.16 | 0.02 | 0.39 | 0.81 | 0.67 |
| her-47d3 | **767** | 664 | 875 | 647 | 591 | 709 | 0.69 | 0.60 | 0.76 | 0.84 | 0.80 | 0.87 | 0.46 | 0.45 |
| her-67bc | **127** | 105 | 156 | 102 | 88 | 119 | 0.28 | 0.25 | 0.31 | 0.19 | 0.02 | 0.38 | 0.37 | **0.68** |
| her-irls | **28.7** | **23.9** | **34.5** | 20.5 | 19.0 | 22.0 | 0.83 | 0.69 | 0.95 | 0.60 | 0.51 | 0.68 | 0.34 | **0.66** |
| her-nirs | 13.0 | 10.5 | 16.0 | 14.6 | 12.1 | 17.6 | 0.34 | 0.29 | 0.39 | 0.16 | 0.02 | 0.38 | 0.60 | **1.15** |
| her-noss | 1,319 | 1,128 | 1,491 | 1,082 | 866 | 1,353 | 0.50 | 0.45 | 0.55 | 0.47 | 0.22 | 0.60 | 0.49 | 0.65 |
| her-riga | 28.6 | 25.4 | 32.3 | 31.3 | 27.0 | 36.2 | 0.54 | 0.47 | 0.62 | 0.44 | 0.22 | 0.59 | 0.86 | 0.98 |
| her-vian | 102 | 77 | 135 | 92 | 79 | 106 | 0.12 | 0.10 | 0.14 | 0.19 | 0.02 | 0.38 | 0.80 | 0.57 |
| hke-nrtn | 63.1 | 48.5 | 76.0 | 101.1 | 56.7 | 180.4 | 0.99 | 0.87 | 1.12 | 0.72 | 0.52 | 0.83 | 0.80 | 0.69 |
| hke-soth | 14.3 | 10.2 | 17.7 | 15.6 | 12.9 | 18.9 | 0.37 | 0.31 | 0.42 | 0.38 | 0.22 | 0.56 | 1.44 | 1.24 |
| hom-west | **448** | **353** | **564** | 298 | 262 | 339 | 0.29 | 0.23 | 0.33 | 0.29 | 0.02 | 0.40 | 0.61 | 0.91 |
| lin-icel | 16.5 | 14.3 | 19.0 | 13.9 | 6.7 | 28.8 | 0.71 | 0.64 | 0.79 | 0.76 | 0.52 | 0.88 | 0.53 | 0.58 |
| mac-nea | 771 | 690 | 871 | 951 | 566 | 1,596 | 0.70 | 0.58 | 0.78 | 0.70 | 0.52 | 0.86 | 0.80 | 0.64 |
| mgw-8c9a | 0.50 | 0.37 | 0.71 | 0.69 | 0.32 | 1.47 | 0.22 | 0.18 | 0.28 | 0.18 | 0.01 | 0.39 | 1.39 | 1.26 |
| nep-8ab | 5.64 | 5.16 | 6.19 | 5.45 | 4.82 | 6.17 | 0.36 | 0.32 | 0.42 | 0.31 | 0.05 | 0.40 | 1.01 | 1.23 |
| nop-34-june | 236 | 166 | 346 | 399 | 163 | 974 | 0.34 | 0.23 | 0.47 | 0.11 | 0.01 | 0.37 | 0.24 | **0.44** |
| ple-celt | 0.29 | 0.24 | 0.35 | 0.40 | 0.20 | 0.78 | 0.14 | 0.12 | 0.17 | 0.17 | 0.01 | 0.39 | 0.94 | 0.59 |
| ple-eche | 4.61 | 3.74 | 5.59 | 4.92 | 4.35 | 5.55 | 0.41 | 0.34 | 0.49 | 0.51 | 0.27 | 0.60 | 0.77 | 0.59 |
| ple-echw | 1.85 | 1.61 | 2.12 | 1.90 | 1.66 | 2.18 | 0.45 | 0.39 | 0.54 | 0.49 | 0.27 | 0.59 | 0.90 | 0.81 |
| ple-nsea | 191 | 172 | 211 | 222 | 187 | 264 | 0.46 | 0.41 | 0.53 | 0.52 | 0.25 | 0.60 | 0.60 | 0.46 |
| sai-3a46 | 159 | 137 | 184 | 188 | 143 | 247 | 0.26 | 0.22 | 0.30 | 0.22 | 0.03 | 0.40 | 1.04 | 1.02 |
| sai-arct | 176 | 163 | 190 | 179 | 165 | 194 | 0.38 | 0.35 | 0.41 | 0.56 | 0.45 | 0.60 | 1.11 | 0.74 |

| Stock | $MSY_B$ | (LCL | UCL) | $MSY_C$ | (LCL | UCL) | rel$B_B$ | (LCL | UCL) | rel$B_C$ | (2.5th | 97.5th) | rel$u_B$ | rel$u_C$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| sai-faro | 42.2 | 37.9 | 46.9 | 45.3 | 38.9 | 52.7 | 0.62 | 0.55 | 0.68 | 0.37 | 0.21 | 0.57 | 0.54 | 0.86 |
| sai-icel | 65.2 | 57.7 | 76.5 | 67.0 | 58.0 | 77.5 | 0.43 | 0.35 | 0.49 | 0.54 | 0.29 | 0.60 | 1.00 | 0.76 |
| san-ns1 | 373 | 335 | 425 | 369 | 321 | 424 | 0.25 | 0.22 | 0.28 | 0.31 | 0.05 | 0.40 | 0.60 | 0.48 |
| san-ns2 | **113** | 96 | 131 | 85 | 73 | 99 | 0.40 | 0.35 | 0.46 | 0.50 | 0.36 | 0.58 | 0.15 | 0.16 |
| san-ns3 | 318 | 299 | 336 | 331 | 286 | 383 | 0.44 | 0.41 | 0.48 | 0.39 | 0.21 | 0.57 | 0.27 | 0.30 |
| sar-soth | 133 | 107 | 165 | 167 | 116 | 240 | 0.12 | 0.10 | 0.15 | 0.23 | 0.03 | 0.39 | 1.37 | **0.57** |
| smn-con | 20.9 | 16.6 | 28.1 | 29.6 | 12.3 | 71.2 | 0.34 | 0.25 | 0.43 | 0.38 | 0.21 | 0.56 | 0.71 | 0.45 |
| sol-bisc | 5.41 | 4.85 | 6.13 | 5.55 | 4.83 | 6.37 | 0.34 | 0.28 | 0.40 | 0.43 | 0.21 | 0.58 | 1.14 | 0.88 |
| sol-celt | 1.17 | 1.06 | 1.34 | 1.19 | 1.07 | 1.32 | 0.41 | 0.34 | 0.47 | 0.43 | 0.23 | 0.55 | 1.11 | 1.06 |
| sol-eche | 4.39 | 3.92 | 4.92 | 4.47 | 3.82 | 5.23 | 0.44 | 0.37 | 0.51 | 0.46 | 0.22 | 0.59 | 1.10 | 1.02 |
| sol-echw | 1.03 | 0.94 | 1.12 | 1.08 | 0.99 | 1.17 | 0.65 | 0.56 | 0.72 | 0.51 | 0.25 | 0.60 | 0.65 | 0.80 |
| sol-iris | 1.48 | 1.25 | 1.83 | 1.46 | 1.18 | 1.80 | 0.08 | 0.06 | 0.10 | 0.18 | 0.02 | 0.39 | 0.75 | **0.34** |
| sol-kask | 0.78 | 0.67 | 0.91 | 0.85 | 0.75 | 0.96 | 0.38 | 0.32 | 0.44 | 0.30 | 0.02 | 0.40 | 0.58 | 0.67 |
| sol-nsea | 25.3 | 21.7 | 30.0 | 25.9 | 23.9 | 28.1 | 0.26 | 0.22 | 0.30 | 0.23 | 0.02 | 0.40 | 1.25 | 1.35 |
| spr-2232 | 334 | 268 | 432 | 346 | 298 | 402 | 0.49 | 0.38 | 0.59 | 0.48 | 0.23 | 0.60 | 0.75 | 0.75 |
| spr-nsea | **470** | 258 | 1,196 | 319 | 242 | 420 | 2.00 | 0.78 | 3.64 | 0.89 | 0.85 | 0.90 | 0.06 | **0.20** |
| usk-icel | **7.01** | 6.28 | 7.88 | 6.29 | 5.77 | 6.87 | 0.26 | 0.22 | 0.32 | 0.37 | 0.28 | 0.40 | 1.84 | 1.44 |
| whb-comb | 1,269 | 1,042 | 1,554 | 1,370 | 1,165 | 1,610 | 0.48 | 0.40 | 0.58 | 0.49 | 0.22 | 0.60 | 0.58 | 0.53 |
| whg-47d | **114.4** | 91.4 | 145.2 | 78.9 | 63.2 | 98.6 | 0.52 | 0.41 | 0.62 | 0.48 | 0.22 | 0.59 | 0.23 | **0.36** |
| whg-7e-k | 14.4 | 11.9 | 17.5 | 15.3 | 13.5 | 17.5 | 0.66 | 0.54 | 0.77 | 0.60 | 0.51 | 0.74 | 0.49 | 0.49 |
| whg-scow | **15.3** | 12.0 | 20.4 | 13.4 | 11.7 | 15.3 | 0.18 | 0.14 | 0.23 | 0.12 | 0.01 | 0.37 | 0.18 | **0.30** |

Of the 128 fully assessed stock, 72 had estimates of $F_{msy}$. These official estimates were compared with $F_{msy}$ = 0.5 $r$ as estimated by BSM. The median ratio of the BSM estimate versus the $F_{msy}$ estimate was 1.0, with 5$^{th}$ percentile 0.51 and 95$^{th}$ percentile 1.84. About 82% of the BSM estimates fell within +/- 50% of the official $F_{msy}$ estimates (see AllStocks_Results_6.xlsx in the online material).

An examination of the recent exploitation history of the 128 fully assessed stocks examined in this study (see AllStocks_Results_6.xlsx in online material) gives the following results: maximum catches had exceeded *MSY* in 118 stocks (92%), resulting in recent biomass below the level that can produce *MSY* in 74 stocks (58%) and in potentially reduced recruitment ($B/k$ < 0.25) in 25 stocks (20%). Four stocks (3%) were severely depleted ($B/k$ < 0.1). In contrast, of the 10 stocks (8%) where catches never exceeded *MSY*, all stocks had recent biomass levels above the one that can produce *MSY*.

## CMSY and BSM results compared with "true" values from simulated CPUE data

Table S7 shows the CMSY estimates of *MSY*, *r*, *k*, and biomass in the last year compared with the "true" values from the simulations of data-limited stocks. "True" values are not included in the confidence limits or 95% ranges of eight of the 24 simulated stocks. The "true" parameter values of the Schaefer model used in the simulations to generate the time series of biomass given the catches were $k = 1000$ in all cases and *r* randomly drawn from a normal distribution corresponding to the respective resilience class (see "Generation of simulated stocks" above). Note that CMSY analyzed here the same data as in Table S3, where some of the "true" values were missed in the same eight stocks. The slight differences in estimated values stem from the random errors that are part of the CMSY model.

**Table S7. Results of estimating the parameters of the Schaefer model with the CMSY method, for 24 simulated stocks. LCL and UCL indicate the lower and upper 95% confidence limits, respectively. Cases where the confidence limits do not include the "true" parameter values are indicated in bold. [SimCatchCPUE_Results_6.xlsx]**

| Stock | *MSY* | (LCL – UCL) | | *r* | (LCL – UCL) | | *k* | (LCL – UCL) | | true*B*/*k* | *B*/*k* | (2.5th-97.5th) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HH_H | 376 | 190 | 745 | 1.19 | 0.96 | 1.48 | 1,264 | 717 | 2,227 | 0.74 | 0.82 | 0.61 | 0.90 |
| HH_L | 87 | 44 | 171 | 0.28 | 0.16 | 0.49 | 1,234 | 507 | 3,005 | 0.73 | 0.80 | 0.54 | 0.89 |
| HH_M | 113 | 59 | 216 | **0.57** | **0.41** | **0.78** | 797 | 412 | 1,541 | 0.74 | 0.82 | 0.57 | 0.90 |
| HH_VL | 19 | 5 | 77 | 0.06 | 0.04 | 0.10 | 1,231 | 387 | 3,918 | 0.73 | 0.80 | 0.52 | 0.90 |
| HL_H | 226 | 207 | 247 | 1.01 | 0.83 | 1.44 | 897 | 601 | 1,138 | 0.30 | 0.32 | 0.03 | 0.39 |
| HL_L | 69 | 61 | 78 | 0.23 | 0.14 | 0.37 | 1,206 | 704 | 2,068 | 0.06 | 0.22 | 0.02 | 0.39 |
| HL_M | 117 | 108 | 126 | 0.46 | 0.35 | 0.65 | 1,008 | 692 | 1,366 | 0.00 | **0.10** | **0.01** | **0.37** |
| HL_VL | 18 | 12 | 28 | 0.06 | 0.04 | 0.10 | 1,167 | 600 | 2,268 | 0.06 | 0.27 | 0.02 | 0.40 |
| HLH_H | 262 | 241 | 285 | 1.10 | 0.90 | 1.38 | 956 | 725 | 1,210 | 0.74 | 0.78 | 0.71 | 0.84 |
| HLH_L | 65 | 53 | 78 | 0.27 | 0.16 | 0.48 | 943 | 490 | 1,776 | 0.66 | 0.82 | 0.61 | 0.87 |
| HLH_M | 85 | 76 | 96 | **0.53** | **0.39** | **0.78** | **639** | **411** | **924** | 0.75 | 0.78 | 0.71 | 0.82 |
| HLH_VL | 22 | 13 | 37 | 0.06 | 0.04 | 0.10 | 1,342 | 680 | 2,647 | 0.72 | 0.65 | 0.51 | 0.82 |
| LH_H | 197 | 182 | 214 | **1.19** | **0.96** | **1.48** | **660** | **510** | **854** | 0.72 | 0.72 | 0.64 | 0.79 |
| LH_L | 152 | 39 | 590 | 0.26 | 0.16 | 0.47 | 2,325 | 655 | 7,830 | 0.72 | 0.84 | 0.53 | 0.90 |
| LH_M | 167 | 102 | 273 | 0.57 | 0.41 | 0.78 | 1,178 | 663 | 2,116 | 0.80 | 0.66 | 0.52 | 0.83 |
| LH_VL | 5 | 1 | 20 | **0.07** | **0.05** | **0.10** | **287** | **98** | **839** | 0.60 | 0.63 | 0.51 | 0.82 |
| LHL_H | 310 | 286 | 336 | 1.19 | 0.96 | 1.48 | 1,039 | 803 | 1,344 | 0.30 | 0.27 | 0.02 | 0.39 |
| LHL_L | 79 | 59 | 104 | 0.20 | 0.13 | 0.39 | 1,596 | 703 | 2,822 | 0.14 | 0.26 | 0.02 | 0.39 |
| LHL_M | 124 | 91 | 170 | **0.30** | **0.26** | **0.37** | **1,652** | **1,139** | **2,238** | 0.40 | **0.27** | **0.08** | **0.39** |
| LHL_VL | 11 | 3 | 51 | **0.06** | **0.04** | **0.10** | 738 | 220 | 2,482 | 0.35 | 0.28 | 0.02 | 0.40 |
| LL_H | 233 | 208 | 261 | 0.95 | 0.82 | 1.41 | 977 | 621 | 1,197 | 0.27 | 0.31 | 0.04 | 0.39 |
| LL_L | 27 | 12 | 60 | 0.18 | 0.12 | 0.32 | 589 | 222 | 1,325 | 0.04 | 0.26 | 0.02 | 0.40 |
| LL_M | **133** | **125** | **142** | 0.56 | 0.40 | 0.78 | 958 | 662 | 1,368 | 0.25 | 0.32 | 0.04 | 0.40 |
| LL_VL | 11 | 4 | 34 | 0.06 | 0.04 | 0.10 | 710 | 258 | 1,958 | 0.22 | 0.24 | 0.02 | 0.40 |

Table S8 shows the BSM estimates of *MSY*, *r*, *k*, and catchability coefficient *q* compared with the "true" values used in the simulations. The "true" value of *k* is 1000 and the "true" value of *q* is $100*10^{-7}$. "True" *MSY* is not included in the BSM confidence limits in three of the 24 stocks (13%); "true" *r* is not included in 12 of the stocks (50%); "true" *k* is not included in eleven stocks (49%); and "true" *q* is not included in 16 of the stocks (67%). In comparison, "true" values were missed in only seven stocks with wider confidence limits of the CMSY method and in eight stocks (33%) with the BSM method when biomass instead of CPUE was used. Note that these "miss-rates" are not indicative of the performance of CMSY or BSM against real stocks, because the simulated stocks included some extreme and unlikely scenarios (see catch and biomass patterns in Appendix IV).

**Table S8. Results of estimating the parameters of the Schaefer model with the BSM method for CPUE, for 24 simulated stocks, where q is the catchability coefficient. LCL and UCL indicate the lower and upper 95% confidence limits, respectively. Cases where the confidence limits do not include the "true" parameter value are indicated in bold. [SimCatchCPUE_Results_6.xlsx]**

| Stock | *MSY* | (LCL – UCL) | | *r* | (LCL - | UCL) | *k* | (LCL - | UCL) | *q* $10^{-7}$ | (LCL - | UCL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HH_H | 244 | 216 | 1832 | 1.05 | 0.97 | 1.15 | 924 | 804 | 6,945 | **131** | **102** | **163** |
| HH_L | 64 | 52 | 86 | 0.28 | 0.23 | 0.33 | 929 | 745 | 1,240 | 110 | 73 | 154 |
| HH_M | 77 | 66 | 95 | **0.50** | **0.45** | **0.58** | **609** | **517** | **745** | **180** | **133** | **238** |
| HH_VL | 10 | 6 | 20 | 0.06 | 0.03 | 0.14 | **662** | **450** | **982** | **157** | **109** | **226** |
| HL_H | 223 | 214 | 233 | **1.06** | **0.98** | **1.16** | **843** | **770** | **913** | **114** | **102** | **127** |
| HL_L | 74 | 64 | 85 | 0.26 | 0.21 | 0.30 | 1,124 | 955 | 1,406 | **86** | **70** | **99** |
| HL_M | 110 | 82 | 154 | 0.50 | 0.44 | 0.56 | 887 | 670 | 1,221 | **61** | **45** | **79** |
| HL_VL | 14 | 5 | 29 | **0.03** | **0.01** | **0.06** | **1,901** | **1,324** | **2,952** | **60** | **42** | **80** |
| HLH_H | 261 | 247 | 278 | 1.06 | 0.99 | 1.17 | 984 | 892 | 1,072 | 97 | 85 | 110 |
| HLH_L | 64 | 56 | 75 | **0.28** | **0.24** | **0.32** | 915 | 781 | 1,114 | 100 | 84 | 116 |
| HLH_M | 81 | 75 | 87 | **0.50** | **0.45** | **0.56** | **645** | **569** | **726** | **147** | **127** | **170** |
| HLH_VL | **53** | **19** | **144** | 0.06 | 0.02 | 0.14 | **3,661** | **2,350** | **6,237** | **699** | **425** | **985** |
| LH_H | 201 | 190 | 215 | **1.06** | **1.00** | **1.17** | **753** | **679** | **825** | **123** | **107** | **141** |
| LH_L | 56 | 44 | 74 | 0.27 | 0.23 | 0.30 | 825 | 635 | 1,140 | 113 | 83 | 147 |
| LH_M | 172 | 156 | 194 | **0.53** | **0.48** | **0.63** | **1,290** | **1,070** | **1,516** | **73** | **59** | **90** |
| LH_VL | **2** | **1** | **5** | **0.06** | **0.05** | **0.10** | **135** | **72** | **265** | **1019** | **706** | **1461** |
| LHL_H | 298 | 282 | 321 | **1.04** | **0.94** | **1.12** | **1,149** | **1,057** | **1,278** | **78** | **63** | **95** |
| LHL_L | 80 | 70 | 94 | **0.28** | **0.25** | **0.33** | 1,137 | 957 | 1,377 | 86 | 71 | 102 |
| LHL_M | 129 | 119 | 140 | 0.50 | 0.45 | 0.55 | 1,033 | 919 | 1,160 | **82** | **71** | **94** |
| LHL_VL | 18 | 6 | 110 | 0.05 | 0.03 | 0.08 | 1,636 | 562 | 6,973 | 106 | 72 | 155 |
| LL_H | 244 | 217 | 277 | **1.05** | **0.97** | **1.14** | 928 | 808 | 1,088 | 108 | 88 | 123 |
| LL_L | **21** | **18** | **25** | 0.27 | 0.21 | 0.30 | **320** | **263** | **435** | **130** | **106** | **151** |
| LL_M | 134 | 120 | 160 | **0.49** | **0.42** | **0.54** | 1,096 | 939 | 1,383 | **64** | **50** | **79** |
| LL_VL | 9 | 5 | 41 | 0.06 | 0.04 | 0.12 | 592 | 327 | 1,681 | 102 | 74 | 141 |

## Comparison of CMSY and BSM parameter estimates for data-limited stocks

Table S9 shows a comparison of CMSY parameter estimates of *r* and *k* with those derived from a full Schaefer model (BSM) for catch and CPUE analysis. Estimates are very similar. Only in two cases (boc-nea and ple-2432) are the BSM estimates of *r* not included in the confidence limits of CMSY.

**Table S9. Comparison of estimates of *r* and *k* by BSM for CPUE and CMSY, fitted to 31 data-limited stocks, where LCL and UCL indicate lower and upper 95% confidence limits, respectively. Stocks without estimates from BSM had less than 10 years of CPUE data available. The cases where the BSM estimate is not included in the CMSY confidence limits are marked in bold. [CPUEStocks_Results_6.xlsx]**

| Stock | $r_{BSM}$ | (LCL | UCL) | $r_{CMSY}$ | (LCL | UCL) | $k_{BSM}$ | (LCL | UCL) | $k_{CMSY}$ | (LCL | UCL) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| arg-rest | 0.28 | 0.24 | 0.33 | 0.28 | 0.16 | 0.49 | 27.8 | 15.6 | 39.1 | 32.0 | 12.0 | 85.0 |
| bll-2232 | 0.50 | 0.45 | 0.59 | 0.57 | 0.41 | 0.78 | 0.52 | 0.38 | 0.74 | 0.43 | 0.27 | 0.69 |
| bll-nsea | 0.50 | 0.45 | 0.58 | 0.57 | 0.41 | 0.78 | 16.9 | 14.6 | 20.3 | 24.7 | 12.8 | 47.6 |
| boc-nea | **0.27** | 0.23 | 0.32 | 0.28 | 0.16 | 0.49 | 1,296 | 576 | 3,752 | 2,110 | 543 | 8,201 |
| bsk-nea | | | | 0.06 | 0.04 | 0.10 | | | | 128 | 46.7 | 349 |
| cod-2532 | 0.53 | 0.47 | 0.65 | 0.51 | 0.38 | 0.74 | 718 | 400 | 958 | 669 | 374 | 1,089 |
| cod-rock | 0.50 | 0.44 | 0.57 | 0.46 | 0.35 | 0.70 | 15.7 | 11.1 | 22.4 | 12.3 | 6.0 | 21.7 |
| dab-2232 | 0.58 | 0.49 | 0.70 | 0.49 | 0.37 | 0.72 | 13.0 | 9.1 | 17.3 | 14.8 | 9.6 | 20.5 |
| dab-nsea | 0.53 | 0.48 | 0.65 | 0.56 | 0.41 | 0.77 | 52.0 | 41.5 | 65.2 | 65.0 | 44.6 | 94.8 |
| eel-eur | 0.26 | 0.20 | 0.30 | 0.18 | 0.12 | 0.27 | 396 | 266 | 644 | 285 | 179 | 456 |
| fle-2223 | 0.52 | 0.47 | 0.67 | 0.55 | 0.40 | 0.78 | 14.5 | 6.4 | 21.2 | 11.8 | 7.6 | 18 |
| fle-2425 | 0.50 | 0.45 | 0.58 | 0.57 | 0.41 | 0.78 | 82.2 | 56.5 | 123 | 126 | 63.5 | 251.8 |
| fle-2628 | 0.50 | 0.44 | 0.56 | 0.57 | 0.41 | 0.78 | 31.6 | 26.4 | 39.3 | 30.8 | 19.5 | 48.6 |
| fle-2732 | 0.51 | 0.46 | 0.60 | 0.56 | 0.41 | 0.78 | 2.34 | 1.75 | 2.80 | 2.47 | 1.67 | 3.63 |
| fle-nsea | 0.51 | 0.47 | 0.62 | 0.57 | 0.41 | 0.78 | 25.9 | 20.7 | 34.0 | 25.9 | 17.5 | 38.8 |
| gfb-comb | 0.51 | 0.46 | 0.60 | 0.57 | 0.41 | 0.78 | 22.8 | 15.0 | 34.7 | 24.4 | 16.2 | 37.0 |
| lem-nsea | 0.53 | 0.48 | 0.63 | 0.47 | 0.36 | 0.71 | 54.2 | 43.4 | 64.7 | 58.3 | 36.1 | 80.5 |
| mur-347d | 0.50 | 0.45 | 0.58 | 0.57 | 0.41 | 0.78 | 17.2 | 15.0 | 20.4 | 16.4 | 10.8 | 25.0 |
| nep-2829 | 0.52 | 0.47 | 0.64 | 0.44 | 0.34 | 0.65 | 3.11 | 2.17 | 4.45 | 3.74 | 2.04 | 5.96 |
| Pan_bor_1 | 0.51 | 0.46 | 0.59 | 0.53 | 0.39 | 0.75 | 5.23 | 4.38 | 6.25 | 5.01 | 3.02 | 7.98 |
| Pan_bor_2 | 0.52 | 0.47 | 0.62 | 0.51 | 0.38 | 0.74 | 15.3 | 12.4 | 18.7 | 16.3 | 9.26 | 26.9 |
| ple-2123 | 0.52 | 0.47 | 0.65 | 0.56 | 0.40 | 0.78 | 18.4 | 13.0 | 25.9 | 21.6 | 13.8 | 33.6 |
| ple-2432 | **0.51** | **0.46** | **0.59** | 0.27 | 0.24 | 0.29 | **7.06** | **4.17** | **10.6** | 13.2 | 10.8 | 16.1 |
| rjh-pore | | | | 0.57 | 0.41 | 0.78 | | | | 4.11 | 2.09 | 8.07 |
| sar-78 | 0.50 | 0.44 | 0.56 | 0.57 | 0.41 | 0.78 | 262 | 206 | 351 | 384 | 198 | 743 |
| sck-nea | | | | 0.27 | 0.16 | 0.46 | | | | 8.85 | 3.50 | 22.4 |
| smn-dp | 0.05 | 0.02 | 0.08 | 0.06 | 0.04 | 0.1 | 4,566 | 2,712 | 7,351 | 2,355 | 1,164 | 4,762 |
| smn-sp | 0.05 | 0.02 | 0.1 | 0.06 | 0.04 | 0.1 | 7,555 | 4,280 | 11,714 | 4,351 | 1,548 | 12,232 |
| tur-2232 | 0.51 | 0.47 | 0.62 | 0.48 | 0.36 | 0.78 | 5.76 | 4.65 | 7.37 | 7.52 | 3.14 | 14.5 |
| tur-kask | 0.50 | 0.45 | 0.58 | 0.55 | 0.4 | 0.77 | 1.43 | 1.18 | 1.80 | 1.38 | 0.77 | 2.41 |
| usk-oth | 0.54 | 0.48 | 0.68 | 0.49 | 0.37 | 0.69 | 76.8 | 54.0 | 114 | 84.0 | 51.9 | 129 |

Table S10 shows a comparison of BSM and CMSY estimates of *MSY*, relative biomass (*B*/*k*) and relative exploitation rate (*u*/*u.msy*) in the last year of the time series for 31 data-limited stocks. Significant deviations occurred in one stock (eel-eur) (4%) for *MSY* and in four stocks (14%) for relative biomass. Relative exploitation estimated by CMSY differed by more than 50% from the BSM estimate in seven stocks (25%).

**Table S10.Comparison of parameter estimates of CMSY and BSM fitted to 28 data-limited stocks, where rel*B* is the *B*/*k* ratio in the last year and *u* is the catch rate (catch/*B*). LCL and UCL indicate lower and upper 95% confidence limits, respectively. Cases where the BSM estimate of MSY or *B*/*k* or *u* are not included in the CMSY confidence limits or percentile range are marked in bold. Similarly, cases where the confidence limits do not overlap are marked in bold. [CPUEStocks_Results_6.xlsx].**

| Stock | $MSY_B$ | (LCL - UCL) | | $MSY_C$ | (LCL - UCL) | | $relB_B$ | (LCL - UCL) | | $relB_C$ | ($2.5^{th}$-$97.5^{th}$) | | $relu_B$ | $relu_C$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| arg-rest | 1.94 | 1.06 | 2.77 | 2.25 | 0.97 | 5.26 | 0.11 | 0.08 | 0.15 | 0.13 | 0.01 | 0.39 | 0.03 | 0.02 |
| bll-2232 | 0.07 | 0.05 | 0.09 | 0.06 | 0.05 | 0.08 | 0.25 | 0.18 | 0.35 | 0.43 | 0.22 | 0.59 | 0.95 | 0.60 |
| bll-nsea | 2.13 | 1.88 | 2.56 | 3.49 | 1.83 | 6.66 | 0.60 | 0.46 | 0.79 | 0.82 | 0.58 | 0.90 | 0.90 | **0.40** |
| boc-nea | 88.2 | 38.0 | 264 | 149 | 30.4 | 730 | 0.11 | 0.08 | 0.16 | 0.18 | 0.01 | 0.39 | 3.53 | **1.27** |
| bsk-nea | | | | 1.98 | 0.66 | 5.92 | | | | 0.17 | 0.01 | 0.39 | | 0.01 |
| cod-2532 | 96.6 | 52.1 | 126 | 84.5 | 57.7 | 124 | 0.17 | 0.11 | 0.26 | 0.29 | 0.02 | 0.40 | 1.19 | 0.76 |
| cod-rock | 1.96 | 1.36 | 2.85 | 1.42 | 0.79 | 2.55 | **0.005** | **0.003** | **0.006** | 0.10 | 0.01 | 0.38 | 0.95 | **0.06** |
| dab-2232 | 1.91 | 1.18 | 2.44 | 1.82 | 1.67 | 1.97 | **0.70** | 0.54 | 0.88 | 0.53 | 0.26 | 0.60 | 0.50 | 0.69 |
| dab-nsea | 6.97 | 5.46 | 8.82 | 9.08 | 8.14 | 10.13 | **0.88** | **0.70** | **1.13** | 0.52 | 0.25 | 0.60 | 0.49 | 0.63 |
| eel-eur | **25.4** | **16.9** | **41.2** | 13.0 | 11.5 | 14.80 | 0.04 | 0.03 | 0.06 | 0.09 | 0.02 | 0.19 | 2.39 | 2.11 |
| fle-2223 | 1.95 | 0.82 | 2.9 | 1.63 | 1.34 | 1.98 | **0.83** | 0.52 | 1.18 | 0.50 | 0.25 | 0.60 | 0.41 | **0.79** |
| fle-2425 | 10.3 | 7.01 | 15.6 | 17.9 | 8.81 | 36.3 | **1.16** | 0.86 | 1.59 | 0.80 | 0.53 | 0.90 | 0.55 | 0.46 |
| fle-2628 | 3.94 | 3.40 | 4.77 | 4.35 | 3.38 | 5.61 | 0.14 | 0.11 | 0.17 | 0.28 | 0.03 | 0.39 | 4.19 | **1.88** |
| fle-2732 | **0.30** | 0.22 | 0.36 | 0.35 | 0.31 | 0.39 | **0.66** | 0.50 | 0.85 | 0.50 | 0.25 | 0.60 | 0.52 | 0.59 |
| fle-nsea | 3.39 | 2.66 | 4.43 | 3.67 | 3.21 | 4.19 | 0.32 | 0.25 | 0.39 | 0.48 | 0.24 | 0.60 | 0.98 | 0.59 |
| gfb-comb | 2.93 | 1.92 | 4.54 | 3.45 | 2.93 | 4.07 | 0.47 | 0.38 | 0.59 | 0.50 | 0.24 | 0.59 | 0.80 | 0.64 |
| lem-nsea | 7.19 | 6.05 | 8.22 | 6.79 | 6.07 | 7.58 | 0.32 | 0.27 | 0.39 | 0.52 | 0.26 | 0.60 | 0.83 | 0.54 |
| mur-347d | 2.16 | 1.90 | 2.58 | 2.32 | 1.94 | 2.78 | 0.20 | 0.15 | 0.26 | 0.33 | 0.14 | 0.40 | 1.90 | 1.05 |
| nep-2829 | 0.41 | 0.29 | 0.59 | 0.41 | 0.27 | 0.63 | 0.37 | 0.30 | 0.45 | 0.25 | 0.02 | 0.40 | 0.66 | 0.94 |
| Pan_bor_1 | 0.67 | 0.58 | 0.78 | 0.66 | 0.49 | 0.90 | 0.14 | 0.12 | 0.17 | 0.23 | 0.02 | 0.39 | 1.56 | 0.97 |
| Pan_bor_2 | 2.00 | 1.69 | 2.38 | 2.10 | 1.41 | 3.11 | 0.18 | 0.12 | 0.24 | 0.14 | 0.01 | 0.38 | 1.27 | 1.57 |
| ple-2123 | 2.45 | 1.66 | 3.5 | 3.01 | 2.39 | 3.8 | **1.01** | **0.79** | **1.30** | 0.47 | 0.25 | 0.59 | 0.37 | **0.63** |
| ple-2432 | 0.91 | 0.53 | 1.37 | 0.88 | 0.71 | 1.08 | **0.62** | **0.48** | **0.79** | 0.27 | 0.2 | 0.4 | 0.70 | **1.66** |
| rjh-pore | | | | 0.58 | 0.29 | 1.15 | | | | 0.49 | 0.22 | 0.60 | | 0.35 |
| sar-78 | 32.7 | 25.8 | 44.4 | 54.3 | 28.3 | 104 | 0.71 | 0.52 | 0.98 | 0.79 | 0.53 | 0.89 | 0.88 | 0.48 |
| sck-nea | | | | 0.60 | 0.27 | 1.30 | | | | 0.11 | 0.01 | 0.39 | | 0.002 |
| smn-dp | 53.1 | 18.1 | 112 | 36.5 | 22.0 | 60.5 | 0.17 | 0.12 | 0.25 | 0.27 | 0.02 | 0.40 | 1.82 | 1.73 |
| smn-sp | 94.1 | 30.6 | 209 | 67.5 | 21.4 | 213 | **0.01** | 0.01 | 0.02 | 0.23 | 0.02 | 0.40 | 1.49 | 0.12 |
| tur-2232 | 0.75 | 0.62 | 0.95 | 0.89 | 0.42 | 1.90 | 0.18 | 0.13 | 0.24 | 0.18 | 0.01 | 0.39 | 1.00 | 0.84 |
| tur-kask | 0.18 | 0.15 | 0.22 | 0.19 | 0.12 | 0.30 | 0.16 | 0.13 | 0.20 | 0.30 | 0.03 | 0.40 | 2.24 | 1.12 |
| usk-oth | 10.4 | 7.09 | 16.0 | 10.3 | 7.77 | 13.7 | 0.56 | 0.45 | 0.70 | 0.50 | 0.26 | 0.60 | 0.61 | 0.69 |

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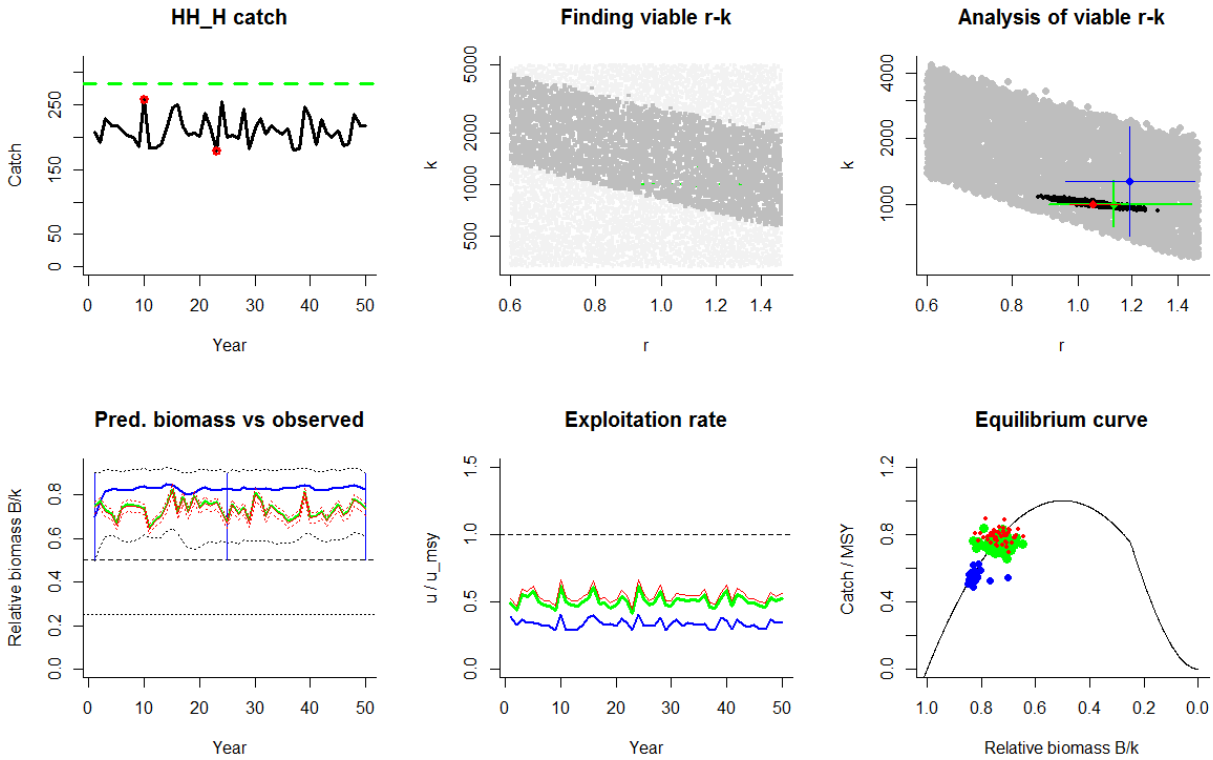
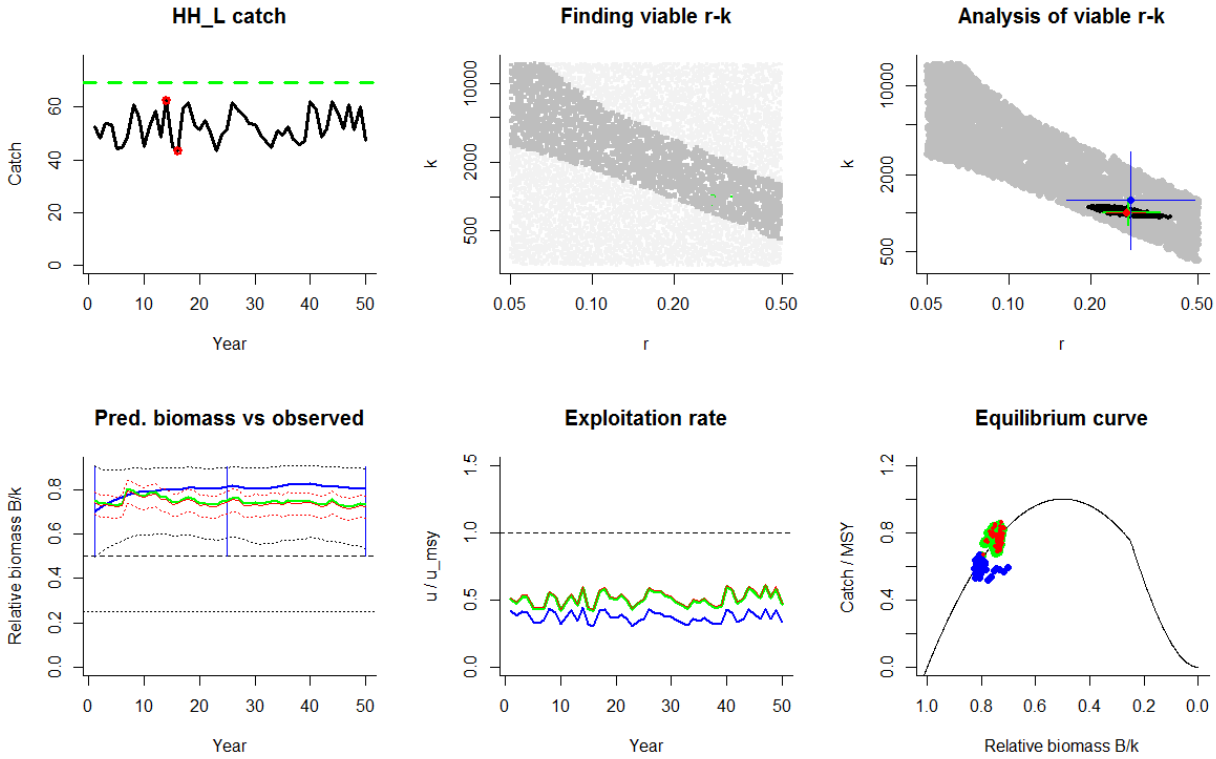
# Appendix I: Simulated stocks with catch and biomass

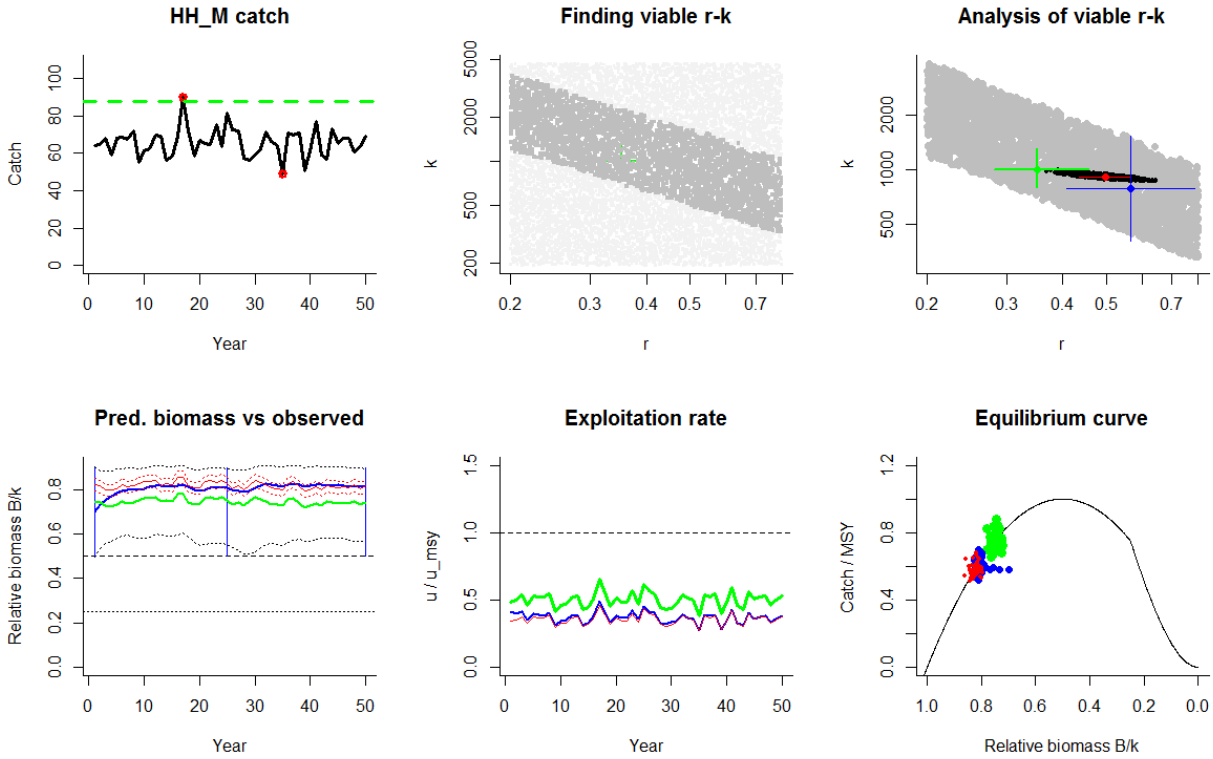
[CMSY_45y.R, SimCatch_6.csv, SimSpec_6.csv
Process error: Sim = 0.2, CMSY = 0.1; Observation error: Sim = 0.1, CMSY = 0.1]
Species: NA , stock: HH_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.6 - 1.5 , prior range for k = 332 - 4984
True values used in simulation: r = 1.13 , k = 1000 , MSY = 282
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.05 , 95% CL = 0.972 - 1.15 , k = 1009 , 95% CL = 976 - 1046
MSY = 266 , 95% CL = 253 - 283
Biomass in last year = 739 or 0.732 k
Exploitation rate in last year = 0.302 or 0.574 u.msy
Results of CMSY analysis with altogether 42576 viable trajectories for 4391 r-k pairs
r = 1.19 , 95% CL = 0.957 - 1.48 , k = 1281 , 95% CL = 722 - 2271
MSY = 381 , 95% CL = 191 - 764
Relative biomass last year= 0.828 k, 2.5th = 0.609 , 97.5th = 0.897
Relative biomass next year= 0.819 k, 2.5th = 0.589 , 97.5th = 0.91
Relative exploitation rate in last year= 0.343
Comment: Simulated data
---



Species: NA , stock: HH_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.05 - 0.5 , prior range for k = 248 - 14890
True values used in simulation: r = 0.278 , k = 1000 , MSY = 69.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.273 , 95% CL = 0.229 - 0.319 , k = 1010 , 95% CL = 952 - 1090
MSY = 68.9 , 95% CL = 61.3 - 76.9
Biomass in last year = 731 or 0.723 k
Exploitation rate in last year = 0.0726 or 0.532 u.msy
Results of CMSY analysis with altogether 30883 viable trajectories for 3176 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 1256 , 95% CL = 519 - 3038
MSY = 88.6 , 95% CL = 45.8 - 172
Relative biomass last year= 0.801 k, 2.5th = 0.535 , 97.5th = 0.894
Relative biomass next year= 0.803 k, 2.5th = 0.535 , 97.5th = 0.895
Relative exploitation rate in last year= 0.336
Comment: Simulated data
---



Species: NA , stock: HH_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.2 - 0.8 , prior range for k = 193 - 4638
True values used in simulation: r = 0.352 , k = 1000 , MSY = 88
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.498 , 95% CL = 0.435 - 0.565 , k = 909 , 95% CL = 881 - 943
MSY = 113 , 95% CL = 102 - 125
Biomass in last year = 744 or 0.818 k
Exploitation rate in last year = 0.0867 or 0.348 u.msy
Results of CMSY analysis with altogether 36751 viable trajectories for 3632 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 783 , 95% CL = 404 - 1518
MSY = 111 , 95% CL = 57.5 - 213
Relative biomass last year= 0.816 k, 2.5th = 0.569 , 97.5th = 0.897
Relative biomass next year= 0.818 k, 2.5th = 0.571 , 97.5th = 0.901
Relative exploitation rate in last year= 0.383
Comment: Simulated data
---



Species: NA , stock: HH_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.015 - 0.1 , prior range for k = 199 - 7966
True values used in simulation: r = 0.047 , k = 1000 , MSY = 11.8
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0495 , 95% CL = 0.0244 - 0.0797 , k = 1022 , 95% CL = 877 - 1274
MSY = 12.6 , 95% CL = 6.8 - 18.4
Biomass in last year = 734 or 0.718 k
Exploitation rate in last year = 0.0121 or 0.489 u.msy
Results of CMSY analysis with altogether 53529 viable trajectories for 6256 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 1250 , 95% CL = 402 - 3887
MSY = 19.4 , 95% CL = 5.03 - 74.7
Relative biomass last year= 0.805 k, 2.5th = 0.527 , 97.5th = 0.897
Relative biomass next year= 0.806 k, 2.5th = 0.525 , 97.5th = 0.898
Relative exploitation rate in last year= 0.31
Comment: Simulated data
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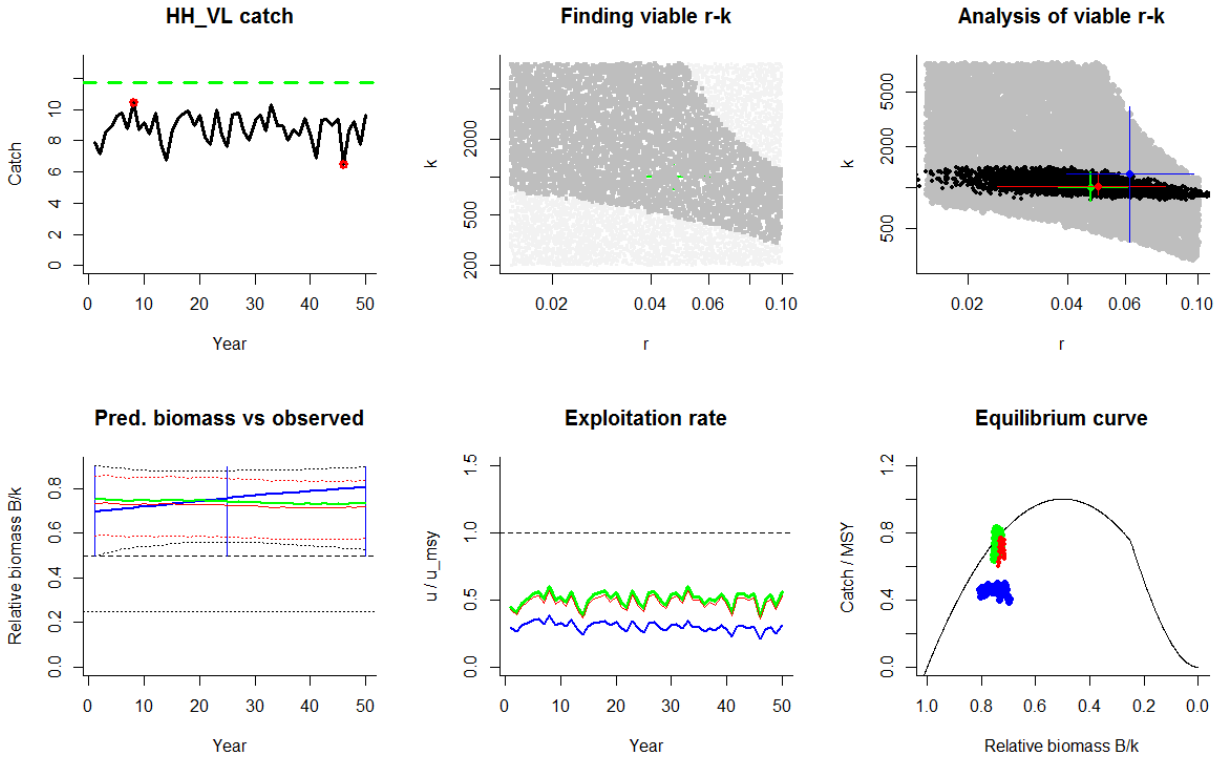

Species: NA , stock: HL_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.6 - 1.5 , prior range for k = 191 - 1913
True values used in simulation: r = 0.86 , k = 1000 , MSY = 215
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.939 , 95% CL = 0.884 - 1.01 , k = 955 , 95% CL = 900 - 1010
MSY = 225 , 95% CL = 217 - 234
Biomass in last year = 298 or 0.312 k
Exploitation rate in last year = 0.531 or 1.13 u.msy
Results of CMSY analysis with altogether 72 viable trajectories for 72 r-k pairs
r = 1.09 , 95% CL = 0.883 - 1.44 , k = 842 , 95% CL = 607 - 1096
MSY = 230 , 95% CL = 207 - 254
Relative biomass last year= 0.33 k, 2.5th = 0.105 , 97.5th = 0.391
Relative biomass next year= 0.363 k, 2.5th = -0.0457 , 97.5th = 0.553
Relative exploitation rate in last year= 1.01
Comment: Simulated data
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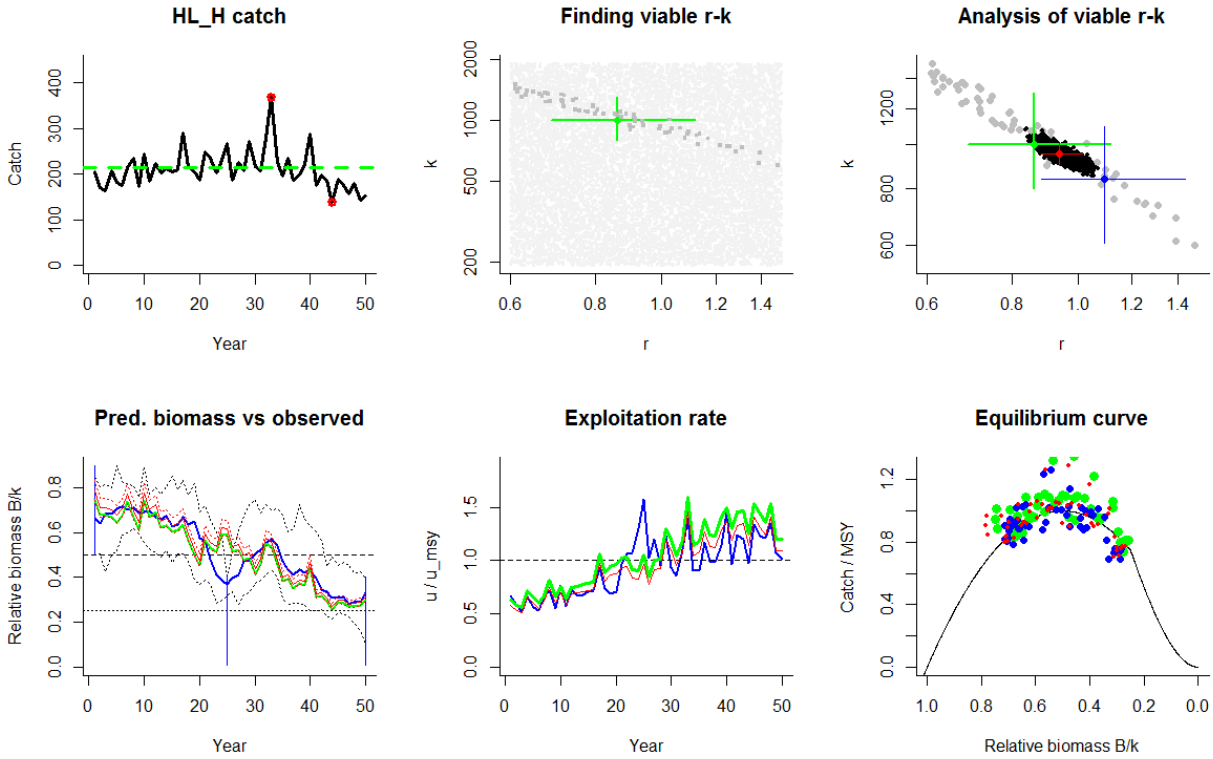
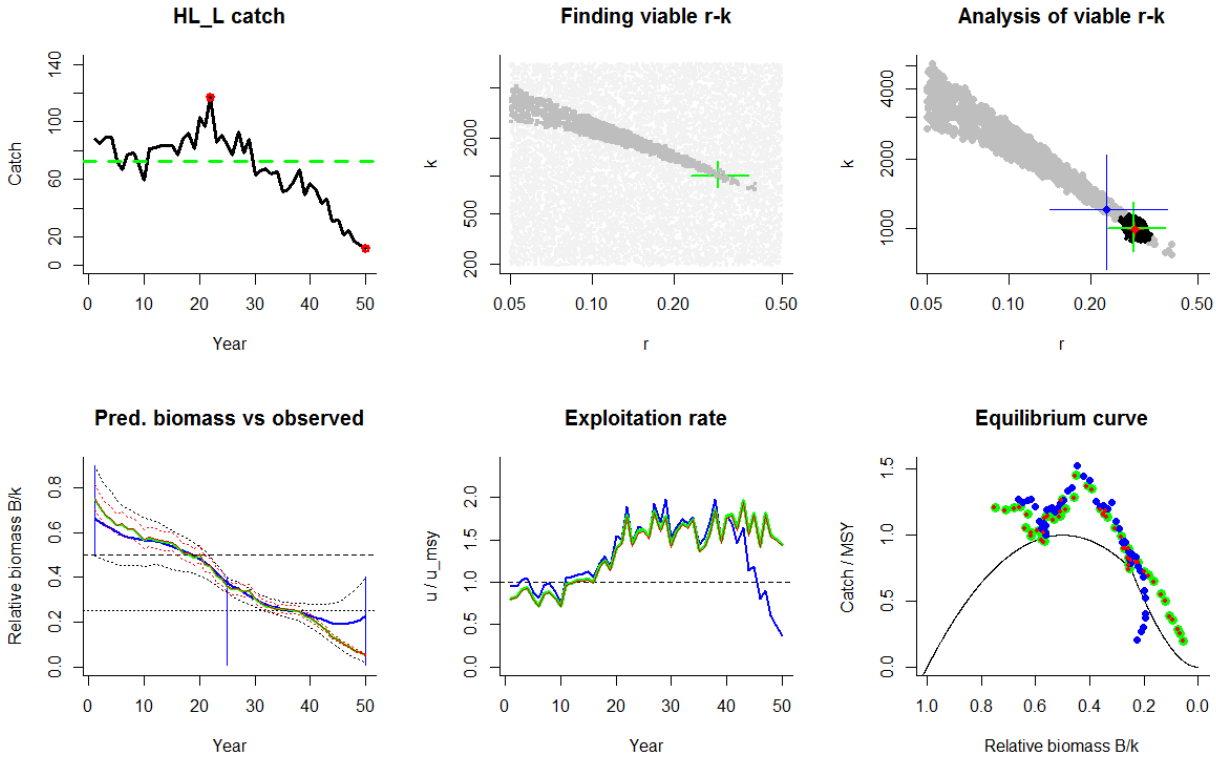


Species: NA , stock: HL_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.05 - 0.5 , prior range for k = 194 - 7754
True values used in simulation: r = 0.29 , k = 1000 , MSY = 72.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.293 , 95% CL = 0.275 - 0.313 , k = 995 , 95% CL = 923 - 1072
MSY = 72.9 , 95% CL = 67.5 - 78.8
Biomass in last year = 55.4 or 0.0557 k
Exploitation rate in last year = 0.259 or 1.76 u.msy
Results of CMSY analysis with altogether 2910 viable trajectories for 1426 r-k pairs
r = 0.229 , 95% CL = 0.142 - 0.387 , k = 1207 , 95% CL = 669 - 2071
MSY = 69 , 95% CL = 60.7 - 78.4
Relative biomass last year= 0.227 k, 2.5th = 0.0186 , 97.5th = 0.396
Relative biomass next year= 0.244 k, 2.5th = 0.0081 , 97.5th = 0.431
Relative exploitation rate in last year= 0.37
Comment: Simulated data
---



Species: NA , stock: HL_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.2 - 0.8 , prior range for k = 192 - 3079
True values used in simulation: r = 0.48 , k = 1000 , MSY = 120
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.504 , 95% CL = 0.452 - 0.58 , k = 611 , 95% CL = 522 - 718
MSY = 77.3 , 95% CL = 63.5 - 95
Biomass in last year = 1.2 or 0.00196 k
Exploitation rate in last year = 0.66 or 2.62 u.msy
Results of CMSY analysis with altogether 1389 viable trajectories for 1010 r-k pairs
r = 0.408 , 95% CL = 0.324 - 0.606 , k = 1125 , 95% CL = 728 - 1473
MSY = 115 , 95% CL = 106 - 124
Relative biomass last year= 0.109 k, 2.5th = 0.0138 , 97.5th = 0.378
Relative biomass next year= 0.126 k, 2.5th = 0.0135 , 97.5th = 0.464
Relative exploitation rate in last year= 0.0177
Comment: Simulated data
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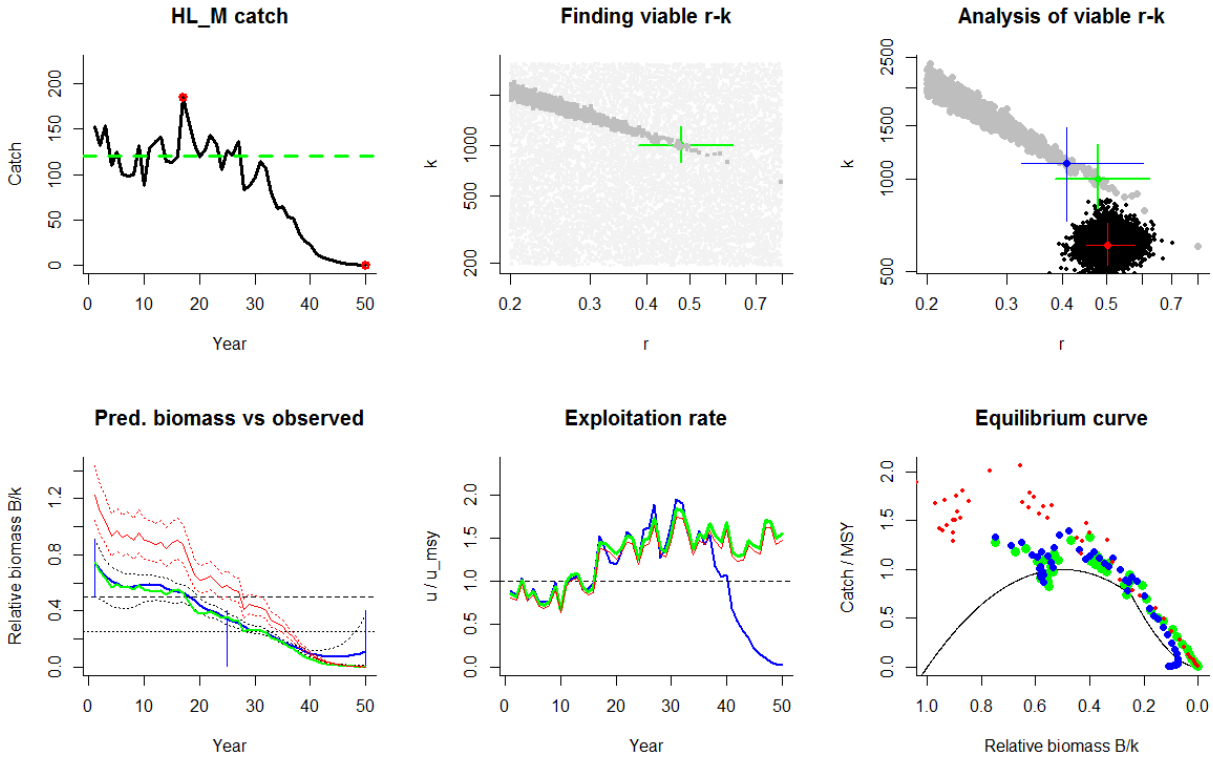

Species: NA , stock: HL_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.015 - 0.1 , prior range for k = 481 - 12824
True values used in simulation: r = 0.068 , k = 1000 , MSY = 17
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0683 , 95% CL = 0.0553 - 0.0833 , k = 1055 , 95% CL = 894 - 1202
MSY = 18 , 95% CL = 14 - 22.7
Biomass in last year = 60.9 or 0.0577 k
Exploitation rate in last year = 0.0909 or 2.66 u.msy
Results of CMSY analysis with altogether 8501 viable trajectories for 2468 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 1163 , 95% CL = 603 - 2244
MSY = 18 , 95% CL = 11.9 - 27.3
Relative biomass last year= 0.265 k, 2.5th = 0.0175 , 97.5th = 0.396
Relative biomass next year= 0.271 k, 2.5th = 0.0125 , 97.5th = 0.406
Relative exploitation rate in last year= 0.513
Comment: Simulated data
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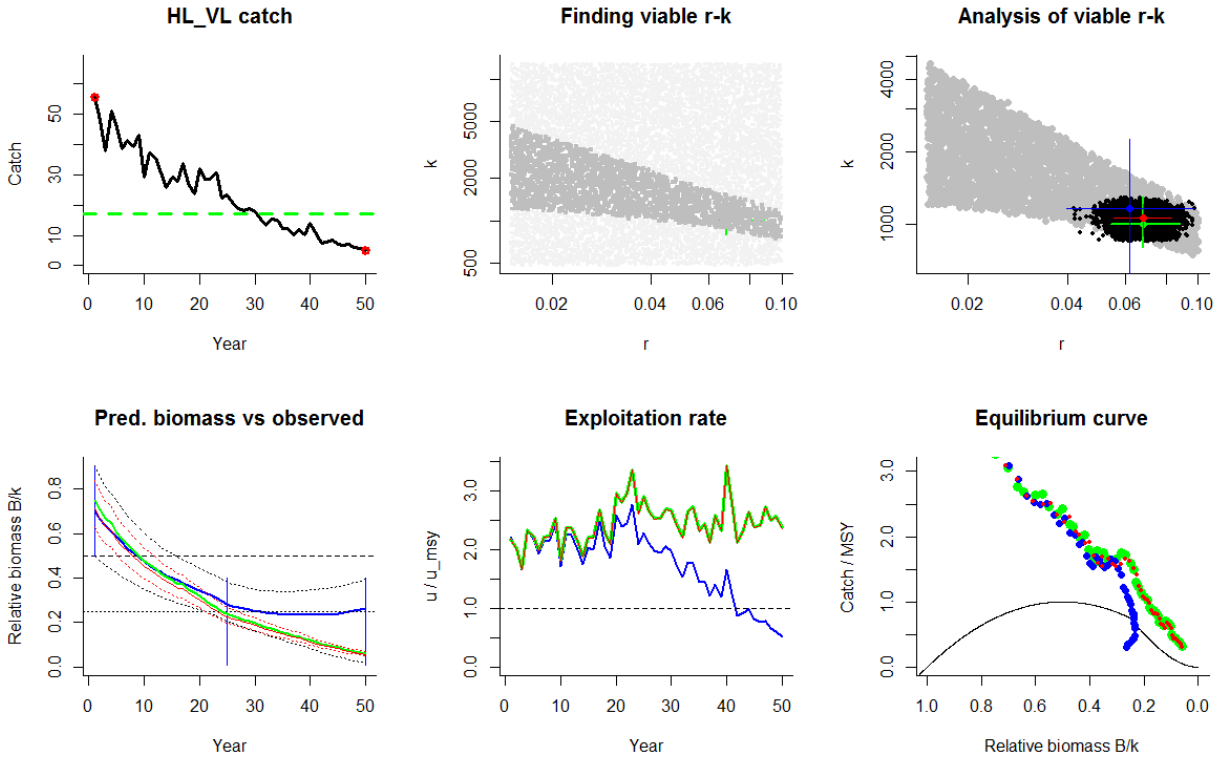

Species: NA , stock: HLH_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.6 - 1.5 , prior range for k = 430 - 6454
True values used in simulation: r = 1.05 , k = 1000 , MSY = 262
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.06 , 95% CL = 1.02 - 1.13 , k = 973 , 95% CL = 914 - 1030
MSY = 259 , 95% CL = 248 - 272
Biomass in last year = 736 or 0.756 k
Exploitation rate in last year = 0.252 or 0.474 u.msy
Results of CMSY analysis with altogether 1627 viable trajectories for 1254 r-k pairs
r = 1.15 , 95% CL = 0.938 - 1.47 , k = 917 , 95% CL = 690 - 1170
MSY = 264 , 95% CL = 244 - 285
Relative biomass last year= 0.774 k, 2.5th = 0.714 , 97.5th = 0.824
Relative biomass next year= 0.773 k, 2.5th = 0.712 , 97.5th = 0.836
Relative exploitation rate in last year= 0.466
Comment: Simulated data
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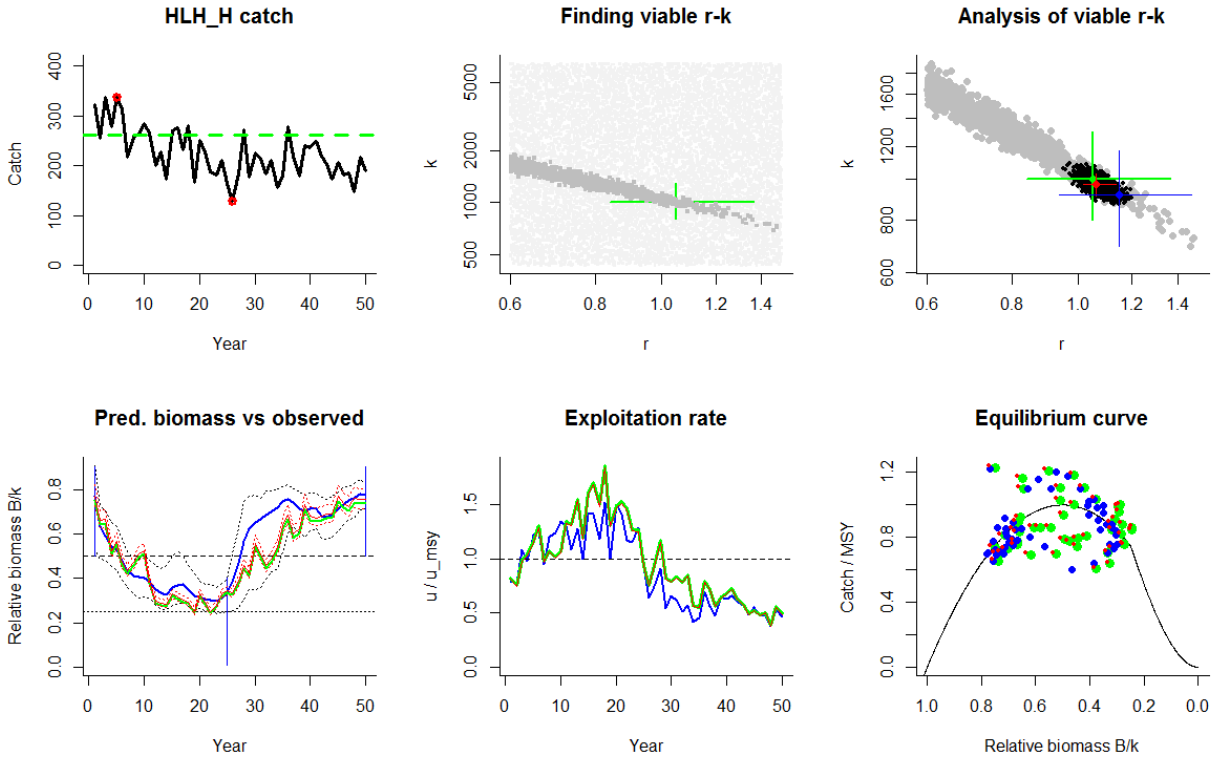

Species: NA , stock: HLH_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.05 - 0.5 , prior range for k = 403 - 24154
True values used in simulation: r = 0.24 , k = 1000 , MSY = 60
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.244 , 95% CL = 0.225 - 0.266 , k = 981 , 95% CL = 890 - 1082
MSY = 59.8 , 95% CL = 54.5 - 65.9
Biomass in last year = 656 or 0.669 k
Exploitation rate in last year = 0.06 or 0.492 u.msy
Results of CMSY analysis with altogether 2215 viable trajectories for 756 r-k pairs
r = 0.279 , 95% CL = 0.16 - 0.488 , k = 930 , 95% CL = 481 - 1797
MSY = 65 , 95% CL = 53.2 - 79.3
Relative biomass last year= 0.814 k, 2.5th = 0.587 , 97.5th = 0.87
Relative biomass next year= 0.814 k, 2.5th = 0.594 , 97.5th = 0.865
Relative exploitation rate in last year= 0.369
Comment: Simulated data
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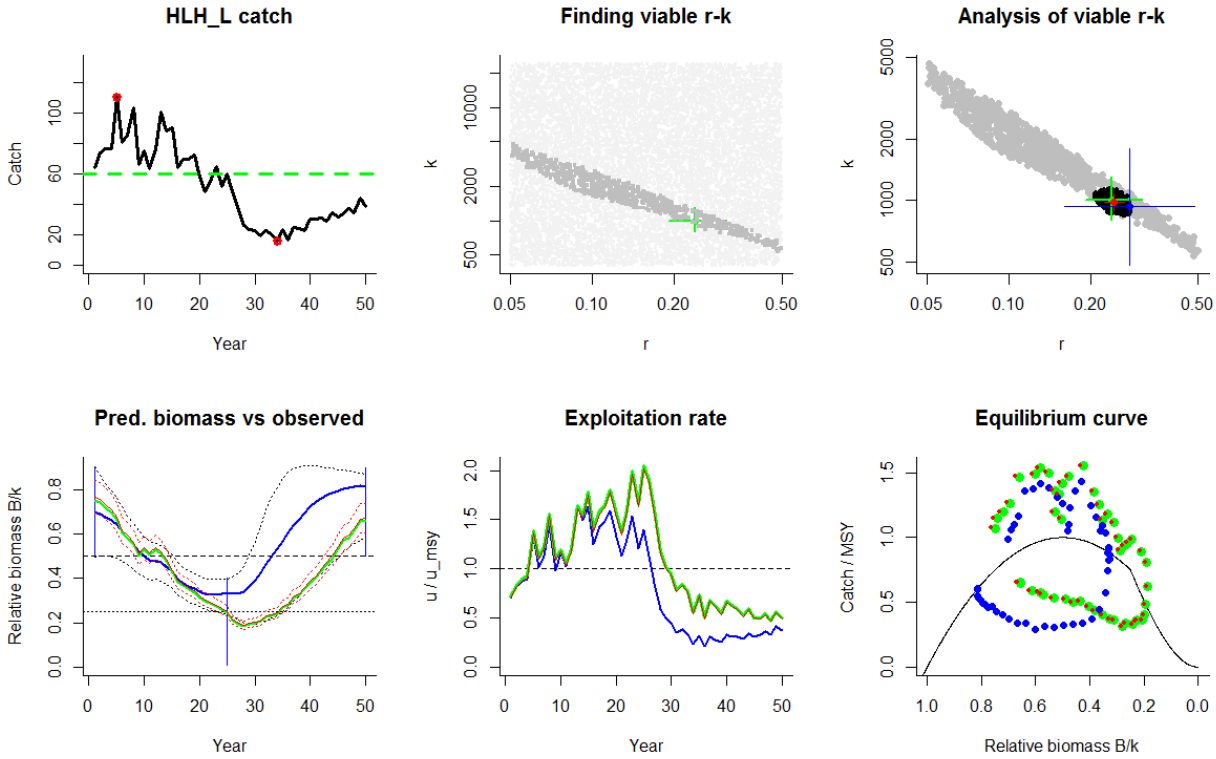

Species: NA , stock: HLH_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.2 - 0.8 , prior range for k = 301 - 7236
True values used in simulation: r = 0.32 , k = 1000 , MSY = 80
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.357 , 95% CL = 0.326 - 0.393 , k = 920 , 95% CL = 851 - 1015
MSY = 82.2 , 95% CL = 77.6 - 87.6
Biomass in last year = 748 or 0.813 k
Exploitation rate in last year = 0.0772 or 0.432 u.msy
Results of CMSY analysis with altogether 1720 viable trajectories for 603 r-k pairs
r = 0.513 , 95% CL = 0.381 - 0.777 , k = 662 , 95% CL = 411 - 947
MSY = 84.9 , 95% CL = 75.2 - 95.8
Relative biomass last year= 0.774 k, 2.5th = 0.715 , 97.5th = 0.821
Relative biomass next year= 0.774 k, 2.5th = 0.713 , 97.5th = 0.82
Relative exploitation rate in last year= 0.469
Comment: Simulated data
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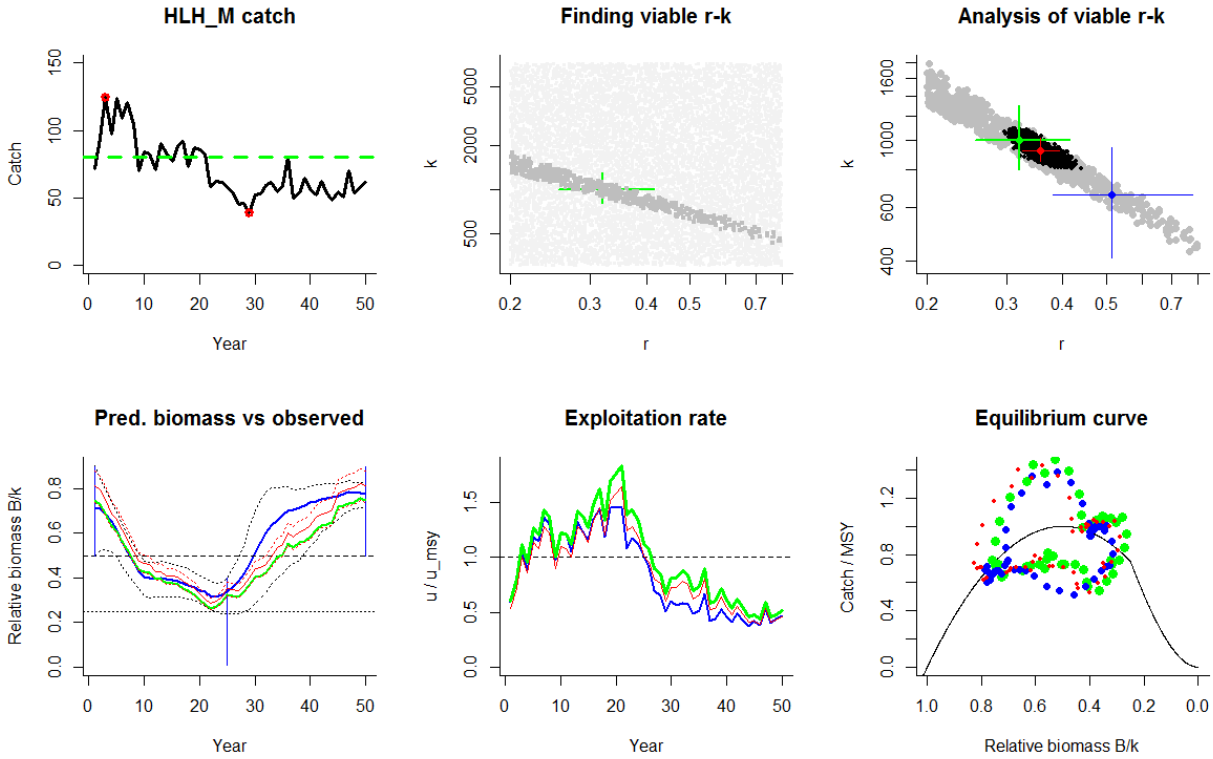
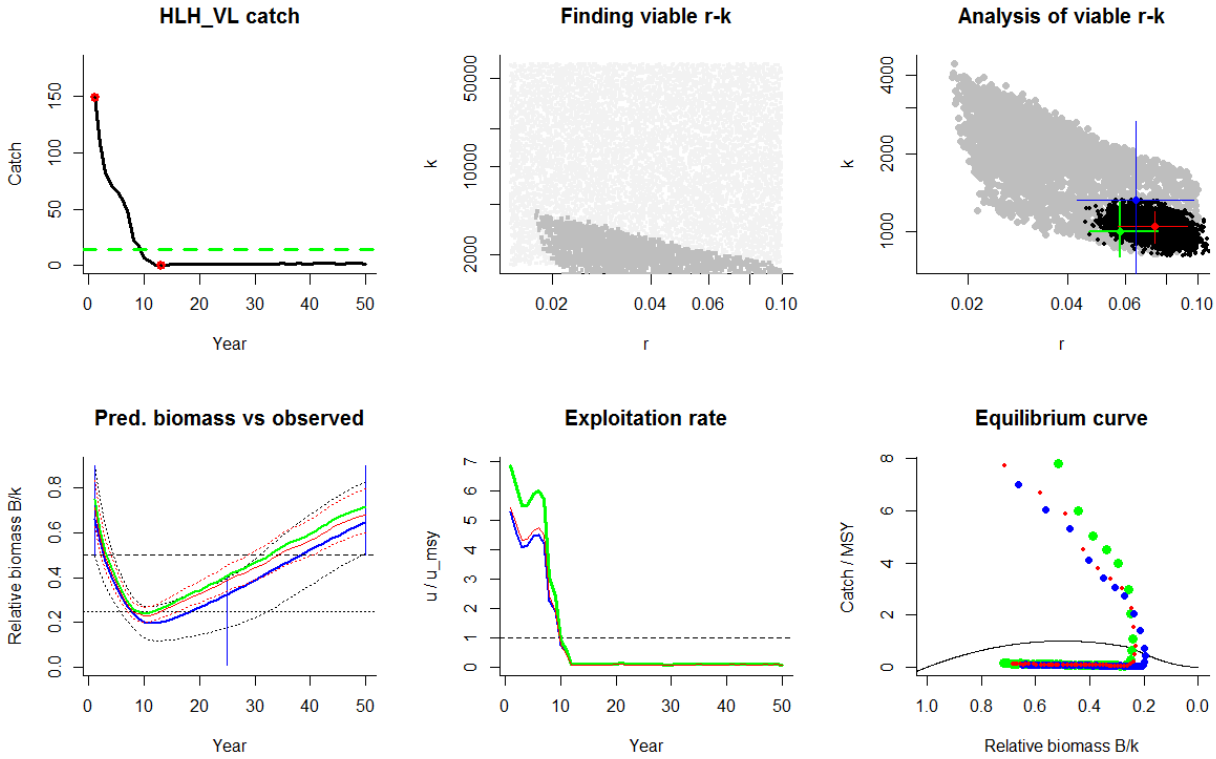
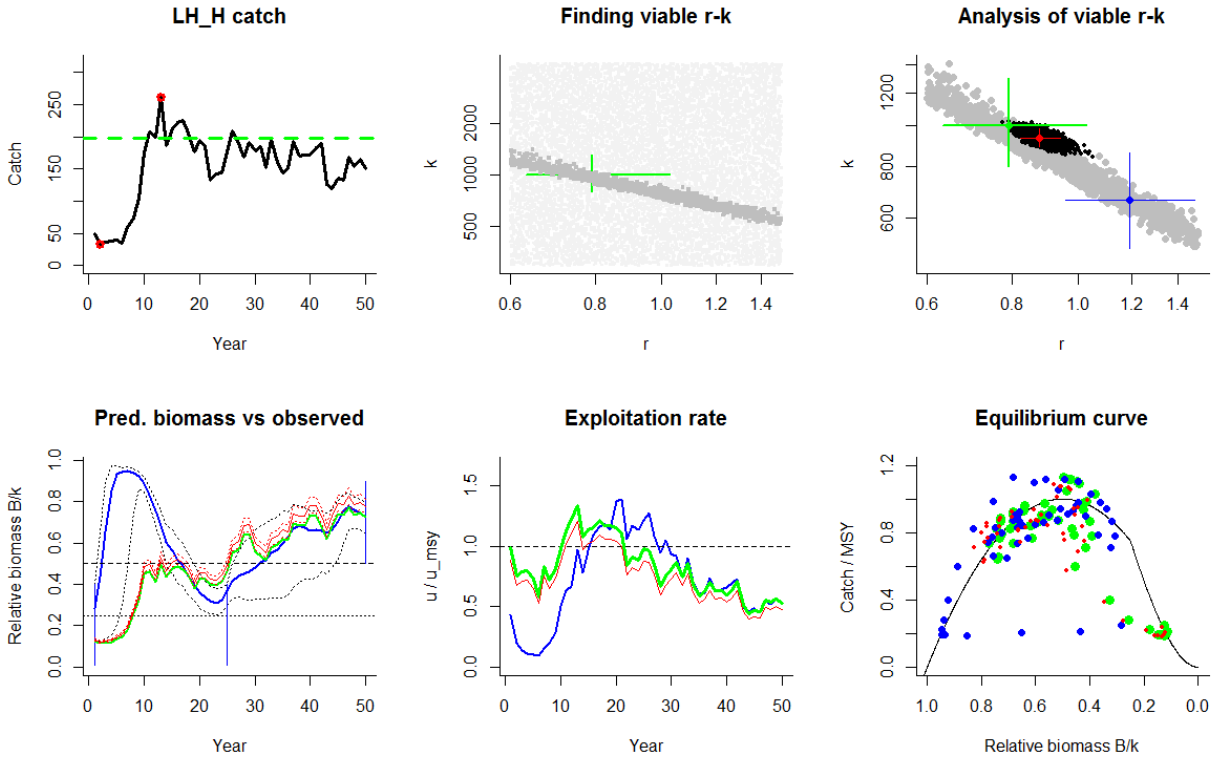


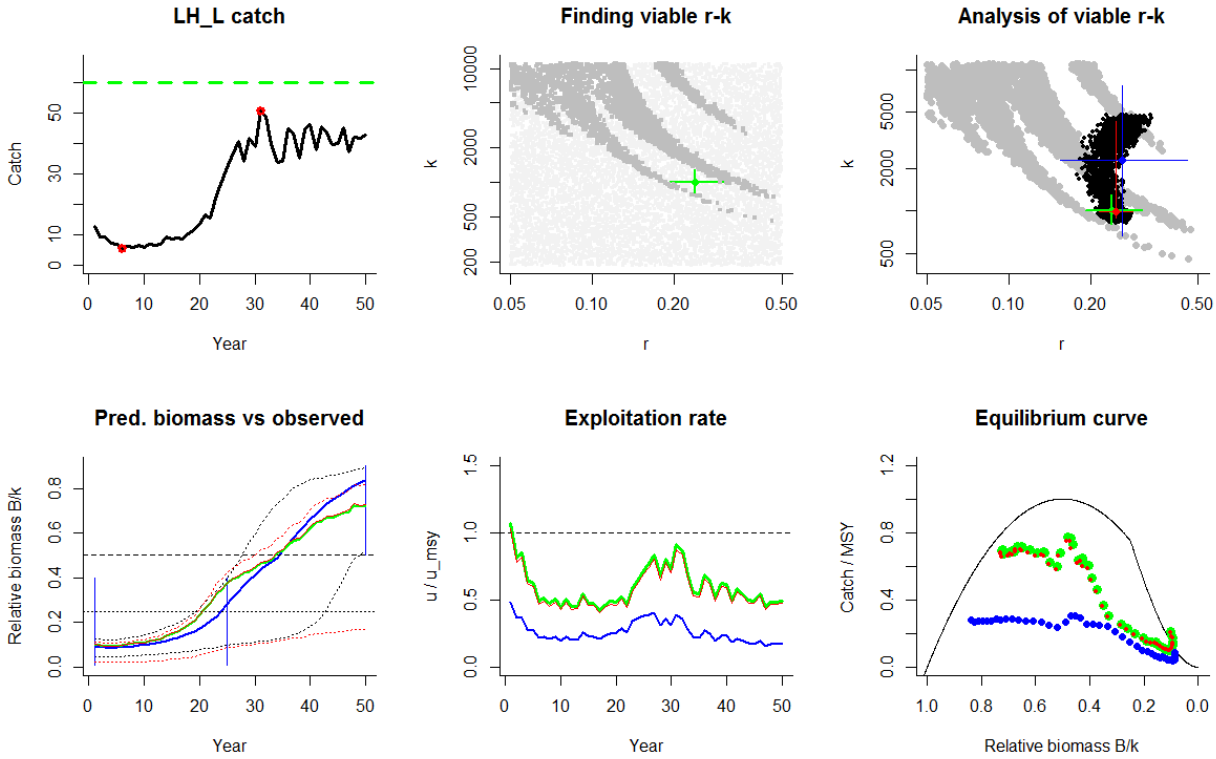
Species: NA , stock: HLH_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.015 - 0.1 , prior range for k = 821 - 65668
True values used in simulation: r = 0.058 , k = 1000 , MSY = 14.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0736 , 95% CL = 0.057 - 0.0927 , k = 1052 , 95% CL = 900 - 1197
MSY = 19.3 , 95% CL = 15.1 - 23.8
Biomass in last year = 717 or 0.681 k
Exploitation rate in last year = 0.00279 or 0.0757 u.msy
Results of CMSY analysis with altogether 5020 viable trajectories for 2662 r-k pairs
r = 0.0646 , 95% CL = 0.0429 - 0.0971 , k = 1318 , 95% CL = 657 - 2648
MSY = 21.3 , 95% CL = 12.1 - 37.5
Relative biomass last year= 0.648 k, 2.5th = 0.509 , 97.5th = 0.829
Relative biomass next year= 0.659 k, 2.5th = 0.521 , 97.5th = 0.84
Relative exploitation rate in last year= 0.0628
Comment: Simulated data
---



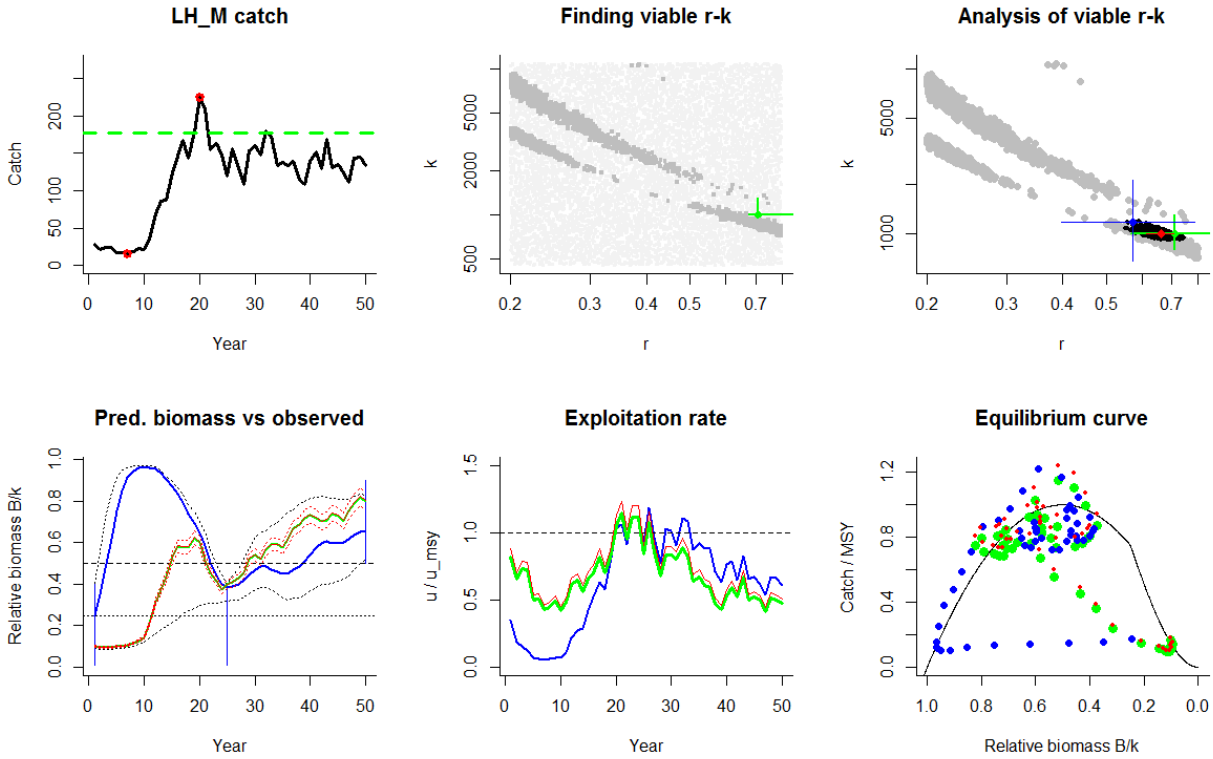
Species: NA , stock: LH_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.6 - 1.5 , prior range for k = 296 - 4438
True values used in simulation: r = 0.79 , k = 1000 , MSY = 198
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.877 , 95% CL = 0.824 - 0.942 , k = 934 , 95% CL = 890 - 980
MSY = 205 , 95% CL = 196 - 216
Biomass in last year = 724 or 0.775 k
Exploitation rate in last year = 0.217 or 0.494 u.msy
Results of CMSY analysis with altogether 1932 viable trajectories for 1405 r-k pairs
r = 1.19 , 95% CL = 0.957 - 1.48 , k = 661 , 95% CL = 509 - 859
MSY = 197 , 95% CL = 181 - 214
Relative biomass last year= 0.727 k, 2.5th = 0.645 , 97.5th = 0.798
Relative biomass next year= 0.722 k, 2.5th = 0.639 , 97.5th = 0.795
Relative exploitation rate in last year= 0.526
Comment: Simulated data
---



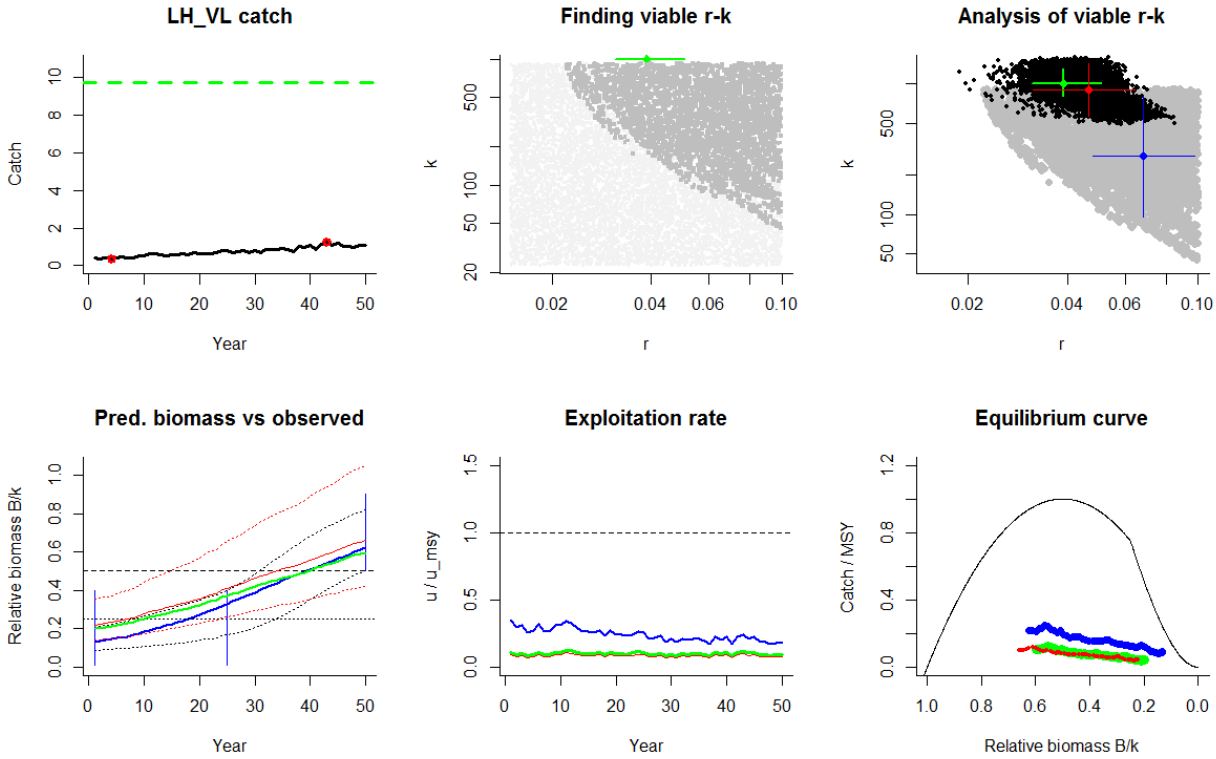
Species: NA , stock: LH_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.05 - 0.5 , prior range for k = 184 - 11070
True values used in simulation: r = 0.24 , k = 1000 , MSY = 60
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.25 , 95% CL = 0.216 - 0.287 , k = 991 , 95% CL = 885 - 4314
MSY = 61.6 , 95% CL = 53.9 - 299
Biomass in last year = 723 or 0.729 k
Exploitation rate in last year = 0.0582 or 0.466 u.msy
Results of CMSY analysis with altogether 2973 viable trajectories for 2955 r-k pairs
r = 0.262 , 95% CL = 0.155 - 0.456 , k = 2299 , 95% CL = 660 - 7745
MSY = 150 , 95% CL = 38.7 - 584
Relative biomass last year= 0.836 k, 2.5th = 0.525 , 97.5th = 0.894
Relative biomass next year= 0.843 k, 2.5th = 0.539 , 97.5th = 0.903
Relative exploitation rate in last year= 0.169
Comment: Simulated data
---



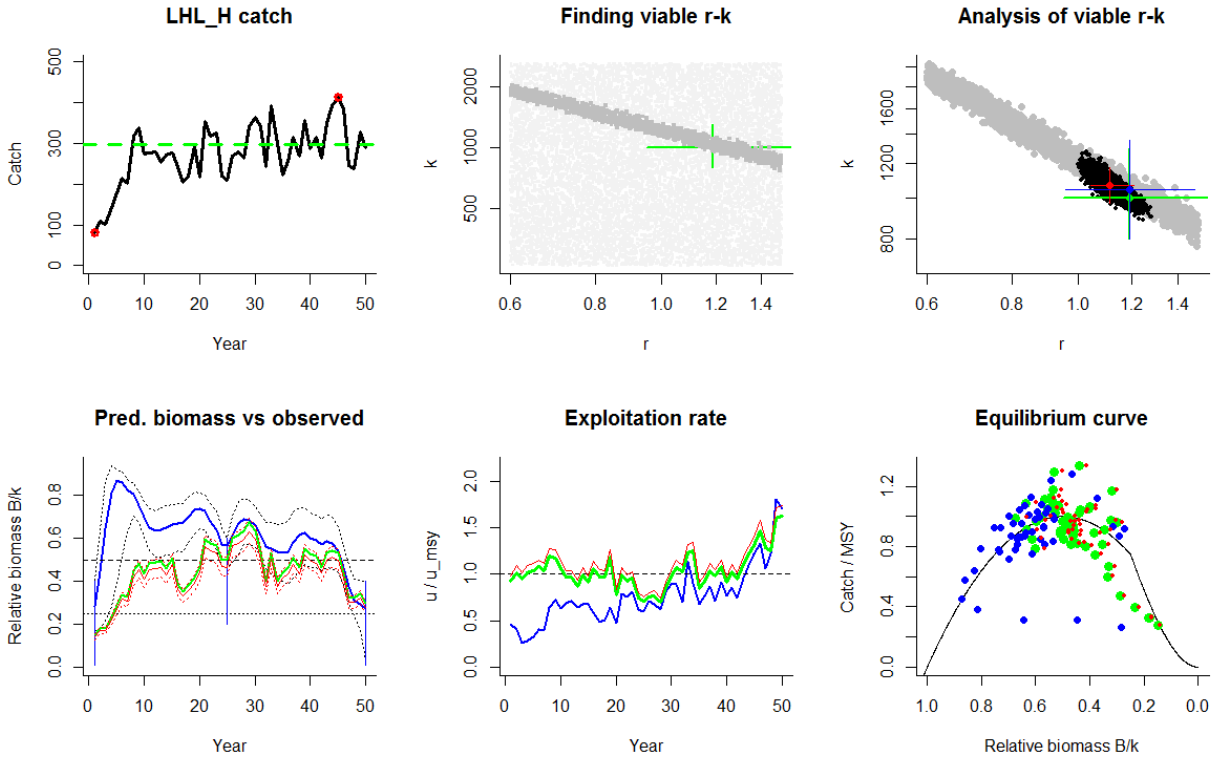
Species: NA , stock: LH_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.2 - 0.8 , prior range for k = 449 - 10787
True values used in simulation: r = 0.71 , k = 1000 , MSY = 178
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.661 , 95% CL = 0.612 - 0.704 , k = 997 , 95% CL = 949 - 1056
MSY = 165 , 95% CL = 156 - 173
Biomass in last year = 801 or 0.804 k
Exploitation rate in last year = 0.176 or 0.533 u.msy
Results of CMSY analysis with altogether 2109 viable trajectories for 1737 r-k pairs
r = 0.571 , 95% CL = 0.397 - 0.785 , k = 1176 , 95% CL = 686 - 2110
MSY = 168 , 95% CL = 109 - 259
Relative biomass last year= 0.659 k, 2.5th = 0.52 , 97.5th = 0.832
Relative biomass next year= 0.655 k, 2.5th = 0.522 , 97.5th = 0.826
Relative exploitation rate in last year= 0.607
Comment: Simulated data
---



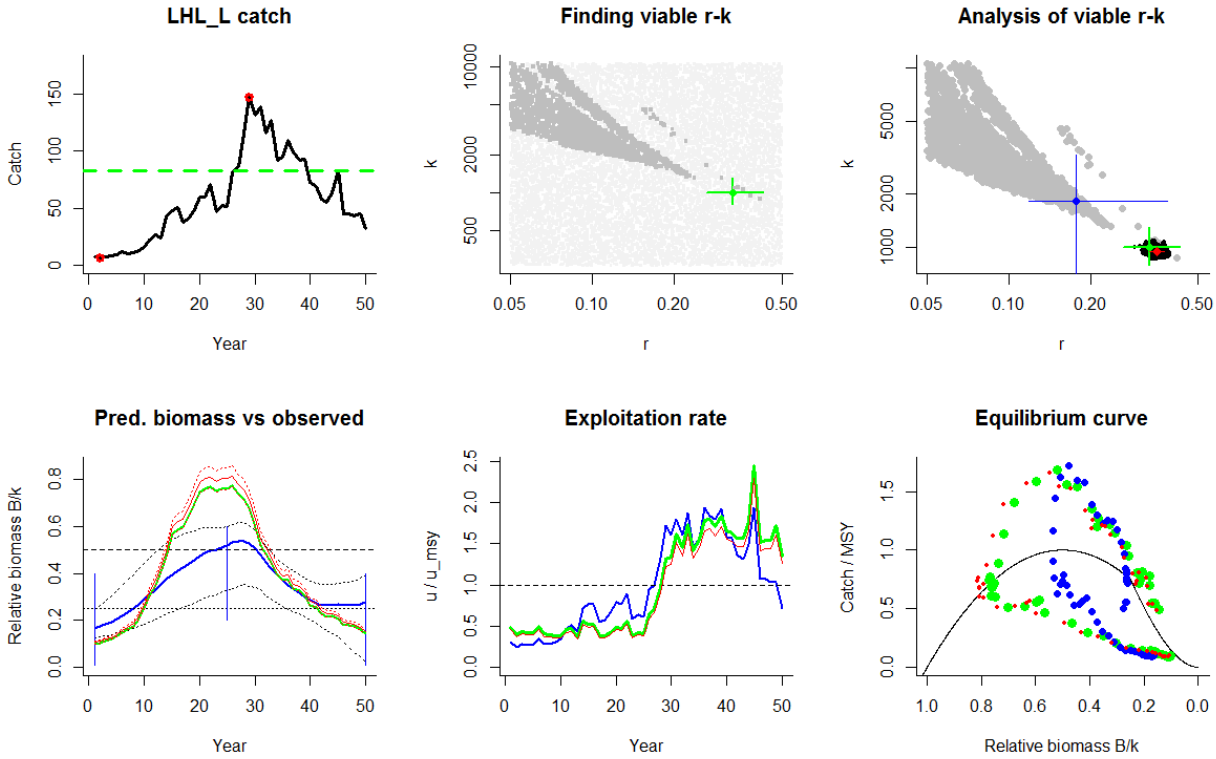
Species: NA , stock: LH_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.015 - 0.1 , prior range for k = 22.9 - 915
True values used in simulation: r = 0.039 , k = 1000 , MSY = 9.75
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0465 , 95% CL = 0.0316 - 0.0641 , k = 906 , 95% CL = 568 - 1424
MSY = 10.2 , 95% CL = 6.88 - 15.8
Biomass in last year = 597 or 0.659 k
Exploitation rate in last year = 0.00174 or 0.0748 u.msy
Results of CMSY analysis with altogether 4315 viable trajectories for 3643 r-k pairs
r = 0.0682 , 95% CL = 0.0478 - 0.0974 , k = 280 , 95% CL = 96.3 - 812
MSY = 4.77 , 95% CL = 1.19 - 19.2
Relative biomass last year= 0.623 k, 2.5th = 0.504 , 97.5th = 0.821
Relative biomass next year= 0.633 k, 2.5th = 0.515 , 97.5th = 0.831
Relative exploitation rate in last year= 0.178
Comment: Simulated data
---



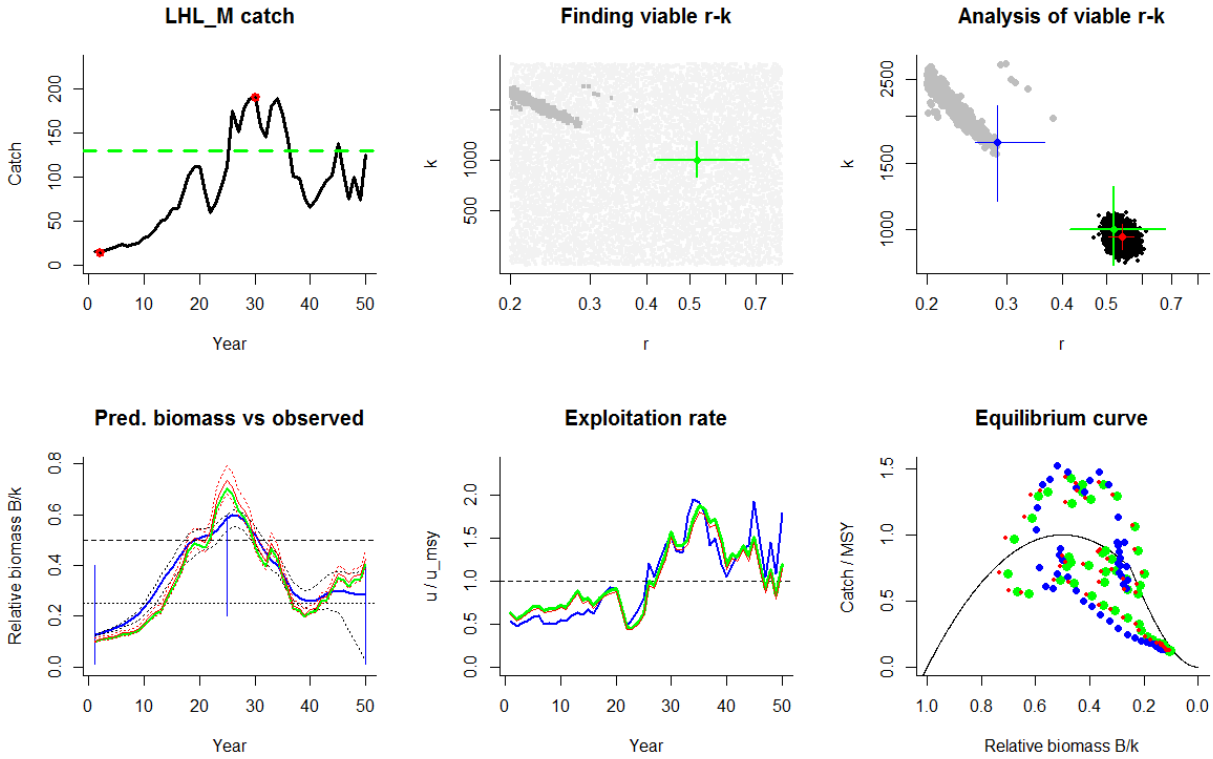
Species: NA , stock: LHL_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.6 - 1.5 , prior range for k = 261 - 2610
True values used in simulation: r = 1.19 , k = 1000 , MSY = 298
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.11 , 95% CL = 1.04 - 1.21 , k = 1065 , 95% CL = 971 - 1171
MSY = 296 , 95% CL = 282 - 312
Biomass in last year = 299 or 0.28 k
Exploitation rate in last year = 0.956 or 1.72 u.msy
Results of CMSY analysis with altogether 3498 viable trajectories for 1323 r-k pairs
r = 1.19 , 95% CL = 0.957 - 1.48 , k = 1043 , 95% CL = 801 - 1358
MSY = 311 , 95% CL = 284 - 340
Relative biomass last year= 0.273 k, 2.5th = 0.0312 , 97.5th = 0.394
Relative biomass next year= 0.232 k, 2.5th = -0.264 , 97.5th = 0.434
Relative exploitation rate in last year= 1.71
Comment: Simulated data
---



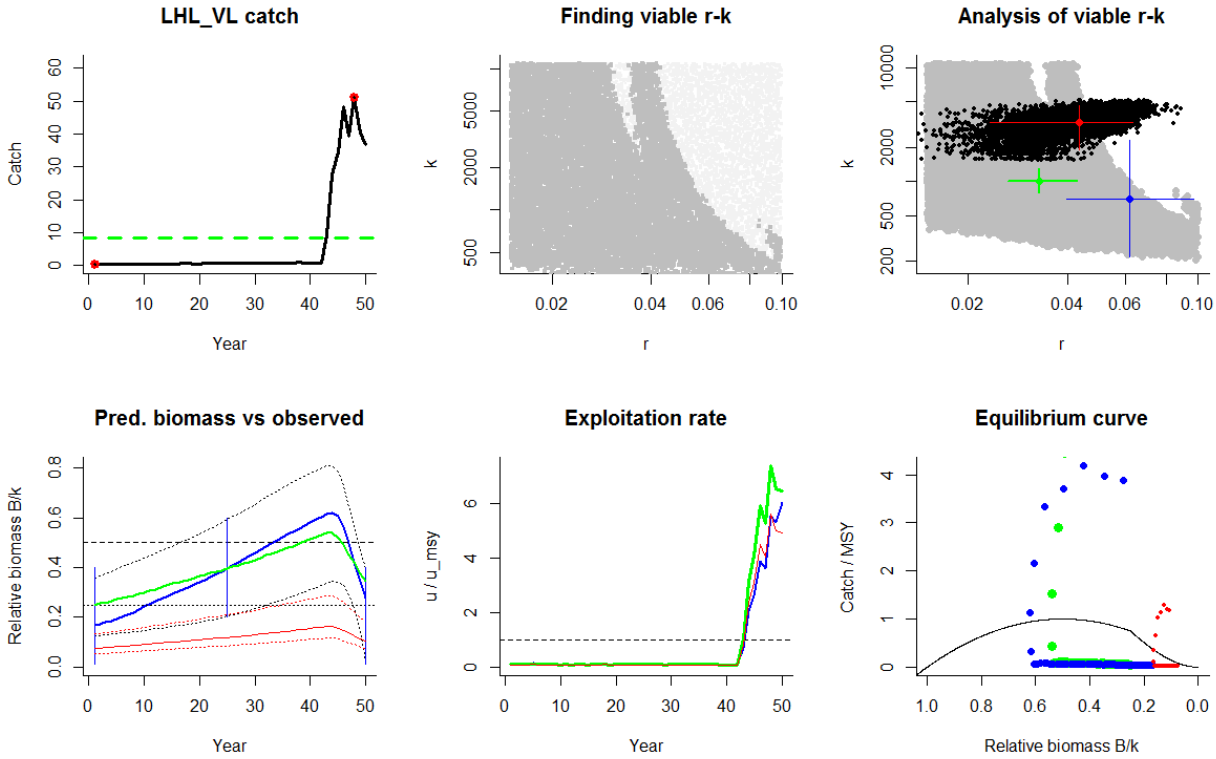
Species: NA , stock: LHL_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.05 - 0.5 , prior range for k = 263 - 10526
True values used in simulation: r = 0.33 , k = 1000 , MSY = 82.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.353 , 95% CL = 0.332 - 0.374 , k = 946 , 95% CL = 897 - 1006
MSY = 83.7 , 95% CL = 77.7 - 89.6
Biomass in last year = 144 or 0.152 k
Exploitation rate in last year = 0.28 or 1.58 u.msy
Results of CMSY analysis with altogether 3856 viable trajectories for 2213 r-k pairs
r = 0.177 , 95% CL = 0.119 - 0.385 , k = 1819 , 95% CL = 691 - 3285
MSY = 80.6 , 95% CL = 55.3 - 117
Relative biomass last year= 0.276 k, 2.5th = 0.0197 , 97.5th = 0.395
Relative biomass next year= 0.289 k, 2.5th = 0.00235 , 97.5th = 0.412
Relative exploitation rate in last year= 0.718
Comment: Simulated data
---



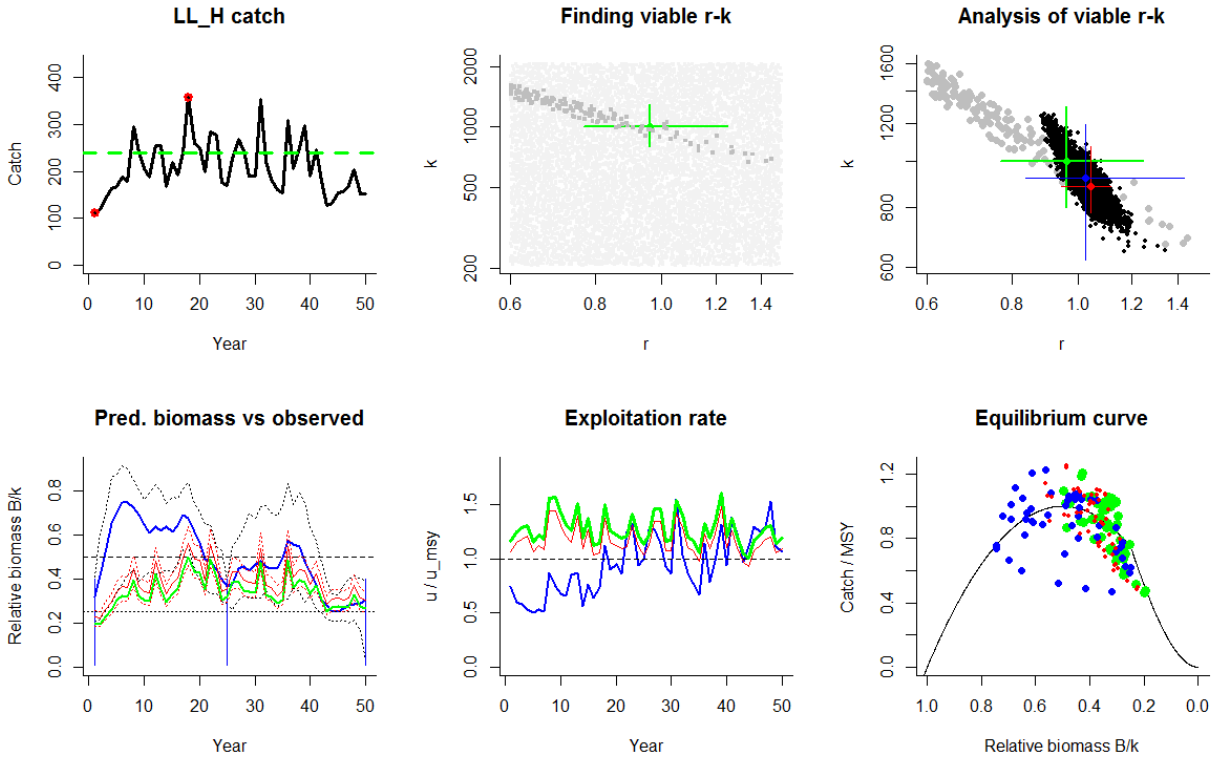
Species: NA , stock: LHL_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.2 - 0.8 , prior range for k = 236 - 3774
True values used in simulation: r = 0.52 , k = 1000 , MSY = 130
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.541 , 95% CL = 0.506 - 0.577 , k = 955 , 95% CL = 884 - 1033
MSY = 129 , 95% CL = 119 - 140
Biomass in last year = 405 or 0.424 k
Exploitation rate in last year = 0.247 or 0.914 u.msy
Results of CMSY analysis with altogether 762 viable trajectories for 762 r-k pairs
r = 0.287 , 95% CL = 0.256 - 0.366 , k = 1698 , 95% CL = 1184 - 2138
MSY = 122 , 95% CL = 96.8 - 153
Relative biomass last year= 0.287 k, 2.5th = 0.0248 , 97.5th = 0.389
Relative biomass next year= 0.278 k, 2.5th = -0.0282 , 97.5th = 0.398
Relative exploitation rate in last year= 1.79
Comment: Simulated data
---



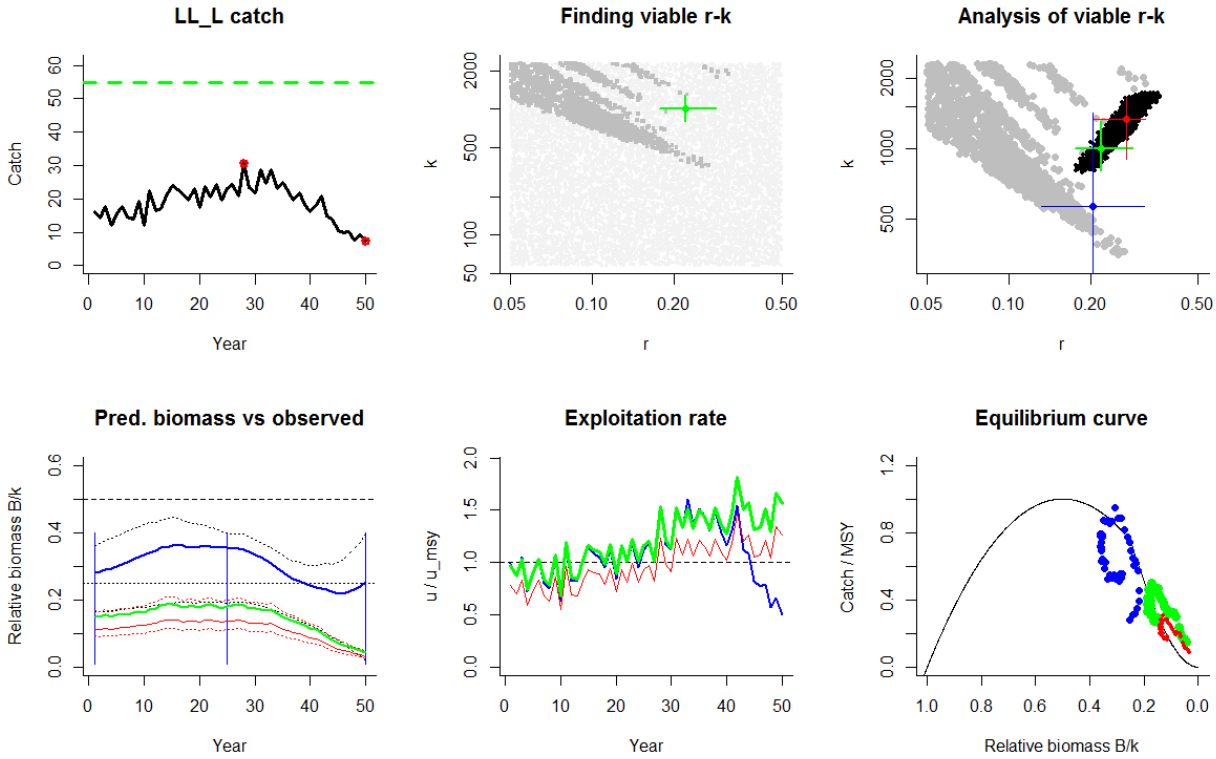
Species: NA , stock: LHL_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.015 - 0.1 , prior range for k = 202 - 10785
True values used in simulation: r = 0.033 , k = 1000 , MSY = 8.25
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0434 , 95% CL = 0.0234 - 0.0634 , k = 3308 , 95% CL = 1883 - 4608
MSY = 36.2 , 95% CL = 12.8 - 67.5
Biomass in last year = 345 or 0.104 k
Exploitation rate in last year = 0.124 or 5.7 u.msy
Results of CMSY analysis with altogether 37434 viable trajectories for 12580 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 710 , 95% CL = 218 - 2308
MSY = 11 , 95% CL = 2.62 - 46.3
Relative biomass last year= 0.277 k, 2.5th = 0.0243 , 97.5th = 0.396
Relative biomass next year= 0.205 k, 2.5th = -0.122 , 97.5th = 0.362
Relative exploitation rate in last year= 6.03
Comment: Simulated data
---



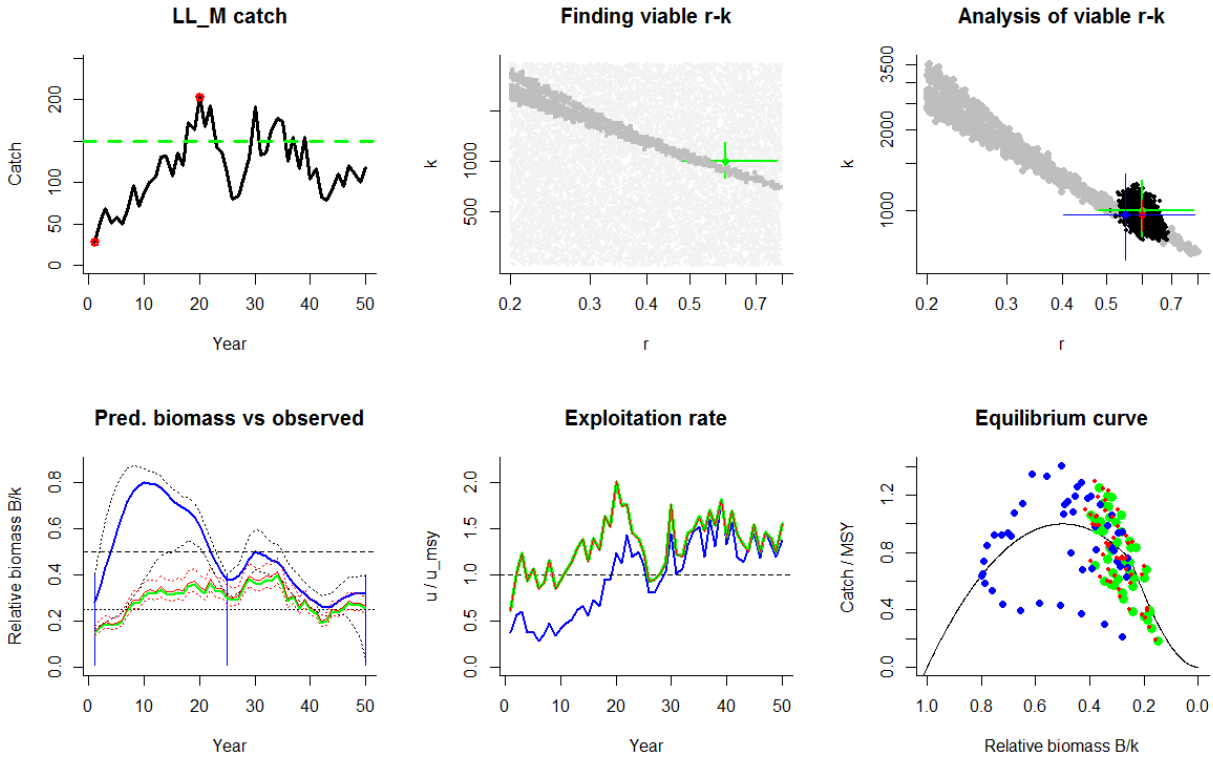
Species: NA , stock: LL_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.6 - 1.5 , prior range for k = 206 - 2060
True values used in simulation: r = 0.96 , k = 1000 , MSY = 240
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.04 , 95% CL = 0.945 - 1.12 , k = 884 , 95% CL = 780 - 1073
MSY = 230 , 95% CL = 211 - 258
Biomass in last year = 267 or 0.302 k
Exploitation rate in last year = 0.634 or 1.22 u.msy
Results of CMSY analysis with altogether 158 viable trajectories for 156 r-k pairs
r = 1.03 , 95% CL = 0.838 - 1.43 , k = 921 , 95% CL = 623 - 1192
MSY = 236 , 95% CL = 211 - 264
Relative biomass last year= 0.302 k, 2.5th = 0.0274 , 97.5th = 0.393
Relative biomass next year= 0.317 k, 2.5th = -0.104 , 97.5th = 0.474
Relative exploitation rate in last year= 1.07
Comment: Simulated data
---



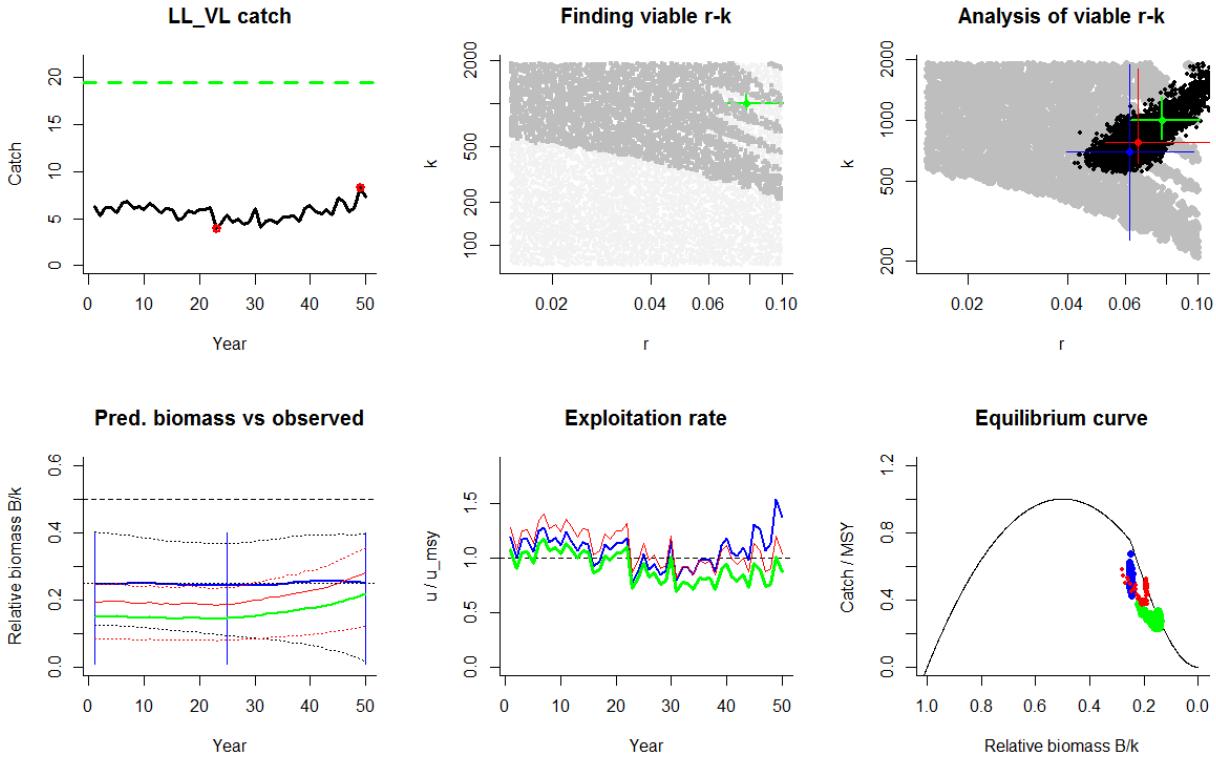
Species: NA , stock: LL_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.05 - 0.5 , prior range for k = 57.4 - 2298
True values used in simulation: r = 0.22 , k = 1000 , MSY = 55
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.273 , 95% CL = 0.205 - 0.32 , k = 1325 , 95% CL = 900 - 1632
MSY = 90.6 , 95% CL = 46.2 - 129
Biomass in last year = 42.6 or 0.0322 k
Exploitation rate in last year = 0.189 or 1.39 u.msy
Results of CMSY analysis with altogether 2346 viable trajectories for 1738 r-k pairs
r = 0.204 , 95% CL = 0.132 - 0.317 , k = 565 , 95% CL = 226 - 1415
MSY = 28.9 , 95% CL = 11.3 - 73.7
Relative biomass last year= 0.254 k, 2.5th = 0.0183 , 97.5th = 0.395
Relative biomass next year= 0.267 k, 2.5th = 0.005 , 97.5th = 0.419
Relative exploitation rate in last year= 0.502
Comment: Simulated data
---



Species: NA , stock: LL_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.2 - 0.8 , prior range for k = 240 - 3837
True values used in simulation: r = 0.6 , k = 1000 , MSY = 150
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.603 , 95% CL = 0.562 - 0.645 , k = 961 , 95% CL = 843 - 1093
MSY = 144 , 95% CL = 129 - 162
Biomass in last year = 253 or 0.263 k
Exploitation rate in last year = 0.436 or 1.45 u.msy
Results of CMSY analysis with altogether 1657 viable trajectories for 1499 r-k pairs
r = 0.553 , 95% CL = 0.401 - 0.785 , k = 964 , 95% CL = 656 - 1374
MSY = 133 , 95% CL = 125 - 142
Relative biomass last year= 0.32 k, 2.5th = 0.0368 , 97.5th = 0.396
Relative biomass next year= 0.33 k, 2.5th = -0.0651 , 97.5th = 0.429
Relative exploitation rate in last year= 1.38
Comment: Simulated data
---



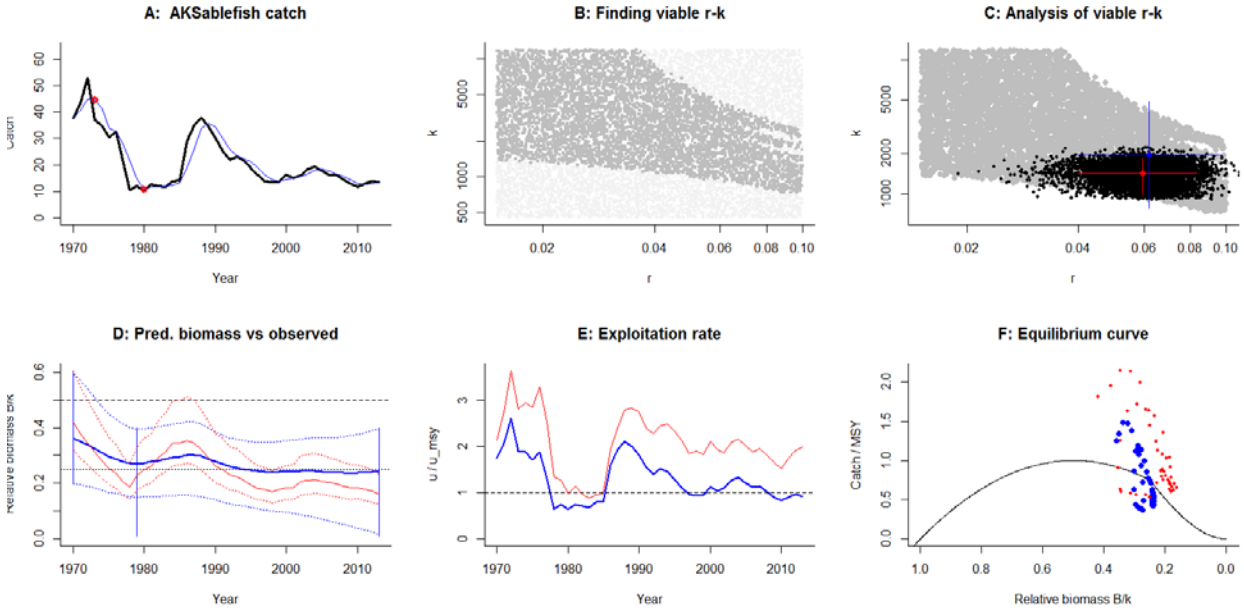
Species: NA , stock: LL_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.015 - 0.1 , prior range for k = 71.5 - 1908
True values used in simulation: r = 0.078 , k = 1000 , MSY = 19.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0655 , 95% CL = 0.0522 - 0.132 , k = 771 , 95% CL = 610 - 1797
MSY = 12.5 , 95% CL = 8.34 - 58.7
Biomass in last year = 217 or 0.281 k
Exploitation rate in last year = 0.0334 or 1.02 u.msy
Results of CMSY analysis with altogether 10932 viable trajectories for 4284 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 693 , 95% CL = 254 - 1891
MSY = 10.7 , 95% CL = 3.6 - 32
Relative biomass last year= 0.249 k, 2.5th = 0.016 , 97.5th = 0.396
Relative biomass next year= 0.245 k, 2.5th = 0.00546 , 97.5th = 0.398
Relative exploitation rate in last year= 1.37
Comment: Simulated data
---



# Appendix II: Fully assessed stocks

## Region: Alaska

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: *Anoplopoma fimbria* , stock: AKSablefish
Name and region: Bering Sea/Aleutian Islands/Gulf of Alaska Sablefish , Alaska
Catch data used from years 1970 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1979 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.015 - 0.1 default , prior range for k = 447 - 11926
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0594 , 95% CL = 0.0399 - 0.0832 , k = 1421 , 95% CL = 983 - 1848
MSY = 20.8 , 95% CL = 12.8 - 32.7
Biomass in last year = 228 or 0.161 k
Exploitation rate in last year = 0.0591 or 1.99 u.msy
Results of CMSY analysis with altogether 15805 viable trajectories for 5539 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 1944 , 95% CL = 778 - 4861
MSY = 30.2 , 95% CL = 12 - 75.7
Relative biomass last year= 0.243 k, 2.5th = 0.0156 , 97.5th = 0.396
Relative biomass next year= 0.245 k, 2.5th = 0.0079 , 97.5th = 0.403
Relative exploitation rate in last year= 0.914
Comment: OK
---



Species: *Atheresthes stomias* , stock: BSAIatf
Name and region: Bering Sea and Aleutian Islands arrowtooth flounder , Alaska
Catch data used from years 1976 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2008 expert
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 120 - 7212
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.178 , 95% CL = 0.148 - 0.217 , k = 912 , 95% CL = 815 - 1061
MSY = 40.7 , 95% CL = 34.6 - 48.6
Biomass in last year = 881 or 0.967 k
Exploitation rate in last year = 0.0239 or 0.268 u.msy
Results of CMSY analysis with altogether 32044 viable trajectories for 4060 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 367 , 95% CL = 154 - 872
MSY = 25.9 , 95% CL = 13.8 - 48.4
Relative biomass last year= 0.719 k, 2.5th = 0.511 , 97.5th = 0.833
Relative biomass next year= 0.719 k, 2.5th = 0.493 , 97.5th = 0.832
Relative exploitation rate in last year= 0.551
Comment: OK
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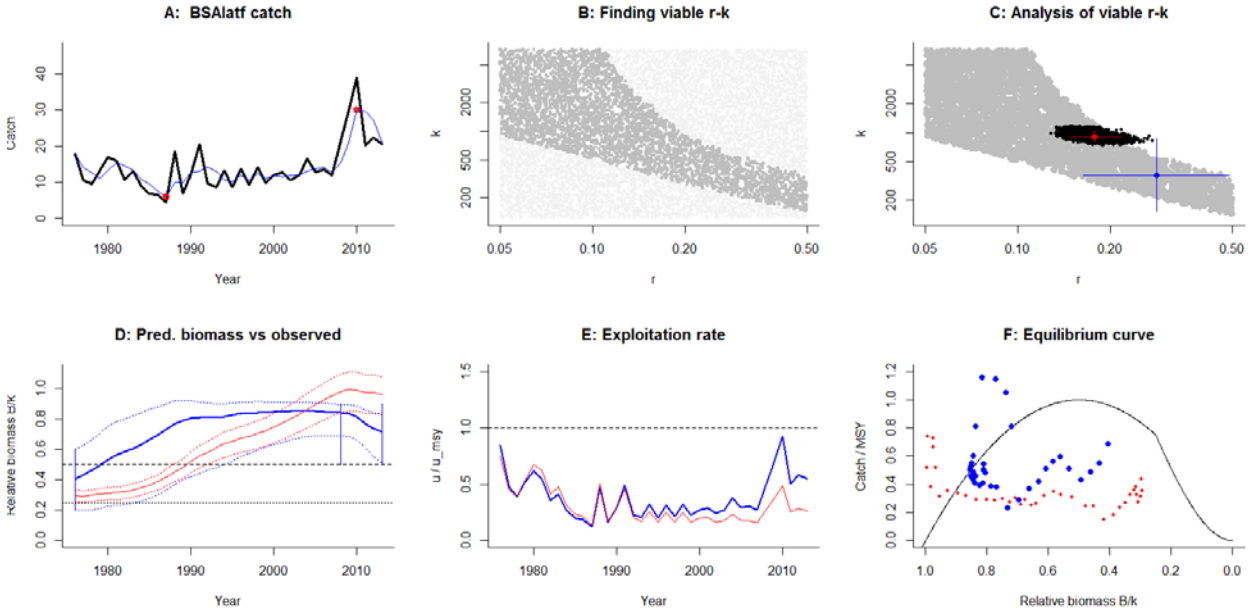
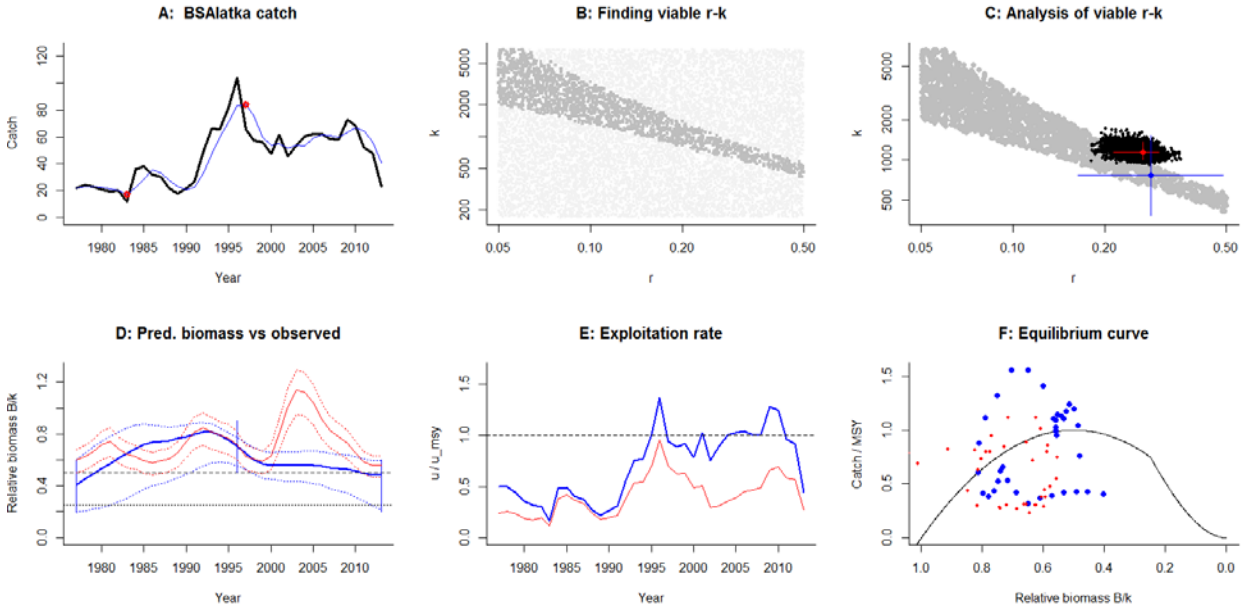


Species: *Pleurogrammus monopterygius* , stock: BSAIatka
Name and region: Bering Sea and Aleutian Islands atka mackerel , Alaska
Catch data used from years 1977 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1996 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 168 - 6702
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.266 , 95% CL = 0.214 - 0.3 , k = 1138 , 95% CL = 1001 - 1361
MSY = 75.1 , 95% CL = 61.4 - 89.5
Biomass in last year = 635 or 0.558 k
Exploitation rate in last year = 0.0645 or 0.485 u.msy
Results of CMSY analysis with altogether 9874 viable trajectories for 1891 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 762 , 95% CL = 385 - 1508
MSY = 53.8 , 95% CL = 41.2 - 70.2
Relative biomass last year= 0.482 k, 2.5th = 0.214 , 97.5th = 0.596
Relative biomass next year= 0.501 k, 2.5th = 0.194 , 97.5th = 0.625
Relative exploitation rate in last year= 0.447
Comment: OK
---



Species: *Reinhardtius hippoglossoides* , stock: BSAIhalibut
Name and region: Bering Sea and Aleutian Islands halibut , Alaska
Catch data used from years 1990 - 2013 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 25.4 - 1016
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.221 , 95% CL = 0.169 - 0.279 , k = 225 , 95% CL = 167 - 350
MSY = 12.5 , 95% CL = 8.98 - 20
Biomass in last year = 80.9 or 0.359 k
Exploitation rate in last year = 0.0417 or 0.378 u.msy
Results of CMSY analysis with altogether 4877 viable trajectories for 1555 r-k pairs
r = 0.27 , 95% CL = 0.159 - 0.465 , k = 81.1 , 95% CL = 40.1 - 162
MSY = 5.47 , 95% CL = 4 - 7.47
Relative biomass last year= 0.463 k, 2.5th = 0.226 , 97.5th = 0.589
Relative biomass next year= 0.482 k, 2.5th = 0.222 , 97.5th = 0.62
Relative exploitation rate in last year= 0.345
Comment: Start year set to 1990.
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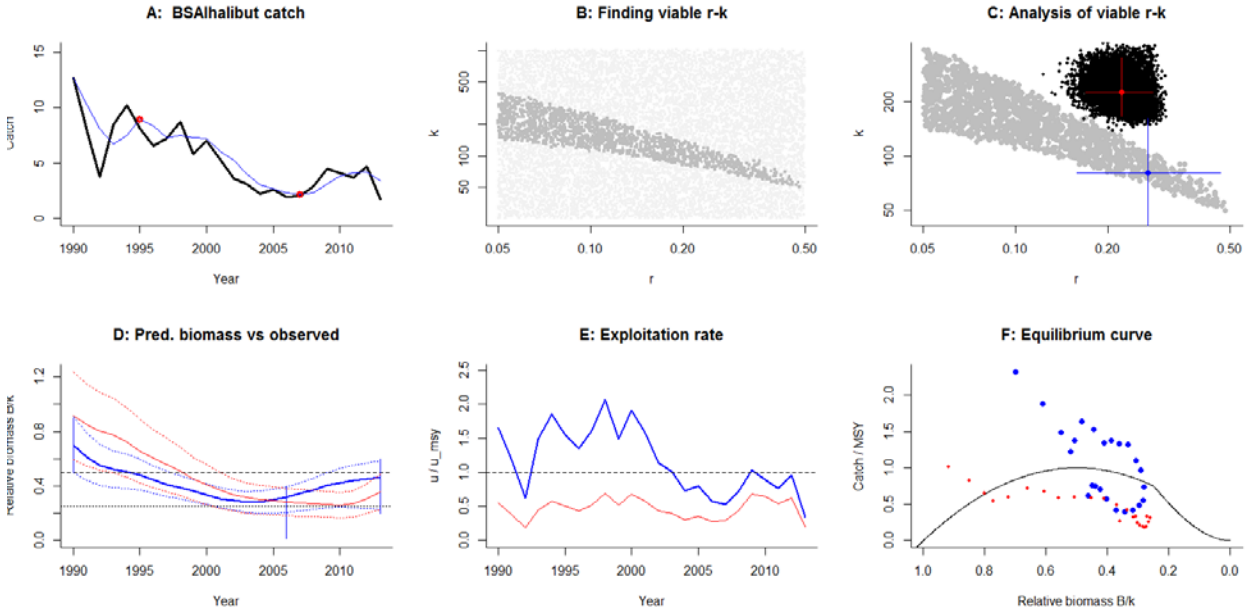

Species: *Sebastes polyspinis* , stock: BSAInorthern
Name and region: Bering Sea and Aleutian Islands northern rockfish , Alaska
Catch data used from years 1977 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2000 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 57.7 - 1538
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0707 , 95% CL = 0.0462 - 0.125 , k = 331 , 95% CL = 264 - 459
MSY = 6.06 , 95% CL = 4.06 - 8.93
Biomass in last year = 221 or 0.668 k
Exploitation rate in last year = 0.011 or 0.311 u.msy
Results of CMSY analysis with altogether 15575 viable trajectories for 5531 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 240 , 95% CL = 93.4 - 615
MSY = 3.72 , 95% CL = 1.41 - 9.82
Relative biomass last year= 0.504 k, 2.5th = 0.238 , 97.5th = 0.597
Relative biomass next year= 0.508 k, 2.5th = 0.229 , 97.5th = 0.604
Relative exploitation rate in last year= 0.543
Comment: OK
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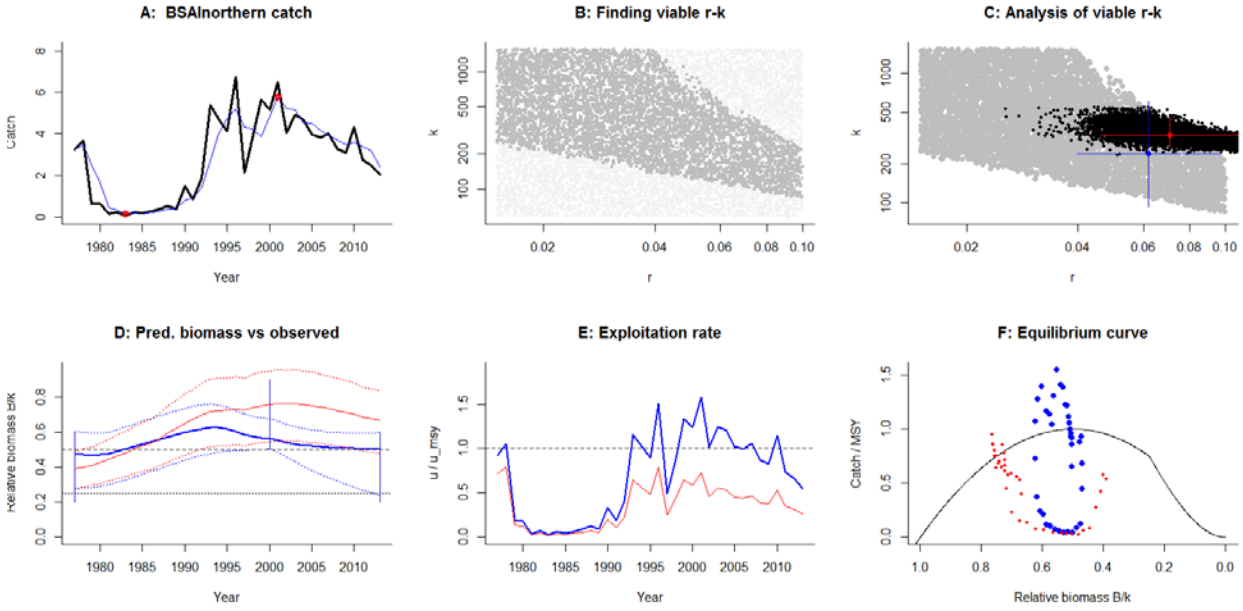

Species: *Pleuronectes quadrituberculatus* , stock: BSAIplaice
Name and region: Bering Sea and Aleutian Islands Alaska plaice , Alaska
Catch data used from years 1985 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2004 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 422 - 11264
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0323 , 95% CL = 0.0168 - 0.0536 , k = 1797 , 95% CL = 1386 - 2419
MSY = 14.6 , 95% CL = 7.49 - 24.3
Biomass in last year = 505 or 0.281 k
Exploitation rate in last year = 0.0421 or 2.61 u.msy
Results of CMSY analysis with altogether 22446 viable trajectories for 7602 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 2273 , 95% CL = 682 - 7571
MSY = 35.3 , 95% CL = 8 - 155
Relative biomass last year= 0.358 k, 2.5th = 0.209 , 97.5th = 0.511
Relative biomass next year= 0.357 k, 2.5th = 0.199 , 97.5th = 0.524
Relative exploitation rate in last year= 0.932
Comment: Start year set to 1985. OK.
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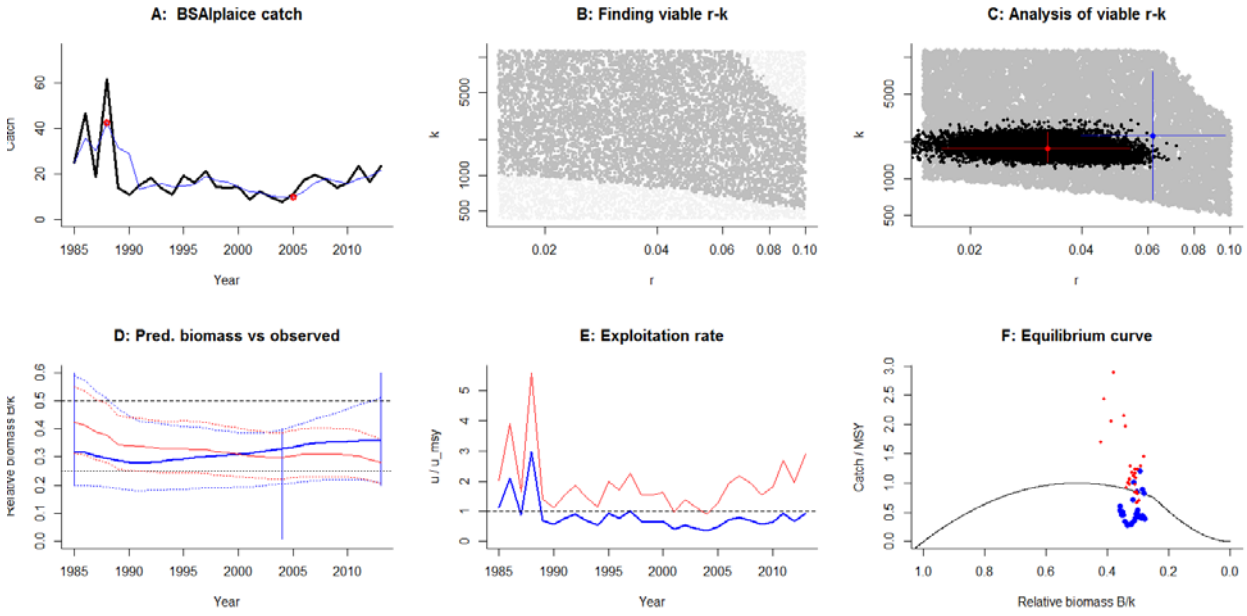

Species: *Sebastes alutus* , stock: BSAIpop
Name and region: Bering Sea and Aleutian Islands Pacific ocean perch , Alaska
Catch data used from years 1980 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2008 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 106 - 6363
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.202 , 95% CL = 0.165 - 0.253 , k = 672 , 95% CL = 605 - 754
MSY = 34 , 95% CL = 28.2 - 41.4
Biomass in last year = 619 or 0.921 k
Exploitation rate in last year = 0.0428 or 0.425 u.msy
Results of CMSY analysis with altogether 38982 viable trajectories for 4490 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 317 , 95% CL = 127 - 790
MSY = 22.3 , 95% CL = 10.9 - 45.9
Relative biomass last year= 0.744 k, 2.5th = 0.515 , 97.5th = 0.863
Relative biomass next year= 0.71 k, 2.5th = 0.443 , 97.5th = 0.846
Relative exploitation rate in last year= 0.944
Comment: Resilience set from Very low to Low and start year to 1980.
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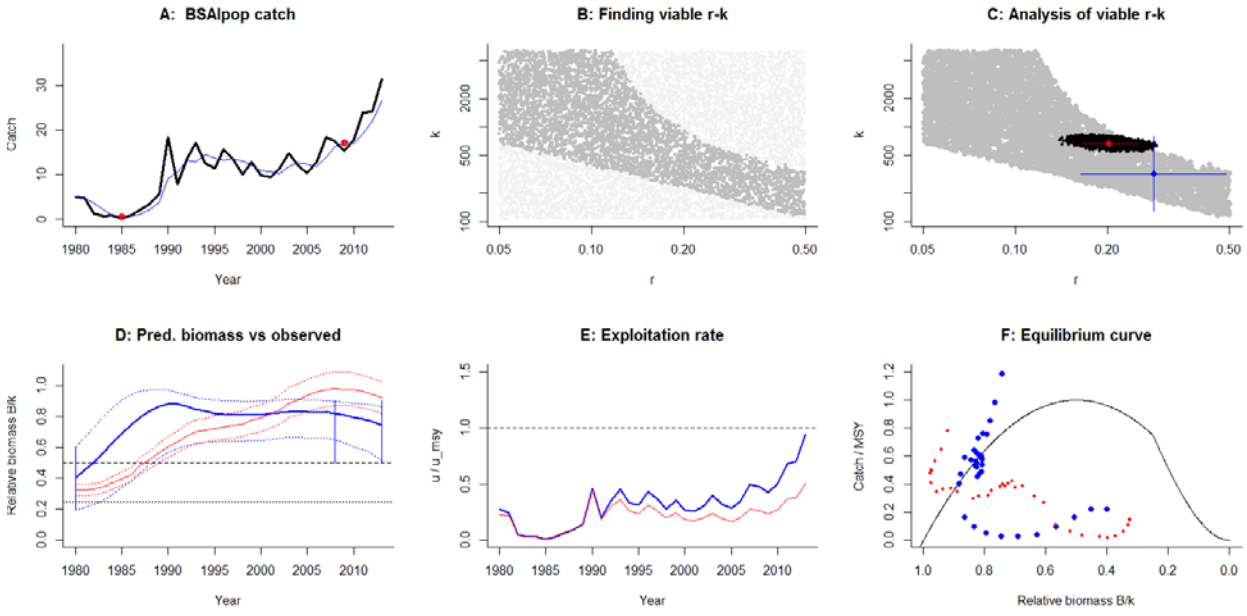

Species: *Lepidopsetta polyxystra* , stock: BSAIrocksole
Name and region: Bering Sea and Aleutian Islands northern rock sole , Alaska
Catch data used from years 1980 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1988 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 261 - 15688
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.28 , 95% CL = 0.254 - 0.32 , k = 1845 , 95% CL = 1702 - 2002
MSY = 130 , 95% CL = 115 - 148
Biomass in last year = 1627 or 0.882 k
Exploitation rate in last year = 0.0385 or 0.275 u.msy
Results of CMSY analysis with altogether 27180 viable trajectories for 3974 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 1124 , 95% CL = 450 - 2808
MSY = 79.3 , 95% CL = 38.4 - 164
Relative biomass last year= 0.811 k, 2.5th = 0.533 , 97.5th = 0.897
Relative biomass next year= 0.796 k, 2.5th = 0.508 , 97.5th = 0.89
Relative exploitation rate in last year= 0.578
Comment: Set start year to 1990.
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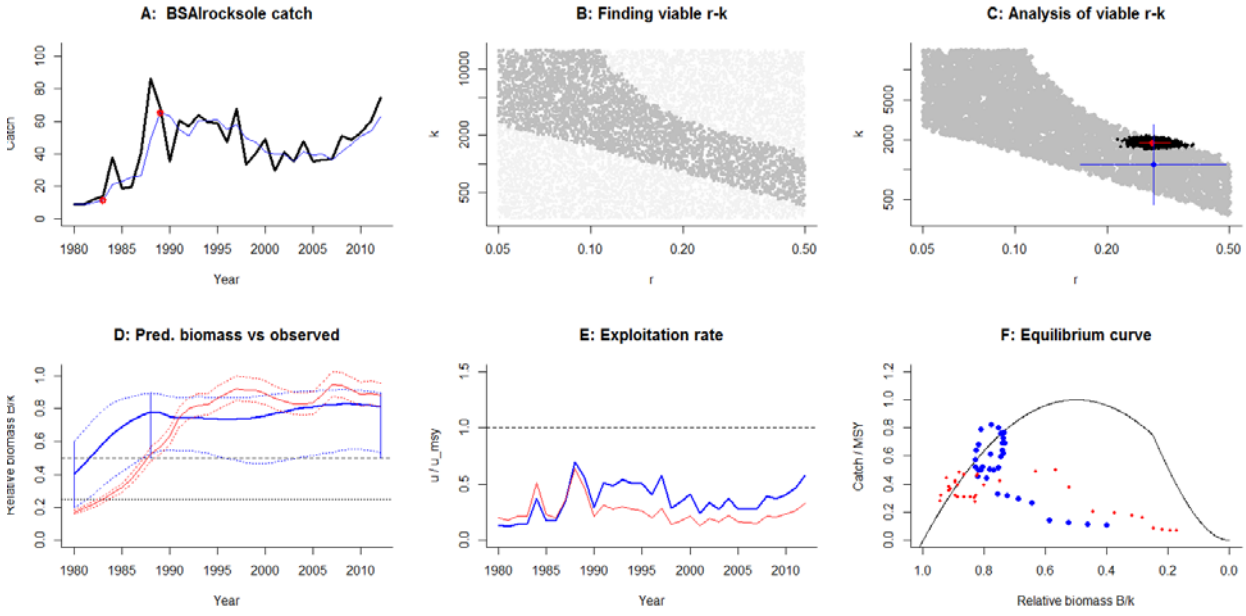

Species: *Sebastes borealis* , stock: BSAIshortraker
Name and region: Bering Sea and Aleutian Islands Shortraker rockfish , Alaska
Catch data used from years 1980 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1986 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.015 - 0.1 default , prior range for k = 8.33 - 222
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0169 , 95% CL = 0.00703 - 0.0354 , k = 67.3 , 95% CL = 51.6 - 90.9
MSY = 0.286 , 95% CL = 0.115 - 0.6
Biomass in last year = 16.9 or 0.25 k
Exploitation rate in last year = 0.0186 or 2.2 u.msy
Results of CMSY analysis with altogether 23616 viable trajectories for 7271 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 28.2 , 95% CL = 9.57 - 82.9
MSY = 0.437 , 95% CL = 0.126 - 1.51
Relative biomass last year= 0.248 k, 2.5th = 0.0163 , 97.5th = 0.396
Relative biomass next year= 0.244 k, 2.5th = -0.00124 , 97.5th = 0.4
Relative exploitation rate in last year= 1.3
Comment: Fit could be improved by setting intbio to 0.2-0.6 in 1990.
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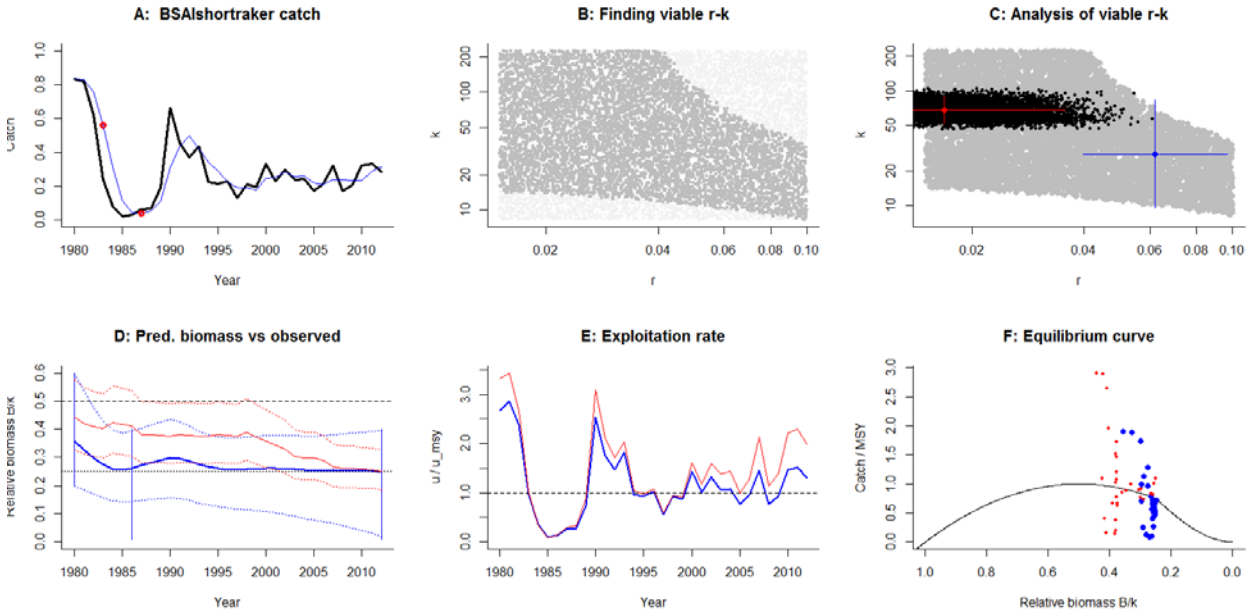

Species: *Limanda aspera* , stock: BSAIyfin
Name and region: Bering Sea and Aleutian Islands yellowfin sole , Alaska
Catch data used from years 1970 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1986 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 823 - 49371
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.314 , 95% CL = 0.27 - 0.37 , k = 3042 , 95% CL = 2866 - 3262
MSY = 239 , 95% CL = 206 - 276
Biomass in last year = 2326 or 0.765 k
Exploitation rate in last year = 0.0664 or 0.423 u.msy
Results of CMSY analysis with altogether 26532 viable trajectories for 3721 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 2894 , 95% CL = 1190 - 7039
MSY = 204 , 95% CL = 104 - 400
Relative biomass last year= 0.828 k, 2.5th = 0.565 , 97.5th = 0.898
Relative biomass next year= 0.816 k, 2.5th = 0.55 , 97.5th = 0.892
Relative exploitation rate in last year= 0.488
Comment: Start year set to 1970.
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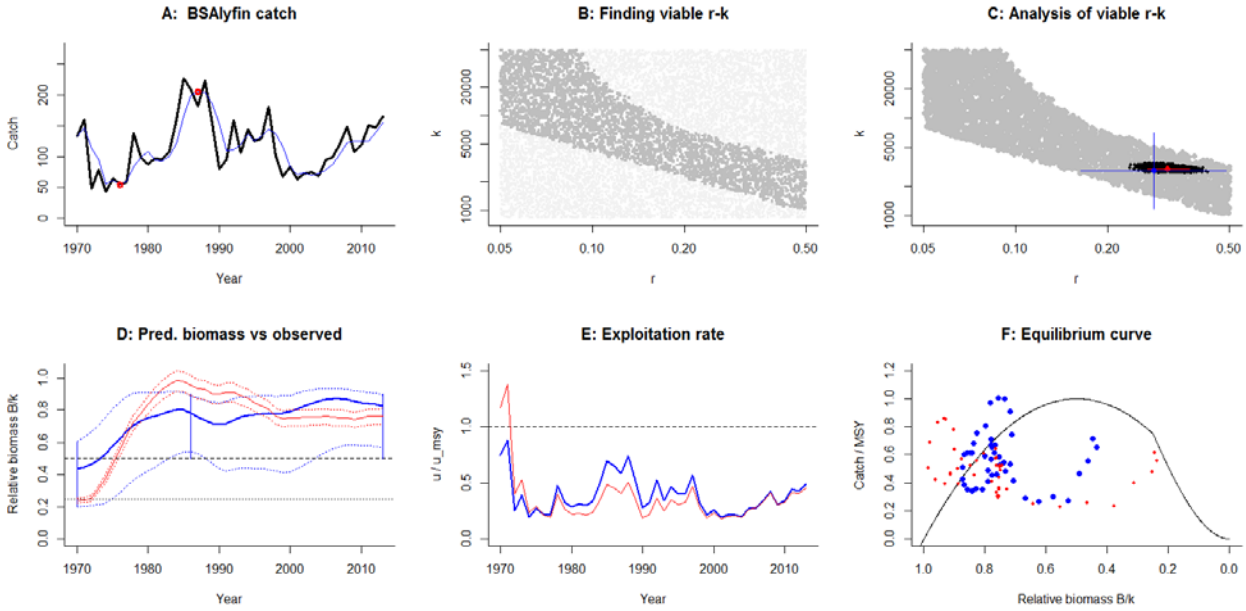

Species: *Gadus macrocephalus* , stock: EBSPcod
Name and region: Bering Sea Pacific cod , Alaska
Catch data used from years 1977 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1996 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 905 - 54290
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.29 , 95% CL = 0.258 - 0.355 , k = 2315 , 95% CL = 1997 - 2766
MSY = 171 , 95% CL = 142 - 205
Biomass in last year = 1374 or 0.594 k
Exploitation rate in last year = 0.165 or 1.14 u.msy
Results of CMSY analysis with altogether 33076 viable trajectories for 3956 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 4037 , 95% CL = 1631 - 9994
MSY = 285 , 95% CL = 141 - 577
Relative biomass last year= 0.819 k, 2.5th = 0.53 , 97.5th = 0.897
Relative biomass next year= 0.804 k, 2.5th = 0.505 , 97.5th = 0.89
Relative exploitation rate in last year= 0.507
Comment: OK. Fit could be improved by setting intbio Low or Medium in 2007.
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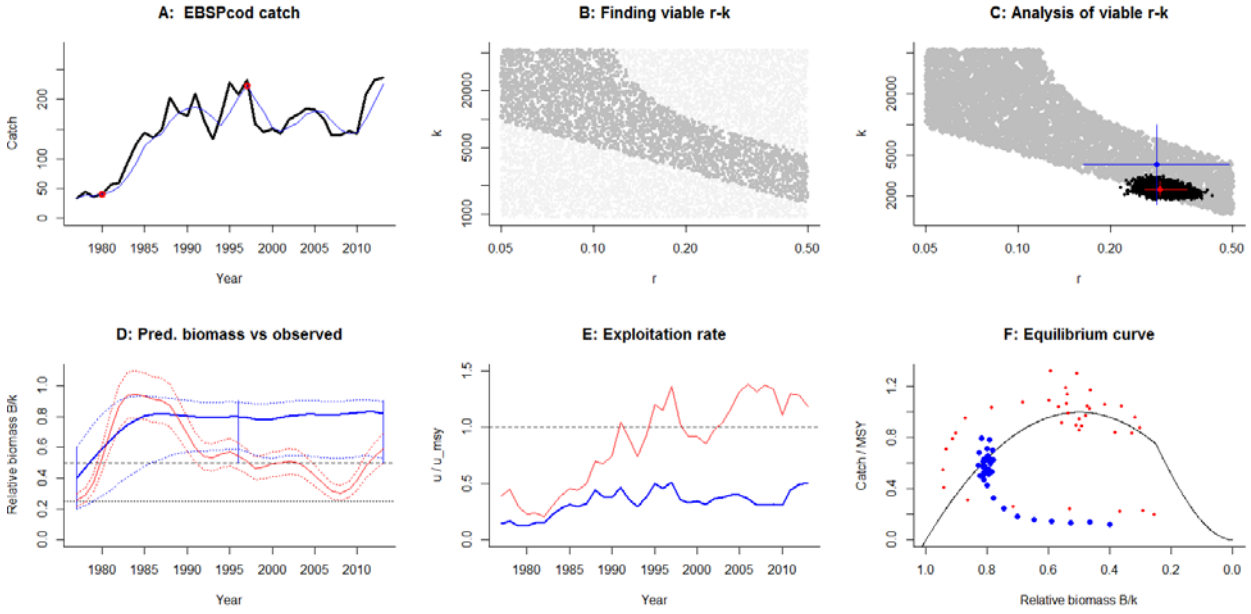

Species: *Theragra chalcogramma* , stock: EBSpollock
Name and region: Eastern Bering Sea pollock , Alaska
Catch data used from years 1964 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1972 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 3585 - 143392
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.332 , 95% CL = 0.267 - 0.438 , k = 12871 , 95% CL = 10586 - 15500
MSY = 1074 , 95% CL = 780 - 1442
Biomass in last year = 9541 or 0.741 k
Exploitation rate in last year = 0.128 or 0.773 u.msy
Results of CMSY analysis with altogether 5126 viable trajectories for 1094 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 16877 , 95% CL = 9077 - 31379
MSY = 1191 , 95% CL = 1030 - 1377
Relative biomass last year= 0.505 k, 2.5th = 0.232 , 97.5th = 0.597
Relative biomass next year= 0.503 k, 2.5th = 0.205 , 97.5th = 0.602
Relative exploitation rate in last year= 1.06
Comment: OK. Fit could be improved by setting endbio High.
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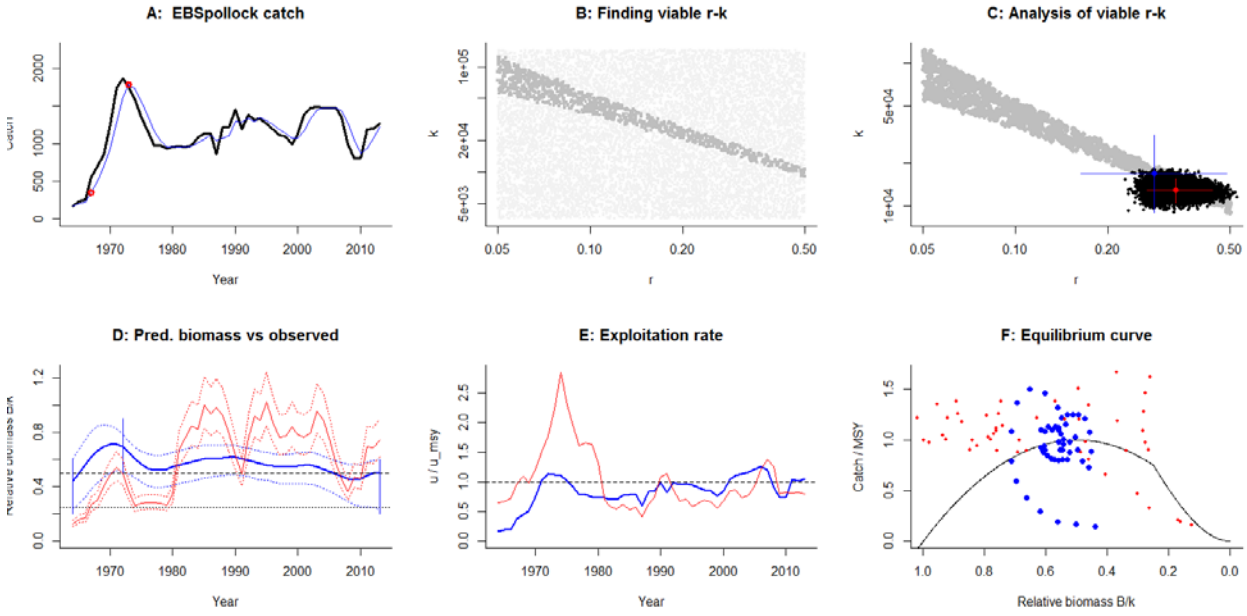
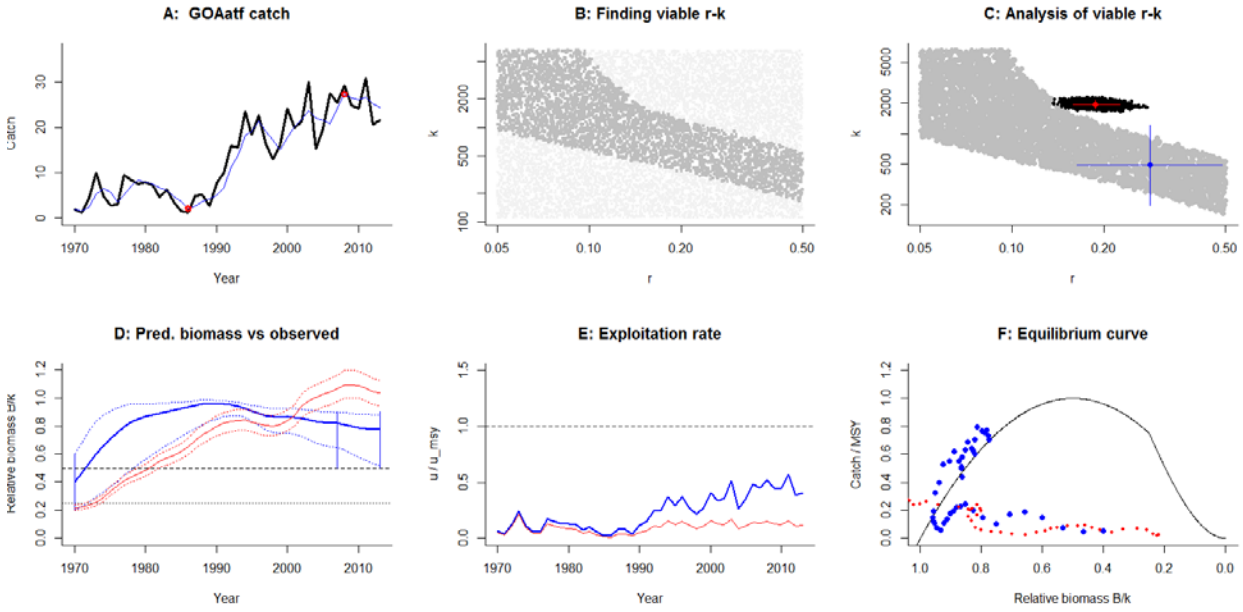


Species: *Atheresthes stomias* , stock: GOAatf
Name and region: Gulf of Alaska arrowtooth flounder , Alaska
Catch data used from years 1970 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2007 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 110 - 6595
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.188 , 95% CL = 0.158 - 0.225 , k = 1930 , 95% CL = 1767 - 2114
MSY = 90.5 , 95% CL = 76.3 - 108
Biomass in last year = 1997 or 1.03 k
Exploitation rate in last year = 0.0122 or 0.13 u.msy
Results of CMSY analysis with altogether 37012 viable trajectories for 3997 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 490 , 95% CL = 198 - 1218
MSY = 34.6 , 95% CL = 17 - 70.5
Relative biomass last year= 0.774 k, 2.5th = 0.519 , 97.5th = 0.881
Relative biomass next year= 0.774 k, 2.5th = 0.505 , 97.5th = 0.881
Relative exploitation rate in last year= 0.404
Comment: Set start year to 1970.



Species: *Sebastes variabilis* , stock: GOAdusky
Name and region: Gulf of Alaska Dusky Rockfish , Alaska
Catch data used from years 1977 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1999 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 15 - 898
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.202 , 95% CL = 0.164 - 0.256 , k = 95.1 , 95% CL = 84.8 - 108
MSY = 4.81 , 95% CL = 3.94 - 5.91
Biomass in last year = 72.7 or 0.764 k
Exploitation rate in last year = 0.0441 or 0.438 u.msy
Results of CMSY analysis with altogether 35334 viable trajectories for 4093 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 65.1 , 95% CL = 26.4 - 161
MSY = 4.59 , 95% CL = 2.28 - 9.24
Relative biomass last year= 0.78 k, 2.5th = 0.521 , 97.5th = 0.885
Relative biomass next year= 0.777 k, 2.5th = 0.507 , 97.5th = 0.883
Relative exploitation rate in last year= 0.441
Comment: OK. Fit could be improved by setting intbio to Medium in 1990.
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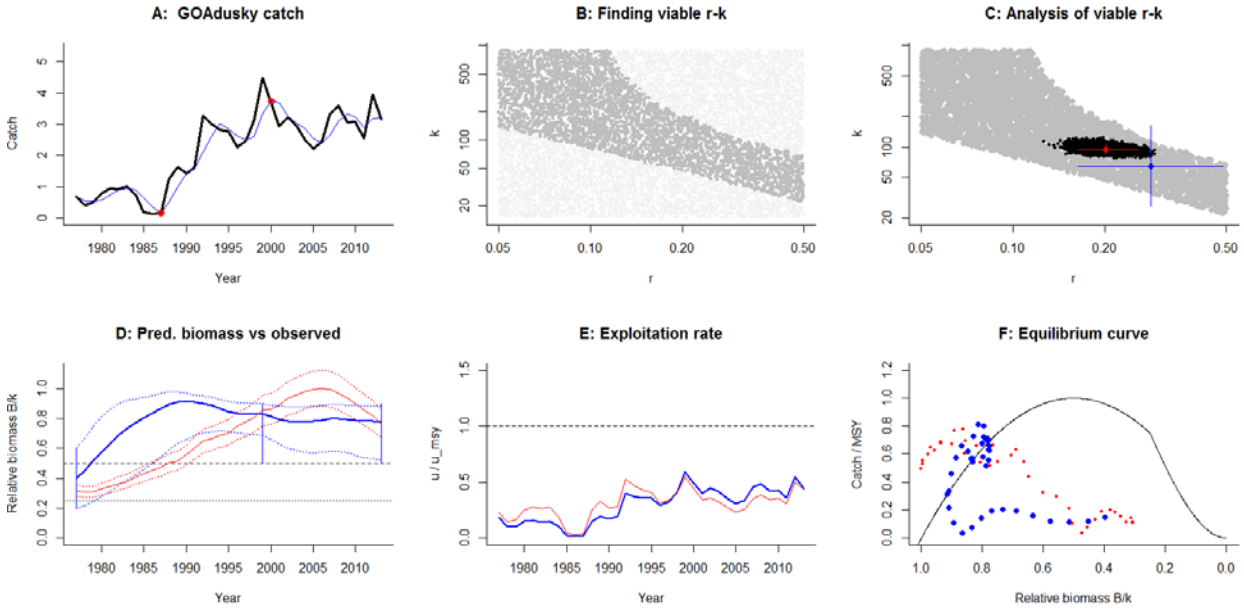

Species: *Hippoglossoides elassodon* , stock: GOAflathead
Name and region: Gulf of Alaska Flathead sole , Alaska
Catch data used from years 1978 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2009 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 14.6 - 874
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.247 , 95% CL = 0.195 - 0.285 , k = 237 , 95% CL = 224 - 255
MSY = 14.7 , 95% CL = 11.8 - 16.9
Biomass in last year = 250 or 1.06 k
Exploitation rate in last year = 0.0103 or 0.0831 u.msy
Results of CMSY analysis with altogether 38718 viable trajectories for 4332 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 60.8 , 95% CL = 23.8 - 155
MSY = 4.29 , 95% CL = 1.99 - 9.24
Relative biomass last year= 0.775 k, 2.5th = 0.517 , 97.5th = 0.885
Relative biomass next year= 0.781 k, 2.5th = 0.514 , 97.5th = 0.89
Relative exploitation rate in last year= 0.424
Comment: OK
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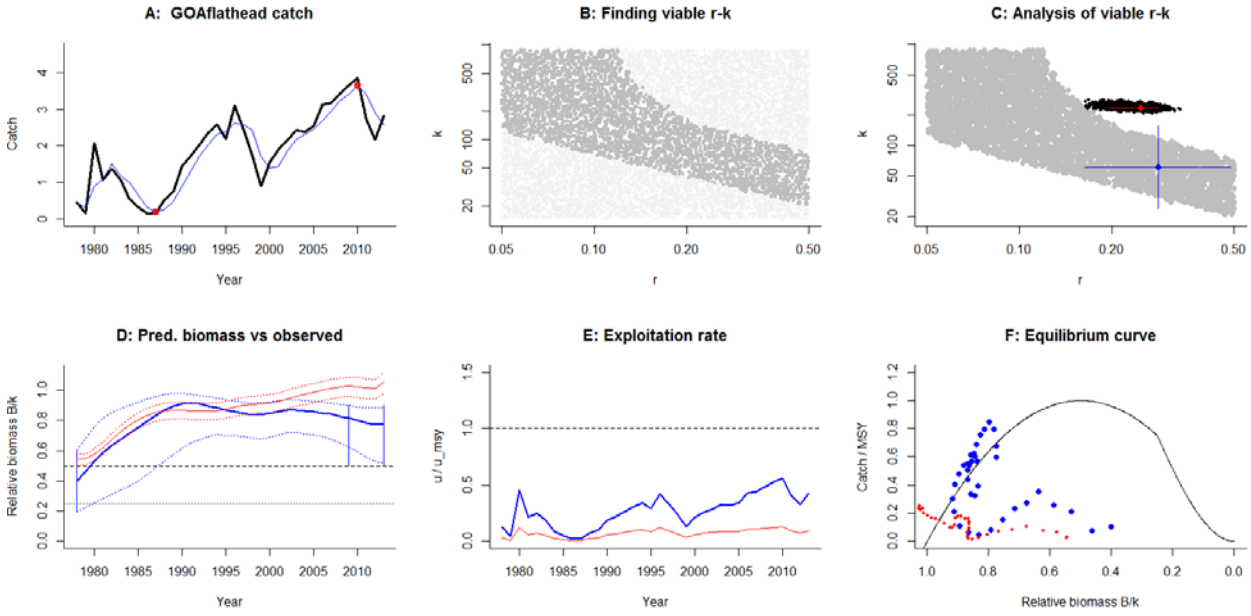

Species: *Sebastes polyspinis* , stock: GOAnorthern
Name and region: Gulf of Alaska northern rockfish , Alaska
Catch data used from years 1961 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1986 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 136 - 3619
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0505 , 95% CL = 0.0286 - 0.0694 , k = 333 , 95% CL = 246 - 453
MSY = 4.09 , 95% CL = 2.49 - 5.91
Biomass in last year = 108 or 0.325 k
Exploitation rate in last year = 0.0411 or 1.63 u.msy
Results of CMSY analysis with altogether 15913 viable trajectories for 6358 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 428 , 95% CL = 151 - 1209
MSY = 6.63 , 95% CL = 2.07 - 21.2
Relative biomass last year= 0.402 k, 2.5th = 0.21 , 97.5th = 0.59
Relative biomass next year= 0.404 k, 2.5th = 0.2 , 97.5th = 0.597
Relative exploitation rate in last year= 0.916
Comment: OK
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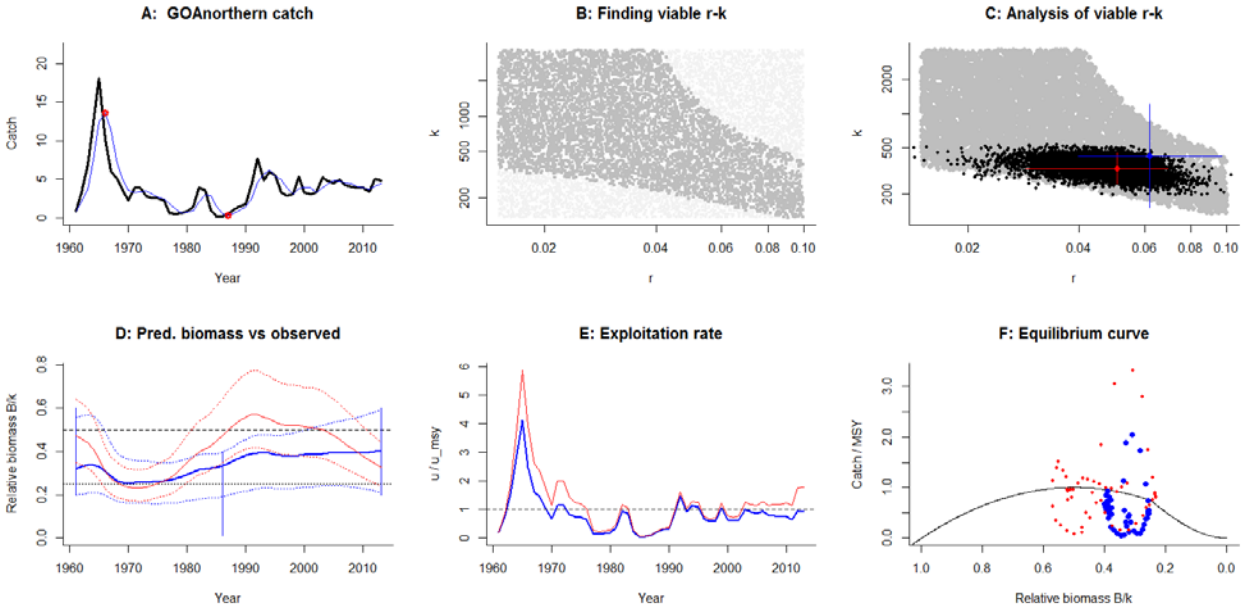

Species: *Gadus macrocephalus* , stock: GOAPcod
Name and region: Gulf of Alaska Pacific cod , Alaska
Catch data used from years 1977 - 2013 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.2 - 0.6 in year 1998 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 322 - 19326
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.271 , 95% CL = 0.222 - 0.307 , k = 1013 , 95% CL = 938 - 1137
MSY = 68.2 , 95% CL = 58.7 - 76.9
Biomass in last year = 671 or 0.662 k
Exploitation rate in last year = 0.115 or 0.851 u.msy
Results of CMSY analysis with altogether 1218 viable trajectories for 665 r-k pairs
r = 0.317 , 95% CL = 0.129 - 0.49 , k = 736 , 95% CL = 445 - 1927
MSY = 58.2 , 95% CL = 51.2 - 66.3
Relative biomass last year= 0.531 k, 2.5th = 0.501 , 97.5th = 0.61
Relative biomass next year= 0.501 k, 2.5th = 0.453 , 97.5th = 0.589
Relative exploitation rate in last year= 1.11
Comment: OK
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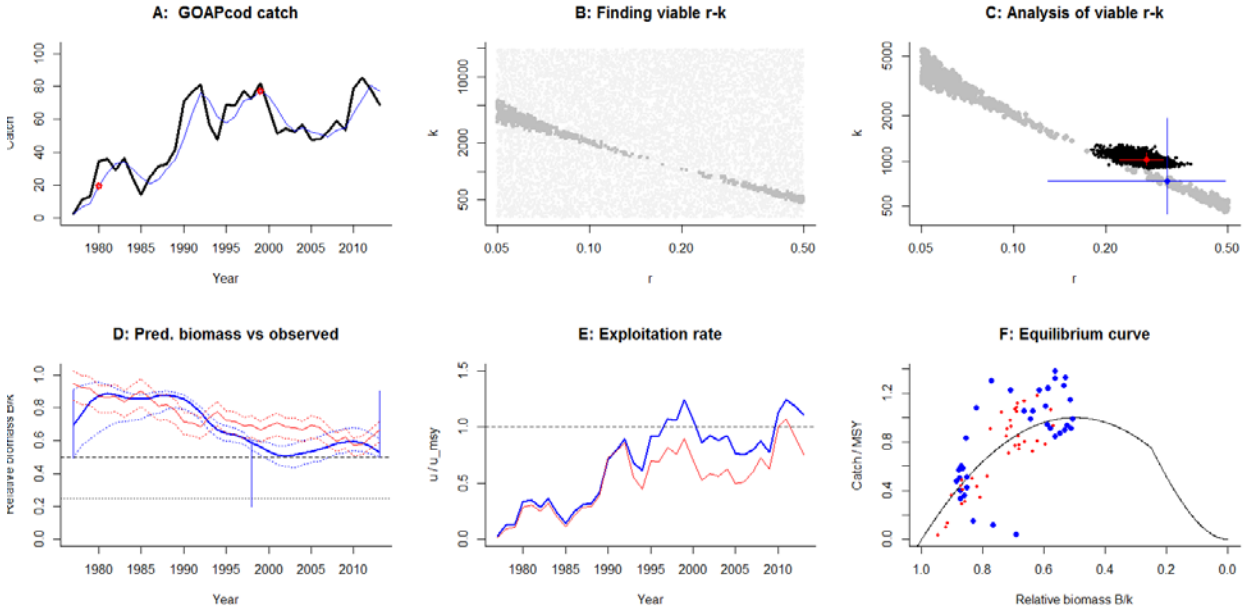

Species: *Theragra chalcogramma* , stock: GOApollock
Name and region: Gulf of Alaska walleye pollock , Alaska
Catch data used from years 1970 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1984 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 540 - 21602
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.272 , 95% CL = 0.228 - 0.309 , k = 2086 , 95% CL = 1684 - 2670
MSY = 141 , 95% CL = 107 - 186
Biomass in last year = 1321 or 0.633 k
Exploitation rate in last year = 0.0711 or 0.523 u.msy
Results of CMSY analysis with altogether 5626 viable trajectories for 1925 r-k pairs
r = 0.236 , 95% CL = 0.145 - 0.4 , k = 1719 , 95% CL = 932 - 3047
MSY = 101 , 95% CL = 86 - 119
Relative biomass last year= 0.503 k, 2.5th = 0.265 , 97.5th = 0.597
Relative biomass next year= 0.507 k, 2.5th = 0.252 , 97.5th = 0.604
Relative exploitation rate in last year= 0.945
Comment: OK
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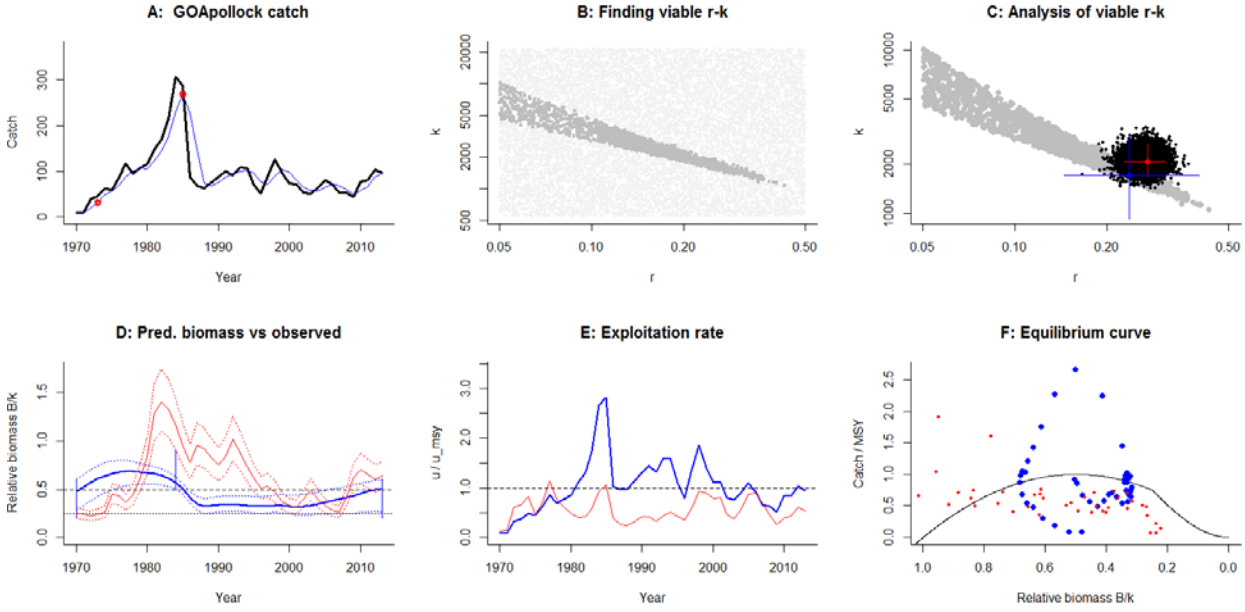

Species: *Sebastes alutus* , stock: GOApop
Name and region: Gulf of Alaska Pacific ocean perch , Alaska
Catch data used from years 1961 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1985 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 530 - 21211
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.25 , 95% CL = 0.205 - 0.283 , k = 2352 , 95% CL = 1936 - 3060
MSY = 147 , 95% CL = 107 - 204
Biomass in last year = 416 or 0.177 k
Exploitation rate in last year = 0.0339 or 0.272 u.msy
Results of CMSY analysis with altogether 2973 viable trajectories for 2552 r-k pairs
r = 0.183 , 95% CL = 0.121 - 0.388 , k = 2550 , 95% CL = 866 - 5316
MSY = 116 , 95% CL = 61.4 - 221
Relative biomass last year= 0.0911 k, 2.5th = 0.0129 , 97.5th = 0.379
Relative biomass next year= 0.0914 k, 2.5th = 0.00838 , 97.5th = 0.409
Relative exploitation rate in last year= 0.622
Comment: Set from Very low to Low.
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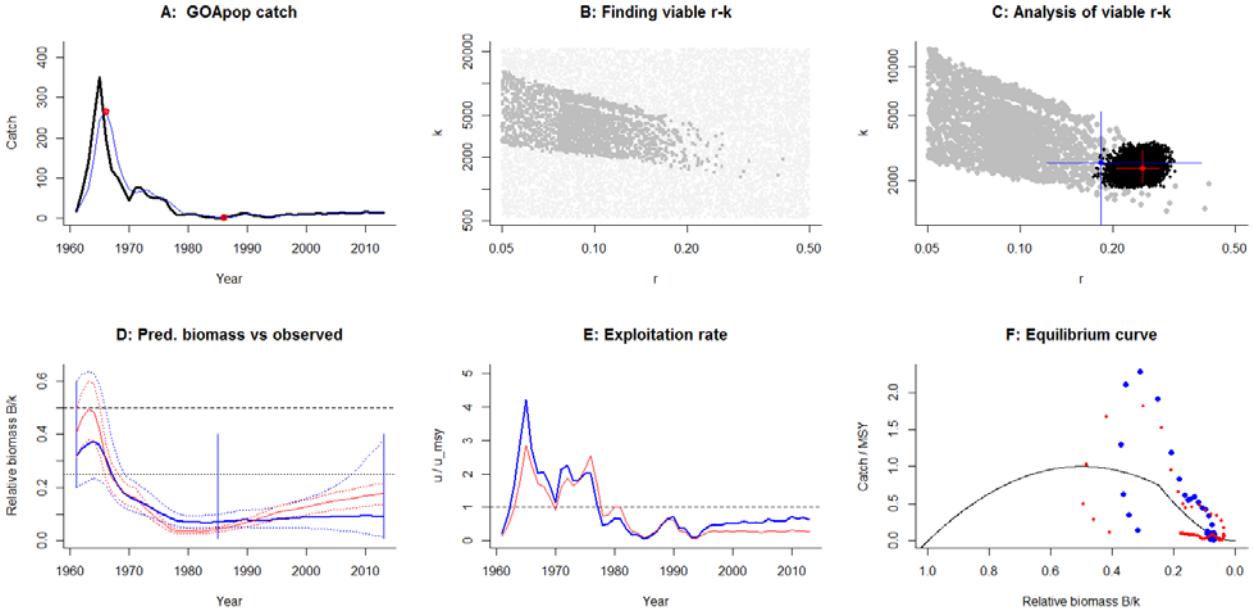

Species: *Glyptocephalus zachirus* , stock: GOArex
Name and region: Gulf of Alaska Rex sole , Alaska
Catch data used from years 1982 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1995 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.015 - 0.1 default , prior range for k = 45.2 - 1206
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.064 , 95% CL = 0.0438 - 0.104 , k = 212 , 95% CL = 148 - 290
MSY = 3.5 , 95% CL = 2.2 - 5.13
Biomass in last year = 117 or 0.552 k
Exploitation rate in last year = 0.0313 or 0.978 u.msy
Results of CMSY analysis with altogether 15618 viable trajectories for 5491 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 172 , 95% CL = 71.1 - 419
MSY = 2.67 , 95% CL = 1.13 - 6.34
Relative biomass last year= 0.484 k, 2.5th = 0.218 , 97.5th = 0.597
Relative biomass next year= 0.476 k, 2.5th = 0.186 , 97.5th = 0.596
Relative exploitation rate in last year= 1
Comment: Set from Low to Very low.
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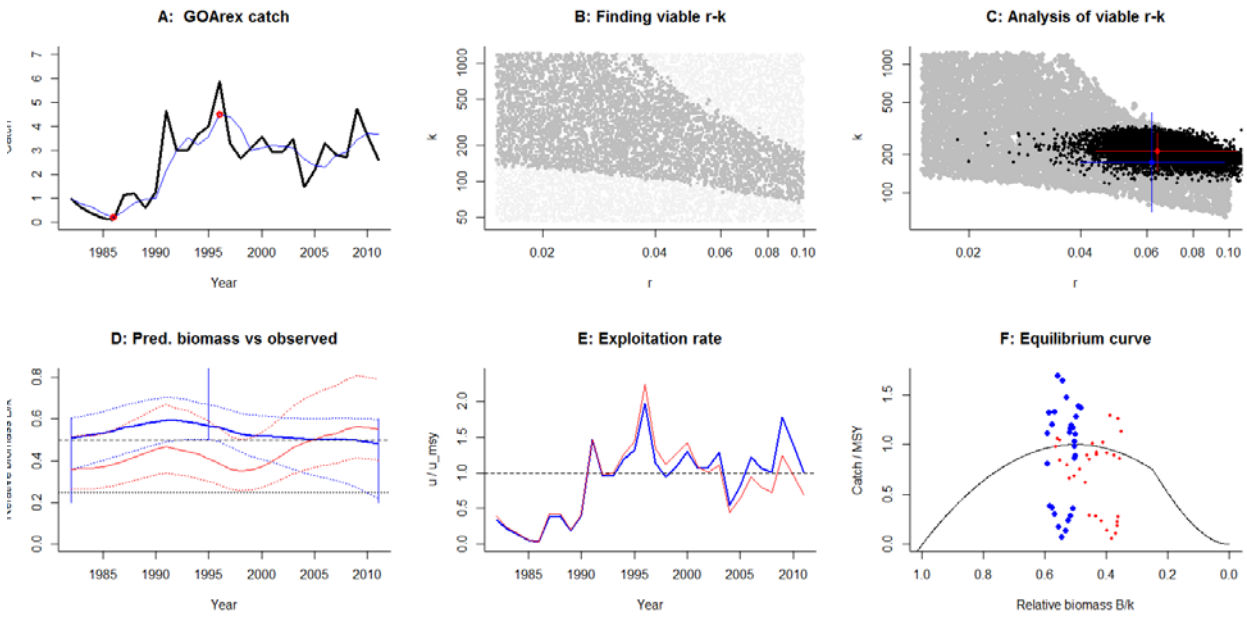

## Region: Pacific

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: *Sebastes aurora* , stock: Aurora_PC
Name and region: Aurora rockfish - Pacific Coast , Pacific
Catch data used from years 1990 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2000 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 2.09 - 55.7
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0279 , 95% CL = 0.012 - 0.0553 , k = 12.4 , 95% CL = 8.27 - 16.9
MSY = 0.0844 , 95% CL = 0.0367 - 0.159
Biomass in last year = 4.33 or 0.35 k
Exploitation rate in last year = 0.00878 or 0.631 u.msy
Results of CMSY analysis with altogether 35386 viable trajectories for 8710 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 8.6 , 95% CL = 2.47 - 29.9
MSY = 0.133 , 95% CL = 0.0278 - 0.641
Relative biomass last year= 0.269 k, 2.5th = 0.0189 , 97.5th = 0.396
Relative biomass next year= 0.273 k, 2.5th = 0.0102 , 97.5th = 0.406
Relative exploitation rate in last year= 0.6
Comment: Set from Low to Very low and changed start year to 1990.
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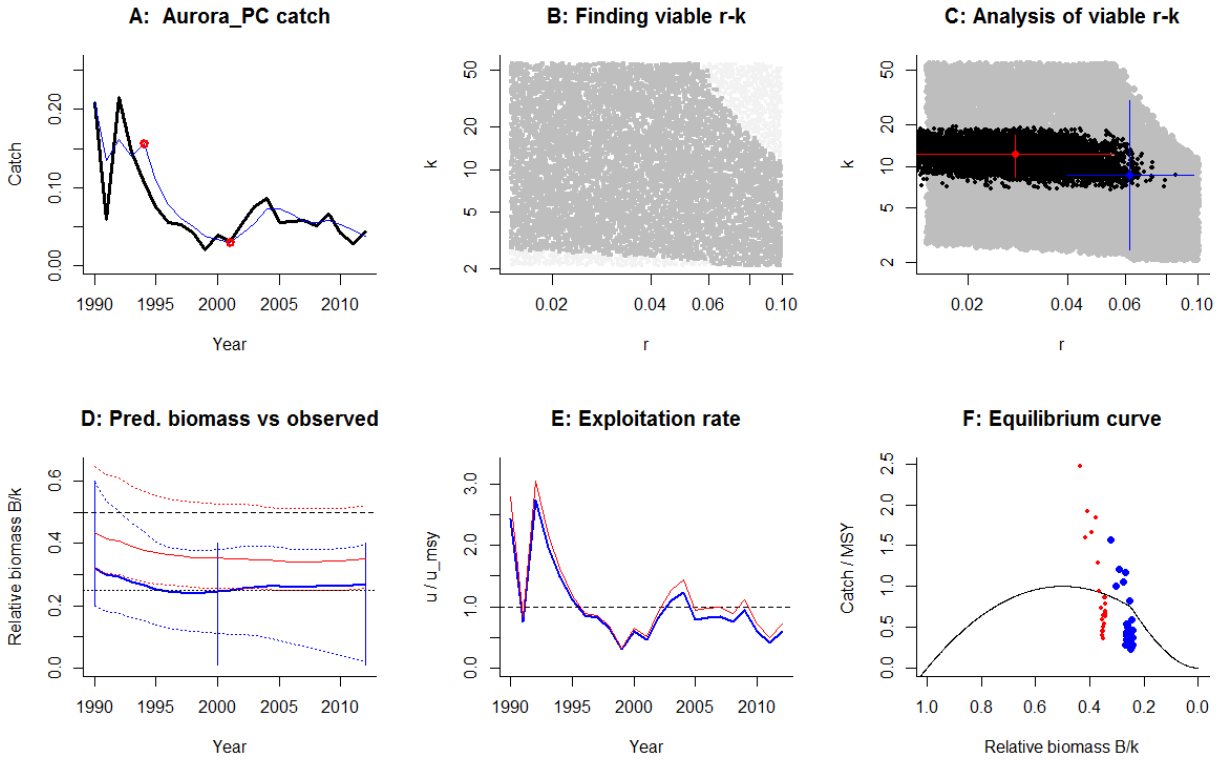

Species: *Thunnus orientalis* , stock: BFTuna_P
Name and region: Pacific Bluefin tuna , Pacific
Catch data used from years 1952 - 2010 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1989 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 45.4 - 727
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.503 , 95% CL = 0.472 - 0.544 , k = 189 , 95% CL = 175 - 207
MSY = 23.9 , 95% CL = 21.9 - 26.3
Biomass in last year = 48.9 or 0.259 k
Exploitation rate in last year = 0.429 or 1.7 u.msy
Results of CMSY analysis with altogether 3206 viable trajectories for 1639 r-k pairs
r = 0.399 , 95% CL = 0.32 - 0.527 , k = 231 , 95% CL = 169 - 299
MSY = 23 , 95% CL = 21.4 - 24.8
Relative biomass last year= 0.324 k, 2.5th = 0.052 , 97.5th = 0.398
Relative biomass next year= 0.317 k, 2.5th = -0.0268 , 97.5th = 0.416
Relative exploitation rate in last year= 1.19
Comment: OK
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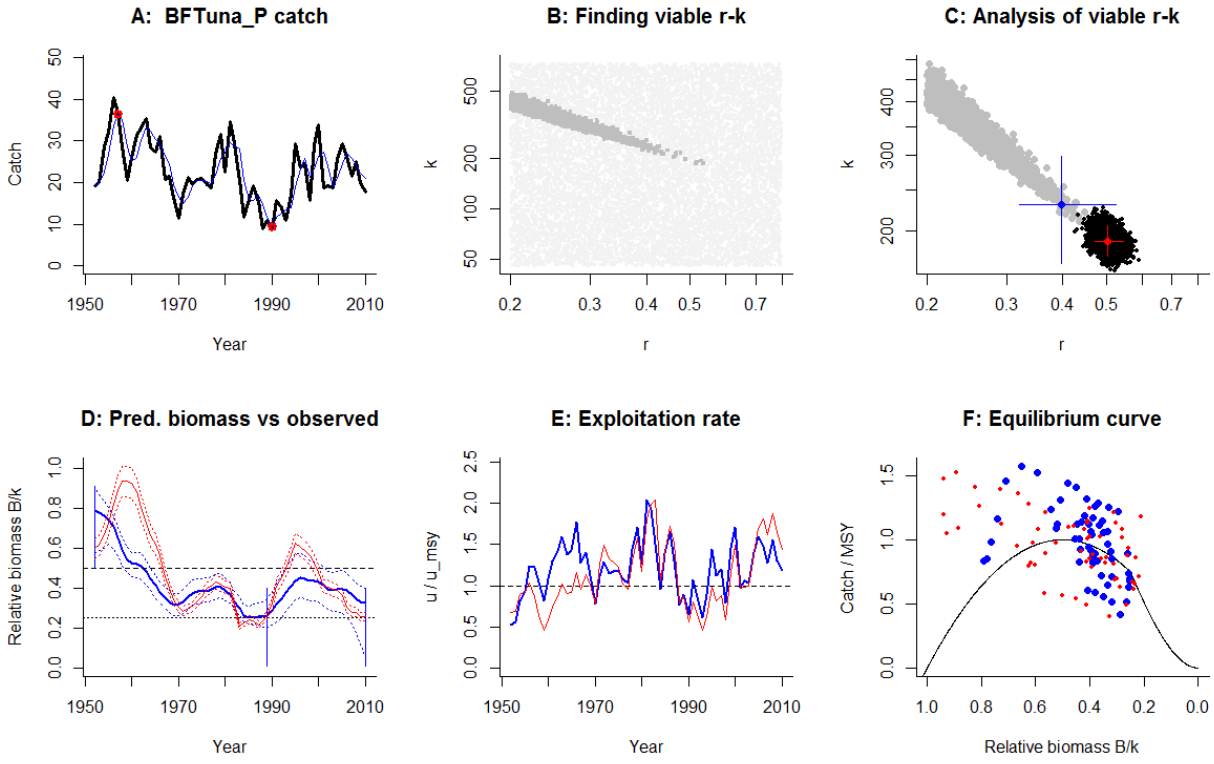

Species: *Makaira nigricans* , stock: BMarlin_NP
Name and region: Blue marlin - North Pacific , Pacific
Catch data used from years 1971 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2004 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 59.8 - 1434
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.503 , 95% CL = 0.459 - 0.565 , k = 154 , 95% CL = 144 - 165
MSY = 19.5 , 95% CL = 18.3 - 20.8
Biomass in last year = 78.7 or 0.511 k
Exploitation rate in last year = 0.23 or 0.913 u.msy
Results of CMSY analysis with altogether 3643 viable trajectories for 831 r-k pairs
r = 0.567 , 95% CL = 0.405 - 0.785 , k = 146 , 95% CL = 99 - 219
MSY = 20.8 , 95% CL = 18.2 - 23.7
Relative biomass last year= 0.561 k, 2.5th = 0.504 , 97.5th = 0.673
Relative biomass next year= 0.58 k, 2.5th = 0.501 , 97.5th = 0.69
Relative exploitation rate in last year= 0.717
Comment: OK
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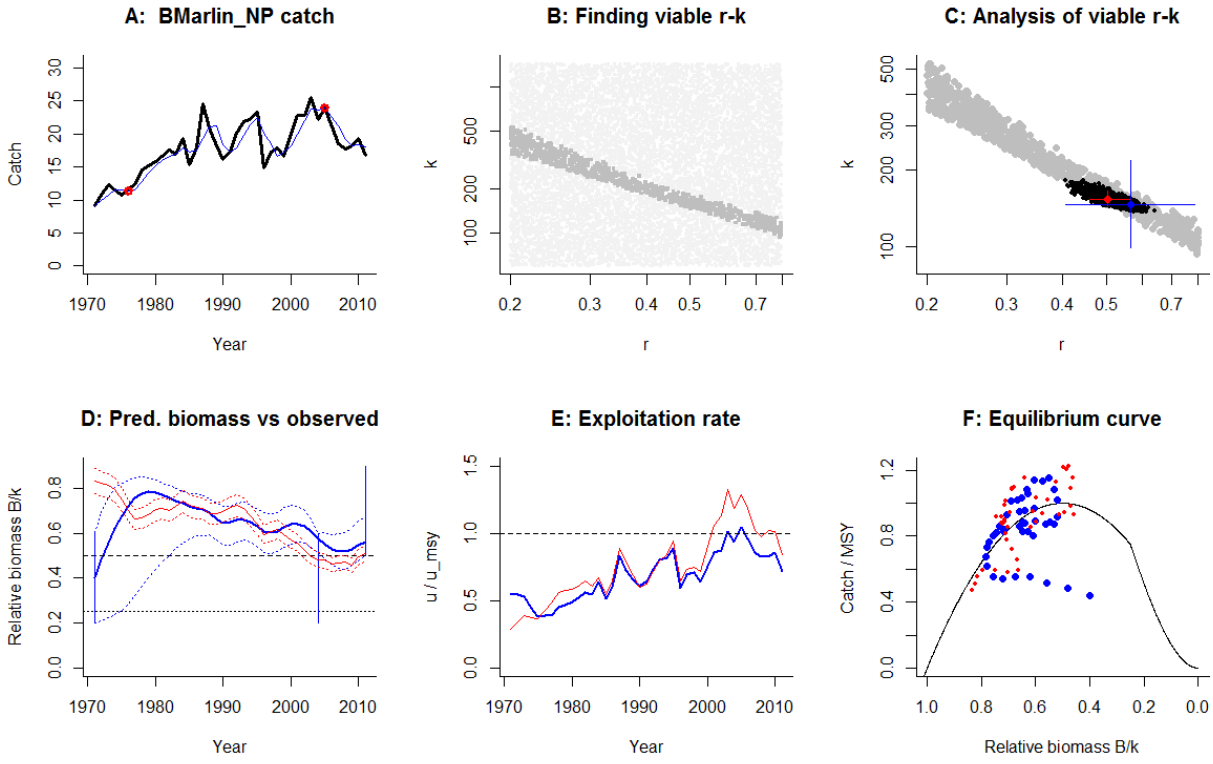

Species: *Sebastes paucispinis* , stock: Boca_PC
Name and region: Bocaccio - Southern Pacific Coast , Pacific
Catch data used from years 1935 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 15.1 - 603
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.254 , 95% CL = 0.216 - 0.282 , k = 55.2 , 95% CL = 49.5 - 62.7
MSY = 3.5 , 95% CL = 2.91 - 4.11
Biomass in last year = 16.6 or 0.3 k
Exploitation rate in last year = 0.00755 or 0.0594 u.msy
Results of CMSY analysis with altogether 3110 viable trajectories for 801 r-k pairs
r = 0.243 , 95% CL = 0.148 - 0.433 , k = 56.9 , 95% CL = 28.6 - 104
MSY = 3.45 , 95% CL = 2.8 - 4.26
Relative biomass last year= 0.107 k, 2.5th = 0.013 , 97.5th = 0.381
Relative biomass next year= 0.112 k, 2.5th = 0.0112 , 97.5th = 0.425
Relative exploitation rate in last year= 0.254
Comment: OK
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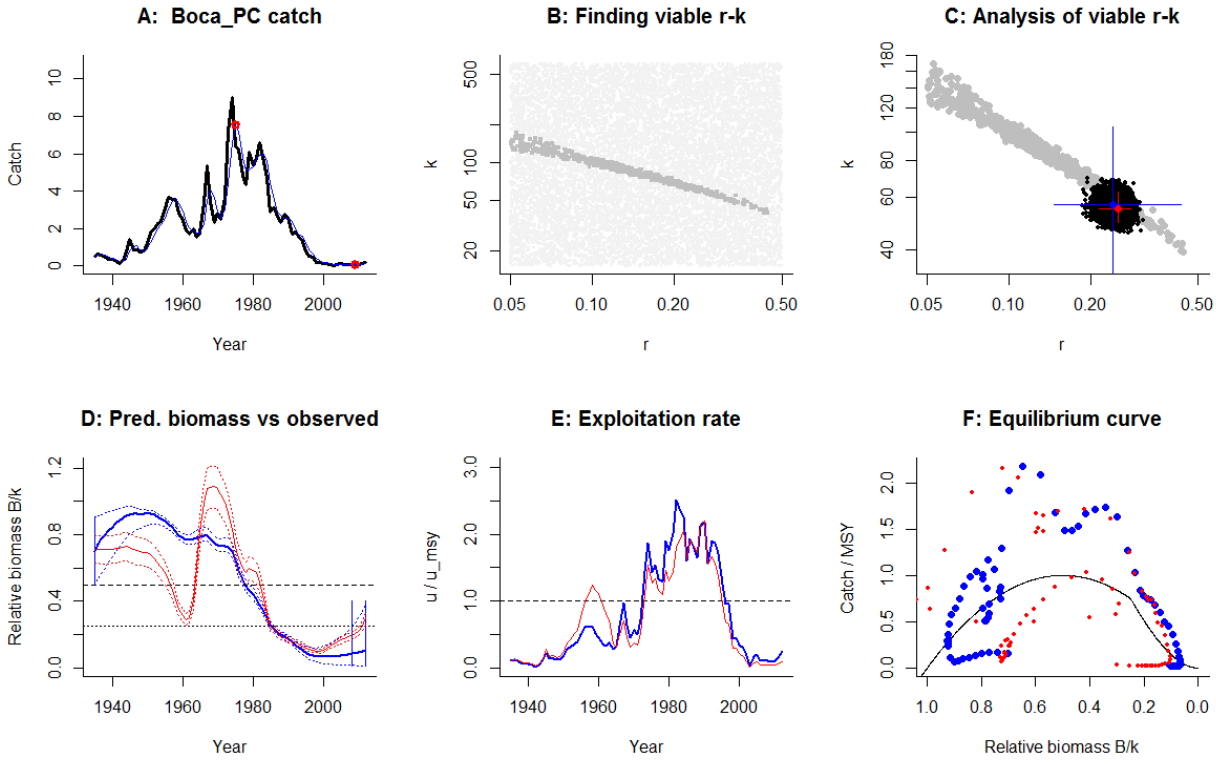

Species: *Sebastes auriculatus* , stock: BrownRF_PC
Name and region: Brown rockfish - Pacific Coast , Pacific
Catch data used from years 1950 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1975 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 0.672 - 26.9
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.214 , 95% CL = 0.194 - 0.236 , k = 3.45 , 95% CL = 3.22 - 3.75
MSY = 0.184 , 95% CL = 0.169 - 0.202
Biomass in last year = 1.4 or 0.406 k
Exploitation rate in last year = 0.0726 or 0.679 u.msy
Results of CMSY analysis with altogether 8669 viable trajectories for 1387 r-k pairs
r = 0.215 , 95% CL = 0.136 - 0.364 , k = 3.2 , 95% CL = 1.76 - 5.46
MSY = 0.172 , 95% CL = 0.149 - 0.199
Relative biomass last year= 0.513 k, 2.5th = 0.272 , 97.5th = 0.597
Relative biomass next year= 0.53 k, 2.5th = 0.278 , 97.5th = 0.617
Relative exploitation rate in last year= 0.537
Comment: Start year set to 1950.
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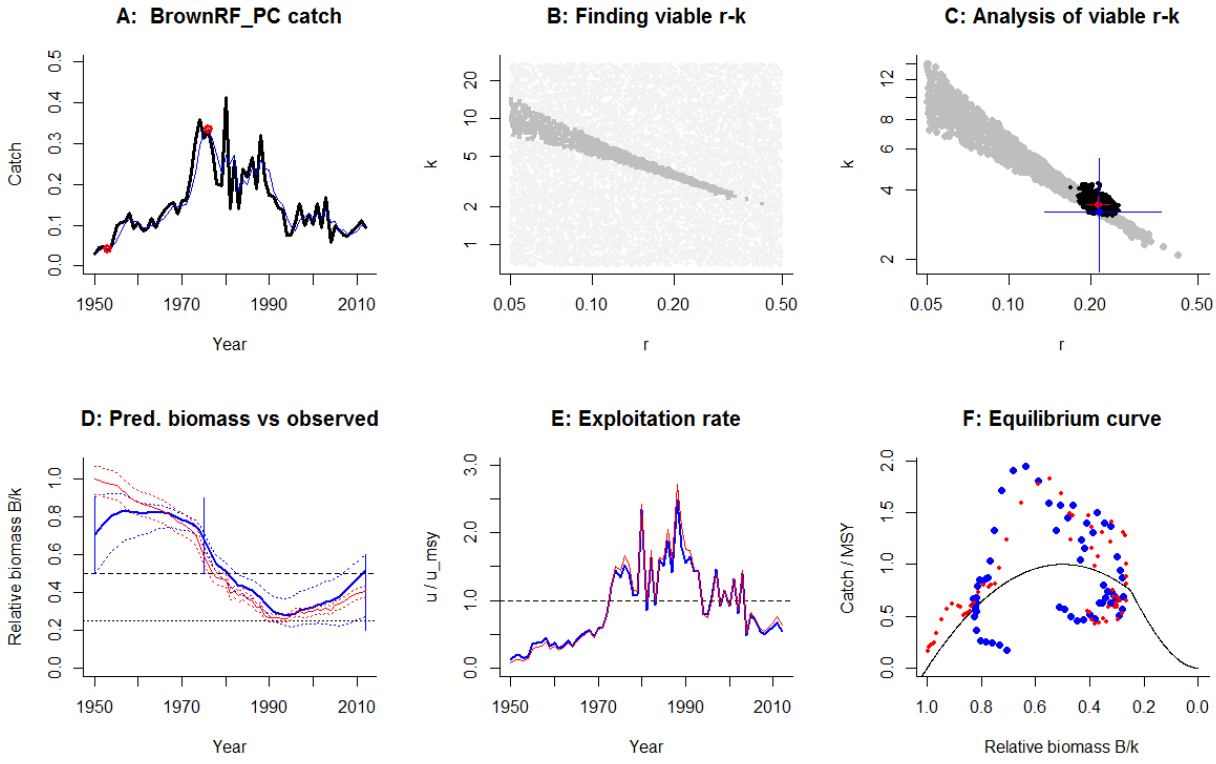

Species: *Sebastes nebulosus* , stock: ChinaRF_PC
Name and region: China rockfish - Pacific Coast , Pacific
Catch data used from years 1970 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 0.132 - 5.28
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.185 , 95% CL = 0.151 - 0.231 , k = 1.25 , 95% CL = 1.14 - 1.38
MSY = 0.0577 , 95% CL = 0.0493 - 0.0692
Biomass in last year = 0.775 or 0.621 k
Exploitation rate in last year = 0.0404 or 0.438 u.msy
Results of CMSY analysis with altogether 3560 viable trajectories for 845 r-k pairs
r = 0.27 , 95% CL = 0.159 - 0.488 , k = 0.681 , 95% CL = 0.349 - 1.25
MSY = 0.046 , 95% CL = 0.0396 - 0.0533
Relative biomass last year= 0.466 k, 2.5th = 0.239 , 97.5th = 0.589
Relative biomass next year= 0.484 k, 2.5th = 0.239 , 97.5th = 0.619
Relative exploitation rate in last year= 0.723
Comment: Start year set to 1970. Fit could be improved by setting intbio to 0.2-0.6 in 2000.
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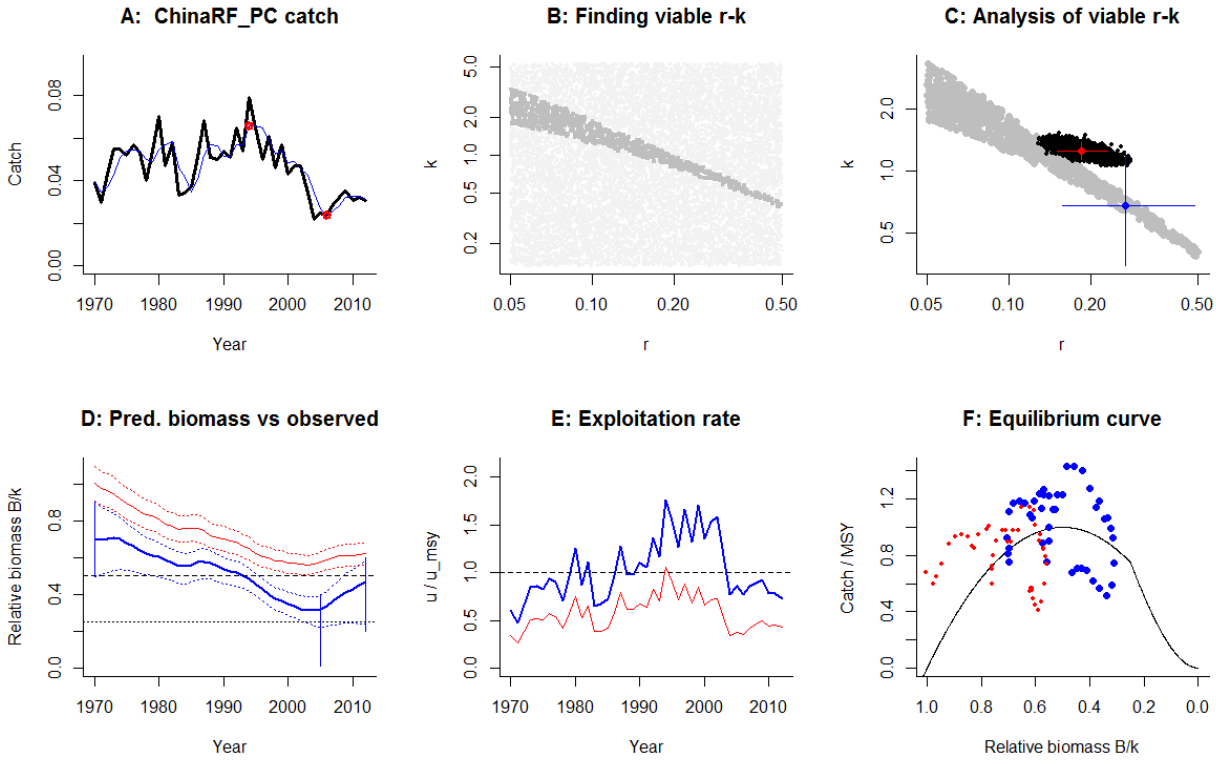

Species: *Sebastes caurinus* , stock: CopperRF_PC
Name and region: Copper rockfish - Pacific Coast , Pacific
Catch data used from years 1950 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2003 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 0.967 - 38.7
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.184 , 95% CL = 0.163 - 0.208 , k = 5.35 , 95% CL = 4.97 - 5.77
MSY = 0.246 , 95% CL = 0.221 - 0.274
Biomass in last year = 3.25 or 0.607 k
Exploitation rate in last year = 0.0239 or 0.26 u.msy
Results of CMSY analysis with altogether 5287 viable trajectories for 1059 r-k pairs
r = 0.2 , 95% CL = 0.129 - 0.34 , k = 4.41 , 95% CL = 2.37 - 7.47
MSY = 0.22 , 95% CL = 0.185 - 0.263
Relative biomass last year= 0.521 k, 2.5th = 0.24 , 97.5th = 0.597
Relative biomass next year= 0.545 k, 2.5th = 0.251 , 97.5th = 0.62
Relative exploitation rate in last year= 0.413
Comment: Start year set to 1950; OK.
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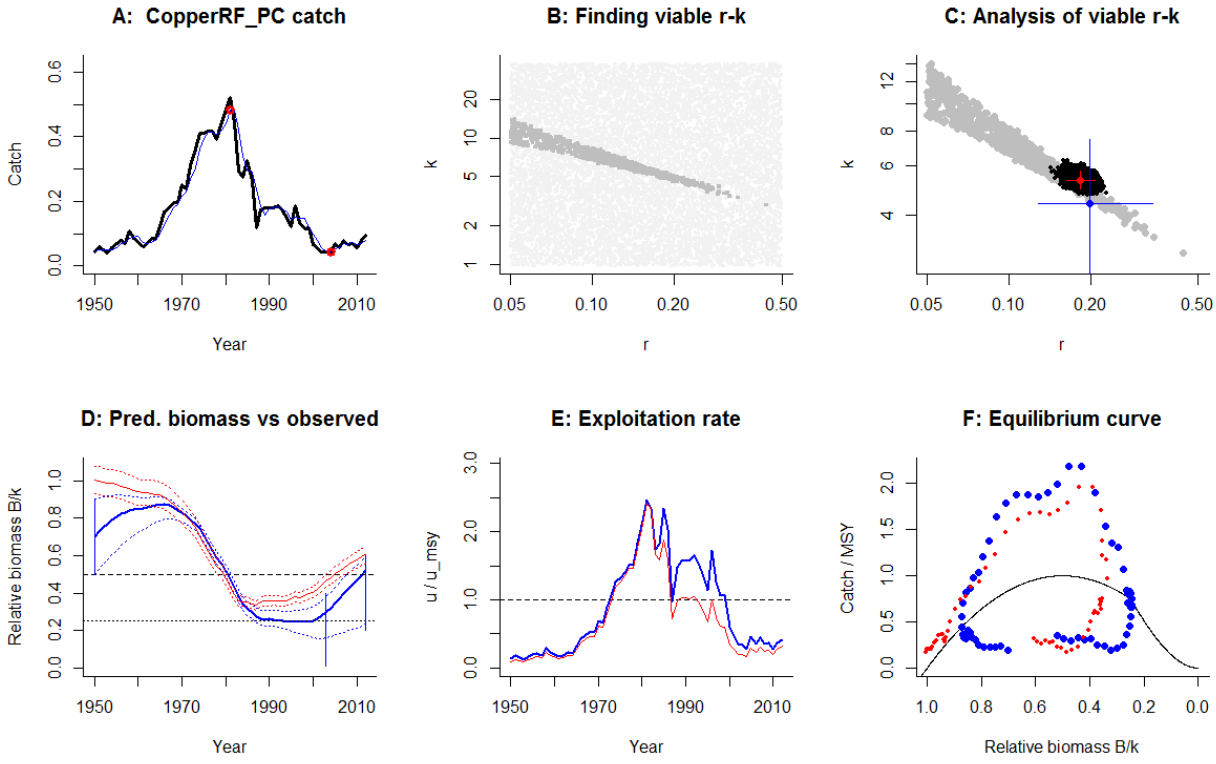

Species: *Sebastes levis* , stock: Cowcod_PC
Name and region: Cowcod - Southern California , Pacific
Catch data used from years 1959 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 0.512 - 20.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.275 , 95% CL = 0.241 - 0.314 , k = 2.05 , 95% CL = 1.74 - 2.7
MSY = 0.141 , 95% CL = 0.116 - 0.184
Biomass in last year = 1.02 or 0.497 k
Exploitation rate in last year = 0.000655 or 0.00476 u.msy
Results of CMSY analysis with altogether 3379 viable trajectories for 1260 r-k pairs
r = 0.254 , 95% CL = 0.152 - 0.469 , k = 2 , 95% CL = 0.972 - 3.74
MSY = 0.127 , 95% CL = 0.102 - 0.158
Relative biomass last year= 0.416 k, 2.5th = 0.211 , 97.5th = 0.592
Relative biomass next year= 0.467 k, 2.5th = 0.236 , 97.5th = 0.646
Relative exploitation rate in last year= 0.00945
Comment: Set from Very low to Low.
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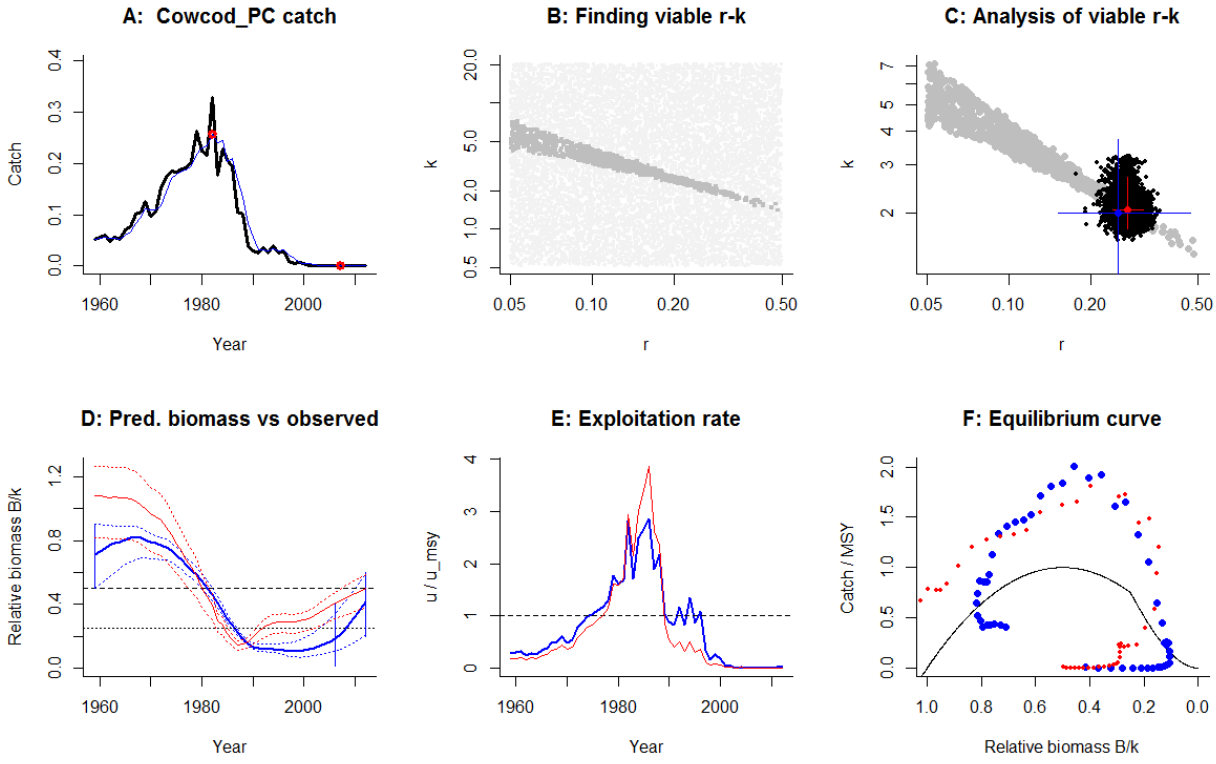

Species: *Sebastes crameri* , stock: DarkblotchedRF_PC
Name and region: Darkblotched rockfish - Pacific Coast , Pacific
Catch data used from years 1950 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 16.2 - 866
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0926 , 95% CL = 0.0646 - 0.118 , k = 37.9 , 95% CL = 33 - 45.7
MSY = 0.882 , 95% CL = 0.657 - 1.1
Biomass in last year = 15.7 or 0.414 k
Exploitation rate in last year = 0.012 or 0.26 u.msy
Results of CMSY analysis with altogether 17603 viable trajectories for 3499 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 37.6 , 95% CL = 20.4 - 69.6
MSY = 0.584 , 95% CL = 0.42 - 0.811
Relative biomass last year= 0.253 k, 2.5th = 0.0181 , 97.5th = 0.395
Relative biomass next year= 0.259 k, 2.5th = 0.0135 , 97.5th = 0.405
Relative exploitation rate in last year= 0.325
Comment: Set from Low to Very low and start year to 1950.
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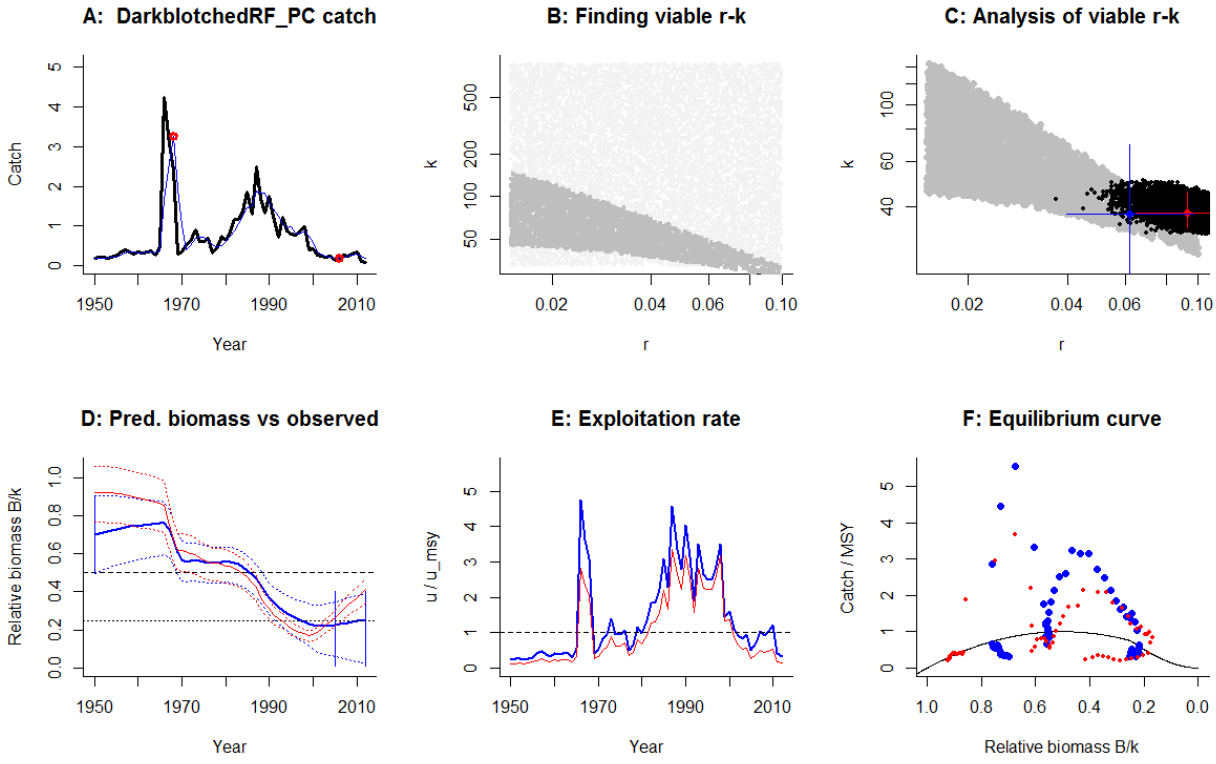

Species: *Sebastolobus altivelis* , stock: LongspinTH_PC
Name and region: Longspine thornyhead - Pacific Coast , Pacific
Catch data used from years 1980 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1994 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 60.4 - 1610
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0594 , 95% CL = 0.0432 - 0.083 , k = 184 , 95% CL = 138 - 241
MSY = 2.76 , 95% CL = 1.96 - 3.8
Biomass in last year = 68.3 or 0.37 k
Exploitation rate in last year = 0.0169 or 0.57 u.msy
Results of CMSY analysis with altogether 1052 viable trajectories for 852 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 114 , 95% CL = 64.3 - 203
MSY = 1.77 , 95% CL = 1.38 - 2.28
Relative biomass last year= 0.352 k, 2.5th = 0.165 , 97.5th = 0.399
Relative biomass next year= 0.357 k, 2.5th = 0.16 , 97.5th = 0.404
Relative exploitation rate in last year= 0.731
Comment: Set from Low to Very low. Fit could be improved by setting intbio Low in 2000.
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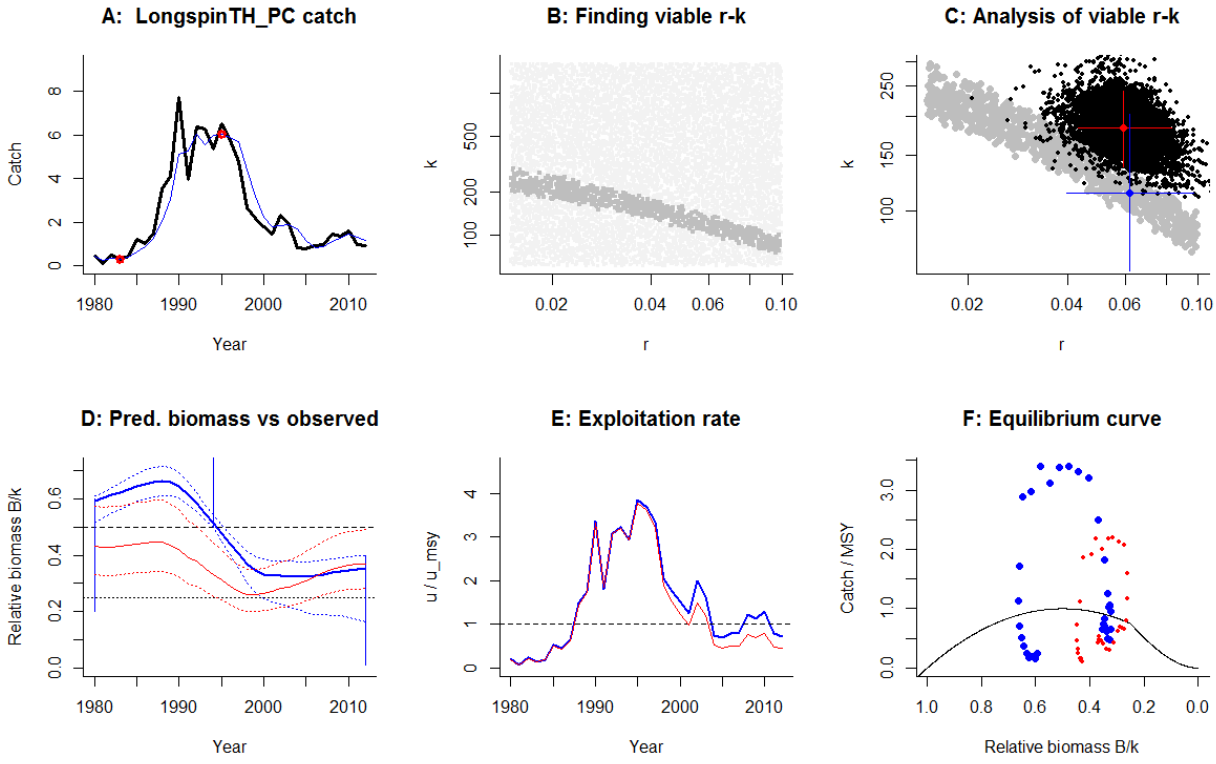

Species: *Eopsetta jordani* , stock: PetraleSole_PC
Name and region: Petrale sole - Pacific Coast , Pacific
Catch data used from years 1959 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1994 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 4.42 - 70.8
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.446 , 95% CL = 0.416 - 0.481 , k = 23.8 , 95% CL = 22.1 - 25.8
MSY = 2.65 , 95% CL = 2.49 - 2.84
Biomass in last year = 15 or 0.631 k
Exploitation rate in last year = 0.0622 or 0.279 u.msy
Results of CMSY analysis with altogether 2832 viable trajectories for 1203 r-k pairs
r = 0.381 , 95% CL = 0.311 - 0.503 , k = 27.1 , 95% CL = 19.8 - 34.5
MSY = 2.59 , 95% CL = 2.4 - 2.78
Relative biomass last year= 0.53 k, 2.5th = 0.293 , 97.5th = 0.598
Relative biomass next year= 0.583 k, 2.5th = 0.33 , 97.5th = 0.66
Relative exploitation rate in last year= 0.417
Comment: OK
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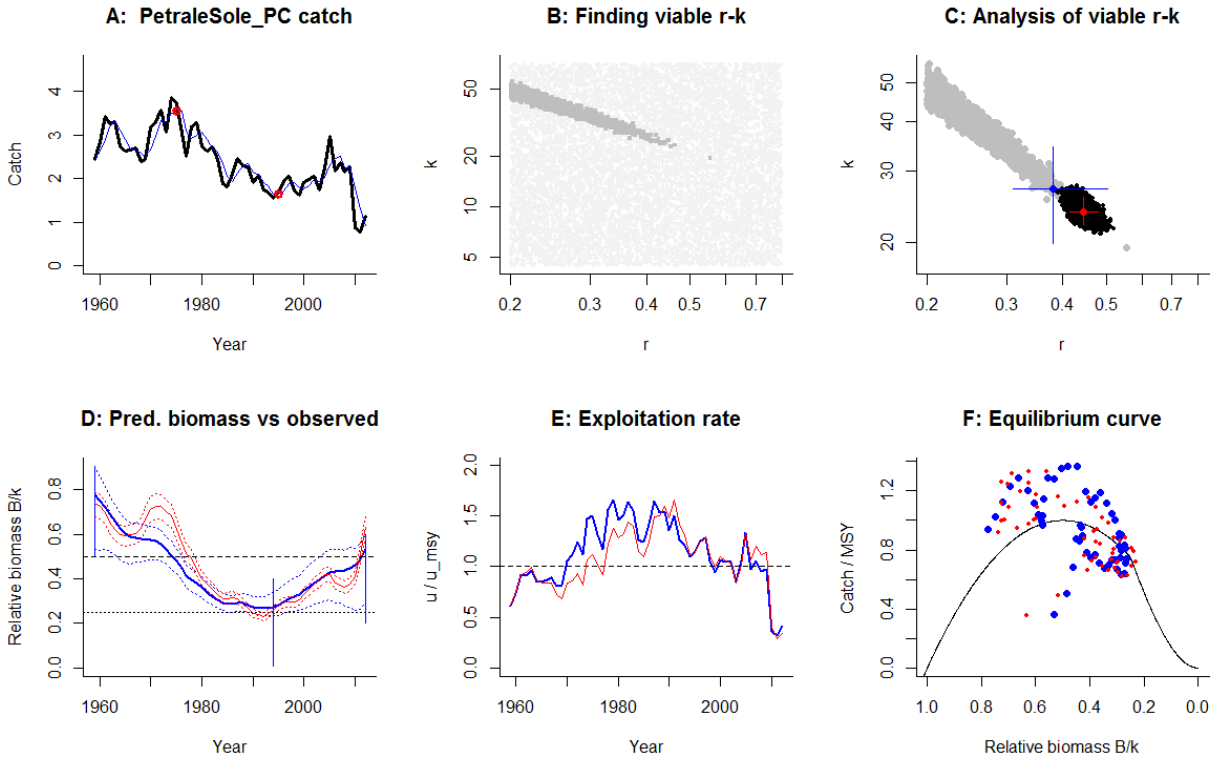

Species: *Merluccius productus* , stock: Phake_PC
Name and region: Pacific hake - Pacific Coast , Pacific
Catch data used from years 1990 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2005 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 443 - 7090
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.495 , 95% CL = 0.428 - 0.547 , k = 3340 , 95% CL = 2818 - 4213
MSY = 411 , 95% CL = 334 - 517
Biomass in last year = 2156 or 0.646 k
Exploitation rate in last year = 0.111 or 0.447 u.msy
Results of CMSY analysis with altogether 7703 viable trajectories for 1197 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 1945 , 95% CL = 1293 - 2926
MSY = 275 , 95% CL = 235 - 322
Relative biomass last year= 0.514 k, 2.5th = 0.262 , 97.5th = 0.597
Relative biomass next year= 0.532 k, 2.5th = 0.24 , 97.5th = 0.637
Relative exploitation rate in last year= 0.721
Comment: Start year set to 1990.
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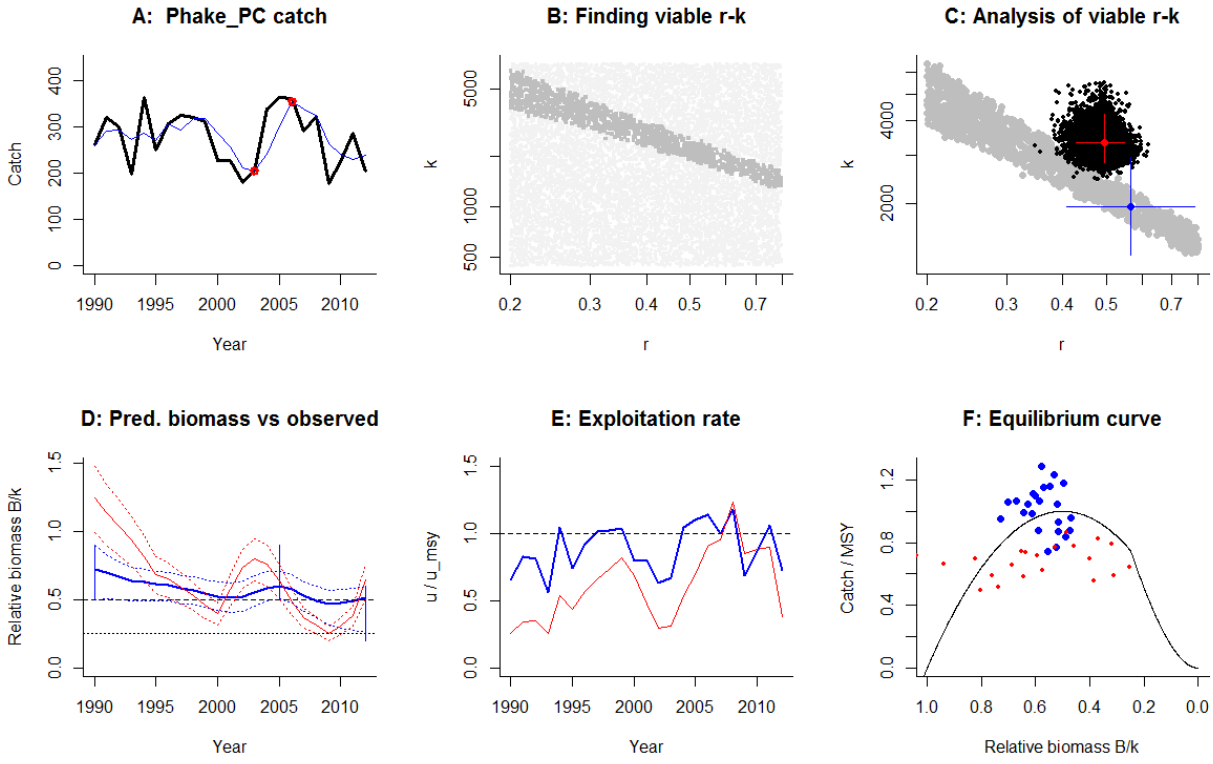

Species: *Sebastes aleutianus* , stock: Rougheye_PC
Name and region: Rougheye rockfish - Pacific Coast , Pacific
Catch data used from years 1980 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2003 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.015 - 0.1 default , prior range for k = 5.84 - 156
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0347 , 95% CL = 0.0189 - 0.0541 , k = 29.4 , 95% CL = 21.1 - 38.3
MSY = 0.254 , 95% CL = 0.139 - 0.404
Biomass in last year = 8.49 or 0.289 k
Exploitation rate in last year = 0.0242 or 1.39 u.msy
Results of CMSY analysis with altogether 25873 viable trajectories for 6603 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 23.5 , 95% CL = 8.53 - 64.6
MSY = 0.364 , 95% CL = 0.12 - 1.1
Relative biomass last year= 0.259 k, 2.5th = 0.0168 , 97.5th = 0.396
Relative biomass next year= 0.259 k, 2.5th = 0.0031 , 97.5th = 0.4
Relative exploitation rate in last year= 0.985
Comment: OK
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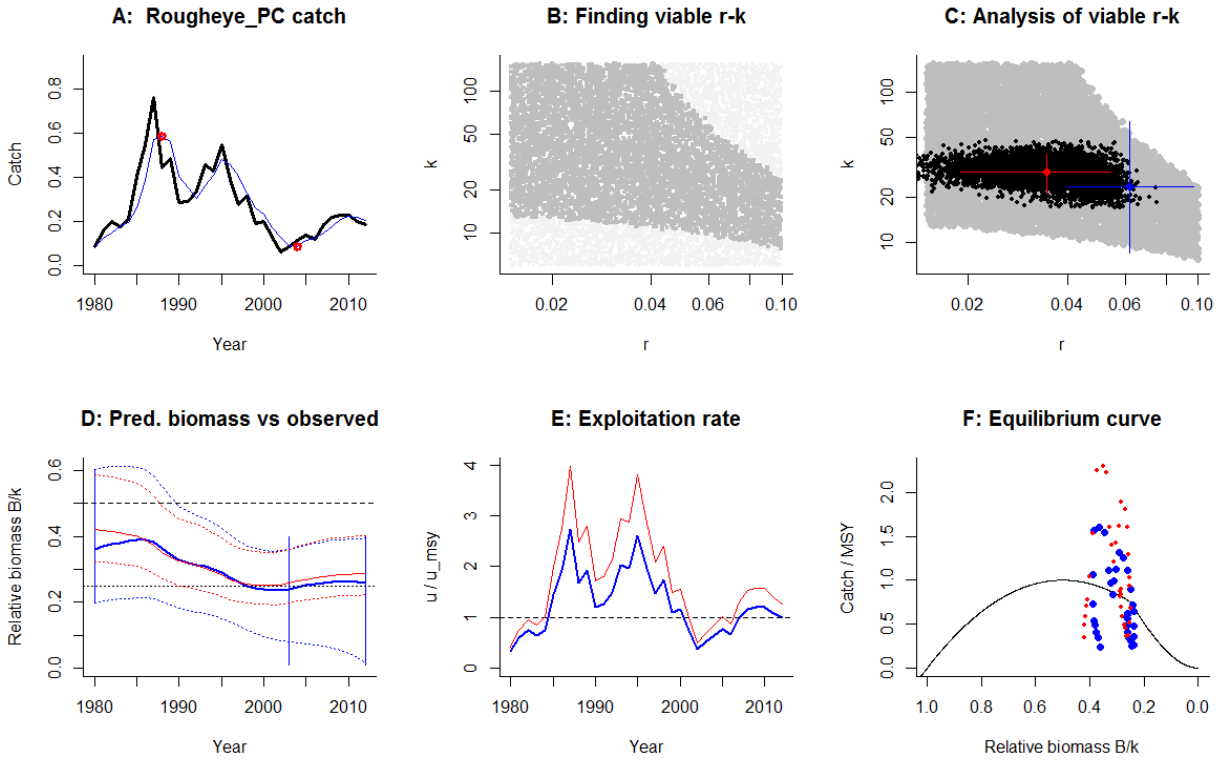

Species: *Sardinops sagax* , stock: Sardine_P
Name and region: Sardine in Pacific Ocean , Pacific
Catch data used from years 1993 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2007 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 200 - 3201
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.501 , 95% CL = 0.443 - 0.567 , k = 1409 , 95% CL = 1247 - 1626
MSY = 177 , 95% CL = 151 - 207
Biomass in last year = 759 or 0.539 k
Exploitation rate in last year = 0.185 or 0.74 u.msy
Results of CMSY analysis with altogether 11348 viable trajectories for 1942 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 946 , 95% CL = 598 - 1495
MSY = 134 , 95% CL = 104 - 173
Relative biomass last year= 0.494 k, 2.5th = 0.257 , 97.5th = 0.597
Relative biomass next year= 0.485 k, 2.5th = 0.187 , 97.5th = 0.617
Relative exploitation rate in last year= 1.04
Comment: OK
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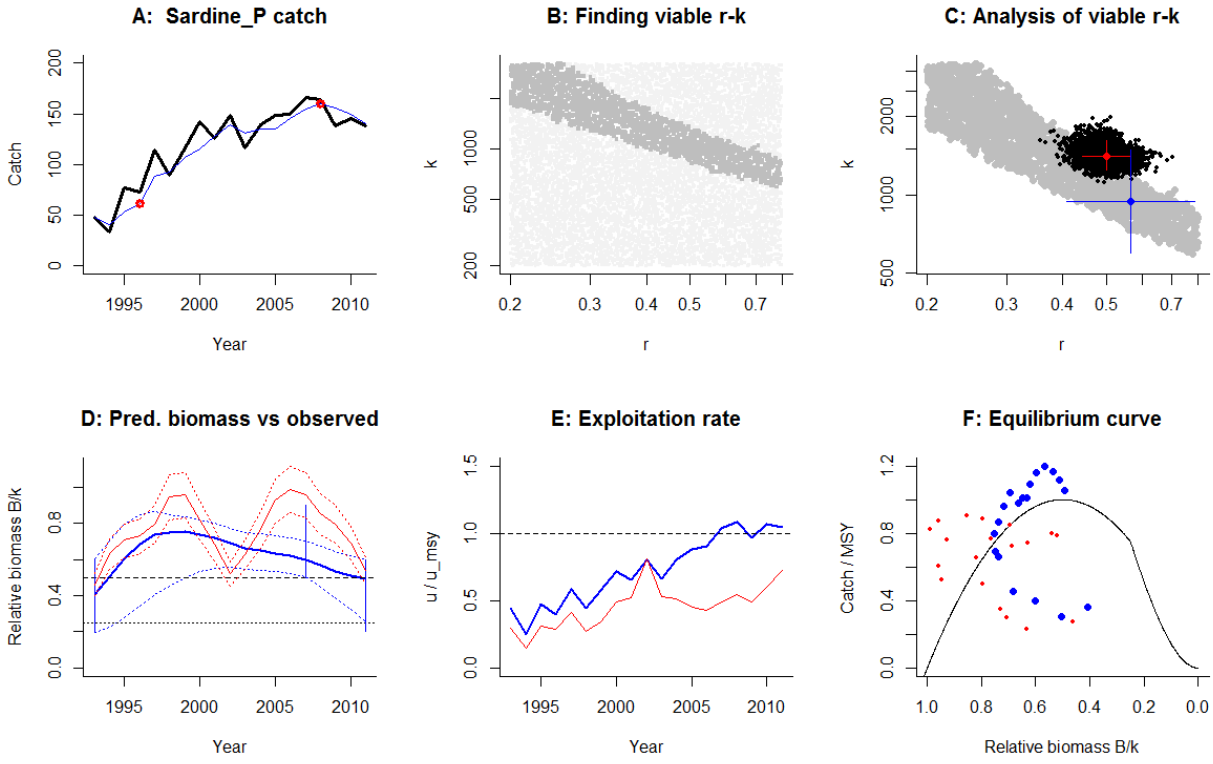
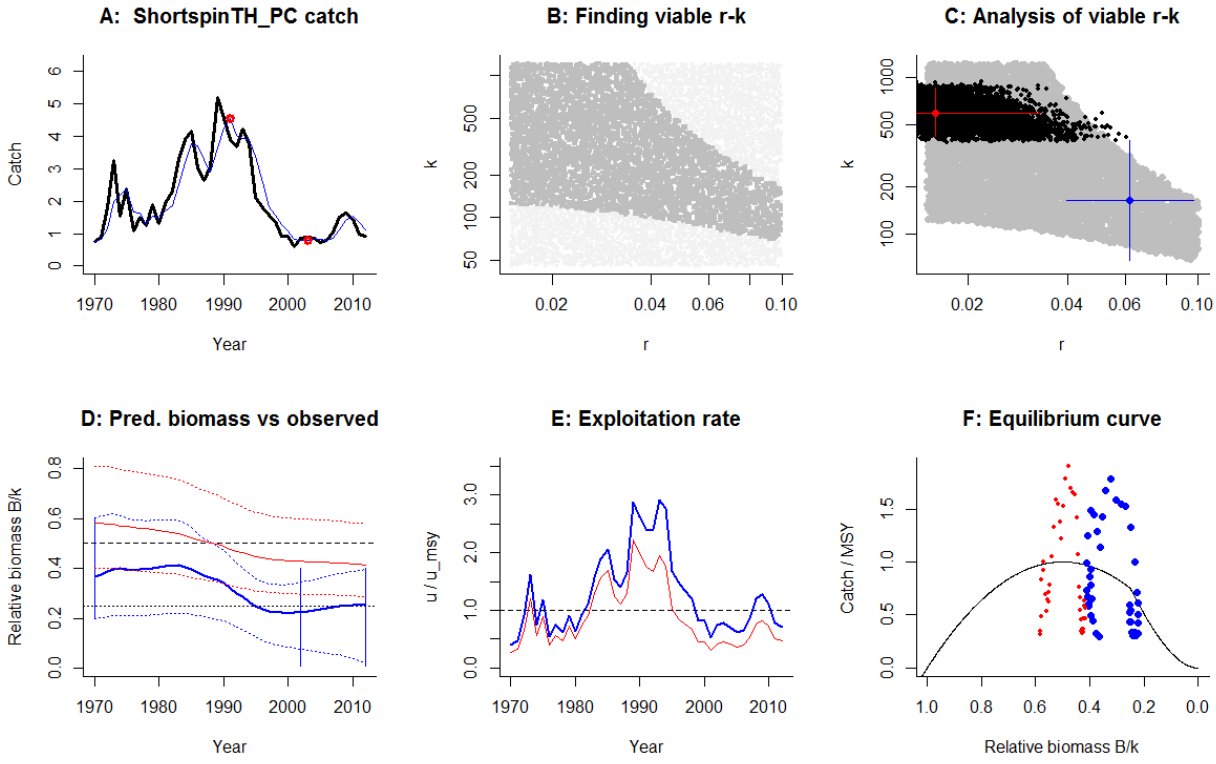
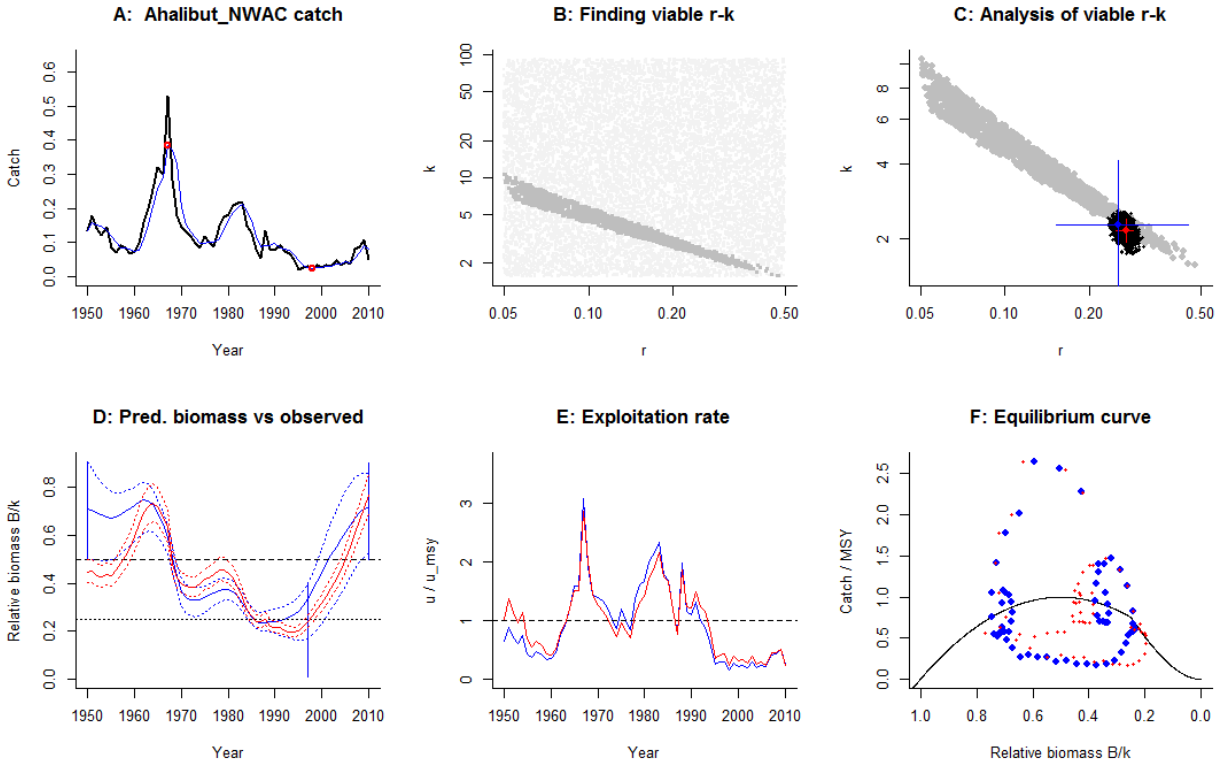


Species: *Sebastolobus alascanus* , stock: ShortspinTH_PC
Name and region: Shortspine thornyhead - Pacific Coast , Pacific
Catch data used from years 1970 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2002 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 45.5 - 1212
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.0159 , 95% CL = 0.00675 - 0.0332 , k = 589 , 95% CL = 422 - 851
MSY = 2.39 , 95% CL = 1.02 - 4.5
Biomass in last year = 244 or 0.415 k
Exploitation rate in last year = 0.00455 or 0.572 u.msy
Results of CMSY analysis with altogether 20210 viable trajectories for 5590 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 164 , 95% CL = 68.6 - 394
MSY = 2.55 , 95% CL = 1.1 - 5.9
Relative biomass last year= 0.253 k, 2.5th = 0.0162 , 97.5th = 0.396
Relative biomass next year= 0.256 k, 2.5th = 0.0071 , 97.5th = 0.403
Relative exploitation rate in last year= 0.706
Comment: OK. Fit could be improved by setting intbio (anywhere) and endbio to Medium.
---

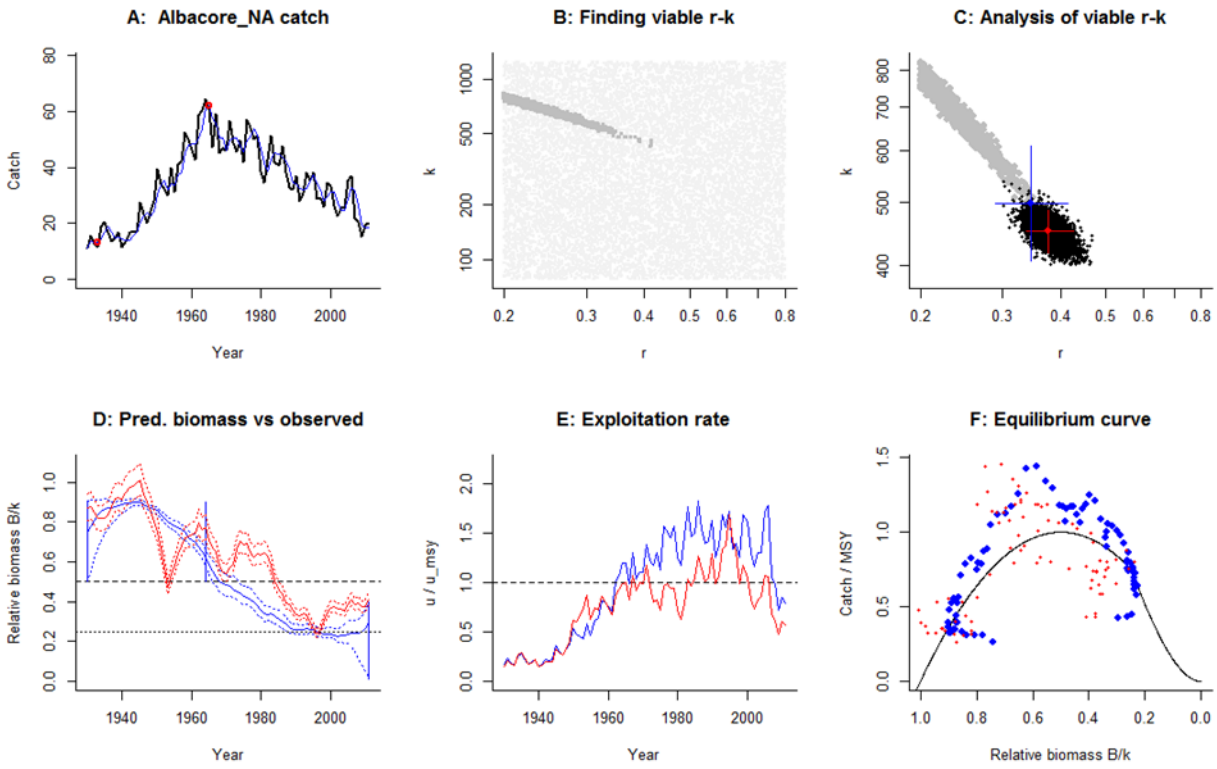


## Region: Northwest Atlantic

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: *Hippoglossus hippoglossus* , stock: Ahalibut_NWAC
Name and region: Atlantic halibut - Northwestern Atlantic Coast , NWA
Catch data used from years 1950 - 2010 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1997 default
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 1.53 - 92.1
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.27 , 95% CL = 0.248 - 0.287 , k = 2.17 , 95% CL = 1.95 - 2.41
MSY = 0.145 , 95% CL = 0.13 - 0.161
Biomass in last year = 1.66 or 0.768 k
Exploitation rate in last year = 0.0495 or 0.367 u.msy
Results of CMSY analysis with altogether 5783 viable trajectories for 2384 r-k pairs
r = 0.254 , 95% CL = 0.152 - 0.448 , k = 2.28 , 95% CL = 1.2 - 4.12
MSY = 0.145 , 95% CL = 0.125 - 0.169
Relative biomass last year= 0.716 k, 2.5th = 0.527 , 97.5th = 0.852
Relative biomass next year= 0.727 k, 2.5th = 0.547 , 97.5th = 0.852
Relative exploitation rate in last year= 0.25
Comment: Resilience changed from Very low to Low.
---



Species: *Thunnus alalunga* , stock: Albacore_NA
Name and region: Albacore - North Atlantic , NWA
Catch data used from years 1930 - 2011 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1964 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 77.3 - 1238
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.376 , 95% CL = 0.338 - 0.425 , k = 451 , 95% CL = 417 - 487
MSY = 42.5 , 95% CL = 38.7 - 46.9
Biomass in last year = 186 or 0.412 k
Exploitation rate in last year = 0.0985 or 0.524 u.msy
Results of CMSY analysis with altogether 2077 viable trajectories for 1097 r-k pairs
r = 0.346 , 95% CL = 0.289 - 0.413 , k = 497 , 95% CL = 406 - 610
MSY = 43 , 95% CL = 40.9 - 45.1
Relative biomass last year= 0.294 k, 2.5th = 0.0247 , 97.5th = 0.398
Relative biomass next year= 0.321 k, 2.5th = -0.00953 , 97.5th = 0.438
Relative exploitation rate in last year= 0.793
Comment: Good fit.
---



Species: *Thunnus obesus* , stock: BETuna_A
Name and region: Bigeye tuna - Atlantic , NWA
Catch data used from years 1950 - 2009 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 1995 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 159 - 2547
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.451 , 95% CL = 0.424 - 0.48 , k = 850 , 95% CL = 831 - 870
MSY = 95.7 , 95% CL = 90.9 - 101
Biomass in last year = 423 or 0.497 k
Exploitation rate in last year = 0.187 or 0.829 u.msy
Results of CMSY analysis with altogether 1410 viable trajectories for 489 r-k pairs
r = 0.568 , 95% CL = 0.411 - 0.785 , k = 661 , 95% CL = 451 - 968
MSY = 93.9 , 95% CL = 83.6 - 105
Relative biomass last year= 0.418 k, 2.5th = 0.216 , 97.5th = 0.593
Relative biomass next year= 0.445 k, 2.5th = 0.184 , 97.5th = 0.627
Relative exploitation rate in last year= 1.12
Comment: OK
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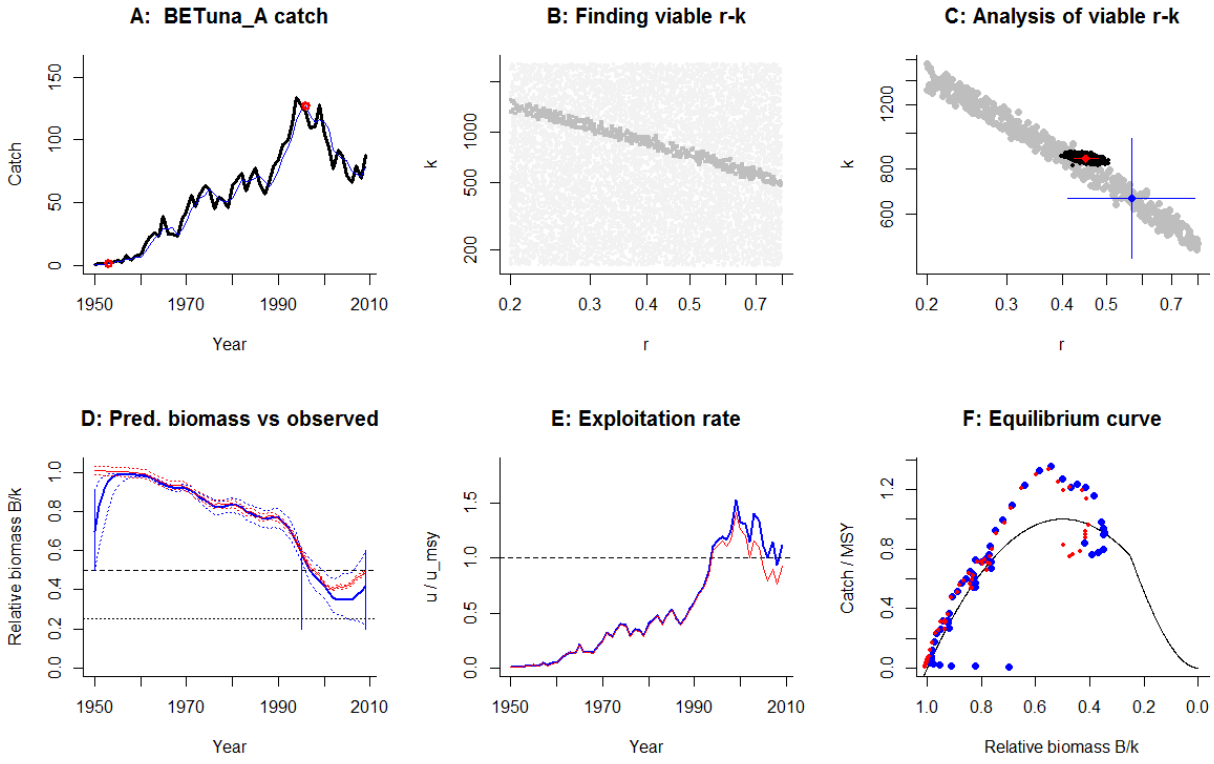

Species: *Pomatomus saltatrix* , stock: Bluefish_AC
Name and region: Bluefish - Atlantic Coast , NWA
Catch data used from years 1985 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1999 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 56 - 896
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.474 , 95% CL = 0.402 - 0.524 , k = 209 , 95% CL = 160 - 350
MSY = 24.6 , 95% CL = 19.5 - 41.2
Biomass in last year = 82 or 0.393 k
Exploitation rate in last year = 0.129 or 0.546 u.msy
Results of CMSY analysis with altogether 1518 viable trajectories for 1455 r-k pairs
r = 0.399 , 95% CL = 0.32 - 0.542 , k = 451 , 95% CL = 222 - 840
MSY = 44.9 , 95% CL = 20.4 - 99.1
Relative biomass last year= 0.182 k, 2.5th = 0.0133 , 97.5th = 0.393
Relative biomass next year= 0.182 k, 2.5th = -0.00294 , 97.5th = 0.459
Relative exploitation rate in last year= 0.601
Comment: OK
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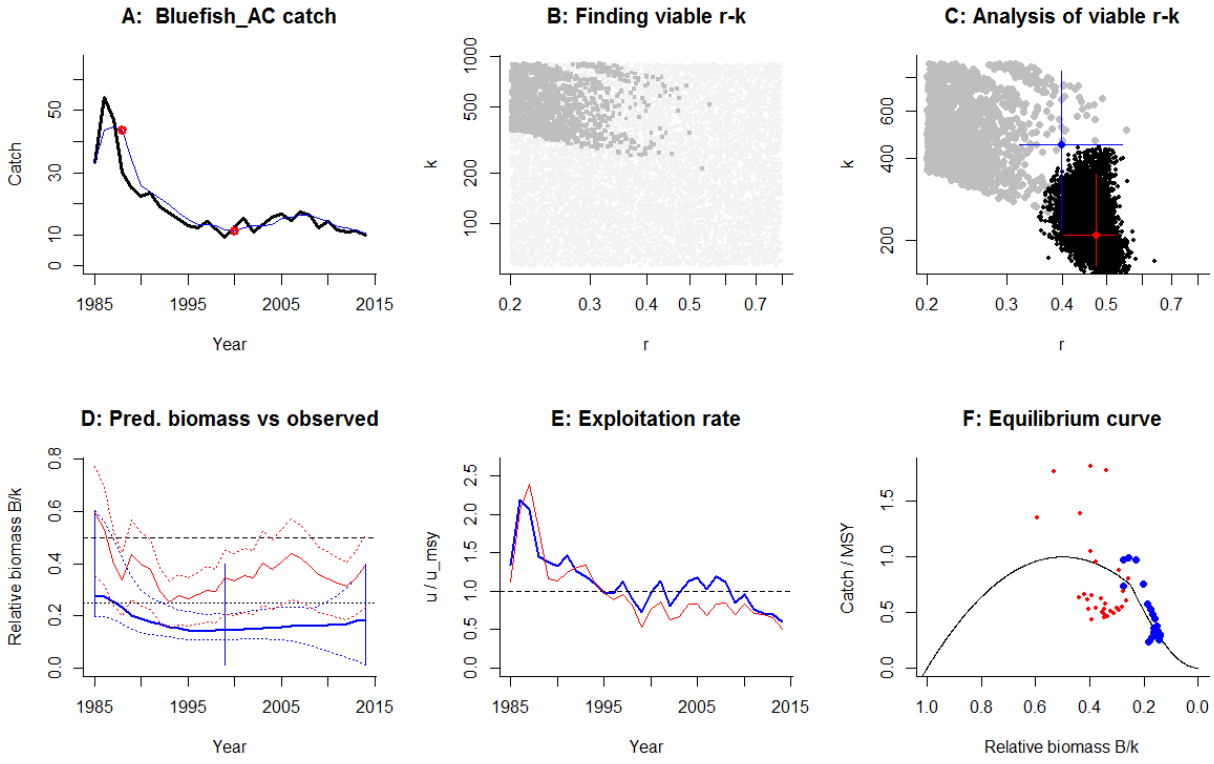

Species: *Centropristis striata* , stock: BSbass_MAC
Name and region: Black seabass - Mid-Atlantic Coast , NWA
Catch data used from years 1968 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1976 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 4.67 - 74.7
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.522 , 95% CL = 0.481 - 0.599 , k = 23.2 , 95% CL = 20.4 - 26.3
MSY = 3.05 , 95% CL = 2.72 - 3.42
Biomass in last year = 12.7 or 0.548 k
Exploitation rate in last year = 0.159 or 0.607 u.msy
Results of CMSY analysis with altogether 2510 viable trajectories for 622 r-k pairs
r = 0.564 , 95% CL = 0.409 - 0.785 , k = 20.5 , 95% CL = 14.1 - 29.6
MSY = 2.89 , 95% CL = 2.64 - 3.17
Relative biomass last year= 0.504 k, 2.5th = 0.247 , 97.5th = 0.598
Relative biomass next year= 0.546 k, 2.5th = 0.248 , 97.5th = 0.649
Relative exploitation rate in last year= 0.532
Comment: OK
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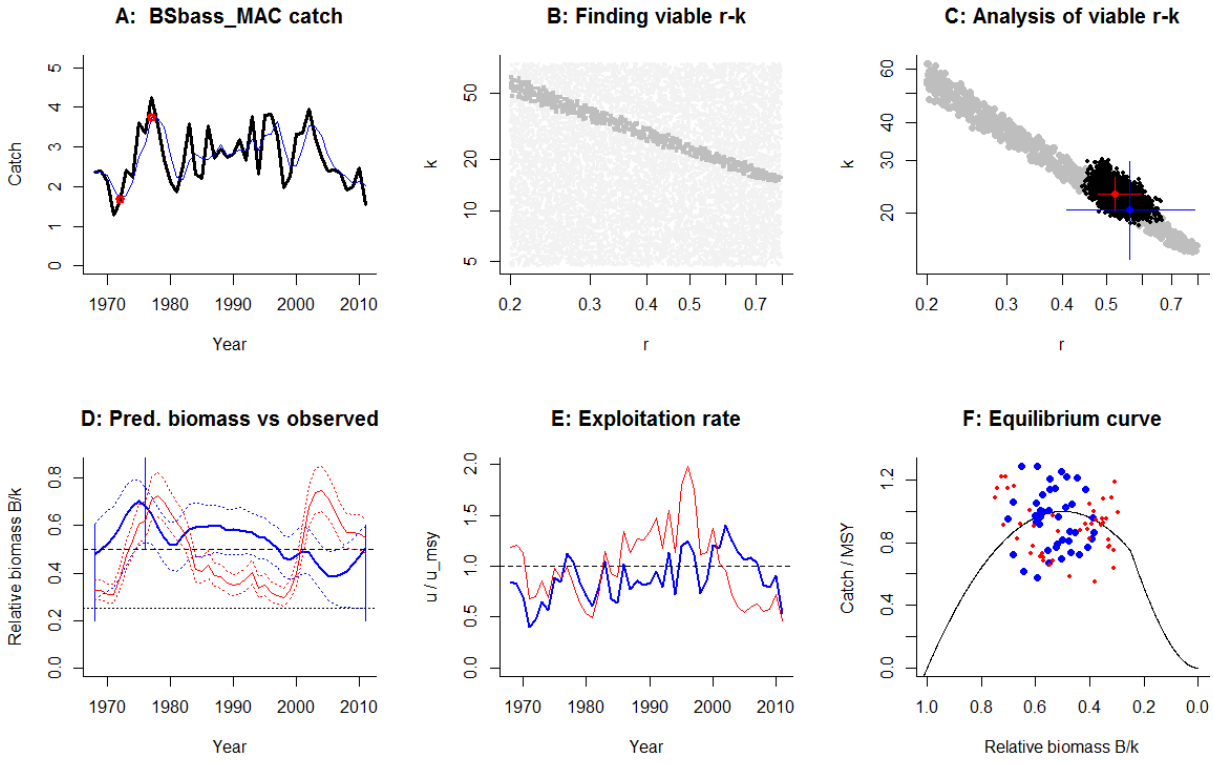

Species: *Gadus morhua* , stock: Cod_GB
Name and region: Georges Bank Atlantic cod , NWA
Catch data used from years 1978 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2007 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 53.9 - 862
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.517 , 95% CL = 0.473 - 0.596 , k = 202 , 95% CL = 167 - 266
MSY = 26.5 , 95% CL = 21.3 - 34.9
Biomass in last year = 29.1 or 0.144 k
Exploitation rate in last year = 0.118 or 0.456 u.msy
Results of CMSY analysis with altogether 1338 viable trajectories for 1247 r-k pairs
r = 0.387 , 95% CL = 0.314 - 0.592 , k = 363 , 95% CL = 182 - 586
MSY = 35.1 , 95% CL = 20.7 - 59.5
Relative biomass last year= 0.114 k, 2.5th = 0.0174 , 97.5th = 0.384
Relative biomass next year= 0.12 k, 2.5th = 0.00856 , 97.5th = 0.465
Relative exploitation rate in last year= 0.465
Comment: OK
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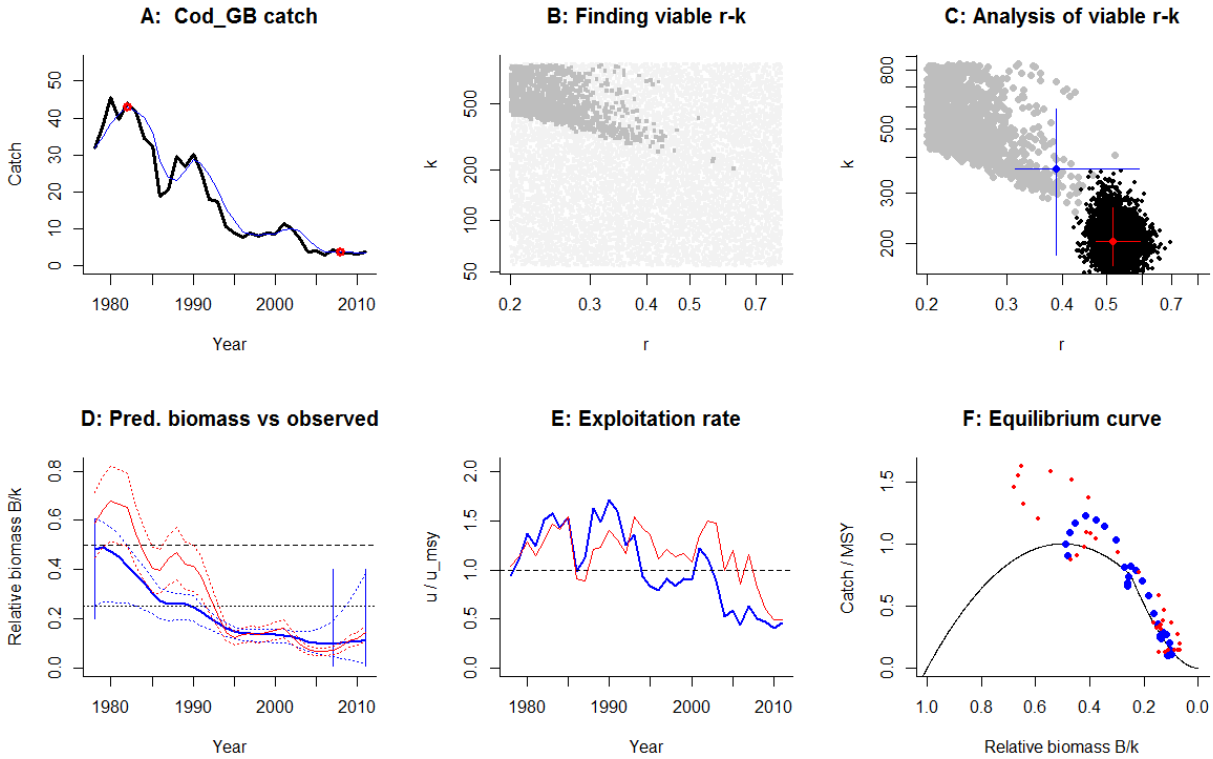

Species: *Gadus morhua* , stock: Cod_GUM
Name and region: Gulf of Maine Atlantic cod , NWA
Catch data used from years 1982 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1998 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 22.4 - 358
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.694 , 95% CL = 0.57 - 0.799 , k = 61 , 95% CL = 51.8 - 77.2
MSY = 10.6 , 95% CL = 8.29 - 13.8
Biomass in last year = 14.7 or 0.241 k
Exploitation rate in last year = 0.517 or 1.49 u.msy
Results of CMSY analysis with altogether 2055 viable trajectories for 1825 r-k pairs
r = 0.413 , 95% CL = 0.329 - 0.672 , k = 147 , 95% CL = 66.9 - 248
MSY = 15.1 , 95% CL = 8.45 - 27.1
Relative biomass last year= 0.202 k, 2.5th = 0.0136 , 97.5th = 0.396
Relative biomass next year= 0.199 k, 2.5th = -0.0414 , 97.5th = 0.437
Relative exploitation rate in last year= 1.12
Comment: OK
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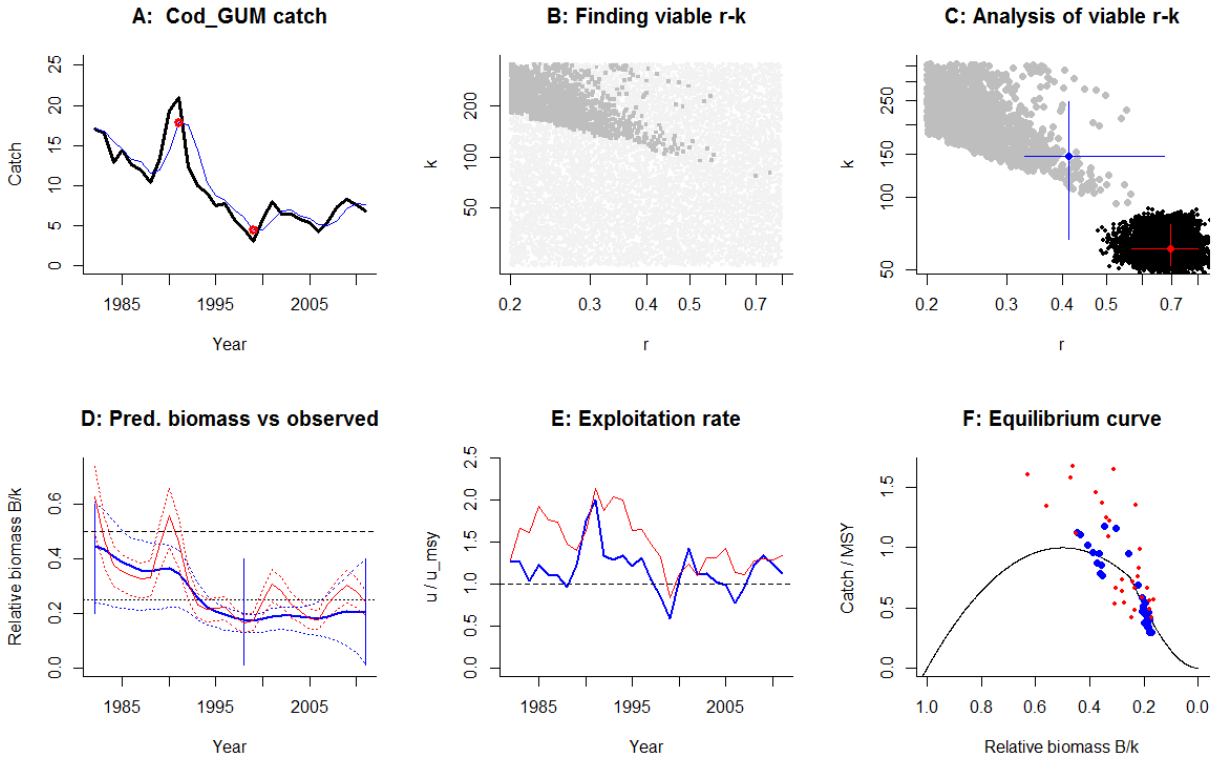

Species: *Melanogrammus aeglefinus* , stock: Haddock_GB
Name and region: Georges Bank Haddock , NWA
Catch data used from years 1960 - 2010 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1996 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 224 - 8953
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.31 , 95% CL = 0.263 - 0.407 , k = 417 , 95% CL = 317 - 607
MSY = 33.1 , 95% CL = 23.4 - 49.2
Biomass in last year = 186 or 0.445 k
Exploitation rate in last year = 0.126 or 0.812 u.msy
Results of CMSY analysis with altogether 2907 viable trajectories for 2479 r-k pairs
r = 0.183 , 95% CL = 0.122 - 0.288 , k = 1137 , 95% CL = 507 - 2423
MSY = 51.9 , 95% CL = 26 - 104
Relative biomass last year= 0.456 k, 2.5th = 0.219 , 97.5th = 0.595
Relative biomass next year= 0.475 k, 2.5th = 0.225 , 97.5th = 0.614
Relative exploitation rate in last year= 0.547
Comment: Resilience set from Medium to Low.
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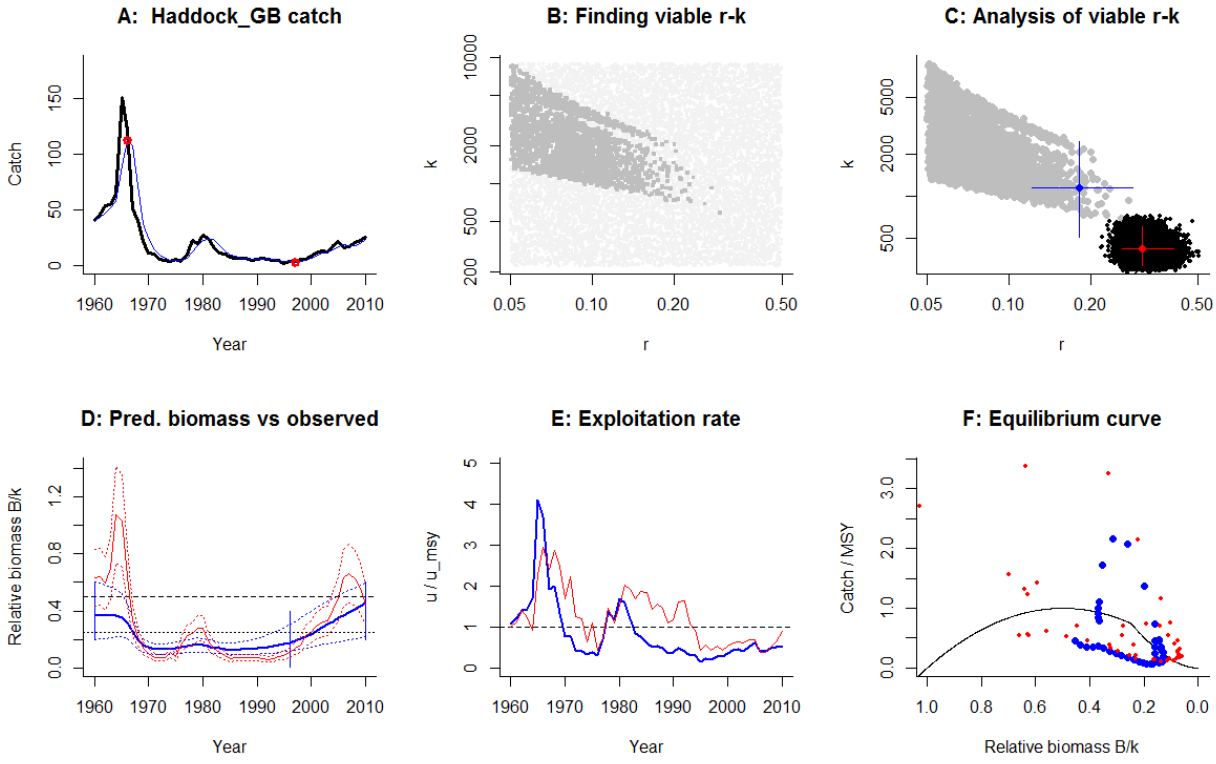

Species: *Melanogrammus aeglefinus* , stock: Haddock_GoM
Name and region: Gulf of Maine Haddock , NWA
Catch data used from years 1977 - 2010 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1993 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 7.42 - 119
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.5 , 95% CL = 0.436 - 0.568 , k = 23.8 , 95% CL = 15.8 - 77
MSY = 3.04 , 95% CL = 1.97 - 9.54
Biomass in last year = 3.65 or 0.153 k
Exploitation rate in last year = 0.317 or 1.27 u.msy
Results of CMSY analysis with altogether 2156 viable trajectories for 1901 r-k pairs
r = 0.407 , 95% CL = 0.325 - 0.656 , k = 30.7 , 95% CL = 17.3 - 42.3
MSY = 3.12 , 95% CL = 2.58 - 3.77
Relative biomass last year= 0.211 k, 2.5th = 0.0151 , 97.5th = 0.392
Relative biomass next year= 0.223 k, 2.5th = -0.0208 , 97.5th = 0.454
Relative exploitation rate in last year= 0.994
Comment: OK
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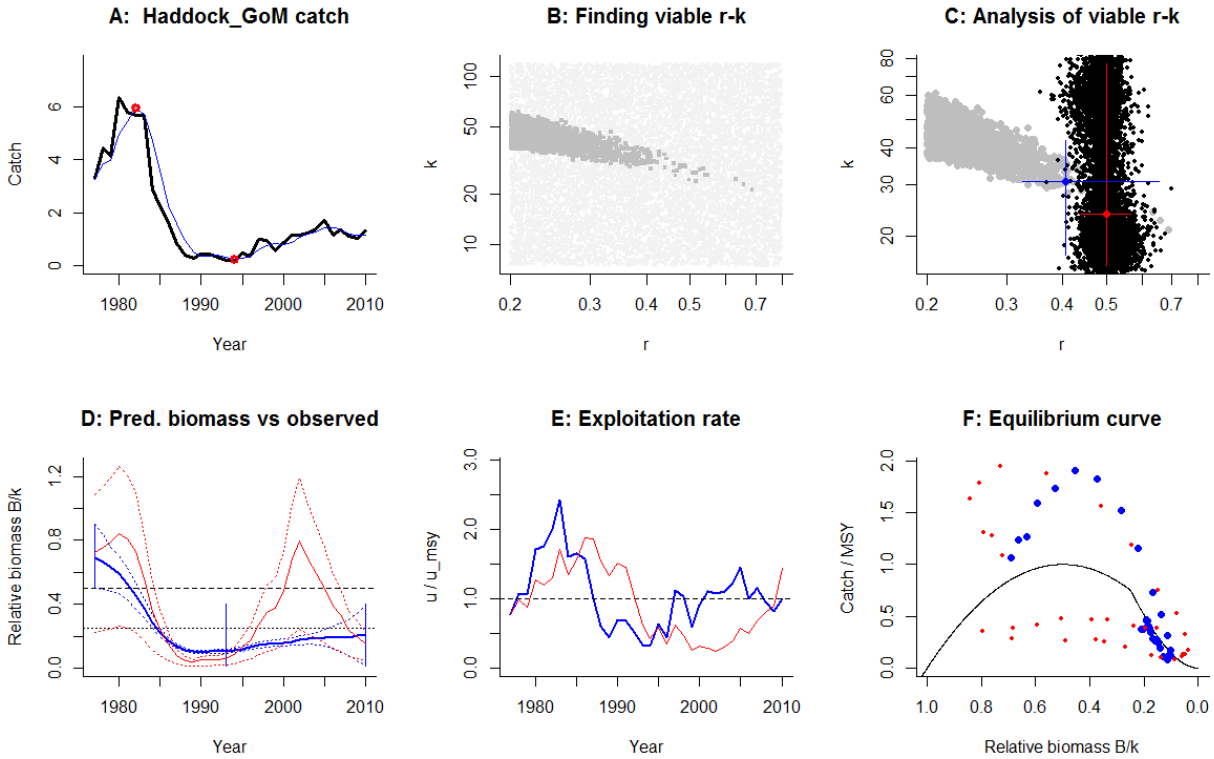

Species: *Clupea harengus* , stock: Herring_A
Name and region: Atlantic herring , NWA
Catch data used from years 1965 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1984 default
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 997 - 23921
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.52 , 95% CL = 0.473 - 0.611 , k = 1687 , 95% CL = 1470 - 2004
MSY = 223 , 95% CL = 188 - 269
Biomass in last year = 1322 or 0.784 k
Exploitation rate in last year = 0.0685 or 0.264 u.msy
Results of CMSY analysis with altogether 4010 viable trajectories for 2798 r-k pairs
r = 0.533 , 95% CL = 0.391 - 0.743 , k = 1901 , 95% CL = 1263 - 2794
MSY = 253 , 95% CL = 218 - 294
Relative biomass last year= 0.882 k, 2.5th = 0.855 , 97.5th = 0.899
Relative biomass next year= 0.889 k, 2.5th = 0.861 , 97.5th = 0.91
Relative exploitation rate in last year= 0.19
Comment: OK
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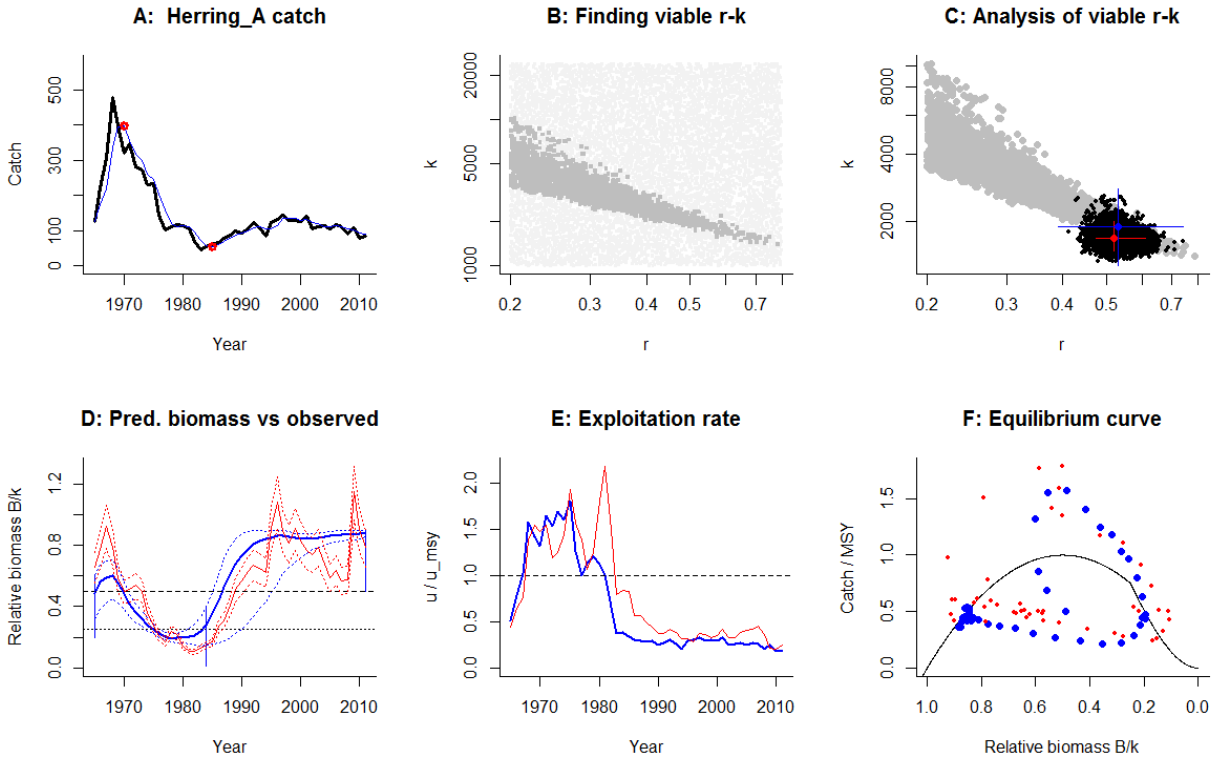

Species: *Xiphias gladius* , stock: Swordfish_NA
Name and region: Swordfish - North Atlantic , NWA
Catch data used from years 1950 - 2011 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 1987 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 24.3 - 388
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.449 , 95% CL = 0.423 - 0.477 , k = 127 , 95% CL = 123 - 131
MSY = 14.3 , 95% CL = 13.6 - 15
Biomass in last year = 73.5 or 0.578 k
Exploitation rate in last year = 0.164 or 0.73 u.msy
Results of CMSY analysis with altogether 668 viable trajectories for 595 r-k pairs
r = 0.573 , 95% CL = 0.422 - 0.778 , k = 96.7 , 95% CL = 68.5 - 137
MSY = 13.8 , 95% CL = 12.8 - 14.9
Relative biomass last year= 0.478 k, 2.5th = 0.241 , 97.5th = 0.595
Relative biomass next year= 0.501 k, 2.5th = 0.23 , 97.5th = 0.628
Relative exploitation rate in last year= 0.946
Comment: OK
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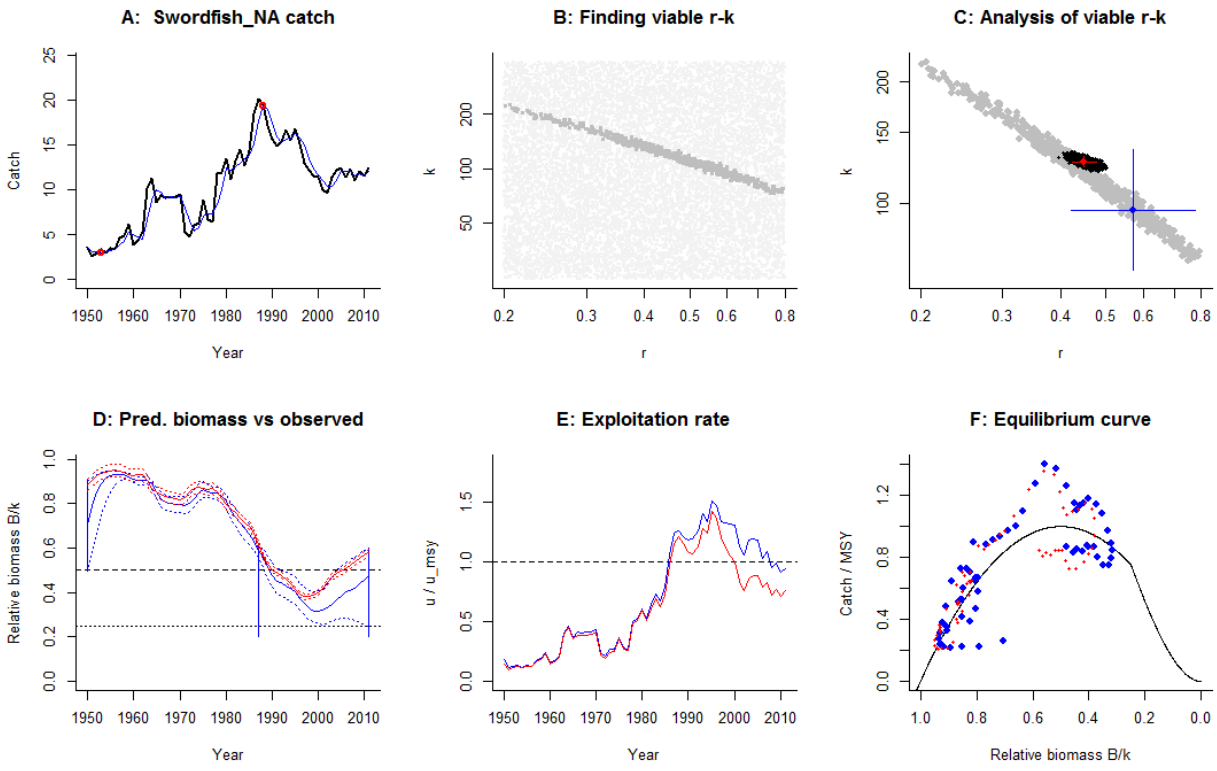

Species: *Urophycis tenuis* , stock: Whake_GUMGB
Name and region: White hake - Gulf of Maine / Georges Bank , NWA
Catch data used from years 1963 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 1992 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 14.3 - 574
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.396 , 95% CL = 0.351 - 0.437 , k = 46.2 , 95% CL = 42.2 - 51.8
MSY = 4.58 , 95% CL = 4.11 - 5.05
Biomass in last year = 31.2 or 0.676 k
Exploitation rate in last year = 0.0683 or 0.346 u.msy
Results of CMSY analysis with altogether 9766 viable trajectories for 2929 r-k pairs
r = 0.262 , 95% CL = 0.155 - 0.475 , k = 70.2 , 95% CL = 34.6 - 133
MSY = 4.6 , 95% CL = 3.69 - 5.73
Relative biomass last year= 0.508 k, 2.5th = 0.246 , 97.5th = 0.597
Relative biomass next year= 0.535 k, 2.5th = 0.256 , 97.5th = 0.627
Relative exploitation rate in last year= 0.62
Comment: OK
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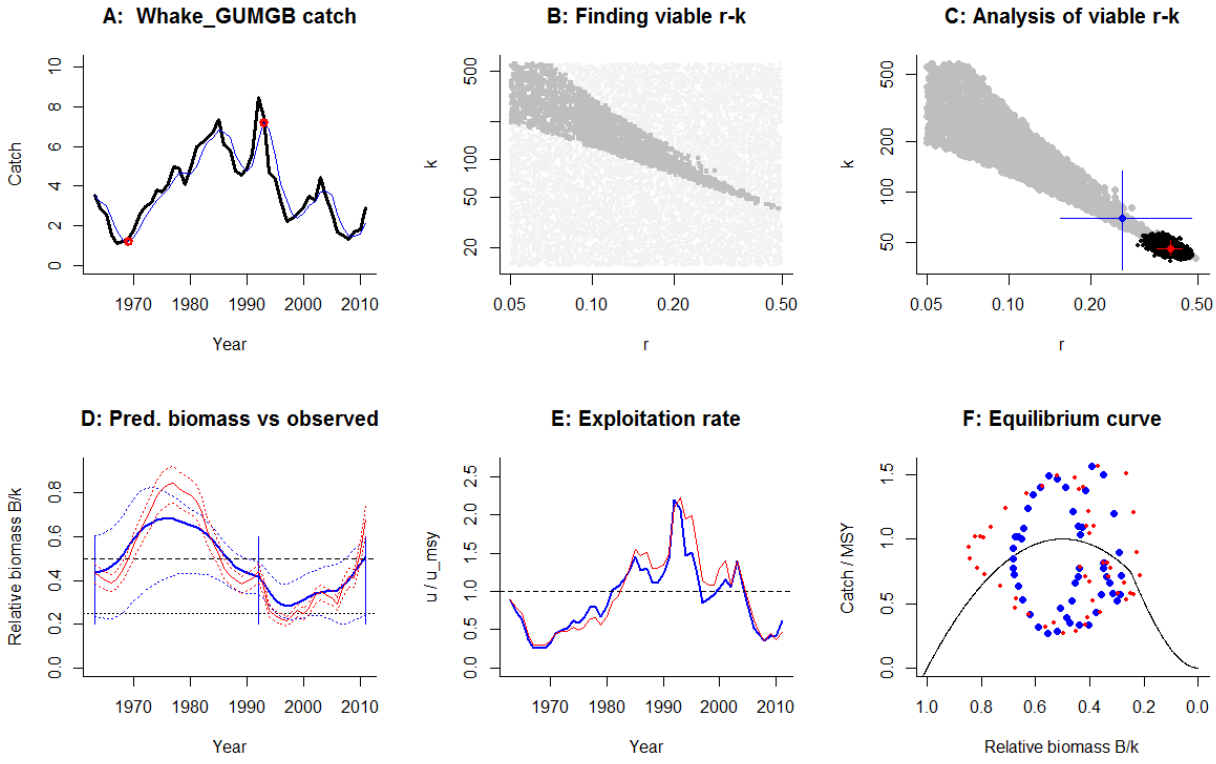

Species: *Limanda ferruginea* , stock: YTFlo_MA
Name and region: Southern New England Mid Atlantic Yellowtail Flounder , NWA
Catch data used from years 1980 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 20.5 - 328
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.506 , 95% CL = 0.453 - 0.597 , k = 107 , 95% CL = 42.7 - 230
MSY = 13.7 , 95% CL = 5.51 - 29.1
Biomass in last year = 5.3 or 0.0494 k
Exploitation rate in last year = 0.0713 or 0.282 u.msy
Results of CMSY analysis with altogether 1611 viable trajectories for 1499 r-k pairs
r = 0.436 , 95% CL = 0.341 - 0.573 , k = 97.1 , 95% CL = 53.8 - 171
MSY = 10.6 , 95% CL = 5.69 - 19.7
Relative biomass last year= 0.12 k, 2.5th = 0.0123 , 97.5th = 0.378
Relative biomass next year= 0.134 k, 2.5th = 0.00938 , 97.5th = 0.471
Relative exploitation rate in last year= 0.154
Comment: OK
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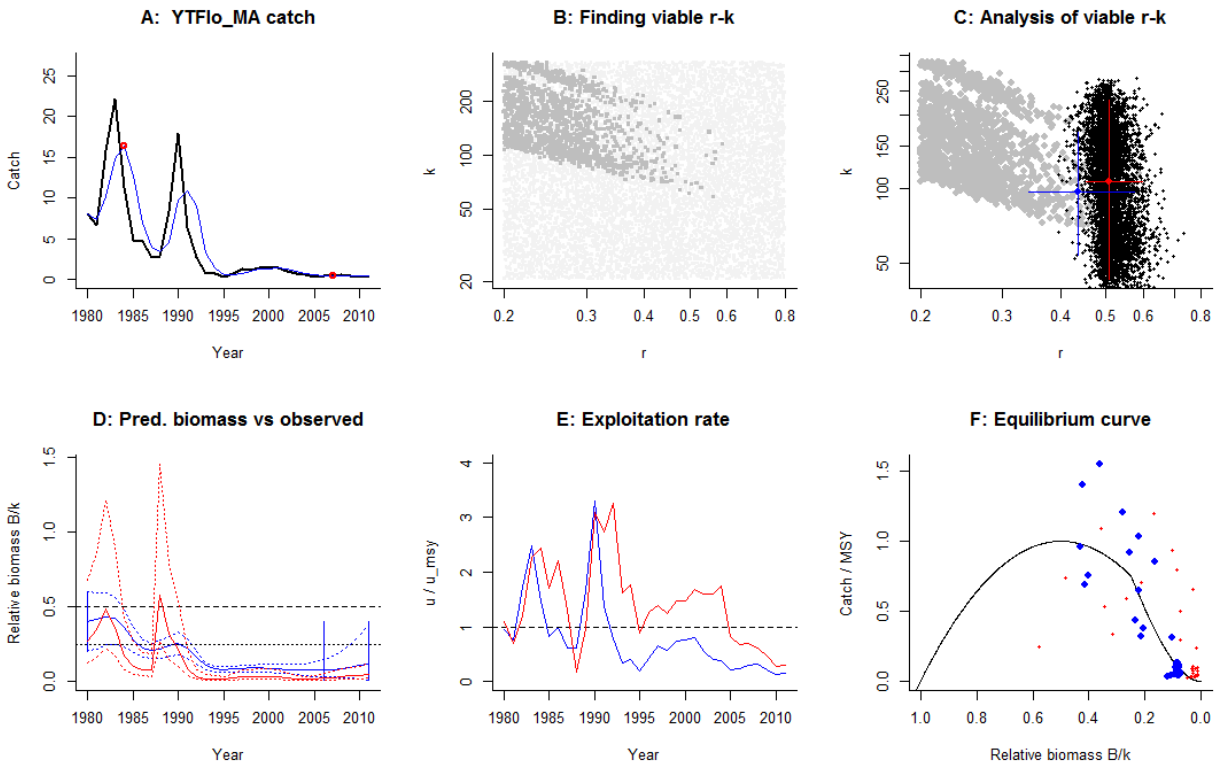

## Region: Caribbean / Gulf of Mexico

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: *Mycteroperca microlepis* , stock: GAGGM
Name and region: Gag - Gulf of Mexico , CA
Catch data used from years 1963 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1990 expert
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 6.5 - 104
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.512 , 95% CL = 0.47 - 0.594 , k = 18 , 95% CL = 14.8 - 21.8
MSY = 2.33 , 95% CL = 1.95 - 2.81
Biomass in last year = 11.2 or 0.621 k
Exploitation rate in last year = 0.0876 or 0.342 u.msy
Results of CMSY analysis with altogether 130 viable trajectories for 130 r-k pairs
r = 0.309 , 95% CL = 0.268 - 0.356 , k = 29.9 , 95% CL = 24.4 - 36.7
MSY = 2.31 , 95% CL = 2.05 - 2.6
Relative biomass last year= 0.124 k, 2.5th = 0.0203 , 97.5th = 0.358
Relative biomass next year= 0.0969 k, 2.5th = -0.0114 , 97.5th = 0.413
Relative exploitation rate in last year= 1.27
Comment: OK.
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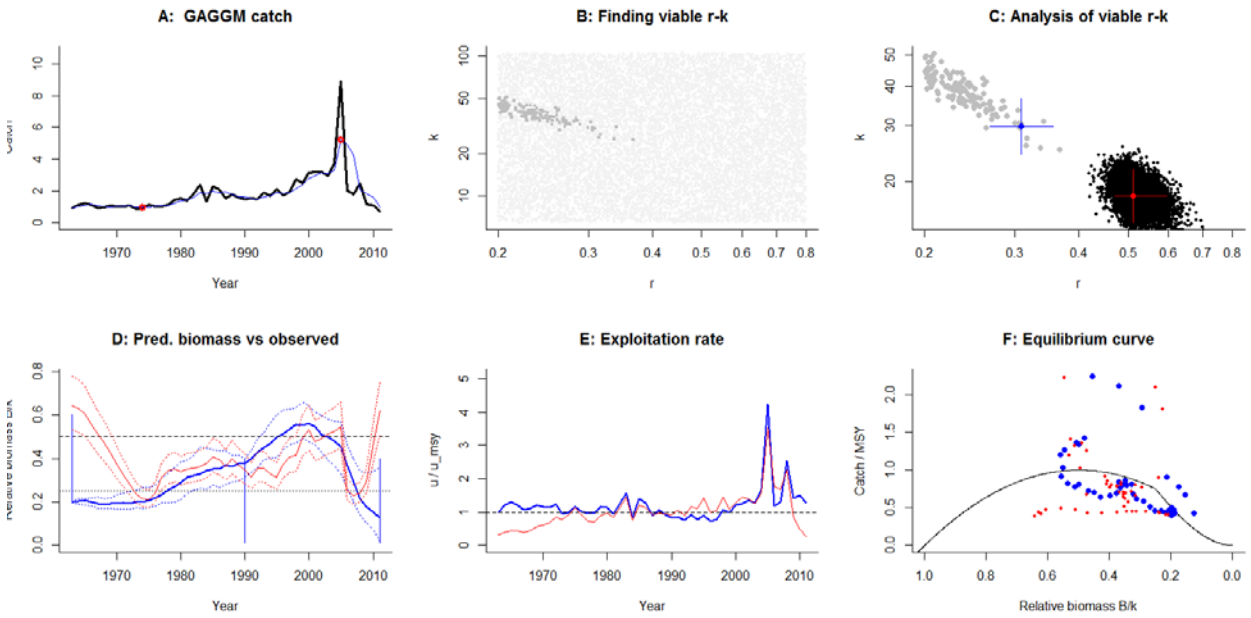
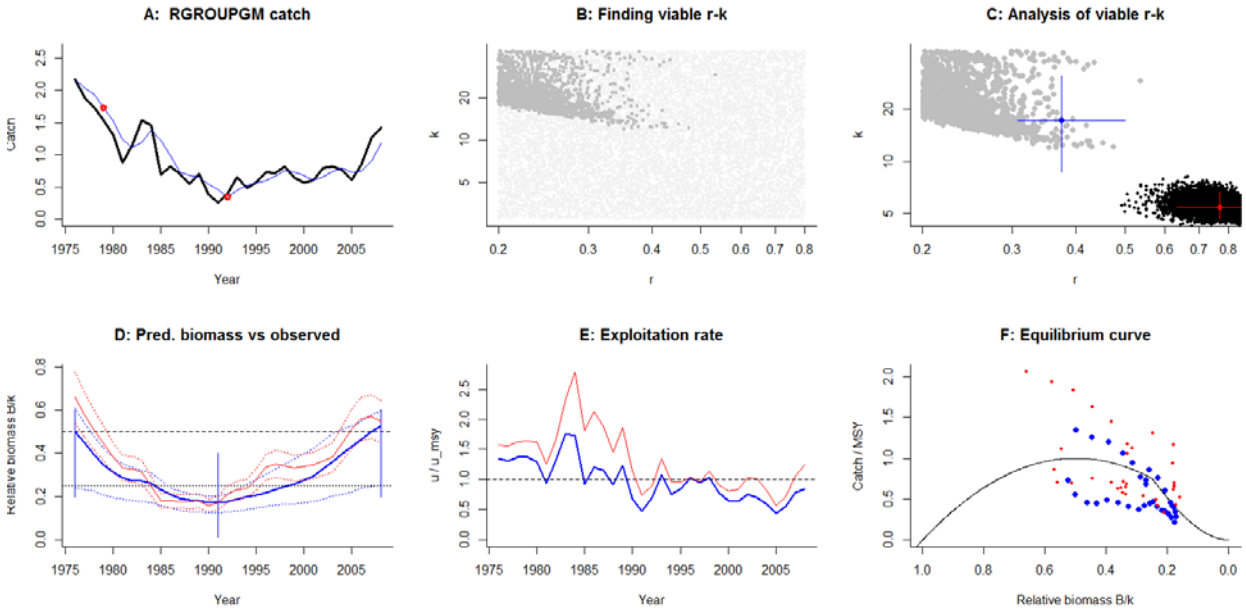


Species: *Epinephelus morio* , stock: RGROUPGM
Name and region: Red grouper - Gulf of Mexico , CA
Catch data used from years 1976 - 2008 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1991 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2.72 - 43.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.767 , 95% CL = 0.633 - 0.885 , k = 5.48 , 95% CL = 4.65 - 6.69
MSY = 1.06 , 95% CL = 0.842 - 1.27
Biomass in last year = 3 or 0.547 k
Exploitation rate in last year = 0.392 or 1.02 u.msy
Results of CMSY analysis with altogether 2426 viable trajectories for 2049 r-k pairs
r = 0.375 , 95% CL = 0.307 - 0.5 , k = 17.2 , 95% CL = 8.68 - 31.2
MSY = 1.61 , 95% CL = 0.741 - 3.51
Relative biomass last year= 0.526 k, 2.5th = 0.256 , 97.5th = 0.598
Relative biomass next year= 0.537 k, 2.5th = 0.248 , 97.5th = 0.618
Relative exploitation rate in last year= 0.84
Comment: OK.
---



Species: *Rhomboplites aurorubens* , stock: VSNAPSATLC
Name and region: Vermilion snapper - South Atlantic Coast , CA
Catch data used from years 1958 - 2007 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2001 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 1.31 - 52.2
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.22 , 95% CL = 0.177 - 0.274 , k = 8.84 , 95% CL = 7.83 - 10.2
MSY = 0.488 , 95% CL = 0.397 - 0.604
Biomass in last year = 2.97 or 0.335 k
Exploitation rate in last year = 0.15 or 1.36 u.msy
Results of CMSY analysis with altogether 7219 viable trajectories for 881 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 4.95 , 95% CL = 2.54 - 9.64
MSY = 0.349 , 95% CL = 0.276 - 0.442
Relative biomass last year= 0.267 k, 2.5th = 0.0242 , 97.5th = 0.395
Relative biomass next year= 0.236 k, 2.5th = -0.0682 , 97.5th = 0.382
Relative exploitation rate in last year= 2.47
Comment: Set resilience from Medium to Low - FB Medium
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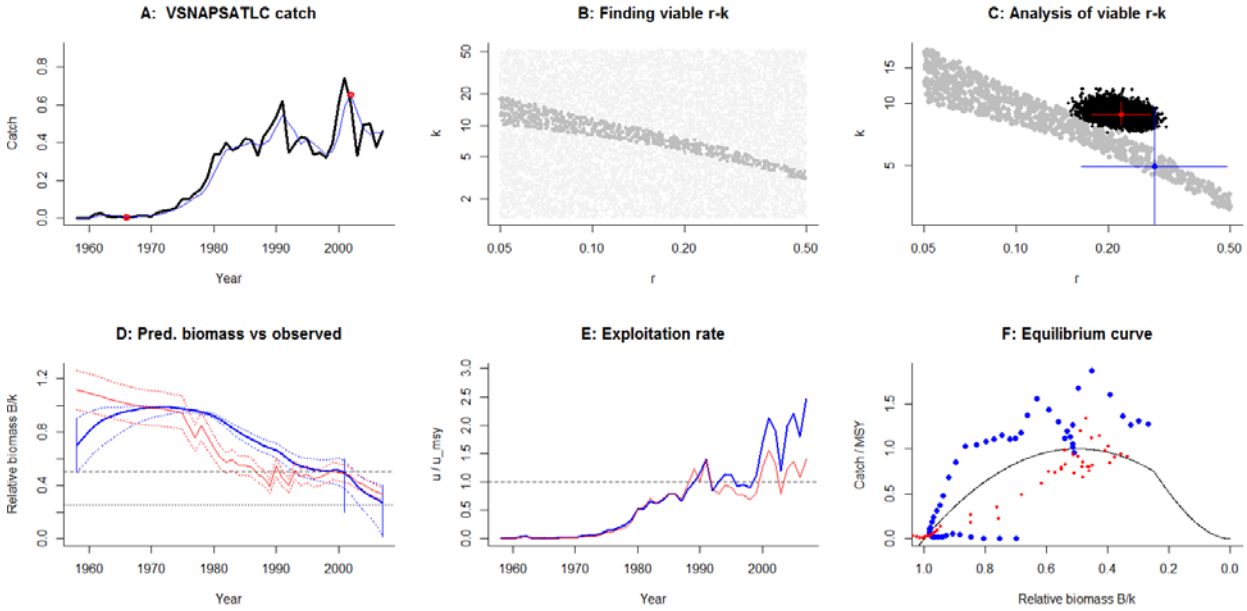
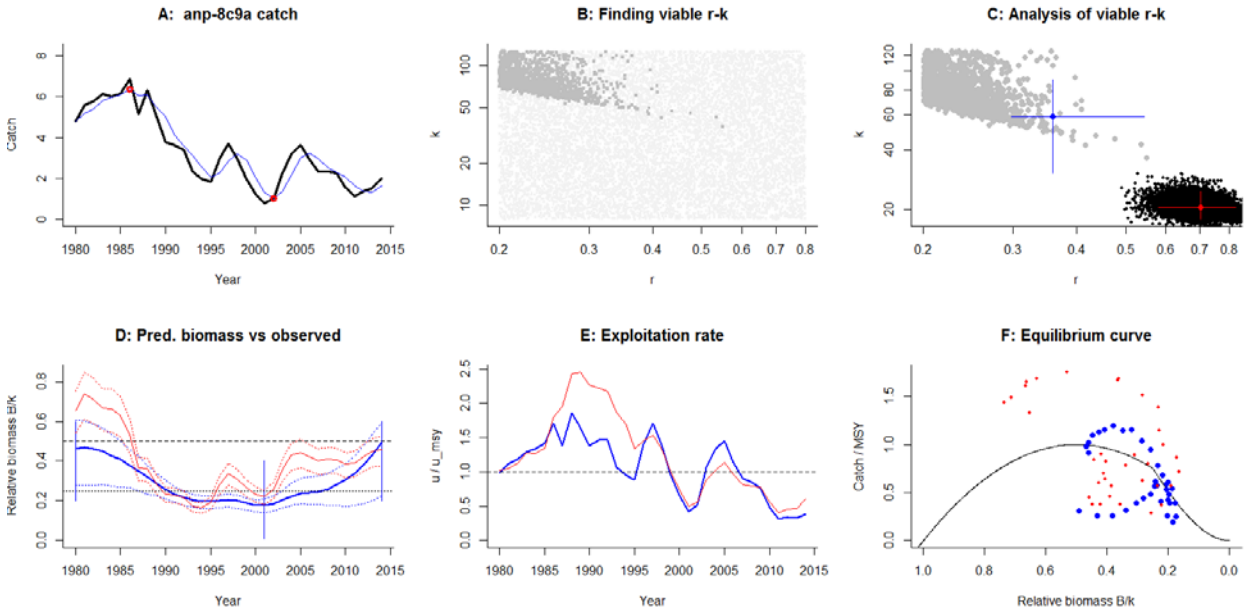


## Region: Northeast Atlantic, ICES Area

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: Lophius piscatorius , stock: anp-8c9a
White anglerfish in Divisions VIIIc and IXa (Cantabrian Sea, Atlanic Iberian Waters) , ICES
Catch data used from years 1980 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2001 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 7.93 - 127
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.703 , 95% CL = 0.58 - 0.822 , k = 20.5 , 95% CL = 17.8 - 24.7
MSY = 3.62 , 95% CL = 2.9 - 4.38
Biomass in last year = 9.38 or 0.458 k
Exploitation rate in last year = 0.174 or 0.496 u.msy
Results of CMSY analysis with altogether 1496 viable trajectories for 1329 r-k pairs
r = 0.359 , 95% CL = 0.298 - 0.544 , k = 59 , 95% CL = 30.6 - 90.2
MSY = 5.29 , 95% CL = 3.31 - 8.47
Relative biomass last year= 0.492 k, 2.5th = 0.226 , 97.5th = 0.595
Relative biomass next year= 0.542 k, 2.5th = 0.261 , 97.5th = 0.654
Relative exploitation rate in last year= 0.384
Comment: Fit could be improved by setting startbio high.
---



Species: *Dicentrarchus labrax* , stock: Bss-47
Name and region: Seabass in Divisions IVb and c, VIIa, and VIId–h (Central and South North Sea, Irish Sea, English Channel, Bristol Channel, Celtic Sea) , ICES
Catch data used from years 1985 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2006 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 8.58 - 343
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.259 , 95% CL = 0.211 - 0.292 , k = 40.9 , 95% CL = 32.7 - 53.8
MSY = 2.62 , 95% CL = 2.1 - 3.32
Biomass in last year = 11.4 or 0.279 k
Exploitation rate in last year = 0.316 or 2.44 u.msy
Results of CMSY analysis with altogether 4509 viable trajectories for 1116 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 38.2 , 95% CL = 19.3 - 75.7
MSY = 2.7 , 95% CL = 2.07 - 3.52
Relative biomass last year= 0.287 k, 2.5th = 0.0296 , 97.5th = 0.396
Relative biomass next year= 0.249 k, 2.5th = -0.0794 , 97.5th = 0.384
Relative exploitation rate in last year= 1.74
Comment: OK.
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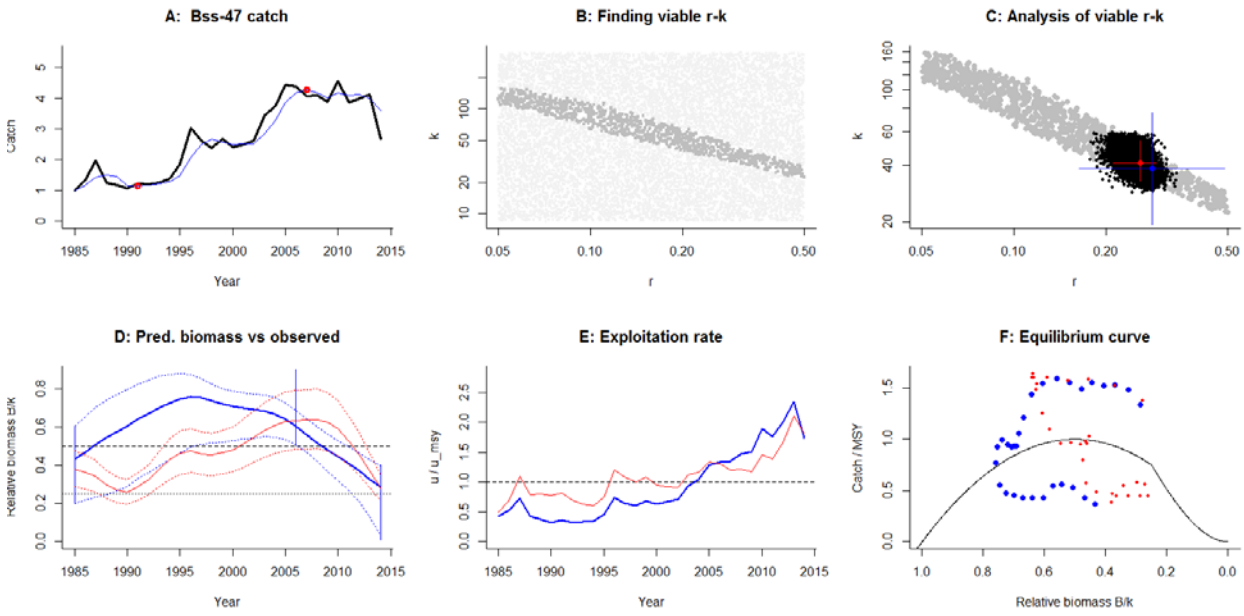

Species: *Gadus morhua* , stock: cod-2224
Name and region: Cod in Sub-division 22 to 24 , ICES
Catch data used from years 1970 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 89.3 - 1428
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.859 , 95% CL = 0.702 - 0.989 , k = 214 , 95% CL = 180 - 263
MSY = 45.1 , 95% CL = 34.7 - 61.5
Biomass in last year = 40.8 or 0.191 k
Exploitation rate in last year = 0.463 or 1.08 u.msy
Results of CMSY analysis with altogether 548 viable trajectories for 533 r-k pairs
r = 0.346 , 95% CL = 0.289 - 0.413 , k = 626 , 95% CL = 474 - 825
MSY = 54 , 95% CL = 44.6 - 65.5
Relative biomass last year= 0.161 k, 2.5th = 0.0157 , 97.5th = 0.39
Relative biomass next year= 0.16 k, 2.5th = -0.0107 , 97.5th = 0.437
Relative exploitation rate in last year= 1
Comment: OK
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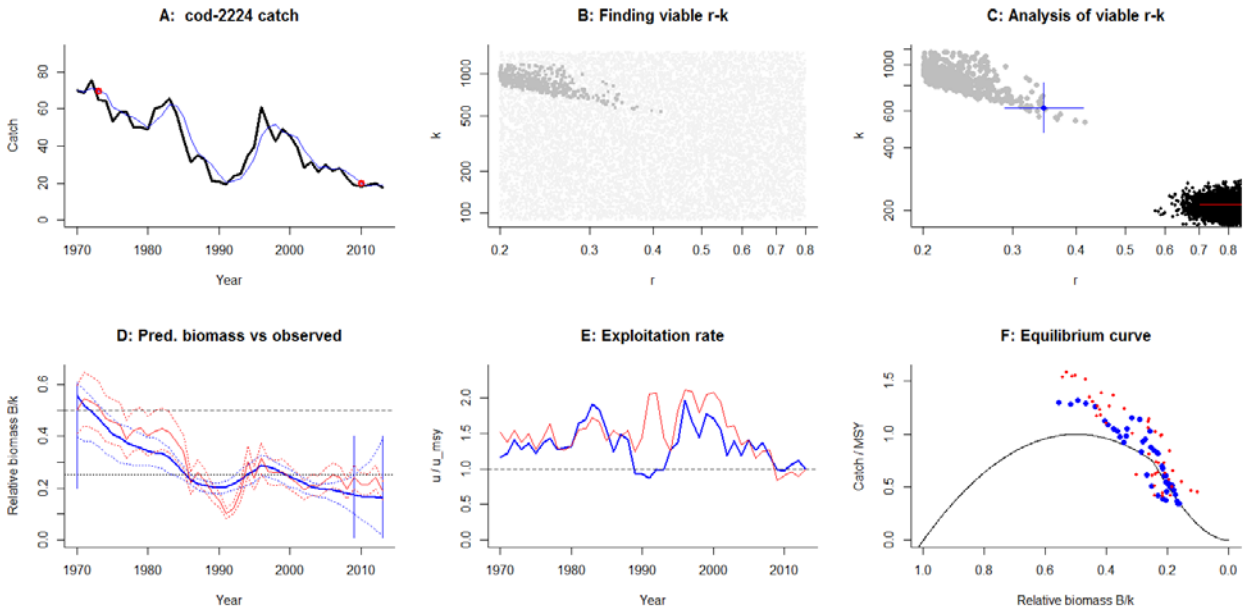

Species: *Gadus morhua* , stock: cod-347d
Name and region: Cod in Subarea IV (North Sea), Divison VIId and IIIa West , ICES
Catch data used from years 1963 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 490 - 7847
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.519 , 95% CL = 0.477 - 0.603 , k = 1653 , 95% CL = 1371 - 2121
MSY = 218 , 95% CL = 176 - 277
Biomass in last year = 332 or 0.201 k
Exploitation rate in last year = 0.128 or 0.496 u.msy
Results of CMSY analysis with altogether 530 viable trajectories for 512 r-k pairs
r = 0.359 , 95% CL = 0.297 - 0.434 , k = 2944 , 95% CL = 2222 - 3899
MSY = 264 , 95% CL = 221 - 316
Relative biomass last year= 0.116 k, 2.5th = 0.013 , 97.5th = 0.384
Relative biomass next year= 0.119 k, 2.5th = -2.91e-05 , 97.5th = 0.447
Relative exploitation rate in last year= 0.75
Comment: OK
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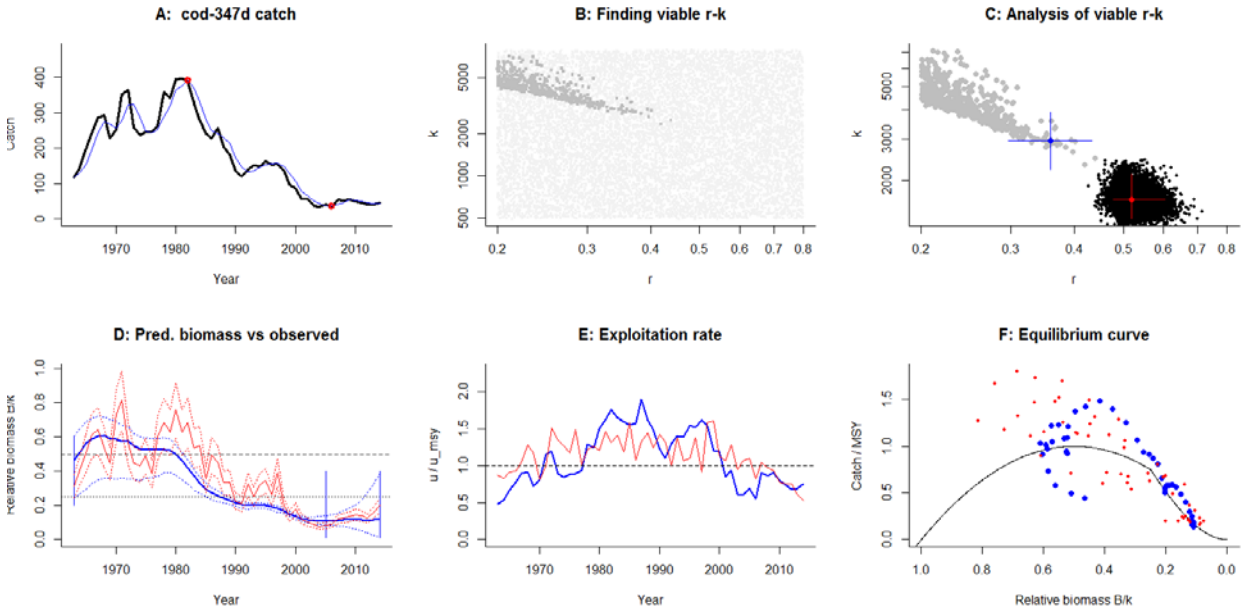

Species: *Gadus morhua* , stock: cod-7e-k
Name and region: Cod in Divisions VIIe-k (Celtic Sea cod) , ICES
Catch data used from years 1971 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 20.7 - 332
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.616 , 95% CL = 0.514 - 0.714 , k = 52.2 , 95% CL = 43 - 64.9
MSY = 8.01 , 95% CL = 6.37 - 10
Biomass in last year = 12.2 or 0.233 k
Exploitation rate in last year = 0.551 or 1.79 u.msy
Results of CMSY analysis with altogether 1994 viable trajectories for 1172 r-k pairs
r = 0.462 , 95% CL = 0.355 - 0.731 , k = 83.4 , 95% CL = 50.3 - 114
MSY = 9.63 , 95% CL = 8.8 - 10.5
Relative biomass last year= 0.25 k, 2.5th = 0.028 , 97.5th = 0.396
Relative biomass next year= 0.249 k, 2.5th = -0.0498 , 97.5th = 0.427
Relative exploitation rate in last year= 0.959
Comment: OK
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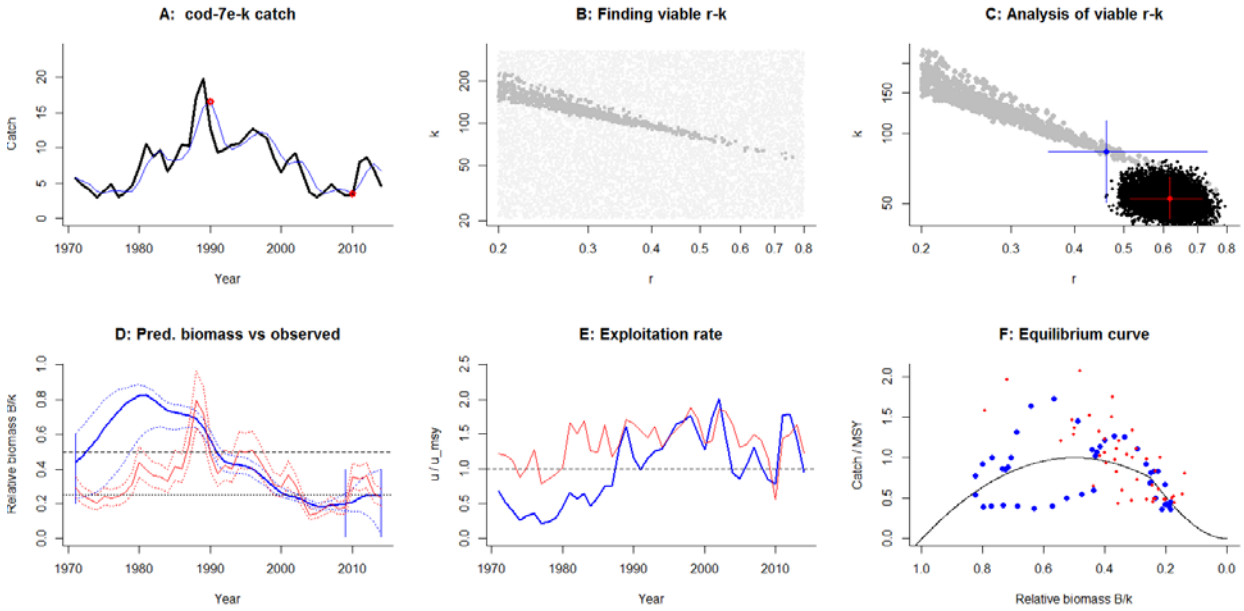

Species: *Gadus morhua* , stock: cod-arct
Name and region: Cod in Subareas I and II (Northeast Arctic cod) , ICES
Catch data used from years 1946 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1990 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2764 - 66339
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.608 , 95% CL = 0.541 - 0.674 , k = 4813 , 95% CL = 4326 - 5454
MSY = 732 , 95% CL = 644 - 827
Biomass in last year = 3152 or 0.655 k
Exploitation rate in last year = 0.283 or 0.932 u.msy
Results of CMSY analysis with altogether 1749 viable trajectories for 1264 r-k pairs
r = 0.455 , 95% CL = 0.351 - 0.65 , k = 6583 , 95% CL = 4441 - 8845
MSY = 749 , 95% CL = 697 - 804
Relative biomass last year= 0.691 k, 2.5th = 0.597 , 97.5th = 0.737
Relative biomass next year= 0.656 k, 2.5th = 0.561 , 97.5th = 0.706
Relative exploitation rate in last year= 0.953
Comment: OK
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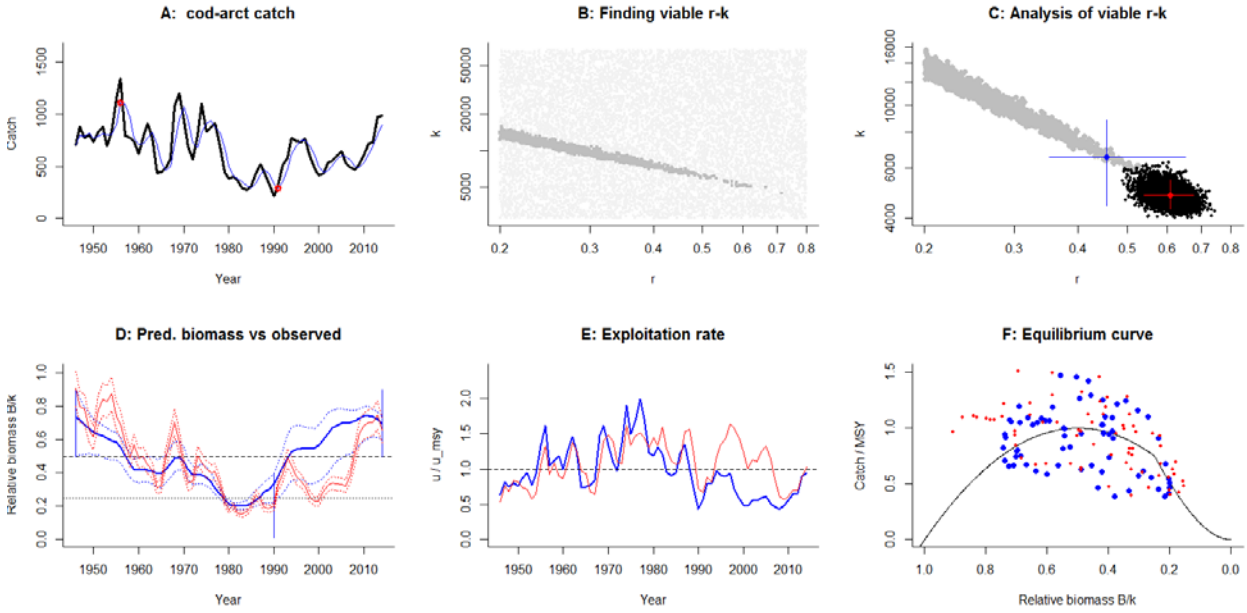

Species: *Gadus morhua* , stock: cod-farp
Name and region: Cod in Subdivision Vb1 (Faroe Plateau) , ICES
Catch data used from years 1961 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1992 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 47.7 - 764
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.528 , 95% CL = 0.481 - 0.613 , k = 172 , 95% CL = 149 - 203
MSY = 22.9 , 95% CL = 19.3 - 27.7
Biomass in last year = 27.7 or 0.161 k
Exploitation rate in last year = 0.219 or 0.828 u.msy
Results of CMSY analysis with altogether 1333 viable trajectories for 1094 r-k pairs
r = 0.417 , 95% CL = 0.33 - 0.607 , k = 244 , 95% CL = 160 - 323
MSY = 25.5 , 95% CL = 23.2 - 27.9
Relative biomass last year= 0.15 k, 2.5th = 0.0187 , 97.5th = 0.393
Relative biomass next year= 0.157 k, 2.5th = -0.00259 , 97.5th = 0.462
Relative exploitation rate in last year= 0.829
Comment: OK
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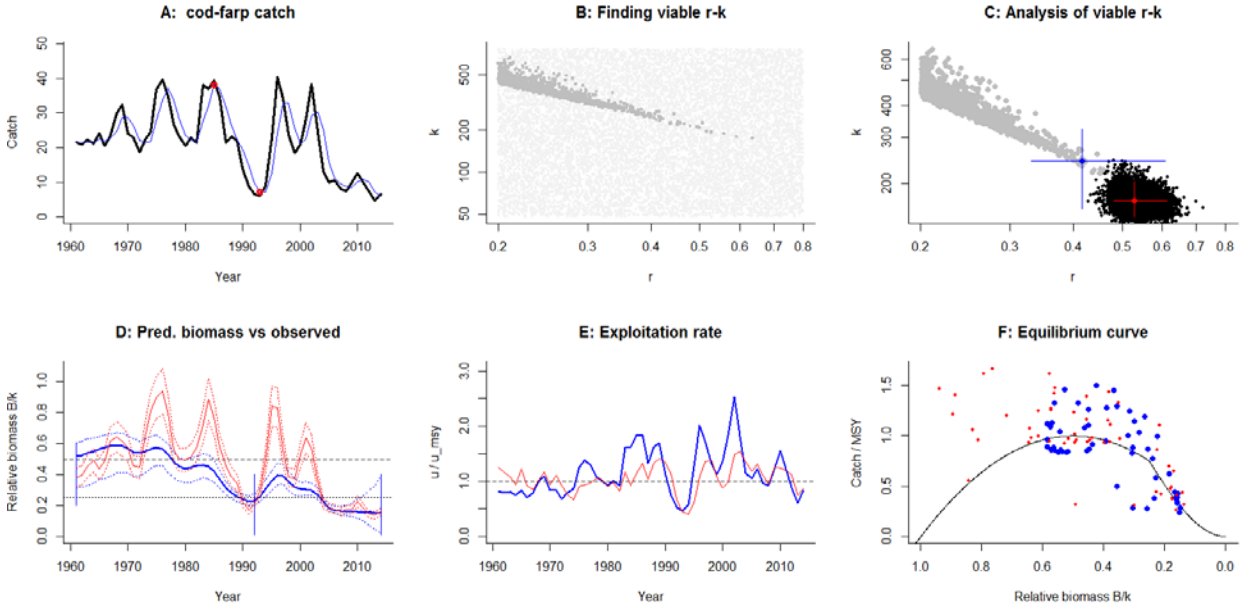

Species: *Gadus morhua* , stock: cod-iceg
Name and region: Cod in Division Va (Icelandic cod) , ICES
Catch data used from years 1955 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 682 - 10905
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.51 , 95% CL = 0.48 - 0.56 , k = 2783 , 95% CL = 2408 - 3276
MSY = 356 , 95% CL = 314 - 415
Biomass in last year = 1181 or 0.424 k
Exploitation rate in last year = 0.18 or 0.708 u.msy
Results of CMSY analysis with altogether 710 viable trajectories for 605 r-k pairs
r = 0.333 , 95% CL = 0.282 - 0.464 , k = 4330 , 95% CL = 2985 - 5325
MSY = 360 , 95% CL = 333 - 390
Relative biomass last year= 0.516 k, 2.5th = 0.214 , 97.5th = 0.59
Relative biomass next year= 0.557 k, 2.5th = 0.221 , 97.5th = 0.623
Relative exploitation rate in last year= 0.596
Comment: OK
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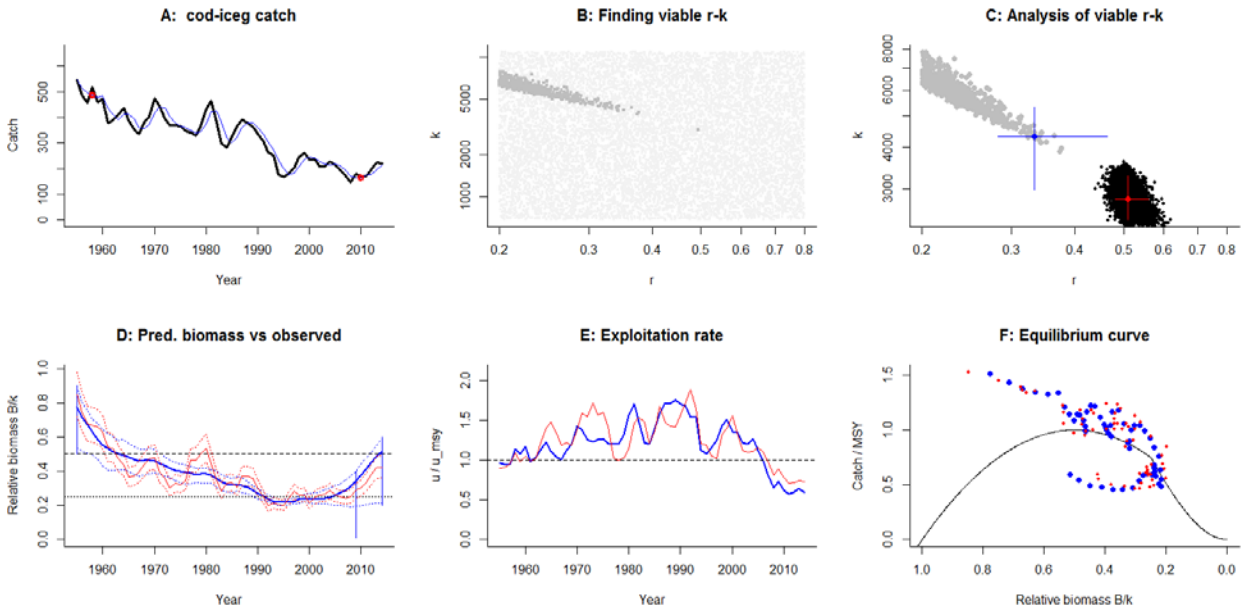

Species: *Gadus morhua* , stock: cod-scow
Name and region: Cod in Division VIa (West of Scotland) , ICES
Catch data used from years 1981 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 30.2 - 483
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.509 , 95% CL = 0.464 - 0.593 , k = 114 , 95% CL = 83 - 165
MSY = 14.7 , 95% CL = 10.6 - 21.8
Biomass in last year = 4.66 or 0.0408 k
Exploitation rate in last year = 0.344 or 1.35 u.msy
Results of CMSY analysis with altogether 1680 viable trajectories for 1581 r-k pairs
r = 0.436 , 95% CL = 0.341 - 0.621 , k = 212 , 95% CL = 103 - 392
MSY = 23.1 , 95% CL = 11.2 - 47.6
Relative biomass last year= 0.0967 k, 2.5th = 0.0123 , 97.5th = 0.37
Relative biomass next year= 0.101 k, 2.5th = 0.00634 , 97.5th = 0.478
Relative exploitation rate in last year= 0.374
Comment: Fit could be improved by setting endbio to 0.01-0.2.
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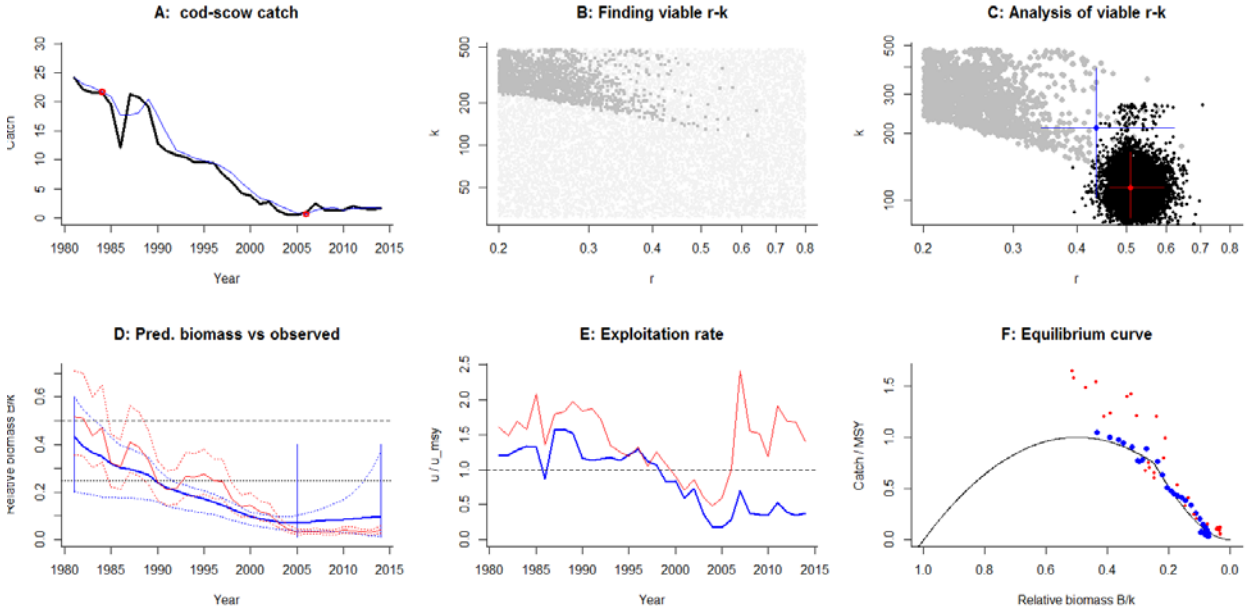

Species: *Squalus acanthias* , stock: dgs-nea
Name and region: Spurdog in Northeast Atlantic , ICES
Catch data used from years 1950 - 2009 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 120 - 4792
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.106 , 95% CL = 0.0879 - 0.132 , k = 1740 , 95% CL = 1463 - 2095
MSY = 46.3 , 95% CL = 36.2 - 60.7
Biomass in last year = 225 or 0.129 k
Exploitation rate in last year = 0.0106 or 0.2 u.msy
Results of CMSY analysis with altogether 2967 viable trajectories for 1241 r-k pairs
r = 0.183 , 95% CL = 0.122 - 0.29 , k = 804 , 95% CL = 470 - 1299
MSY = 36.7 , 95% CL = 31.7 - 42.6
Relative biomass last year= 0.169 k, 2.5th = 0.0144 , 97.5th = 0.391
Relative biomass next year= 0.182 k, 2.5th = 0.0121 , 97.5th = 0.421
Relative exploitation rate in last year= 0.207
Comment: Resilience set from Very low to Low.
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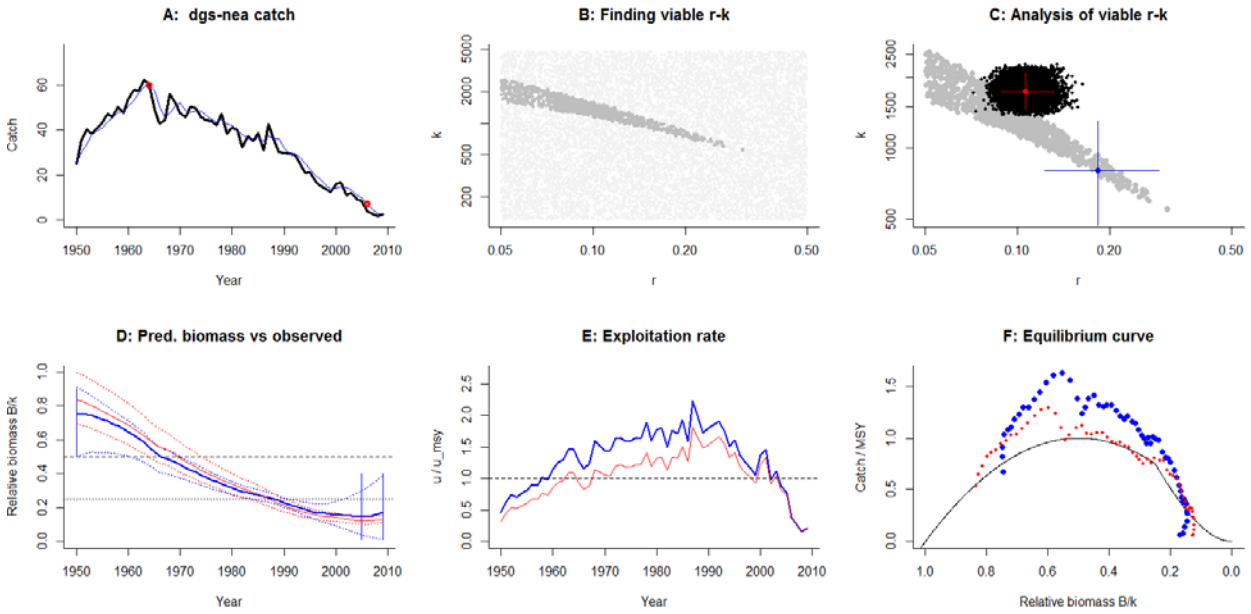

Species: *Reinhardtius hippoglossoides* , stock: ghl-arct
Name and region: Greenland halibut in Subareas I and II , ICES
Catch data used from years 1964 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1993 default
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 283 - 16985
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.315 , 95% CL = 0.272 - 0.365 , k = 417 , 95% CL = 342 - 509
MSY = 32.8 , 95% CL = 25.6 - 42.1
Biomass in last year = 309 or 0.741 k
Exploitation rate in last year = 0.0481 or 0.305 u.msy
Results of CMSY analysis with altogether 3701 viable trajectories for 2932 r-k pairs
r = 0.236 , 95% CL = 0.145 - 0.431 , k = 654 , 95% CL = 267 - 1427
MSY = 38.5 , 95% CL = 21.7 - 68.2
Relative biomass last year= 0.738 k, 2.5th = 0.54 , 97.5th = 0.871
Relative biomass next year= 0.755 k, 2.5th = 0.563 , 97.5th = 0.875
Relative exploitation rate in last year= 0.287
Comment: OK
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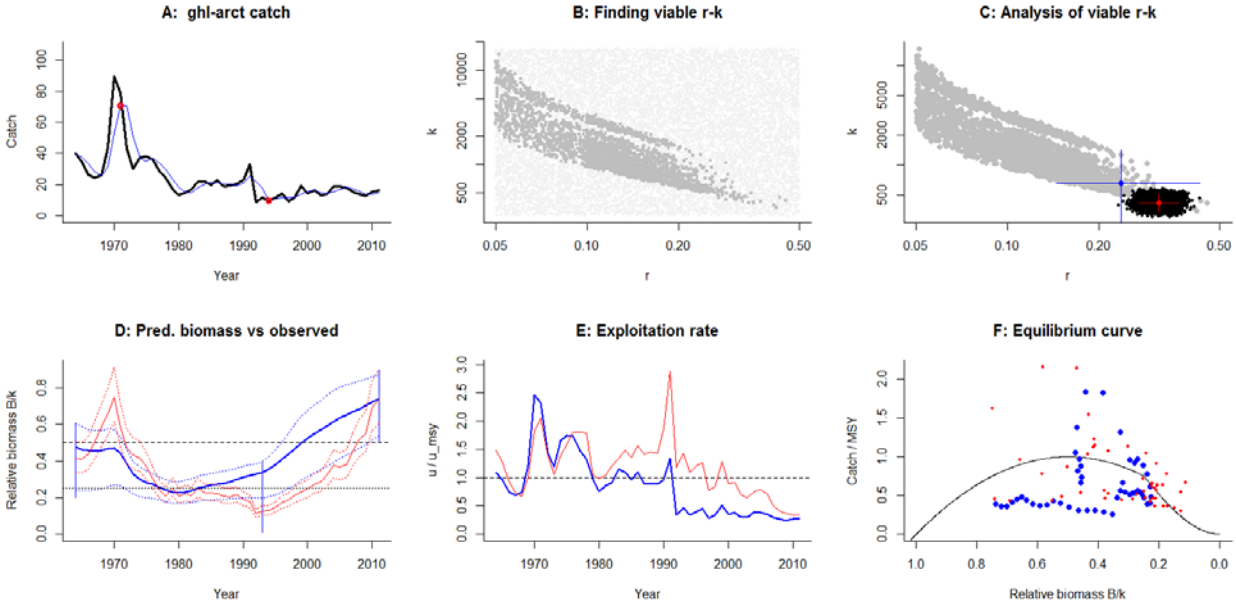

Species: *Melanogrammus aeglefinus* , stock: had-346a
Name and region: Haddock in Sub-area IV (North Sea) and Division IIIa West and VIa , ICES
Catch data used from years 1972 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 539 - 8623
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.494 , 95% CL = 0.427 - 0.545 , k = 2113 , 95% CL = 1690 - 2934
MSY = 260 , 95% CL = 200 - 365
Biomass in last year = 461 or 0.218 k
Exploitation rate in last year = 0.0987 or 0.399 u.msy
Results of CMSY analysis with altogether 828 viable trajectories for 750 r-k pairs
r = 0.318 , 95% CL = 0.275 - 0.385 , k = 2778 , 95% CL = 2106 - 3505
MSY = 221 , 95% CL = 187 - 261
Relative biomass last year= 0.142 k, 2.5th = 0.0162 , 97.5th = 0.373
Relative biomass next year= 0.143 k, 2.5th = 0.00087 , 97.5th = 0.432
Relative exploitation rate in last year= 0.738
Comment: OK
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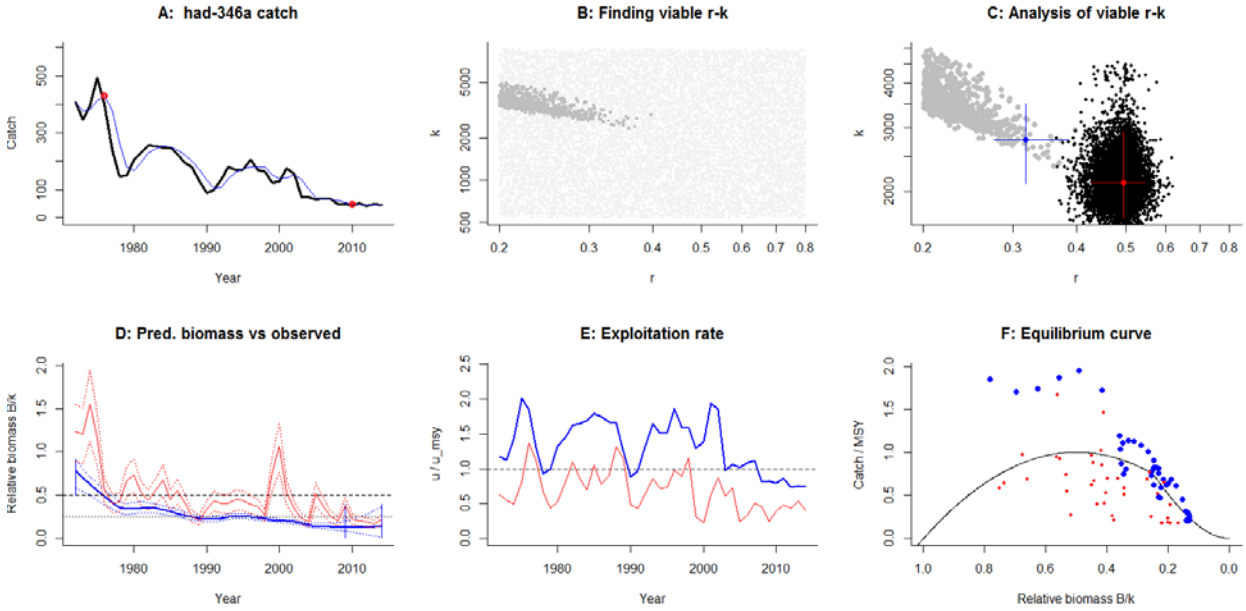

Species: *Melanogrammus aeglefinus* , stock: had-7b-k
Name and region: Haddock in Divisions VIIb,c,e-k , ICES
Catch data used from years 1993 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2005 expert
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 68.6 - 1646
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.505 , 95% CL = 0.458 - 0.584 , k = 111 , 95% CL = 89.4 - 151
MSY = 14.1 , 95% CL = 11.1 - 19.3
Biomass in last year = 74.7 or 0.675 k
Exploitation rate in last year = 0.316 or 1.25 u.msy
Results of CMSY analysis with altogether 2931 viable trajectories for 2075 r-k pairs
r = 0.399 , 95% CL = 0.32 - 0.5 , k = 179 , 95% CL = 130 - 244
MSY = 17.8 , 95% CL = 14.8 - 21.4
Relative biomass last year= 0.537 k, 2.5th = 0.501 , 97.5th = 0.624
Relative biomass next year= 0.506 k, 2.5th = 0.445 , 97.5th = 0.604
Relative exploitation rate in last year= 0.8
Comment: OK
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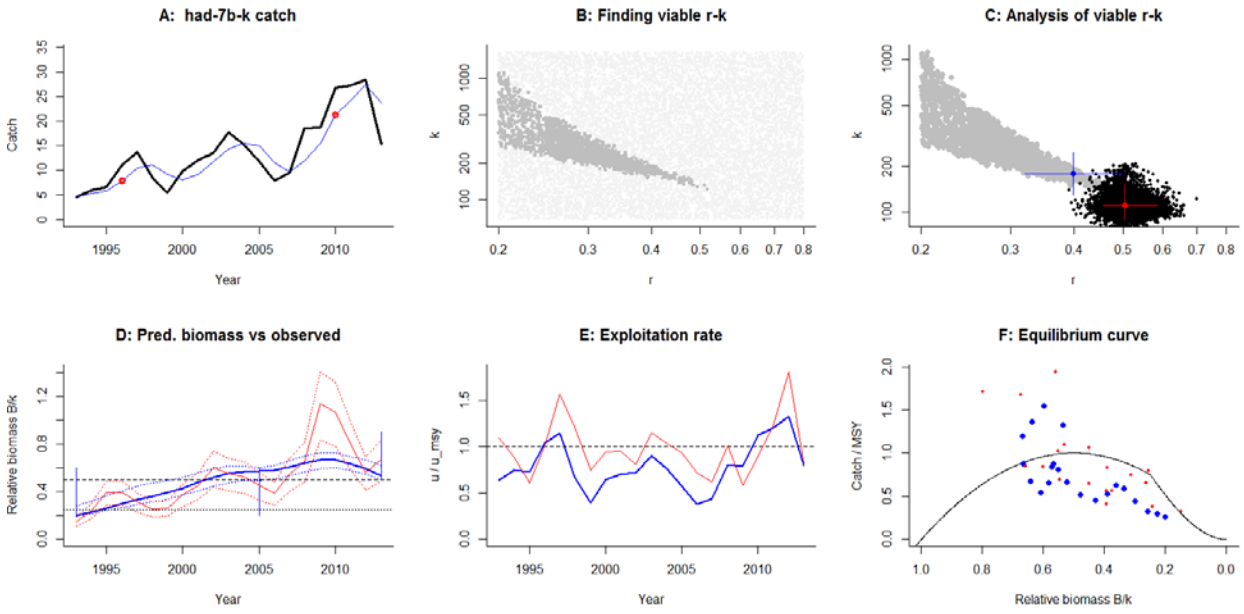

Species: *Melanogrammus aeglefinus* , stock: had-arct
Name and region: Haddock in Subareas I and II (Northeast Arctic) , ICES
Catch data used from years 1950 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1984 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 729 - 17492
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.542 , 95% CL = 0.486 - 0.639 , k = 1091 , 95% CL = 946 - 1285
MSY = 149 , 95% CL = 122 - 185
Biomass in last year = 1153 or 1.06 k
Exploitation rate in last year = 0.199 or 0.733 u.msy
Results of CMSY analysis with altogether 1213 viable trajectories for 1032 r-k pairs
r = 0.472 , 95% CL = 0.36 - 0.699 , k = 1337 , 95% CL = 843 - 1876
MSY = 158 , 95% CL = 138 - 180
Relative biomass last year= 0.529 k, 2.5th = 0.501 , 97.5th = 0.609
Relative biomass next year= 0.485 k, 2.5th = 0.374 , 97.5th = 0.593
Relative exploitation rate in last year= 1.06
Comment: Fit could be improved by setting intbio Low in 2000.
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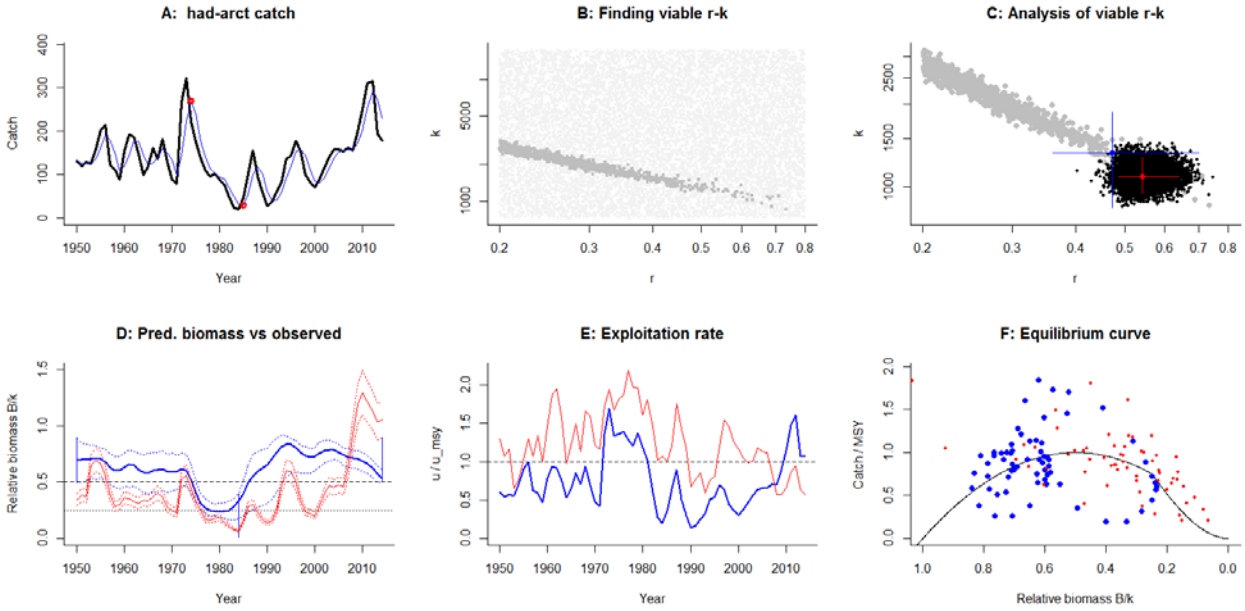

Species: *Melanogrammus aeglefinus* , stock: had-faro
Name and region: Haddock in Division Vb , ICES
Catch data used from years 1957 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1994 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 31.5 - 504
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.493 , 95% CL = 0.429 - 0.54 , k = 146 , 95% CL = 126 - 170
MSY = 17.8 , 95% CL = 15 - 21.1
Biomass in last year = 20.9 or 0.143 k
Exploitation rate in last year = 0.14 or 0.568 u.msy
Results of CMSY analysis with altogether 1557 viable trajectories for 1110 r-k pairs
r = 0.387 , 95% CL = 0.312 - 0.479 , k = 180 , 95% CL = 137 - 236
MSY = 17.4 , 95% CL = 15.5 - 19.5
Relative biomass last year= 0.206 k, 2.5th = 0.0137 , 97.5th = 0.397
Relative biomass next year= 0.241 k, 2.5th = -0.00164 , 97.5th = 0.465
Relative exploitation rate in last year= 0.446
Comment: Fit could be improved by setting intbio High in 2000.
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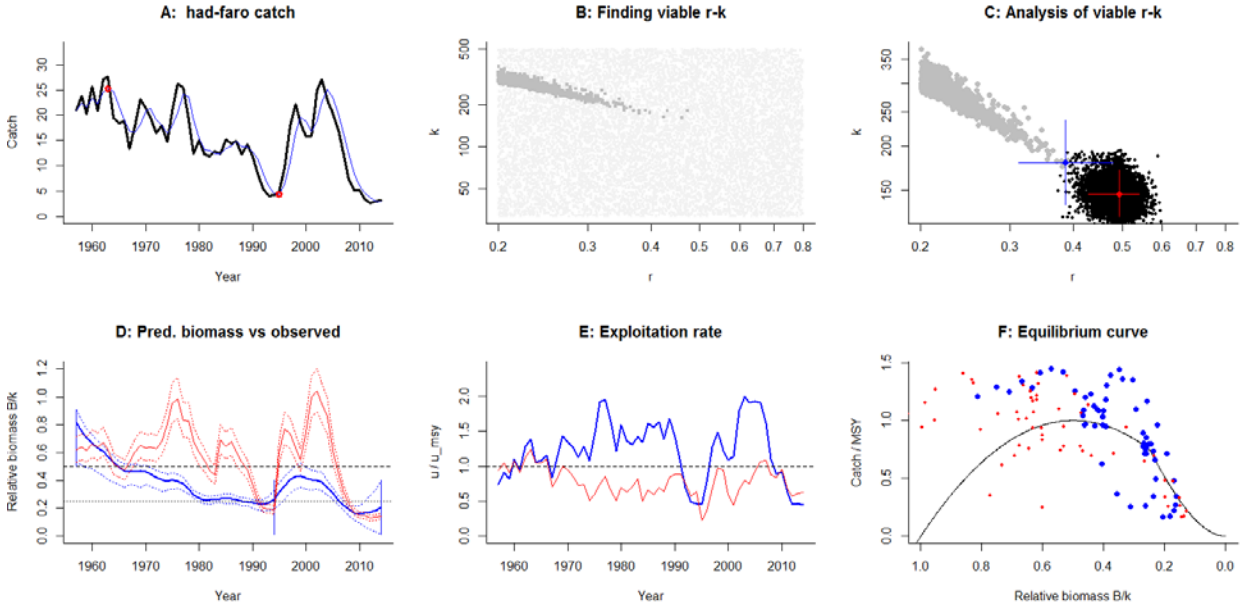

Species: *Melanogrammus aeglefinus* , stock: had-iceg
Name and region: Haddock in Division Va (Icelandic cod) , ICES
Catch data used from years 1979 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2007 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 129 - 2070
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.606 , 95% CL = 0.523 - 0.682 , k = 405 , 95% CL = 359 - 465
MSY = 61.4 , 95% CL = 52.7 - 71.1
Biomass in last year = 125 or 0.309 k
Exploitation rate in last year = 0.372 or 1.23 u.msy
Results of CMSY analysis with altogether 8665 viable trajectories for 1515 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 513 , 95% CL = 329 - 799
MSY = 72.5 , 95% CL = 57.8 - 91
Relative biomass last year= 0.486 k, 2.5th = 0.225 , 97.5th = 0.597
Relative biomass next year= 0.536 k, 2.5th = 0.211 , 97.5th = 0.666
Relative exploitation rate in last year= 0.626
Comment: OK. Fit could be improved by setting intbio Low in 2000.
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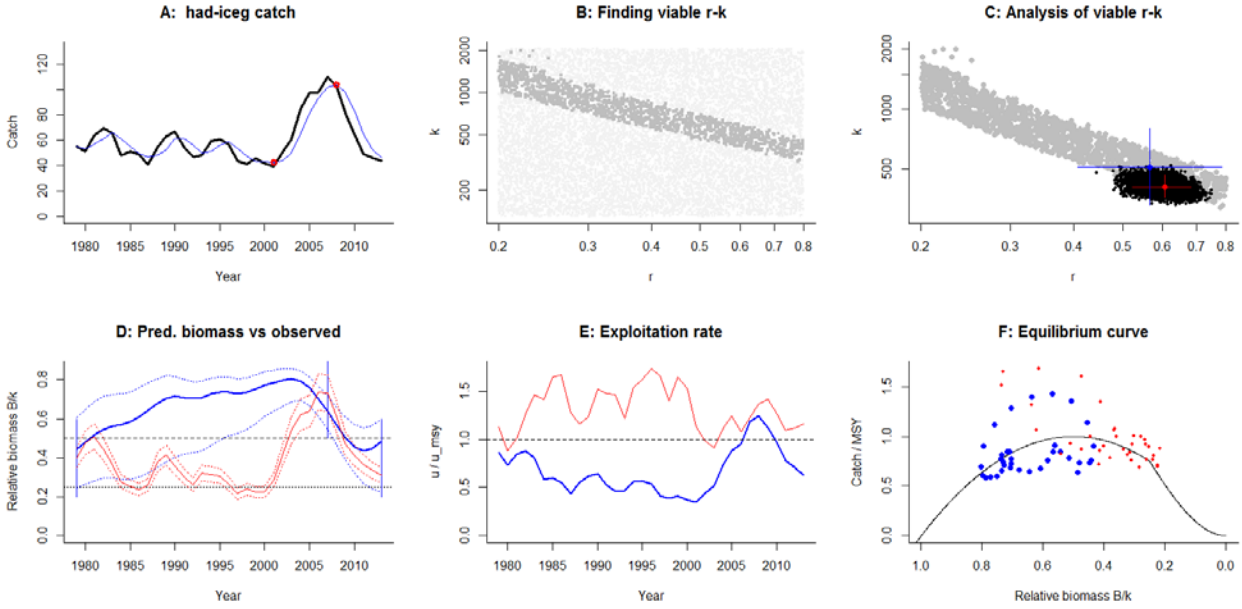

Species: *Melanogrammus aeglefinus* , stock: had-rock
Name and region: Haddock in Division VIb (Rockall) , ICES
Catch data used from years 1991 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 23.6 - 378
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.497 , 95% CL = 0.434 - 0.556 , k = 98.6 , 95% CL = 72.3 - 157
MSY = 12.3 , 95% CL = 8.91 - 19.6
Biomass in last year = 17.5 or 0.178 k
Exploitation rate in last year = 0.0883 or 0.355 u.msy
Results of CMSY analysis with altogether 2694 viable trajectories for 2301 r-k pairs
r = 0.494 , 95% CL = 0.372 - 0.779 , k = 140 , 95% CL = 63.9 - 259
MSY = 17.3 , 95% CL = 9.07 - 33
Relative biomass last year= 0.119 k, 2.5th = 0.0152 , 97.5th = 0.385
Relative biomass next year= 0.132 k, 2.5th = 0.00386 , 97.5th = 0.476
Relative exploitation rate in last year= 0.475
Comment: OK; good fit.
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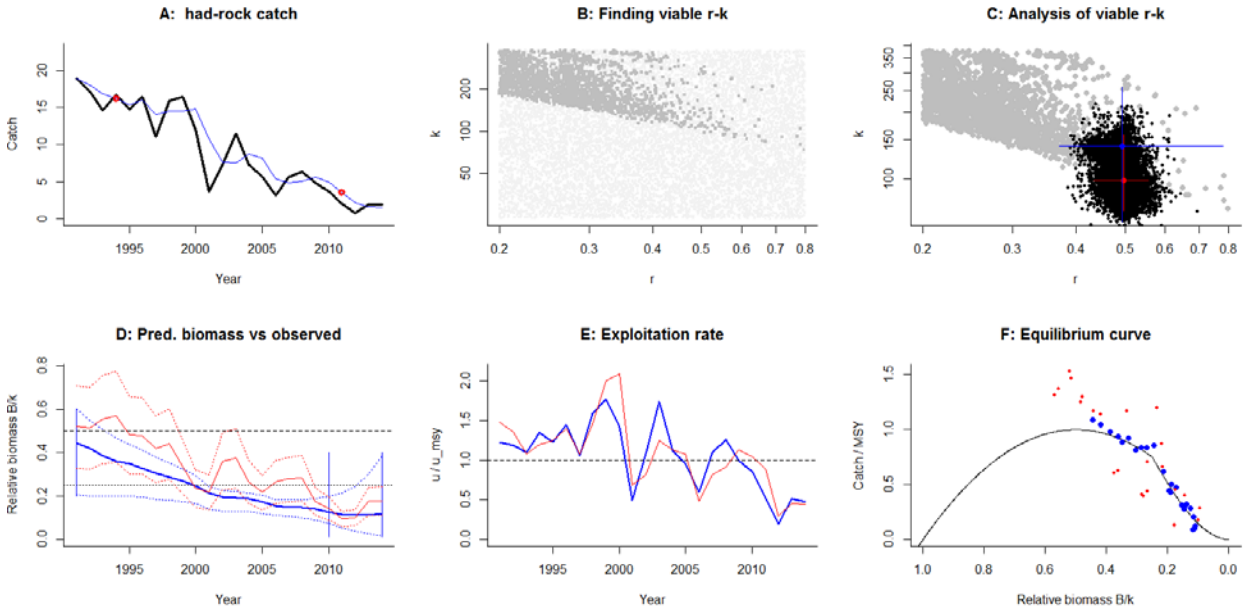

Species: *Clupea harengus* , stock: her-2532-gor
Name and region: Herring in Subdivisions 25 - 29 (excluding Gulf of Riga) and 32 , ICES
Catch data used from years 1974 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 461 - 7373
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.361 , 95% CL = 0.306 - 0.438 , k = 2839 , 95% CL = 2456 - 3324
MSY = 257 , 95% CL = 221 - 306
Biomass in last year = 1482 or 0.522 k
Exploitation rate in last year = 0.0752 or 0.417 u.msy
Results of CMSY analysis with altogether 1784 viable trajectories for 1032 r-k pairs
r = 0.364 , 95% CL = 0.301 - 0.571 , k = 2529 , 95% CL = 1519 - 3247
MSY = 230 , 95% CL = 205 - 259
Relative biomass last year= 0.51 k, 2.5th = 0.275 , 97.5th = 0.597
Relative biomass next year= 0.555 k, 2.5th = 0.304 , 97.5th = 0.643
Relative exploitation rate in last year= 0.564
Comment: OK
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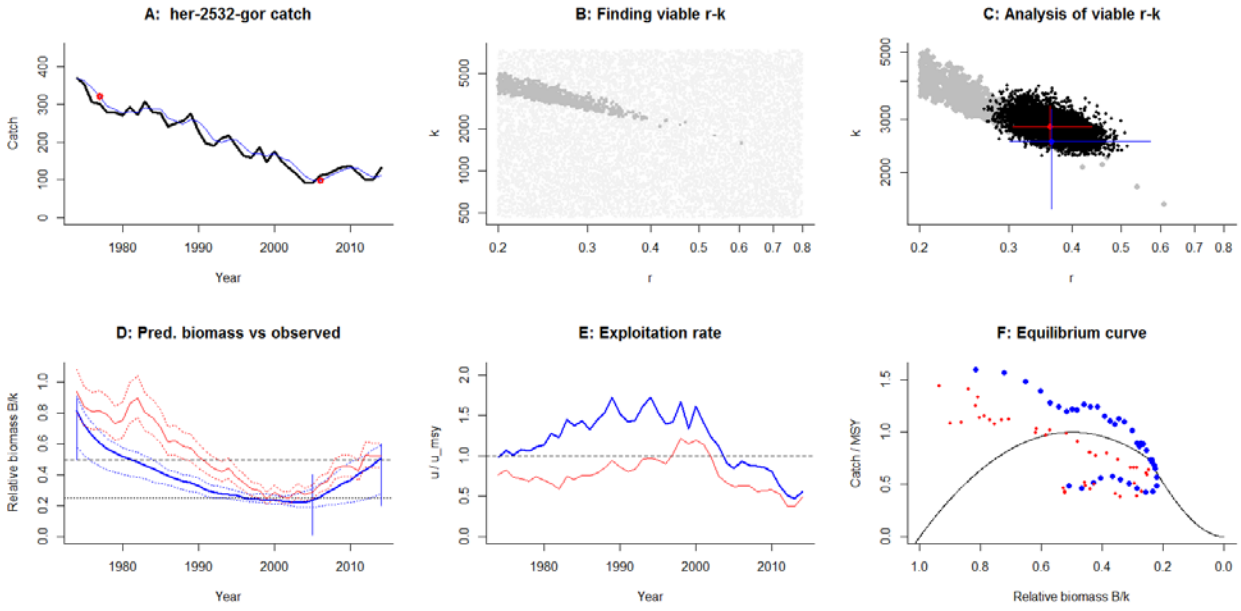

Species: *Clupea harengus* , stock: her-30
Name and region: Herring in Subdivision 30 (Bothnian Sea) , ICES
Catch data used from years 1973 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2010 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 267 - 6419
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.41 , 95% CL = 0.342 - 0.497 , k = 862 , 95% CL = 754 - 994
MSY = 88.6 , 95% CL = 73.4 - 108
Biomass in last year = 913 or 1.06 k
Exploitation rate in last year = 0.117 or 0.572 u.msy
Results of CMSY analysis with altogether 1407 viable trajectories for 740 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 470 , 95% CL = 320 - 689
MSY = 66.5 , 95% CL = 59.6 - 74.1
Relative biomass last year= 0.517 k, 2.5th = 0.501 , 97.5th = 0.568
Relative biomass next year= 0.433 k, 2.5th = 0.354 , 97.5th = 0.5
Relative exploitation rate in last year= 1.61
Comment: OK. Fit could be improved by setting intbio Medium in 2000.
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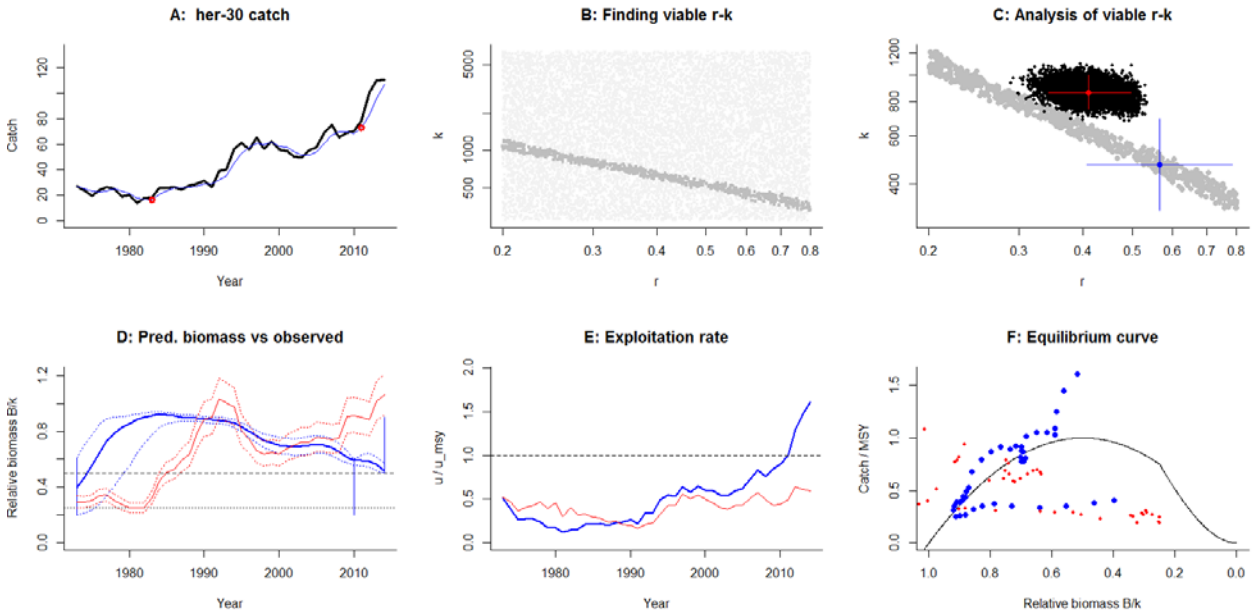

Species: *Clupea harengus* , stock: her-3a22
Name and region: Herring in Division IIIa and Subdivisions 22 - 24 , ICES
Catch data used from years 1991 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 241 - 3860
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.523 , 95% CL = 0.489 - 0.571 , k = 1036 , 95% CL = 891 - 1187
MSY = 136 , 95% CL = 114 - 163
Biomass in last year = 189 or 0.183 k
Exploitation rate in last year = 0.211 or 0.805 u.msy
Results of CMSY analysis with altogether 2449 viable trajectories for 2042 r-k pairs
r = 0.455 , 95% CL = 0.351 - 0.717 , k = 1647 , 95% CL = 708 - 3148
MSY = 187 , 95% CL = 87.5 - 401
Relative biomass last year= 0.16 k, 2.5th = 0.0155 , 97.5th = 0.39
Relative biomass next year= 0.166 k, 2.5th = -0.00557 , 97.5th = 0.473
Relative exploitation rate in last year= 0.624
Comment: OK
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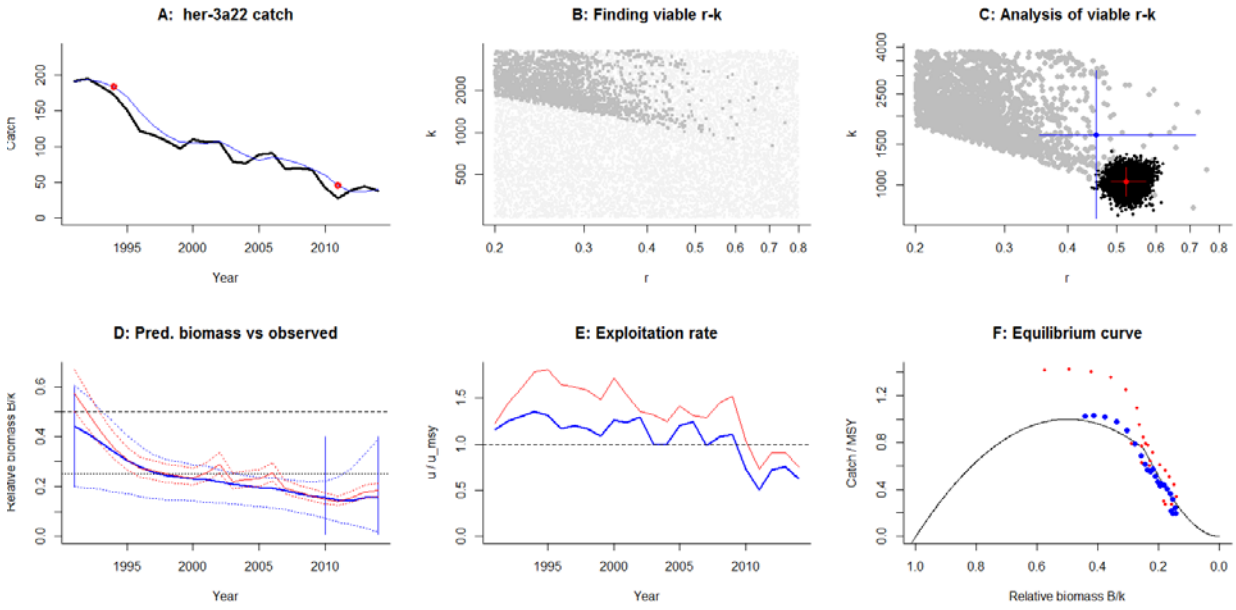

Species: *Clupea harengus* , stock: her-47d3
Name and region: Herring in Subarea IV and Divisions IIIa and VIId , ICES
Catch data used from years 1947 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1978 default
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 2446 - 58710
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.485 , 95% CL = 0.416 - 0.526 , k = 6369 , 95% CL = 5763 - 7265
MSY = 767 , 95% CL = 664 - 875
Biomass in last year = 4378 or 0.687 k
Exploitation rate in last year = 0.111 or 0.46 u.msy
Results of CMSY analysis with altogether 1058 viable trajectories for 354 r-k pairs
r = 0.463 , 95% CL = 0.349 - 0.732 , k = 5592 , 95% CL = 3376 - 7762
MSY = 647 , 95% CL = 591 - 709
Relative biomass last year= 0.844 k, 2.5th = 0.798 , 97.5th = 0.874
Relative biomass next year= 0.816 k, 2.5th = 0.783 , 97.5th = 0.847
Relative exploitation rate in last year= 0.473
Comment: OK
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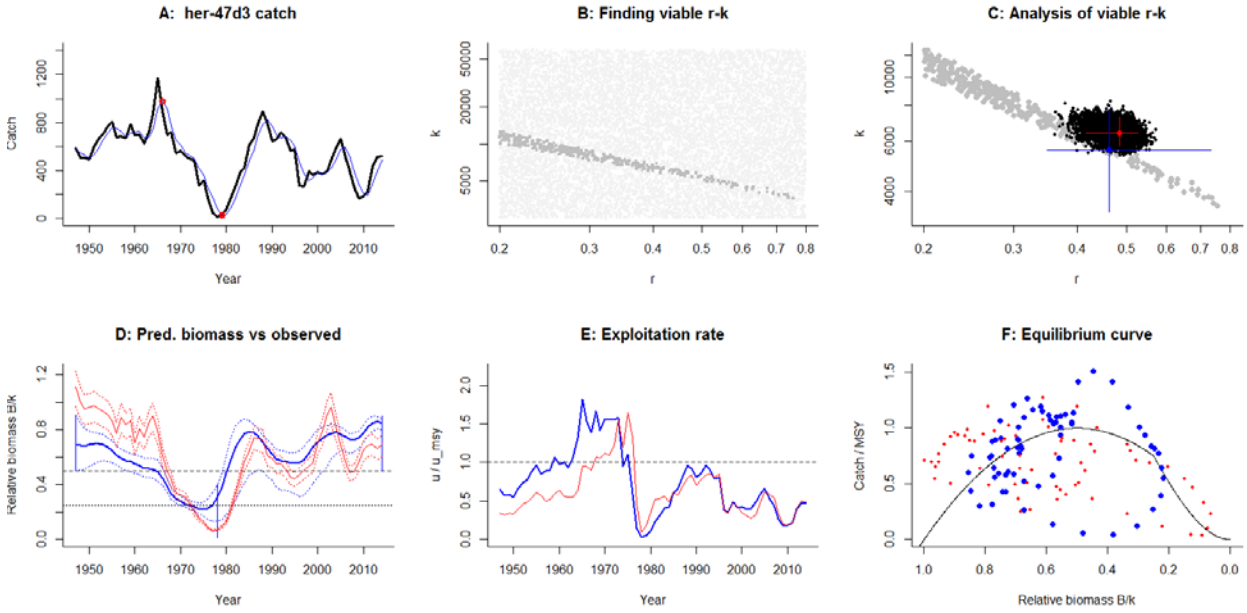

Species: *Clupea harengus* , stock: her-67bc
Name and region: Herring in Divisions VIa and VIIb,c (West of Scotland, West of Ireland) , ICES
Catch data used from years 1957 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 274 - 4383
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.39 , 95% CL = 0.329 - 0.471 , k = 1302 , 95% CL = 1177 - 1463
MSY = 127 , 95% CL = 105 - 156
Biomass in last year = 367 or 0.281 k
Exploitation rate in last year = 0.072 or 0.369 u.msy
Results of CMSY analysis with altogether 425 viable trajectories for 384 r-k pairs
r = 0.297 , 95% CL = 0.261 - 0.339 , k = 1375 , 95% CL = 1115 - 1695
MSY = 102 , 95% CL = 87.5 - 119
Relative biomass last year= 0.189 k, 2.5th = 0.0193 , 97.5th = 0.385
Relative biomass next year= 0.199 k, 2.5th = 4.35e-05 , 97.5th = 0.432
Relative exploitation rate in last year= 0.704
Comment: Fit could be improved by setting intbio Medium in 1995.
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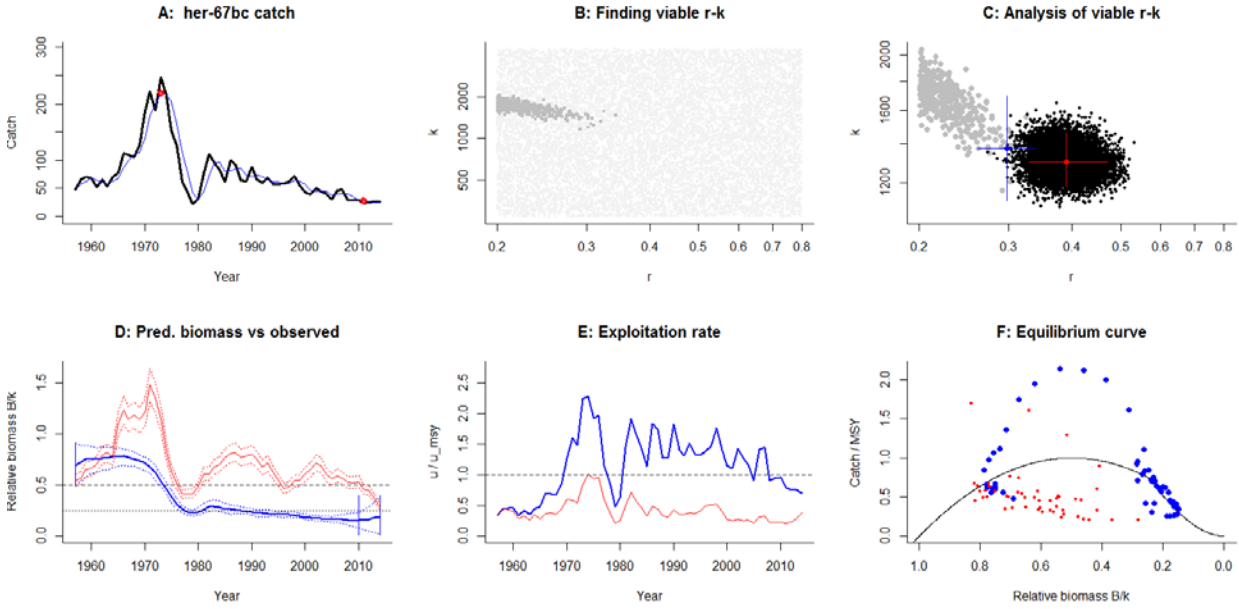

Species: *Clupea harengus* , stock: her-irls
Name and region: Herring in Division VIIa South of 52° 30' N and VIIg,h,j,k , ICES
Catch data used from years 1958 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 89.6 - 2150
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.462 , 95% CL = 0.384 - 0.515 , k = 249 , 95% CL = 218 - 301
MSY = 28.7 , 95% CL = 23.9 - 34.5
Biomass in last year = 208 or 0.834 k
Exploitation rate in last year = 0.0781 or 0.338 u.msy
Results of CMSY analysis with altogether 2298 viable trajectories for 1639 r-k pairs
r = 0.387 , 95% CL = 0.312 - 0.479 , k = 212 , 95% CL = 165 - 272
MSY = 20.5 , 95% CL = 19 - 22
Relative biomass last year= 0.599 k, 2.5th = 0.508 , 97.5th = 0.678
Relative biomass next year= 0.614 k, 2.5th = 0.527 , 97.5th = 0.684
Relative exploitation rate in last year= 0.636
Comment: Fit could be improved by setting intbio Low in 2002.
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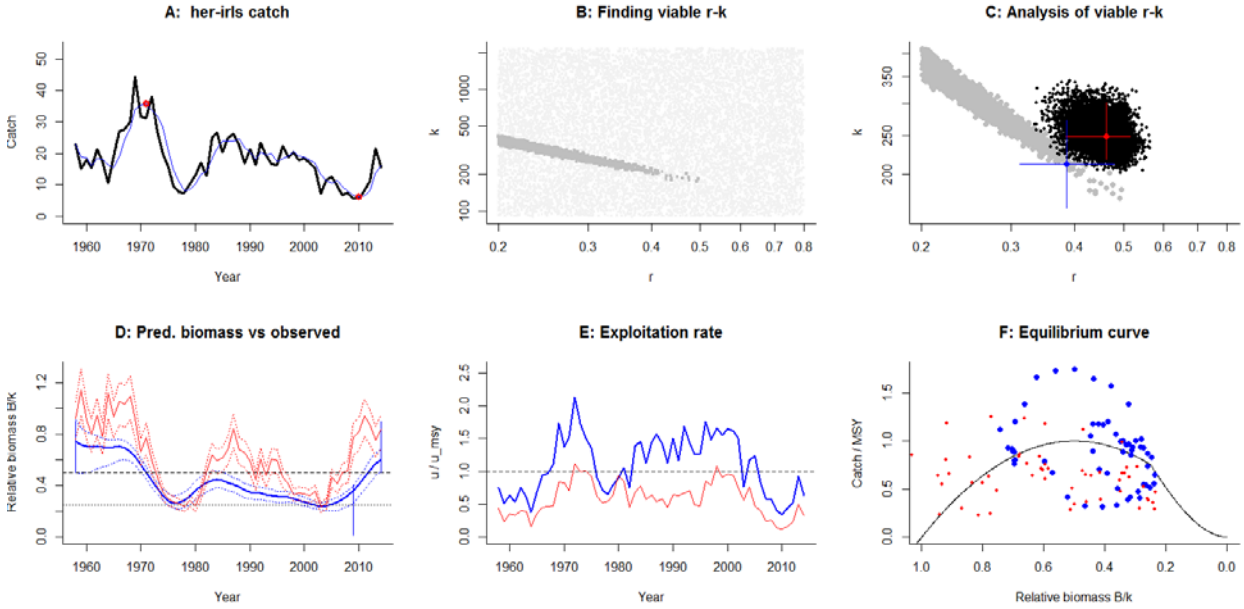

Species: *Clupea harengus* , stock: her-nirs
Name and region: Herring in Division VIIa North of 52° 30' N (Irish Sea) , ICES
Catch data used from years 1961 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2003 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 36.9 - 591
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.422 , 95% CL = 0.369 - 0.49 , k = 123 , 95% CL = 105 - 145
MSY = 13 , 95% CL = 10.5 - 16
Biomass in last year = 41.5 or 0.338 k
Exploitation rate in last year = 0.126 or 0.599 u.msy
Results of CMSY analysis with altogether 293 viable trajectories for 287 r-k pairs
r = 0.321 , 95% CL = 0.275 - 0.393 , k = 182 , 95% CL = 135 - 234
MSY = 14.6 , 95% CL = 12.1 - 17.6
Relative biomass last year= 0.156 k, 2.5th = 0.0153 , 97.5th = 0.381
Relative biomass next year= 0.158 k, 2.5th = -0.0114 , 97.5th = 0.419
Relative exploitation rate in last year= 1.14
Comment: OK
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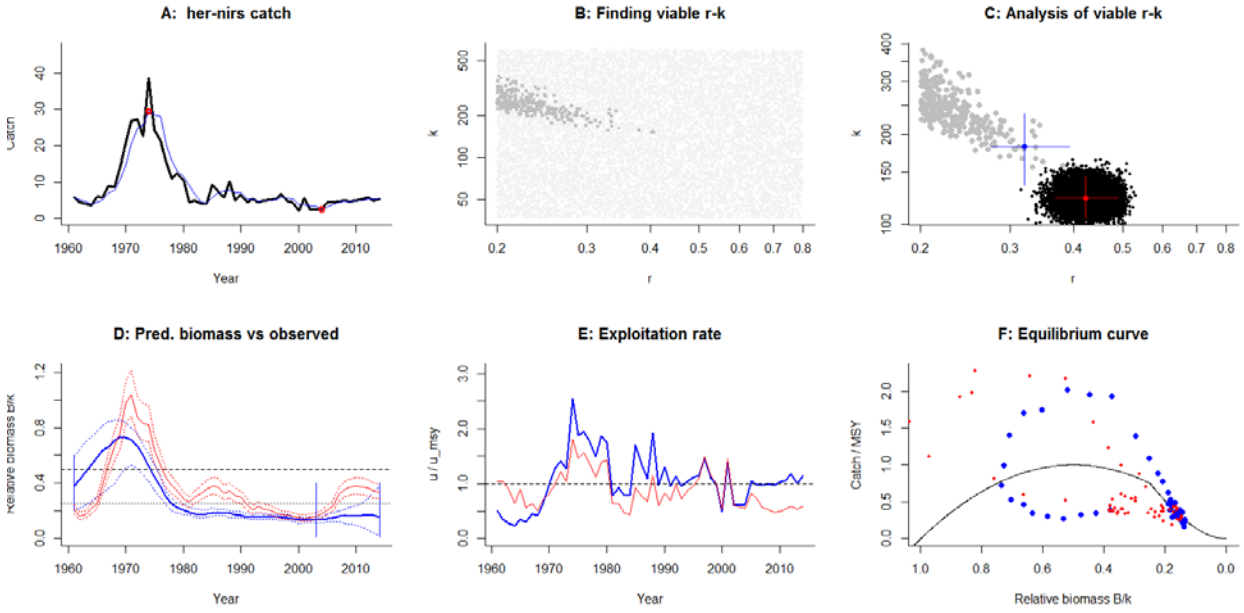

Species: *Clupea harengus* , stock: her-noss
Name and region: Norwegian spring-spawning herring , ICES
Catch data used from years 1988 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 1954 - 31267
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.475 , 95% CL = 0.4 - 0.523 , k = 11174 , 95% CL = 10180 - 12366
MSY = 1319 , 95% CL = 1128 - 1491
Biomass in last year = 5617 or 0.503 k
Exploitation rate in last year = 0.117 or 0.492 u.msy
Results of CMSY analysis with altogether 11732 viable trajectories for 1548 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 7654 , 95% CL = 4922 - 11904
MSY = 1082 , 95% CL = 866 - 1353
Relative biomass last year= 0.465 k, 2.5th = 0.22 , 97.5th = 0.595
Relative biomass next year= 0.52 k, 2.5th = 0.212 , 97.5th = 0.67
Relative exploitation rate in last year= 0.458
Comment: OK
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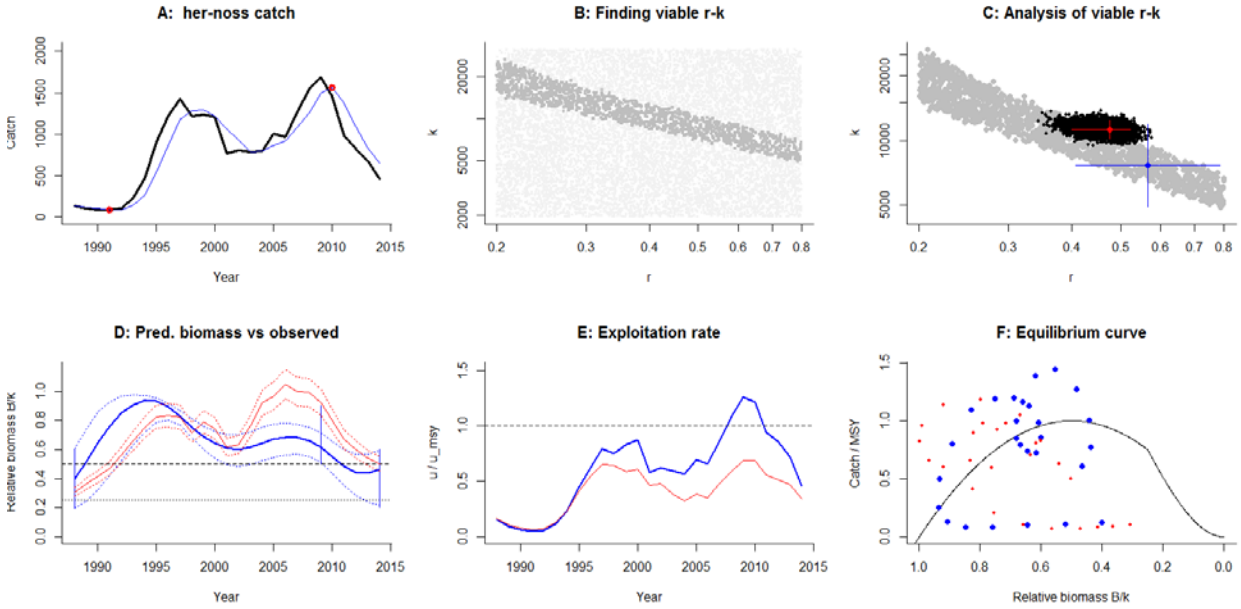

Species: *Clupea harengus* , stock: her-riga
Name and region: Herring in the Gulf of Riga , ICES
Catch data used from years 1977 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2003 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 49.8 - 797
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.495 , 95% CL = 0.437 - 0.542 , k = 232 , 95% CL = 205 - 270
MSY = 28.6 , 95% CL = 25.4 - 32.3
Biomass in last year = 126 or 0.545 k
Exploitation rate in last year = 0.214 or 0.863 u.msy
Results of CMSY analysis with altogether 5599 viable trajectories for 1086 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 221 , 95% CL = 148 - 331
MSY = 31.3 , 95% CL = 27 - 36.2
Relative biomass last year= 0.44 k, 2.5th = 0.217 , 97.5th = 0.59
Relative biomass next year= 0.458 k, 2.5th = 0.174 , 97.5th = 0.624
Relative exploitation rate in last year= 0.953
Comment: OK
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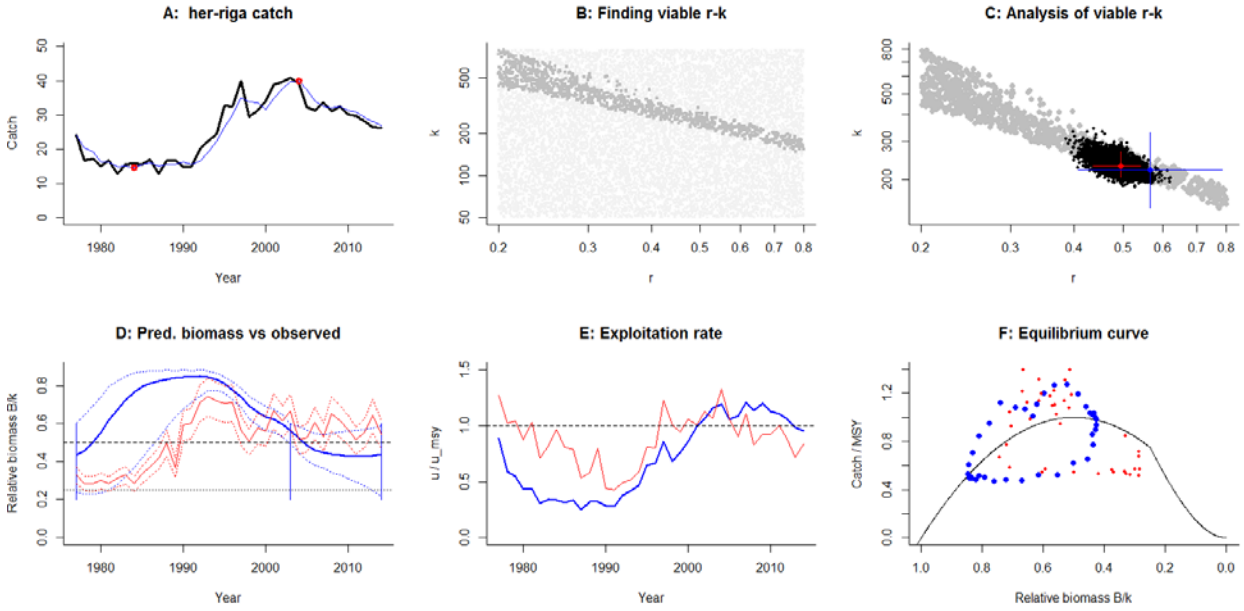

Species: *Clupea harengus* , stock: her-vian
Name and region: Herring in Division VIa (North) , ICES
Catch data used from years 1957 - 2013 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1979 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 243 - 3881
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.432 , 95% CL = 0.36 - 0.503 , k = 938 , 95% CL = 786 - 1158
MSY = 102 , 95% CL = 76.7 - 135
Biomass in last year = 114 or 0.121 k
Exploitation rate in last year = 0.173 or 0.803 u.msy
Results of CMSY analysis with altogether 266 viable trajectories for 254 r-k pairs
r = 0.333 , 95% CL = 0.282 - 0.41 , k = 1103 , 95% CL = 832 - 1404
MSY = 91.8 , 95% CL = 79.4 - 106
Relative biomass last year= 0.187 k, 2.5th = 0.0157 , 97.5th = 0.38
Relative biomass next year= 0.204 k, 2.5th = -0.000554 , 97.5th = 0.437
Relative exploitation rate in last year= 0.668
Comment: OK
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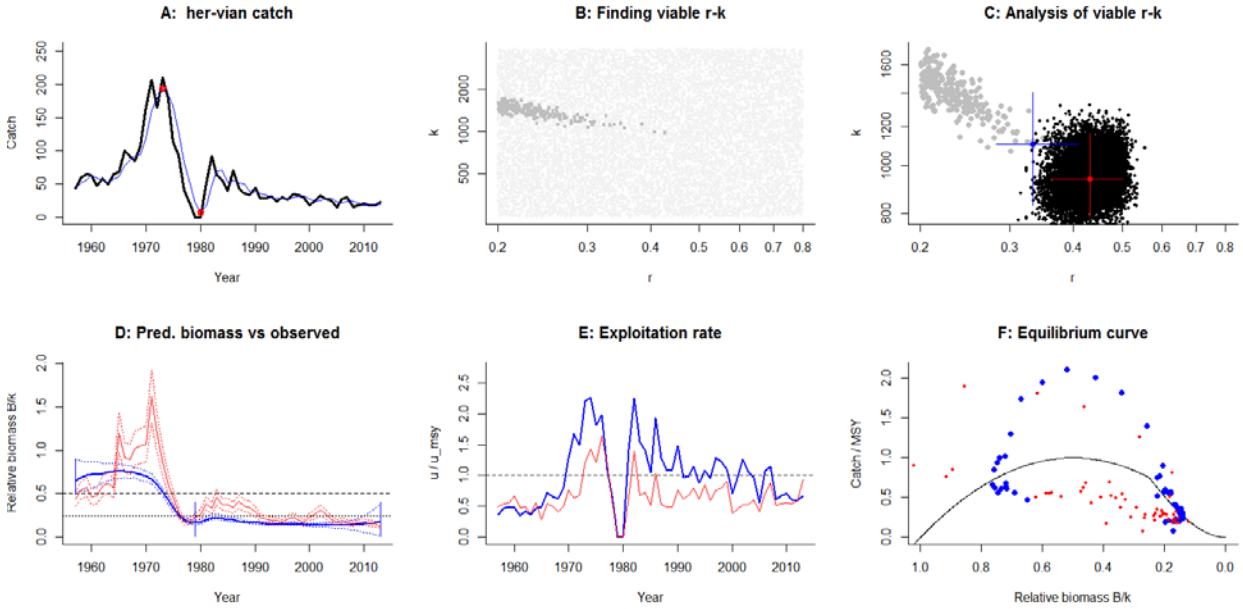

Species: *Merluccius merluccius* , stock: hke-nrtn
Hake in Division IIIa, Subareas IV, VI and VII and Divisions VIIIa,b,d (Northern stock) , ICES
Catch data used from years 1978 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2010 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 251 - 6020
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.906 , 95% CL = 0.733 - 1.04 , k = 278 , 95% CL = 247 - 315
MSY = 63.1 , 95% CL = 48.5 - 76
Biomass in last year = 275 or 0.989 k
Exploitation rate in last year = 0.362 or 0.799 u.msy
Results of CMSY analysis with altogether 27131 viable trajectories for 3146 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 715 , 95% CL = 383 - 1333
MSY = 101 , 95% CL = 56.7 - 180
Relative biomass last year= 0.718 k, 2.5th = 0.516 , 97.5th = 0.831
Relative biomass next year= 0.695 k, 2.5th = 0.446 , 97.5th = 0.821
Relative exploitation rate in last year= 0.681
Comment: Fit could be improved by setting intbio Low in 2005.
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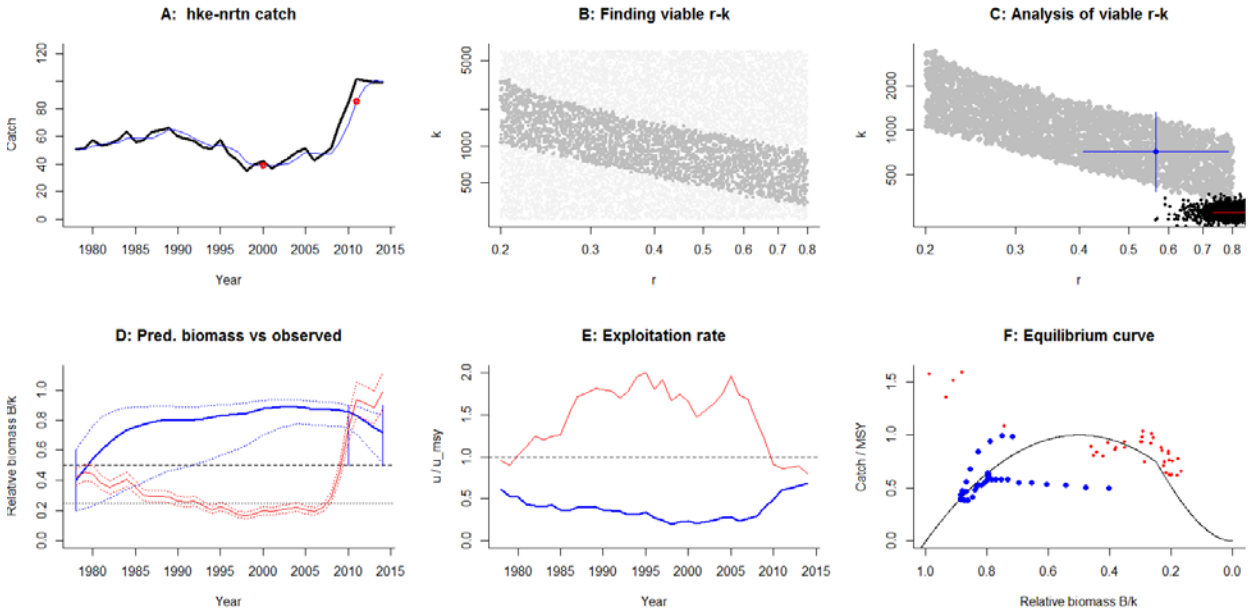

Species: *Merluccius merluccius* , stock: hke-soth
Hake in Division IIIa, Subareas IV, VI and VII and Divisions VIIIa,b,d (Northern stock) , ICES
Catch data used from years 1982 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2003 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 26.7 - 427
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.884 , 95% CL = 0.663 - 1.05 , k = 64.3 , 95% CL = 55.5 - 75.3
MSY = 14.3 , 95% CL = 10.2 - 17.7
Biomass in last year = 23.5 or 0.366 k
Exploitation rate in last year = 0.634 or 1.44 u.msy
Results of CMSY analysis with altogether 2822 viable trajectories for 2152 r-k pairs
r = 0.465 , 95% CL = 0.357 - 0.725 , k = 134 , 95% CL = 78.2 - 193
MSY = 15.6 , 95% CL = 12.9 - 18.9
Relative biomass last year= 0.385 k, 2.5th = 0.216 , 97.5th = 0.562
Relative biomass next year= 0.381 k, 2.5th = 0.166 , 97.5th = 0.577
Relative exploitation rate in last year= 1.2
Comment: OK
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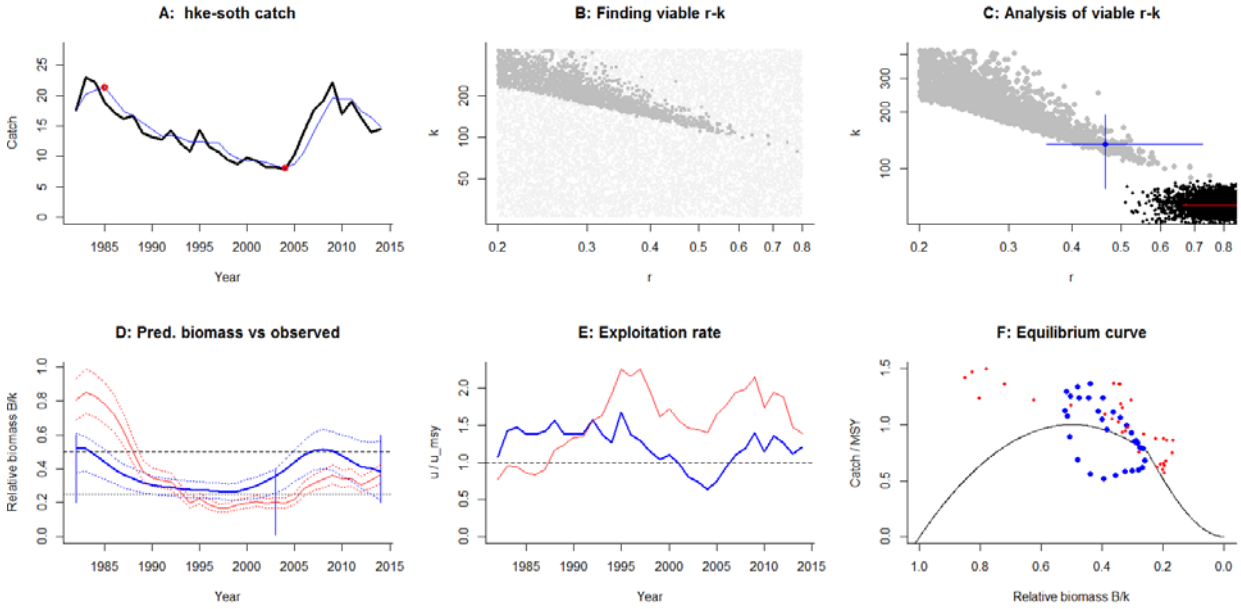

Species: *Trachurus trachurus* , stock: hom-west
Name and region: Horse mackerel in Divisions IIa, IVa, Vb, VIa, VIIa-c, e-k, VIII (Western stock) , ICES
Catch data used from years 1982 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1996 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 596 - 9538
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.447 , 95% CL = 0.368 - 0.511 , k = 4013 , 95% CL = 3438 - 4927
MSY = 448 , 95% CL = 353 - 564
Biomass in last year = 1144 or 0.285 k
Exploitation rate in last year = 0.136 or 0.609 u.msy
Results of CMSY analysis with altogether 1790 viable trajectories for 1481 r-k pairs
r = 0.498 , 95% CL = 0.373 - 0.752 , k = 2395 , 95% CL = 1486 - 3409
MSY = 298 , 95% CL = 262 - 339
Relative biomass last year= 0.287 k, 2.5th = 0.0214 , 97.5th = 0.396
Relative biomass next year= 0.314 k, 2.5th = -0.0337 , 97.5th = 0.453
Relative exploitation rate in last year= 0.755
Comment: OK
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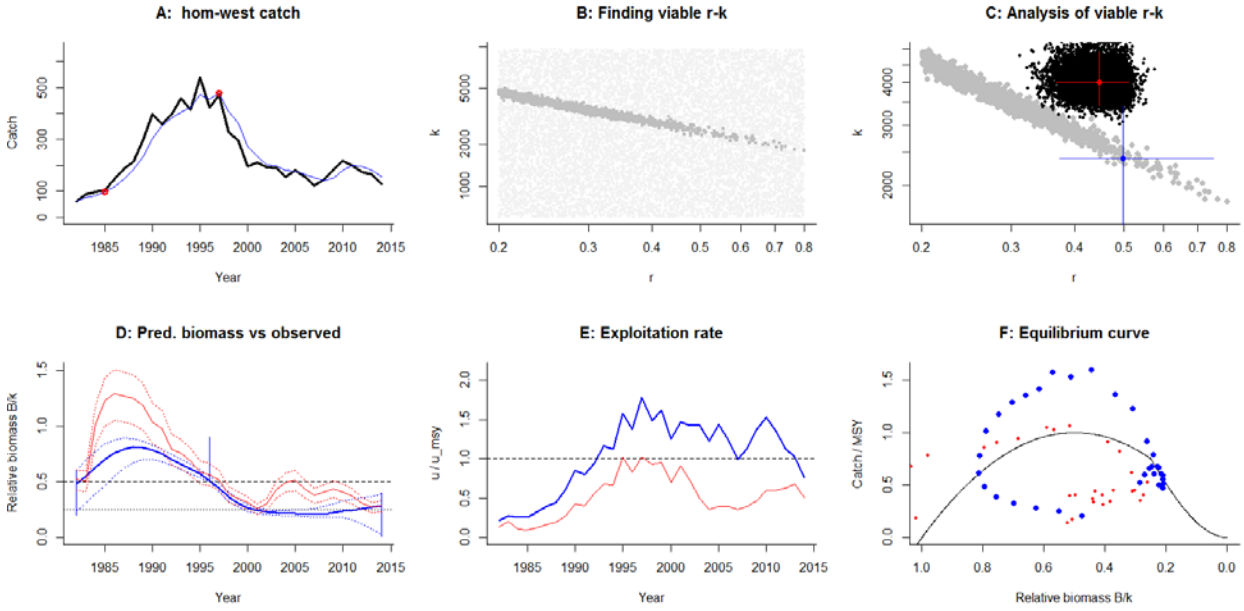

Species: *Molva molva* , stock: lin-icel
Name and region: Ling in Division Va , ICES
Catch data used from years 1982 - 2014 , biomass = observed
Prior initial relative biomass = 0.01 - 0.4 expert
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2010 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 30.9 - 742
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.51 , 95% CL = 0.482 - 0.551 , k = 129 , 95% CL = 115 - 142
MSY = 16.5 , 95% CL = 14.3 - 19
Biomass in last year = 90.9 or 0.706 k
Exploitation rate in last year = 0.136 or 0.533 u.msy
Results of CMSY analysis with altogether 22648 viable trajectories for 4326 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 98.6 , 95% CL = 49.1 - 198
MSY = 13.9 , 95% CL = 6.75 - 28.8
Relative biomass last year= 0.765 k, 2.5th = 0.516 , 97.5th = 0.878
Relative biomass next year= 0.743 k, 2.5th = 0.446 , 97.5th = 0.867
Relative exploitation rate in last year= 0.638
Comment: Resilience changed from Low to Medium; fit could be improved by setting intbio to Low in 2000.

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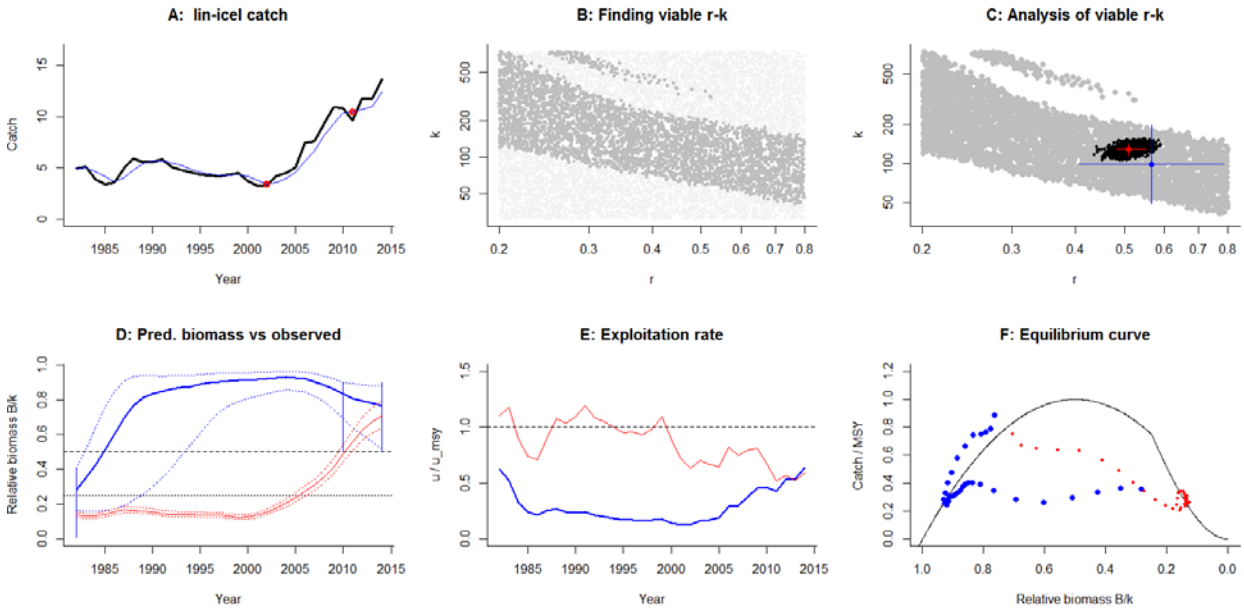

Species: *Scomber scombrus* , stock: mac-nea
Mackerel (combined Southern, Western & N. Sea spawn. comp.) , ICES
Catch data used from years 1980 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 1991 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2133 - 51203
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.438 , 95% CL = 0.367 - 0.504 , k = 7017 , 95% CL = 6248 - 8400
MSY = 771 , 95% CL = 690 - 871
Biomass in last year = 4891 or 0.697 k
Exploitation rate in last year = 0.174 or 0.796 u.msy
Results of CMSY analysis with altogether 7853 viable trajectories for 2797 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 6724 , 95% CL = 3719 - 12157
MSY = 951 , 95% CL = 566 - 1596
Relative biomass last year= 0.7 k, 2.5th = 0.523 , 97.5th = 0.863
Relative biomass next year= 0.665 k, 2.5th = 0.482 , 97.5th = 0.844
Relative exploitation rate in last year= 0.712
Comment: OK. Fit could be improved by setting startbio High and intbio Medium in 2005.
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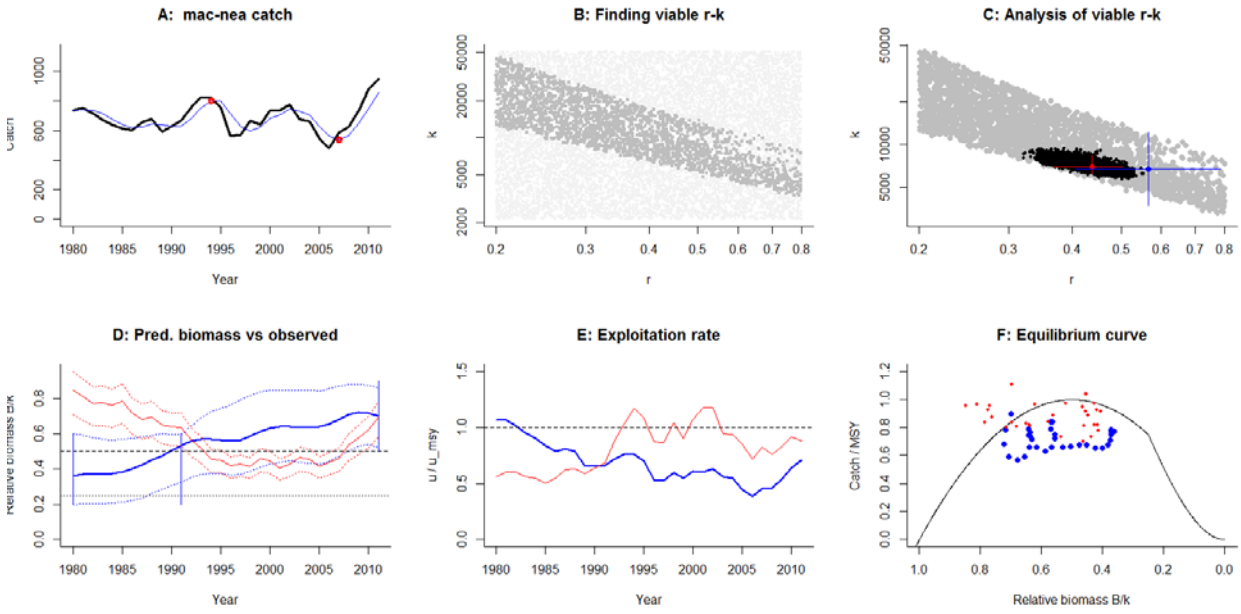

Species: *Lepidorhombus whiffiagonis* , stock: mgw-8c9a
Name and region: Megrim in Divisions VIIIc and IXa , ICES
Catch data used from years 1986 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 1.76 - 70.4
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.315 , 95% CL = 0.268 - 0.377 , k = 6.4 , 95% CL = 5.09 - 8.2
MSY = 0.503 , 95% CL = 0.367 - 0.706
Biomass in last year = 1.44 or 0.225 k
Exploitation rate in last year = 0.218 or 1.39 u.msy
Results of CMSY analysis with altogether 7481 viable trajectories for 4516 r-k pairs
r = 0.262 , 95% CL = 0.155 - 0.465 , k = 10.5 , 95% CL = 4.03 - 26.2
MSY = 0.69 , 95% CL = 0.324 - 1.47
Relative biomass last year= 0.181 k, 2.5th = 0.0142 , 97.5th = 0.393
Relative biomass next year= 0.176 k, 2.5th = -0.0101 , 97.5th = 0.415
Relative exploitation rate in last year= 1.6
Comment: OK
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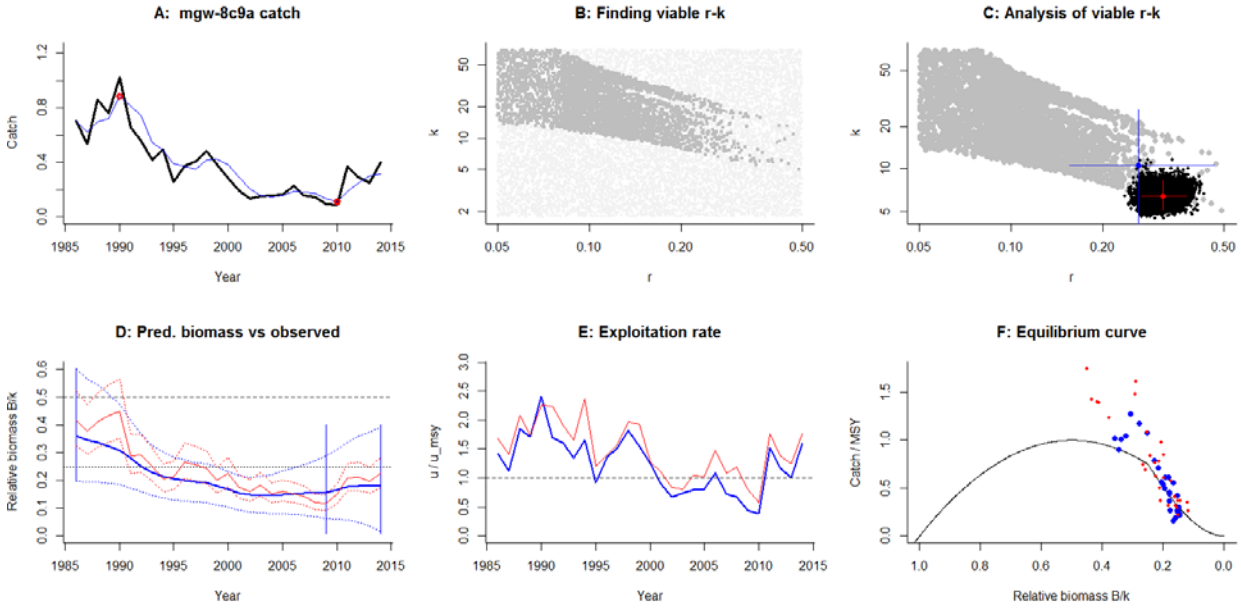

Species: *Nephrops norvegicus* , stock: nep-8ab
Name and region: Nephrops in Divisions VIIIa,b (Bay of Biscay, FU 23, 24) , ICES
Catch data used from years 1984 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2004 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 8.42 - 135
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.507 , 95% CL = 0.476 - 0.566 , k = 44.3 , 95% CL = 37.9 - 50.6
MSY = 5.64 , 95% CL = 5.16 - 6.19
Biomass in last year = 16 or 0.36 k
Exploitation rate in last year = 0.256 or 1.01 u.msy
Results of CMSY analysis with altogether 1646 viable trajectories for 846 r-k pairs
r = 0.546 , 95% CL = 0.395 - 0.785 , k = 39.9 , 95% CL = 26.1 - 58.8
MSY = 5.45 , 95% CL = 4.82 - 6.17
Relative biomass last year= 0.305 k, 2.5th = 0.053 , 97.5th = 0.397
Relative biomass next year= 0.312 k, 2.5th = -0.0524 , 97.5th = 0.435
Relative exploitation rate in last year= 1.39
Comment: OK
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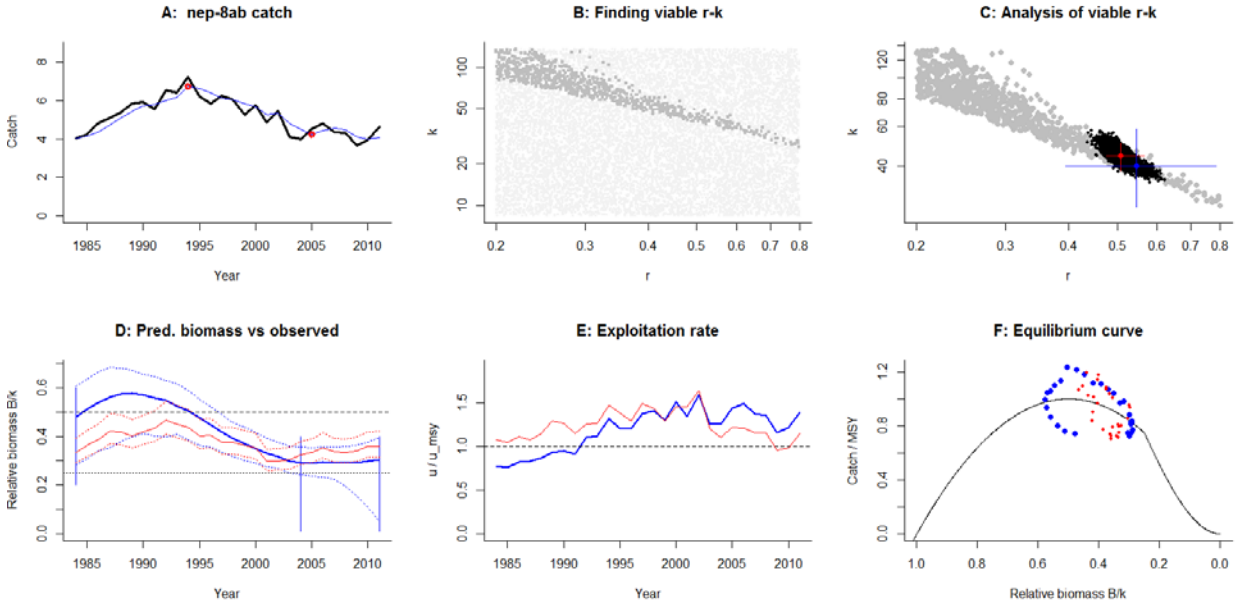

Species: *Trisopterus esmarkii* , stock: nop-34-june
Name and region: Norway Pout in Subarea IV (North S.) and IIIa (Skagerrak - Kattegat) , ICES
Catch data used from years 1983 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2004 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 572 - 9152
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.498 , 95% CL = 0.436 - 0.552 , k = 1909 , 95% CL = 1367 - 2780
MSY = 236 , 95% CL = 166 - 346
Biomass in last year = 646 or 0.339 k
Exploitation rate in last year = 0.0596 or 0.239 u.msy
Results of CMSY analysis with altogether 2153 viable trajectories for 1991 r-k pairs
r = 0.43 , 95% CL = 0.337 - 0.605 , k = 3714 , 95% CL = 1673 - 7462
MSY = 399 , 95% CL = 163 - 974
Relative biomass last year= 0.111 k, 2.5th = 0.0138 , 97.5th = 0.371
Relative biomass next year= 0.124 k, 2.5th = 0.000888 , 97.5th = 0.454
Relative exploitation rate in last year= 0.929
Comment: OK
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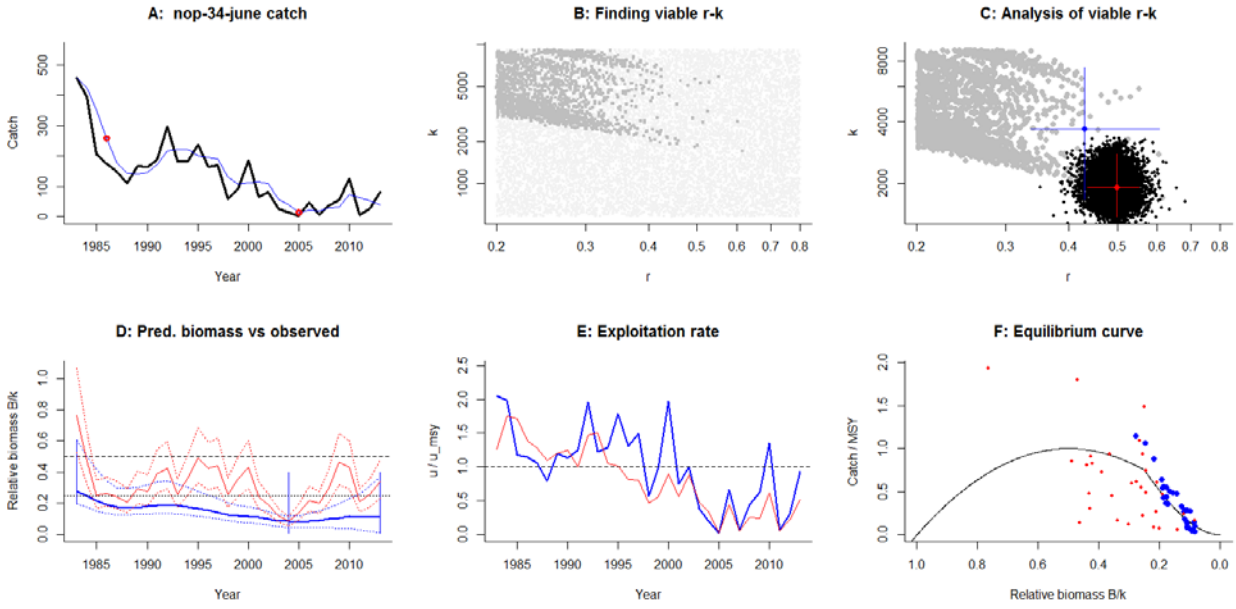

Species: *Pleuronectes platessa* , stock: ple-celt
Name and region: Plaice in Divisions VIIf,g (Celtic Sea) , ICES
Catch data used from years 1993 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2007 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.546 - 8.74
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.525 , 95% CL = 0.485 - 0.587 , k = 2.23 , 95% CL = 1.85 - 2.62
MSY = 0.294 , 95% CL = 0.237 - 0.352
Biomass in last year = 0.318 or 0.143 k
Exploitation rate in last year = 0.246 or 0.939 u.msy
Results of CMSY analysis with altogether 2529 viable trajectories for 2090 r-k pairs
r = 0.525 , 95% CL = 0.387 - 0.763 , k = 3.04 , 95% CL = 1.48 - 5.82
MSY = 0.399 , 95% CL = 0.203 - 0.784
Relative biomass last year= 0.166 k, 2.5th = 0.0142 , 97.5th = 0.391
Relative biomass next year= 0.185 k, 2.5th = -0.0114 , 97.5th = 0.477
Relative exploitation rate in last year= 0.59
Comment: OK
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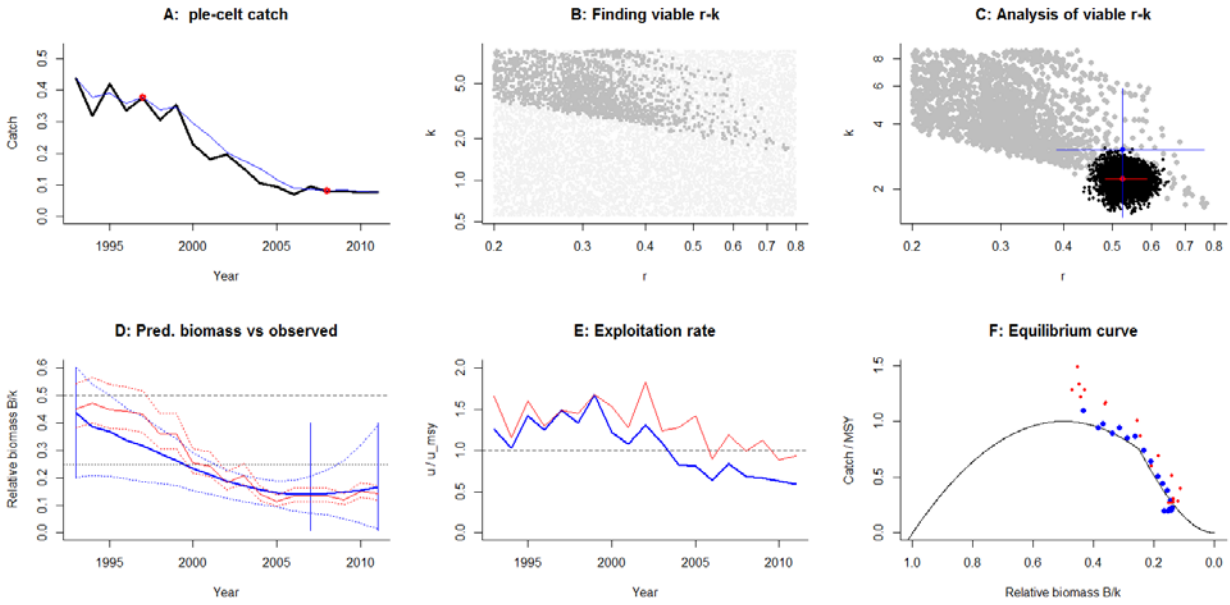

Species: *Pleuronectes platessa* , stock: ple-eche
Name and region: Plaice in Division VIId (Eastern Channel) , ICES
Catch data used from years 1980 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 9.12 - 146
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.589 , 95% CL = 0.503 - 0.673 , k = 31.4 , 95% CL = 26.4 - 37.7
MSY = 4.61 , 95% CL = 3.74 - 5.59
Biomass in last year = 13 or 0.414 k
Exploitation rate in last year = 0.228 or 0.774 u.msy
Results of CMSY analysis with altogether 3192 viable trajectories for 1682 r-k pairs
r = 0.537 , 95% CL = 0.393 - 0.742 , k = 36.6 , 95% CL = 24.9 - 53.2
MSY = 4.92 , 95% CL = 4.35 - 5.55
Relative biomass last year= 0.507 k, 2.5th = 0.271 , 97.5th = 0.596
Relative biomass next year= 0.554 k, 2.5th = 0.293 , 97.5th = 0.654
Relative exploitation rate in last year= 0.561
Comment: OK
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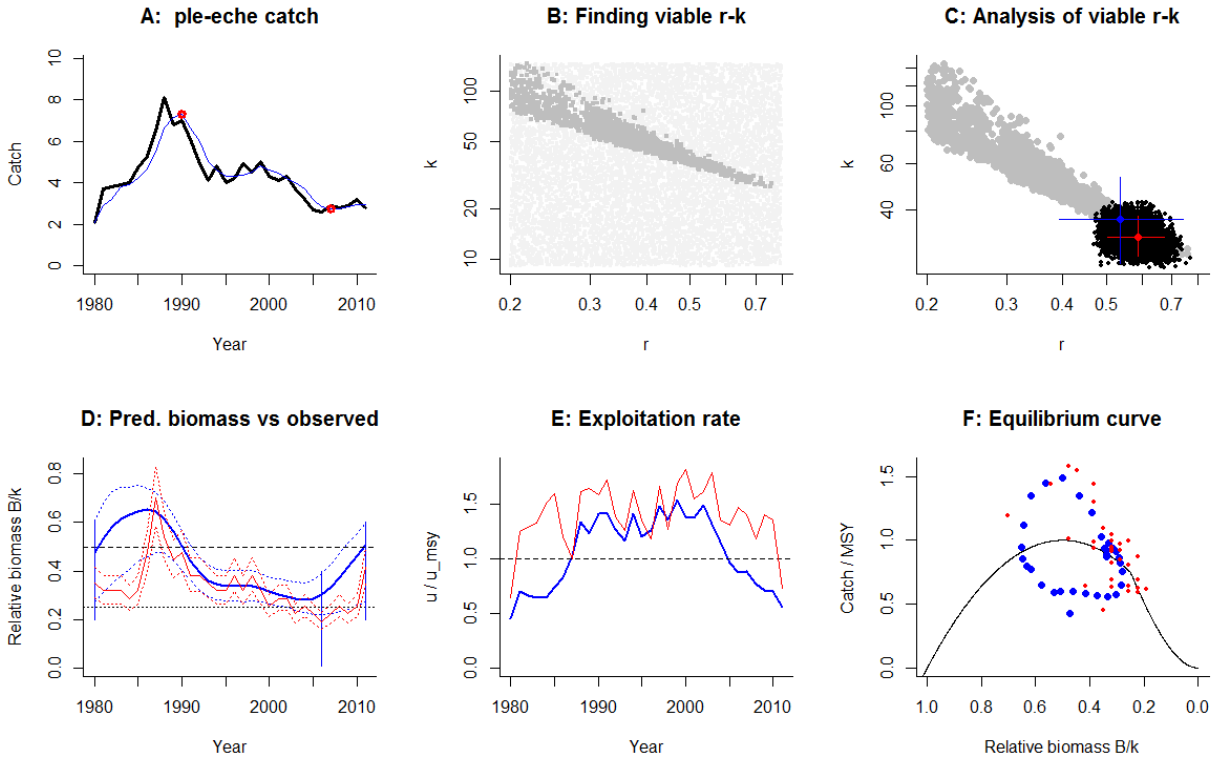

Species: *Pleuronectes platessa* , stock: ple-echw
Name and region: Plaice in Division VIIe (Western Channel) , ICES
Catch data used from years 1980 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 3.69 - 59.1
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.5 , 95% CL = 0.46 - 0.55 , k = 14.8 , 95% CL = 12.6 - 17.3
MSY = 1.85 , 95% CL = 1.61 - 2.12
Biomass in last year = 6.73 or 0.453 k
Exploitation rate in last year = 0.225 or 0.902 u.msy
Results of CMSY analysis with altogether 4004 viable trajectories for 2511 r-k pairs
r = 0.498 , 95% CL = 0.373 - 0.705 , k = 15.3 , 95% CL = 10.1 - 21.8
MSY = 1.9 , 95% CL = 1.66 - 2.18
Relative biomass last year= 0.49 k, 2.5th = 0.268 , 97.5th = 0.593
Relative biomass next year= 0.51 k, 2.5th = 0.267 , 97.5th = 0.618
Relative exploitation rate in last year= 0.818
Comment: OK
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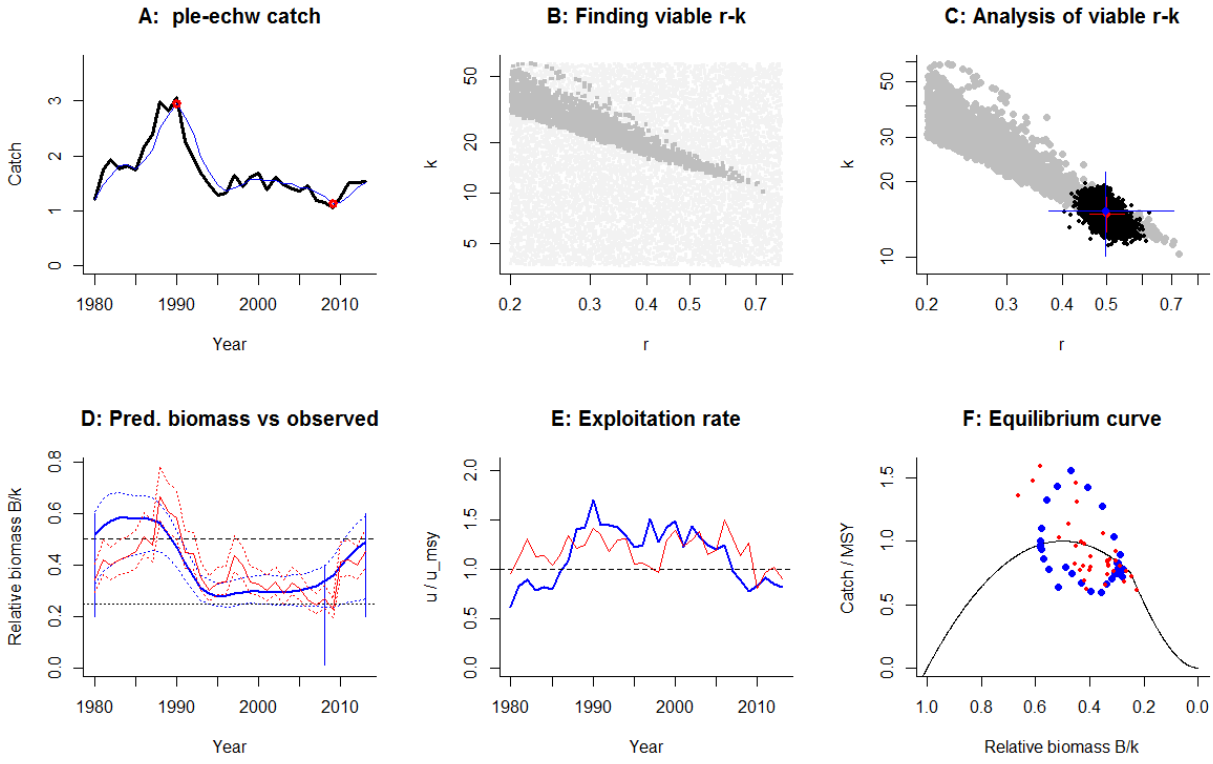

Species: *Pleuronectes platessa* , stock: ple-nsea
Name and region: Plaice Subarea IV (North Sea) , ICES
Catch data used from years 1960 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1982 expert
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 398 - 6365
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.578 , 95% CL = 0.53 - 0.635 , k = 1325 , 95% CL = 1153 - 1480
MSY = 191 , 95% CL = 172 - 211
Biomass in last year = 610 or 0.46 k
Exploitation rate in last year = 0.173 or 0.598 u.msy
Results of CMSY analysis with altogether 524 viable trajectories for 489 r-k pairs
r = 0.309 , 95% CL = 0.268 - 0.356 , k = 2873 , 95% CL = 2282 - 3618
MSY = 222 , 95% CL = 187 - 264
Relative biomass last year= 0.515 k, 2.5th = 0.25 , 97.5th = 0.595
Relative biomass next year= 0.557 k, 2.5th = 0.291 , 97.5th = 0.643
Relative exploitation rate in last year= 0.475
Comment: Start year set to 1960.
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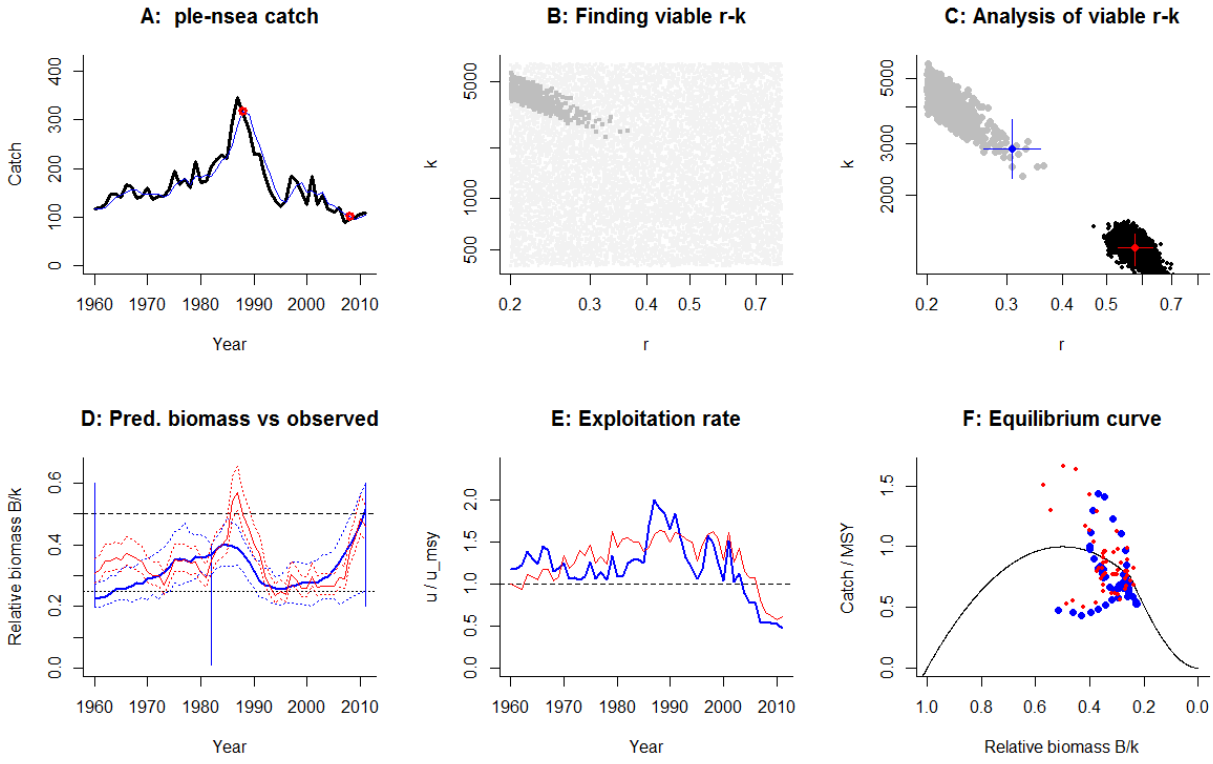

Species: *Pollachius virens* , stock: sai-3a46
Name and region: Saithe in Subarea IV (North Sea) Division IIIa West and Subarea VI , ICES
Catch data used from years 1967 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2000 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 381 - 6093
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.504 , 95% CL = 0.468 - 0.557 , k = 1253 , 95% CL = 1081 - 1471
MSY = 159 , 95% CL = 137 - 184
Biomass in last year = 324 or 0.259 k
Exploitation rate in last year = 0.262 or 1.04 u.msy
Results of CMSY analysis with altogether 616 viable trajectories for 566 r-k pairs
r = 0.313 , 95% CL = 0.269 - 0.392 , k = 2395 , 95% CL = 1667 - 3208
MSY = 188 , 95% CL = 143 - 247
Relative biomass last year= 0.222 k, 2.5th = 0.0268 , 97.5th = 0.399
Relative biomass next year= 0.239 k, 2.5th = -0.0107 , 97.5th = 0.445
Relative exploitation rate in last year= 0.977
Comment: OK
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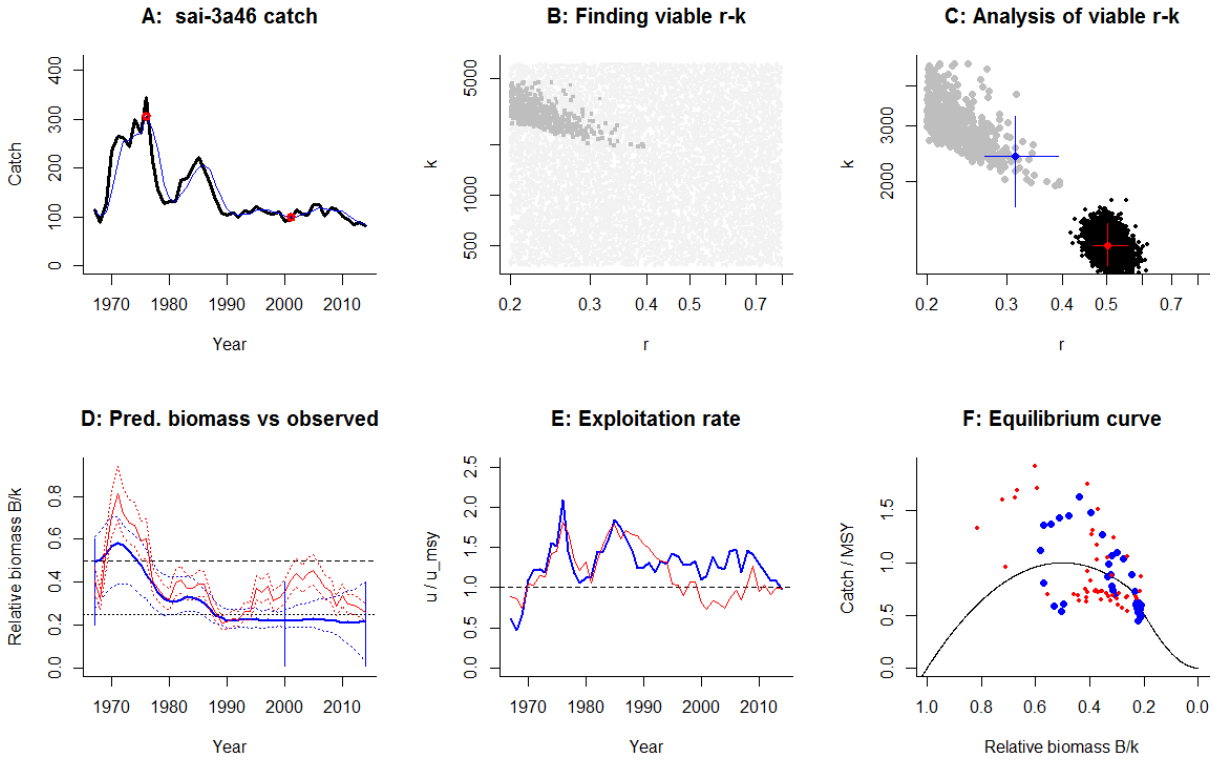

Species: *Pollachius virens* , stock: sai-arct
Name and region: Saithe in Subareas I and II (Northeast Arctic) , ICES
Catch data used from years 1960 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1986 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 308 - 4934
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.551 , 95% CL = 0.503 - 0.599 , k = 1280 , 95% CL = 1188 - 1391
MSY = 176 , 95% CL = 163 - 190
Biomass in last year = 491 or 0.384 k
Exploitation rate in last year = 0.305 or 1.11 u.msy
Results of CMSY analysis with altogether 1099 viable trajectories for 499 r-k pairs
r = 0.529 , 95% CL = 0.389 - 0.778 , k = 1353 , 95% CL = 882 - 1916
MSY = 179 , 95% CL = 165 - 194
Relative biomass last year= 0.564 k, 2.5th = 0.449 , 97.5th = 0.599
Relative biomass next year= 0.578 k, 2.5th = 0.457 , 97.5th = 0.641
Relative exploitation rate in last year= 0.654
Comment: OK
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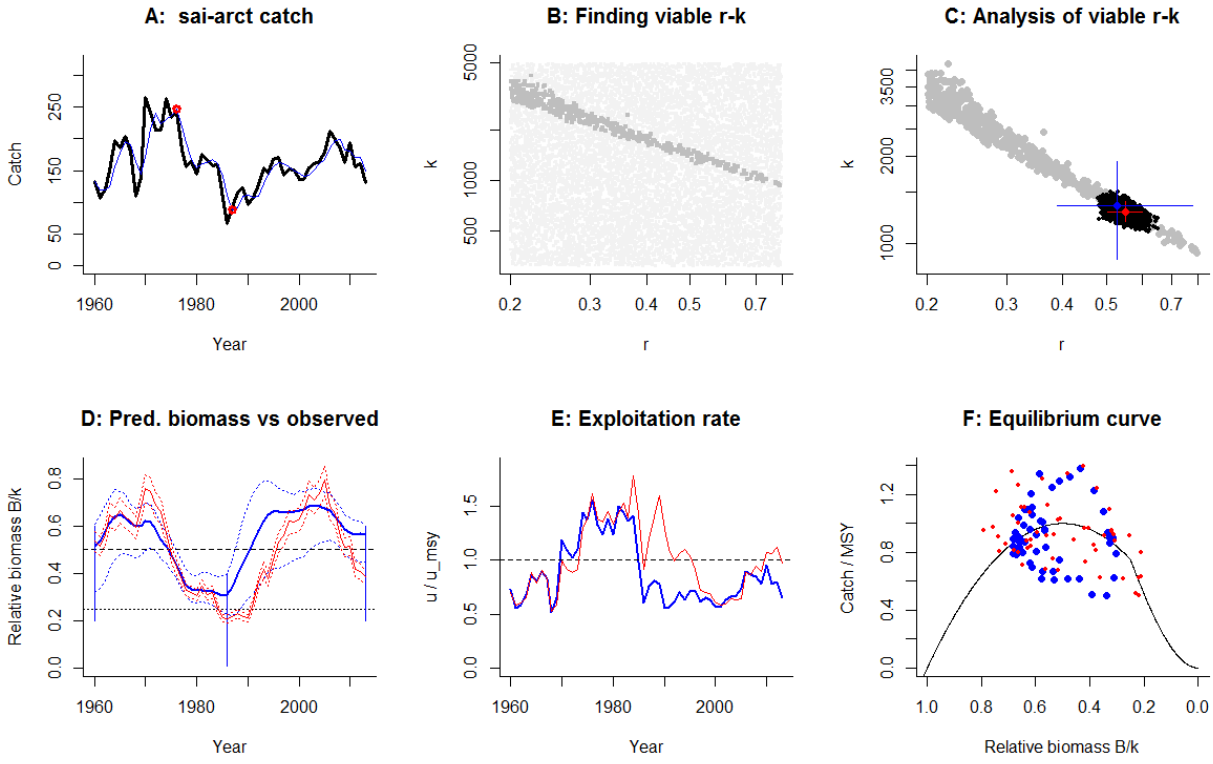

Species: *Pollachius virens* , stock: sai-faro
Name and region: Saithe in Division Vb (Faroe Saithe) , ICES
Catch data used from years 1961 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2006 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 81.5 - 1304
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.493 , 95% CL = 0.438 - 0.534 , k = 344 , 95% CL = 314 - 385
MSY = 42.2 , 95% CL = 37.9 - 46.9
Biomass in last year = 213 or 0.619 k
Exploitation rate in last year = 0.134 or 0.544 u.msy
Results of CMSY analysis with altogether 4819 viable trajectories for 803 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 320 , 95% CL = 213 - 480
MSY = 45.3 , 95% CL = 38.9 - 52.7
Relative biomass last year= 0.368 k, 2.5th = 0.213 , 97.5th = 0.568
Relative biomass next year= 0.408 k, 2.5th = 0.2 , 97.5th = 0.631
Relative exploitation rate in last year= 0.716
Comment: OK
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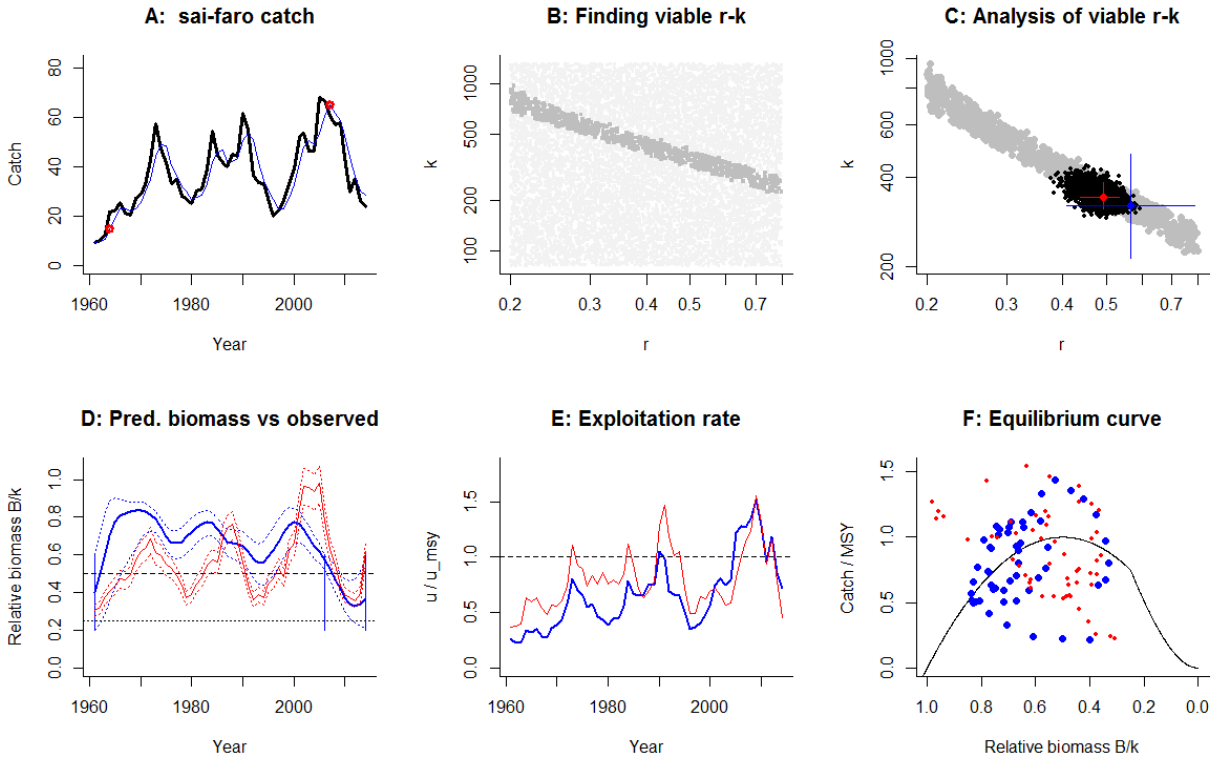

Species: *Pollachius virens* , stock: sai-icel
Name and region: Icelandic saithe (Division Va) , ICES
Catch data used from years 1980 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1999 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 118 - 1886
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.477 , 95% CL = 0.414 - 0.522 , k = 550 , 95% CL = 478 - 665
MSY = 65.2 , 95% CL = 57.7 - 76.5
Biomass in last year = 234 or 0.426 k
Exploitation rate in last year = 0.238 or 0.995 u.msy
Results of CMSY analysis with altogether 1897 viable trajectories for 930 r-k pairs
r = 0.533 , 95% CL = 0.391 - 0.77 , k = 503 , 95% CL = 323 - 738
MSY = 67 , 95% CL = 58 - 77.5
Relative biomass last year= 0.545 k, 2.5th = 0.291 , 97.5th = 0.597
Relative biomass next year= 0.559 k, 2.5th = 0.279 , 97.5th = 0.634
Relative exploitation rate in last year= 0.7
Comment: OK
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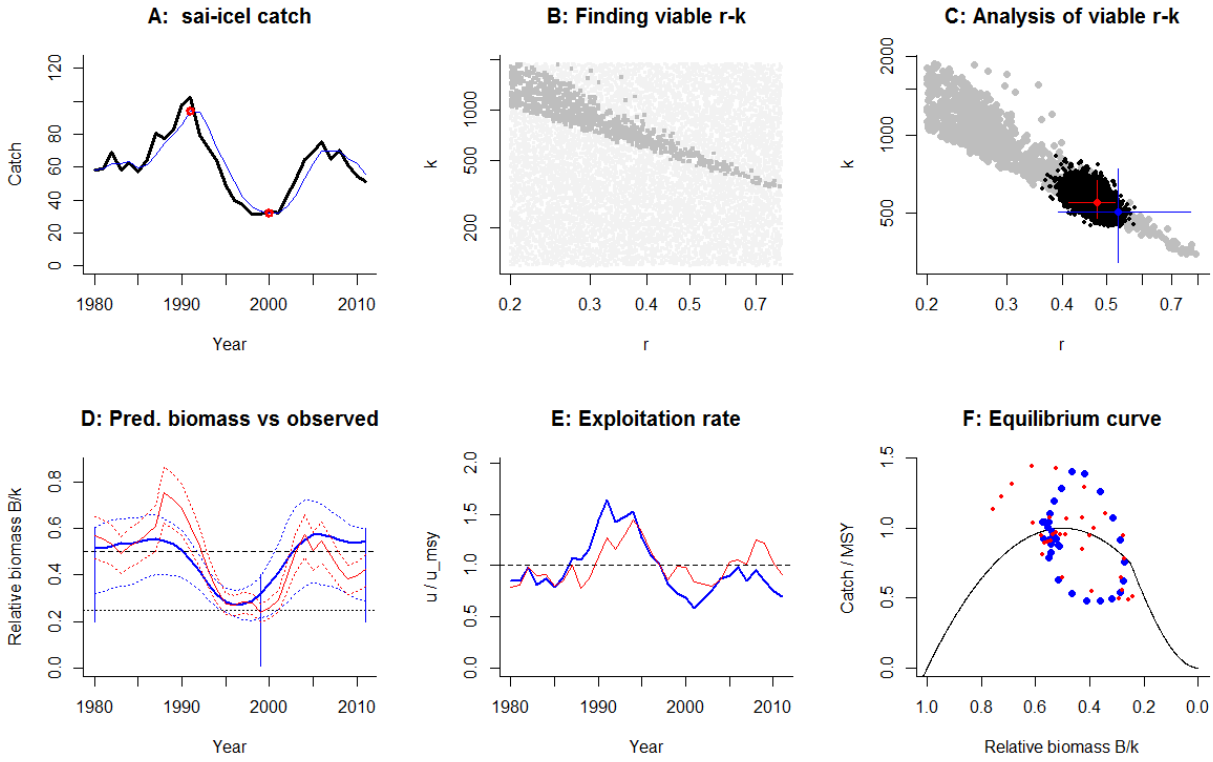

Species: *Ammodytes tobianus* , stock: san-ns1
Name and region: Sandeel in the Dogger Bank area (SA 1) , ICES
Catch data used from years 1983 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2004 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.6 - 1.5 default , prior range for k = 310 - 3097
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.06 , 95% CL = 0.984 - 1.17 , k = 1406 , 95% CL = 1264 - 1593
MSY = 373 , 95% CL = 335 - 425
Biomass in last year = 351 or 0.249 k
Exploitation rate in last year = 0.314 or 0.596 u.msy
Results of CMSY analysis with altogether 274 viable trajectories for 267 r-k pairs
r = 0.995 , 95% CL = 0.829 - 1.42 , k = 1482 , 95% CL = 967 - 1910
MSY = 369 , 95% CL = 321 - 424
Relative biomass last year= 0.312 k, 2.5th = 0.0499 , 97.5th = 0.398
Relative biomass next year= 0.442 k, 2.5th = -0.0218 , 97.5th = 0.61
Relative exploitation rate in last year= 0.33
Comment: OK. Fit could be improved by setting intbio Medium in 2010.
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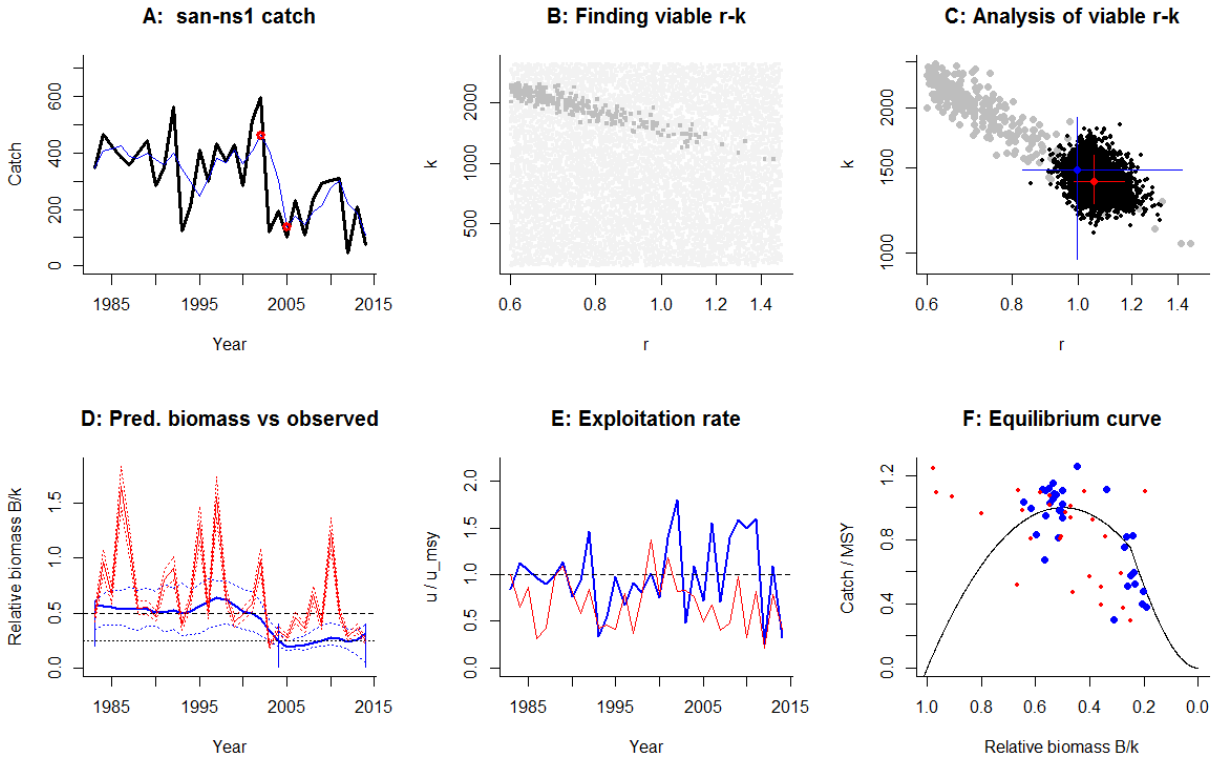

Species: *Ammodytes tobianus* , stock: san-ns2
Name and region: Sandeel in the South Eastern North Sea (SA 2) , ICES
Catch data used from years 1985 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.6 - 1.5 default , prior range for k = 73.6 - 736
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.04 , 95% CL = 0.94 - 1.12 , k = 434 , 95% CL = 380 - 494
MSY = 113 , 95% CL = 95.6 - 131
Biomass in last year = 174 or 0.402 k
Exploitation rate in last year = 0.0771 or 0.148 u.msy
Results of CMSY analysis with altogether 19 viable trajectories for 19 r-k pairs
r = 0.896 , 95% CL = 0.755 - 1.02 , k = 380 , 95% CL = 309 - 488
MSY = 85.1 , 95% CL = 72.9 - 99.4
Relative biomass last year= 0.503 k, 2.5th = 0.362 , 97.5th = 0.581
Relative biomass next year= 0.675 k, 2.5th = 0.526 , 97.5th = 0.823
Relative exploitation rate in last year= 0.101
Comment: OK. Fit could be improved by setting intbio High in 1995.
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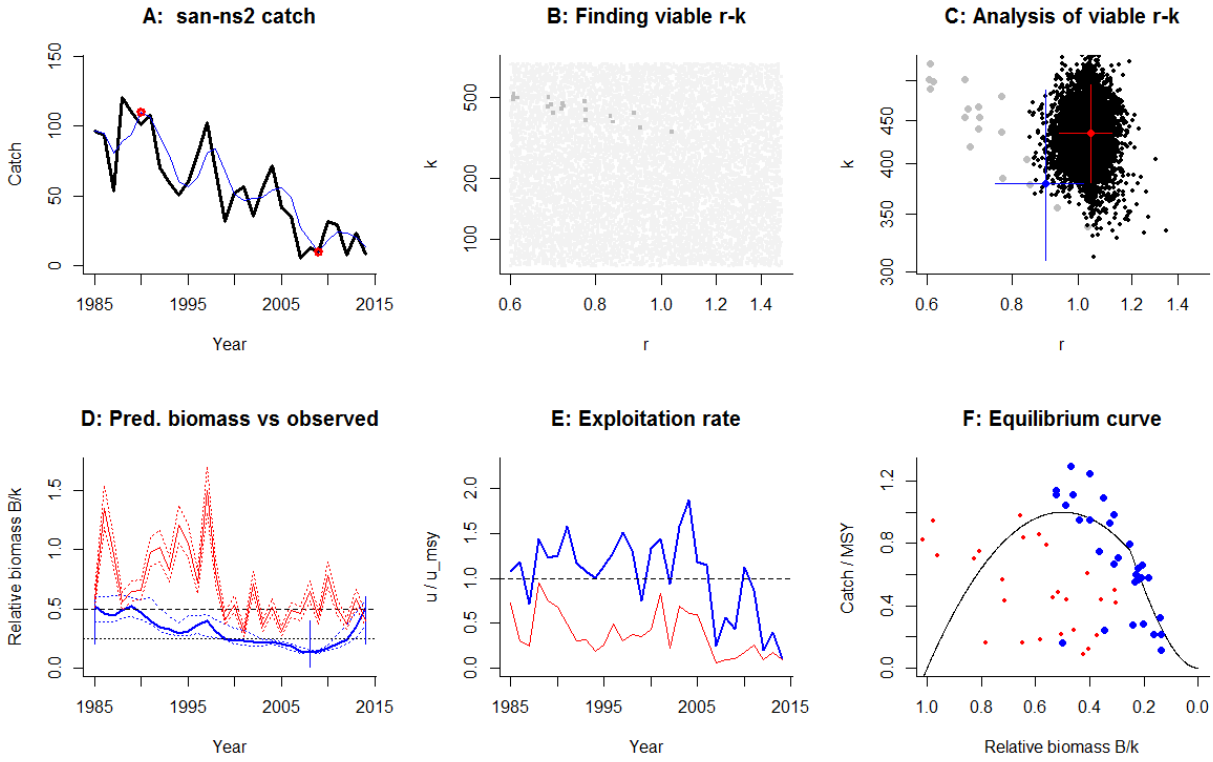

Species: *Ammodytes tobianus* , stock: san-ns3
Name and region: Sandeel in the Central Eastern North Sea (SA 3) , ICES
Catch data used from years 1983 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.6 - 1.5 default , prior range for k = 300 - 3002
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.05 , 95% CL = 0.978 - 1.13 , k = 1210 , 95% CL = 1114 - 1307
MSY = 318 , 95% CL = 299 - 336
Biomass in last year = 535 or 0.442 k
Exploitation rate in last year = 0.142 or 0.271 u.msy
Results of CMSY analysis with altogether 359 viable trajectories for 352 r-k pairs
r = 1.05 , 95% CL = 0.851 - 1.38 , k = 1262 , 95% CL = 890 - 1675
MSY = 331 , 95% CL = 286 - 383
Relative biomass last year= 0.387 k, 2.5th = 0.208 , 97.5th = 0.575
Relative biomass next year= 0.579 k, 2.5th = 0.277 , 97.5th = 0.798
Relative exploitation rate in last year= 0.564
Comment: OK
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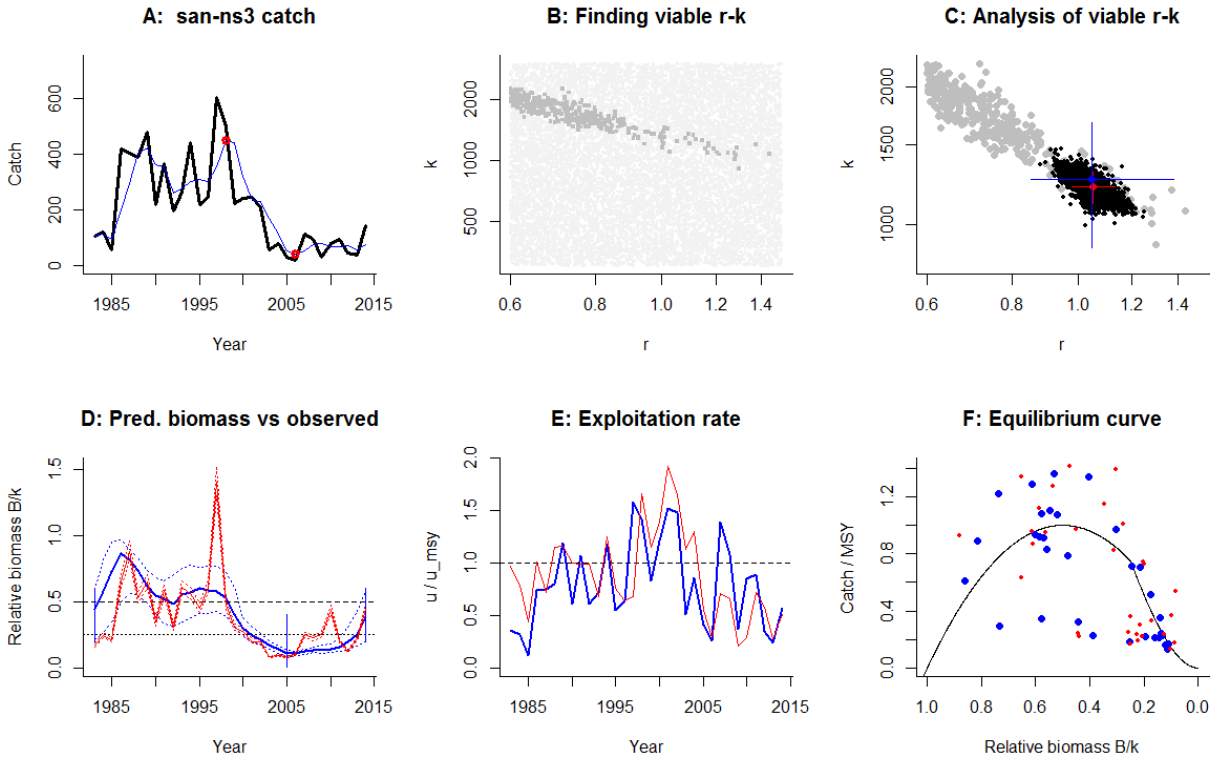

Species: *Sardina pilchardus* , stock: sar-soth
Name and region: Sardine in Divisions VIIIc and IXa , ICES
Catch data used from years 1978 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 258 - 4127
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.509 , 95% CL = 0.465 - 0.591 , k = 1028 , 95% CL = 842 - 1275
MSY = 133 , 95% CL = 107 - 165
Biomass in last year = 123 or 0.12 k
Exploitation rate in last year = 0.349 or 1.37 u.msy
Results of CMSY analysis with altogether 1643 viable trajectories for 1447 r-k pairs
r = 0.399 , 95% CL = 0.32 - 0.565 , k = 1673 , 95% CL = 980 - 2505
MSY = 167 , 95% CL = 116 - 240
Relative biomass last year= 0.228 k, 2.5th = 0.0285 , 97.5th = 0.387
Relative biomass next year= 0.264 k, 2.5th = 0.00843 , 97.5th = 0.45
Relative exploitation rate in last year= 0.368
Comment: OK. Fit could be improved by setting startbio Low and intbio High in 1995.
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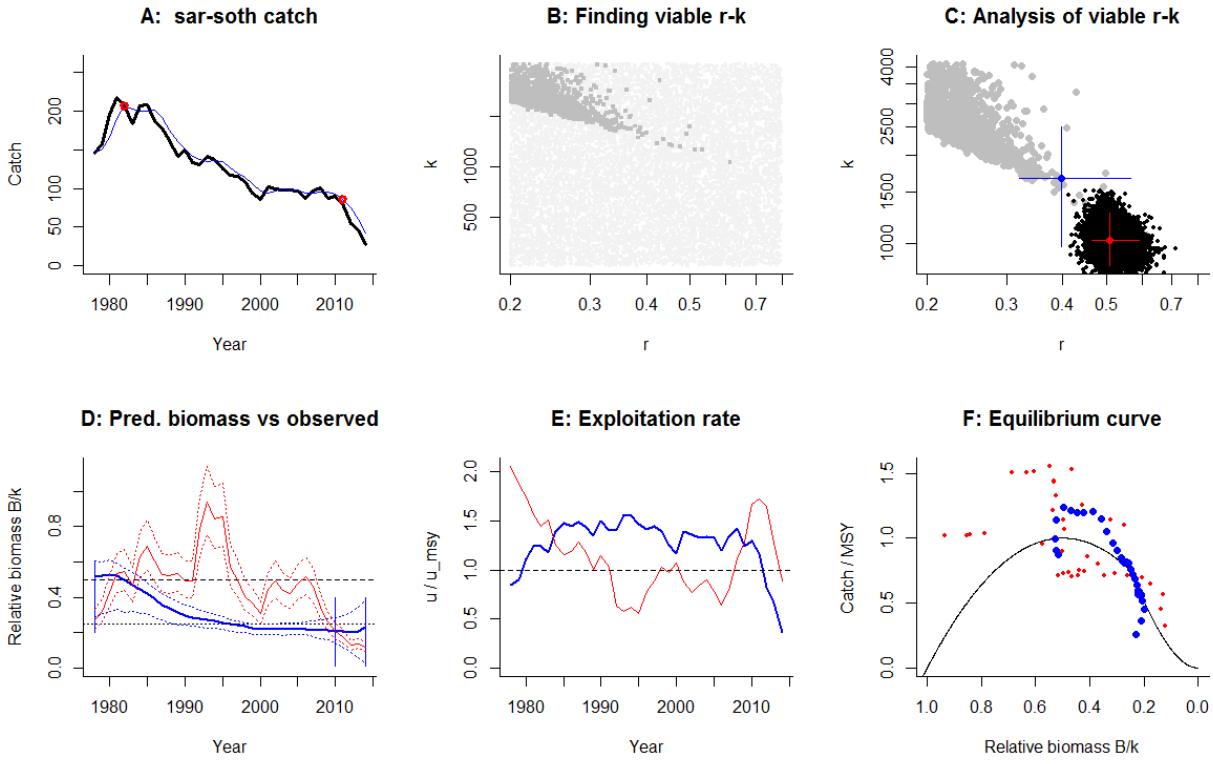

Species: Sebastes *mentella* , stock: smn-con
Name and region: Beaked redfish in Subarea XIV and Division Va (Icelandic slope stock) (East of Greenland, Iceland grounds) , ICES
Catch data used from years 2000 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 62.8 - 2511
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.273 , 95% CL = 0.236 - 0.308 , k = 307 , 95% CL = 241 - 411
MSY = 20.9 , 95% CL = 16.6 - 28.1
Biomass in last year = 104 or 0.34 k
Exploitation rate in last year = 0.0966 or 0.707 u.msy
Results of CMSY analysis with altogether 11247 viable trajectories for 4276 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 420 , 95% CL = 156 - 1134
MSY = 29.6 , 95% CL = 12.3 - 71.2
Relative biomass last year= 0.382 k, 2.5th = 0.211 , 97.5th = 0.562
Relative biomass next year= 0.414 k, 2.5th = 0.215 , 97.5th = 0.624
Relative exploitation rate in last year= 0.42
Comment: OK. Resilience changed from Very low to Low.
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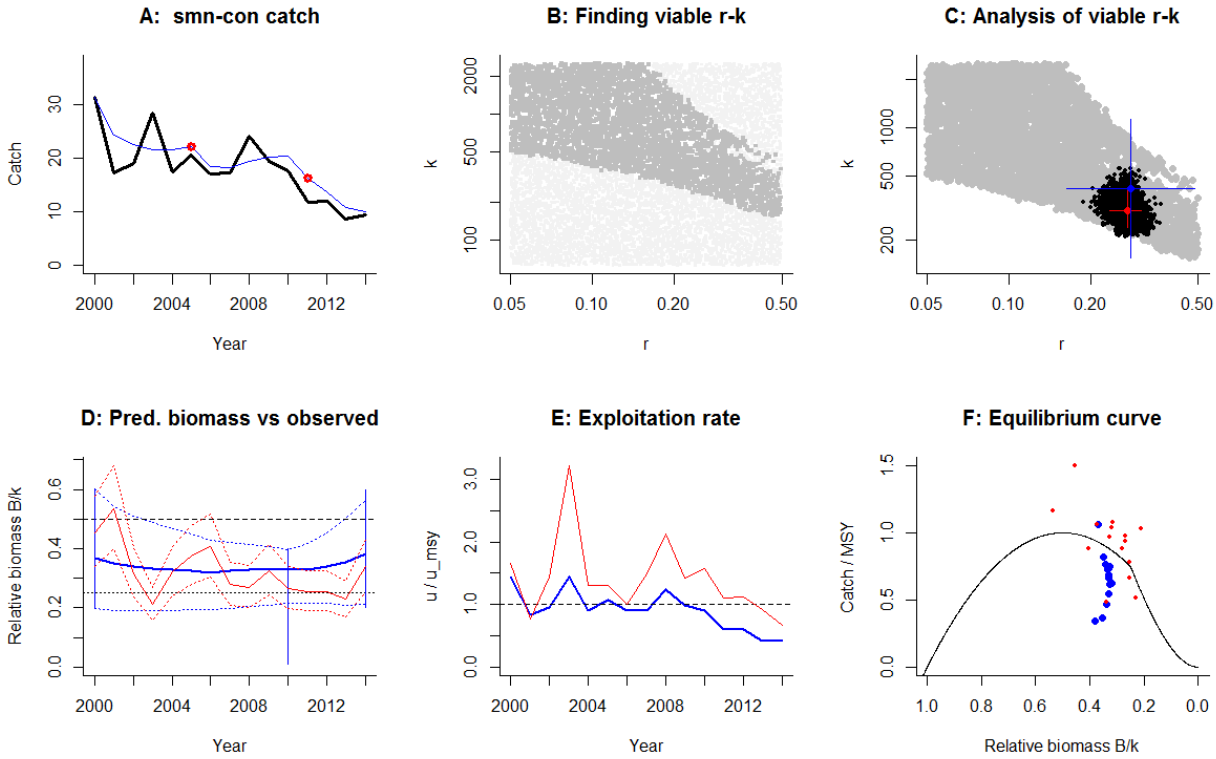

Species: *Solea solea* , stock: sol-bisc
Name and region: Sole in Divisions VIIIa,b (Bay of Biscay) , ICES
Catch data used from years 1984 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 8.42 - 135
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.507 , 95% CL = 0.466 - 0.576 , k = 42.5 , 95% CL = 35.6 - 50.7
MSY = 5.41 , 95% CL = 4.85 - 6.13
Biomass in last year = 14.4 or 0.338 k
Exploitation rate in last year = 0.29 or 1.14 u.msy
Results of CMSY analysis with altogether 1547 viable trajectories for 854 r-k pairs
r = 0.546 , 95% CL = 0.395 - 0.785 , k = 40.6 , 95% CL = 26.3 - 60.3
MSY = 5.55 , 95% CL = 4.83 - 6.37
Relative biomass last year= 0.428 k, 2.5th = 0.215 , 97.5th = 0.575
Relative biomass next year= 0.457 k, 2.5th = 0.197 , 97.5th = 0.607
Relative exploitation rate in last year= 0.829
Comment: OK
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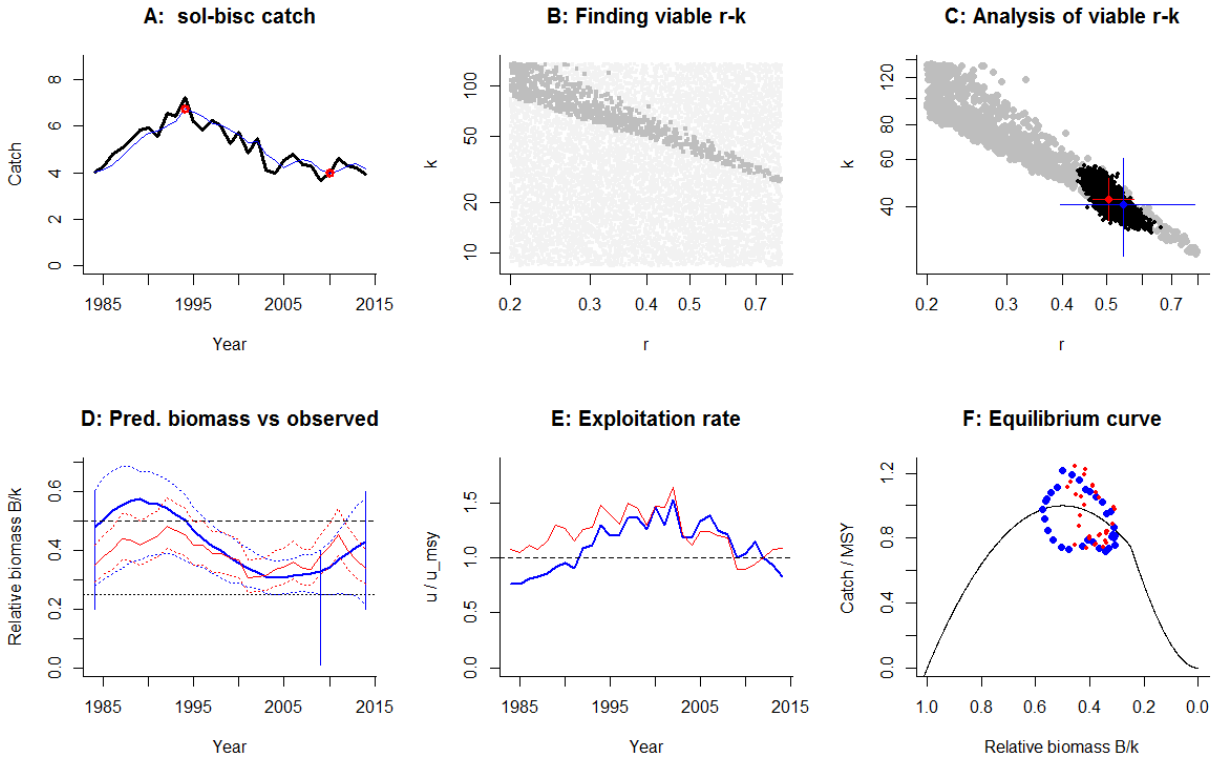

Species: *Solea solea* , stock: sol-celt
Name and region: Sole in Divisions VIIf, g (Celtic Sea) , ICES
Catch data used from years 1971 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2.33 - 37.2
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.487 , 95% CL = 0.421 - 0.531 , k = 9.68 , 95% CL = 8.53 - 11.8
MSY = 1.17 , 95% CL = 1.06 - 1.34
Biomass in last year = 4 or 0.413 k
Exploitation rate in last year = 0.27 or 1.11 u.msy
Results of CMSY analysis with altogether 2188 viable trajectories for 1627 r-k pairs
r = 0.505 , 95% CL = 0.377 - 0.712 , k = 9.42 , 95% CL = 6.34 - 13.3
MSY = 1.19 , 95% CL = 1.07 - 1.32
Relative biomass last year= 0.427 k, 2.5th = 0.234 , 97.5th = 0.553
Relative biomass next year= 0.43 k, 2.5th = 0.204 , 97.5th = 0.573
Relative exploitation rate in last year= 1.03
Comment: OK
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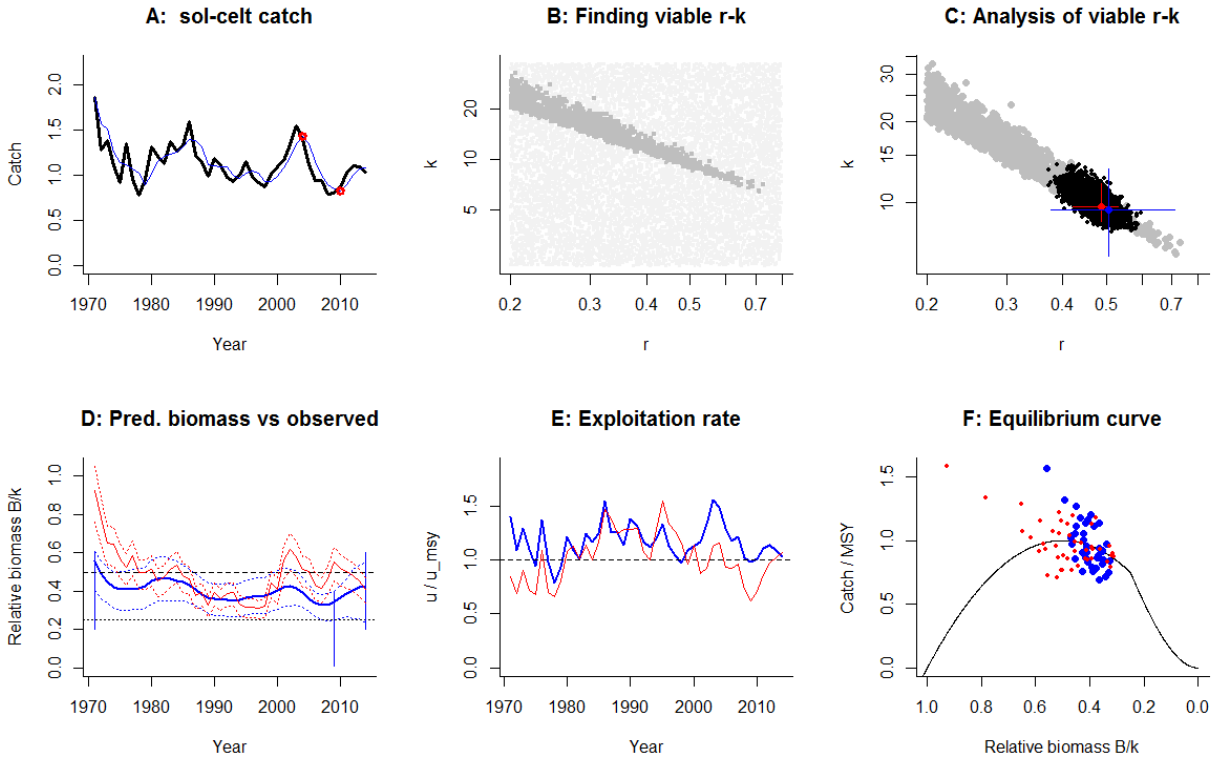

Species: *Solea solea* , stock: sol-eche
Name and region: Sole in Division VIId (Eastern Channel) , ICES
Catch data used from years 1982 - 2013 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 1997 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 6.23 - 99.7
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.517 , 95% CL = 0.476 - 0.6 , k = 33.5 , 95% CL = 28.8 - 39.4
MSY = 4.39 , 95% CL = 3.92 - 4.92
Biomass in last year = 14.7 or 0.437 k
Exploitation rate in last year = 0.286 or 1.1 u.msy
Results of CMSY analysis with altogether 5147 viable trajectories for 1300 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 31.6 , 95% CL = 21 - 47.5
MSY = 4.47 , 95% CL = 3.82 - 5.23
Relative biomass last year= 0.458 k, 2.5th = 0.218 , 97.5th = 0.593
Relative biomass next year= 0.465 k, 2.5th = 0.162 , 97.5th = 0.612
Relative exploitation rate in last year= 1.07
Comment: OK
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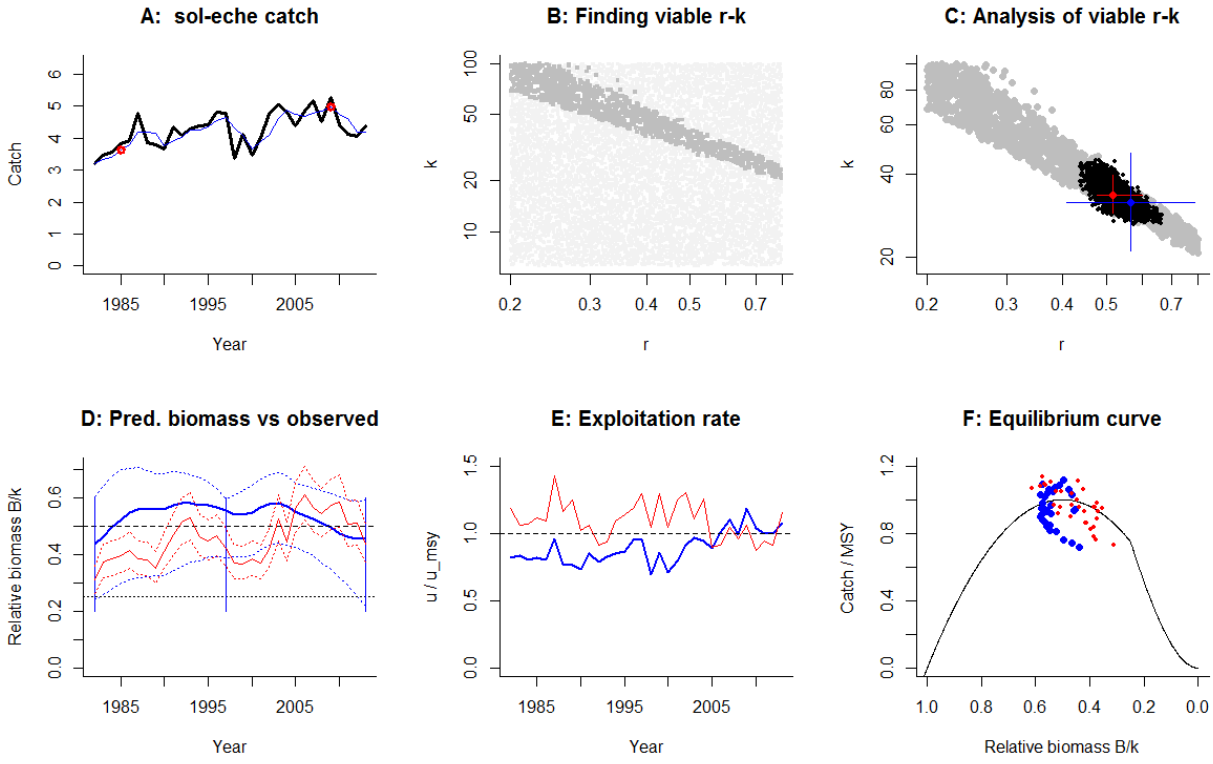

Species: *Solea solea* , stock: sol-echw
Name and region: Sole in Division VIIe (Western Channel) , ICES
Catch data used from years 1969 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1983 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 1.79 - 28.7
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.479 , 95% CL = 0.413 - 0.522 , k = 8.63 , 95% CL = 7.79 - 10
MSY = 1.03 , 95% CL = 0.944 - 1.12
Biomass in last year = 5.62 or 0.651 k
Exploitation rate in last year = 0.156 or 0.654 u.msy
Results of CMSY analysis with altogether 5394 viable trajectories for 1388 r-k pairs
r = 0.537 , 95% CL = 0.393 - 0.773 , k = 8.04 , 95% CL = 5.35 - 11.5
MSY = 1.08 , 95% CL = 0.993 - 1.17
Relative biomass last year= 0.507 k, 2.5th = 0.254 , 97.5th = 0.597
Relative biomass next year= 0.529 k, 2.5th = 0.248 , 97.5th = 0.626
Relative exploitation rate in last year= 0.808
Comment: OK
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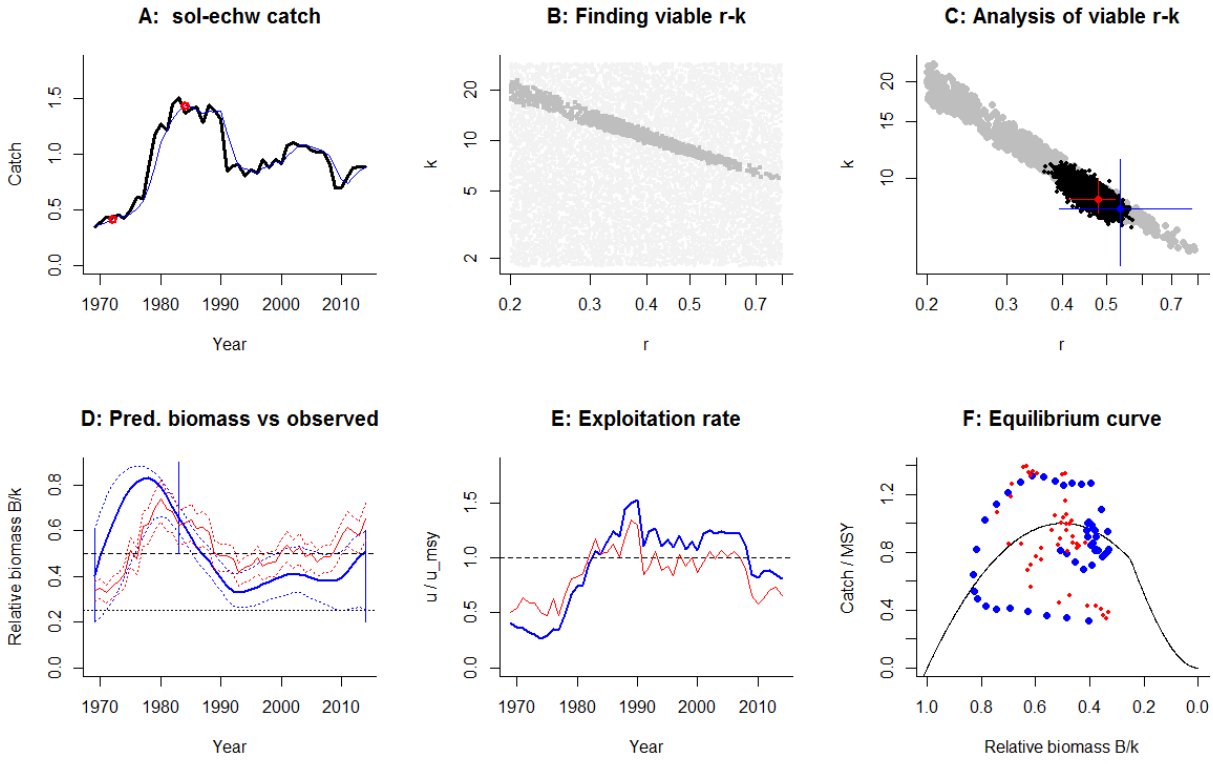

Species: *Solea solea* , stock: sol-iris
Name and region: Sole in Division VIIa (Irish Sea) , ICES
Catch data used from years 1970 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2.83 - 45.3
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.473 , 95% CL = 0.412 - 0.516 , k = 12.6 , 95% CL = 10.6 - 15.8
MSY = 1.48 , 95% CL = 1.25 - 1.83
Biomass in last year = 1.02 or 0.0811 k
Exploitation rate in last year = 0.177 or 0.75 u.msy
Results of CMSY analysis with altogether 843 viable trajectories for 784 r-k pairs
r = 0.37 , 95% CL = 0.304 - 0.559 , k = 15.8 , 95% CL = 9.38 - 21.3
MSY = 1.46 , 95% CL = 1.18 - 1.8
Relative biomass last year= 0.185 k, 2.5th = 0.0186 , 97.5th = 0.395
Relative biomass next year= 0.208 k, 2.5th = 0.0102 , 97.5th = 0.462
Relative exploitation rate in last year= 0.184
Comment: OK
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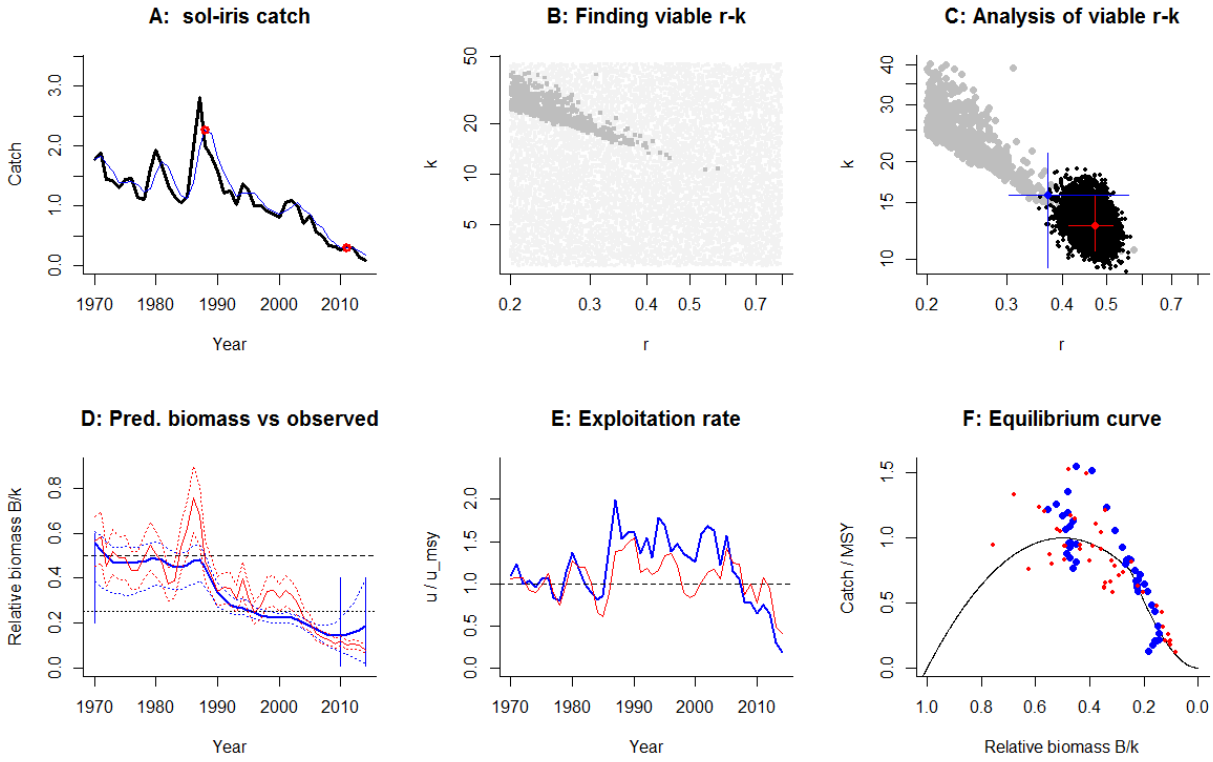

Species: *Solea solea* , stock: sol-kask
Name and region: Sole in Division IIIa and Subdivisions 22-24 (Skagerrak, Kattegat, and the Belts) , ICES
Catch data used from years 1984 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 1.64 - 26.2
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.505 , 95% CL = 0.46 - 0.58 , k = 6.1 , 95% CL = 5.34 - 7.22
MSY = 0.78 , 95% CL = 0.67 - 0.913
Biomass in last year = 2.32 or 0.381 k
Exploitation rate in last year = 0.147 or 0.581 u.msy
Results of CMSY analysis with altogether 2447 viable trajectories for 1373 r-k pairs
r = 0.517 , 95% CL = 0.383 - 0.758 , k = 6.57 , 95% CL = 4.21 - 9.42
MSY = 0.848 , 95% CL = 0.753 - 0.957
Relative biomass last year= 0.299 k, 2.5th = 0.0175 , 97.5th = 0.396
Relative biomass next year= 0.347 k, 2.5th = -0.028 , 97.5th = 0.466
Relative exploitation rate in last year= 0.656
Comment: OK. Fit could be improved by setting intbio High in 2005.
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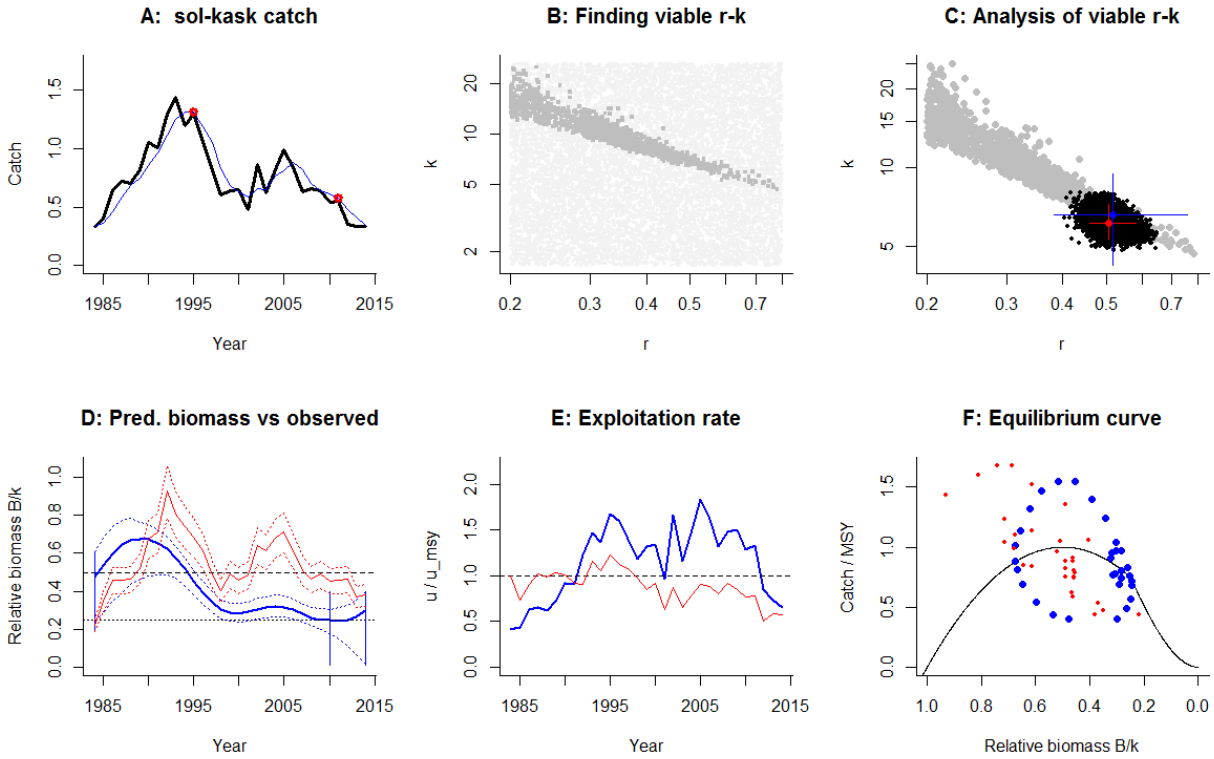

Species: *Solea solea* , stock: sol-nsea
Name and region: Sole in Subarea IV (North Sea) , ICES
Catch data used from years 1960 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 54 - 863
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.507 , 95% CL = 0.472 - 0.568 , k = 198 , 95% CL = 168 - 235
MSY = 25.3 , 95% CL = 21.7 - 30
Biomass in last year = 50.7 or 0.257 k
Exploitation rate in last year = 0.318 or 1.25 u.msy
Results of CMSY analysis with altogether 1779 viable trajectories for 1294 r-k pairs
r = 0.456 , 95% CL = 0.349 - 0.673 , k = 227 , 95% CL = 148 - 309
MSY = 25.9 , 95% CL = 23.9 - 28.1
Relative biomass last year= 0.23 k, 2.5th = 0.0232 , 97.5th = 0.395
Relative biomass next year= 0.225 k, 2.5th = -0.0435 , 97.5th = 0.431
Relative exploitation rate in last year= 1.07
Comment: Start year set to 1960.
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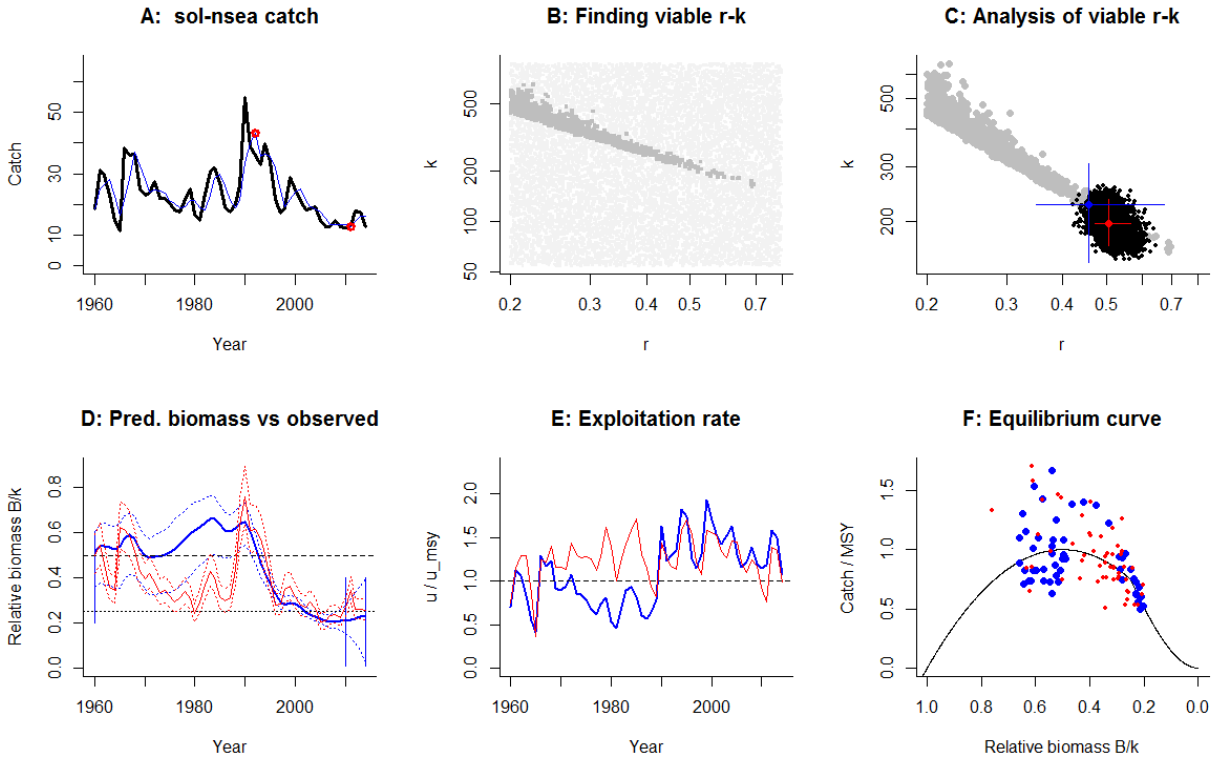

Species: *Sprattus sprattus* , stock: spr-2232
Name and region: Sprat in Subdivisions 22 - 32 (Baltic Sea) , ICES
Catch data used from years 1974 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1997 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 600 - 9607
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.49 , 95% CL = 0.417 - 0.537 , k = 2756 , 95% CL = 2296 - 3593
MSY = 334 , 95% CL = 268 - 432
Biomass in last year = 1360 or 0.494 k
Exploitation rate in last year = 0.183 or 0.747 u.msy
Results of CMSY analysis with altogether 8252 viable trajectories for 1156 r-k pairs
r = 0.561 , 95% CL = 0.405 - 0.777 , k = 2466 , 95% CL = 1650 - 3684
MSY = 346 , 95% CL = 298 - 402
Relative biomass last year= 0.478 k, 2.5th = 0.229 , 97.5th = 0.596
Relative biomass next year= 0.514 k, 2.5th = 0.214 , 97.5th = 0.649
Relative exploitation rate in last year= 0.738
Comment: OK
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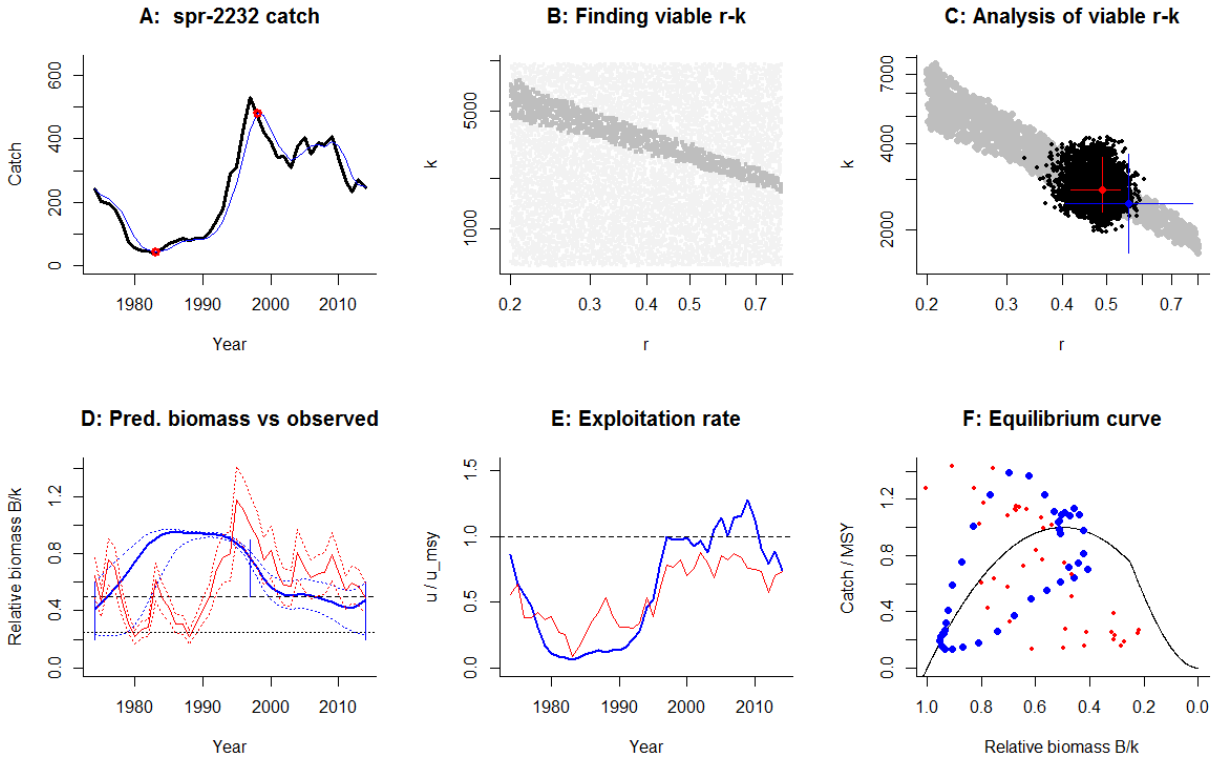

Species: *Sprattus sprattus* , stock: spr-nsea
Name and region: Sprat in Subarea IV (North Sea) , ICES
Catch data used from years 1974 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1986 default
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 1312 - 31488
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.499 , 95% CL = 0.438 - 0.563 , k = 3787 , 95% CL = 2082 - 9737
MSY = 470 , 95% CL = 258 - 1196
Biomass in last year = 7582 or 2 k
Exploitation rate in last year = 0.0147 or 0.0591 u.msy
Results of CMSY analysis with altogether 2665 viable trajectories for 1477 r-k pairs
r = 0.456 , 95% CL = 0.351 - 0.637 , k = 2794 , 95% CL = 1739 - 4177
MSY = 319 , 95% CL = 242 - 420
Relative biomass last year= 0.893 k, 2.5th = 0.853 , 97.5th = 0.9
Relative biomass next year= 0.896 k, 2.5th = 0.862 , 97.5th = 0.912
Relative exploitation rate in last year= 0.295
Comment: OK
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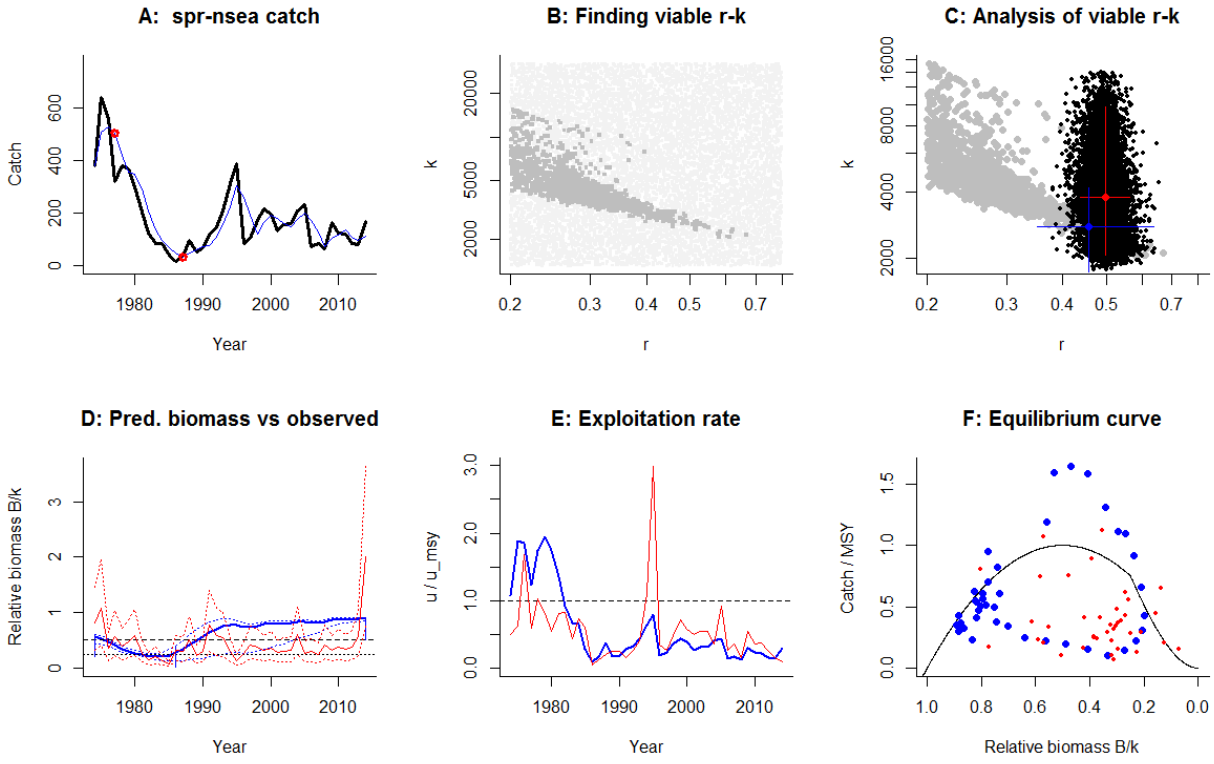

Species: *Brosme brosme* , stock: usk-icel
Name and region: Tusk in Division Va and Subarea XIV , ICES
Catch data used from years 1980 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2009 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 16.9 - 678
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.33 , 95% CL = 0.299 - 0.372 , k = 85.4 , 95% CL = 69.7 - 100
MSY = 7.01 , 95% CL = 6.28 - 7.88
Biomass in last year = 22 or 0.257 k
Exploitation rate in last year = 0.304 or 1.84 u.msy
Results of CMSY analysis with altogether 1051 viable trajectories for 606 r-k pairs
r = 0.385 , 95% CL = 0.301 - 0.493 , k = 65.4 , 95% CL = 48.9 - 87.5
MSY = 6.29 , 95% CL = 5.77 - 6.87
Relative biomass last year= 0.369 k, 2.5th = 0.279 , 97.5th = 0.399
Relative biomass next year= 0.356 k, 2.5th = 0.243 , 97.5th = 0.407
Relative exploitation rate in last year= 1.3
Comment: OK. Fit could be improved by setting intbio Low in 2000.
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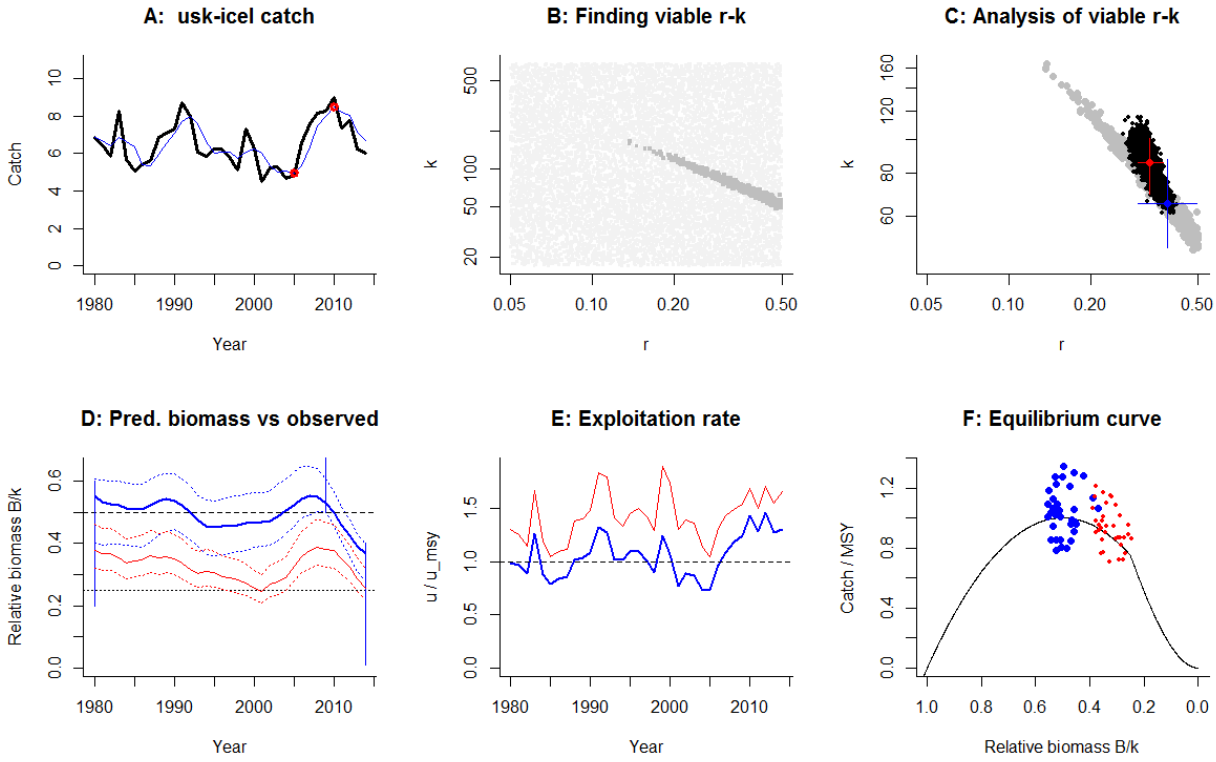

Species: *Micromesistius poutassou* , stock: whb-comb
Name and region: Blue whiting combined stock (Sub-areas I-IX, XII & XIV) , ICES
Catch data used from years 1981 - 2014 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2802 - 44840
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.465 , 95% CL = 0.398 - 0.515 , k = 10973 , 95% CL = 9227 - 13398
MSY = 1269 , 95% CL = 1042 - 1554
Biomass in last year = 5315 or 0.484 k
Exploitation rate in last year = 0.135 or 0.581 u.msy
Results of CMSY analysis with altogether 4747 viable trajectories for 951 r-k pairs
r = 0.557 , 95% CL = 0.403 - 0.785 , k = 9833 , 95% CL = 6425 - 14751
MSY = 1370 , 95% CL = 1165 - 1610
Relative biomass last year= 0.492 k, 2.5th = 0.221 , 97.5th = 0.596
Relative biomass next year= 0.549 k, 2.5th = 0.228 , 97.5th = 0.671
Relative exploitation rate in last year= 0.85
Comment: OK. Fit could be improved by setting startbio Low and intbio Low in 1995.
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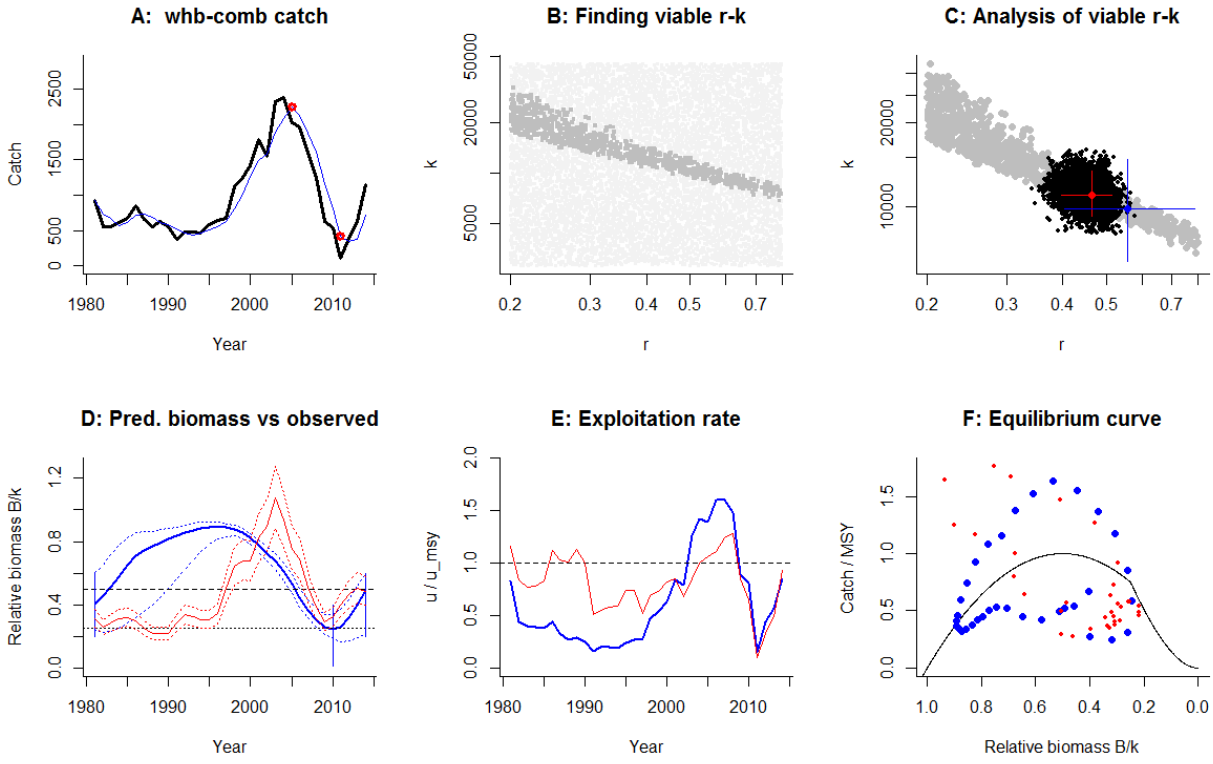

Species: *Merlangius merlangus* , stock: whg-47d
Name and region: Whiting Subarea IV (North Sea) and Division VIId (Eastern Channel) , ICES
Catch data used from years 1990 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 191 - 3052
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.494 , 95% CL = 0.425 - 0.549 , k = 930 , 95% CL = 776 - 1162
MSY = 114 , 95% CL = 91.4 - 145
Biomass in last year = 482 or 0.518 k
Exploitation rate in last year = 0.0572 or 0.231 u.msy
Results of CMSY analysis with altogether 4798 viable trajectories for 2600 r-k pairs
r = 0.452 , 95% CL = 0.349 - 0.664 , k = 699 , 95% CL = 424 - 1012
MSY = 78.9 , 95% CL = 63.2 - 98.6
Relative biomass last year= 0.484 k, 2.5th = 0.216 , 97.5th = 0.594
Relative biomass next year= 0.545 k, 2.5th = 0.243 , 97.5th = 0.664
Relative exploitation rate in last year= 0.402
Comment: OK. Fit could be improved by setting intbio High in 2000.
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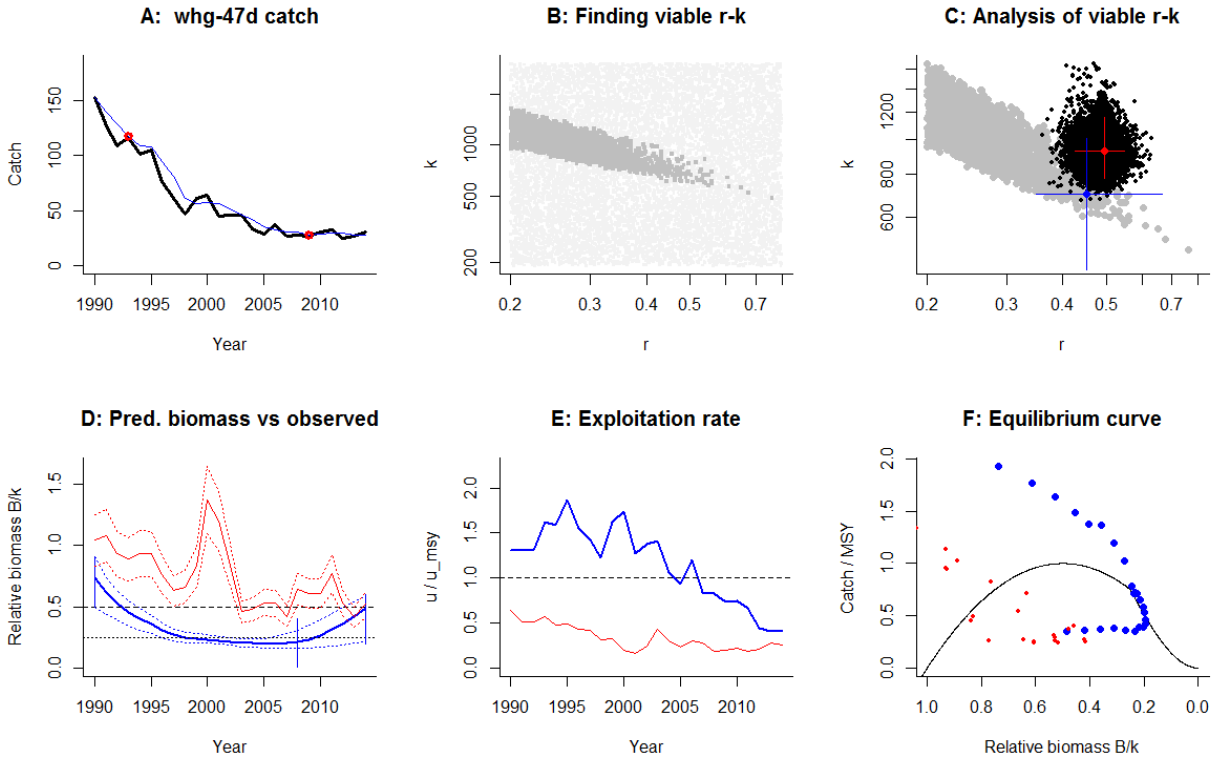

Species: *Merlangius merlangus* , stock: whg-7e-k
Name and region: Whiting in Division VIIe-k , ICES
Catch data used from years 1982 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 default
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 51.2 - 1229
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.565 , 95% CL = 0.494 - 0.661 , k = 101 , 95% CL = 87 - 123
MSY = 14.4 , 95% CL = 11.9 - 17.5
Biomass in last year = 66.7 or 0.659 k
Exploitation rate in last year = 0.137 or 0.486 u.msy
Results of CMSY analysis with altogether 2090 viable trajectories for 1223 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 109 , 95% CL = 73.1 - 161
MSY = 15.3 , 95% CL = 13.5 - 17.5
Relative biomass last year= 0.604 k, 2.5th = 0.508 , 97.5th = 0.74
Relative biomass next year= 0.655 k, 2.5th = 0.548 , 97.5th = 0.784
Relative exploitation rate in last year= 0.538
Comment: OK. Fit could be improved by setting startbio Low.
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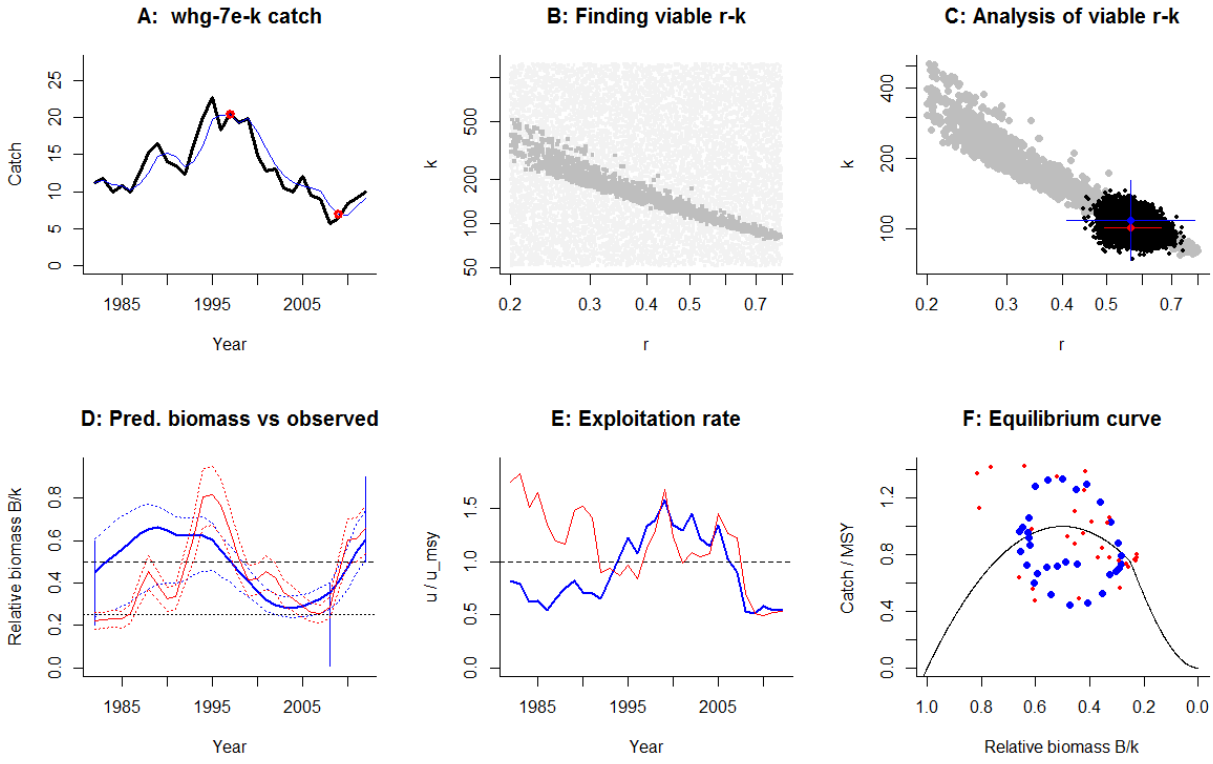

Species: *Merlangius merlangus* , stock: whg-scow
Name and region: Whiting in Division VIa (West of Scotland) , ICES
Catch data used from years 1981 - 2014 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 25.9 - 414
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.491 , 95% CL = 0.419 - 0.538 , k = 126 , 95% CL = 101 - 167
MSY = 15.3 , 95% CL = 12 - 20.4
Biomass in last year = 22.8 or 0.18 k
Exploitation rate in last year = 0.0435 or 0.177 u.msy
Results of CMSY analysis with altogether 1937 viable trajectories for 1392 r-k pairs
r = 0.458 , 95% CL = 0.351 - 0.685 , k = 116 , 95% CL = 72.8 - 163
MSY = 13.4 , 95% CL = 11.7 - 15.3
Relative biomass last year= 0.123 k, 2.5th = 0.0122 , 97.5th = 0.372
Relative biomass next year= 0.134 k, 2.5th = 0.00473 , 97.5th = 0.462
Relative exploitation rate in last year= 0.234
Comment: OK
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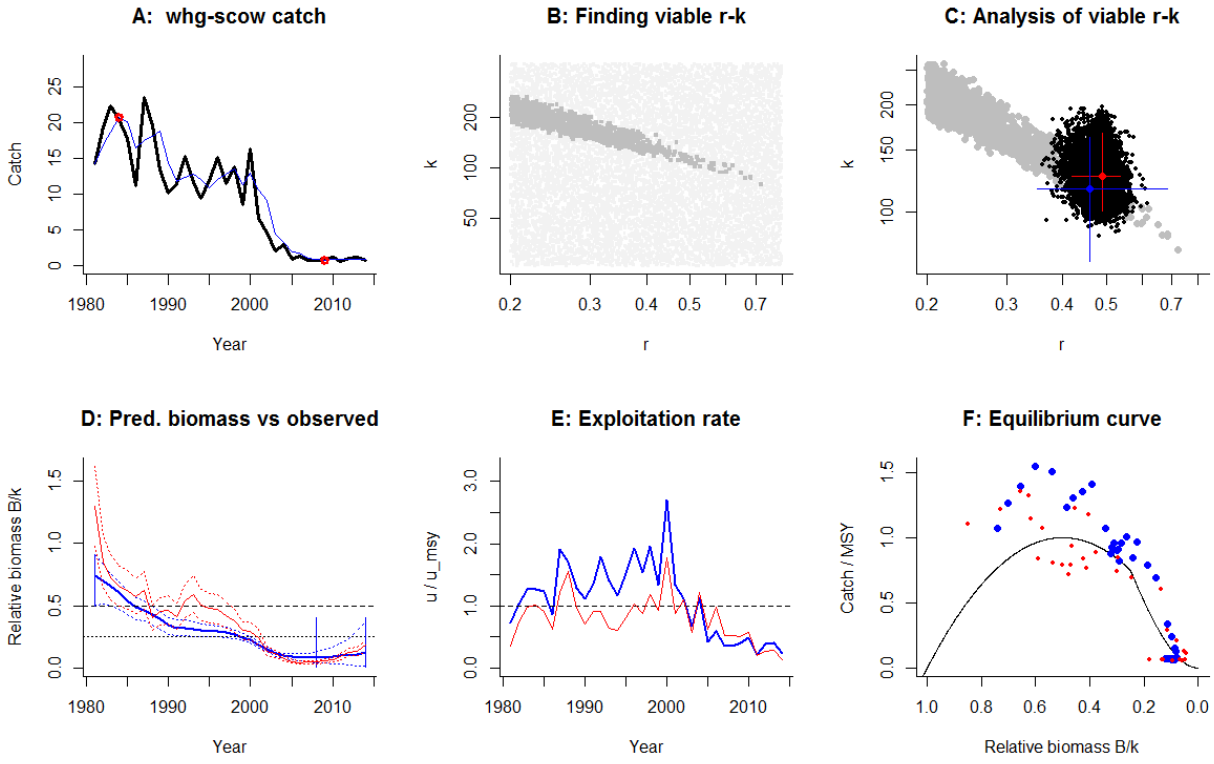
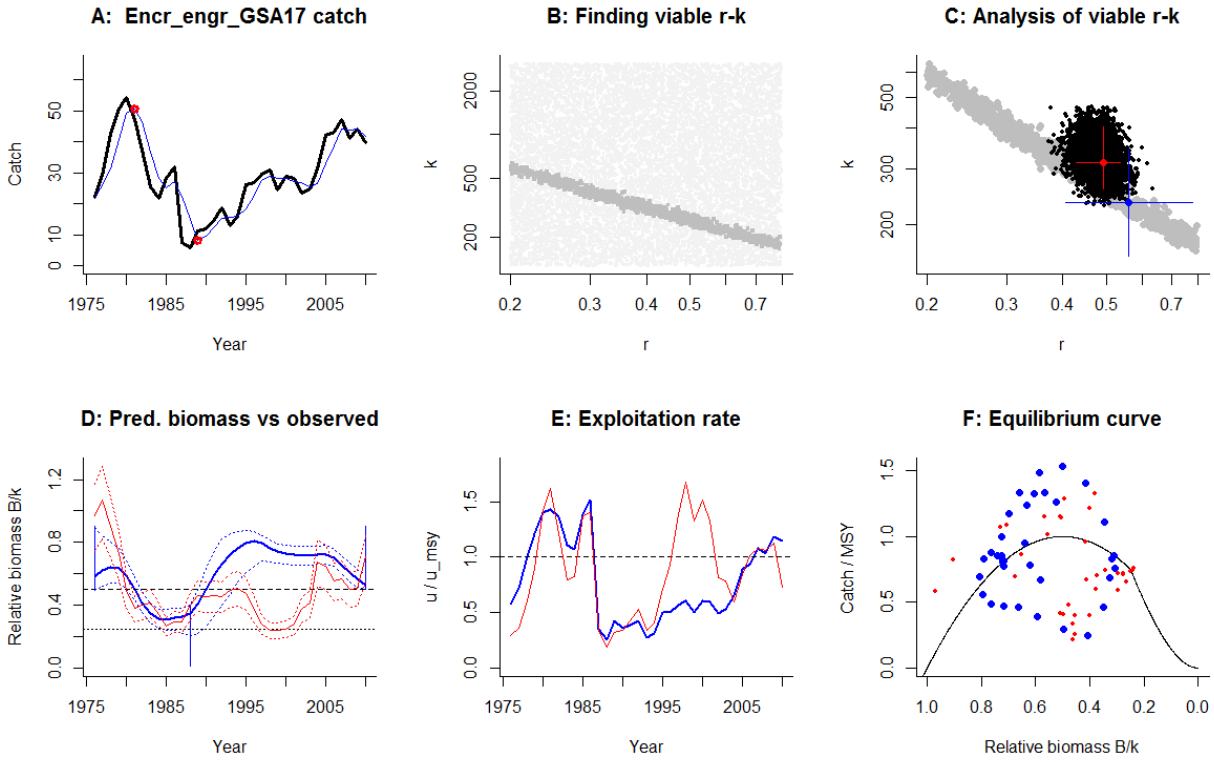


## Region: Mediterranean

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: *Engraulis encrasicolus* , stock: Encr_engr_GSA17
Name and region: Anchovy - Northern Adriatic /GSA17 , Med
Catch data used from years 1976 - 2010 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1988 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 127 - 3045
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.493 , 95% CL = 0.429 - 0.538 , k = 312 , 95% CL = 259 - 404
MSY = 38.3 , 95% CL = 31.5 - 49.4
Biomass in last year = 220 or 0.706 k
Exploitation rate in last year = 0.189 or 0.767 u.msy
Results of CMSY analysis with altogether 1904 viable trajectories for 1031 r-k pairs
r = 0.561 , 95% CL = 0.405 - 0.777 , k = 235 , 95% CL = 160 - 345
MSY = 33 , 95% CL = 29.5 - 36.9
Relative biomass last year= 0.526 k, 2.5th = 0.501 , 97.5th = 0.596
Relative biomass next year= 0.491 k, 2.5th = 0.431 , 97.5th = 0.571
Relative exploitation rate in last year= 1.14
Comment: Set from High to Medium
---



Species: *Mullus barbatus barbatus* , stock: mul-gsa6
Name and region: Red mullet - Northern Spain /GSA6 , Med
Catch data used from years 1995 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2003 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 1.81 - 29
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.537 , 95% CL = 0.491 - 0.621 , k = 9.77 , 95% CL = 7.7 - 11.6
MSY = 1.31 , 95% CL = 1.13 - 1.5
Biomass in last year = 2.91 or 0.298 k
Exploitation rate in last year = 0.388 or 1.45 u.msy
Results of CMSY analysis with altogether 3814 viable trajectories for 1731 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 8.61 , 95% CL = 5.49 - 13.5
MSY = 1.22 , 95% CL = 0.959 - 1.55
Relative biomass last year= 0.28 k, 2.5th = 0.0296 , 97.5th = 0.396
Relative biomass next year= 0.26 k, 2.5th = -0.101 , 97.5th = 0.413
Relative exploitation rate in last year= 1.8
Comment: OK
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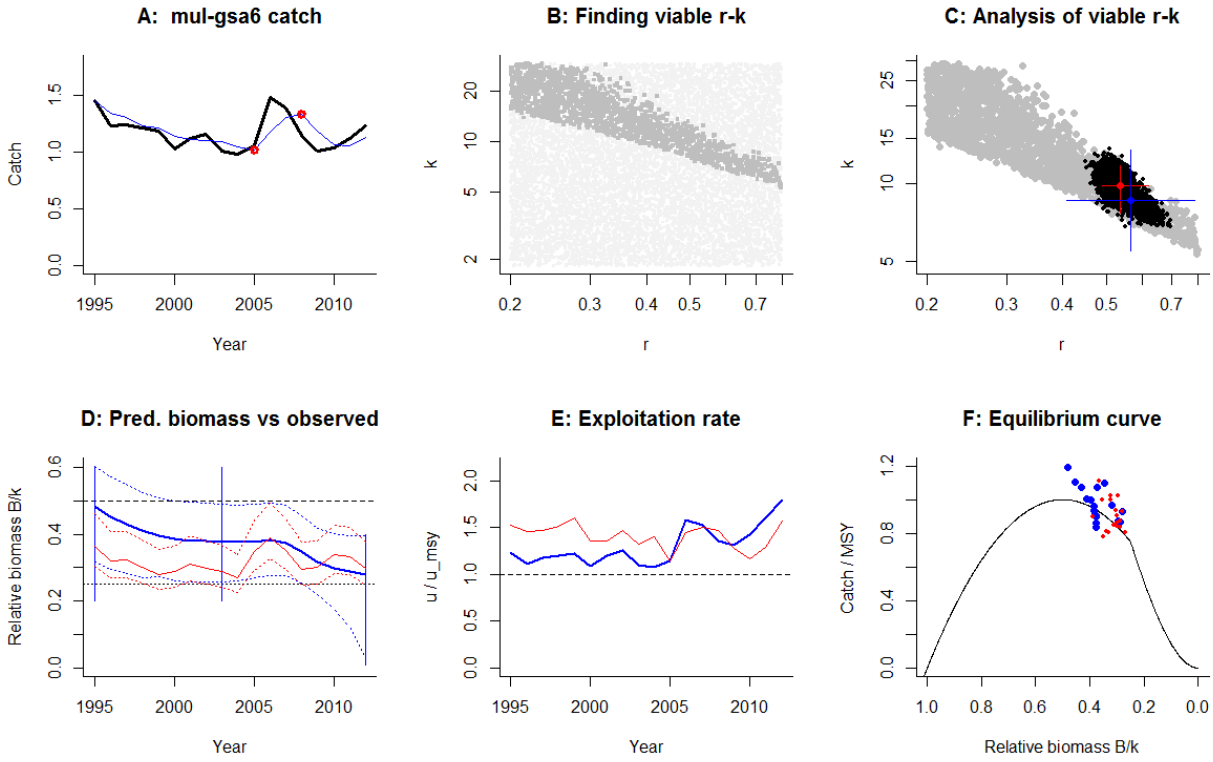

Species: *Mullus surmuletus* , stock: mullsur_gsa1516
Name and region: Surmullet - Malta Island &South of Sicily /GSA15&16 , Med
Catch data used from years 2002 - 2012 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.6 - 1.5 default , prior range for k = 1.74 - 17.4
Results from Bayesian Schaefer model using catch & observed biomass
r = 1.07 , 95% CL = 1.01 - 1.19 , k = 6.99 , 95% CL = 5.7 - 8.13
MSY = 1.87 , 95% CL = 1.56 - 2.15
Biomass in last year = 2.92 or 0.419 k
Exploitation rate in last year = 0.342 or 0.642 u.msy
Results of CMSY analysis with altogether 1355 viable trajectories for 905 r-k pairs
r = 1.16 , 95% CL = 0.943 - 1.45 , k = 7 , 95% CL = 4.65 - 10.5
MSY = 2.04 , 95% CL = 1.41 - 2.95
Relative biomass last year= 0.251 k, 2.5th = 0.0166 , 97.5th = 0.395
Relative biomass next year= 0.305 k, 2.5th = -0.133 , 97.5th = 0.568
Relative exploitation rate in last year= 0.736
Comment: OK
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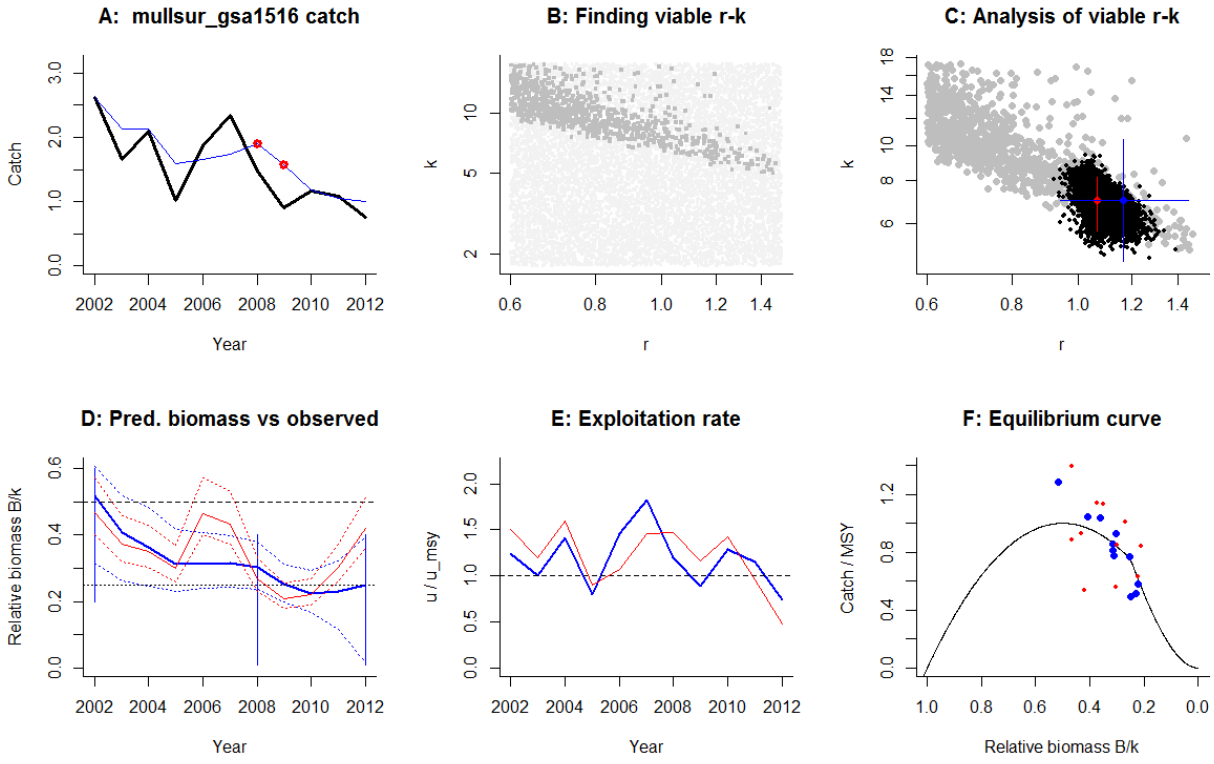

## Region: Black Sea

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: *Engraulis encrasicolus* , stock: BS_anch
Name and region: Black Sea anchovy , BS
Catch data used from years 1995 - 2011 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 677 - 10840
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.501 , 95% CL = 0.447 - 0.575 , k = 3550 , 95% CL = 2802 - 4678
MSY = 447 , 95% CL = 337 - 611
Biomass in last year = 669 or 0.189 k
Exploitation rate in last year = 0.422 or 1.68 u.msy
Results of CMSY analysis with altogether 4643 viable trajectories for 1282 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 2454 , 95% CL = 1617 - 3724
MSY = 347 , 95% CL = 291 - 413
Relative biomass last year= 0.248 k, 2.5th = 0.028 , 97.5th = 0.388
Relative biomass next year= 0.236 k, 2.5th = -0.087 , 97.5th = 0.419
Relative exploitation rate in last year= 1.65
Comment: SSB=TB
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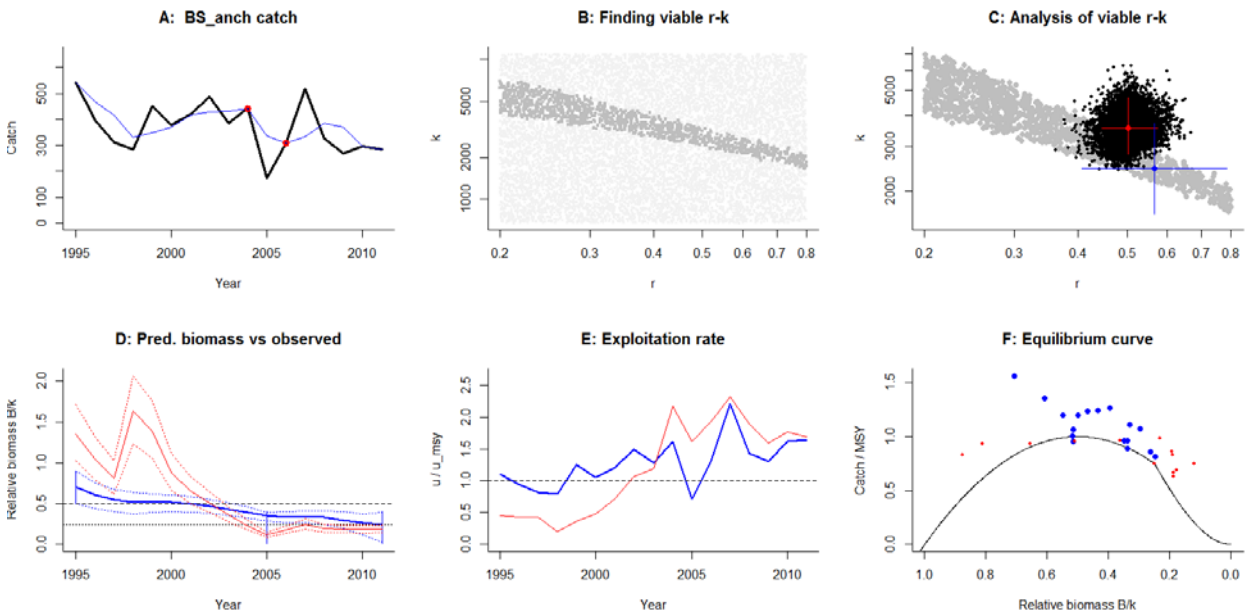

Species: *Sprattus sprattus* , stock: Spr_BS
Name and region: Black Sea sprat , BS
Catch data used from years 1992 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2002 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 253 - 6074
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.502 , 95% CL = 0.449 - 0.568 , k = 577 , 95% CL = 493 - 694
MSY = 72.8 , 95% CL = 60.3 - 88.4
Biomass in last year = 414 or 0.718 k
Exploitation rate in last year = 0.244 or 0.973 u.msy
Results of CMSY analysis with altogether 38880 viable trajectories for 4560 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 616 , 95% CL = 308 - 1231
MSY = 87 , 95% CL = 42.6 - 178
Relative biomass last year= 0.752 k, 2.5th = 0.515 , 97.5th = 0.865
Relative biomass next year= 0.68 k, 2.5th = 0.377 , 97.5th = 0.827
Relative exploitation rate in last year= 0.922
Comment: Landings
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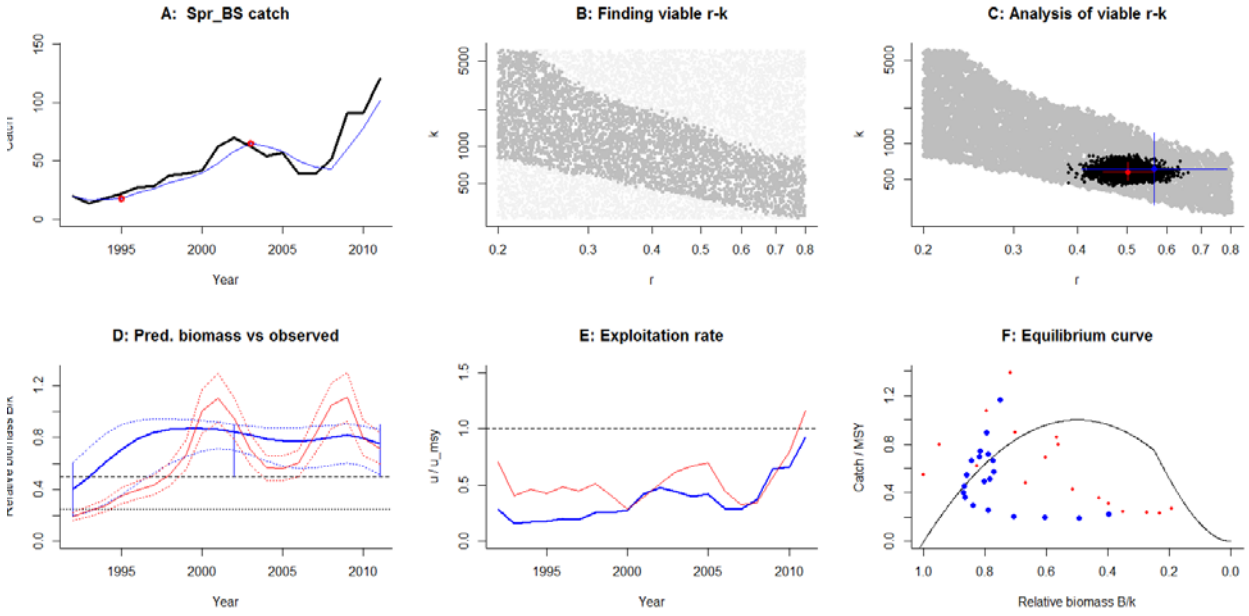

Species: *Scophthalmus maximus* , stock: Tur_BS
Name and region: Turbot in Black Sea , BS
Catch data used from years 1950 - 2011 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1986 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 6.23 - 99.6
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.498 , 95% CL = 0.459 - 0.534 , k = 23.8 , 95% CL = 21.4 - 26.7
MSY = 2.96 , 95% CL = 2.62 - 3.34
Biomass in last year = 1.61 or 0.0677 k
Exploitation rate in last year = 0.775 or 3.11 u.msy
Results of CMSY analysis with altogether 329 viable trajectories for 309 r-k pairs
r = 0.309 , 95% CL = 0.268 - 0.356 , k = 40.3 , 95% CL = 32.3 - 50.4
MSY = 3.11 , 95% CL = 2.66 - 3.64
Relative biomass last year= 0.333 k, 2.5th = 0.0314 , 97.5th = 0.394
Relative biomass next year= 0.374 k, 2.5th = 0.00315 , 97.5th = 0.436
Relative exploitation rate in last year= 0.428
Comment: Landings + IUU; OK.
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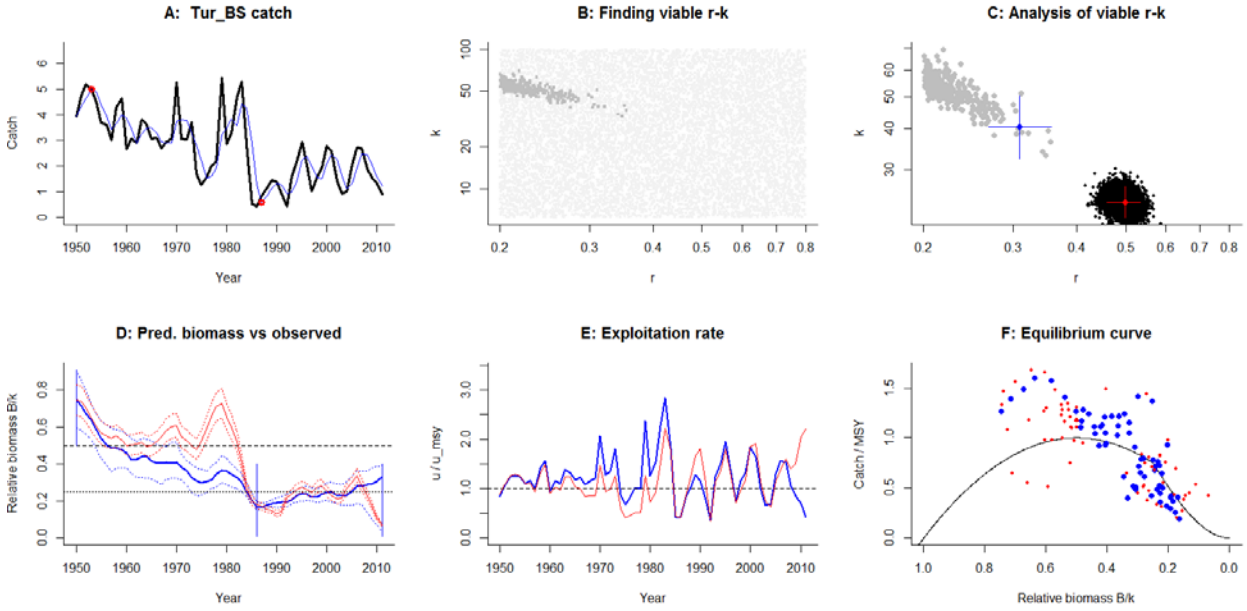

## Region: South Africa

[CMSY_46e.R, AllStocks_ID20.csv, AllStocks_Spec16.csv]
Species: *Argyrozona argyrozona* , stock: CRPN_S
Name and region: Carpenter South Coast , South Africa
Catch data used from years 1987 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2000 expert
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 1.39 - 83.5
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.227 , 95% CL = 0.17 - 0.28 , k = 6.22 , 95% CL = 5.28 - 9.03
MSY = 0.358 , 95% CL = 0.293 - 0.442
Biomass in last year = 6.01 or 0.965 k
Exploitation rate in last year = 0.0169 or 0.149 u.msy
Results of CMSY analysis with altogether 19976 viable trajectories for 4045 r-k pairs
r = 0.278 , 95% CL = 0.162 - 0.487 , k = 6.18 , 95% CL = 1.93 - 19.4
MSY = 0.429 , 95% CL = 0.132 - 1.4
Relative biomass last year= 0.875 k, 2.5th = 0.767 , 97.5th = 0.899
Relative biomass next year= 0.881 k, 2.5th = 0.781 , 97.5th = 0.907
Relative exploitation rate in last year= 0.133
Comment: OK
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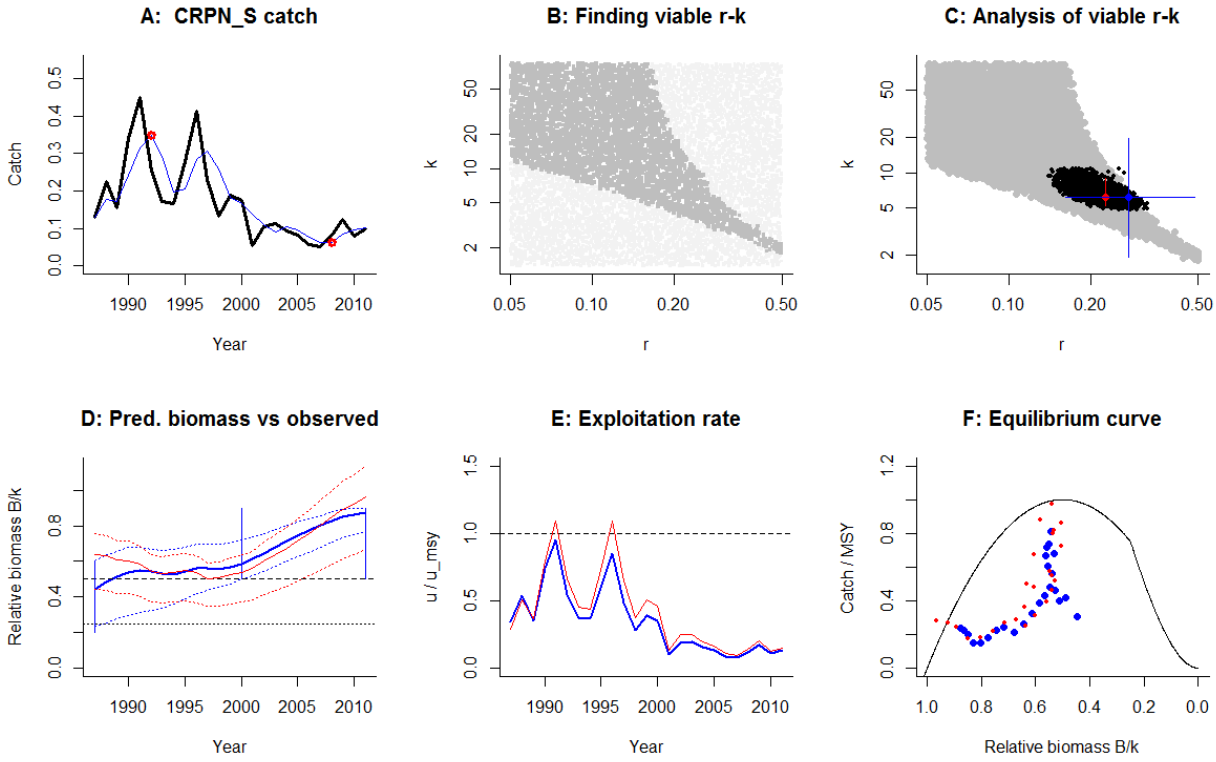

Species: *Argyrozona argyrozona* , stock: CRPN_SE
Name and region: Carpenter South-East Coast , South Africa
Catch data used from years 1987 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2000 expert
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 1.96 - 118
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.215 , 95% CL = 0.177 - 0.264 , k = 10.1 , 95% CL = 8.61 - 12.8
MSY = 0.546 , 95% CL = 0.464 - 0.648
Biomass in last year = 9.34 or 0.926 k
Exploitation rate in last year = 0.0222 or 0.207 u.msy
Results of CMSY analysis with altogether 18307 viable trajectories for 4490 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 8.43 , 95% CL = 2.67 - 26.7
MSY = 0.595 , 95% CL = 0.182 - 1.95
Relative biomass last year= 0.829 k, 2.5th = 0.545 , 97.5th = 0.898
Relative biomass next year= 0.833 k, 2.5th = 0.563 , 97.5th = 0.9
Relative exploitation rate in last year= 0.269
Comment: OK
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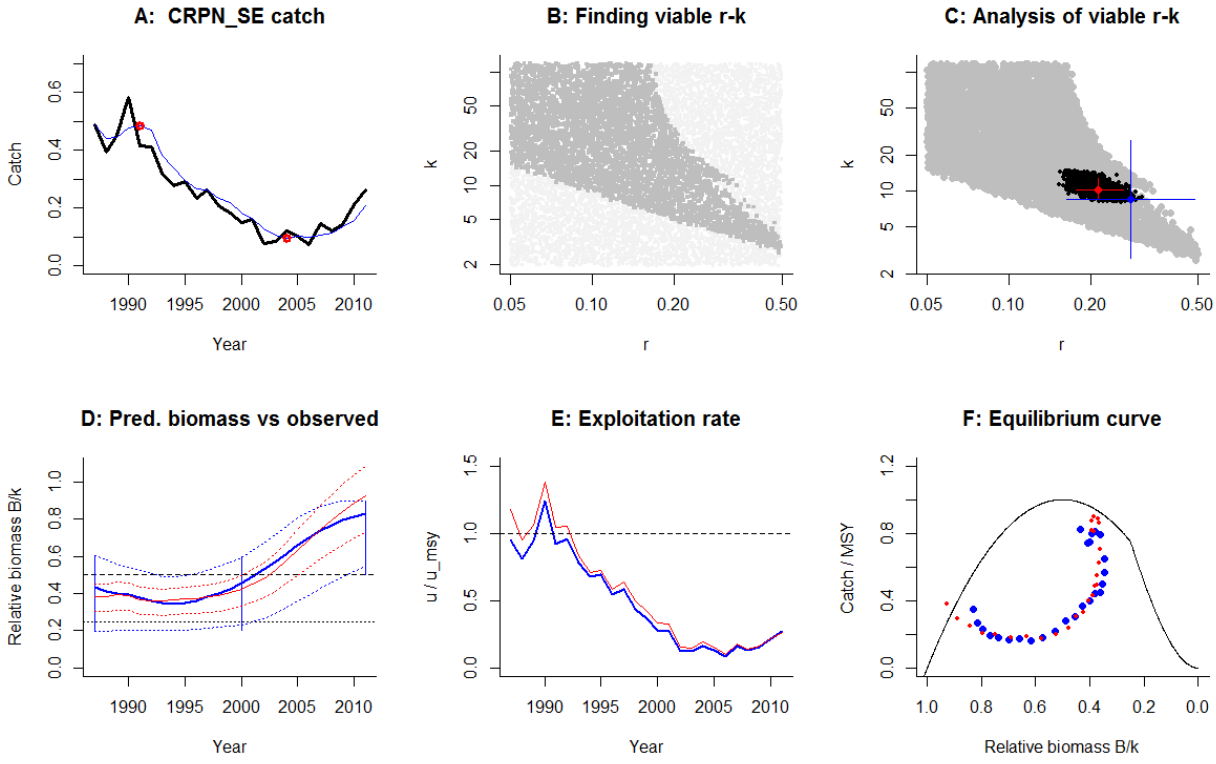

Species: *Pachymetopon blochii* , stock: HTTN_SW
Name and region: Hottentot South-West Coast , South Africa
Catch data used from years 1987 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1996 expert
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.705 - 16.9
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.479 , 95% CL = 0.389 - 0.531 , k = 1.47 , 95% CL = 1.29 - 1.81
MSY = 0.174 , 95% CL = 0.15 - 0.205
Biomass in last year = 1.23 or 0.834 k
Exploitation rate in last year = 0.0456 or 0.191 u.msy
Results of CMSY analysis with altogether 2868 viable trajectories for 1762 r-k pairs
r = 0.266 , 95% CL = 0.242 - 0.292 , k = 2.77 , 95% CL = 2.38 - 3.23
MSY = 0.184 , 95% CL = 0.164 - 0.207
Relative biomass last year= 0.896 k, 2.5th = 0.882 , 97.5th = 0.9
Relative biomass next year= 0.899 k, 2.5th = 0.885 , 97.5th = 0.907
Relative exploitation rate in last year= 0.2
Comment: OK
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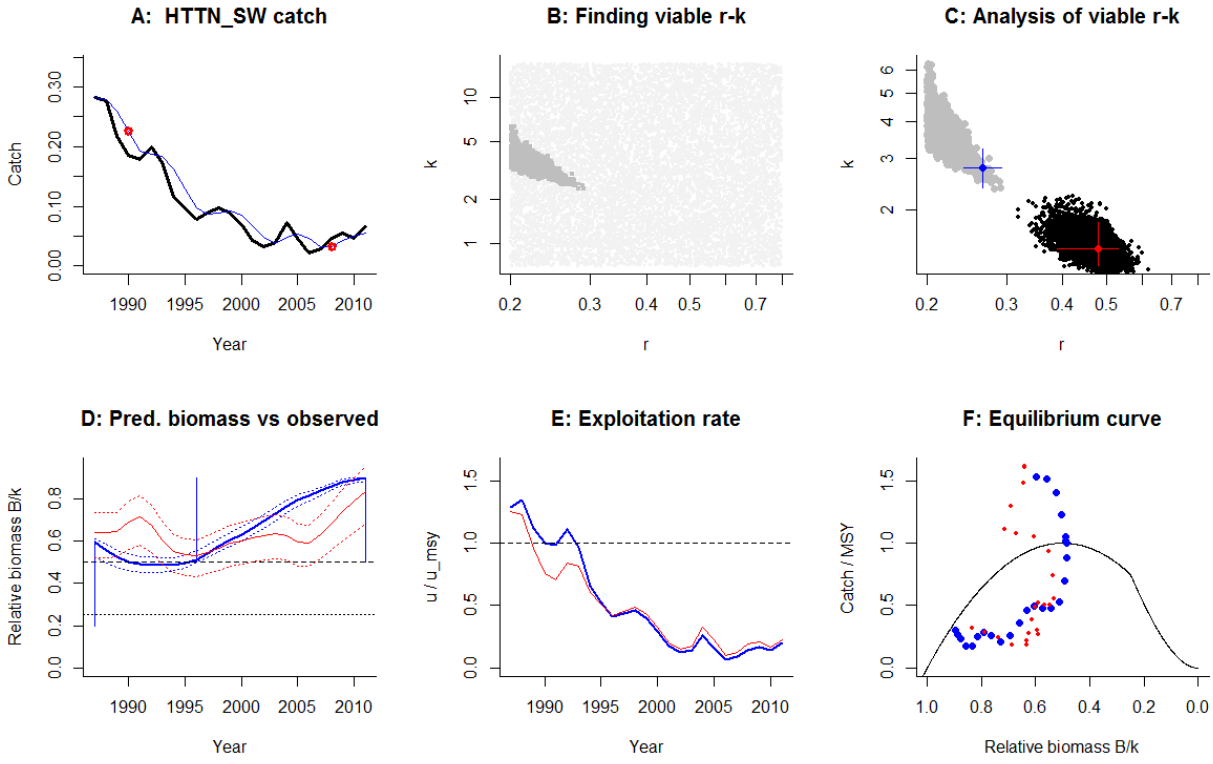

Species: *Pachymetopon blochii* , stock: HTTN_W
Name and region: Hottentot West Coast , South Africa
Catch data used from years 1987 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1994 expert
Prior final relative biomass = 0.5 - 0.9 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 1.63 - 39.1
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.48 , 95% CL = 0.391 - 0.531 , k = 4.05 , 95% CL = 3.65 - 4.8
MSY = 0.482 , 95% CL = 0.411 - 0.557
Biomass in last year = 3.85 or 0.953 k
Exploitation rate in last year = 0.0322 or 0.134 u.msy
Results of CMSY analysis with altogether 3238 viable trajectories for 2042 r-k pairs
r = 0.276 , 95% CL = 0.248 - 0.307 , k = 5.96 , 95% CL = 5.06 - 7.02
MSY = 0.411 , 95% CL = 0.368 - 0.459
Relative biomass last year= 0.895 k, 2.5th = 0.877 , 97.5th = 0.9
Relative biomass next year= 0.899 k, 2.5th = 0.882 , 97.5th = 0.908
Relative exploitation rate in last year= 0.204
Comment: OK
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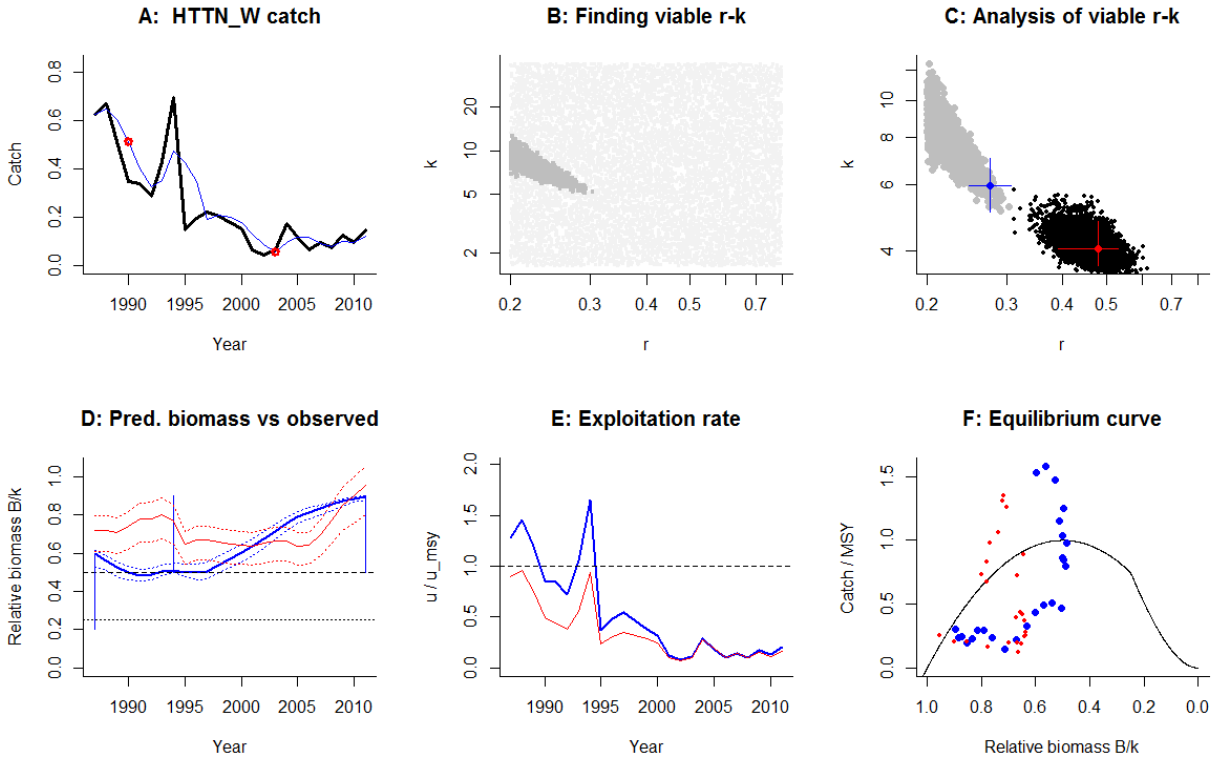

Species: *Genypterus capensis* , stock: KKLI_S
Name and region: Kingklip South Coast , South Africa
Catch data used from years 1959 - 2012 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1986 default
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 13.4 - 535
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.17 , 95% CL = 0.143 - 0.203 , k = 54.5 , 95% CL = 50.4 - 59.7
MSY = 2.32 , 95% CL = 2 - 2.71
Biomass in last year = 26.8 or 0.491 k
Exploitation rate in last year = 0.044 or 0.517 u.msy
Results of CMSY analysis with altogether 17419 viable trajectories for 2375 r-k pairs
r = 0.278 , 95% CL = 0.162 - 0.478 , k = 29.2 , 95% CL = 15.2 - 56
MSY = 2.03 , 95% CL = 1.64 - 2.51
Relative biomass last year= 0.491 k, 2.5th = 0.231 , 97.5th = 0.596
Relative biomass next year= 0.515 k, 2.5th = 0.233 , 97.5th = 0.621
Relative exploitation rate in last year= 0.685
Comment: OK
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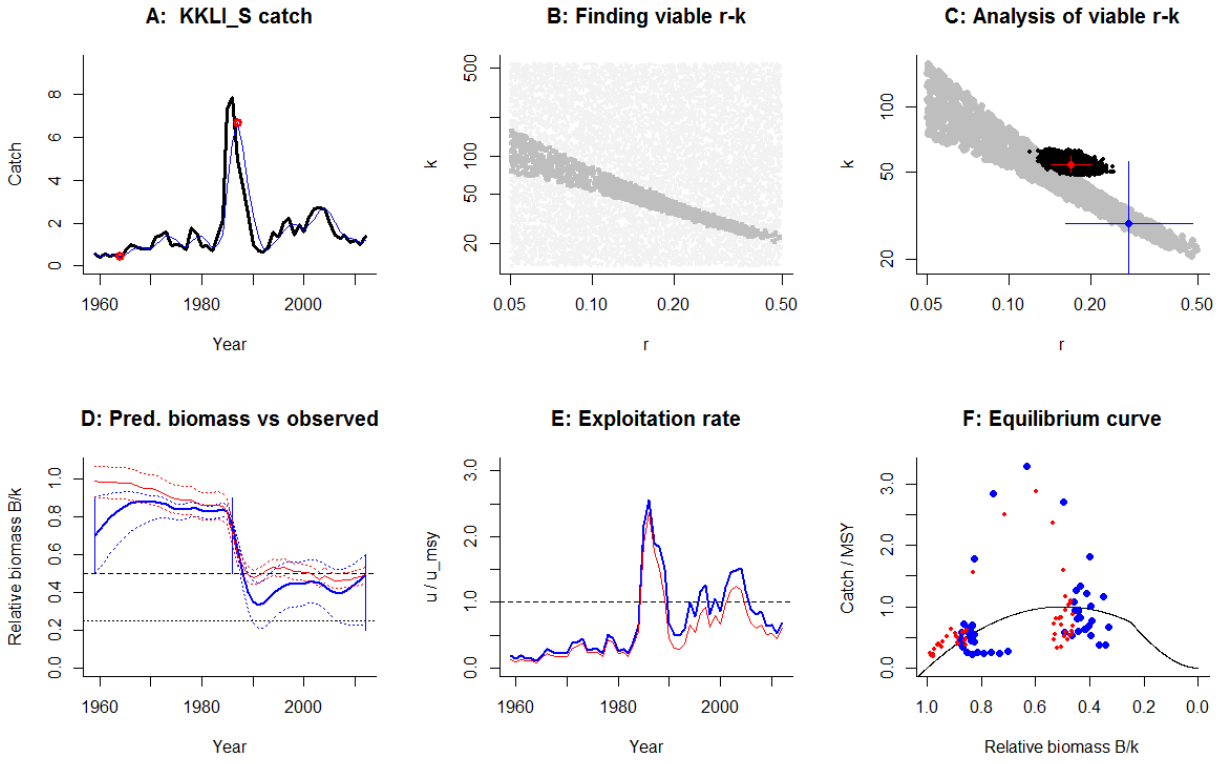

Species: *Argyrosomus inodorus* , stock: KOB_S
Name and region: Silver Kob South Coast , South Africa
Catch data used from years 1987 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2004 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 1.4 - 56.2
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.343 , 95% CL = 0.303 - 0.403 , k = 6.94 , 95% CL = 5.44 - 8.11
MSY = 0.591 , 95% CL = 0.52 - 0.669
Biomass in last year = 3.27 or 0.471 k
Exploitation rate in last year = 0.136 or 0.793 u.msy
Results of CMSY analysis with altogether 5709 viable trajectories for 2636 r-k pairs
r = 0.278 , 95% CL = 0.162 - 0.478 , k = 9.46 , 95% CL = 4.02 - 22.2
MSY = 0.657 , 95% CL = 0.355 - 1.22
Relative biomass last year= 0.402 k, 2.5th = 0.218 , 97.5th = 0.573
Relative biomass next year= 0.41 k, 2.5th = 0.196 , 97.5th = 0.606
Relative exploitation rate in last year= 0.786
Comment: OK. Resilience changed from Medium to Low.
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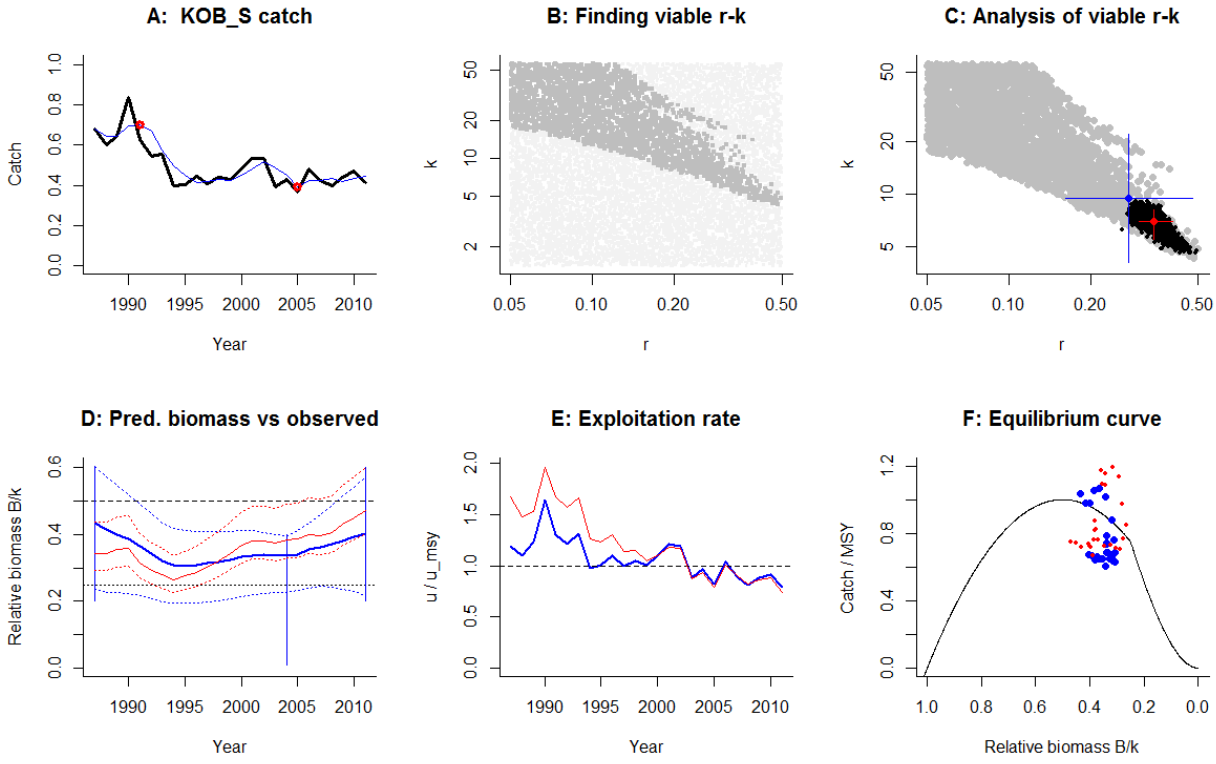

Species: *Argyrosomus inodorus* , stock: KOB_SE
Name and region: Silver Kob South-East Coast , South Africa
Catch data used from years 1987 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 0.77 - 30.8
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.356 , 95% CL = 0.307 - 0.416 , k = 3.64 , 95% CL = 2.86 - 4.37
MSY = 0.322 , 95% CL = 0.274 - 0.374
Biomass in last year = 1.82 or 0.502 k
Exploitation rate in last year = 0.107 or 0.604 u.msy
Results of CMSY analysis with altogether 5366 viable trajectories for 2523 r-k pairs
r = 0.274 , 95% CL = 0.16 - 0.468 , k = 4.96 , 95% CL = 2.12 - 11.6
MSY = 0.339 , 95% CL = 0.183 - 0.628
Relative biomass last year= 0.431 k, 2.5th = 0.221 , 97.5th = 0.576
Relative biomass next year= 0.45 k, 2.5th = 0.218 , 97.5th = 0.612
Relative exploitation rate in last year= 0.587
Comment: OK. Resilience changed from Medium to Low.
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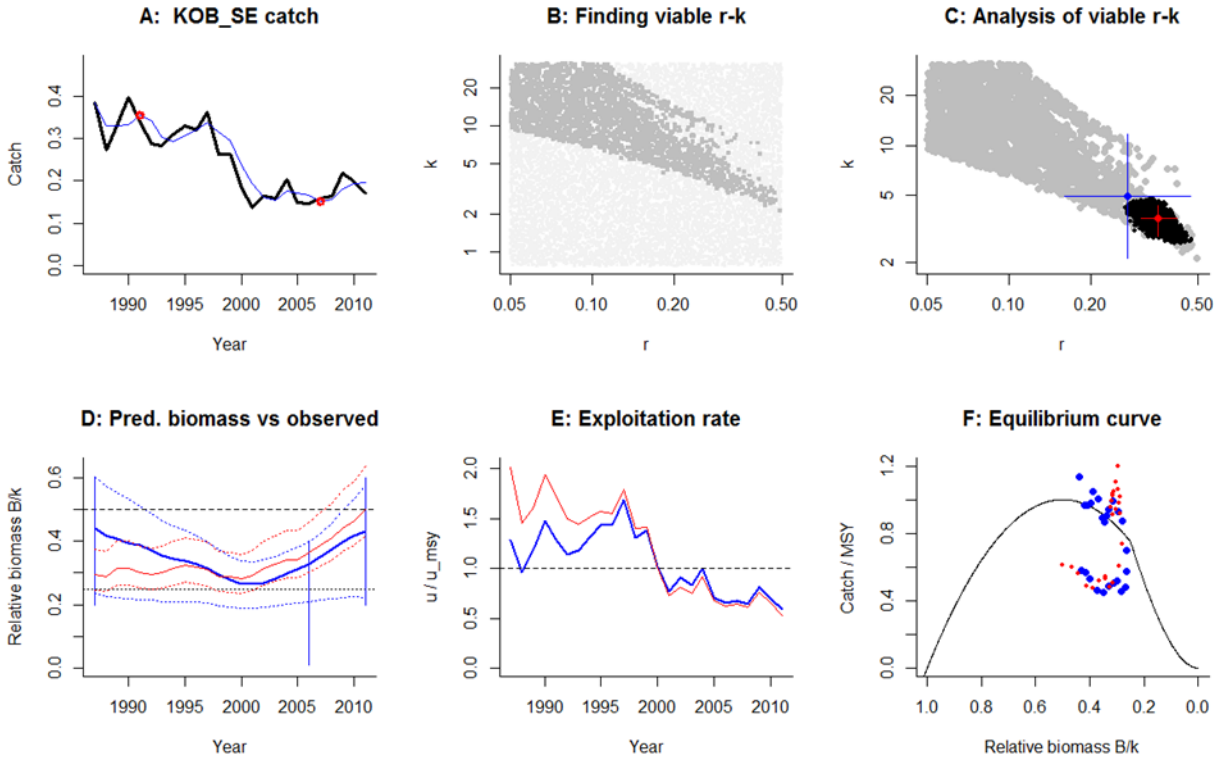
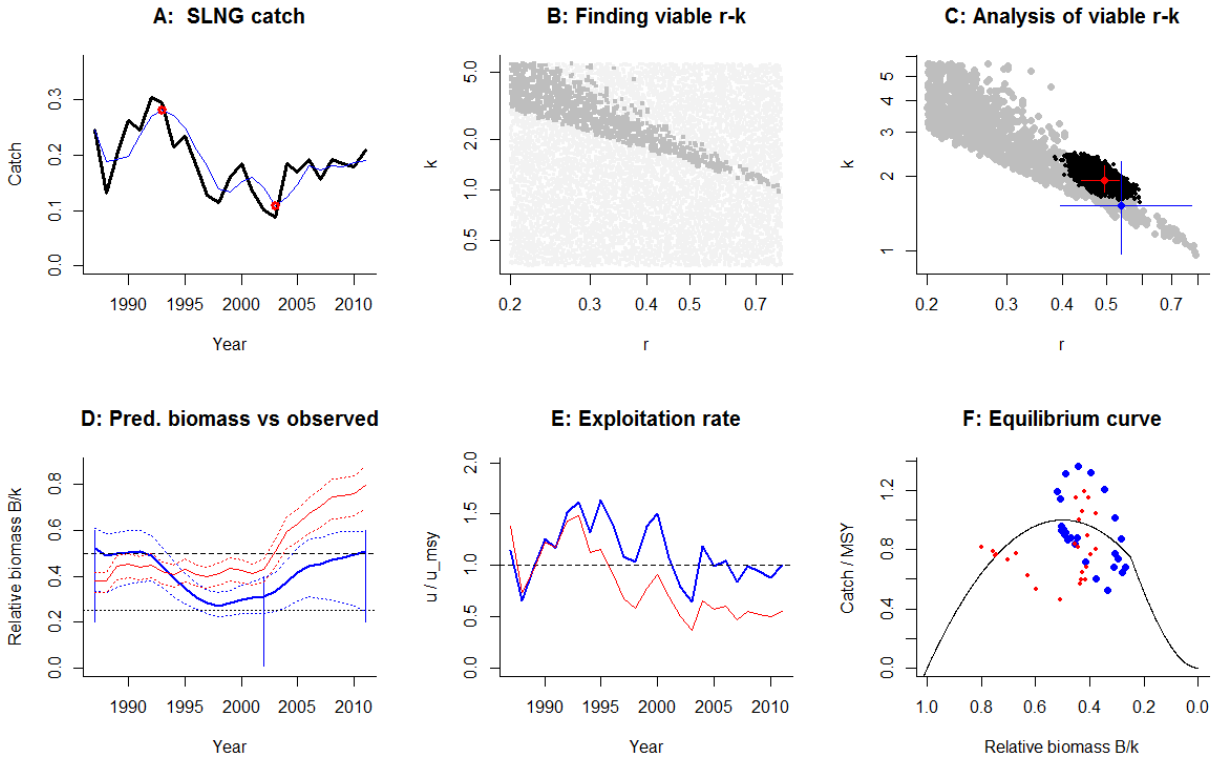
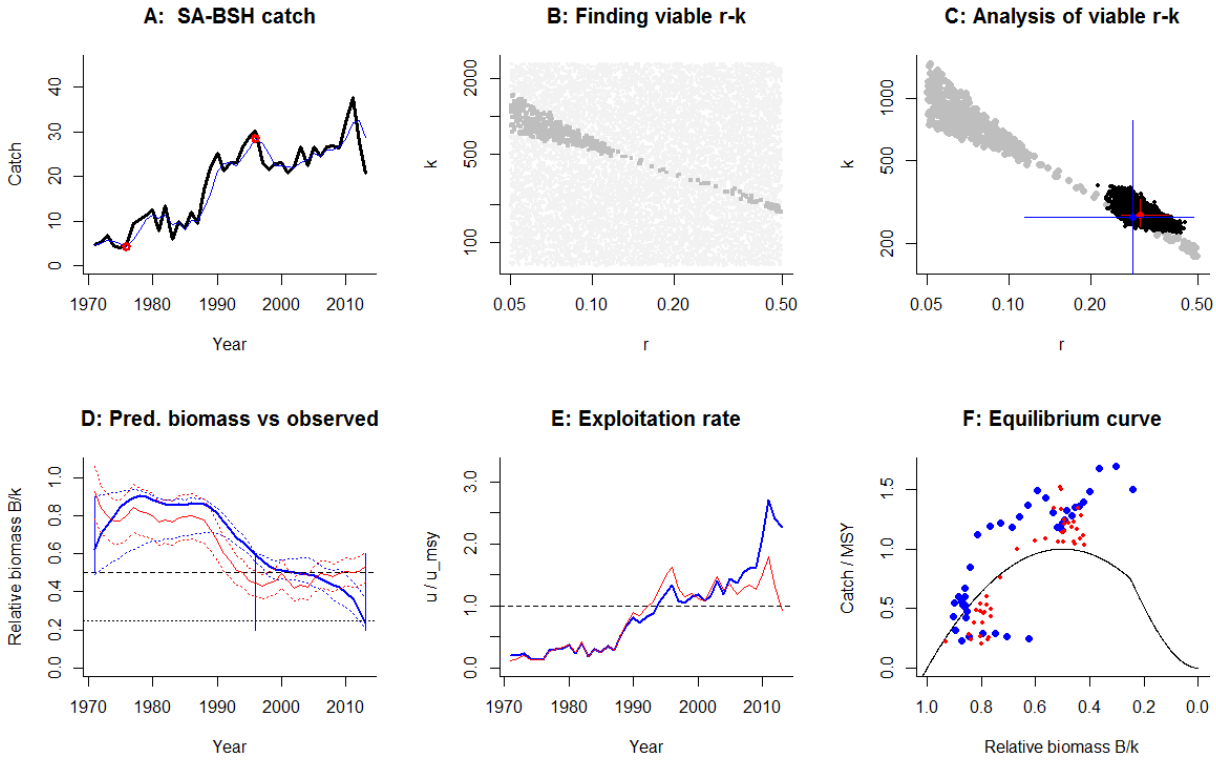


Species: *Chrysoblephus puniceus* , stock: SLNG
Name and region: Slinger Kwazulu-Natal , South Africa
Catch data used from years 1987 - 2011 , biomass = observed
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2002 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.352 - 5.63
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.494 , 95% CL = 0.439 - 0.533 , k = 1.91 , 95% CL = 1.73 - 2.19
MSY = 0.235 , 95% CL = 0.216 - 0.259
Biomass in last year = 1.52 or 0.797 k
Exploitation rate in last year = 0.125 or 0.508 u.msy
Results of CMSY analysis with altogether 2179 viable trajectories for 1180 r-k pairs
r = 0.541 , 95% CL = 0.395 - 0.773 , k = 1.52 , 95% CL = 0.972 - 2.29
MSY = 0.206 , 95% CL = 0.172 - 0.247
Relative biomass last year= 0.506 k, 2.5th = 0.248 , 97.5th = 0.595
Relative biomass next year= 0.505 k, 2.5th = 0.205 , 97.5th = 0.61
Relative exploitation rate in last year= 1
Comment: OK. Fit could be improved by setting intbio to Medium in 2000 and endbio to High.
---

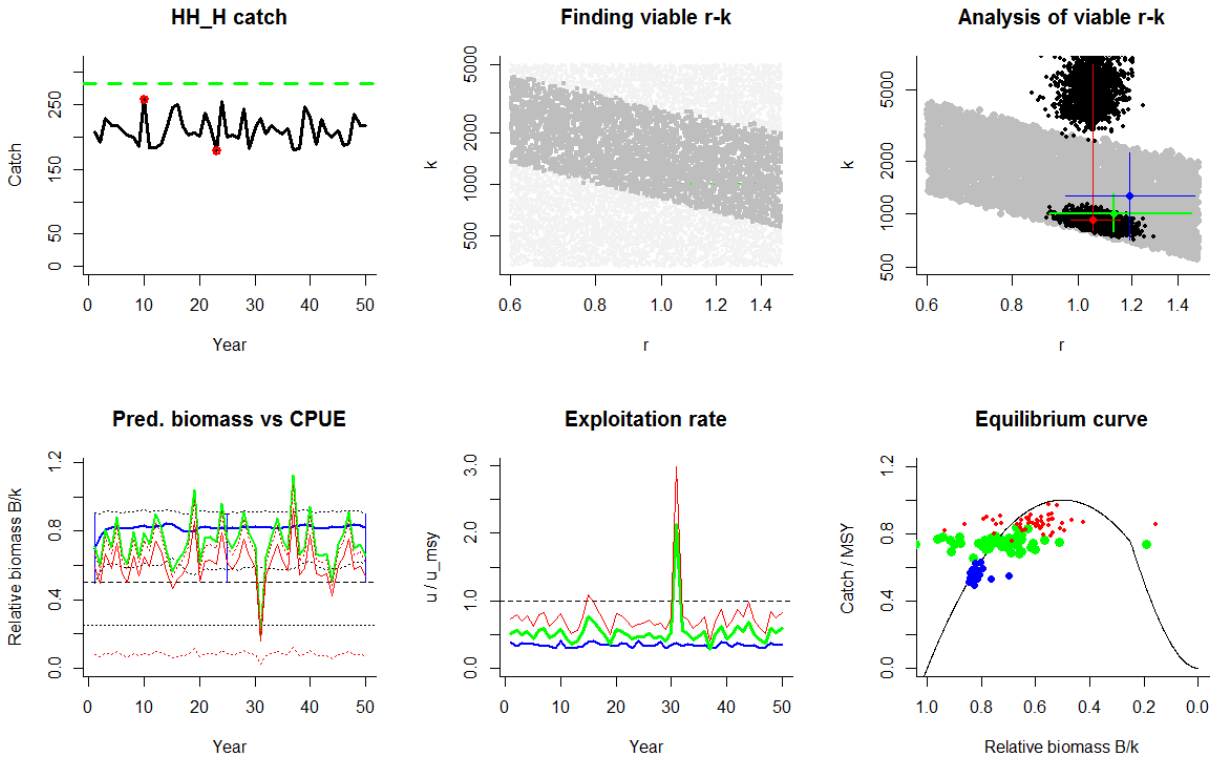


Species: *Prionace glauca* , stock: SA-BSH
Name and region: South Atlantic Blue Shark , South Africa
Catch data used from years 1971 - 2013 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9 expert
Prior intermediate rel. biomass= 0.2 - 0.6 in year 1996 expert
Prior final relative biomass = 0.2 - 0.6 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 64.9 - 2597
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.307 , 95% CL = 0.261 - 0.388 , k = 274 , 95% CL = 240 - 324
MSY = 21.4 , 95% CL = 18.6 - 24.5
Biomass in last year = 146 or 0.533 k
Exploitation rate in last year = 0.197 or 1.28 u.msy
Results of CMSY analysis with altogether 1035 viable trajectories for 460 r-k pairs
r = 0.287 , 95% CL = 0.114 - 0.482 , k = 267 , 95% CL = 136 - 779
MSY = 19.1 , 95% CL = 14.2 - 25.7
Relative biomass last year= 0.24 k, 2.5th = 0.201 , 97.5th = 0.365
Relative biomass next year= 0.185 k, 2.5th = 0.117 , 97.5th = 0.336
Relative exploitation rate in last year= 2.27
Comment: OK
---

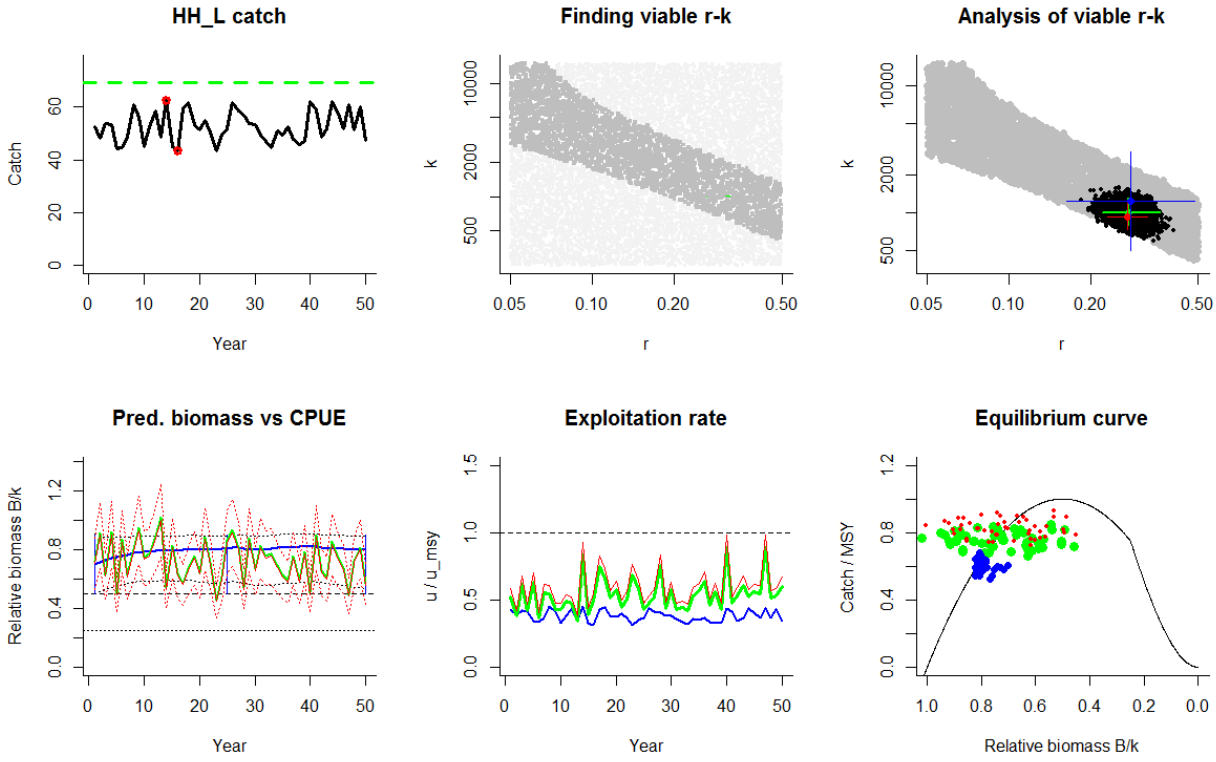


# Appendix III. Simulated stock with catch and CPUE stocks

[CMSY_45y.R, SimCatchCPUE_6.csv, SimSpecCPUE_6.csv]
Process error: Sim=0.2, CMSY=0.1; Observation error: Sim=0.1, CMSY=0.1; q error: Sim=0.2, CMSY=NA
Species: NA , stock: HH_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.6 - 1.5 , prior range for k = 332 - 4984
Prior range of q = 8.61e-06 - 2.72e-05
True values used in simulation: r = 1.13 , k = 1000 , MSY = 282, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 1.05 , 95% CL = 0.975 - 1.15 , k = 924 , 95% CL = 804 - 6945
MSY = 244 , 95% CL = 216 - 1832
q = 1.31e-05 , lcl = 1.02e-05 , ucl = 1.63e-05
Biomass in last year from q*CPUE = 498 or 0.539 k
Exploitation rate in last year = 0.448
Results of CMSY analysis with altogether 43030 viable trajectories for 4429 r-k pairs
r = 1.19 , 95% CL = 0.957 - 1.48 , k = 1264 , 95% CL = 717 - 2227
MSY = 376 , 95% CL = 190 - 745
Relative biomass last year= 0.822 k, 2.5th = 0.606 , 97.5th = 0.897
Relative biomass next year= 0.813 k, 2.5th = 0.585 , 97.5th = 0.91
Relative exploitation rate in last year= 0.351
---



Species: NA , stock: HH_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.05 - 0.5 , prior range for k = 248 - 14890
Prior range of q = 4.91e-06 - 3.11e-05
True values used in simulation: r = 0.278 , k = 1000 , MSY = 69.5, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.275 , 95% CL = 0.232 - 0.325 , k = 929 , 95% CL = 745 - 1240
MSY = 63.6 , 95% CL = 51.8 - 86.4
q = 1.1e-05 , lcl = 7.34e-06 , ucl = 1.54e-05
Biomass in last year from q*CPUE = 520 or 0.56 k
Exploitation rate in last year = 0.102
Results of CMSY analysis with altogether 30950 viable trajectories for 3170 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 1234 , 95% CL = 507 - 3005
MSY = 87.1 , 95% CL = 44.4 - 171
Relative biomass last year= 0.799 k, 2.5th = 0.536 , 97.5th = 0.893
Relative biomass next year= 0.801 k, 2.5th = 0.534 , 97.5th = 0.895
Relative exploitation rate in last year= 0.343
---



Species: NA , stock: HH_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.2 - 0.8 , prior range for k = 193 - 4638
Prior range of q = 1.09e-05 - 4.36e-05
True values used in simulation: r = 0.352 , k = 1000 , MSY = 88, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.502 , 95% CL = 0.449 - 0.577 , k = 609 , 95% CL = 517 - 745
MSY = 76.7 , 95% CL = 66.2 - 95.3
q = 1.8e-05 , lcl = 1.33e-05 , ucl = 2.38e-05
Biomass in last year from q*CPUE = 360 or 0.59 k
Exploitation rate in last year = 0.179
Results of CMSY analysis with altogether 36520 viable trajectories for 3625 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 797 , 95% CL = 412 - 1541
MSY = 113 , 95% CL = 58.7 - 216
Relative biomass last year= 0.818 k, 2.5th = 0.57 , 97.5th = 0.897
Relative biomass next year= 0.819 k, 2.5th = 0.573 , 97.5th = 0.902
Relative exploitation rate in last year= 0.375
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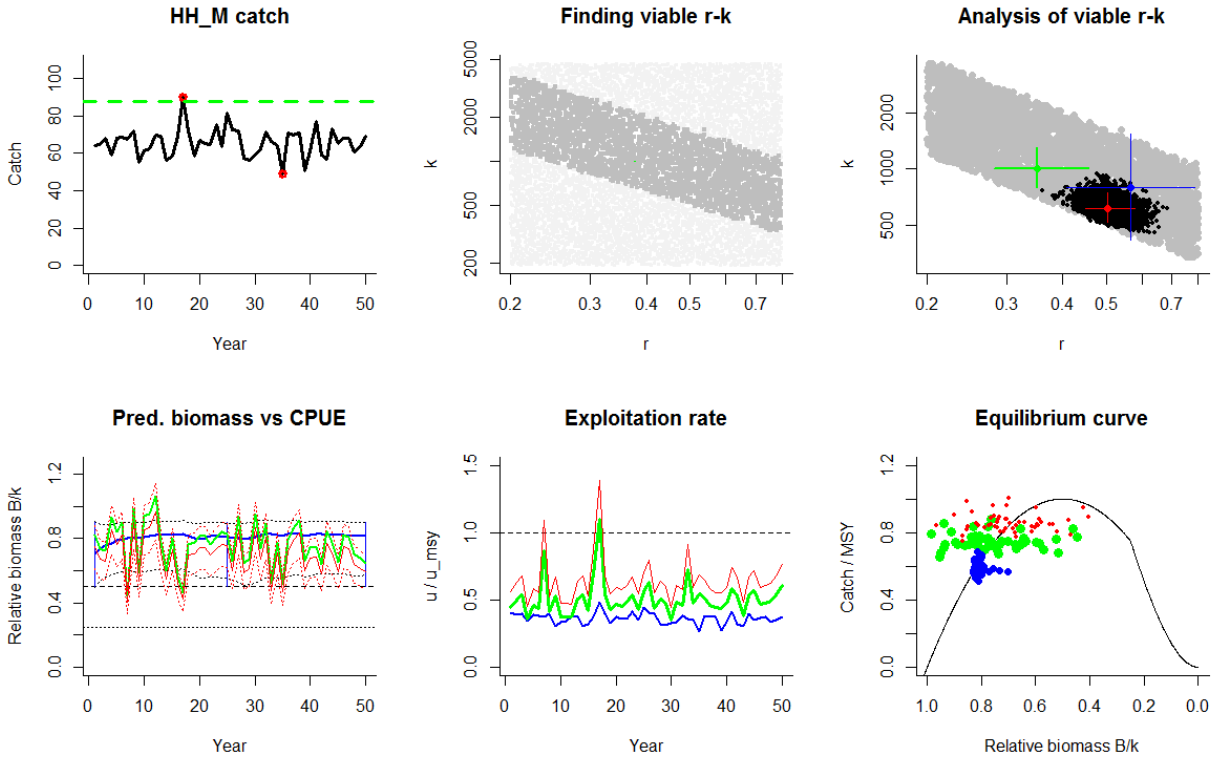

Species: NA , stock: HH_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.5 - 0.9 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.015 - 0.1 , prior range for k = 199 - 7966
Prior range of q = 8.06e-06 - 4.16e-05
True values used in simulation: r = 0.047 , k = 1000 , MSY = 11.8, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0588 , 95% CL = 0.0313 - 0.137 , k = 662 , 95% CL = 450 - 982
MSY = 9.96 , 95% CL = 5.51 - 19.8
q = 1.57e-05 , lcl = 1.09e-05 , ucl = 2.26e-05
Biomass in last year from q*CPUE = 448 or 0.677 k
Exploitation rate in last year = 0.0198
Results of CMSY analysis with altogether 53001 viable trajectories for 6272 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 1231 , 95% CL = 387 - 3918
MSY = 19.1 , 95% CL = 4.73 - 77
Relative biomass last year= 0.798 k, 2.5th = 0.521 , 97.5th = 0.898
Relative biomass next year= 0.799 k, 2.5th = 0.519 , 97.5th = 0.898
Relative exploitation rate in last year= 0.317
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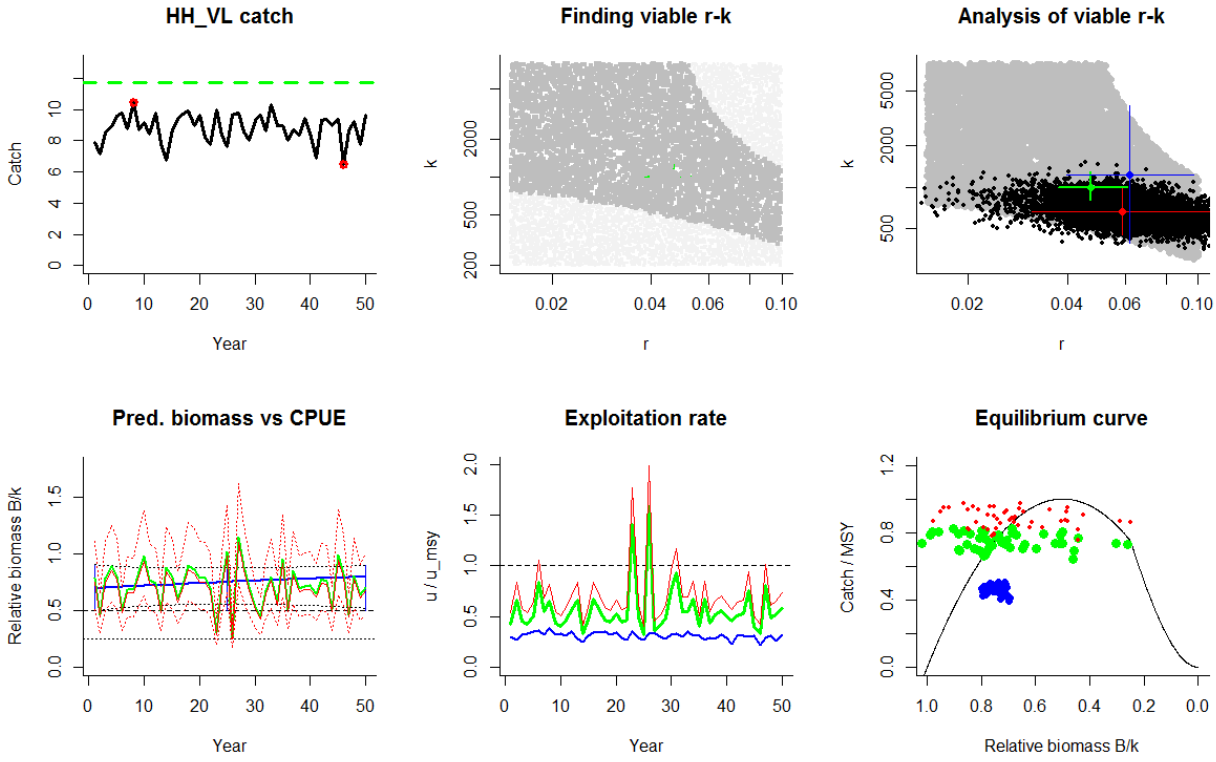

Species: NA , stock: HL_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.6 - 1.5 , prior range for k = 191 - 1913
Prior range of q = 8.24e-06 - 2.6e-05
True values used in simulation: r = 0.86 , k = 1000 , MSY = 215, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 1.06 , 95% CL = 0.982 - 1.16 , k = 843 , 95% CL = 770 - 913
MSY = 223 , 95% CL = 214 - 233
q = 1.14e-05 , lcl = 1.02e-05 , ucl = 1.27e-05
Biomass in last year from q*CPUE = 280 or 0.333 k
Exploitation rate in last year = 0.564
Results of CMSY analysis with altogether 81 viable trajectories for 81 r-k pairs
r = 1.01 , 95% CL = 0.833 - 1.44 , k = 897 , 95% CL = 601 - 1138
MSY = 226 , 95% CL = 207 - 247
Relative biomass last year= 0.321 k, 2.5th = 0.0349 , 97.5th = 0.392
Relative biomass next year= 0.349 k, 2.5th = -0.162 , 97.5th = 0.585
Relative exploitation rate in last year= 1.05
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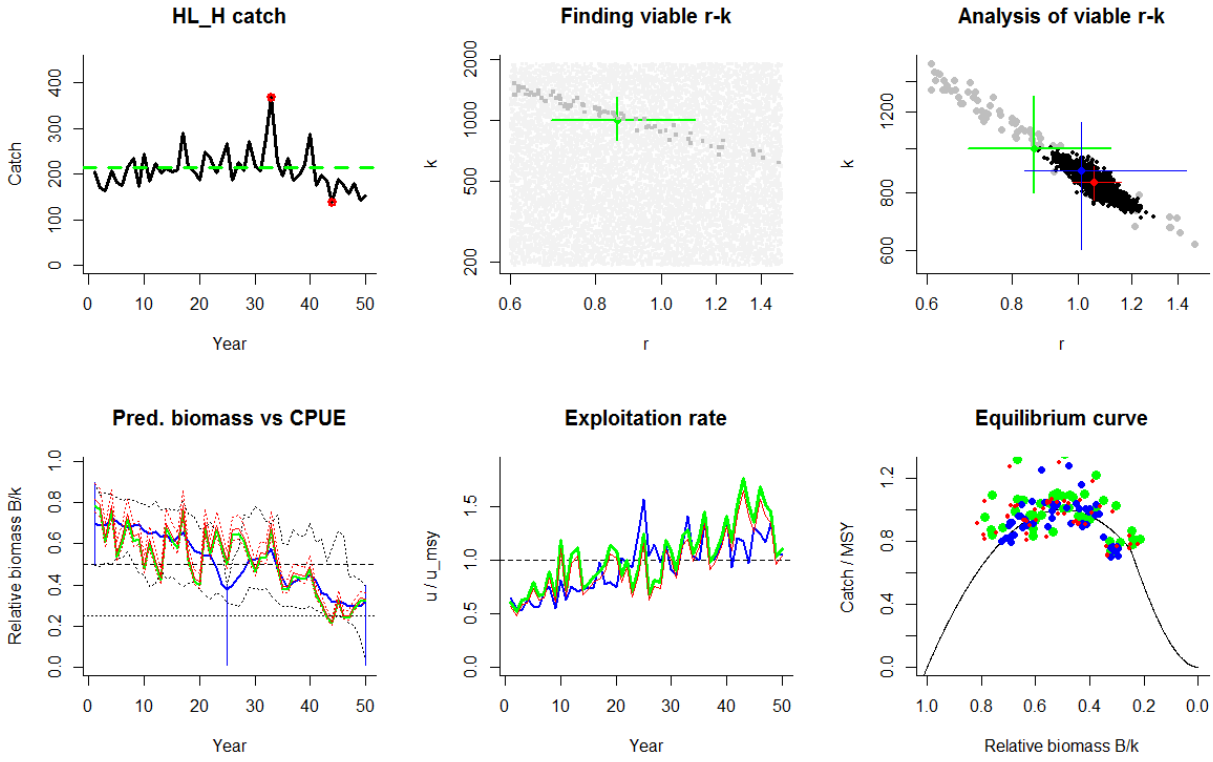

Species: NA , stock: HL_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.05 - 0.5 , prior range for k = 194 - 7754
Prior range of q = 3.09e-06 - 1.95e-05
True values used in simulation: r = 0.29 , k = 1000 , MSY = 72.5, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.265 , 95% CL = 0.212 - 0.299 , k = 1124 , 95% CL = 955 - 1406
MSY = 73.7 , 95% CL = 64.4 - 85.4
q = 8.58e-06 , lcl = 7.03e-06 , ucl = 9.87e-06
Biomass in last year from q*CPUE = 87.4 or 0.0777 k
Exploitation rate in last year = 0.164
Results of CMSY analysis with altogether 3159 viable trajectories for 1529 r-k pairs
r = 0.229 , 95% CL = 0.142 - 0.368 , k = 1206 , 95% CL = 704 - 2068
MSY = 69 , 95% CL = 60.9 - 78.2
Relative biomass last year= 0.221 k, 2.5th = 0.0201 , 97.5th = 0.395
Relative biomass next year= 0.242 k, 2.5th = 0.00941 , 97.5th = 0.431
Relative exploitation rate in last year= 0.381
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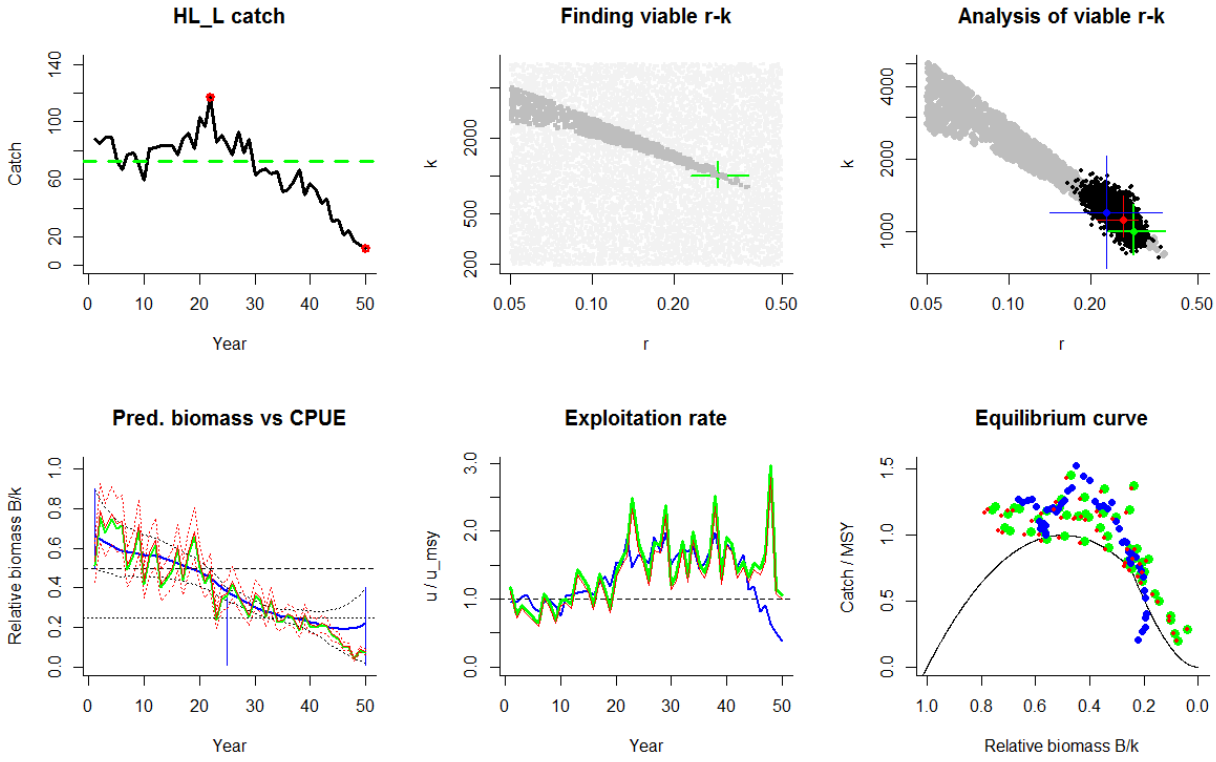

Species: NA , stock: HL_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.2 - 0.8 , prior range for k = 192 - 3079
Prior range of q = 3.27e-06 - 1.31e-05
True values used in simulation: r = 0.48 , k = 1000 , MSY = 120, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.498 , 95% CL = 0.436 - 0.557 , k = 887 , 95% CL = 670 - 1221
MSY = 110 , 95% CL = 81.5 - 154
q = 6.07e-06 , lcl = 4.54e-06 , ucl = 7.86e-06
Biomass in last year from q*CPUE = 2.13 or 0.0024 k
Exploitation rate in last year = 0.372
Results of CMSY analysis with altogether 1400 viable trajectories for 1045 r-k pairs
r = 0.463 , 95% CL = 0.355 - 0.649 , k = 1008 , 95% CL = 692 - 1366
MSY = 117 , 95% CL = 108 - 126
Relative biomass last year= 0.0962 k, 2.5th = 0.0128 , 97.5th = 0.37
Relative biomass next year= 0.106 k, 2.5th = 0.0125 , 97.5th = 0.468
Relative exploitation rate in last year= 0.0198
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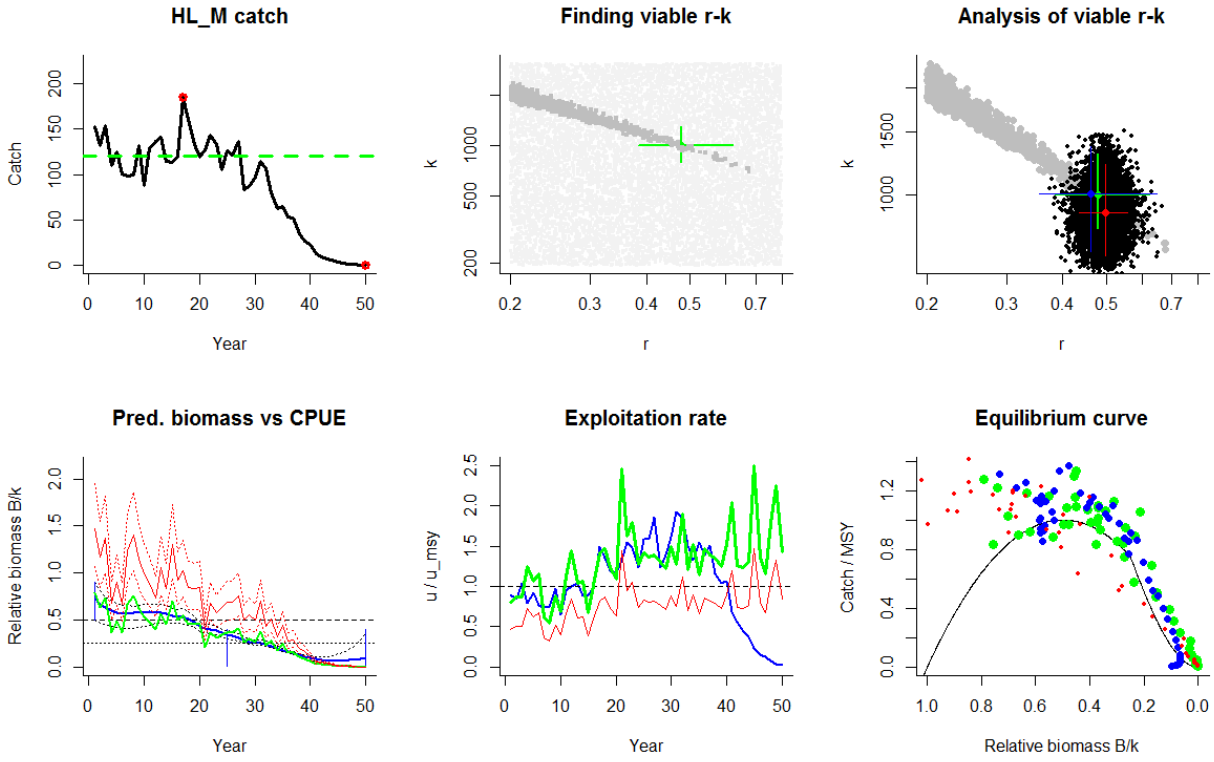

Species: NA , stock: HL_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.015 - 0.1 , prior range for k = 481 - 12824
Prior range of q = 2.13e-06 - 1.1e-05
True values used in simulation: r = 0.068 , k = 1000 , MSY = 17, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0284 , 95% CL = 0.0101 - 0.0581 , k = 1901 , 95% CL = 1324 - 2952
MSY = 13.5 , 95% CL = 5.23 - 28.6
q = 6e-06 , lcl = 4.23e-06 , ucl = 7.96e-06
Biomass in last year from q*CPUE = 100 or 0.0526 k
Exploitation rate in last year = 0.0553
Results of CMSY analysis with altogether 8536 viable trajectories for 2463 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 1167 , 95% CL = 600 - 2268
MSY = 18.1 , 95% CL = 11.8 - 27.8
Relative biomass last year= 0.266 k, 2.5th = 0.0158 , 97.5th = 0.397
Relative biomass next year= 0.272 k, 2.5th = 0.0106 , 97.5th = 0.406
Relative exploitation rate in last year= 0.51
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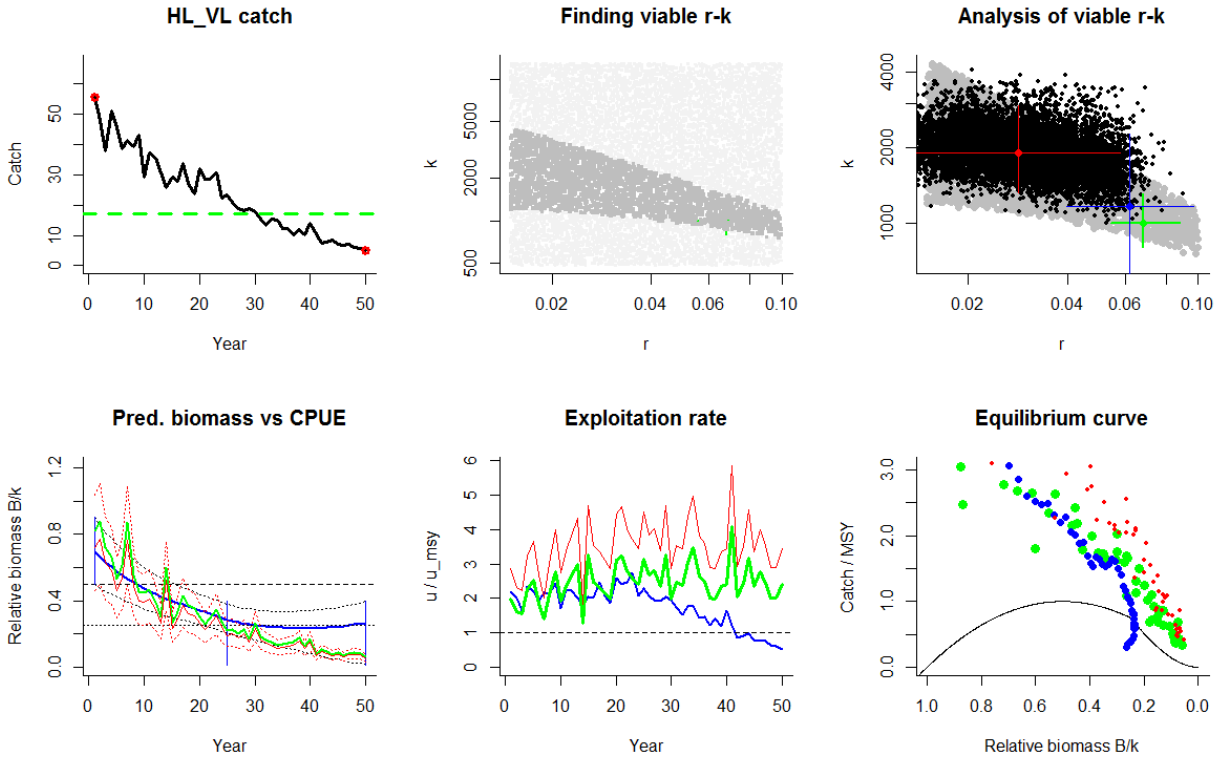

Species: NA , stock: HLH_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.6 - 1.5 , prior range for k = 430 - 6454
Prior range of q = 9.76e-06 - 3.09e-05
True values used in simulation: r = 1.05 , k = 1000 , MSY = 262, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 1.06 , 95% CL = 0.988 - 1.17 , k = 984 , 95% CL = 892 - 1072
MSY = 261 , 95% CL = 247 - 278
q = 9.66e-06 , lcl = 8.46e-06 , ucl = 1.1e-05
Biomass in last year from q*CPUE = 743 or 0.755 k
Exploitation rate in last year = 0.249
Results of CMSY analysis with altogether 1813 viable trajectories for 1340 r-k pairs
r = 1.1 , 95% CL = 0.905 - 1.38 , k = 956 , 95% CL = 725 - 1210
MSY = 262 , 95% CL = 241 - 285
Relative biomass last year= 0.776 k, 2.5th = 0.713 , 97.5th = 0.835
Relative biomass next year= 0.772 k, 2.5th = 0.699 , 97.5th = 0.823
Relative exploitation rate in last year= 0.468
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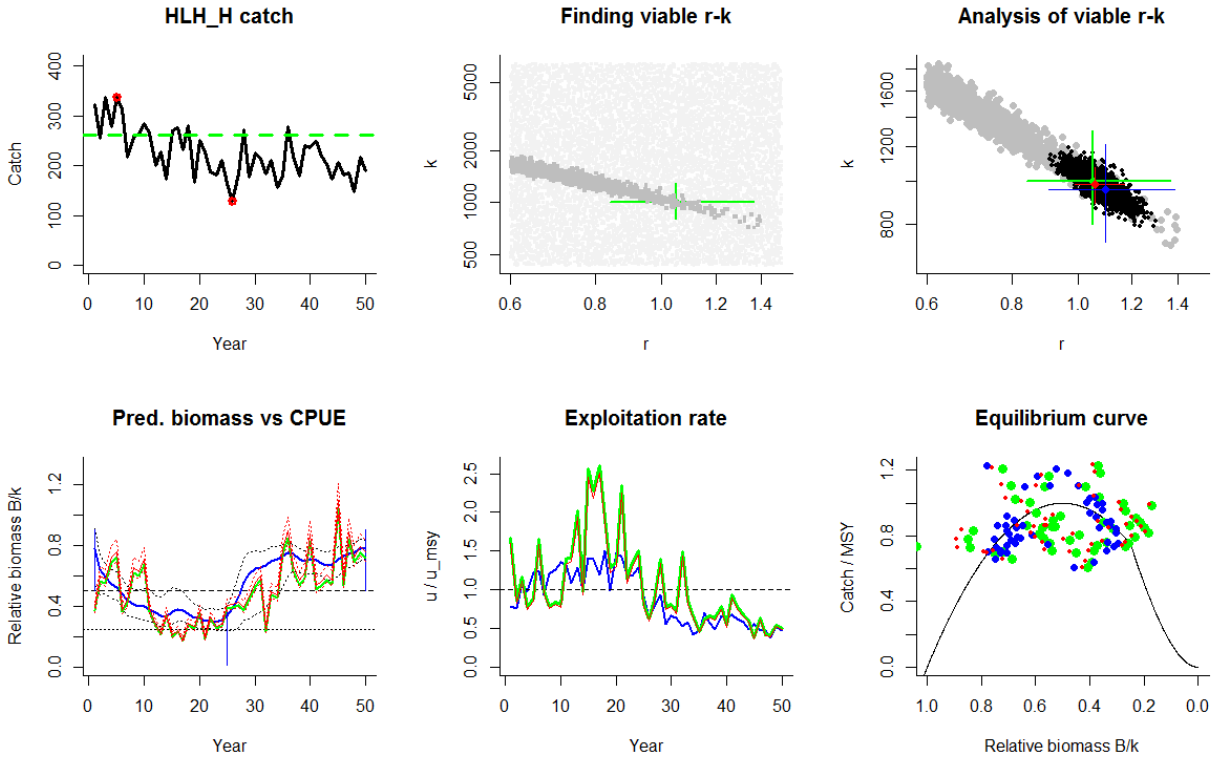

Species: NA , stock: HLH_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.05 - 0.5 , prior range for k = 403 - 24154
Prior range of q = 6.75e-06 - 4.27e-05
True values used in simulation: r = 0.24 , k = 1000 , MSY = 60, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.277 , 95% CL = 0.245 - 0.319 , k = 915 , 95% CL = 781 - 1114
MSY = 63.5 , 95% CL = 56.2 - 75.1
q = 9.97e-06 , lcl = 8.44e-06 , ucl = 1.16e-05
Biomass in last year from q*CPUE = 828 or 0.905 k
Exploitation rate in last year = 0.0475
Results of CMSY analysis with altogether 2392 viable trajectories for 800 r-k pairs
r = 0.274 , 95% CL = 0.16 - 0.478 , k = 943 , 95% CL = 490 - 1776
MSY = 64.5 , 95% CL = 53.4 - 78
Relative biomass last year= 0.82 k, 2.5th = 0.606 , 97.5th = 0.869
Relative biomass next year= 0.817 k, 2.5th = 0.619 , 97.5th = 0.863
Relative exploitation rate in last year= 0.369
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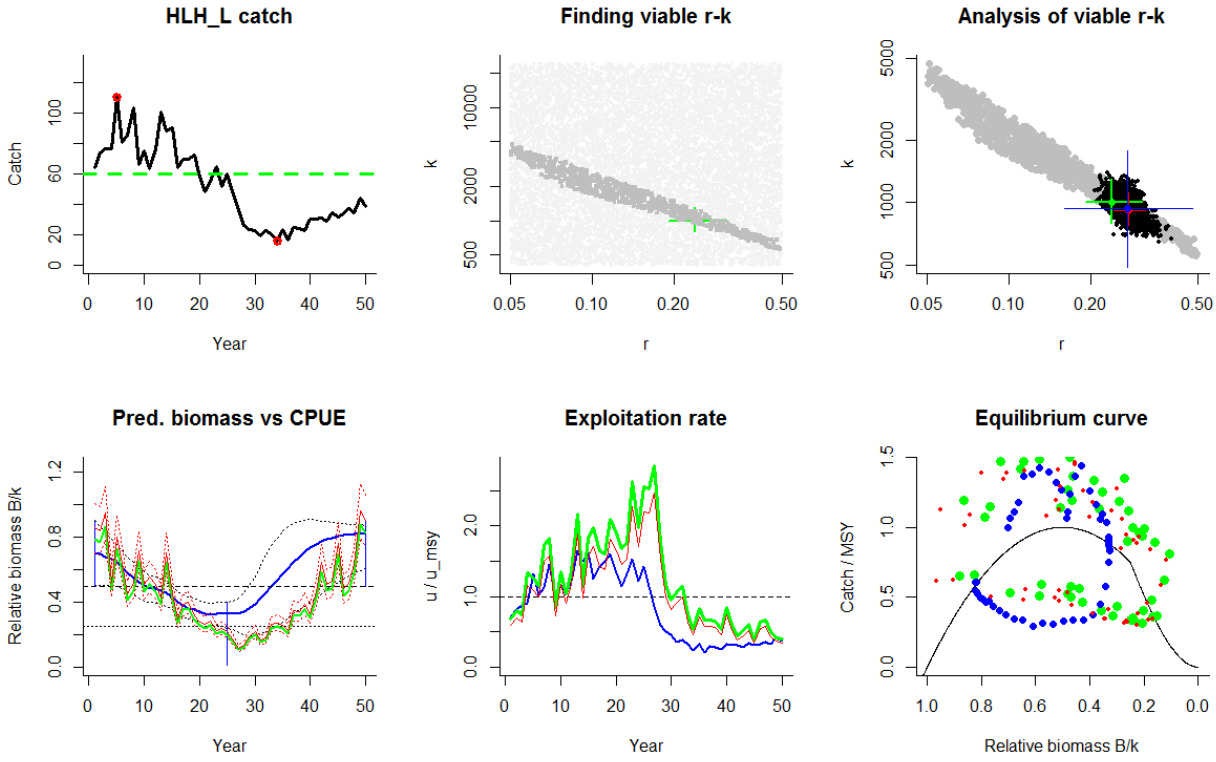

Species: NA , stock: HLH_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.2 - 0.8 , prior range for k = 301 - 7236
Prior range of q = 1.26e-05 - 5.04e-05
True values used in simulation: r = 0.32 , k = 1000 , MSY = 80, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.501 , 95% CL = 0.45 - 0.562 , k = 645 , 95% CL = 569 - 726
MSY = 80.9 , 95% CL = 75 - 87.2
q = 1.47e-05 , lcl = 1.27e-05 , ucl = 1.7e-05
Biomass in last year from q*CPUE = 547 or 0.849 k
Exploitation rate in last year = 0.106
Results of CMSY analysis with altogether 1552 viable trajectories for 559 r-k pairs
r = 0.533 , 95% CL = 0.391 - 0.781 , k = 639 , 95% CL = 411 - 924
MSY = 85.1 , 95% CL = 75.7 - 95.7
Relative biomass last year= 0.776 k, 2.5th = 0.709 , 97.5th = 0.816
Relative biomass next year= 0.774 k, 2.5th = 0.72 , 97.5th = 0.82
Relative exploitation rate in last year= 0.467
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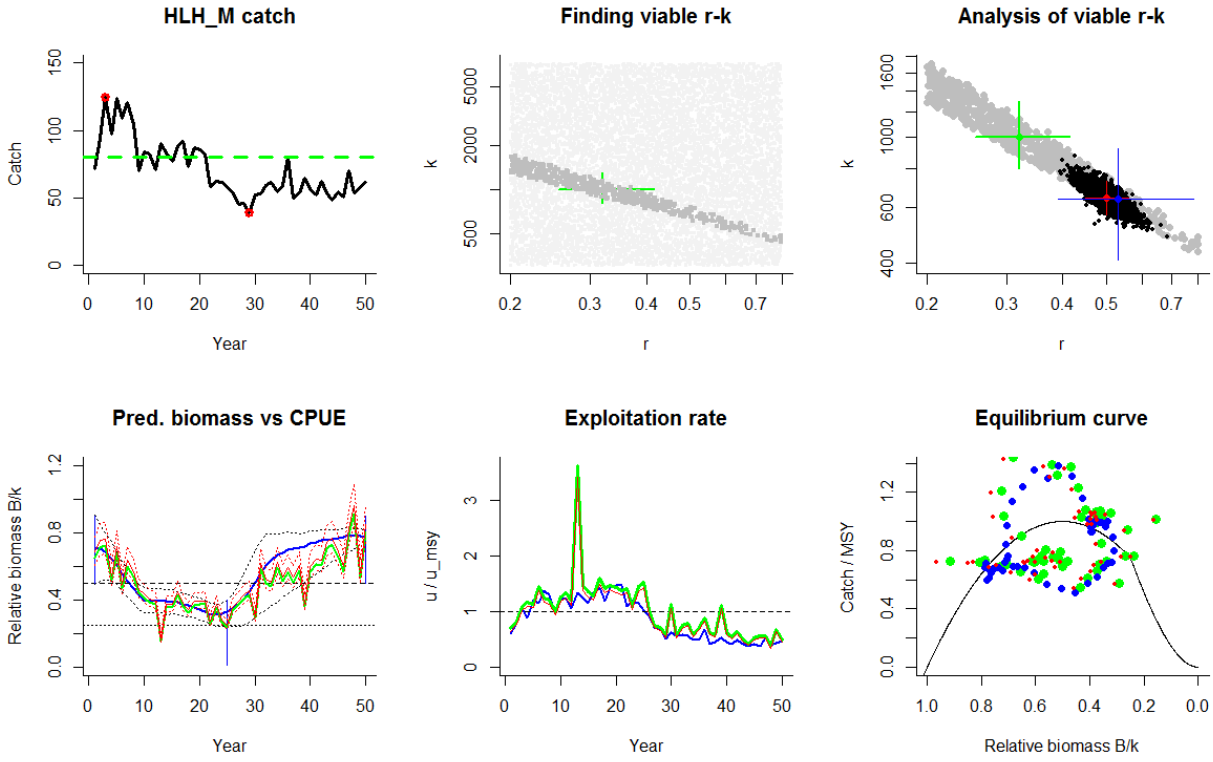

Species: NA , stock: HLH_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.015 - 0.1 , prior range for k = 821 - 65668
Prior range of q = 3.41e-05 - 0.000176
True values used in simulation: r = 0.058 , k = 1000 , MSY = 14.5, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0576 , 95% CL = 0.0229 - 0.141 , k = 3661 , 95% CL = 2350 - 6237
MSY = 53.1 , 95% CL = 19.5 - 144
q = 6.99e-05 , lcl = 4.25e-05 , ucl = 9.85e-05
Biomass in last year from q*CPUE = 105 or 0.0288 k
Exploitation rate in last year = 0.019
Results of CMSY analysis with altogether 4960 viable trajectories for 2679 r-k pairs
r = 0.0649 , 95% CL = 0.0433 - 0.0972 , k = 1342 , 95% CL = 680 - 2647
MSY = 21.8 , 95% CL = 12.7 - 37.4
Relative biomass last year= 0.649 k, 2.5th = 0.51 , 97.5th = 0.82
Relative biomass next year= 0.66 k, 2.5th = 0.523 , 97.5th = 0.832
Relative exploitation rate in last year= 0.0613
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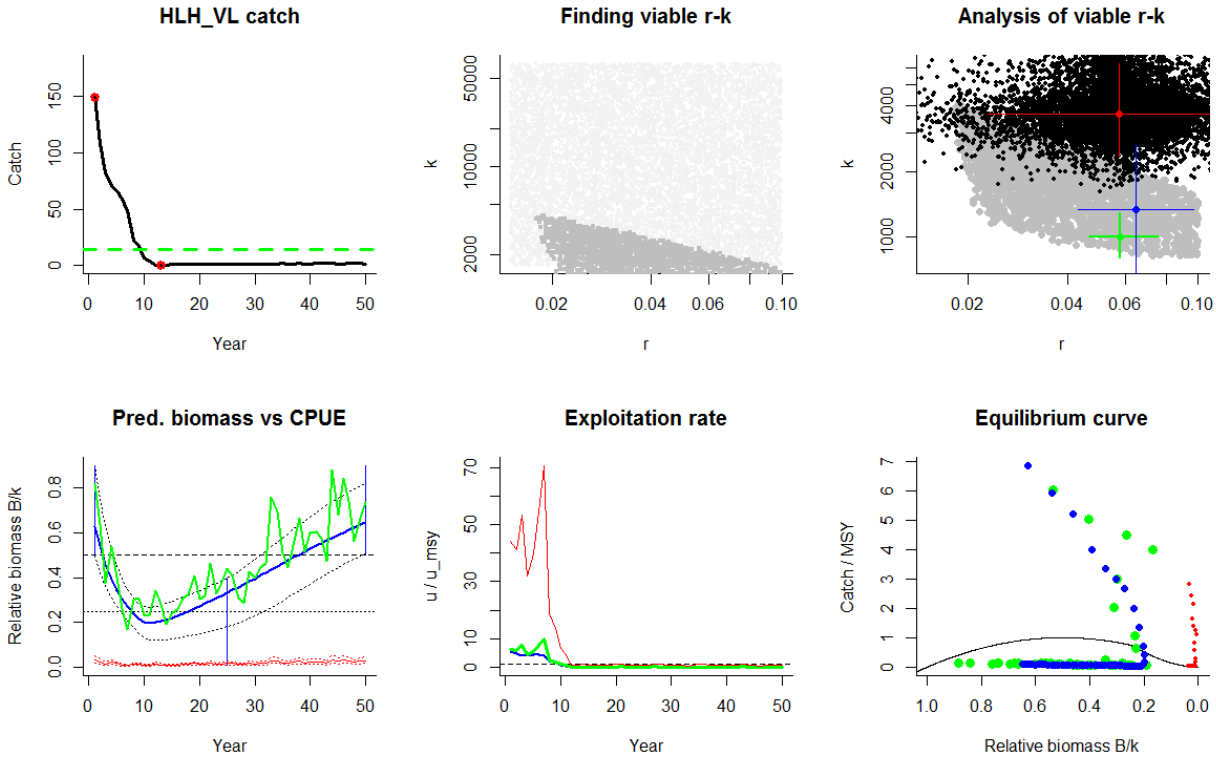

Species: NA , stock: LH_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.6 - 1.5 , prior range for k = 296 - 4438
Prior range of q = 1.13e-05 - 3.56e-05
True values used in simulation: r = 0.79 , k = 1000 , MSY = 198, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 1.06 , 95% CL = 0.997 - 1.17 , k = 753 , 95% CL = 679 - 825
MSY = 201 , 95% CL = 190 - 215
q = 1.23e-05 , lcl = 1.07e-05 , ucl = 1.41e-05
Biomass in last year from q*CPUE = 589 or 0.781 k
Exploitation rate in last year = 0.267
Results of CMSY analysis with altogether 1909 viable trajectories for 1432 r-k pairs
r = 1.19 , 95% CL = 0.962 - 1.48 , k = 660 , 95% CL = 510 - 854
MSY = 197 , 95% CL = 182 - 214
Relative biomass last year= 0.722 k, 2.5th = 0.64 , 97.5th = 0.793
Relative biomass next year= 0.722 k, 2.5th = 0.632 , 97.5th = 0.796
Relative exploitation rate in last year= 0.529
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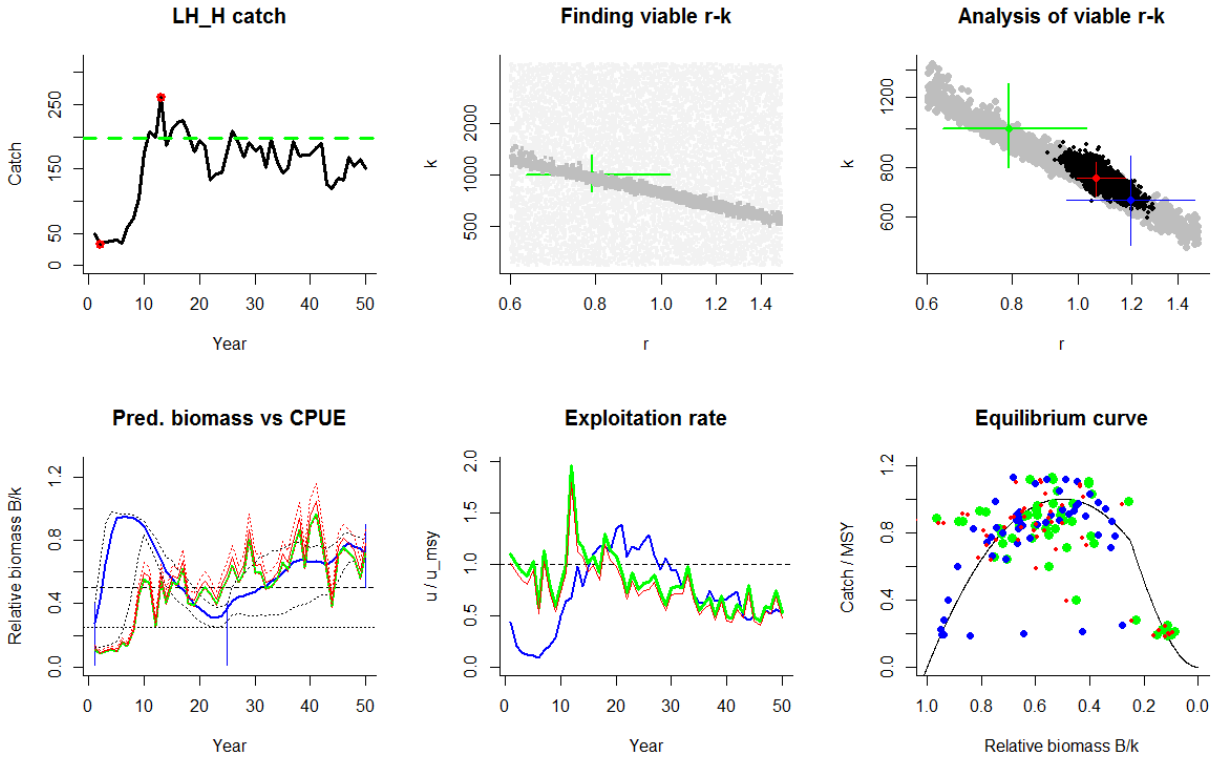
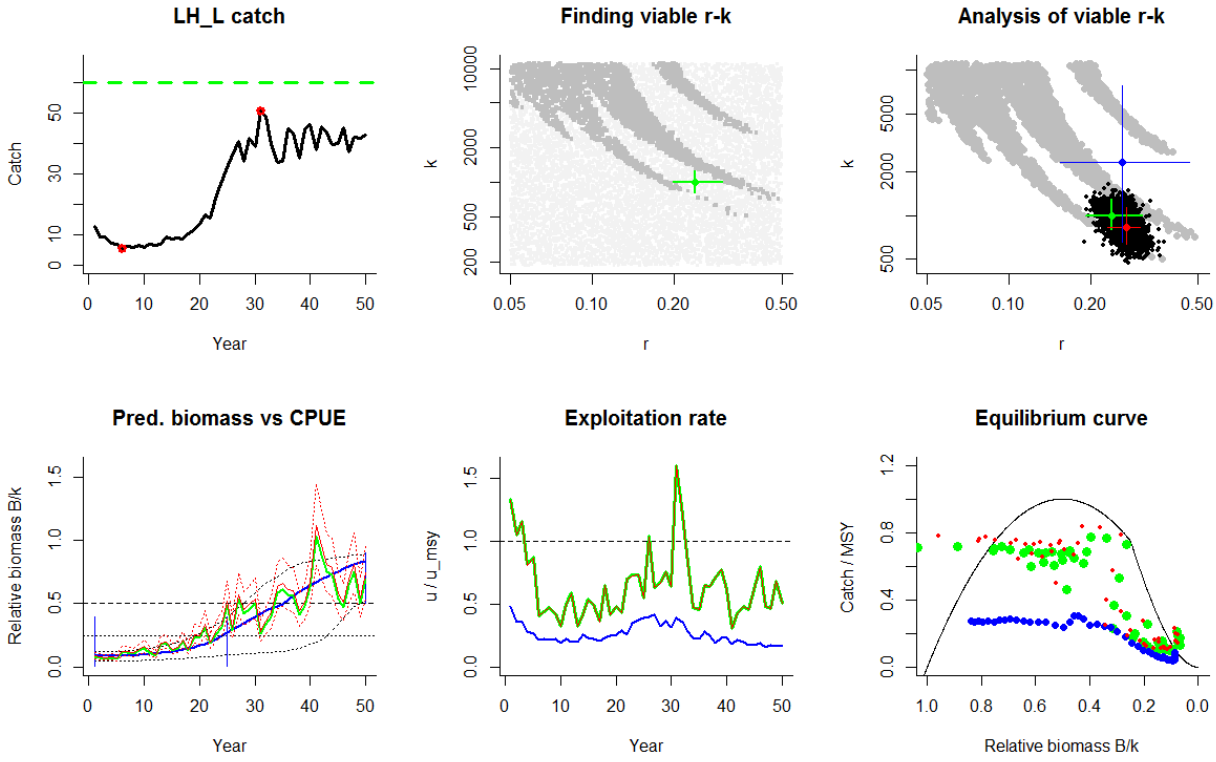
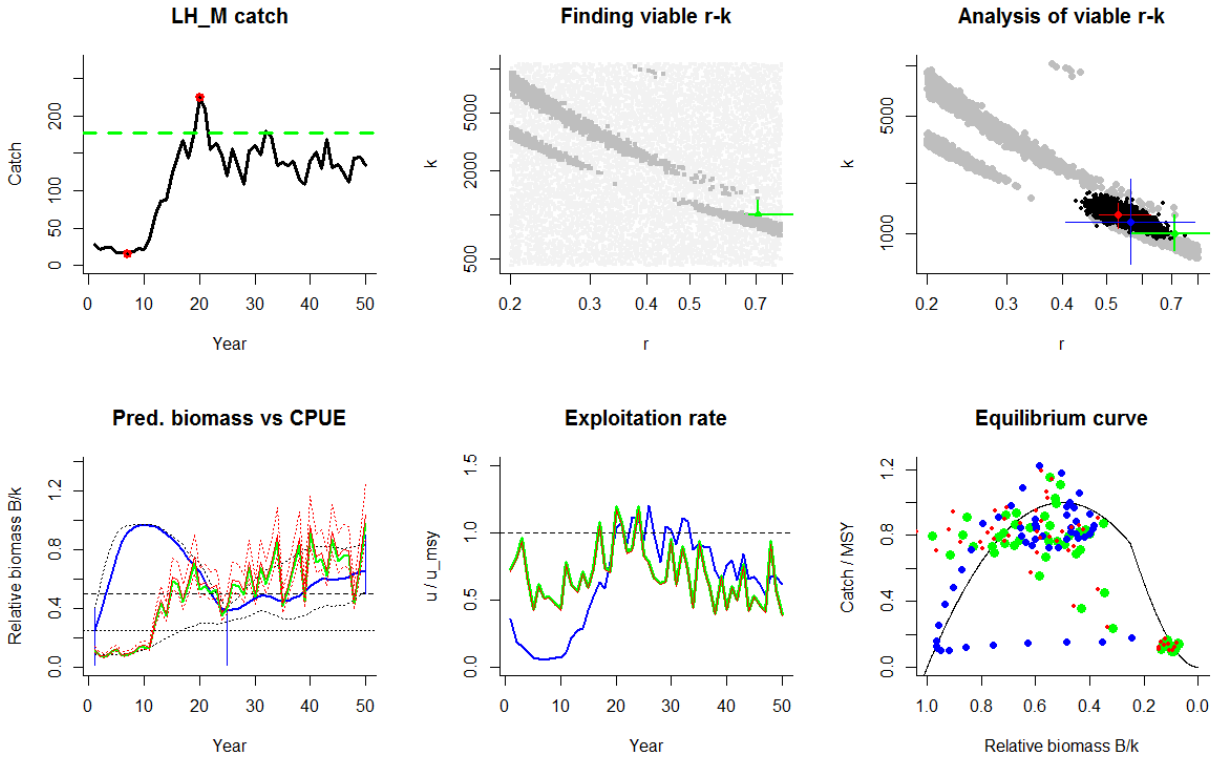


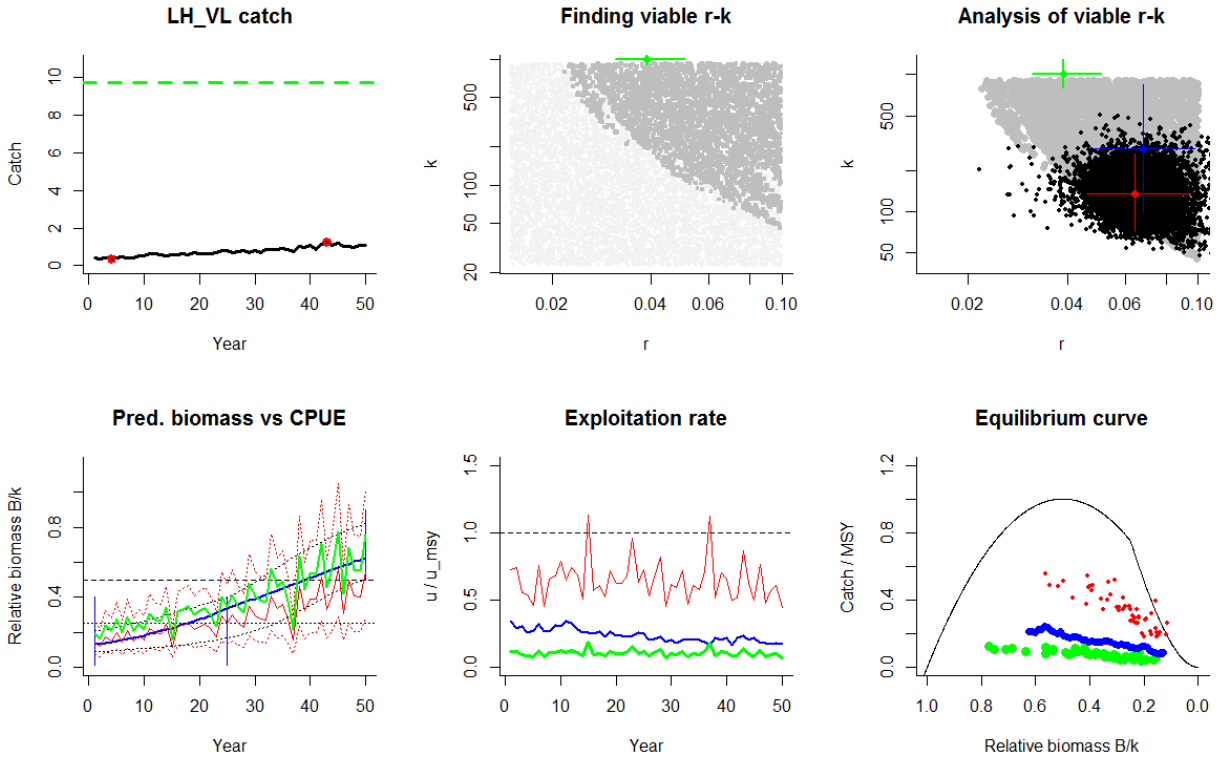
Species: NA , stock: LH_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.05 - 0.5 , prior range for k = 184 - 11070
Prior range of q = 6.56e-06 - 4.15e-05
True values used in simulation: r = 0.24 , k = 1000 , MSY = 60, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.271 , 95% CL = 0.231 - 0.305 , k = 825 , 95% CL = 635 - 1140
MSY = 55.6 , 95% CL = 44 - 73.7
q = 1.13e-05 , lcl = 8.31e-06 , ucl = 1.47e-05
Biomass in last year from q*CPUE = 617 or 0.748 k
Exploitation rate in last year = 0.0682
Results of CMSY analysis with altogether 3111 viable trajectories for 3079 r-k pairs
r = 0.262 , 95% CL = 0.155 - 0.465 , k = 2325 , 95% CL = 655 - 7830
MSY = 152 , 95% CL = 39.2 - 590
Relative biomass last year= 0.838 k, 2.5th = 0.529 , 97.5th = 0.897
Relative biomass next year= 0.845 k, 2.5th = 0.54 , 97.5th = 0.905
Relative exploitation rate in last year= 0.167
---



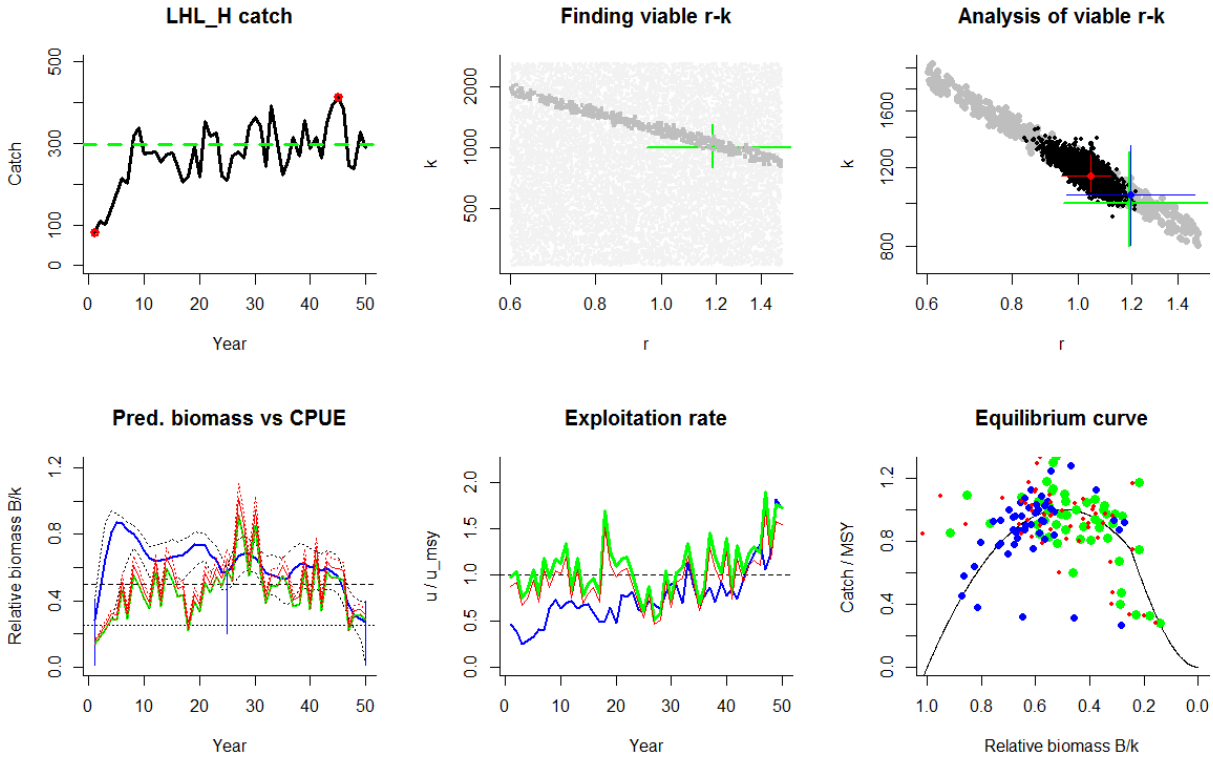
Species: NA , stock: LH_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.2 - 0.8 , prior range for k = 449 - 10787
Prior range of q = 5.46e-06 - 2.18e-05
True values used in simulation: r = 0.71 , k = 1000 , MSY = 178, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.531 , 95% CL = 0.482 - 0.628 , k = 1290 , 95% CL = 1070 - 1516
MSY = 172 , 95% CL = 156 - 194
q = 7.34e-06 , lcl = 5.89e-06 , ucl = 9.04e-06
Biomass in last year from q*CPUE = 1338 or 1.04 k
Exploitation rate in last year = 0.105
Results of CMSY analysis with altogether 2065 viable trajectories for 1674 r-k pairs
r = 0.567 , 95% CL = 0.405 - 0.785 , k = 1178 , 95% CL = 663 - 2116
MSY = 167 , 95% CL = 102 - 273
Relative biomass last year= 0.657 k, 2.5th = 0.517 , 97.5th = 0.826
Relative biomass next year= 0.651 k, 2.5th = 0.513 , 97.5th = 0.826
Relative exploitation rate in last year= 0.612
---



Species: NA , stock: LH_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.5 - 0.9
Prior range for r = 0.015 - 0.1 , prior range for k = 22.9 - 915
Prior range of q = 5.39e-05 - 0.000278
True values used in simulation: r = 0.039 , k = 1000 , MSY = 9.75, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0644 , 95% CL = 0.0459 - 0.0951 , k = 135 , 95% CL = 72.4 - 265
MSY = 2.14 , 95% CL = 1.2 - 4.76
q = 0.000102 , lcl = 7.06e-05 , ucl = 0.000146
Biomass in last year from q*CPUE = 73.9 or 0.548 k
Exploitation rate in last year = 0.014
Results of CMSY analysis with altogether 4315 viable trajectories for 3643 r-k pairs
r = 0.0682 , 95% CL = 0.0478 - 0.0974 , k = 287 , 95% CL = 98.2 - 839
MSY = 4.89 , 95% CL = 1.2 - 19.9
Relative biomass last year= 0.626 k, 2.5th = 0.505 , 97.5th = 0.822
Relative biomass next year= 0.637 k, 2.5th = 0.515 , 97.5th = 0.833
Relative exploitation rate in last year= 0.173
---



Species: NA , stock: LHL_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.6 - 1.5 , prior range for k = 261 - 2610
Prior range of q = 5.23e-06 - 1.65e-05
True values used in simulation: r = 1.19 , k = 1000 , MSY = 298, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 1.04 , 95% CL = 0.944 - 1.12 , k = 1149 , 95% CL = 1057 - 1278
MSY = 298 , 95% CL = 282 - 321
q = 7.83e-06 , lcl = 6.3e-06 , ucl = 9.49e-06
Biomass in last year from q*CPUE = 360 or 0.313 k
Exploitation rate in last year = 0.793
Results of CMSY analysis with altogether 1061 viable trajectories for 477 r-k pairs
r = 1.19 , 95% CL = 0.962 - 1.48 , k = 1039 , 95% CL = 803 - 1344
MSY = 310 , 95% CL = 286 - 336
Relative biomass last year= 0.271 k, 2.5th = 0.0214 , 97.5th = 0.394
Relative biomass next year= 0.23 k, 2.5th = -0.252 , 97.5th = 0.437
Relative exploitation rate in last year= 1.71
---



Species: NA , stock: LHL_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.05 - 0.5 , prior range for k = 263 - 10526
Prior range of q = 3.08e-06 - 1.95e-05
True values used in simulation: r = 0.33 , k = 1000 , MSY = 82.5, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.279 , 95% CL = 0.247 - 0.328 , k = 1137 , 95% CL = 957 - 1377
MSY = 80 , 95% CL = 69.5 - 93.6
q = 8.64e-06 , lcl = 7.1e-06 , ucl = 1.02e-05
Biomass in last year from q*CPUE = 137 or 0.12 k
Exploitation rate in last year = 0.295
Results of CMSY analysis with altogether 3816 viable trajectories for 2192 r-k pairs
r = 0.197 , 95% CL = 0.128 - 0.388 , k = 1596 , 95% CL = 703 - 2822
MSY = 78.5 , 95% CL = 59.4 - 104
Relative biomass last year= 0.259 k, 2.5th = 0.021 , 97.5th = 0.394
Relative biomass next year= 0.269 k, 2.5th = 0.00176 , 97.5th = 0.412
Relative exploitation rate in last year= 0.786
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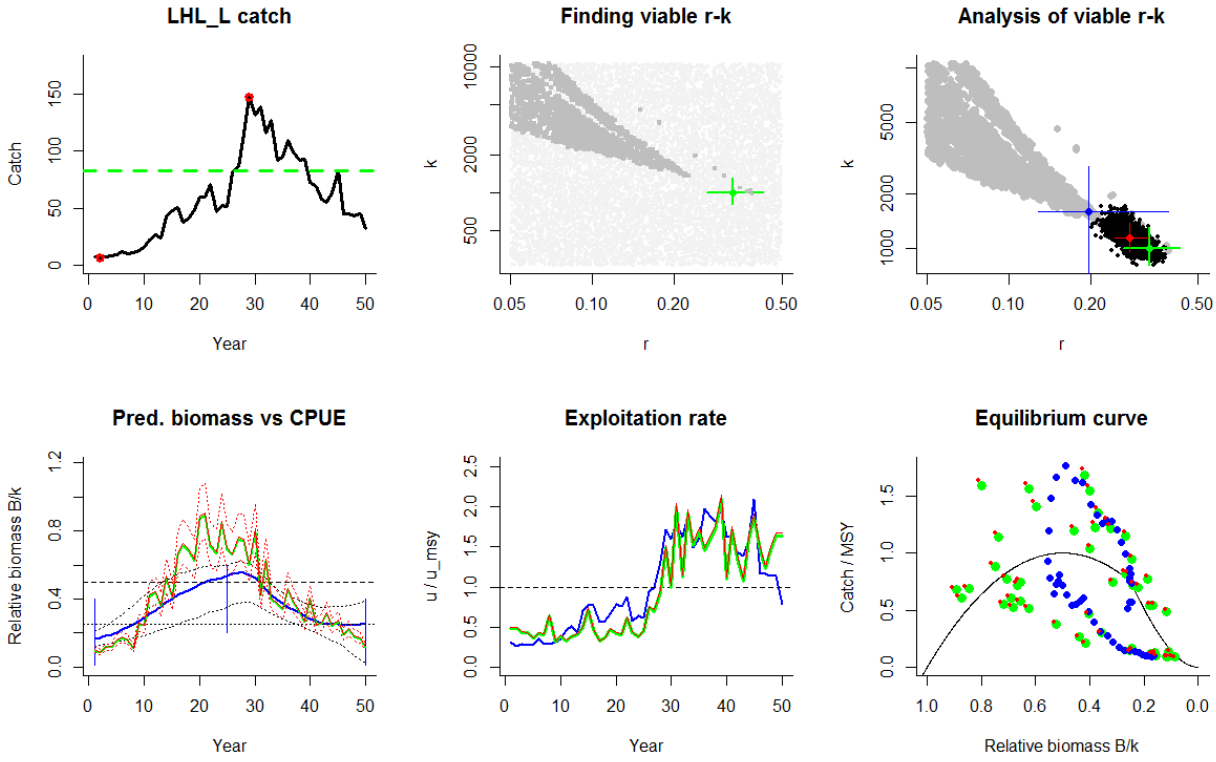

Species: NA , stock: LHL_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.2 - 0.8 , prior range for k = 236 - 3774
Prior range of q = 7.21e-06 - 2.88e-05
True values used in simulation: r = 0.52 , k = 1000 , MSY = 130, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.499 , 95% CL = 0.452 - 0.551 , k = 1033 , 95% CL = 919 - 1160
MSY = 129 , 95% CL = 119 - 140
q = 8.17e-06 , lcl = 7.12e-06 , ucl = 9.36e-06
Biomass in last year from q*CPUE = 427 or 0.413 k
Exploitation rate in last year = 0.234
Results of CMSY analysis with altogether 783 viable trajectories for 783 r-k pairs
r = 0.301 , 95% CL = 0.261 - 0.372 , k = 1652 , 95% CL = 1139 - 2238
MSY = 124 , 95% CL = 90.8 - 170
Relative biomass last year= 0.272 k, 2.5th = 0.0759 , 97.5th = 0.39
Relative biomass next year= 0.268 k, 2.5th = 0.0164 , 97.5th = 0.396
Relative exploitation rate in last year= 1.85
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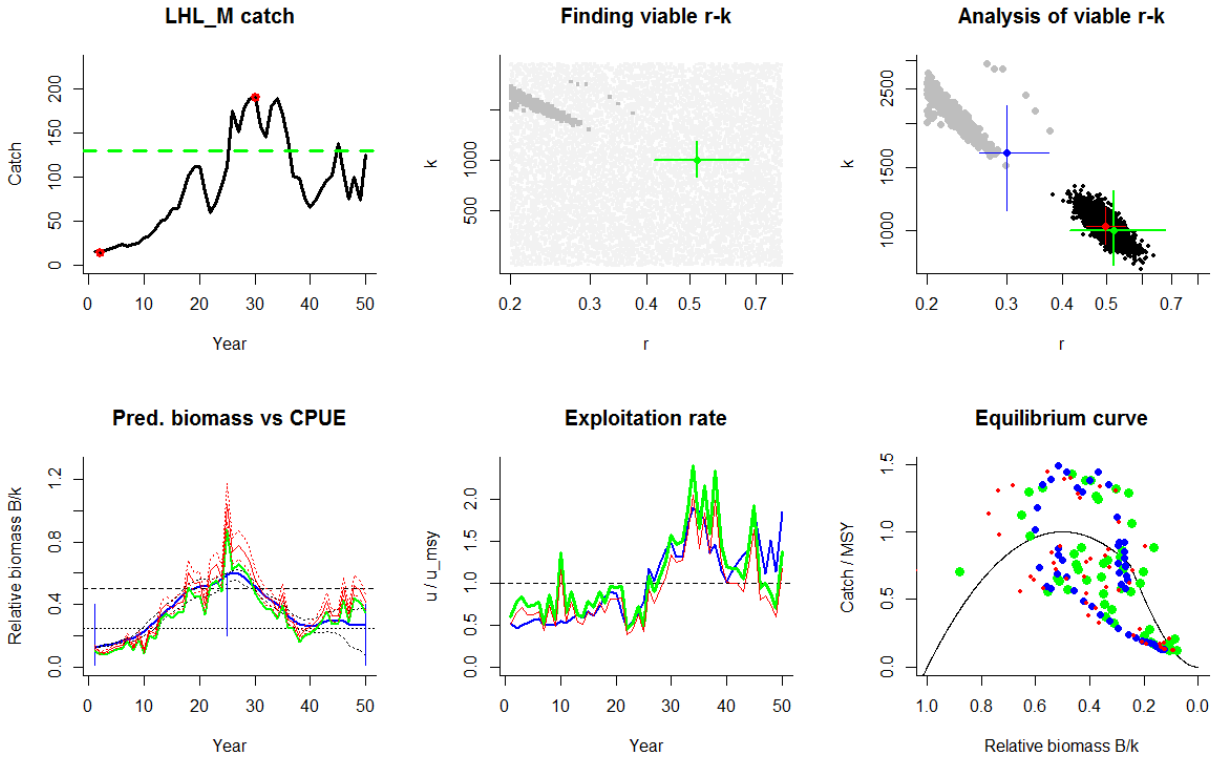

Species: NA , stock: LHL_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.2 - 0.6 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.015 - 0.1 , prior range for k = 202 - 10785
Prior range of q = 4.66e-06 - 2.41e-05
True values used in simulation: r = 0.033 , k = 1000 , MSY = 8.25, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0514 , 95% CL = 0.0252 - 0.0831 , k = 1636 , 95% CL = 562 - 6973
MSY = 18.2 , 95% CL = 6.44 - 110
q = 1.06e-05 , lcl = 7.23e-06 , ucl = 1.55e-05
Biomass in last year from q*CPUE = 298 or 0.182 k
Exploitation rate in last year = 0.143
Results of CMSY analysis with altogether 37386 viable trajectories for 12582 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 738 , 95% CL = 220 - 2482
MSY = 11.5 , 95% CL = 2.55 - 51.4
Relative biomass last year= 0.276 k, 2.5th = 0.0245 , 97.5th = 0.397
Relative biomass next year= 0.207 k, 2.5th = -0.12 , 97.5th = 0.363
Relative exploitation rate in last year= 5.81
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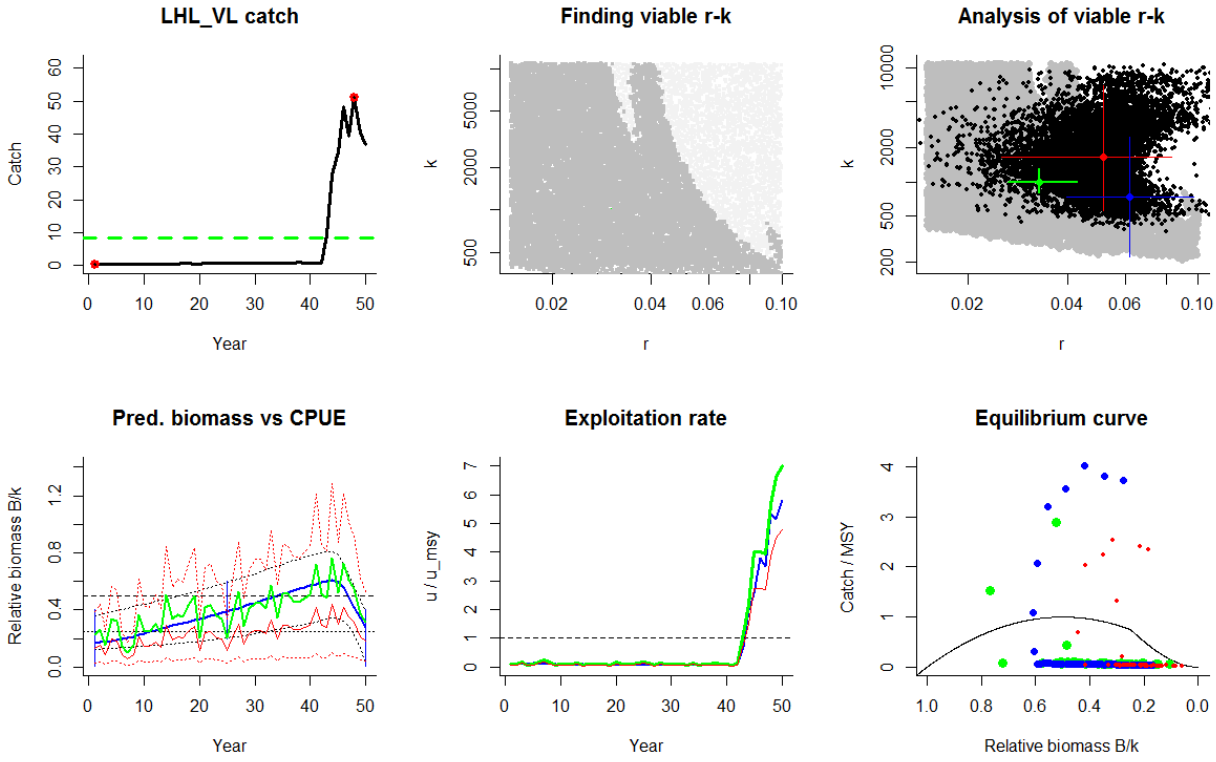

Species: NA , stock: LL_H
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.6 - 1.5 , prior range for k = 206 - 2060
Prior range of q = 8.07e-06 - 2.55e-05
True values used in simulation: r = 0.96 , k = 1000 , MSY = 240, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 1.05 , 95% CL = 0.969 - 1.14 , k = 928 , 95% CL = 808 - 1088
MSY = 244 , 95% CL = 217 - 277
q = 1.08e-05 , lcl = 8.81e-06 , ucl = 1.23e-05
Biomass in last year from q*CPUE = 227 or 0.245 k
Exploitation rate in last year = 0.745
Results of CMSY analysis with altogether 165 viable trajectories for 164 r-k pairs
r = 0.954 , 95% CL = 0.825 - 1.41 , k = 977 , 95% CL = 621 - 1197
MSY = 233 , 95% CL = 208 - 261
Relative biomass last year= 0.307 k, 2.5th = 0.0414 , 97.5th = 0.393
Relative biomass next year= 0.302 k, 2.5th = -0.167 , 97.5th = 0.584
Relative exploitation rate in last year= 1.06
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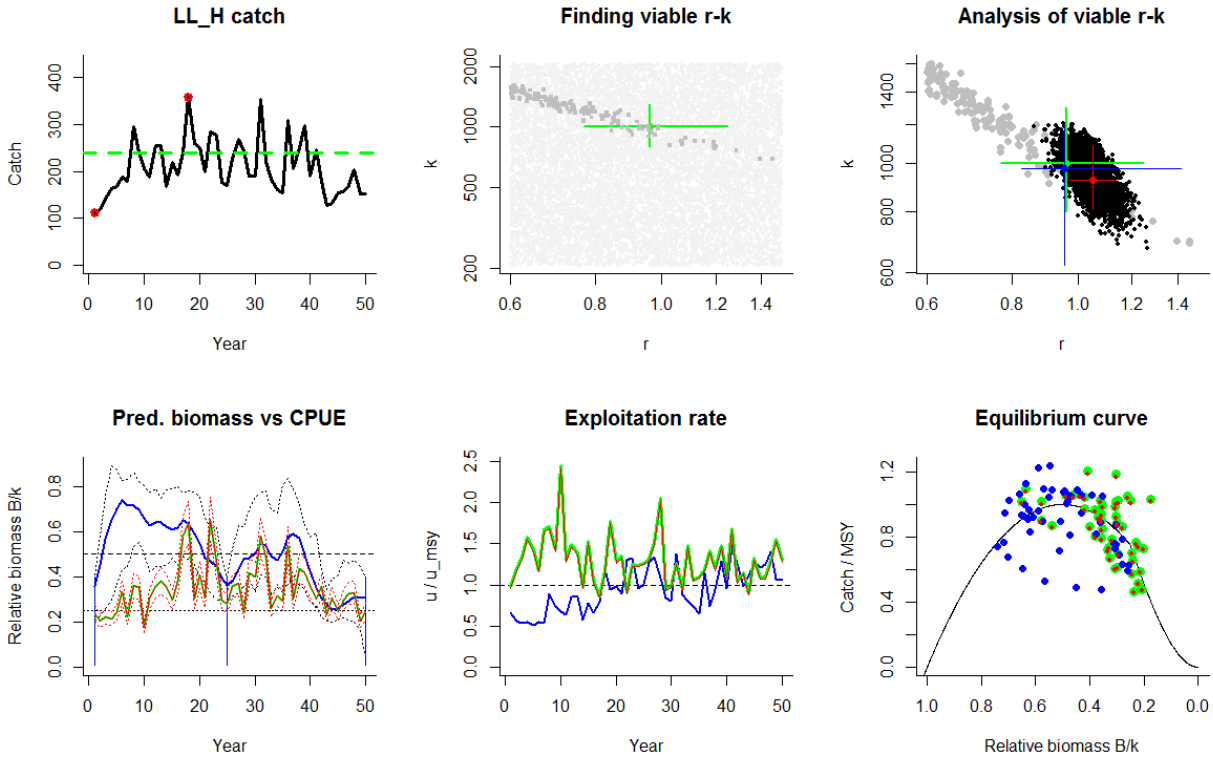
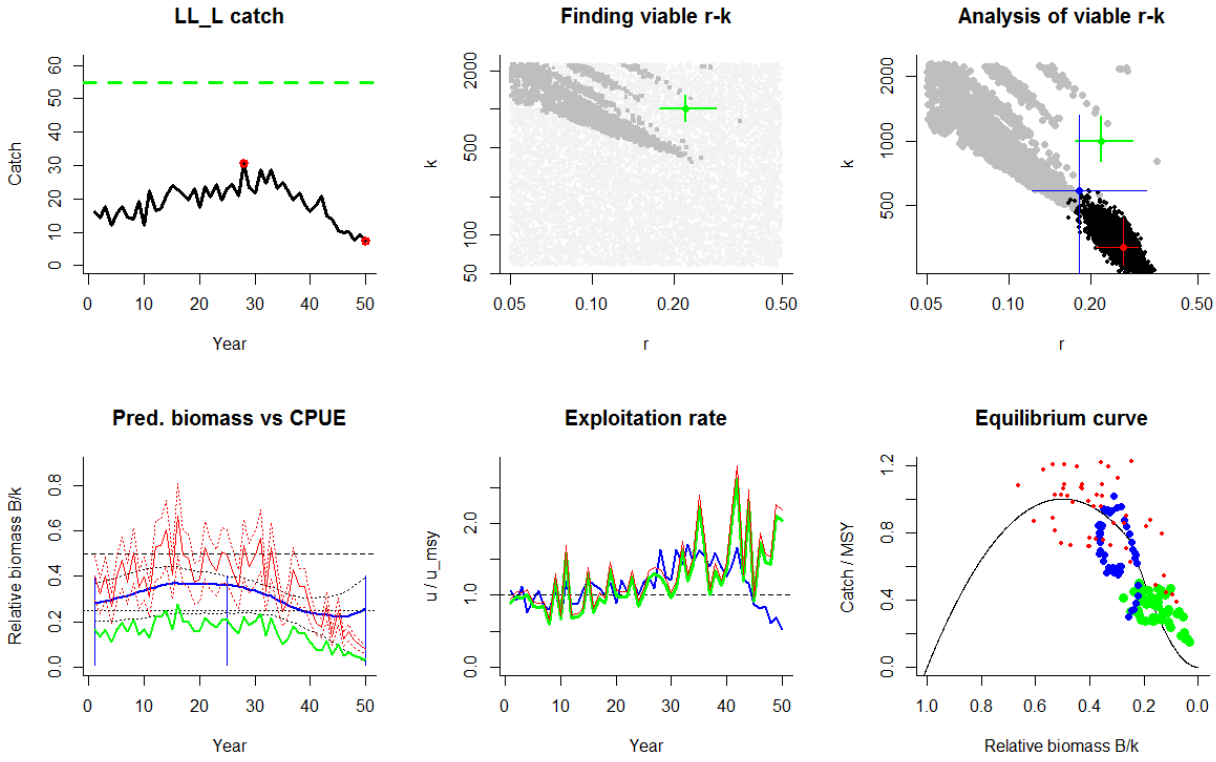


Species: NA , stock: LL_L
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.05 - 0.5 , prior range for k = 57.4 - 2298
Prior range of q = 4.05e-06 - 2.56e-05
True values used in simulation: r = 0.22 , k = 1000 , MSY = 55, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.265 , 95% CL = 0.21 - 0.3 , k = 320 , 95% CL = 263 - 435
MSY = 21 , 95% CL = 18.1 - 25.3
q = 1.3e-05 , lcl = 1.06e-05 , ucl = 1.51e-05
Biomass in last year from q*CPUE = 25.2 or 0.0789 k
Exploitation rate in last year = 0.32
Results of CMSY analysis with altogether 2410 viable trajectories for 1725 r-k pairs
r = 0.183 , 95% CL = 0.122 - 0.323 , k = 589 , 95% CL = 222 - 1325
MSY = 26.9 , 95% CL = 12.1 - 59.7
Relative biomass last year= 0.257 k, 2.5th = 0.0212 , 97.5th = 0.396
Relative biomass next year= 0.273 k, 2.5th = 0.00898 , 97.5th = 0.419
Relative exploitation rate in last year= 0.531
---



Species: NA , stock: LL_M
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.2 - 0.8 , prior range for k = 240 - 3837
Prior range of q = 5.03e-06 - 2.01e-05
True values used in simulation: r = 0.6 , k = 1000 , MSY = 150, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.492 , 95% CL = 0.423 - 0.542 , k = 1096 , 95% CL = 939 - 1383
MSY = 134 , 95% CL = 120 - 160
q = 6.43e-06 , lcl = 5.01e-06 , ucl = 7.91e-06
Biomass in last year from q*CPUE = 400 or 0.365 k
Exploitation rate in last year = 0.275
Results of CMSY analysis with altogether 1741 viable trajectories for 1566 r-k pairs
r = 0.557 , 95% CL = 0.403 - 0.78 , k = 958 , 95% CL = 662 - 1368
MSY = 133 , 95% CL = 125 - 142
Relative biomass last year= 0.323 k, 2.5th = 0.0408 , 97.5th = 0.396
Relative biomass next year= 0.331 k, 2.5th = -0.0627 , 97.5th = 0.423
Relative exploitation rate in last year= 1.37
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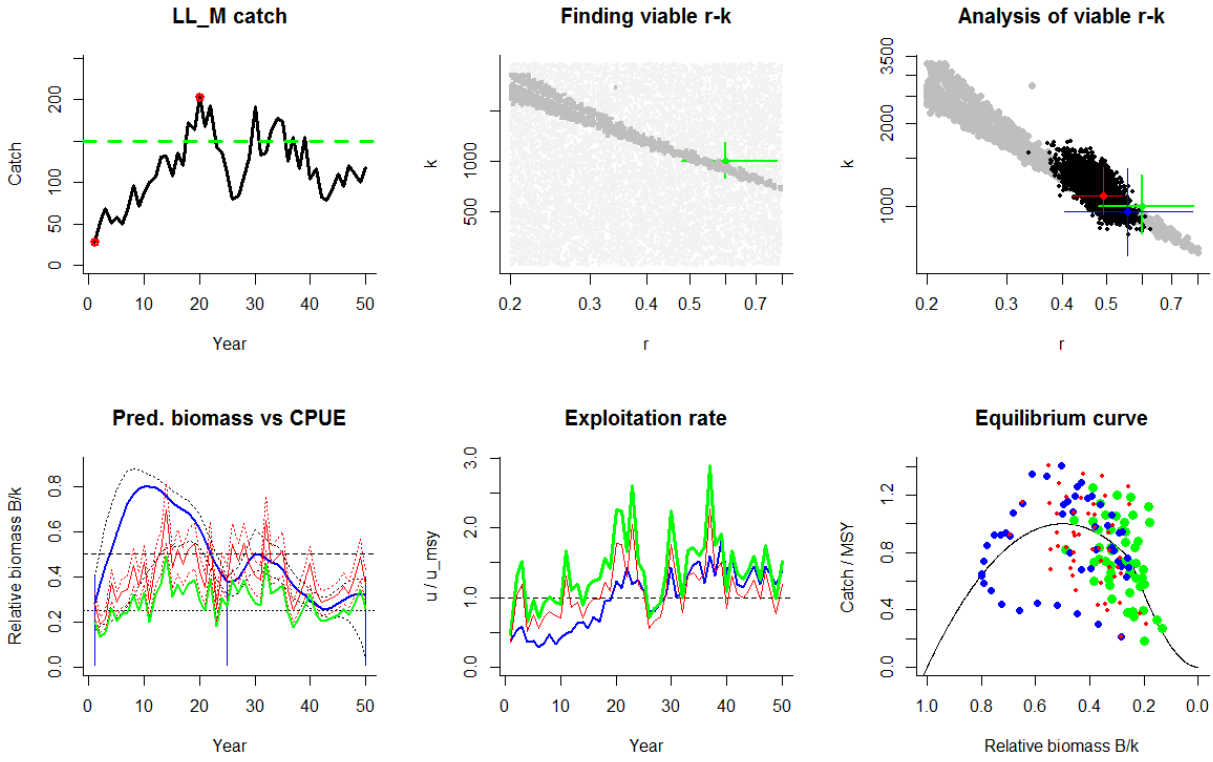
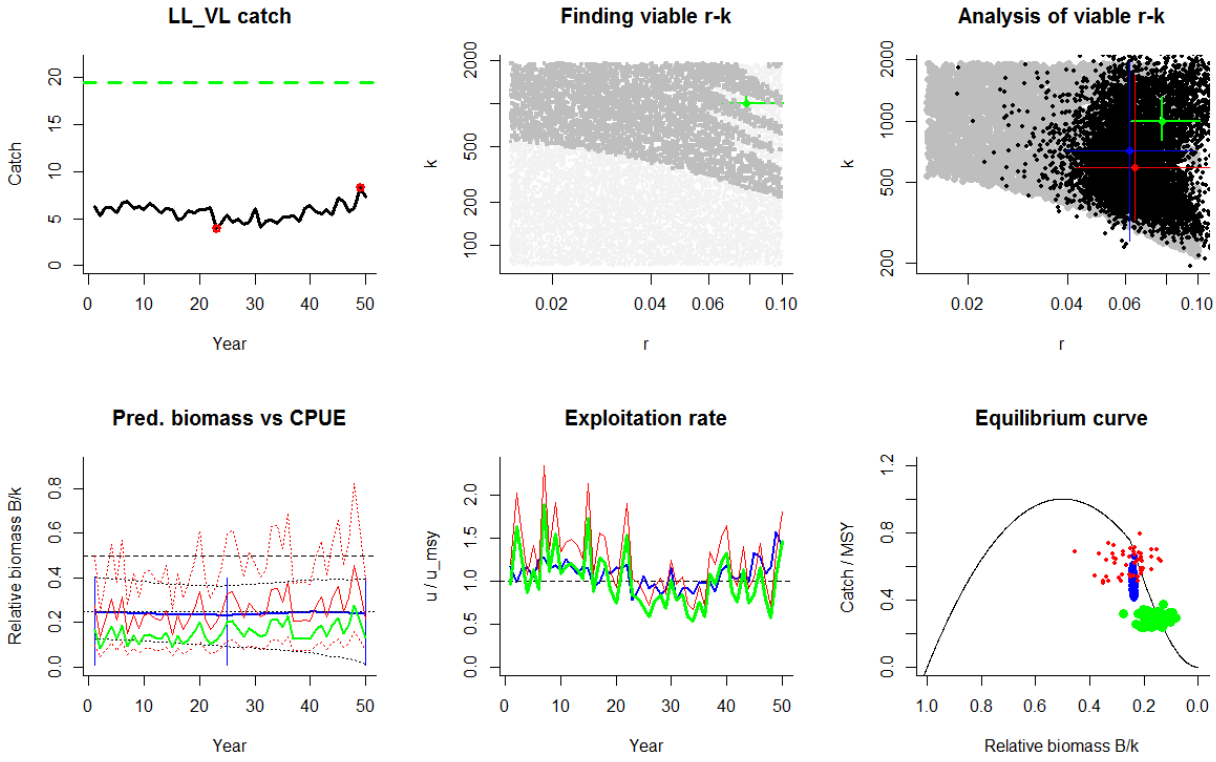
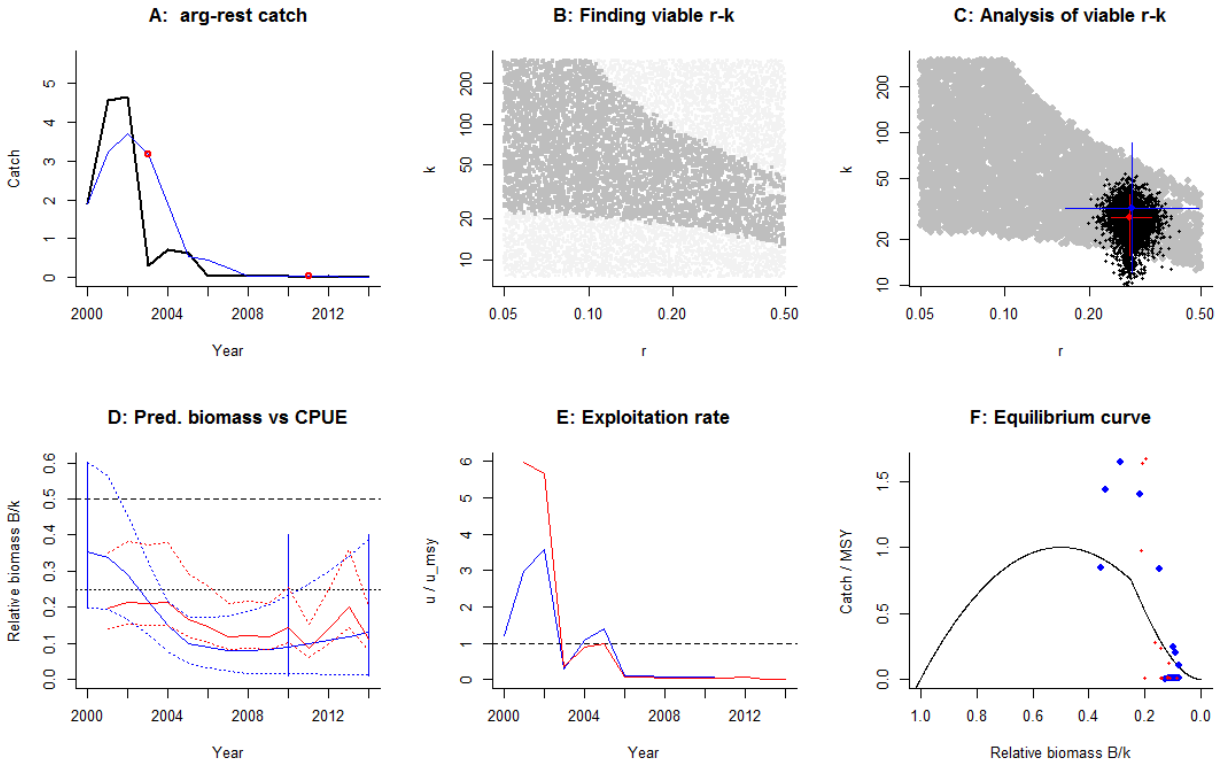


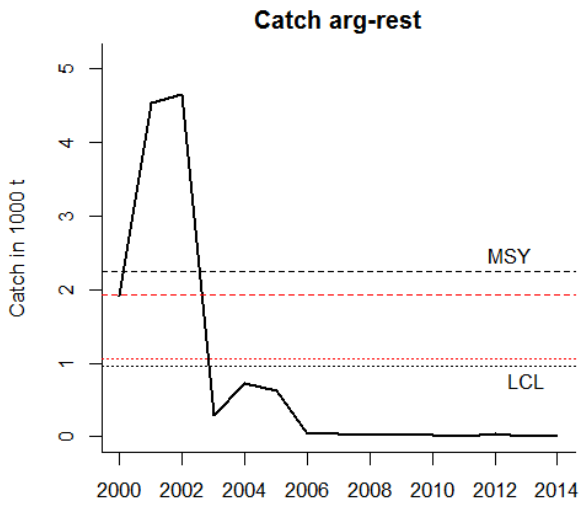
Species: NA , stock: LL_VL
Name and region: NA , NA
Catch data used from years 1 - 50 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.01 - 0.4
Prior range for r = 0.015 - 0.1 , prior range for k = 71.5 - 1908
Prior range of q = 5.56e-06 - 2.87e-05
True values used in simulation: r = 0.078 , k = 1000 , MSY = 19.5, q = 1.0e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0644 , 95% CL = 0.0426 - 0.117 , k = 592 , 95% CL = 327 - 1681
MSY = 9.12 , 95% CL = 5.38 - 41.2
q = 1.02e-05 , lcl = 7.36e-06 , ucl = 1.41e-05
Biomass in last year from q*CPUE = 127 or 0.214 k
Exploitation rate in last year = 0.0572
Results of CMSY analysis with altogether 10827 viable trajectories for 4203 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 710 , 95% CL = 258 - 1958
MSY = 11 , 95% CL = 3.62 - 33.5
Relative biomass last year= 0.239 k, 2.5th = 0.0157 , 97.5th = 0.396
Relative biomass next year= 0.234 k, 2.5th = 0.00577 , 97.5th = 0.399
Relative exploitation rate in last year= 1.4
---

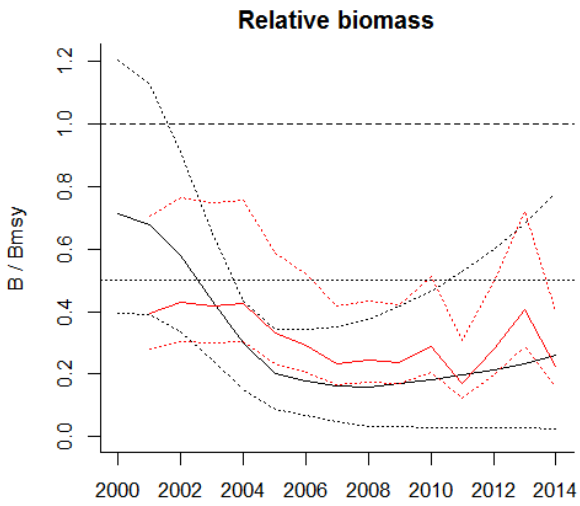


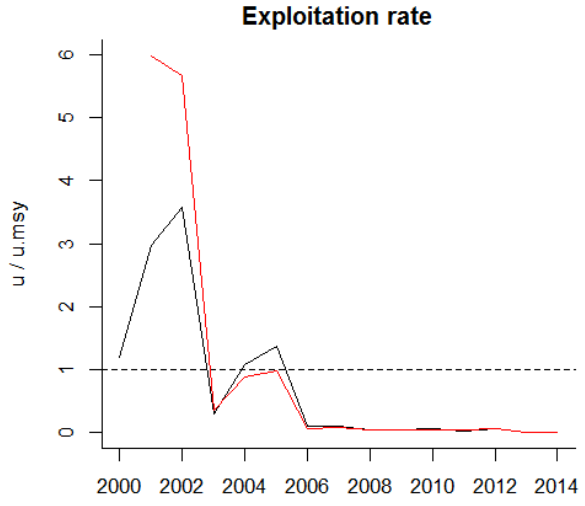
# Appendix IV. Data-limited stocks with catch or landings and CPUE

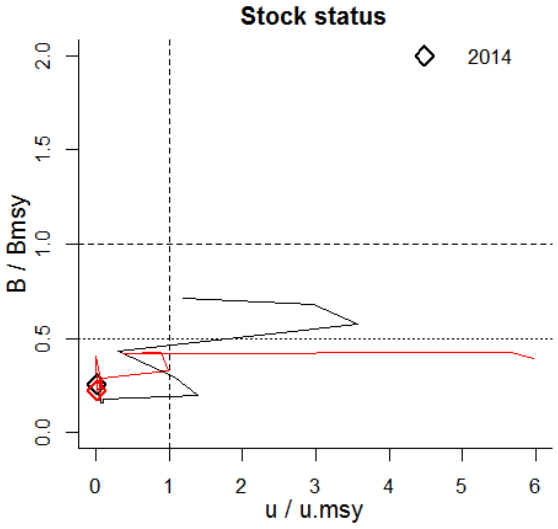
[CMSY_46e.R, AllStocks_Catch16.csv, AllStocks_ID20.csv]
Species: *Argentina silus* , stock: arg-rest
Name and region: "Greater silver smelt in Subareas VII-X, XII, and Division VIb (other areas)" , ICES
Catch data used from years 2000 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 7.41 - 296
Prior range of q = 0.0253 - 0.16
Results from Bayesian Schaefer model using catch & CPUE
r = 0.277 , 95% CL = 0.24 - 0.333 , k = 27.8 , 95% CL = 15.6 - 39.1
MSY = 1.94 , 95% CL = 1.06 - 2.77
q = 0.0242 , lcl = 0.0184 , ucl = 0.0337
Biomass in last year from q*CPUE = 3.14 or 0.113 k
Exploitation rate in last year = 0.00404
Results of CMSY analysis with altogether 14506 viable trajectories for 5080 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 32 , 95% CL = 12 - 85
MSY = 2.25 , 95% CL = 0.966 - 5.26
Relative biomass last year= 0.13 k, 2.5th = 0.0132 , 97.5th = 0.39
Relative biomass next year= 0.146 k, 2.5th = 0.0129 , 97.5th = 0.45
Relative exploitation rate in last year= 0.00171
Comment: CPUE from Porcupine bank survey. Start year set to 2000.
---



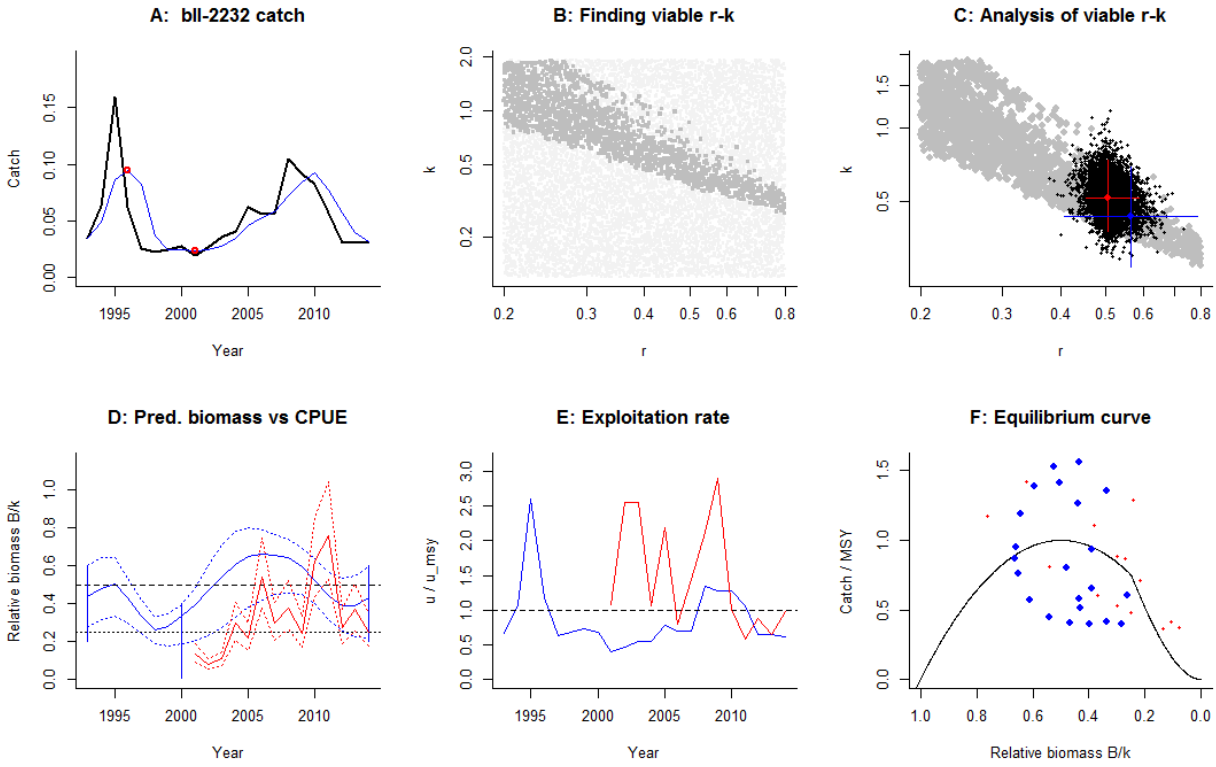

Catch arg-rest
Catch in 1000 t
MSY
LCL
0
1
2
3
4
5
2000
2002
2004
2006
2008
2010
2012
2014

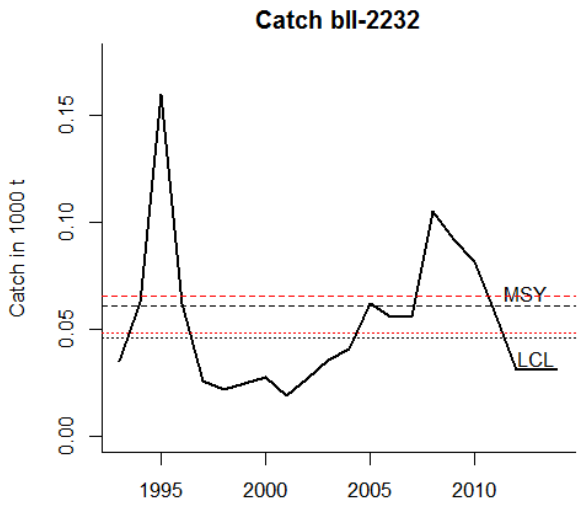

Relative biomass
B / Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
2000
2002
2004
2006
2008
2010
2012
2014

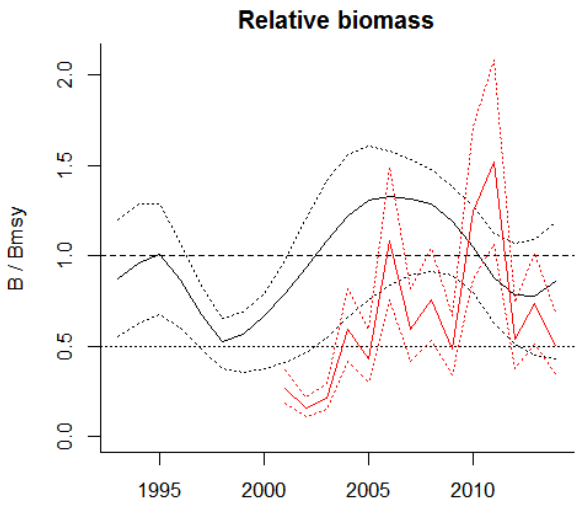

Exploitation rate
u / u.msy
0
1
2
3
4
5
6
2000
2002
2004
2006
2008
2010
2012
2014

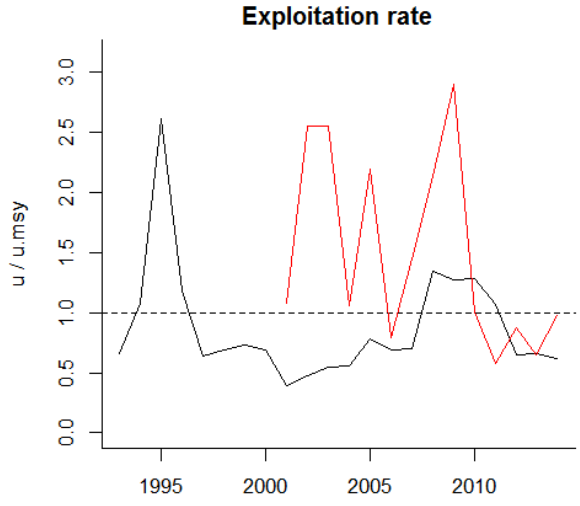

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
5
6
u / u.msy

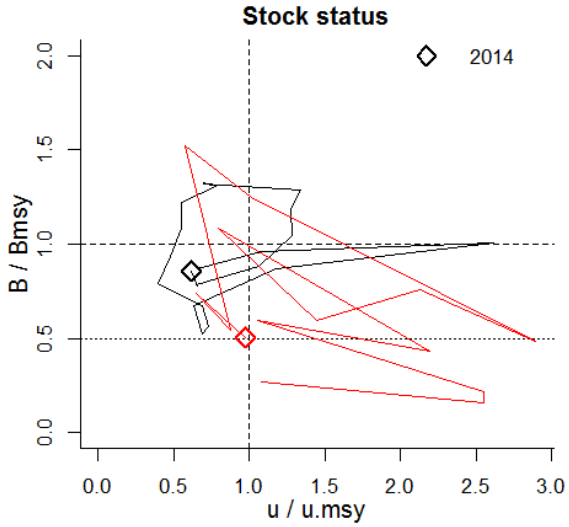
Species: *Scophthalmus rhombus* , stock: bll-2232
Name and region: Brill in Subdivisions 22–32 (Baltic Sea) , ICES
Catch data used from years 1993 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2000 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.119 - 1.9
Prior range of q = 0.00486 - 0.0195
Results from Bayesian Schaefer model using catch & CPUE
r = 0.505 , 95% CL = 0.453 - 0.589 , k = 0.516 , 95% CL = 0.376 - 0.738
MSY = 0.0655 , 95% CL = 0.0482 - 0.0931
q = 0.00714 , lcl = 0.00513 , ucl = 0.0102
Biomass in last year from q*CPUE = 0.13 or 0.252 k
Exploitation rate in last year = 0.241
Results of CMSY analysis with altogether 4576 viable trajectories for 2070 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 0.43 , 95% CL = 0.269 - 0.689
MSY = 0.0609 , 95% CL = 0.046 - 0.0805
Relative biomass last year= 0.429 k, 2.5th = 0.217 , 97.5th = 0.592
Relative biomass next year= 0.489 k, 2.5th = 0.216 , 97.5th = 0.667
Relative exploitation rate in last year= 0.614
Comment: Start year set to 1993.
---



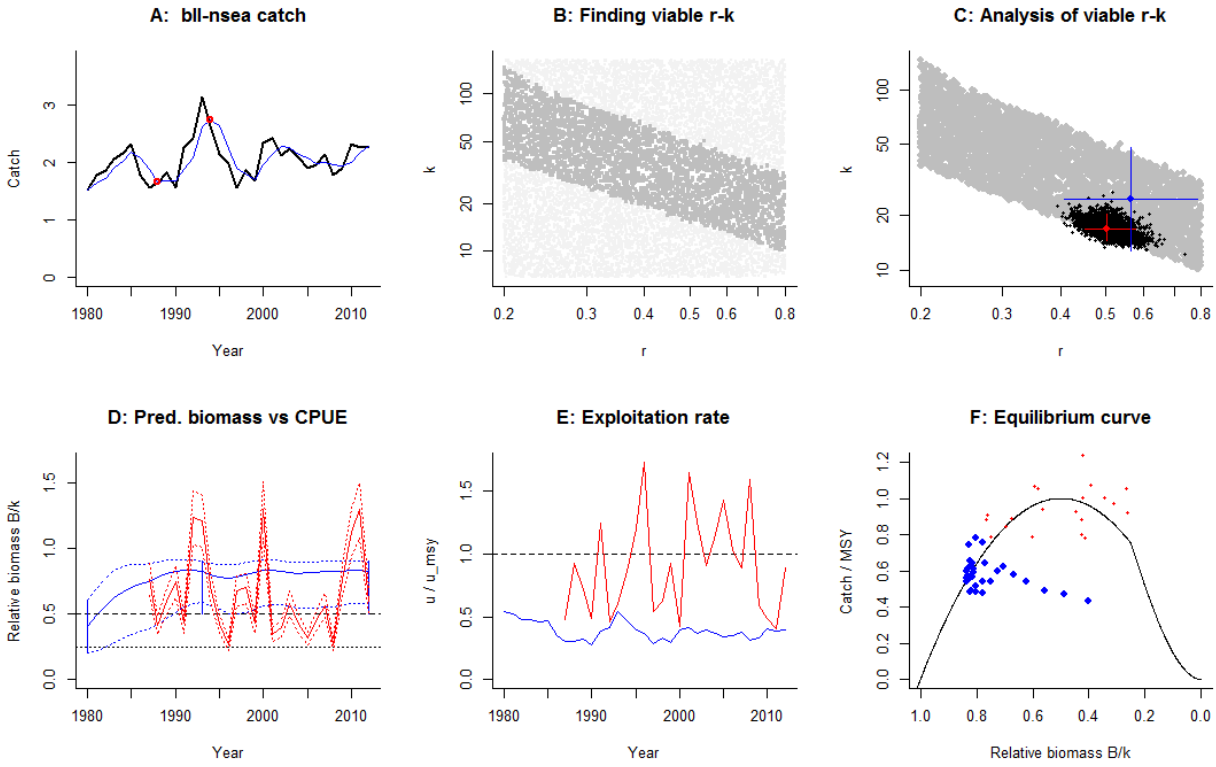

Catch bll-2232
Catch in 1000 t
0.00
0.05
0.10
0.15
MSY
LCL
1995
2000
2005
2010

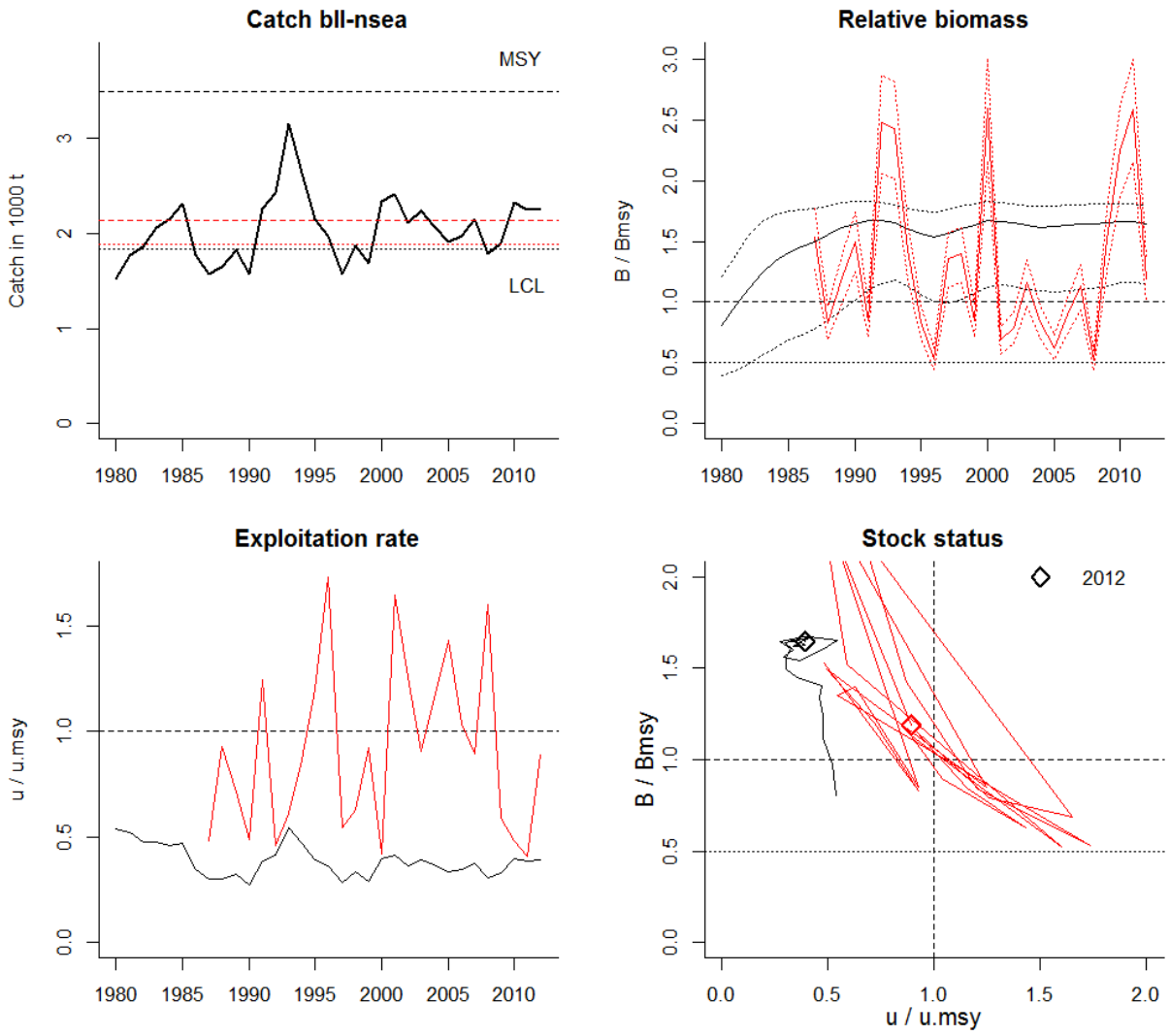

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
1995
2000
2005
2010


Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1995
2000
2005
2010

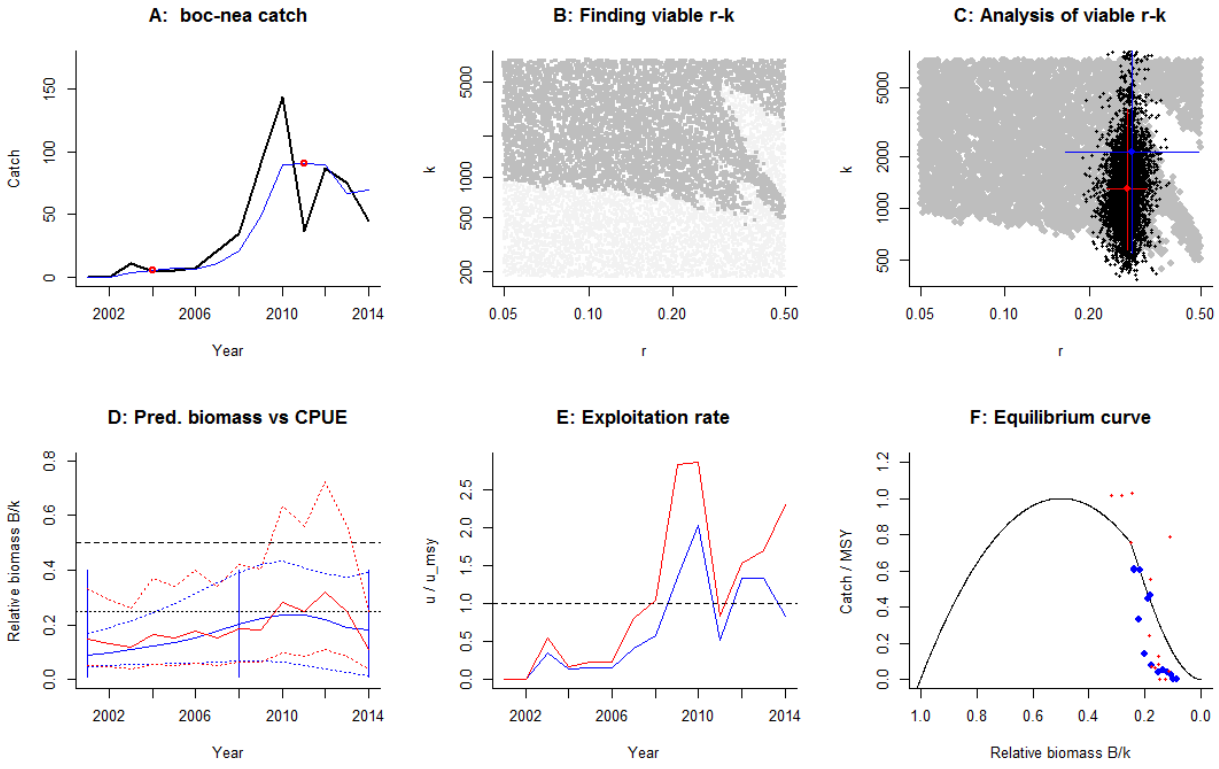

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
u / u.msy

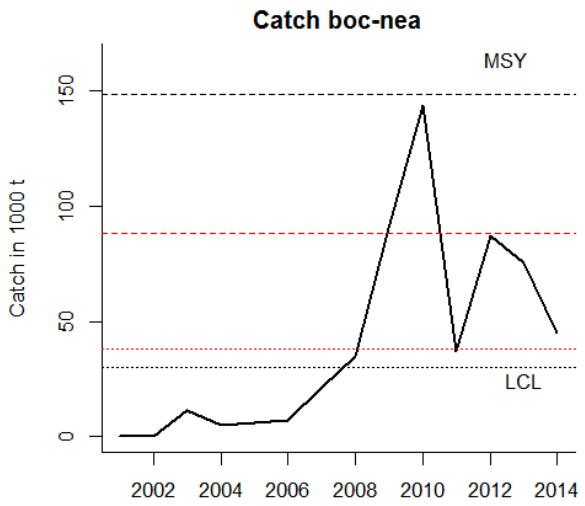
Species: *Scophthalmus rhombus* , stock: bll-nsea
Name and region: Brill in Subarea IV, Divisions IIIa and VIId,e , ICES
Catch data used from years 1980 - 2012 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1993 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 6.82 - 164
Prior range of q = 7.27e-05 - 0.000291
Results from Bayesian Schaefer model using catch & CPUE
r = 0.502 , 95% CL = 0.449 - 0.577 , k = 16.9 , 95% CL = 14.6 - 20.3
MSY = 2.13 , 95% CL = 1.88 - 2.56
q = 0.000115 , lcl = 8.73e-05 , ucl = 0.000148
Biomass in last year from q*CPUE = 10.1 or 0.595 k
Exploitation rate in last year = 0.226
Results of CMSY analysis with altogether 32259 viable trajectories for 3624 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 24.7 , 95% CL = 12.8 - 47.6
MSY = 3.49 , 95% CL = 1.83 - 6.66
Relative biomass last year= 0.822 k, 2.5th = 0.577 , 97.5th = 0.896
Relative biomass next year= 0.813 k, 2.5th = 0.562 , 97.5th = 0.894
Relative exploitation rate in last year= 0.393
Comment: Start year set to 1980.
---

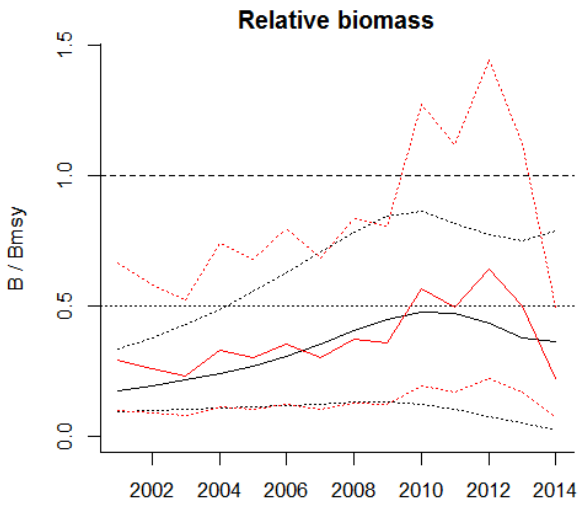


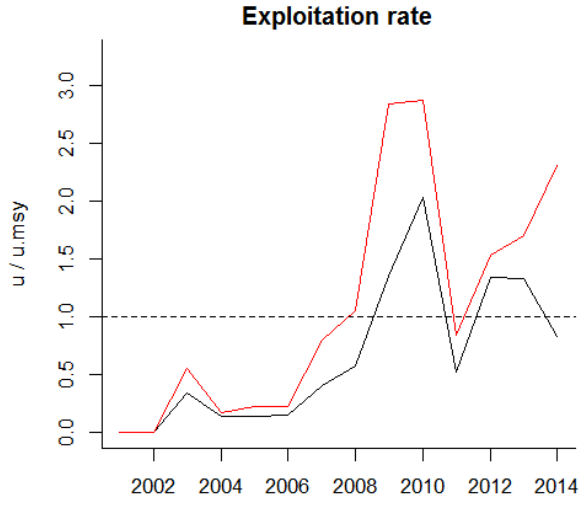

Catch bll-nsea
MSY
LCL
Catch in 1000 t
0
1
2
3
1980
1985
1990
1995
2000
2005
2010
Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Exploitation rate
u / u.msy
Stock status
2012
B / Bmsy
u / u.msy

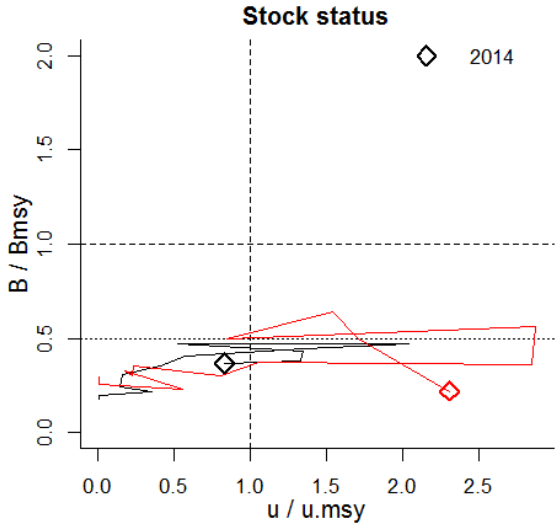
Species*: Capros aper* , stock: boc-nea
Boarfish in Subareas VI–VIII (Celtic Seas and the English Channel, Bay of Biscay)
Catch data used from years 2001 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.01 - 0.4 expert
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2008 expert
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 181 - 7240
Prior range of q = 1.99e-06 - 1.26e-05
Results from Bayesian Schaefer model using catch & CPUE
r = 0.274 , 95% CL = 0.231 - 0.319 , k = 1296 , 95% CL = 576 - 3752
MSY = 88.2 , 95% CL = 38 - 264
q = 4.42e-06 , lcl = 3e-06 , ucl = 6.07e-06
Biomass in last year from q*CPUE = 143 or 0.111 k
Exploitation rate in last year = 0.483
Results of CMSY analysis with altogether 13239 viable trajectories for 5451 r-k pairs
r = 0.282 , 95% CL = 0.163 - 0.487 , k = 2110 , 95% CL = 543 - 8201
MSY = 149 , 95% CL = 30.4 - 730
Relative biomass last year= 0.183 k, 2.5th = 0.0127 , 97.5th = 0.393
Relative biomass next year= 0.172 k, 2.5th = -0.0483 , 97.5th = 0.429
Relative exploitation rate in last year= 0.831
Comment: OK
---



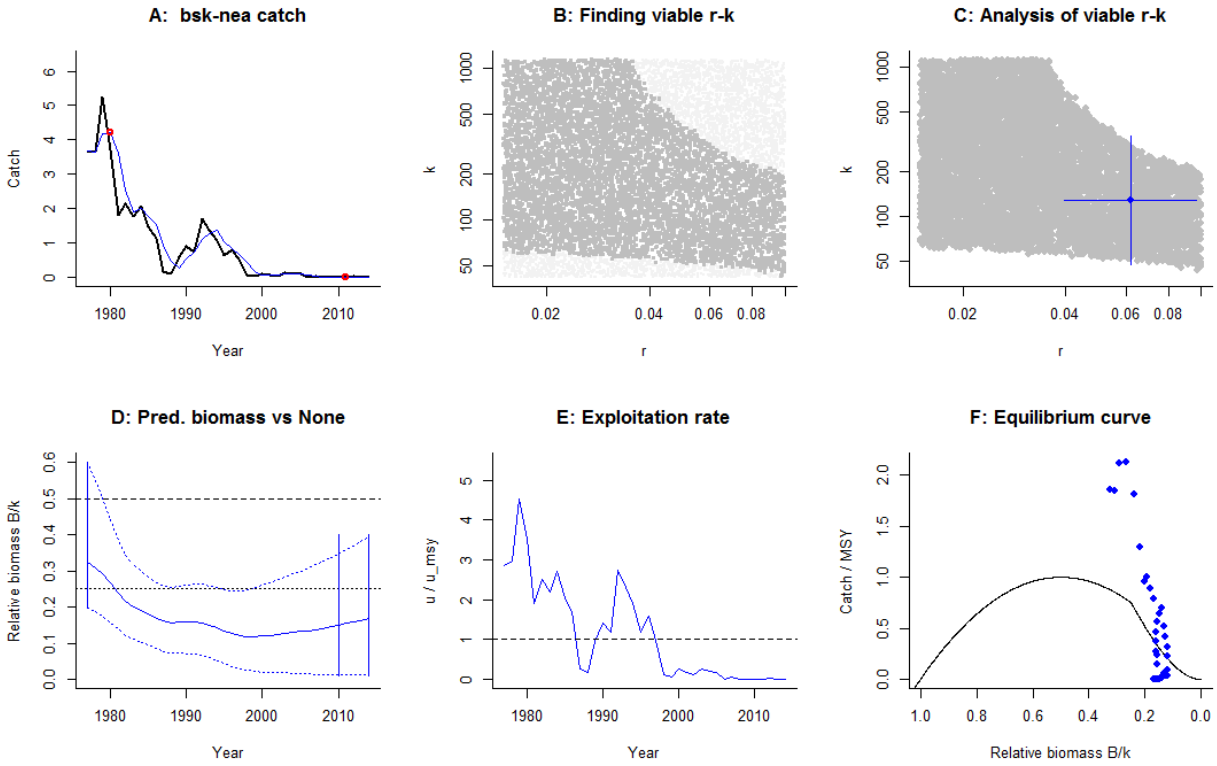

Catch boc-nea
MSY
LCL
Catch in 1000 t
0
50
100
150
2002
2004
2006
2008
2010
2012
2014

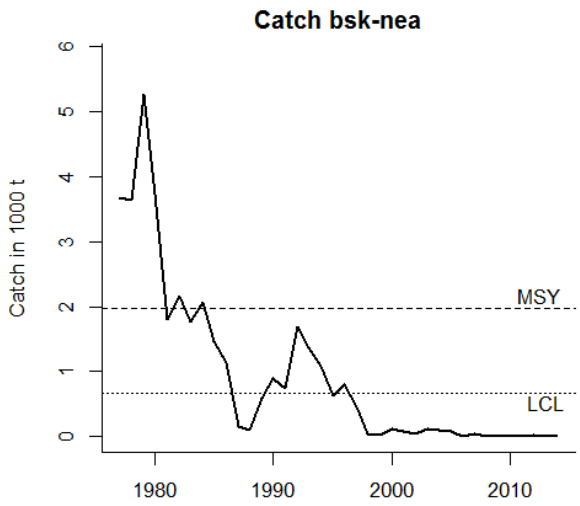

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2002
2004
2006
2008
2010
2012
2014

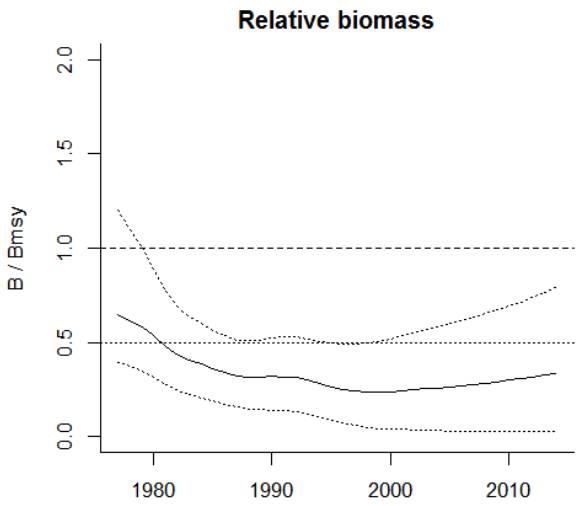

Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
2002
2004
2006
2008
2010
2012
2014

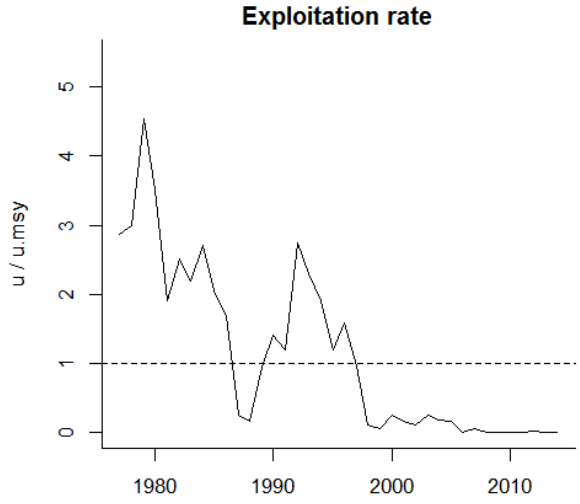

Stock status
2014
B / Bmsy
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5

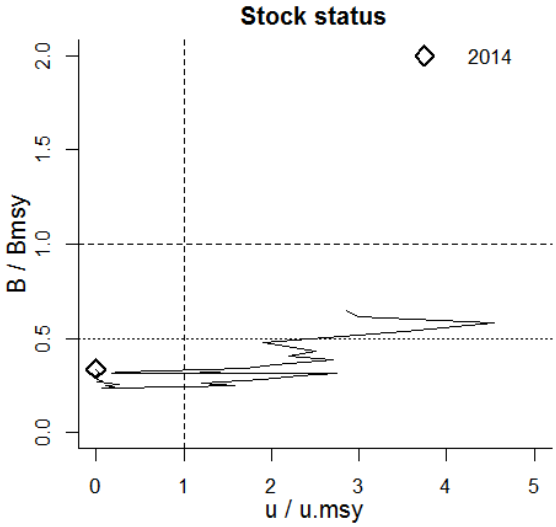
Species: *Cetorhinus maximus* , stock: bsk-nea
Name and region: Basking shark in the Northeast Atlantic , ICES
Catch data used from years 1977 - 2014 , biomass = None
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 42.1 - 1123
Results of CMSY analysis with altogether 22612 viable trajectories for 7238 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 128 , 95% CL = 46.7 - 349
MSY = 1.98 , 95% CL = 0.662 - 5.92
Relative biomass last year= 0.169 k, 2.5th = 0.0139 , 97.5th = 0.395
Relative biomass next year= 0.175 k, 2.5th = 0.0139 , 97.5th = 0.408
Relative exploitation rate in last year= 0
Comment: No abundance data available.
---



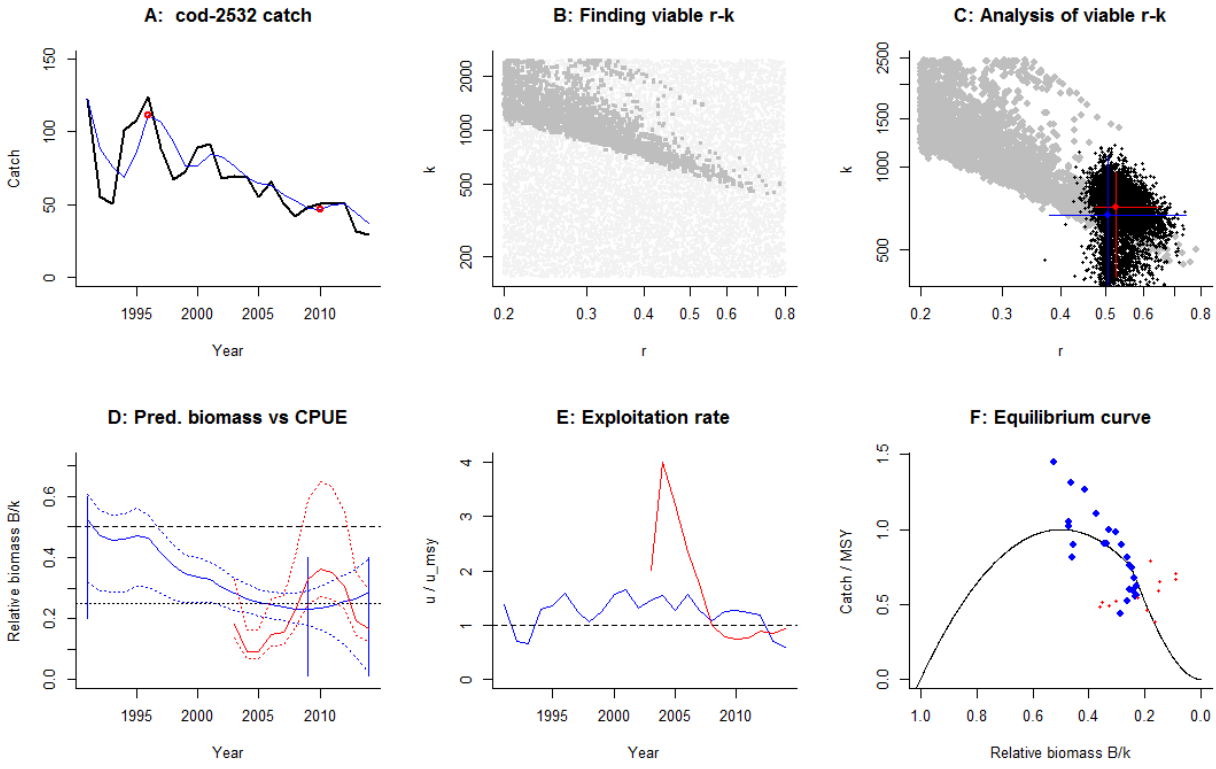

Catch bsk-nea
Catch in 1000 t
0
1
2
3
4
5
6
MSY
LCL
1980
1990
2000
2010

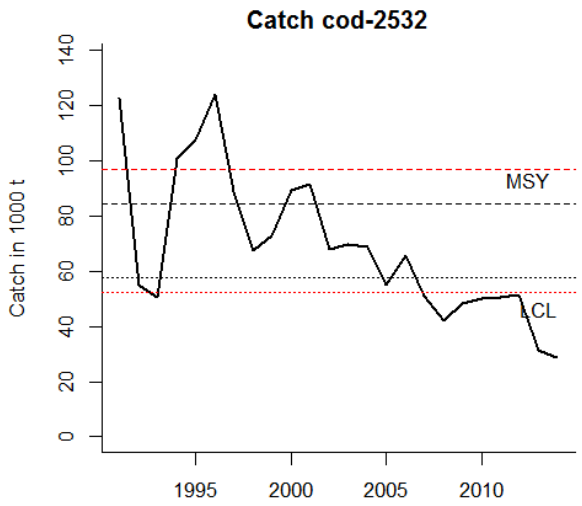

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
1980
1990
2000
2010

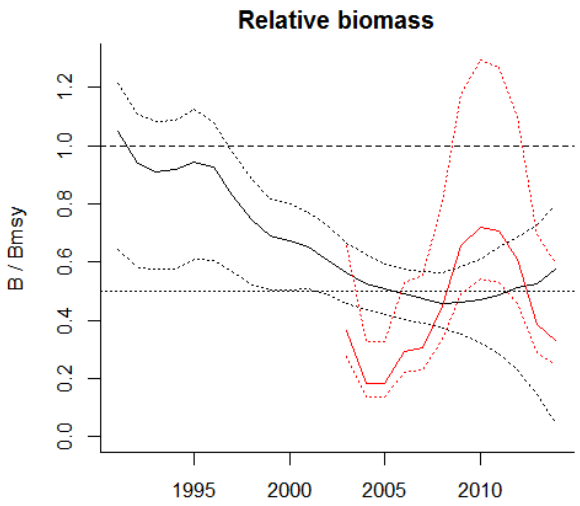

Exploitation rate
u / u.msy
0
1
2
3
4
5
1980
1990
2000
2010

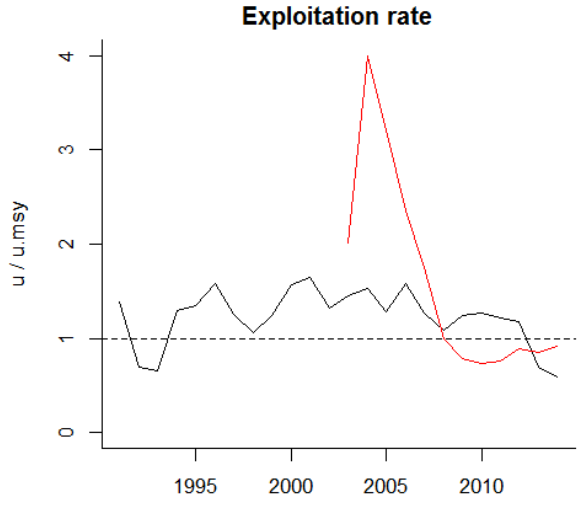

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
5
u / u.msy

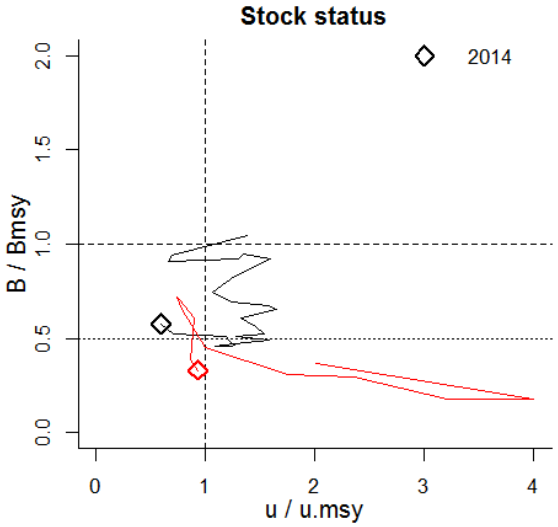
Species: *Gadus morhua* , stock: cod-2532
Name and region: Cod in Subdivisions 25–32 , ICES
Catch data used from years 1991 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 153 - 2450
Prior range of q = 0.000939 - 0.00376
Results from Bayesian Schaefer model using catch & CPUE
r = 0.525 , 95% CL = 0.473 - 0.646 , k = 718 , 95% CL = 400 - 958
MSY = 96.6 , 95% CL = 52.1 - 126
q = 0.00106 , lcl = 0.000686 , ucl = 0.00156
Biomass in last year from q*CPUE = 119 or 0.166 k
Exploitation rate in last year = 0.312
Results of CMSY analysis with altogether 4217 viable trajectories for 2934 r-k pairs
r = 0.505 , 95% CL = 0.377 - 0.743 , k = 669 , 95% CL = 374 - 1089
MSY = 84.5 , 95% CL = 57.7 - 124
Relative biomass last year= 0.289 k, 2.5th = 0.0235 , 97.5th = 0.397
Relative biomass next year= 0.328 k, 2.5th = -0.0287 , 97.5th = 0.467
Relative exploitation rate in last year= 0.593
Comment: Start year set to 1991.
---



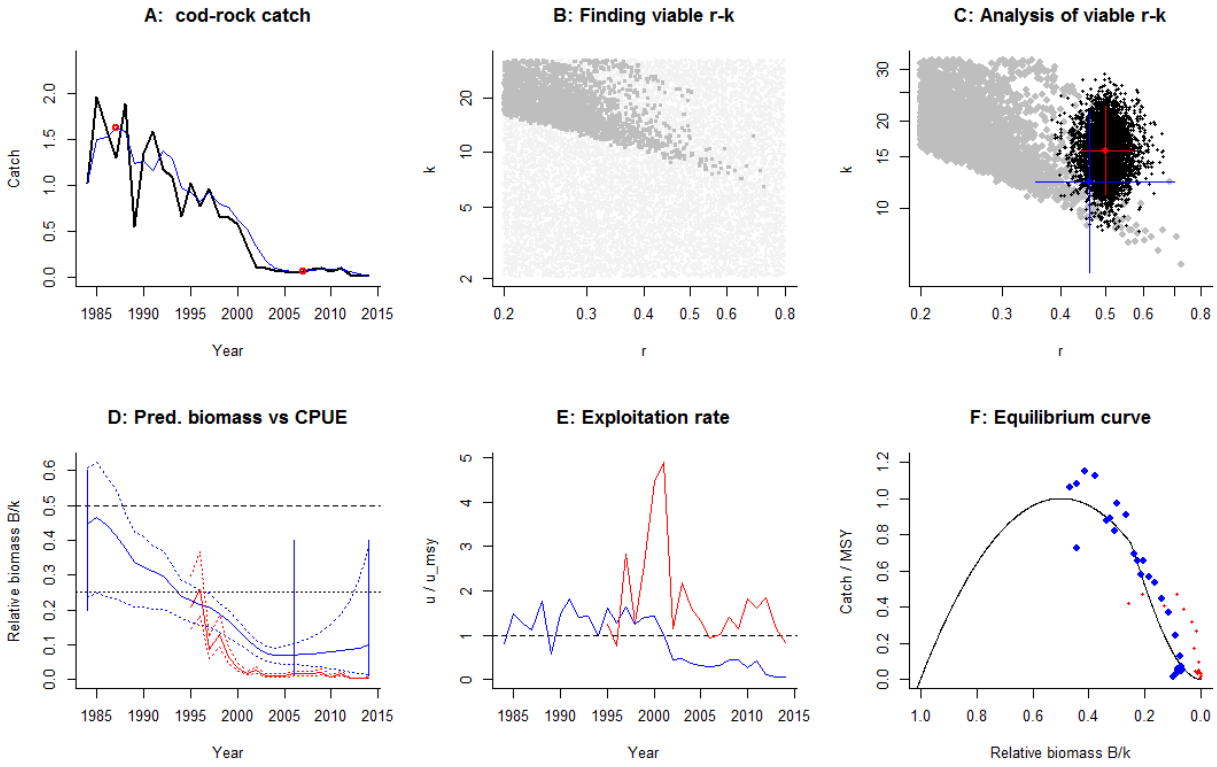

Catch cod-2532
Catch in 1000 t
0
20
40
60
80
100
120
140
MSY
CL
1995
2000
2005
2010

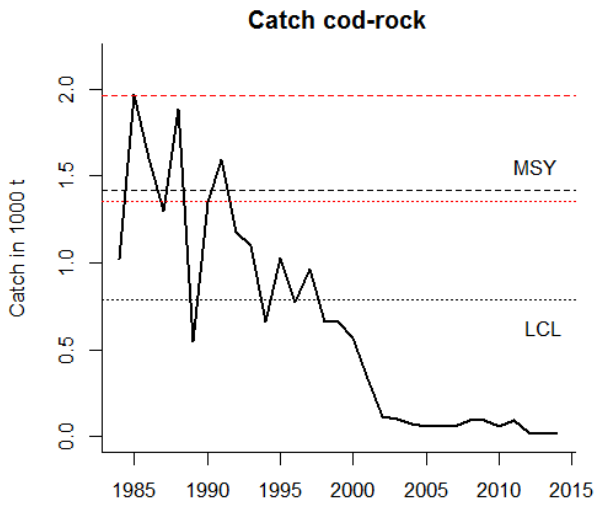

Relative biomass
B / Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1995
2000
2005
2010

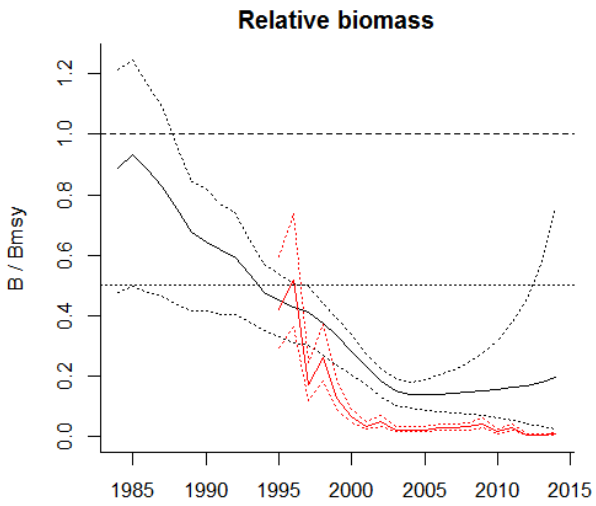

Exploitation rate
u / u.msy
0
1
2
3
4
1995
2000
2005
2010

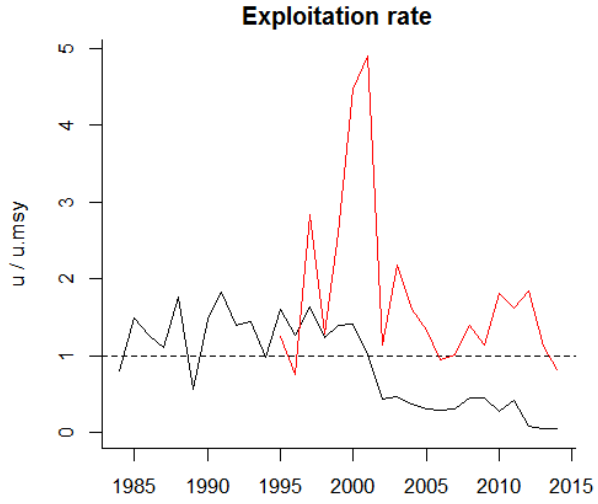

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
u / u.msy

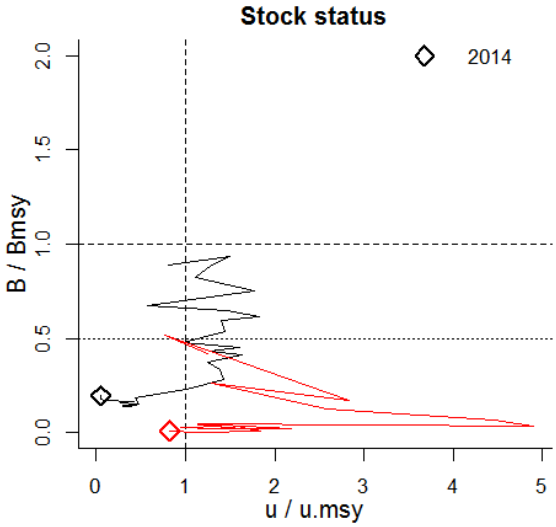
Species: *Gadus morhua* , stock: cod-rock
Name and region: "Cod in Division VIb (Rockall)" , ICES
Catch data used from years 1984 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2.03 - 32.5
Prior range of q = 0.00654 - 0.0262
Results from Bayesian Schaefer model using catch & CPUE
r = 0.5 , 95% CL = 0.44 - 0.568 , k = 15.7 , 95% CL = 11.1 - 22.4
MSY = 1.96 , 95% CL = 1.36 - 2.85
q = 0.0138 , lcl = 0.0103 , ucl = 0.0183
Biomass in last year from q*CPUE = 0.0727 or 0.00462 k
Exploitation rate in last year = 0.238
Results of CMSY analysis with altogether 3093 viable trajectories for 2714 r-k pairs
r = 0.461 , 95% CL = 0.353 - 0.7 , k = 12.3 , 95% CL = 5.99 - 21.7
MSY = 1.42 , 95% CL = 0.787 - 2.55
Relative biomass last year= 0.0978 k, 2.5th = 0.0137 , 97.5th = 0.379
Relative biomass next year= 0.11 k, 2.5th = 0.0126 , 97.5th = 0.491
Relative exploitation rate in last year= 0.0541
Comment: Landings in kg/h of Irish otter trawlers; CMSY would benefit from final 0.01-0.2 prior.
---



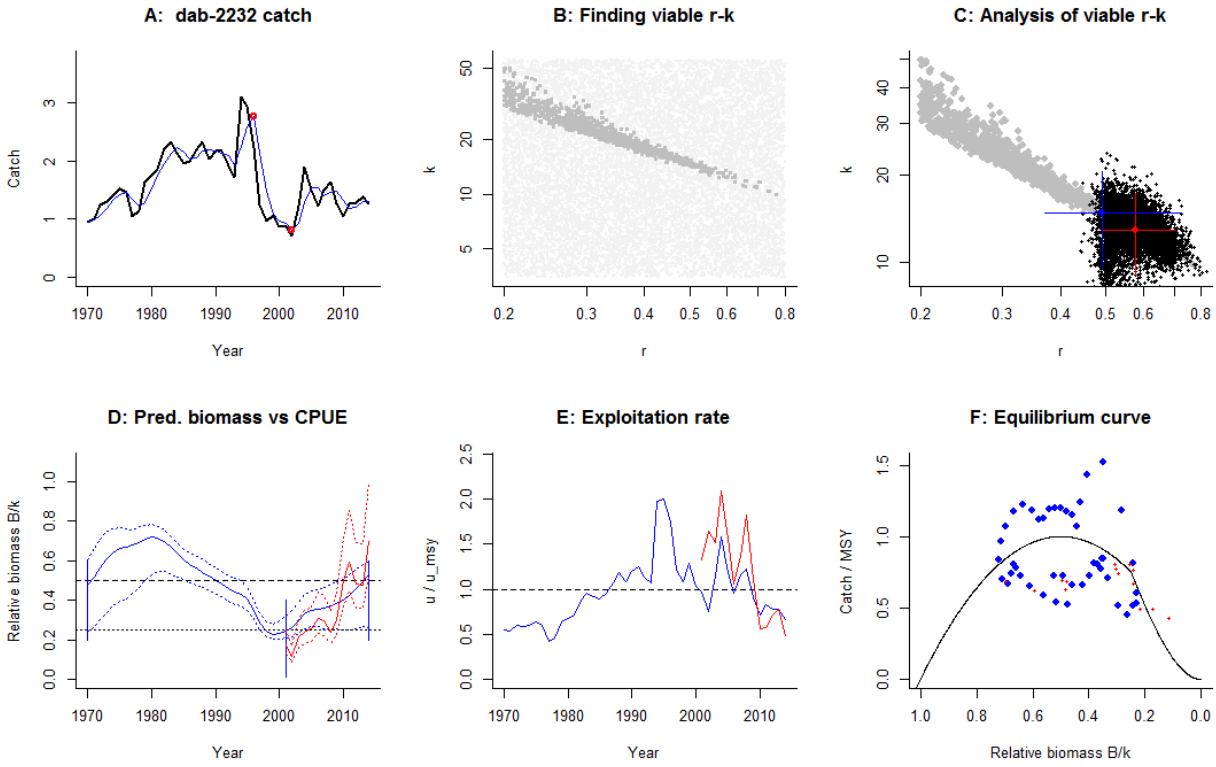

Catch cod-rock
Catch in 1000 t
MSY
LCL
0.0
0.5
1.0
1.5
2.0
1985
1990
1995
2000
2005
2010
2015

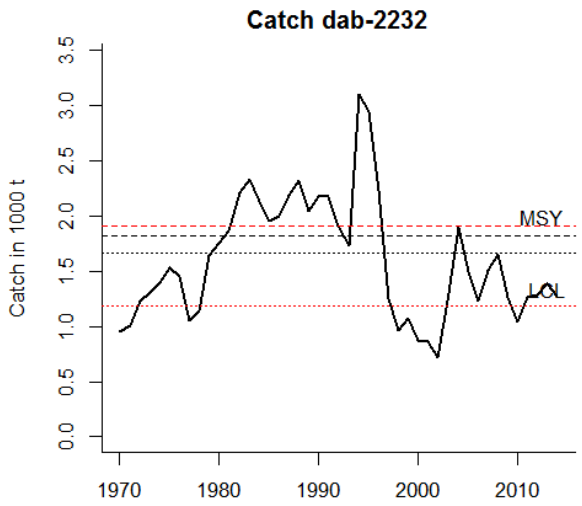

Relative biomass
B / Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1985
1990
1995
2000
2005
2010
2015

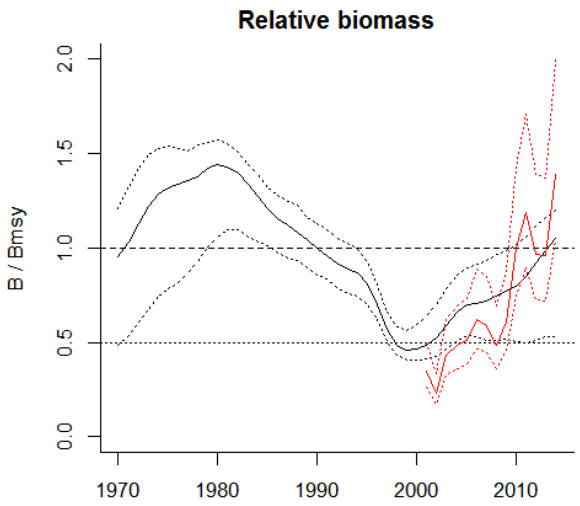

Exploitation rate
u / u.msy
0
1
2
3
4
5
1985
1990
1995
2000
2005
2010
2015

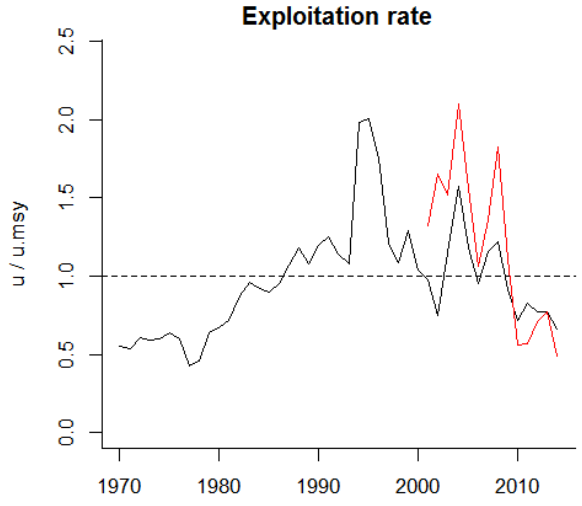

Stock status
2014
B / Bmsy
u / u.msy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
5

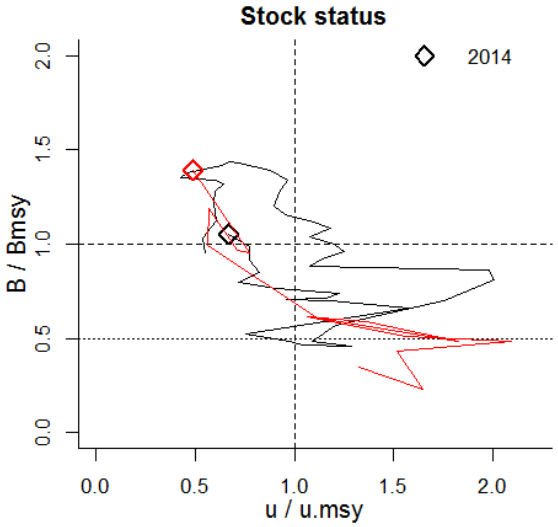
Species: *Limanda limanda* , stock: dab-2232
Name and region: Dab in Subdivisions 22–32 (Baltic Sea) , ICES
Catch data used from years 1970 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2001 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 3.45 - 55.2
Prior range of q = 0.0162 - 0.0647
Results from Bayesian Schaefer model using catch & CPUE
r = 0.577 , 95% CL = 0.487 - 0.703 , k = 13 , 95% CL = 9.06 - 17.3
MSY = 1.91 , 95% CL = 1.18 - 2.44
q = 0.0159 , lcl = 0.0126 , ucl = 0.0205
Biomass in last year from q*CPUE = 9.03 or 0.695 k
Exploitation rate in last year = 0.145
Results of CMSY analysis with altogether 2506 viable trajectories for 1040 r-k pairs
r = 0.49 , 95% CL = 0.37 - 0.723 , k = 14.8 , 95% CL = 9.62 - 20.5
MSY = 1.82 , 95% CL = 1.67 - 1.97
Relative biomass last year= 0.526 k, 2.5th = 0.263 , 97.5th = 0.598
Relative biomass next year= 0.551 k, 2.5th = 0.268 , 97.5th = 0.632
Relative exploitation rate in last year= 0.665
Comment: OK
---



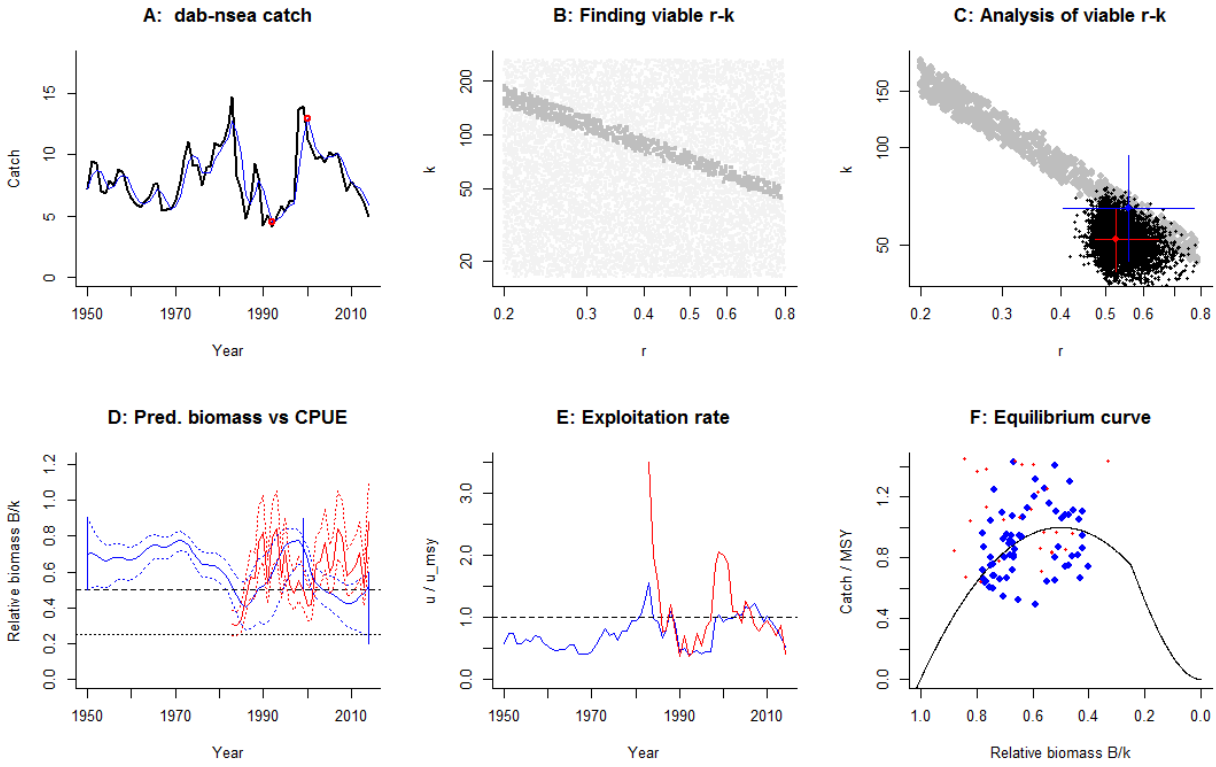

Catch dab-2232
Catch in 1000 t
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
MSY
1970
1980
1990
2000
2010

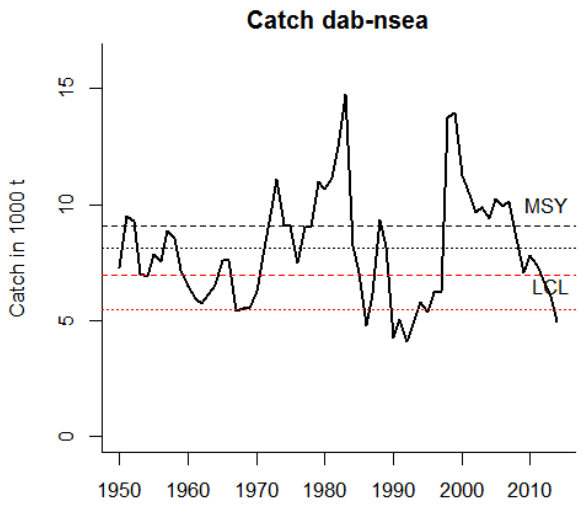

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
1970
1980
1990
2000
2010

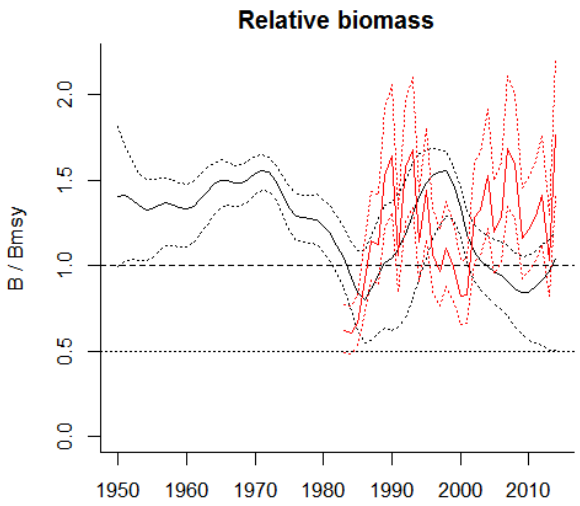

Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
1970
1980
1990
2000
2010

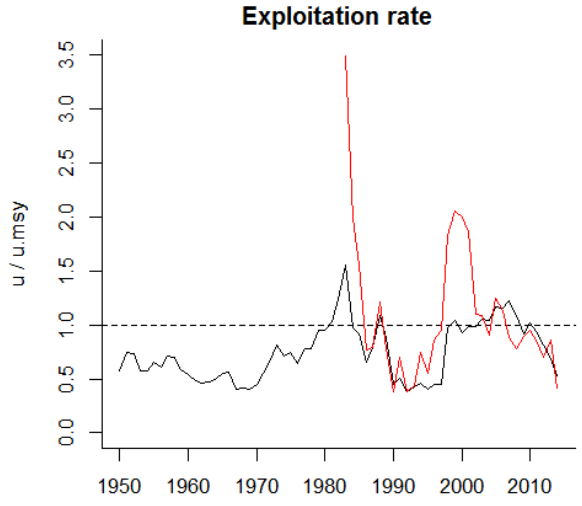

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
u / u.msy

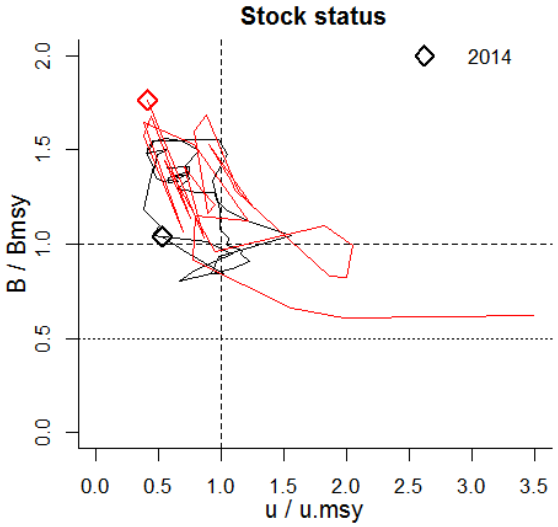
Species: *Limanda limanda* , stock: dab-nsea
Name and region: Dab in Subarea IV and Division IIIa , ICES
Catch data used from years 1950 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1999 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 16.2 - 259
Prior range of q = 0.000705 - 0.00282
Results from Bayesian Schaefer model using catch & CPUE
r = 0.526 , 95% CL = 0.475 - 0.648 , k = 52 , 95% CL = 41.5 - 65.2
MSY = 6.97 , 95% CL = 5.46 - 8.82
q = 0.000755 , lcl = 0.000586 , ucl = 0.000952
Biomass in last year from q*CPUE = 45.7 or 0.881 k
Exploitation rate in last year = 0.13
Results of CMSY analysis with altogether 5382 viable trajectories for 744 r-k pairs
r = 0.559 , 95% CL = 0.405 - 0.77 , k = 65 , 95% CL = 44.6 - 94.8
MSY = 9.08 , 95% CL = 8.14 - 10.1
Relative biomass last year= 0.519 k, 2.5th = 0.253 , 97.5th = 0.597
Relative biomass next year= 0.565 k, 2.5th = 0.268 , 97.5th = 0.657
Relative exploitation rate in last year= 0.525
Comment: OK
---



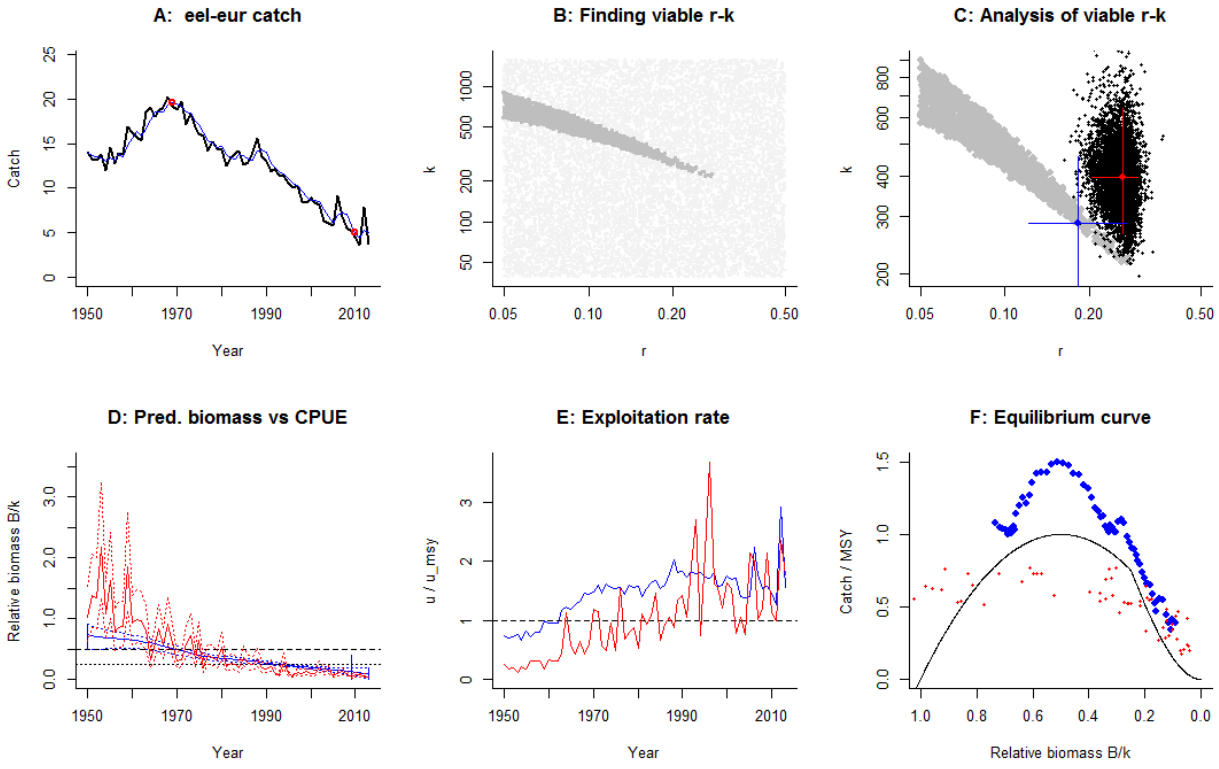

Catch dab-nsea
Catch in 1000 t
0
5
10
15
MSY
LCL
1950
1960
1970
1980
1990
2000
2010

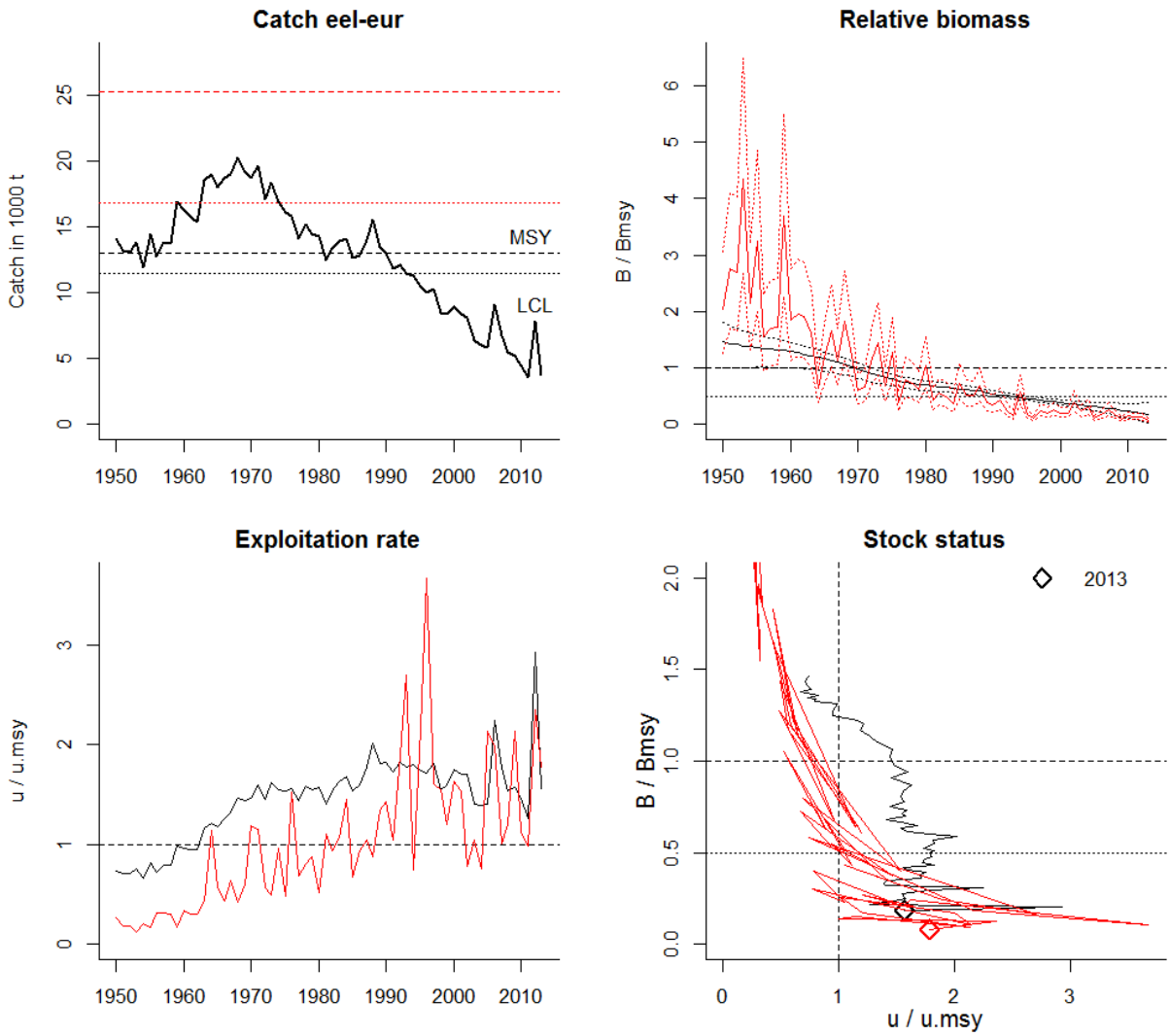

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
1950
1960
1970
1980
1990
2000
2010


Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1950
1960
1970
1980
1990
2000
2010

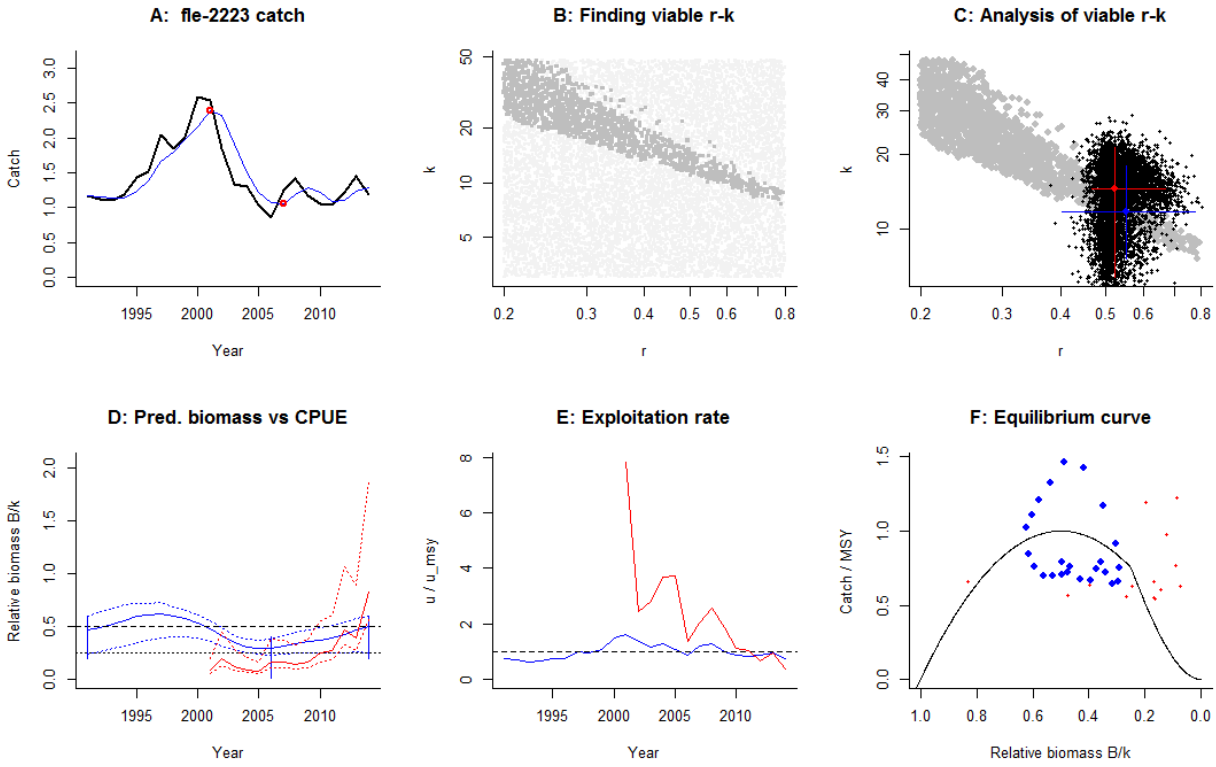

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
u / u.msy

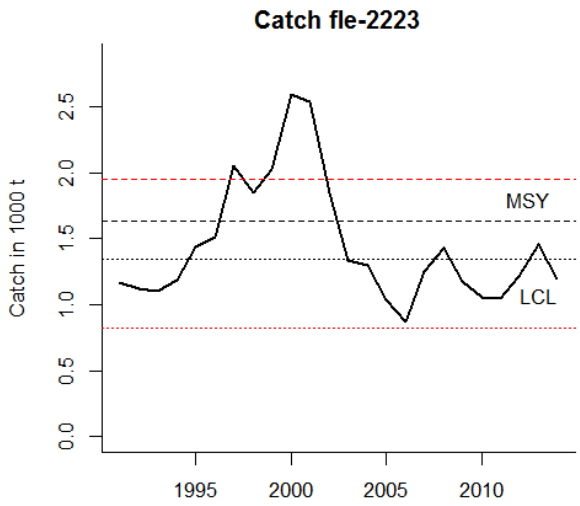
Species: *Anguilla anguilla* , stock: eel-eur
Name and region: European eel throughout its natural range , ICES
Catch data used from years 1950 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.5 - 0.9 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.01 - 0.2 expert
Prior range for r = 0.05 - 0.5 default , prior range for k = 39 - 1562
Prior range of q = 0.000184 - 0.00117
Results from Bayesian Schaefer model using catch & CPUE
r = 0.262 , 95% CL = 0.205 - 0.297 , k = 396 , 95% CL = 266 - 644
MSY = 25.4 , 95% CL = 16.9 - 41.2
q = 0.000431 , lcl = 0.000318 , ucl = 0.000563
Biomass in last year from q*CPUE = 16.2 or 0.041 k
Exploitation rate in last year = 0.314
Results of CMSY analysis with altogether 3244 viable trajectories for 1885 r-k pairs
r = 0.183 , 95% CL = 0.122 - 0.274 , k = 285 , 95% CL = 179 - 456
MSY = 13 , 95% CL = 11.5 - 14.8
Relative biomass last year= 0.0928 k, 2.5th = 0.0152 , 97.5th = 0.192
Relative biomass next year= 0.0823 k, 2.5th = 0.00159 , 97.5th = 0.197
Relative exploitation rate in last year= 1.56
Comment: Endbio set to 0.01-0.2. Yellow eel abundance data used as CPUE.
---

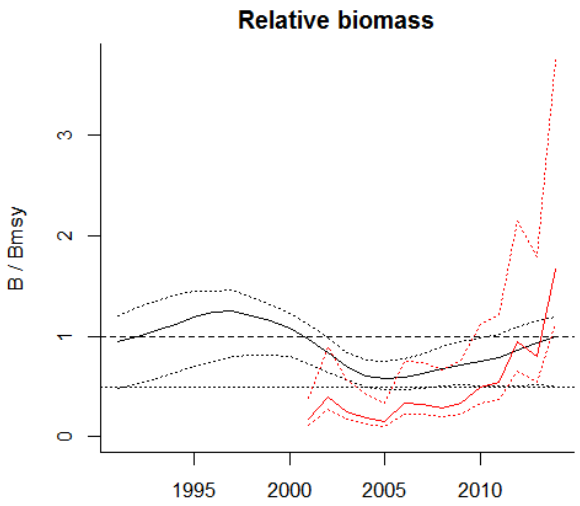


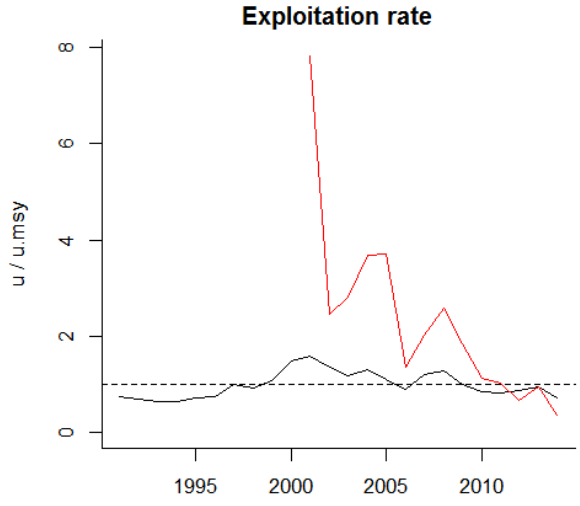

Catch eel-eur
Catch in 1000 t
MSY
LCL
Relative biomass
B / Bmsy
Exploitation rate
u / u.msy
Stock status
2013
B / Bmsy
u / u.msy

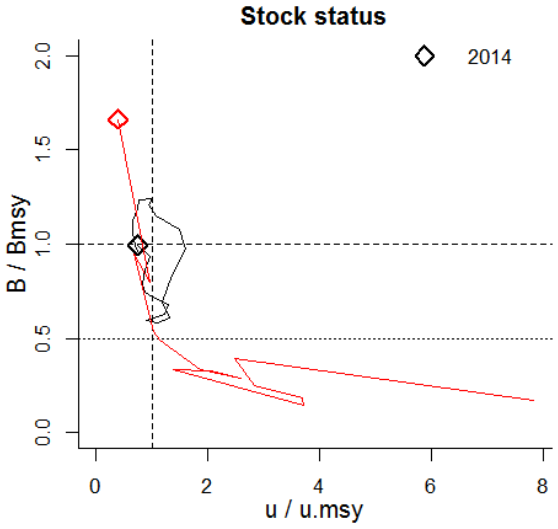
Species: *Platichthys flesus* , stock: fle-2223
Name and region: Flounder in Subdivisions 22–23 (Belts and sound) , ICES
Catch data used from years 1991 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 2.98 - 47.7
Prior range of q = 0.0306 - 0.122
Results from Bayesian Schaefer model using catch & CPUE
r = 0.522 , 95% CL = 0.465 - 0.669 , k = 14.5 , 95% CL = 6.42 - 21.2
MSY = 1.95 , 95% CL = 0.821 - 2.88
q = 0.032 , lcl = 0.0226 , ucl = 0.0515
Biomass in last year from q*CPUE = 12 or 0.831 k
Exploitation rate in last year = 0.107
Results of CMSY analysis with altogether 3891 viable trajectories for 1579 r-k pairs
r = 0.553 , 95% CL = 0.401 - 0.777 , k = 11.8 , 95% CL = 7.59 - 18
MSY = 1.63 , 95% CL = 1.34 - 1.98
Relative biomass last year= 0.497 k, 2.5th = 0.252 , 97.5th = 0.595
Relative biomass next year= 0.519 k, 2.5th = 0.239 , 97.5th = 0.625
Relative exploitation rate in last year= 0.736
Comment: Start year set to 1991. CMSY fit could be improved by setting intbio to Low in 2000.
---



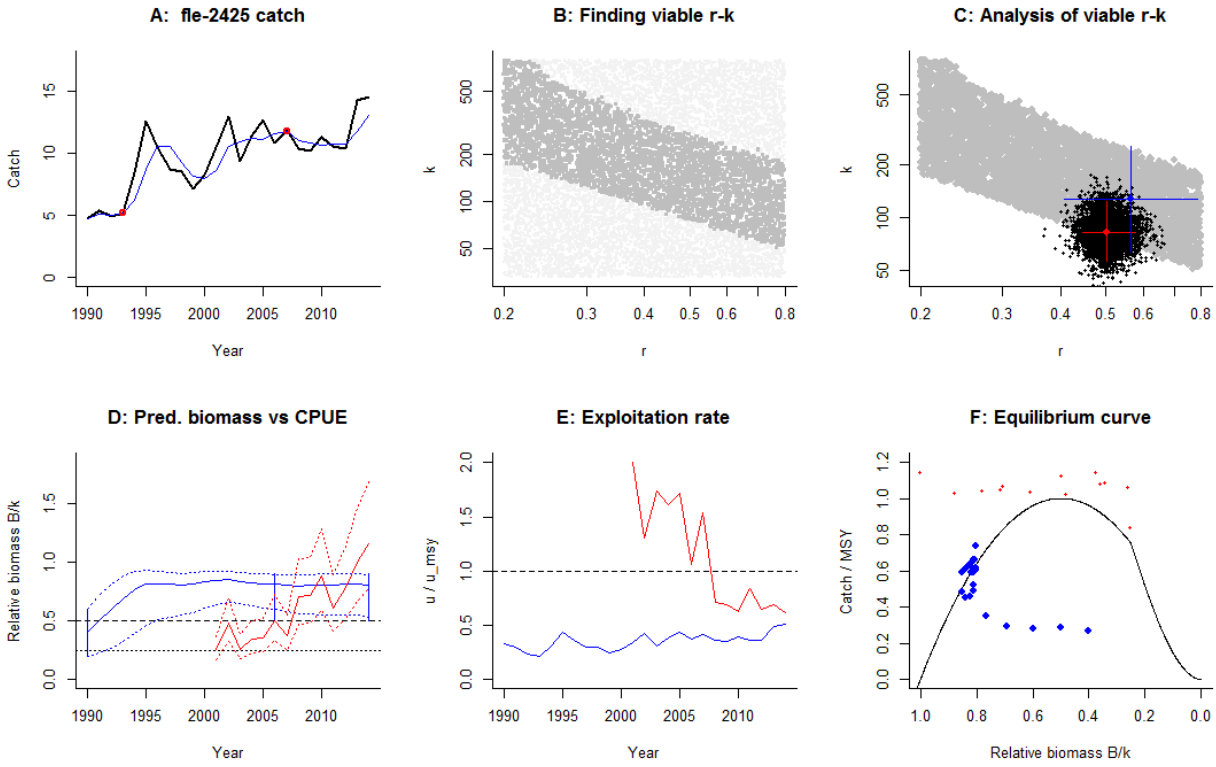

Catch fle-2223
Catch in 1000 t
0.0
0.5
1.0
1.5
2.0
2.5
MSY
LCL
1995
2000
2005
2010

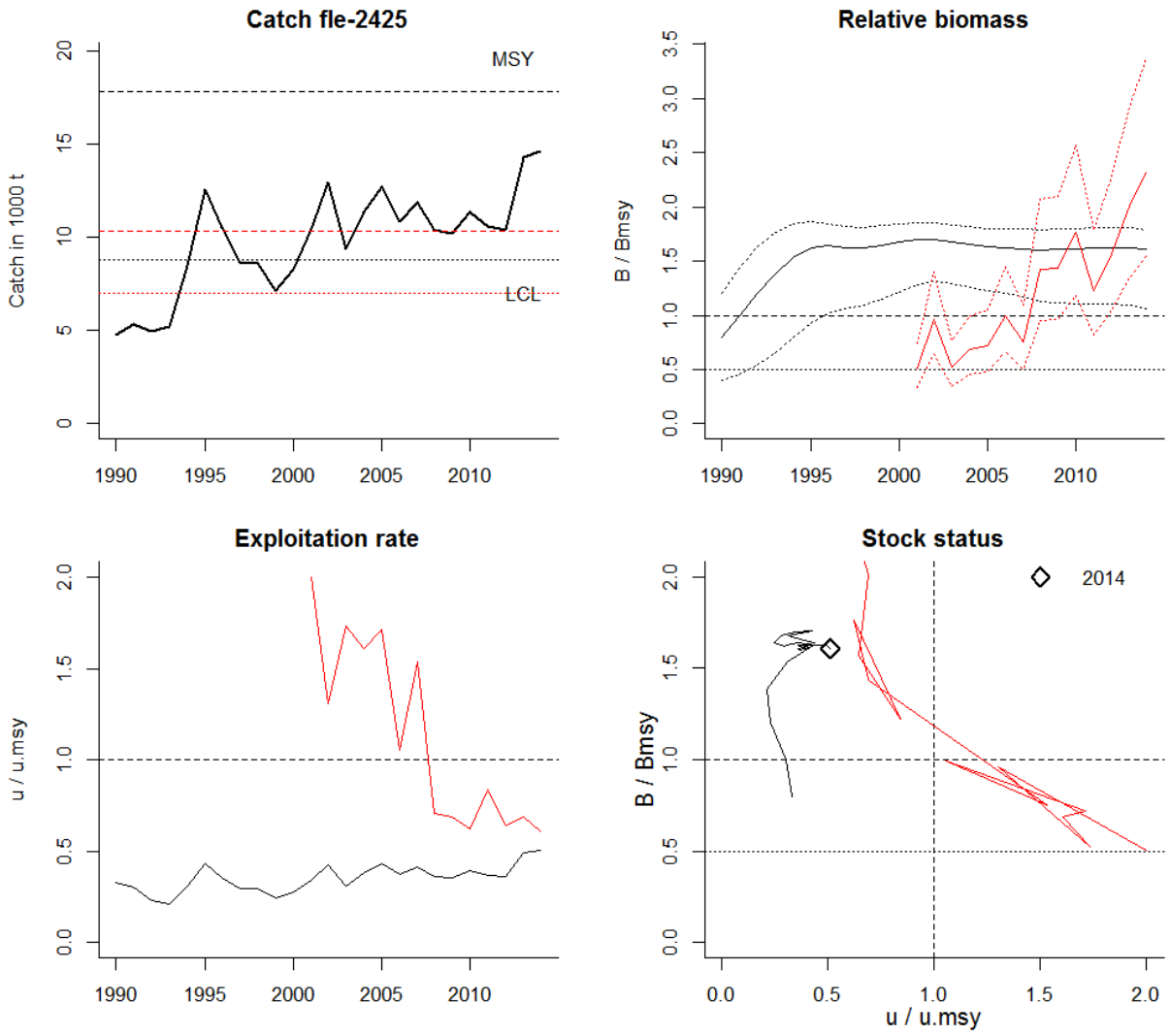

Relative biomass
B / Bmsy
0
1
2
3
1995
2000
2005
2010


Exploitation rate
u / u.msy
0
2
4
6
8
1995
2000
2005
2010

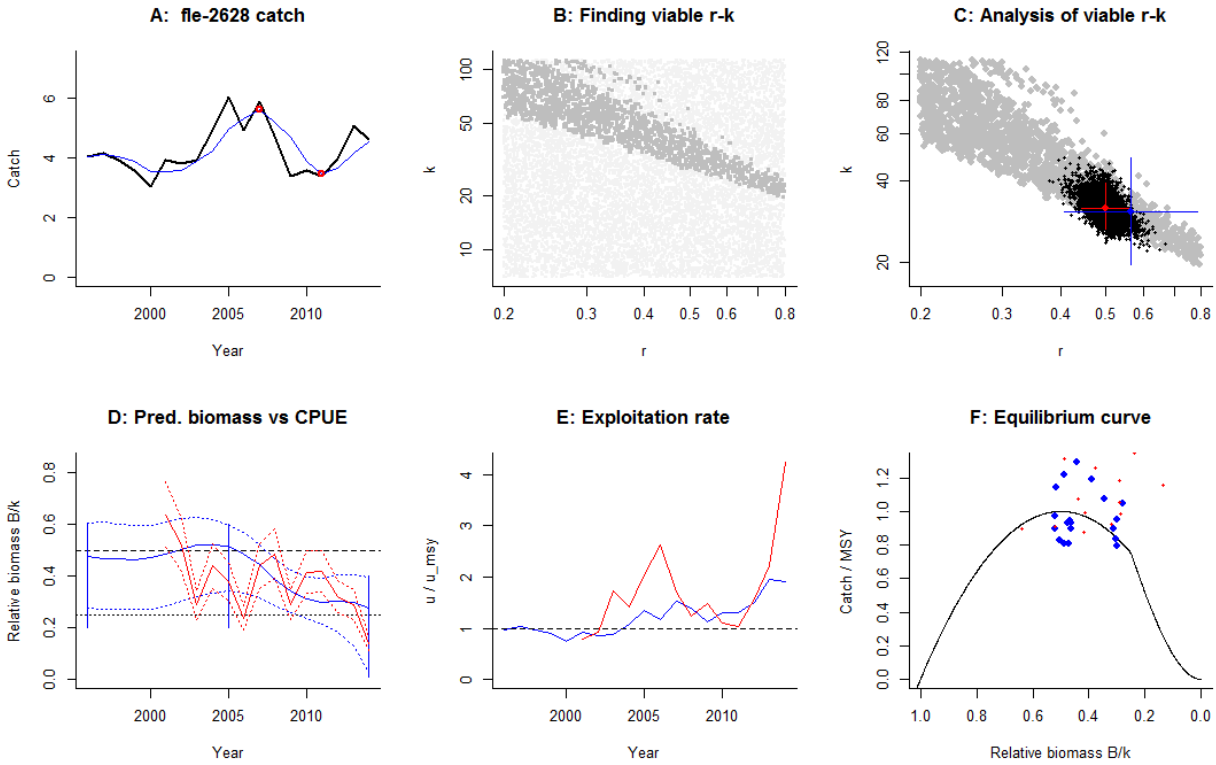

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
2
4
6
8
u / u.msy

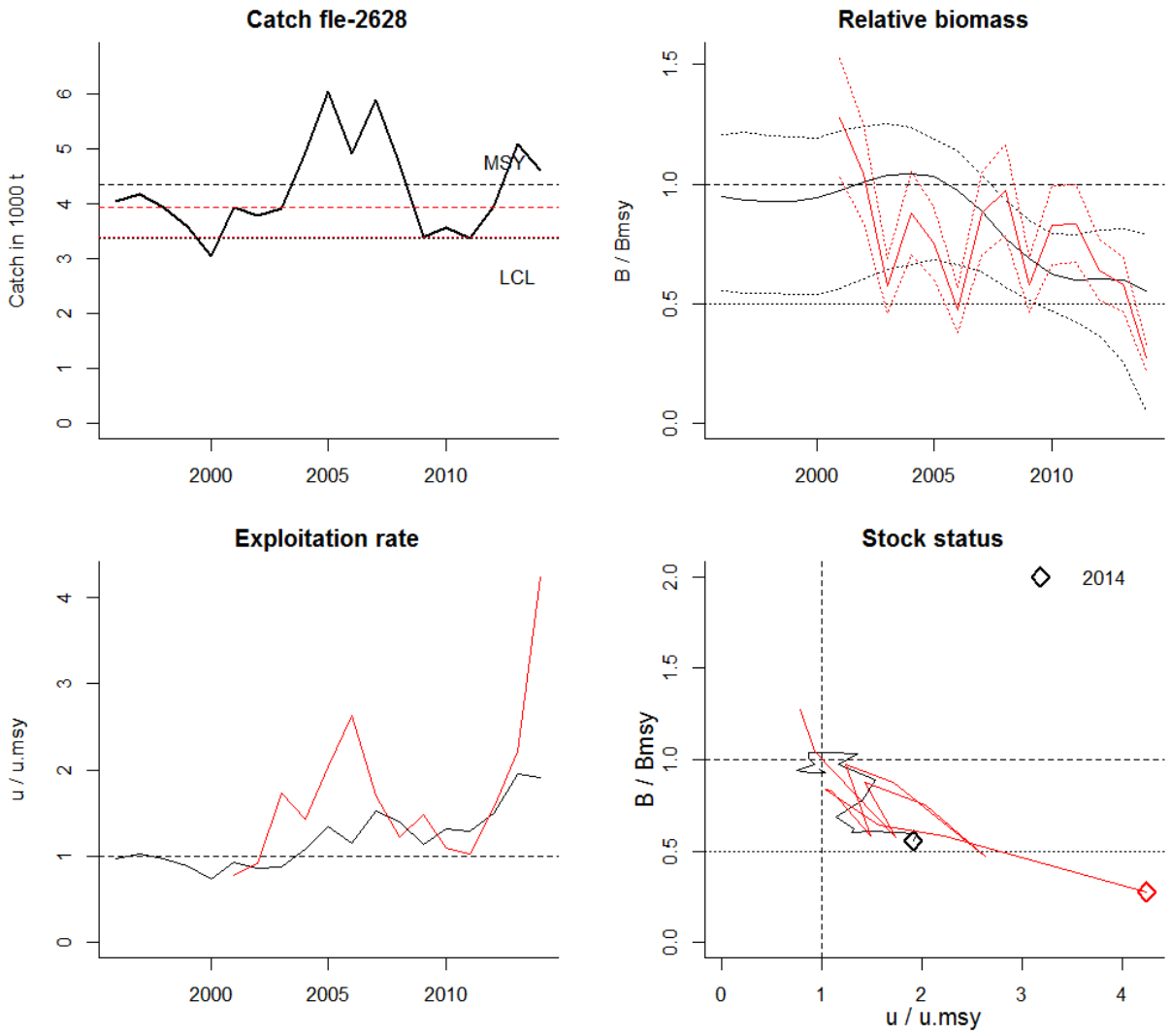
Species: *Platichthys flesus* , stock: fle-2425
Name and region: Flounder in Subdivisions 24–25 (Southern Baltic Sea) , ICES
Catch data used from years 1990 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2006 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 32.8 - 787
Prior range of q = 0.00093 - 0.00372
Results from Bayesian Schaefer model using catch & CPUE
r = 0.502 , 95% CL = 0.445 - 0.579 , k = 82.2 , 95% CL = 56.5 - 123
MSY = 10.3 , 95% CL = 7.01 - 15.6
q = 0.00149 , lcl = 0.00109 , ucl = 0.00201
Biomass in last year from q*CPUE = 95.3 or 1.16 k
Exploitation rate in last year = 0.138
Results of CMSY analysis with altogether 40447 viable trajectories for 4257 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 126 , 95% CL = 63.5 - 252
MSY = 17.9 , 95% CL = 8.81 - 36.3
Relative biomass last year= 0.804 k, 2.5th = 0.531 , 97.5th = 0.895
Relative biomass next year= 0.789 k, 2.5th = 0.498 , 97.5th = 0.889
Relative exploitation rate in last year= 0.508
Comment: Start year set to 1990. CMSY fit could be improved by setting intbio to Medium in 2000.
---



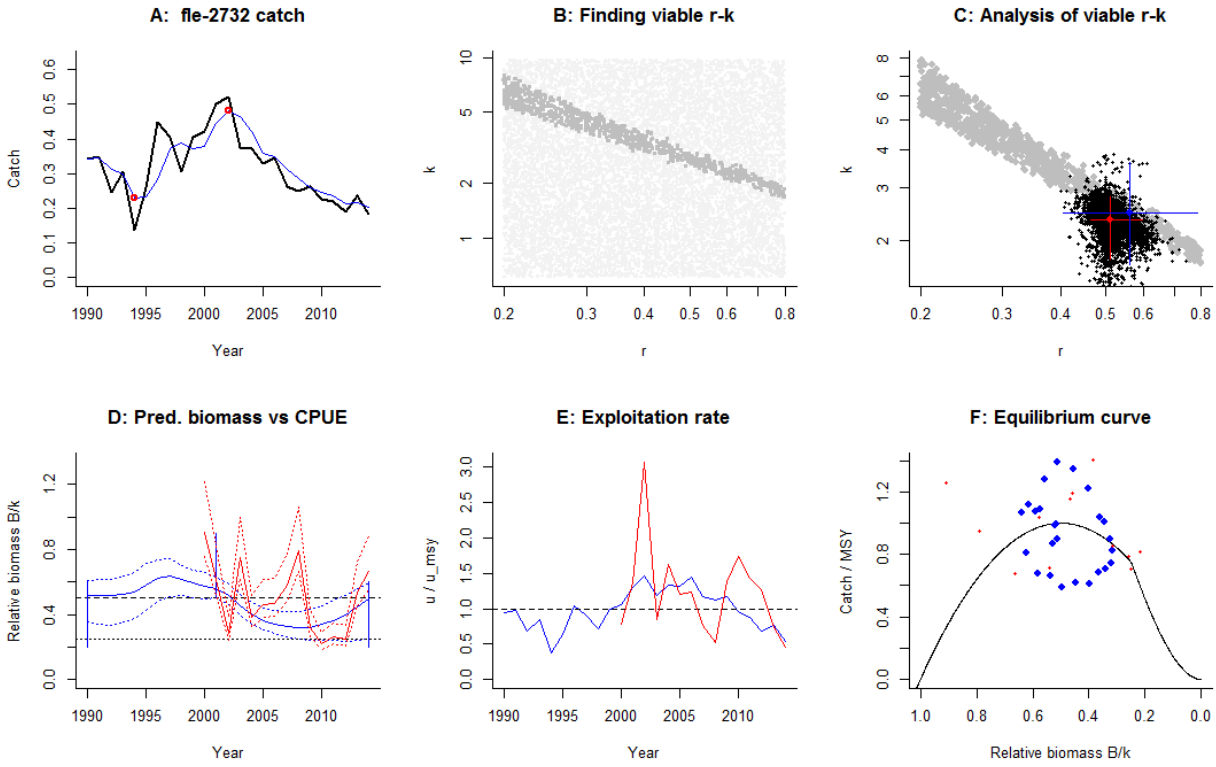

Catch fle-2425
MSY
LCL
Catch in 1000 t
0
5
10
15
20
1990
1995
2000
2005
2010
Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1990
1995
2000
2005
2010
Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
1990
1995
2000
2005
2010
Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
u / u.msy

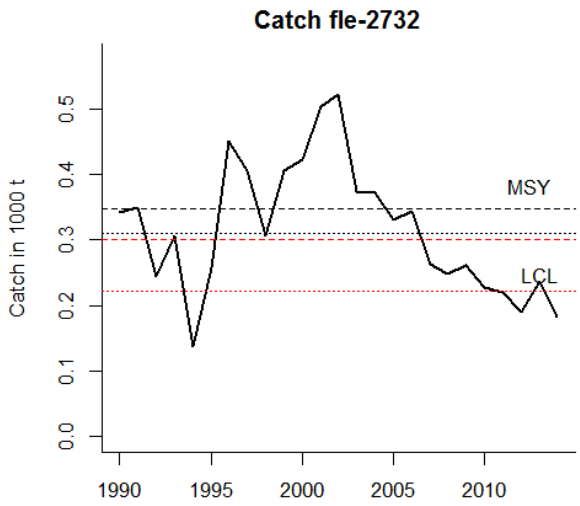
Species: *Platichthys flesus* , stock: fle-2628
Name and region: Flounder in Subdivisions 26 and 28 (Eastern Gotland and Gulf of Gdansk) , ICES
Catch data used from years 1996 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.2 - 0.6 in year 2005 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 7.03 - 113
Prior range of q = 0.00808 - 0.0323
Results from Bayesian Schaefer model using catch & CPUE
r = 0.499 , 95% CL = 0.442 - 0.559 , k = 31.6 , 95% CL = 26.4 - 39.3
MSY = 3.94 , 95% CL = 3.4 - 4.77
q = 0.0166 , lcl = 0.0134 , ucl = 0.0199
Biomass in last year from q*CPUE = 4.36 or 0.138 k
Exploitation rate in last year = 1.04
Results of CMSY analysis with altogether 4293 viable trajectories for 1734 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 30.8 , 95% CL = 19.5 - 48.6
MSY = 4.35 , 95% CL = 3.38 - 5.61
Relative biomass last year= 0.278 k, 2.5th = 0.0255 , 97.5th = 0.394
Relative biomass next year= 0.237 k, 2.5th = -0.14 , 97.5th = 0.395
Relative exploitation rate in last year= 1.91
Comment: OK
---

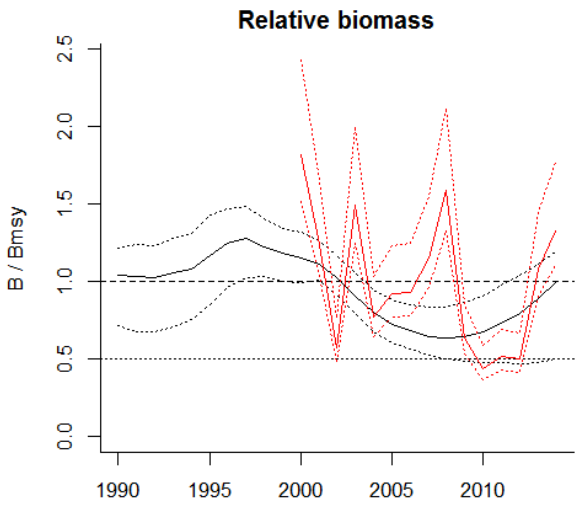


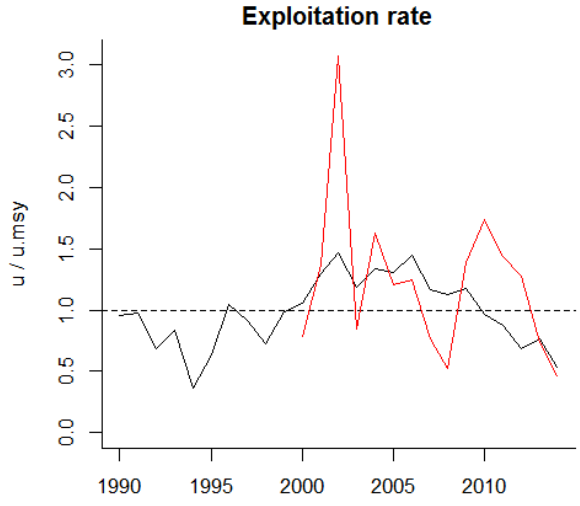

Catch fle-2628
Catch in 1000 t
MSY
LCL
Relative biomass
B / Bmsy
Exploitation rate
u / u.msy
Stock status
2014
B / Bmsy
u / u.msy

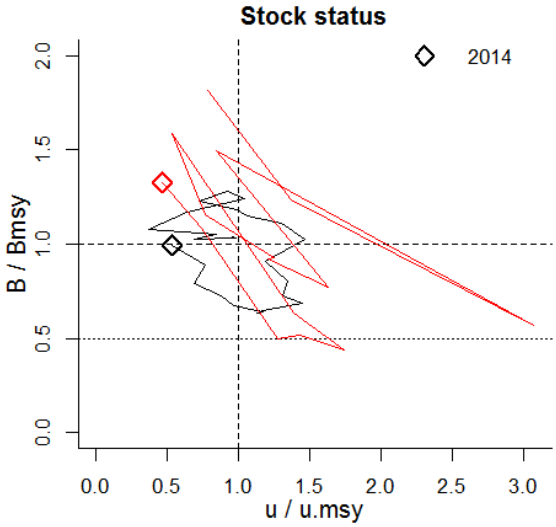
Species: *Platichthys flesus* , stock: fle-2732
Flounder in Subdivisions 27 and 29–32 (Northern Central and Northern Baltic Sea) , ICES
Catch data used from years 1990 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2001 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.603 - 9.65
Prior range of q = 0.000733 - 0.00293
Results from Bayesian Schaefer model using catch & CPUE
r = 0.509 , 95% CL = 0.463 - 0.599 , k = 2.34 , 95% CL = 1.75 - 2.8
MSY = 0.301 , 95% CL = 0.222 - 0.356
q = 0.000957 , lcl = 0.000745 , ucl = 0.00126
Biomass in last year from q*CPUE = 1.55 or 0.662 k
Exploitation rate in last year = 0.131
Results of CMSY analysis with altogether 2087 viable trajectories for 828 r-k pairs
r = 0.561 , 95% CL = 0.405 - 0.785 , k = 2.47 , 95% CL = 1.67 - 3.63
MSY = 0.347 , 95% CL = 0.31 - 0.39
Relative biomass last year= 0.497 k, 2.5th = 0.251 , 97.5th = 0.596
Relative biomass next year= 0.555 k, 2.5th = 0.279 , 97.5th = 0.665
Relative exploitation rate in last year= 0.53
Comment: Start year set to 1990.
---



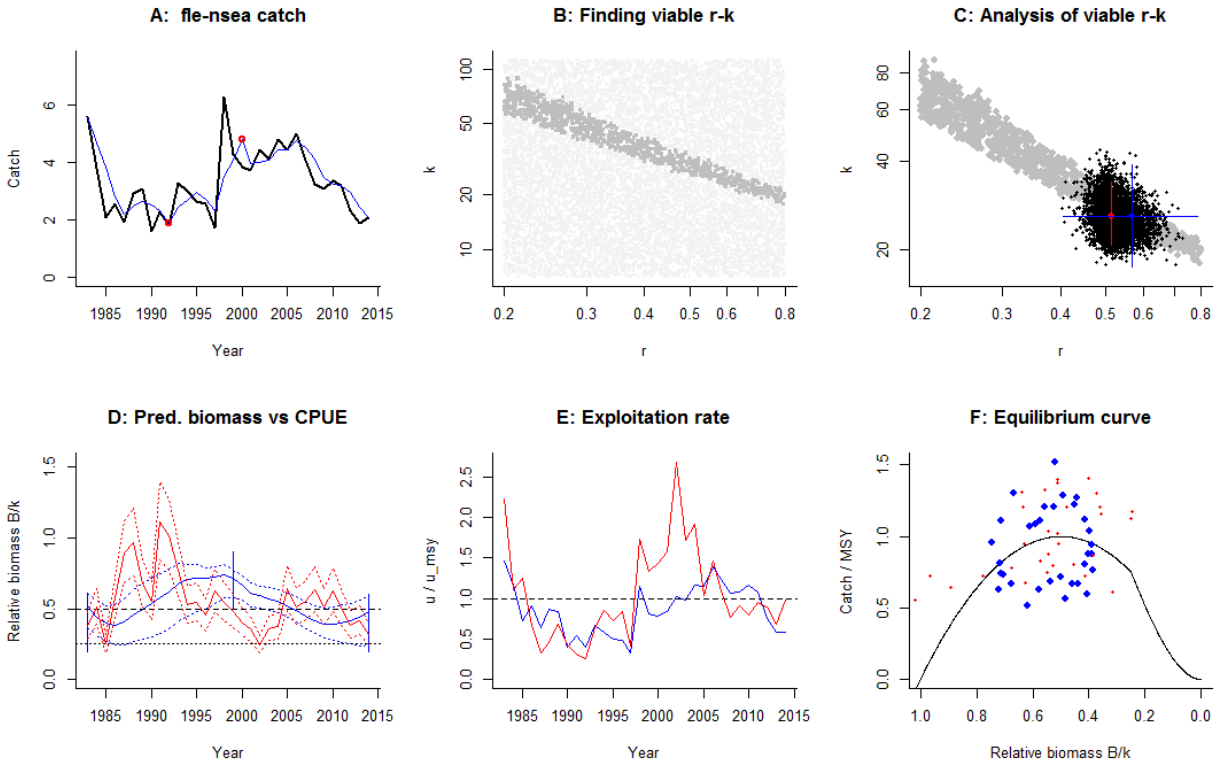

Catch fle-2732
Catch in 1000 t
0.0
0.1
0.2
0.3
0.4
0.5
MSY
LCL
1990
1995
2000
2005
2010

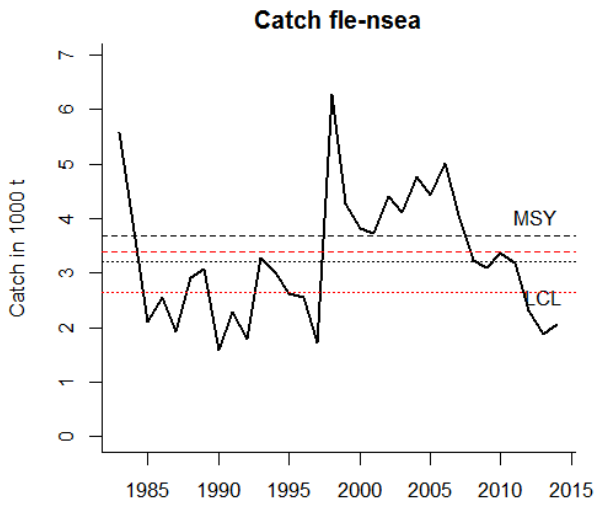

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
2.5
1990
1995
2000
2005
2010

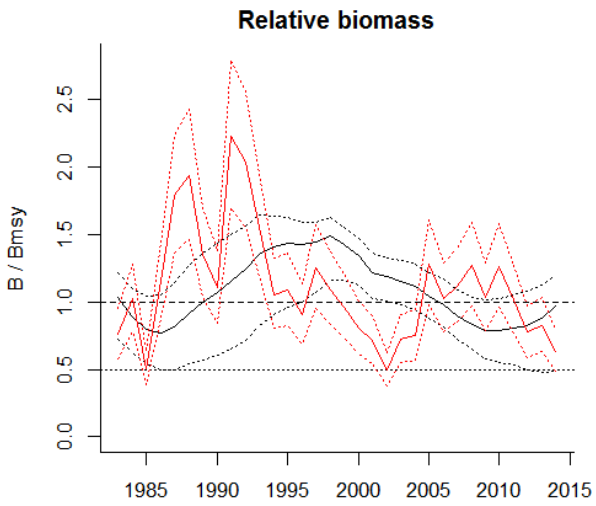

Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1990
1995
2000
2005
2010

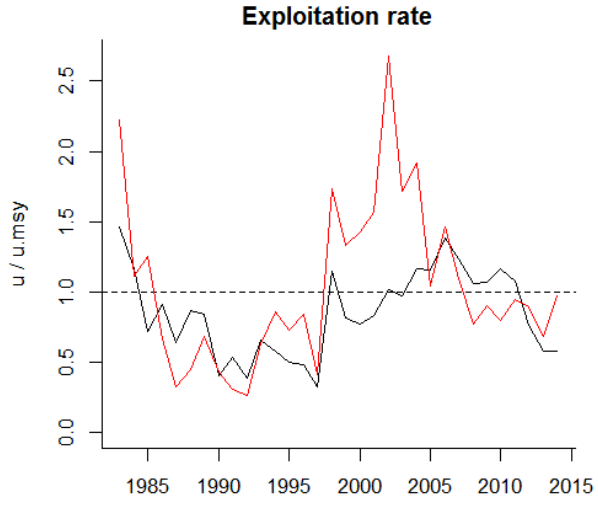

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
u / u.msy

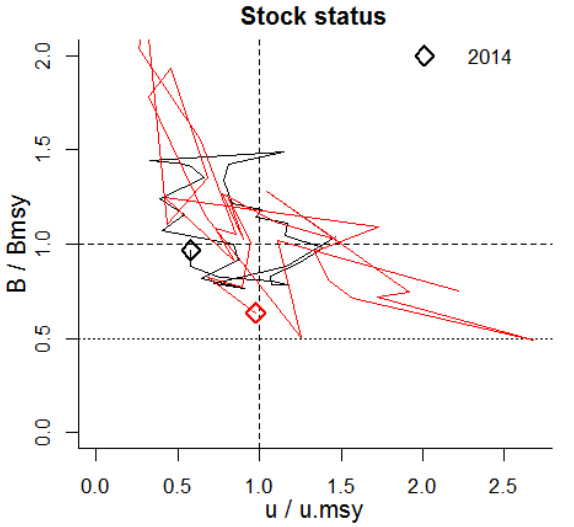
Species: *Platichthys flesus* , stock: fle-nsea
Name and region: Flounder in Division IIIa and Subarea IV , ICES
Catch data used from years 1983 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1999 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 6.98 - 112
Prior range of q = 0.000244 - 0.000977
Results from Bayesian Schaefer model using catch & CPUE
r = 0.513 , 95% CL = 0.466 - 0.615 , k = 25.9 , 95% CL = 20.7 - 34
MSY = 3.39 , 95% CL = 2.66 - 4.43
q = 0.000296 , lcl = 0.000239 , ucl = 0.000371
Biomass in last year from q*CPUE = 8.24 or 0.318 k
Exploitation rate in last year = 0.252
Results of CMSY analysis with altogether 3922 viable trajectories for 1004 r-k pairs
r = 0.567 , 95% CL = 0.405 - 0.785 , k = 25.9 , 95% CL = 17.5 - 38.8
MSY = 3.67 , 95% CL = 3.21 - 4.19
Relative biomass last year= 0.484 k, 2.5th = 0.245 , 97.5th = 0.596
Relative biomass next year= 0.549 k, 2.5th = 0.257 , 97.5th = 0.67
Relative exploitation rate in last year= 0.58
Comment: OK
---



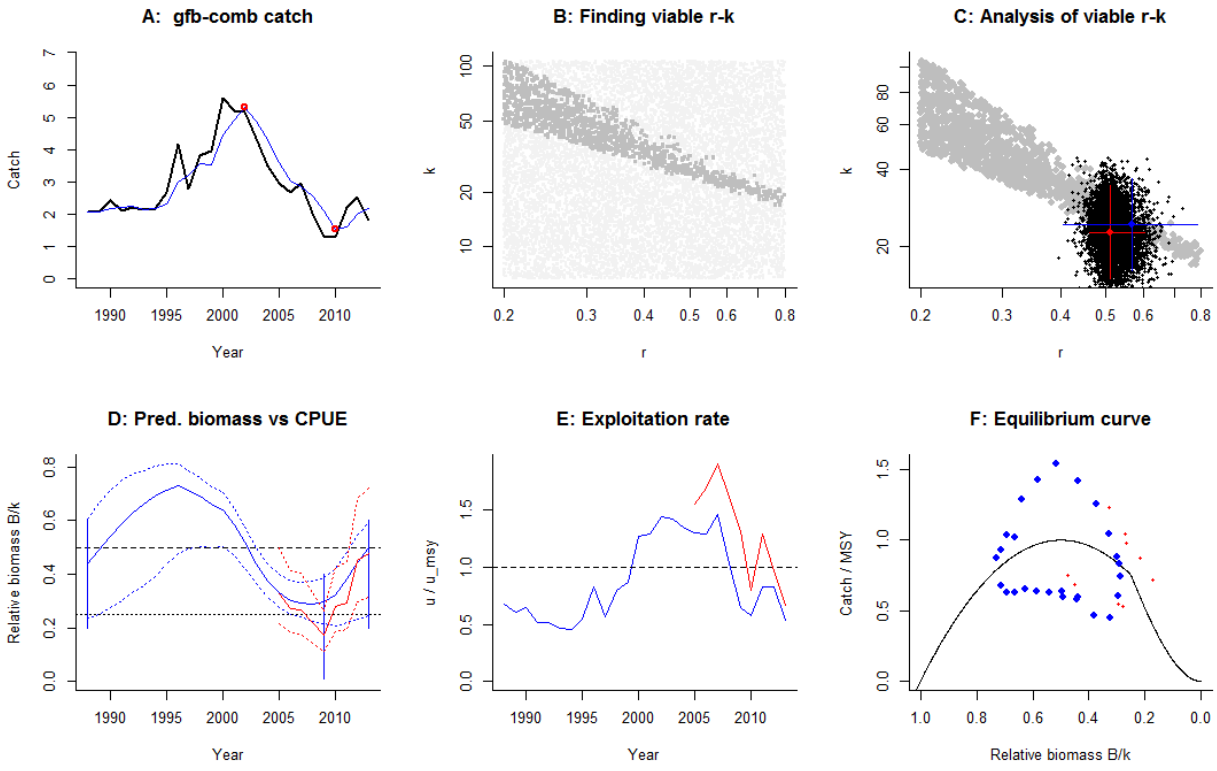

Catch fle-nsea
Catch in 1000 t
MSY
LCL
0
1
2
3
4
5
6
7
1985
1990
1995
2000
2005
2010
2015

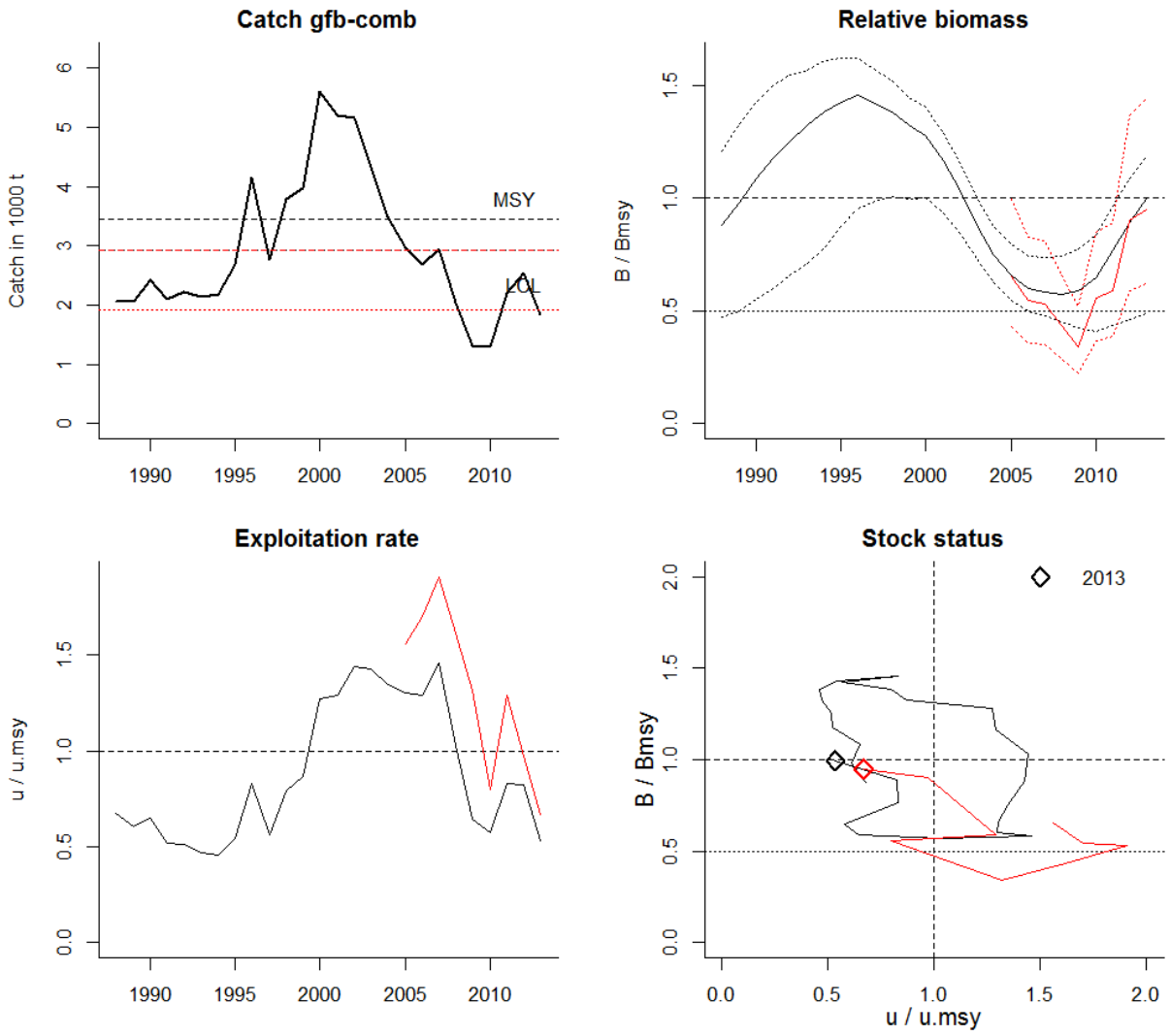

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
2.5
1985
1990
1995
2000
2005
2010
2015


Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
1985
1990
1995
2000
2005
2010
2015

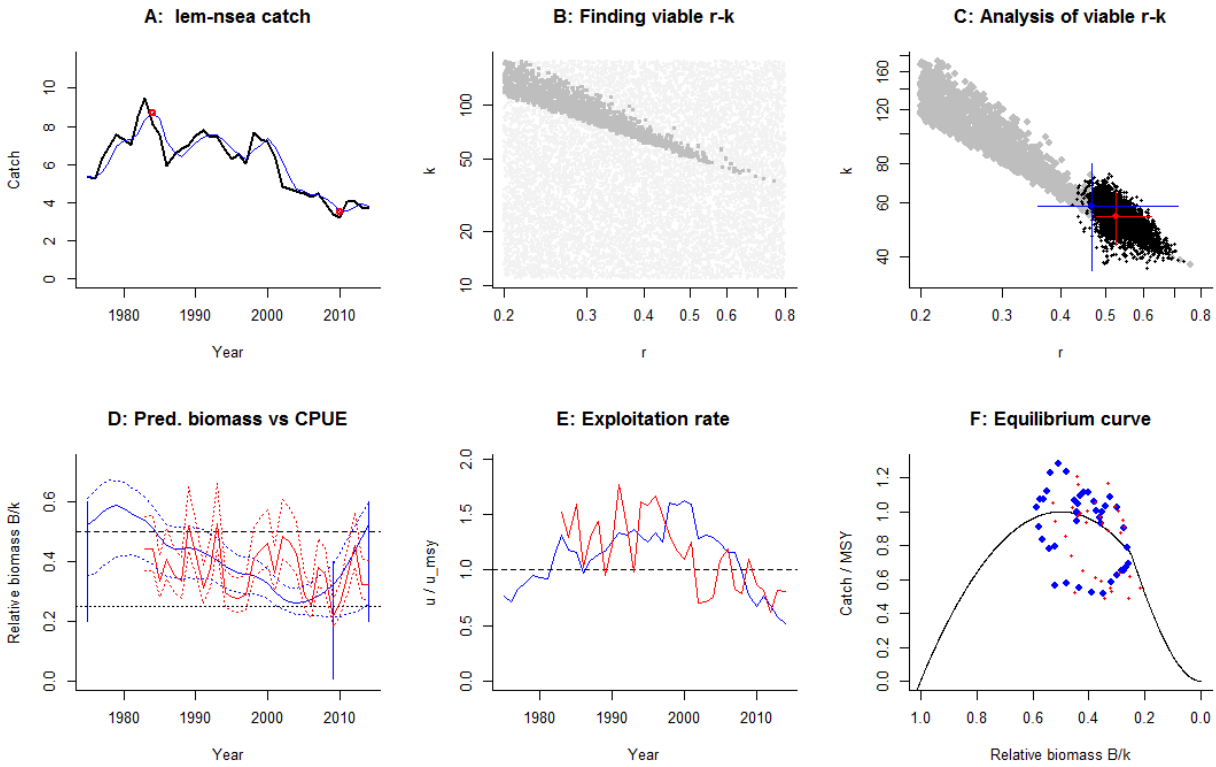

Stock status
2014
B / Bmsy
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5

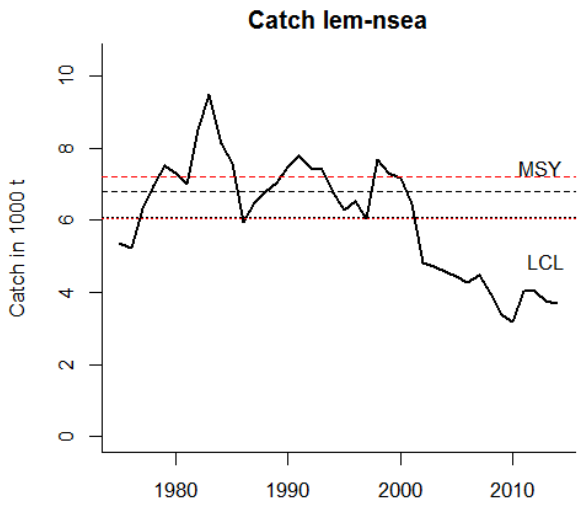
Species: *Phycis blennoides* , stock: gfb-comb
Name and region: Great forkbeard in Northeast Atlantic , ICES
Catch data used from years 1988 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 6.65 - 106
Prior range of q = 0.000103 - 0.000411
Results from Bayesian Schaefer model using catch & CPUE
r = 0.509 , 95% CL = 0.461 - 0.604 , k = 22.8 , 95% CL = 15 - 34.7
MSY = 2.93 , 95% CL = 1.92 - 4.54
q = 0.000143 , lcl = 0.000115 , ucl = 0.00018
Biomass in last year from q*CPUE = 10.8 or 0.475 k
Exploitation rate in last year = 0.202
Less than 10 years with abundance data available, shown on second axis
Results of CMSY analysis with altogether 3688 viable trajectories for 1304 r-k pairs
r = 0.567 , 95% CL = 0.405 - 0.785 , k = 24.4 , 95% CL = 16.2 - 37
MSY = 3.45 , 95% CL = 2.93 - 4.07
Relative biomass last year= 0.498 k, 2.5th = 0.243 , 97.5th = 0.595
Relative biomass next year= 0.542 k, 2.5th = 0.249 , 97.5th = 0.658
Relative exploitation rate in last year= 0.534
Comment: OK
---

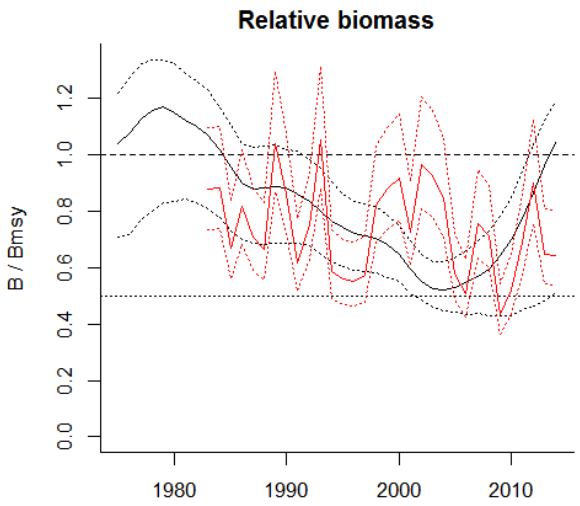


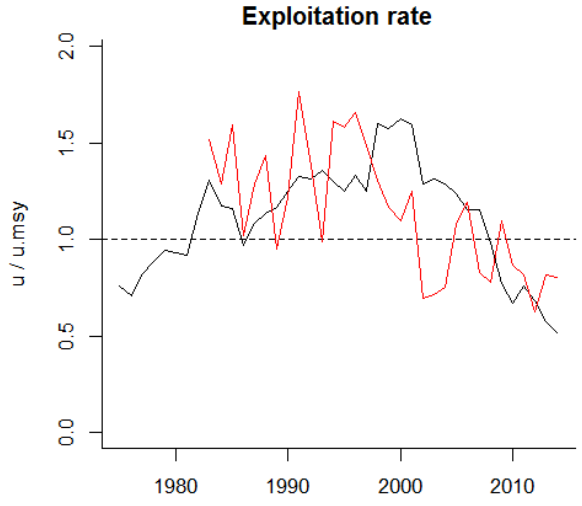

Catch gfb-comb
Catch in 1000 t
MSY
LOL
Relative biomass
B / Bmsy
Exploitation rate
u / u.msy
Stock status
2013
B / Bmsy
u / u.msy

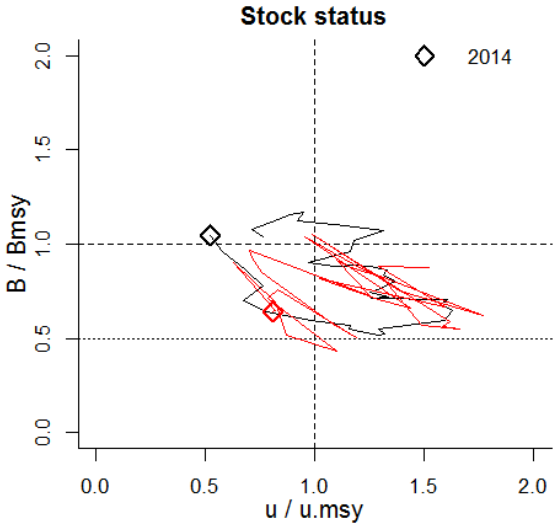
Species: *Microstomus kitt* , stock: lem-nsea
Lemon sole in Subarea IV (North Sea) and Divisions IIIa (Skagerrak–Kattegat) and VIId (Eastern Channel)
Catch data used from years 1975 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 10.9 - 174
Prior range of q = 8.22e-05 - 0.000329
Results from Bayesian Schaefer model using catch & CPUE
r = 0.525 , 95% CL = 0.477 - 0.627 , k = 54.2 , 95% CL = 43.4 - 64.7
MSY = 7.19 , 95% CL = 6.05 - 8.22
q = 8.9e-05 , lcl = 7.33e-05 , ucl = 0.000108
Biomass in last year from q*CPUE = 17.5 or 0.322 k
Exploitation rate in last year = 0.219
Results of CMSY analysis with altogether 2824 viable trajectories for 1839 r-k pairs
r = 0.465 , 95% CL = 0.357 - 0.711 , k = 58.3 , 95% CL = 36.1 - 80.5
MSY = 6.79 , 95% CL = 6.07 - 7.58
Relative biomass last year= 0.522 k, 2.5th = 0.256 , 97.5th = 0.595
Relative biomass next year= 0.57 k, 2.5th = 0.277 , 97.5th = 0.651
Relative exploitation rate in last year= 0.521
Comment: OK
---



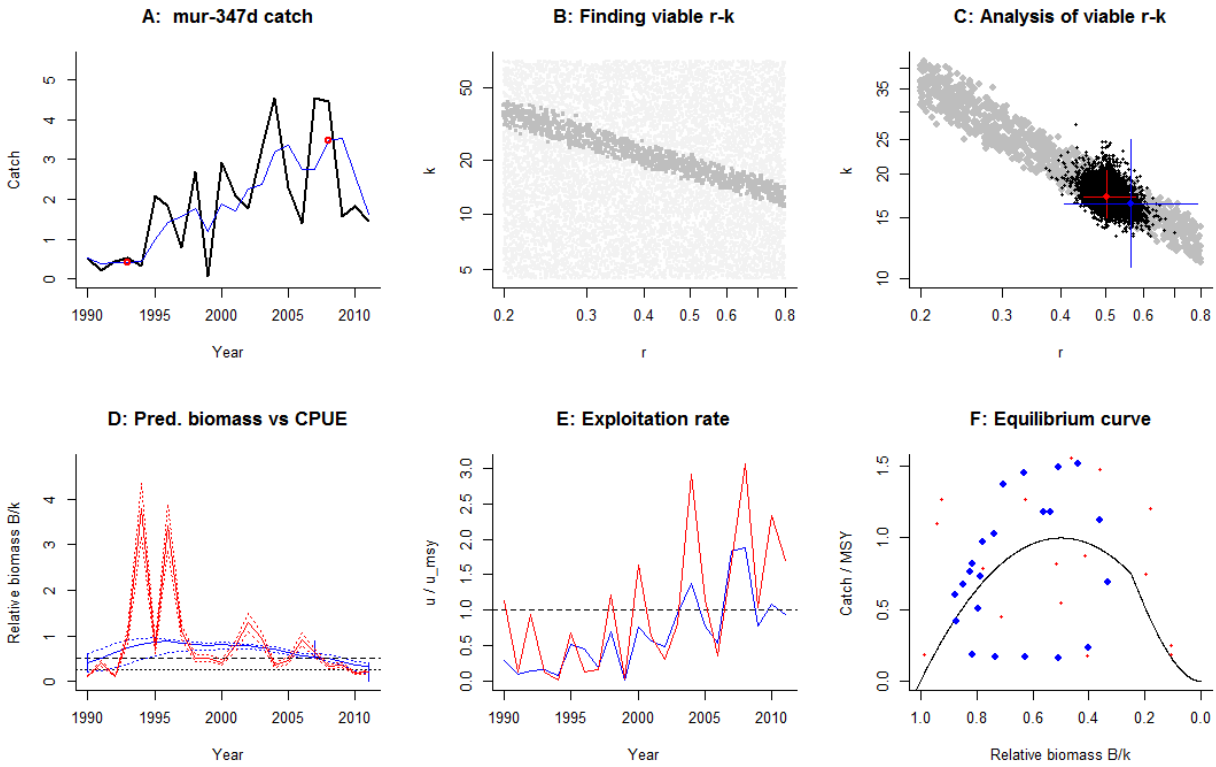

Catch lem-nsea
Catch in 1000 t
MSY
LCL
0
2
4
6
8
10
1980
1990
2000
2010

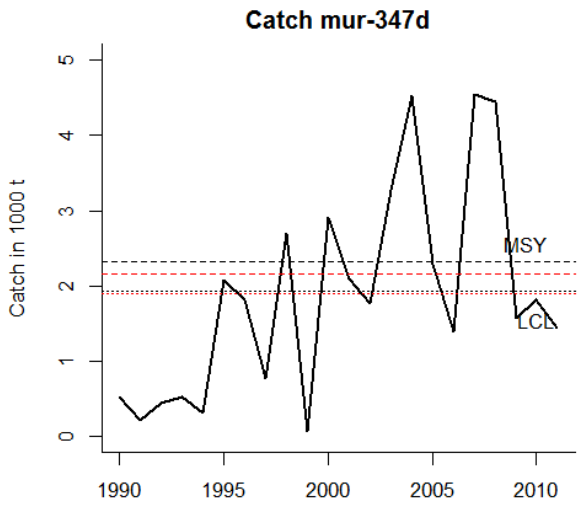

Relative biomass
B / Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1980
1990
2000
2010

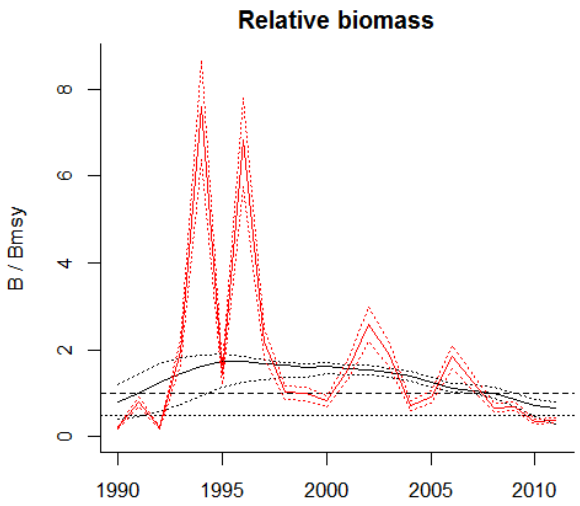

Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
1980
1990
2000
2010

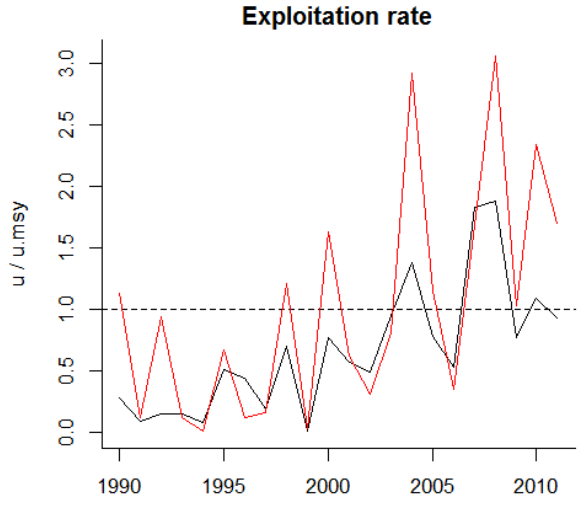

Stock status
2014
B / Bmsy
u / u.msy
0.0
0.5
1.0
1.5
2.0

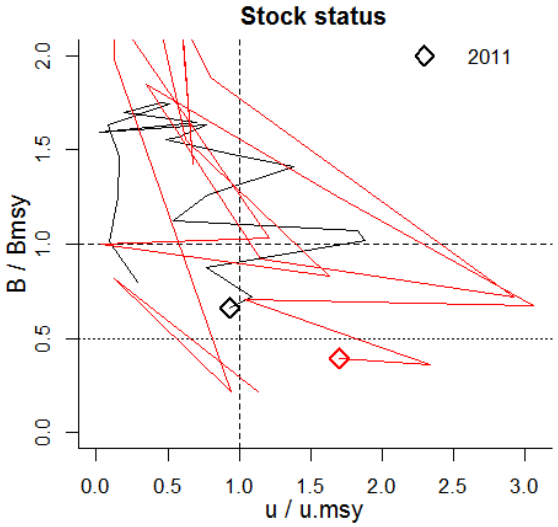
Species: *Mullus surmuletus* , stock: mur-347d
Name and region: Red striped mullet - in Subarea IV (North Sea) and Divisions VIId (Eastern English Channel) and IIIa (Skagerrak–Kattegat) , ICES
Catch data used from years 1990 - 2011 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2007 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 4.41 - 70.5
Prior range of q = 6.08e-05 - 0.000243
Results from Bayesian Schaefer model using catch & CPUE
r = 0.503 , 95% CL = 0.449 - 0.578 , k = 17.2 , 95% CL = 15 - 20.4
MSY = 2.16 , 95% CL = 1.9 - 2.58
q = 0.000113 , lcl = 8.65e-05 , ucl = 0.000145
Biomass in last year from q*CPUE = 3.36 or 0.196 k
Exploitation rate in last year = 0.479
Results of CMSY analysis with altogether 5678 viable trajectories for 1039 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 16.4 , 95% CL = 10.8 - 25
MSY = 2.32 , 95% CL = 1.94 - 2.78
Relative biomass last year= 0.331 k, 2.5th = 0.144 , 97.5th = 0.397
Relative biomass next year= 0.358 k, 2.5th = 0.0806 , 97.5th = 0.458
Relative exploitation rate in last year= 0.935
Comment: OK
---



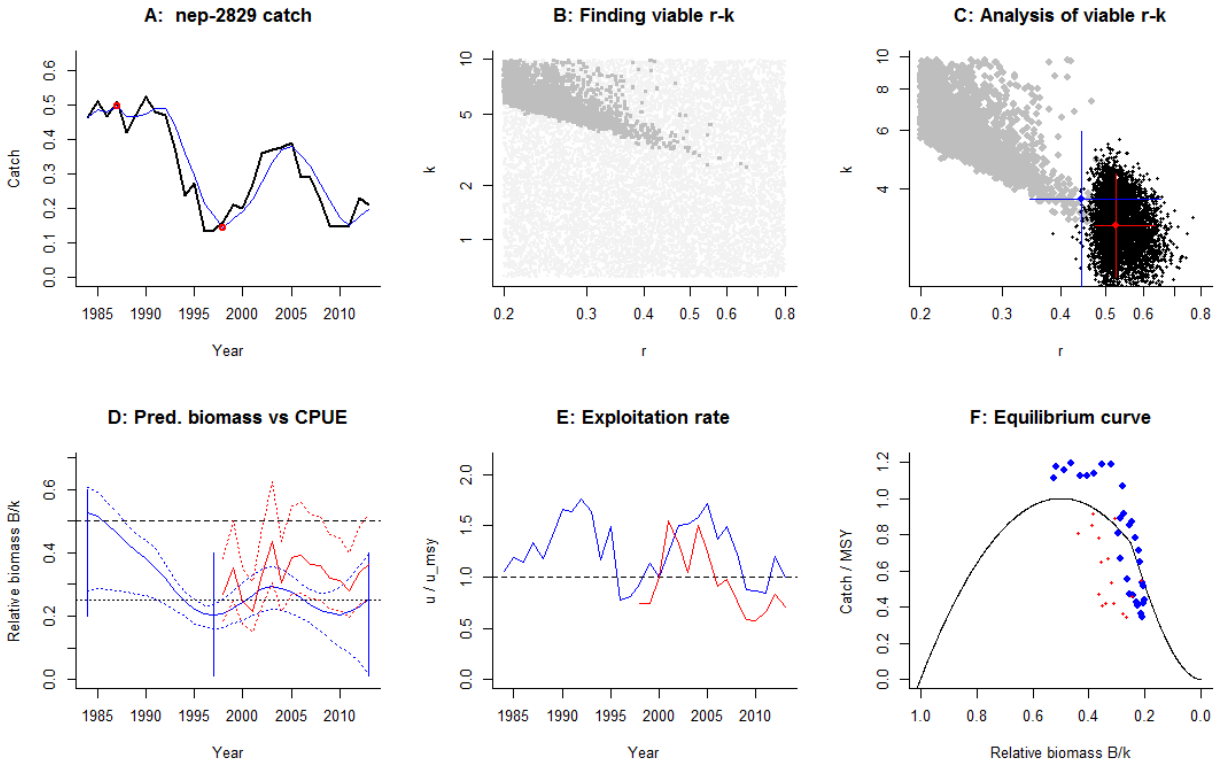

Catch mur-347d
Catch in 1000 t
MSY
LCL
0
1
2
3
4
5
1990
1995
2000
2005
2010

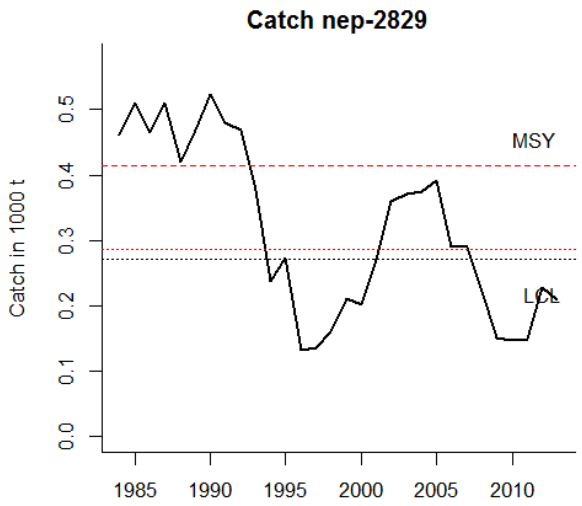

Relative biomass
B / Bmsy
0
2
4
6
8
1990
1995
2000
2005
2010

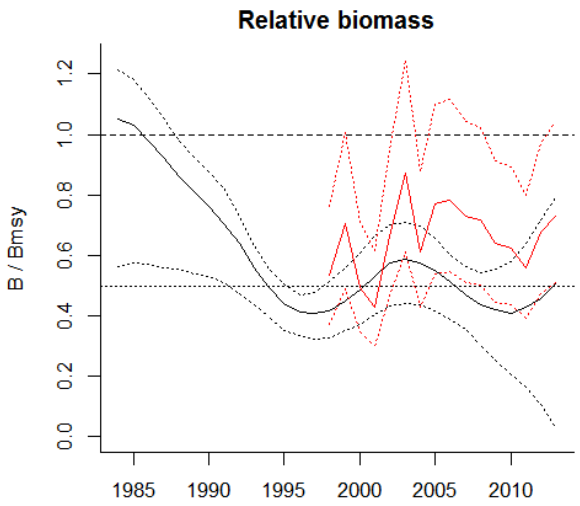

Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1990
1995
2000
2005
2010

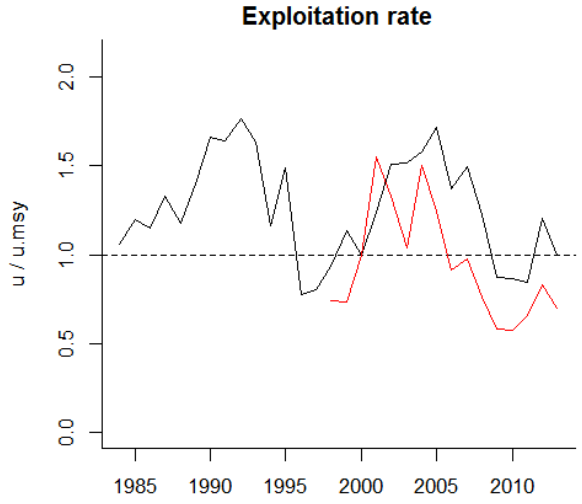

Stock status
2011
B / Bmsy
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0

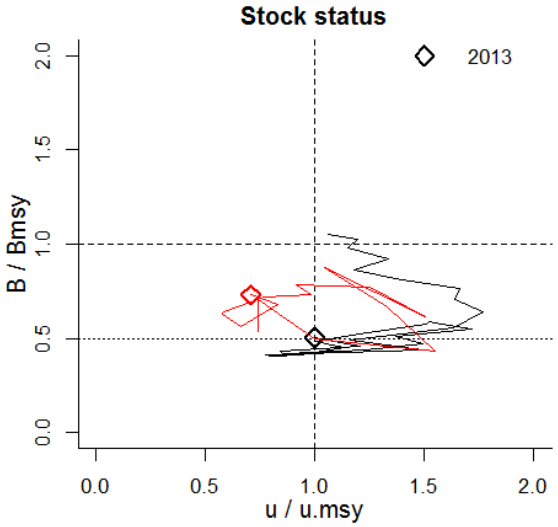
Species: *Nephrops norvegicus* , stock: nep-2829
Name and region: Neprophs in FUs 28 and 29 , ICES
Catch data used from years 1984 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 1997 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.618 - 9.89
Prior range of q = 0.00512 - 0.0205
Results from Bayesian Schaefer model using catch & CPUE
r = 0.524 , 95% CL = 0.475 - 0.635 , k = 3.11 , 95% CL = 2.17 - 4.45
MSY = 0.415 , 95% CL = 0.286 - 0.587
q = 0.00494 , lcl = 0.00397 , ucl = 0.00608
Biomass in last year from q*CPUE = 1.13 or 0.365 k
Exploitation rate in last year = 0.173
Results of CMSY analysis with altogether 3058 viable trajectories for 2410 r-k pairs
r = 0.443 , 95% CL = 0.344 - 0.655 , k = 3.74 , 95% CL = 2.04 - 5.96
MSY = 0.414 , 95% CL = 0.272 - 0.629
Relative biomass last year= 0.253 k, 2.5th = 0.0161 , 97.5th = 0.395
Relative biomass next year= 0.282 k, 2.5th = -0.0281 , 97.5th = 0.439
Relative exploitation rate in last year= 0.998
Comment: OK
---



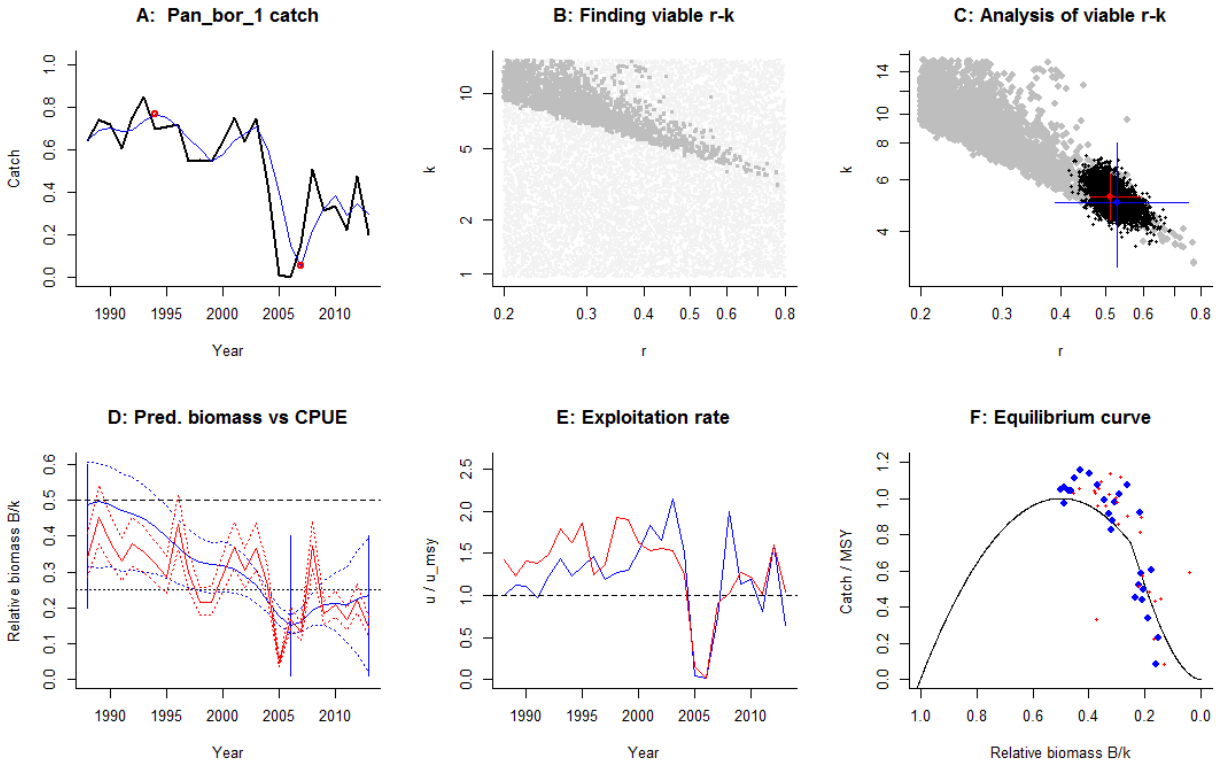

Catch nep-2829
Catch in 1000 t
MSY
0.0
0.1
0.2
0.3
0.4
0.5
1985
1990
1995
2000
2005
2010

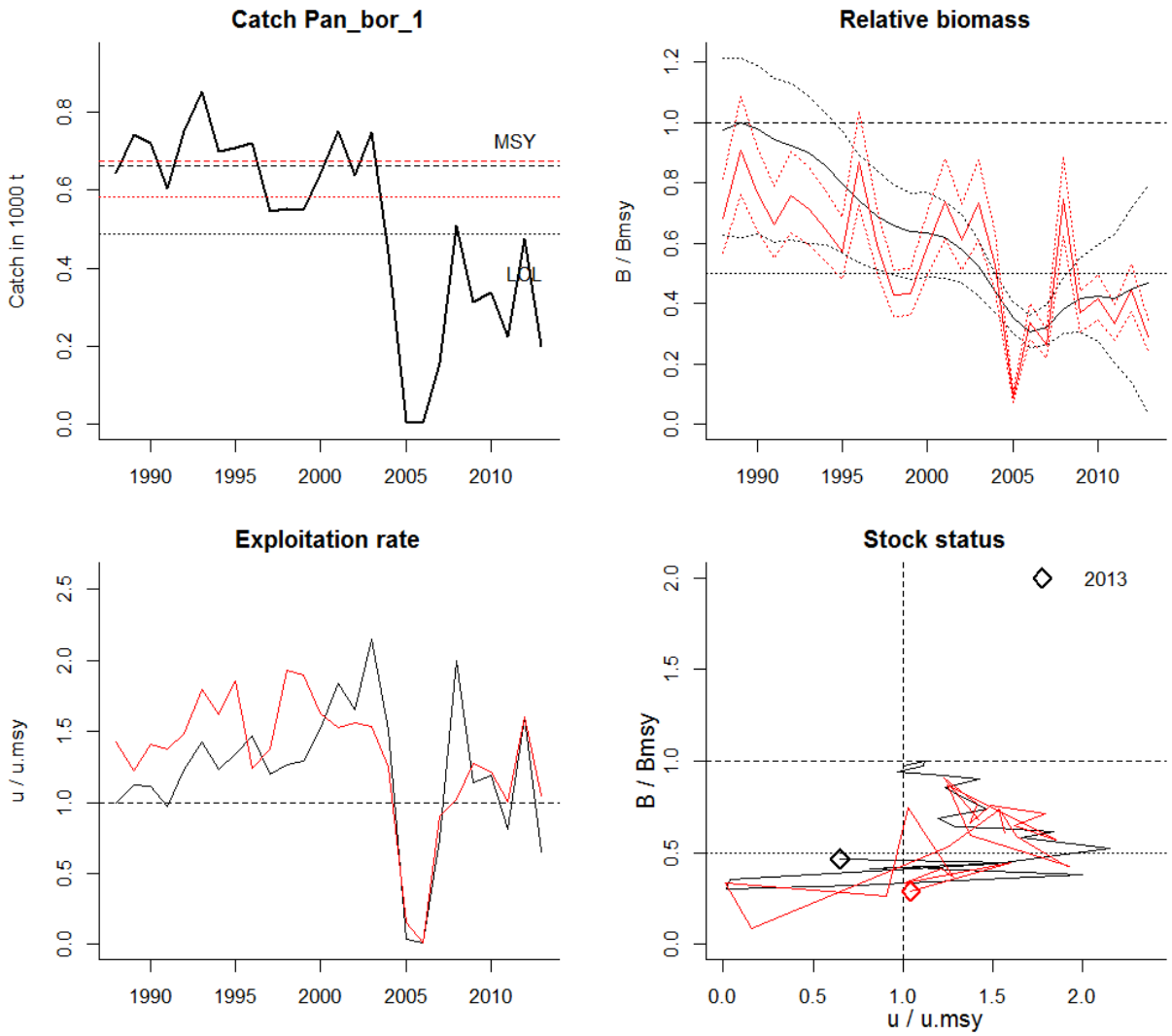

Relative biomass
B / Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1985
1990
1995
2000
2005
2010


Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
1985
1990
1995
2000
2005
2010

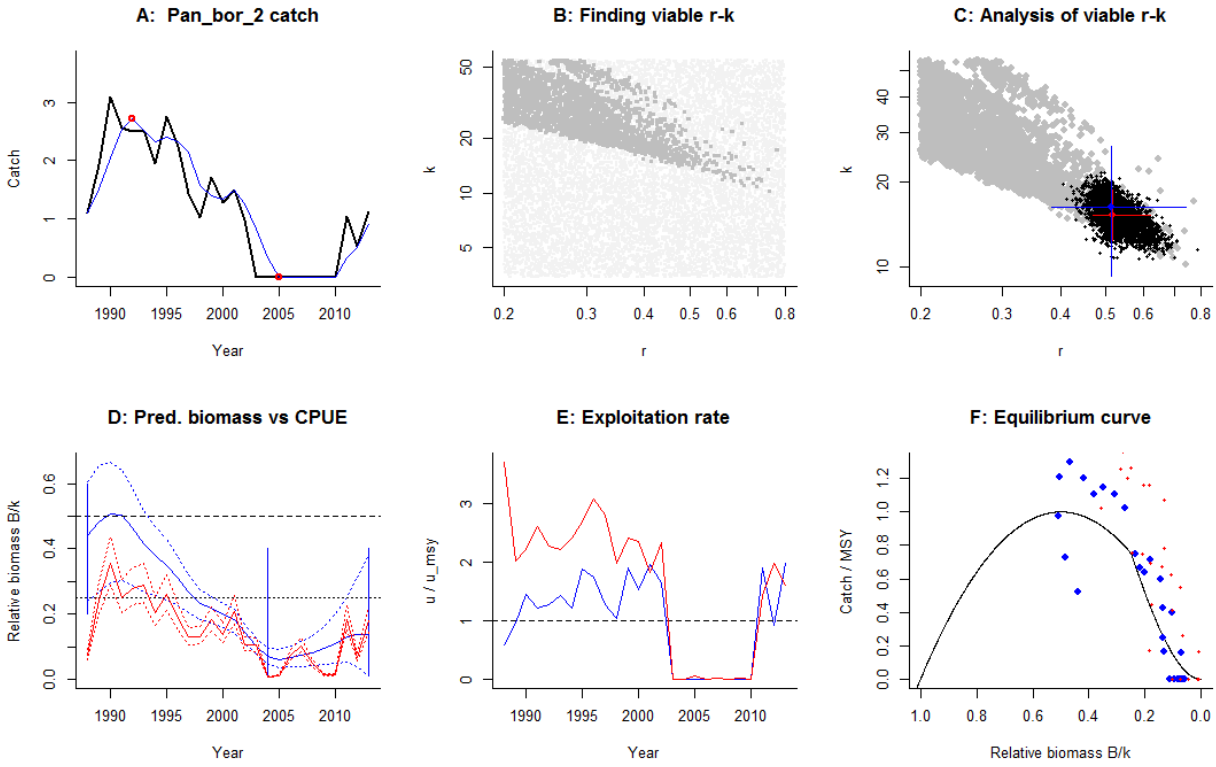

Stock status
2013
B / Bmsy
u / u.msy
0.0
0.5
1.0
1.5
2.0

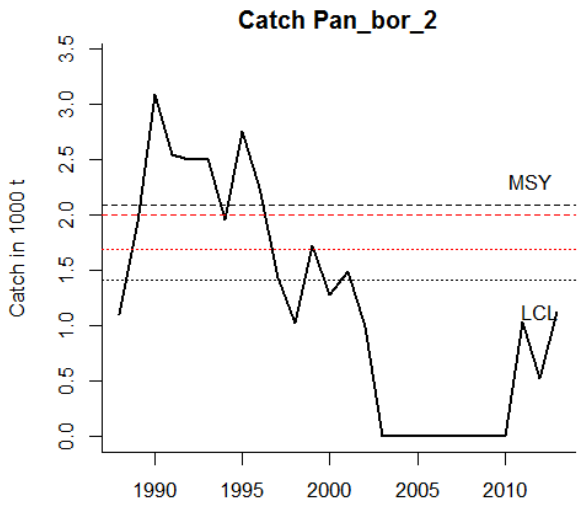
Species: *Pandalus borealis* , stock: Pan_bor_1
Name and region: Northern shrimp in Arnarfjordur , ICES
Catch data used from years 1988 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2006 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.96 - 15.4
Prior range of q = 0.702 - 2.81
Results from Bayesian Schaefer model using catch & CPUE
r = 0.51 , 95% CL = 0.465 - 0.593 , k = 5.23 , 95% CL = 4.38 - 6.25
MSY = 0.674 , 95% CL = 0.582 - 0.782
q = 0.969 , lcl = 0.822 , ucl = 1.15
Biomass in last year from q*CPUE = 0.755 or 0.145 k
Exploitation rate in last year = 0.397
Results of CMSY analysis with altogether 3146 viable trajectories for 2332 r-k pairs
r = 0.529 , 95% CL = 0.389 - 0.749 , k = 5.01 , 95% CL = 3.02 - 7.98
MSY = 0.663 , 95% CL = 0.486 - 0.903
Relative biomass last year= 0.233 k, 2.5th = 0.0196 , 97.5th = 0.395
Relative biomass next year= 0.254 k, 2.5th = -0.0358 , 97.5th = 0.455
Relative exploitation rate in last year= 0.65
Comment: OK
---

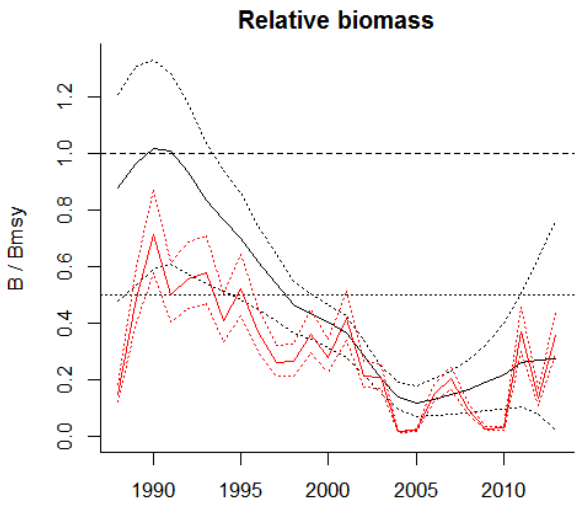


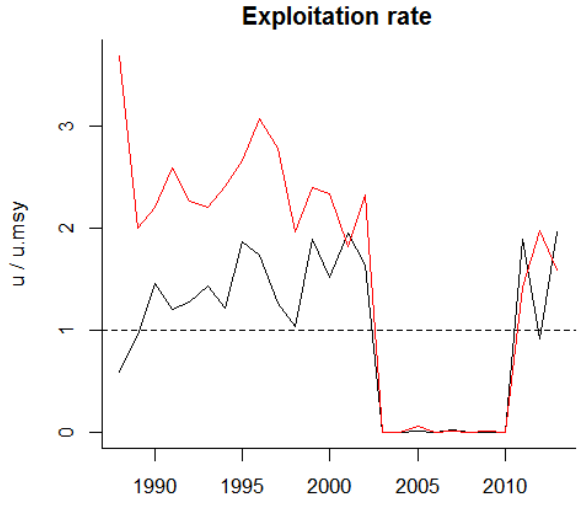

Catch Pan_bor_1
Catch in 1000 t
MSY
LOL
Relative biomass
B / Bmsy
Exploitation rate
u / u.msy
Stock status
2013
B / Bmsy
u / u.msy

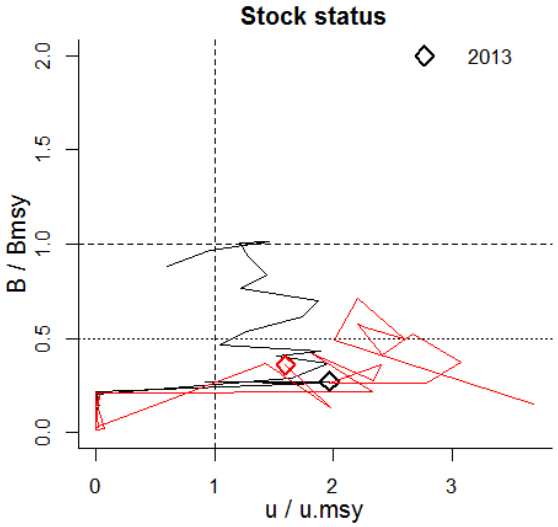
Species: *Pandalus borealis* , stock: Pan_bor_2
Name and region: Northern shrimp in Isafjardardjup , ICES
Catch data used from years 1988 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2004 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 3.4 - 54.4
Prior range of q = 0.632 - 2.53
Results from Bayesian Schaefer model using catch & CPUE
r = 0.516 , 95% CL = 0.469 - 0.621 , k = 15.3 , 95% CL = 12.4 - 18.7
MSY = 2 , 95% CL = 1.69 - 2.38
q = 0.719 , lcl = 0.544 , ucl = 1.05
Biomass in last year from q*CPUE = 2.74 or 0.179 k
Exploitation rate in last year = 0.328
Results of CMSY analysis with altogether 3332 viable trajectories for 2735 r-k pairs
r = 0.513 , 95% CL = 0.381 - 0.74 , k = 16.3 , 95% CL = 9.26 - 26.9
MSY = 2.1 , 95% CL = 1.41 - 3.11
Relative biomass last year= 0.137 k, 2.5th = 0.0124 , 97.5th = 0.381
Relative biomass next year= 0.114 k, 2.5th = -0.0424 , 97.5th = 0.436
Relative exploitation rate in last year= 1.97
Comment: OK
---



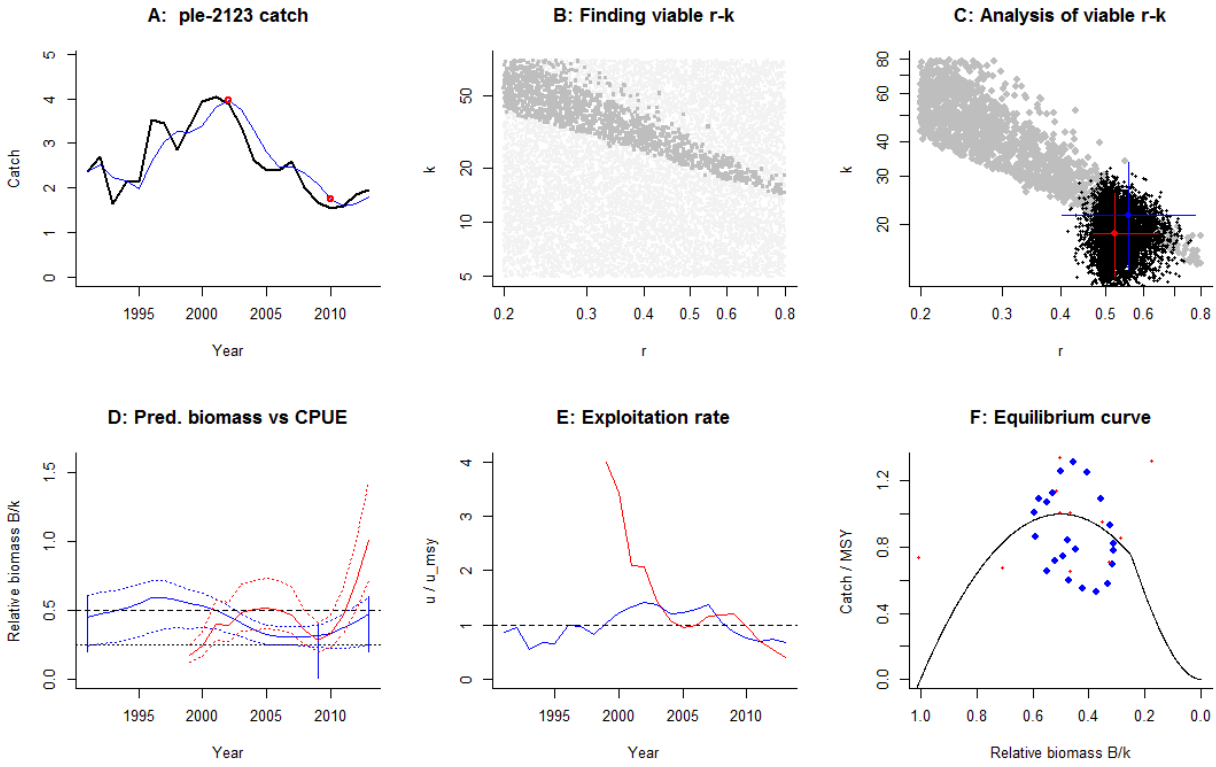

Catch Pan_bor_2
Catch in 1000 t
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
MSY
LCL
1990
1995
2000
2005
2010

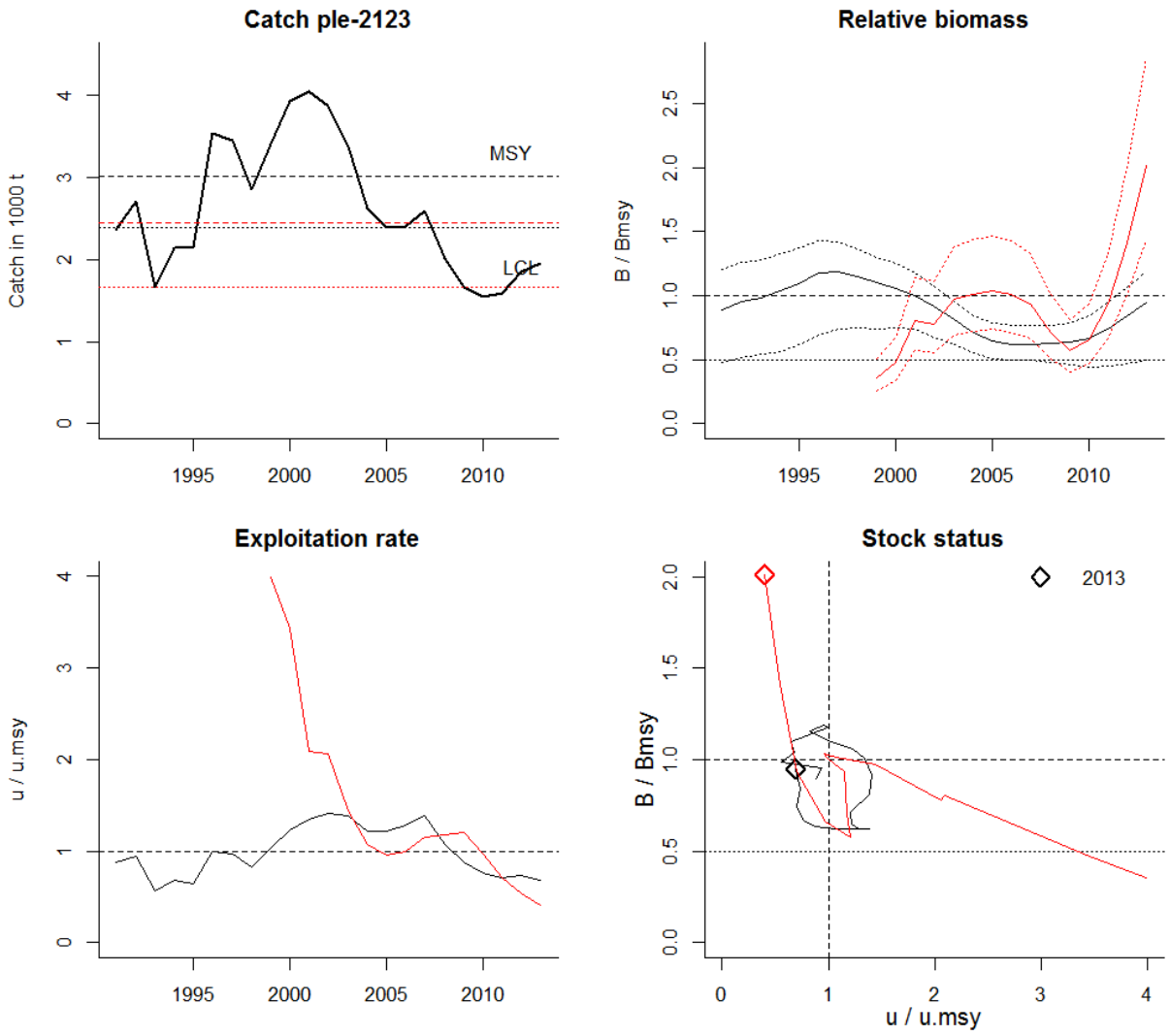

Relative biomass
B / Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1990
1995
2000
2005
2010


Exploitation rate
u / u.msy
0
1
2
3
1990
1995
2000
2005
2010


Stock status
2013
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
u / u.msy

Species: *Pleuronectes platessa* , stock: ple-2123
Name and region: Plaice in Subdivisions 21, 22, and 23 (Kattegat, Belts, and Sound) , ICES
Catch data used from years 1991 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 4.94 - 79.1
Prior range of q = 0.000111 - 0.000442
Results from Bayesian Schaefer model using catch & CPUE
r = 0.522 , 95% CL = 0.469 - 0.646 , k = 18.4 , 95% CL = 13 - 25.9
MSY = 2.45 , 95% CL = 1.66 - 3.5
q = 0.000107 , lcl = 8.27e-05 , ucl = 0.000136
Biomass in last year from q*CPUE = 18.6 or 1.01 k
Exploitation rate in last year = 0.0969
Results of CMSY analysis with altogether 3313 viable trajectories for 1454 r-k pairs
r = 0.557 , 95% CL = 0.403 - 0.777 , k = 21.6 , 95% CL = 13.8 - 33.6
MSY = 3.01 , 95% CL = 2.39 - 3.79
Relative biomass last year= 0.473 k, 2.5th = 0.247 , 97.5th = 0.591
Relative biomass next year= 0.525 k, 2.5th = 0.258 , 97.5th = 0.653
Relative exploitation rate in last year= 0.686
Comment: OK
---




Catch ple-2123
Catch in 1000 t
MSY
LCL
0
1
2
3
4
1995
2000
2005
2010
Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
2.5
1995
2000
2005
2010
Exploitation rate
u / u.msy
0
1
2
3
4
1995
2000
2005
2010
Stock status
2013
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
u / u.msy

Species: *Pleuronectes platessa* , stock: ple-2432
Name and region: Plaice in Subdivisions 24-32 (Baltic Sea) , ICES
Catch data used from years 1991 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2001 expert
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 1.46 - 23.3
Prior range of q = 0.00433 - 0.0173
Results from Bayesian Schaefer model using catch & CPUE
r = 0.508 , 95% CL = 0.465 - 0.592 , k = 7.06 , 95% CL = 4.17 - 10.6
MSY = 0.909 , 95% CL = 0.527 - 1.37
q = 0.00712 , lcl = 0.00554 , ucl = 0.00916
Biomass in last year from q*CPUE = 4.35 or 0.617 k
Exploitation rate in last year = 0.179
Results of CMSY analysis with altogether 743 viable trajectories for 704 r-k pairs
r = 0.266 , 95% CL = 0.242 - 0.292 , k = 13.2 , 95% CL = 10.8 - 16.1
MSY = 0.876 , 95% CL = 0.713 - 1.08
Relative biomass last year= 0.267 k, 2.5th = 0.204 , 97.5th = 0.402
Relative biomass next year= 0.256 k, 2.5th = 0.173 , 97.5th = 0.419
Relative exploitation rate in last year= 1.57
Comment: Different trends in CMSY and BSM abundance and exploitation rates. More data needed to confirm stock status.

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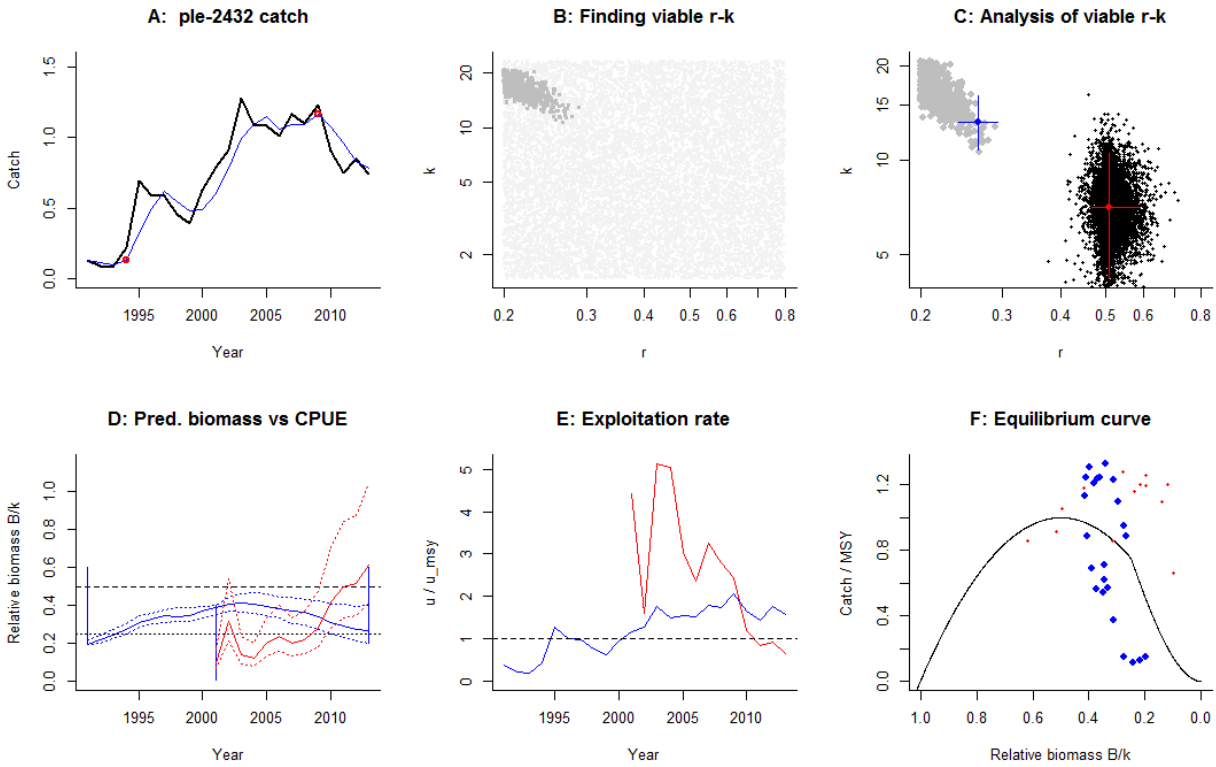
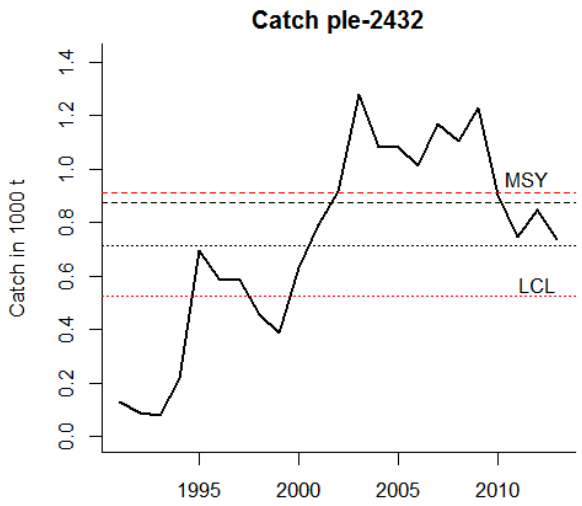
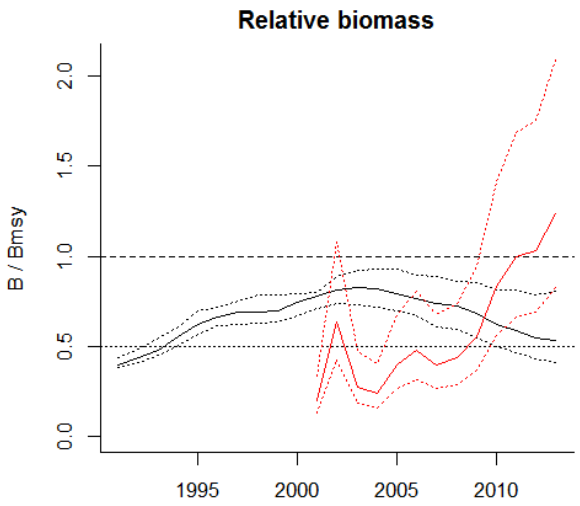
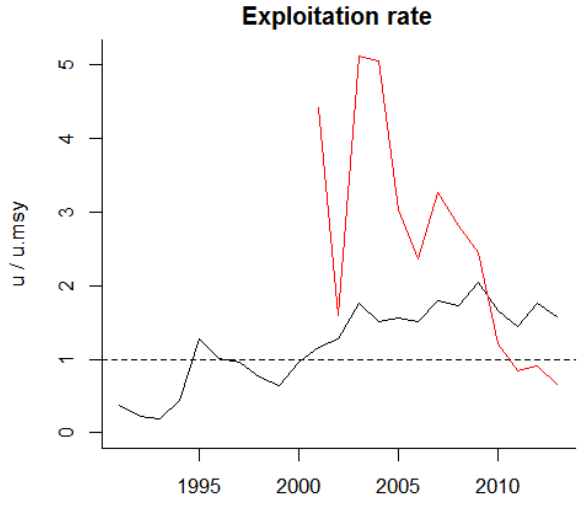
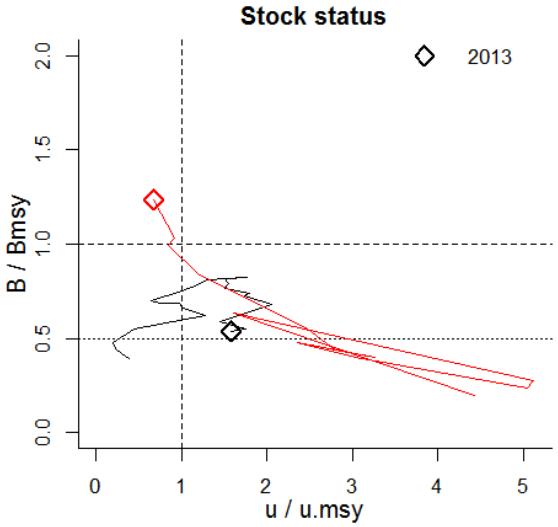



Catch ple-2432
Catch in 1000 t
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
MSY
LCL
1995
2000
2005
2010


Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
1995
2000
2005
2010


Exploitation rate
u / u.msy
0
1
2
3
4
5
1995
2000
2005
2010


Stock status
2013
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
5
u / u.msy

Species: *Raja brachyura* , stock: rjh-pore
Name and region: Blond ray in Division Ixa , ICES
Catch data used from years 2003 - 2013 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.722 - 11.6
Less than 10 years with abundance data available, shown on second axis
Results of CMSY analysis with altogether 8717 viable trajectories for 3382 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 4.11 , 95% CL = 2.09 - 8.07
MSY = 0.581 , 95% CL = 0.295 - 1.15
Relative biomass last year= 0.487 k, 2.5th = 0.223 , 97.5th = 0.595
Relative biomass next year= 0.564 k, 2.5th = 0.255 , 97.5th = 0.69
Relative exploitation rate in last year= 0.486 Comment: Only 5 years of abundance data, too few for BSM. CPUE is therefore plotted on second axis, i.e., with a different scale than CMSY. More data needed to build confidence in CMSY fit.

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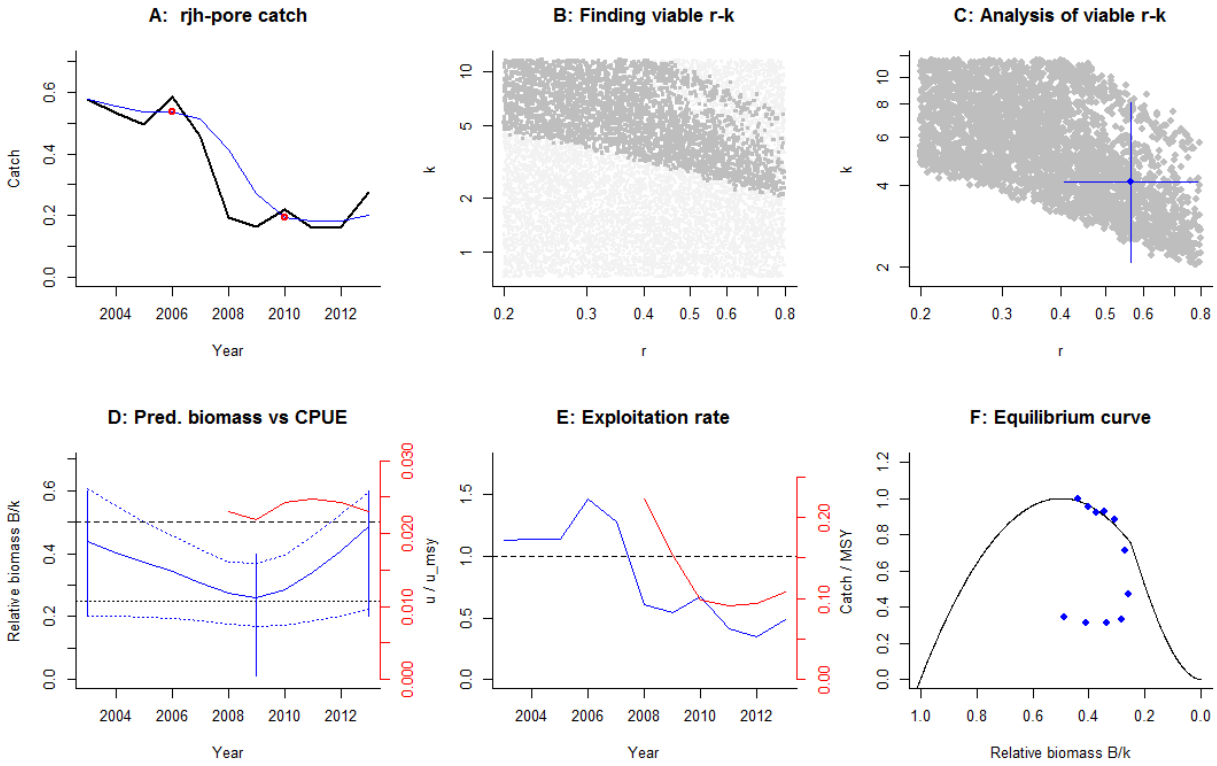
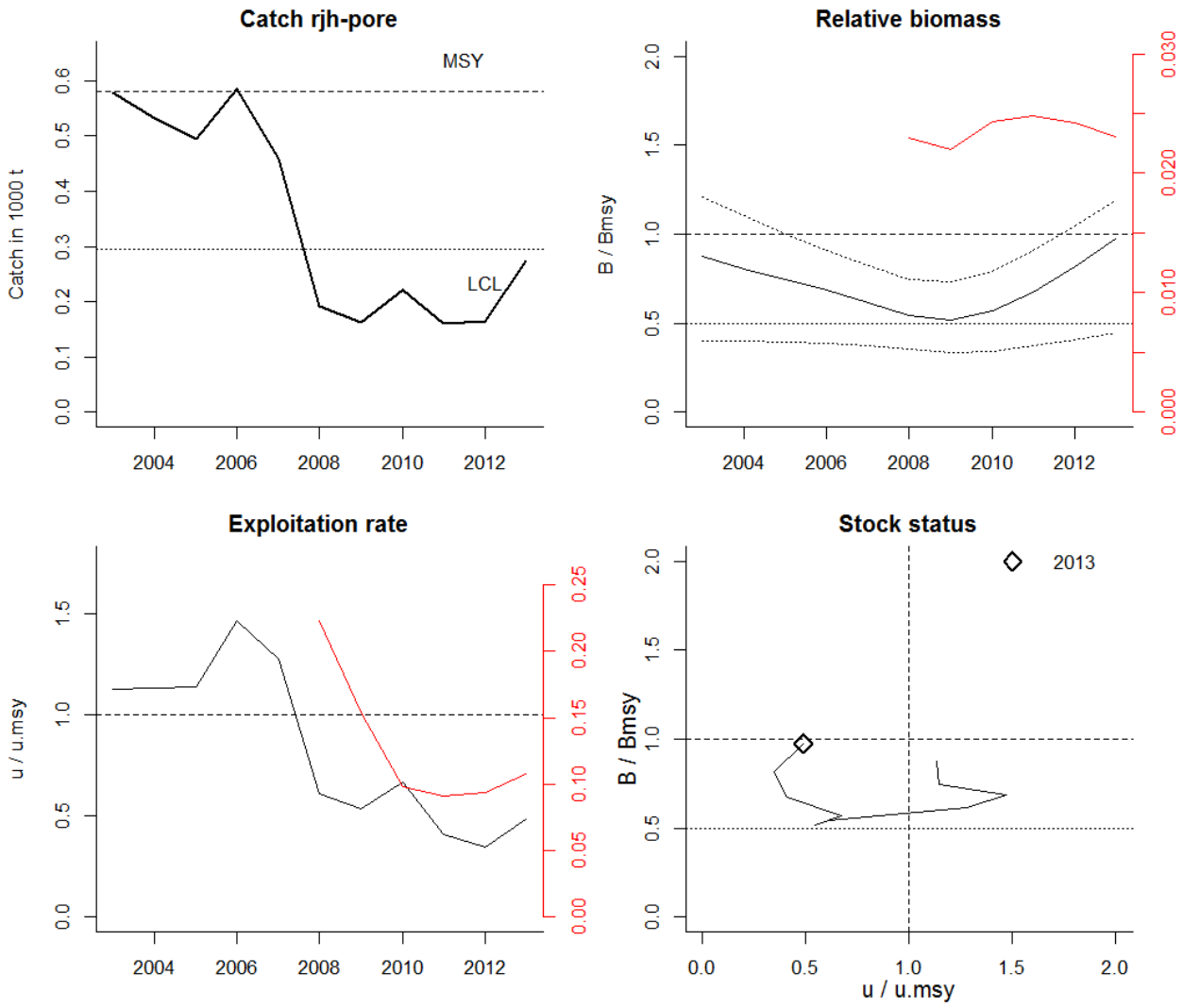
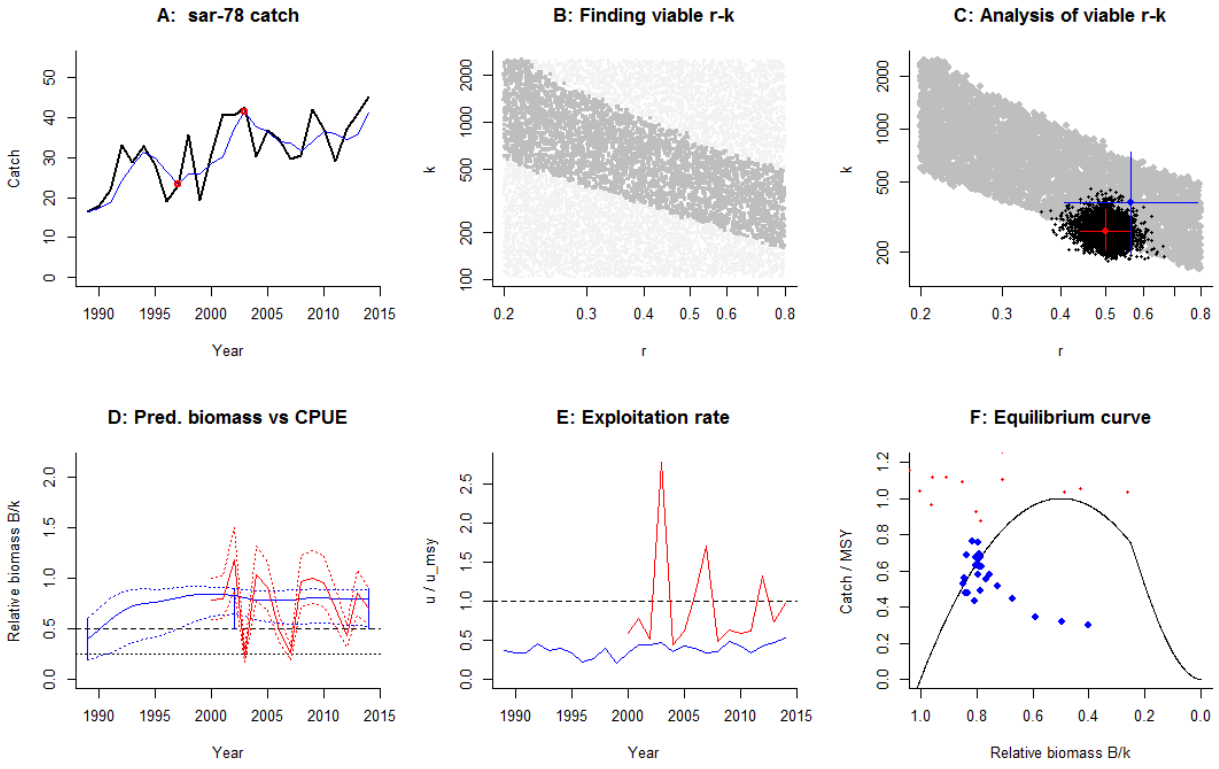
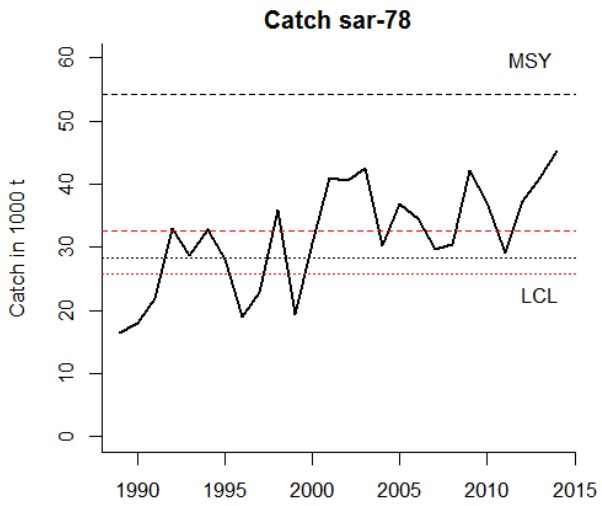
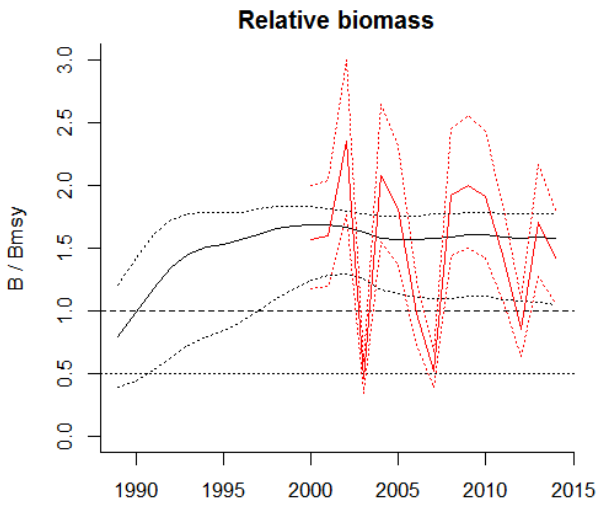


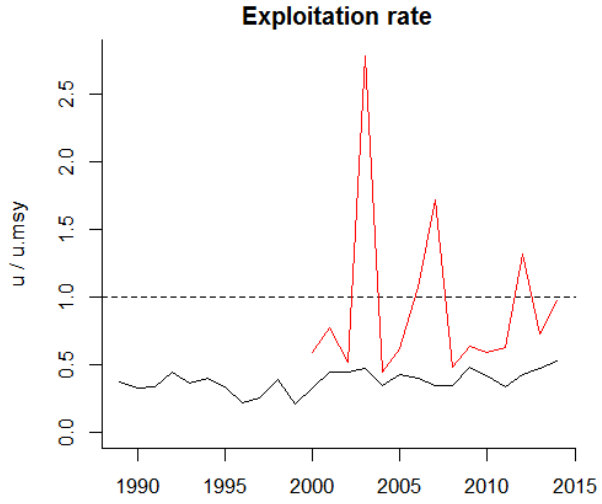

Catch rjh-pore
MSY
LCL
Catch in 1000 t
0.0
0.1
0.2
0.3
0.4
0.5
0.6
2004
2006
2008
2010
2012
Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0.000
0.010
0.020
0.030
Exploitation rate
u / u.msy
0.00
0.05
0.10
0.15
0.20
0.25
Stock status
2013
B / Bmsy
u / u.msy

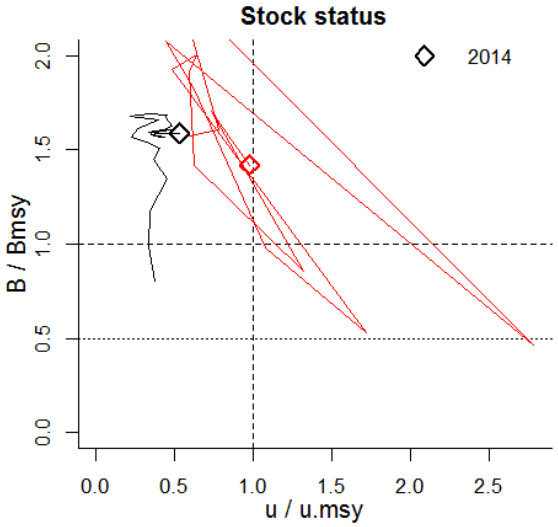
Species: *Sardina pilchardus* , stock: sar-78
Name and region: Sardine in Divisions VIIIa,b,d and Subarea VII , ICES
Catch data used from years 1989 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 2002 default
Prior final relative biomass = 0.5 - 0.9 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 103 - 2479
Prior range of q = 1.02 - 4.09
Results from Bayesian Schaefer model using catch & CPUE
r = 0.5 , 95% CL = 0.44 - 0.563 , k = 262 , 95% CL = 206 - 351
MSY = 32.7 , 95% CL = 25.8 - 44.4
q = 1.82 , lcl = 1.33 , ucl = 2.49
Biomass in last year from q*CPUE = 186 or 0.71 k
Exploitation rate in last year = 0.221
Results of CMSY analysis with altogether 36408 viable trajectories for 3971 r-k pairs
r = 0.566 , 95% CL = 0.407 - 0.785 , k = 384 , 95% CL = 198 - 743
MSY = 54.3 , 95% CL = 28.3 - 104
Relative biomass last year= 0.792 k, 2.5th = 0.527 , 97.5th = 0.887
Relative biomass next year= 0.776 k, 2.5th = 0.496 , 97.5th = 0.877
Relative exploitation rate in last year= 0.527
Comment: OK
---



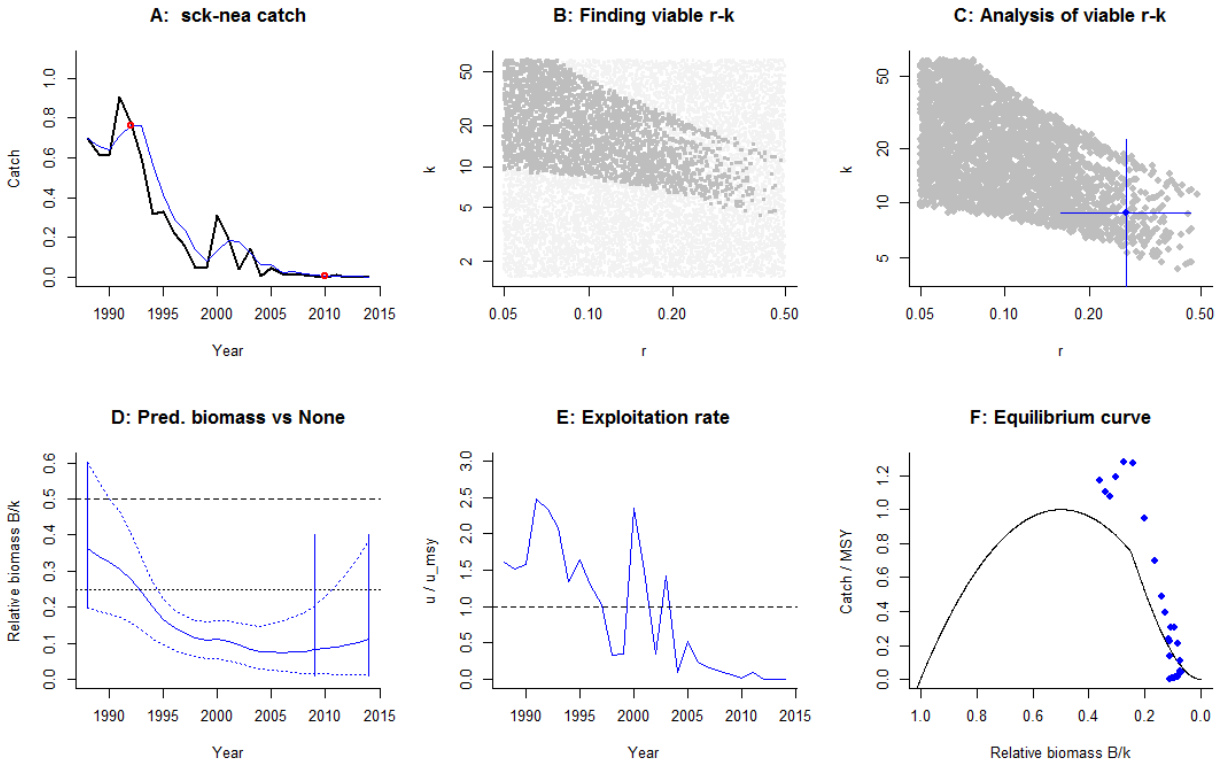

Catch sar-78
MSY
LCL
Catch in 1000 t
0
10
20
30
40
50
60
1990
1995
2000
2005
2010
2015

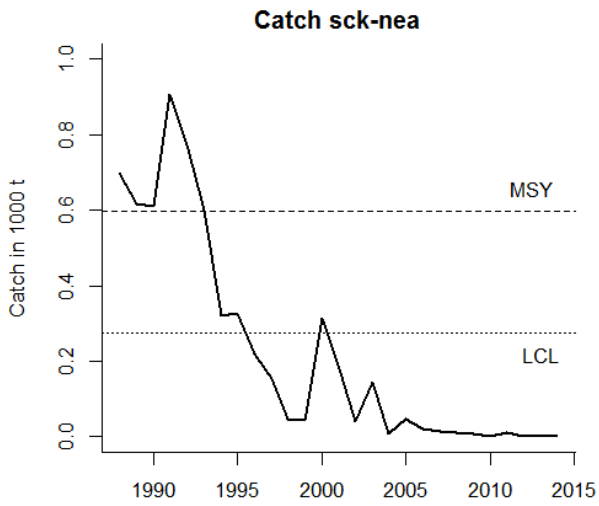

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1990
1995
2000
2005
2010
2015

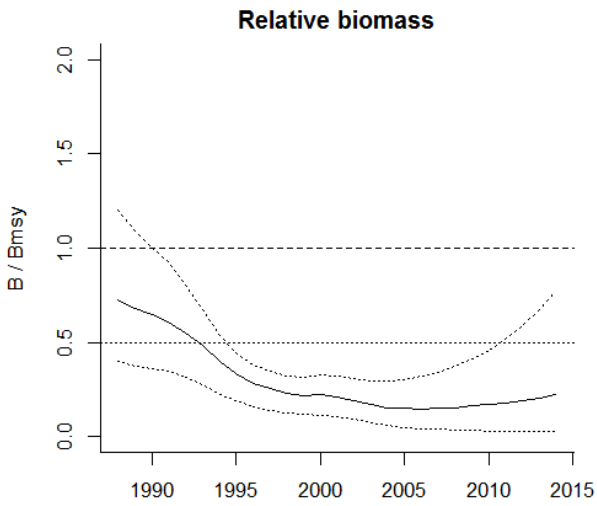

Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
1990
1995
2000
2005
2010
2015

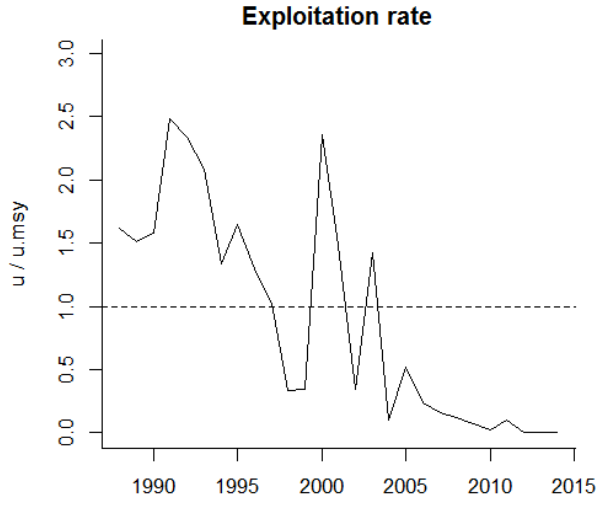

Stock status
2014
B / Bmsy
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5

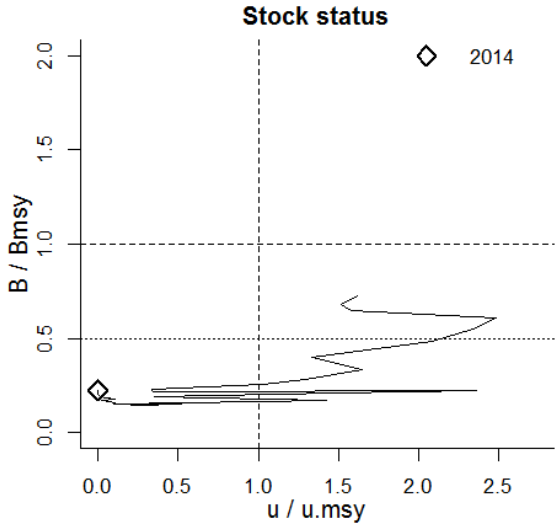
Species: *Dalatias licha* , stock: sck-nea
Name and region: "Kitefin shark in the Northeast Atlantic" , ICES
Catch data used from years 1988 - 2014 , biomass = None
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2009 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.05 - 0.5 default , prior range for k = 1.53 - 61
Results of CMSY analysis with altogether 5530 viable trajectories for 2889 r-k pairs
r = 0.27 , 95% CL = 0.159 - 0.459 , k = 8.85 , 95% CL = 3.5 - 22.4
MSY = 0.597 , 95% CL = 0.274 - 1.3
Relative biomass last year= 0.112 k, 2.5th = 0.0137 , 97.5th = 0.387
Relative biomass next year= 0.122 k, 2.5th = 0.0138 , 97.5th = 0.44
Relative exploitation rate in last year= 0
Comment: No abundance data available. CMSY fit seems OK.
---



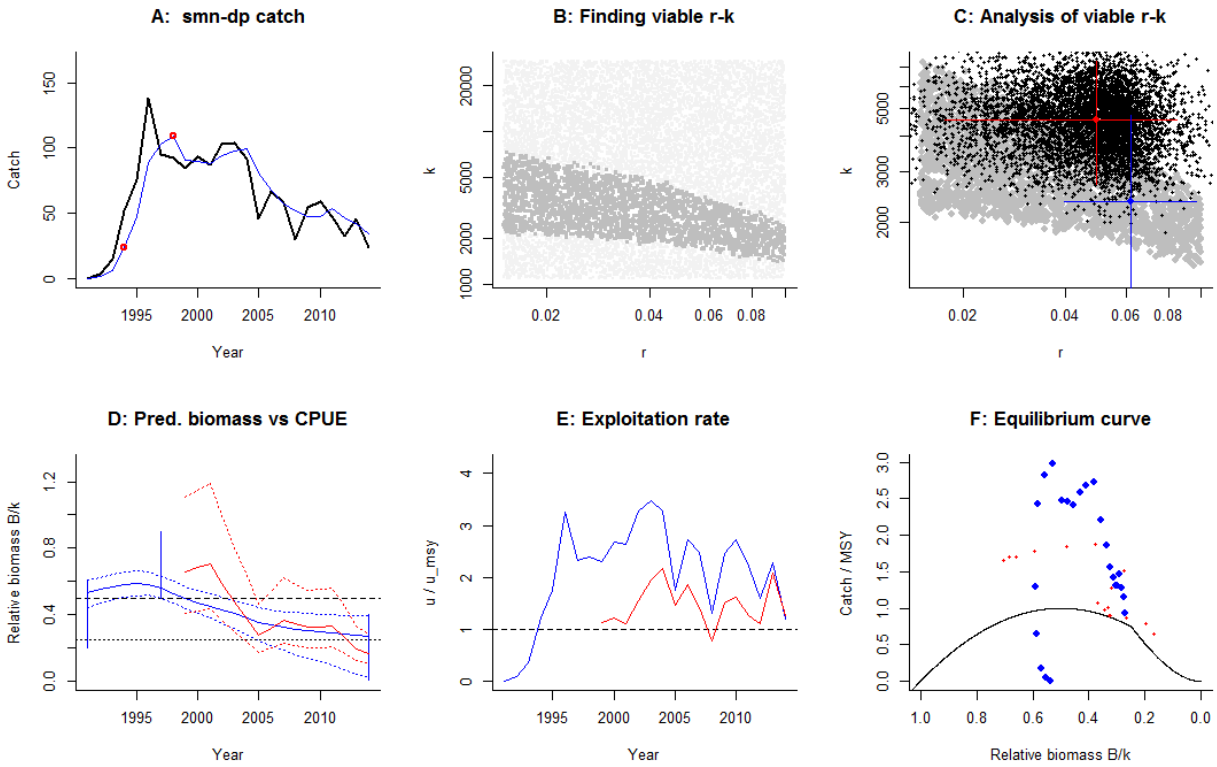

Catch sck-nea
Catch in 1000 t
0.0
0.2
0.4
0.6
0.8
1.0
MSY
LCL
1990
1995
2000
2005
2010
2015

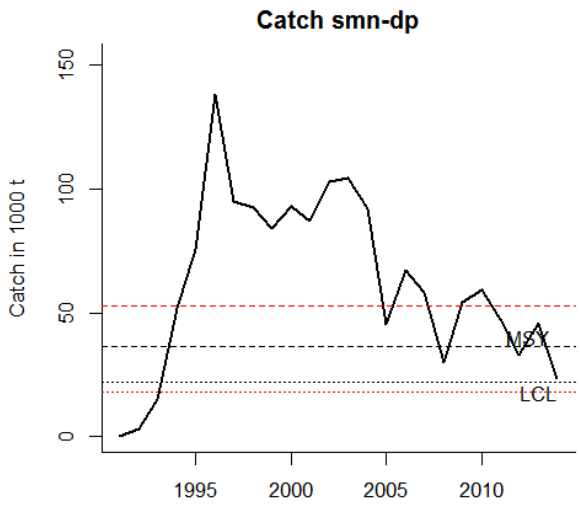

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
1990
1995
2000
2005
2010
2015

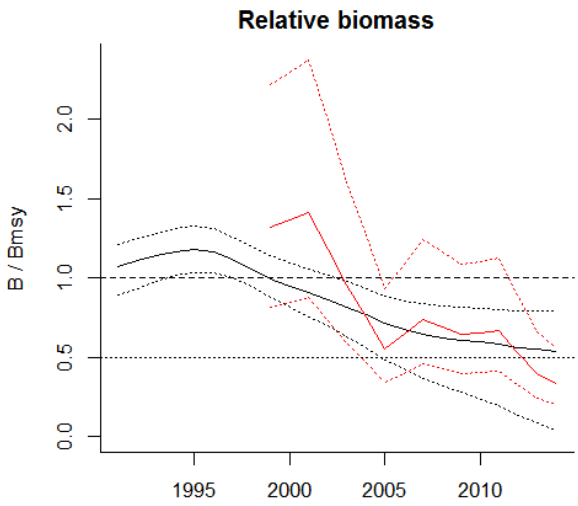

Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1990
1995
2000
2005
2010
2015

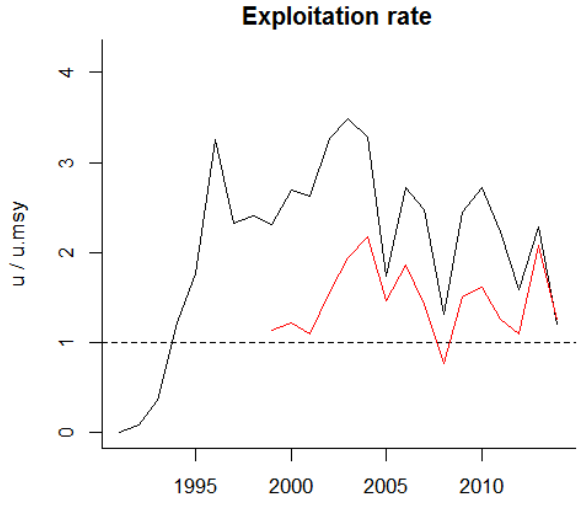

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
2.5
u / u.msy

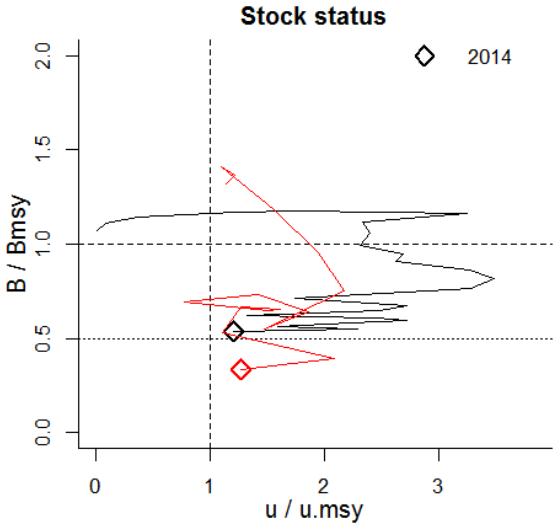
Species: *Sebastes mentella* , stock: smn-dp
Name and region: "Beaked redfish in Subareas V, XII, and XIV (Iceland and Faroes grounds, north of Azores, east of Greenland)" and NAFO Subareas 1+2 (deep pelagic stock > 500 m) , ICES
Catch data used from years 1991 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.5 - 0.9 in year 1997 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.015 - 0.1 default , prior range for k = 1088 - 29018
Prior range of q = 0.000144 - 0.000745
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0491 , 95% CL = 0.0176 - 0.0846 , k = 4566 , 95% CL = 2712 - 7351
MSY = 53.1 , 95% CL = 18.1 - 112
q = 0.000311 , lcl = 0.000212 , ucl = 0.000447
Biomass in last year from q*CPUE = 766 or 0.168 k
Exploitation rate in last year = 0.0446
Results of CMSY analysis with altogether 6503 viable trajectories for 2719 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 2355 , 95% CL = 1164 - 4762
MSY = 36.5 , 95% CL = 22 - 60.5
Relative biomass last year= 0.27 k, 2.5th = 0.0212 , 97.5th = 0.397
Relative biomass next year= 0.268 k, 2.5th = 0.00191 , 97.5th = 0.4
Relative exploitation rate in last year= 1.2
Comment: Missing years in survey were interpolated. Start year set to 1995.
---



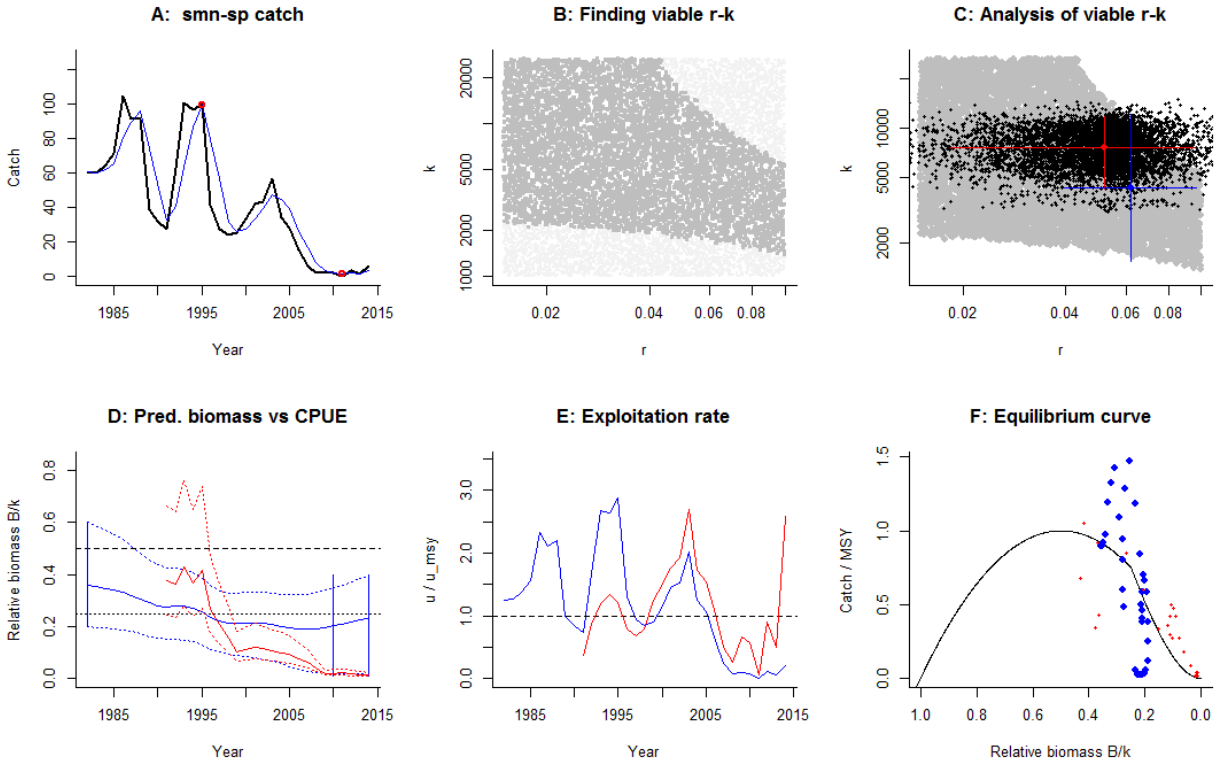

Catch smn-dp
Catch in 1000 t
0
50
100
150
1995
2000
2005
2010
MSY
LCL

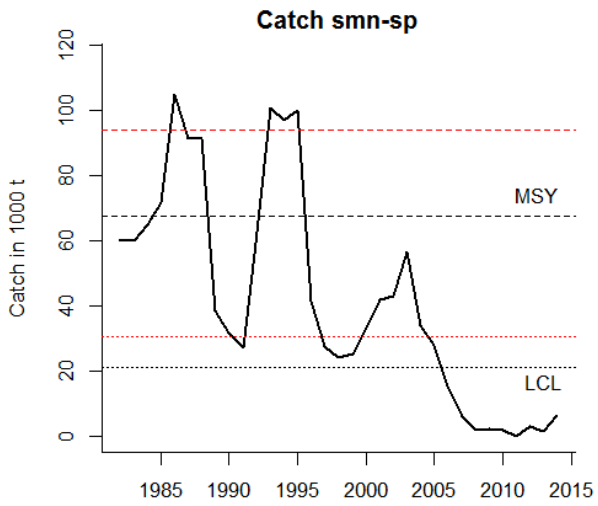

Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2.0
1995
2000
2005
2010

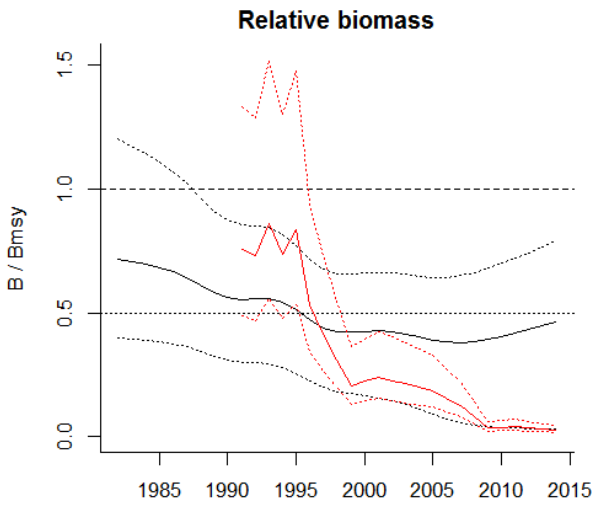

Exploitation rate
u / u.msy
0
1
2
3
4
1995
2000
2005
2010

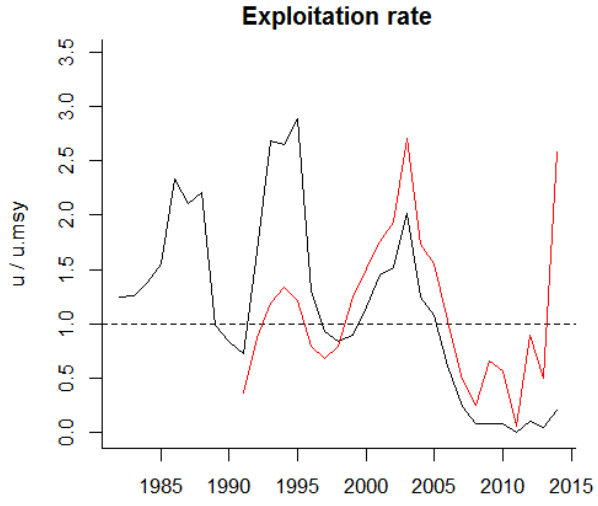

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
u / u.msy

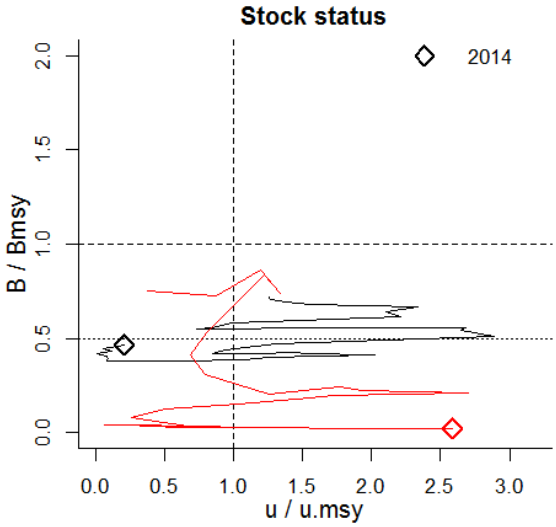
Species: *Sebastes mentella* , stock: smn-sp
Name and region: "Beaked redfish in Subareas V, XII, and XIV (Iceland and Faroes grounds, north of Azores, east of Greenland) and NAFO Subareas 1+2 (shallow pelagic stock < 500 m)" , ICES
Catch data used from years 1982 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.015 - 0.1 default , prior range for k = 993 - 26469
Prior range of q = 0.000367 - 0.0019
Results from Bayesian Schaefer model using catch & CPUE
r = 0.0521 , 95% CL = 0.0185 - 0.0952 , k = 7555 , 95% CL = 4280 - 11714
MSY = 94.1 , 95% CL = 30.6 - 209
q = 0.000786 , lcl = 0.000543 , ucl = 0.00116
Biomass in last year from q*CPUE = 95.5 or 0.0126 k
Exploitation rate in last year = 0.0389
Results of CMSY analysis with altogether 24997 viable trajectories for 6781 r-k pairs
r = 0.062 , 95% CL = 0.0397 - 0.097 , k = 4351 , 95% CL = 1548 - 12232
MSY = 67.5 , 95% CL = 21.4 - 213
Relative biomass last year= 0.233 k, 2.5th = 0.0161 , 97.5th = 0.396
Relative biomass next year= 0.24 k, 2.5th = 0.0147 , 97.5th = 0.41
Relative exploitation rate in last year= 0.205
Comment: Acoustic survey data used for abundance; missing years were interpolated. CMSY fit could be improved by setting endbio to 0.01 – 0.2 k.
---




Catch smn-sp
Catch in 1000 t
0
20
40
60
80
100
120
MSY
LCL
1985
1990
1995
2000
2005
2010
2015


Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
1985
1990
1995
2000
2005
2010
2015


Exploitation rate
u / u.msy
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1985
1990
1995
2000
2005
2010
2015


Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
u / u.msy

Species: *Scophthalmus maximus* , stock: tur-2232
Name and region: Turbot in Subdivisions 22–32 (Baltic Sea) , ICES
Catch data used from years 1995 - 2014 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2010 default
Prior final relative biomass = 0.01 - 0.4 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 1.27 - 20.4
Prior range of q = 0.00179 - 0.00718
Results from Bayesian Schaefer model using catch & CPUE
r = 0.515 , 95% CL = 0.468 - 0.616 , k = 5.76 , 95% CL = 4.65 - 7.37
MSY = 0.751 , 95% CL = 0.623 - 0.951
q = 0.00213 , lcl = 0.0016 , ucl = 0.00297
Biomass in last year from q*CPUE = 1.04 or 0.18 k
Exploitation rate in last year = 0.257
Results of CMSY analysis with altogether 2081 viable trajectories for 1708 r-k pairs
r = 0.476 , 95% CL = 0.362 - 0.776 , k = 7.52 , 95% CL = 3.14 - 14.5
MSY = 0.894 , 95% CL = 0.42 - 1.9
Relative biomass last year= 0.178 k, 2.5th = 0.0148 , 97.5th = 0.389
Relative biomass next year= 0.181 k, 2.5th = -0.0237 , 97.5th = 0.472
Relative exploitation rate in last year= 0.793
Comment: Start year set to 1995.
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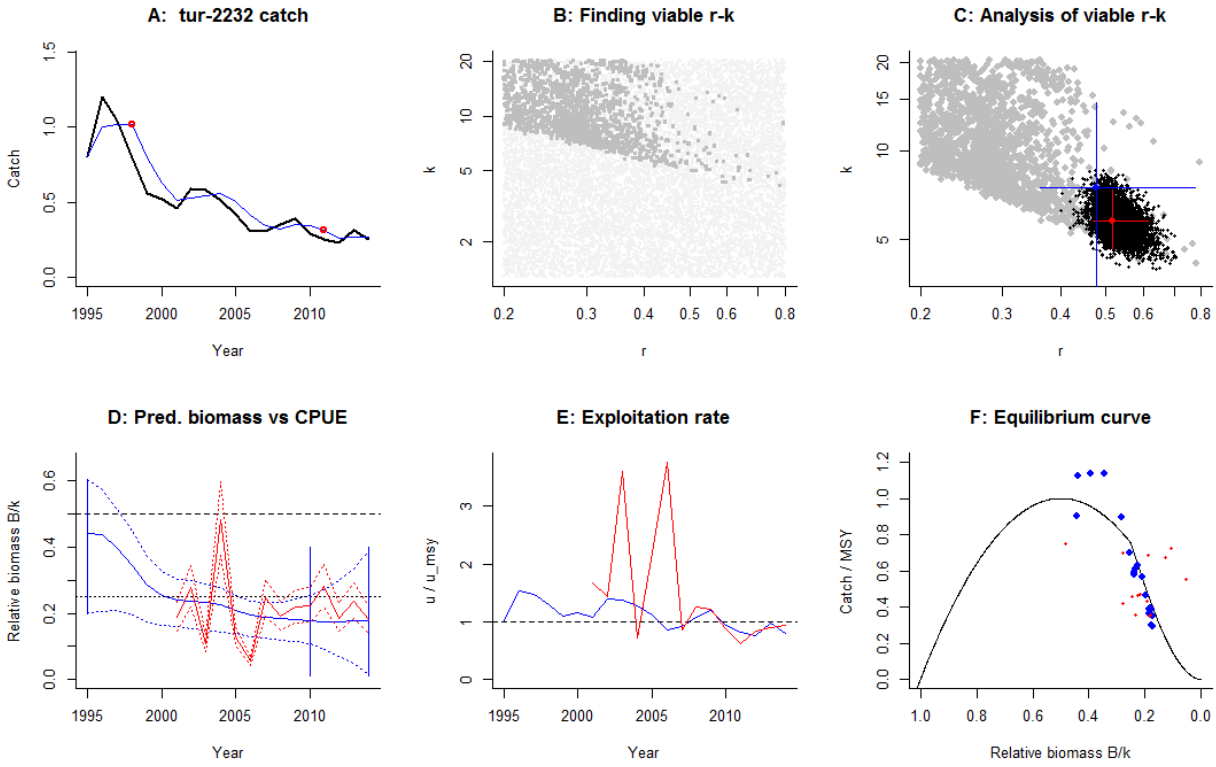
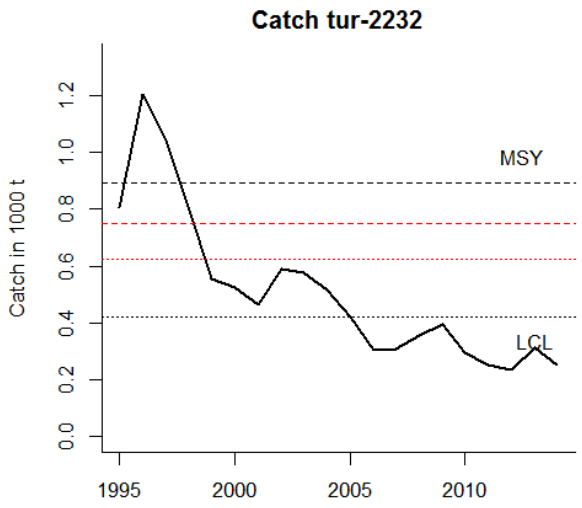
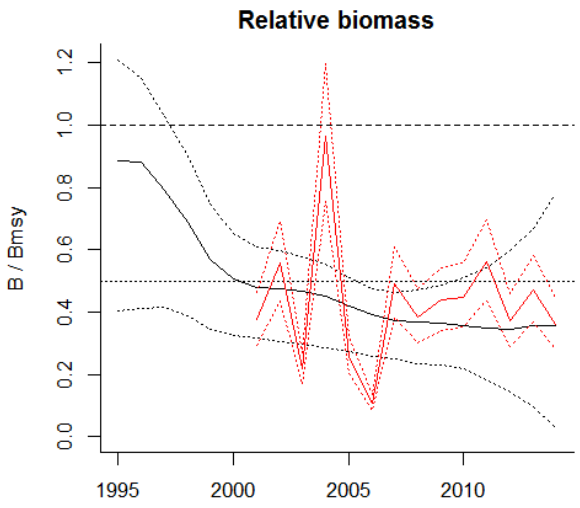
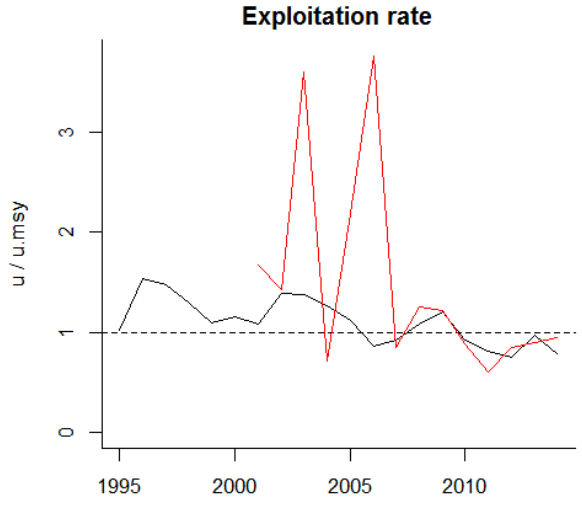
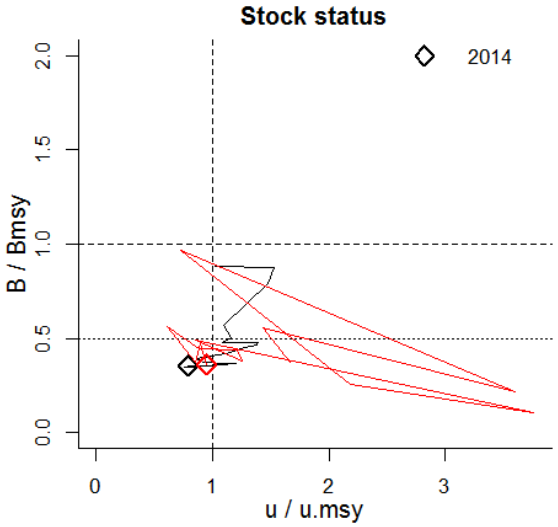


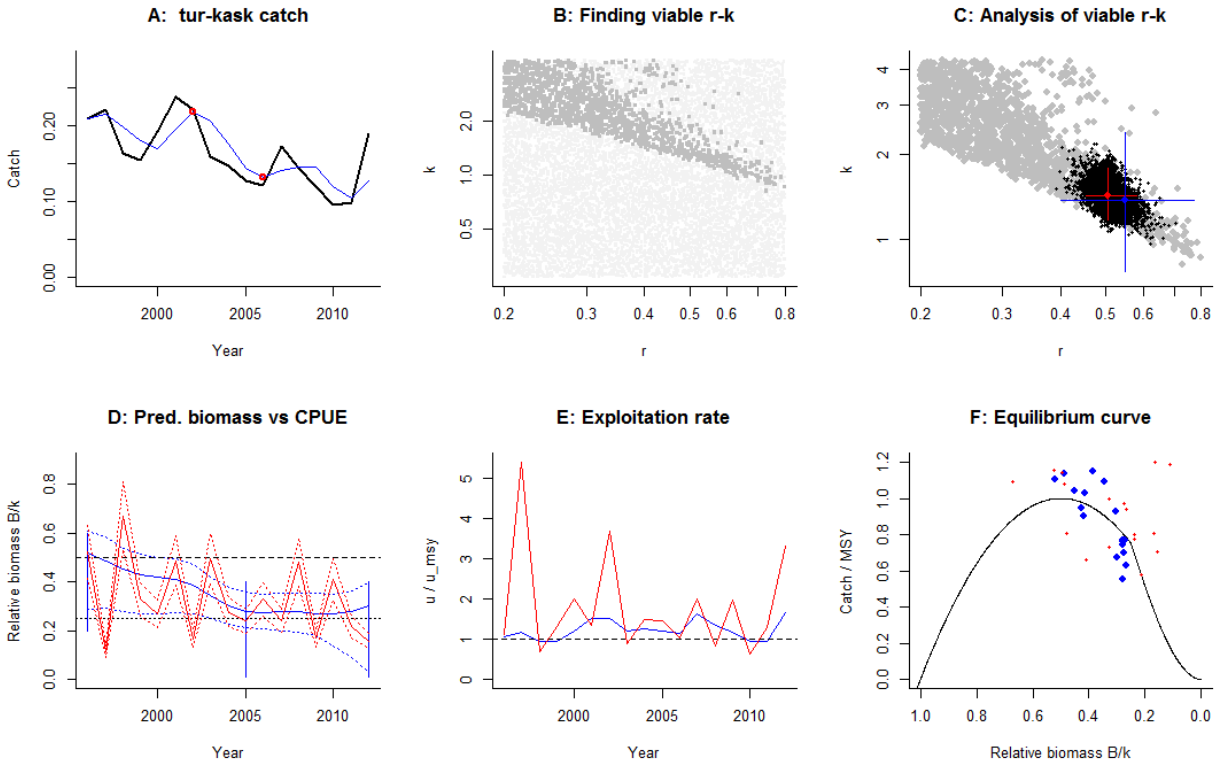

Catch tur-2232
Catch in 1000 t
MSY
LCL
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1995
2000
2005
2010

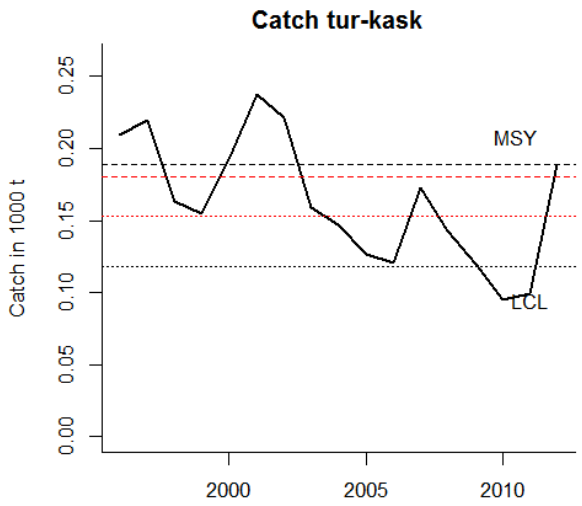

Relative biomass
B / Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1995
2000
2005
2010

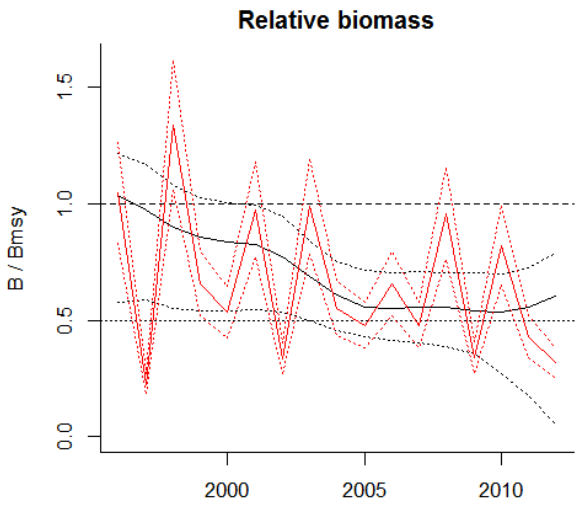

Exploitation rate
u / u.msy
0
1
2
3
1995
2000
2005
2010

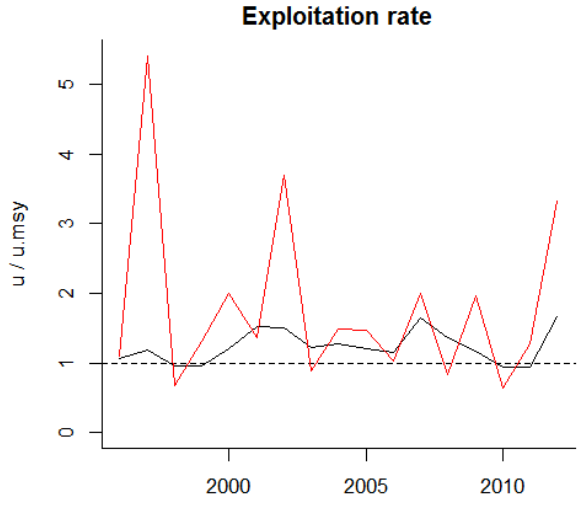

Stock status
2014
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
u / u.msy

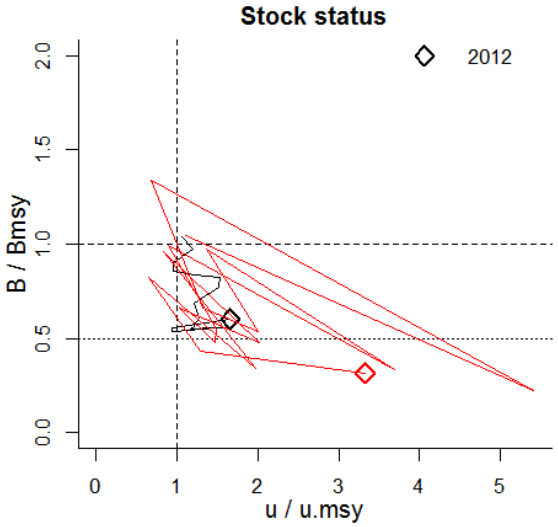
Species: *Scophthalmus maximus* , stock: tur-kask
Name and region: Turbot in Division IIIa , ICES
Catch data used from years 1996 - 2012 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2005 default
Prior final relative biomass = 0.01 - 0.4 expert
Prior range for r = 0.2 - 0.8 default , prior range for k = 0.271 - 4.34
Prior range of q = 0.00159 - 0.00638
Results from Bayesian Schaefer model using catch & CPUE
r = 0.504 , 95% CL = 0.453 - 0.581 , k = 1.43 , 95% CL = 1.18 - 1.8
MSY = 0.18 , 95% CL = 0.153 - 0.224
q = 0.00261 , lcl = 0.00207 , ucl = 0.0033
Biomass in last year from q*CPUE = 0.226 or 0.159 k
Exploitation rate in last year = 0.565
Results of CMSY analysis with altogether 2992 viable trajectories for 1572 r-k pairs
r = 0.549 , 95% CL = 0.399 - 0.772 , k = 1.38 , 95% CL = 0.771 - 2.41
MSY = 0.189 , 95% CL = 0.118 - 0.303
Relative biomass last year= 0.301 k, 2.5th = 0.0268 , 97.5th = 0.396
Relative biomass next year= 0.313 k, 2.5th = -0.0725 , 97.5th = 0.436
Relative exploitation rate in last year= 1.66
Comment: OK.
---




Catch tur-kask
Catch in 1000 t
0.00
0.05
0.10
0.15
0.20
0.25
MSY
LCL
2000
2005
2010


Relative biomass
B / Bmsy
0.0
0.5
1.0
1.5
2000
2005
2010


Exploitation rate
u / u.msy
0
1
2
3
4
5
2000
2005
2010


Stock status
2012
B / Bmsy
0.0
0.5
1.0
1.5
2.0
0
1
2
3
4
5
u / u.msy

Species: *Brosme brosme* , stock: usk-oth
Tusk in Divisions IIIa, Vb, VIa, and XIIb and Subareas IV, VII, VIII, and IX (other areas). , ICES
Catch data used from years 1988 - 2011 , biomass = CPUE
Prior initial relative biomass = 0.2 - 0.6 default
Prior intermediate rel. biomass= 0.01 - 0.4 in year 2004 default
Prior final relative biomass = 0.2 - 0.6 , default
Prior range for r = 0.2 - 0.8 default , prior range for k = 16.5 - 264
Prior range of q = 0.00326 - 0.013
Results from Bayesian Schaefer model using catch & CPUE
r = 0.537 , 95% CL = 0.476 - 0.675 , k = 76.8 , 95% CL = 54 - 114
MSY = 10.4 , 95% CL = 7.09 - 16
q = 0.00298 , lcl = 0.00239 , ucl = 0.00376
Biomass in last year from q*CPUE = 43.4 or 0.564 k
Exploitation rate in last year = 0.164
Results of CMSY analysis with altogether 3248 viable trajectories for 2039 r-k pairs
r = 0.49 , 95% CL = 0.37 - 0.687 , k = 84 , 95% CL = 51.9 - 129
MSY = 10.3 , 95% CL = 7.77 - 13.7
Relative biomass last year= 0.503 k, 2.5th = 0.263 , 97.5th = 0.596
Relative biomass next year= 0.535 k, 2.5th = 0.268 , 97.5th = 0.636
Relative exploitation rate in last year= 0.614
Comment: OK. Standardized cpue for 4–5 longliners (<110 GRT) fishing in Faroese waters (criteria: ling & tusk >60% of catch and depth below 200 m). Set from Low to Medium resilience.
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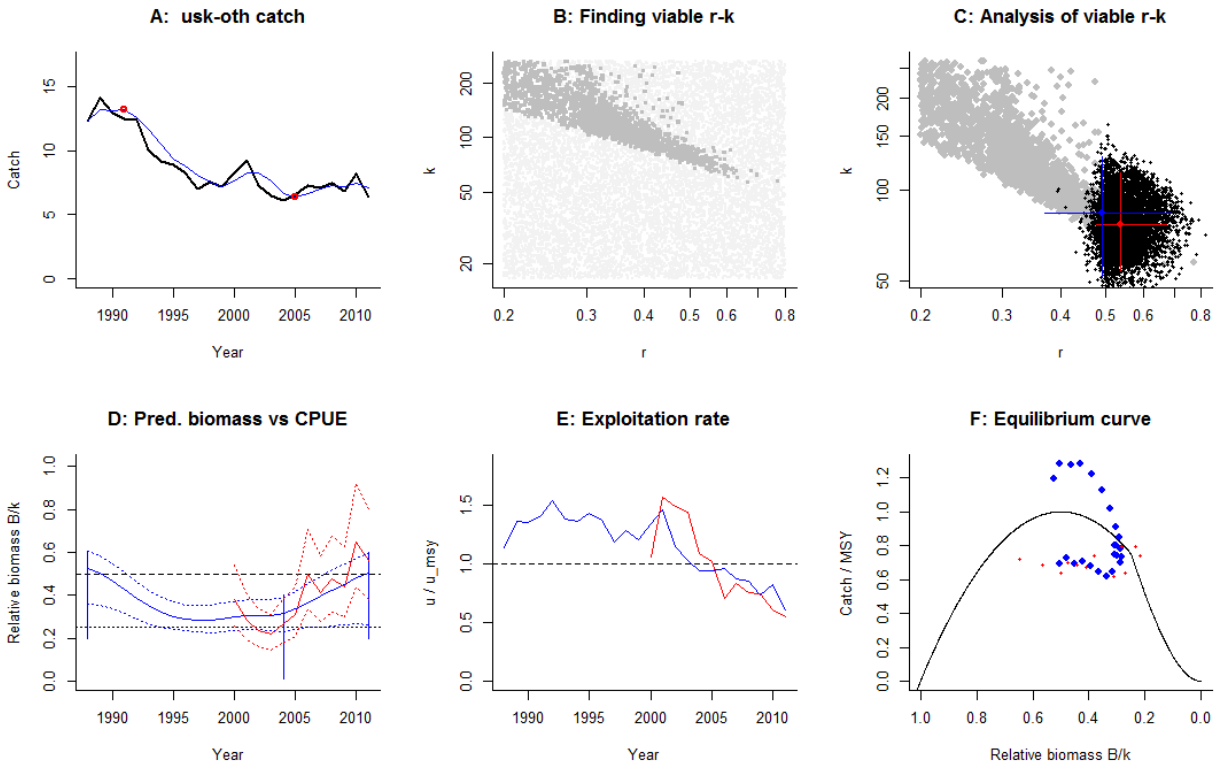

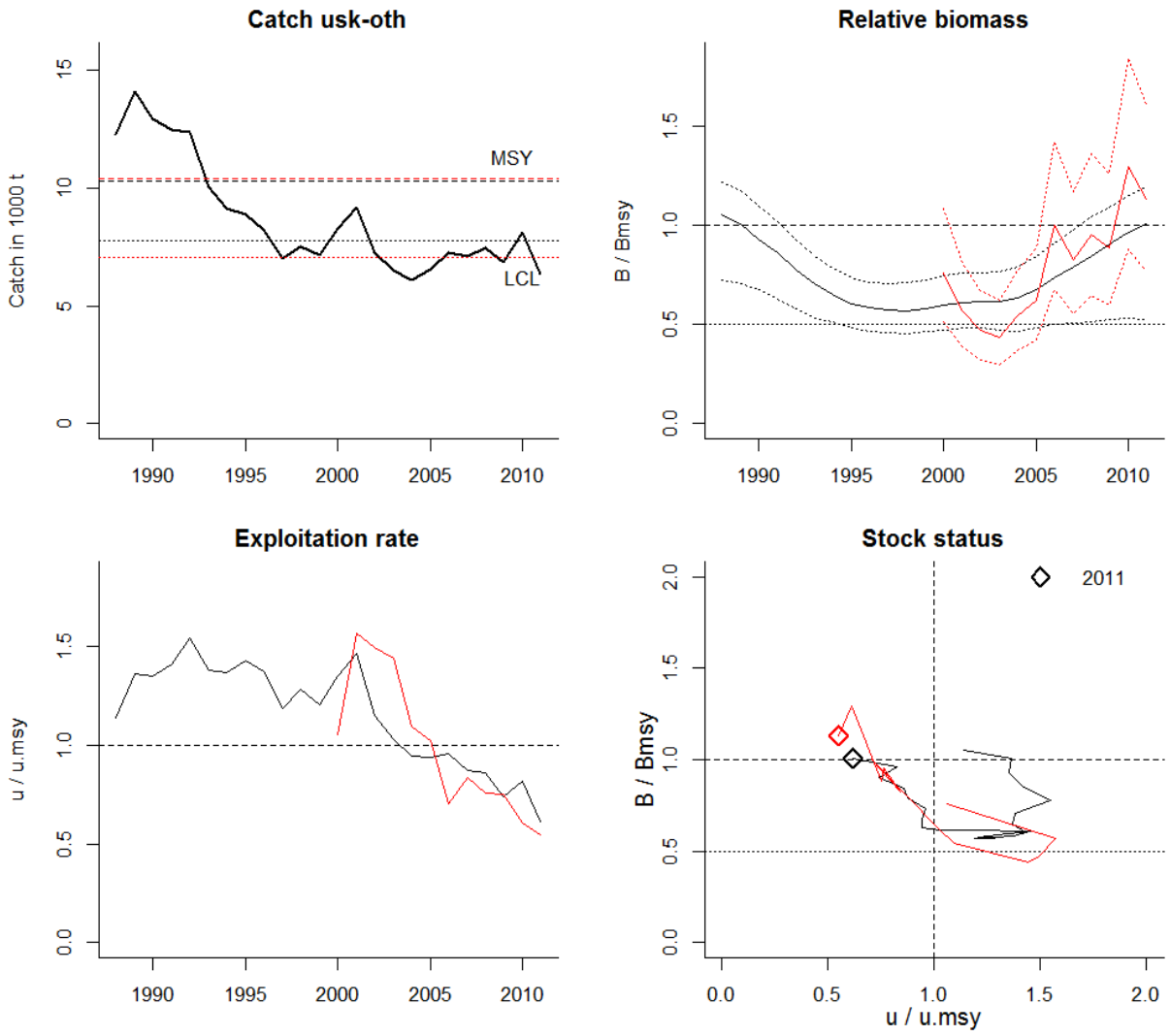
Catch usk-oth
Catch in 1000 t
MSY
LCL
Relative biomass
B / Bmsy
Exploitation rate
u / u.msy
Stock status
2011
B / Bmsy
u / u.msy

# Appendix V: Landings vs catches

[CMSY_44.R, SimCatch07.csv, SimSpec07.csv]
Species: NA , stock: 07_HLH_M
Name and region: Simulated data , NA
Catch data used from years 1 - 50 , biomass = simulated
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0.01 - 0.4 in year 25
Prior final relative biomass = 0.4 - 0.8
If current catches continue, is the stock likely to crash within 3 years? No
Prior range for r = 0.2 - 0.8 , prior range for k = 310 - 2480
True r = 0.5 , true k = 1000 (true values known because data were simulated)
True MSY = 125 , true mean catch / MSY ratio = 0.646
True biomass in last year = 708 or 0.708 k
Results from Bayesian Schaefer model using catch & simulated biomass
r = 0.392 , 95% CL = 0.349 - 0.442 , k = 922 , 95% CL = 845 - 1021
MSY = 90.4 , 95% CL = 83.9 - 97.9
Results of CMSY analysis with altogether 2714 viable trajectories for 640 r-k pairs
255 r-k pairs above r = 0.367 and 1184 trajectories within r-k CLs were analyzed
r = 0.549 , 95% CL = 0.384 - 0.784 , k = 651 , 95% CL = 439 - 965
MSY = 89.3 , 95% CL = 83 - 96.2
Predicted biomass last year= 0.728 , 2.5th = 0.598 , 25th = 0.713 , 97.5th = 0.757
Predicted biomass next year= 0.717 , 2.5th = 0.605 , 25th = 0.704 , 97.5th = 0.745
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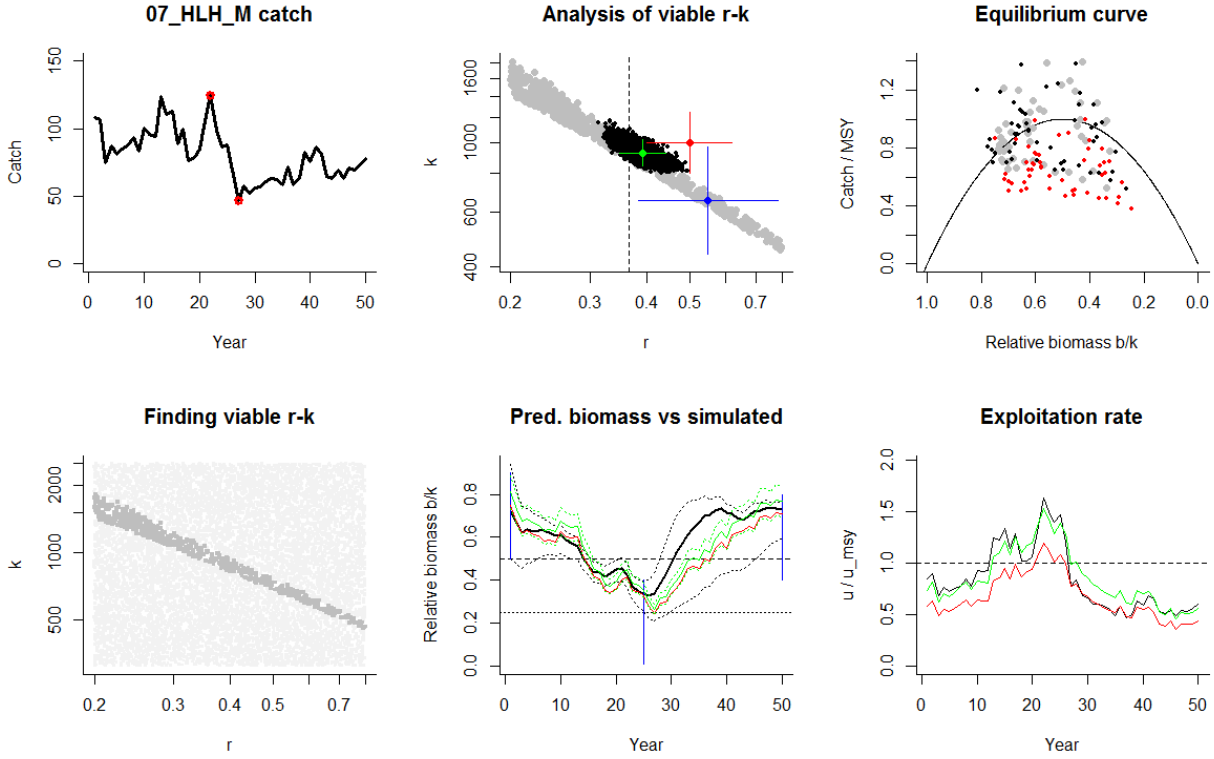


[CMSY_44.R, AllStocks_Catch_07.csv, AllStocks_ID_07.csv]
Species: *Melanogrammus aeglefinus* , stock: had-346a-land
Name and region: Haddock , Haddock in Sub-area IV (North Sea) and Division IIIa West and Via, Landings only

Catch data used from years 1972 - 2013 , biomass = observed
Prior initial relative biomass = 0.5 - 0.9
Prior intermediate rel. biomass= 0 - 1 in year 1992
Prior final relative biomass = 0.01 - 0.4
If current catches continue, is the stock likely to crash within 3 years? Possible
Prior range for r = 0.2 - 0.8 , prior range for k = 263 - 3156
Results from Bayesian Schaefer model using catch & observed biomass
r = 0.489 , 95% CL = 0.414 - 0.537 , k = 2589 , 95% CL = 2084 - 3341
MSY = 315 , 95% CL = 235 - 413
Biomass in last year = 436 or 0.169 k
Results of CMSY analysis with altogether 1047 viable trajectories for 877 r-k pairs
375 r-k pairs above r = 0.243 and 380 trajectories within r-k CLs were analyzed
r = 0.397 , 95% CL = 0.247 - 0.654 , k = 1310 , 95% CL = 729 - 2297
MSY = 130 , 95% CL = 110 - 154
Predicted biomass last year= 0.273 , 2.5th = 0.0211 , 25th = 0.155 , 97.5th = 0.394
Predicted biomass next year= 0.309 , 2.5th = 0.00559 , 25th = 0.169 , 97.5th = 0.446
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