Supplementary Information

The purse-seine fishery for small pelagic fishes off the Madeira Archipelago

The model specification, results and diagnostic tests of generalised additive models (i.e. GAM plots) describing the influence of the amount of each species in the catch, the fishing location, depth and season on the amount of dead discards, slipping and total discards in the Madeiran purse-seine fishery over the 15-month period investigated. Landings of this fishery are mostly composed of blue jack mackerel *Trachurus picturatus*, Atlantic chub mackerel *Scomber colias*, and small amounts of sardine *Sardina pilchardus*.

```
# Dead discards

anova(newgam3)

Family: gaussian
Link function: identity

Formula:
logDD ~ s(logT.pic) + s(logS.col) + s(logS.pil) + Lat * Lon +
    Depth + Season

Parametric Terms:
        df     F p-value
Lat      1 5.824  0.0212
Lon      1 5.926  0.0202
Depth    1 2.433  0.1279
Season   3 0.038  0.9900
Lat:Lon  1 5.936  0.0201

Approximate significance of smooth terms:
              edf Ref.df      F  p-value
s(logT.pic) 3.189  3.863  1.419  0.29783
s(logS.col) 2.371  2.888 24.925 9.44e-10
s(logS.pil) 1.627  1.954  7.366  0.00465


plot.gam(newgam3)
```
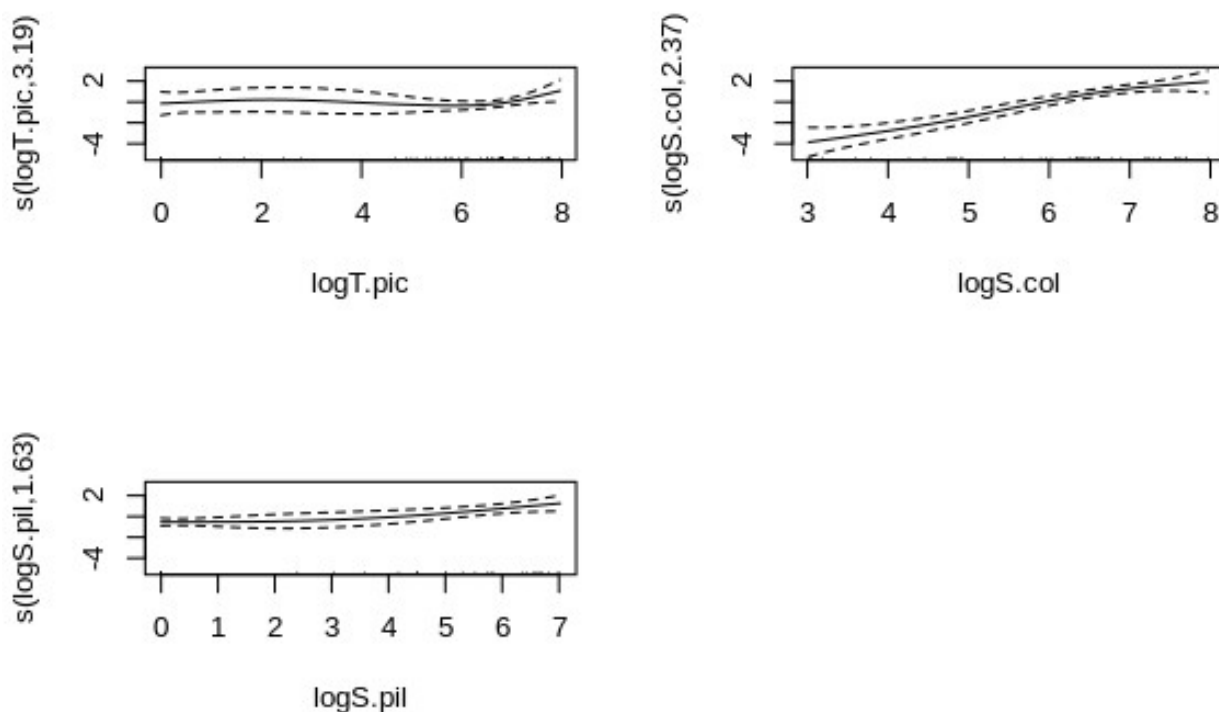


```
gam.check(newgam3)

Method: GCV   Optimizer: magic
Smoothing parameter selection converged after 6 iterations.
The RMS GCV score gradient at convergence was 3.054356e-05 .
The Hessian was positive definite.
Model rank =  35 / 35

Basis dimension (k) checking results. Low p-value (k-index<1) may
```
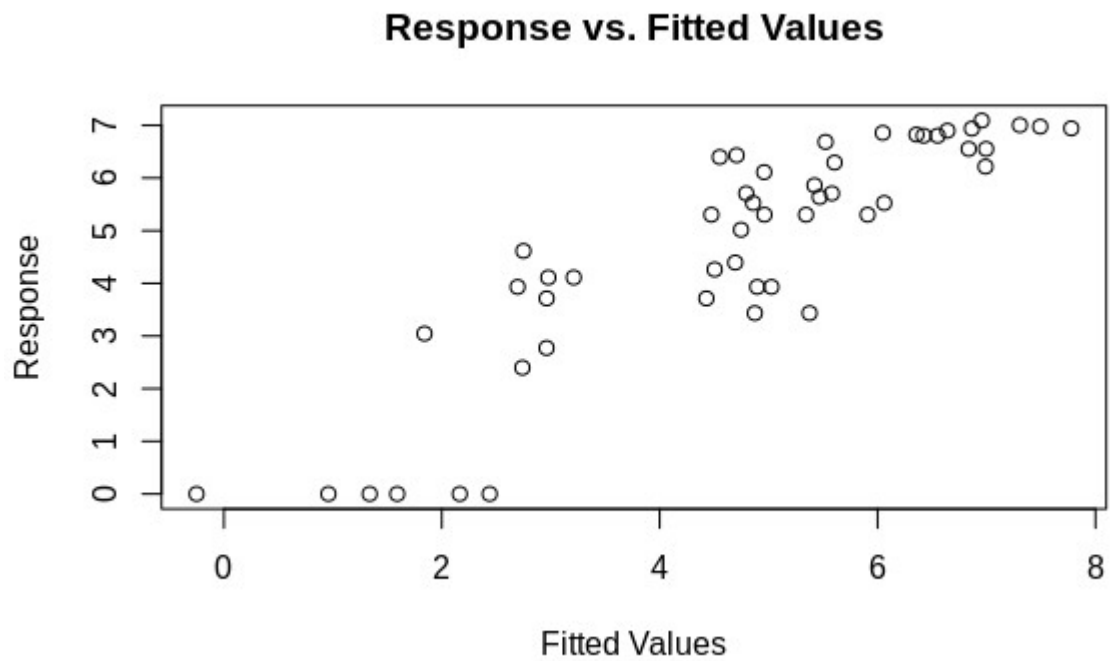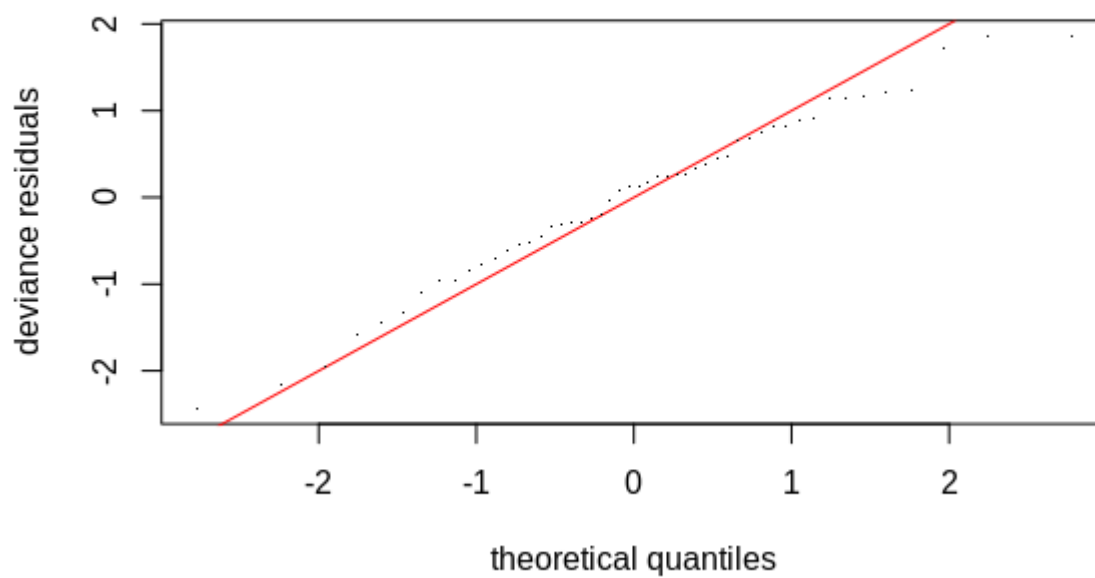
indicate that k is too low, especially if edf is close to k'.

```
               k'  edf k-index p-value
s(logT.pic) 9.00 3.19    1.11    0.76
s(logS.col) 9.00 2.37    1.28    0.97
s(logS.pil) 9.00 1.63    1.01    0.49
```


Response vs. Fitted Values

`qq.gam(newgam3)`

Slipping

```
anova(newgam2)
```

```
Family: gaussian
Link function: identity

Formula:
logS ~ s(logT.pic) + s(logS.col) + s(logS.pil) + Lat * Lon +
    Depth + Season

Parametric Terms:
        df     F p-value
Lat     1 0.038 0.84750
Lon     1 0.039 0.84443
Depth   1 1.092 0.30348
Season  3 5.581 0.00321
Lat:Lon 1 0.041 0.84108

Approximate significance of smooth terms:
             edf Ref.df      F  p-value
s(logT.pic) 2.804  3.416  5.851 0.001941
s(logS.col) 3.384  4.102 10.682 4.89e-06
s(logS.pil) 2.116  2.498  8.053 0.000615
```
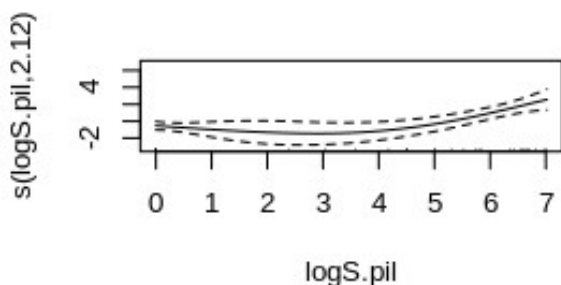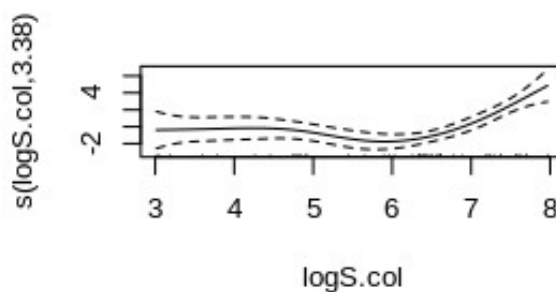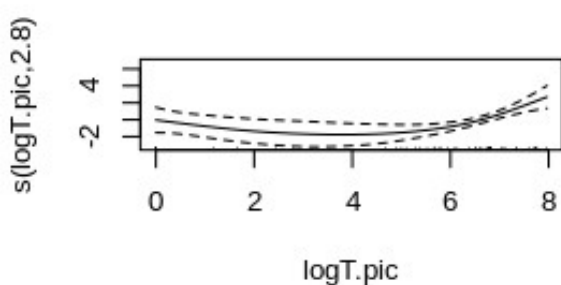
```
plot.gam(newgam2)
```



```
gam.check(newgam2)
```

```
Method: GCV   Optimizer: magic
Smoothing parameter selection converged after 6 iterations.
The RMS GCV score gradient at convergence was 9.026201e-07 .
The Hessian was positive definite.
Model rank =  35 / 35

Basis dimension (k) checking results. Low p-value (k-index<1) may
indicate that k is too low, especially if edf is close to k'.
```
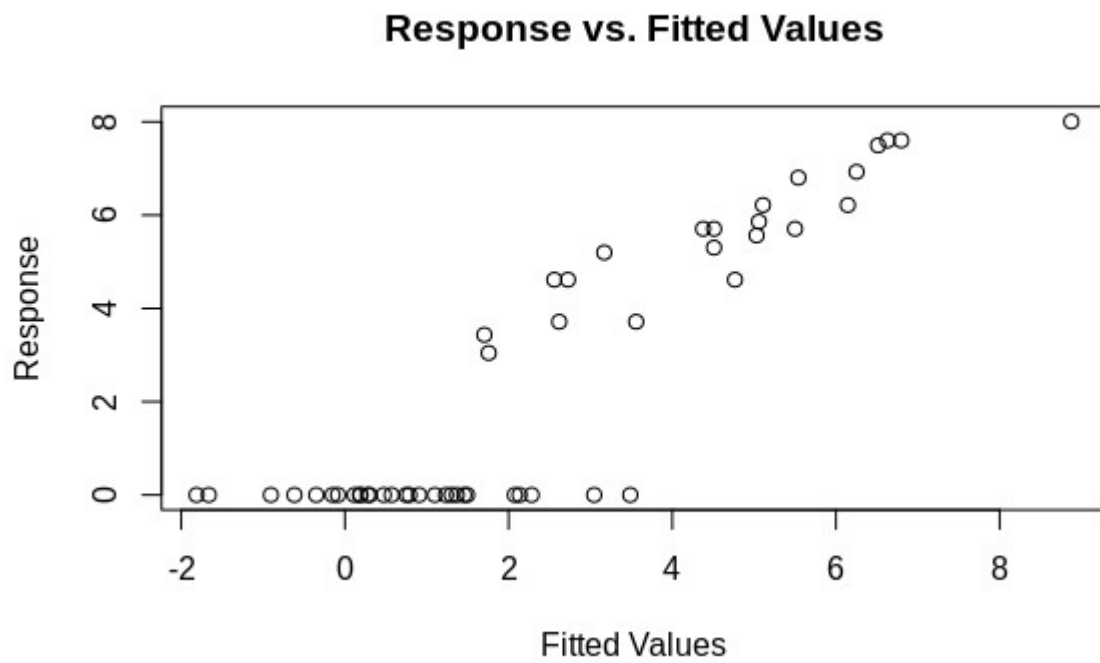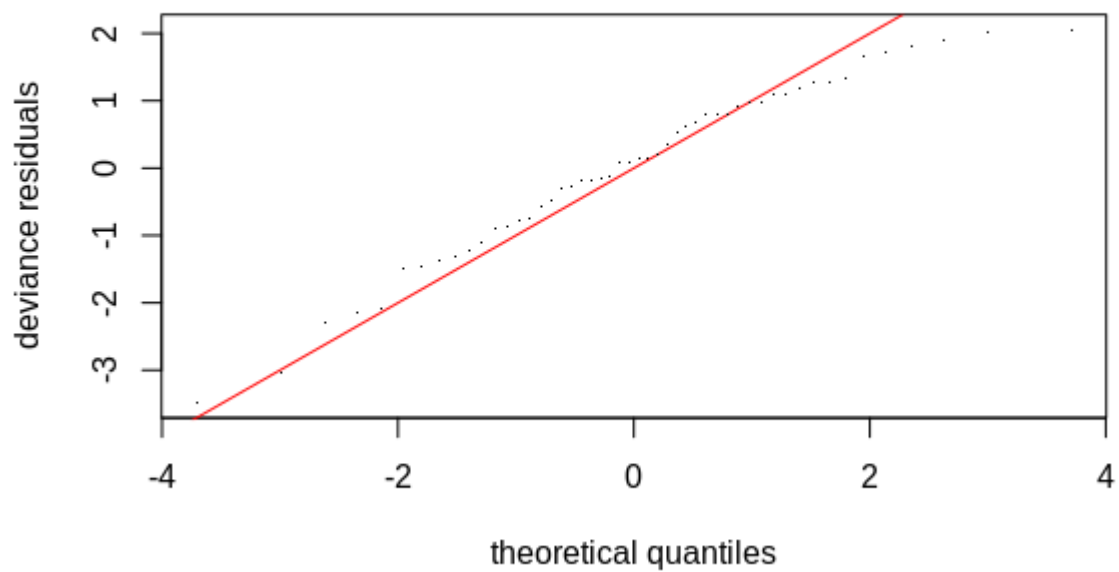
```
             k'  edf k-index p-value
s(logT.pic) 9.00 2.80    1.10    0.71
s(logS.col) 9.00 3.38    1.04    0.53
s(logS.pil) 9.00 2.12    1.19    0.88
```

Response vs. Fitted Values

`qq.gam(newgam2)`

```
# Total discards

anova(newgam1)

Family: gaussian
Link function: identity

Formula:
logDiscards ~ s(logT.pic) + s(logS.col) + s(logS.pil) + Lat *
    Lon + Depth + Season

Parametric Terms:
        df     F p-value
Lat      1 3.100  0.0869
Lon      1 3.201  0.0822
Depth    1 3.833  0.0582
Season   3 0.404  0.7509
Lat:Lon  1 3.203  0.0821

Approximate significance of smooth terms:
              edf Ref.df      F  p-value
s(logT.pic) 4.064  4.863  3.303   0.0146
s(logS.col) 1.031  1.060 58.582 2.91e-10
s(logS.pil) 1.477  1.770  7.333   0.0106

plot.gam(newgam1)
```
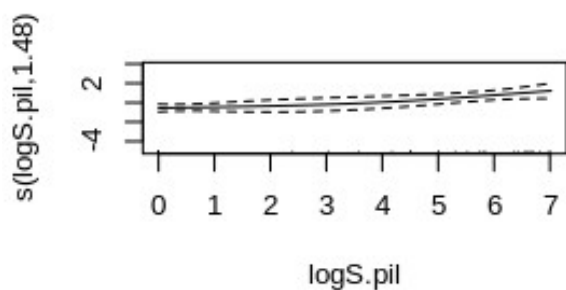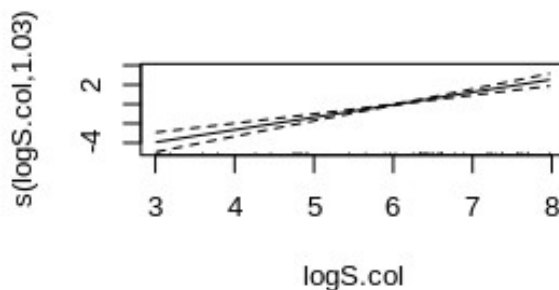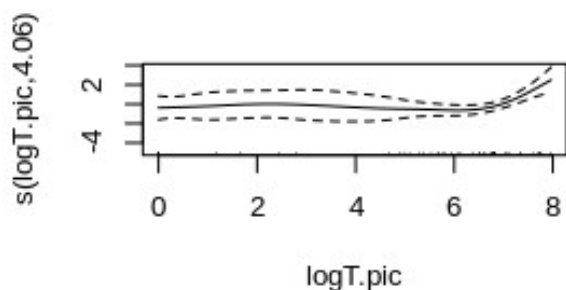


```
gam.check(newgam1)

Method: GCV   Optimizer: magic
Smoothing parameter selection converged after 12 iterations.
The RMS GCV score gradient at convergence was 7.790831e-07 .
The Hessian was positive definite.
Model rank =  35 / 35

Basis dimension (k) checking results. Low p-value (k-index<1) may
indicate that k is too low, especially if edf is close to k'.
```
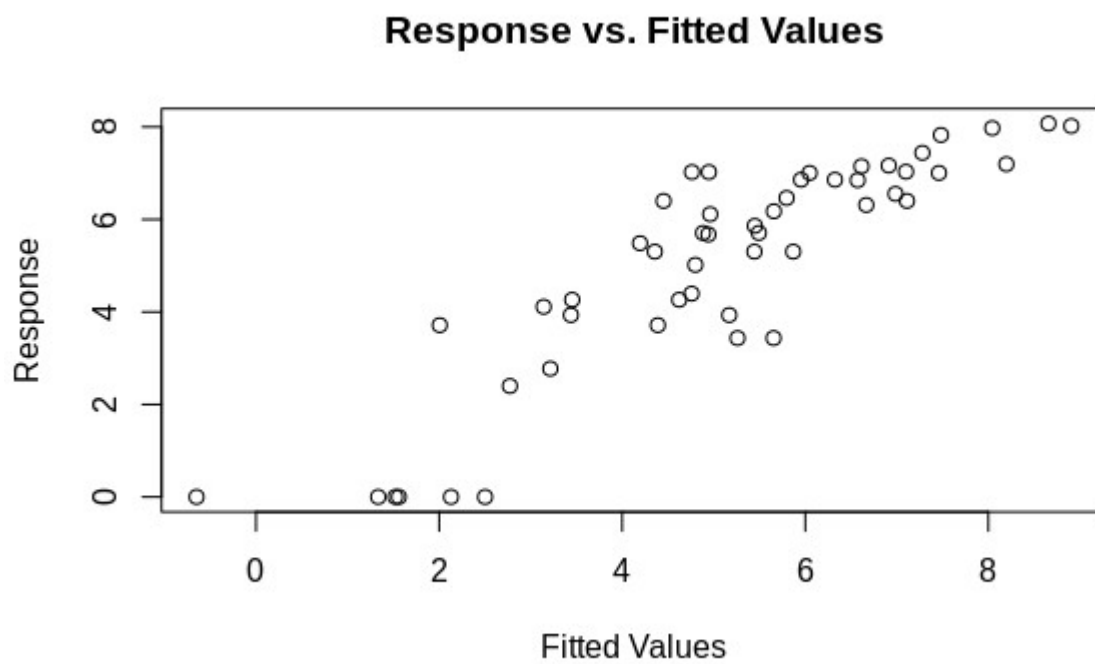
```
              k'  edf k-index p-value
s(logT.pic) 9.00 4.06    1.05    0.63
s(logS.col) 9.00 1.03    1.27    0.94
s(logS.pil) 9.00 1.48    1.03    0.54
```

Response vs. Fitted Values

`qq.gam(newgam1)`