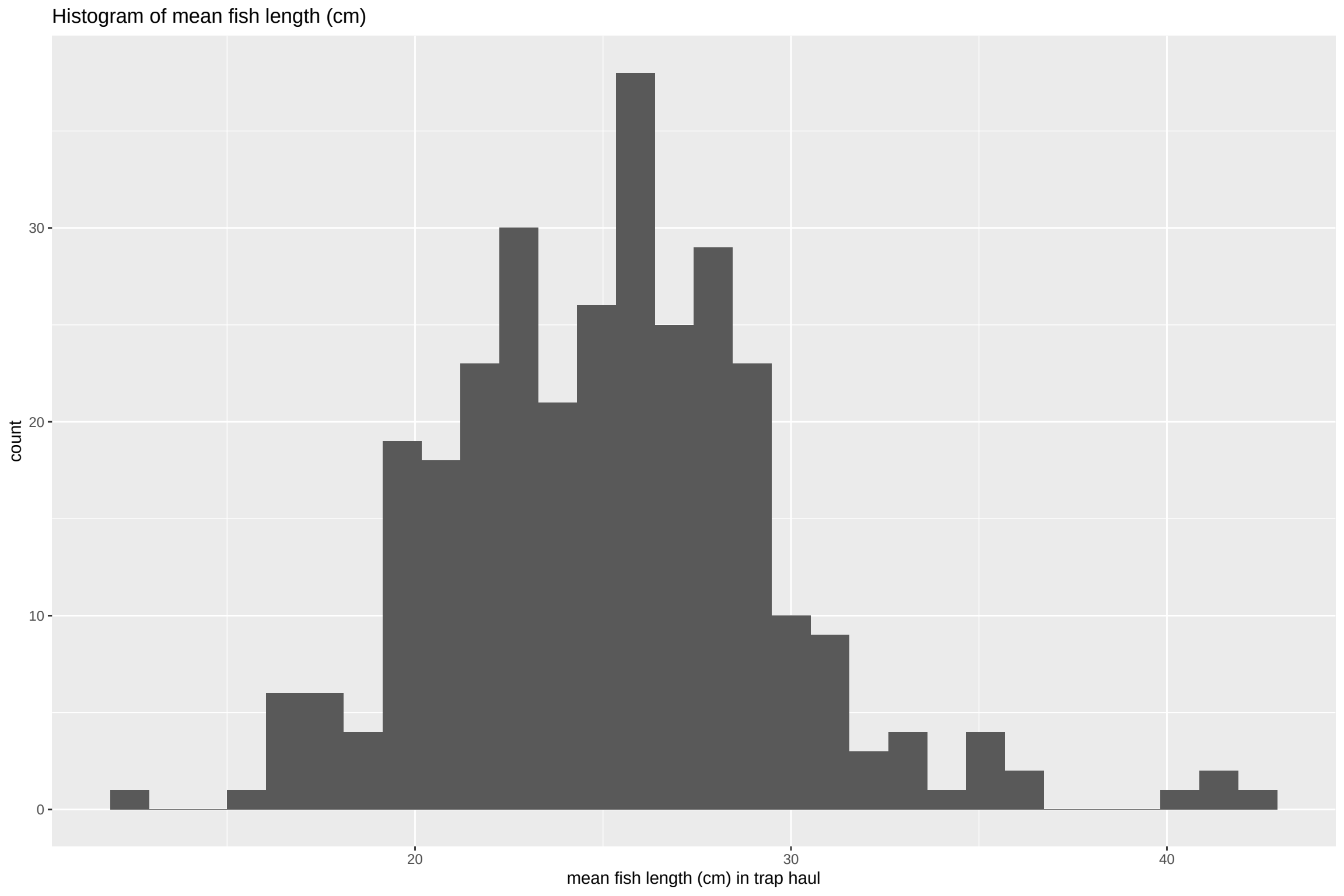
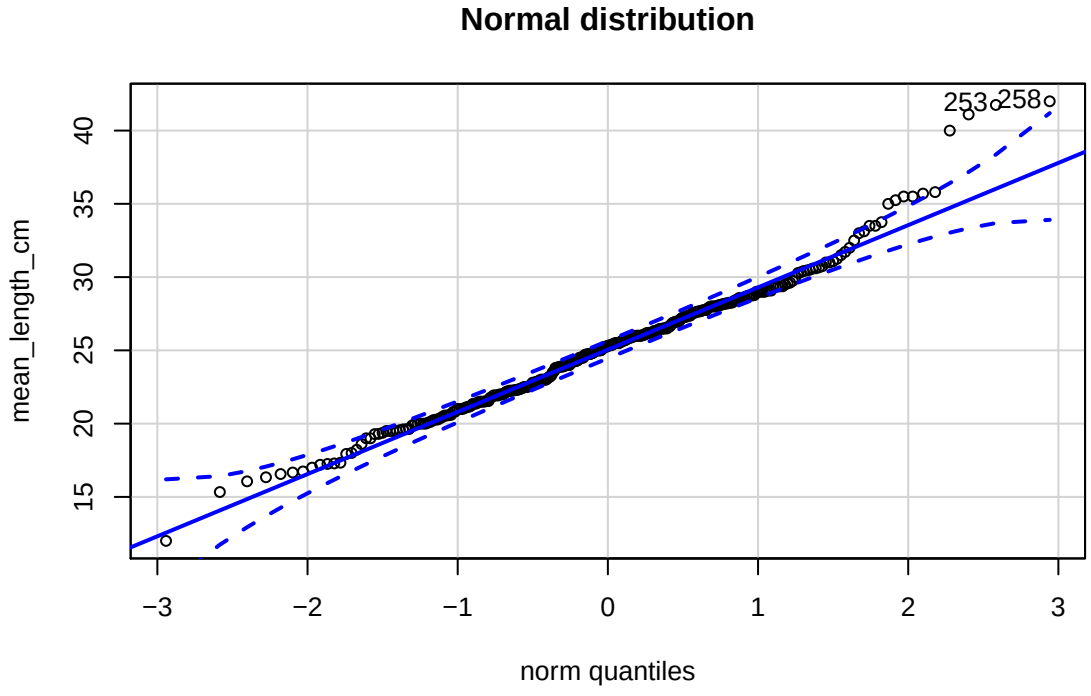
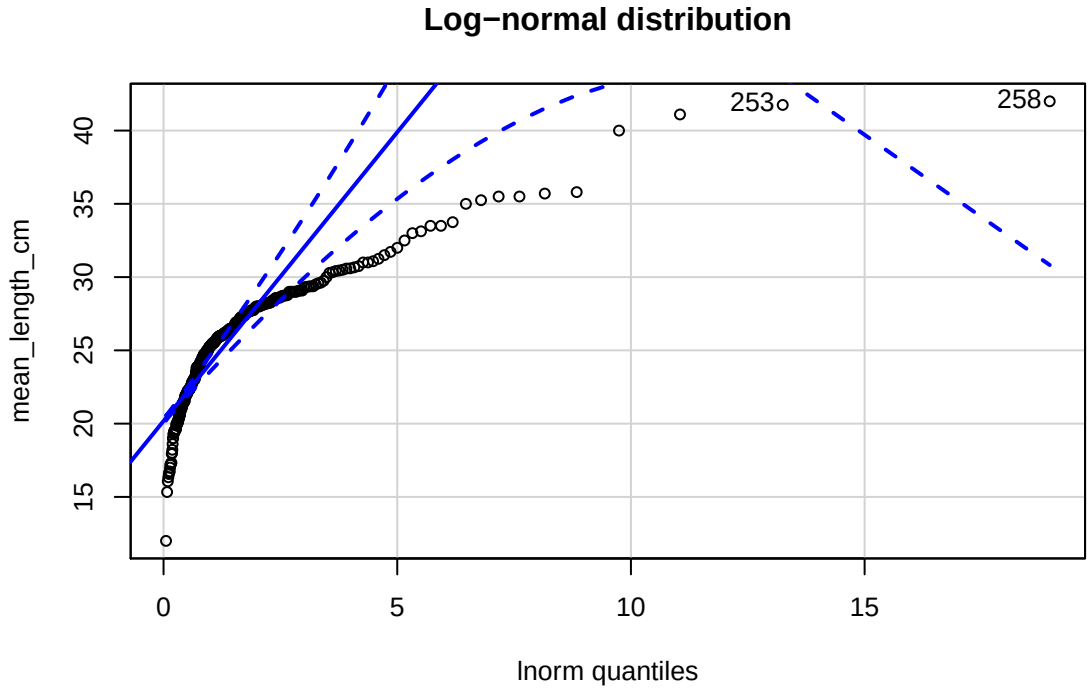
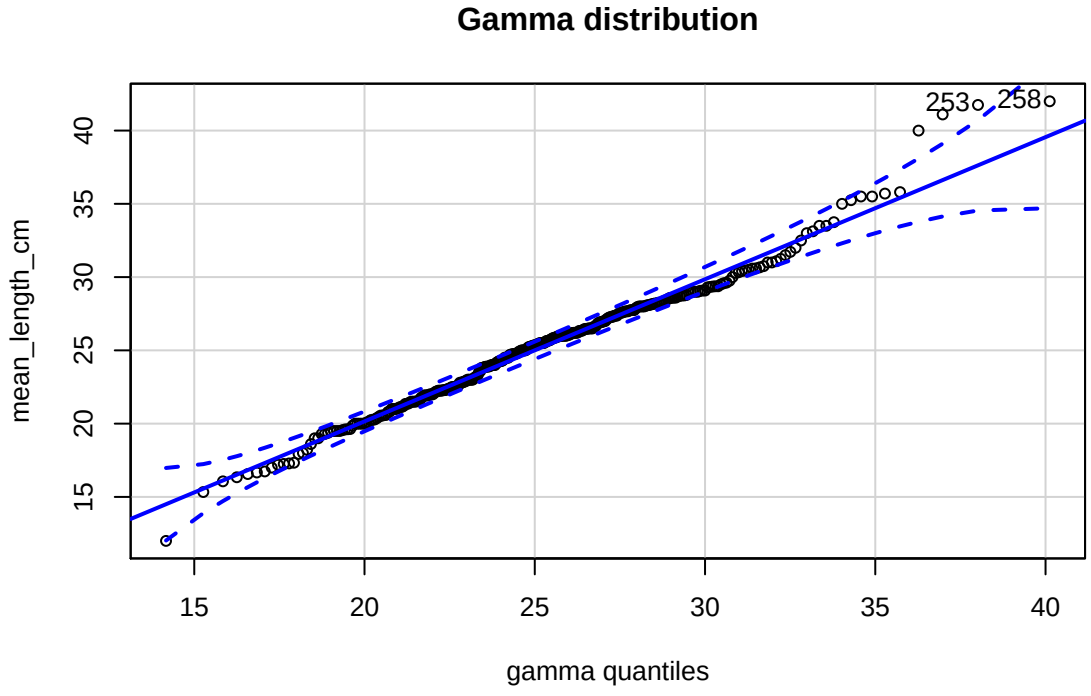

Histogram of mean fish length (cm)
count
0
10
20
30
20
30
40
mean fish length (cm) in trap haul

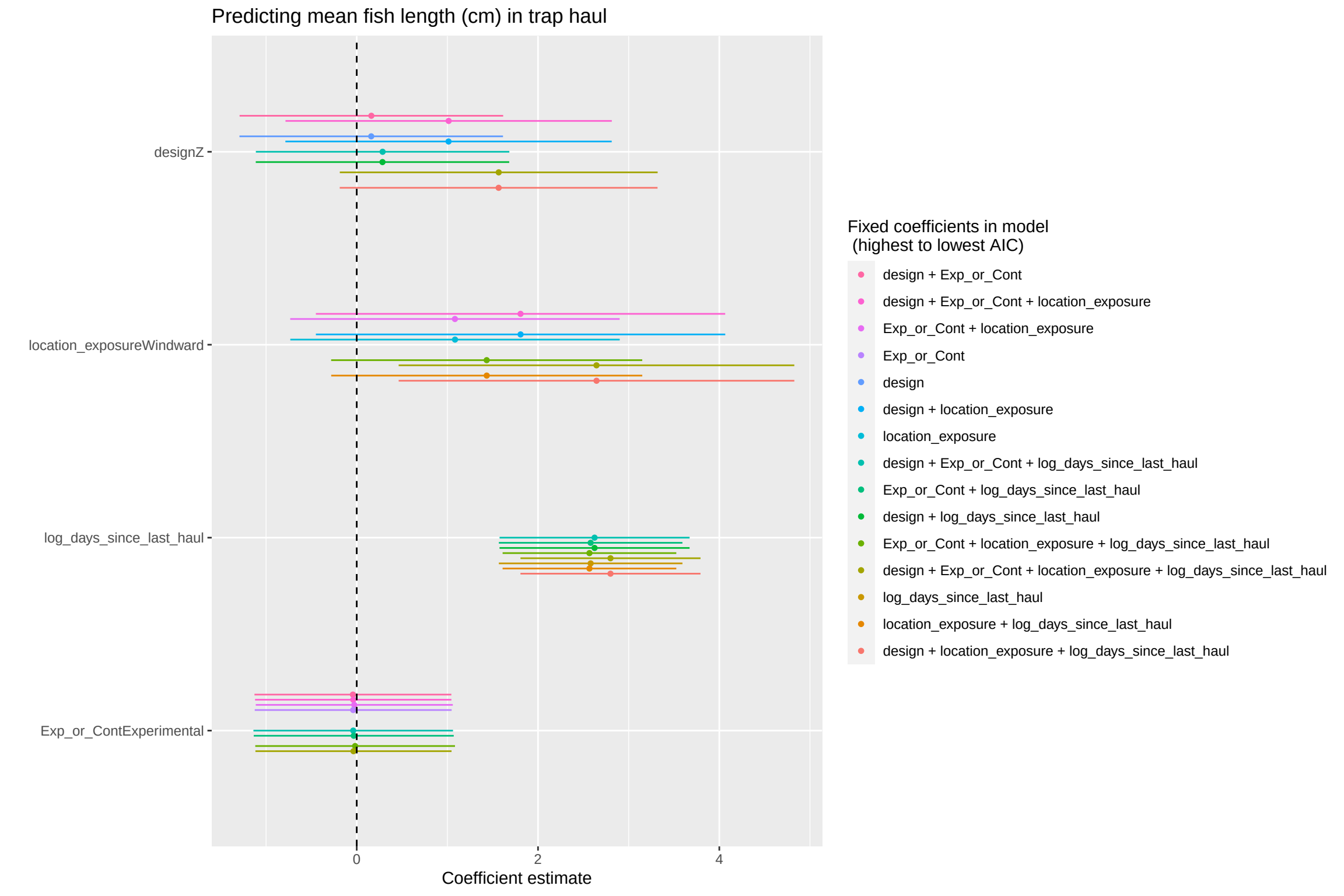

Normal distribution
mean_length_cm
norm quantiles
253
258
15
20
25
30
35
40
−3
−2
−1
0
1
2
3


Log−normal distribution
mean_length_cm
lnorm quantiles
253
258
15
20
25
30
35
40
0
5
10
15


Gamma distribution
mean_length_cm
gamma quantiles
253
258
15
20
25
30
35
40

```
Global model call: lmer(formula = mean_length_cm ~ design + log_days_since_last_haul +
    location_exposure + Exp_or_Cont + (1 | TrapID) + (1 | Date_YMD),
    data = trap_haul_no_zero, REML = FALSE, na.action = "na.fail")
---
Model selection table
   (Int) dsg Exp_or_Cnt lct_exp log_dys_snc_lst_hal df   logLik   AICc delta
14 17.32   +                  +               2.799  7 -864.667 1743.7  0.00
13 19.17                      +               2.567  6 -866.186 1744.7  0.94
9  19.31                                      2.581  5 -867.461 1745.1  1.41
16 17.34   +          +       +               2.799  8 -864.665 1745.8  2.10
15 19.18              +       +               2.567  7 -866.186 1746.7  3.04
10 19.00   +                                  2.624  6 -867.385 1747.0  3.34
11 19.33              +                        2.580  6 -867.460 1747.2  3.49
12 19.02   +          +                       2.624  7 -867.382 1749.1  5.43
1  25.08                                             4 -875.401 1758.9 15.23
5  24.95                      +                      5 -874.736 1759.7 15.96
6  24.09   +                  +                      6 -874.153 1760.6 16.88
2  24.95   +                                         5 -875.379 1761.0 17.25
3  25.10              +                              5 -875.399 1761.0 17.29
7  24.97              +       +                      6 -874.734 1761.7 18.04
8  24.11   +          +       +                      7 -874.151 1762.7 18.97
4  24.97   +          +                              6 -875.376 1763.0 19.32
   weight
14  0.321
13  0.200
9   0.158
16  0.112
15  0.070
10  0.060
11  0.056
12  0.021
1   0.000
5   0.000
6   0.000
2   0.000
3   0.000
7   0.000
8   0.000
4   0.000
Models ranked by AICc(x)
Random terms (all models):
'1 | TrapID', '1 | Date_YMD'
```

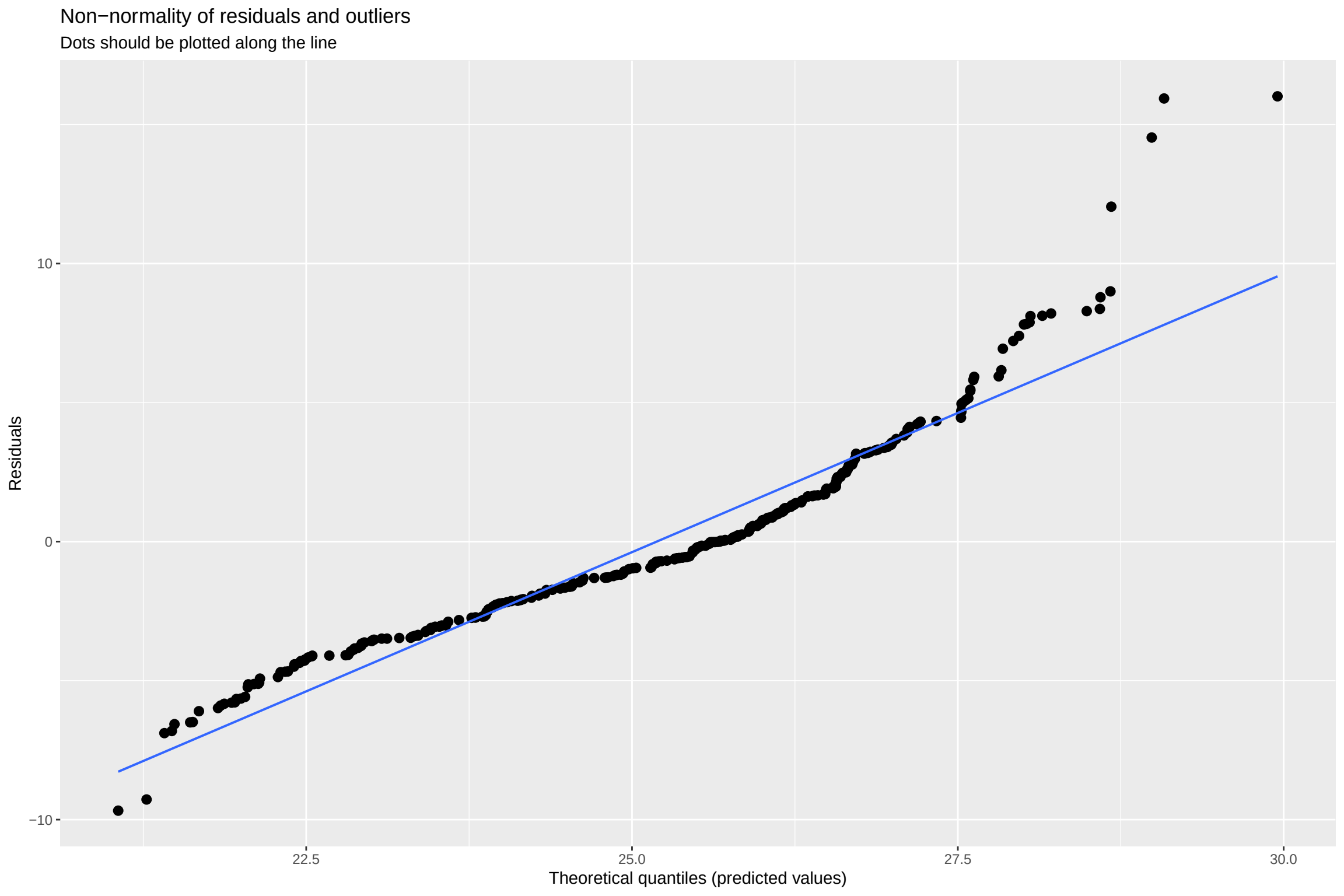
| model | sigma | logLik | AIC | BIC | deviance | df.residual |
|---|---|---|---|---|---|---|
| design + location_exposure + log_days_since_last_haul | 3.90 | −864.67 | 1743.33 | 1769.42 | 1729.33 | 300 |
| location_exposure + log_days_since_last_haul | 3.91 | −866.19 | 1744.37 | 1766.73 | 1732.37 | 301 |
| log_days_since_last_haul | 3.91 | −867.46 | 1744.92 | 1763.56 | 1734.92 | 302 |
| design + Exp_or_Cont + location_exposure + log_days_since_last_haul | 3.90 | −864.67 | 1745.33 | 1775.15 | 1729.33 | 299 |
| Exp_or_Cont + location_exposure + log_days_since_last_haul | 3.91 | −866.19 | 1746.37 | 1772.46 | 1732.37 | 300 |
| design + log_days_since_last_haul | 3.91 | −867.38 | 1746.77 | 1769.13 | 1734.77 | 301 |
| Exp_or_Cont + log_days_since_last_haul | 3.91 | −867.46 | 1746.92 | 1769.28 | 1734.92 | 301 |
| design + Exp_or_Cont + log_days_since_last_haul | 3.91 | −867.38 | 1748.76 | 1774.85 | 1734.76 | 300 |
| none | 3.91 | −875.40 | 1758.80 | 1773.71 | 1750.80 | 303 |
| location_exposure | 3.91 | −874.74 | 1759.47 | 1778.11 | 1749.47 | 302 |
| design + location_exposure | 3.89 | −874.15 | 1760.31 | 1782.67 | 1748.31 | 301 |
| design | 3.90 | −875.38 | 1760.76 | 1779.39 | 1750.76 | 302 |
| Exp_or_Cont | 3.91 | −875.40 | 1760.80 | 1779.43 | 1750.80 | 302 |
| Exp_or_Cont + location_exposure | 3.91 | −874.73 | 1761.47 | 1783.83 | 1749.47 | 301 |
| design + Exp_or_Cont + location_exposure | 3.89 | −874.15 | 1762.30 | 1788.39 | 1748.30 | 300 |
| design + Exp_or_Cont | 3.90 | −875.38 | 1762.75 | 1785.11 | 1750.75 | 301 |

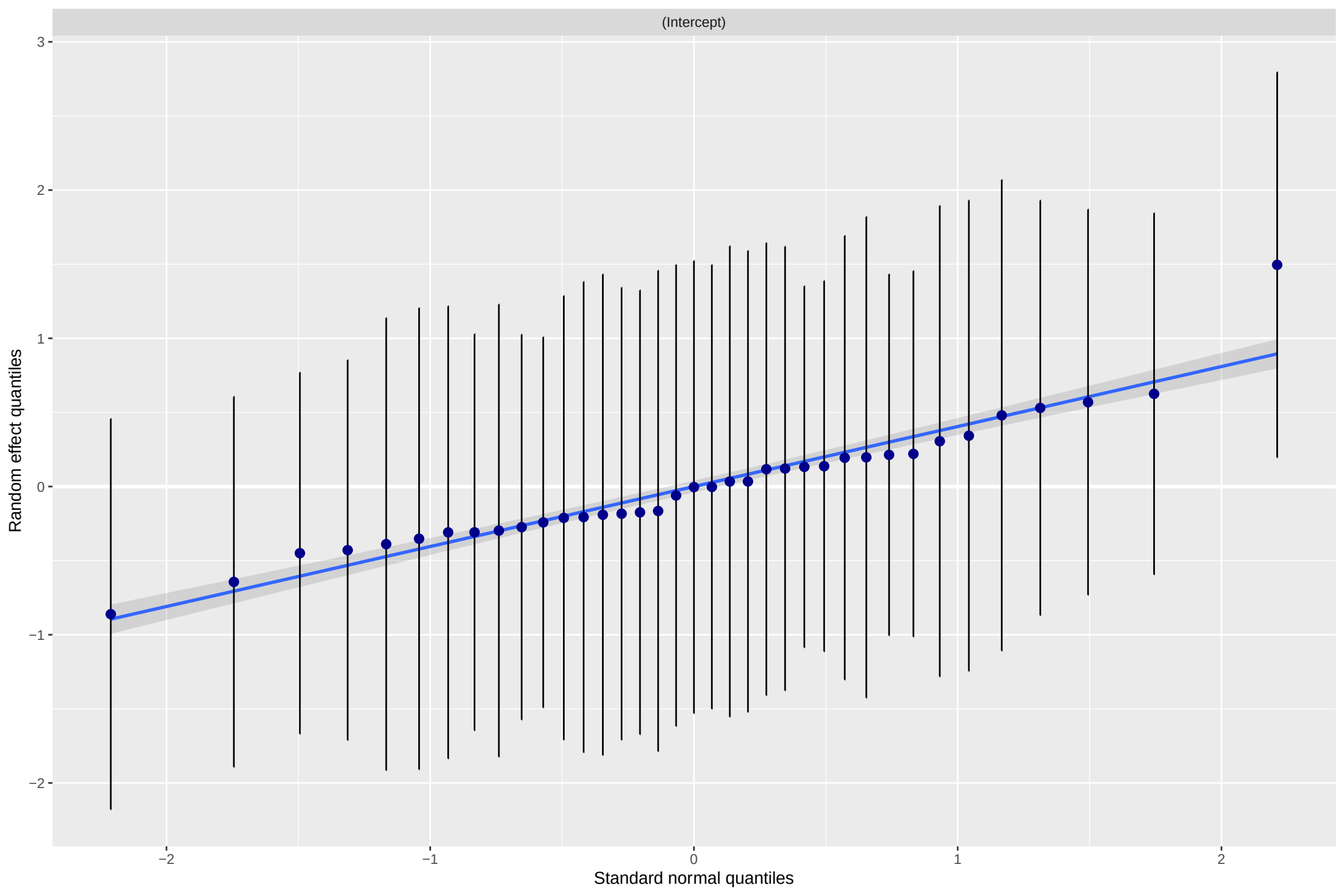

Predicting mean fish length (cm) in trap haul
designZ
location_exposureWindward
log_days_since_last_haul
Exp_or_ContExperimental
0
2
4
Coefficient estimate
Fixed coefficients in model
(highest to lowest AIC)
design + Exp_or_Cont
design + Exp_or_Cont + location_exposure
Exp_or_Cont + location_exposure
Exp_or_Cont
design
design + location_exposure
location_exposure
design + Exp_or_Cont + log_days_since_last_haul
Exp_or_Cont + log_days_since_last_haul
design + log_days_since_last_haul
Exp_or_Cont + location_exposure + log_days_since_last_haul
design + Exp_or_Cont + location_exposure + log_days_since_last_haul
log_days_since_last_haul
location_exposure + log_days_since_last_haul
design + location_exposure + log_days_since_last_haul

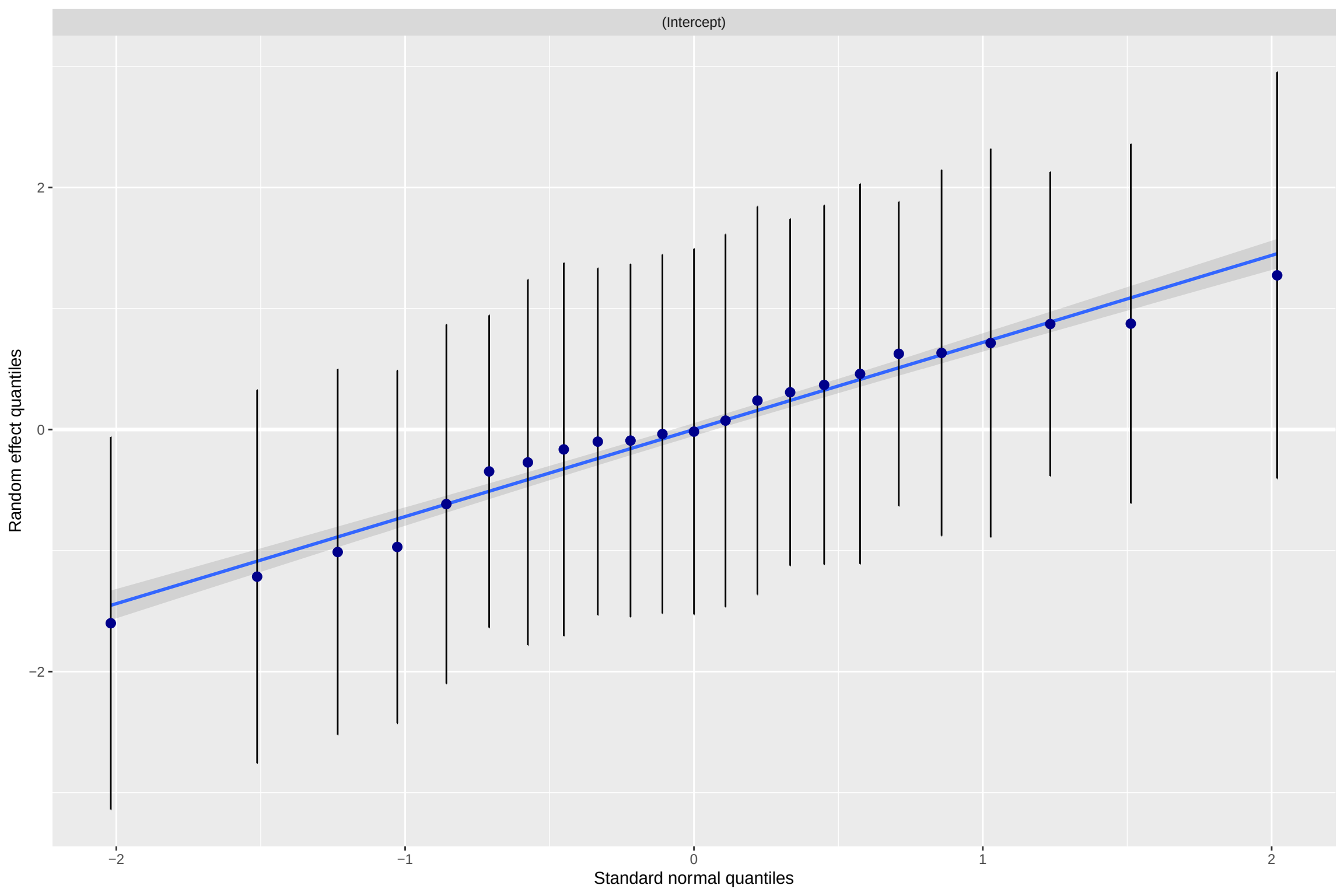
```
Backward reduced random-effect table:

               Eliminated npar  logLik    AIC    LRT Df Pr(>Chisq)
<none>                       8 -864.67 1745.3
(1 | TrapID)            0    7 -865.87 1745.7 2.4108  1    0.12050
(1 | Date_YMD)          0    7 -866.29 1746.6 3.2492  1    0.07146 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Backward reduced fixed-effect table:
Degrees of freedom method: Satterthwaite

                         Eliminated Sum Sq Mean Sq NumDF   DenDF F value
Exp_or_Cont                       1   0.06    0.06     1  29.248  0.0042
design                            2  46.57   46.57     1 104.974  3.0641
location_exposure                 3  41.14   41.14     1 106.658  2.6850
log_days_since_last_haul          0 382.10  382.10     1  20.651 24.9495
                           Pr(>F)
Exp_or_Cont                0.94895
design                     0.08296 .
location_exposure          0.10425
log_days_since_last_haul 6.356e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Model found:
mean_length_cm ~ log_days_since_last_haul + (1 | TrapID) + (1 | Date_YMD)
```

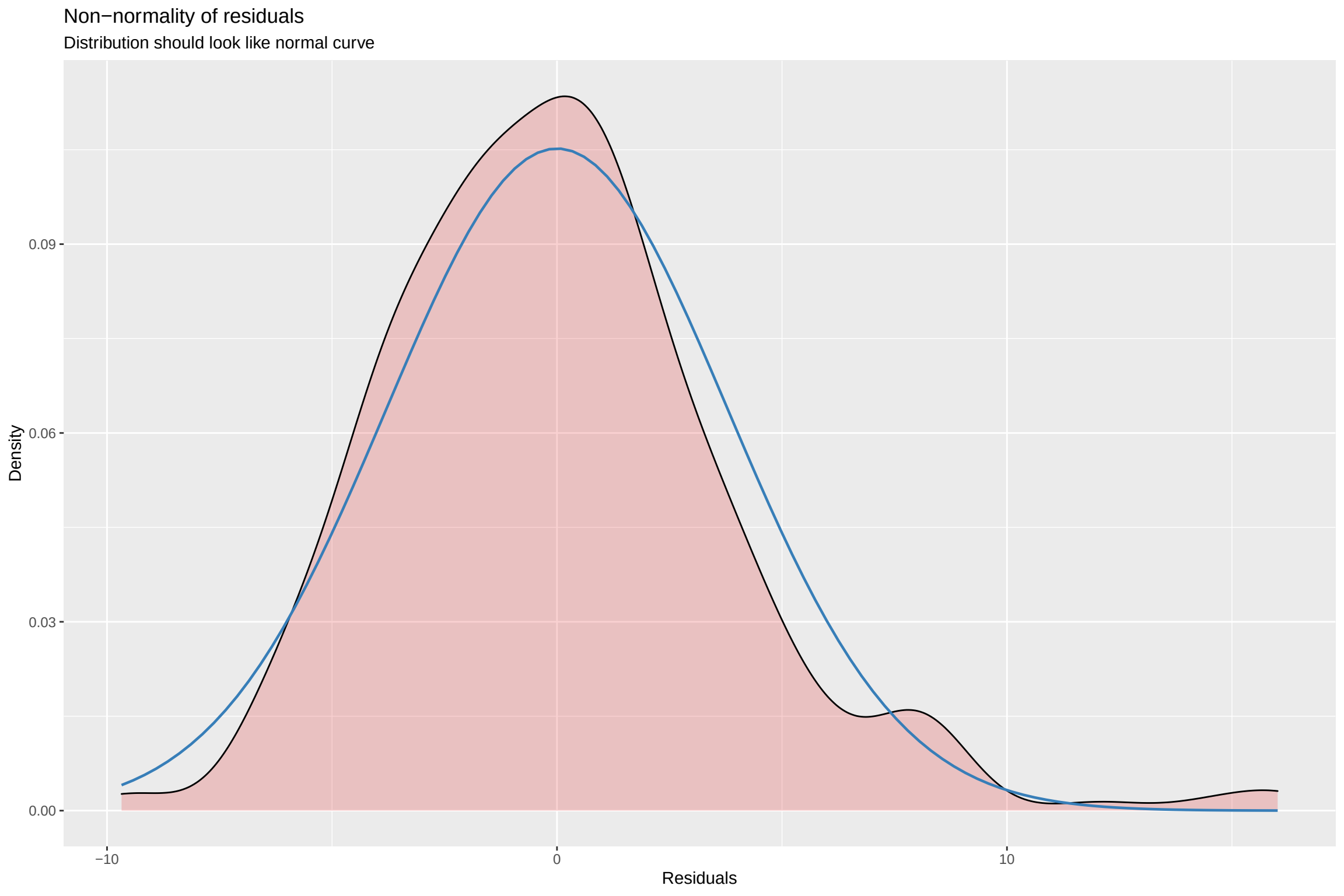
## Optimal model found using 'step' function which performs backward elimination of fixed−effect terms

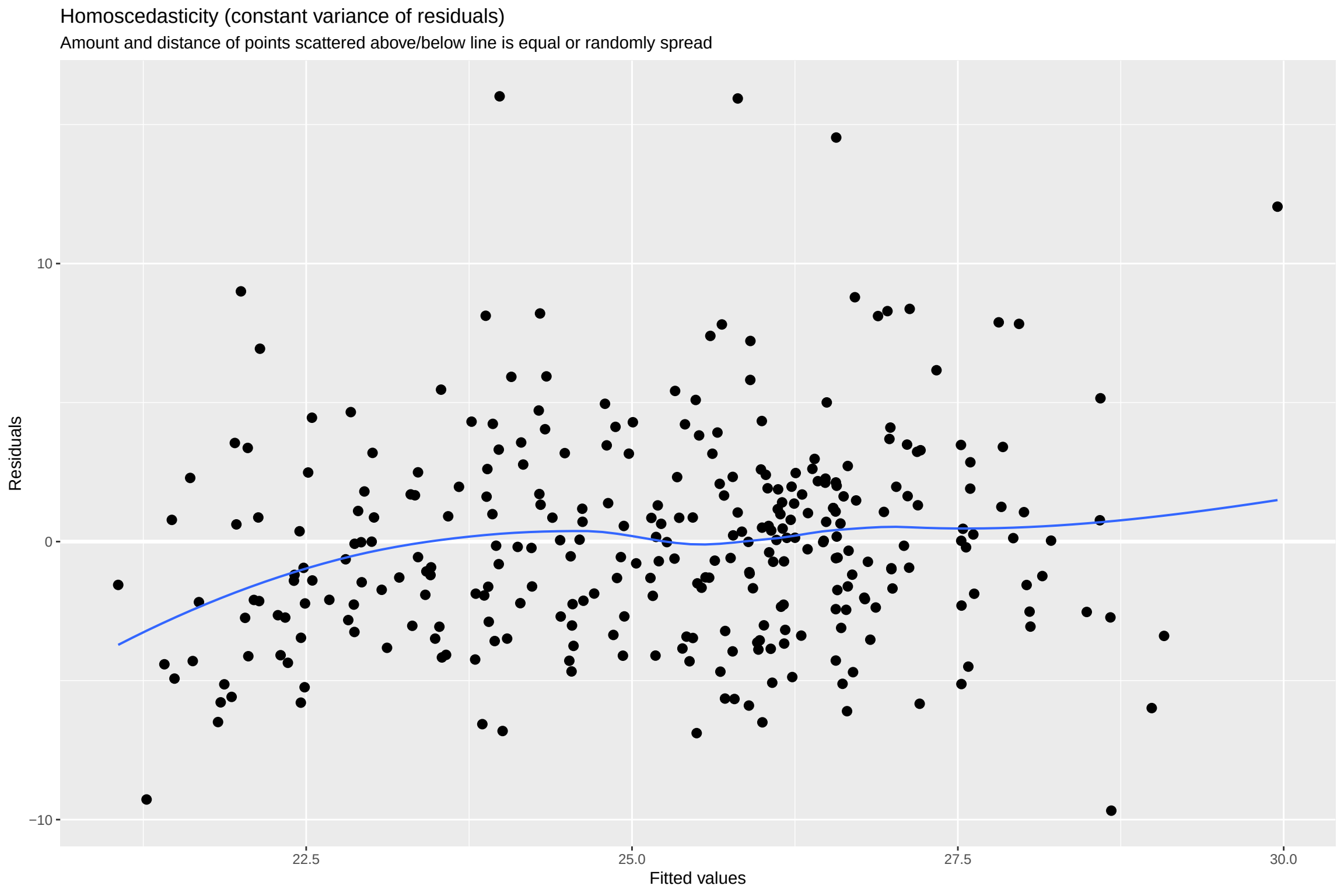
```
Linear mixed model fit by maximum likelihood . t−tests use Satterthwaite's
  method [lmerModLmerTest]
Formula: mean_length_cm ~ log_days_since_last_haul + (1 | TrapID) + (1 |
    Date_YMD)
   Data: trap_haul_no_zero

     AIC      BIC   logLik deviance df.resid
  1744.9   1763.6   −867.5   1734.9      302

Scaled residuals:
    Min      1Q  Median      3Q     Max
−2.4728 −0.6452 −0.0381  0.5038  4.0926

Random effects:
 Groups   Name        Variance Std.Dev.
 TrapID   (Intercept)  0.7159  0.8461
 Date_YMD (Intercept)  1.0804  1.0394
 Residual             15.3150  3.9134
Number of obs: 307, groups:  TrapID, 37; Date_YMD, 23

Fixed effects:
                         Estimate Std. Error      df t value Pr(>|t|)
(Intercept)               19.3115     1.2187 22.3752  15.846 1.19e−13 ***
log_days_since_last_haul   2.5805     0.5166 20.6510   4.995 6.36e−05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr)
lg_dys_sn__ −0.956
```


Non−normality of residuals and outliers
Dots should be plotted along the line
Residuals
10
0
−10
22.5
25.0
27.5
30.0
Theoretical quantiles (predicted values)


(Intercept)
Random effect quantiles
Standard normal quantiles
3
2
1
0
−1
−2
−2
−1
0
1
2


(Intercept)
Random effect quantiles
2
0
−2
−2
−1
0
1
2
Standard normal quantiles


Non−normality of residuals
Distribution should look like normal curve
Density
0.09
0.06
0.03
0.00
−10
0
10
Residuals


Homoscedasticity (constant variance of residuals)
Amount and distance of points scattered above/below line is equal or randomly spread
Residuals
10
0
−10
22.5
25.0
27.5
30.0
Fitted values

# Model summaries for all models with delta AIC < 2

```
$‘design + location_exposure + log_days_since_last_haul‘
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
  method [lmerModLmerTest]
Formula:
mean_length_cm ~ design + location_exposure + log_days_since_last_haul +
    (1 | TrapID) + (1 | Date_YMD)
   Data: trap_haul_no_zero

     AIC      BIC   logLik deviance df.resid
  1743.3   1769.4   -864.7   1729.3      300

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5119 -0.6380 -0.0195  0.4568  4.1615

Random effects:
 Groups   Name        Variance Std.Dev.
 TrapID   (Intercept)  0.6457  0.8036
 Date_YMD (Intercept)  0.8422  0.9177
 Residual             15.1989  3.8986
Number of obs: 307, groups:  TrapID, 37; Date_YMD, 23

Fixed effects:
                           Estimate Std. Error       df t value Pr(>|t|)
(Intercept)                 17.3201     1.5711  57.5091  11.024 8.29e-16 ***
designZ                      1.5655     0.8944 104.9741   1.750   0.0830 .
location_exposureWindward    2.6452     1.1135 143.6223   2.376   0.0188 *
log_days_since_last_haul     2.7994     0.5067  24.1542   5.525 1.08e-05 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) desgnZ lctn_W
designZ     -0.678
lctn_xpsrWn -0.459  0.627
lg_dys_sn__ -0.855  0.268  0.142

$‘location_exposure + log_days_since_last_haul‘
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
  method [lmerModLmerTest]
Formula: mean_length_cm ~ location_exposure + log_days_since_last_haul +
    (1 | TrapID) + (1 | Date_YMD)
   Data: trap_haul_no_zero

     AIC      BIC   logLik deviance df.resid
  1744.4   1766.7   -866.2   1732.4      301

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.4453 -0.6286 -0.0413  0.4457  4.1318

Random effects:
 Groups   Name        Variance Std.Dev.
 TrapID   (Intercept)  0.7100  0.8426
 Date_YMD (Intercept)  0.8339  0.9132
 Residual             15.3209  3.9142
Number of obs: 307, groups:  TrapID, 37; Date_YMD, 23

Fixed effects:
                           Estimate Std. Error       df t value Pr(>|t|)
(Intercept)                 19.1685     1.1573  22.6011  16.563 3.95e-14 ***
location_exposureWindward    1.4344     0.8754 106.6577   1.639    0.104
log_days_since_last_haul     2.5674     0.4888  20.9285   5.253 3.34e-05 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) lctn_W
lctn_xpsrWn -0.060
lg_dys_sn__ -0.951 -0.034

$log_days_since_last_haul
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
  method [lmerModLmerTest]
Formula: mean_length_cm ~ log_days_since_last_haul + (1 | TrapID) + (1 |
    Date_YMD)
   Data: trap_haul_no_zero

     AIC      BIC   logLik deviance df.resid
  1744.9   1763.6   -867.5   1734.9      302

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.4728 -0.6452 -0.0381  0.5038  4.0926

Random effects:
 Groups   Name        Variance Std.Dev.
 TrapID   (Intercept)  0.7159  0.8461
 Date_YMD (Intercept)  1.0804  1.0394
 Residual             15.3150  3.9134
Number of obs: 307, groups:  TrapID, 37; Date_YMD, 23

Fixed effects:
                           Estimate Std. Error      df t value Pr(>|t|)
(Intercept)                 19.3115     1.2187 22.3752  15.846 1.19e-13 ***
log_days_since_last_haul    2.5805     0.5166 20.6510   4.995 6.36e-05 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr)
lg_dys_sn__ -0.956
```

# Full model summary

```
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
  method [lmerModLmerTest]
Formula:
mean_length_cm ~ design + log_days_since_last_haul + location_exposure +
    Exp_or_Cont + (1 | TrapID) + (1 | Date_YMD)
   Data: trap_haul_no_zero

     AIC      BIC   logLik deviance df.resid
  1745.3   1775.1   -864.7   1729.3      299

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.5093 -0.6407 -0.0172  0.4540  4.1641

Random effects:
 Groups   Name        Variance Std.Dev.
 TrapID   (Intercept)  0.6449  0.8030
 Date_YMD (Intercept)  0.8423  0.9178
 Residual              15.1992  3.8986
Number of obs: 307, groups:  TrapID, 37; Date_YMD, 23

Fixed effects:
                             Estimate Std. Error        df t value Pr(>|t|)
(Intercept)                 17.33813    1.59526  60.04345  10.869 8.23e-16 ***
designZ                      1.56649    0.89442 104.73212   1.751   0.0828 .
log_days_since_last_haul     2.79948    0.50668  24.14748   5.525 1.08e-05 ***
location_exposureWindward    2.64490    1.11338 143.57125   2.376   0.0188 *
Exp_or_ContExperimental     -0.03564    0.55192  29.24792  -0.065   0.9489
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr) desgnZ lg____ lctn_W
designZ     -0.665
lg_dys_sn__ -0.841  0.268
lctn_xpsrWn -0.452  0.627  0.142
Exp_r_CntEx -0.173 -0.017 -0.005  0.002
```