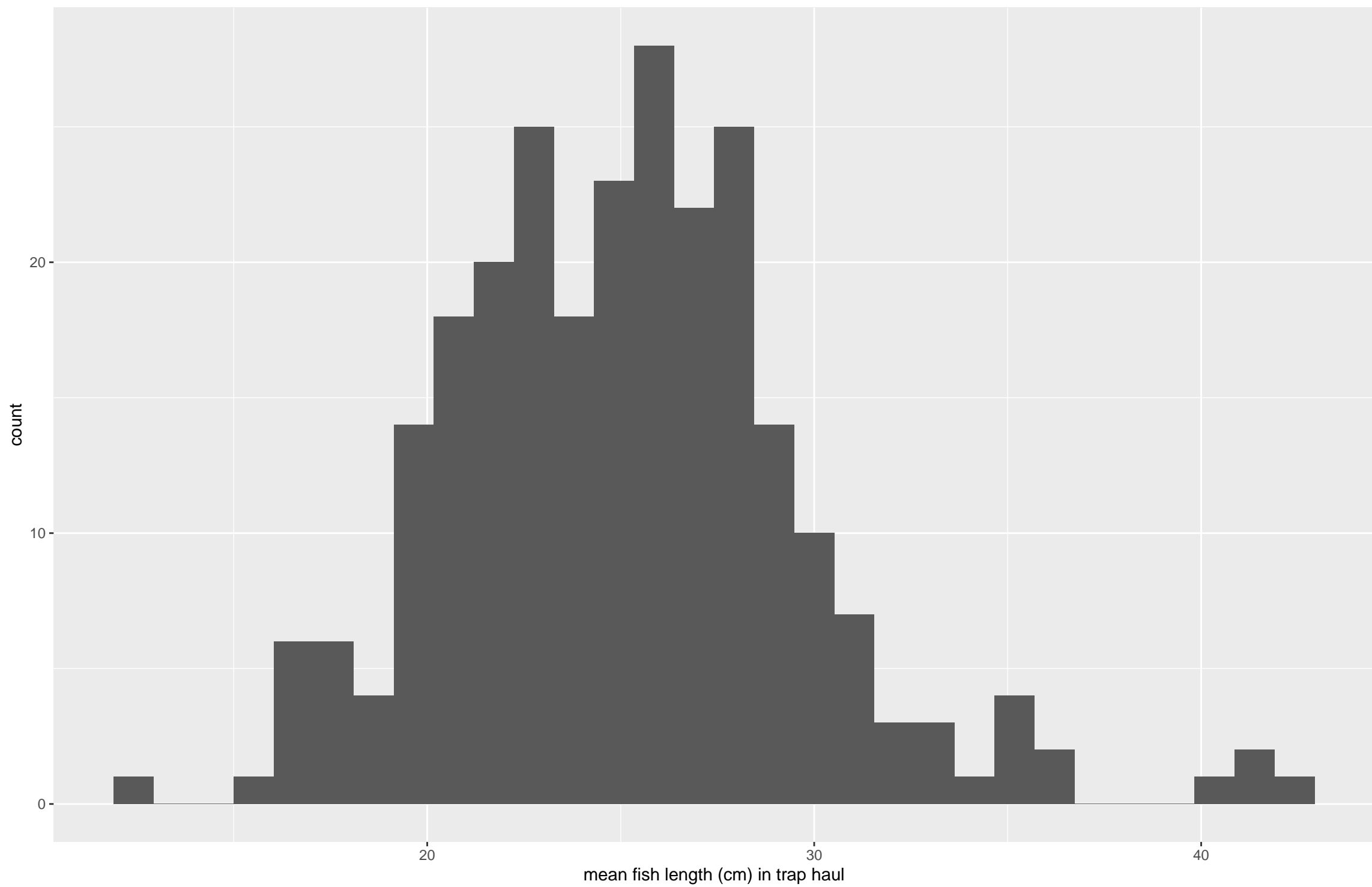
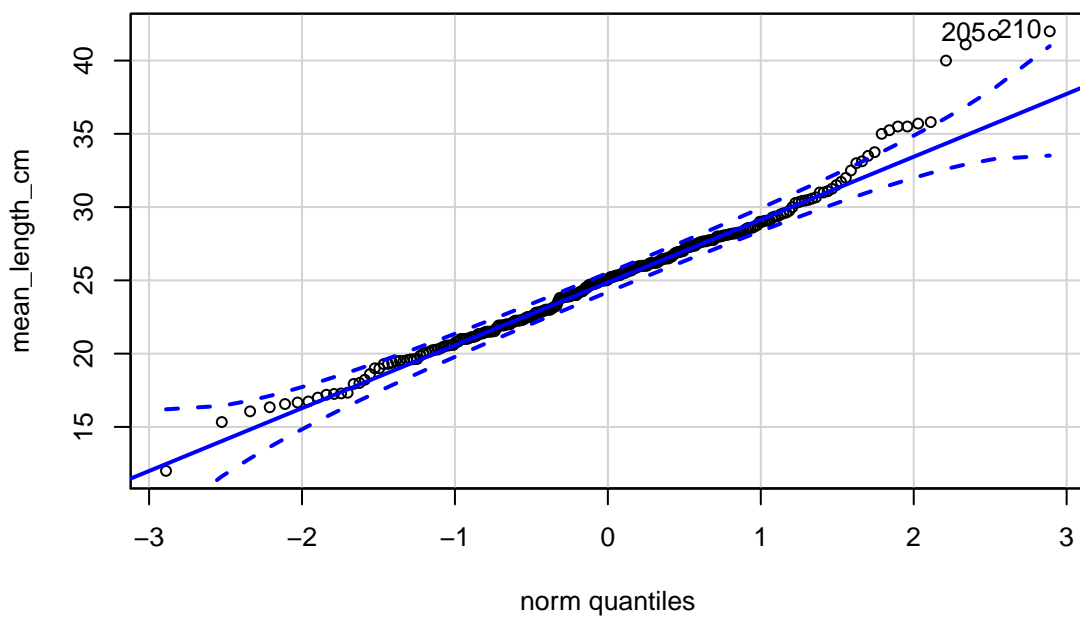


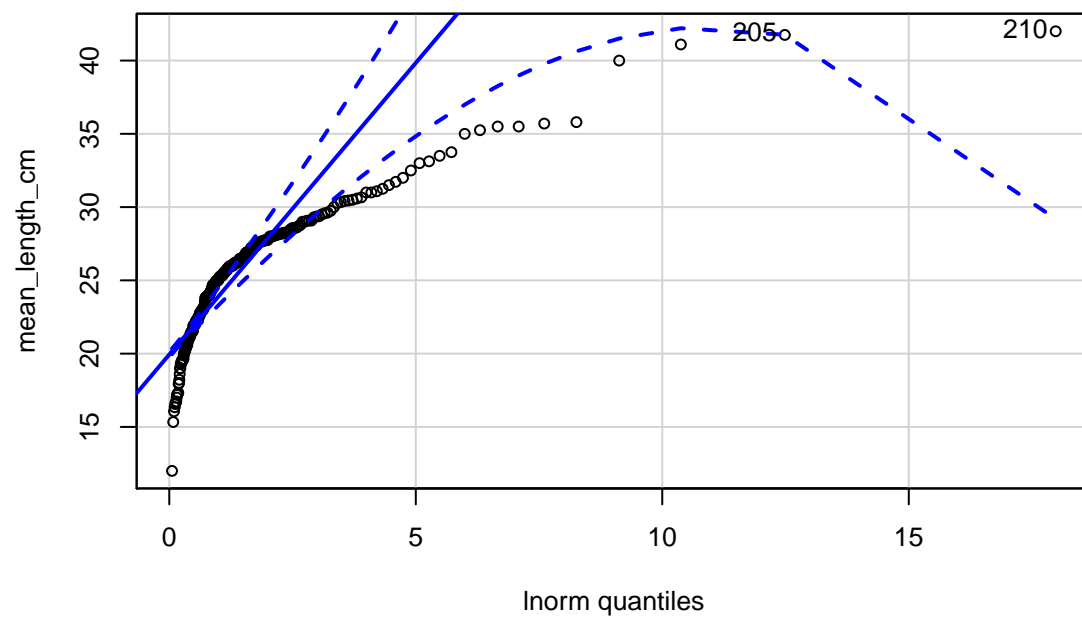
Histogram of mean fish length (cm)



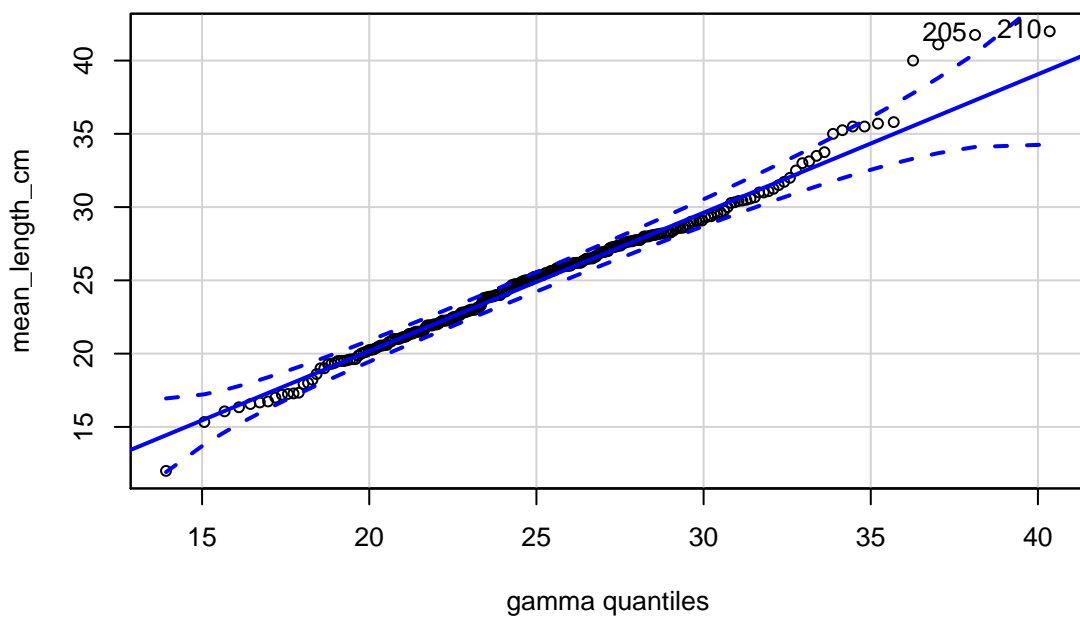
Normal distribution



Log-normal distribution



Gamma distribution



```
Global model call: lmer(formula = mean_length_cm ~ design + log_days_since_last_haul +
  location_exposure + Exp_or_Cont + depth_m + (1 | TrapID) +
  (1 | Date_YMD), data = trap_haul_no_zero_depth, REML = FALSE,
  na.action = "na.fail")
```

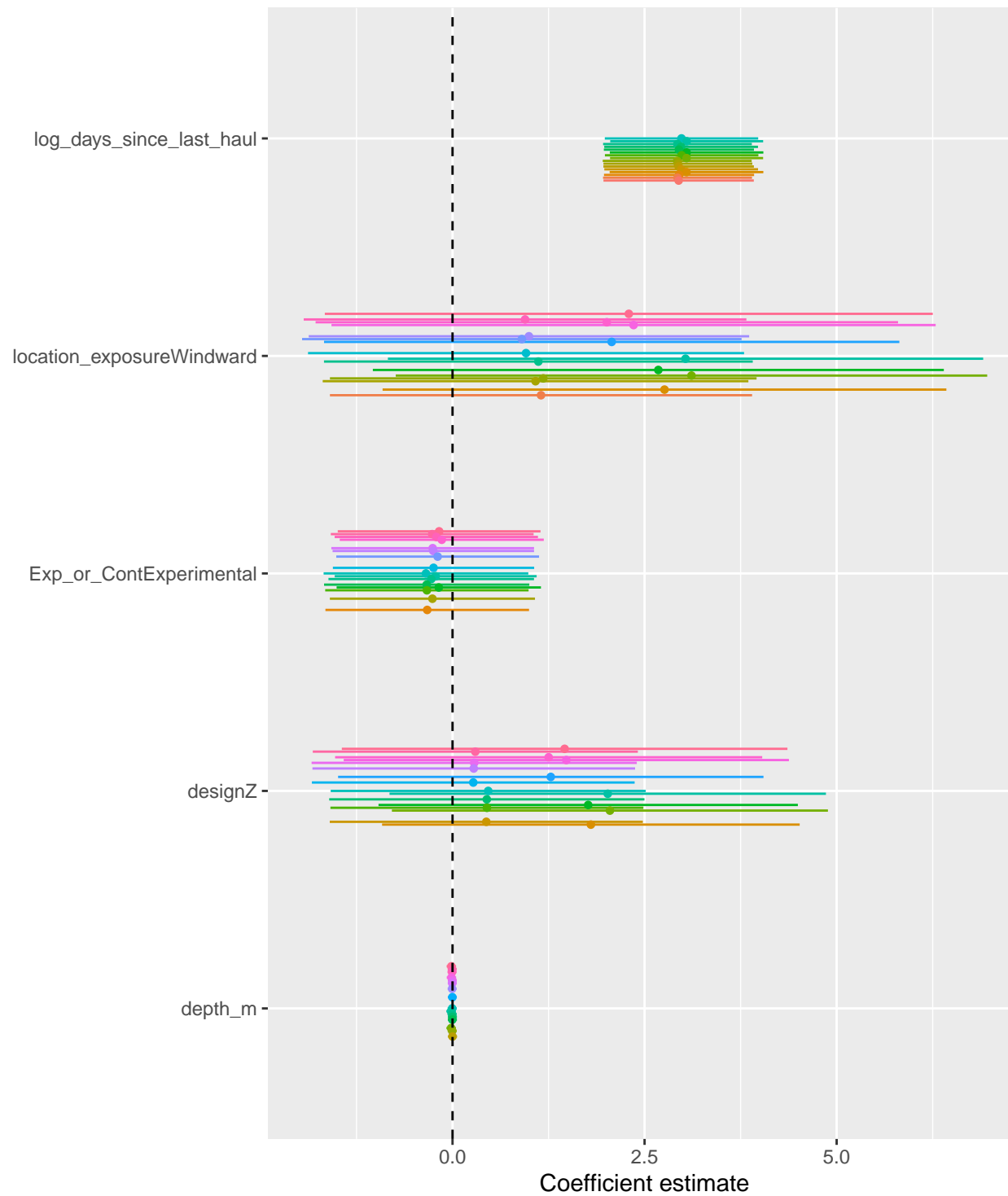
```
---
```

```
Model selection table
```

	(Int)	dpt_m	dsg	Exp_or_Cnt	lct_exp	log_dys_snc_lst_hal	df	logLik
17	18.54						2.943	5 -739.789
25	18.50				+		2.929	6 -739.454
21	18.70			+			2.949	6 -739.671
27	16.57		+		+		3.046	7 -738.620
19	18.08		+				2.976	6 -739.701
18	18.54	-6.609e-05					2.943	6 -739.789
29	18.63			+	+		2.933	7 -739.381
26	18.66	-4.191e-03			+		2.925	7 -739.445
28	16.97	-1.798e-02	+		+		3.047	8 -738.457
23	18.24		+	+			2.982	7 -739.579
31	16.69		+	+	+		3.047	8 -738.585
22	18.79	-2.337e-03		+			2.947	7 -739.668
20	18.14	-1.700e-03	+				2.976	7 -739.700
30	18.86	-5.848e-03		+	+		2.928	8 -739.363
32	17.15	-1.907e-02	+	+	+		3.048	9 -738.404
24	18.38	-4.083e-03	+	+			2.981	8 -739.571
1	25.08						4	-749.414
9	25.01				+		5	-749.197
5	25.21			+			5	-749.345
3	24.84		+				5	-749.383
2	25.14	-1.839e-03					5	-749.412
11	23.82		+		+		6	-748.798
13	25.12			+	+		6	-749.156
10	25.19	-5.085e-03			+		6	-749.183
7	24.97		+	+			6	-749.313
6	25.34	-3.572e-03		+			6	-749.338
4	24.93	-2.789e-03	+				6	-749.379
12	24.14	-1.443e-02	+		+		7	-748.692
15	23.93		+	+	+		7	-748.776
14	25.35	-6.338e-03		+	+		7	-749.134
8	25.12	-4.605e-03	+	+			7	-749.302
16	24.29	-1.531e-02	+	+	+		8	-748.659
	AICc	delta	weight					
17	1489.8	0.00	0.235					
25	1491.2	1.43	0.115					
21	1491.7	1.86	0.093					
27	1491.7	1.87	0.092					

model	sigma	logLik	AIC	BIC	deviance	df.residual
log_days_since_last_haul	4.07	-739.79	1489.58	1507.36	1479.58	254
location_exposure + log_days_since_last_haul	4.07	-739.45	1490.91	1512.25	1478.91	253
Exp_or_Cont + log_days_since_last_haul	4.07	-739.67	1491.34	1512.68	1479.34	253
design + location_exposure + log_days_since_last_haul	4.05	-738.62	1491.24	1516.14	1477.24	252
design + log_days_since_last_haul	4.07	-739.70	1491.40	1512.74	1479.40	253
depth_m + log_days_since_last_haul	4.07	-739.79	1491.58	1512.92	1479.58	253
Exp_or_Cont + location_exposure + log_days_since_last_haul	4.07	-739.38	1492.76	1517.66	1478.76	252
depth_m + location_exposure + log_days_since_last_haul	4.07	-739.45	1492.89	1517.79	1478.89	252
depth_m + design + location_exposure + log_days_since_last_haul	4.05	-738.46	1492.91	1521.37	1476.91	251
design + Exp_or_Cont + log_days_since_last_haul	4.06	-739.58	1493.16	1518.06	1479.16	252
design + Exp_or_Cont + location_exposure + log_days_since_last_haul	4.05	-738.59	1493.17	1521.63	1477.17	251
depth_m + Exp_or_Cont + log_days_since_last_haul	4.07	-739.67	1493.34	1518.23	1479.34	252
depth_m + design + log_days_since_last_haul	4.07	-739.70	1493.40	1518.30	1479.40	252
depth_m + Exp_or_Cont + location_exposure + log_days_since_last_haul	4.07	-739.36	1494.73	1523.18	1478.73	251
depth_m + design + Exp_or_Cont + location_exposure + log_days_since_last_haul	4.05	-738.40	1494.81	1526.82	1476.81	250
depth_m + design + Exp_or_Cont + log_days_since_last_haul	4.07	-739.57	1495.14	1523.60	1479.14	251
none	4.06	-749.41	1506.83	1521.06	1498.83	255
location_exposure	4.06	-749.20	1508.39	1526.18	1498.39	254
Exp_or_Cont	4.06	-749.35	1508.69	1526.47	1498.69	254
design	4.06	-749.38	1508.77	1526.55	1498.77	254
depth_m	4.06	-749.41	1508.82	1526.61	1498.82	254
design + location_exposure	4.04	-748.80	1509.60	1530.94	1497.60	253
Exp_or_Cont + location_exposure	4.06	-749.16	1510.31	1531.65	1498.31	253
depth_m + location_exposure	4.06	-749.18	1510.37	1531.71	1498.37	253
design + Exp_or_Cont	4.05	-749.31	1510.63	1531.97	1498.63	253
depth_m + Exp_or_Cont	4.06	-749.34	1510.68	1532.02	1498.68	253
depth_m + design	4.06	-749.38	1510.76	1532.10	1498.76	253
depth_m + design + location_exposure	4.05	-748.69	1511.38	1536.28	1497.38	252
design + Exp_or_Cont + location_exposure	4.04	-748.78	1511.55	1536.45	1497.55	252
depth_m + Exp_or_Cont + location_exposure	4.06	-749.13	1512.27	1537.17	1498.27	252
depth_m + design + Exp_or_Cont	4.06	-749.30	1512.60	1537.50	1498.60	252
depth_m + design + Exp_or_Cont + location_exposure	4.05	-748.66	1513.32	1541.77	1497.32	251

Predicting mean fish length (cm) in trap haul



Fixed coefficients in model (highest to lowest AIC)

- depth_m + design + Exp_or_Cont + location_exposure
- depth_m + design + Exp_or_Cont
- depth_m + Exp_or_Cont + location_exposure
- design + Exp_or_Cont + location_exposure
- depth_m + design + location_exposure
- depth_m + design
- depth_m + Exp_or_Cont
- design + Exp_or_Cont
- depth_m + location_exposure
- Exp_or_Cont + location_exposure
- design + location_exposure
- depth_m
- design
- Exp_or_Cont
- location_exposure
- depth_m + design + Exp_or_Cont + log_days_since_last_haul
- depth_m + design + Exp_or_Cont + location_exposure + log_days_since_last_haul
- depth_m + Exp_or_Cont + location_exposure + log_days_since_last_haul
- depth_m + design + log_days_since_last_haul
- depth_m + Exp_or_Cont + log_days_since_last_haul
- design + Exp_or_Cont + location_exposure + log_days_since_last_haul
- design + Exp_or_Cont + log_days_since_last_haul
- depth_m + design + location_exposure + log_days_since_last_haul
- depth_m + location_exposure + log_days_since_last_haul
- Exp_or_Cont + location_exposure + log_days_since_last_haul
- depth_m + log_days_since_last_haul
- design + log_days_since_last_haul
- design + location_exposure + log_days_since_last_haul
- Exp_or_Cont + log_days_since_last_haul
- location_exposure + log_days_since_last_haul
- log_days_since_last_haul

Backward reduced random-effect table:

	Eliminated	npar	logLik	AIC	LRT	Df	Pr(>Chisq)
<none>		9	-738.40	1494.8			
(1 TrapID)	0	8	-739.54	1495.1	2.2774	1	0.1313
(1 Date_YMD)	0	8	-738.97	1493.9	1.1239	1	0.2891

Backward reduced fixed-effect table:

Degrees of freedom method: Satterthwaite

	Eliminated	Sum Sq	Mean Sq	NumDF	DenDF	F value
Exp_or_Cont	1	1.76	1.76	1	16.927	0.1072
depth_m	2	5.52	5.52	1	16.708	0.3355
design	3	27.68	27.68	1	92.809	1.6869
location_exposure	4	11.17	11.17	1	95.400	0.6748
log_days_since_last_haul	0	575.84	575.84	1	20.994	34.7566

Pr(>F)

Exp_or_Cont	0.7473
depth_m	0.5702
design	0.1972
location_exposure	0.4134
log_days_since_last_haul	7.502e-06 ***

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_depth

      AIC      BIC    logLik deviance df.resid
1489.6   1507.4   -739.8   1479.6     254

Scaled residuals:
      Min       1Q   Median       3Q      Max
-2.4258 -0.6376 -0.0397  0.4514  4.0427

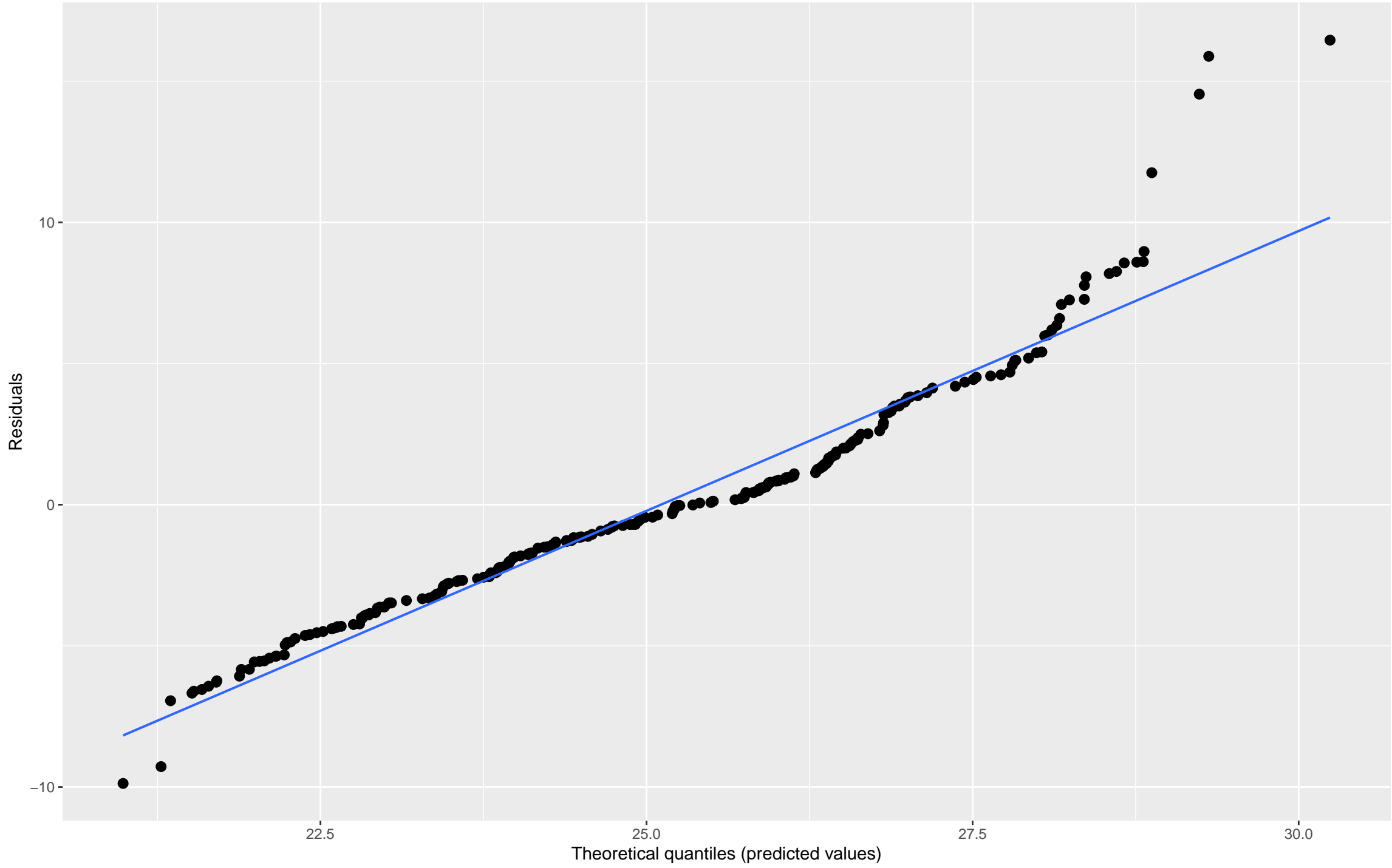
Random effects:
      Groups      Name      Variance Std.Dev.
TrapID   (Intercept)  0.8819   0.9391
Date_YMD (Intercept)  0.5687   0.7541
Residual                    16.5678   4.0704
Number of obs: 259, groups:  TrapID, 23; Date_YMD, 23

Fixed effects:
              Estimate Std. Error      df t value Pr(>|t|)
(Intercept)      18.5387      1.1780 22.3524  15.737 1.4e-13 ***
log_days_since_last_haul  2.9433      0.4992 20.9940   5.895 7.5e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr)
lg_dys_sn__ -0.948
```

Non-normality of residuals and outliers

Dots should be plotted along the line



(Intercept)

Random effect quantiles

Standard normal quantiles

3
2
1
0
-1
-2

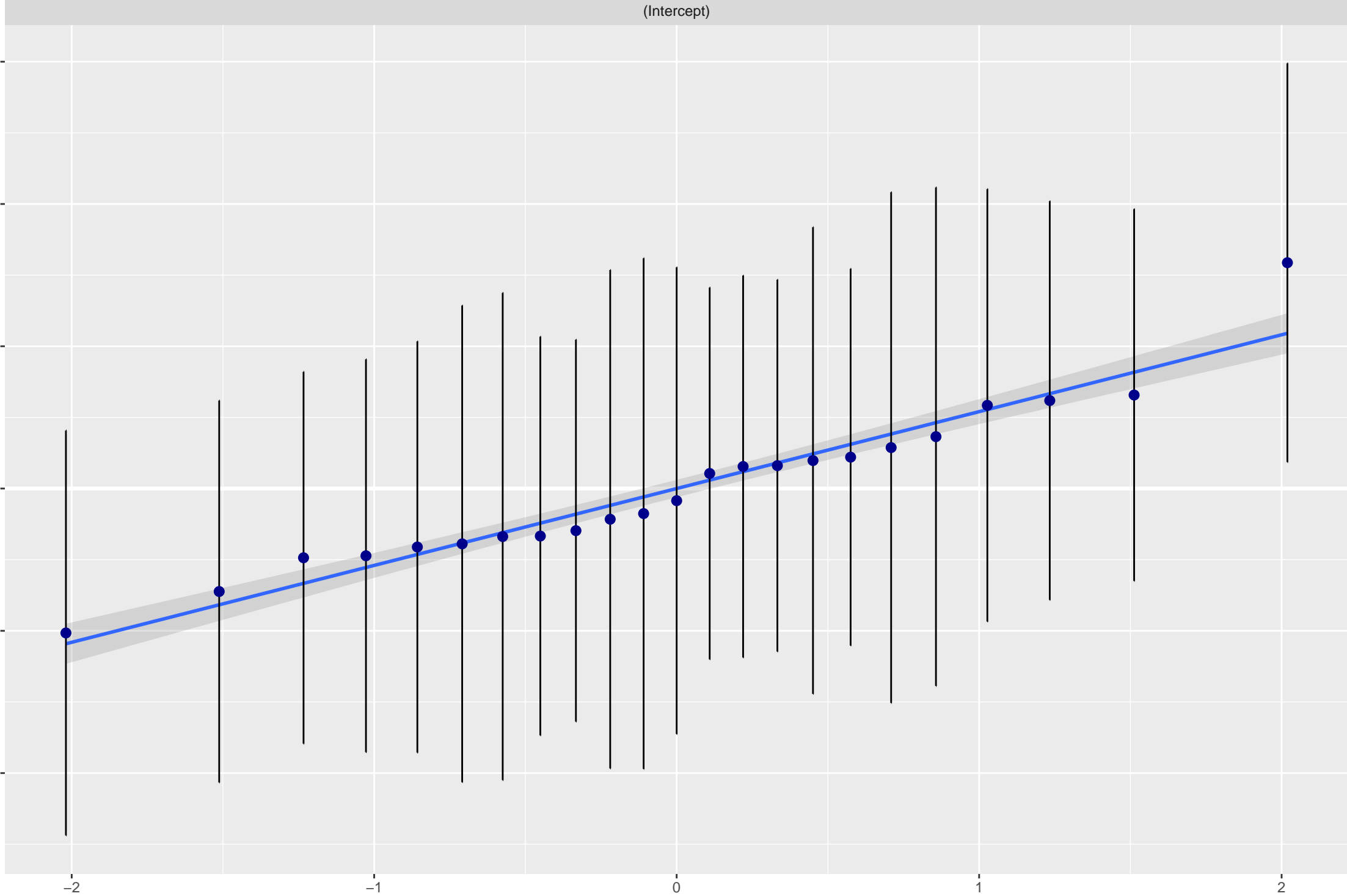
-2

-1

0

1

2



(Intercept)

Random effect quantiles

2
1
0
-1
-2

-2

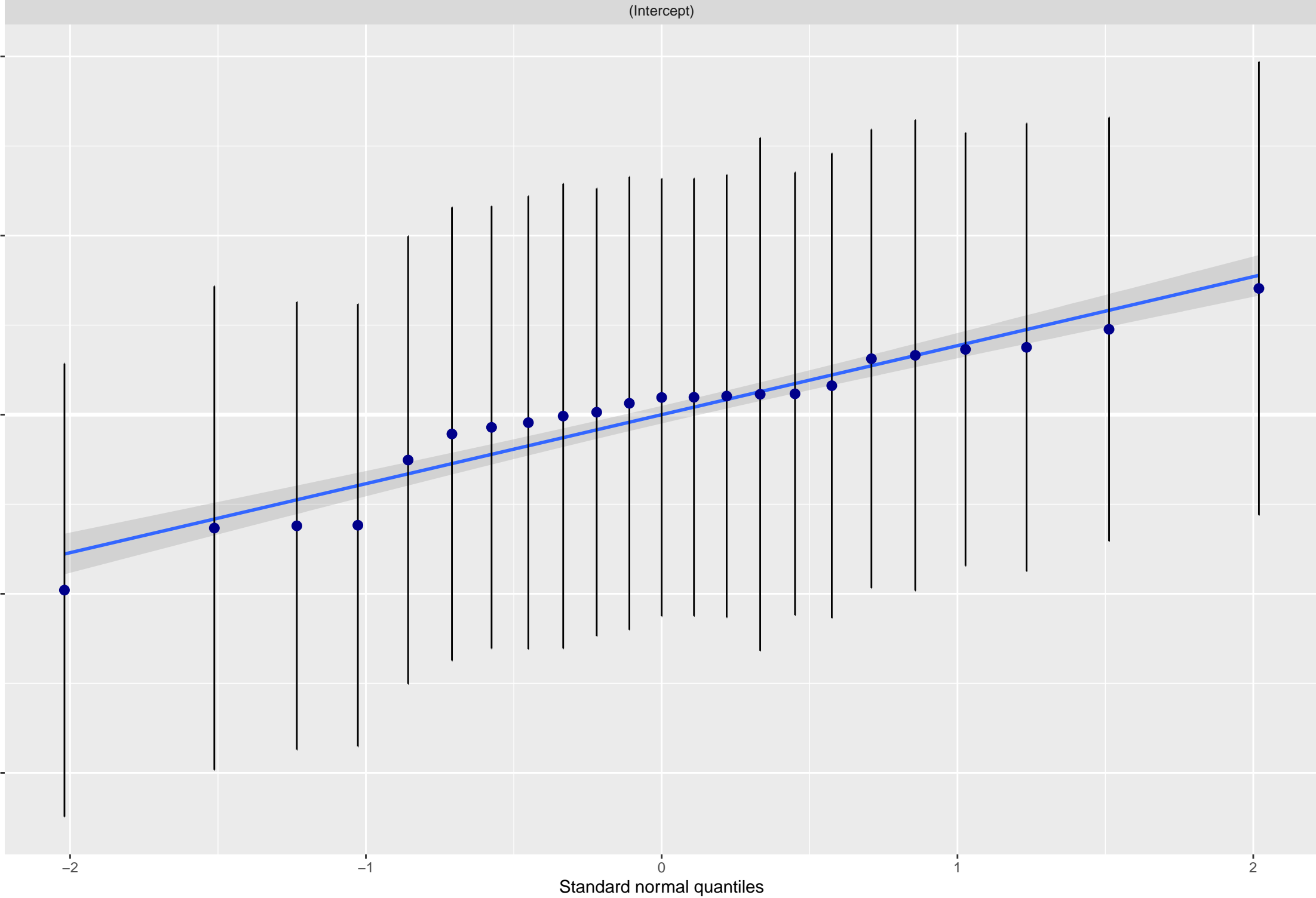
-1

0

1

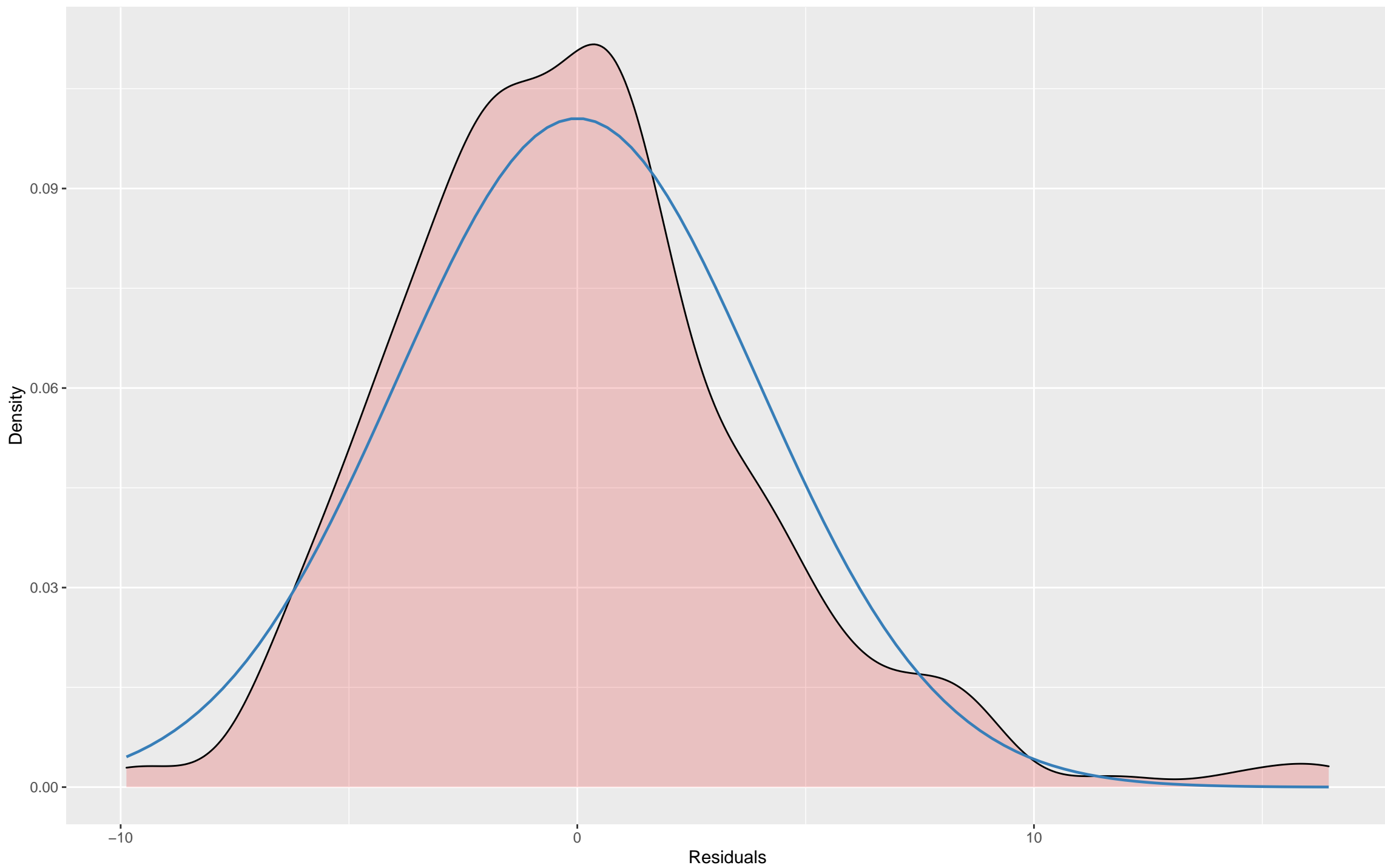
2

Standard normal quantiles



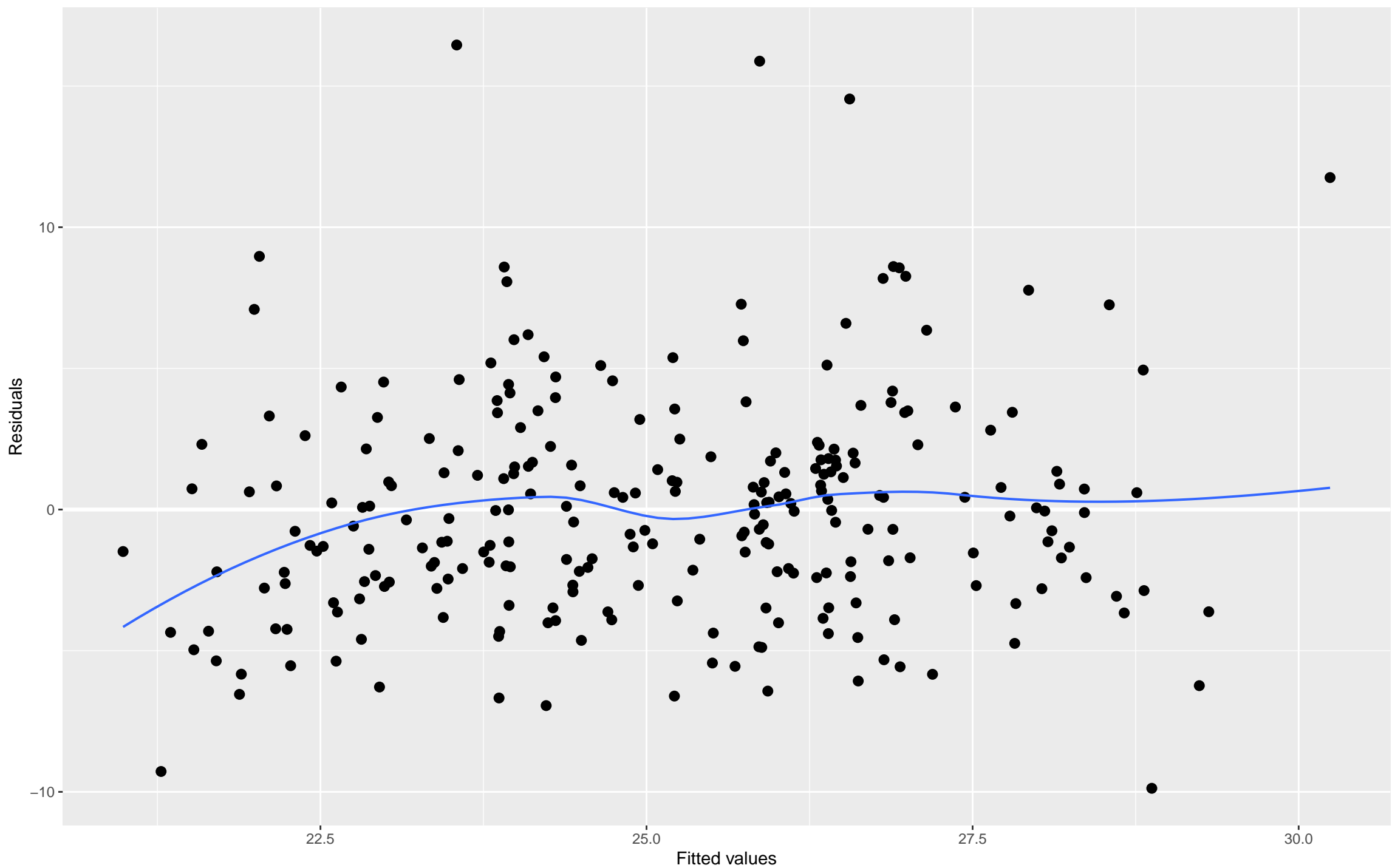
Non-normality of residuals

Distribution should look like normal curve



Homoscedasticity (constant variance of residuals)

Amount and distance of points scattered above/below line is equal or randomly spread



Model summaries for all models with delta AIC < 2

```
$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_depth

      AIC      BIC    logLik deviance df.resid
1489.6  1507.4   -739.8  1479.6      254

Scaled residuals:
   Min       1Q   Median       3Q      Max
-2.4258 -0.6376 -0.0397  0.4514  4.0427

Random effects:
 Groups Name Variance Std.Dev.
TrapID (Intercept) 0.8819 0.9391
Date_YMD (Intercept) 0.5687 0.7541
Residual 16.5678 4.0704
Number of obs: 259, groups: TrapID, 23; Date_YMD, 23

Fixed effects:
              Estimate Std. Error    df t value Pr(>|t|)
(Intercept)    18.5387    1.1780 22.3524  15.737 1.4e-13 ***
log_days_since_last_haul 2.9433    0.4992 20.9940  5.895 7.5e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr)
lg_dys_en__ -0.948

$'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_depth

      AIC      BIC    logLik deviance df.resid
1490.9  1512.2   -739.5  1478.9      253

Scaled residuals:
   Min       1Q   Median       3Q      Max
-2.4168 -0.6453 -0.0646  0.4685  4.0576

Random effects:
 Groups Name Variance Std.Dev.
TrapID (Intercept) 0.8808 0.9385
Date_YMD (Intercept) 0.5264 0.7285
Residual 16.5545 4.0687
Number of obs: 259, groups: TrapID, 23; Date_YMD, 23

Fixed effects:
              Estimate Std. Error    df t value Pr(>|t|)
(Intercept)    18.4998    1.1667 22.0827  15.857 1.49e-13 ***
location_exposureWindward 1.1517    1.4019 95.4001  0.821 0.413
log_days_since_last_haul 2.9286    0.4946 21.0804  5.922 6.95e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) lctn_W
lctn_xparWn -0.031
lg_dys_en__ -0.945 -0.048

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

      AIC      BIC    logLik deviance df.resid
1491.3  1512.7   -739.7  1479.3      253

Scaled residuals:
   Min       1Q   Median       3Q      Max
-2.4073 -0.6251 -0.0089  0.4677  4.0665

Random effects:
 Groups Name Variance Std.Dev.
TrapID (Intercept) 0.8823 0.9393
Date_YMD (Intercept) 0.5618 0.7495
Residual 16.5566 4.0690
Number of obs: 259, groups: TrapID, 23; Date_YMD, 23

Fixed effects:
              Estimate Std. Error    df t value Pr(>|t|)
(Intercept)    18.7024    1.2238 25.3509  15.282 2.66e-14 ***
Exp_or_ContExperimental -0.3294    0.6760 17.1133  -0.487 0.632
log_days_since_last_haul 2.9485    0.4984 20.9834  5.916 7.17e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) Ex__CE
Exp_r_CntEx -0.277
lg_dys_en__ -0.906 -0.018
```

```
$'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_depth

      AIC      BIC    logLik deviance df.resid
1491.2  1516.1   -738.6  1477.2      252

Scaled residuals:
   Min       1Q   Median       3Q      Max
-2.4621 -0.6307 -0.0547  0.4853  4.0670

Random effects:
 Groups Name Variance Std.Dev.
TrapID (Intercept) 0.8546 0.9245
Date_YMD (Intercept) 0.5945 0.7710
Residual 16.4079 4.0507
Number of obs: 259, groups: TrapID, 23; Date_YMD, 23

Fixed effects:
              Estimate Std. Error    df t value Pr(>|t|)
(Intercept)    16.5661    1.9115 83.4618  8.667 2.91e-13 ***
design2 1.8011    1.3867 92.8087  1.299 0.197
location_exposureWindward 2.7590    1.8722 109.8954  1.474 0.143
log_days_since_last_haul 3.0456    0.5103 22.9172  5.968 4.44e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) design2 lctn_W
design2 -0.786
lctn_xparWn -0.538 0.667
lg_dys_en__ -0.723 0.190 0.093

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

      AIC      BIC    logLik deviance df.resid
1491.4  1512.7   -739.7  1479.4      253

Scaled residuals:
   Min       1Q   Median       3Q      Max
-2.4398 -0.6378 -0.0396  0.4813  4.0399

Random effects:
 Groups Name Variance Std.Dev.
TrapID (Intercept) 0.8776 0.9368
Date_YMD (Intercept) 0.6018 0.7757
Residual 16.5344 4.0663
Number of obs: 259, groups: TrapID, 23; Date_YMD, 23

Fixed effects:
              Estimate Std. Error    df t value Pr(>|t|)
(Intercept)    18.0811    1.6185 59.8021  11.172 2.86e-16 ***
design2 0.4395    1.0395 80.9931  0.423 0.674
log_days_since_last_haul 2.9764    0.5104 22.1827  5.831 7.00e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) design2
design2 -0.680
lg_dys_en__ -0.802 0.172
```

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 + depth_m + (1 | TrapID) + (1 | Date_YMD)
Data: trap_haul_no_zero_depth

      AIC      BIC    logLik deviance df.resid
1494.8  1526.8    -738.4   1476.8      250

Scaled residuals:
    Min       1Q   Median       3Q      Max
-2.4875 -0.6255 -0.0441  0.4720  4.0420

Random effects:
Groups      Name      Variance Std.Dev.
TrapID      (Intercept)  0.7814   0.8840
Date_YMD    (Intercept)  0.5724   0.7566
Residual                    16.4392   4.0545
Number of obs: 259, groups: TrapID, 23; Date_YMD, 23

Fixed effects:
              Estimate Std. Error    df t value Pr(>|t|)
(Intercept)    17.14780    2.09062 76.60872   8.202 4.29e-12 ***
designZ          2.02027    1.44925 77.79361   1.394   0.167
log_days_since_last_haul  3.04803    0.50786 22.89662   6.002 4.12e-06 ***
location_exposureWindward  3.03300    1.97678 85.59994   1.534   0.129
Exp_or_ContExperimental -0.21956    0.67049 16.92730  -0.327   0.747
depth_m         -0.01907    0.03116 16.53700  -0.612   0.549
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
      (Intr) designZ lg_____ lctn_W EX__CE
designZ      -0.598
lg_dys_wn_____ -0.655  0.184
lctn_xparWn -0.393  0.700  0.089
Exp_r_CntEx -0.264  0.058 -0.007  0.119
depth_m     -0.346 -0.298 -0.008 -0.302  0.104
```