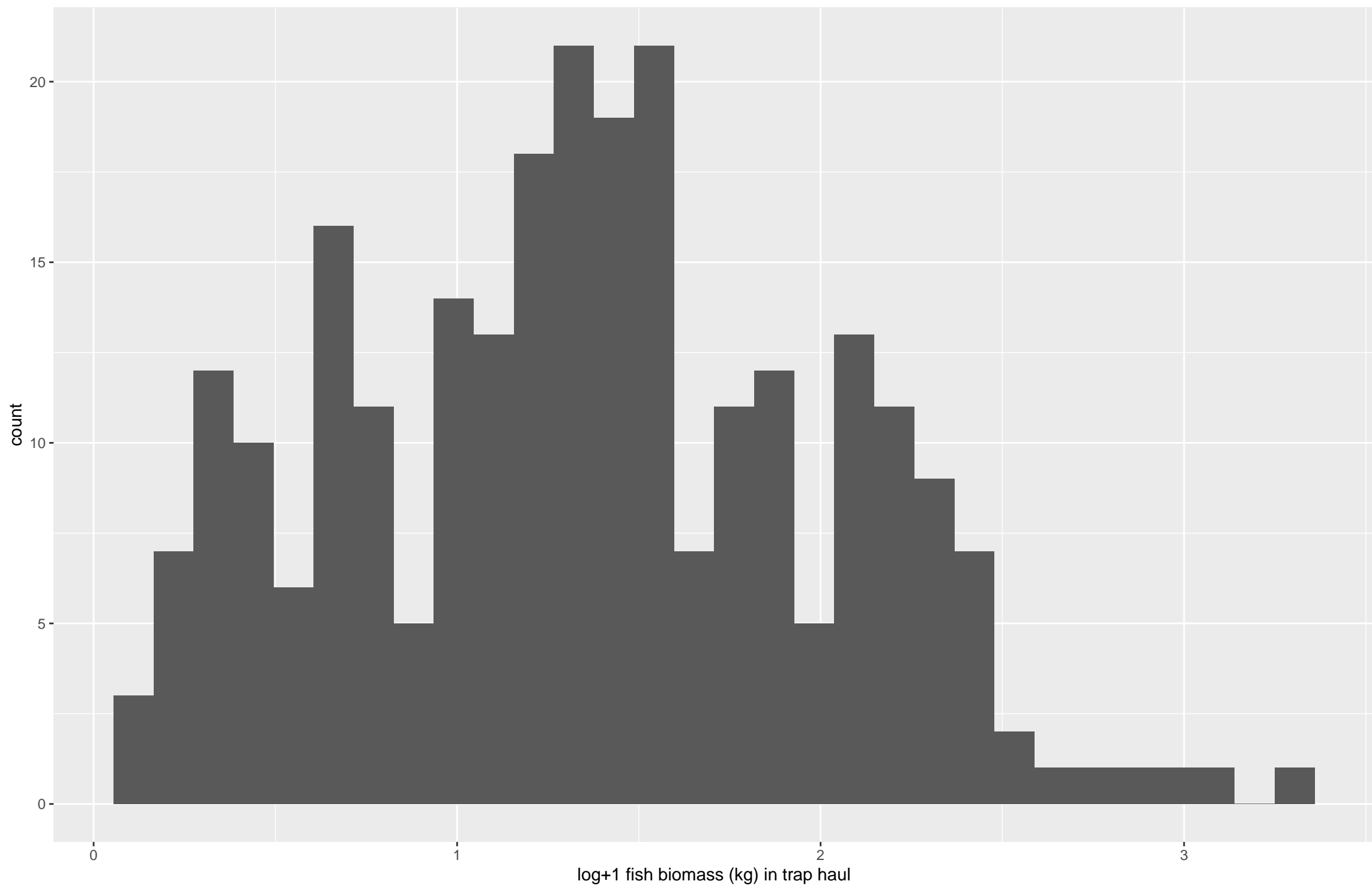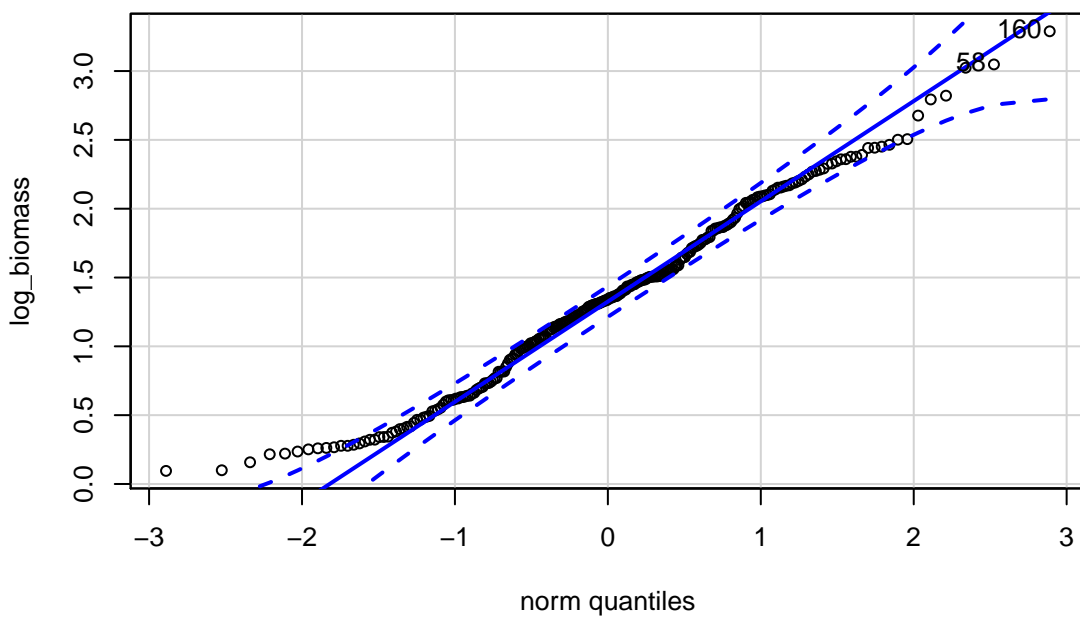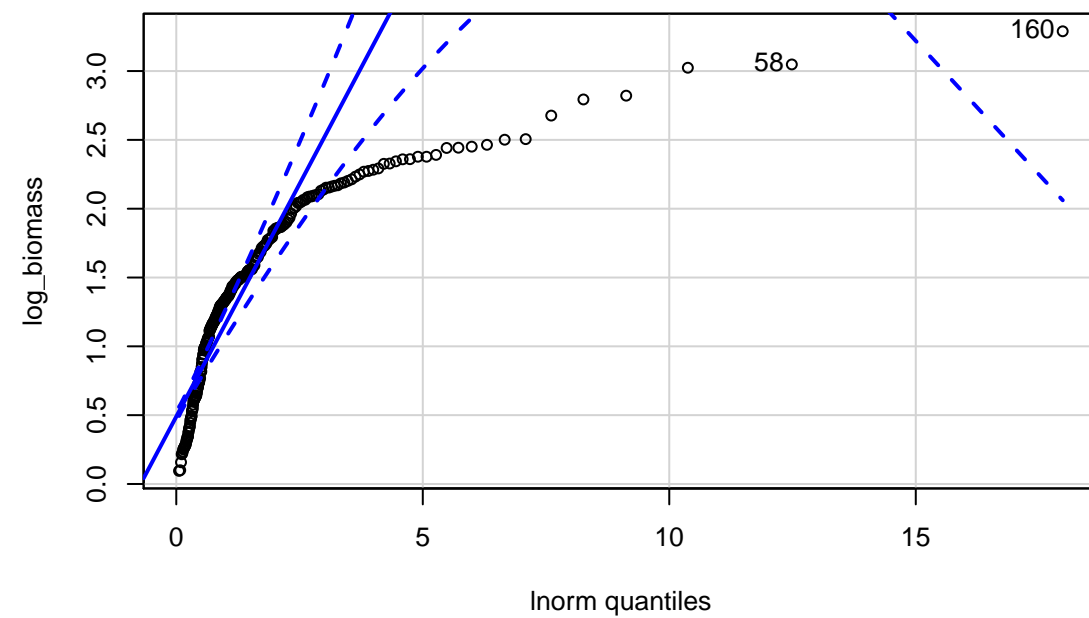Histogram of log+1 fish biomass (kg)
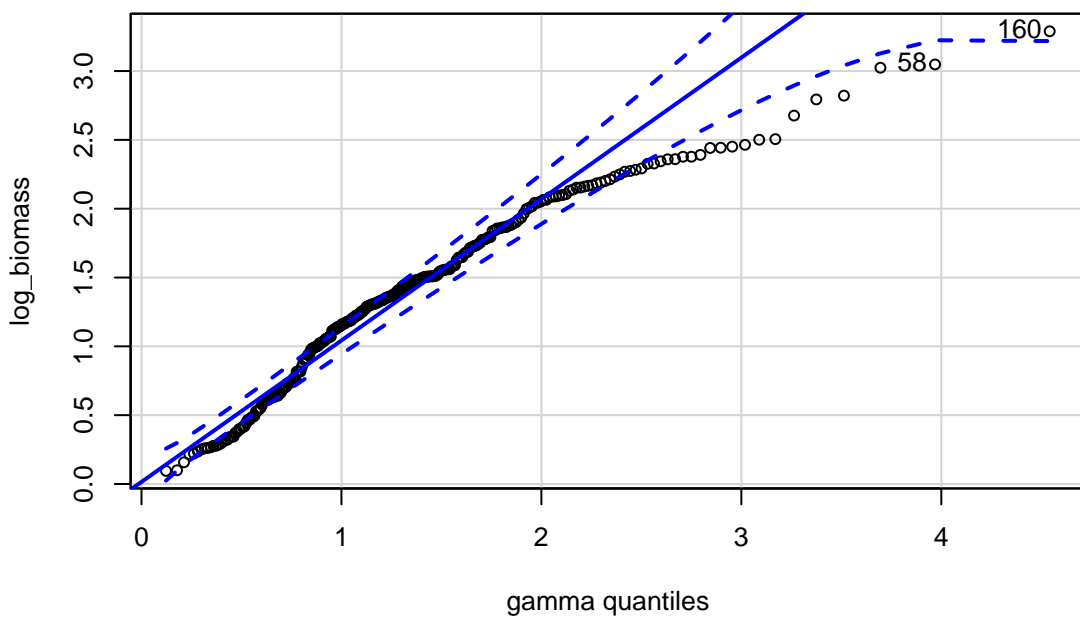
Normal distribution

Log−normal distribution

Gamma distribution

```
Global model call: lmer(formula = log_biomass ~ 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
19 0.3547              +                                   0.3257  6 -235.794
17 0.6293                                                  0.3087  5 -237.268
27 0.3034              +                  +                0.3281  7 -235.744
23 0.3699              +          +                        0.3263  7 -235.754
20 0.3710 -4.913e-04   +                                   0.3254  7 -235.789
25 0.6451                                 +                0.3094  6 -236.861
21 0.6433                          +                       0.3091  6 -237.241
18 0.5997  7.951e-04                                       0.3093  6 -237.257
31 0.3225              +          +       +                0.3283  8 -235.717
28 0.3309 -1.279e-03   +                  +                0.3281  8 -235.718
29 0.6687                          +       +               0.3102  7 -236.793
26 0.5802  1.774e-03                      +                0.3109  7 -236.809
24 0.3960 -7.525e-04   +          +                        0.3260  8 -235.744
22 0.6195  6.120e-04              +                        0.3096  7 -237.235
30 0.6104  1.529e-03              +       +                0.3114  8 -236.755
32 0.3557 -1.437e-03   +          +       +                0.3284  9 -235.685
1  1.3210                                                          4 -241.969
3  1.1270              +                                           5 -240.987
9  1.3390                                  +                       5 -241.524
5  1.3310                          +                               5 -241.957
2  1.3190  6.780e-05                                               5 -241.969
7  1.1380              +          +                                6 -240.969
4  1.1580 -9.690e-04   +                                           6 -240.969
11 1.1330              +                  +                        6 -240.986
13 1.3590                          +       +                       6 -241.480
10 1.3040  1.025e-03                      +                        6 -241.506
6  1.3330 -6.282e-05              +                                6 -241.957
8  1.1770 -1.160e-03   +          +                                7 -240.944
15 1.1500              +          +       +                        7 -240.965
12 1.1560 -1.022e-03   +                  +                        7 -240.969
14 1.3290  8.269e-04              +       +                        7 -241.468
16 1.1770 -1.157e-03   +          +       +                        8 -240.944
     AICc delta weight
19 483.9  0.00  0.225
17 484.8  0.85  0.147
27 485.9  2.01  0.082
23 486.0  2.03  0.081
```

model	sigma	logLik	AIC	BIC	deviance	df.residual
design + log_days_since_last_haul	0.56	−235.79	483.59	504.93	471.59	253
log_days_since_last_haul	0.56	−237.27	484.54	502.32	474.54	254
design + location_exposure + log_days_since_last_haul	0.56	−235.74	485.49	510.39	471.49	252
design + Exp_or_Cont + log_days_since_last_haul	0.56	−235.75	485.51	510.41	471.51	252
depth_m + design + log_days_since_last_haul	0.56	−235.79	485.58	510.48	471.58	252
location_exposure + log_days_since_last_haul	0.56	−236.86	485.72	507.06	473.72	253
Exp_or_Cont + log_days_since_last_haul	0.56	−237.24	486.48	507.82	474.48	253
depth_m + log_days_since_last_haul	0.56	−237.26	486.51	507.85	474.51	253
design + Exp_or_Cont + location_exposure + log_days_since_last_haul	0.56	−235.72	487.43	515.89	471.43	251
depth_m + design + location_exposure + log_days_since_last_haul	0.56	−235.72	487.44	515.89	471.44	251
Exp_or_Cont + location_exposure + log_days_since_last_haul	0.56	−236.79	487.59	512.48	473.59	252
depth_m + location_exposure + log_days_since_last_haul	0.56	−236.81	487.62	512.52	473.62	252
depth_m + design + Exp_or_Cont + log_days_since_last_haul	0.56	−235.74	487.49	515.94	471.49	251
depth_m + Exp_or_Cont + log_days_since_last_haul	0.56	−237.23	488.47	513.37	474.47	252
depth_m + Exp_or_Cont + location_exposure + log_days_since_last_haul	0.56	−236.75	489.51	517.96	473.51	251
depth_m + design + Exp_or_Cont + location_exposure + log_days_since_last_haul	0.56	−235.69	489.37	521.38	471.37	250
none	0.56	−241.97	491.94	506.17	483.94	255
design	0.56	−240.99	491.97	509.76	481.97	254
location_exposure	0.56	−241.52	493.05	510.83	483.05	254
Exp_or_Cont	0.56	−241.96	493.91	511.70	483.91	254
depth_m	0.56	−241.97	493.94	511.72	483.94	254
design + Exp_or_Cont	0.56	−240.97	493.94	515.28	481.94	253
depth_m + design	0.56	−240.97	493.94	515.28	481.94	253
design + location_exposure	0.56	−240.99	493.97	515.31	481.97	253
Exp_or_Cont + location_exposure	0.56	−241.48	494.96	516.30	482.96	253
depth_m + location_exposure	0.56	−241.51	495.01	516.35	483.01	253
depth_m + Exp_or_Cont	0.56	−241.96	495.91	517.25	483.91	253
depth_m + design + Exp_or_Cont	0.56	−240.94	495.89	520.79	481.89	252
design + Exp_or_Cont + location_exposure	0.56	−240.97	495.93	520.83	481.93	252
depth_m + design + location_exposure	0.56	−240.97	495.94	520.84	481.94	252
depth_m + Exp_or_Cont + location_exposure	0.56	−241.47	496.94	521.83	482.94	252
depth_m + design + Exp_or_Cont + location_exposure	0.56	−240.94	497.89	526.34	481.89	251

Predicting log+1 fish biomass (kg) in trap haul
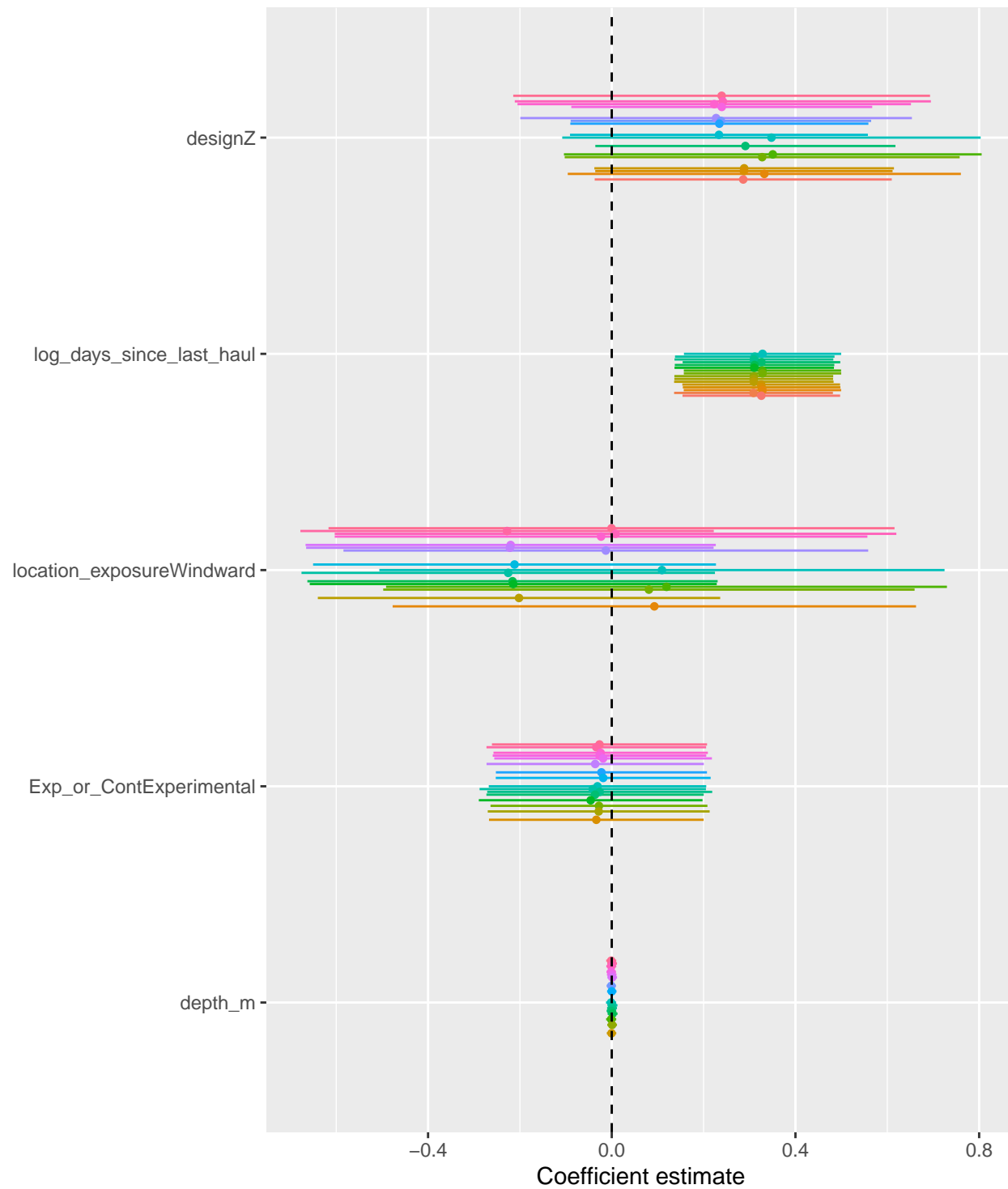
Fixed coefficients in model
(highest to lowest AIC)

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

```
Backward reduced random-effect table:

                  Eliminated npar  logLik     AIC      LRT Df Pr(>Chisq)
<none>                       9 -235.69 489.37
(1 | TrapID)            0     8 -242.77 501.54 14.1705  1   0.000167 ***
(1 | Date_YMD)          0     8 -239.73 495.47  8.0967  1   0.004434 **
---
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
depth_m                           1 0.0203  0.0203     1 19.836  0.0647
Exp_or_Cont                       2 0.0168  0.0168     1 21.719  0.0535
location_exposure                 3 0.0319  0.0319     1 83.096  0.1017
design                            4 0.9433  0.9433     1 66.888  3.0092
log_days_since_last_haul          0 3.8558  3.8558     1 24.596 12.2460
                         Pr(>F)
depth_m                  0.801763
Exp_or_Cont              0.819274
location_exposure        0.750595
design                   0.087398 .
log_days_since_last_haul 0.001798 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Model found:
log_biomass ~ 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: log_biomass ~ log_days_since_last_haul + (1 | TrapID) + (1 |
    Date_YMD)
   Data: trap_haul_no_zero_depth

     AIC       BIC    logLik deviance df.resid
   484.5     502.3    -237.3    474.5      254

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.15571 -0.75091 -0.03651  0.66536  2.73301

Random effects:
 Groups    Name        Variance Std.Dev.
 TrapID    (Intercept) 0.04780  0.2186
 Date_YMD  (Intercept) 0.03568  0.1889
 Residual              0.31487  0.5611
Number of obs: 259, groups:  TrapID, 23; Date_YMD, 23

Fixed effects:
                          Estimate Std. Error        df t value Pr(>|t|)
(Intercept)                0.62928    0.21087  28.02892   2.984  0.00584 **
log_days_since_last_haul   0.30868    0.08821  24.59583   3.499  0.00180 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
           (Intr)
lg_dys_sn__ -0.938
```
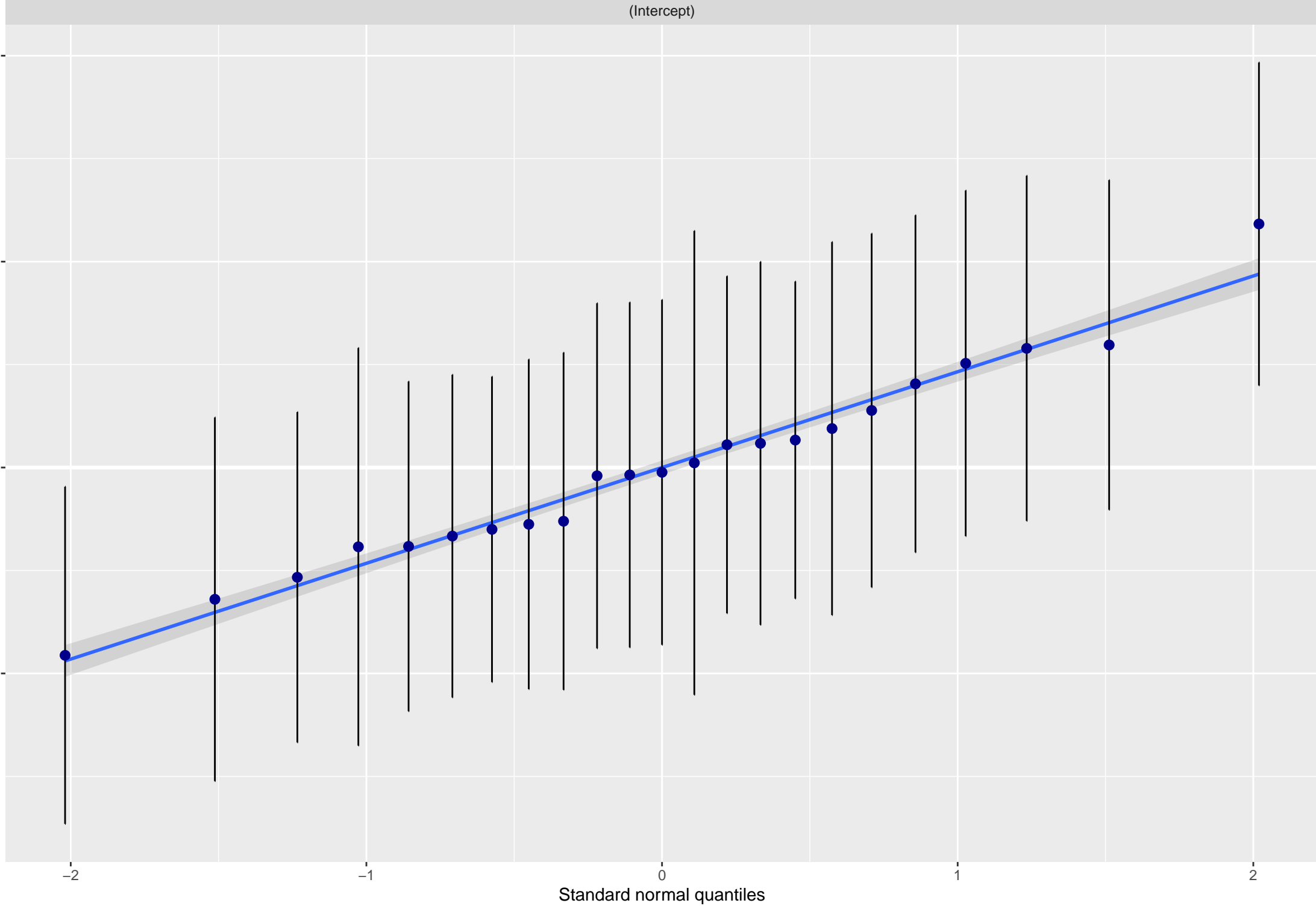
Non−normality of residuals and outliers
Dots should be plotted along the line
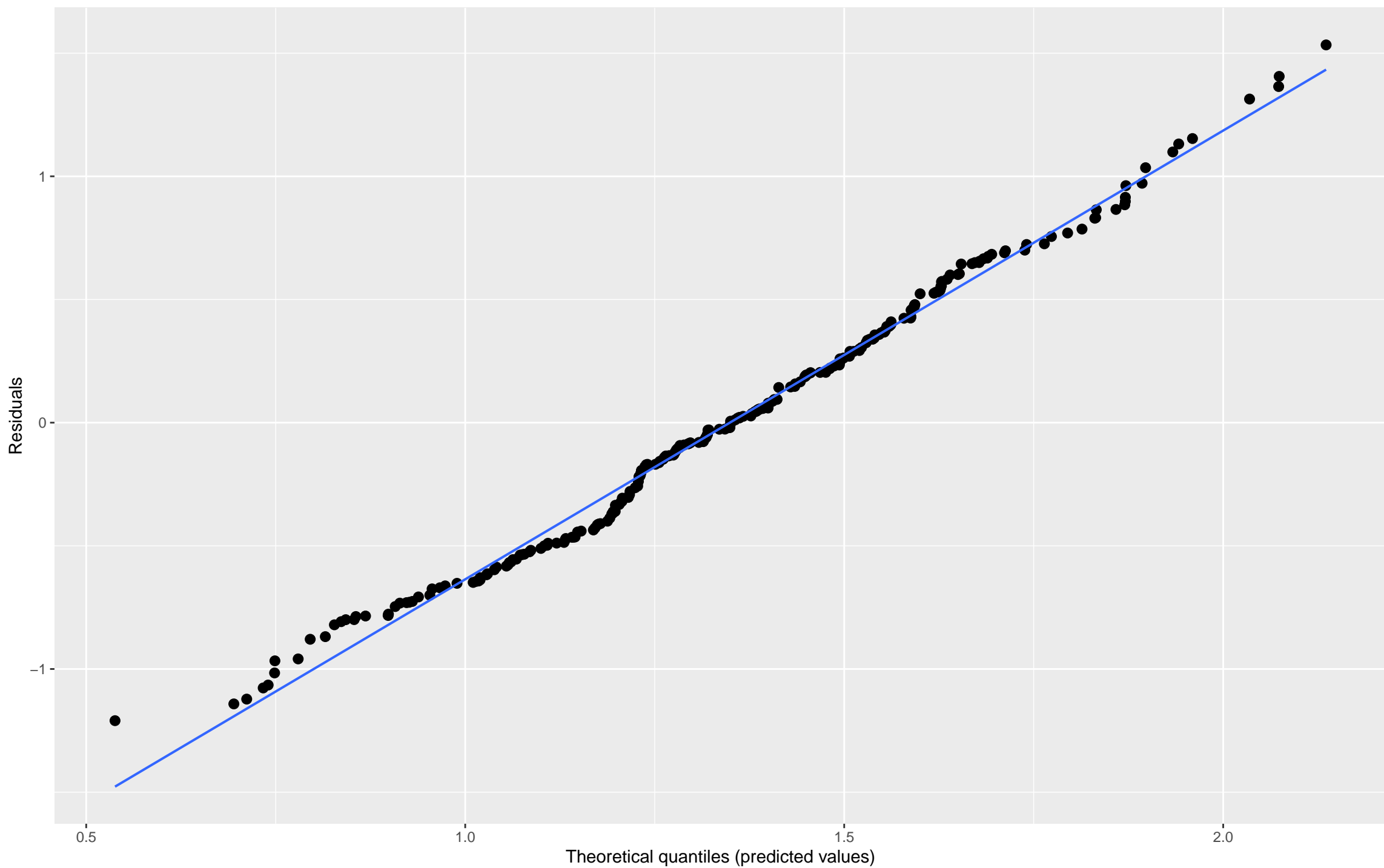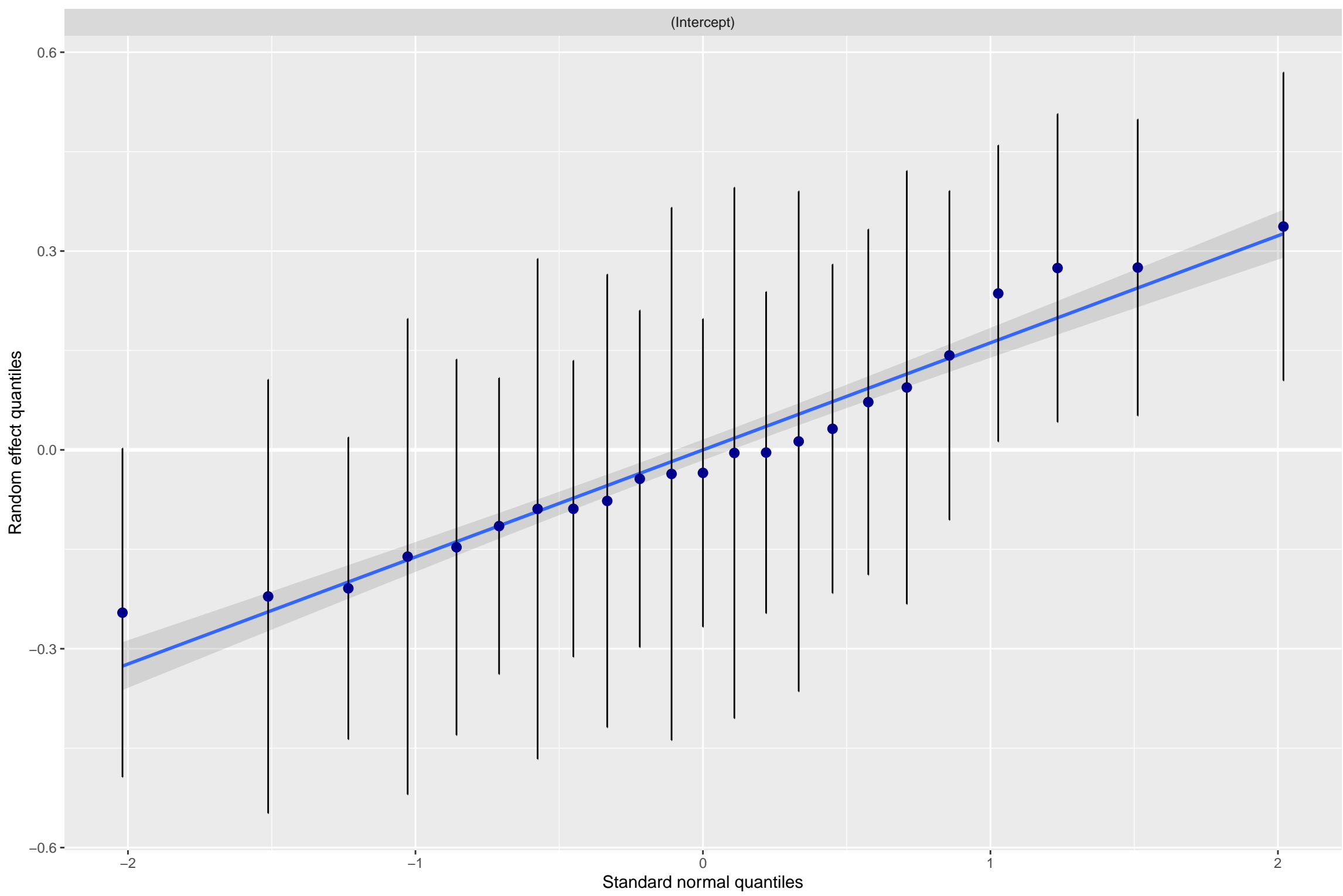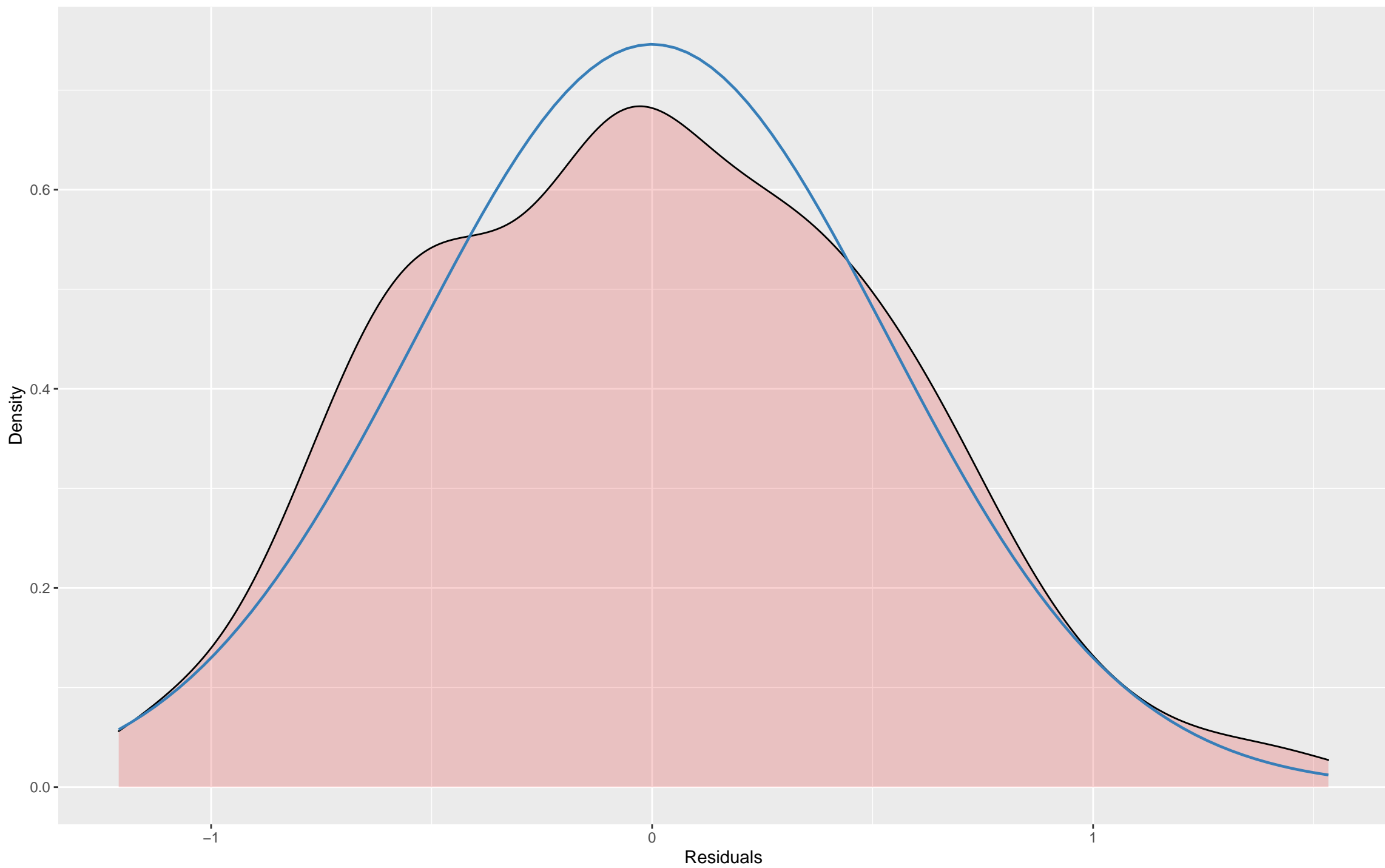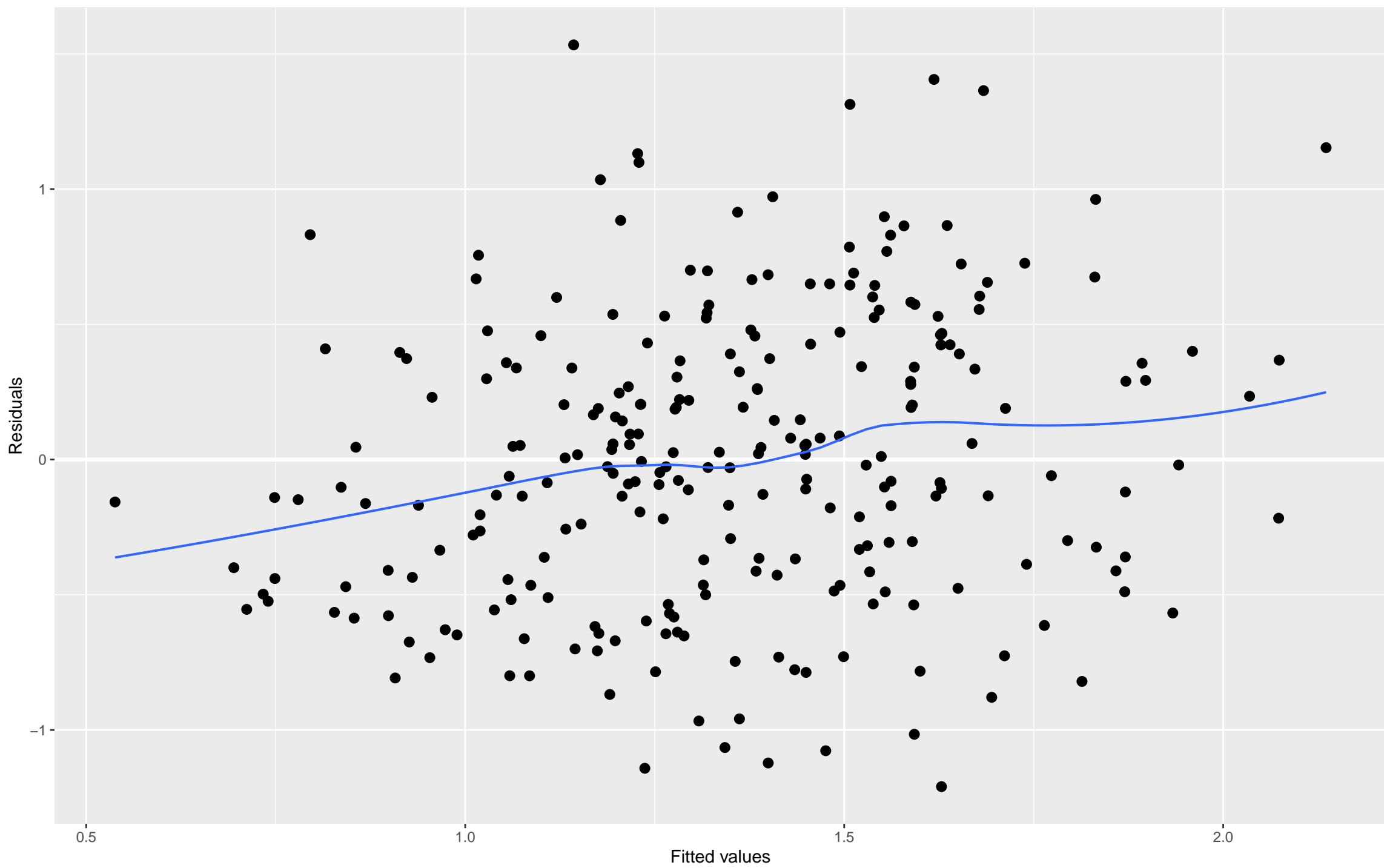
Non−normality of residuals
Distribution should look like normal curve

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

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

     AIC      BIC   logLik deviance df.resid
   483.6    504.9   -235.8    471.6      253

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.19251 -0.75747 -0.00531  0.65725  2.72597

Random effects:
 Groups    Name        Variance Std.Dev.
 TrapID    (Intercept) 0.04293  0.2072
 Date_YMD  (Intercept) 0.03400  0.1844
 Residual              0.31346  0.5599
Number of obs: 259, groups:  TrapID, 23; Date_YMD, 23

Fixed effects:
                          Estimate Std. Error       df t value Pr(>|t|)
(Intercept)                0.35473    0.26242 60.76337   1.352  0.18147
designZ                    0.28628    0.16503 66.88796   1.735  0.08740 .
log_days_since_last_haul   0.32566    0.08756 25.19514   3.719  0.00101 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr) desgnZ
designZ     -0.613
lg_dys_sn__ -0.810  0.120

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

     AIC      BIC   logLik deviance df.resid
   484.5    502.3   -237.3    474.5      254

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.15571 -0.75091 -0.03651  0.66536  2.73301

Random effects:
 Groups    Name        Variance Std.Dev.
 TrapID    (Intercept) 0.04780  0.2186
 Date_YMD  (Intercept) 0.03568  0.1889
 Residual              0.31487  0.5611
Number of obs: 259, groups:  TrapID, 23; Date_YMD, 23

Fixed effects:
                          Estimate Std. Error       df t value Pr(>|t|)
(Intercept)                0.62928    0.21087 28.02892   2.984  0.00584 **
log_days_since_last_haul   0.30868    0.08821 24.59583   3.499  0.00180 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr)
lg_dys_sn__ -0.938
```

Full model summary

```
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's
  method [lmerModLmerTest]
Formula: log_biomass - 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
   489.4    521.4   -235.7    471.4      250

Scaled residuals:
     Min       1Q   Median       3Q      Max
-2.17470 -0.76768 -0.01432  0.67428  2.71930

Random effects:
 Groups   Name        Variance Std.Dev.
 TrapID   (Intercept) 0.04203  0.2050
 Date_YMD (Intercept) 0.03322  0.1823
 Residual             0.31387  0.5602
Number of obs: 259, groups:  TrapID, 23; Date_YMD, 23

Fixed effects:
                           Estimate Std. Error         df t value Pr(>|t|)
(Intercept)                0.355708   0.343455 77.280063   1.036 0.303583
designZ                    0.347730   0.232458 62.072994   1.496 0.139751
log_days_since_last_haul   0.328373   0.087354 25.110776   3.759 0.000912 ***
location_exposureWindward  0.109282   0.313994 65.831277   0.348 0.728921
Exp_or_ContExperimental   -0.031063   0.120847 21.364733  -0.257 0.799603
depth_m                   -0.001437   0.005647 19.835844  -0.254 0.801763
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr) desgnZ lg____ lctn_W Ex__CE
designZ     -0.509
lg_dys_sn__ -0.648  0.137
lctn_xpsrWn -0.336  0.699  0.076
Exp_r_CntEx -0.282  0.047 -0.009  0.119
depth_m     -0.384 -0.335 -0.006 -0.345  0.111
```