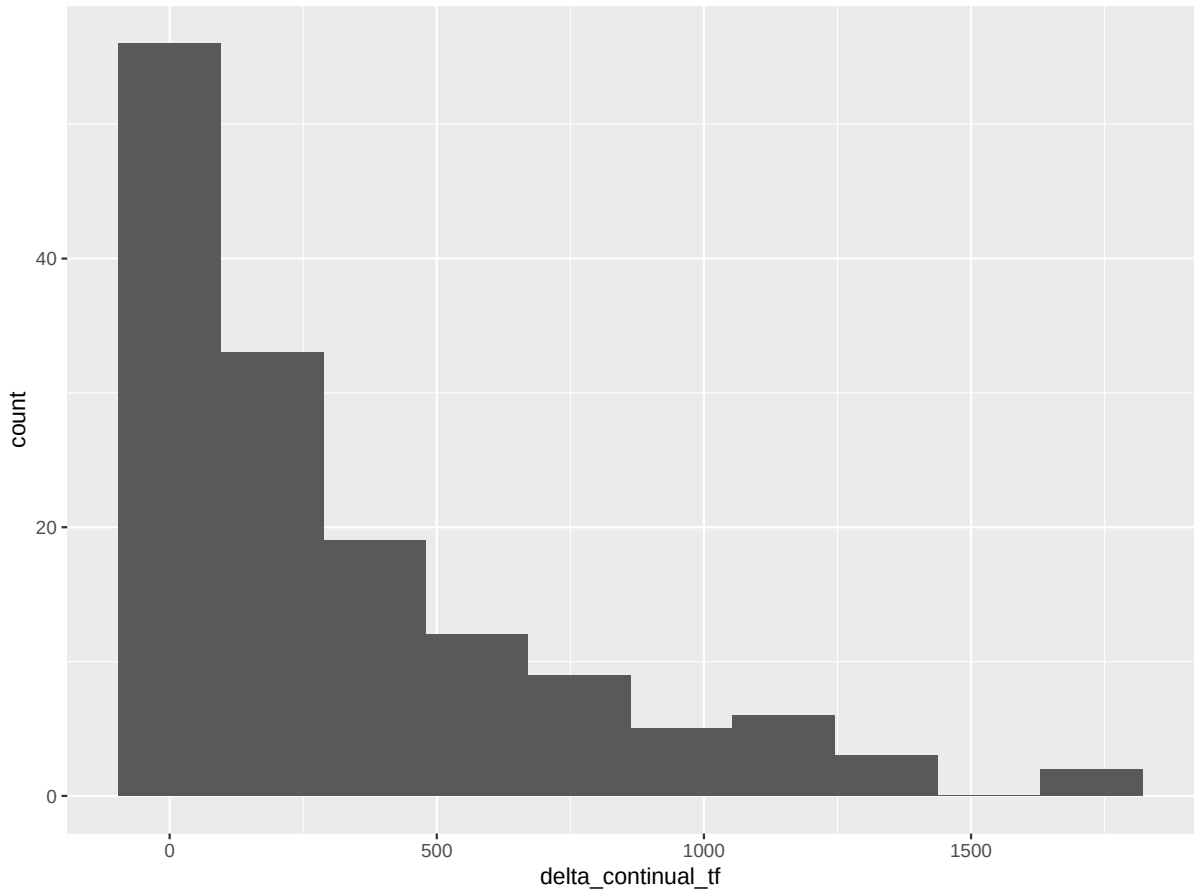
model residuals

Linear transformation (to use Gamma model):

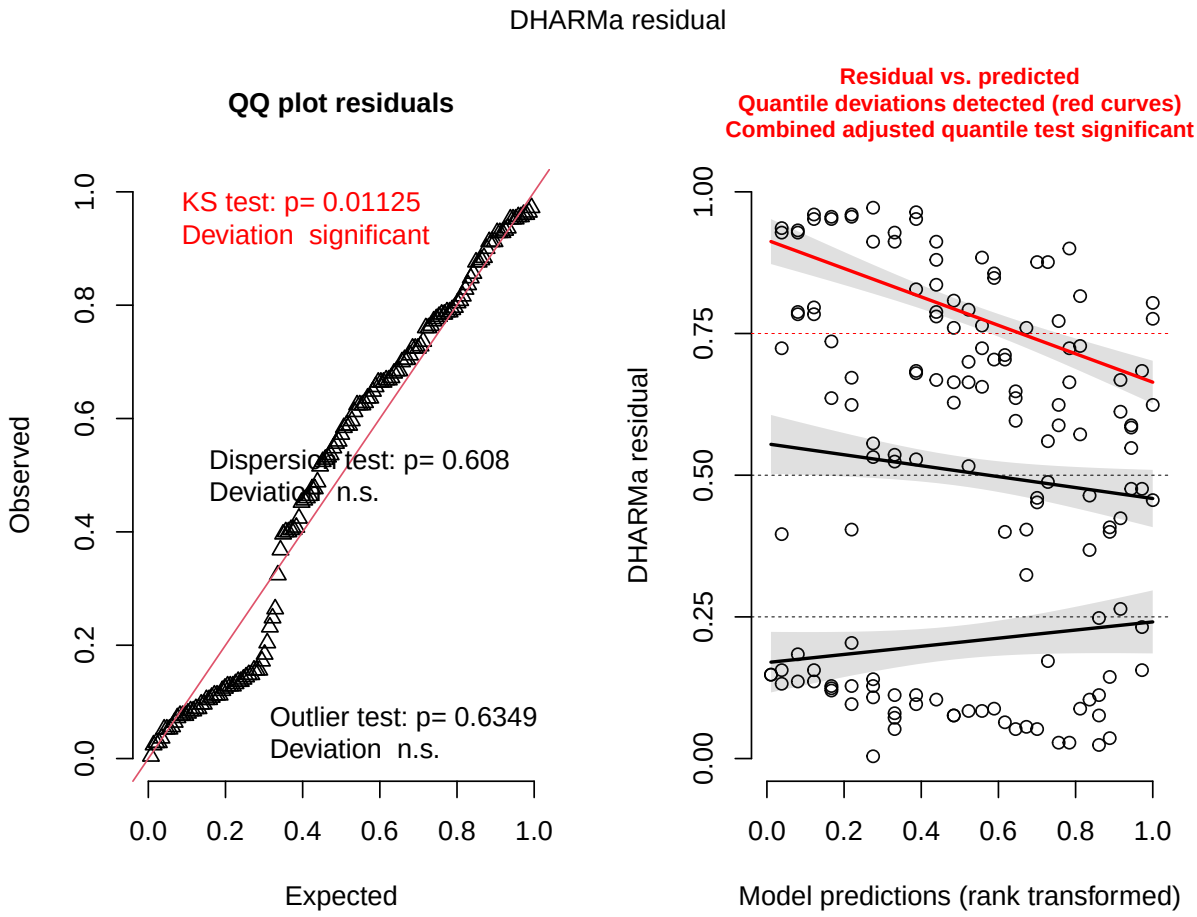
```
# linear transformation: multiply by -1, add 8
transform <- delta_continual %>%
  mutate(delta_continual_tf = delta_continual*-1 + 8) %>%
  filter(exp_dates == "during")

ggplot(transform, aes(x = delta_continual_tf)) +
  geom_histogram(bins = 10)
```



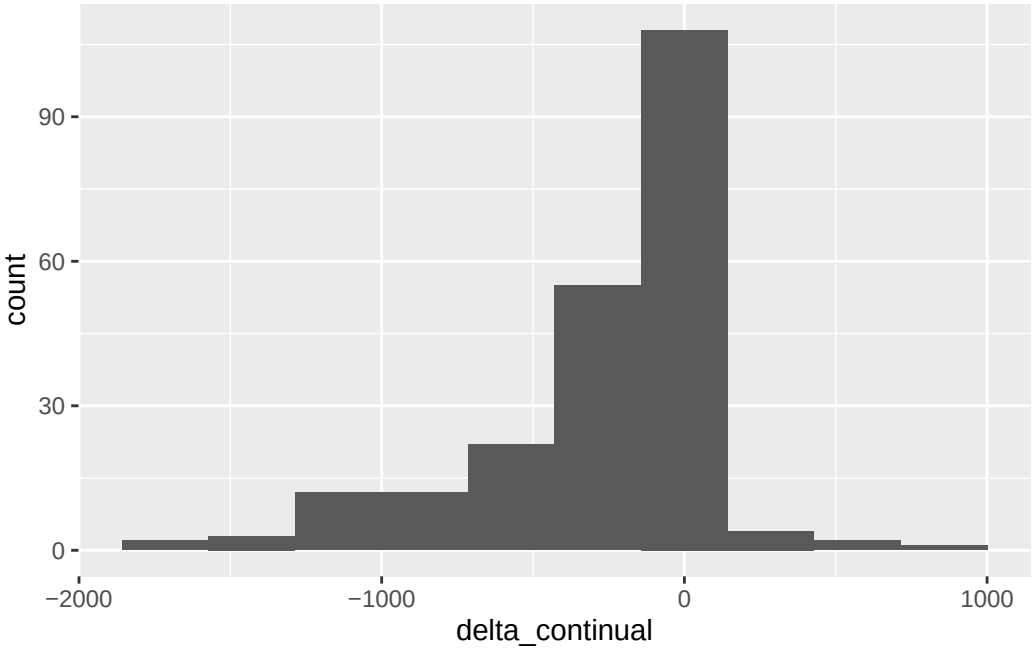

```
lm_kelp_during_tf <- glmmTMB::glmmTMB(
  delta_continual_tf ~ time_since_end + (1|site),
  data = transform,
  na.action = na.pass,
  family = Gamma(link = "log"))

plot(simulateResiduals(lm_kelp_during_tf))
```


DHARMa residual
QQ plot residuals
KS test: p= 0.01125
Deviation significant
Dispersion test: p= 0.608
Deviation n.s.
Outlier test: p= 0.6349
Deviation n.s.
Observed
Expected
0.0
0.2
0.4
0.6
0.8
1.0
Residual vs. predicted
Quantile deviations detected (red curves)
Combined adjusted quantile test significant
DHARMa residual
Model predictions (rank transformed)
0.00
0.25
0.50
0.75
1.00

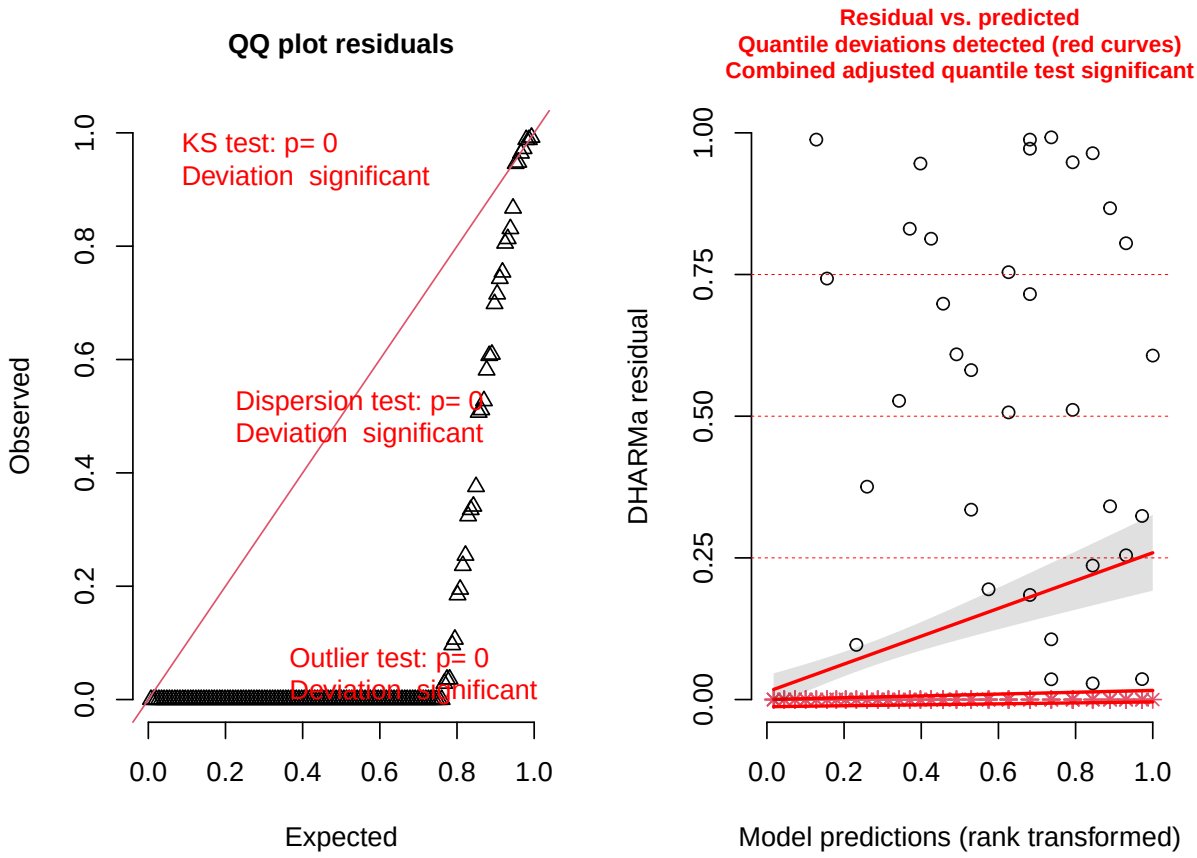
Tweedie model

variable histogram




```
lm_kelp_during_tweedie <- glmmTMB(
  delta_continual ~ time_since_end + (1|site),
  data = delta_continual %>% filter(exp_dates == "during"),
  family = tweedie(),
  na.action = na.pass)

plot(simulateResiduals(lm_kelp_during_tweedie))
```



Tweedie model with season as a fixed effect

```
lm_kelp_during_season_tweedie <- glmmTMB(
  delta_continual ~ time_since_end + quarter + time_since_end*quarter + (1|site),
  data = delta_continual %>% filter(exp_dates == "during"),
  family = tweedie(),
  na.action = na.pass)

plot(simulateResiduals(lm_kelp_during_season_tweedie))
```

DHARMa residual