Analysis_TurnAngle_SpatDisc

Anna Steel

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Turning Angles

Using dataset filtered and discretized by distance, we will calculate the turning angles (only for rel 1&2)

get data

```r
red.r21 <- readRDS("Maestros/RediscSpat_27m.RData")

 options(digit.secs = 6)
 red.r21$date = as.POSIXct(red.r21$date)
```

clean data

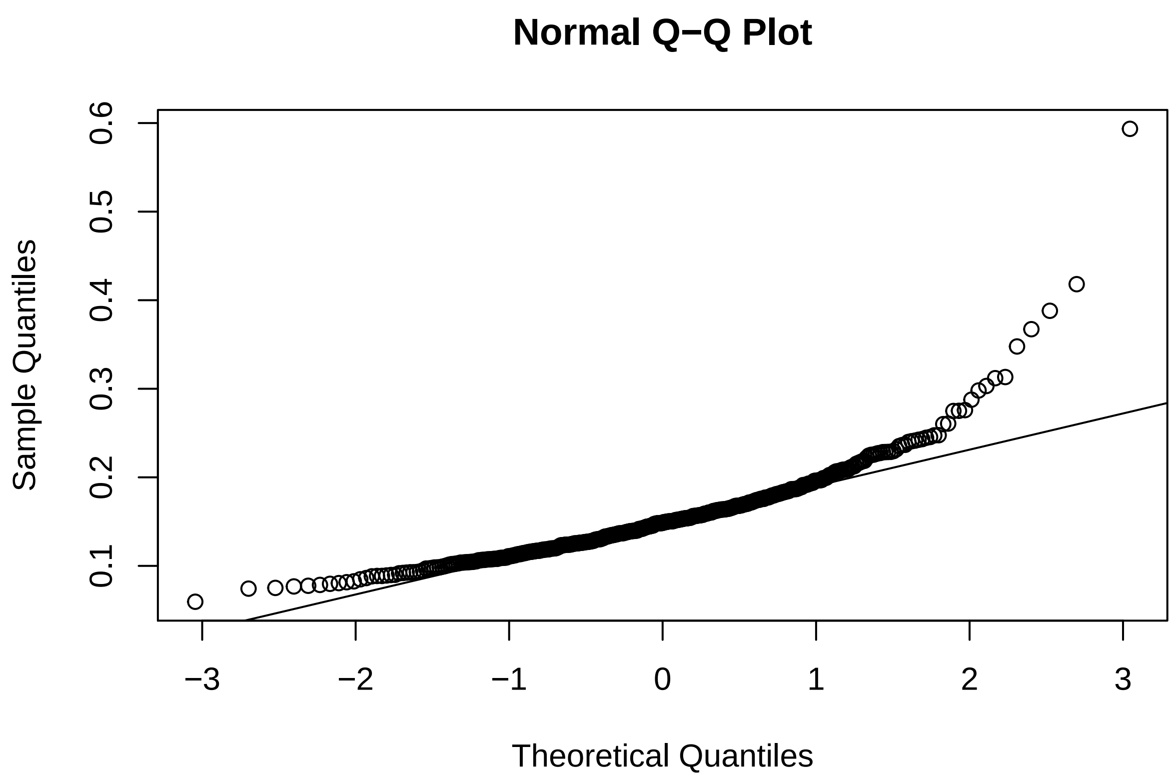
autocorrelation eval; isn't working yet

mean bearings and turning angles - unsure if this is correct! Check conversion to bearings wth mo's for-loop and function ('bearing()')

```r
## Calculate mean bearings and turn angles for each fish so we can use standard statistics on independen
   red.indivmn = as.data.frame(summarise(group_by(red.r21, id, RelEv, RelHr),
          mn.bearing=as.numeric(mean.circular(circular(compass.angle, units="degrees"))),  # use circul
          mn.turndeg=as.numeric(mean(abs(rel.deg), na.rm=T)),  # because these are +/- values from stra
          mn.stgft = as.numeric(mean(stage_ft))))


 ##  Look at normality and heterogeneity of variance
   # check for homogeneitry of var for subsequent ANOVA
     bartlett.test(red.indivmn$mn.turndeg~red.indivmn$RelEv)
```

```
##
##  Bartlett test of homogeneity of variances
##
## data:  red.indivmn$mn.turndeg by red.indivmn$RelEv
## Bartlett's K-squared = 36.935, df = 1, p-value = 1.221e-09
```

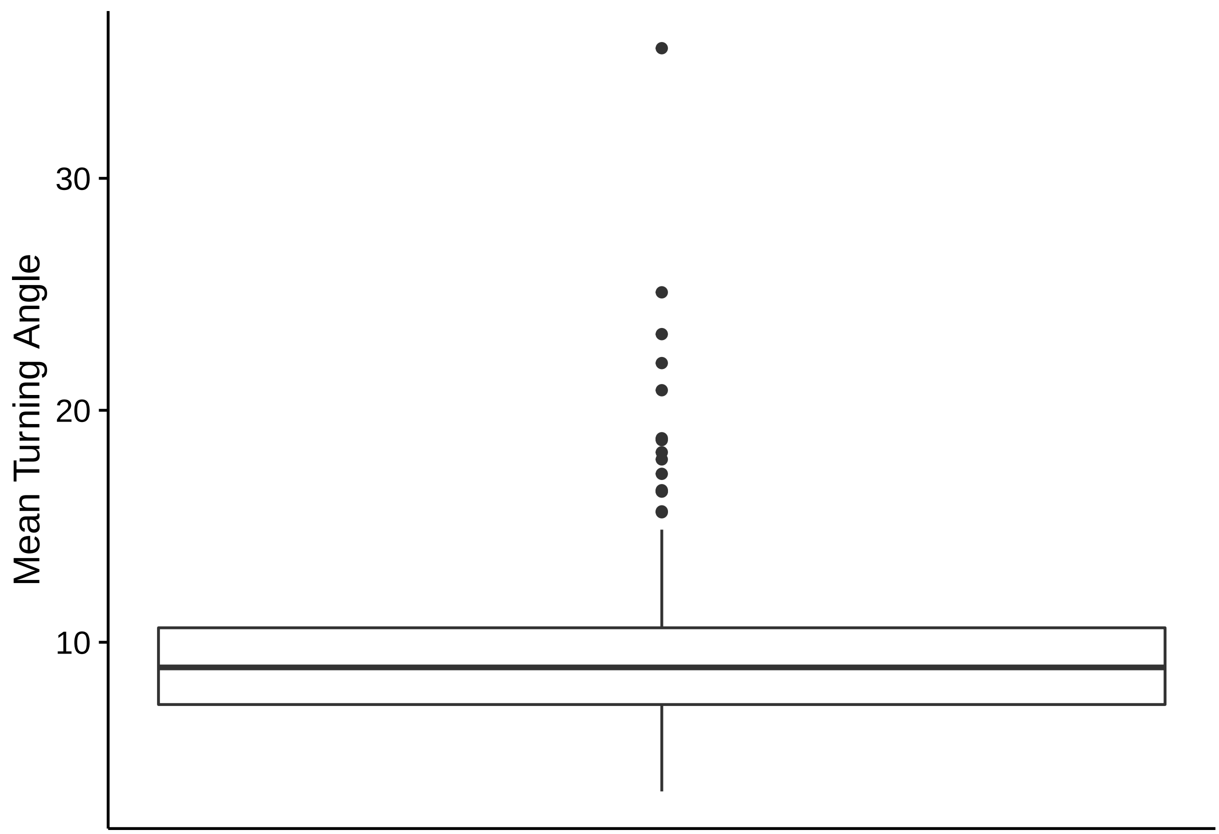
```r
       # Bartlett's K-squared = .38811, p=0.533

   # check for ~N
     #windows()
      qqnorm(red.indivmn$mn.turndeg/60)
      qqline(red.indivmn$mn.turndeg/60)
```



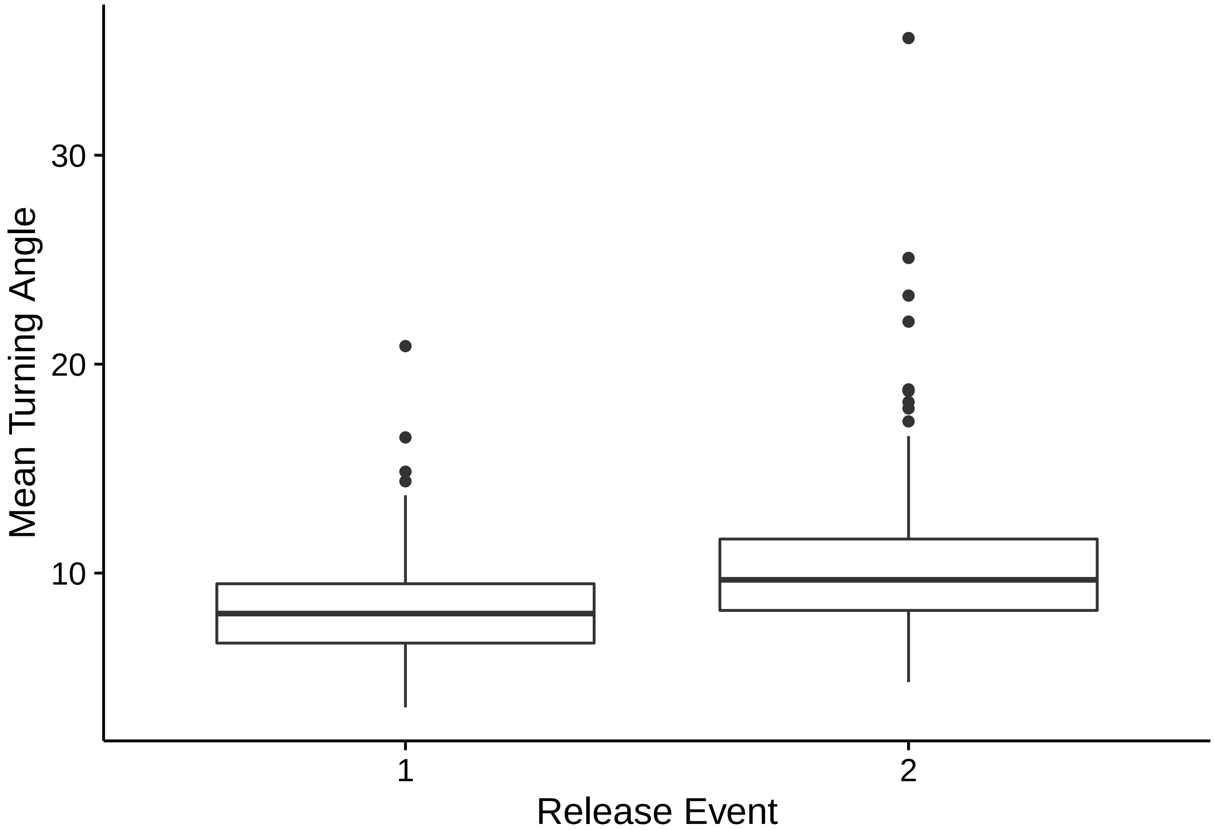

```
        # not perfect but not tooo bad


      # From Lix et al 1996, the Welch test is the least sensitive (in terms of type 1 error) to skew/k
      #  but this is still a parametric test that compares means (assumes means describe the distributi
      #   pt.Welch.aov = oneway.test(red.indivmn$mn.turndeg ~ factor(red.indivmn$RelEv))
      #      # F = 29.166, num df = 1, denom df = 427.53, p-value = 0.0000001104
      #   library(userfriendlyscience)
      #    posthocTGH(y=red.indivmn$mn.turndeg, x=factor(red.indivmn$RelEv)  )

      # t.test
   t.test(red.indivmn$mn.turndeg~red.indivmn$RelEv)
```

```
##
##  Welch Two Sample t-test
##
## data:  red.indivmn$mn.turndeg by red.indivmn$RelEv
## t = -6.9511, df = 367.2, p-value = 1.664e-11
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.597288 -1.451806
## sample estimates:
## mean in group 1 mean in group 2
##        8.337256       10.361803
```

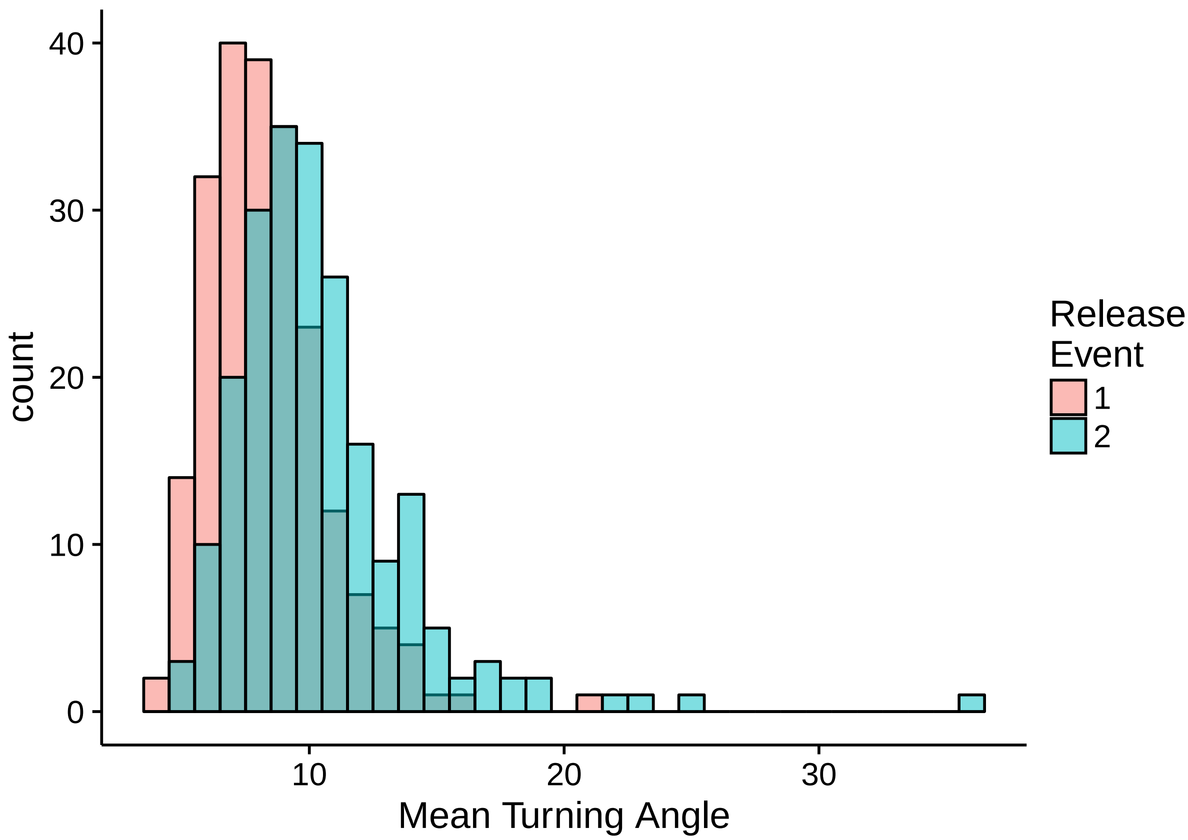
```r
# all fish together
ggplot(red.indivmn, aes(y=mn.turndeg, x=1)) +
  geom_boxplot() + ylab("Mean Turning Angle") +
   theme(axis.title.x=element_blank(),
      axis.text.x=element_blank(),
      axis.ticks.x=element_blank())
```



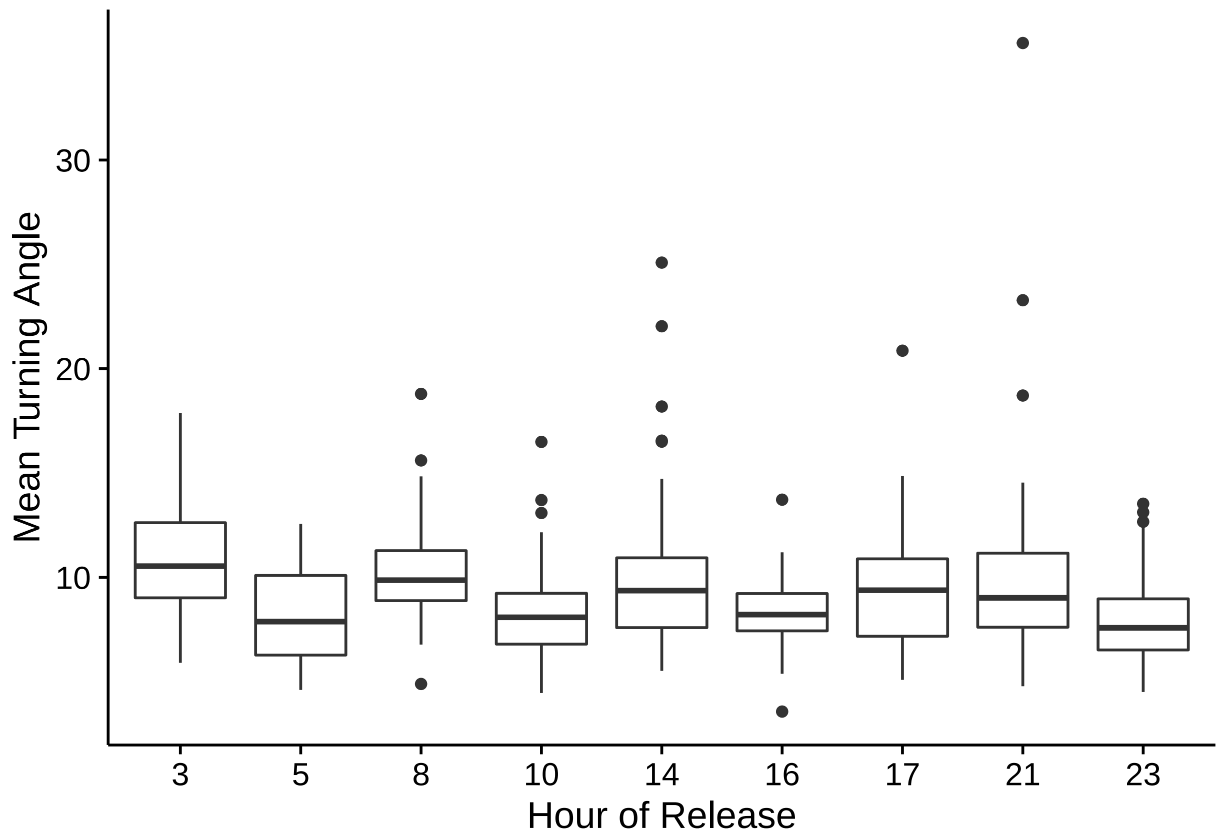

```r
#  by release event:
ggplot(data=red.indivmn, aes(y=mn.turndeg, x=factor(RelEv))) +
  geom_boxplot() + xlab("Release Event") + ylab("Mean Turning Angle")
```



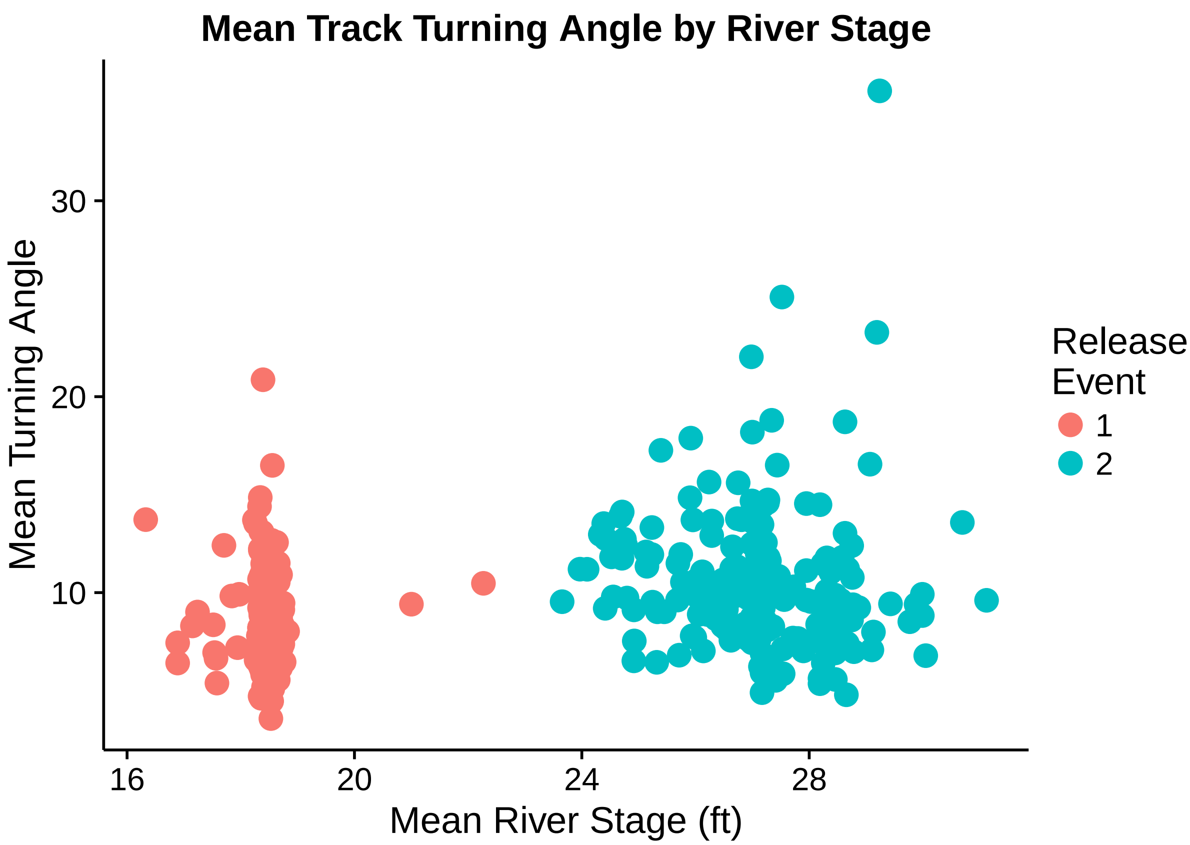

```
ggplot(data=red.indivmn, aes(x=mn.turndeg, group=factor(RelEv), fill=factor(RelEv))) +
  geom_histogram(alpha=0.5, position="identity", binwidth=1, color="black") +
  scale_fill_discrete(name="Release\nEvent") + xlab("Mean Turning Angle")
```




```r
# by release hour
 ggplot(data=red.indivmn, aes(x=factor(RelHr), y=mn.turndeg)) +
  geom_boxplot() + xlab("Hour of Release") + ylab("Mean Turning Angle")
```




```r
# by mean River stage
ggplot(red.indivmn, aes(y=mn.turndeg, x=mn.stgft, colour=factor(RelEv))) +
  geom_point(pch=16, cex=4) +
  xlab("Mean River Stage (ft)") + ylab("Mean Turning Angle") +
  ggtitle("Mean Track Turning Angle by River Stage") + scale_colour_discrete(name="Release\nEvent")
```


Mean Track Turning Angle by River Stage
Mean Turning Angle
30
20
10
16
20
24
28
Mean River Stage (ft)
Release Event
1
2