

Giant Seabass Tracking Project

Juliette Verstaen

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1. Load Packages and Data

```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.2.1 --
## v ggplot2 3.1.0     v purrr   0.2.5
## v tibble  2.0.1     v dplyr   0.7.8
## v tidyr   0.8.2     v stringr 1.3.1
## v readr   1.3.1     vforcats 0.3.0

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()   masks stats::lag()

library(sf)

## Linking to GEOS 3.6.1, GDAL 2.1.3, PROJ 4.9.3
library(sp)
library(ggpubr)

## Loading required package: magrittr
##
## Attaching package: 'magrittr'

## The following object is masked from 'package:purrr':
##
##     set_names

## The following object is masked from 'package:tidyr':
##
##     extract

library(readxl)
library(lubridate)
```

```

## 
## Attaching package: 'lubridate'
## The following object is masked from 'package:base':
## 
##     date
library(raster)

## 
## Attaching package: 'raster'
## The following object is masked from 'package:ggpubr':
## 
##     rotate
## The following object is masked from 'package:magrittr':
## 
##     extract
## The following object is masked from 'package:dplyr':
## 
##     select
## The following object is masked from 'package:tidyverse':
## 
##     extract
library(rworldmap)

## ### Welcome to rworldmap ###
## For a short introduction type : vignette('rworldmap')
library(ggplot2)
library(scales)

## 
## Attaching package: 'scales'
## The following object is masked from 'package:purrr':
## 
##     discard
## The following object is masked from 'package:readr':
## 
##     col_factor
library(here)

## here() starts at /GitHub/CINMS_Spring2019

## 
## Attaching package: 'here'
## The following object is masked from 'package:lubridate':
## 
##     here

```

Necessary data format and notes Date and Time: yyyy-mm-dd hh:mm:ss Station: SB-XX Lat/long: Almost every station has 2-3 different lat/longs associated with it (although they are very very close). I didn't mess with this since its close enough. Some points on graphs are a little wonky because of this

I only kept in 5 columns: time stamp, transmitter, station name, lat, and long. Adding all the info for the other columns is not necessary for my analyze thus far, but if important into the future would need to be included here, and then renamed appropriately in the code below.

Future fun stuff: Add temperature data to some of the graphs and maybe do some statistical testing to prove that the lower temps mean less likely to see seabass. Maybe find a threshold.

1. Data

```
detec1 <- read_excel(here::here("seabass/data", "detections_6_4_2019.xls"))
detec2 <- read_excel(here::here("seabass/data", "detections_4_3_2019.xls"))
###load in other data here as you get it and then add to the rbind code

detec <- rbind(detec1, detec2) %>%
  distinct()

#rename columns
names(detec) <- c("date_time", "transmitter", "station", "lat", "long")

#simplify transmitter name
detec <- detec %>%
  separate(transmitter, c("first", "second", "transmitter")) %>%
  dplyr::select(date_time, transmitter, station, long, lat) %>%
  filter( transmitter != "62806")

class(detec$date_time)

## [1] "POSIXct" "POSIXt"
#needs to be in "POSIXct" "POSIXt"

trans_counts <-detec %>%
  group_by(transmitter) %>%
  count(transmitter) %>%
  ungroup()
```

2. Abacus graphs

Separate by fish and station

```
# 1 fish
f1_29792 <- detec %>%
  filter(transmitter == "29792")

#2 fish
f2_9712 <- detec %>%
  filter(transmitter == "9712")

#3 fish
f3_9714 <- detec %>%
  filter(transmitter == "9714")

#4 fish
```

```
f4_9716 <- detec %>%
  filter(transmitter == "9716")

#5 fish
f5_9718 <- detec %>%
  filter(transmitter == "9718")
```

Plot abacus graphs

Fish 1: 29792

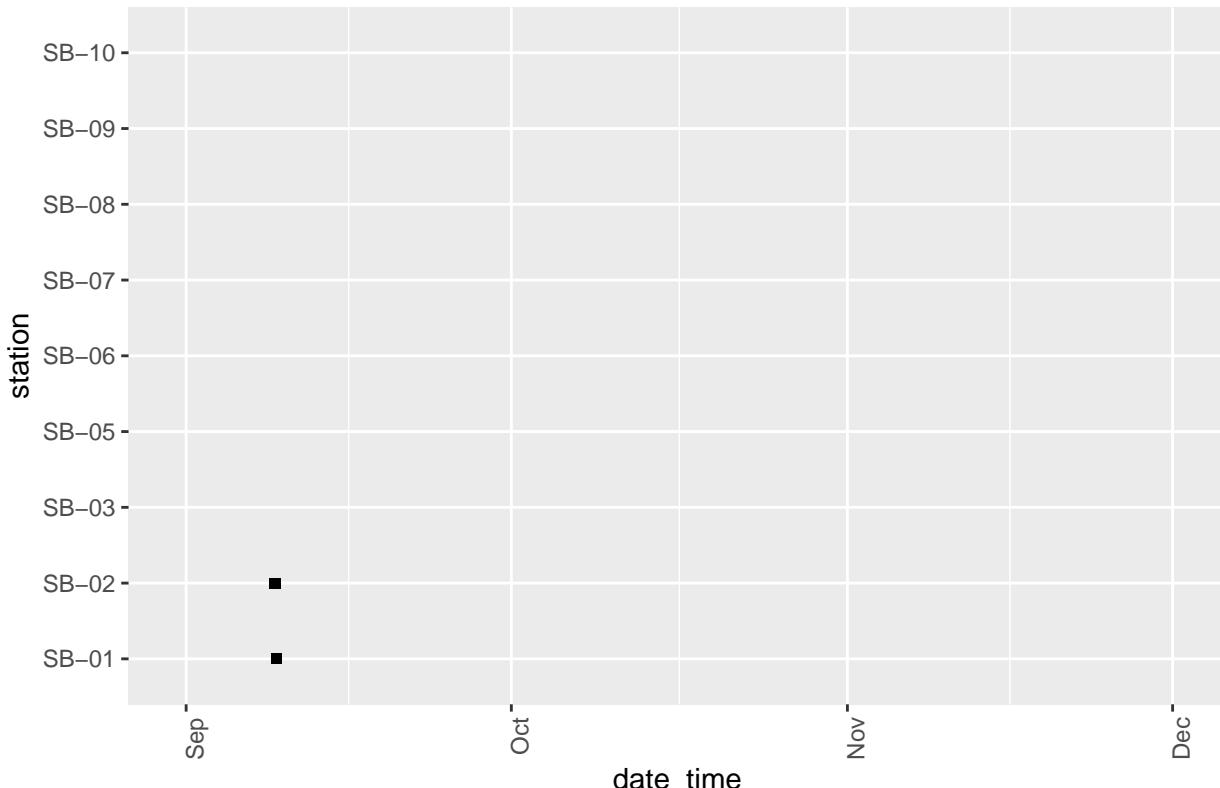
```
#1 fish
f1 <- ggplot(f1_29792, aes(x=date_time, y= station )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  ggtitle("Transmitter #29792") +
  scale_x_datetime() +
  xlim(c(as.POSIXct('2018-08-31 00:00:00', format = "%Y-%m-%d %H:%M:%S"),
        as.POSIXct('2018-12-01 00:00:00', format = "%Y-%m-%d %H:%M:%S")))

## Scale for 'x' is already present. Adding another scale for 'x', which
## will replace the existing scale.

f1

## Warning: Removed 334 rows containing missing values (geom_point).
```

Transmitter #29792

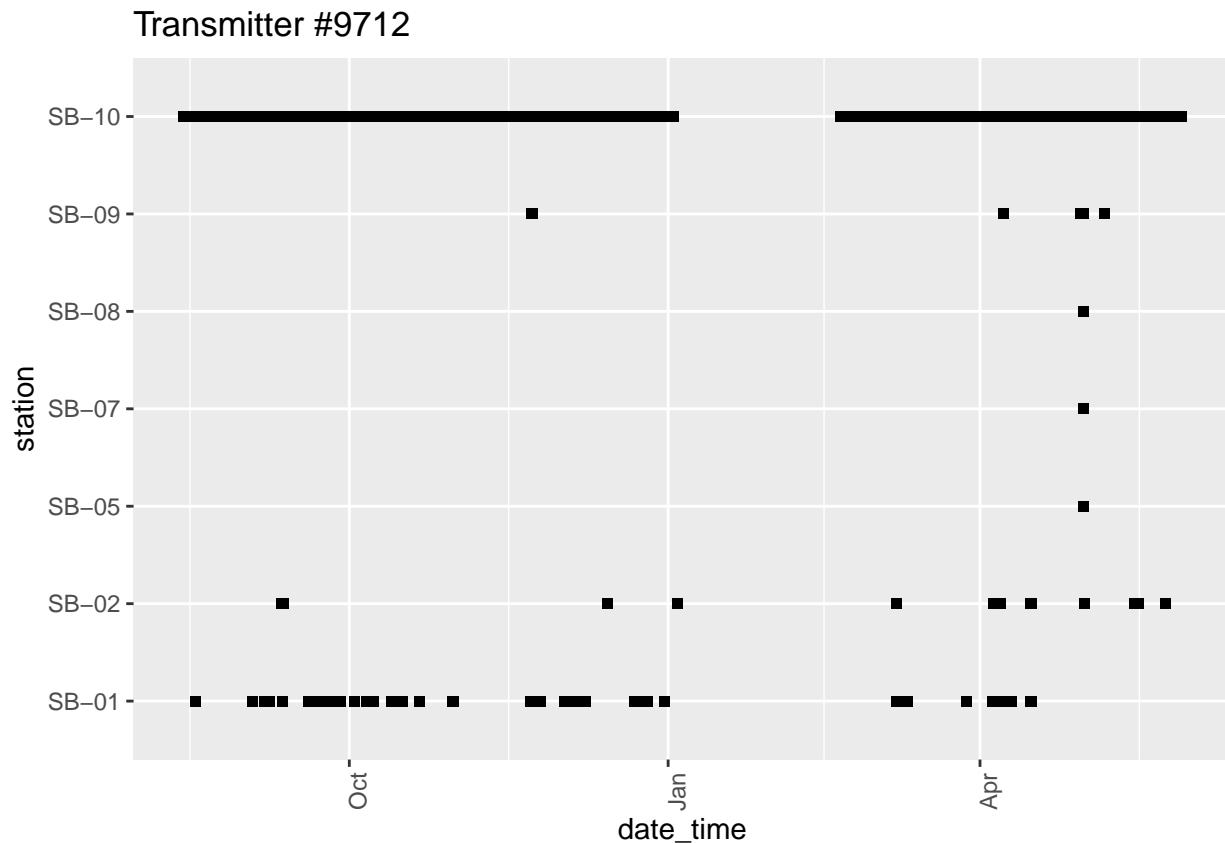


#first 9ish points are from the tracker being on the boat, so not including them in the graph

Fish 2: 9712

```
#2 fish
f2 <-ggplot(f2_9712, aes(x=date_time, y= station )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  scale_x_datetime() +
  ggtitle("Transmitter #9712")
```

f2

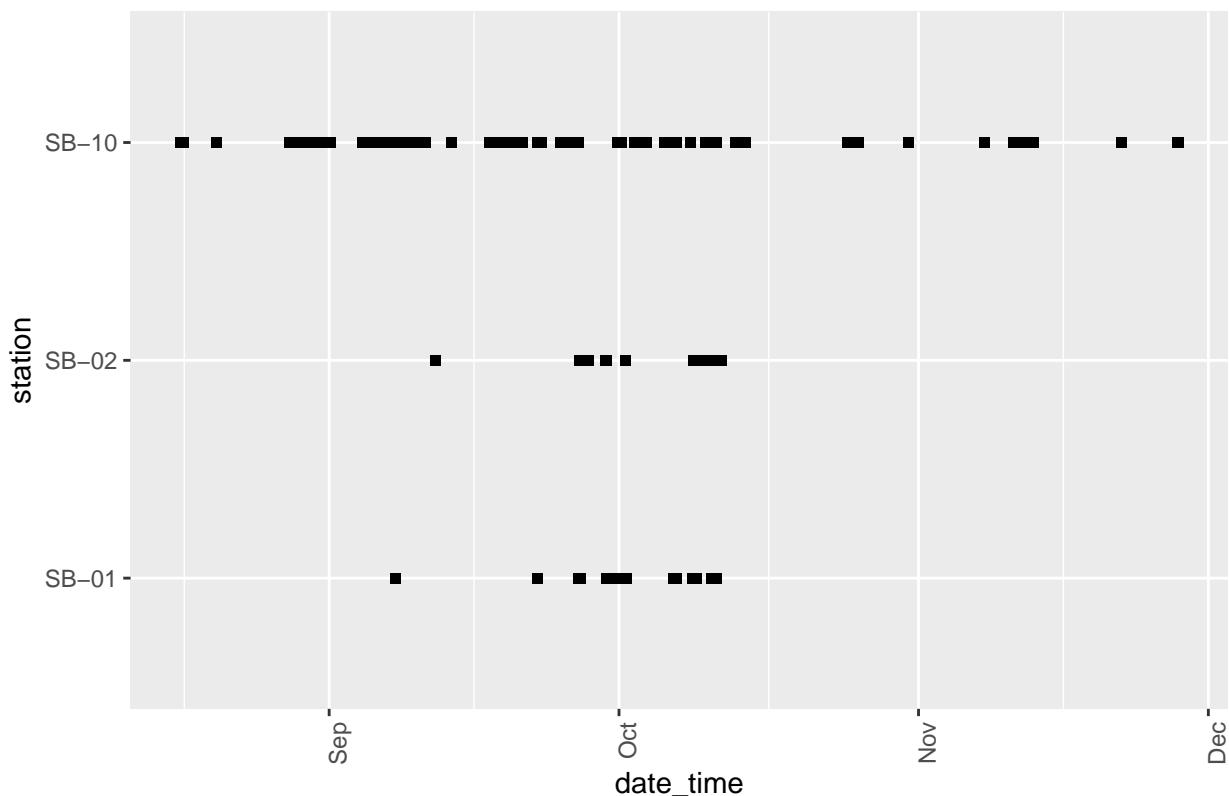


Fish 3: 9714

```
#3 fish
f3 <-ggplot(f3_9714, aes(x=date_time, y= station )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  scale_x_datetime() +
  ggtitle("Transmitter #9714")
```

f3

Transmitter #9714

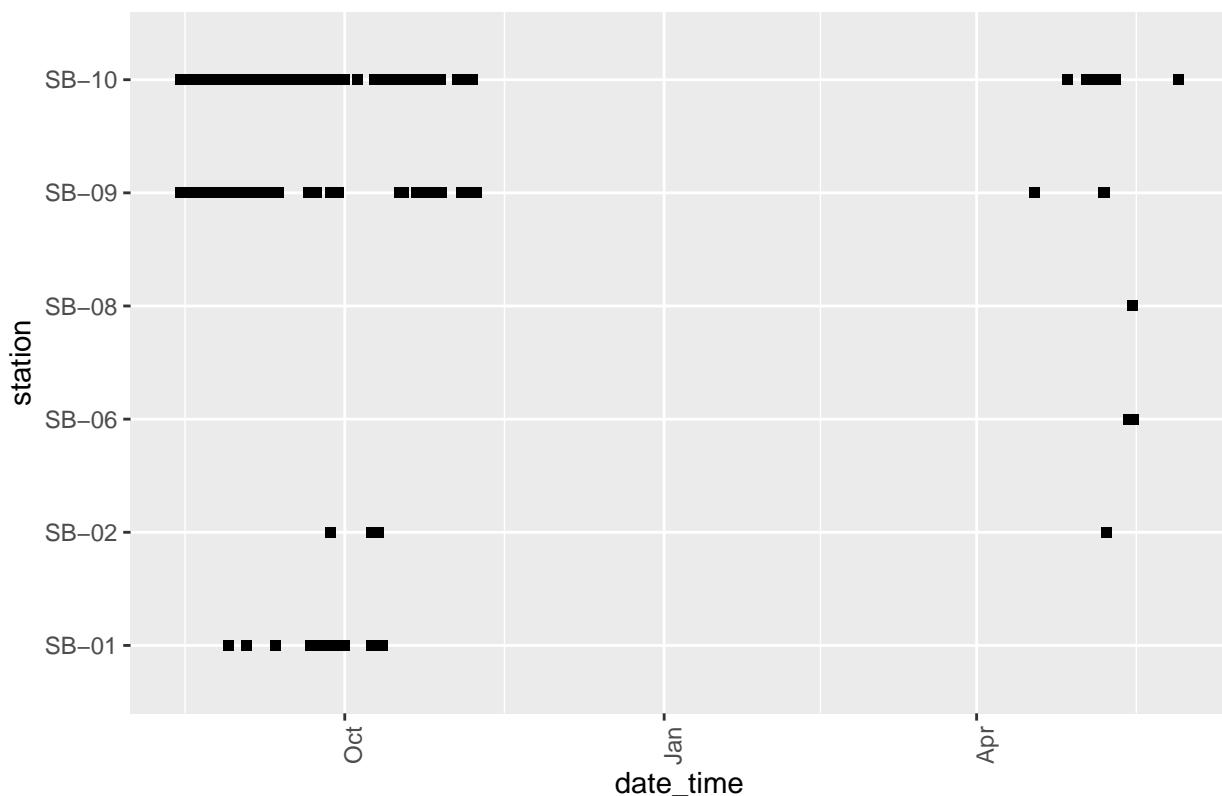


Fish 4: 9716

```
#4 fish
f4 <- ggplot(f4_9716, aes(x=date_time, y= station )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  scale_x_datetime() +
  ggtitle("Transmitter #9716")
```

f4

Transmitter #9716

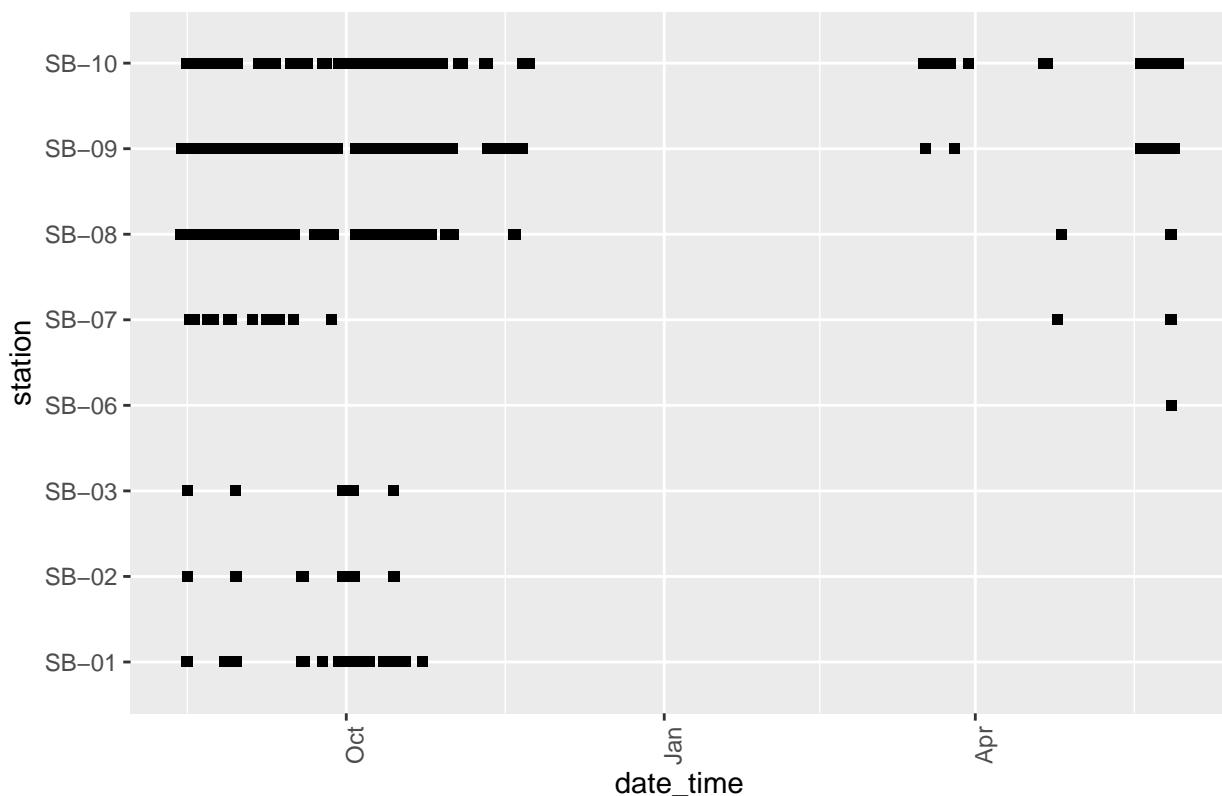


Fish 5: 9718

```
#5 fish
f5 <- ggplot(f5_9718, aes(x=date_time, y= station )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  scale_x_datetime() +
  ggtitle("Transmitter #9718")
```

f5

Transmitter #9718



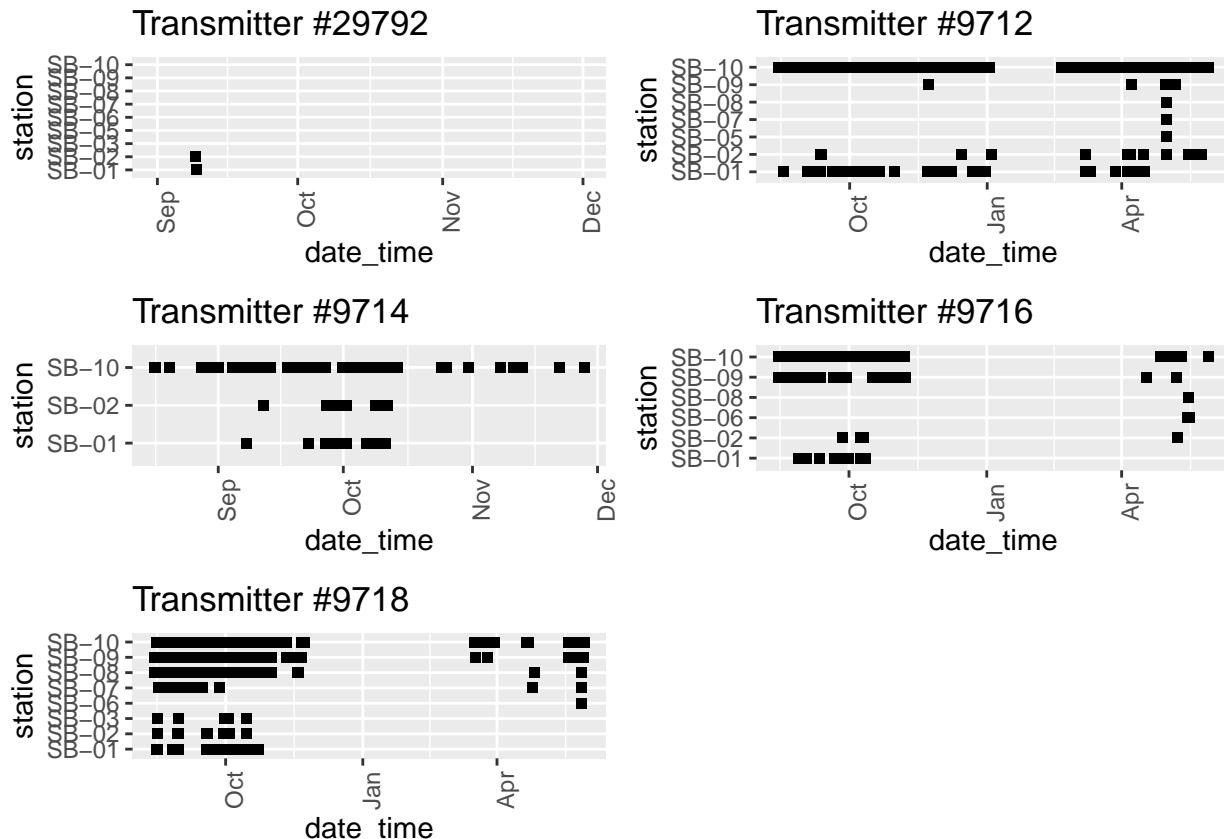
All abacus graphs separate

```
all_abacus <- ggarrange(f1, f2, f3,f4, f5 ,  
                        ncol = 2, nrow = 3)
```

```
## Warning: Removed 334 rows containing missing values (geom_point).
```

```
#f3 only has one obsrvation
```

```
all_abacus
```

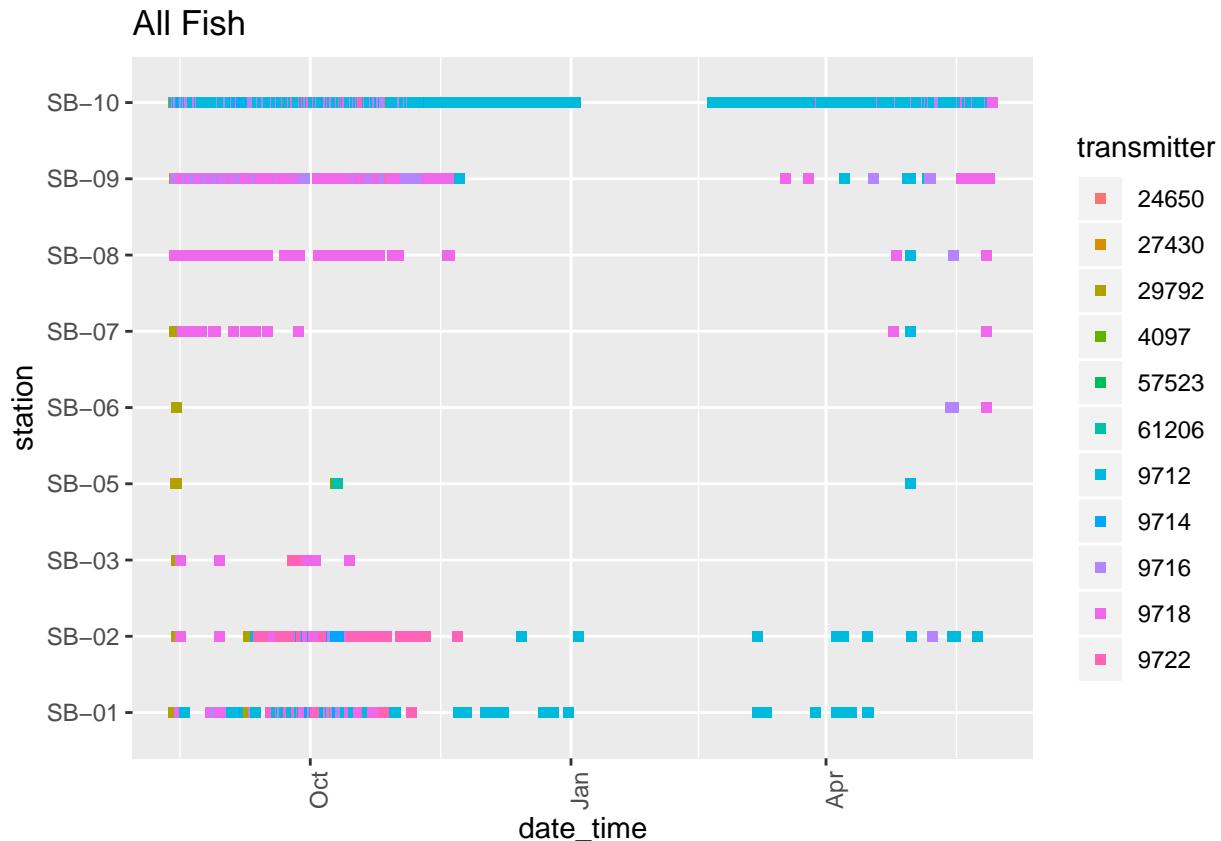


```
#ggsave("all_abacus.jpg", width=5, height=7, dpi=300)
```

All fish on one abacus graph

```
all <- ggplot(detec) +
  geom_point(shape=15, aes(x=date_time, y= station, color= transmitter )) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  scale_x_datetime() +
  ggtitle("All Fish")
```

```
all
```



Note: To zoom in on only one part of a graph when x-axis is date: xlim(c(as.POSIXct('2018-08-31 00:00:00', format = "%Y-%m-%d %H:%M:%S"), as.POSIXct('2018-12-01 00:00:00', format = "%Y-%m-%d %H:%M:%S")))

3. Detection frequencies

A. Histograms: Frequency detections/hour over time

the grouping I did should have worked but double check R logic behind it

Fish 1: 29792

```
##data wrangle

f1_hourly <- detec %>%
  filter(transmitter == "29792") %>%
  mutate(freq= 1) %>%
  separate(date_time, c("date", "time"), sep= " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  group_by(date, hour, transmitter, station, lat, long) %>%
  summarise(freq=sum(freq)) %>%
  mutate(minute= "00") %>%
  mutate(second= "00") %>%
  unite(time_1, minute, second, sep= ":")%>%
  unite(time, hour, time_1, sep = ":") %>%
  unite(date_time, date, time, sep = " ")

#changing classes for time and coordinates
```

```

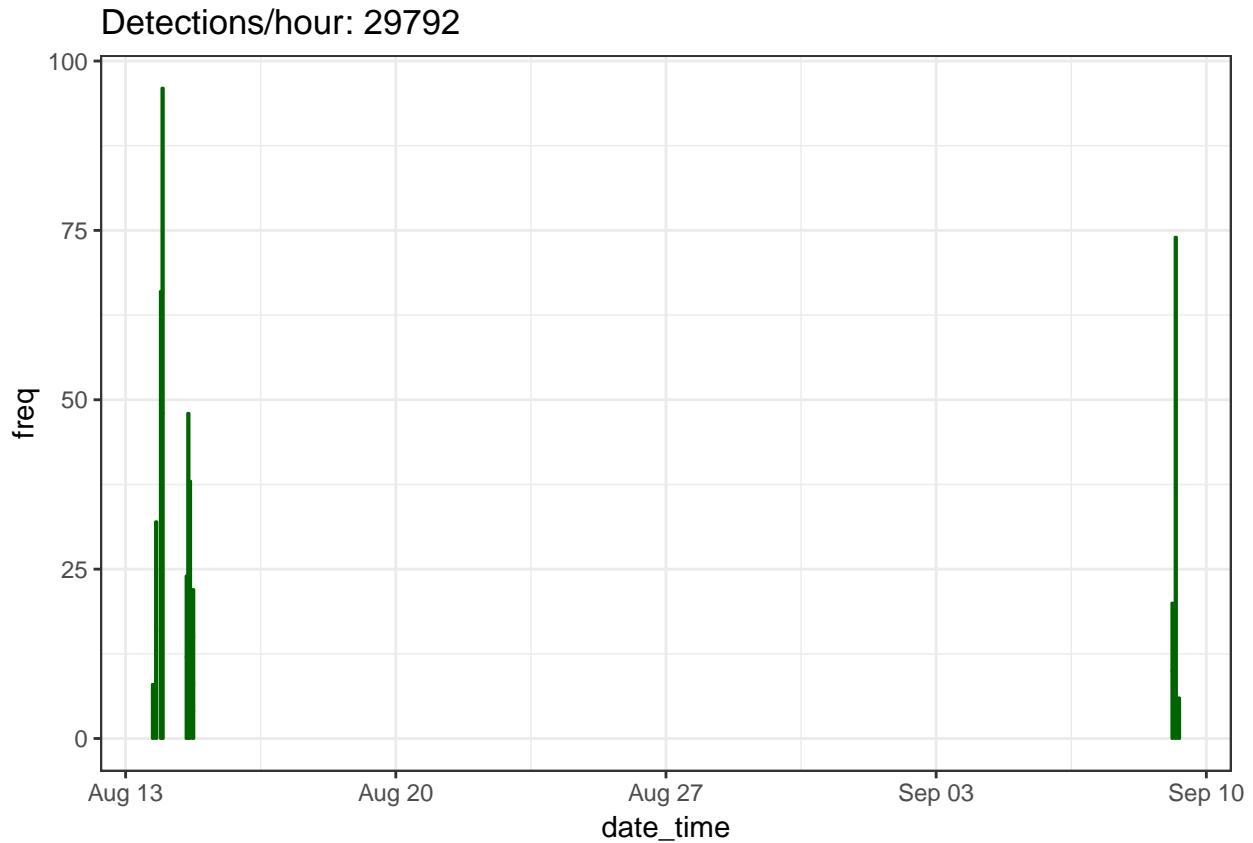
f1_hourly$date_time <- as.POSIXct(f1_hourly$date_time, format="%Y-%m-%d %H:%M")
data(f1_hourly, package = "sp")

## Warning in data(f1_hourly, package = "sp"): data set 'f1_hourly' not found
f1_hourly_sf <- st_as_sf(f1_hourly, coords= c("long","lat"), crs=4326)
f1_hourly_sp <- as(f1_hourly_sf, "Spatial")

f1_hist <- ggplot(data=f1_hourly, aes(x=date_time, y=freq)) +
  geom_bar(stat="identity", color="darkgreen")+
  theme_bw()+
  ggtitle("Detections/hour: 29792")
#   xlim(c(as.POSIXct('2018-08-31 00:00:00', format = "%Y-%m-%d %H:%M:%S"),
#         as.POSIXct('2018-12-01 00:00:00', format = "%Y-%m-%d %H:%M:%S")))

f1_hist

```



Fish 2: 9712

```

##data wrangle

f2_hourly <- detec %>%
  filter(transmitter == "9712")%>%
  mutate(freq= 1) %>%
  separate(date_time, c("date", "time"), sep= " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  group_by(date, hour, transmitter, station, lat, long) %>%
  summarise(freq=sum(freq)) %>%

```

```

  mutate(minute= "00") %>%
  mutate(second= "00") %>%
  unite(time_1, minute, second, sep= ":")%>%
  unite(time, hour, time_1, sep = ":") %>%
  unite(date_time, date, time, sep = " ")

#changing classes for time and coordinates
f2_hourly$date_time <- as.POSIXct(f2_hourly$date_time, format="%Y-%m-%d %H:%M")
data(f2_hourly, package = "sp")

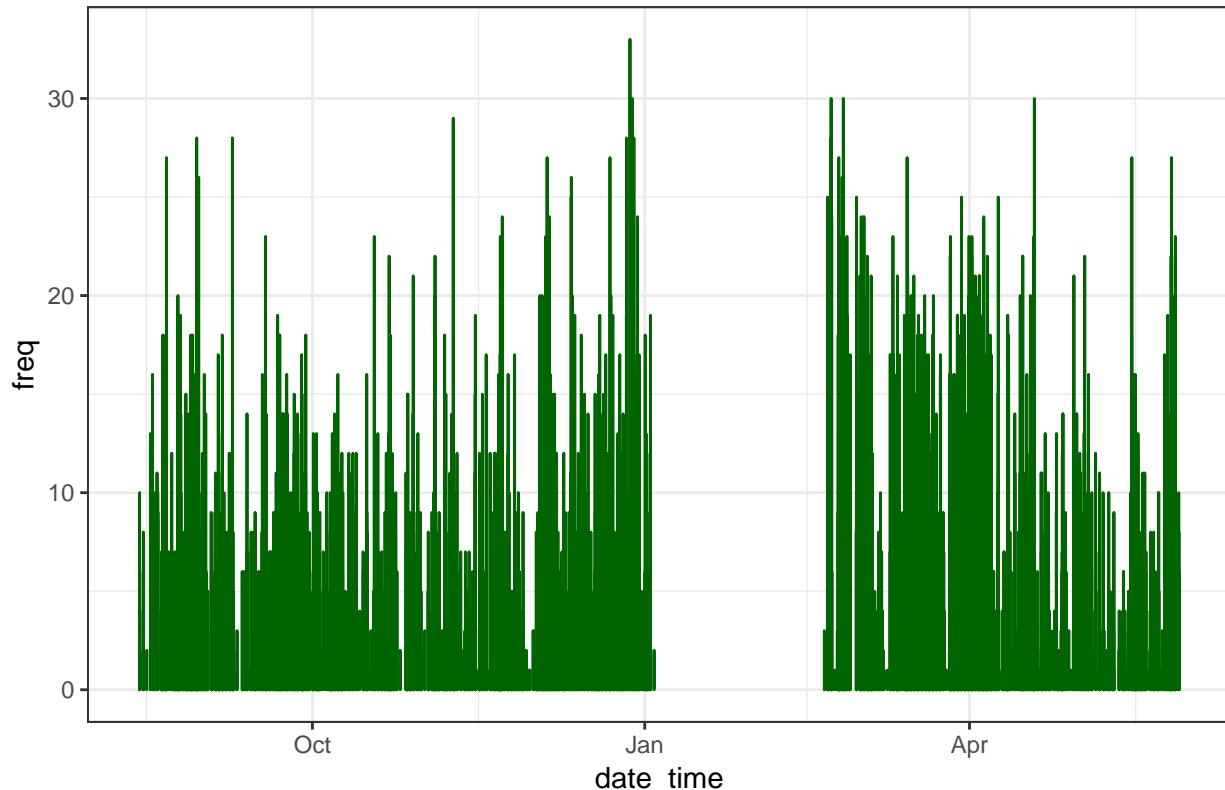
## Warning in data(f2_hourly, package = "sp"): data set 'f2_hourly' not found
f2_hourly_sf <- st_as_sf(f2_hourly, coords= c("long","lat"), crs=4326)
f2_hourly_sp <- as(f2_hourly_sf, "Spatial")

f2_hist <- ggplot(data=f2_hourly, aes(x=date_time, y=freq)) +
  geom_bar(stat="identity", color="darkgreen")+
  theme_bw()+
  ggtitle("Detections/hour: 9712")
f2_hist

## Warning: Removed 1 rows containing missing values (position_stack).

```

Detections/hour: 9712



Fish 3: 9714

```

##data wrangle

f3_hourly <- detec %>%

```

```

filter(transmitter == "9714") %>%
mutate(freq= 1) %>%
separate(date_time, c("date", "time"), sep= " ") %>%
separate(time, c("hour", "minute", "second"), sep = ":") %>%
group_by(date, hour, transmitter, station, lat, long) %>%
summarise(freq=sum(freq)) %>%
mutate(minute= "00") %>%
mutate(second= "00") %>%
unite(time_1, minute, second, sep= ":")%>%
unite(time, hour, time_1, sep = ":") %>%
unite(date_time, date, time, sep = " ")

#changing classes for time and coordinates
f3_hourly$date_time <- as.POSIXct(f3_hourly$date_time, format="%Y-%m-%d %H:%M")
data(f3_hourly, package = "sp")

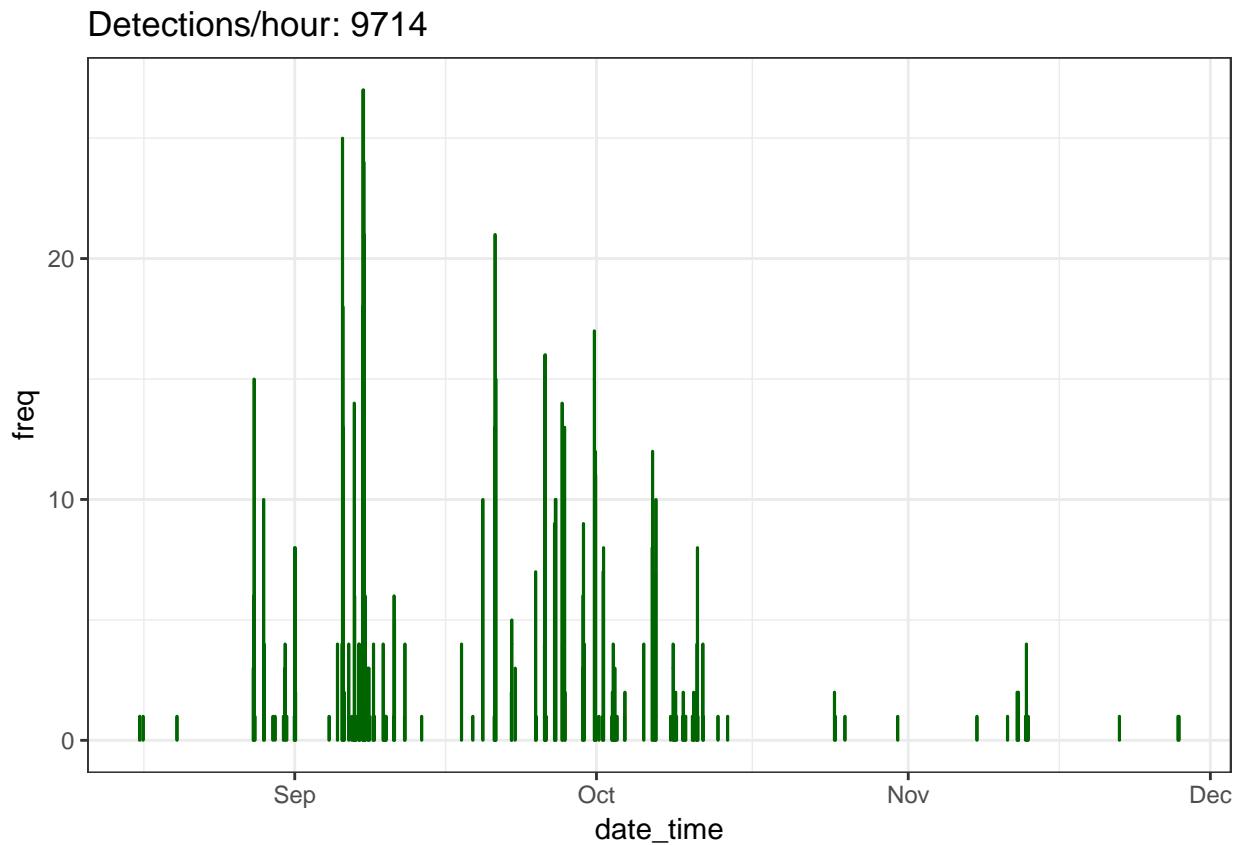
```

```

## Warning in data(f3_hourly, package = "sp"): data set 'f3_hourly' not found
f3_hourly_sf <- st_as_sf(f3_hourly, coords= c("long","lat"), crs=4326)
f3_hourly_sp <- as(f3_hourly_sf, "Spatial")

f3_hist <- ggplot(data=f3_hourly, aes(x=date_time, y=freq)) +
  geom_bar(stat="identity", color="darkgreen")+
  theme_bw()+
  ggtitle("Detections/hour: 9714")
f3_hist

```



```

##data wrangle

f4_hourly <- detec %>%
  filter(transmitter == "9716")%>%
  mutate(freq= 1) %>%
  separate(date_time, c("date", "time"), sep= " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  group_by(date, hour, transmitter, station, lat, long) %>%
  summarise(freq=sum(freq)) %>%
  mutate(minute= "00") %>%
  mutate(second= "00") %>%
  unite(time_1, minute, second, sep= ":")%>%
  unite(time, hour, time_1, sep = ":") %>%
  unite(date_time, date, time, sep = " ")

#changing classes for time and coordinates
f4_hourly$date_time <- as.POSIXct(f4_hourly$date_time, format="%Y-%m-%d %H:%M")
data(f4_hourly, package = "sp")

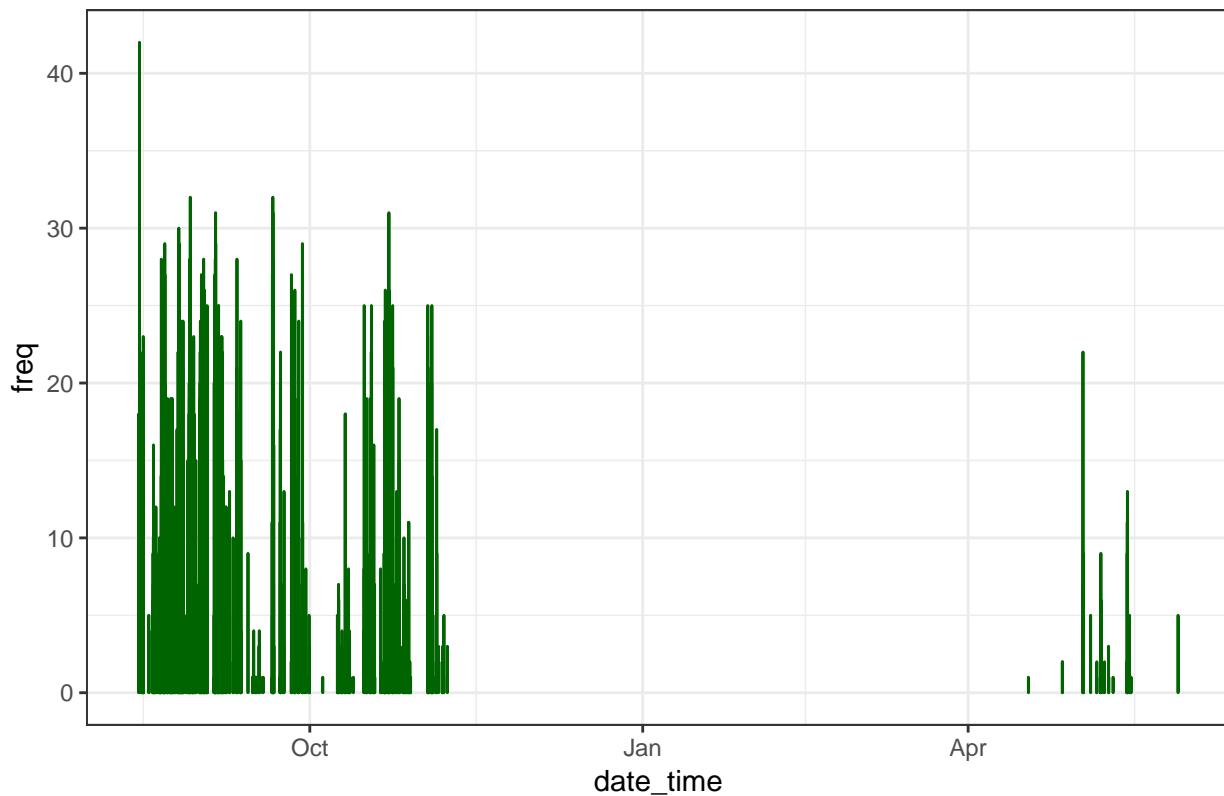
## Warning in data(f4_hourly, package = "sp"): data set 'f4_hourly' not found

f4_hourly_sf <- st_as_sf(f4_hourly, coords= c("long","lat"), crs=4326)
f4_hourly_sp <- as(f4_hourly_sf, "Spatial")

f4_hist <- ggplot(data=f4_hourly, aes(x=date_time, y=freq)) +
  geom_bar(stat="identity", color="darkgreen")+
  theme_bw()+
  ggtitle("Detections/hour: 9716")
f4_hist

```

Detections/hour: 9716



Fish 5: 9718

```
##data wrangle

f5_hourly <- detec %>%
  filter(transmitter == "9718") %>%
  mutate(freq= 1) %>%
  separate(date_time, c("date", "time"), sep= " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  group_by(date, hour, transmitter, station, lat, long) %>%
  summarise(freq=sum(freq)) %>%
  mutate(minute= "00") %>%
  mutate(second= "00") %>%
  unite(time_1, minute, second, sep= ";")%>%
  unite(time, hour, time_1, sep = ":") %>%
  unite(date_time, date, time, sep = " ")

#changing classes for time and coordinates
f5_hourly$date_time <- as.POSIXct(f5_hourly$date_time, format="%Y-%m-%d %H:%M")
data(f5_hourly, package = "sp")

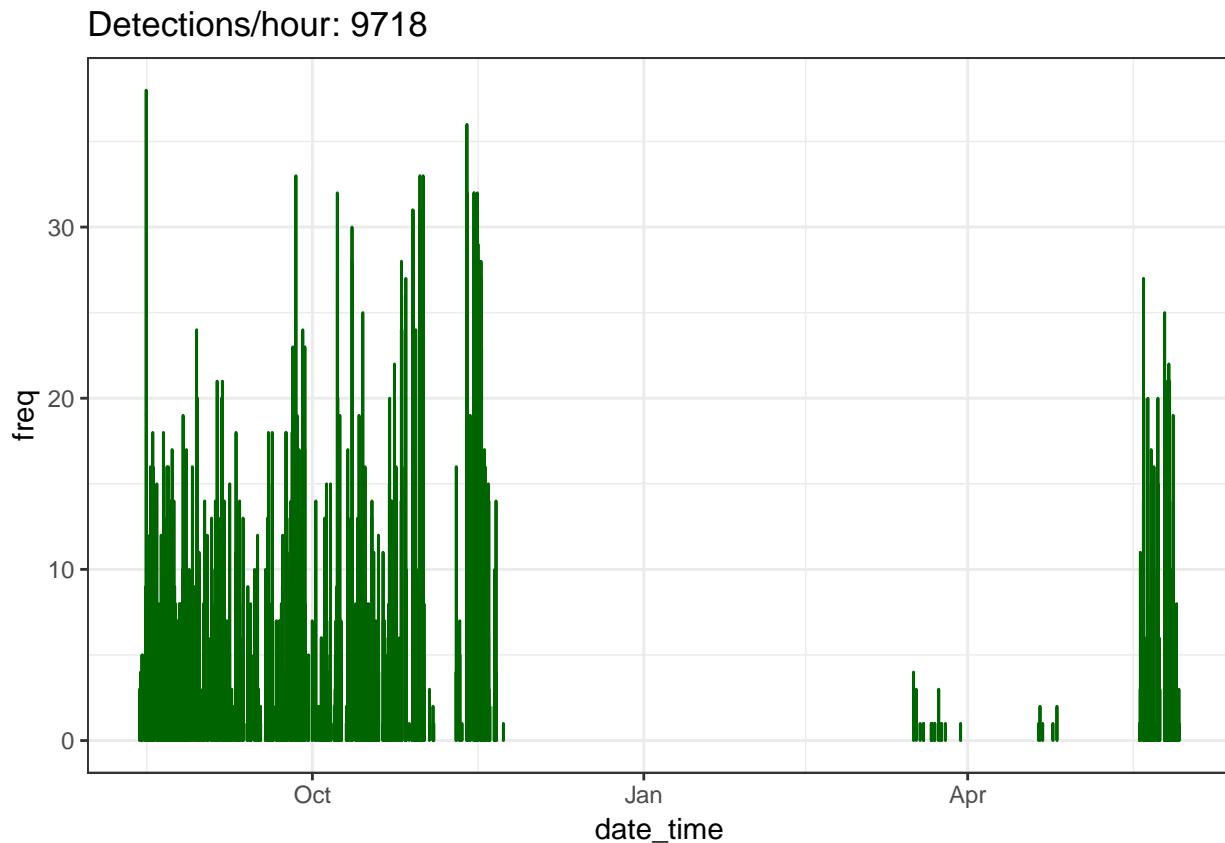
## Warning in data(f5_hourly, package = "sp"): data set 'f5_hourly' not found
f5_hourly_sf <- st_as_sf(f5_hourly, coords= c("long","lat"), crs=4326)
f5_hourly_sp <- as(f5_hourly_sf, "Spatial")

f5_hist <- ggplot(data=f5_hourly, aes(x=date_time, y=freq)) +
  geom_bar(stat="identity", color="darkgreen")+
```

```

theme_bw()+
ggtitle("Detections/hour: 9718")
f5_hist

```



All Frequency/Hour Histograms

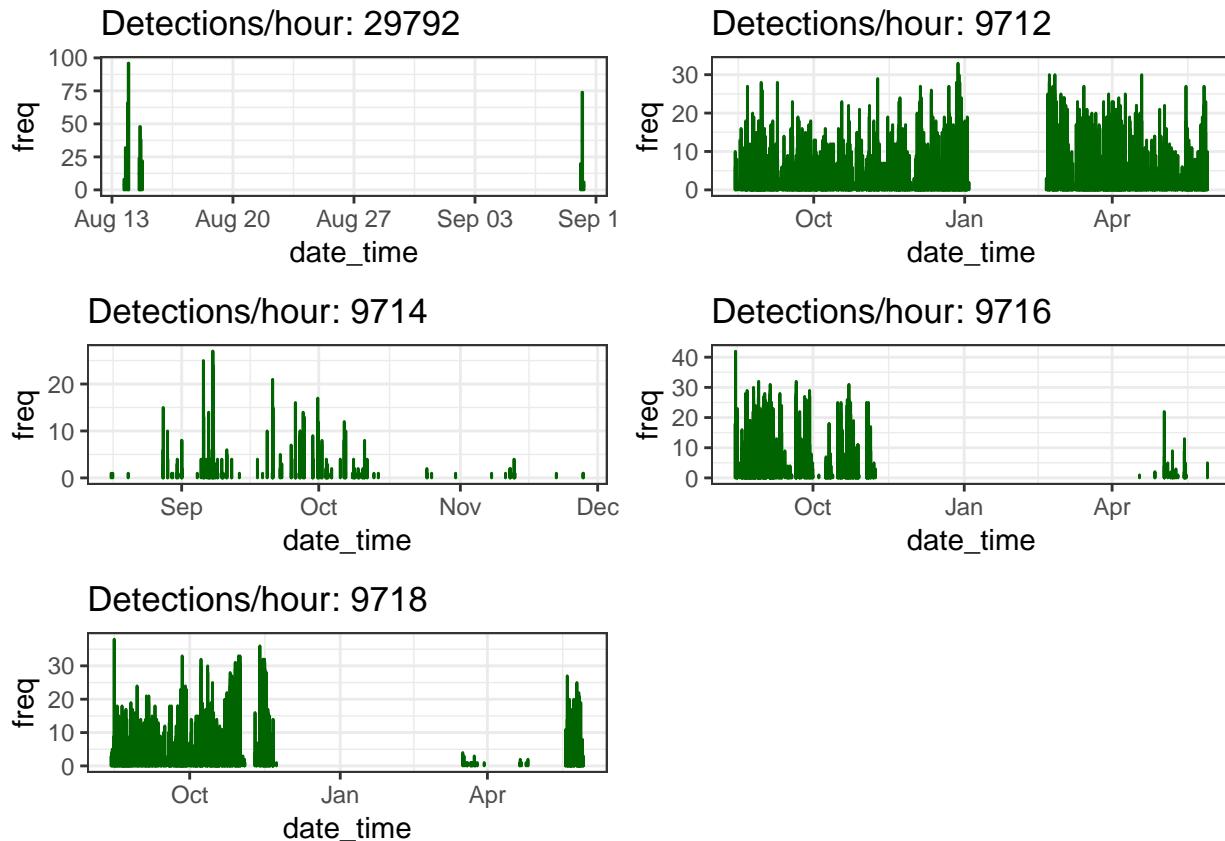
```

all_hist <- ggarrange(f1_hist, f2_hist, f3_hist,f4_hist, f5_hist ,
                      ncol = 2, nrow = 3)

## Warning: Removed 1 rows containing missing values (position_stack).
#f3 only has one observation

all_hist

```



```
#ggsave("all_hist.jpg", width=5, height=7, dpi=300)
```

Aggregated Frequency/hour

```
all_hourly <- detec %>%
  mutate(freq= 1) %>%
  separate(date_time, c("date", "time"), sep= " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  group_by(date, hour, transmitter, station, lat, long) %>%
  summarise(freq=sum(freq)) %>%
  mutate(minute= "00") %>%
  mutate(second= "00") %>%
  unite(time_1, minute, second, sep= ":")%>%
  unite(time, hour, time_1, sep = ":") %>%
  unite(date_time, date, time, sep = " ")

#changing classes for time and coordinates
all_hourly$date_time <- as.POSIXct(all_hourly$date_time, format="%Y-%m-%d %H:%M")
data(all_hourly, package = "sp")

## Warning in data(all_hourly, package = "sp"): data set 'all_hourly' not
## found

all_hourly_sf <- st_as_sf(all_hourly, coords= c("long","lat"), crs=4326)
all_hourly_sp <- as(all_hourly_sf, "Spatial")

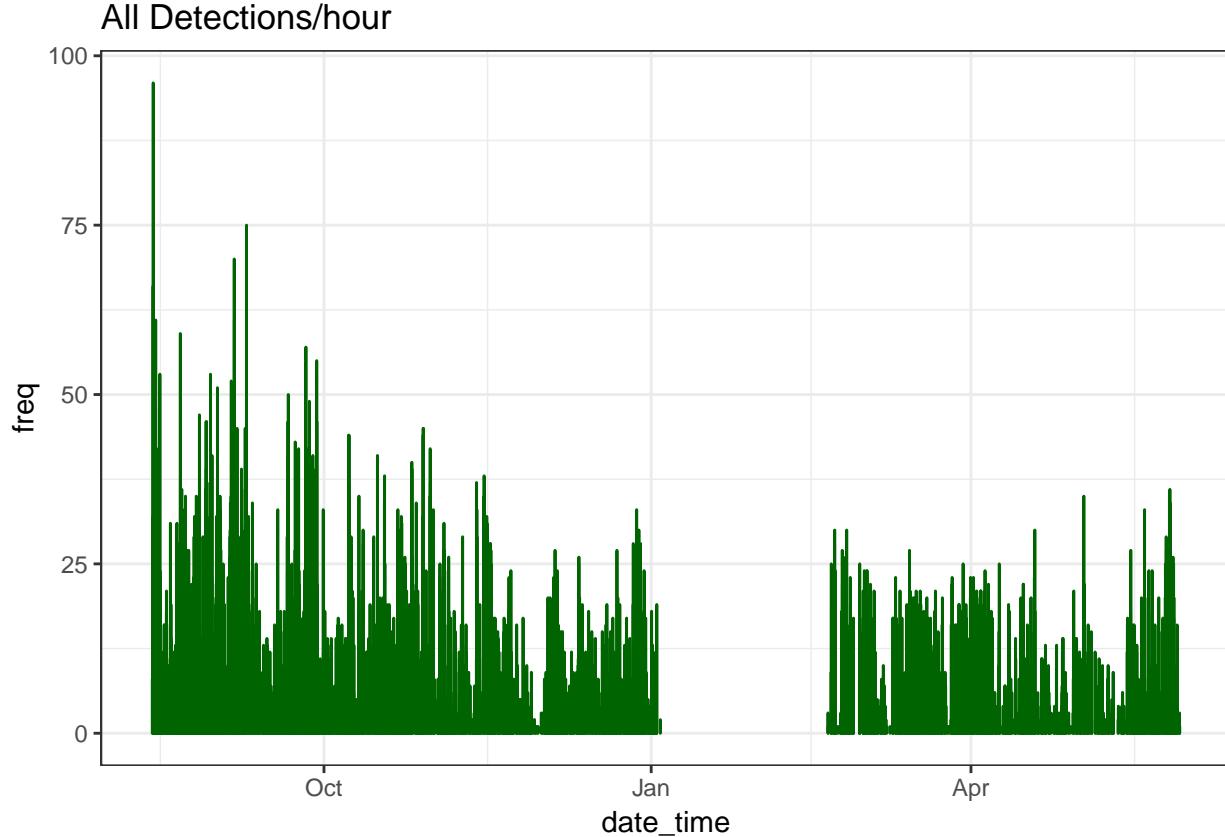
all_hist <- ggplot(data=all_hourly, aes(x=date_time, y=freq)) +
  geom_bar(stat="identity", color="darkgreen") +
```

```

theme_bw()+
ggtitle("All Detections/hour")
all_hist

## Warning: Removed 1 rows containing missing values (position_stack).

```



B. Spatial mapping of detection frequency at each station

Reading in CA shapefiles

```

ca <- st_read(dsn = "data/ca_shape/CA", layer = "CA")

## Reading layer `CA` from data source `/GitHub/CINMS_Spring2019/seabass/data/ca_shape/CA` using driver
## Simple feature collection with 1 feature and 1 field
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:            xmin: -124.4151 ymin: 32.53423 xmax: -114.1308 ymax: 42.0095
## epsg (SRID):    4326
## proj4string:    +proj=longlat +datum=WGS84 +no_defs
ca <- ca%>%
  st_transform(4326)

```

Location GPS points for each receiver

```
statGPS <- read_csv("data/StationGPS.csv")
```

```
## Parsed with column specification:
```

```

## cols(
##   station = col_character(),
##   lat = col_double(),
##   long = col_double()
## )
#converting to spatial
data(statGPS, package = "sp")

## Warning in data(statGPS, package = "sp"): data set 'statGPS' not found
statGPS_sf <- st_as_sf(statGPS, coords= c("long","lat"), crs=4326)
statGPS_sp <- as(statGPS_sf, "Spatial")

```

All Detections

```

##data wrangle

all_freq <- detec %>%
  mutate(freq= 1) %>%
  group_by(station, lat, long) %>%
  summarise(freq=sum(freq)) %>%
  filter(freq != 1)

#converting to spatial
data(all_freq, package = "sp")

## Warning in data(all_freq, package = "sp"): data set 'all_freq' not found
all_freq_sf <- st_as_sf(all_freq, coords= c("long","lat"), crs=4326)
all_freq_sp <- as(all_freq_sf, "Spatial")

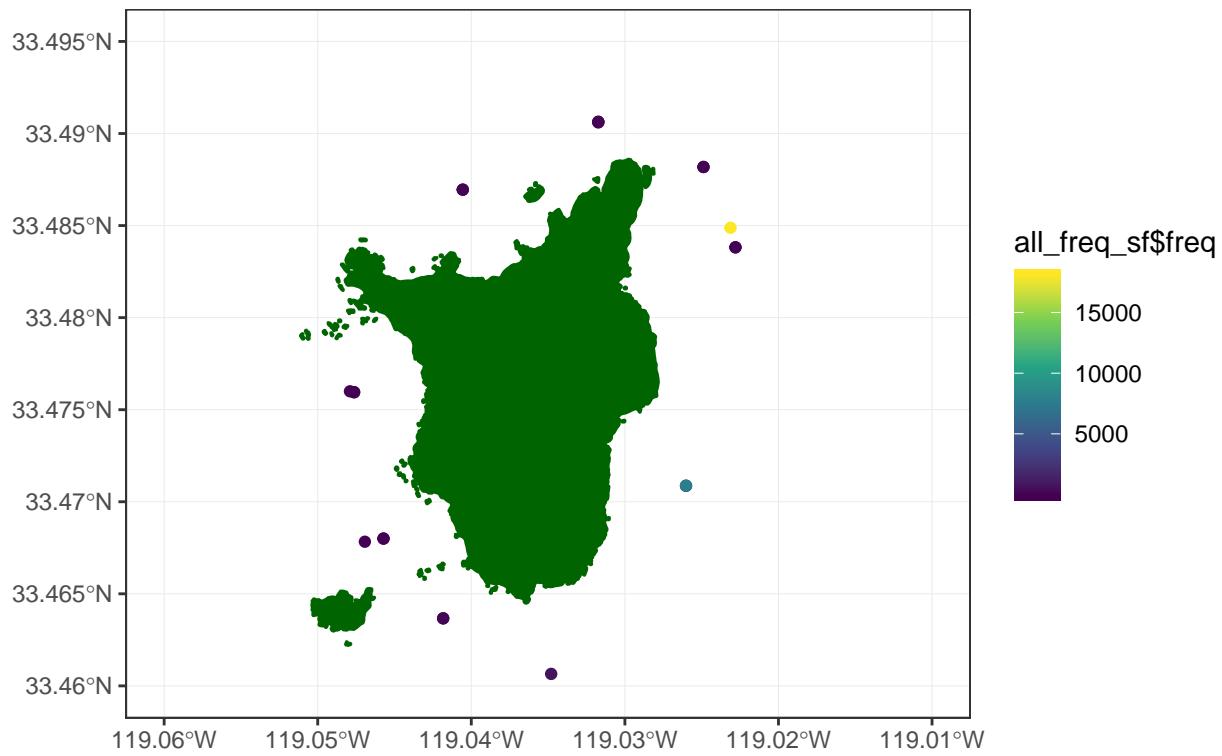
#map detections by frequency= color

all_freq_map <- ggplot(data = statGPS_sf) +
  geom_sf(color= "gray76")+
  geom_sf(data= all_freq_sf, aes(color = all_freq_sf$freq))+ 
  scale_colour_viridis_c() +
  geom_sf(data = ca, color = "darkgreen", fill = "darkgreen") +
  ggtitle("Most Frequented Receivers") +
  coord_sf(xlim = c(-119.01, -119.06), ylim = c(33.46, 33.495))+
  theme_bw()

all_freq_map

```

Most Frequently Receivers



Unsure as to why some of the stations in the top right are not in the same exact location as the tracking signals. I created a csv file with just the stations so many the locations I pulled from the OG data file weren't right?

Fish 1 (29792) Detections

```
f1_freq <- f1_29792 %>%
  mutate(freq= 1) %>%
  group_by(station, lat, long) %>%
  summarise(freq=sum(freq))

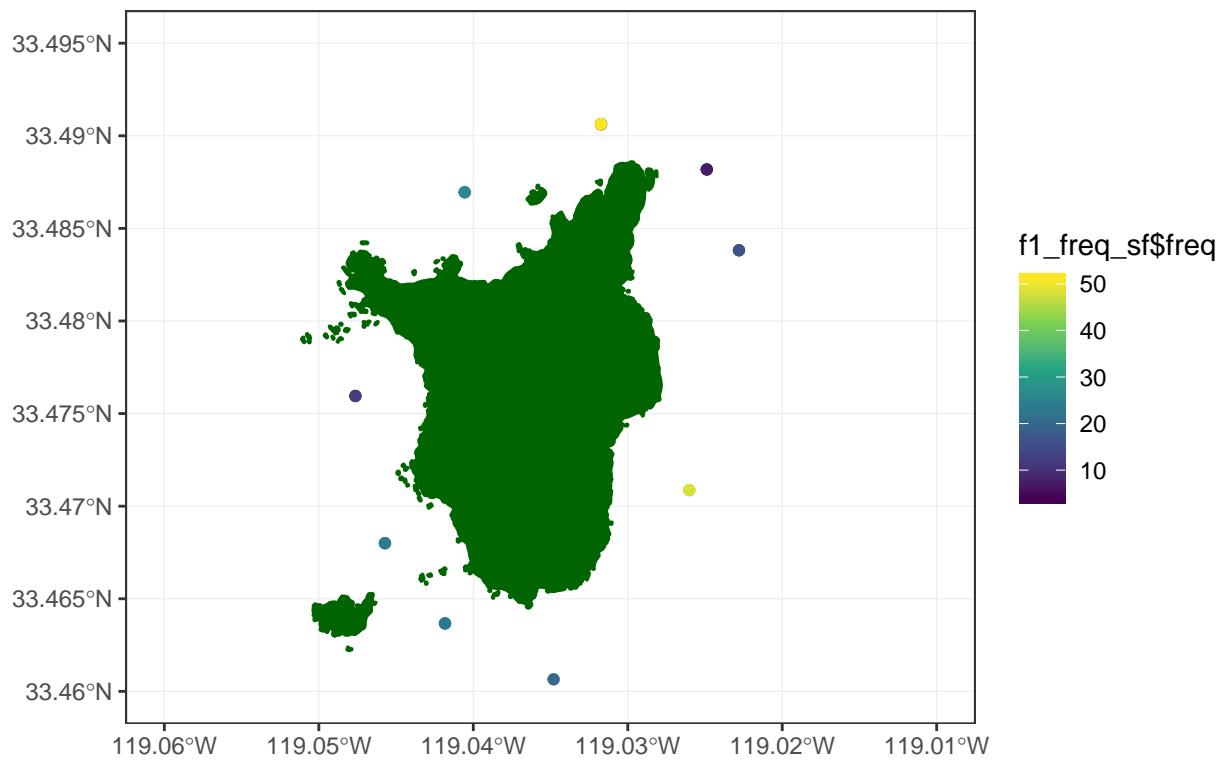
#converting to spatial
data(f1_freq, package = "sp")

## Warning in data(f1_freq, package = "sp"): data set 'f1_freq' not found
f1_freq_sf <- st_as_sf(f1_freq, coords= c("long","lat"), crs=4326)
f1_freq_sp <- as(f1_freq_sf, "Spatial")

f1_freq_map <- ggplot(data = statGPS_sf) +
  geom_sf(color= "gray76")+
  geom_sf(data= f1_freq_sf, aes(color = f1_freq_sf$freq))+
  scale_colour_viridis_c() +
  geom_sf(data = ca, color = "darkgreen", fill = "darkgreen") +
  ggtitle("Detections f1(29792)") +
  coord_sf(xlim = c(-119.01, -119.06), ylim = c(33.46, 33.495))+
  theme_bw()
```

```
f1_freq_map
```

Detections f1(29792)



#note: have not removed the first day data where the transmitter was on the boat

Fish 2 (9712) Detections

```
f2_freq <- f2_9712 %>%
  mutate(freq= 1) %>%
  group_by(station, lat, long) %>%
  summarise(freq=sum(freq))

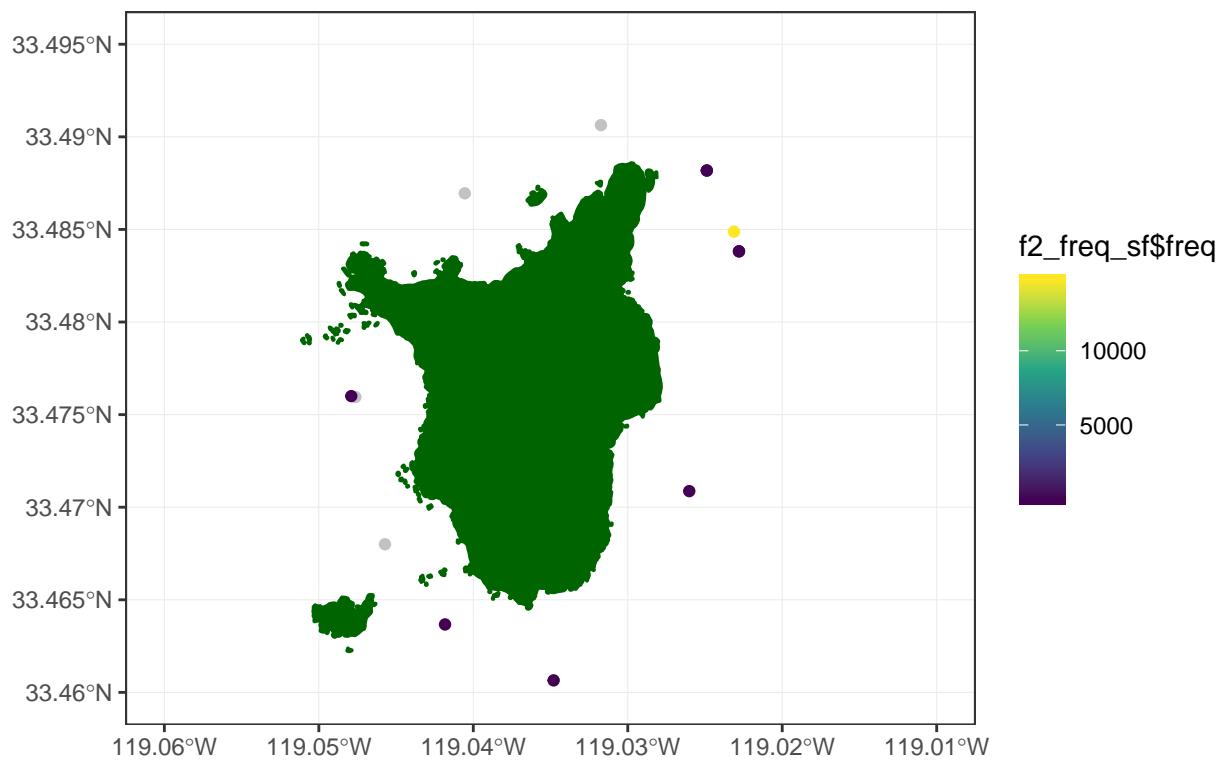
#converting to spatial
data(f2_freq, package = "sp")

## Warning in data(f2_freq, package = "sp"): data set 'f2_freq' not found
f2_freq_sf <- st_as_sf(f2_freq, coords= c("long","lat"), crs=4326)
f2_freq_sp <- as(f2_freq_sf, "Spatial")

f2_freq_map <- ggplot(data = statGPS_sf) +
  geom_sf(color= "gray76")+
  geom_sf(data= f2_freq_sf, aes(color = f2_freq_sf$freq))+ 
  scale_colour_viridis_c() +
  geom_sf(data = ca, color = "darkgreen", fill = "darkgreen") +
  ggtitle("Detections f2(9712)")+
  coord_sf(xlim = c(-119.01, -119.06), ylim = c(33.46, 33.495))+
  theme_bw()

f2_freq_map
```

Detections f2(9712)



Fish 3 (9714) Detections

```
f3_freq <- f3_9714 %>%
  mutate(freq= 1) %>%
  group_by(station, lat, long) %>%
  summarise(freq=sum(freq))

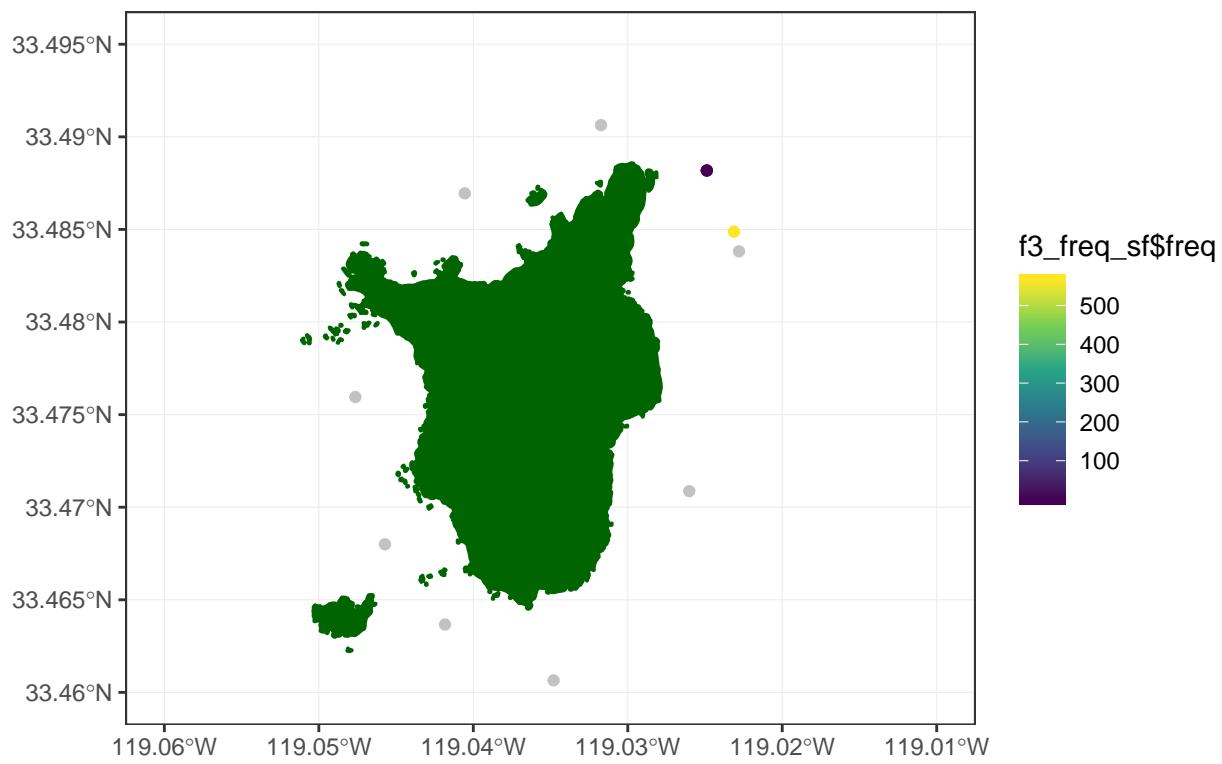
#converting to spatial
data(f3_freq, package = "sp")

## Warning in data(f3_freq, package = "sp"): data set 'f3_freq' not found
f3_freq_sf <- st_as_sf(f3_freq, coords= c("long","lat"), crs=4326)
f3_freq_sp <- as(f3_freq_sf, "Spatial")

f3_freq_map <- ggplot(data = statGPS_sf) +
  geom_sf(color= "gray76")+
  geom_sf(data= f3_freq_sf, aes(color = f3_freq_sf$freq))+
  scale_colour_viridis_c() +
  geom_sf(data = ca, color = "darkgreen", fill = "darkgreen") +
  ggtitle("Detections f3(9714)")+
  coord_sf(xlim = c(-119.01, -119.06), ylim = c(33.46, 33.495))+
  theme_bw()

f3_freq_map
```

Detections f3(9714)



Fish 4 (9716) Detections

```
f4_freq <- f4_9716 %>%
  mutate(freq= 1) %>%
  group_by(station, lat, long) %>%
  summarise(freq=sum(freq))

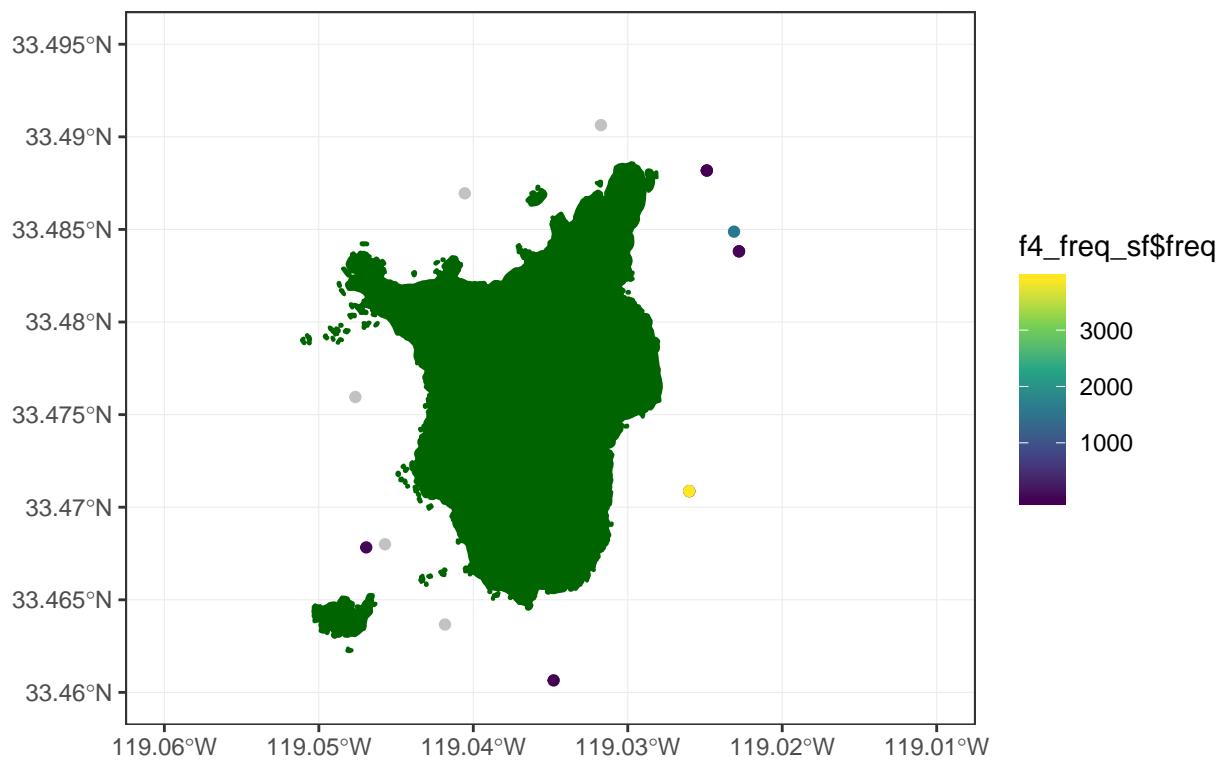
#converting to spatial
data(f4_freq, package = "sp")

## Warning in data(f4_freq, package = "sp"): data set 'f4_freq' not found
f4_freq_sf <- st_as_sf(f4_freq, coords= c("long","lat"), crs=4326)
f4_freq_sp <- as(f4_freq_sf, "Spatial")

f4_freq_map <- ggplot(data = statGPS_sf) +
  geom_sf(color= "gray76")+
  geom_sf(data= f4_freq_sf, aes(color = f4_freq_sf$freq))+
  scale_colour_viridis_c() +
  geom_sf(data = ca, color = "darkgreen", fill = "darkgreen") +
  ggtitle("Detections f4(9716)")+
  coord_sf(xlim = c(-119.01, -119.06), ylim = c(33.46, 33.495))+
  theme_bw()

f4_freq_map
```

Detections f4(9716)



Fish 5 (9718) Detections

```
f5_freq <- f5_9718 %>%
  mutate(freq= 1) %>%
  group_by(station, lat, long) %>%
  summarise(freq=sum(freq))

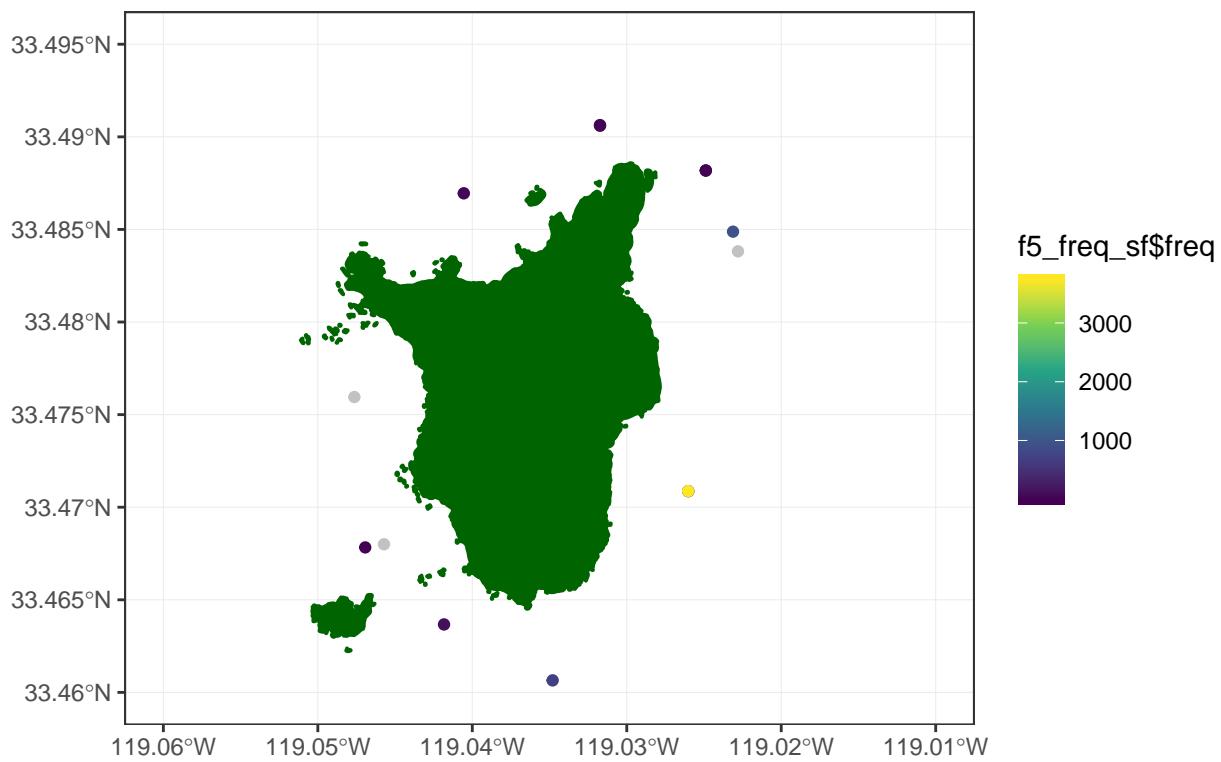
#converting to spatial
data(f5_freq, package = "sp")

## Warning in data(f5_freq, package = "sp"): data set 'f5_freq' not found
f5_freq_sf <- st_as_sf(f5_freq, coords= c("long","lat"), crs=4326)
f5_freq_sp <- as(f5_freq_sf, "Spatial")

f5_freq_map <- ggplot(data = statGPS_sf) +
  geom_sf(color= "gray76")+
  geom_sf(data= f5_freq_sf, aes(color = f5_freq_sf$freq))+
  scale_colour_viridis_c() +
  geom_sf(data = ca, color = "darkgreen", fill = "darkgreen") +
  ggtitle("Detections f5(9718)")+
  coord_sf(xlim = c(-119.01, -119.06), ylim = c(33.46, 33.495))+
  theme_bw()

f5_freq_map
```

Detections f5(9718)



4. Diurnal Movement Patterns

For these plots the time stamp is separated out by day (x axis) and hour of the day (y axis) to see if there is a pattern in movement associated with the time of the day.

Fish 1: 9718

```
f1di <- f1_29792 %>%
  separate(date_time, c("date", "time"), sep = " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  dplyr::select(date, hour, transmitter, station, long, lat)

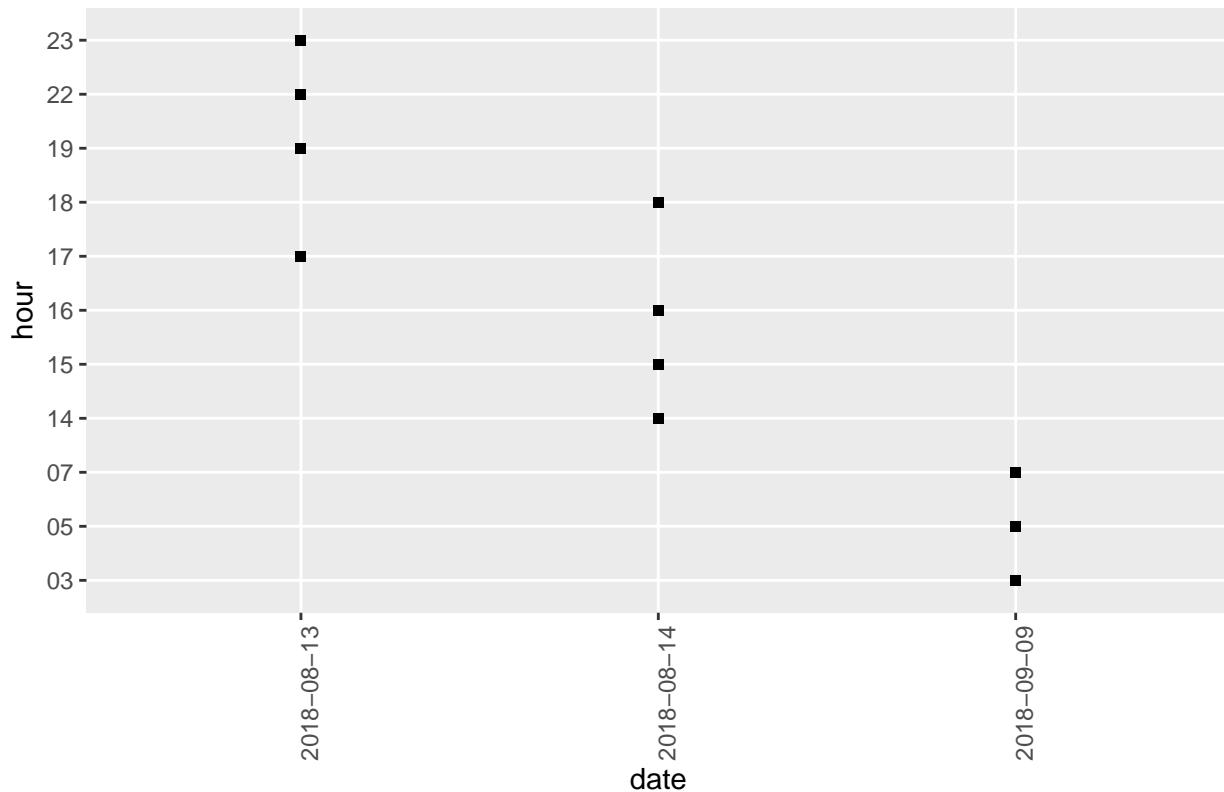
#converting to POSIX is not working for some reason, this may be important in the future but perhaps not
#as.POSIXct(f5di$date, format="%Y-%m-%d")
#as.POSIXct(f5di$time, format="%h-%m-%s")

#1 fish
f1di_graph <- ggplot(f1di, aes(x=date, y= hour )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  ggtitle("Transmitter #29792")

#    scale_y_continuous(breaks=c(00:00:00, 08:00:00, 16:00:00, 24:00:00))

f1di_graph
```

Transmitter #29792



Fish 2: 9712

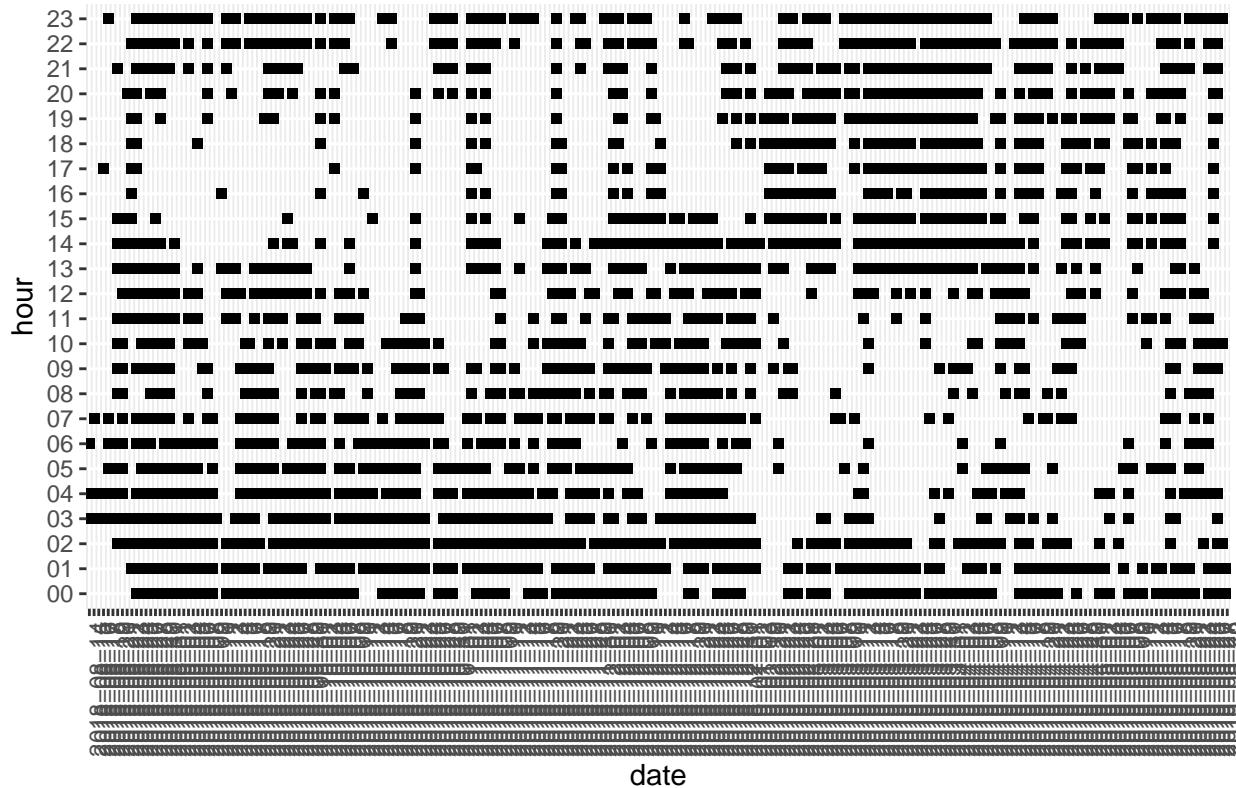
```
f2di <- f2_9712 %>%
  separate(date_time, c("date", "time"), sep = " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  dplyr::select(date, hour, transmitter, station, long, lat)

#converting to POSIX is not working for some reason, this may be important in the future but perphaps n
#as.POSIXct(f5di$date, format="%Y-%m-%d")
#as.POSIXct(f5di$time, format="%h-%m-%s")

#1 fish
f2di_graph <- ggplot(f2di, aes(x=date, y= hour )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  ggtitle("Transmitter #29792")
#    scale_y_continuous(breaks=c(00:00:00,08:00:00, 16:00:00, 24:00:00))

f2di_graph
```

Transmitter #29792



Fish 3: 9714

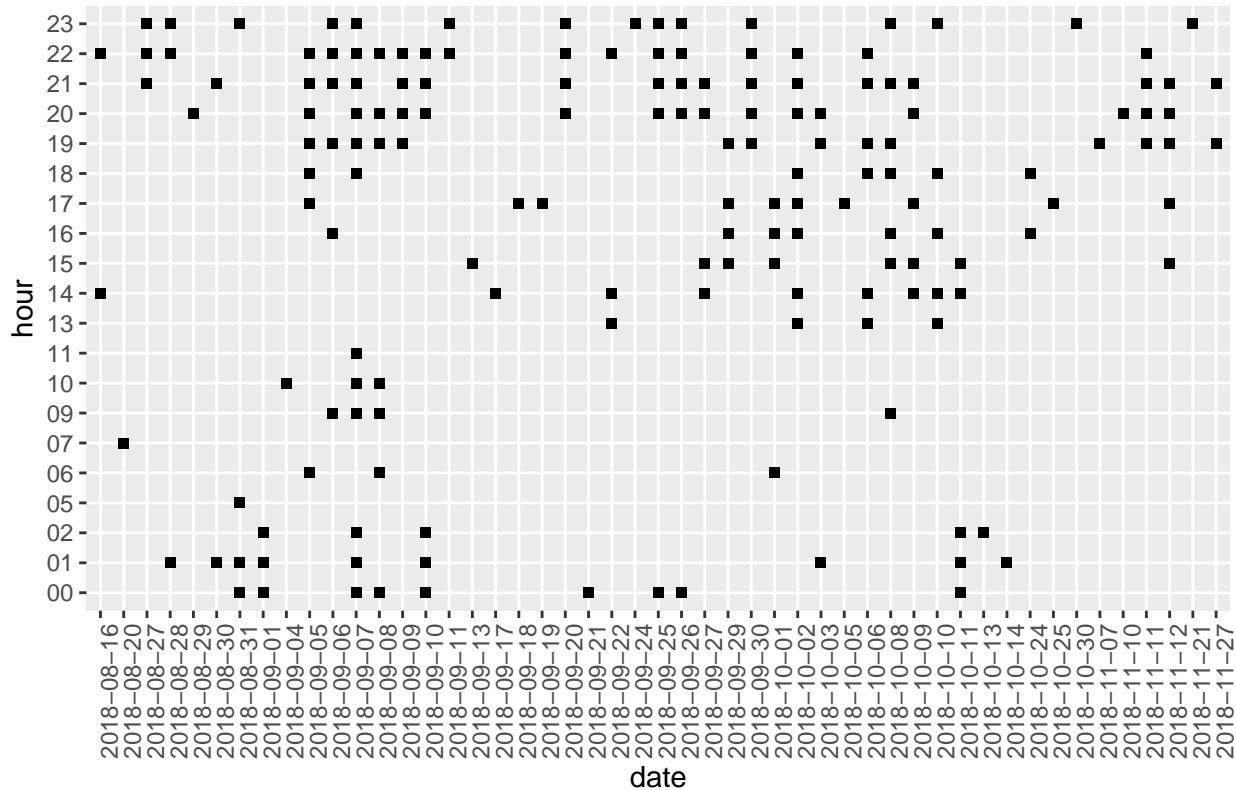
```
f3di <- f3_9714 %>%
  separate(date_time, c("date", "time"), sep = " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  dplyr::select(date, hour, transmitter, station, long, lat)

#converting to POSIX is not working for some reason, this may be important in the future but perphaps n
#as.POSIXct(f5di$date, format="%Y-%m-%d")
#as.POSIXct(f5di$time, format="%h-%m-%s")

#1 fish
f3di_graph <- ggplot(f3di, aes(x=date, y= hour )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  ggtitle("Transmitter #9714")
#  scale_y_continuous(breaks=c(00:00:00,08:00:00, 16:00:00, 24:00:00))

f3di_graph
```

Transmitter #9714



Fish 4: 9716

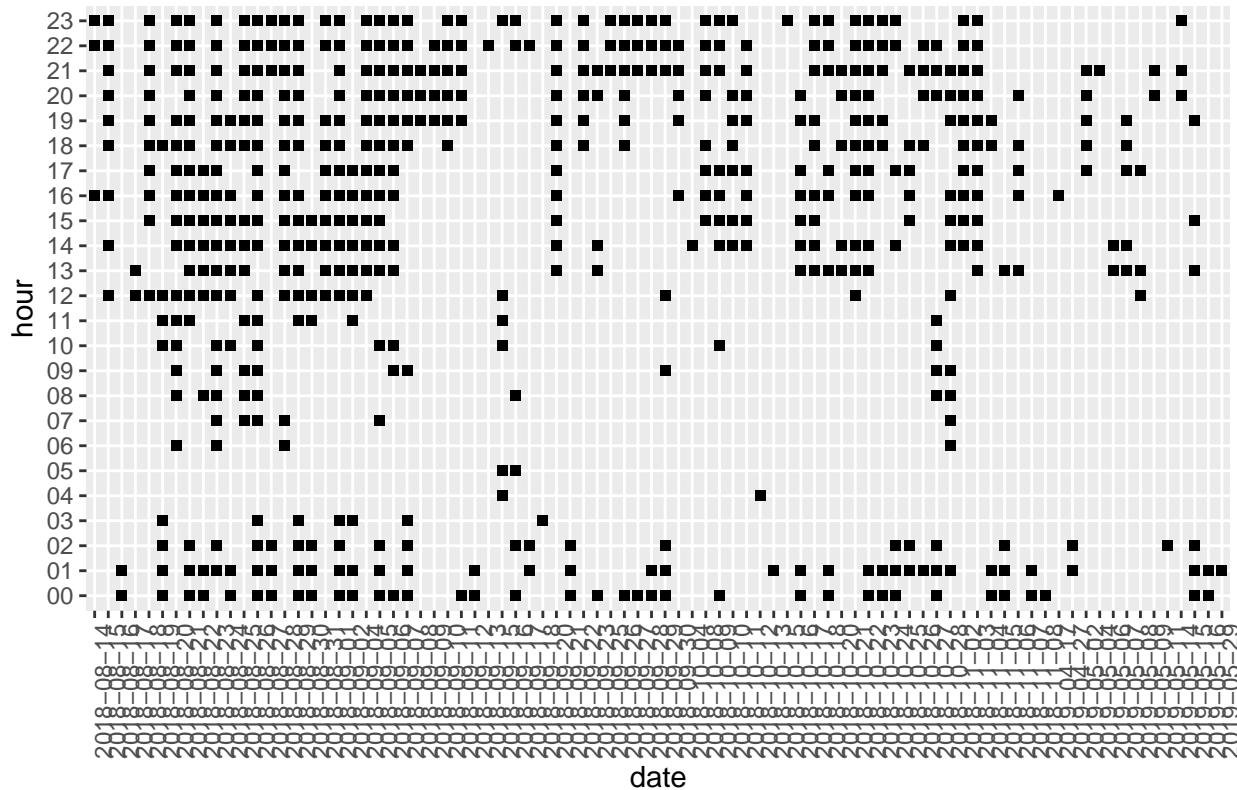
```
f4di <- f4_9716 %>%
  separate(date_time, c("date", "time"), sep = " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  dplyr::select(date, hour, transmitter, station, long, lat)

#converting to POSIX is not working for some reason, this may be important in the future but perphaps n
#as.POSIXct(f5di$date, format="%Y-%m-%d")
#as.POSIXct(f5di$time, format="%h-%m-%s")

#1 fish
f4di_graph <- ggplot(f4di, aes(x=date, y= hour )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  ggtitle("Transmitter #9716")
#    scale_y_continuous(breaks=c(00:00:00,08:00:00, 16:00:00, 24:00:00))

f4di_graph
```

Transmitter #9716



Fish 5: 9718

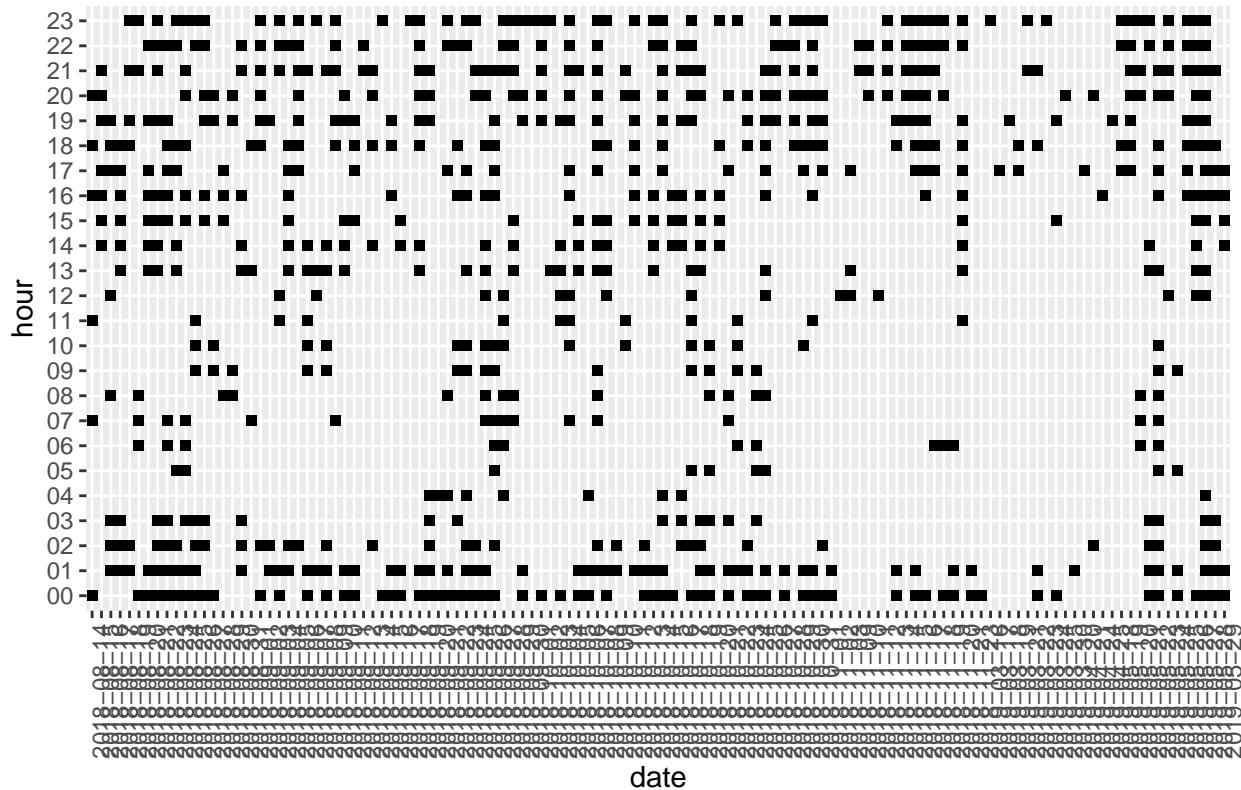
```
f5di <- f5_9718 %>%
  separate(date_time, c("date", "time"), sep = " ") %>%
  separate(time, c("hour", "minute", "second"), sep = ":") %>%
  dplyr::select(date, hour, transmitter, station, long, lat)

#converting to POSIX is not working for some reason, this may be important in the future but perphaps n
#as.POSIXct(f5di$date, format="%Y-%m-%d")
#as.POSIXct(f5di$time, format="%H-%M-%S")

#5 fish
f5di_graph <- ggplot(f5di, aes(x=date, y= hour )) +
  geom_point(shape=15) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  ggtitle("Transmitter #9718")

f5di_graph
```

Transmitter #9718



5. Seasonal Variations

When enough data comes through bar graph; x= calender month, y= number of detections per month

```
all_monthly <- detec %>%
  mutate(freq= 1) %>%
  separate(date_time, c("date", "time"), sep= " ") %>%
  separate(date, c("year", "month", "day"), sep = "-") %>%
  group_by(year, month) %>%
  summarise(detections=sum(freq))

monthly_bar <- ggplot(data=all_monthly, aes(x=month, y=detections, fill= year)) +
  geom_bar(stat="identity" )+
  theme_bw()+
  ggtitle("Total detections by month")
monthly_bar
```

Total detections by month

