# Capstone Project Fish Species Analysis

## Introduction to Data Science

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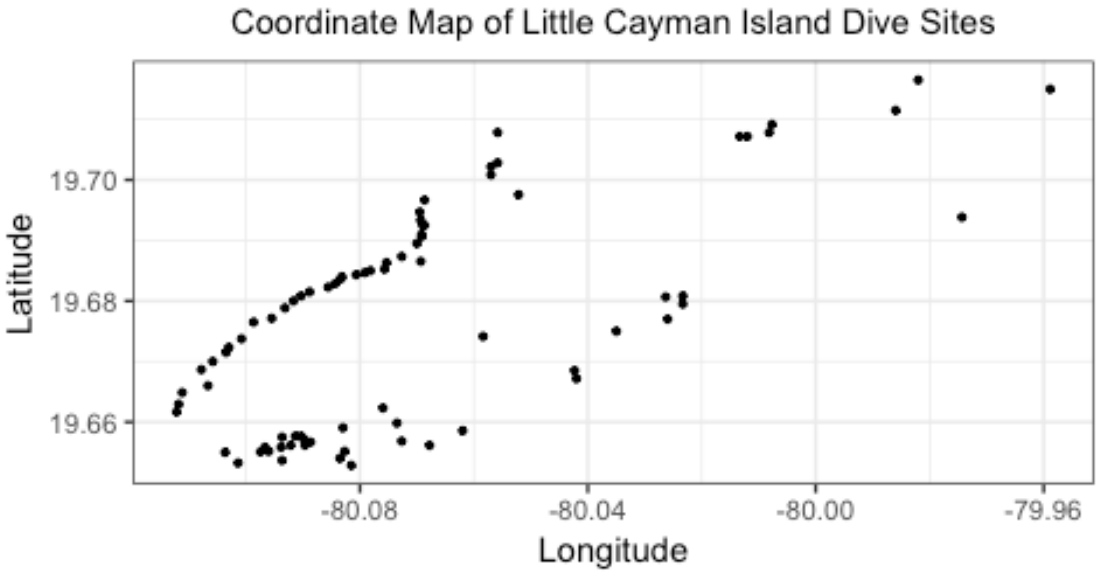
### Library Calls

Load the necessary packages.

```
library(readr)
library(dplyr)
library(stringr)
library(ggplot2)
library(grid)
library(gridExtra)
```

### Simple Visualization

Use the Zone_Codes file to generate a plot showing the latitude and longitude of all of the dive sites at Little Cayman.



## Data Preparation

Load the data into a data frame. Remove all non-fish species by Family_Name. Non-fish species observed in the data set include sharks, rays, eels, turtles and a dolphin.

```
Little_Cayman <- read_csv("Little_Cayman.csv")
non_fish_family <- c("Requiem Shark", "Conger", "Dolphin", "Stingray",
"Manta", "Moray", "Eagle Ray", "Snake Eel", "Carpet Shark", "Hammerhead
Shark", "Electric Ray", "Round Stingrays", "Sea Turtles", "#N/A")
LC <- Little_Cayman %>% filter(!(Family_Name %in% non_fish_family))
```

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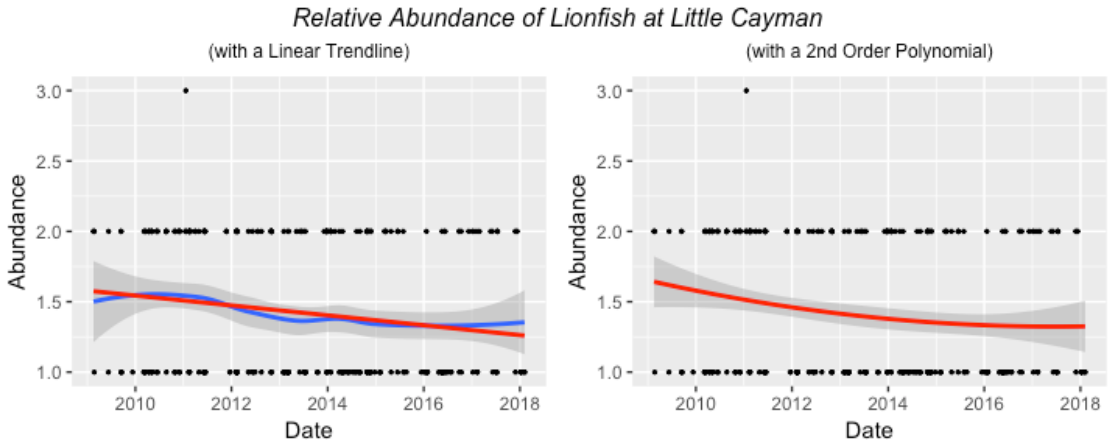
## Lionfish Exploration

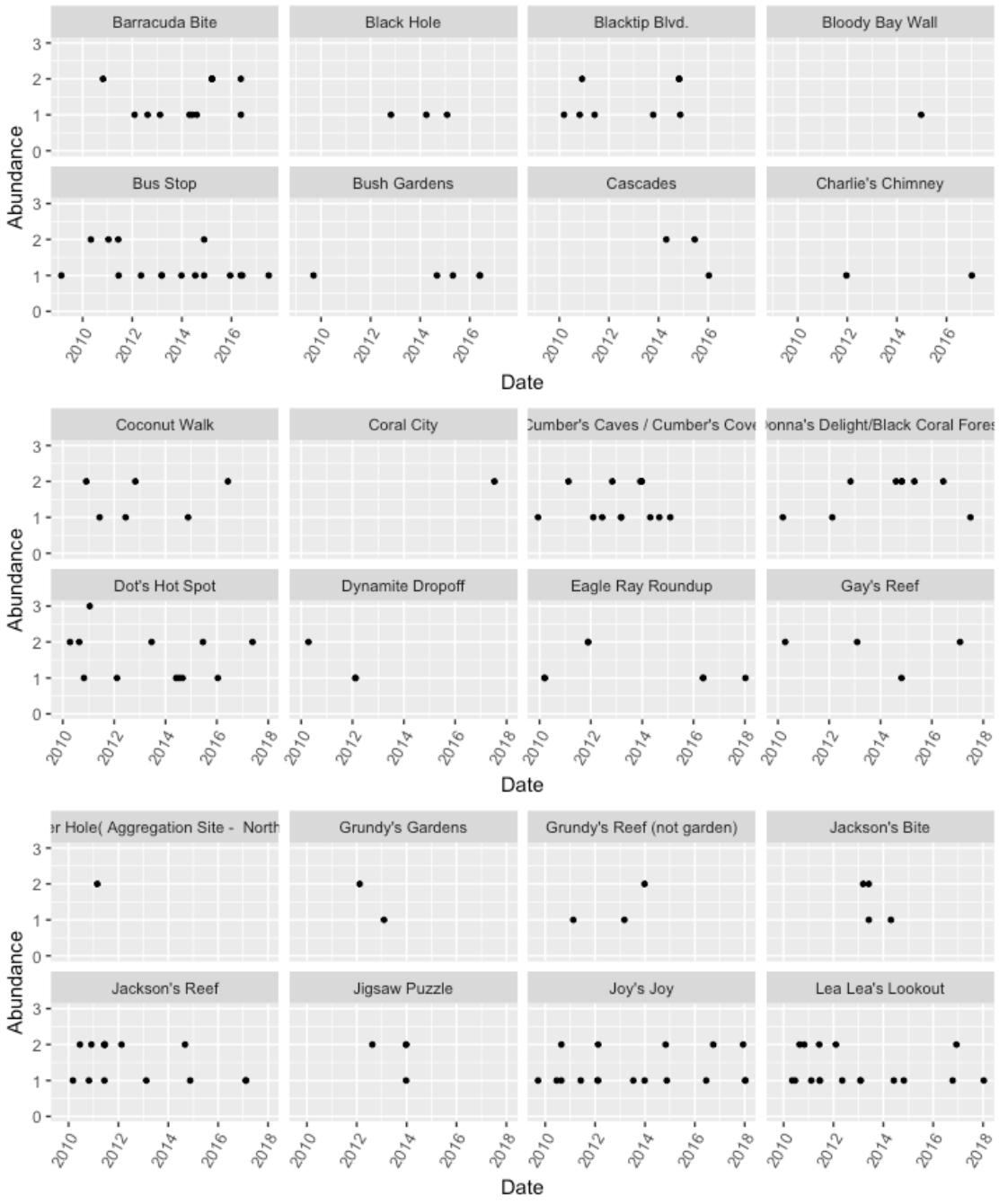
The Red Lionfish, otherwise known as the Common Lionfish, is species 683 and is a member of the Scorpionfish family. Here is a list of the 5 species of Scorpionfish observed at Little Cayman.

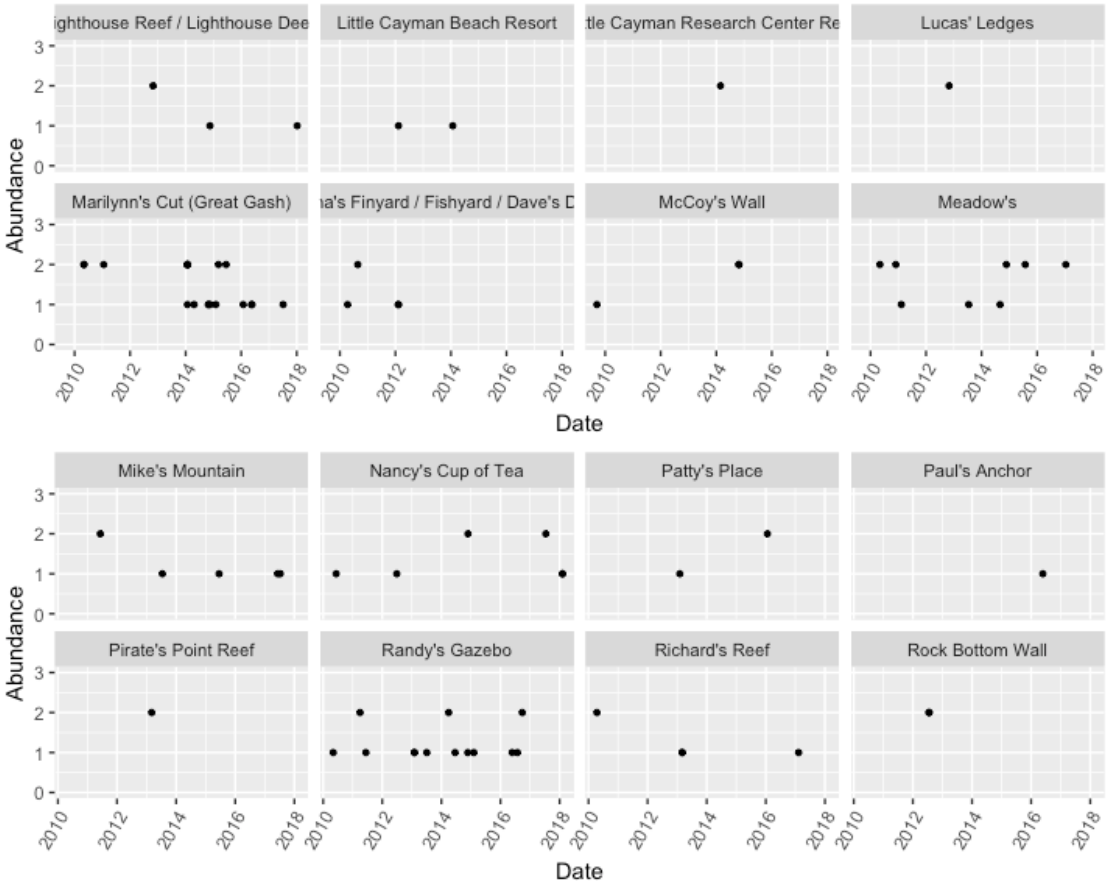
```
## # A tibble: 5 x 2
##                          English_Name count
##                                 <chr> <int>
## 1              Mushroom Scorpionfish     2
## 2                Plumed Scorpionfish     2
## 3 Red Lionfish (aka Common Lionfish)   347
## 4                   Reef Scorpionfish     1
## 5                Spotted Scorpionfish   144
```

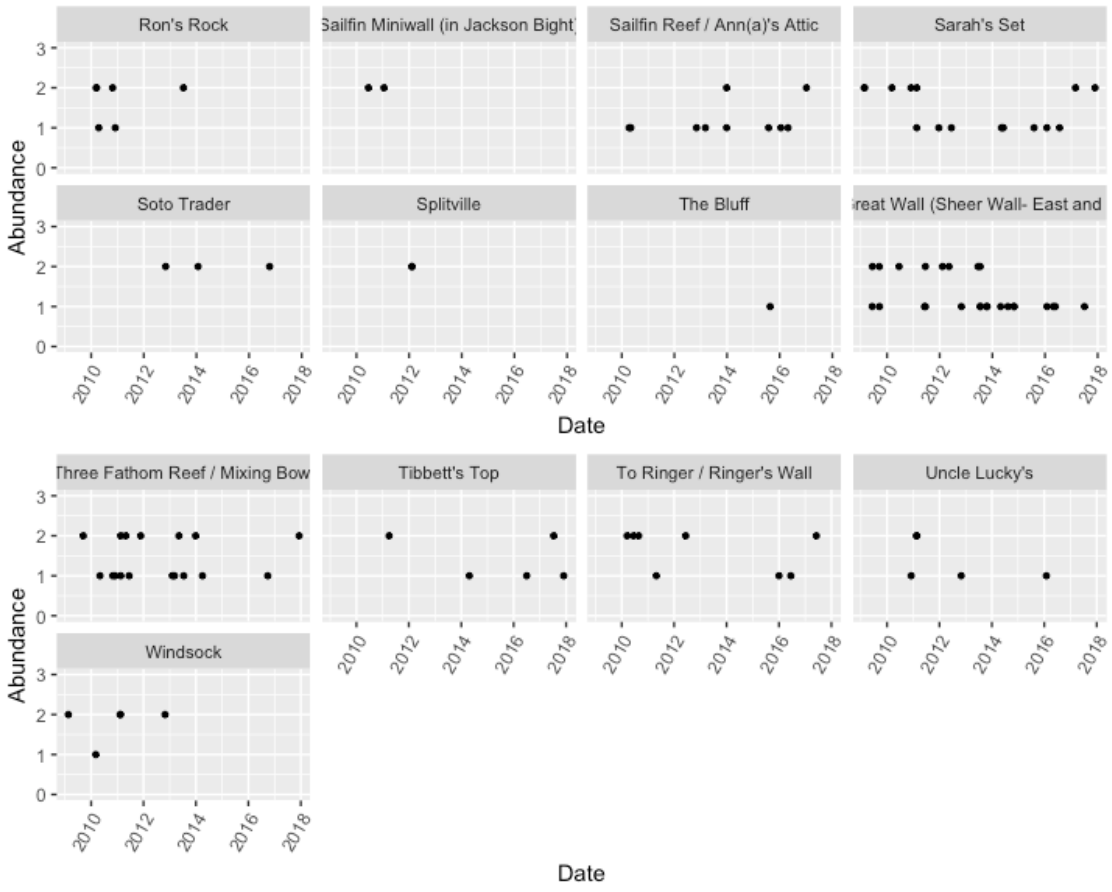
Generate plots showing Lionfish abundance as a function of time. The following figure shows the Lionfish presence at all dive sites at Little Cayman. A smooth curve with corresponding confidence interval and a trendline are added to the plot on the left side of the figure. A second order (red) polyonomial was then fit to the data as seen on the right side of the figure.




The following series of plots show the Lionfish presence at numerous dive sites at Little Cayman.


Barracuda Bite
Black Hole
Blacktip Blvd.
Bloody Bay Wall
Bus Stop
Bush Gardens
Cascades
Charlie's Chimney
Coconut Walk
Coral City
Dot's Hot Spot
Dynamite Dropoff
Eagle Ray Roundup
Gay's Reef
Grundy's Gardens
Grundy's Reef (not garden)
Jackson's Bite
Jackson's Reef
Jigsaw Puzzle
Joy's Joy
Lea Lea's Lookout
Abundance
Date


ighthouse Reef / Lighthouse Dee
Little Cayman Beach Resort
tle Cayman Research Center Re
Lucas' Ledges
Marilynn's Cut (Great Gash)
a's Finyard / Fishyard / Dave's D
McCoy's Wall
Meadow's
Abundance
Date
Mike's Mountain
Nancy's Cup of Tea
Patty's Place
Paul's Anchor
Pirate's Point Reef
Randy's Gazebo
Richard's Reef
Rock Bottom Wall
Abundance
Date

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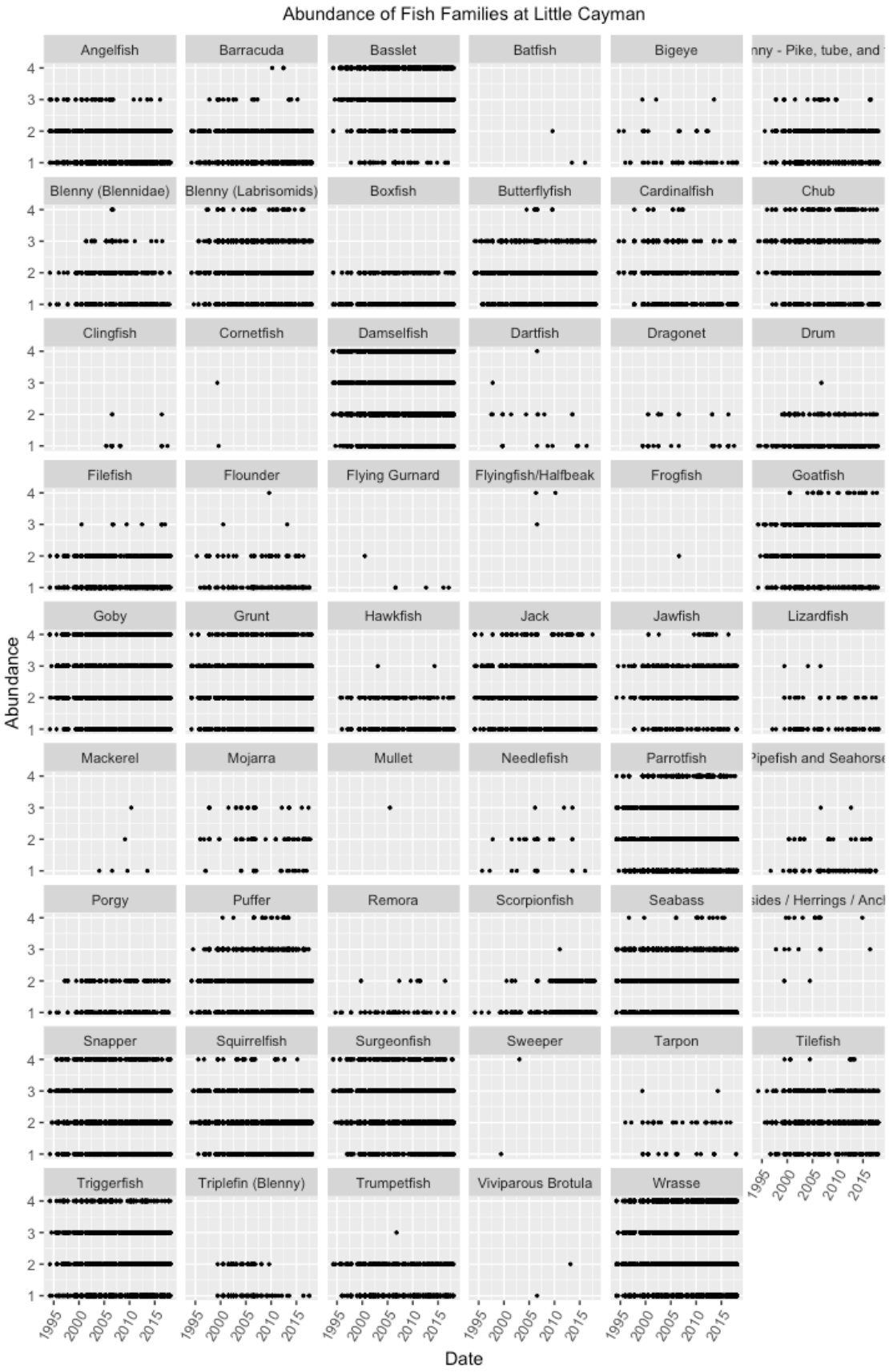
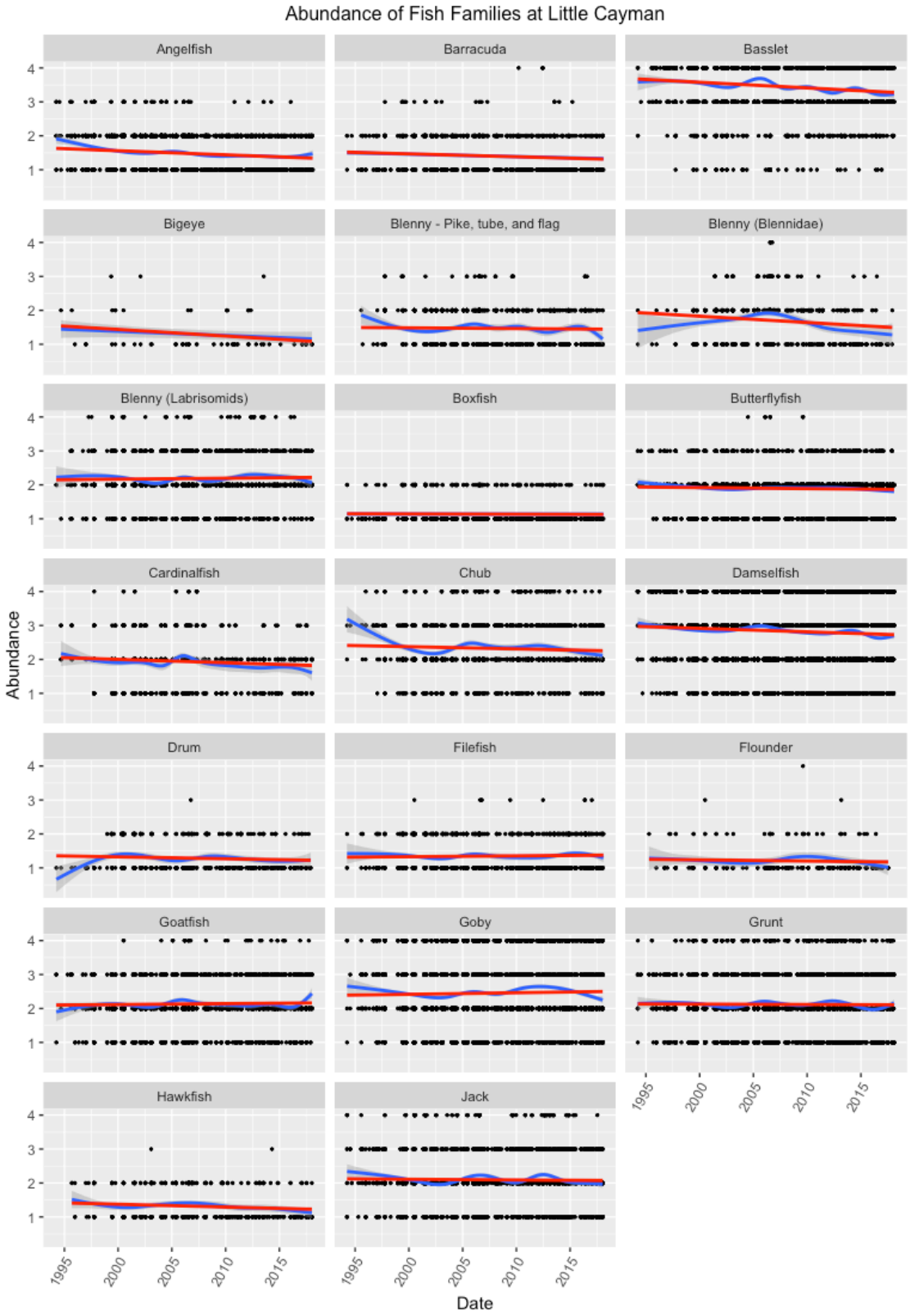
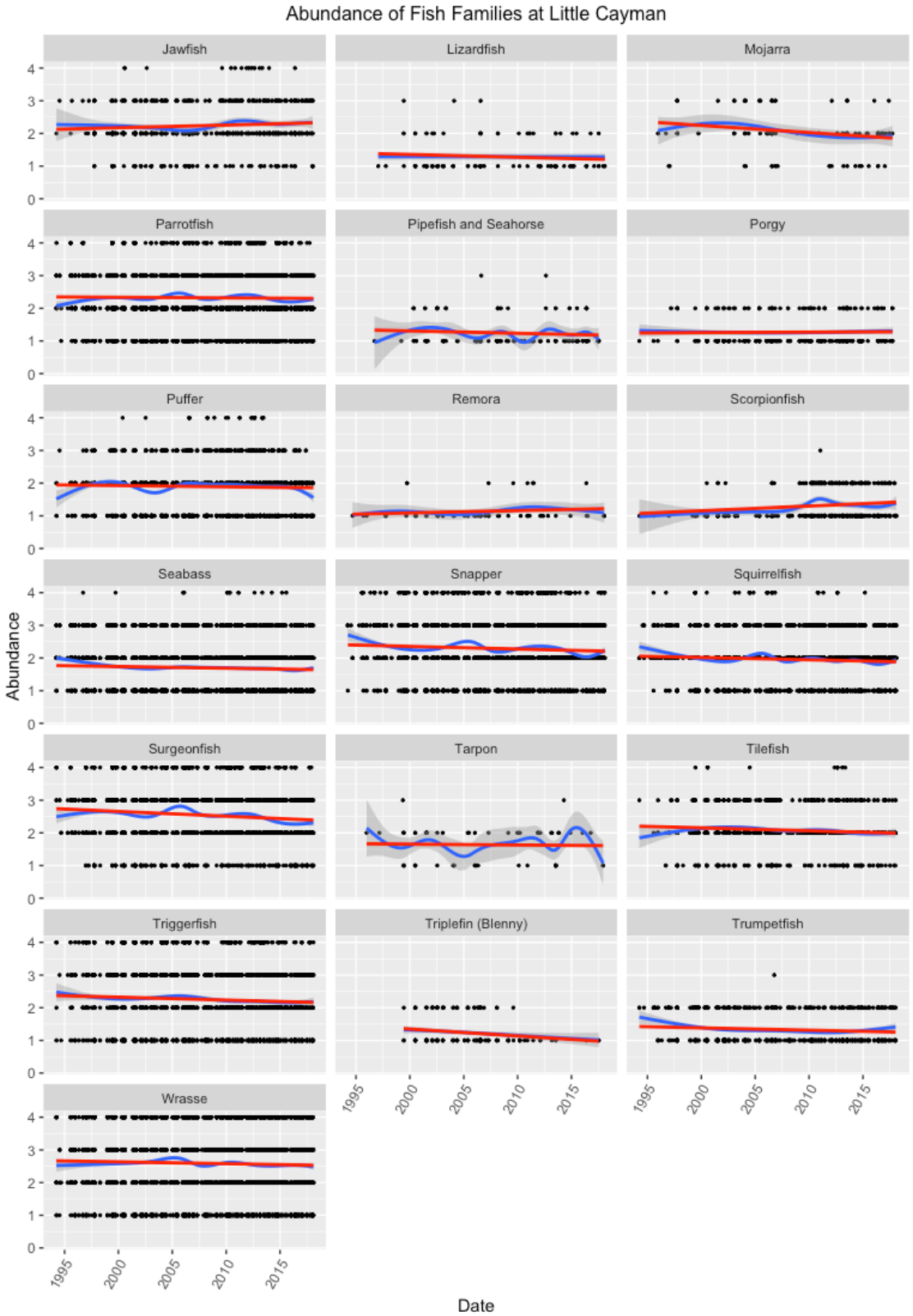
## Fish Family Exploration for all Sites

Generate plots of all fish families at all dive sites around Little Cayman using the Family_Name.


Abundance of Fish Families at Little Cayman
Angelfish
Barracuda
Basslet
Batfish
Bigeye
nny - Pike, tube, and
Blenny (Blennidae)
Blenny (Labrisomids)
Boxfish
Butterflyfish
Cardinalfish
Chub
Clingfish
Cornetfish
Damselfish
Dartfish
Dragonet
Drum
Filefish
Flounder
Flying Gurnard
Flyingfish/Halfbeak
Frogfish
Goatfish
Goby
Grunt
Hawkfish
Jack
Jawfish
Lizardfish
Mackerel
Mojarra
Mullet
Needlefish
Parrotfish
Pipefish and Seahorse
Porgy
Puffer
Remora
Scorpionfish
Seabass
sides / Herrings / Anch
Snapper
Squirrelfish
Surgeonfish
Sweeper
Tarpon
Tilefish
Triggerfish
Triplefin (Blenny)
Trumpetfish
Viviparous Brotula
Wrasse
Abundance
1
2
3
4
1995
2000
2005
2010
2015
Date

Fish families with less than thirty surveys for all species in the family are identified and removed from the data set. The abundance vs. time of numerous families is then plotted side-by-side with a smooth curve (including confidence interval) added to each family plot.

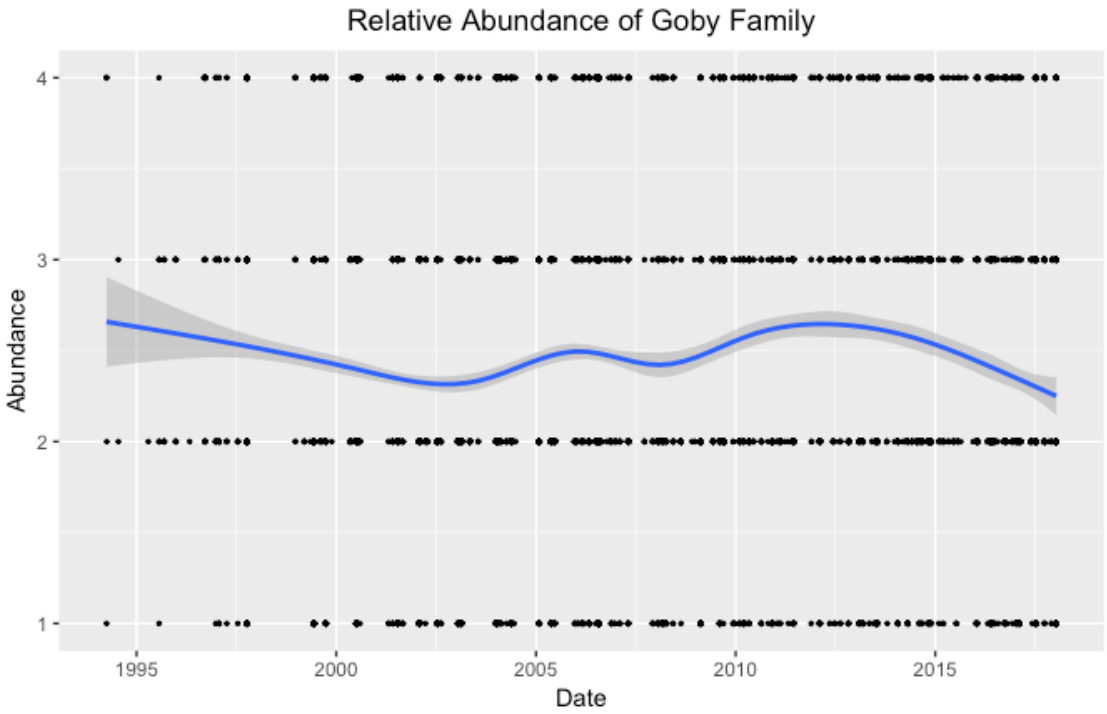

Abundance of Fish Families at Little Cayman
Angelfish
Barracuda
Basslet
Bigeye
Blenny - Pike, tube, and flag
Blenny (Blennidae)
Blenny (Labrisomids)
Boxfish
Butterflyfish
Cardinalfish
Chub
Damselfish
Drum
Filefish
Flounder
Goatfish
Goby
Grunt
Hawkfish
Jack
Abundance
Date
1995
2000
2005
2010
2015

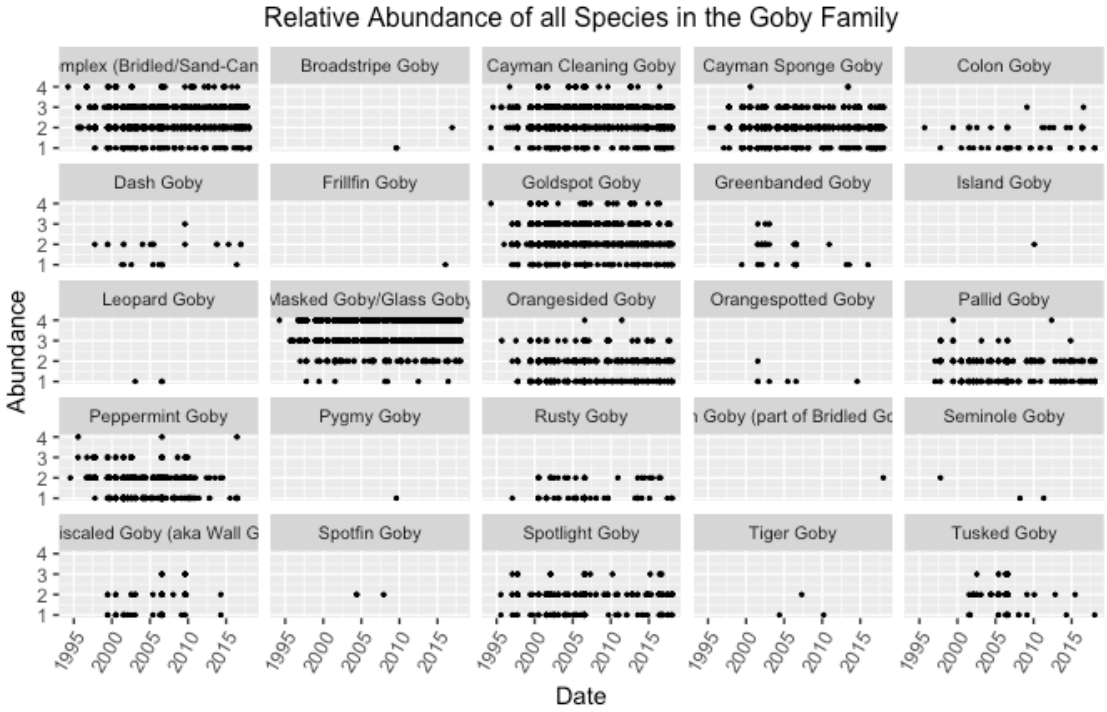

Abundance of Fish Families at Little Cayman
Jawfish
Lizardfish
Mojarra
Parrotfish
Pipefish and Seahorse
Porgy
Puffer
Remora
Scorpionfish
Seabass
Snapper
Squirrelfish
Surgeonfish
Tarpon
Tilefish
Triggerfish
Triplefin (Blenny)
Trumpetfish
Wrasse
Abundance
Date
0
1
2
3
4
1995
2000
2005
2010
2015

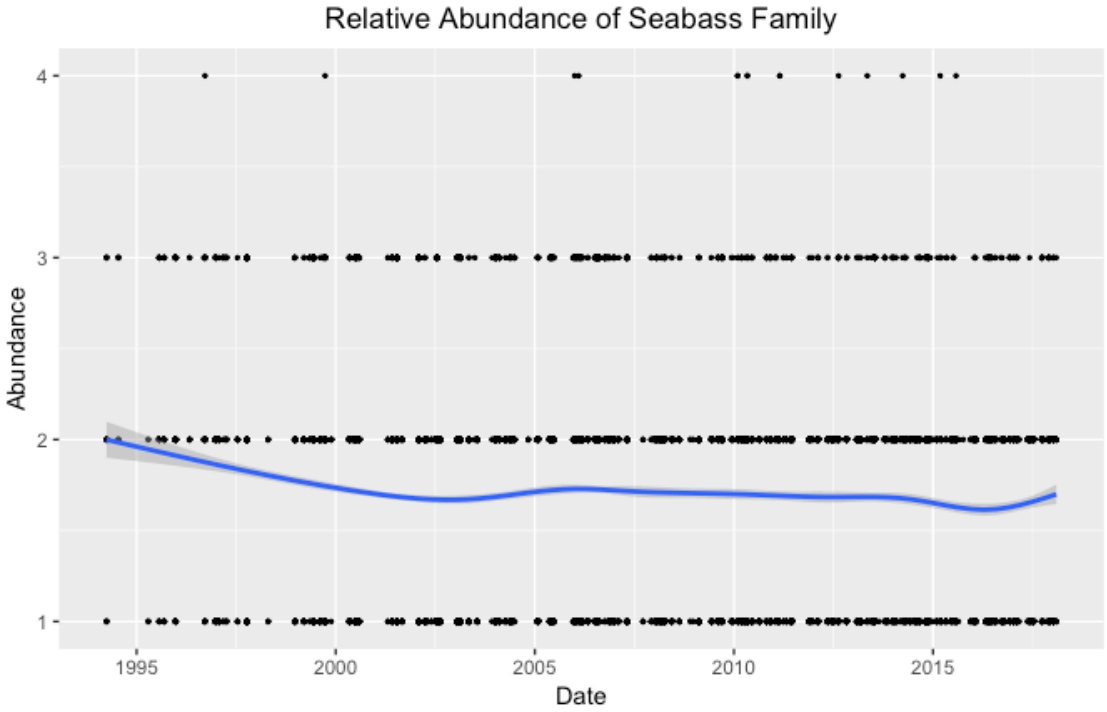
## Fish Species Exploration for Specific Families

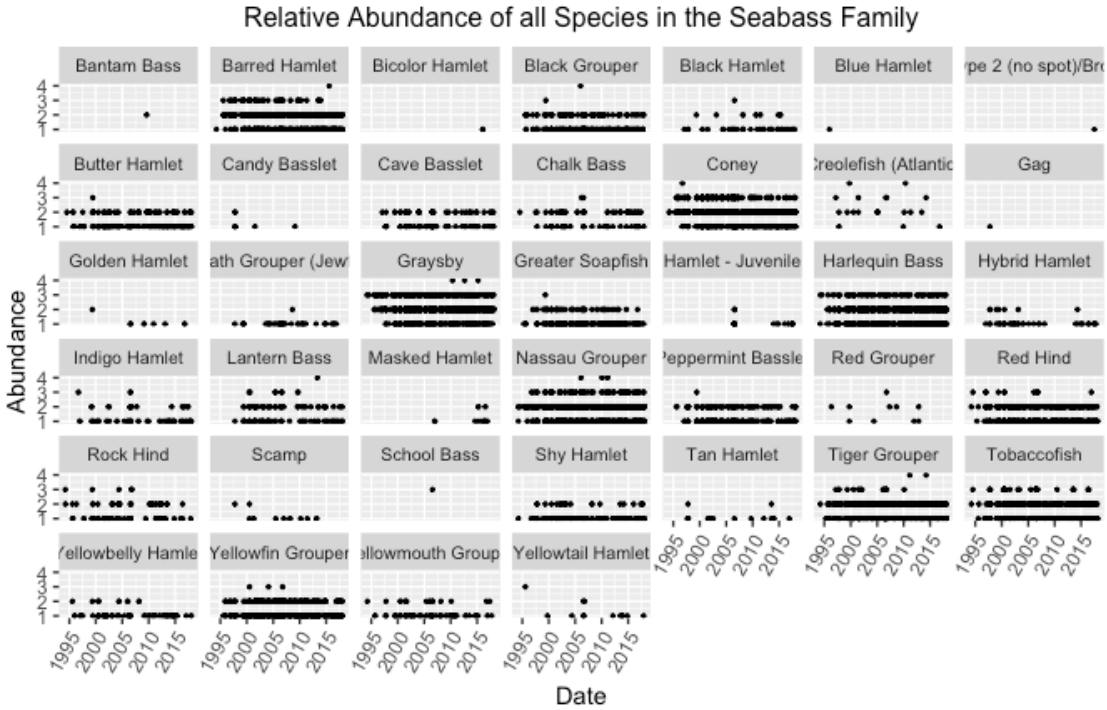
The following pairs of plots show the abundance vs. time for specific fish families. The first plot shows the entire family at all sites at Little Cayman. A smooth curve and confidence interval are added to this plot. The second plot shows all of the species within each family.

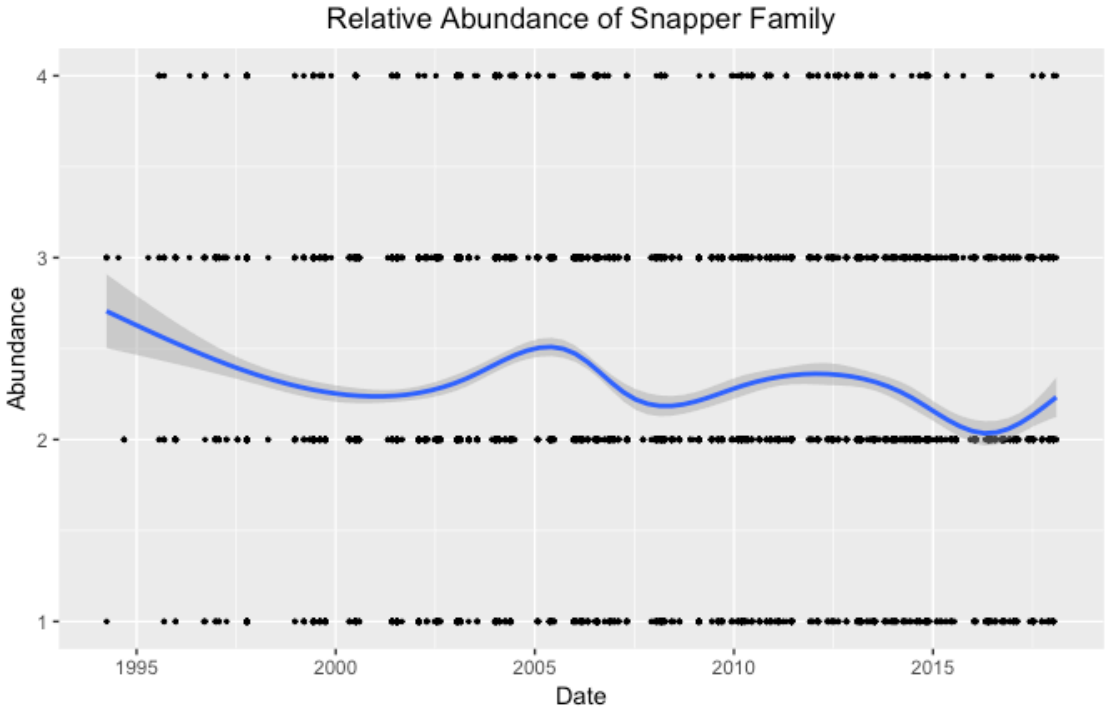
Grouper and Snapper are prime predators in the Caribbean waters. Grouper are part of the Seabass family. The juveniles of these species, the fish in the Goby family and the fish in the Wrasse family have small, cigar-shaped bodies, ideal prey for the Lionfish.

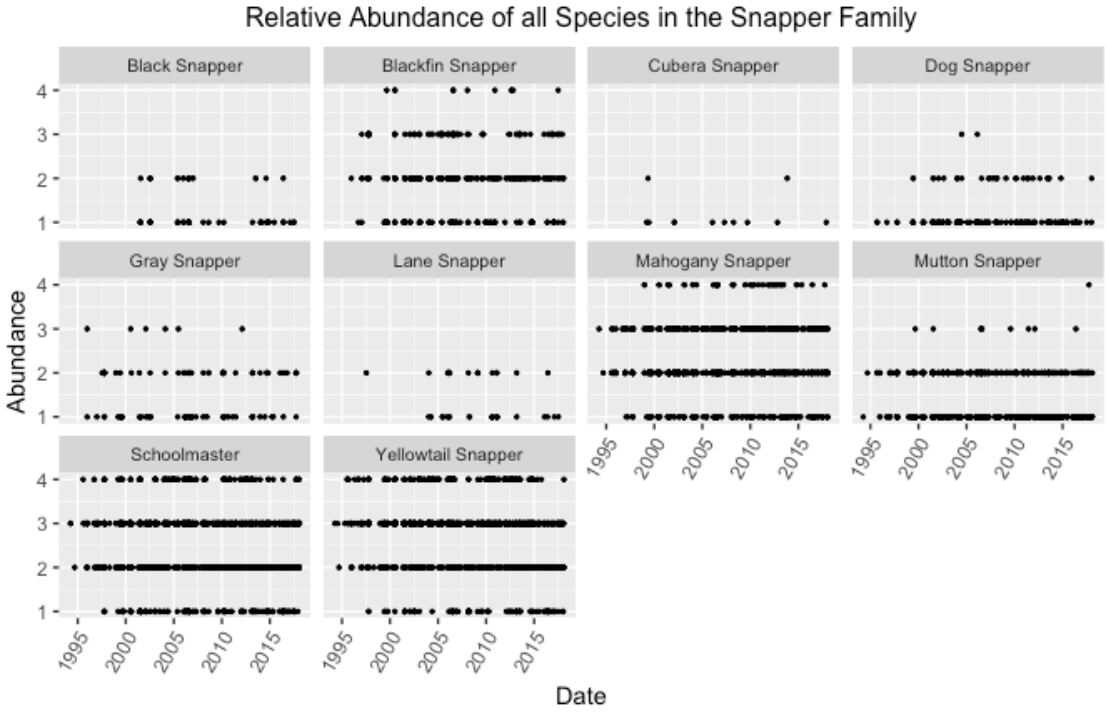

Relative Abundance of Goby Family
Abundance
4
3
2
1
1995
2000
2005
2010
2015
Date

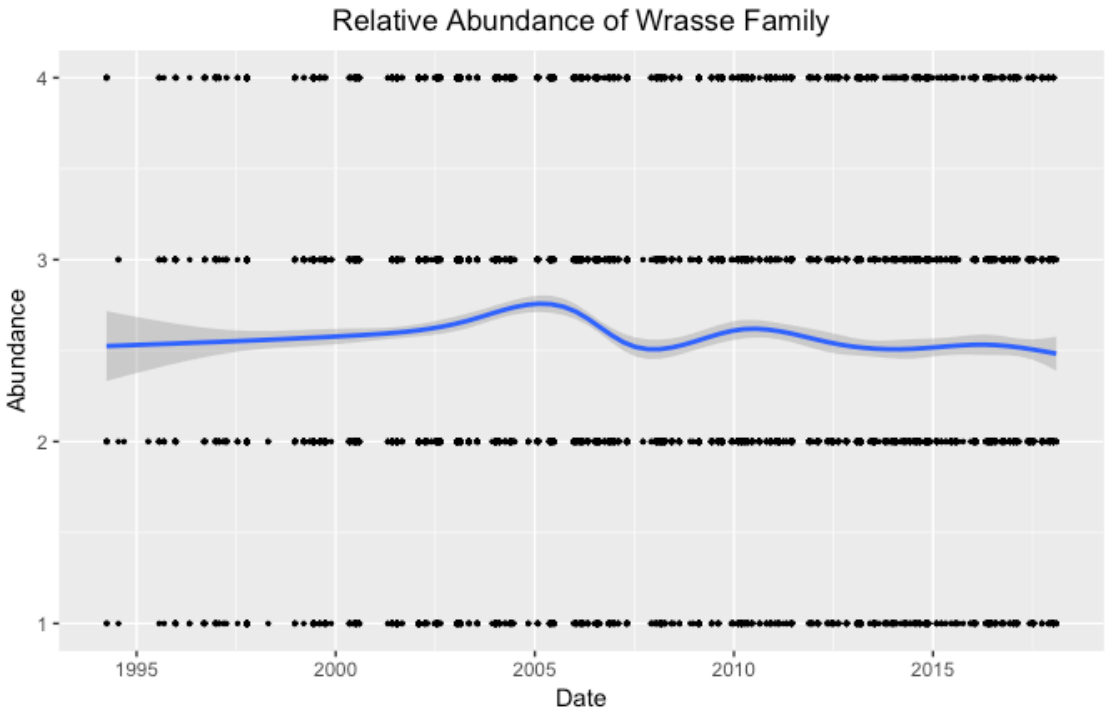

Relative Abundance of all Species in the Goby Family
mplex (Bridled/Sand-Can
Broadstripe Goby
Cayman Cleaning Goby
Cayman Sponge Goby
Colon Goby
Dash Goby
Frillfin Goby
Goldspot Goby
Greenbanded Goby
Island Goby
Leopard Goby
Masked Goby/Glass Goby
Orangesided Goby
Orangespotted Goby
Pallid Goby
Peppermint Goby
Pygmy Goby
Rusty Goby
Goby (part of Bridled Go
Seminole Goby
iscaled Goby (aka Wall G
Spotfin Goby
Spotlight Goby
Tiger Goby
Tusked Goby
Abundance
Date

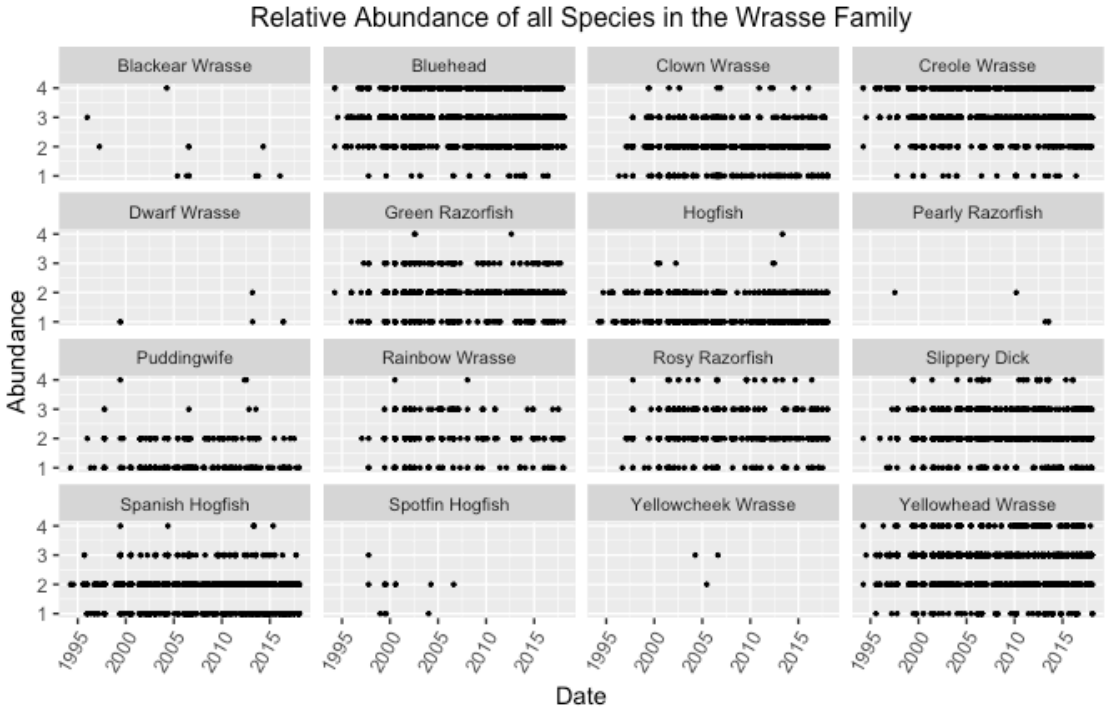

Relative Abundance of Seabass Family
Abundance
Date
1
2
3
4
1995
2000
2005
2010
2015


Relative Abundance of all Species in the Seabass Family
Abundance
Date
Bantam Bass
Barred Hamlet
Bicolor Hamlet
Black Grouper
Black Hamlet
Blue Hamlet
Butter Hamlet
Candy Basslet
Cave Basslet
Chalk Bass
Coney
Gag
Golden Hamlet
Graysby
Greater Soapfish
Hamlet - Juvenile
Harlequin Bass
Hybrid Hamlet
Indigo Hamlet
Lantern Bass
Masked Hamlet
Nassau Grouper
Red Grouper
Red Hind
Rock Hind
Scamp
School Bass
Shy Hamlet
Tan Hamlet
Tiger Grouper
Tobaccofish
Yellowfin Grouper
Yellowtail Hamlet


Relative Abundance of Snapper Family
Abundance
Date
1
2
3
4
1995
2000
2005
2010
2015


Relative Abundance of all Species in the Snapper Family
Black Snapper
Blackfin Snapper
Cubera Snapper
Dog Snapper
Gray Snapper
Lane Snapper
Mahogany Snapper
Mutton Snapper
Schoolmaster
Yellowtail Snapper
Abundance
Date

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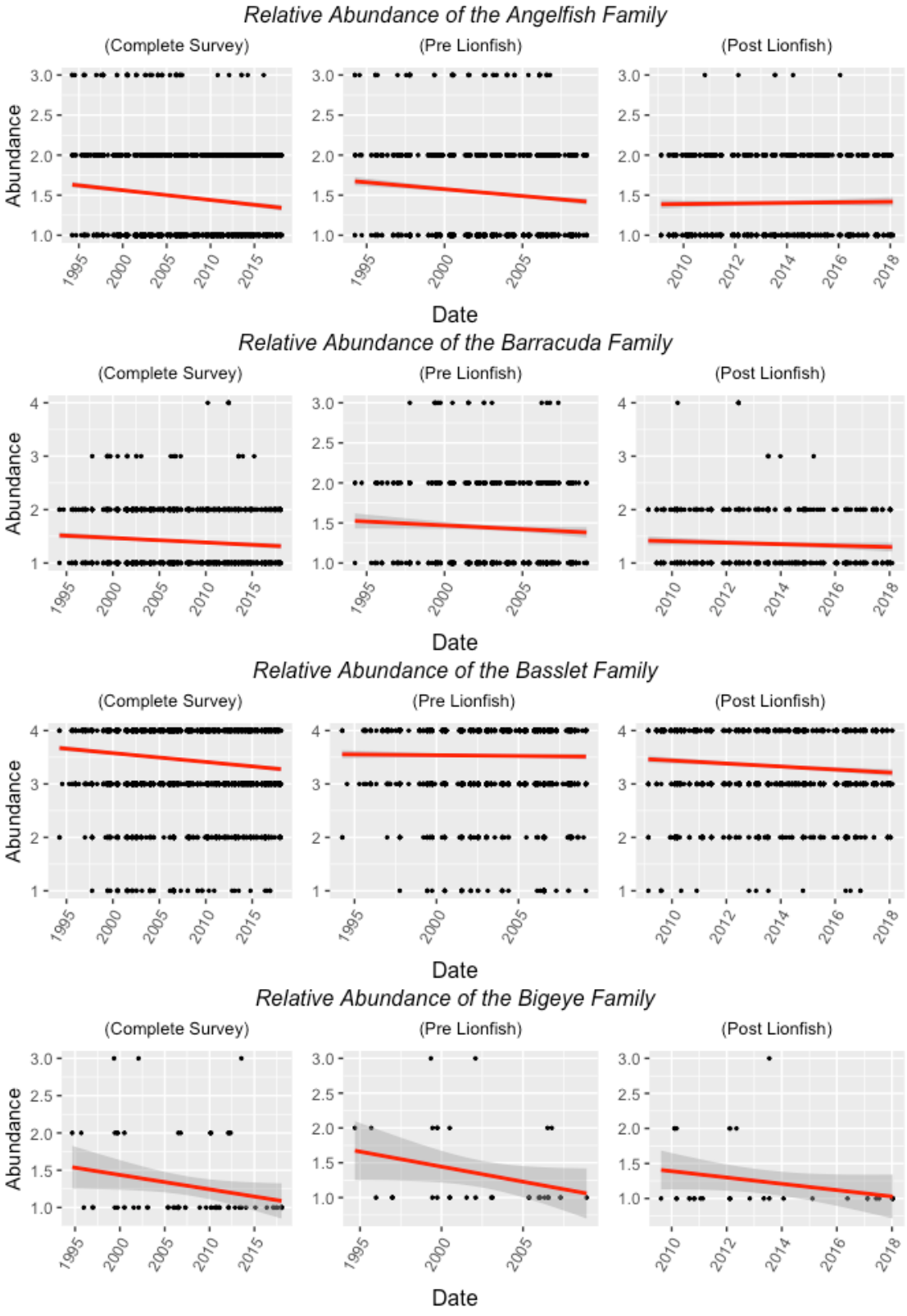
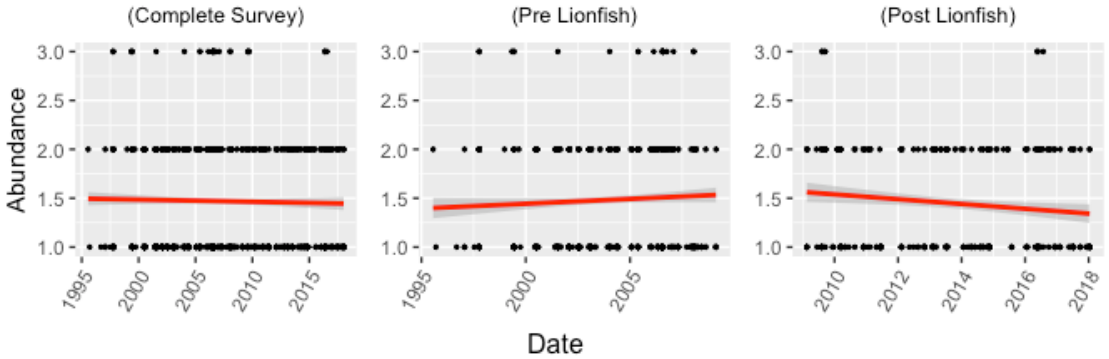
## Exploration of All Families Before and After Lionfish Invasion

The following plots show the survey data for each fish family. The plot on the left shows all the data for the named family, the center plot shows the data from when the surveys began to when the first Lionfish sighting occurred (2009-02-17) and the

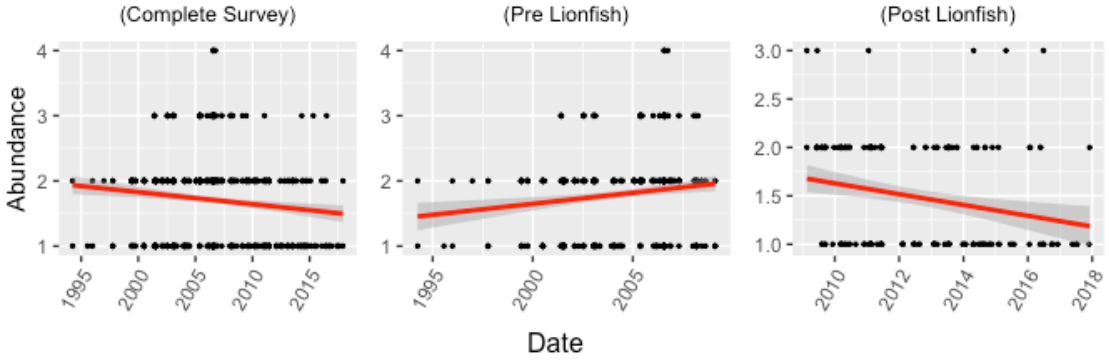
plot on the right shows the data from the first Lionfish sighting to when the data was obtained. Each sub plot has a corresponding trendline added.



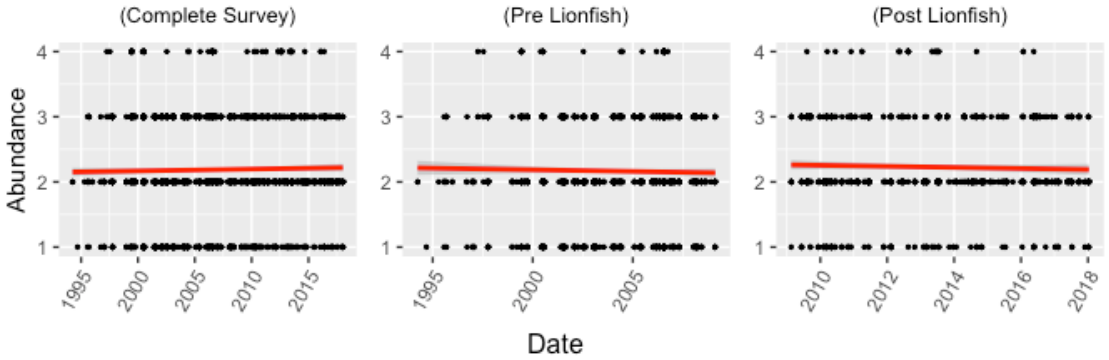
*Relative Abundance of the Blenny - Pike, tube, and flag Family*



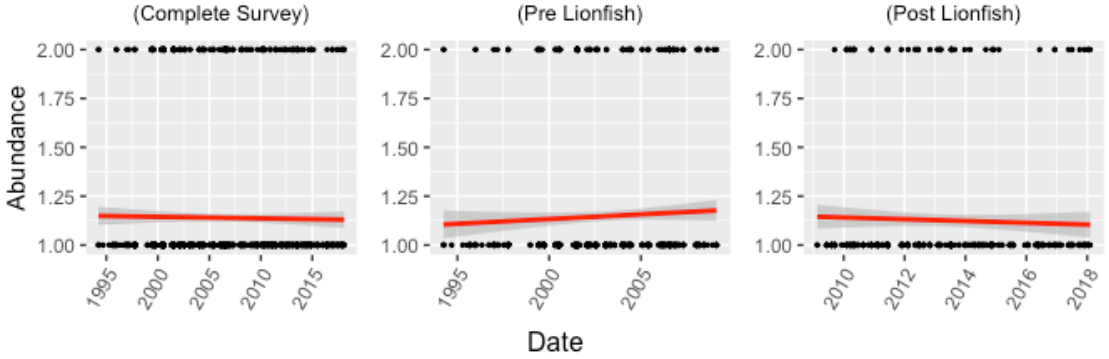

*Relative Abundance of the Blenny (Blennidae) Family*

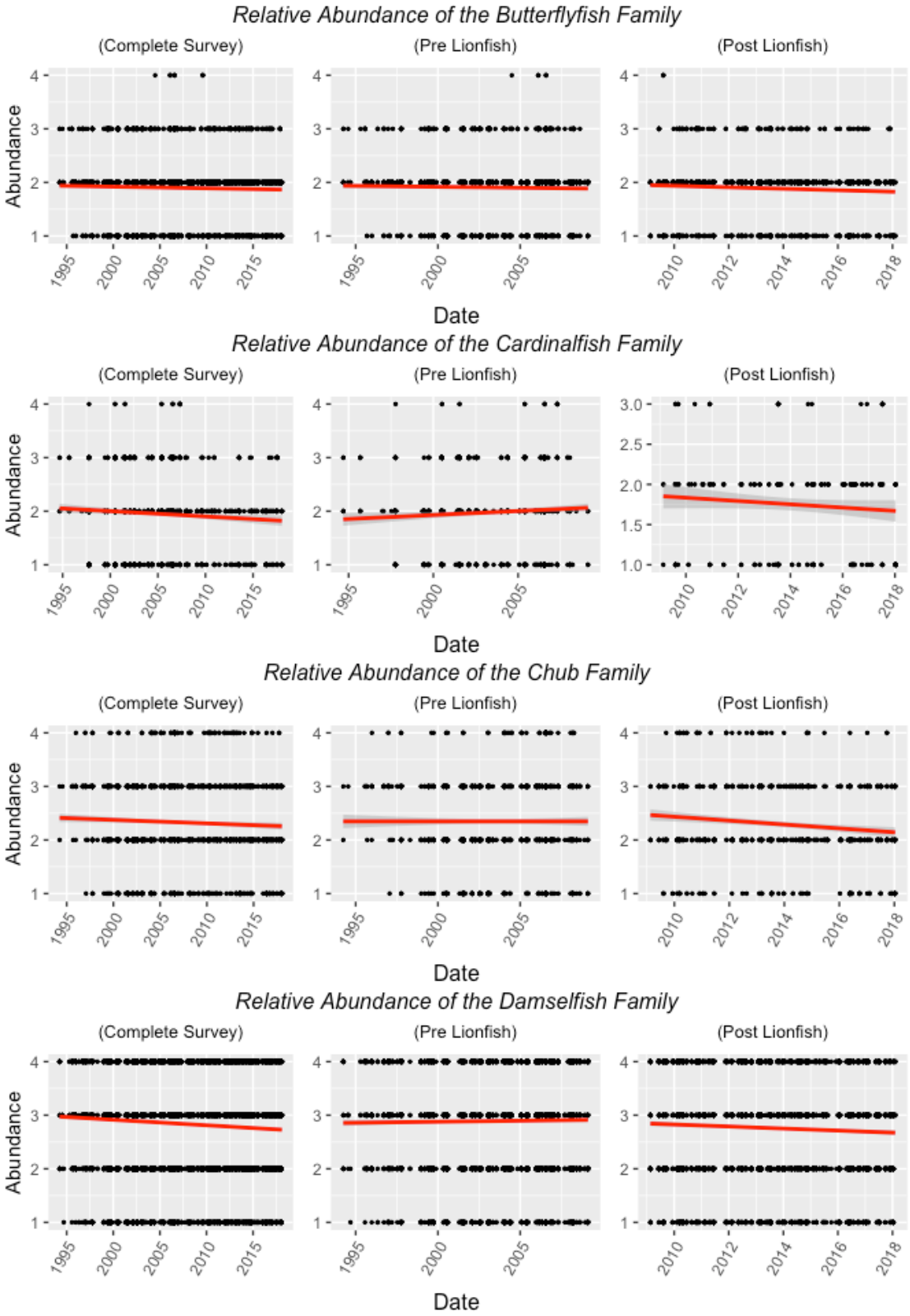


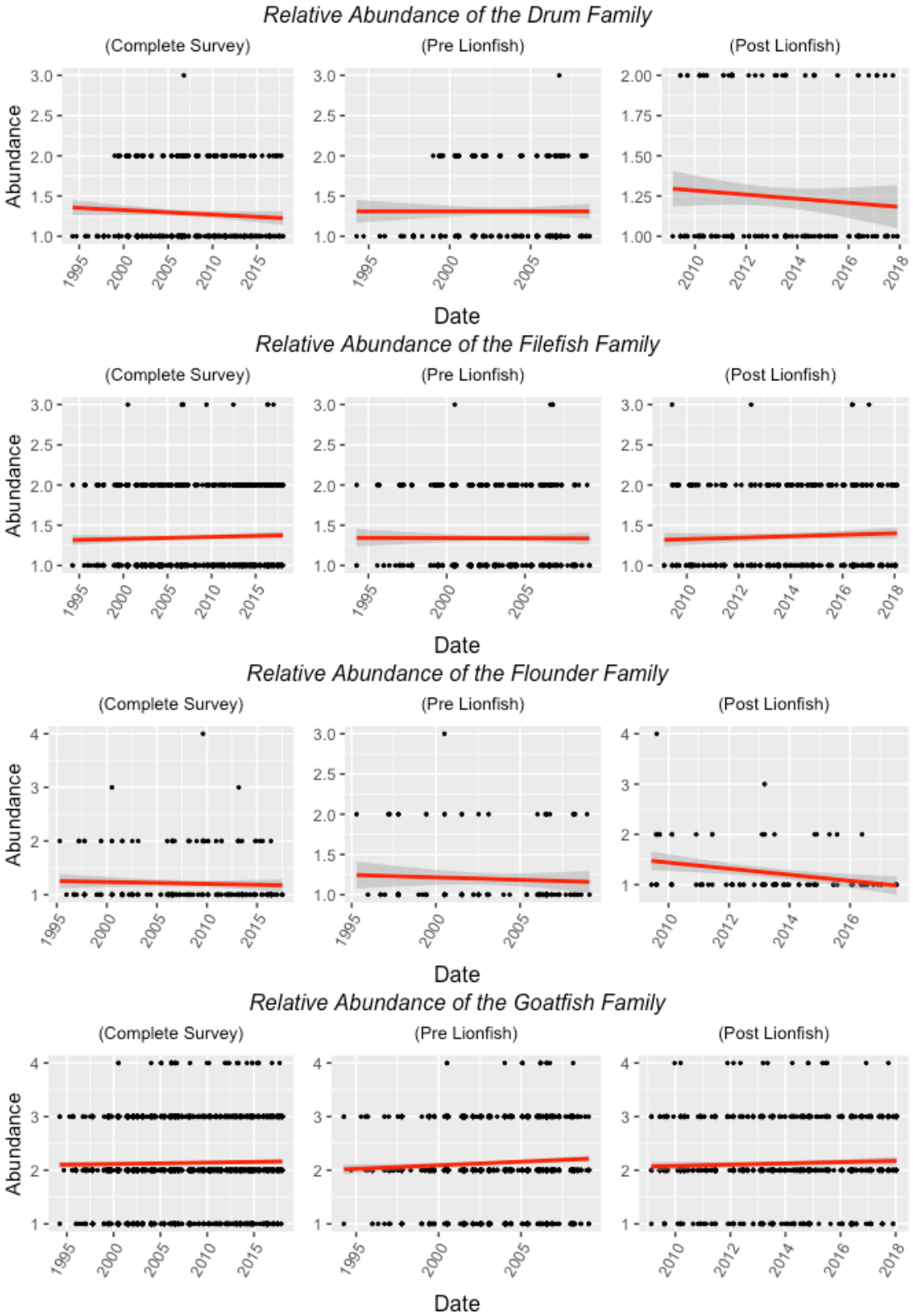

*Relative Abundance of the Blenny (Labrisomids) Family*

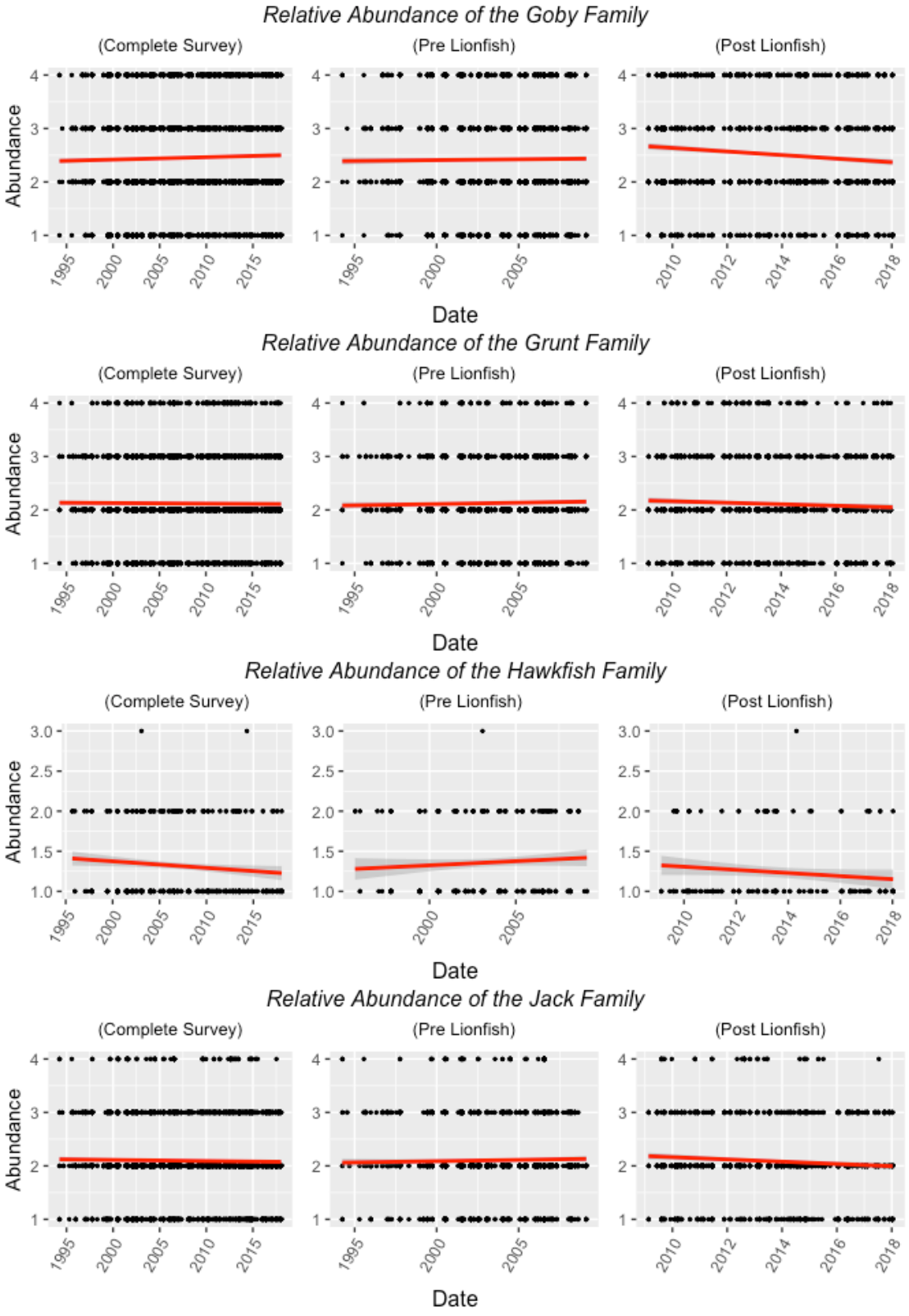



*Relative Abundance of the Boxfish Family*

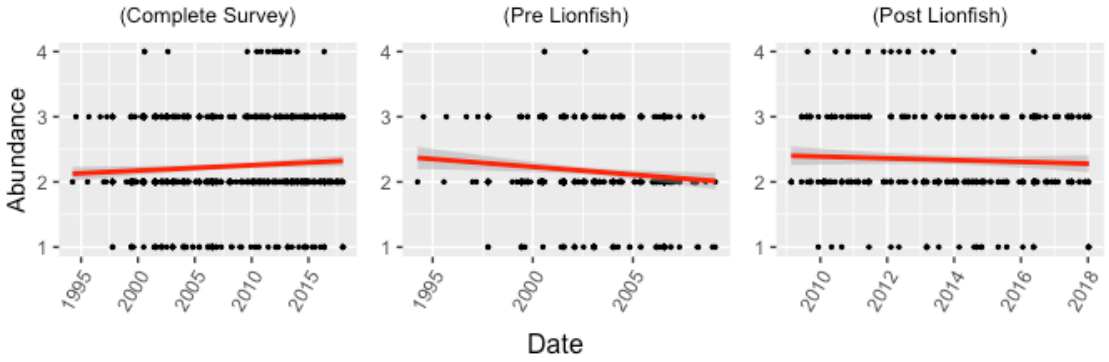



Relative Abundance of the Butterflyfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Cardinalfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Chub Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Damselfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date

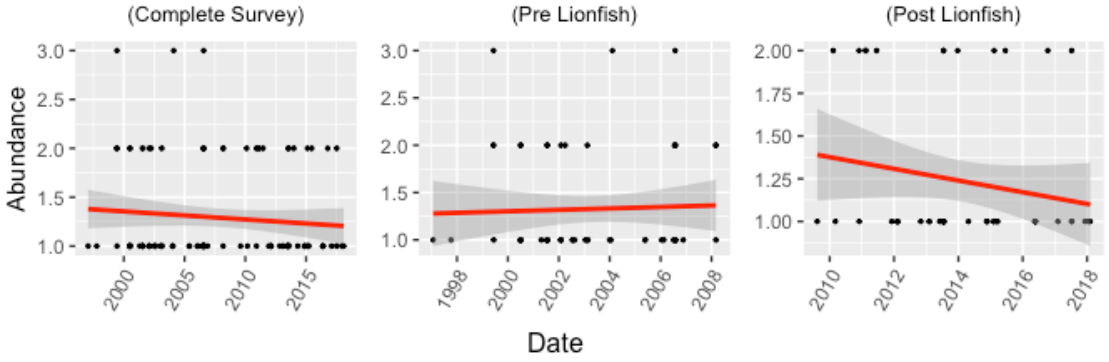

Relative Abundance of the Drum Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Filefish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Flounder Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Goatfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date


Relative Abundance of the Goby Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Grunt Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Hawkfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Jack Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date

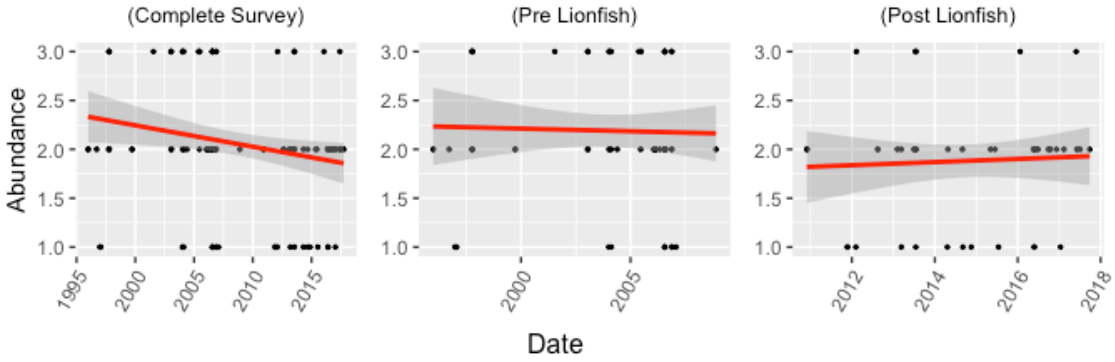
*Relative Abundance of the Jawfish Family*



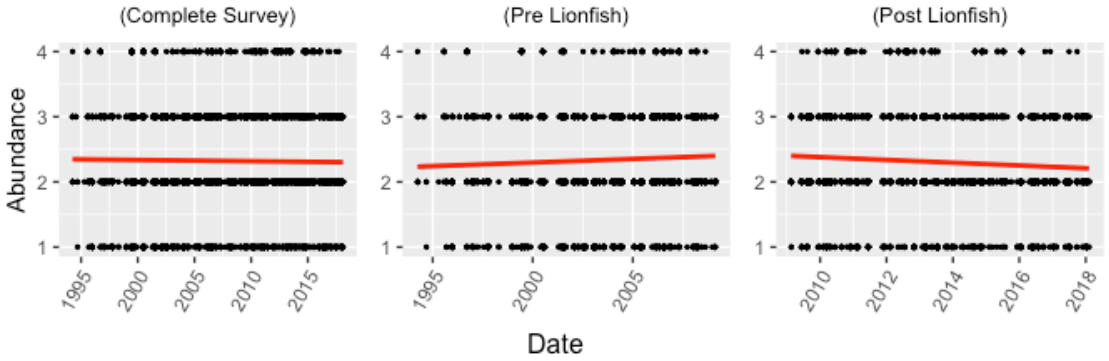

*Relative Abundance of the Lizardfish Family*

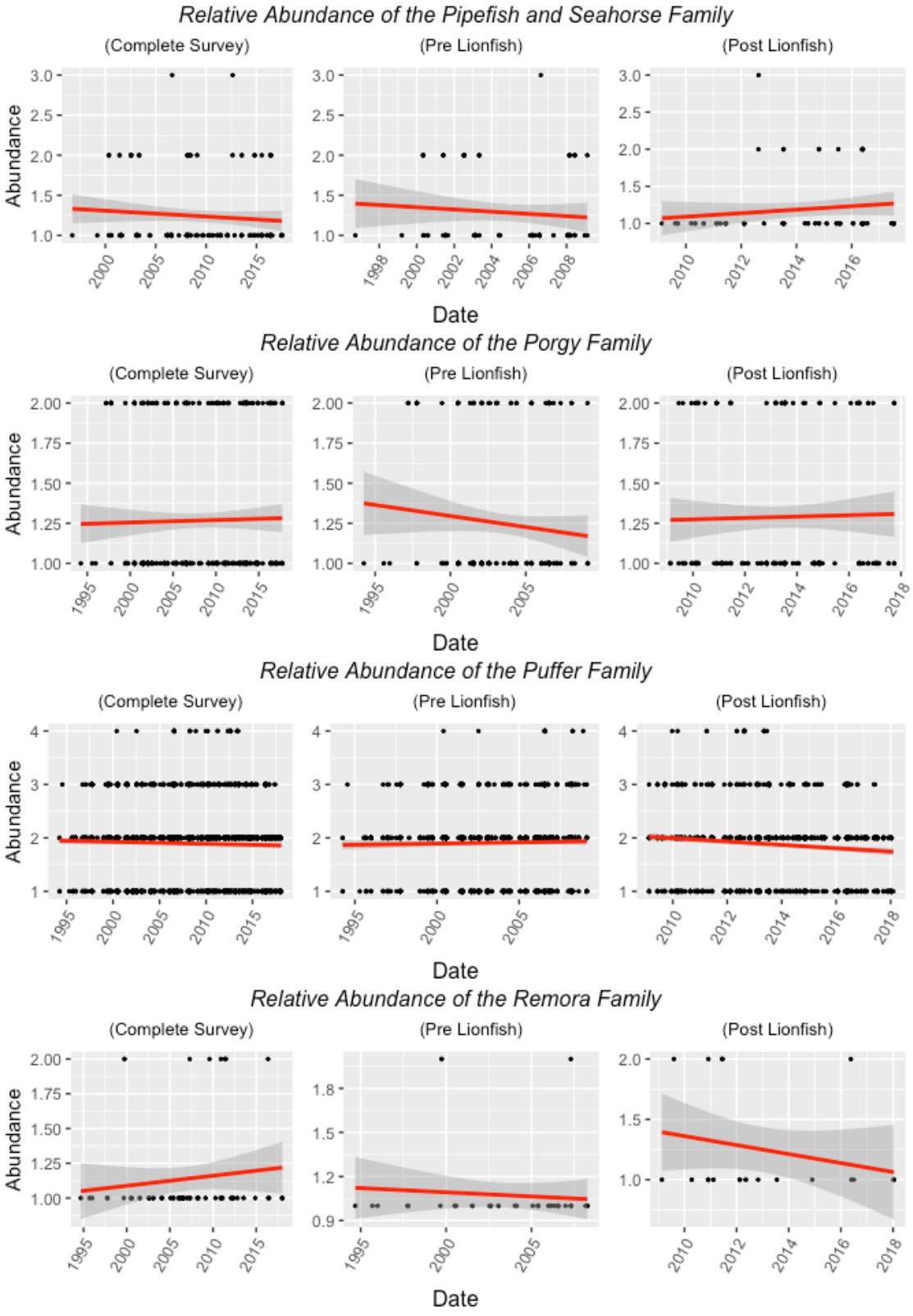


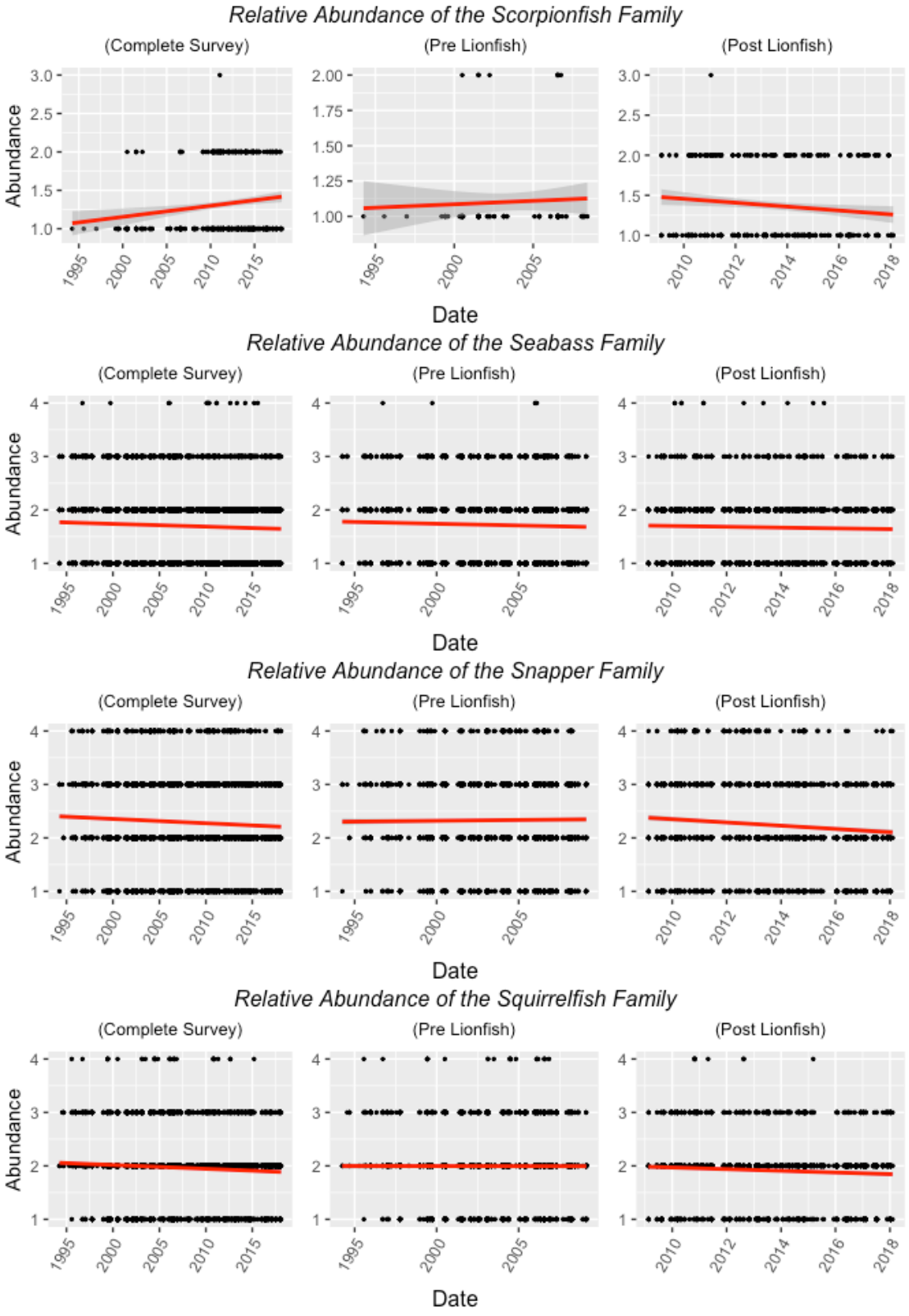

*Relative Abundance of the Mojarra Family*

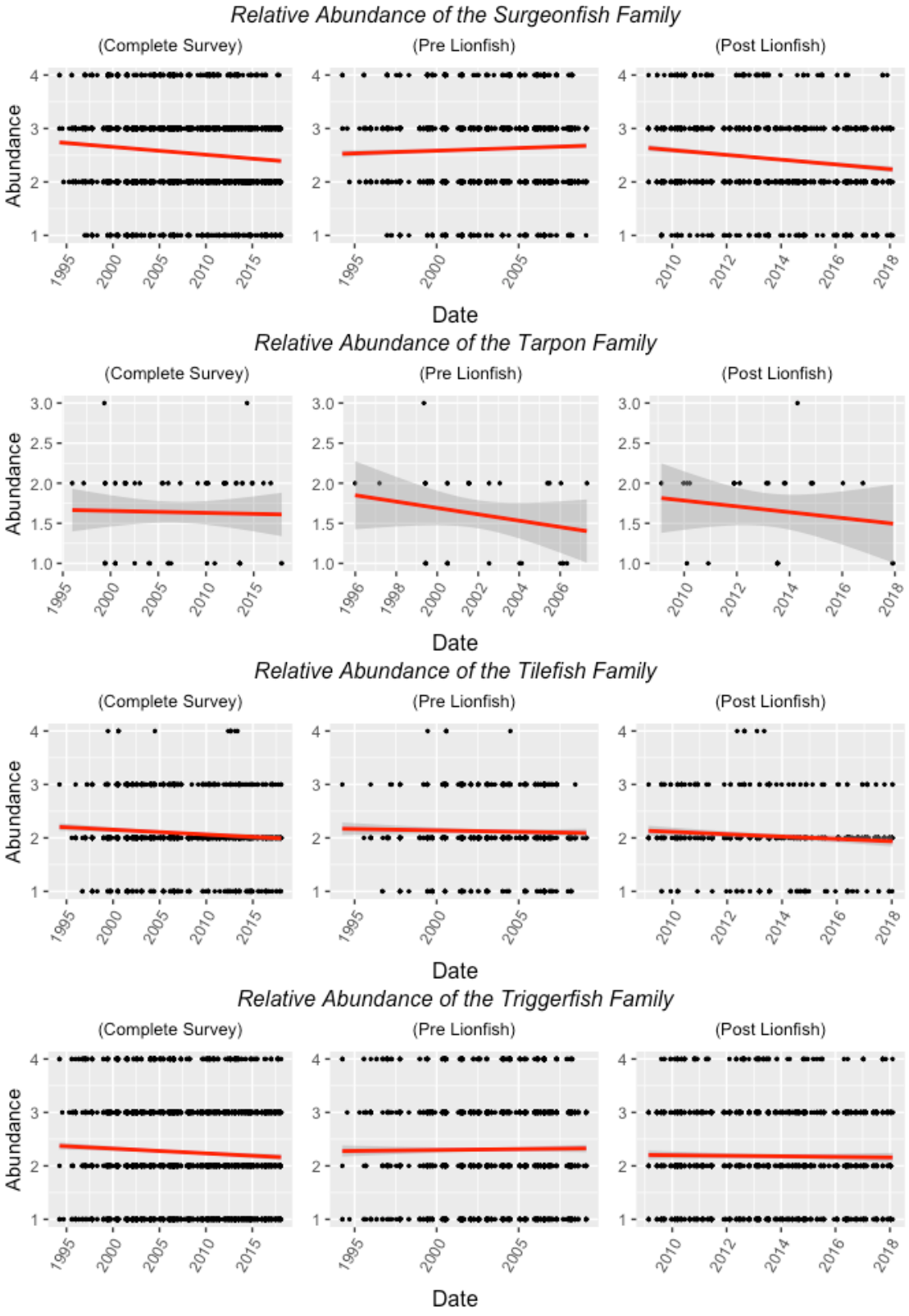


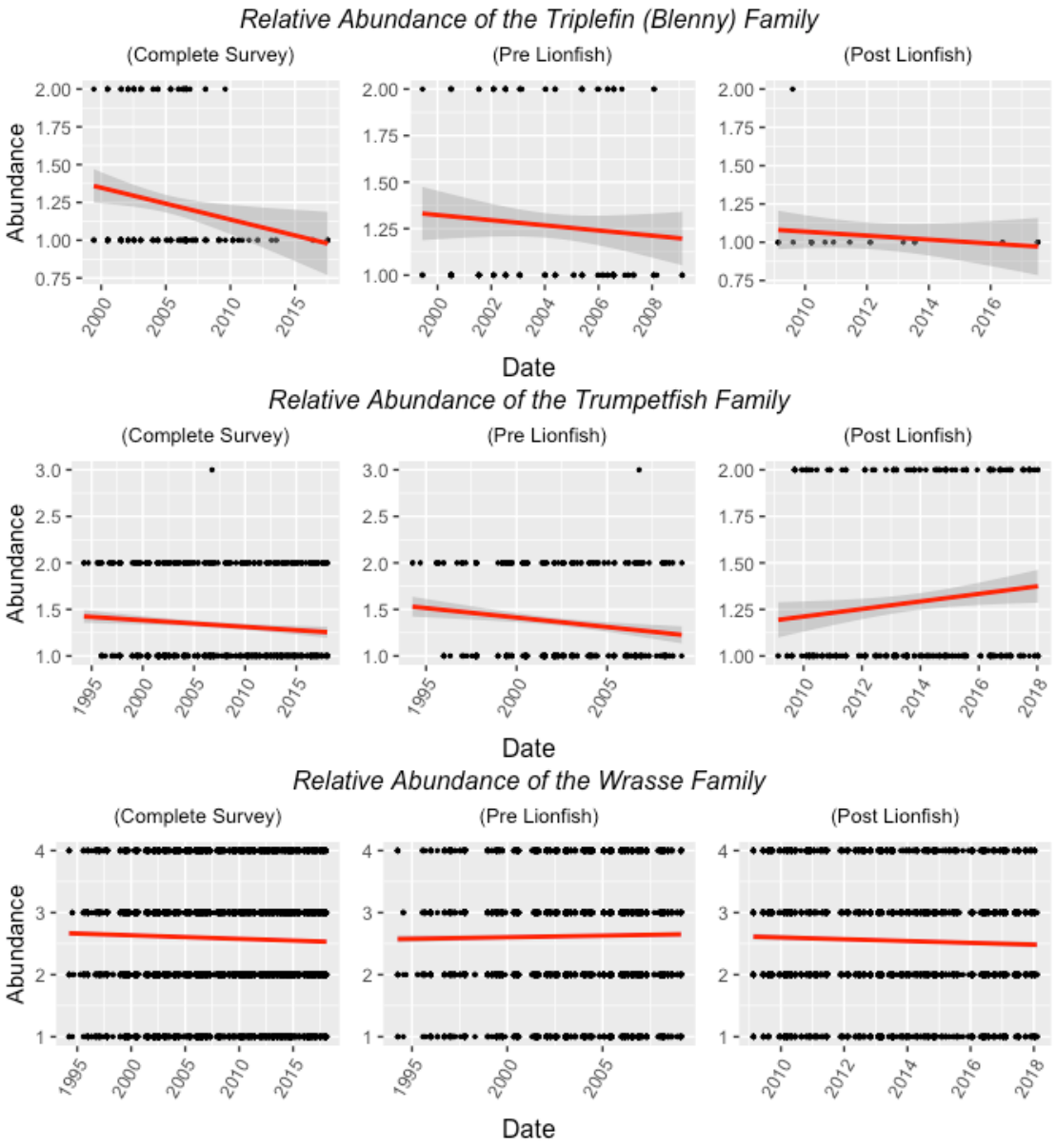

*Relative Abundance of the Parrotfish Family*




Relative Abundance of the Pipefish and Seahorse Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Porgy Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Puffer Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Remora Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date


Relative Abundance of the Scorpionfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Seabass Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Snapper Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Squirrelfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date


Relative Abundance of the Surgeonfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Tarpon Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Tilefish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date
Relative Abundance of the Triggerfish Family
(Complete Survey)
(Pre Lionfish)
(Post Lionfish)
Abundance
Date




```
## [[1]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.12486]
## 5 5 (3-3,1-3) arrange text[GRID.text.12487]
##
## [[2]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
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## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.12625]
## 5 5 (3-3,1-3) arrange text[GRID.text.12626]
##
## [[3]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.12764]
## 5 5 (3-3,1-3) arrange text[GRID.text.12765]
##
## [[4]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.12903]
## 5 5 (3-3,1-3) arrange text[GRID.text.12904]
##
## [[5]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.13042]
## 5 5 (3-3,1-3) arrange text[GRID.text.13043]
##
## [[6]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.13181]
## 5 5 (3-3,1-3) arrange text[GRID.text.13182]
##
## [[7]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.13320]
## 5 5 (3-3,1-3) arrange text[GRID.text.13321]
##
## [[8]]
```

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## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.13459]
## 5 5 (3-3,1-3) arrange text[GRID.text.13460]
##
## [[9]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.13598]
## 5 5 (3-3,1-3) arrange text[GRID.text.13599]
##
## [[10]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.13737]
## 5 5 (3-3,1-3) arrange text[GRID.text.13738]
##
## [[11]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.13876]
## 5 5 (3-3,1-3) arrange text[GRID.text.13877]
##
## [[12]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.14015]
## 5 5 (3-3,1-3) arrange text[GRID.text.14016]
##
## [[13]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
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## 4 4 (1-1,1-3) arrange text[GRID.text.14154]
## 5 5 (3-3,1-3) arrange text[GRID.text.14155]
##
## [[14]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.14293]
## 5 5 (3-3,1-3) arrange text[GRID.text.14294]
##
## [[15]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.14432]
## 5 5 (3-3,1-3) arrange text[GRID.text.14433]
##
## [[16]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.14571]
## 5 5 (3-3,1-3) arrange text[GRID.text.14572]
##
## [[17]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.14710]
## 5 5 (3-3,1-3) arrange text[GRID.text.14711]
##
## [[18]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.14849]
## 5 5 (3-3,1-3) arrange text[GRID.text.14850]
##
## [[19]]
## TableGrob (3 x 3) "arrange": 5 grobs
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```
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.14988]
## 5 5 (3-3,1-3) arrange text[GRID.text.14989]
##
## [[20]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.15127]
## 5 5 (3-3,1-3) arrange text[GRID.text.15128]
##
## [[21]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.15266]
## 5 5 (3-3,1-3) arrange text[GRID.text.15267]
##
## [[22]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.15405]
## 5 5 (3-3,1-3) arrange text[GRID.text.15406]
##
## [[23]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.15544]
## 5 5 (3-3,1-3) arrange text[GRID.text.15545]
##
## [[24]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.15683]
```

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## 5 5 (3-3,1-3) arrange text[GRID.text.15684]
##
## [[25]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.15822]
## 5 5 (3-3,1-3) arrange text[GRID.text.15823]
##
## [[26]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.15961]
## 5 5 (3-3,1-3) arrange text[GRID.text.15962]
##
## [[27]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.16100]
## 5 5 (3-3,1-3) arrange text[GRID.text.16101]
##
## [[28]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.16239]
## 5 5 (3-3,1-3) arrange text[GRID.text.16240]
##
## [[29]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.16378]
## 5 5 (3-3,1-3) arrange text[GRID.text.16379]
##
## [[30]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                grob
```

```
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.16517]
## 5 5 (3-3,1-3) arrange text[GRID.text.16518]
##
## [[31]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.16656]
## 5 5 (3-3,1-3) arrange text[GRID.text.16657]
##
## [[32]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.16795]
## 5 5 (3-3,1-3) arrange text[GRID.text.16796]
##
## [[33]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.16934]
## 5 5 (3-3,1-3) arrange text[GRID.text.16935]
##
## [[34]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.17073]
## 5 5 (3-3,1-3) arrange text[GRID.text.17074]
##
## [[35]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.17212]
## 5 5 (3-3,1-3) arrange text[GRID.text.17213]
```

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##
## [[36]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.17351]
## 5 5 (3-3,1-3) arrange text[GRID.text.17352]
##
## [[37]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.17490]
## 5 5 (3-3,1-3) arrange text[GRID.text.17491]
##
## [[38]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.17629]
## 5 5 (3-3,1-3) arrange text[GRID.text.17630]
##
## [[39]]
## TableGrob (3 x 3) "arrange": 5 grobs
##   z     cells    name                 grob
## 1 1 (2-2,1-1) arrange        gtable[layout]
## 2 2 (2-2,2-2) arrange        gtable[layout]
## 3 3 (2-2,3-3) arrange        gtable[layout]
## 4 4 (1-1,1-3) arrange text[GRID.text.17768]
## 5 5 (3-3,1-3) arrange text[GRID.text.17769]
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