HURRICANE ISLAND – SCALLOP PROJECT

Data Analysis by TEAM – Inquisitors

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INTRODUCTION – STAKEHOLDERS WHO CARE

- *Midcoast Maine Collaborative Scallop Project*
  - Part of the Hurricane Island Initiative
  - Centers around studying the growth rates and characteristics of scallops
  - Kept in enclosed wells of water near the sea.
  - Scallops pulled and weighed.
  - Temperature and luminance of water recorded.
  - Wanted us to perform analysis on whether various environmental conditions affected the growth of the scallops.

RESEARCH QUESTIONS

1. Differences in growth rate of Male and Female scallops?
2. How gear types impact the growth of scallops?
3. How does temperature differ between surface of the net and bottom of Cage?
4. Temperature gradients over 2 years?
5. How does temperature and Light intensity levels vary at surface of the Net and Bottom of the Net?
6. What is the relation of environmental temperature and gear types to the weights of scallop? (meat weight, viscera weight, etc.)?

DATA

- Data was collected in periods over several months, daily.
- These scallops were kept in pools near, but separate from ocean. Closed off for years.
- Some kept in cages, some in nets.
- Two Types of Data sheets we worked with:
  - Cage/Net Data
  - SPAT Data

DATA CONT.

- Cage/Net Data – Sampled every 15 minutes
  - Date
  - Temperature
  - Luminescence/Square feet – Amount of light measured

- SPAT Data – Measures of individual scallops pulled from the water
  - Surface Temp – Average water temp where the scallop was located
  - Gear Type – Kept in Net or Cage
  - Sex
  - Shell Height – mm
  - Total Visceral Weight – All organs and tissue
  - Meat Weight – Muscles
  - Gonad Weight – Reproductive organs
  - Shell Weight
  - GSI – Gonadosomadic Index – Proportion of gonad weight to tissue weight

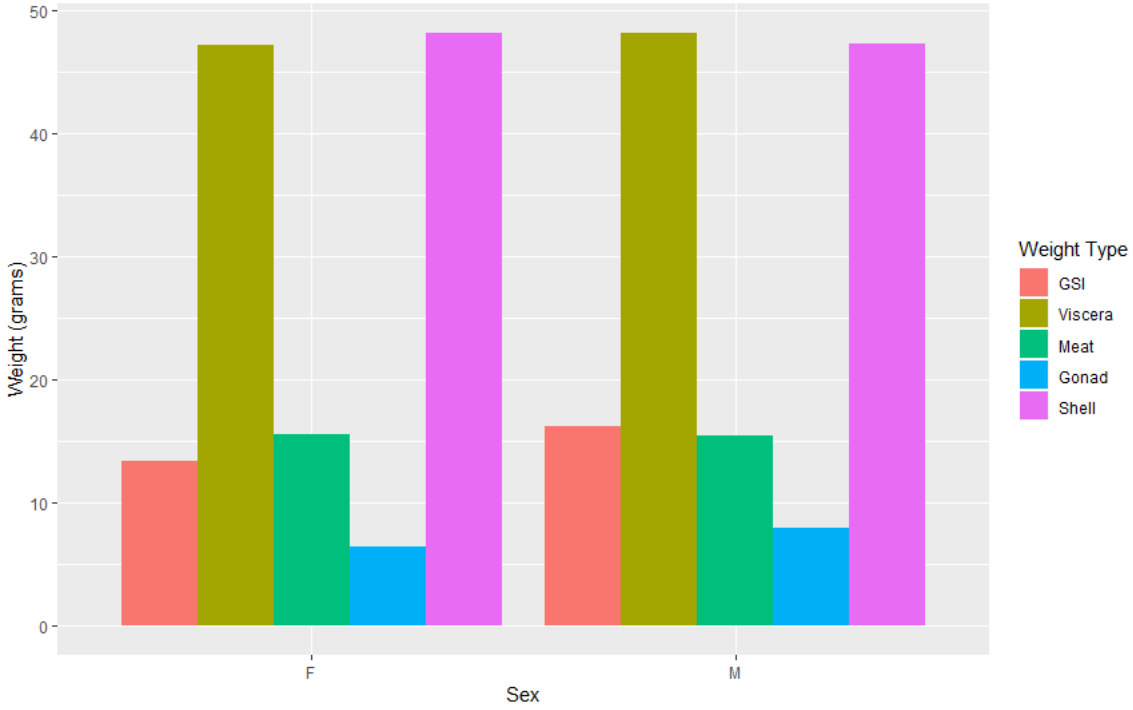
USAGE/LIMITATIONS OF THE DATA

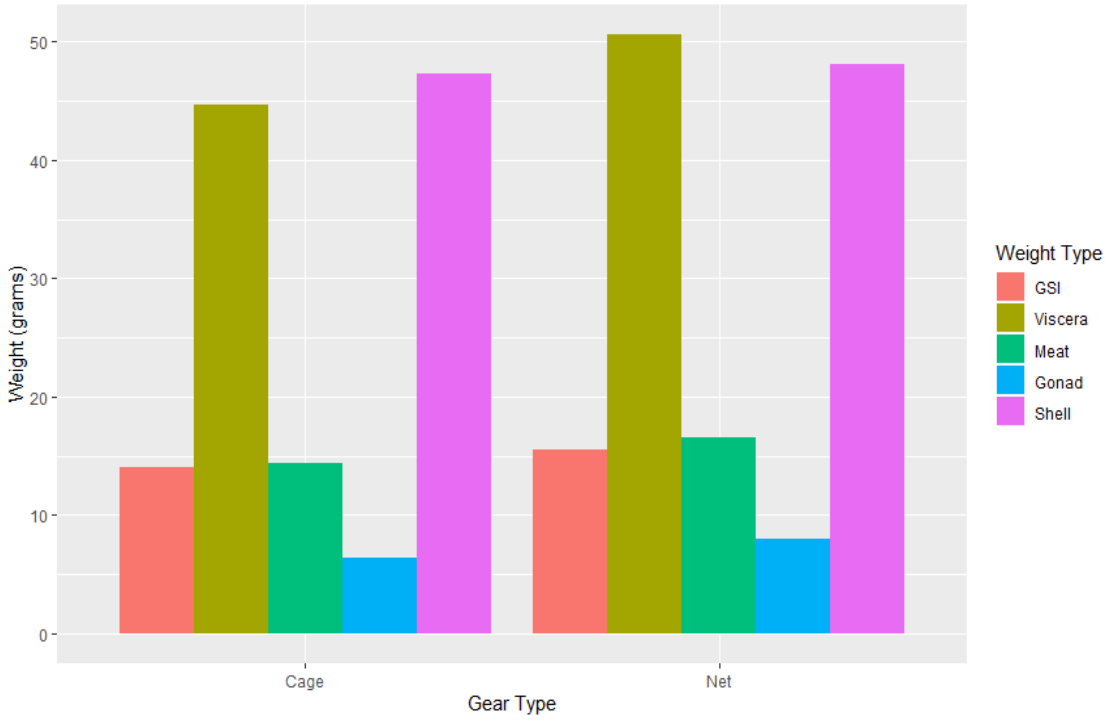
- Data cleaning primarily consisted of removing incomplete data and formatting.
- Some entries had to be excluded due to typos, caused some problems earlier.
- Main issues with data revolved around limited overlapping values with the Net/Cage data and SPAT data.
  - Some parts as few as 6 points overlapping
- Temperature tests were difficult because they were for only two levels of depth, not the whole length of the net.

DATA ANALYSIS

- Rplots of the different combinations of data related to our research questions.
- Analysis of each plot
- For analysis purposes we used average temperatures and intensity across all sheets for the course of a day and used those.

SEX & GEAR TYPE VS. WEIGHT





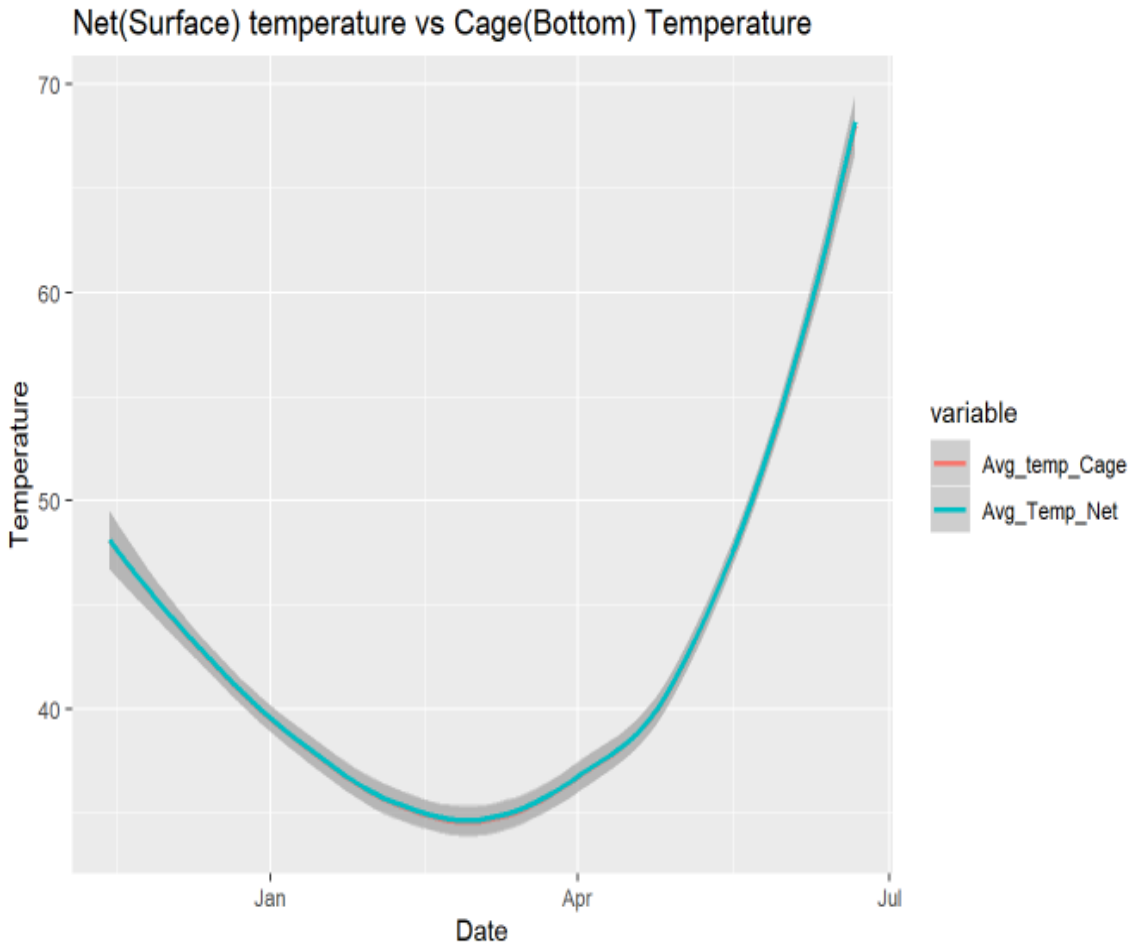
Note: GSI is a ratio, not measured in grams

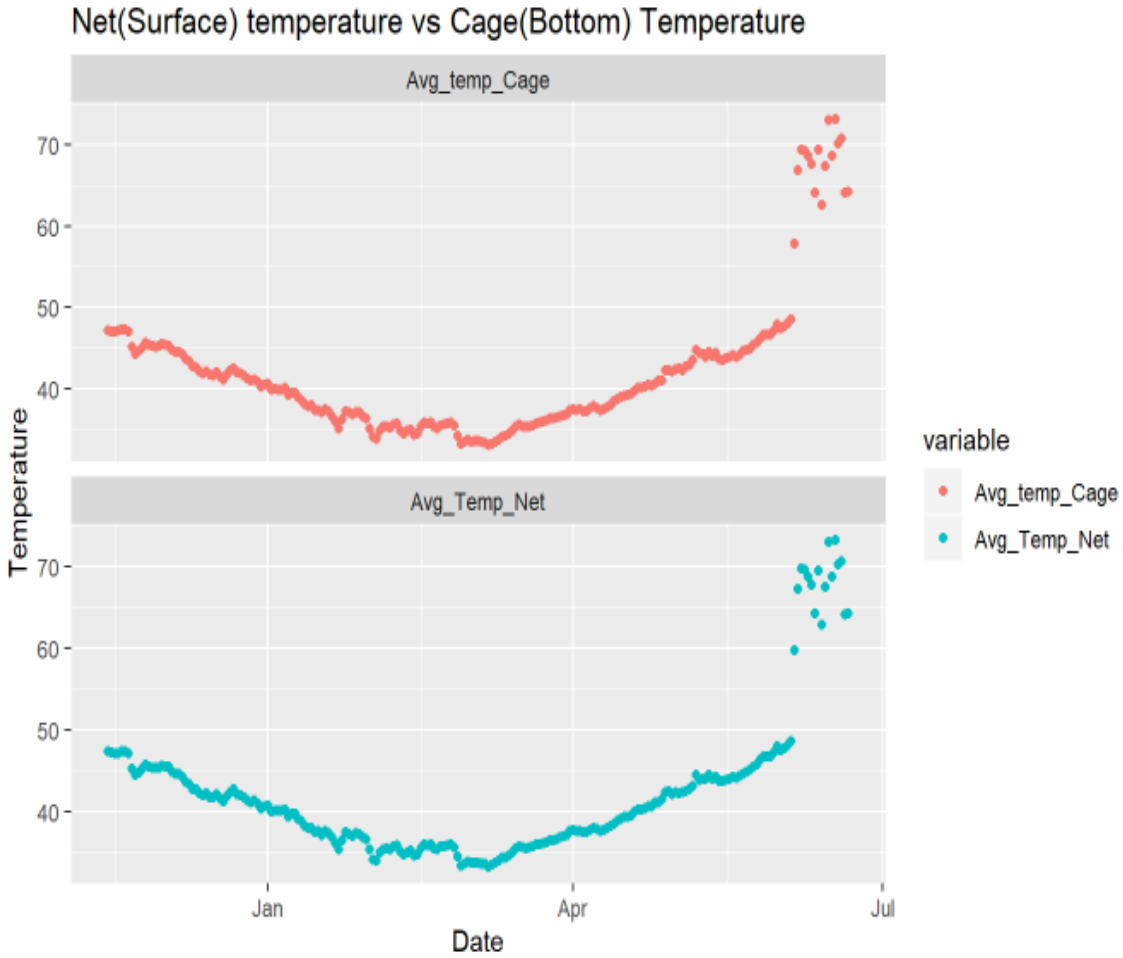
Answers Research Questions – 1 & 2

SEX & GEAR TYPE VS. WEIGHT

- Graphs look virtually identical across both categories on both sides
  - Slight Increase in Visceral Weight for nets vs. cages
- Reasonably conclude that these have no bearing on weight.
- Further breakdowns of categories like Nets levels were inconclusive.

NET SURFACE VS CAGE BOTTOM TEMPERATURE



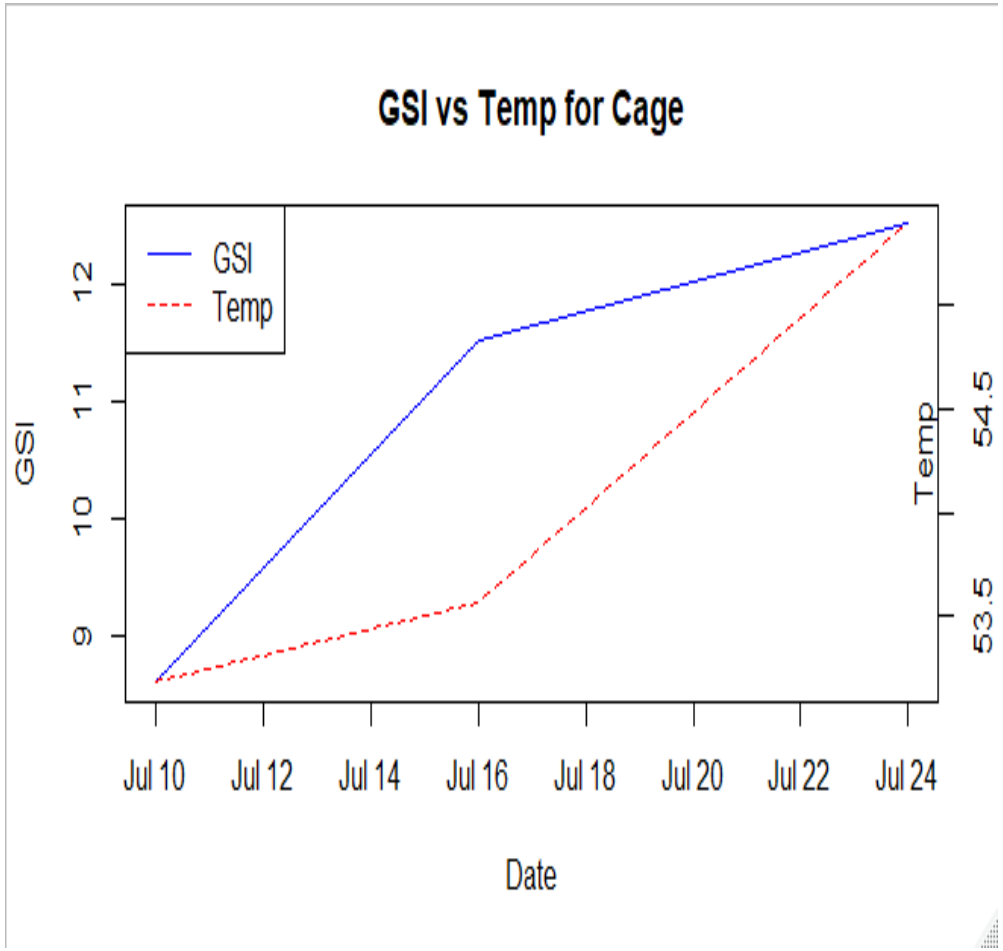


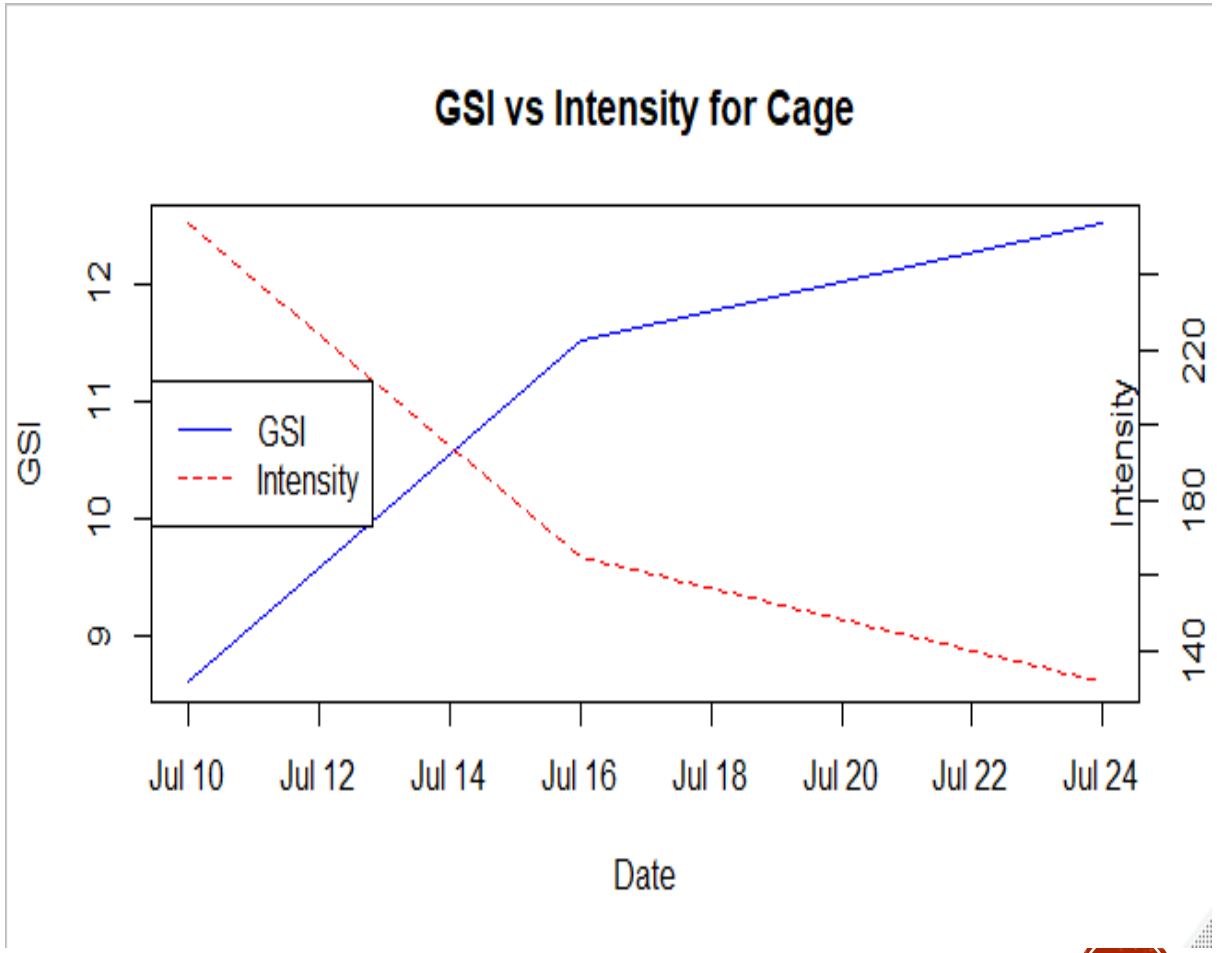
Answers Research Questions – 3

NET SURFACE VS CAGE BOTTOM TEMPERATURE (CONTD...)

- Average temperature for the surface and bottom temperature are identical.
- Both follow similar trend and are observed to be overlapping.

AVG GSI VS AVG TEMPERATURE AND INTENSITY FOR CAGE

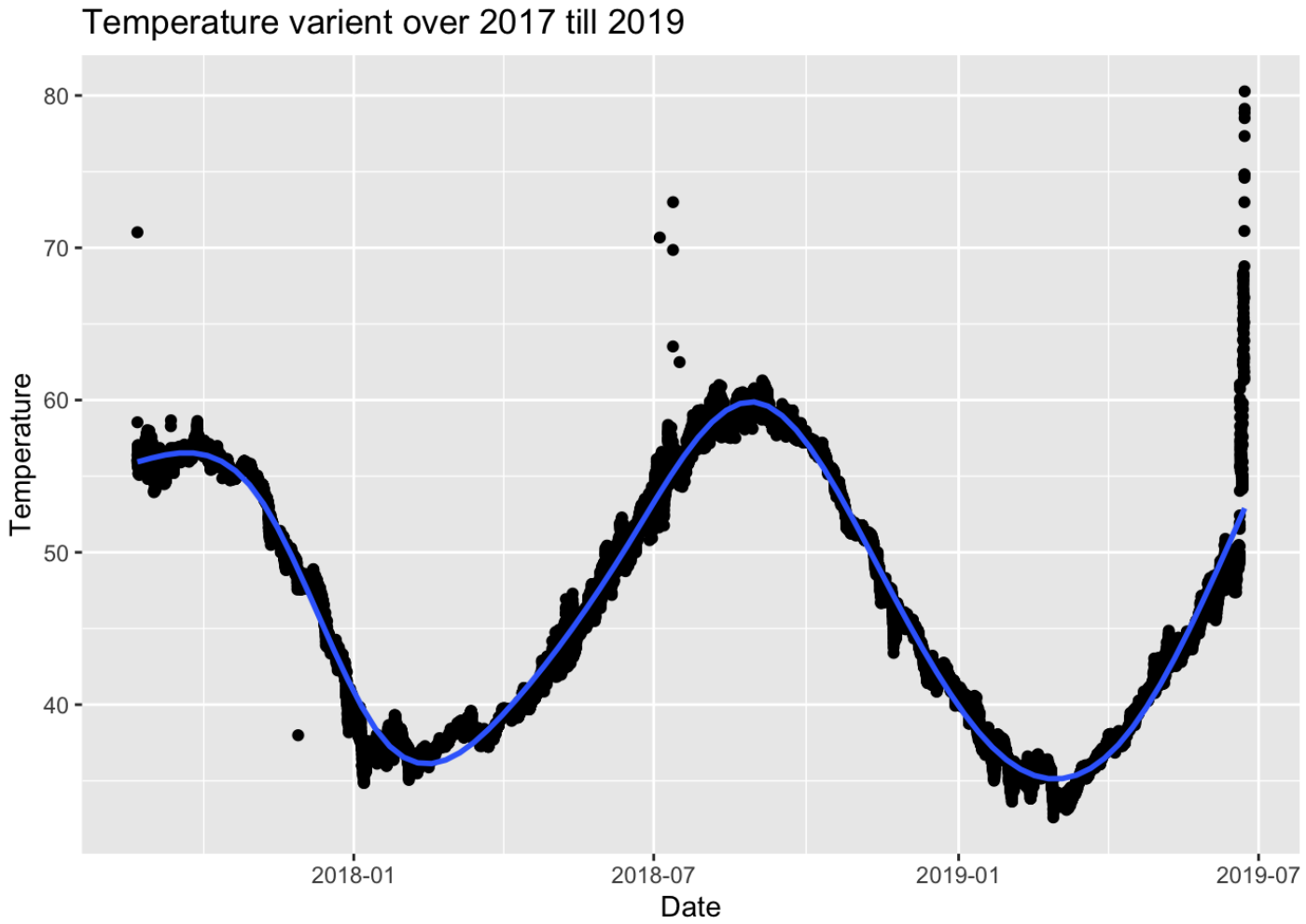




AVG GSI VS AVG TEMPERATURE AND INTENSITY FOR CAGE (CONTD...)

- Average GSI and Average Temperature for Cage is directly proportional to each other as per the graph while it is indirectly proportional to Intensity.
- Average GSI and Average Temperature increases for the month of July while the Intensity decreases.
- Above plot is for three data points.
- Due to less data, the plot is inconclusive.

TEMPERATURE GRADIENT OVER 2 YEARS

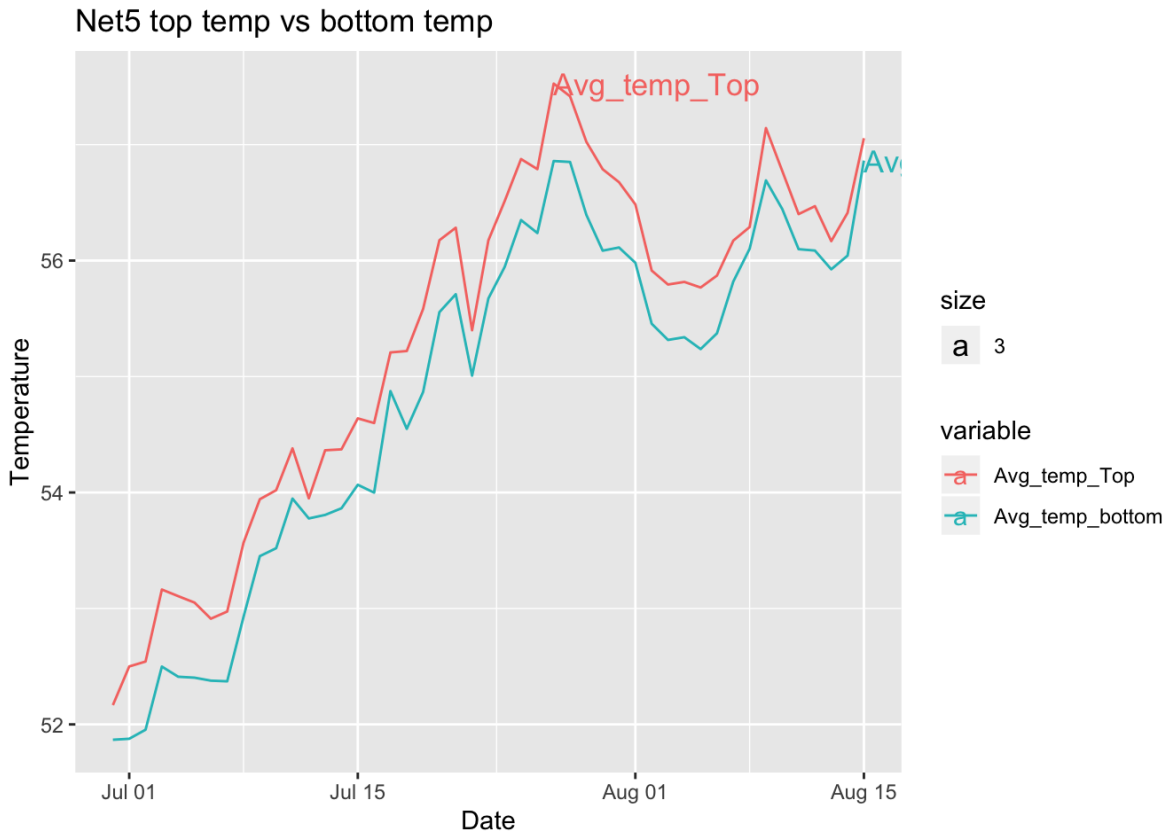


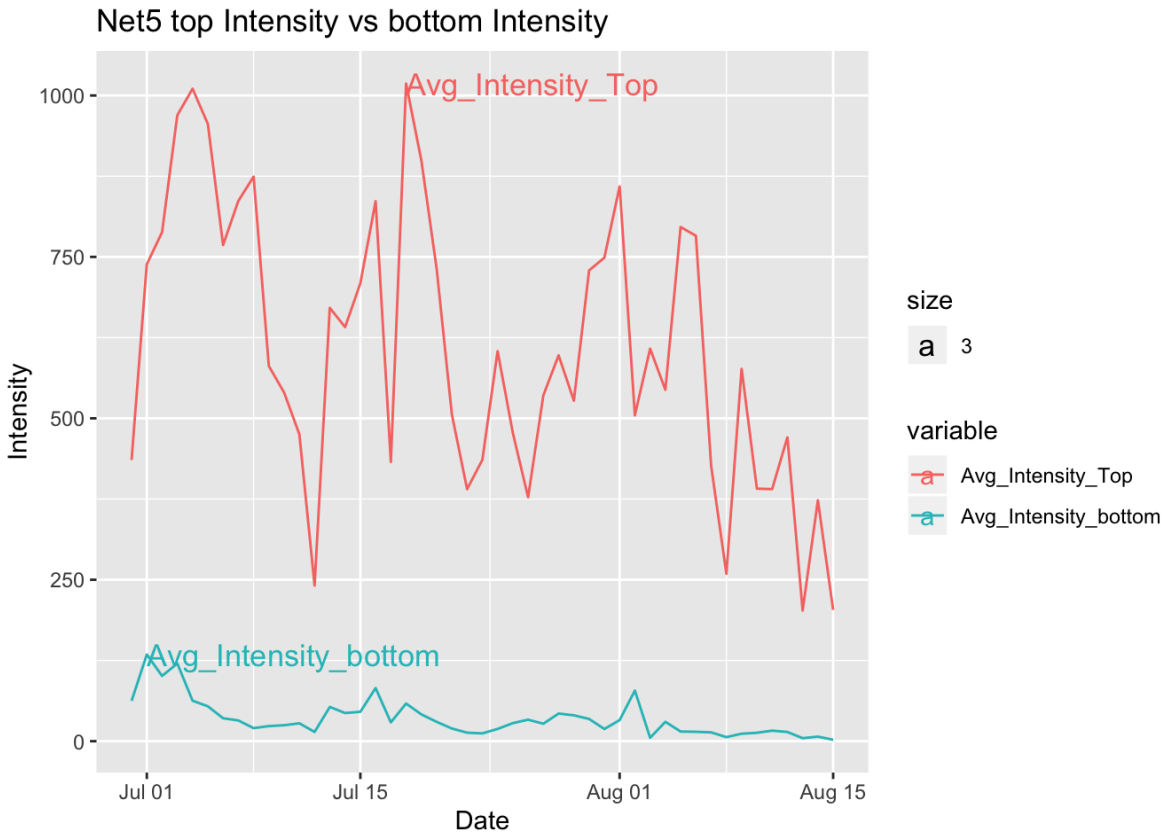
Answers Research Questions – 4

TEMPERATURE GRADIENT OVER 2 YEARS

- It can be observed that the temperature rises in the months of august.
- The average peak temperature is observed to have increased in the year 2018 whereas the lows are observed to decrease in 2019.

NET – TOP VS BOTTOM – TEMPERATURE AND INTENSITY



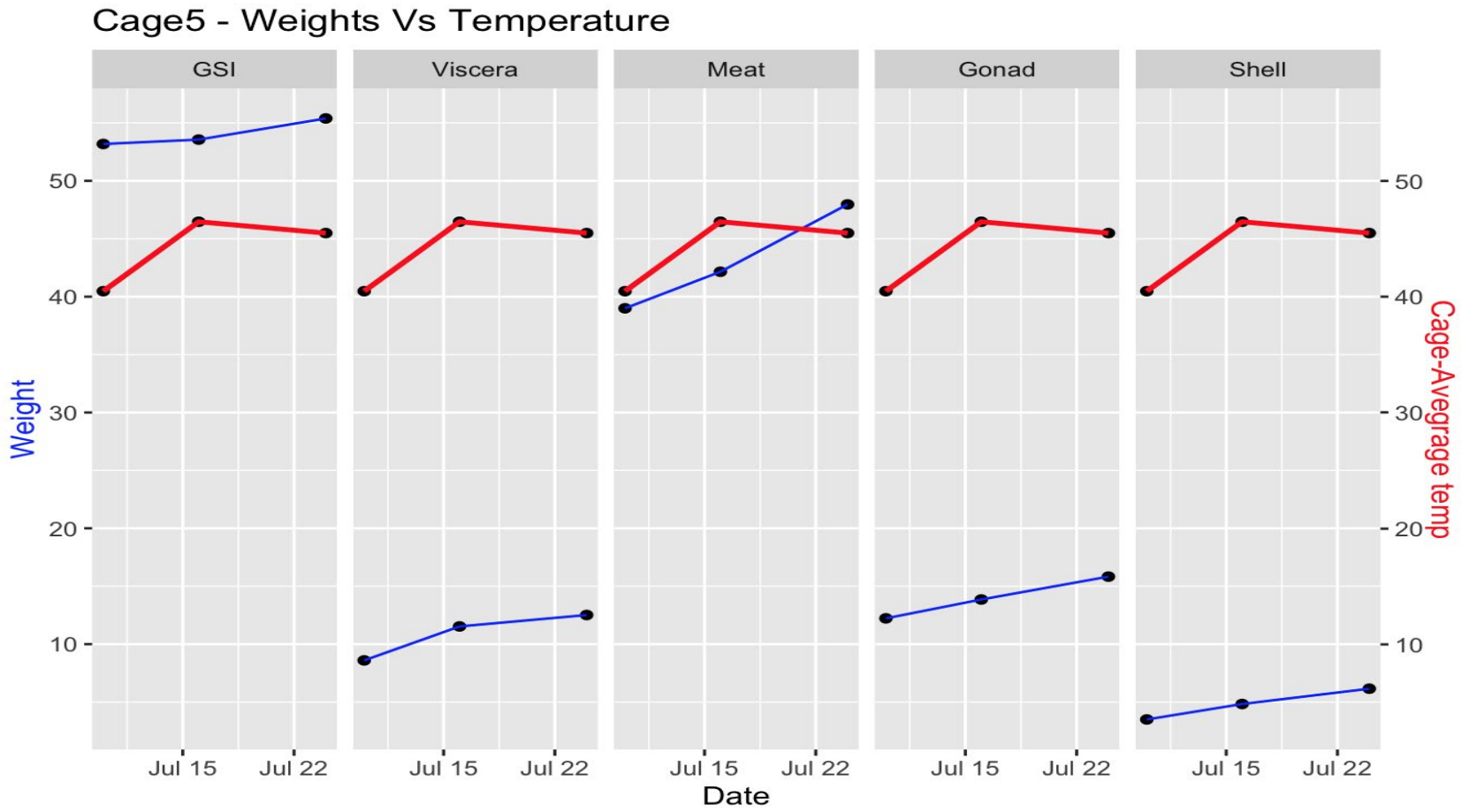


Answers Research Questions – 5

NET – TOP TEMPERATURE VS BOTTOM TEMPERATURE

- The average of temperatures is calculated for each day and plotted against date for both Net top and Net bottom.
- The temperatures at top and bottom both follow the same trend and shows the difference is almost constant.
- A few differences July first week and August second week.
- It can be observed that the intensity at the bottom did not vary much and stayed below 250
- Intensity at the top of the net varied from 230 to more than 1000.
- Big difference was observed in July but eventually reduced in August
- Contrarily, the temperature which were high in August and low in July comparatively.

WEIGHTS VS AVERAGE TEMPERATURE - CAGE

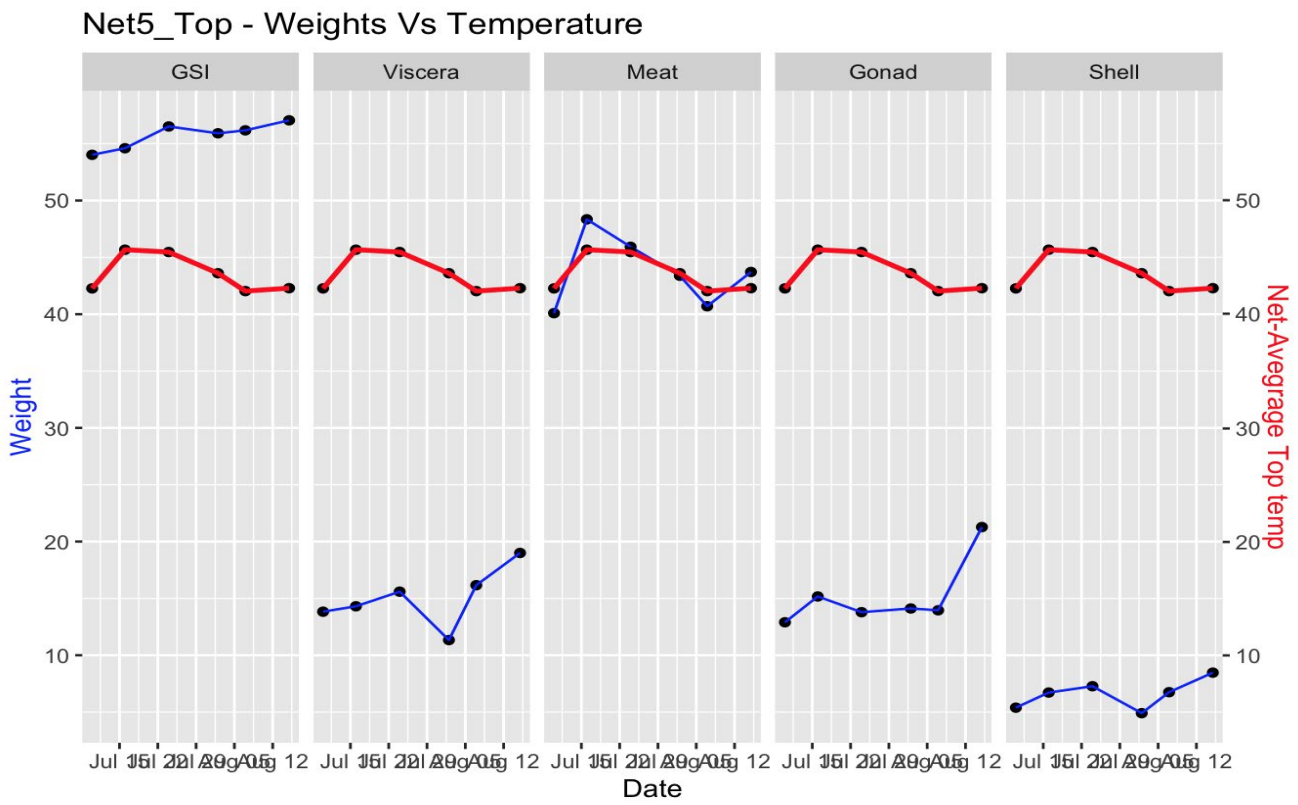


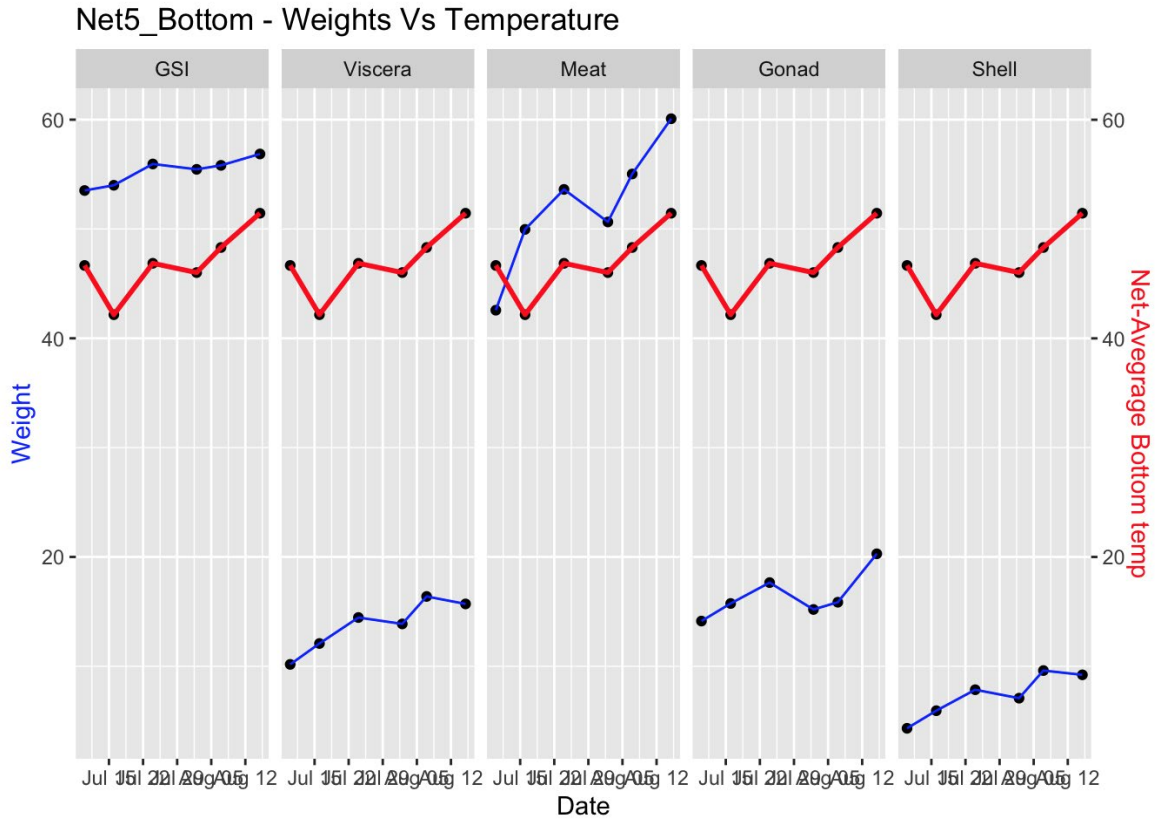
Answers Research Questions – 6

WEIGHTS VS AVERAGE TEMPERATURE - CAGE

- Only 3 data points matched between Cage5_GSI and GSI_Data_sheet.
- Viscera, Gonad and shell weights follow similar pattern of growth whereas the Meat weight is observed to have an increase with decrease in the temperature.

WEIGHTS VS AVERAGE TEMPERATURE – NET TOP AND BOTTOM





Answers Research Questions – 6

WEIGHTS VS AVERAGE TEMPERATURE – NET TOP AND BOTTOM

- Only 6 data points matched between Net5_GSI and GSI_Data_sheet.
- Temperature trends differ from top and bottom of the Nets.
- Meat weight follows the same trend as the temperature at the top of the Net.
- The Meat weight at the top of the Net varies the range of 40 to 50 with temperature range of 40 to 47
- At the bottom of the Net, the temperature are observed to have a range of 40 to 50 and the Meat weight goes up to 60 with the rise in temperature.

WHAT DECISIONS SHOULD BE MADE BASED ON YOUR ANALYSIS

- Research questions that had enough data found mostly limited correlation
- Other things had too little data to draw meaningful conclusions from.
- Collect more data so as to provide more overlapping values with the SPAT data.
- Have temperature sensors at different levels?
- Ear hanging of scallops will increase the growth twice as fast as normal. (Jennifer Page, 2016)

REFERENCES

- Jennifer Page. (2016, Sep 8). Hanging Scallops by a thread. Retrieved from http://www.hurricaneisland.net/science-for-everyone/2016/9/8/hanging-scallops-by-a-thread?rq=ear