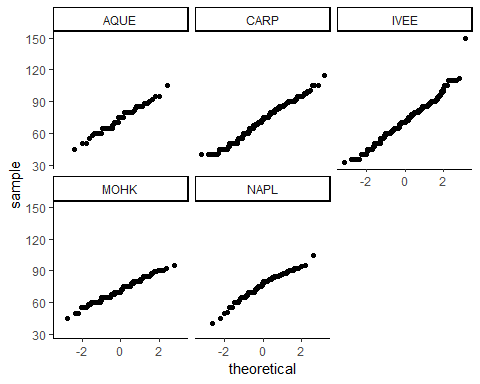
assignment4

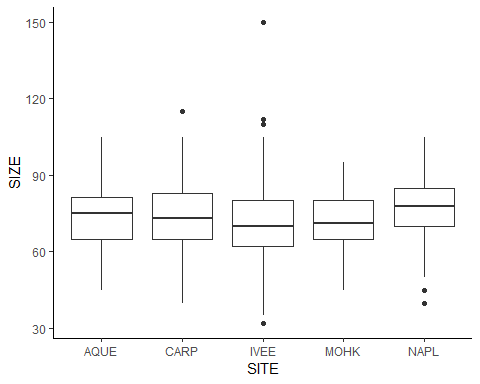
na

November 14, 2018

#\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_part 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_#  
  
# filter for only 2017  
lsa\_filt2017 <- lsa\_filt %>%  
 filter(YEAR == 2017)  
  
# look at site distributions  
qq\_site\_means <- ggplot(lsa\_filt2017, aes(sample = SIZE)) +  
 geom\_qq() +  
 facet\_wrap(~ SITE) +  
 theme\_classic()  
qq\_site\_means



box\_site\_means <- ggplot(lsa\_filt2017, aes(x = SITE, y = SIZE)) +  
 geom\_boxplot() +  
 theme\_classic()  
box\_site\_means



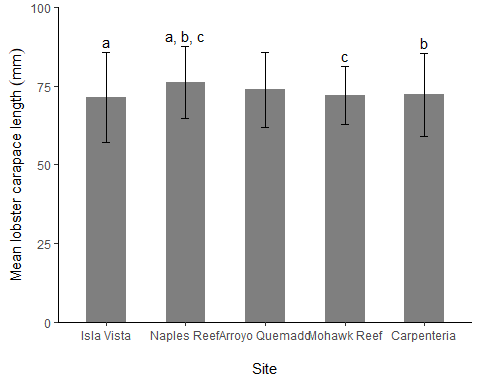
# convert site to factor in lsa\_filt  
lsa\_filt2017$SITE <- as.factor(lsa\_filt2017$SITE)  
  
# find site means, variance, etc.  
lsa\_site\_means <- lsa\_filt2017 %>%  
 group\_by(MPA, SITE) %>%  
 summarize(  
 mean\_size = mean(SIZE),  
 sd\_size = sd(SIZE),  
 var\_size = var(SIZE),  
 n = length(SIZE)  
 ) %>%  
 arrange(MPA) %>%  
 mutate(yloc = mean\_size + sd\_size + 3.5) # loc of annotation  
  
lsa\_site\_means$SITE <- factor(lsa\_site\_means$SITE, levels = c("IVEE","NAPL","AQUE","MOHK","CARP"))  
  
  
# levines test for equal variances  
lsa\_levine <- leveneTest(SIZE ~ SITE, data = lsa\_filt2017)  
lsa\_levine

## Levene's Test for Homogeneity of Variance (center = median)  
## Df F value Pr(>F)   
## group 4 8.3893 1.065e-06 \*\*\*  
## 1663   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

# anova with unequal variances  
lsa\_aov\_size\_site <- oneway(lsa\_filt2017$SITE, y = lsa\_filt2017$SIZE, posthoc = 'games-howell', corrections = F, levene = T)  
lsa\_aov\_size\_site

## ### Oneway Anova for y=SIZE and x=SITE (groups: AQUE, CARP, IVEE, MOHK, NAPL)  
##   
## Omega squared: 95% CI = [0; .02], point estimate = .01  
## Eta Squared: 95% CI = [0; .01], point estimate = .01  
##   
## SS Df MS F p  
## Between groups (error + effect) 2354.51 4 588.63 3.42 .009  
## Within groups (error only) 285871.12 1663 171.9   
##   
##   
## ### Levene's test for homogeneity of variance:  
##   
## F[4, 1663] = 8.77, p < .001.  
##   
## ### Post hoc test: games-howell  
##   
## diff ci.lo ci.hi t df p  
## CARP-AQUE -1.67 -5.95 2.62 1.08 82.28 .814  
## IVEE-AQUE -2.44 -6.80 1.91 1.56 88.61 .526  
## MOHK-AQUE -1.90 -6.37 2.58 1.18 97.81 .765  
## NAPL-AQUE 2.34 -2.66 7.34 1.29 134.26 .696  
## IVEE-CARP -0.78 -2.87 1.31 1.02 1242.45 .848  
## MOHK-CARP -0.23 -2.57 2.11 0.27 379.43 .999  
## NAPL-CARP 4.00 0.73 7.27 3.38 162.35 .008  
## MOHK-IVEE 0.55 -1.94 3.03 0.60 447.17 .974  
## NAPL-IVEE 4.78 1.41 8.15 3.91 182.49 .001  
## NAPL-MOHK 4.23 0.71 7.76 3.30 201.12 .010

# y loc for annotations  
yloc\_i <- lsa\_site\_means %>%  
 filter(SITE == "IVEE") %>%  
 pull(yloc)  
  
yloc\_n <- lsa\_site\_means %>%  
 filter(SITE == "NAPL") %>%  
 pull(yloc)  
  
yloc\_c <- lsa\_site\_means %>%  
 filter(SITE == "CARP") %>%  
 pull(yloc)  
  
yloc\_m <- lsa\_site\_means %>%  
 filter(SITE == "MOHK") %>%  
 pull(yloc)  
  
  
#\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_plot\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_#  
lsa\_aov\_colplt <- ggplot(lsa\_site\_means, aes(x = SITE, y = mean\_size)) +  
 geom\_col(fill = "gray50", width = 0.5) +  
 theme\_classic() +  
 geom\_errorbar(aes(ymax =mean\_size + sd\_size, ymin = mean\_size - sd\_size), width = 0.1) +  
 scale\_y\_continuous(expand = c(0,0), limits = c(0,100)) +  
 labs(y=expression(Mean~lobster~carapace~length~(mm))) +  
 scale\_x\_discrete(labels = c("Isla Vista","Naples Reef","Arroyo Quemado","Mohawk Reef", "Carpenteria")) +  
 annotate("text", x = c(1), y = yloc\_i, label = "a") +  
 annotate("text", x = c(2), y = yloc\_n, label = "a, b, c") +  
 annotate("text", x = c(5), y = yloc\_c, label = "b") +  
 annotate("text", x = c(4), y = yloc\_m, label = "c") +  
 xlab("\nSite")  
lsa\_aov\_colplt



ggsave(filename = "colplotlobstersize.png", plot = lsa\_aov\_colplt,  
 scale = 1, width = 6, height = 4.5, units = "in",  
 dpi = 300)  
  
#\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_table\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_#  
lsa\_aov\_tabledf <- lsa\_site\_means %>%  
 ungroup() %>%  
 mutate(sitel = case\_when(  
 SITE == "IVEE" ~ "Isla Vista",  
 SITE == "NAPL" ~ "Naples Reef",  
 SITE == "AQUE" ~ "Arroyo Quemado",  
 SITE == "CARP" ~ "Carpinteria",  
 SITE == "MOHK" ~ "Mohawk Reef")  
 ) %>%  
 select(sitel, mean\_size, sd\_size, n)  
  
lsa\_aov\_table <- kable(lsa\_aov\_tabledf,   
 format = "markdown",  
 caption = "Table 1. Mean and standard deviation of lobster carapace length at five California sites in 2017. Source: Santa Barbara Coastal Long Term Ecological Research Project.",   
 col.names=c('Site',  
 'Mean carapace length (mm)',  
 'Standard deviation of carapace length (mm)',  
 'n'),  
 digits=2)  
lsa\_aov\_table

|  |  |  |  |
| --- | --- | --- | --- |
| Site | Mean carapace length (mm) | Standard deviation of carapace length (mm) | n |
| Arroyo Quemado | 73.90 | 11.89 | 67 |
| Carpinteria | 72.23 | 13.21 | 705 |
| Mohawk Reef | 72.00 | 9.28 | 178 |
| Isla Vista | 71.45 | 14.32 | 606 |
| Naples Reef | 76.23 | 11.39 | 112 |

Significance result for MPA t.test between 2012 and 2017: (t(748) = -1.916, p = 0.056, = 0.05)

Significance result for nonMPA t.test between 2012 and 2017: (t(1147) = 2.697, p = 0.007, = 0.05) effect size small: (Cohen’s = 0.21)

#\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_part 4\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_#  
#Proportions of “legal” lobsters at the 5 sites in 2017  
#The legal minimum carapace size for lobster is 82.6 mm  
  
lsa\_legal <- lsa\_filt2017 %>%   
 mutate(legal = case\_when(  
 SIZE > 82.6 ~ "y",  
 SIZE < 82.6 ~ "n"))  
  
  
sum\_legal <- lsa\_legal %>%   
 group\_by(SITE) %>%   
 filter (legal == "y") %>%   
 summarize(   
 legal = length(legal))  
  
sum\_illegal <- lsa\_legal %>%   
 group\_by(SITE) %>%   
 filter (legal == "n") %>%   
 summarize(   
 illegal = length(legal))  
  
legal\_joined <- left\_join(sum\_legal, sum\_illegal, by = "SITE") %>%   
 select(legal, illegal)  
  
rownames(legal\_joined) <- c('Arroyo Quemado', 'Carpenteria', 'Isla Vista', 'Mohawk Reef', 'Naples Reef')

## Warning: Setting row names on a tibble is deprecated.

#legal\_table <- legal\_joined create matrix  
  
prop <- prop.table(as.matrix(legal\_joined), 1)  
  
prop\_rounded <- round (prop, 2) #Round proportions to 2 digits  
prop\_rounded

## legal illegal  
## Arroyo Quemado 0.24 0.76  
## Carpenteria 0.25 0.75  
## Isla Vista 0.21 0.79  
## Mohawk Reef 0.13 0.87  
## Naples Reef 0.33 0.67

prop\_table <- kable(prop\_rounded,   
 format = "markdown",   
 caption = "Table 2. Proportion of lobsters that are above the legal minimum carapace size for lobster (82.6 mm) at five California sites in 2017. Source: Santa Barbara Coastal Long Term Ecological Research Project.",   
 col.names = c('Proportion Above Minimum Size', 'Proportion Below Min Size'))  
  
prop\_table

|  |  |  |
| --- | --- | --- |
|  | Proportion Above Minimum Size | Proportion Below Min Size |
| Arroyo Quemado | 0.24 | 0.76 |
| Carpenteria | 0.25 | 0.75 |
| Isla Vista | 0.21 | 0.79 |
| Mohawk Reef | 0.13 | 0.87 |
| Naples Reef | 0.33 | 0.67 |

legal\_chi <- chisq.test(legal\_joined)  
legal\_chi

##   
## Pearson's Chi-squared test  
##   
## data: legal\_joined  
## X-squared = 18.497, df = 4, p-value = 0.0009864

A greater proportion of lobsters are below the legal minimum carapace size than above for all locations. The proportion of legal sized lobsters is smallest at Mohawk Reef as there is rougly 7 times more lobsters as this site that do not meet the legal minimum size. Naples Reef has the largest proportion of legal sized lobsters, roughly half that of the proportion of lobsters below the minimum size.

**Research Question**: Is perception of UCSB’s responsiveness to family needs dependent on gender?

**Research Question**: Is there an association between site and proportion of “legal” lobsters?

#### Hypothesis Testing & Chi Square

Null Hypothesis: Location is independent of proportions of lobsters that are above the legal minimum. Alternative Hypothesis: Proportions of lobsters that are above the minimum size requirement are significantly different between sites.

**Conclusion**: Proportions of lobsters that are above the minimum size requirement differs significantly by site (2(4) = 18.497, *p* < 0.001, = 0.05).

legal\_chi$observed

## legal illegal  
## Arroyo Quemado 16 51  
## Carpenteria 179 526  
## Isla Vista 130 476  
## Mohawk Reef 24 154  
## Naples Reef 37 75

round(legal\_chi$expected,0)

## legal illegal  
## Arroyo Quemado 16 51  
## Carpenteria 163 542  
## Isla Vista 140 466  
## Mohawk Reef 41 137  
## Naples Reef 26 86

legal\_chi$stdres #if standardized residuals are >2 this might be driving the significant finding

## legal illegal  
## Arroyo Quemado 0.1464223 -0.1464223  
## Carpenteria 1.8631463 -1.8631463  
## Isla Vista -1.2357993 1.2357993  
## Mohawk Reef -3.2327773 3.2327773  
## Naples Reef 2.5706474 -2.5706474

Naples and Mohawk Reefs might be driving significance.

legal\_expand <- data.frame(expand.grid(rownames(prop), colnames(prop)), value = c(prop)) # moves from a contigency table format to an expanded table format where we can expand either row or column and then by what value  
  
colnames(legal\_expand) <- c("Site","Legality","Proportion")  
View(legal\_expand)  
  
stacked\_legal <- ggplot(legal\_expand, aes(x = Site, y = Proportion)) +  
 geom\_col(aes(fill = Legality), width = 0.5) +  
 theme\_classic() +  
 coord\_flip()  
  
stacked\_legal

