ESM 211 - Winter 17
Assignment 2
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After comments on the first assignment, we looked for data on effort for Skipjack fisheries on the Atlantic Ocean. We found data from ICCAT on the number of fishing hours associated with catch from years 2006 to 2015. We then explored the relationship between effort (fishing hours) and time (Fig. 1), by fitting a linear model where coefficients were estimated by Ordinary Least Squares with heteroskedastic-robust standard errors, and tested the significance of the slope and intercept coefficients. Neither the intercept or slope showed significant change through time (Table 1), indicating that fishing effort had remained relatively constant from 2006 to 2015 (Fig 1).

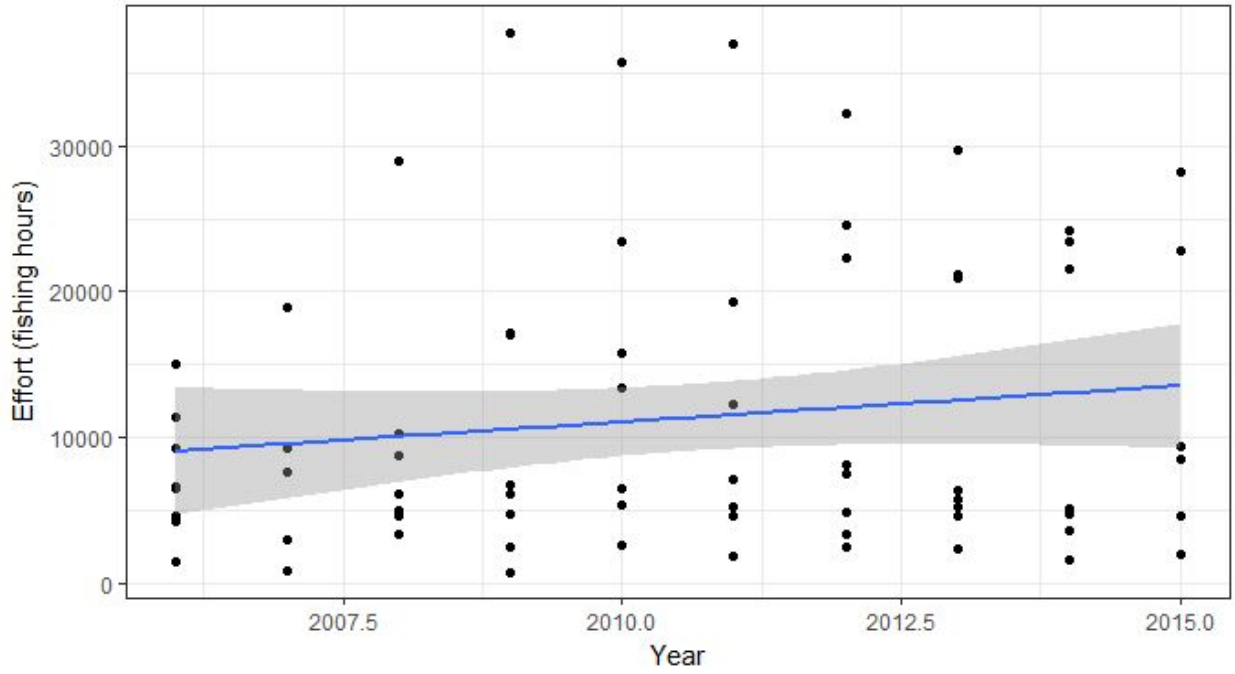

Figure 1: Total effort (fishing hours) by country through time.

Table 1- Regression coefficients for Fishing effort (hours) as a function of time

Effort	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Year	498.4674	343.7049	1.45	0.151	-187.0304	1183.965
_cons	-990880.4	690769.6	-1.43	0.156	-2368577	386816.2

Number of obs	72
F(1, 70)	2.10
Prob > F	0.1514
R-squared	0.0209
Root MSE	9778.6

We then used a larger dataset that included catches from 1950 to 2015, by country (Fig 2), and calculated the total catches by year (Fig. 3). We counted the unique countries that participated in the fishery or for which there is data (Figure 4), and used this as a proxy of total fishing effort. We then normalized total catches by dividing them by the number of countries participating in the fishery each year (Fig. 5). Here, we can see an increase in catches even after normalizing for our proxy of effort. For the Eastern stock (ATE), we see a steady increase since 1950, resulting in an order of magnitude higher values for 2015, as compared to 1950. On the other hand, the Western stock (WTE) does not show an increase of similar magnitude. Interannual variability in the data is in the order of 5,000 tonnes for ATE, and 1500 for ATW. Tables 2 and 3 present the regression coefficients for CPUE as a function of time, for each stock.

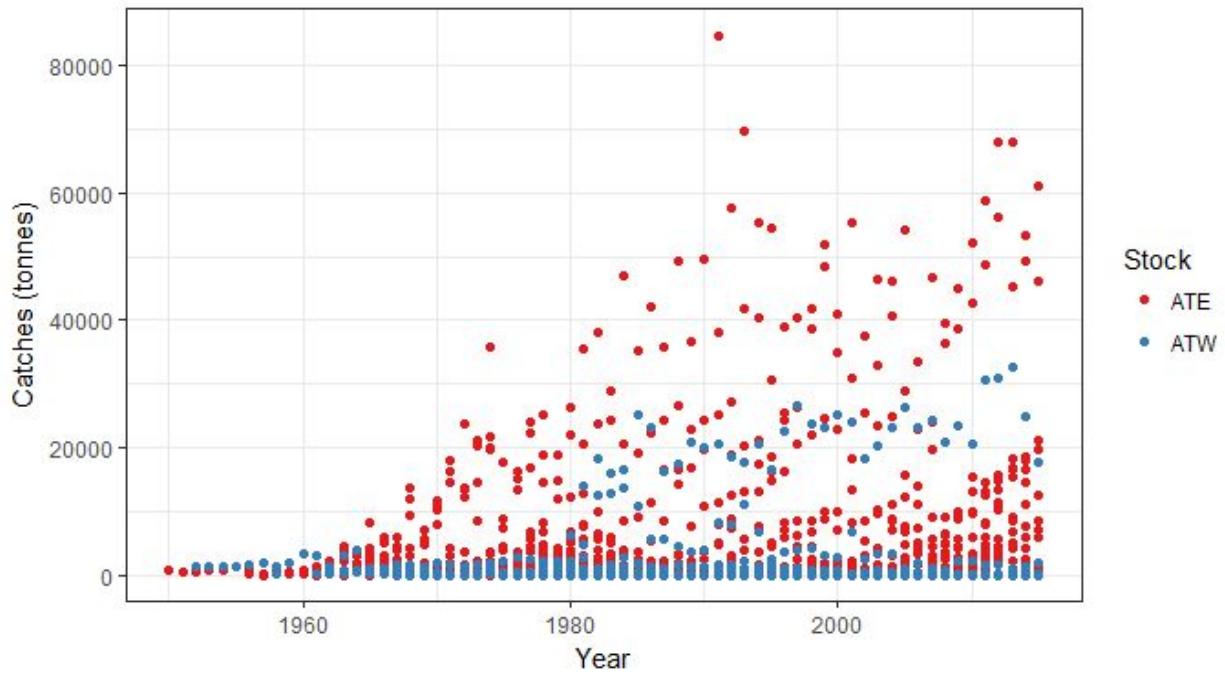

Figure 2: Annual catches (tonnes) of Skipjack by country, from two different stocks. Red points represent catches from the East Atlantic Stock (ATE) and blue points from the West Atlantic Stock (ATW)

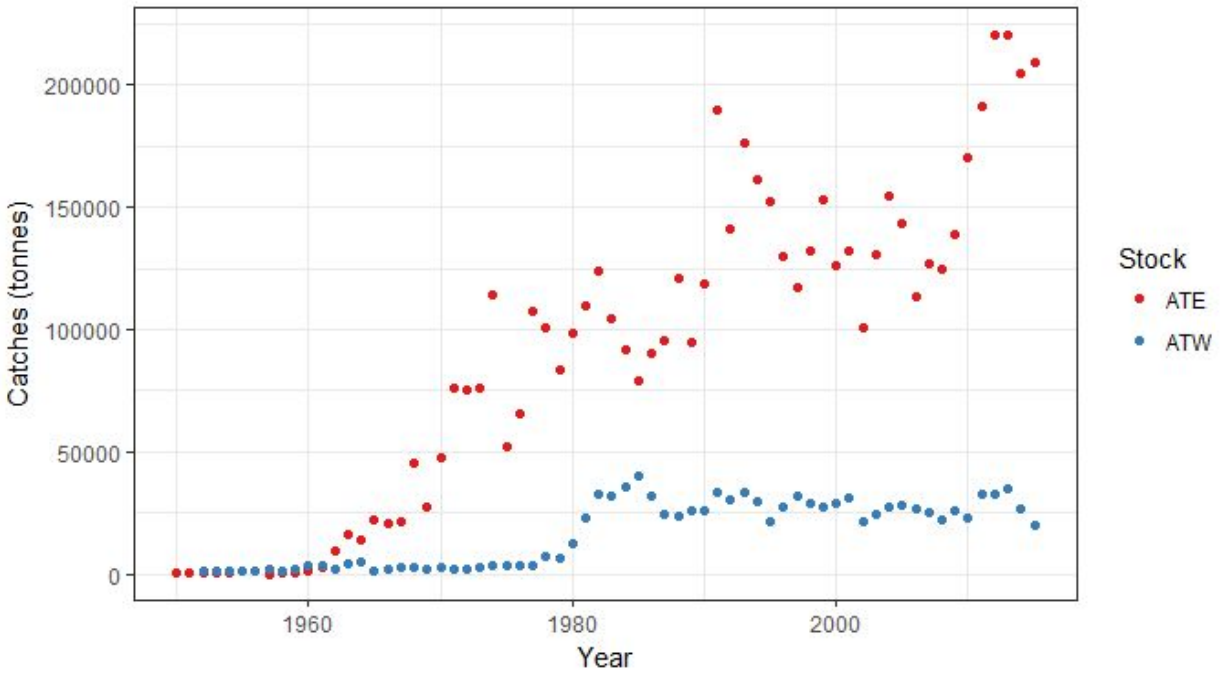

Figure 3: Total catches (tonnes) of skipjack per year from the two stocks available on the Atlantic Ocean.

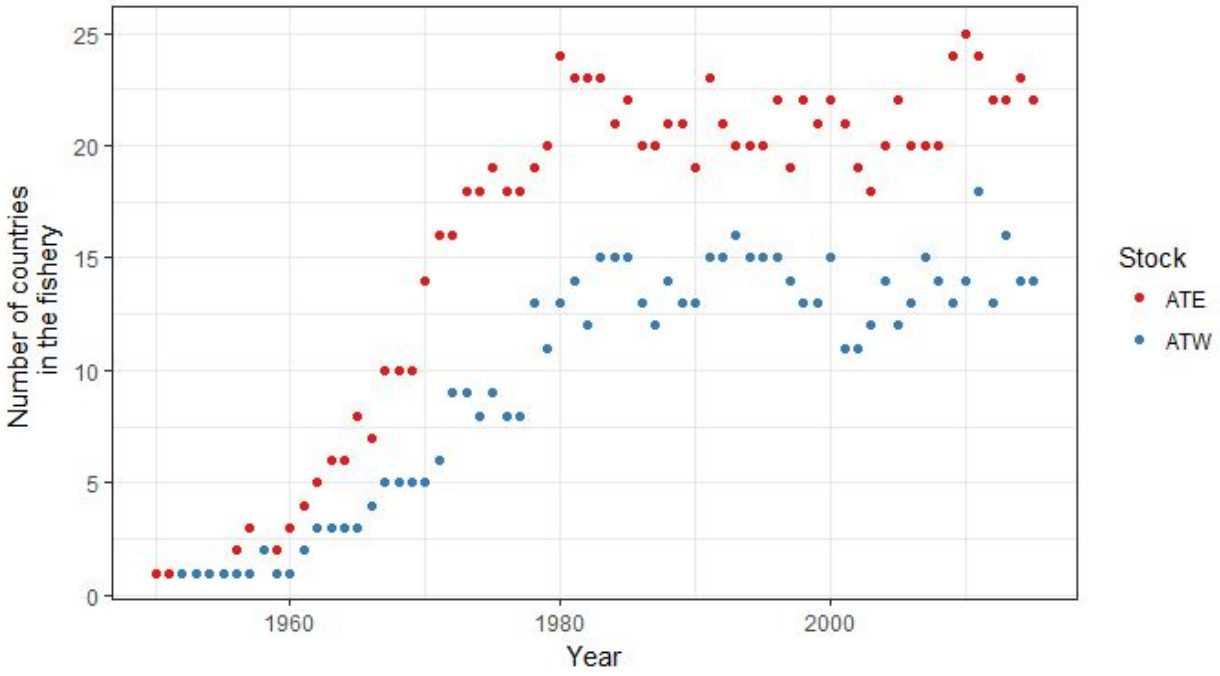

Figure 4: Number of countries involved on the harvest of the Skipjack on the East (ATE - red points) and West (ATW - blue points) Atlantic Ocean Stocks.

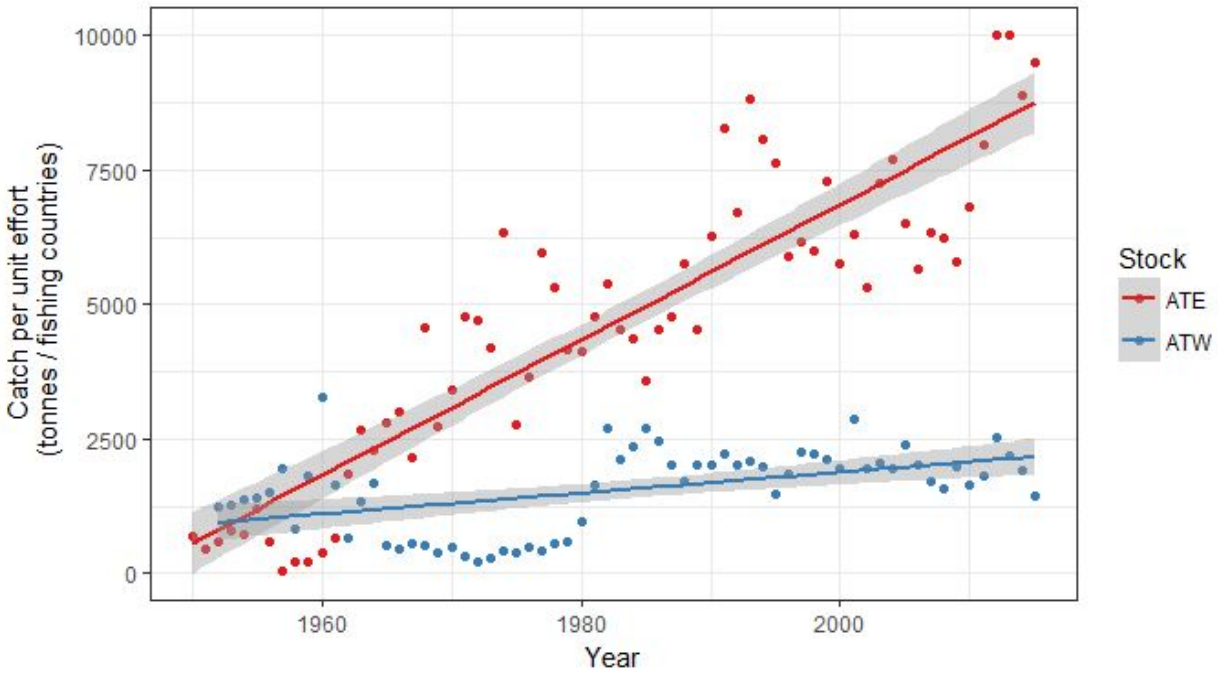

Figure 5: Annual mean catch (tonnes/country) of skipjack captured on from two stocks on the Atlantic Ocean. Red and blue points represent catches from the East Atlantic Stock and West Atlantic Stock, respectively. Colored lines represent the trend for mean catches per country from each stock.

Table 2- Regression coefficients for Catch per unit effort (ATE) as a function of time

ATE	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
YearC	126.1791	7.113363	17.74	0.000	111.9685	140.3896
_cons	-245490.6	14060.76	-17.46	0.000	-273580.2	-217401

Number of obs	66
F(1, 64)	314.65
Prob > F	0.0000
R-squared	0.8137
Root MSE	1168.1

Table 3- Regression coefficients for Catch per unit effort (ATW) as a function of time

ATW	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
YearC	19.41188	4.098257	4.74	0.000	11.21958	27.60418
_cons	-36949.18	8172.87	-4.52	0.000	-53286.52	-20611.85

Number of obs	64
F(1, 62)	22.44
Prob > F	0.0000
R-squared	0.2245
Root MSE	677.07