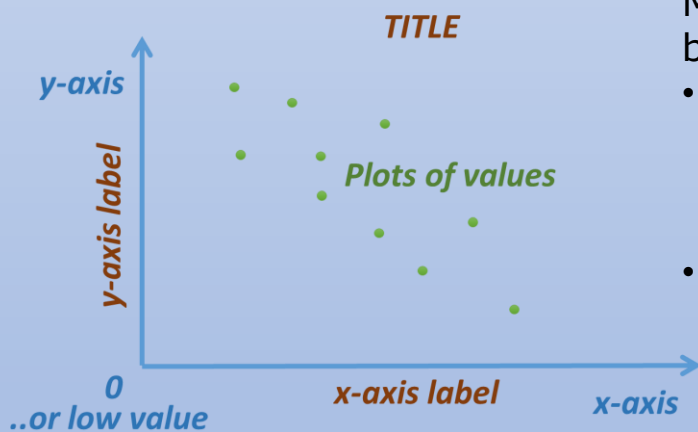
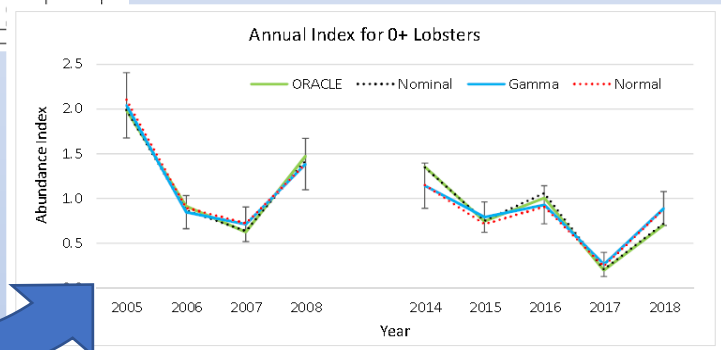


## Picturing the information

Scientists use graphs to visualize a large amount of information as a simple image. This makes it much easier to understand what the information is showing you.

Graphs are diagrams that show relationships between variables and quantities. They usually have two variables, each measured along one pair of axes at right angles.

Year	GLM Analysis		ORACLE Analysis		GLM vs ORACLE Analysis		Nominal Analysis	GLM Normal
	Index	SE	Index	SE	Index	SE	Index	Index
2005	2.044	0.365	1.987	0.376	2.84%	-3.03%	1.991	2.106
2006	0.846	0.185	0.914	0.200	-7.40%	-7.13%	0.869	0.896
2007	0.711	0.193	0.624	0.149	13.94%	29.68%	0.636	0.721
2008	1.385	0.289	1.473	0.375	-5.96%	-23.03%	1.424	1.388
2014	1.144	0.253	1.355	0.293	-15.57%	-13.52%	1.347	1.151
2015	0.791	0.171	0.745	0.192	6.25%	-11.04%	0.750	0.712
2016	0.928	0.171	1.007	0.242	-7.80%	-11.42%	1.060	0.906
2017	0.262	0.195	0.195	0.073	33.86%	84.45%		
2018	0.887	0.700	0.168	26.94%	12.41%			
Mean	1.0		1.00					



Most graphs have the following basic components:

- **x-axis** – the horizontal line on the bottom that usually contains the **independent variable** or categories
- **y-axis** – the vertical line on the left that usually contains the **dependent variable**.

**Independent variables** don't depend on another variable, whereas **dependent variables** do. For example, in the graph for abundance of lobster above, the variable "Year" does not depend on "abundance index", but "abundance index" depends on "Year".

This series of information sheets will show you different types of graphs used by scientists and how to read them.

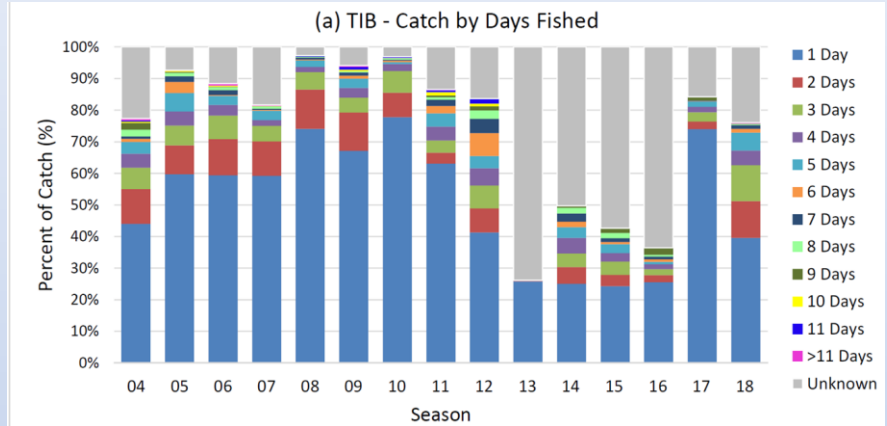
# Graphs

## — Types of graphs —

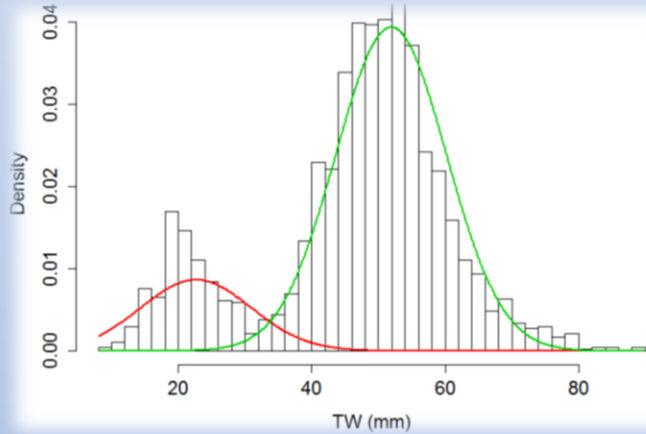
There are many different types of graphs. Some examples commonly used in fisheries meetings are:

**Bar graphs** – show categories of data on a rectangular bar. The height of each section of the bar is proportional to the values they represent.

Annual Tropical Rock Lobster TIB catch categorized by days fished per trip

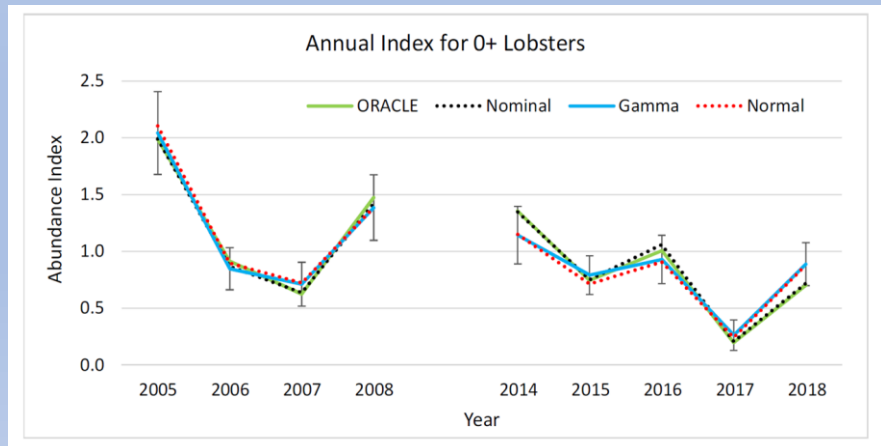


Histogram and fitted normal component density distributions of TRL TW for all pre-season surveys (from Upston et al. 2018)



**Histograms** – show the distribution of the raw data. They are like a bar graph, except that each bar represents the count or proportion of a single variable category or interval.

Modelling of the performance of Tropical Rock Lobster Harvest Strategies. Average variability of catch and average catch



**Line graphs** – are often used to show a change in values over time and are useful for looking at a trend in the change of values over time.

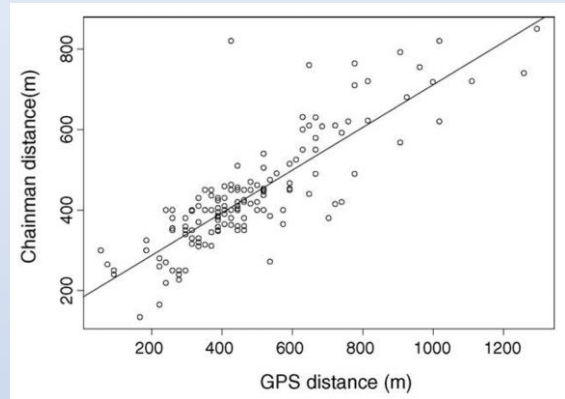
# Graphs

## — Types of graphs —

There are many different types of graphs. Some examples commonly used in fisheries meetings are:

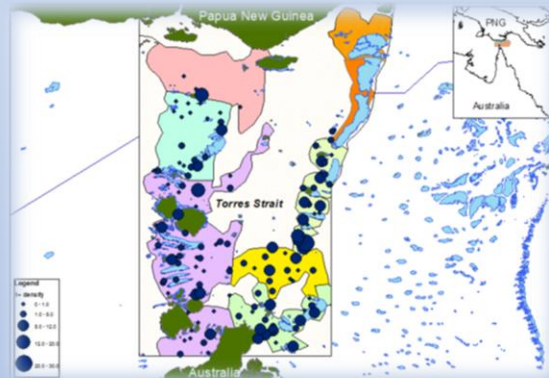
**Scatter plots** – use dots to represent values of two variables. Both variables are usually continuous. A trend line is sometimes overlaid.

Relationship between Tropical Lobster dive survey distances measured by Chainman compared to GPS



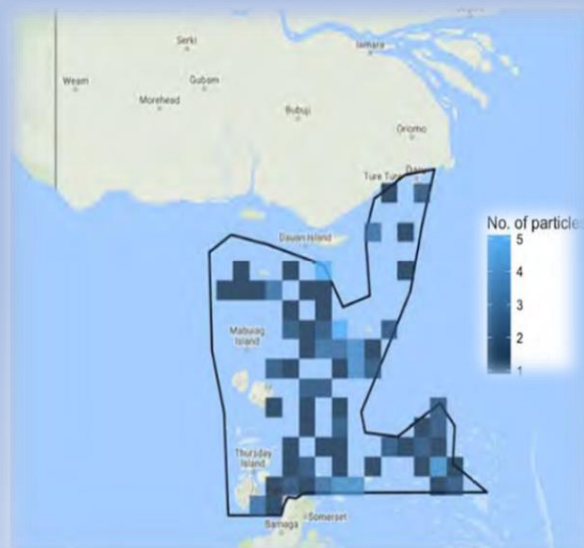
Map of Torres Strait showing distribution of recruiting (1+) ornate rock lobsters during the November 2014 pre-season survey. Filled circles are proportional to abundance (Plaganyi et al. 2015)

**Bubble plots** – are like scatter plots, but the dots are different sizes representing the value of the variable at that point. They are very useful for example for showing abundance at different locations on a map.



Heat map showing particles released from Yule Is and where settlement would occur in the TRL fishery (Plaganyi et al. 2018)

**Heat Maps** – are used to represent values as different colors, usually on a map. The usually shows the average of total value for the area covered.



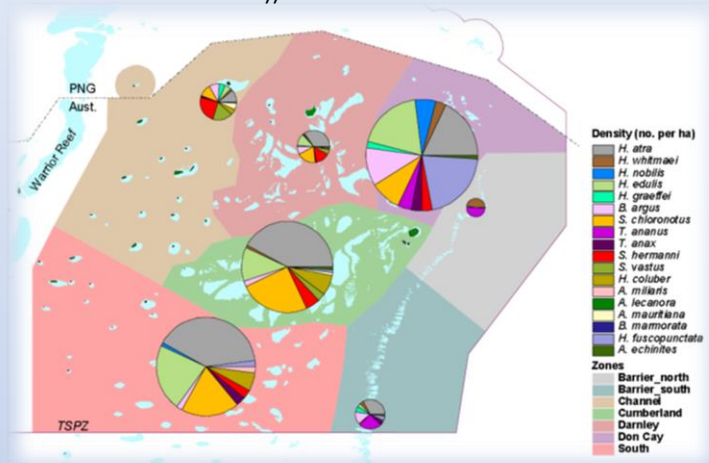
# Graphs

## — Types of graphs —

There are many different types of graphs. Some examples commonly used in fisheries meetings are:

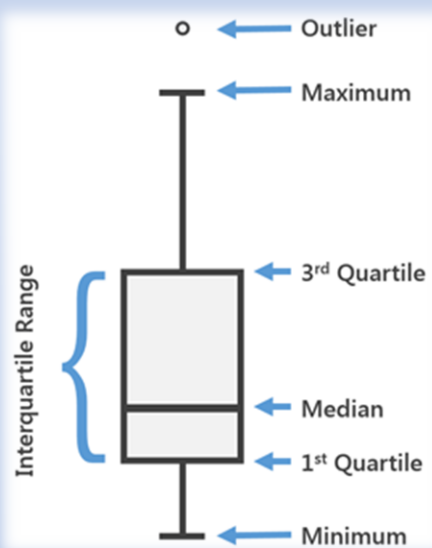
Density of commercial holothurians sampled during the survey in April 2002. The area of the pie diagram is proportional to the population density (no./ha) in each zone. (Range 210.8 per ha (Don Cay) to 66.9 per ha (Barrier North)). From Skewes et al. 2004

**Pie graphs** – represent values with the size of each piece of the pie. Slices are usually **categorical variables**. All together the slices add up to 100%.



**Box plots** – show the distribution of the data for each category. They show a lot of information about the data including the:

- Minimum
- 1<sup>st</sup> quartile (lower 25% of data)
- Median (the middle value)
- 3<sup>rd</sup> quartile (75% of the data)
- Maximum
- Outliers (values that are way outside the normal range)



Variables can be split into **continuous**, **discrete** and **categorical** variables. **Continuous** variables are numeric values measured and have an infinite number of values between any two values such as density, length or time. **Discrete** variables are also numeric, but have a countable number of values between two values. They are usually counts such as abundance or number of dives undertaken in a day. **Categorical** variables can be any value representing a category or distinct group. They might or might not have a logical order. Examples are gender, fisherman's name or moon phase.