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Data Wrangling and Reformatting

Data Description:

Data Provided is of percentage of bleaching over the years for different types of corals across 8 different sites.

Data Reformatting for further Analysis:

A snippet of data provided is as below:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1				soft corals								sea fans				
2	name	longitude	latitude	2017	2016	2015	2014	2013	2012	2011	2010	2017	2016	2015	2014	2013
3	site01	143.515	-11.843	83.870%	80.210%	75.340%	74.990%	57.700%	56.430%	55.430%	56.290%	47.320%	47.120%	46.870%	41.340%	40.88
4	site02	147.898	18.937	21.230%	19.230%	17.210%	15.780%	14.800%				56.320%	54.320%	50.210%	48.500%	46.39
5	site03	144.081	-10.321	75.340%	60.230%	37.210%	26.890%	25.890%				75.230%	50.210%	32.450%	10.450%	8.28
6	site04	150.444	-20.414	12.450%	11.780%	11.340%	10.980%	10.890%	10.670%	10.230%	10.010%	77.890%	65.230%	30.780%	27.670%	26.98
7	site05	143.786	-13.107	94.230%	91.230%	76.230%	60.230%	30.230%	28.450%	29.130%	14.450%	48.340%	46.230%	42.230%	40.120%	40.10
8	site06	146.589	-17.981									86.450%	75.640%	60.750%	58.340%	55.37
9	site07	145.043	-14.383	67.890%	60.780%	58.760%	56.450%	55.120%	40.120%	39.980%	40.340%					
10	site08	145.715	-16.091	65.230%	63.210%	60.120%	60.030%	58.890%				48.230%	45.320%	40.890%	39.840%	38.66
11																

Here it can be seen that data is formatted in a way which is not easy to visualize in tableau since aggregation across different coral types and over the years cannot be done in this format.

A snipped of reformatted data looks as follows:

A	B	C	D	E	F	G	H	I	J	K	L	M
name	longitude	latitude	2017	2016	2015	2014	2013	2012	2011	2010	Type	Avg over Years per Site
site01	143.515	-11.843	83.870%	80.210%	75.340%	74.990%	57.700%	56.430%	55.430%	56.290%	soft corals	67.533%
site02	147.898	-18.937	21.230%	19.230%	17.210%	15.780%	14.800%				soft corals	17.650%
site03	144.081	-10.321	75.340%	60.230%	37.210%	26.890%	25.890%				soft corals	45.112%
site04	150.444	-20.414	12.450%	11.780%	11.340%	10.980%	10.890%	10.670%	10.230%	10.010%	soft corals	11.044%
site05	143.786	-13.107	94.230%	91.230%	76.230%	60.230%	30.230%	28.450%	29.130%	14.450%	soft corals	53.023%
site06	146.589	-17.981									soft corals	0.000%
site07	145.043	-14.383	67.890%	60.780%	58.760%	56.450%	55.120%	40.120%	39.980%	40.340%	soft corals	52.430%
site08	145.715	-16.091	65.230%	63.210%	60.120%	60.030%	58.890%				soft corals	61.496%
site01	143.515	-11.843	47.320%	47.120%	46.870%	41.340%	40.880%	38.560%	39.120%	37.340%	sea fans	42.319%
site02	147.898	-18.937	56.320%	54.320%	50.210%	48.500%	46.390%	45.980%			sea fans	50.287%
site03	144.081	-10.321	75.230%	50.210%	32.450%	10.450%	8.280%	6.340%			sea fans	30.493%
site04	150.444	-20.414	77.890%	65.230%	30.780%	27.670%	26.980%	25.120%	23.450%	22.780%	sea fans	37.488%
site05	143.786	-13.107	48.340%	46.230%	42.230%	40.120%	40.100%	39.780%	38.990%	37.650%	sea fans	41.680%
site06	146.589	-17.981	86.450%	75.640%	60.750%	58.340%	55.370%	50.340%	41.370%	40.210%	sea fans	58.559%
site07	145.043	-14.383									sea fans	0.000%
site08	145.715	-16.091	48.230%	45.320%	40.890%	39.840%	38.660%	32.450%			sea fans	40.898%
site01	143.515	-11.843	68.230%	65.610%	62.130%	58.980%	51.980%	50.370%	40.250%	39.780%	blue corals	54.666%

The data is wrangled in such a way that the SiteName, Years and Type of Corals become Dimensions. The data is rearranged in vertical stacked form by type to do this.

Type column was added manually in excel to support the reformatting and indicate the coral type.

Data issues and corrections :

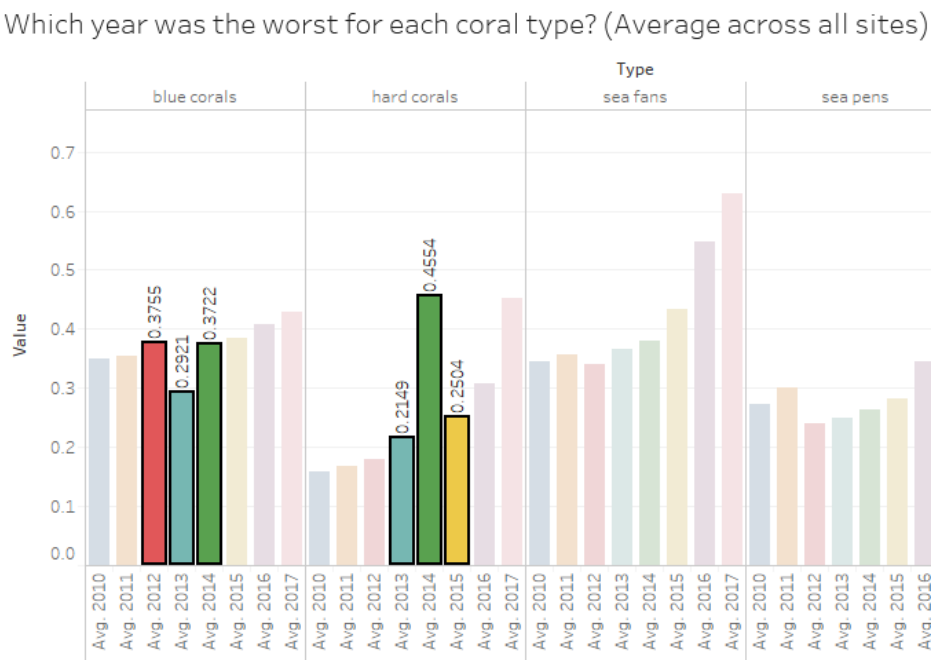
Upon plotting the data some issues can be observed. The observed issues and their corrections are detailed as below:

- **Missing Values**:
  - Not all sites have all types of corals.
  - Bleaching % for certain years have not been recorded.
  - These missing values are identified as NULL and have been handled by ignoring them.

- **Data Entry issues**:

  Plotting the data Initially in Tableau indicates some data entry issues, which can be seen as follows:

  - Bleaching Percentage data



This graph shows the average Bleaching % across sites for each coral type over the year. Here some unusual trend in bleaching % can be observed in the highlighted parts indicating a data inconsistency.
Upon looking into the raw data at those times following data issues have been found and rectified as below:

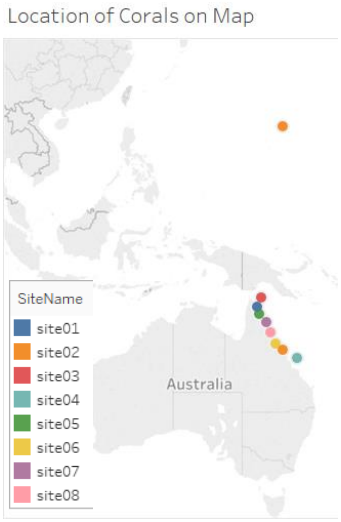
- 2014 data for hard corals for site08 has a data entry issue

Original reading : 148.80 %
Corrected reading : 14.88 %

- 2013 data for blue corals for site07 has a data entry issue

Original reading : 0.470%
Corrected reading : 46.96 %

  - Location information:



The site information contains its location information in form of Latitude and Logitude values. When these are plotted on a map, the location for site02 seems way off from other sites, *and also corals affected by bleaching usually exists in shallow waters and near the coast* which further indicate and error in the location information. Current location information is shown in the table below:

It can be seen from the table that there must be a negative sign for latitude value of site02. Correcting this errors shows a more realistic location of site02 off the coast of Australia like other sites in this analysis. Correction details and its plot on map is shown below:

Corrected Value for site02 : Latitude = -18.937

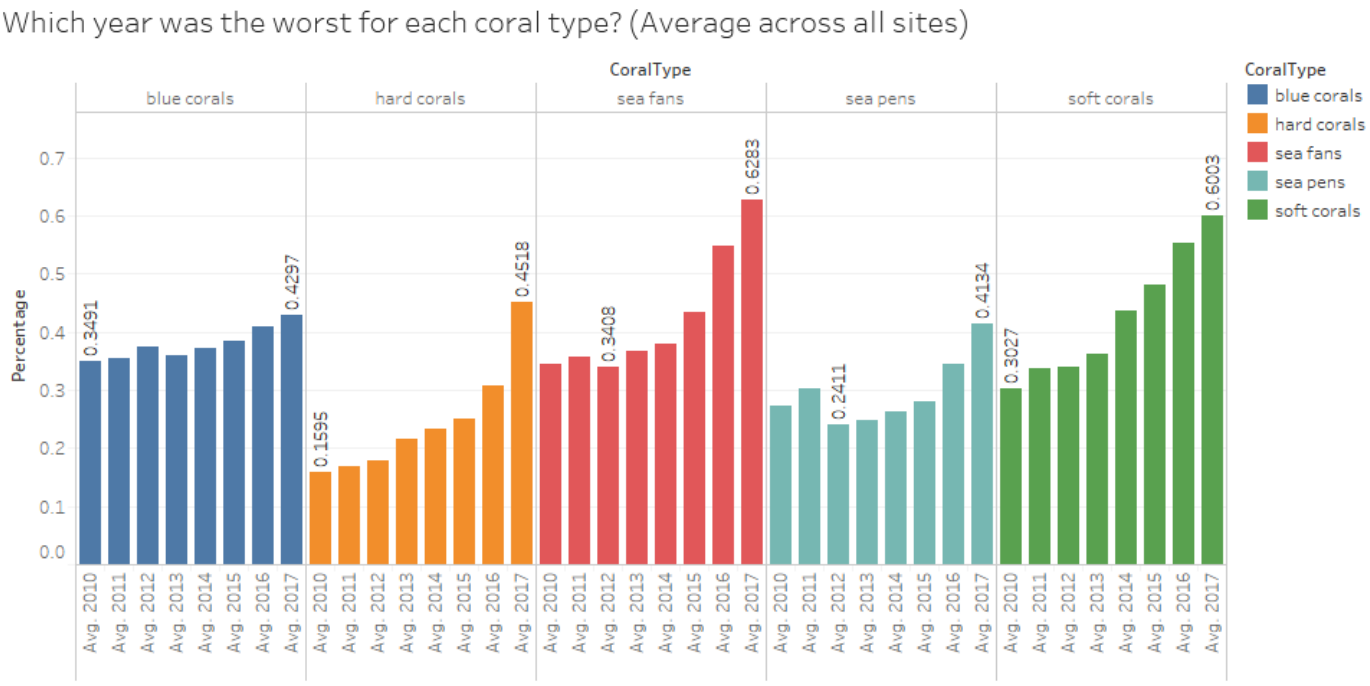
name	longitude	latitude
site01	143.515	-11.843
site02	147.898	18.937
site03	144.081	-10.321
site04	150.444	-20.414
site05	143.786	-13.107
site06	146.589	-17.981
site07	145.043	-14.383
site08	145.715	-16.091

Data Visualization and Findings

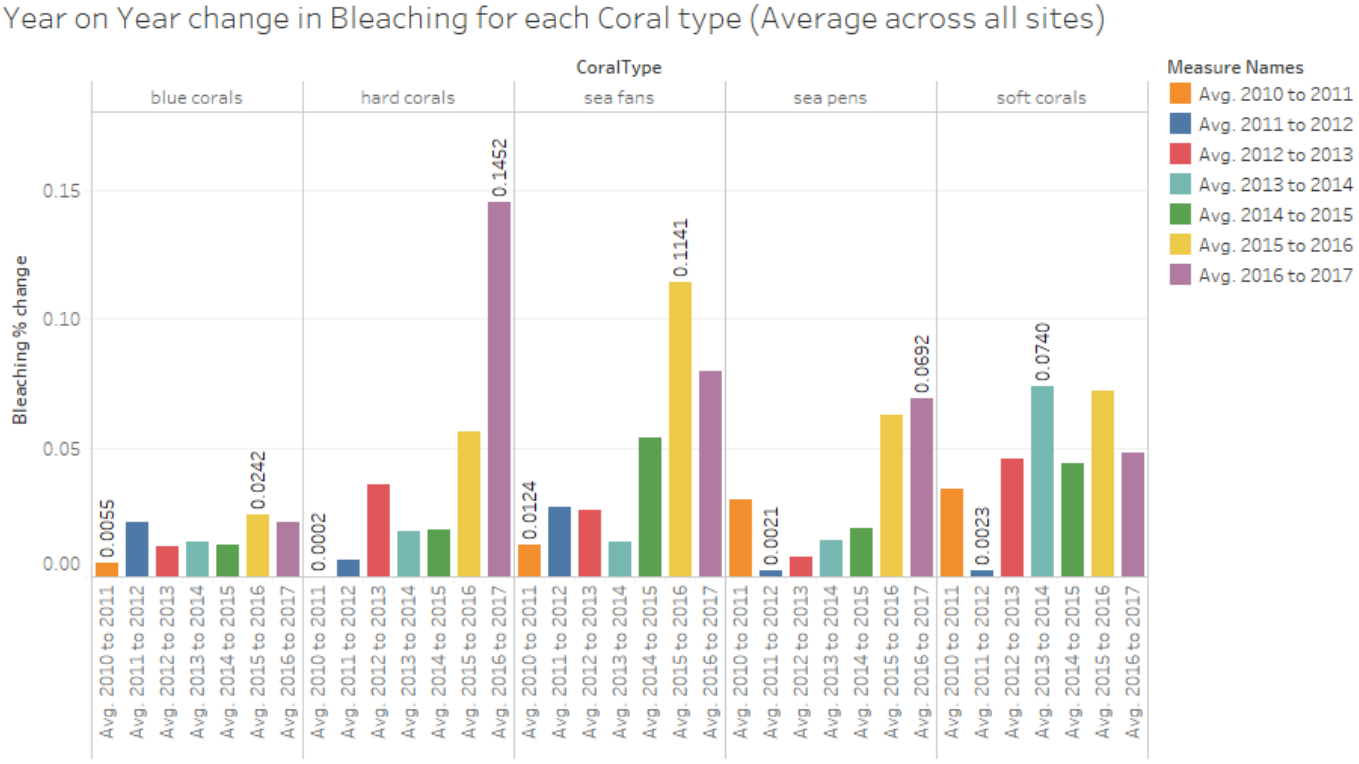
1. **In which years and for which kinds of coral bleaching is the worst?**

   This question can be answered in 2 parts as follows.

   a. **Which year was the worst for each coral type?**



This plot shows average bleaching across all sites for each year and for each coral type. This graph indicates that 2017 has been the worst year for all types of corals in terms of absolute percentage. But, if compare year on year change in bleaching we can see some interesting trend as shown below. Year to Year change was calculated using Tableau's calculated field option.



Here we can see that each coral type has had different years when the increase in bleaching was the most.

Blue Corals : 2016, Hard Corals: 2017, Sea Fans: 2016, Sea Pens: 2017, Soft Corals: 2014

The other part of this question is :

b. **Which coral bleaching was the worst in each year?**

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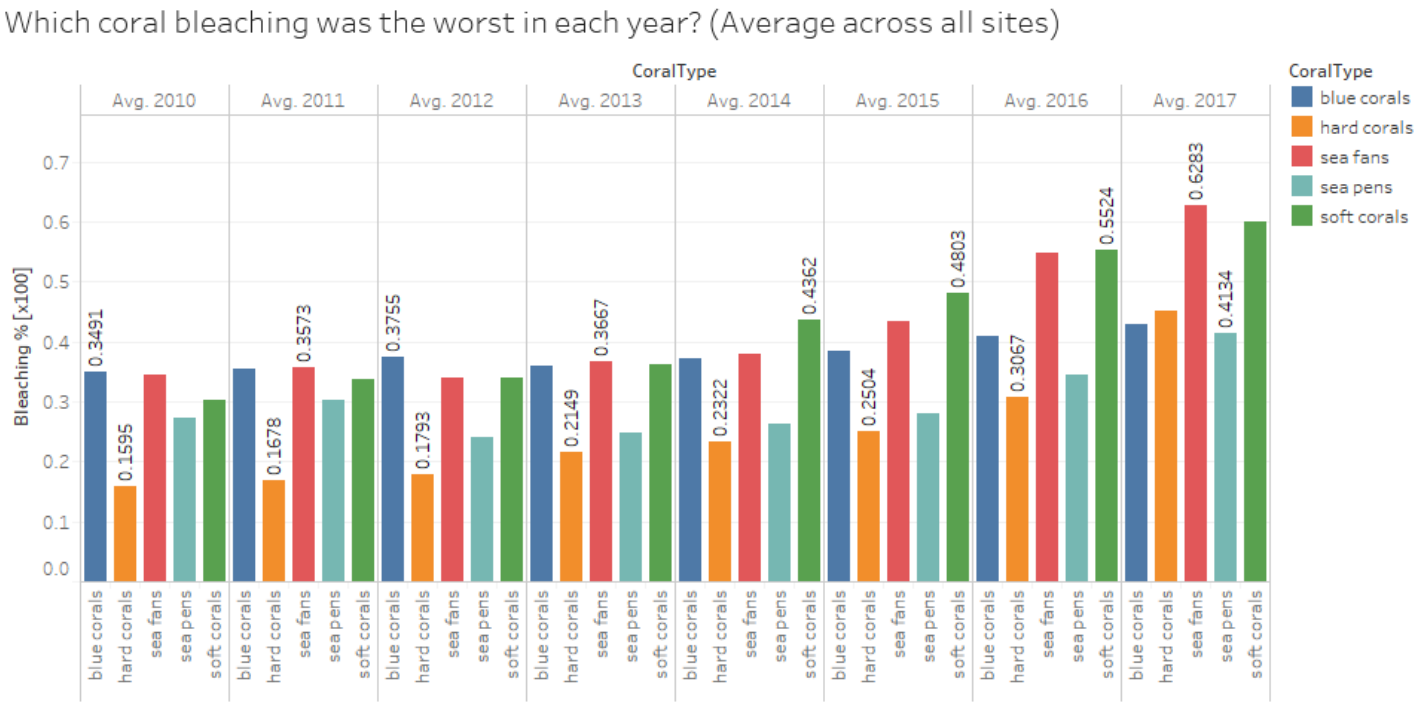


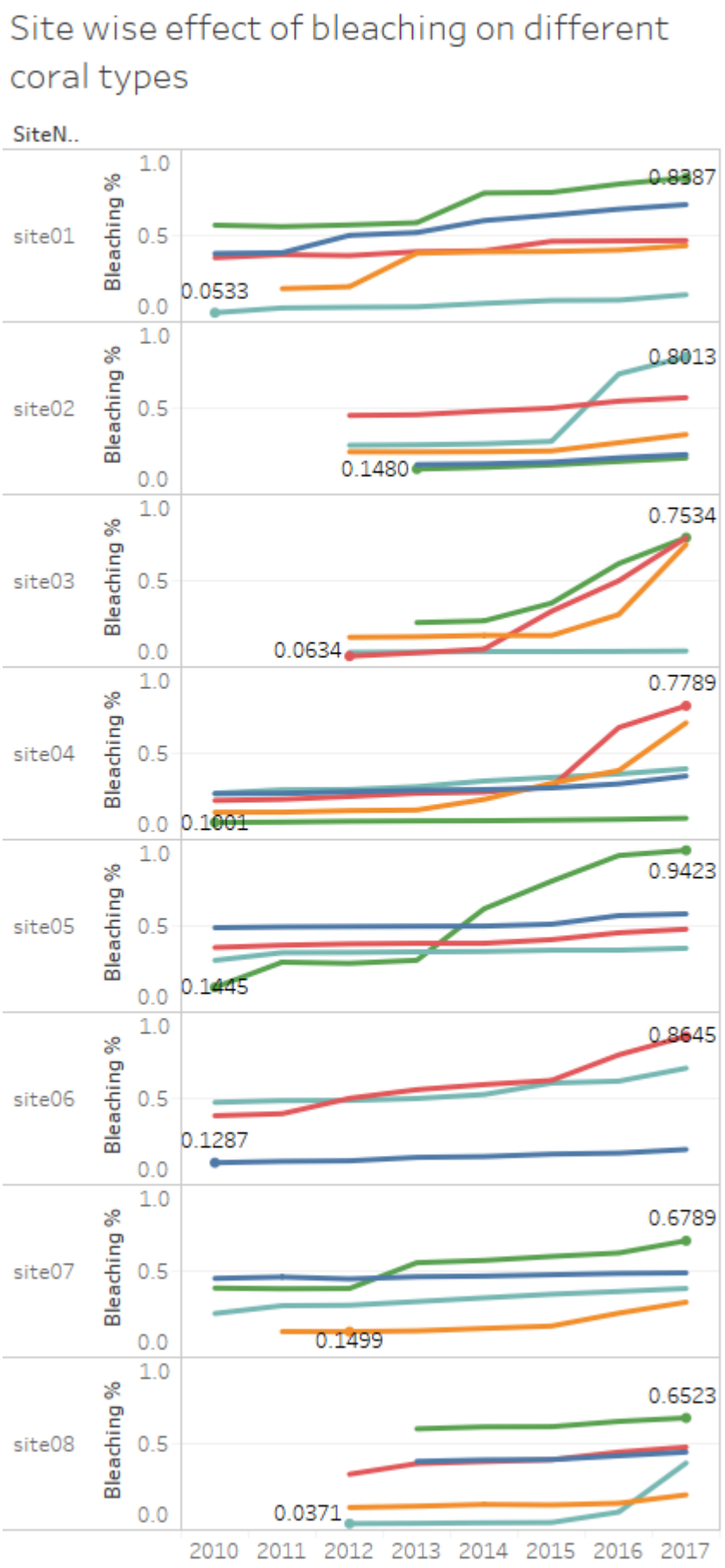
Avg. 2010, Avg. 2011, Avg. 2012, Avg. 2013, Avg. 2014, Avg. 2015, Avg. 2016 and Avg. 2017 for each CoralType. Color shows details about CoralType.

The above graph shows bleaching percentage in each year for all coral types averaged across all sites. Type of coral bleached the most in each year are as follows as per the above graph:

- 2010: Blue Corals
- 2011: Sea Fans
- 2012: Blue Corals
- 2013: Sea Fans
- 2014: Soft Corals
- 2015: Soft Corals
- 2016: Soft Corals
- 2017: Sea Fans

Overall there has been increasing trend in bleaching over the years, and especially after 2013, all types of coral went through a lot of bleaching due to effects of global warming.

2. How the location of the site affects bleaching on the different kinds of coral?



This graph here shows the effect of bleaching over the years at each site and further for each coral type as well.

From the graph we can see that at each site different type of corals are affected more than the other.

Site01: At this site Soft Corals are affected the most.

Site02: At this site Sea Pens are the most affected

Site03: At this site 3 coral types affected the most with similar magnitude – Soft Corals hard, Corals and Sea Fans.

Site04: At this site Sea Fans are affected the most.

Site05: At this site Soft Corals are affected the most.

Site06: At this site Sea Fans are affected the most.

Site07: At this site Soft Corals are affected the most.

Site08: At this site Soft Corals are affected the most.

Overall it looks like soft corals are affected the most across all sites.