Aerial Survey Report: Sargassum and Land Based Run-off

Nature Foundation

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A Member of

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1. Introduction

On December 3rd 2011 the St. Maarten Nature Foundation conducted Arial Surveys with the Flight School Caribbean Flight Academy to look for incidents of Sargasso Seaweed which may be headed in the direction of local beaches.

During the Aerial Survey, which occurred after a heavy rain-event, significant areas of run-off were also detected.

The funding for the Aerial survey was made possible through the generous funding of the St. Maarten Hospitality and Trade Association (SHTA) dollar-a-day program.

2. Background Sargasso

Sargassum is a genus of brown (class *Phaeophyceae*) macroalga (seaweed) in the order Fucales. Numerous species are distributed throughout the temperate and tropical oceans of the world, where they generally inhabit shallow water and coral reefs. However, the genus may be best known for its planktonic (free-floating) species. While most species within the class *Phaeophyceae* are predominantly cold water organisms that benefit from nutrients upwelling, genus Sargassum appears to be an exception to this general rule. Any number of the normally benthic species may take on a planktonic, often pelagic existence after being removed from reefs during rough weather. However, two species (*S. natans* and *S. fluitans*) have become holopelagic — reproducing vegetatively and never attaching to the seafloor during their lifecycle. The Atlantic Ocean's Sargasso Sea was named after the algae, as it hosts a large amount of Sargassum.

Figure 2: a floating patch of Sargasso

The Sargasso Sea is a region in the middle of the North Atlantic Ocean, surrounded by ocean currents. It is bounded on the west by the Gulf Stream; on the north, by the North Atlantic Current; on the east, by the Canary Current; and on the south, by the North Atlantic Equatorial Current. This system of currents forms the North Atlantic Subtropical Gyre. All the currents deposit the marine plants and garbage they carry into this sea.

The Sargasso Sea is 700 statute miles wide and 2,000 statute miles long (1,100 km wide and 3,200 km long). It stretches from roughly 70 degrees west to 40 degrees west, and from 25 degrees north to 35 degrees north. Bermuda is near the western fringes of the sea. The Sargasso Sea is the only "sea" without shores. The ocean water in the Sargasso Sea is distinctive for its deep blue color and exceptional clarity, with underwater visibility of up to 200 feet (61 m).

Figure 2: the Sargasso Sea

The Seaweed, known as Sargasso Weed, has been plaguing the Caribbean and St. Maarten for some months. The resulting large influx of Sargasso Weed has been due to a suspected southward shift in the Gulf Stream, which has pushed the Sargasso Sea– an area of the Atlantic Ocean where Sargasso Weed is in thick concentration, south to our area.

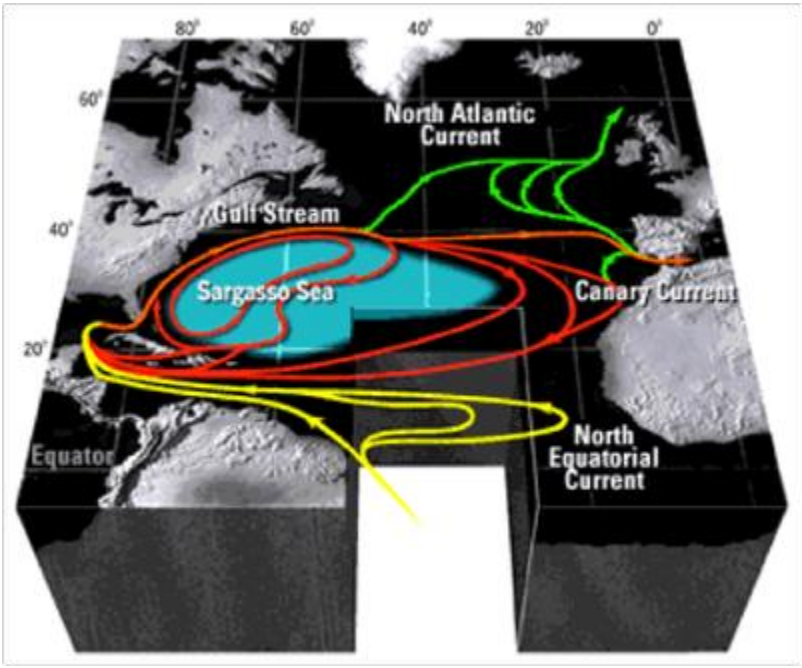

Figure 3: Current Directions of the Sargasso Sea

There were initial concerns that the decomposing seaweed on the beach could be detrimental to public health. However, based on studies conducted by the Nature Foundation it has been found that once the Sargasso weed is out of the water and drying out it simply decomposes like any other grass. There are no inherent dangerous toxins found in the decomposing seaweed and its decomposition only causes a foul smell which dissipates after the seaweed has finished decomposing. Similarly the burning of the seaweed has the same effect as the burning of any land based grass or foliage. The Nature Foundation has also removed sea turtle eggs which were incubating to ensure their safety and protect them from both the seaweed and any cleanup measures which may be involved in clearing the seaweed from the beach.


Figure 4: Sargasso on Guana Bay Beach in September/ October

Government, the Nature Foundation and Private Individuals have been continuously removing seaweed from many of the highly frequented beaches and there have been several community based cleanup campaigns aimed at cleaning up the seaweed. Once rinsed in fresh water and laid out to dry the Sargasso weed is one of the best fertilizers one can hope for and many have been using it for this purpose.

3. Methods used

For the Aerial Surveys use was made of a Cessna 172 Aircraft (Aircraft I.D N479TT) captained by Cpt. Ricardo Wilson of the Caribbean Flight Academy. Take off occurred in a Westerly direction after which survey commenced at approximately ten A.M surveying the shore in an easterly direction. Photographs were taken using a Canon EOS DSLR Camera and patches of the Sargassum were recorded on a data sheet. The entire eastern coast of St. Maarten was monitored at an altitude of 500ft. Survey was completed at 10:25 after which the aircraft returned to the Princess Juliana International Airport.

4. Results

A total of five (5) medium patches of Sargassum and three (3) small patches of Sargassum were observed floating in a westerly, south-westerly direction. Two medium patches were drifting towards the Eastern Shore of the Island and are expected to come ashore in the vicinity of Back Bay.

A fly-over was conducted over Guana Bay and Dawn beach and very little Sargassum was observed in that direction, with some small patches being immediately offshore of those beaches.

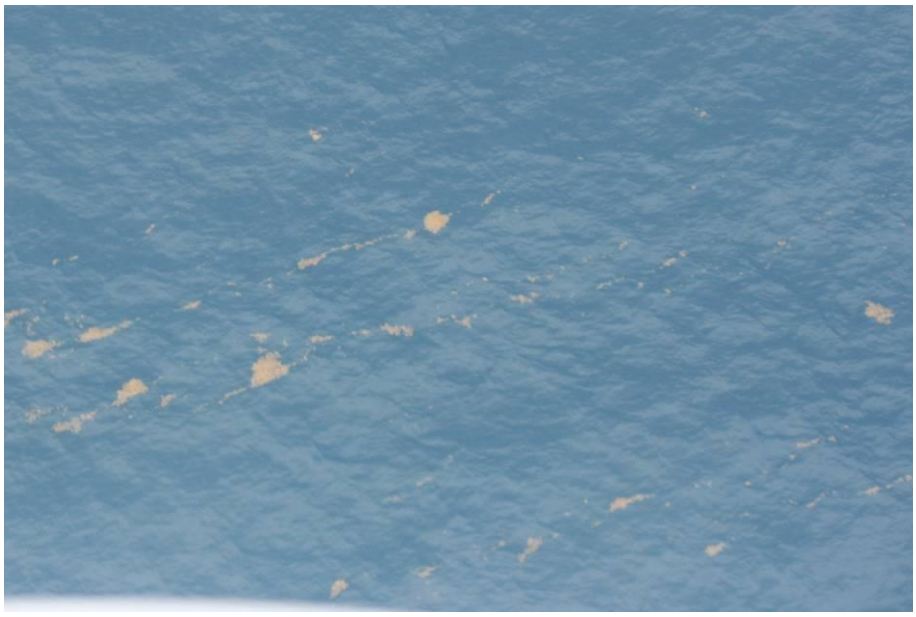

Figure5: Medium patch headed in a westerly direction

Figure 6: Medium patch headed in a westerly direction

Figure 7: Medium patch headed in a westerly direction

Figure 8: Patches were headed in the direction of Back Bay

5. Run-off Surveying

Prior to departure on the Sargasso Surveys the island experienced heavy, persistent rain. While conducting the Sargasso Surveys significant run-off was noticed at Cay Bay/ Indigo Bay, Cay Bay/ GEBE and Belair Beach.

Cay Bay has always had the natural tendency to suffer from run-off during heavy rainfall. Also the bay by the GEBE plant is vulnerable to run-off during a heavy, prolonged rain event. The reason for this is the soil type. Both the Cay Bay area and the bay area by GEBE have soil-types that have high run-off potential.

Soils are classified by the Natural Resource Conservation Service into four Hydrologic Soil Groups based on the soil's runoff potential. The four Hydrologic Soils Groups are A, B, C and D, where A's generally have the smallest runoff potential and Ds the greatest. Group D soils are clay loam, silty clay loam, sandy clay, silty clay or clay. This HSG has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with high swelling potential, soils

with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material. (http://www.ecn.purdue.edu/runoff/documentation/hsg.html)

According to the 1996 report "Zoning plan for the Hillside area Sint Maarten" by Eco Vision, the soil in Cay Bay and by GEBE consists of clay loam. Run-off is excessive and infiltration is very low with a high water-retaining capacity. During heavy rains the soil swells due to water retention but because of the low infiltration capability any extra rainfall causes the soil to break free and wash away.

Follow-up water quality tests were conducted at these locations along the shore and it was determined that the water at Cay Bay/ GEBE and Belair had high levels of Nitrates and phosphates in the run-off, causing these inorganic chemicals to be present in the water and suggesting the presence of pollutants in the water. The general direction of flow of the run-off was in a westerly direction off-shore. Tests carried out at Cay Bay/ Indigo Bay showed no levels of pollutants or toxins.

The Nature Foundation suggests that barriers be put in place to prevent as much soil-runoff from these locations as possible.

Figure 8: Run-off at Cay Bay/ Indigo Bay

Figure 9: Run-off at Belair Beach

Figure 10: Run-off at Cay Bay/ GEBE

Figure 11: Run-off at Cay Bay/ GEBE

6. Conclusion

On December 3rd 2011 the St. Maarten Nature Foundation conducted Arial Surveys with the Flight School Caribbean Flight Academy to look for incidents of Sargasso Seaweed which may be headed in the direction of local beaches.

During the Aerial Survey, which occurred after a heavy rain-event, significant areas of run-off were also detected.

The funding for the Aerial survey was made possible through the generous funding of the St. Maarten Hospitality and Trade Association (SHTA) dollar-a-day program.

Sargassum is a genus of brown (class *Phaeophyceae*) macroalga (seaweed) in the order Fucales. Numerous species are distributed throughout the temperate and tropical oceans of the world, where they generally inhabit shallow water and coral reefs. However, the genus may be best known for its planktonic (free-floating) species.

Most of the Sargasso Seaweed lies concentrated in the Sargasso Sea, a region in the middle of the North Atlantic Ocean surrounded by ocean currents. It is bounded on the west by the Gulf Stream; on the north, by the North Atlantic Current; on the east, by the Canary Current; and on the south, by the North Atlantic Equatorial Current.

The Seaweed, known as Sargasso Weed, has been plaguing the Caribbean and St. Maarten for some months. The resulting large influx of Sargasso Weed has been due to a suspected southward shift in the Gulf Stream, which has pushed the Sargasso Sea– an area of the Atlantic Ocean where Sargasso Weed is in thick concentration, south to our area.

There were initial concerns that the decomposing seaweed on the beach could be detrimental to public health. However, based on studies conducted by the Nature Foundation it has been found that once the Sargasso weed is out of the water and drying out it simply decomposes like any other grass.

Government, the Nature Foundation and Private Individuals have been continuously removing seaweed from many of the highly frequented beaches and there have been several community based cleanup campaigns aimed at cleaning up the seaweed.

A total of five (5) medium patches of Sargassum and three (3) small patches of Sargassum were observed floating in a westerly, south-westerly direction. Two medium patches were drifting towards the Eastern Shore of the Island and are expected to come ashore in the vicinity of Back Bay.

A fly-over was conducted over Guana Bay and Dawn beach and very little Sargassum was observed in that direction, with some small patches being immediately offshore of those beaches.

The Nature Foundation will continuously monitor the status of the Sargasso Weed and notify the authorities if there is an imminent risk of a large influx of Sargasso in the St. Maarten Area.

Prior to departure on the Sargasso Surveys the island experienced heavy, persistent rain. While conducting the Sargasso Surveys significant run-off was noticed at Cay Bay/ Indigo Bay, Cay Bay/ GEBE and Belair Beach.

Follow-up water quality tests were conducted at these locations along the shore and it was determined that the water at Cay Bay/ GEBE and Belair had high levels of Nitrates and phosphates in the run-off, causing these inorganic chemicals to be present in the water and suggesting the presence of pollutants in the water. The general direction of flow of the run-off was in a westerly direction off-shore. Tests carried out at Cay Bay/ Indigo Bay showed no levels of pollutants or toxins.

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7. Appendix 1: Meteorological Conditions for St. Maarten December 3rd 2011

Table 1 Weather Data

Temperature	Forecast	Average	Historical Range
High	**28** °C	**28** °C	**24** to **31** °C
Low	**24** °C	**25** °C	**21** to **29** °C
Precipitation			
Rain	**3.6** mm	**0.0** mm	**0.0** to **0.0** mm
Humidity			
High Dew Point	-	**23** °C	**17** to **28** °C
Low Dew Point	-	**21** °C	**14** to **26** °C
Wind			
Speed	**E14** km/h	**E18** km/h	**0** to **235** km/h