Observation of microplastic in Waimushan

Student: Cheng Han-Zhan, Yu Hsuan-Chou, Min Ru-Tsai

School: Keelung Municipal Anle Senior High School

Teacher: Alice Liu

Abstract

In recent years, countries have been concerned about the distribution of microplastics in the ocean. we began to participate in GLOBE last year, and we worked with Italy and Australia's DEAKIN University. We observe from time to time the changes in the number of microplastics in Keelung Waimu Mountain, the northernmost coast of Taiwan, over the past four months. It is hoped that the classification of microplastics and the conditions of the observed environment will explore the conditions under which microplastics affect the number of microplastics in the northern oceans of Taiwan between winter and spring. In addition, during the period of submarine volcanic eruptions, a large number of pumice stones reached the coast of Taiwan, and we also used this to explore the changes of microplastics during the pumice period.

Keyword: microplastic, Waimushan, underwater volcanic pumice

Research question

1. How to distinguish microplastic patterns under a dissecting microscope？
2. How was the sample distribute under the environment conditions at the same site in different time？
3. How to change in the amount of microplastics in the ocean before and after the pumice incident？

Introduction & Review of Literature

In recent years, plastic waste has frequently appeared all over the world. Taiwan's seaside is also full of plastic, and this garbage will form microplastics after decomposition. So we wanted to understand how microplastics change over time at a single station, so we designed an experiment. Observing the changes in microplastics over the past four months from time to time, the experimental content includes observing the temperature of seawater, pH and so on.

What is the microplastic?

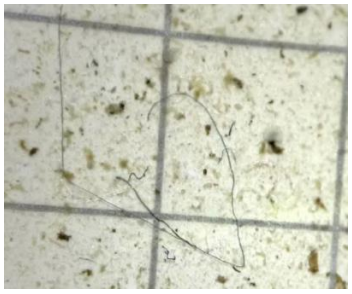
According to the definition of the National Oceanic and Atmospheric Administration (NOAA), microplastics refer to plastics with a diameter of less than 5mm, which is generally invisible to the naked eye and must be observed with microscopes and other related instruments. Microplastics are micro-glue beads that are decomposed into pieces of cosmetics from large plastic waste, which float in the atmosphere and the hydrology of the earth, and even fall to the ground with rain and snow, and flow to rivers, lakes and oceans. If you smoke a lot of microplastics into the body, you will suffer from diseases such as lung inflammation, infertility and cancer.

How to identify the microplastic?

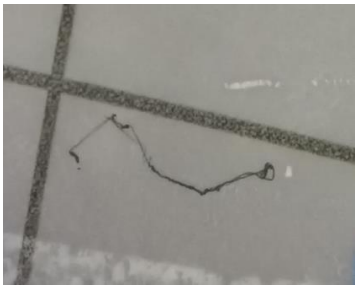
Because at present we can only distinguish linear microplastics, first we find out the linear observations, and then we can distinguish from the appearance, the first observation can be distorted. If not, it can be classified into the part that is not microplastics, most of which are biological hair, dander,etc. The second point to observe the tail end of these lines, whether there is a fork like the hemp rope, in line with the above two points must be microplastics. The third point can also observe whether the lines are different in thickness, if there is this property is also a microplastic.

Microbe

Microplastics Of Varying Thicknesses



Special Microplastics



Extremely Twisted Microplastics

Sampling site

(A) The Sampling site was conducted at Huhai Rd., Zhongshan Dist., Keelung City, Taiwan (R.O.C.).(25.163583”N, 121.726055”E).

(B) The Laboratory was at No. 360, An 1st Rd. Anle Dist., Keelung City , Taiwan(R.O.C.)(25.1350661°N 121.7305695°E)

During 07 August to 09 March,2022.

(A)

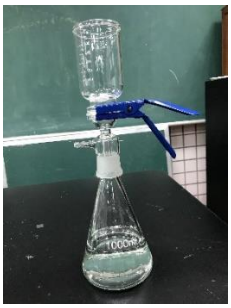
(B)

Data Collection

Waimushan is the sampling site at 25.1635833" N latitude and 121.726055"E longitude during 07 August to 09 March,2022.The Biology Laboratory of Anle High School is the experimental site. We adopted a fixed time and location approach to sampling seawater and recorded the weather conditions, wind direction, ocean currents, air pressure, and humidity at that time. We also write down the temperature ,salinity, and pH of seawater. In addition, we received pumice from the eruption of the submarine volcano around January in the Ogasawara Islands of Japan, and we wanted to list pumice as one of the factors of observation, and explore the relationship between pumice and microplastics.

Equipment

1. A bucket with a rope 	**2. Thermometer** 	**3.Air pressure gage** 
4.Salinometer 	**5.Plastic bottle (6000ml)** 	**6.Graduate** 
7.ph detector 	**8. Washing bottle** 	**9. Dissecting microscope** 

10. Polarized light microscopy 	**11. Petri dish** 	**12. Tweezers** 
13. Beaker 	**14. Suction filter device** 	**15. Filtration device** 
16. Filter paper 		

Process

At the beach:

Step1: Throw the bucket out of the country, pull it back with a rope, rinse the bucket first, and the sample measured the second time.

Step2: Put a portion of the recovered seawater into a graduated cylinder and take the rest back to the lab in plastic bottles.

Step3: Use physical instruments- thermometer, salinity meter into the graduated cylinder.

Step4: It is then measured with a chemical instrument - pH detector.

Step5: Find an open place to place the air pressure gage, let it stand for a period of time and observe the value of atmospheric pressure and relative humidity.

Step6: Go online to find the direction of the current, the time of rising and falling tide, and the value of the wind direction.

Step7: Fill in the values measured in the above four items into the ‘'Seawater Sampling Form"

In the laboratory:

Step1: Assemble the suction filter equipment, filtration equipment (the two need to be connected together).

Step2: Pour the collected seawater into 200 mL in a beaker.

Step3: Write the coordinates on the filter paper, wet and place them in the filter device.

Step4: Slowly pour seawater from above the filter unit and extract the gas from the device with the suction filter.

Step5: After pumping to a certain extent, remove the filter paper and place it in a Petri dish.

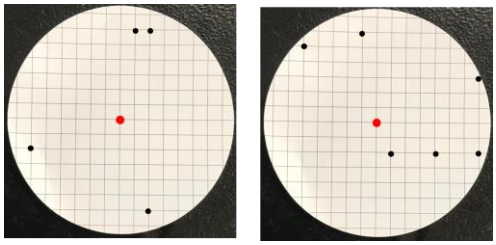
Step6: Use a dissecting microscope to observe the microplastics on the filter paper.

Step7: The microplastics found remember to take pictures and write down their features.

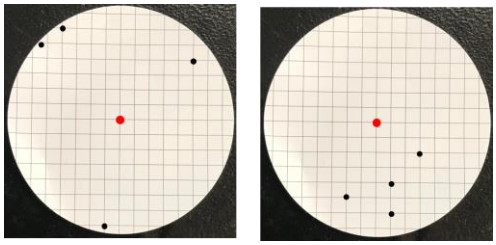
Microplastics distribution

The distribution presented on the filter paper after each 200 mL of seawater solution passes through the filter paper.

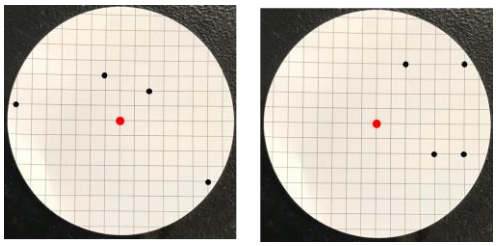
November 07,2021



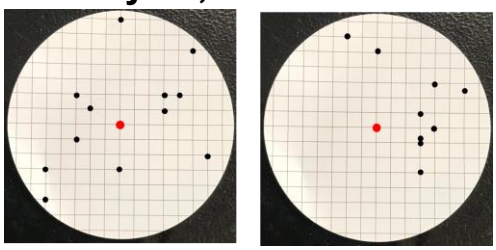
November 12,2021



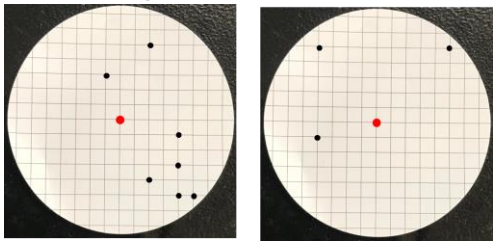
December 10,2021



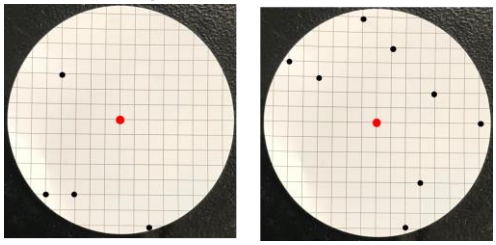
January 07,2021



February 04,2021



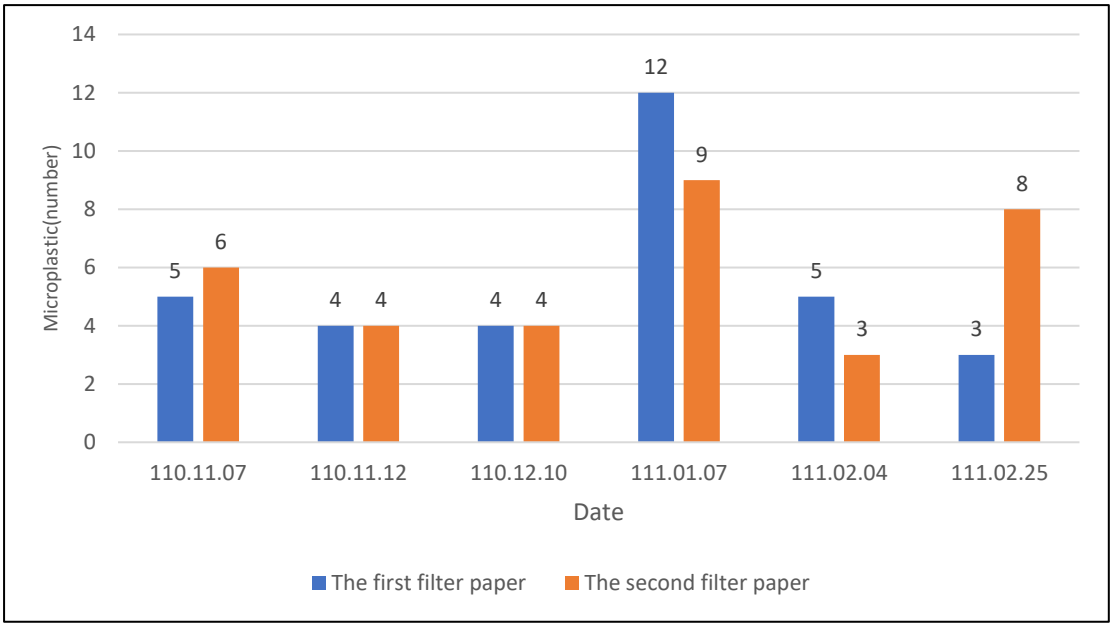
February 25,2021



Seawater sampling table

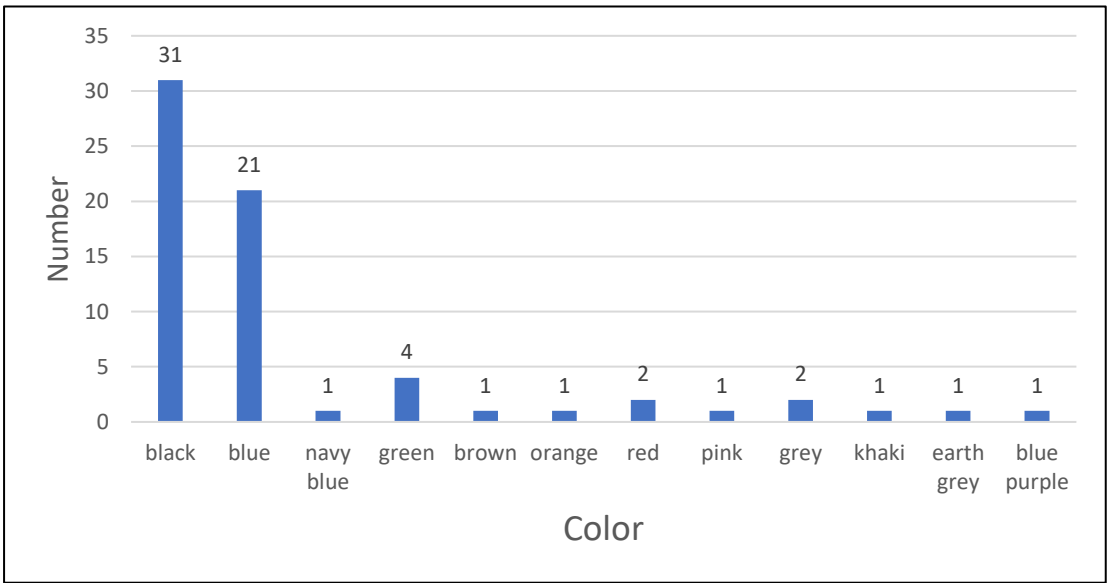
Date	110.11.07	110.11.12	110.12.10	111.01.07	111.02.04
Place	Waimushan Seaside				
Time	09:38	13:23	13:50	13:50	09:50
Weather	Sunny	Cloudy	Sunny	Cloudy	Rainy
Wind	Northeast	Northeast	North	Northeast	Northeast
Temperature (°C)	28	23	23	17	16
Degree (%)	68	65.6	76.3	80.5	90.1
Atmospheric Pressure (hPa)	1013	1019	1019	1022	1022
Sea Water Temperature (°C)	24	20.5	20.1	18	17
Ocean Current	Southwest	Southwest	Southwest	Southwest	Southwest
Salinity(‰)	3.2	3	2.9	2.9	2.5
Ph Value	7.9	8.6	8.7	9.0	8.1
Dry Tide Time	04:01	09:38	07:53	06:16	04:55
Full Tide Time	11:59	17:14	15:32	13:58	12:30

Long chart of the number of microplastics



From the table, it can be seen that 1/7 of the microplastics are much higher than other times, followed by 11/7 and 2/25, which we speculate is because of 1/7 The observation time is close to full tide, so it will be the most.

long chart of microplastic color



It can be seen from the table that the color of microplastics is most black, followed by blue, which is very different from the number of other colors.

Table 1. Correlation of microplastics to the time of full tide				
high tide time	1	2	total	
02:21	5	6	11	-0.8182
03:51	4	4	8	
01:42	4	4	8	
00:08	12	9	21	
02:40	5	3	8	
01:45	3	8	11	

The time from full tide has a very good negative correlation with the amount of microplastics.

Table 2. Correlation of microplastics to the time from dry tide				
dry tide time	1	2	total	
05:37	5	6	11	0.612956
03:45	4	4	8	
05:57	4	4	8	
07:34	12	9	21	
04:55	5	3	8	
02:38	3	8	11	

The time from dry tide has a good positive correlation with the amount of microplastics.

Table 3. Correlation of microplastics with temperature					
total	1	2	Temperature (°C)		
11	5	6	28	-0.3253	
8	4	4	23		
8	4	4	23		
21	12	9	17		
8	5	3	16		
11	3	8	19		

The relationship between temperature and the amount of microplastics is not strong.

Discussion

(1) We found that the microplastic patterns of the seaside are mostly linear, twisted, and the endpoints are bifurcated like hemp rope, which can be identified by GLOBE's protocol picture book.

(2) We speculate that the number of microplastics is related to the time of full tide dry tide, taking 1/7 as an example, the time we collected is closest to the time of full tide, so the number of microplastics is the largest, and from the "seawater sampling table." And "The long chart of the number of microplastics in each observation day" can be seen that the number of microplastics is not greatly related to weather, temperature, and humidity.

(3) We found in 1/7 of the seawater that contains the pumice of the volcano in the Ogasawara Islands of Japan, which we thought could be explored, so we included it in our experiment. In subsequent experiments, it was found that pumice does not directly affect the number of microplastics, and the number of microplastics in the seawater before and after pumice is not too different.

Conclusion

Based on the results of our many experiments, we infer that the number of microplastics is related to the time of dry tide, and we have also observed that most of the colors of microplastics are black and blue, but we do not know where they originate, so they can be used as a topic for our future discussion And in the future, we can also go to the factor of full tide time to explore its relationship with microplastics, and then find other factors related to microplastics, we also try to use hot touch And polarized microscopy to observe microplastics, but the data collected is not sufficient, so it is also the direction we can try in the future.

Bibliography/Citations

(1) Assoc. Prof. A. Sutti, Stuart Robottom, Sandro Sutti, A microplastics recognition guide, pp20.

(2) V. Hidalgo-Ruz, L. Gutow, R.C. Thompson, M. Thiel (2012)Microplastics in the marine environment: a review of the methods used for identification and quantification.Environ.

(3) Yulan,Z.,Shichang,K.,Steve,A.,Deonie,A.,Mika,S.Atmosphericmicroplastics: A review on current status and perspectives. Earth-Science Reviews, 203, [103118]