

# STUDY OF MICROPLASTICS CONTAMINATION IN SOIL, SEAWATER AND SEAGRASS AT SIKAO DISTRICT, TRANG PROVINCE.



Class level Senior high school

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Princess Chulabhorn Science High School Trang

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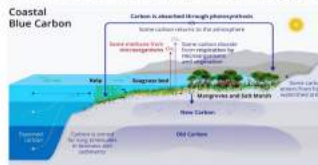


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These ecosystems play a crucial role in mitigating climate change by sequestering carbon dioxide from the atmosphere and storing it in their biomass and sediments.



<https://www.google.com/search?q=https://doi.org/10.1089/nasa.2016.0074&btnG=Google+Search>



<https://thekey.news/columnists/energykey/172149/>



# Introduction

The study found that the density of microplastics in seagrass beds The values were two times higher than in areas without seagrass.

The accumulation of microplastics in sediment in seagrasses bed (*Halodule uninervis*) Sattahip bay, Chon Buri Province  
Christmas Pattanasirinonand

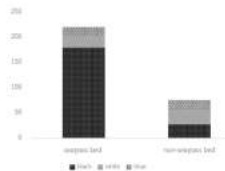
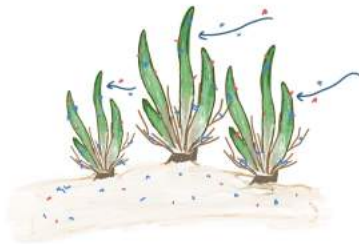


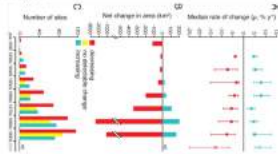
Figure 2 The number of of microplastic colours in seagrasses bed and non-seagrass

# Introduction



**Rates of decline have accelerated current rate of decline of almost 1.5% per year,**

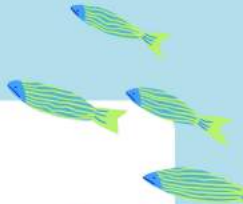
Accelerating loss of seagrasses across the globe threatens coastal ecosystems  
Michelle Waycott



seagrass has been experiencing a concerning decline, with an average annual rate of 1.5 %, and an estimated loss of 70 % since the early 20th century However, the most significant contributors to seagrass decline are human activities, including water pollution, overexploitation, habitat destruction, and fisheries operations

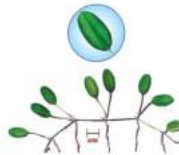
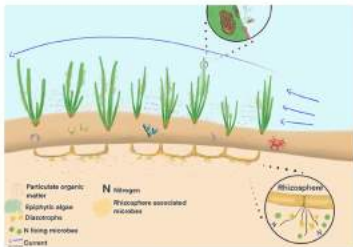


# Introduction



A new study has provided compelling evidence that polystyrene MPs and nanoplastics can permeate the plant surface and infiltrate internal tissues, inflicting adverse impacts on the growth and photosynthetic machinery of seagrass species, such as *Cymodocea nodosa*.

Microplastics in the seagrass ecosystems: A critical review  
Changjun Li



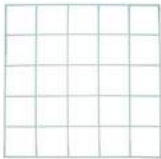
# Research Question



1. Are there any differences in water quality between Pak Khlong Beach and Ao Kham?
2. Are the amounts of microplastics in the soil and the seawater around Pak Khlong Beach and Ao Kham different?
3. Do the quantities of microplastics in soil in different species of seagrass areas differ?
4. Do the quantities of microplastics in different species of seagrass differ?
5. Do the size, color and shape of microplastics in different species of seagrass differ?



# MATERIALS



Quadrat size  
50×50 cm.



Sieve size 5 mm.  
and 1 mm.



Filter fabric 300 and 20  $\mu\text{m}$



stereo microscope



Vacuum pump



manta net

# CHEMICALS



Ferrous Sulfate ( $\text{FeSO}_4$ ) 0.05 M



Hydrogen Peroxide ( $\text{H}_2\text{O}_2$ ) 30%



Potassium Hydroxide ( $\text{KOH}$ ) 1%



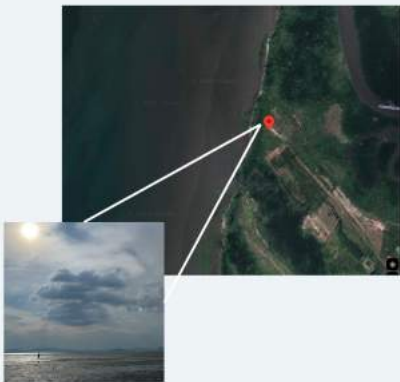
Normal Saline Solution



Distilled Water

# Methods

## Study sites



Pak Khlong Beach Trang province  
( latitude 7°37'34.3"N longitude99°16'17.4"E)

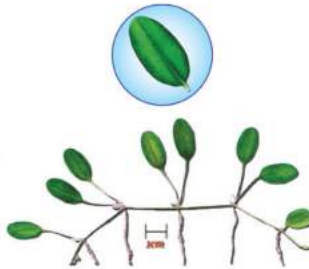


( latitude 7°30'07.9"N longitude99°18'03.6"E)  
Ao Kham Trang province

## Species of Seagrass



*Cymodocea rotundata*



*Halophila ovalis*



*Enhalus acoroides*

# Methods

Determine the sampling seawater, soil and seagrass by randomly and Send the data into the GLOBE Data Entry



1

2

3

4

Analyze water quality and Microplastics in soil, water and seagrass



Study of the leaf cross section of seagrass.

Statistical Data



# Methods

## Measure water quality

To measure water quality according to the GLOBE protocol



Measure pH



Dissolved oxygen



Salinity in the seawater

# Methods

## Study of soil microplastic

Sieve the dried soil samples through 5 mm and 1 mm mesh sieves.



1



Filter the clearer water through a 300  $\mu$ m filter cloth, then re-filter it with the filter cloth. Repeat this process 3-5 times.

2

Place the sample into the process (WPO)

3



4

The dried samples is examined under a stereo microscope and record observations

# Methods

## Study of seawater microplastic

Deploy the manta net, which has a known cross-sectional area, and attach a flow meter to the forested area



The dried samples is examined under a stereo microscope and record observations



1



2



3



Place the sample into the process (WPO)

# Methods

## Study of seagrass microplastic



Place the sample into the process (WPO) and leaving it overnight

1

Rinse with distilled water.  
Cut the sample into small pieces



2



3



remove the sample with a 20  $\mu\text{m}$  filter cloth.



4

The dried samples is examined under a stereo microscope and record observations

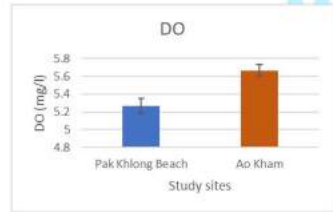
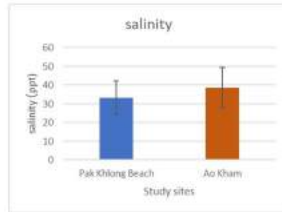
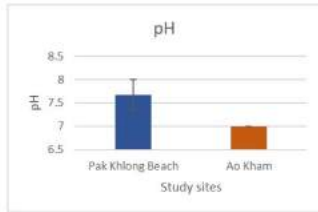


# Results



# Seawater quality

Figure 1 : The charts show water quality



# **Study of microplastics**



# Microplastics in seawater



Table1: shows the quantity of microplastics in seawater.

| Study sites             | Microplastic numbers |                 |                 |
|-------------------------|----------------------|-----------------|-----------------|
|                         | 1mm-300 $\mu$ m      | 300-20 $\mu$ m  | Total           |
| <b>Pak Khlong Beach</b> | 1.67 $\pm$ 0.67      | 1.33 $\pm$ 0.33 | 3.00 $\pm$ 0.17 |
| <b>Ao Kham</b>          | 2.00 $\pm$ 1.00      | 2.67 $\pm$ 0.88 | 4.67 $\pm$ 0.33 |



# Microplastics in soil

Table2: shows the quantities of microplastics in soil from various types of seagrass sources

| Study sites      | In                  | Microplastic numbers |                 |                 |                  |                  |
|------------------|---------------------|----------------------|-----------------|-----------------|------------------|------------------|
|                  |                     | >5mm                 | 5mm-1mm         | 1mm-300 $\mu$ m | 300-20 $\mu$ m   | Total            |
| Pak Khlong Beach | <i>H. ovalis</i>    | 2.00 $\pm$ 0.58      | 2.00 $\pm$ 1.53 | 9.33 $\pm$ 0.88 | 8.67 $\pm$ 0.33  | 15.00 $\pm$ 1.26 |
|                  | <i>C. rotundata</i> | 1.33 $\pm$ 0.67      | 1.00 $\pm$ 0.58 | 2.33 $\pm$ 1.20 | 2.00 $\pm$ 1.00  | 6.67 $\pm$ 0.30  |
|                  | <i>E. acoroides</i> | 2.00 $\pm$ 1.15      | 4.33 $\pm$ 0.88 | 7.67 $\pm$ 1.53 | 13.67 $\pm$ 2.33 | 19.00 $\pm$ 1.04 |
| Ao Kham          | <i>H. ovalis</i>    | 1.33 $\pm$ 0.67      | 2.33 $\pm$ 0.33 | 3.33 $\pm$ 0.88 | 3.00 $\pm$ 1.53  | 10.00 $\pm$ 0.44 |
|                  | <i>C. rotundata</i> | 0.33 $\pm$ 0.33      | 1.67 $\pm$ 0.88 | 3.67 $\pm$ 0.67 | 2.33 $\pm$ 1.20  | 8.00 $\pm$ 0.69  |
|                  | <i>E. acoroides</i> | 0.67 $\pm$ 0.33      | 3.67 $\pm$ 0.67 | 4.67 $\pm$ 0.67 | 5.00 $\pm$ 1.53  | 14.00 $\pm$ 0.99 |

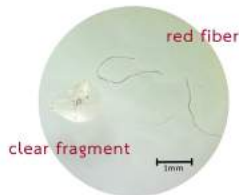
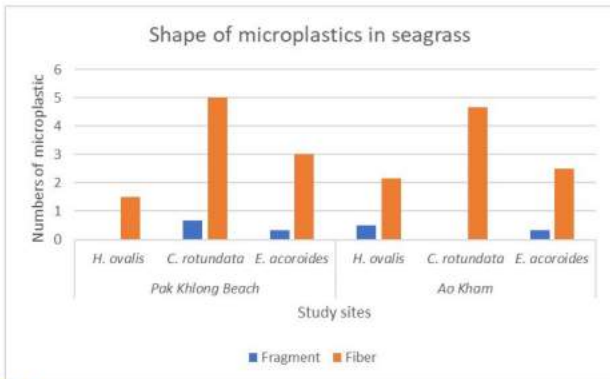
# Microplastics in seagrass

Table 3 :shows the quantities of microplastics in Seagrass.

| Study sites         | species             | Microplastic numbers |                 |                 |
|---------------------|---------------------|----------------------|-----------------|-----------------|
|                     |                     | 1mm-300 $\mu$ m      | 300-20 $\mu$ m  | Total           |
| Pak Khlong<br>Beach | <i>H. ovalis</i>    | 2.00 $\pm$ 0.58      | 1.00 $\pm$ 0.58 | 1.50 $\pm$ 0.43 |
|                     | <i>C. rotundata</i> | 6.67 $\pm$ 2.33      | 4.67 $\pm$ 2.03 | 5.67 $\pm$ 1.45 |
|                     | <i>E. acoroides</i> | 4.00 $\pm$ 0.58      | 3.33 $\pm$ 1.33 | 3.67 $\pm$ 0.94 |
| Ao Kham             | <i>H. ovalis</i>    | 2.33 $\pm$ 0.88      | 3.00 $\pm$ 1.53 | 2.67 $\pm$ 0.80 |
|                     | <i>C. rotundata</i> | 5.67 $\pm$ 1.45      | 4.33 $\pm$ 1.20 | 5.00 $\pm$ 0.89 |
|                     | <i>E. acoroides</i> | 3.67 $\pm$ 0.33      | 2.00 $\pm$ 0.58 | 2.83 $\pm$ 0.48 |

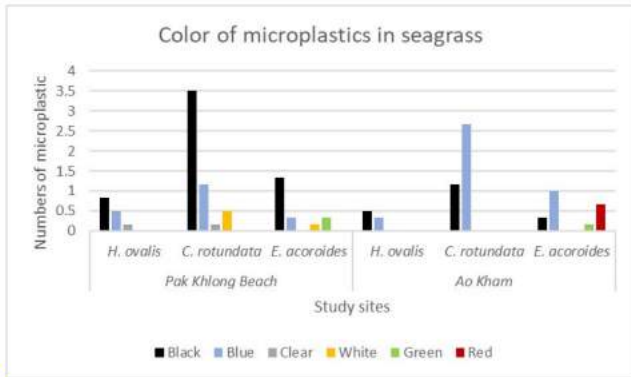
# Microplastics in seagrass

Figure 2: shows the number of microplastic in different-shape in seagrass

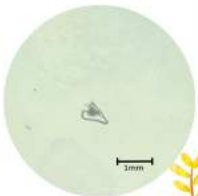


# Microplastics in seagrass

Figure 3: shows the number of different microplastic color in seagrass



clear fiber



black fragment



# DICCUSSION



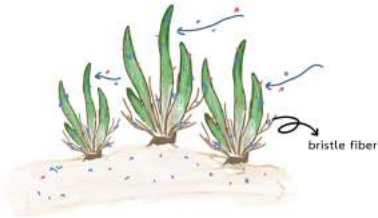
# Dicussion

The water quality and the quantity of microplastics in both study sites do not statistically differ. This is because both areas have **similar geographical** features.



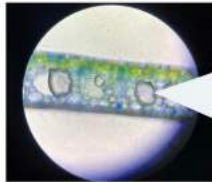
# Dicussion

The soil in *Enhalus acoroides* area has the highest amount of microplastics. This is because the physical characteristics of it, such as the length and density of bristle fibers, make it a trap for microplastics, leading to more accumulation in the soil compared to other areas.

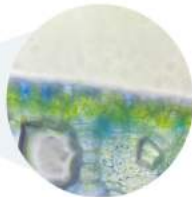


# Dicussion

*Cymodocea rotundata* has the highest quantity, followed by *Halophila ovalis* and , respectively. This is because has **thin leaves** with extensive **internal gaps**, allowing microplastics to accumulate easily.

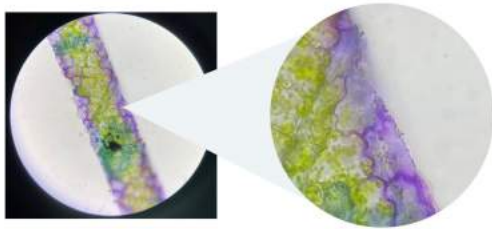


*Cymodocea rotundata*



# Dicussion

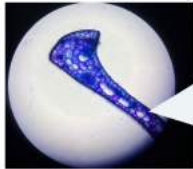
*Halophila ovalis* has **fewer internal gaps** within its leaves



*Halophila ovalis*

# Discussion

while *Enhalus acoroides* has **thicker leaf** surfaces, making it difficult for microplastics to accumulate within the leaves.

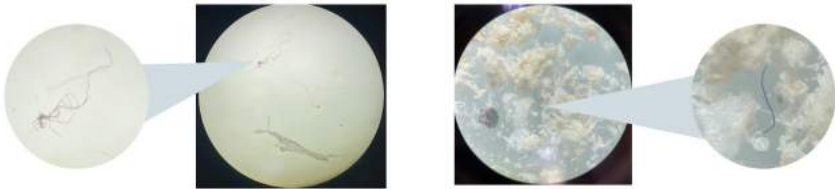


*Enhalus acoroides*



# Dicussion

The size of microplastics found in each type of seagrass in both areas is **similar in terms of shape and color**, indicating a possible origin from **fishing gear** and equipment used in **fishing activities** in the area, which are mostly made of nylon and fiber.( Supakorn Thepwilai,2021)



# CONCLUSION



# CONCLUSION

1. The amount of microplastics in the soil and seawater at Pak Klong Beach and Ao Kham Beach was not significantly different
2. It was found that *Enhalus acoroides* area in the soil had the highest levels of microplastics



# CONCLUSION

3. *Cymodocea rotundata* had more microplastics than both *Enhalus acoroides* and *Halophila ovalis* in order.



4. Their size being from 1 mm – 20  $\mu\text{m}$  Most of the microplastics found are linear and black. According to the size, shape and color

5. The water quality in both study sites do not statistically differ.

# Citation

- Cecelia M. Gerstenbacher, Cecelia M. Gerstenbacher et al. (2022). A review of microplastic impacts on seagrasses, epiphytes, and associated sediment communities. ScienceDirect. A review of microplastic impacts on seagrasses, epiphytes, and associated sediment communities – ScienceDirect
- Christmas Patsirinon and Jariyawadee Suriyapan. (2020). Accumulation of microplastics in sediment in the seagrass landscape (Halodule uninervis), Sattahip Bay, Chonburi Province. Khon Kaen University. <https://ag2.kku.ac.th/kaj/PDF.cfm>
- Department of Marine and Coastal Resources. (2022). Status of Seagrass Beds in 2021. Knowledge Repository. Department of Marine and Coastal Resources. [https://km.dmcr.go.th/c\\_4/d\\_19474](https://km.dmcr.go.th/c_4/d_19474)
- Richard 'RJ' Lilley and Dr Benjamin Jones. (2021). Help Reduce Microplastic Pollution?. Seagrass Project. <https://www.projectseagrass.org/guest-blog/>

**THANK YOU**