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

Class level Senior high school

Princess Chulabhorn Science High School Trang

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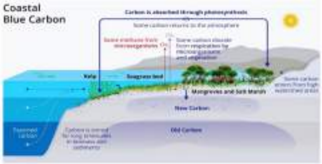
Introduction

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://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

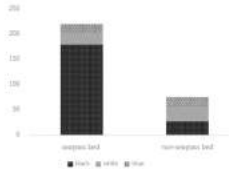
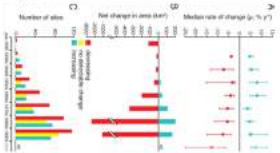


Figure 2 The number of of microplastic colours in seagrasses bed and non-seagrass

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

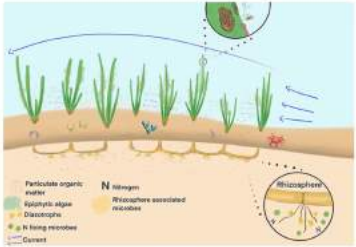


seagrass has been experiencing a concerning decline, with an average annual rate of 1.5 %, and an estimated loss of 70 % since the early 20th century However, the most significant contributors to seagrass decline are human activities, including water pollution, overexploitation, habitat destruction,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

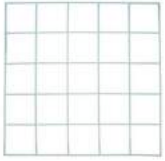
Microplastics in the seagrass ecosystems: A critical review
Changjun Li



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



Quadrate size
50×50 cm.

Sieve size 5 mm.
and 1 mm.

Filter fabric 300 and 20 µm

stereo microscope

Vacuum pump

manta net

CHEMICALS

Ferrous Sulfate (FeSO4) 0.05 M

Hydrogen Peroxide (H2O2) 30%

Potassium Hydroxide (KOH) 1%

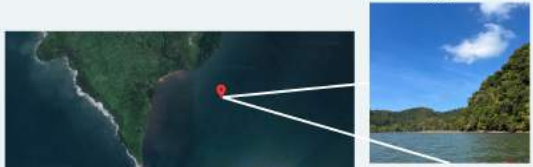
Normal Saline Solution

Distilled Water

Methods

Study sites

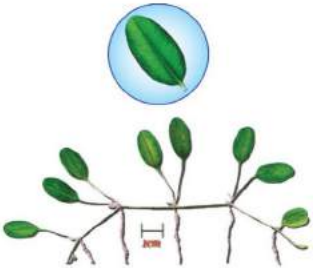
(latitude 7°30'07.9"N longitude99°18'03.6"E)
Ao Kham Trang province



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

Species of Seagrass

Cymodocea rotundata



Halophila ovalis

Enhalus acoroides

https://www.dmcr.go.th/infoAll/187

Methods

Study of the leaf cross section of seagrass.

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

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

1

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

2

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

3

Place the sample into the process (WPO)

4

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

Methods

Study of seawater microplastic

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

2. Place the sample into the process (WPO)

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

Methods

Study of seagrass microplastic

1

Rinse with distilled water.
Cut the sample into small pieces

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

2

3

remove the sample with a 20 µm filter cloth.

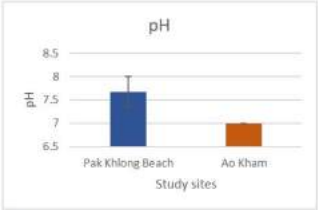
The dried samples is examined under a stereo microscope and record observations

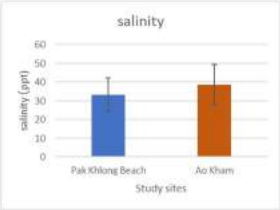
4

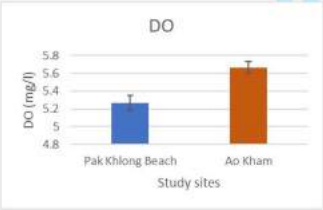
Results

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-300µm	300-20 µm	Total
Pak Khlong Beach	1.67 ± 0.67	1.33 ± 0.33	3.00 ± 0.17
Ao Kham	2.00 ± 1.00	2.67 ± 0.88	4.67 ± 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-300μm	300-20μm	Total
Pak Khlong Beach	*H. ovalis*	2.00 ± 0.58	2.00 ± 1.53	9.33 ± 0.88	8.67 ± 0.33	15.00 ± 1.26
	C. rotundata	1.33 ± 0.67	1.00 ± 0.58	2.33 ± 1.20	2.00 ± 1.00	6.67 ± 0.30
	E. acoroides	2.00 ± 1.15	4.33 ± 0.88	7.67 ± 1.53	13.67 ± 2.33	19.00 ± 1.04
Ao Kham	*H. ovalis*	1.33 ± 0.67	2.33 ± 0.33	3.33 ± 0.88	3.00 ± 1.53	10.00 ± 0.44
	C. rotundata	0.33 ± 0.33	1.67 ± 0.88	3.67 ±0.67	2.33 ± 1.20	8.00 ± 0.69
	E. acoroides	0.67 ± 0.33	3.67 ± 0.67	4.67 ± 0.67	5.00 ± 1.53	14.00 ± 0.99

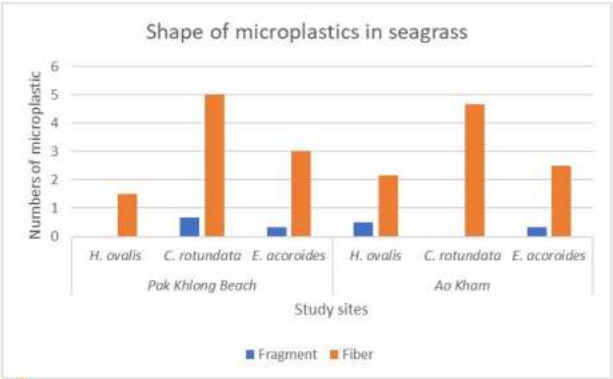
Microplastics in seagrass

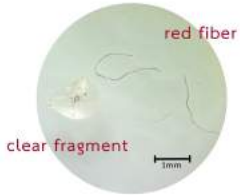
Table 3 :shows the quantities of microplastics in Seagrass.

Study sites	species	Microplastic numbers		
		1mm-300µm	300-20µm	Total
Pak Khlong Beach	*H. ovalis*	2.00 ± 0.58	1.00 ± 0.58	1.50 ± 043
	C. rotundata	6.67 ± 2.33	4.67 ± 2.03	5.67 ± 1.45
	E. acoroides	4.00 ± 0.58	3.33 ± 1.33	3..67 ± 0.94
Ao Kham	*H. ovalis*	2.33 ± 0.88	3.00 ± 1.53	2.67 ± 0.80
	C. rotundata	5.67 ± 1.45	4.33 ± 1.20	5.00 ± 0.89
	E. acoroides	3.67 ± 0.33	2.00 ± 0.58	2.83 ±0.48

Microplastics in seagrass

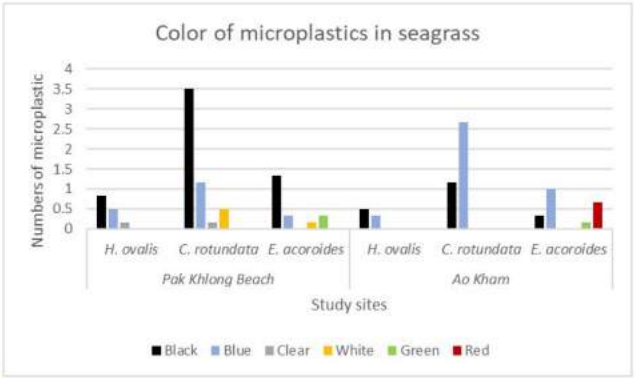
Figure 2: shows the number of microplastic in different-shape in seagrass

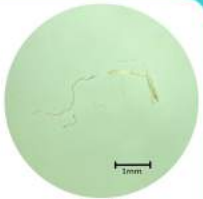




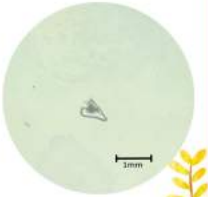
Microplastics in seagrass

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





clear fiber



black fragment

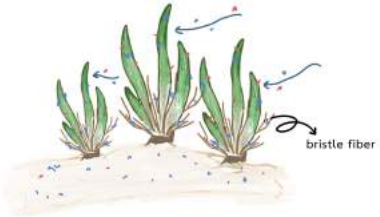
DICCUSSION

Diccussion

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.

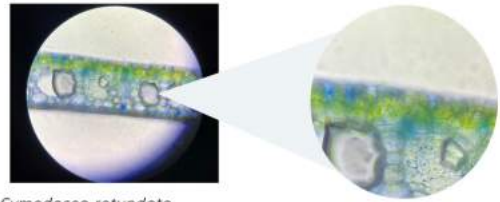
Diccussion

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.



Diccussion

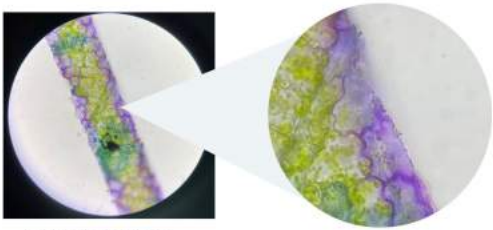
Cymodocea rotundata has the highest quantity, followed by *Halophila ovalis* and , respectively. This is because has **thin leaves** with extensive **internal gaps**, allowing microplastics to accumulate easily.



Cymodocea rotundata

Diccussion

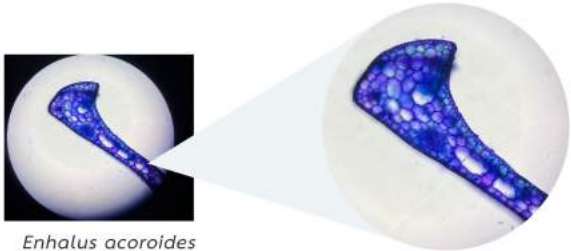
Halophila ovalis has **fewer internal gaps** within its leaves



Halophila ovalis

Diccussion

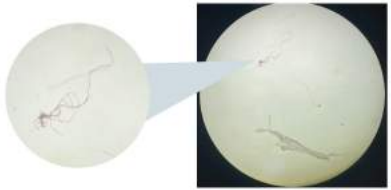
while *Enhalus acoroides* has **thicker leaf** surfaces, making it difficult for microplastics to accumulate within the leaves.

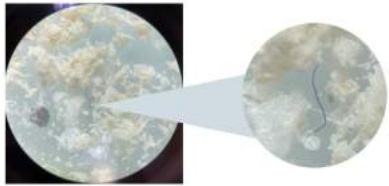


Enhalus acoroides

Diccussion

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 μm 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

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THANK YOU