# Study of Fiddler Crab Density Affecting Soil Properties and Carbon Sequestration in Ban Modtanoi Mangrove Forest, Kantang District,Trang Province

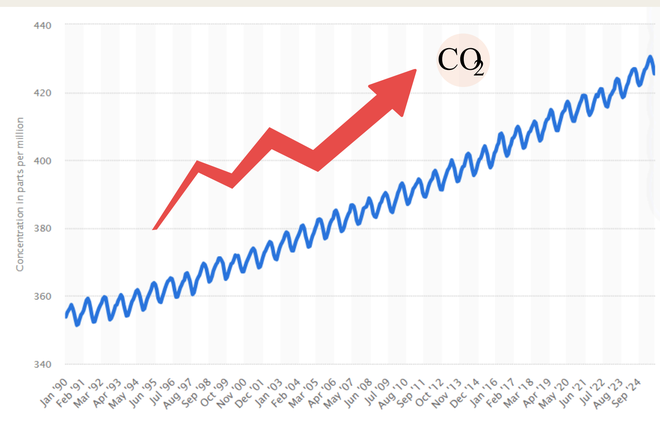
Researchers : Miss Natthawanee Chuhoithong, Miss Waratchaya Kwannimit
Project advisors: Mrs. Sirikwan Nuphutthi and Miss Nuengruethai Chaimanee
School : Princess Chulabhorn Science High School Trang

## Abstract

This study on the effects of fiddler crab density on soil properties and carbon sequestration in mangrove soils was conducted in Ban Modtanoi mangrove forest, Kantang District, Trang Province. The objectives of the study were to examine the effects of fiddler crab density on soil properties and to compare the amount of carbon sequestration in mangrove soils at Ban Modtanoi, Kantang District, Trang Province. The GLOBE Soil Protocol was employed to analyze the physical and chemical properties of the soil, and soil organic carbon (%OC) was calculated from the loss on ignition (%LOI) at a combustion temperature of 450°C. The results showed that areas with higher fiddler crab density exhibited significantly greater carbon sequestration capacity. Site B (the pier area), which had a fiddler crab density of 80 individuals per square meter, showed a high soil organic carbon content of 2.65 %OC and an organic matter content of 6.92 %LOI. In contrast, Site A (the community enterprise area), with a lower crab density of 44.8 individuals per square meter, exhibited lower values, with 1.54 %OC and 4.36 %LOI. In addition, Site B had higher soil moisture (22.85%) and a clay loam soil texture, whereas Site A had lower soil moisture (17.28%) and a sandy clay loam texture. Both sites had a soil pH of 6 and contained only trace amounts of N, P, and K nutrients.

## Introduction

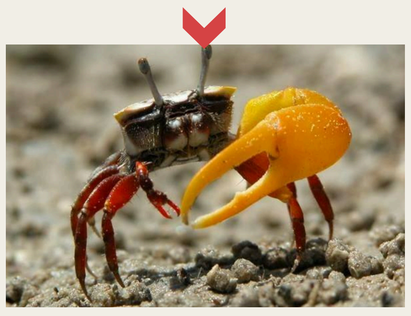
Graph Showing the Average Monthly Carbon Dioxide ($CO_2$) Levels in the Global Atmosphere from 1990 to 2025




Increasing Carbon Levels

SOURCE: WWW.STATISTA.COM

Mangrove Forests Absorb Carbon



Fiddler Crab (Benthic Animal)

## Research Questions

1. Is the density of fiddler crabs related to soil properties in mangrove forests? If so, how?
2. Does the density of fiddler crabs affect the amount of carbon sequestration in mangrove soil? If so, how?

## Research Hypotheses

1. The density of fiddler crab populations affects soil properties in mangrove forests.
2. The density of fiddler crab populations affects the amount of carbon sequestration in mangrove soil.

## Acknowledgments

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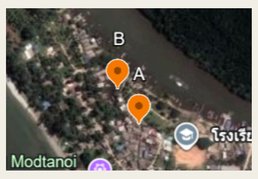
## Methodology

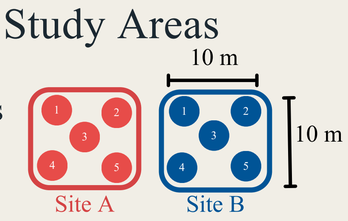
**01 Study Area Selection**



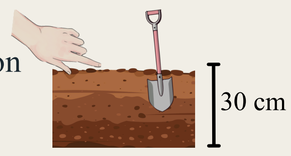

Ban Motanoi Mangrove Forest, Kantang District, Trang Province
7°18'26"N 99°25'05"E

**02 Division of Study Areas**

2.1 Study Sites



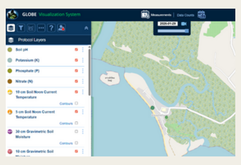

2.2 Data Collection




**03 Soil Quality Analysis**

Soil texture | Soil color | N P K | pH | Moisture content | Temperature | %LOI | %OC

**04 Data Recording**



GLOBE Data Entry

**05 Data Analysis**

## Results

Table shows Density of Fiddler Crabs and Soil Properties at Each Study Site

| Site | Fiddler Crab Density (individuals/m²) | Soil Properties | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Soil Texture | Soil Color | Temperature (°C) | Moisture Content (%) | pH | Soil Nutrients | | | %LOI | %OC |
| | | | | | | | N | P | K | | |
| A | 44.8 | Sandy Clay Loam | Very Dark Grayish Brown | 37 | 17.28 | 6 | trace | trace | trace | 4.36 | 1.54 |
| B | 80 | Clay Loam | Very Dark Gray | 31 | 22.85 | 6 | trace | trace | trace | 6.92 | 2.65 |

## Conclusion

This study concludes that fiddler crab density is an important biological factor enhancing carbon sequestration efficiency in mangrove forests. Crab burrowing activity improves soil physical properties, particularly soil moisture and structure, which facilitate organic matter accumulation. As a result, areas with higher crab density exhibited significantly higher soil organic carbon (%OC) than areas with lower crab density. These findings emphasize that fiddler crabs are not merely common mangrove inhabitants but function as "ecosystem engineers," supporting the role of mangrove forests as highly effective natural carbon sinks

## Reference

Almeida, C. M. R., Santos, J. A., Mucha, A. P., & Bordalo, A. A. (2023). Effects of bioturbation by the fiddler crab *Leptuca speciosa* on mangrove peat in Barnes Sound, Florida, USA. Journal of Crustacean Biology, 43(2), https://doi.org/10.1093/jcbiol/ruad006