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From Scientific Knowledge to Practice for Sustainable Development: Mangrove Conservation in Thailand

Tritep Vichkovitten
Department of Environmental Sciences
Faculty of Science and Technology, Thammasat University, THAILAND

Wanasea Study Tour

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Tritep Vichkovitten

- PhD in Biology (Marine ecology) from University of Southern Denmark, Denmark.
- Assistant Professor at the Department of Environmental Sciences, Faculty of Science and Technology, Thammasat University, Thailand.
- Doing research on mangrove plant and its environment.

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Faculty of Science and Technology
Thammasat University

- Established in 1986, primarily consisted of 5 departments
  - Department of Statistics
  - Department of Mathematics
  - Department of Computer
  - Department of Environmental Sciences
  - Department of Health Science
- The faculty has 10 departments, presently.

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Mangroves

Mangroves are dominated in estuarine and coastal areas with the influences of freshwater of tropical and subtropical regions.

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They provide a wide range of economical and ecological services.

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Many of the mangrove communities are served as the destination for ecotourism.

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Mangroves helped to protect coastal areas against the gigantic Tsunami hit the Southern part of Thailand in 2004.

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Mangroves

Mangrove communities and characteristics vary within the gradient of environmental setting across the intertidal landscape.

Different species of mangrove trees differ in their physiological tolerance of inundation and salinity, which contributes to patterns of zonation and species richness in mangroves.

The trophic relationships between mangrove and coastal marine ecosystems can be characterized by the biomass and the productivity of the mangrove and being closely linked to the structure of the mangrove forests.

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Massive mangrove mortalities are generally caused by either natural or human-induced fluctuations of environmental conditions which are also related to sedimentary qualities.

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Mangroves

Scientific issue:

Litter production is widely used as a measurement of mangrove productivity and is useful in comparing between species and communities, export of materials supporting food web in adjacent estuarine ecosystems. It is necessary to know its ecological characteristics which provide useful information for conservation and management.

Mass mortality of mangrove plants in the area has been observed during the last decade. Therefore, it is necessary to know the benthic environmental changes in relation to dead of mangrove plants in the areas.

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Methodology

1. Litter production was examined using litter traps hang within the mangrove forests based on three different size classes where Site A, representing mature stage categories, Site B, representing the young mature categories and Site C, representing the young tree categories.

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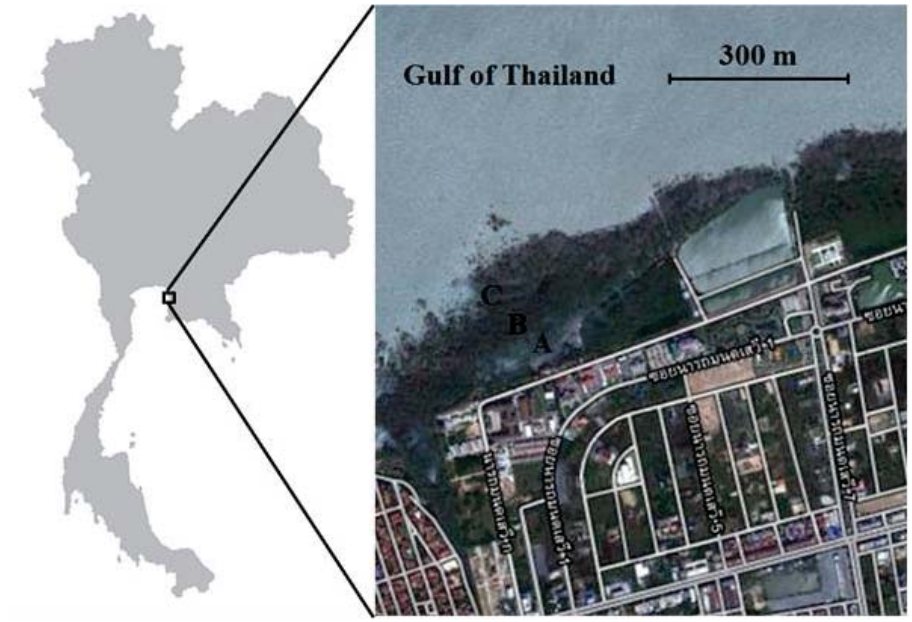

All three sampling sites of mangrove (*Avicennia alba* Bl.) at Chonburi Province on the east coast of Thailand.

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Methodology

The study plots and litter trap establishment at all three sampling sites of mangrove (*Avicennia alba* Bl.) at Chonburi Province on the east coast of Thailand.

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Methodology

2. Environmental condition in relation to mangrove dieback, four study sites were chosen based on variation of dieback duration.

2.1 Site A was used as the control site where plants were young and healthy and no sign of dead plant was observed. This control site was generally located in the outermost seaward area.

2.2 Site B, representing the area where plants started dying with noticeable of withered leaves, dried trunk.

2.3 Site C was the area of standing dead trees for 1-2 yr, where no leaf attached to the tree and bark was peeled off.

2.4 Site D, representing the area contained dead trees for longer periods (≥5 yr) which characterized by tree trunk laid on the ground.

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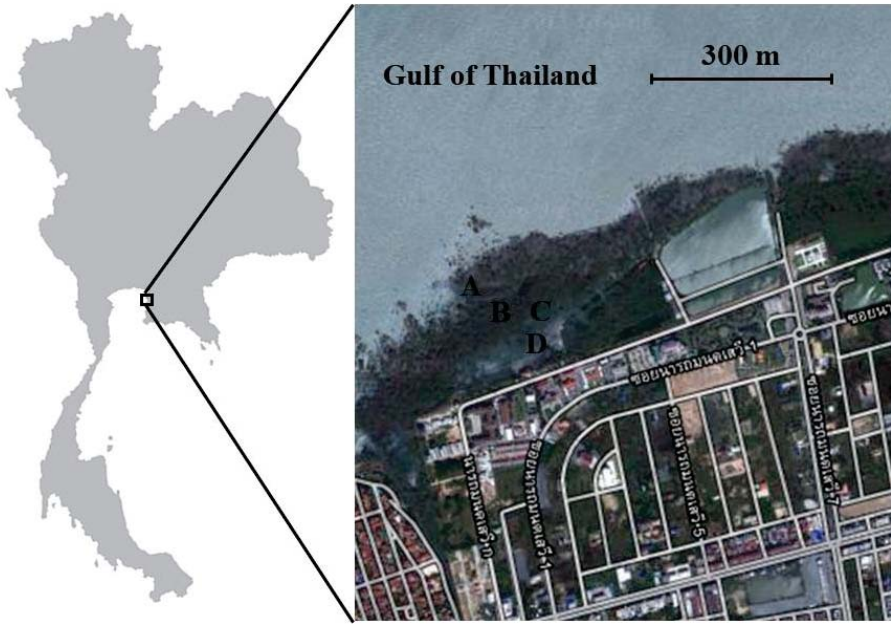

Sampling sites from mangrove (*Avicennia alba* Bl.) at Chonburi coastal area, Thailand. Site A refers to reference site, B: trees start to die, C: standing dead trees for 1-2 yr, and D refers to dead trees for longer periods (≥5 yr).

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Methodology

3. Sediment samples were collected in triplicate using plexiglass hand corers. Organic matter content was measured as loss on ignition in the muffle furnace.

4. Porewater was collected in the field and used for determination of salinity, pH, sulfide, NH_4^+ , NO_2^-+NO_3^- and PO_4^{3-} concentrations.

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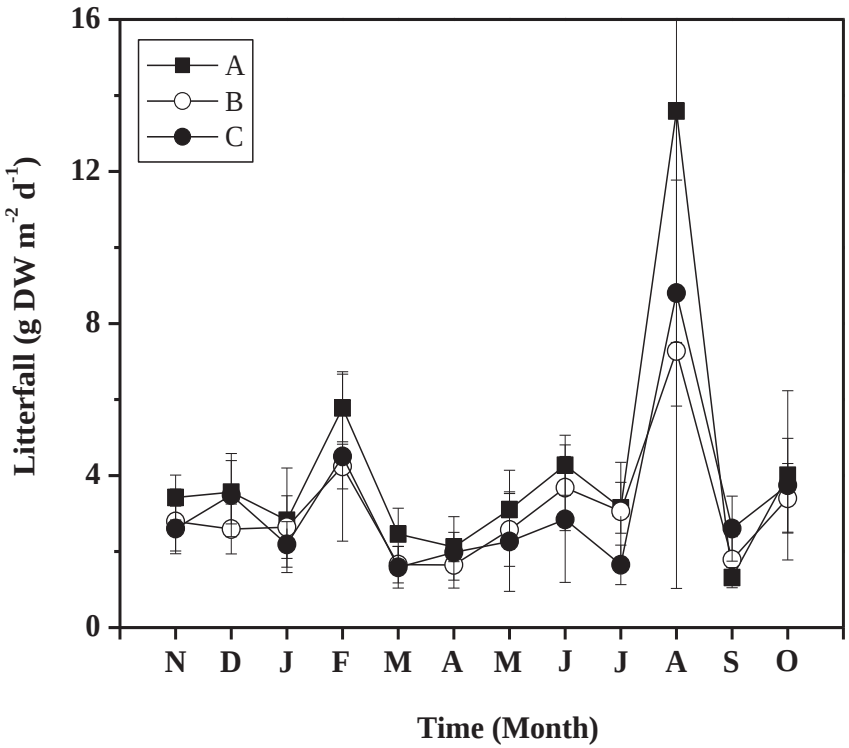
Findings and results



Litterfall (g DW m^{-2} d^{-1}) from three different size classes of mangrove (*Avicennia alba* Bl.) at Chonburi coastal area, Thailand. Site A, B and C refers to mature, young mature and young forests, respectively.

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Findings and results

Variation of litter production between 11.00 and 14.57 Mg DW ha^{-1} yr^{-1} represent a high input of organic matter to the aquatic system.

Leaf litter is the main contributing fraction to total litterfall with two peaks in rainy season and at the beginning of summer which represents significant loads of organic matter available for decomposition and mineralization of nutrients to coastal environments.

Dynamics of porewater signatures such as salinity, pH, redox potential, sulfide and nutrients can be used to demonstrate biogeochemical processes among different plant developmental stage.

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Findings and results

Seasonal variation can strengthen plant influencing sediment biogeochemistry especially in the rainy season due to greater input of organic matter from litterfall and well development of anaerobic decomposition processes occurred in sediment.

Much higher organic matter contents of 10-28% recorded in the dieback sites and even the control site still had high organic matter content between 5-17%. Such high organic matter content in sediment could stimulate decomposition and mineralization processes.

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Findings and results

Porewater sulfide were detected between 0.12-3.93 mM across the study sites with high sulfide concentrations were significantly detected at *A. alba* dieback sites compared to reference site suggesting porewater sulfide concentrations could be accounted for *A. alba* mortality.

Porewater from the dieback sites contained higher nutrients concentrations compared to the reference site suggesting high decomposition and mineralization rates of large amount of organic matter in the sediments whereas some of the decomposition and mineralization products were used in the assimilation processes of live vegetation, therefore lesser amount was measured.

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Implementation and Dissemination

The project was in collaboration with government sector (Provincial Natural Resources and Environment Office).

The findings can be disseminated to civil society, local community, student, via leaflet, training and field trip.

In some case, alternative management action can be applied to fulfill the mangrove conservation purpose.

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Implementation and Dissemination

New planting method is applied to increase the survival of mangrove seedling in the area, which has unfavorable environmental conditions.

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Implementation and Dissemination

Student’s field study

Discussion with local community leader

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Implementation and Dissemination

Youth’s field training related to mangrove ecology and conservation.

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Conclusion

Mangrove forests are highly productive ecosystem. They can supply organic matter to benthic community and also export this organic matter supporting food web in surrounded estuarine ecosystems.

Mangrove dieback is mostly detected at fully developed forest in the inner part of the estuary, therefore, to conserve this mangrove ecosystem, coastal management efforts need to be applied in order to reduce impacts from sediment accumulation in this mangrove wetlands.

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