Crab and shellfish occurrences in the newly-grown mangrove habitats in southern Thailand

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Abstract. Mangrove crabs and shellfish populating in Prince of Songkla University’s new grown mangrove forest were investigated from January 2011 to December 2011 and then repeated annually. A total of 12 species under 6 families of crab and 11 species under 5 families of shellfish were recorded. The most abundant family of crab was Sesarmidae (64.18 %), followed by Ocypodidae, Varunidae, Macrophthalmidae, Portunidae and Dotillidae. Episesarma mederi (H. Milne Edwards, 1853) showed highest dominant species. In addition, the most dominant family of shellfish was Potamididae (13.79 %), followed by Melampidae, Assimineidae, Onchidiidae and Littorinidae. Sea snail (Cerithidae quadrata; Sowerby, 1866) presented the most dominant coastal mollusc species. Abundance and diversification crabs and mollusks show important component of food web of this type ecosystem. However, only trapped hold samples during low tide were collected but this preliminary finding enables reasonable specified regulation measures.

1. Introduction
Mangroves are recognized as a crucial link between land and sea. This coastal ecosystem is significant not only as a protection against shoreline erosion and disaster, but also as the home of rich biodiversity they represent that provides food, dwelling, and energy for animal and mankind [1]. Tropical mangroves are highly productive and greatly contributive to food chain and food web [2]. They provide habitats, nesting, place for breeding, and feeding grounds for countless species of fish, crustaceans, marine fauna and wild birds.

Pattani Bay is known as a unique ecosystem into which two main rivers, Pattani River and Yaring River, directly flow [1]. Rapid sedimentation process in the Pattani Bay area has resulted in the development of new plain mudflats naturally forming along the 2-mile coastline of Pattani River mouth which has yet to be occupied by any plant species. This huge sediment land has been claimed de facto as the territory of Prince of Songkla University of Pattani. In 1987, the university launched a project to plant mangroves along the coasts of Pattani bay. The formerly mudflat in which sediments deposited now is a 40-hectare habitat of planted mangroves. It has been well-managed as a mangrove study center and supported as a feeding and shelter protected area for many organisms. However, there has been scarcely any published report on the species composition and distribution of fauna or habitat...
restoration in human-planted mangroves. Moreover, there has been no scientific information regarding species composition and distribution of the organisms living in this habitat, especially crabs and molluscs.

Therefore, this study aimed to investigate and identify the species composition and distribution of crabs and molluscs in human-planted mangrove forests.

2. Method
The study area was located in the northern part of Prince of Songkla University of Pattani in southern Thailand (6° 53′ 27.61″ N, 101° 14′ 21.29″ E—6° 53′ 21.01″ N, 101° 14′ 29.01″ E and 6° 52′ 47.87″ N, 101° 13′ 37.32″ E—6° 52′ 41.25″ N, 101° 13′ 39.69″ E), connected to Pattani Bay and South China Sea (Figure 1). Sampling was conducted in each of three sub-sampling sites by digging holes sized 1.0x1.0 m² at a depth of 50 cm for trapping crabs and molluscs in this area. The holes were left overnight, and the sample trapped in the holes was collected in the next morning. The specimens were identified according to Ng [3], Swennen et al. [4], Sanpanich et al. [5], Sottiyothin and Kulabtong [6], weighted, counted and stored in 10% formalin solution. Additional observation was carried out on the organisms living on the bottom surface outside the trap holes for a comparison purpose. All activities were investigated from January 2011 to December 2011 and then repeated annually until 2013.

Figure 1. Location of the study area in the Campus of Prince of Songkla University, Pattani, Thailand.

3. Results
A total of 24 species and 11 families of crabs and molluscs were collected. Out of these, 73.7% were crabs and 26.3% were molluscs of various families. The crab class Malacostraca was the dominant group, and most of the molluscs were gastropods. Decapoda was the most dominant order, followed by Mesogastropoda, Acteophila, and Neotaenioglossa. In addition, Sesarmidae was the most dominant family of crab, followed by Potamididae, Melampidae, Ocypodidae, Varunidae, Macrophthalmidae, Assimineidae, Onchidiidae, Portunidae, Dotillidae, and Littorinidae (table 1).
Table 1. Relative contribution by family of crab and mollusks collected in mangrove forest of Prince of Songkla University, Pattani.

| Animal Order | Family     | Number | %   |
|--------------|------------|--------|-----|
| Crab         | Decapoda   | Sesarmidae | 405 | 64.18 |
|              |            | Macrophthalmidae | 13  | 2.06  |
|              |            | Ocypodidae  | 20  | 3.17  |
|              |            | Portunidae  | 6   | 0.95  |
|              |            | Dotillidae  | 4   | 0.63  |
|              |            | Varunidae   | 17  | 2.69  |
| Mollusks     | Acteophila | Assimineidae | 9   | 1.43  |
|              | Neotaenioglossa | Littorinidae | 3   | 0.48  |
|              | Acteophila | Melampidae  | 59  | 9.35  |
|              | Onchidiacea| Onchidiidae | 8   | 1.27  |
|              | Mesogastropoda | Potamididae | 87  | 13.79 |

The most numerous species of crabs was *Episesarma mederi* (average length of 1.48 cm), followed by *Parasesarma plicatum* (average length of 1.32 cm), *Perisesarma eumolpe* (1.58 cm), *Metaplax elegans* (1.25 cm) and *Macrophthalmus latreillei* (1.56 cm). The most numerous species of molluscs was *Cerithidae quadrata* (average length of 3.02 cm), followed by *Cassidula nucleus* (average length of 1.13 cm), *Cassidula sp.* (1.46 cm) and *Cassidula aurisfelis* (1.61 mm) (table 2).

Additionally, the observation of crabs and molluscs outside the sampling holes found that some species that were not trapped and recorded in the hole appeared in this habitat, including *Scylla serrata*, *Scylla tranquebaricus*, *Varuna yui*, *Uca perplexa*, *Uca urvillei*, *Paracleistostoma* sp., *Cerithidae cingulata*, *Ellobiumaurismidae* and *Assiminea brevicula*.
Table 2. Distribution and number of species of the shellfish in mangrove forest, Prince of Songkla University Pattani campus.

| Order/Family | Species name | N  | Sex | Mean length (cm) | SD | Length range (cm) | Mean weight (g) | SD | Weight range (g) |
|--------------|--------------|----|-----|-----------------|----|------------------|-----------------|----|-----------------|
| Decapoda     | Ilyoplax orientalis (De Man, 1888) | 4  | M   | 1.33            | 0.09 | 1.2 1.4          | 1.15            | 0.33 | 0.69-1.53      |
|              |              |  | F   |                 |     |                  |                 |     |                 |
|              | Macrophthalmus lateritiei (Desmarest, 1822) | 13 | 8   | 1.56            | 0.28 | 0.9-2.1         | 1.4             | 0.79 | 0.12-3.61      |
|              |              |  | 5   |                 |     |                  |                 |     |                 |
|              | Uca amalipes (H. Milne Edwards, 1837) | 11 | 6   | 1.76            | 0.33 | 1.3-2.5         | 2.22            | 0.78 | 0.97-3.48      |
|              |              |  | 5   |                 |     |                  |                 |     |                 |
|              | Uca forcipata (Adams & White, 1848) | 1  | 1   | 22              |      |                  | 5              |      |                 |
|              |              |  | 0   |                 |     |                  |                 |     |                 |
|              | Uca paradoxumieri (Bott, 1973) | 8  | 7   | 1.53            | 0.25 | 1.2-1.8        | 1.64            | 0.74 | 0.87-2.6      |
|              |              |  | 1   |                 |     |                  |                 |     |                 |
| Portunidae   | Scylla okvacea (Herbst, 1796) | 6  | 6   | 4.43            | 1.31 | 2.8-6.5        | 2.12            | 0.67 | 4.2-52      |
|              |              |  | 0   |                 |     |                  |                 |     |                 |
| Sesarmidae   | Epiibesarma mederi (H. Milne Edwards, 1853) | 234 | 206 | 4.8            | 0.79 | 0.4-4.4        | 4.58            | 0.93 | 0.02-5.6      |
|              |              |  | 28  |                 |     |                  |                 |     |                 |
| Sesarmidae   | Epiibesarma versicolor (Tweedie, 1940) | 8  | 5   | 2.78            | 0.48 | 1.9-3.6        | 1.86            | 0.91 | 1.09-4.0      |
|              |              |  | 3   |                 |     |                  |                 |     |                 |
| Sesarmidae   | Epiibesarma chengtongense (Sereen & Soh, 1967) | 2  | 2   | 3.2            | 0.12 | 3.1-3.3         | 3.0             | 0.46 | 27.3-53      |
|              |              |  | 0   |                 |     |                  |                 |     |                 |
| Sesarmidae   | Parasesarma plicatum (lateville, 1806) | 106 | 62  | 4.4            | 0.29 | 0.6-2.1        | 1.47            | 0.10 | 0.14-5.6      |
|              |              |  | 44  |                 |     |                  |                 |     |                 |
| Sesarmidae   | Perisesarma eunolps (De Man, 1895) | 55 | 40  | 1.58            | 0.23 | 1.2-2.1        | 2.8             | 0.64 | 0.74-10.57    |
|              |              |  | 15  |                 |     |                  |                 |     |                 |
| Varunidae    | Metapipl magnus (De Man, 1888) | 16 | 10  | 1.25            | 0.31 | 0.6-2.2        | 1.12            | 0.12 | 0.25-6.1      |
|              |              |  | 6   |                 |     |                  |                 |     |                 |
| Varunidae    | Metapipl dentipes (Heller, 1830) | 1  | 0   | 1              | 0.46 | 0.1-0.7         | 5              | 0.07 | 0.01-0.07    |
|              |              |  | 1   |                 |     |                  |                 |     |                 |
| Acteophila   | Cassidula aurifera (Brugulere, 1789) | 12 | 161 | 0.24            | 1.2  | 0.58            | 0.27            | 0.11 | 0.11        |
| Melampidae   | Cassidula sp | 21 | 146 | 0.19            | 1.1  | 0.55            | 0.17            | 0.03 | 0.03         |
| Melampidae   | Cassidula nuculus (Gelin, 1791) | 23 | 113 | 0.21            | 0.5  | 0.27            | 0.09            | 0.06 | 0.06         |
| Melampidae   | Cassidula mustelina (Deshayes, 1830) | 3  | 207 | 0.05            | 2.2  | 1.31            | 0.08            | 1.22 | 1.39         |
| Littorinimorpha | Assiminea brevicula (Pfeiffer, 1854) | 9  | 0.41 | 0.13            | 2.06 | 0.04            | 0.02            | 0.01 | 0.01         |
| Mesogastropoda | Potamididae | 3  | 267 | 0.88            | 2.1  | 2.41            | 0.7             | 1.85 | 3.3         |
|              | Cerithidae sp | 77 | 302 | 0.44            | 2.2  | 1.83            | 0.59            | 0.93 | 3.82         |
|              | Cerithidae quadrata (Sowerby, 1866) | 6  | 33  | 0.18            | 3.35 | 2.24            | 0.37            | 1.82 | 8.79         |
|              | Cerithium corallium (Kiener, 1841) | 1  | 67  |                 |     |                 | 23             |      |                |
|              | Telescopium telescopium (Linnaeus, 1758) | 1  | 67  |                 |     |                 | 23             |      |                |
| Genus    | Species                       | Onchidiidae | Onchidiidae | Onchidiidae |
|----------|-------------------------------|-------------|-------------|-------------|
| Neotaenioglossa | Littoraria melanostoma (Gray, 1839) | 0.61 0.6 - 0.64 | 3 1.8 0.15 1.2 1.7 0.02 0.06 0.60 0.64 | 0.02 0.06 0.64 0.02 0.06 0.64 |
| Neotaenioglossa | Onchidiidae sp              | 8           | 8           | 8           |
4. Discussion and Conclusion
The inner part of PSU’s planted mangrove forest, once a bared mudflat, was converted into a productive home of mangrove trees as a feeding, living or refuge area of wild crabs and molluscs. At least 24 species from 11 families of crabs and molluscs were members of this human-modified rehabilitative forest.

Most of the crabs found in this habitat were ground-dwelling species Sesarmidae, especially *Episesarma mederi* and *Parasesarma plicatum*, dominated the daily catch. They were important economic species collected by the villagers and fishermen living near the university. They were widely used to make native favourite menu called salted crab. These crabs are “semi-terrestrial” and tolerant to fluctuating salinity [7]. They can breathe by circulating the water in the mesh for oxygenation and then back to their gills for air exchange. Although they were more abundant in number, these crabs were rarely found because they are very sensitive to disturbance, and always escape into cracks or tree roots. They feed mainly on rotten mangrove leaves, seeds and branches [8], [9]. Furthermore, they are capable of consuming a large amount of mangrove litter and generating a significant relation of the energy flow within the mangrove forest. Sesarminae crabs usually produce air circulation around mangrove roots due to their burrow-doffing behaviour. Another economically important species is *Scylla olivacea*. This species also digs their burrow inside mangrove forests. However, most of the collected crabs were considered as non-economically important species but more appreciated for their ecological values. For molluscs, most of them were gastropods and slugs.

The presence of *Cerithidae quadrata* presented mollusc-dominated community. These snail are capable of climbing up a tree to feed on algae growing on the roots and stems of mangrove. They are consumed as food in rural areas, but not in Pattani region. They always show a relation with *Cassidula nucleus* and *Cassidula aurisfelis* These small-sized snails prefer to climb up the mangrove trees and feed by grazing algae growing on the trees and on the ground.

In addition, the abundance and diversity of crabs and molluscs occurring inside the PSU’s planted mangrove forest are an important part of the food web of this mudflat ecosystem. However, this study has a limitation, i.e., the sample was only trapped into the holes during low tide. Further study will need more complete data collection and specimen identification of this mangrove forest.

5. References
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