La mer 34: 67–73, 1996
Société franco-japonaise d'océanographie, Tokyo

Seagrasses and epiphytes in Thale Sap Songkhla, Southern Thailand

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Abstract : Seagrass biomass in Thale Sap Songkhla was monthly investigated from December 1992 to November 1993. Seagrasses were found in only 2 areas in Thale Sap Songkhla. *Halodule pinifolia* and *Halophila ovalis* were obtained on the sandy bottom 1300 m from the mouth of Thale Sap Songkhla while *Halophila beccarii* inhabited the area close to the western shoreline of Thale Sap Songkhla. *Halophila beccarii* and *Halodule pinifolia* were found almost throughout the year, with average annual biomass of 95.3 and 84.1 g(d.w.)m^{-2}, respectively. *Halophila ovalis* was the least abundant species and could be found during only 6 months in the year (March to September). The maximum biomass of three species of seagrasses was in the light rainy period during July to August (southwest monsoon) while the minimum was in the heavy rainy period during October to December (northeast monsoon). Most epiphytes found on the three species of seagrasses were benthic diatoms. The dominant was *Cocconeis* sp. Old leaves of seagrasses tended to have more epiphytes than young leaves.

1. Introduction

Seagrass bed is well-known to be important for fisheries (KLUMPP *et al.*, 1989). Juvenile spotted seatrout used seagrass beds as their major habitat (MCMICHAEL and PETERS, 1989). The seagrass distribution and diversity have been investigated along the coast of Andaman Sea and Gulf of Thailand (POOVACHIRANON, 1988; LEWMANOMONT *et al.*, 1991). However, the seagrass community survey in Songkhla Lake is limited.

Songkhla lake is located between latitudes 7°08′ N and 7°50′ N, and between longitudes 100°07′ E and 100°37′ E (Fig. 1). It is the only lake in Thailand and covers a total area of 986.8 km^2 (98680ha), divided into 3 parts: Thale Noi, Thale Luang and Thale Sap Songkhla (the lowermost part of Songkhla Lake, connecting with the open sea) (BROHMANONDA and SUNGKASEM, 1982). The salinity of water in Thale Sap Songkhla is brackish to seawater according to seasons. The average depth at the middle of Thale Sap Songkhla is 1.2 m. The deepest area is about 8.0–8.8 m measured at Pak Khat and the mouth of Thale Sap Songkhla (RAKKHEAW, 1994).

The present study was designed to investigate the distribution and seasonal variation of seagrasses in Thale Sap Songkhla.

2. Materials and methos

Surveys and samplings of seagrasses in Thale Sap Songkhla were done during low tide using a Tamura grab of 0.05 m^2 in surface area. This particular grab, with serrated teeth, was suitable for sampling small seagrasses growing on the soft bottom. Random samplings were done around the shore and the middle of the lake to locate areas covered by seagrasses. After the areas were found, they were then sampled every month from December 1992 to November 1993. Ten replicate samplings were done for each sampling site. Samples were washed through a series of sieves with 5 mm and 1 mm apertures. Seagrasses and their epiphytes were identified. Each species of seagrasses was washed in 5% phosphoric acid (BROUNS, 1987), then dried at 60–80 ℃ for 48 hours to determine their dry weights. Measurement of seagrass blade length was also carried out.

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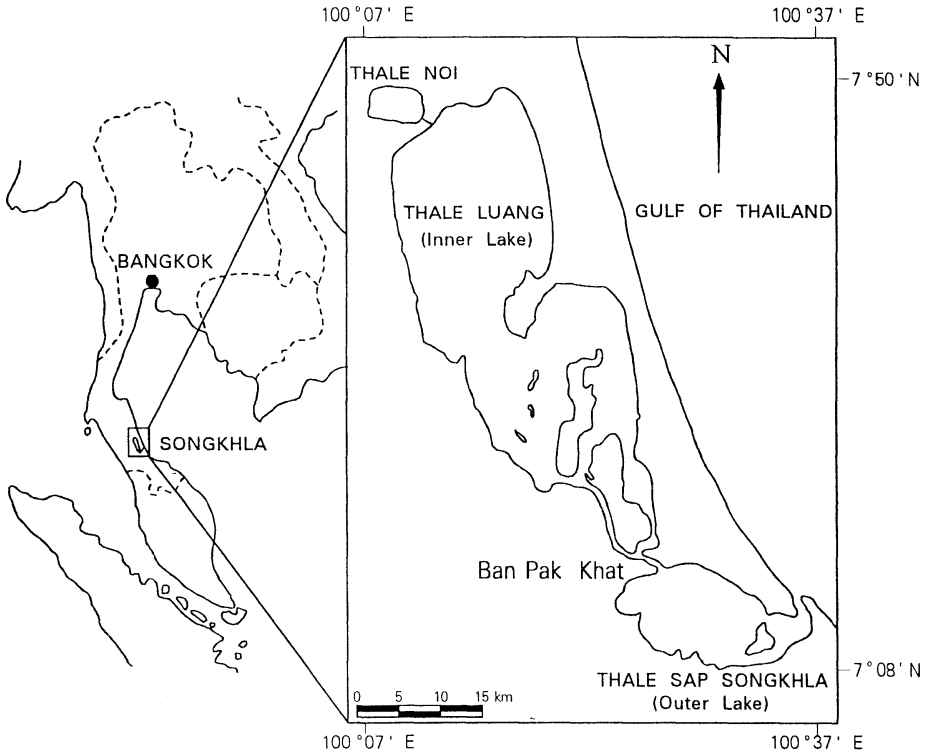


Fig. 1. Map showing Songkhla Lake and the study area (Thale Sap Songkhla).

3. Results

The distribution and abundance of seagrasses in Thale Sap Songkhla are shown in Fig. 2.

a. Species and distribution

Seagrasses were found in only 2 areas in Thale Sap Songkhla. The first area was the sandy bottom 1300 m from the mouth of Thale Sap Songkhla (area I). Seagrasses were patchily distributed in a narrow area. Two species of seagrasses, *Halodule pinifolia* and *Halophila ovalis*, inhabited the area. The other area was close to Ban Hua Hat shoreline (area II) where the water was rather stagnant and only *Halophila beccarii* was found in a narrow strip.

b. Biomass and seasonal variation

Halophila beccarii was the most abundant species, and could be found almost throughout the year, with biomass in the range of 0–204.8 g (d. w.) m^{-2} (annual average 95.3 g (d. w.) m^{-2}). Biomass of other species was 8.7–224.0 g (d. w.) m^{-2} (annual average 84.1 g (d. w.) m^{-2}) for *Halodule pinifolia* and 0–10.7 g (d. w.) m^{-2} (annual average 2.7 g (d. w.) m^{-2}) for *Halophila ovalis*. *Halophila ovalis* was the least abundant species and could be found during only 6 months in the year (March to September). The young leaves occurred in March when the salinity increased.

The maximum biomass of three species of seagrasses was in the light rainy period during July to August (southwest monsoon) while the minimum was in the heavy rainy period during October to December (northeast monsoon). The blade length of seagrass was much longer in the SW monsoon season than those in the NE monsoon season (Table 1). During a heavy rain period, the salinity was very low and blades of seagrasses became soft, yellowish brown and rotten. Only the rhizome was collected in some case.

Halophila beccarii could be found in a wide range of salinity from freshwater to brackish water. *Halodule pinifolia* could also be found in

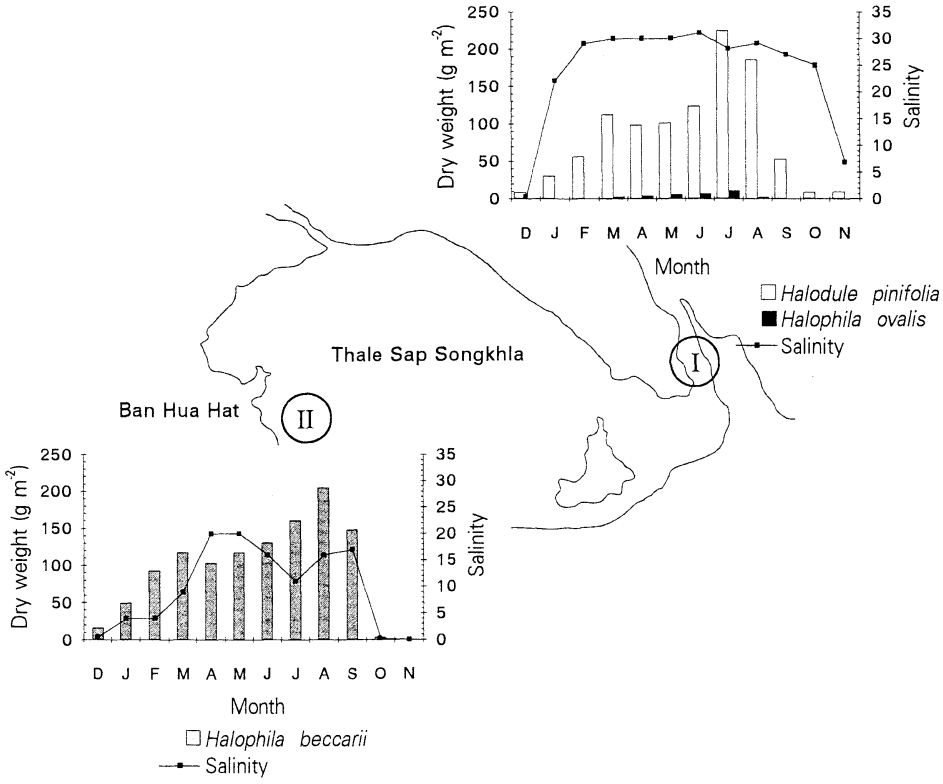


Fig. 2. Distribution and seasonal pattern of seagrass biomass in relation to salinity (PSU) at areas I and II.

Table 1. Length (cm) of blade plus petiole of seagrasses distributed in Thale Sap Songkhla.

Species	SW monsoon	NE monsoon
Halodule pinifolia	18.5–35.0 (July)	2.0–8.0 (December)
Halophila ovalis	3.0–8.0 (July)	2.3–3.9 (March)
Halophila beccarii	3.0–4.8 (August)	1.5–2.2 (December)

a wide range of salinity from brackish water to seawater. *Halophila ovalis* could tolerate only a narrow range of salinity.

c. Epiphyte diversity

Most epiphytes were diatoms, *Tabellaria* sp., *Cocconeis* sp. and *Nitzschia* spp., while some branching algae and other diatoms could also be found sporadically (Table 2). *Cocconeis* sp. was the most abundant diatom with *Tabellaria* sp. ranked the second. The latter was often found on leaves of *Halophila beccarii* inhabiting the area hardly perturbed by tidal current and boat transportation. *Nitzschia* spp., *Pleurosigma* sp. and branching algae were rarely found. *Cocconeis* sp. was more abundant in the dry season (February–April) compared to the wet season and *vice versa* in *Tabellaria* sp. During the SW monsoon season, especially in July, the number of epiphyte species increased, but the cell number of each species was low. Mature leaves also tended to have more epiphytes than young leaves.

Tabellaria sp., a rod-shaped diatom, grew by attaching new cells to the existing ones forming filaments in all directions (Fig. 2 a and b). On the contrary, *Cocconeis* sp. was an oval-shaped solitary diatom which attached firmly to the leaf surface (Fig. 2 c). It never formed filaments or attached newly formed cells to the existing ones. For the branching algae, attachment to the leaf margin was observed (Fig. 2 d).

Table 2. Epiphytic microalgae on seagrasses collected from Thale Sap Songkhla.

Months	Taxa	Host[1]	Density[2]
December '92	*Tabellaria* sp.	Hb	High
January '93	*Tabellaria* sp.	Hb	Rare
February '93	*Cocconeis* sp.	Hp	Rare
March '93	*Cocconeis* sp.	Hb, Hp	Medium
	Cocconeis sp.	Ho	Rare
April '93	*Cocconeis* sp.	Hb, Hp	High
	Branching algae	Hp	Rare
June '93	*Tabellaria* sp.	Hp, Hb	Rare
	Nitzschia spp.	Hp, Ho	Rare
	Branching algae	Hp	Rare
July '93	*Tabellaria* sp.	Hp, Ho, Hb	Rare
	Cocconeis sp.	Hp, Ho, Hb	Rare
	Pleurosigma sp.	Hp, Ho, Hb	Rare
	Nitzschia spp.	Hp, Ho, Hb	Rare
	Branching algae	Hp	Rare
August '93	*Cocconeis* sp.	Hp, Ho, Hb	Rare
	Nitzschia spp.	Hp, Hb	Rare
	Branching algae	Hp	Rare
September '93	Branching algae	Hp	Medium
	Cocconeis sp.	Hp, Ho, Hb	Rare
	Nitzschia sp.	Hb	Rare
October '93	Branching algae	Hp	Medium
	Cocconeis sp.	Hp, Hb	Rare
	Tabellaria sp.	Hb	Rare
November '93	Branching algae	Hp	Medium
	Cocconeis sp.	Hp	Medium

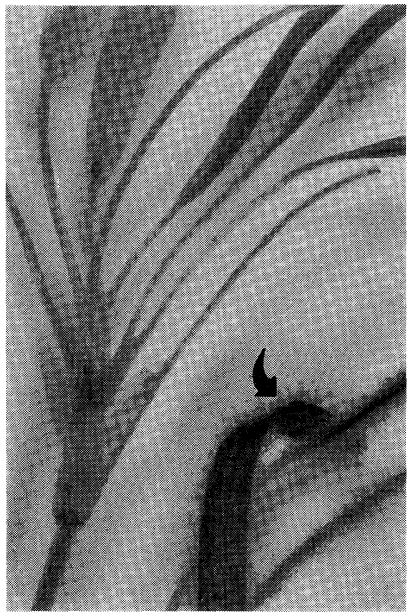
[1] Hb, *Halophila beccarii* ; Hp, *Halodule pinifolia* ; Ho, *Halophila ovalis*
[2] Density of epiphytes on surface area of leaves

4. Discussion

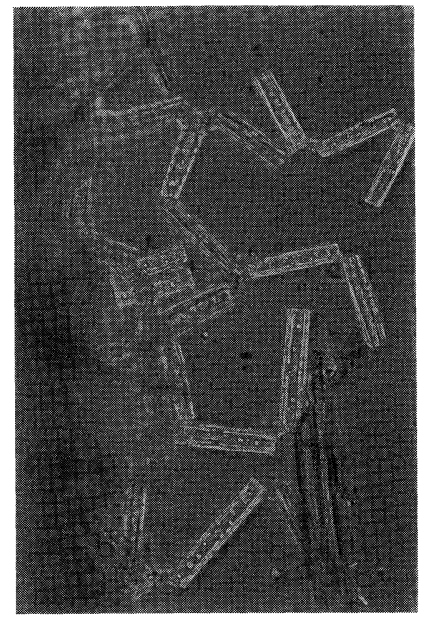
a. Distribution and biomass of seagrasses

In the present study, only 3 species of seagrasses were found in Thale Sap Songkhla: *Halodule pinifolia*. *Halophila beccarii* and *Halophila ovalis*. LEWMANOMONT *et al.* (1991) surveyed the coastal area in the Gulf of Thailand just north of the mouth of Songkhla Lake and found 4 species of seagrasses. Three of the 4 species in their study were the same as those found in the present study. The other species was *Ruppia maritima* reported in a lagoon in India where salinity was in the range of 18–38 (VIRNSTEIN and CARBONARA, 1985). *Halophila beccarii* was found in only one area and as the sole species in Thale Sap Songkhla. The substrate in the particular area was silt with little fine sand which was quite different from the substrate close to the mouth of the lake where *Halodule pinifolia* and *Halophila ovalis* were found. The substrate in the latter area was mostly coarse sand with shells in certain parts (CHATUPOTE *et al.*, 1994). The relationship between seagrass species and substrate compositions found in the present study agreed with various reports (den HARTOG, 1970; WALKER and PRINCE, 1987; LEWMANOMONT *et al.*, 1991; PARTHASARATHY *et al.*, 1991). In addition, it was found that pH and phosphorus in sediment at area II (*Halophila beccarii* area) were lower than those at area I (*Halodule pinifolia* area) (CHATUPOTE *et al.*, 1994). These two parameters may relate to seagrass diversity.

Seasonal variation of salinity in Thale Sap Songkhla affected not only seagrass distribution but also its growth and seasonal variation in abundance. *Halodule pinifolia* could be found throughout the year with low abundance in the heavy rainy period and good growth in the light rainy period. In July, its blade length

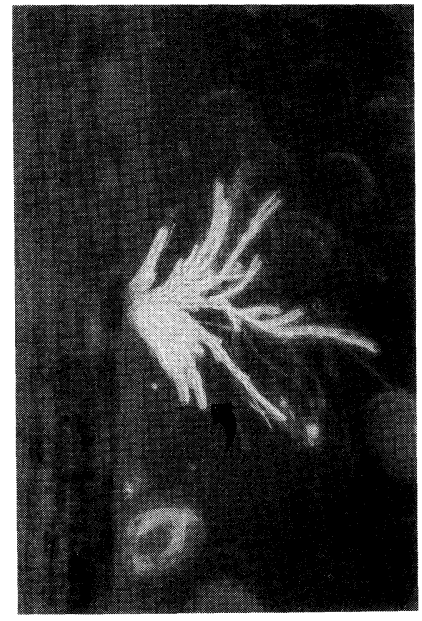


a. *Halophila beccarii* with thick growth of *Tabellaria* (×6.7)



b. *Tabellaria* (×200)

c. *Cocconeis* (×1000)



d. Branching algae (×100)

Fig. 3. Epiphytes on seagrass leaves.

was much longer than that in December and longer than what had been reported by LEWMANOMONT *et al.* (1991). *Halophila ovalis*, on the other hand, was found in only 6 months of a year. During 5 months of the rainy season, its stem above the substrate was rotten and died, only to grow again from the rhizome when salinity in the lake started to increase in early summer. Results of laboratory experiments showed that *Halophila ovalis* would not develop an apex, and died when salinity was 5, but would develop new leaves when salinity was 20 (ANGSUPANICH, unpublished data). Other two species in the genus *Halophila*, *H. decipiens* and *H. johnsonii* raised in 5 died within 3 days (DEWES *et al.*, 1989). Water temperature did not seem to be the cause of death in *H. ovalis*, as it was found in both tropical and temperate zones, indicating its tolerance to a wide range of temperatures (PHILLIPS and MENEZ, 1988).

The annual average biomass of *Halodule pinifolia* in Thale Sap Songkhla and Ban Tub Lamu, Phang-nga was similar, 84.1 and 93.6 g (d. w.) m^{-2}, respectively. On the other hand, the biomass of *Halophila ovalis* in Thale Sap Songkhla was only 1/15 that in Ban Tub Lamu. However, in Ban Tub Lamu, *Halophila ovalis* was also the least abundant species of seagrasses, with average biomass of 40.0 g (d. w.) m^{-2} (LEWMANOMONT *et al.*, 1991).

b. Epiphyte diversity

Epiphytes found on the 3 species of seagrasses in Thale Sap Songkhla were small benthic algae. Both solitary and branching forms of benthic algae were found and most of them were diatoms, which agreed with a study by THURSBY in 1978 (cited by HARLIN, 1980). who reported the attachment of *Cocconeis* sp. on *Halodule* sp. *Cocconeis* sp. also distributed more widely than *Tabellaria* sp. which was found only in *Halophila beccarii*. Salinity may be the limiting factor for the growth of *Tabellaria* sp.. However, on an equal area of seagrass blade, *Tabellaria* sp. had higher cell numbers compared to *Cocconeis* sp., *because Tabellaria* colonies protruded in all directions. Old blades of seagrass in the present study also tended to support higher numbers of epiphytes than young ones, which agreed well with what had been found in *Thalassia hemprichii* (HEIJS, 1984) and *Enhalus acoroides* (BROUNS and HEIJS , 1986). MCROY and GOERING (1974) reported that nutrients in the sediment could be passed from the seagrass root to blade and later to epiphytes. Epiphytes also could absorb 15–100% of the phosphorus released from the seagrass leaves (PENHALE and THAYER, 1980 cited in H EIJS, 1984). It is possible that an old leaf tends to release larger amounts of nutrients than a young leaf.

Acknowledgements

This research received financial support from the National Research Council of Thailand and the Japan Society for the Promotion of Science. Several persons have provided assistance, advice and encouragement in my research over the years, including Professor Yusho ARUGA, Dr. Sommai CHIAYVAREESAJJA, Ms. Kusuma SUPATTRAKUL, Mr. Suteera TONGKAO and Mr. Samran SUWANRATANA. I thank them for their patience and understanding.

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Received January 25, 1995
Accepted March 22, 1996