

The remnant of vegetation on a coastal sandbar in Songkhla Province, Peninsular Thailand

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ABSTRACT. Surveys of vegetation on coastal sandbars in Songkhla Province show that almost all the natural vegetation has been eradicated except for a small remnant stand found on a coastal sandbar beside the shore at Ban Taling-Chan village in Chana District. Such vegetation may have dominated the landscape of the coastal sandbars in Songkhla in the past. Vegetation profiles and a list of species are presented. Ninety-eight species of vascular plants in the study site were recorded between March 1993–September 1993 and May 1997–December 2000.

INTRODUCTION

Songkhla Province is situated on the eastern side of peninsular Thailand. Along the coastal part stretches a shoreline of emergence. Over millions of years sediments from rivers and ocean currents were deposited on the shallow sea floor along this shoreline. During the Tertiary the peninsula inclined, with the resulting emergent land forming the present east coast. Many parallel sandbars are found along the shoreline and each represents an old beach deposit, lying inland in the form of low ridges or terraces 1.5–2.5 m high (Pongsaputra 1991).

The sandbars creates a unique habitat for plant communities to develop. Publications and plant collections of this habitat have been so far very limited

Climate along the coast of Songkhla

Songkhla is subjected to a tropical monsoon climate, characterised by a distinct dry season from January to September with rainfall less than 300 mm per month for those nine months and a high rainfall, affected by the north-easterly wind, from October to December. Rainfall average is ca. 500–2500 mm per month for those three months. The average annual total rainfall is up to 2000 mm. The average year-round temperature is ca. 28°C.

Vegetation on the coastal sandbars

According to Whitmore (1975), the vegetation occurring on coastal sandbars in Southeast Asia is so-called heath forest. This is the natural vegetation of podzols that occurs in places where parent materials consist predominantly of quartz, i.e., beach sand,

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sandstone or quartzite. The greatest extent of heath forest in Southeast Asia is in Borneo where it occurs along the coastline on raised terraces of poorly consolidated, coarse, sandy, marine and riverine sedimentation left stranded by the fluctuating sea-level of the late Pleistocene (Burnham, 1984). Similar but less extensive terraces that also bear or once bore heath forest occur along the south coasts of Thailand and Cambodia (Whitmore, 1975).

The characteristic structural features of heath forest are that trees of large girth are rare, and that tree canopies are low, uniform and usually closed with no trace of layering (Ashton, 1971). There are more trees with small leaves than in other types of rainforest. Many species have sclerophyllous leaves. The ground commonly has a covering of bryophytes and stilt-rooted trees are more common than buttressed ones. Big woody climbers are rare, but wiry-stemmed climbers are frequent. Epiphytes and photophytes are also frequent and occur nearer the ground than in other evergreen rainforest types. Myrmecophytes are also abundant in this type of forest (Whitmore, 1984).

Congdon (1982) also mentioned heath forest in his study of the vegetation of Tarutao National Park in Satun Province. However, the heath forest found on Tarutao has a lower canopy and contains fewer species than the typical heath forest described by Whitmore (1984).

The aims of this study were to survey the natural vegetation on the sandbars of the podzolic soils that run parallel to the shoreline in Songkhla and to record the plant taxa comprising this vegetation.

METHODS

Surveys of the vegetation along the coastal sandbars of Songkhla Province from Sating-Phra in the north to Thae-Paa district in the north were conducted between March 1993–September 1994 in order to select a sample site(s) for the study.

A transect line was established through a sandbar on which apparently natural vegetation remained. This transect line started at the edge of the sandbar, then ran through the vegetation at right angles to the shoreline. Along this transect line, four 20 x 10 m² plots were laid at 50 m intervals in order to obtain vegetation profiles. Plant collections were made all over the study site once a month from between March 1993–September 1993 and from May 1997–December 2000. From the collections a plant species list was developed. Voucher specimens are in PSU.

RESULTS

A stand of apparently natural vegetation was located at Ban Taling-Chan, Chana District at 7°01.44' 0"N 100°45' 04.68"E. (see profile diagrams of Plots 1–4; Figure 1A, B). The stand is ca. 1.5 km in length (along the shoreline), 0.3 km in width and covers an area of 0.45 km².

Ninety-eight species of vascular plants were collected and identified as shown in Table 1.

Table 1. List of plant species found.

Family	Species	Vernacular	Habit	Abundance
Anacardiaceae	<i>Buchanania arborescens</i> (Blume.) Blume	Khi kratai	Tree	++++
Annonaceae	<i>Desmos dasymaschalus</i> Safford	Bu rong	Scandent	+++
Apocynaceae	<i>Cerbera manghas</i> L.	Tin pet sai	Tree	++
	<i>Cerbera odollam</i> Gaertn.	Tin pet thale	Small tree	++
	<i>Rauvolfia verticillata</i> (Lour.) Baill.	Chaek	Shrub	+++
	<i>Spirolobium cambodianum</i> Baill.	Phetcha hueng takkat	Small shrub	+++
	<i>Willughbeia coriacea</i> Wall.	Khui	Shrub	+++
Aquifoliaceae	<i>Ilex cymosa</i> Blume	Sai khi tai	Shrubby tree	++++
Asclepiadaceae	<i>Dischidia major</i> (Vahl) Merr.	Chuk rohini	Climber	+++
	<i>Hoya diversifolia</i> Blume	Yan lin khwai	Climber	+++
	<i>Hoya parasitica</i> (Roxb.) Wall. ex Traill	Nom phi chit	Climber	+++
Celastraceae	<i>Eunonymus javanicus</i> Blume	Duk kai	Shrub	++++
	<i>Pleurostylia opposita</i> (Wall.) Aston.	Daeng hin	Small tree	+++++
Clusiaceae	<i>Calophyllum pulcherrimum</i> Wall.	Tang hon	Small tree	++
	<i>Garcinia cowa</i> Roxb. ex DC.	Cha muang	Small tree	+++
	<i>Garcinia merguensis</i> Wight	Nuan	Small tree	++
	<i>Garcinia nervosa</i> Miq.	Ma phut pa	Small tree	++
	<i>Garcinia vilersiana</i> Pierre	Pha wa bai yai	Small tree	+++
Commelinaceae	<i>Commelina benghalensis</i> L.	Phak plap	Herb	+++++
	<i>Cyanotis cristata</i> D. Don	Ya hua rak noi	Herb	+++
	<i>Murdannia</i> sp.	-	Herb	+++
Connaraceae	<i>Connarus semidecandrus</i> Jack	Thopthaep khrua	Scandent	+++
Davalliaceae	<i>Davalia denticulata</i> (Burm.f.) Mett. ex Kuhn	Nakkharat	Fern	+++
Dennstaedtiaceae	<i>Pteridium aquilinum</i> var. <i>wightianum</i> (J.Agardh) R.M. Tryon	Chon yai	Fern	++
Dilleniaceae	<i>Dillenia hookeri</i> Pierre	San din	Shrub	+++
	<i>Tetracera indica</i> (Christm. & Panz.) Merr.	Yan pot	Climber	+++++
	<i>Tetracera loureiri</i> (Finet & Gagnep.) Pierre ex Craib	Rot su khon	Climber	+++++
Dipterocarpaceae	<i>Dipterocarpus chartaceus</i> Symington	Yang wat	Tree	++
	<i>Dipterocarpus obtusifolius</i> Teijsm. ex Miq.	Hiang	Tree	++
	<i>Shorea roxburghii</i> G.Don	Phayom	Tree	++
	<i>Vatica harmandiana</i> Pierre	Sak nam	Tree	+++
Ebenaceae	<i>Diospyros ferrea</i> (Willd.) Bakh.	Lambit thale	Shrub	+++++
Ericaceae	<i>Vaccinium bracteatum</i> Thunb.	Thing thuat	Small tree	+++
Euphorbiaceae	<i>Breynia vitis-idaea</i> (Burm.f.) C.E.C. Fisch.	Kangpla thale	Shrub	+++
	<i>Chaetocarpus castanocarpus</i> (Roxb.) Thwaites	Khi non	Shrub	+++
	<i>Phyllanthus oxyphyllus</i> Miq.	Yai chung lan	Small tree	+++

Table 1. (continued)

Family	Species	Vernacular	Habit	Abundance
Fabaceae	<i>Abrus precatorius</i> L.	Ma klam ta nu	Climber	+++
	<i>Derris scandens</i> (Roxb.) Benth.	Thao wan priang	Climber	+++
Gnetaceae	<i>Gnetum tenuifolium</i> Ridl.	Mueai nok	Liana	++
Goodeniaceae	<i>Scaevola taccada</i> (Gaertn.) Roxb.	Rak thale	Shrubby tree	++
Lamiaceae	<i>Gmelina philipensis</i> Cham.	Song maeo	Small tree	+++
	<i>Vitex rotundifolia</i> L.f.	Khon thi so thale	Herb	+++
Lauraceae	<i>Neolitsea zeylanica</i> (Nees) Merr.	Ian	Shrub	+++
Liliaceae	<i>Dianella ensifolia</i> (L.) DC.	Ya nu ton	Herb	+++
Loranthaceae	<i>Dendrophthoe pentandra</i> (L.) Miq.	Kafak ma muang	Parasite Shrub	++++
Melastomataceae	<i>Melastoma malabathricum</i> L.	Klong khlang khi nok	Shrub	+++++
	<i>Memecylon corticosum</i> Ridl.	Mai thao nang yat	Shrubby tree	++++
Myrsinaceae	<i>Ardisia crenata</i> Sims	Ta pet ta kai	Shrub	+++
	<i>Rapanea porteriana</i> (A.DC.) Mez	Rang ka thae	Tree	+++
Myrtaceae	<i>Baeckea frutescens</i> L.	Son sai	Shrubby tree	++++
	<i>Rhodomyrtus tomentosa</i> (Aiton) Hassk.	Phruat	Shrub	++++
	<i>Syzygium grande</i> (Wight.) Walp.	Ma mao	Tree	+++++
	var. <i>grande</i>			
	<i>Syzygium zeylanicum</i> (L.) DC.	Samet daeng bai mon	Shrubby tree	+++
	<i>Syzygium gratum</i> (Wight.) S.N.Mitra	Samet chun	Tree	+++++
	var. <i>gratum</i>			
	<i>Melaleuca cajuputi</i> Powell	Samet khao	Tree	+++
Ochnaceae	<i>Ochna integerrima</i> (Lour.) Merr.	Kamlang chang san	Shrubby tree	++++
Olacaceae	<i>Olax psittacorum</i> (Willd.) Vahl	Nam chai khrai	Scandent	++
	<i>Strombosia javanica</i> Blume	-	Shrub	++
Oleaceae	<i>Olea brachiata</i> (Lour.) Merr.	Ket san	Tree	++++
Orchidaceae	<i>Cymbidium finlaysonianum</i> Lindl.	Kare karon	Orchid	++
	<i>Dendrobium crumenatum</i> Sw.	Wai tamoi	Orchid	++++
	<i>Dendrobium secundum</i> (Blume) Lindl.	Ueang praeng si fan	Orchid	++
	<i>Doritis pulcherrima</i> Lindl.	Ma wing	Orchid	+++++
Pandanaceae	<i>Pandanus odoratissimus</i> L.f.	Pa-nae	Tree	+++
Pittosporaceae	<i>Pittosporum ferrugineum</i> W.T.Aiton	Sum ton	Tree	+++
Poaceae	<i>Eragrostis gangetica</i> (Roxb.) Steud.	Ya krok	Herb	+++
	<i>Eriachne pallescens</i> R.Br.	Ya nuat moen	Herb	+++
	<i>Isachne globosa</i> (Thunb.) Kuntze	-	Herb	++
	<i>Ischaemum barbatum</i> Retz.	Ya yon hu	Herb	++
	<i>Perotis indica</i> (L.) Kuntze	-	Herb	++++
	<i>Rhynchelytrum repens</i> (Willd.) C.E. Hubb.	-	Herb	++
Polypodiaceae	<i>Drynaria sparsisora</i> (Desv.) S. Moore	Kratae tai mai	Fern	++++
	<i>Microsorium nigrescens</i> (Blume) Copel.	Kraprok wao	Fern	++++

Table 1. (continued)

Family	Species	Vernacular	Habit	Abundance
	<i>Myrmecophila crustacea</i> (Copel.) Tagawa	-	Fern	+
	<i>Pyrrosia adnascens</i> (G.Forst.) Ching	-	Fern	+++
	<i>Pyrrosia piloselloides</i> (L.) M.G.Price	Klet nak kha rat	Fern	++++
	<i>Pyrrosia nummularifolia</i> (Sw.) Ching	Bia mai	Fern	+++
Psilotaceae	<i>Psilotum nudum</i> (L.) P.Beauv.	Wai thanoi	Fern ally	+
Rubiaceae	<i>Chasallia chartacea</i> Craib	Yai khlang	Shrub	++
	<i>Chassalia curviflora</i> (Wall.) Thwaites	Khem phra ram	Shrub	++
	<i>Guettarda speciosa</i> L.	Kongkang hu chang	Shrubby tree	+
	<i>Hedyotis</i> sp.	-	Herb	++++
	<i>Ixora javanica</i> (Blume) DC.	Khem daeng	Shrub	++
	<i>Prismatomeris tetrandra</i> (Roxb.) K.Schum. var. <i>tetrandra</i>	Duk kai	Shrub	++++
	<i>Psychotria sarmentosa</i> Blume	Duk kai yan	Climber	++
	<i>Psychotria</i> sp.	-	Shrub	+++
	<i>Catunaregam tomentosa</i> (Blume ex DC.) Tirveng.	Nam khet	Shrubby tree	+++
Rutaceae	<i>Micromelum minutum</i> (G.Forst.) Wight & Arn.	Mui chang	Small tree	+++
Sapindaceae	<i>Mischocarpus sundaicus</i> Blume	Baek phrai	Small tree	+++
Sapotaceae	<i>Palaquium obovatum</i> (Griff.) Engl.	Khanun nok	Tree	+++
Schizaeaceae	<i>Lygodium microphyllum</i> (Cav.) R.Br.	Liphao yung	Climbing fern	+++
	<i>Lygodium salicifolium</i> C. Presl	Liphao yai	Climbing fern	+++
	<i>Schizaea dichotoma</i> (L.) Sw.	Tan san	Fern	++++
Simaroubaceae	<i>Eurycoma longifolia</i> Jack	Pla lai phueak	Tree	++
Sterculiaceae	<i>Helicteres angustifolia</i> L.	Khi on	Shrub	+++
Theaceae	<i>Adinandra integerrima</i> T.Anderson ex Dyer	Phikun pa	Tree	+++
Viscaceae	<i>Viscum articulatum</i> Burm.f.	Kafak tin-pu	Parasite	+++
Vittariaceae	<i>Vittaria elongata</i> Sw.	Wan hua laman	Fern	+

Abundance: + = rare (once or twice found in the study site); ++ = few (more than twice but less than ten times found in the study site) ; +++ = often found (found more than ten times but not well dispersed); ++++ = well dispersed in the study site but not everywhere; +++++ = found everywhere in the study site.

DISCUSSION AND CONCLUSIONS

Almost all of the natural vegetation along the coast of Songkhla has either been eradicated or is endangered. The small stand found at Ban Taling-Chan is characterised by a low uniform tree canopy, no trace of layering among the trees (see also Plot 1, 2 and 3; Figure 1 A, B), many tree species with small, sclerophyllous leaves (e.g. *Syzygium gratum*, *Palaquium obovatum*, *Rapanea portieriana*), ground covered with bryophytes in some areas, the frequent occurrence of wiry-stemmed climbers such as *Hoya diversifolia* and *Abrus precatorius*, many epiphytes and photophytes occurring near the ground

(Figure 1 C), the frequent occurrence of myrmecophytes such as *Dischidia rafflesiana* and the abundance of parasitic plants such as *Dendrophthoe pentandra* and *Viscum articulatum*).

Given certain physical characteristics of the study site such as podzolised soil and a tropical monsoon climate with a distinct dry period, the characteristics of this remnant vegetation agree quite well with the definition of the heath forest reported by Ashton (1971), Congdon (1982) and Whitmore (1984).

Tree canopy structure shows some interesting characteristics, particularly when trees of same species are compared. The ones at the edge of the sandbar next to the open sea have a very low canopy, coming close to the ground. Those further inland, have a more regular canopy. The physical factors that might have shaped tree canopies in the study site include high winds from the open sea. Wind might also affect the dispersal pattern of the plant species. This can be seen from the low uniform canopies of trees that occur in a unit comprising many species. These units stand parallel to the direction of the wind, and alternate with “wind passages”, which are narrow gaps where no woody plants are able to grow due to the wind (Figure 1 A, B). The plant species which grow in these units have not only adapted themselves to the poor soils, but are also to cope with the effects of the high winds, i.e. high rates of transpiration, mechanical damage etc.

If the uniform vegetation which occurs on the sandbar beside the open sea is defined as one distinct type (Plots 1–3), then the vegetation profile in Plot 4 may represent another. This plot is furthest from the sea, and is rather different in terms of species composition and vegetation structure. The dominant tree species in Plot 4 is *Dipterocarpus chartaceus*, which does not occur in the other plots. A number of differences in vegetation structure were noted including the occurrence high tree canopies, layering of the canopies, the presence of epiphytes in the canopies and the presence of big lianas (e.g. *Gnetum tenuifolium*). The area in which Plot 4 was laid may represent the starting point of an ecotone which borders “typical” sandbar forest and other forest types. Also, there are no direct effects of wind in Plot 4, since it is protected by the forest nearer the shore. At this stage it is unwise to present a detailed description of the vegetation without any study of the vegetation history of the site.

Among the 98 species of vascular plants found in the study site, 13 species are ferns and a fern-ally (*Psilotum nudum*), one species is a gymnosperm (*Gnetum tenuifolium*) and the others are flowering plants. (See also table 1).

Plants on the coastal sandbars grow under drought conditions, especially in the dry season, and are subjected to high rates of transpiration brought about by high winds. Many of the plants show typical characteristics of xerophytes, such as a succulent stem, small, sclerophyllous leaves with pale coloration, spines on the stem, a thick cuticle and many hairs in order to resist the drought situation in a long dry season by drought tolerance (Kramer, 1983) Examples include tree species such as *Catunaregum tomentosa*, *Olea maritima*, *Syzygium* spp, *Palaquium obovatum* and *Rapanea porteri*ana. It would be of interest to study the morphology and anatomy of the plants in order to examine their adaptations to this habitat in more detail.

At this stage it is difficult draw conclusions as to whether or not the stand represents truly natural vegetation. Only when details of its vegetation history are available will the

picture become clearer. It is strongly recommended that further investigation of the vegetation composition and history of coastal sandbars should be carried out, not only in Songkhla Province but also other parts of Thailand and the Malay Peninsula.

The natural coastal forest on the sandbars in Songkhla has been severely affected by urban, industrial and tourism development as well as by agriculture and land management. The remnant stand of apparently natural forest at Ban Taling-Chan may be the last example of the kind of vegetation that once dominated the landscape of coastal sandbars in Songkhla. It is regrettable that this stand remains unprotected.

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Figure 1. A; B: Uniform canopies of trees and shrubs in the direction of wind passages at Ban Taling-Chan; C: *Drynaria sparsisora*, an epiphyte attached to the ground; D: *Vatica harmandiana*; E: *Schizaea dichotoma*.