

LITERATURE REVIEW

Morphology

I. Ferns

The Plant

The whole part of the plant with various sizes and forms, is known as a sporophyte. There are three general parts: rhizome (stem), frond (leaf) and root. Their habitats vary to their species, variety and their own capable of adaptation. They will be terrestrial when their rhizome and root are under or on the ground surface, be aquatic when their rhizome and root flood with water, be epiphyte when their rhizome and roots are on the other plants, or rock. If they have their true roots under the ground surface and their slender rhizome cling to other plants, they will be climbing ferns.

The rhizome

Rhizome may erect or creeping under or over the ground surface, protected when young by hairs and scales or only one of them. Scales and hairs may be caducous or permanent. Scales varies in sizes, forms and colors (see (Fig III)); their edges and surfaces may be covered with hairs or may be glabrous. Hairs on the rhizome, scales or other part of plant body may be unicellular or multicellular with various forms (Fig III).

Some erect rhizomes are short, covered with tuft of frond upon. If the erect rhizomes are high and thick that similar to the trunk of other plant, they will be called stock. An erect stock usually bears a rosette of fronds at its apex. (Pl. VI a.).

Creeping rhizome may bear well-spaced or irregular of fronds and the rhizome may be branched or not.

The Fronds

Young fronds of ferns that always coil are called croziers. The croziers are usually covered with hairs or scales. The process of coiling and uncoiling are known as circinate vernation.

Mature fronds and young fronds are comprise of two main part, the stalk which is called a stipes and the expanded part which is called lamina or blade. Stipes usually bear hairs and scales or only one or none at their base or throughout their length. Lamina may be simple or compound (Fig. II)., of various forms and sizes. When the leaflets of the compound fronds arranged themselves like the barbs of a feather the compound fronds will be called pinnate and each leaflet called a pinna, and the axis bearing the pinnae is called rachis. If the whole frond is bipinnate, each ultimate leaflet will be called a pinnule. But there are no special terms for the ultimate leaflets when they have more than bipinnate. Edges of simple fronds or leaflets



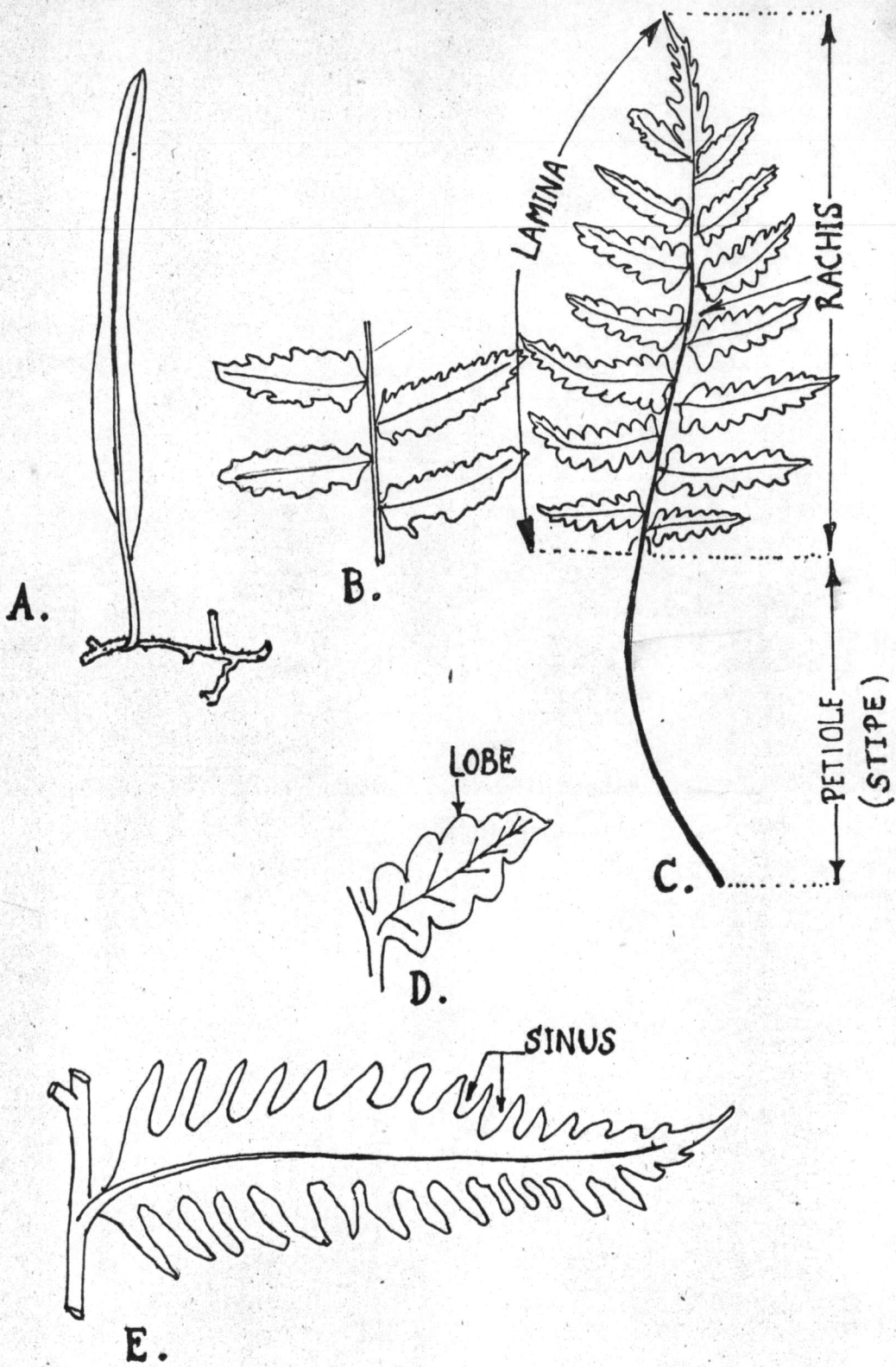


Fig. 2

may be entire, undulate toothed or lobed. The space between two lobes is called a sinus (Fig. II E.). When a lamina or pinna is deeply cut more than half way but the cutting does not fully reach the rachis or midrib, the blade or pinna is said to be pinnatifid (Fig. II E.). Some ferns as in some species of Thelypteris, the primary division is pinnate and the secondary division is pinnatifid which is called pinnate-pinnatifid. (Pl. XXXIII-XXXVI).

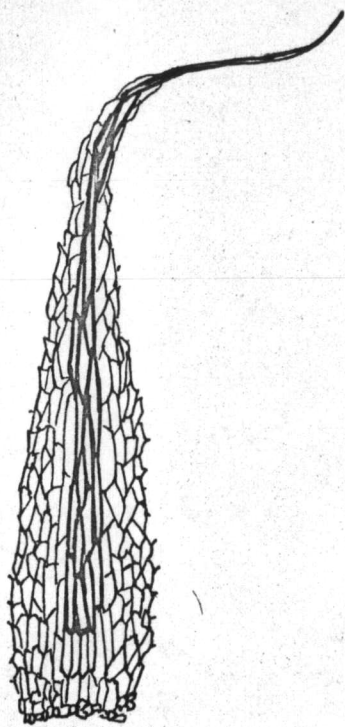
A pinna is divided into two halves by its midrib (costa). The half which is toward to the apex of the frond is called acroscopic, the other half called basisopic. The midrib of a pinna or pinnule is called a costa, the midrib of a lobe of a pinna or pinnule is called a costule.

Venation

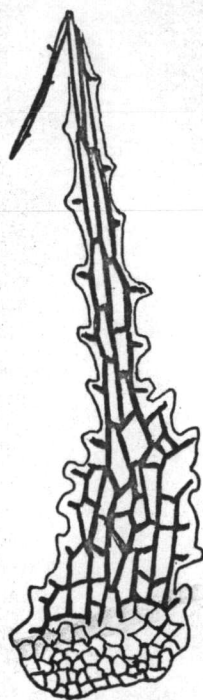
Veins may be either free or anatomosing. Free veins are classified into three types: simple, dichotomous (equal forks) or branched (usually pinnate, Pl. VI c.). Anatomosing veins are those that form a complex network. The small area with various shape, surrounded by reticulate veins, are called areoles. And areoles may be with or without free veinlets.

Sori

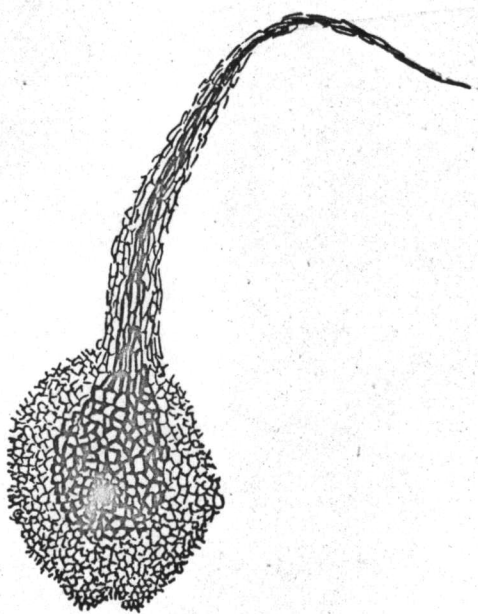
Sorus (Sori, plural) is a group of sporangia. Ferns are propagated by dust like spores which are in the capsule or sporangia. Sori may bear indusium (thin protective covering over the clustered sporangia) or exindusiate.



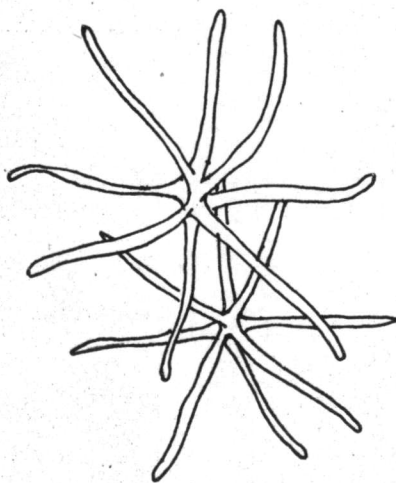
a.



b.



c.



d.

Fig. 3

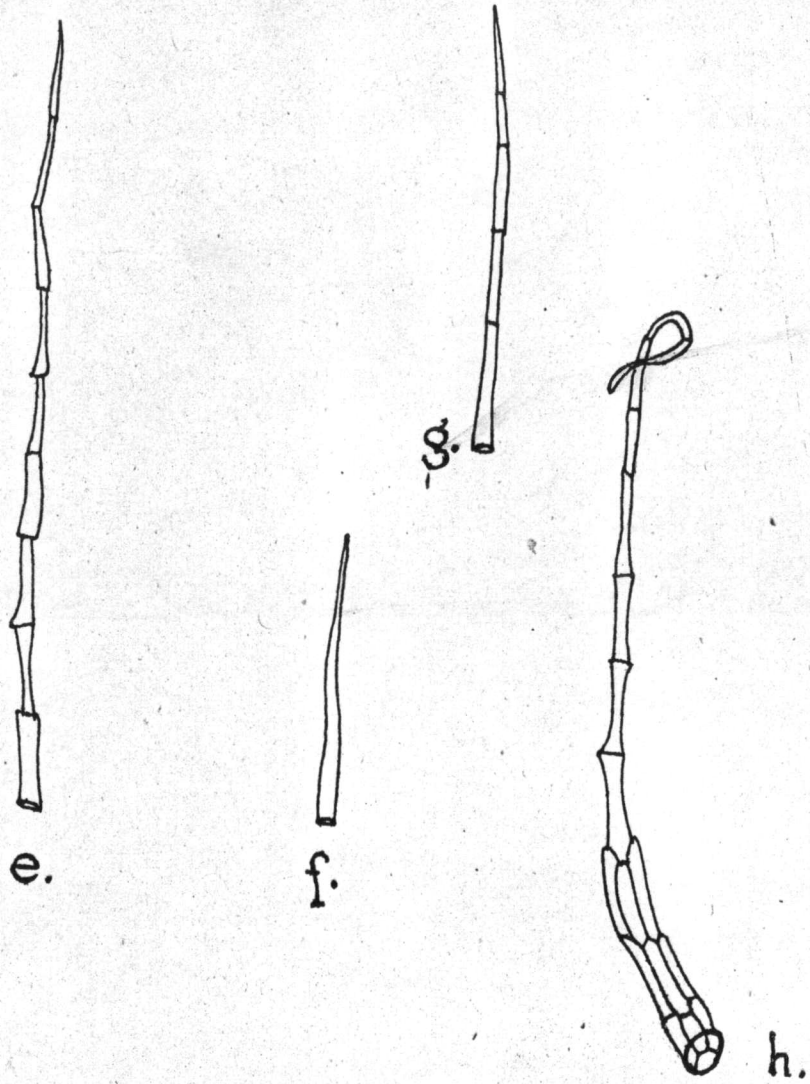


Fig. 3

Indusia may be round, reniform, peltate or similar shape to sori. Sori may be round, elongate or cup-shaped. Round sori, may be at the end of the vein, upon the vein or at the vein junction, is the characteristic of Polypodiaceae. Sori may be elongate along the margin as in Adiantaceae or sunk in groove as in Vittariaceae. Sori may spread on the whole surface of pinna or lamina with no distinguishable separate sori, such arrangement is called acrostichoid.

Sporangia

Sporangia of ferns are mostly alike except in some family such as Osmundaceae, Ophioglossaceae, Marattiaceae, Schizaeaceae. They are club-shaped. The sporangial wall is one layer thick and has an annulus. The annulus is quite variable in form and consists of specialized thick wall cells which is interrupted on one side by the thin wall cells. From the base of the sporangium a small stalk connects each sporangium to the pinna. At maturity the sporangium breaks at the lip cells and the spores are dispersed.

Spores

The spores of ferns are of two main shapes. They are always formed in group of four (tetrad). The first one is that all four spores meet one another at the centre of the sphere, and each spore then has three face in contact with the other spores and one outer face; it is called tetrahedral. The other one is that the tetrad arranges it self into two hemisphere, hemisphere is divided-

into two spores, one pair at right angles to the other, these spores are called bilateral.

II. Fern allies

The Plant

Plants of various sizes and shapes are terrestrial or epiphytic herbs, rarely are aquatic. Sporophyte plants, composing of roots, stems and leaves (except Psilotum with no root and leaf), are dominant. Stem is usually dichotomously branched, erect, pendulous or prostrate with no leaf gaps. Leaf is usually simple, small, sessile with single vein. Leaf that bearing sporangia is called sporophyll. Sporophyll is usually different more or less from vegetative leaf and arranged in group mostly at the tip of a branch or a stem. Groups of sporophyll are called strobilus. Sporangia are produced at the lateral side of a stem, in the axil of a leaf or embedded in the broad base of a leaf.

Most of the terms used for defining ferns are based on Holttum, 1960 in his Flora of Malaya Vol. II.

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Taxonomic Works on ferns and fern allies in Thailand

Taxonomic studies on ferns and fern allies in Thailand are scanty. During the period of 1899-1968, a few trips were made. E.J. Schmidt (1900-1916), Danish Botanist arrived in Siam in 1899. Botanical collections on flowering plants and cryptogam were made on the area of Koh Chang, an island of the province Trat, at the East coast of Thailand. Plant specimens were contributed to expert botanists of other fields, the result was published, under title of Flora of Koh Chang. Part Filicinae was studied by H. Christ, 35 genera and 67 species of ferns were listed at that time. (Schmidt, 1900-1916).

Between 1902 and 1932, Dr. A.F.G. Kerr worked originally in Siam as a doctor, later as the government botanist. He made a large number of botanical collections, including ferns (Jacobs 1962). His fern collections studied by Eryl Smith, an English doctor in 1929. (Smith, 1929).

Dr. Eryl Smith worked at Kew on ferns. (Jacobs 1962). She had collected a large amount of ferns from Thailand. Unfortunately by car accident, her papers on ferns of Thailand could not be published.

During 1934- 1935, G. Seidenfaden, Danish botanist had collected fern specimens from Suratthani and Chantaburi. Taxonomic studies were made by Dr. C. Christensen (Seidenfaden, 1934-1935), 30 genera and 47 species of ferns were collected at that times.

Dr. Tardieu-Blot and Dr. Carl Christensen (1934-1941) had studied ferns and fern allies in Indo-China Peninsula and some provinces in North East of Thailand, the result was published in Flore Générale de L'Indo-Chine, Cryptogams Vasculaires (Tard. & C. Chr., 1939-1941).

During 1957-1960, Thailand and Denmark worked together under the title "Studies in the Flora of Thailand." Plant specimens were contributed to many field specialists. Part Filicinae was studied by Dr. R.E. Holttum of Kew, at that time fern collections were about 157 species (Bruun, 1961). Dr. R.E. Holttum had published the Ferns of Malaya in 1954. Fern collections were about 108 genera and 468 species, and many species of them are also found in Thailand, especially in the southern part of Thailand. This textbook is much valuable for this study.

Another study was made during 1965-1966 by Dr. M. Tagawa and Dr. K. Iwatsuki, Japanese botanist at Kyoto University. They could collect about 116 genera and 442 species of Pteridophyte in many provinces of Thailand. Their enumerations concerning the ferns flora of Thailand were nearly completed. According to Taxonomic sequence in the enumerations, they followed and modified the system of Dr. Holttum (1954). Little change was made with the name and the circumscription of some genera. They classified all of the sub-families of the largest family

Dennstaedtiaceae as the new families. They combined the genus Abacopteris and the genus Cyclosorus within the genus Thelypteris. Genus Hymenophyllum was split into 11 genera. According to their expedition, they could collect many species that new to science.

At the same time, Dr. M. Tagawa and Dr. K. Iwatsuki worked in Thailand. Drs. E. Hennipman and Dr. A. Touw worked on the Thai-Dutch botanical expedition (Hennipman & Touw, 1966).

In 1966 J.O. Sawyer and Chirayupin Chermisrivathana collected Plant specimens in the area of Doi Suthep, Doi Pui (Sawyer & Chermisrivathana, 1969). Fern collections about 21 genera and 33 species were listed.

In 1968 T. Smitinand, the curator of the Forest Herbarium of the Royal Forest Department, studied on the Vegetation of Khao Yai, and he listed roughly 24 species of ferns.

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