

ON THE FAMILY PHYLLOCLADACEAE

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Abstract: A new, monogeric family Phyllocladaceae is described. Because of the presence of the unique foliar structure which is generally known as a phylloclade, this family is considered as representing a vital link between the primitive members of progymnosperms and the conifers. Citations of the previous references and brief descriptions of the family as well as the genus are presented.

Ten years ago, after examining the preserved material of *Phyllocladus hypophyllus* Hook. f., an unusual conifer from Sarawak, I made an assessment on the phylogentic position of the genus *Phyllocladus* (Keng, 1963a). From a survey of literature, this genus was variously classified as representing a subtribe, a tribe or a subfamily of either Taxaceae, or Podocarpaceae. At that time I was contented with the conclusion drawn by Pilger that this genus should be retained in the subfamily Phyllocladoideae of the family Podocarpaceae.

The peculiar leaf-like structure of this genus, commonly known as 'phylloclade' (from which the generic name was derived), was a puzzle to me for a long time. This structure is in fact a fusion of very complicated branch systems, rather than a simple flattened branch (Keng, 1963b). After careful consideration, I come to the conclusion that the so-called phylloclade of *Phyllocladus* is almost certainly a remnant of a very ancient structure and has been hitherto grossly misinterpreted. Since the juvenile foliage leaves are simple, and the adult 'phylloclade' a fusion of open dichotomous branch systems, I therefore postulate that the 'phylloclade' of this genus probably plays a vital link between the primitive members of progymnosperms (Beck, 1960, 1966) of which the foliar branch systems are open dichotomous, and the coniferophytes whose foliage leaves are uniformly simple. The details of my proposition shall be published elsewhere.

In this paper, I should like to uphold the family name Phyllocladaceae which was once only casually mentioned in a college textbook by Core (1955), and later cited by myself (Keng, 1963a). Unfortunately it was not proposed in conformity with Articles 16 & 36 of the International Code of Botanical Nomenclature, therefore this family name was overlooked by Gould (1962) and others.

I am inclined to think that the family Phyllocladaceae is probably the most primitive one among the four families under the suborder Taxineae (the other three being: Taxaceae, Podocarpaceae and Cephalotaxaceae) of the Coniferae (Keng, 1969). The fact that so many morphological characters of the monogeric family Phyllocladaceae are in common with the Taxaceae on the one hand and with the Podocarpaceae on the other (Kildahl, 1908; Maheshwari, 1962; Keng, 1963a) can plausibly be explained as that this family inherited these characters directly from the progenitor and from which both Taxaceae and Podocarpaceae were subsequently evolved.

TAXONOMIC TREATMENT

Phyllocladaceae, E. L. Core ex H. Keng, *fam. nov.*

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Coniferae, Trib. Taxeae Hook. f. in Benth. & Hook. f. Gen. Pl. 3: 432, 1880, quoad *Phyllocladus*.

Coniferae, Unterfam. Taxoideae, Trib. Taxeae Eichl. in Engl. & Prantl, Pflanzenfam. 2, 1: 108, 1889, quoad *Phyllocladus*.

Taxaceae, Unterfam. Phyllocladoideae, Pilg. in Engl., Pflanzenreich, 4, 5: 38, 1903.

Podocarpaceae, Unterfam. Phyllocladoideae, Pilg. in Engl., Bot. Jahrb. 54: 33, 1916, in Engl. & Prantl, Pflanzenfam. ed. 2, 13: 249, 1926; Pilg. & Melch. in Melch. & Werderm., Syl. Pflanzenfam. 12 ed. 1: 337, 1954.

Arbores sempervirentes, raro frutices; ramis plerumque subverticillatis; ramulis ultimis in phyllocladia pinnata. Strobili monoeci vel dioeci; ♂ ed apicem ramulorum fasciculati, ovoidei vel cylindracei, pedicellati; antherae subsessiles, spiralliter confertae, biloculares; ♀ ad basin ramulorum vel ad incisuram pinnae, ovoidei vel subglobosi; squamae simplices, imbricate; ovula erecta. Strobilus maturus plerumque 1-spermus. Semina ovoidea, arillata, ex squamis cupulatis carnosulis; testa crustacea.

Evergreen trees, rarely shrubs; branches mostly subverticillate; ultimate branchlets in pinnate phylloclades. Strobili monoecious or dioecious; ♂ at the top of branches, fascicled, stalked, ovoid or cylindrical; anthers subsessile, spirally arranged, locules 2; ♀ in the axils of scales at the base of branchlets or on the notches of pinnae, ovoid or subglobose; cone-scales simple, imbricate; ovules erect. Mature strobilus often 1-seeded. Seeds ovoid, seated on a scaly fleshy cup. Seeds arillate; testa crustaceous.

Phyllocladus L. C. & A. Rich. Comm. Conif. Cycad. (1826) 129, t. 3; Hook. f. in Benth. & Hook. f. Gen. Pl. 3 (1880) 432; Eichl. in Engl. & Prantl, Pflanzenfam. 2, 1 (1889) 108; Pilg. in Engl. Pflanzenreich 4, 5 (1903) 94, f. 18 in Engl. & Prantl, Pflanzenfam. ed. 2, 13 (1926) 249.

Brownetera L. C. Rich. in Ann. Mus. Hist. Nat. Paris 16 (1810) 299, nomen.

Thalamia Sprengel, Anl. Kenntn. Gew. ed. 2, 2 (1817) 218.

Trees or sometimes shrubs, evergreen. Branches and branchlets in whorls or nearly so. Juvenile and true leaves simple, minute, linear or scale-like. Phylloclades (actually leafy, fused branch systems) from simple, pinnatifid to pinnately compound, found on the axils of the scale-like true leaves. Pinnate phylloclades 4-6 in a whorl (or a pseudowhorl), forming the ultimate branchlets. Simple phylloclade, or the segments (3-9) of a pinnate phylloclade, thick coriaceous, obovate to rhomboid, apex acuminate or notched. Strobili unisexual, dioecious or rarely monoecious (ovulate ones usually very much outnumber the staminate ones). Staminate strobili cylindrical, long-stalked, often produced in clusters from the tip of the dwarf shoots; cone-scales numerous, spirally arranged; pollen sacs 2 on each scale; pollen grains winged. Ovulate strobili ovoid or globular, solitary, usually borne on the apical notch of a simple phylloclade or of the segments of a pinnate phylloclade (or sometimes when the segments being reduced, then these strobili seemingly borne on a long and thick stalk); fertile scales 3-5 or fewer; ovule solitary in the axil of a fertile scale, usually only one (rarely two) ovule per strobilus developed into a seed, and finally assumes the terminal position. Seed ovoid, protruding from a papy cup-shaped arillus; both seed and arillus seated on a somewhat succulent receptacle which is formed by a fusion of the reduced scales.

Species 6 or 7, New Zealand, Tasmania to Malesia (New Guinea, Celebes, the Philippines, & Borneo). (Fig. 1) Type species: *Phyllocladus asplenifolius* (Labill.)

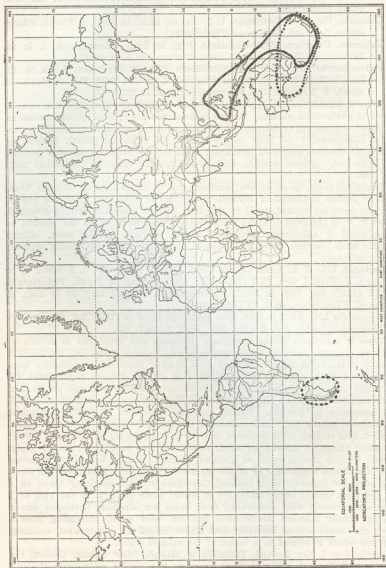


Fig. 1. Distribution of *Phyllocladus* (Phyllocladaceae); living (in solid line) and fossil (in broken lines). [The data of fossil findings are based on R. A. Couper in Proc. Roy. Soc. B. 152: 491-500, 1960]. (Base map: Goode's Series No. 1M, Chicago Univ. Press).

Hook. (*Ph. rhomboidales* L. C. & A. Rich) from Tasmania.

ACKNOWLEDGEMENTS

I would like to thank Dr. R. C. Bakhuizen van den Brink, Jr., for discussing on the nomenclatural problem of this family, to Dr. C. X. Furtado for going through the latin diagnosis, to Dr. G. Lim for reading the introduction and to Mrs. M. Goh for typing the manuscript.

REFERENCES

- Beck, C. B., 1960. The identity of *Archaeopteris* and *Callixylon*. *Brittonia*, **12**: 351-368.
 ———, 1966. On the origin of gymnosperms. *Taxon*, **15**: 337-339.
 Core, E. L., 1955. *Plant taxonomy*. Englewood: Prentice-Hall.
 Gould, S. W., 1962. *Families of the plant kingdom*. New Haven: IPIX.
 Keng, H., 1963a. Taxonomic position of *Phyllocladus* and the classification of conifers. *Gard. Bul. Sing.*, **22**: 127-129.
 ———, 1963b. Aspects of morphology of *Phyllocladus hypophyllus*. *Ann. Bot. n.s.*, **27**: 69-73.
 ———, 1969. Aspects of morphology of *Amentotaxus formosana* with a note on the taxonomic position of the genus. *Jour. Arnold Arb.*, **50**: 432-446.
 Kildahl, N. J., 1908. Affinities of *Phyllocladus*. *Bot. Gaz.*, **46**: 464-465.
 Maheshwari, P., 1962. The overpowering role of morphology in taxonomy. *Bull. Bot. Surv. India*, **4**: 85-94.