

Masahiro KATO*: **Notes on the two fern genera**
Adenoderris and *Cheilanthesis*

加藤雅啓*: シダの2属 *Adenoderris* と *Cheilanthesis* について

The athyroid ferns (which in the broad sense adopted here are properly called Woodsiaceae as a family) have been delimited in many different ways (Alston 1956, Ching 1940, 1978, Holttum 1949, Kato 1972, Sledge 1973, Tagawa & Iwatsuki 1972, Tryon & Tryon 1982). *Adenoderris* and *Cheilanthesis* are problematic genera whose systematic treatment differs considerably with different authors, mainly because they are not well-defined with special reference to the usual key characters. I had an opportunity to examine the type or authentic specimens of these genera represented at the Herbarium of the University of Michigan (MICH) and the Herbarium of Kunming Botanical Institute (KUN), Academia Sinica. This report presents new information about the morphology and relationships of *Adenoderris* and *Cheilanthesis*.

Adenoderris *Adenoderris* is a small genus of two species occurring in Central America and the West Indies and grows among rocks or in rock crevices. It was established by J. Smith in 1875 for *Aspidium glandulosum* Hook. & Grev., non Blume, which had been renamed *Polystichum glandulosum* by Presl. Maxon (1905) recognized two species, *Adenoderris viscidula* (Mett.) Maxon (= *A. glandulosa* (Presl) J. Sm.) and *A. sororia* Maxon, although it was only recent that Tryon & Tryon (1982) pointed out that *A. glandulosa* (Presl) J. Sm. is a valid name older than *A. viscidula*. *A. glandulosa* occurs in Cuba and Jamaica and *A. sororia* in Guatemala, where it is known only by the type collection.

Adenoderris is characterized by a short, erect, scaly rhizome bearing a fascicle of small, pinnate to pinnate-pinnatifid, free-veined leaves with short petioles scaly at the base, round sori covered with peltate indusia, and bilateral spores. Its leaf form is similar to that of *Polystichum* and *Woodsia*, while the sorus resembles that of some genera with dryopteroid affinities such as *Cyrtomium*, *Polystichum*, *Rumohra*, and *Stigmatopteris*.

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The systematic position of *Adenoderris* has been controversial. The genus had generally been reduced to *Polystichum* until Maxon (1905) supported its generic recognition, and Christensen (1938) accepted it as a genus related to *Polystichum*. Copeland (1947) pointed that *Adenoderris* is not near *Polystichum* and suggested an affinity to *Dryopteris* and also to *Woodsia*. Tryon & Tryon (1982) placed *Adenoderris* in the tribe Physematieae including *Athyrium*, *Woodsia* and related genera, based on its petiolar anatomy, i.e. the two vascular bundles in the petiole. They examined the spores with the SEM showing them to be similar to those of the tribe Dryopterideae.

Vascular anatomy has been of great value to indicate affinities of ferns (Ogura 1972). In this respect, the petiolar anatomy of *Adenoderris* was reexamined to help judge its systematic position.

Petiolar anatomy. The basal part of a petiole of *Adenoderris glandulosa* was studied (Fig. 1). The original specimen is Hunnewell 11473 from Cuba deposited at the University of Michigan Herbarium (to which I am thankful for permission to study a small piece of a petiole detached from the specimen). Dried material was boiled to restore the original condition to some extent and then hand-sectioned, although it was still somewhat compressed dorsiventrally.

The outermost layer consists of several layers of rather thick-walled, small epidermal cells. Inside of these, there are one or two layers of large, parenchymatous cells. Within the parenchyma are two vascular bundles each enclosed in a layer filled with tannin-like deposits. Xylem is somewhat triangular in transverse section. The inner and abaxial part consists of metaxylem of thicker tracheids while the outer and adaxial part consists of thinner tracheids, although protoxylem points were not located.

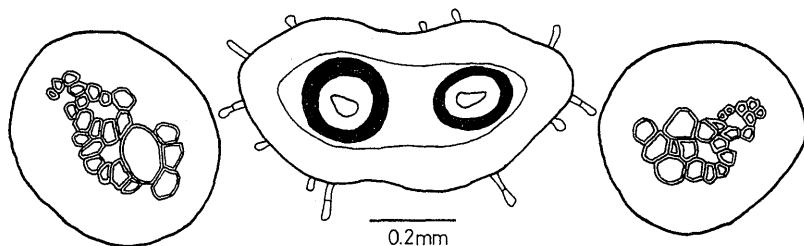


Fig. 1. Transsection of petiole of *Adenoderris glandulosa* and triangular xylem enlarged. Adaxial side top.

Taxonomic implications. Kato (1972) studied both the number of vascular bundles and the configuration of xylem in transection in the petioles of several fern groups including the athyrioids. He argued that petiolar anatomy is useful to delimit the genera of athyrioid affinities, although some similarity is present between the different groups. Athyrioid and dryopteroid groups may be discriminated by the xylem configuration: omega-shaped in the athyrioid and triangular with one hooked end in the dryopteroid. *Adenoderris* is similar to the dryopteroid group, especially *Stenolepia*, in having triangular xylem with no hooked end, so far as I have observed. Furthermore, the number of bundles is nearly constant in each group, with occasional exceptions. In general, the athyrioid group has two vascular bundles in the petiole while the dryopteroid has more than two, commonly three to over 10. However, some larger species of *Diplazium*, in the former group, have subsidiary bundles in addition to the main two, and smaller species in the latter group may have relatively few bundles, down to two. The simple petiolar anatomy of *Adenoderris* may be due to small leaf size, as in *Polystichum tripteron*.

Thus, the petiolar anatomy indicates an affinity of *Adenoderris* to the dryopteroid group rather than to the athyrioid, as do the indusium and spores. The simple anatomy, correlated with small leaf size, the peltate indusium and epipetric habitat suggest that it is considerably derived. It is close to *Polystichum* in having oblanceolate leaves, auricled acroscopic bases of pinnae and peltate indusia.

Cheilanthopsis *Cheilanthopsis* is a monotypic genus which was established by Hieronymus in 1920 for *Cheilanthes straminea* Brause from Yunnan, southwestern China. Later, Ching (1932) reduced *Cheilanthopsis straminea* to *C. indusiosa* (Christ) Ching, originally described as a *Woodsia* from Yunnan in 1909. It grows on rocks or in rock crevices as does *Woodsia*.

Cheilanthopsis is principally characterized by its sori, which have been described as exindusiate and protected by indusium-like thin tissue of the lamina margin. Other characters are very similar to those of *Woodsia*. Articulation of pinnae, which was added to its diagnosis by Ching, seems not to clearly distinguish *Cheilanthopsis* from *Woodsia*, because this also occurs to a certain extent in *W. elongata* Hook.

Alston (1956) placed *Cheilanthopsis* with *Woodsia* in Athyriaceae and Brown (1964) and Ching (1978) considered it close to *Woodsia*. Ching (1932) had formerly placed it near *Cheilanthes*.

To determine the taxonomic status and affinity of *Cheilanthesopsis*, comparative observations with morphologically similar *Woodsia elongata* were made with particular reference to soral characters. It was concluded that *Cheilanthesopsis* should be reduced to *Woodsia* and the correct name of its sole species is *Woodsia indusiosa* Christ. The following description of *W. indusiosa* is based on an isotype (MICH) of *Cheilanthes straminea* Brause as well as specimens of *W. indusiosa* deposited at KUN.

Sorus. The sori of *Woodsia indusiosa* are dorsal near vein-endings. The receptacle is slightly raised on the vein. The sporangia when young are covered by a small indusium consisting of 4-7, small, more or less oblong, glandular, plate-like segments which surround the receptacle as in some species of *Woodsia* (Fig. 2). At maturity the indusium is shriveled and inferior under the sporangia, hardly visible from above, but occasionally the tips protrude beyond the sporangia.

False indusium. The false indusium of *Woodsia indusiosa* is an indusium-like reflexed outgrowth protruding from the lamina margin as the marginal flap of

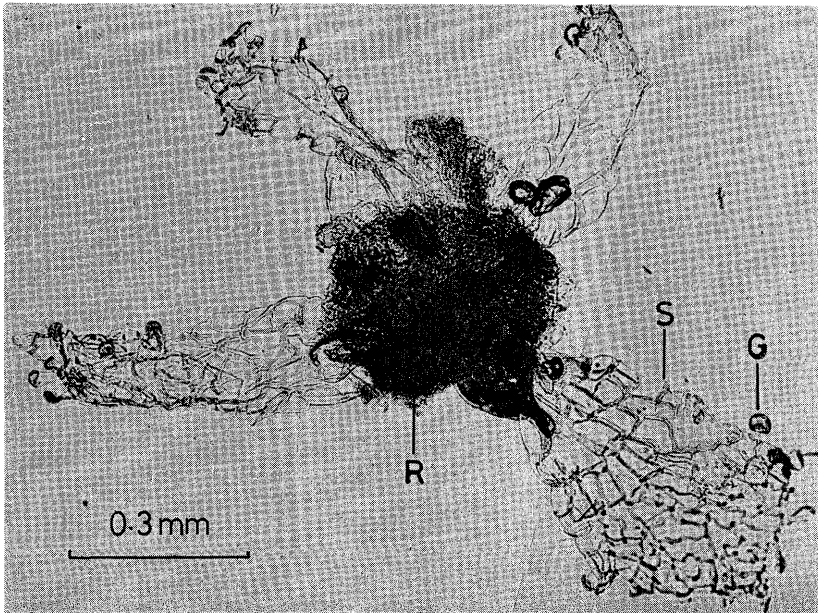


Fig. 2. Segmented indusium at base of sorus of *Cheilanthesopsis indusiosa* (= *Woodsia indusiosa*) from which sporangia are removed. G: gland, R: receptacle, S: indusium segment.

some ferns with marginal sori such as *Pteris* and *Pteridium* and therefore not constituting a true indusium which arises on the receptacle. It is large and covers the sorus almost entirely. It consists of a layer of thin-walled cells as in the true indusium, and is fringed with multicellular hairs similar to those on the rachis, costa and veins. Similar but reduced false indusia are present at the lamina margin opposite vein-endings at the distal part of pinnae and pinna segments where no sorus is borne on the vein.

The false indusia of *Woodsia elongata*, which Brown (1964) called accessory indusia, are smaller than those of *W. indusiosa*, and hardly visible under the larger globose true indusia. In this species, too, reduced false indusia are attached at non-soriferous distal parts of pinnae as well.

Status and affinity of *Cheilanthesis*. The present observation that the sorus of *Woodsia indusiosa* bears true indusia as well as false indusia as does that of *W. elongata* clearly shows that there remains no diagnostic character to separate *Cheilanthesis* and *Woodsia*. Other characters of hairs, leaf form, and pinna margins indicate an affinity of *Woodsia indusiosa* to *W. elongata*, as stated by Brown (1964). Geographically, too, they are close: *W. indusiosa* is distributed in southwestern China and *W. elongata* in the Himalayas to southwestern China.

A revised synonymy and diagnosis of *Woodsia indusiosa* follows:

Woodsia indusiosa Christ, Not. Syst. 1: 44. 1909. —*Cheilanthesis indusiosa* (Christ) Ching, Sinensia 3: 154. 1932; C. Chr. Ind. Fil. Suppl. 3: 55. 1934; Copel. Gen. Fil. 107. 1947. Type: Yunnan, Ducloux 162 (not seen).

Cheilanthes straminea Brause, Hedw. 54: 205. t. 4, f. H. 1914. —*Cheilanthesis straminea* (Brause) Hieron. Notizbl. 7: 406. 1920; Copel. Univ. Calif. Publ. Bot. 16: 95. 1929. Type: Yunnan, Na-hong, 3000 m, Maire 6487 (isotype MICH!).

Rhizome short, ascending, scaly; stipes clustered, up to 5 cm long, stramineous, deciduously scaly and hairy; scales lanceolate, up to 8 mm long, 1 mm broad, brown, entire, hairs small, multicellular, septate; leaves oblanceolate, acuminate, attenuate downward into very small pinnae, bipinnatifid, 25–45 cm long, 4–6 cm broad; pinnae 30–35 pairs, semiarticulate, sessile, patent, narrowly deltoid-oblong to oblong, middle pinnae up to 3 cm long, 1 cm broad, broadest at base, obtuse at apex, pinnatifid; segments oblong, contiguous or separated by narrow sinus, 2–2.5 mm broad, obtuse at apex, crenate, lamina yellow-glandular on both sur-

faces, minutely hirsute above, rachis sparsely scaly with small, linear, brown, entire scales and densely hairy with soft, multicellular, septate hairs, costae and veins similarly hairy, veins free, pinnate with simple veinlets in segments; sori round, 1-4, submarginal on each side of segments, dorsal near the apex of veinlets, indusiate with indusia each consisting of 4-7, small, glandular, plate-like segments, covered with brown, membranous, large, fringed false indusia outgrowing from reflexed lamina margin, smaller false indusia also present at non-sori-ferous distal part of pinnae and segments; spores brown to dark-brown, large, oblong, bilateral, monolete, reticulate to verrucose.

Distribution. Yunnan (SW. China).

This is closely similar to *Woodsia elongata* in the oblanceolate leaves with strongly attenuate bases, crenate segments, septate hairs, and false (or accessory) indusia, but rather clearly differs in its more sori per segment, its small segmented indusia, and its larger false indusia. In its segmented indusia it is similar to *W. montevidensis* (Spreng.) Hieron. and *W. scopulina* Eaton.

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メシダ群に入るかどうか所属が研究者によって異なる中米・西インド諸島に分布する *Adenoderris* (2種) と、中国雲南省に産する *Cheilanthesis* (単型属) の分類上の位置をより明らかにするため、指標形質を比較観察した。

Adenoderris の葉柄内の維管束の木部断面は三角形のオンダ型の一型であることが確かめられ、その数は2本で小型の葉と関係があると推定される。羽片基部前側が耳状で、包膜が楕状であることなどから、イノデ属に近縁な特殊に分化した属であろう。

Cheilanthesis は他の諸形質ではイワデンダ属に似るが、包膜を欠きソーラスは葉縁の偽包膜によって被われるとされてきた。しかし、ソーラスの基部に数枚の裂片からなる真の包膜があることが観察され、この属はイワデンダ属に帰属することになる。*Cheilanthesis indusiosa* (Christ) Ching の正しい学名は *Woodsia indusiosa* Christ である。本種は小さな偽包膜をもつ *W. elongata* と類縁があると考えられる。

□宇田川俊一・室井哲夫 (訳): **カビの分離・培養と同定** (Malloch, D.: *Moulds: their isolation, cultivation and identification*) 100 pp. 1983. 医歯薬出版, 東京. ¥2,800. この4年ほどの間に、菌類に関する実験実習書や研究法解説書がいくつか出版された。それぞれに編著者の姿勢が異なるので、特色のある内容となっている。本書は取扱う対象をカビに限定して、陸生菌の採集・分離法を示したものである。また、よく出現する属についての検索表と、65属以上の比較的大きな線画、その簡単な解説を示している。普通に出現するものについてはかなりの程度に属の同定が可能であるし、種の同定のための文献も加えてある。本格的にカビの採集・分離・同定に取り組む前の、予備的トレーニングのための指導書としてたいへんに好都合である。本書の訳出により菌類の学習のために新しい方向からの手掛りが1つ加わったことは、喜ばしいことと思う。

(三浦宏一郎)