A note on the systematic position of *Rumohra adiantiformis*

Masahiro KATO*

加藤雅啓：*Rumohra adiantiformis* の分類上の位置について

*Rumohra adiantiformis* has a combination of davallioid vegetative characters and polystichoid soral ones in a first glance, and is belonged to the different families according to the difference in the evaluation of various characteristic features. It was originally described as *Polypodium adiantiforme* by FORSTER in 1786 and subsequently transferred to *Polystichum* by J. SMITH (1875) and to *Dryopteris* by O. KUNTZE (1898). The genus *Rumohra* was established independent of *P. adiantiforme* by RADDI in 1819 for *R. aspidioiodes*, which was considered as a synonym of *P. adiantiforme* by CHING (1934) who treated the species as congeneric with *Polystichum aristata* and its allies now referred to *Arachniodes* in Peranemaceae** (Dryopteridaceae), although he distinguished *P. adiantiforme* as a monotypic subgenus. CHING's opinion was followed by COPELAND (1947), while HOLTUM (1947) gave another conception that *Rumohra* was not congeneric with *P. aristata* group, transferring it as a monotypic genus from Dryopteroidae to Davallioideae. TARDIEU-BLOT has added five new species from Madagascar to *Rumohra* since 1955, following HOLTUM as to the systematic position of this genus.

It seems to be recognized that *R. adiantiformis* is distinct from *Arachniodes*, but it is peculiar even in the Davalliaeeae as shown for instance by its peltate indusia. It is intended in this paper to give some comments on the systematic position of *R. adiantiformis* based on the re-examination of the indicative features. Observation is made on the herbarium specimens kept in Kyoto University and on the living plants cultivated at the green-house, Department of Botany, Kyoto University.

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*Observation and Discussion*

Rhizome and Stipe.—The rhizome is dorsiventral in construction bearing the leaves arranged dorsally in two rows and numerous roots on the ventral surface. The

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* Department of Botany, Faculty of Science, Kyoto University, Kyoto, 606.
vascular structure of rhizome (Fig. 1–1) is a dorsiventral dictyostele, as reported by Mettenius as early as 1864. These two and the bundles connecting them outline the leaf-gaps, at every base of which departs a bundle supplying a determinate rhizome-branch. Several leaf-traces from each leaf-gap form anastomosis running parallel with the surfaces of rhizome and enter into a base of stipe, while the root-traces depart from the ventral strand and the bundles of determinate rhizome-branches. In the above anatomical features of rhizome, R. adiantiformis is not distinct from the Davalliaceae.

The stipe of R. adiantiformis has no articulation, while all the species of Davalliaceae have articulation at the base of stipe. The petiolar anatomy is of Aspidium type (Ogura, 1972) as shown in Fig. 1–2. In a cross section of stipe, several bundles are arranged in an arc, of which adaxial two have a triangular xylem with an incurved hook. In an upper part of stipe and rachis the bundles anastomose with each other but the adaxial two remain separate. In the Davalliaceae, on the contrary, several bundles (two in Leucostegia) supply a stipe, of which adaxial two have a broad linear xylem in a cross section different from the Aspidium type (Fig. 2–1). The bundles connect with each

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**Fig. 1. Rumohra adiantiformis.**

1. cross section of rhizome (×3) and diagrammatic figure of its vascular structure.
other upwards to form an X-shape as in *Davallia denticulata*, *Gymnogrammitis dareiformis* and *Leucostegia* or a U-shape as in *Araieostegia hookeri*, *Davallia mariesii*, *Davallodes viscidulum* and *Humata tyeirmanni*.

As a diagnostic features to define the families of the higher leptosporangiate ferns, the features observed in the petiolar anatomy are practical and useful, for the figures of cross-section of petiole are quite constant in such families as Peranemaceae (*Aspidium* type), Lomariopsidaceae (*Aspidium* type), Thelypteridaceae (*Onoclea* type), Athyriaceae (*Onoclea* type), Aspleniaceae (*Asplenium* type) and so on, as shown by Ogura (1972). In the course of my study on the Athyriaceae, this character of this and some other families are observed in details. Among 61 species actually observed by me, there is no exception available concerning to the features of petiolar anatomy in every family (Kato, 1972). Really, some genera or species formerly placed in various systematic positions have been fixed reasonably in their families based on petiolar anatomy as well as the other characters: for example, *Hypodeumatium* and *Microchlaena* in Athyriaceae by Iwatsuki (1964 & 1970) and *Stenolepia* in Peranemaceae by me (1972). As far as this

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**Fig. 2.** *Davallodes viscidulum* (1) and *Elaphoglossum yoshinagae* (2).

1,2. cross section of basal part of petiole (×20) and adaxial bundle enlarged (×200).
feature of petiolar anatomy is concerned, *R. adiantiformis* is distinct from Davalliaceae and similar to Peranemaceae and Lomariopsidaceae (Fig. 2–2).

Scale.—Rhizome and stipe of *R. adiantiformis* are covered with scales. The ovate-lanceolate brown scales are basally point-attached by short stalks with cordate basal laminae overlapping each other (Fig. 3–1). This feature is distinct from the peltate scales of Davallia, Humata, Davallodes and some other genera, though basally attached scales are also found in Davalliaceae (*Araiostegia, Leucostegia* and several species of *Davallia*). In the morphology of the scales, therefore, we cannot draw any conclusive remarks on the systematic position of *R. adiantiformis*.

Soral character.—The position of sori is variable even within the individual plants of *R. adiantiformis*. Some plants bear the sori terminal at the vein-endings and others superficial in appearance on the veins (Fig. 3–3, 4), the latter having been actually figured by TARDIEU-BLOT (1958, f. 9). In Davalliaceae all the sori are terminal at the vein-endings. Even in *Gymnogrammitis* which is usually described as having superficial sori, the exindusiate sori are often placed at the bifurcation of veins or at the point where the veins are more or less bent in the broad pinnule-segments (Fig. 3–5). This may safely be interpreted as to have been derived from the typical marginal sori in Davalliaceae by extreme shortening of branch-veinlets with the sori at their ends. By this interpretation, we can conclude that all the sori of the Davalliaceae are terminal at the vein-endings, and the naked sori may move to the apparently dorsal position of veins by shortening of the branch-veinlets on which the sori are placed terminally.

The indusia are peltate at maturity and morphologically distinct from those of Davalliaceae which are fixed by base or by base and sides. As shown in Fig. 3–2, the indusia take an appearance of round-reniform at first, grow larger and finally become peltate by growth of basal indusial laminae. This observation will support the general opinion that the peltate indusia are derived from the round-reniform ones. In this context it is interesting that peltately indusiate genera or species such as *Polystichum*, *Cyclopetelis* and *Thelypteris boydiae* are related to such genera with round-reniform indusia as *Dryopteris*, *Ctenitis* and *Thelypteris*, respectively. By the soral character as noted above *R. adiantiformis* is distinct from the Davalliaceae as in the case of petiolar anatomy.

Groove and the other vegetative features.—*R. adiantiformis* has the several vegetative characters common with the Davalliaceae on which base HOLTUM and his followers refer this to the nominal family. They are the dorsiventral rhizome and the raised upper surface of leaf-axes winged at sides as well as coriaceous texture of leaves, anadromic arrangement of pinnules on the pinna and the shape of leaves and pinnules similar to that in *Davallia*. However, those characters are not so constant as petiolar anatomy and soral character: *Anisocampium* and *Hypodematium* with dorsiventral rhizome are included in Athyraceae which usually bear radially constructed rhizome (KATO, 1972 & IWATSUKI, 1964); among the Davalliaceous genera, *Leucostegia* has a grooved leaf-axis.
Fig. 3. *Runohra adiantiformis* (1-4) and *Gymnogrammitis daceiformis* (5).

1. scale on rhizome, ×16, 2. a part of young pinnule showing indusial development, ×12. Note a small round-reniform indusium on right. 3. pinnule with terminal sori, ×5. 4. pinnule with superficial sori, ×5. 5. pinnule (K. IWATSUKI, N. FUKUOKA & A. CHINTAYUNGKUN T9639), ×6.

while the other genera have a raised one, and *Pteridrys* having a raised leaf-axis belongs to Peranemaceae. As briefly noted here, the above characters are not so indicative to diagnose the systematic position of *R. adiantiformis* in the Davalliaceae. In such features, we can refer *R. adiantiformis* to, for instance, the Peranemaceae, though as not so typical form there. On the contrary, we cannot keep *R. adiantiformis* in the Davalliaceae, for it makes heterogeneous the features of petiolar anatomy and soral cons-
struction not only within the Davalliaeceae but among the higher leptosporangiate ferns in general.

To summarize the above discussion, it is reasonable to exclude *R. adiantiformis* from the Davalliaeceae. It may be suggested here that *R. adiantiformis* may belong to Peranemaceae or Lomariopsidaceae on the basis of such common characters as a non-articulated stipe, features observed in the petiolar anatomy, scale and soral character as well as bilateral spores with a perispore and chromosome number of \( n=41 \) as already reported. The species resembles Lomariopsidaceae in dorsiventral rhizome and raised leaf-axis, though this family differs strikingly from *R. adiantiformis* in acrostichoid sori. In Peranemaceae there is no species having dorsiventral rhizome and the raised leaf-axis is known only in *Pteridryis* of tectarioid sub-group, although *R. adiantiformis* is the same with this family in soral character. The systematic position of the species is still obscure and here it is tentatively referred to Peranemaceae, pending further studies on the classification of both the families. *R. adiantiformis* may better be compared in detail with *Polystichopsis* as a member of the subfamily Tectarioideae of the family Peranemaceae.

References


Tardieu-Blot, M. L. 1958. 5e Famille-Polyiodiaceées (sensu lato) 1. *Flore de Madagascar et des Comores.*

**Rumohra adiantiformis** は背腹性のある根茎、葉形、軸の構造などの点でシノブに、稜状包膜ではイノデに似ている。そのために、どちらの形質を重視するかによってこの種の分類上の位置が学者間で異なっていて、シノブ科に入れるのか、カナワラヒ属に入れる説の二つがある。私もこの種の位置を明らかにする目的で幾つかの形質を検討してみた。その中で、葉柄の縦管束がオシダ型であること、鱗片が基部付着であること、胞子囊群は葉脈上につくことなどが観察された。とりわけ、葉柄の縦管束は科のレベルで安定であり、問題となる種の位置を決定する上で有効であることが知られているが、本種がオシダ型であること他の形質も考慮に入れると、シノブ科よりもオシダ科あるいはツルキジノオ科に属する考えられる。最終的な判定はオシダ科、ツルキジノオ科の分類と共になされなければならないが、ここではオシダ科の一員とし、例えば *Polystichopsis* との比較検討を示唆しておきたい。