Stelar Structure of *Asplenium obtusifolium* and Its Allied Species in the New World Tropics, with Comparison to the Asian Members of *Asplenium* Sect. *Hymenasplenium*

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The stelar structure of *Asplenium obtusifolium* and its related species (*A. repandatum, A. riparium, A. triquetrum, A. volubile, A. purpurascens, A. oregae, A. delitescens, A. hoffmannii*, and *A. laetum*) in the New World tropics was observed and compared to that of Asian species of *Asplenium* sect. *Hymenasplenium*. Both of the groups were found to share peculiar stelar structures: steles with two meristeles, a broader ventral and a narrower dorsal, each providing one of the two leaf traces; leaf gaps arranged in two rows between the dorsal and ventral strands, which are connected by thin meristeles, delimiting the leaf gaps. These structures are distinct from the radial symmetrical ones general in *Asplenium*. Together with cytological evidence, this strongly indicates that the New and Old World groups are closely related. Thus, these Neotropical species should be included in sect. *Hymenasplenium*.

Key words: Aspleniaceae — *Asplenium obtusifolium* group — *Asplenium* sect. *Hymenasplenium* — New World tropics — Stelar structure — Systematics

*Asplenium* sect. *Hymenasplenium* was revised at this rank by Iwatsuki (1975) as consisting entirely of Old World species related to *A. unilaterale* Lam. These species shared long-creeping rhizomes with dorsiventral construction, bearing stipes in two rows on the dorsal surface and roots on the ventral surface. This rhizome organization is exceptional in Aspleniaceae because most of its other members have short, erect-ascending, and radial ones (Mitsuta *et al.*, 1980). *Diplora d’urvillei* (Bory) C. Chr., a member of a segregated genus of Aspleniaceae also has a long creeping rhizome, but its structure is still a radial dictyostele (Mitsuta *et al.*, 1980).

The stelar structure of *A. unilaterale* was first examined by Hayata (1927). He removed tissues other than the stele from the rhizome by the use of forceps and dissecting needles, and directly observed its stelar structure. Later, Iwatsuki and Kato (1975) made more detailed and extensive study of stelar structure for all the species belonging to this group using Hayata’s method. They found that these species share the peculiar stelar structure: steles with two meristeles, a broader ventral and a narrower dorsal strand, each strand providing one of the two leaf traces, leaf gaps
arranged in two rows between the dorsal and ventral strands, these two strands being connected by thin meristeles, which delimit the leaf gaps (Fig. 1). Only the location of root traces is variable in this group. Root traces are observed on ventral and connecting strands in all the species, and in some species are observed on the dorsal strands as well.

Based on these anatomical observations, together with comparisons of other morphological characters, Iwatsuki (1975) circumscribed *A. unilaterale* and its related species (*A. excisum* Presl., *A. subnormale* Copel., *A. obscurum* Blume, and *A. cheilosorum* Kunze ex Mett.) as a monophyletic group and referred them to *Asplenium* sect. *Hymenasplenium* (Hayata) K. Iwatsuki. This circumscription was later supported by cytological data. Mitui et al. (1990) reported that all the members of sect. *Hymenasplenium* in Asia have common and peculiar in *Asplenium* basic chromosome numbers: \( x = 39 \) (*A. subnormale* has \( x = 38 \)). Almost all other species of Aspleniaceae so far examined have \( x = 36 \) chromosomes. Recently, Kato et al. (1990) examined vascular anatomy, chromosome number, and other characters of Asian *Asplenium cardiophyllum* with unusual simple, cordate-based, and anastomosing-veined leaves. They found that *A. cardiophyllum* shares the same stelar structure and unique basic chromosome