

A developmental sequence for paraphyses in *Neckeropsis* (Neckeraceae) ^[1]

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Abstract

Some species of *Neckeropsis* have leaf-like structures that develop on the perichaetia after fertilization of the archegonia. It has been suggested that these structures are either ligulate perichaetial leaves or multiseriate paraphyses. Using light microscopy, a detailed morphological and ontogenetic description was done for the paraphyses in the reproductive branches of *N. disticha*. Important developmental stages were also described for nine other species of *Neckeropsis* (*N. exserta*, *N. lepineana*, *N. nitidula*, *N. obtusata*, *N. nano-disticha*, *N. crinita*, *N. undulata*, *N. fimbriata* and *N. andamana*) to document the development of the different types of paraphyses. Transitions between uniseriate and multiseriate paraphyses were documented at different stages in the development of the fertilized branch. These were interpreted as a transition series similar to the heteroblastic sequence in branch leaves; where the uniseriate and multiseriate paraphyses correspond to the juvenile and mature stages, respectively. Of the nine species, five possess multiseriate paraphyses that are fully developed at different points of the progression series. In *N. nano-disticha* and *N. crinita* the paraphyses are thinner and fully developed at early mature stage, while in *N. undulata* and *N. disticha* the fully developed paraphyses are narrowly ligulate and represent the middle mature stage in the developmental sequence. In *Neckeropsis andamana* and *N. fimbriata* the paraphyses are ligulate to lanceolate and correspond to the late mature stage. These results provide ontogenetic data for paraphyses, and could establish the states and direction of this character for a phylogenetic analysis.

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