

Studies on Lejeuneaceae subfam. Ptychanthoideae, VII.  
Paraphyllia in *Brachiolejeunea laxifolia* (Tayl.) Schiffn.

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*Brachiolejeunea laxifolia* (Tayl.) Schiffn., the type species of the genus *Brachiolejeunea* (Evans, 1908), is widespread in the mountains of Central and South America.

Though much descriptive work has been done on this species (e.g. Spruce, 1884; Bischler, 1965; Fulford & Crandall, 1967) no mention has thus far been made of the presence of 'lamellae' on the shoots. The lamellae are located on the dorsal side of stems, branches and innovations, arising from the cortical cells along the dorsal border of the two interlocking lateral merophytes. They can easily be observed in optical view, using a dissecting microscope, or in stem cross section (Fig. 1 *a*). The lamellae stretch over the whole length of the merophytes and, when well developed, are only separated from each other by the dorsal leaf-insertion cells. They are unistratose and of uneven height, the postical part being lower than the antical part. At the postical side they are usually one cell high (30–40  $\mu\text{m}$ ), gradually becoming 3–4 cells high (50–70(–80)  $\mu\text{m}$ ) towards the antical side, ending abruptly just before the leaf insertion (Fig. 1 *b, c*).

The length of the lamellae varies with the length of the merophytes. Well developed lamellae are usually 170–270  $\mu\text{m}$  long but on plants with more dense foliage and shorter merophytes their average length is 120–170  $\mu\text{m}$ . Length decreases towards the shoot apex. The cells of the lamellae vary in form and size. The upper cells are subquadrate and 20–34  $\times$  18–20  $\mu\text{m}$  in cross section; the lower cells, which are adjacent to the stem, are larger and more rectangular in size, measuring 40–60  $\times$  20–24  $\mu\text{m}$  (Fig. 1 *b: a*). The lamellae are to be found over the whole length of the shoots, being reduced only at the shoot apex. On branches and innovations the lamellae are lacking only at the ultimate base of the shoot, below the first pair of mature leaves.

Morphologically the lamellae described here should be considered paraphyllia, as they are unistratose, reduced foliose structures. In Musci, a distinction is sometimes made between paraphyllia and pseudoparaphyllia: the term paraphyllia being used for structures which occur at random on shoots and branches, whereas pseudoparaphyllia are restricted to branch primordia and mature branches, where they occur in small numbers (Ireland, 1971). Notwithstanding their restricted location, we prefer to use the general term paraphyllia for the lamellae of *Brachiolejeunea laxifolia* since the term pseudoparaphyllum has never been used in liverworts. As to the origin of the paraphyllia in *Brachiolejeunea laxifolia*, a leafy or cortical origin might be considered. Although ontogenetic proof is lacking, a cortical origin seems more likely, since we never found

coalescence of leaf and paraphyllum, not even at the shoot apex. It is therefore not very likely that the lamella arose by outgrowth of the dorsal leaf base.

In cross section (Fig. 1 *a*) it appears that the lower lamella cell is very similar in size and shape to the adjacent stem cortex cells. It could therefore be assumed that the lower cells are cortex cells and that the lamellae are simply an outgrowth of the cortex. However, we did not see a paraphyllum growing out of a cortical cell, as was observed in *Odontoschisma* by Garjeanne (1928). The function of these paraphyllia is not clear. Goebel (1930) suggests two possible functions for paraphyllia: assimilation (as in the Andean liverwort genus *Stephaniella*) and water retention. Because of their small size and hidden position, under the imbricated leaves, both possibilities are not very plausible. As to water retention, the lobule of *Brachiolejeunea laxifolia* is a far more effective structure.

Ireland (1971) considers paraphyllia to be highly relevant in distinguishing families, genera and species in mosses. In liverworts, paraphyllia are much rarer but they have been shown to characterise certain species of *Plagiochila* (Inoue, 1967) and *Cryptochila grandiflora* (Grolle, 1971). Highly specialised dorsal paraphyllia occur in the peculiar Andean genus *Stephaniella* (Schmitt & Winkler, 1968).

The systematic value of the paraphyllia of *Brachiolejeunea laxifolia* can only be properly evaluated when the whole genus is revised. Thus far these paraphyllia have proved to be constantly present in all (about 100) specimens of *B. laxifolia* examined. No other species of *Brachiolejeunea* has ever been reported to possess paraphyllia, nor any other species of Lejeuneaceae. Thus, the paraphyllia of *Brachiolejeunea* seem to be unique structures in this large liverwort family.

#### SPECIMENS EXAMINED

MEXICO: Liebman, Herb. Mus. Vinrob. 5985 (G).

COSTA RICA: Werckle 6243 (G).

VENEZUELA: Funck & Schlim s.n. (G); Onraedt 78.V.5903 (hb. Onraedt, U).

COLOMBIA: Bischler 801, 1723, 2312 & 2332 (COL, PC, U); Breure B 87 (COL, U); Cleef & Fernandez 612a (COL, U); Cleef & Jaramillo 4193 (COL, U); Cleef 942, 1170, 2795b, 3690a, 3698a, 3750b, 3973b, 6394, 6438b, 6626a & 8254a (COL, U); Funck & Schlim 287 (NY); Grubb & Guymer B.51 (BM, S); van der Hammen & Jaramillo 2455 (COL, U); Killip & Smith 15743 (JE, S); *ibid.* 19918 (JE); Lindig s.n. (G); Mägdefrau 1566a (U); Onraedt 78.A.6000 & 78.A.6002 (JE, hb. Onraedt); *ibid.* 78.A.6041 (hb. Onraedt, U); Schaeck 72.A.70 (hb. Onraedt, U); Troll 2180 & 2203 (JE); *ibid.* 2204 & s.n. (S); Wallace s.n. (NY); Weir 185 & s.n. (NY).

ECUADOR: Jameson s.n. (isotypes BM, G, MANCH, NY); *ibid.* 232 (BM); Harling 2205 (JE, S); *ibid.* 2306 (JE); Spruce s.n. (BM, G, MANCH, NY, S, YU); Villanicentia s.n. (YU).

PERU: Hegewald 7060 & 9261 (hb. Hegewald, U); Spruce s.n. (MANCH).

BOLIVIA: Brooke 6824A, 6863A & 6915C (BM); *ibid.* 6871A (hb. Fulford);

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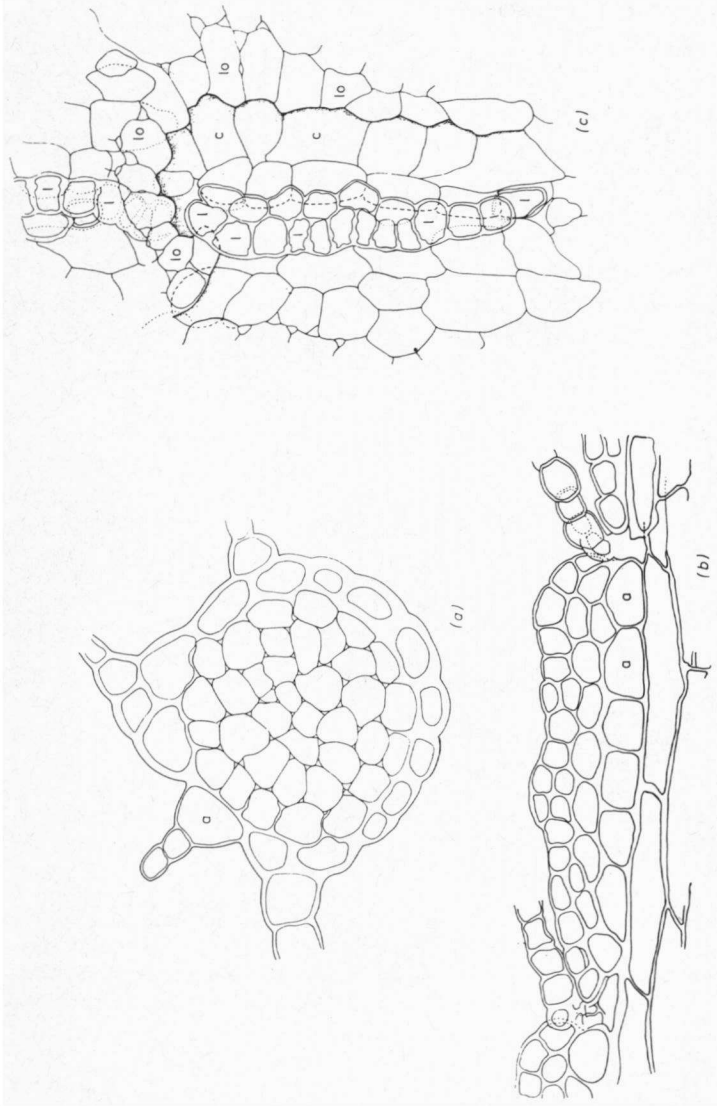


Fig. 1. *Brachiolejeunea laxifolia* (Tayl.) Schiffn. (a) Stem cross section with lamella; a, lower lamella cell, X720; (b) lamella, longitudinal view; a, lower lamella cell, X400; (c) lamella, optical view; c, stemcortex; l, lamella; lo, lobe, X400. (a) From Cleef & Fernandez 612a; (b) from Bischler 801; (c) from Bischler 1723.

Hermann 24701 (S); Herzog 3380 & 3398 (JE); Levier 5884 (G); Rusby 3087 (NY); Spruce 3087 (MANCH); Williams 2242 (NY, U, YU).  
BRASIL: Baptista s.n. (U).

### SUMMARY

A lamellate paraphyllum on the dorsal side of the shoots in *Brachiolejeunea laxifolia* is described and its origin discussed. It is probably a useful species character, unique in the Lejeuneaceae.

### ACKNOWLEDGMENTS

We are grateful to Mr A. Eddy (BM), Dr M. H. Fulford (hb. Fulford), Dr P. E. Geissler (G), Dr F. K. Meyer (JE), Dr S. R. Edwards (MANCH), Dr P. Holmgren (NY), M. H. Onraedt (hb. Onraedt), Dr T. B. Engelmark (S) and Dr J. Rodman (YU) for the loan of specimens, to Dr R. Grolle for his suggestions and to Mr T. Schipper for inking the drawings.

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