An Observation on the Gametophyte of *Cheiroleuria bicuspis* var. *integripolia*

By

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In the April number of the Botanical Magazine, Tokyo, Vol. XLII (1928), I proposed a new family *Cheiroleuriaceae* for a single genus *Cheiroleuria* from the morphological stand of its sporophyte. The development of stomata cells of *Cheiroleuria* is most striking. It is none of *Polypodiaceae*, but is *Cibotium*-type. The sporangium has oblique ring and four rows of cells in the stalk. It is no wonder that a fern as *Cheiroleuria* having such conspicuous characteristics in the sporophyte induces us to conceive the possible occurrence of noticeable characteristics in its gametophyte. In the Island of Hachijyo this fern grows on the shady wet volcanic rocks along the clean running water. I looked for its gametophyte when I came along, but could not find even a single piece. In the sacred ground of Great Shrine of Ise, *Cheiroleuria* grows profusely, so, last October, I proceeded there presuming that its prothallia would be

Infected portion of prothallium. (×210). Photograph taken by Mr. F. MAEKAWA.
found. Getting special permission from the office of the Shrine, and guarded by the staffs I hunted the prothallia thoroughly. There, Cheiropleuria grows on the slope of sandy loam under the shady forest. The ground is wet, and prothallia of various sorts are richly growing with mosses and hepatics. But, the prothallia of Cheiropleuria are very scanty and their detection was pretty hard. Within a square meter thousands of prothallia of such as Lindsaya, Diplazium, Dryopteris, Polystichum, Microlepia, Asplenium, Plagiogyria are growing mixed with a few prothallia of Cheiropleuria. The prothallia of Cheiropleuria are discriminated from the prothallia of other kind only when they accompany their oblong or elliptical cotyledones, or their brown rhizoids are seen under a lens. In the earlier stage of the growth, or till the prothallium becomes nearly one millimeter in length it is oblong, consisting of two or three layers of cells in the central portion and of single layer at the margin. They put out rhizoids on the undersurface along the costal line. At first, the rhizoid appears as an epidermal process like an initial antheridium of Polypodiaceae, but becomes brown according to the growth of its length. From the tips of some rhizoids the endophytic varicose fungal filament breaks in as far as the median layer of prothallium. Then, it begins to branch and coil, and fill the cells, just as in the prothallium of Marattiaceae, giving rise to the nutritive layer (Speichel Gewebe or Ernahrungs Schicht by German). Stimulated by the mycelium the cells of median layer multiply rapidly, till at last the entire cell layers in the costal part count five to ten. The apical cell at the frontal tip of the prothallium puts out many cells on the lateral sides, and the anterior part of prothallium becomes heart shape like the ordinary prothallia of Polypodiaceae. Uninfected obovate or oblong-ovovate prothallia about two or two and half millimeter long were also observed. I am quite uncertain whether these will die without forming any sexual organs or shall develope to a male individuals. When the prothallium becomes three or five millimeters long, antheridia and archegonia appear around the anterior and anterior-lateral edges of rhizoidal
zone. Antheridia show a great deal of similarity to those of Polypodiaceae, while archegonia have a straight neck like Hymenophyllaceae or Schizaeaceae, being rectangular to the oblique surface of costal rhizoidal portion. In this point, Cheiropleuriaceae display intermediate character between Polypodiaceae and Schizaeaceae. Prothallium perishes after the formation of first juvenile leaf. The existence of mycorrhiza in the prothallium of Leptosporangiate Ferns is specialized hitherto to some of Osmundaceae, Schizaeaceae, and Gleicheniaceae. So, the occurrence of mycorrhiza in the prothallium as well as the straightness of archegonial neck confirm that Cheiropleuria should by all means be eliminated from Polypodiaceae. The scarcity of prothallia of Cheiropleuria is perhaps due to the uneasy infection of endophytic fungus. But, if mycorrhiza is once formed, the prothallia never decay till each of them brings forth one sporophyte. The symbiose of prothallia and endophytic fungus in the Filices seems to be an ancestral characteristic inheriting still in the architype ferns such as Marattiaceae, Osmundaceae, Gleicheniaceae, and Cheiropleuriaceae. I presume, the same phenomenon may exist in the prothallium of Dipteridaceae and Matoniaceae.

The following description should be added to the description of the family Cheiropleuriaceae.

Longitudinal section of sprout which adhers still to the prothallium.

a. antheridium; c. cotyledon; f. foot; r. root; s. stem; t. trichomes.

Gametophyta:—Prothallium cordatum cum cauda oblonga 1 mm. longa 3–5 mm. longum et latum, medio cellulis circa 5–10 stratis consti-
tutum medio cum zona mycorhizoidale, ventre cum rhizoideis fuscis vel
rubro-fuscis fibrosum, margine tenerum cum cellulis unistratis chloro-
phyllatis constitutum. Antheridia et archegonia circum aream rhizoidal-
lem anteriore vel anteriori-laterale disposita; antheridia depresso-sphaerica
cum stipite cellulae uniseriis brevissimo, spermatozoid adhuc ignotum;
arachegonia cum cola recta cellulis quadrisserialibus et in quaque serie cum
cellula operculata unica 4-5 cellulata. Cellulae canali tres sine septis.

Principal literatures cited.


"": The Eusporangiatae; Carnegie Institution of Washington No. 141 (1911).


