

M. Sc. IInd Semester (Botany)

Paper-V (Pteridophytes)

Marsiliales- *Regnellidium* & *Pilularia*

By

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Regnellidium

Kingdom: Plantae
Clade: Tracheophytes
Class: Polypodiopsida
Order: Salviniales
Family: Marsileaceae
Genus: *Regnellidium*
Species: *diphyllum*



A. Diversity of *Regnellidium diphyllum*



B. Basal part showing sporocarp

Regnellidium is a monotypic genus of ferns belonging to family Marsileaceae. The single living species, *Regnellidium diphyllum*, the two-leaf water fern, is native to south-eastern Brazil and adjacent regions of Argentina. It resembles its relatives from the genus *Marsilea*, but has 2-lobed leaves.

The internal structure of stem, leaf, and root is found to correspond closely with that of *Marsilea*. The morphology of the vascular tissues is very similar to that of many other leptosporangiate ferns. Growth of stem, leaf, and sporocarp is initiated by division of apical cells with two cutting faces, while the tissues of the root arise from a cell with four cutting faces. The bifacial initial of a leaf cuts off 15 or more segments to the right and a similar number to the left. Each member contains more than 10 pairs of segments that go to form the petiole divides by approximately radial walls to "sectors" which, with the "marginal cell" remaining between the last two sector walls, are then divided periclinally that separate epidermis, cortex, and vascular bundle. On each side of the petiolar bundle is a large vessel which is formed from a series of cells belonging to sector II of the various segments. Each cell of this series, contrary to its neighbours, does not divide either transversely or longitudinally, although its nucleus may divide as many as four times. In the 3 or 4 segments of each side which go to form the pinnae, the marginal cells retain the power of splitting off

sectors which then rapidly extend radially and divide in two planes so as to produce the fan-shaped pinnae. In its origin and in the insertion of its vascular bundle the sporocarp is seen to be a lateral organ. In spite of the approximately spherical form of the capsule, its symmetry is strictly bilateral. Development of the sporocarp follows for a time the same course as the petiole. Then on each side of the tip region certain marginal cells cut off soral initials, while the adjoining sectors elongate radially in such way as to leave each soral initial imbedded. Each sorus is surrounded by a soral canal which for some time opens to the ventral surface by a pore. The vascular system of the capsule is similar to that of *Marsilea*, but because the attachment of the stalk is on the dorsal side of the capsule, the venation in *Regnellidium* is more obviously a series of dichotomies resembling the plan seen in the pinna. Attachment of the soral receptacle to the partitions lying between the soral canals is found to characterize the capsule at all stages. The vascular supply of each receptacle enters at the end, not the side. In both these respects *Regnellidium* differs from *Marsilea*. The wall of the mature capsule shows the same peculiar thickening of the hypodermis as *Marsilea*, but is not so highly specialized. The peculiar "overlap" which is found in the other members of the family occurs here also. In its general features and in details of structure *Regnellidium* is intermediate between *Marsilea* and *Pilularia*. No trace of more than two leaflets has been found, and the sporocarp is uniformly single. The vascular structure of the capsule strongly suggests that it represents a pair of pinnae.

Pilularia L.

Kingdom: Plantae

Clade: Tracheophytes

Class: Polypodiopsida

Order: Salviniiales

Family: Marsileaceae

Genus: *Pilularia*

Species: *P. globulifera* L.



A. Vegetative structure of *Pilularia* B. *Pilularia* plant with sporocarp

***Pilularia* L.** is also a water fern, known as **Pillwort**. It is an unusual species of fern native to Western Europe, where it grows at edges of lakes, ponds, ditches and marshes, on wet clay or clay-sand soil, sometimes in water up to 30 cm. deep. Distribution of *Pilularia globulifera* L. is also reported in Poland. Pillwort has slender, cylindrical, rush-like fronds up to 8 cm tall that are shaped like crosiers as they unfurl. It has a pea-shaped, 4-chambered sporocarp about 3 mm (0.1mm in diameter), each chamber formed from a modified leaf and containing several sori bearing both megasporangia and microsporangia. The species is thus heterosporous.

Pillwort grows on silt and mud at the margins of lakes, ponds and other watercourses that are submerged for at least part of the year. Some of the plants growing in its phyto-socio association with this species in the UK include water celery (*Apium inundatum*), marsh pennywort (*Hydrocotyle vulgaris*) and lesser spearwort (*Ranunculus flammula*). In its habitat in shallow water on pond margins or in marshy areas. Wet grassland, it seems to grow well in bare locations where it faces little competition. Populations vary greatly from year to year; it sometimes "disappears" from a site only to recur there many years later, and cleaning out a ditch may stimulate it to reappear. This is a rare species, declining as its wetland habitats are reduced by eutrophication and drainage, but is regarded as of least concern by the IUCN Red List. It has also listed on the Wildlife members of

Northern Ireland in 1985, but it has not been seen there since 1970 and may now be extinct in the province. It is protected under the Wildlife and Countryside Act 1981 in the rest of the UK, where it is now classified as vulnerable. It is listed as threatened or endangered in nearly all the countries in which it grows. Though sometimes, *Pillwort* can be grown in a "bog garden" or as a marginal aquatic in a garden pond. But still its conservation is of measure issue worldwide.

PROPAGATION: The species is able to propagate vegetatively by fragmentation of branching rhizomes and generatively by formation of sporocarps and the sexual process.
SPOROCARPS: Sporocarps occurred on 10 to 30% of the entire population area and matured from August to November. Around 50 sporocarps on average in the oligotrophic habitat developed in the flat pond bottom were observed in around five plots. 70 sporocarps occurred on average. The highest number of sporocarps, 112 on average, was observed in Poręba Wielka in the eutrophic habitat with irregular surface of the fishpond bed, where ferns mature earlier.

VIABILITY OF SPORES: The majority of spores were viable, gametophyte development started in about 70% of macrospores. The green parts of the female prothalli protruding from spores were discoid; some of them developed short structures that may be identified as rudimentary rhizoids. Male prothalli were hidden inside spores; male gametes were released faster in warm water.

CHROMOSOME NUMBER: In all populations it was found to be $2n = 26$.

MORPHOLOGY: Depending on water depth, develops two morphological forms: terrestrial and aquatic. Plants growing on an emerged substratum form short and dense tufts, with erect and succulent leaves up to 10–12 cm long. The smallest mature specimen of terrestrial form was noted in Poręba Wielka and reached 1.2 cm. Ferns growing in water have delicate and slender leaves, up to 50 cm long. Newly immersed areas are colonized by long rhizomes with internodes up to 14 cm long; secondary branches are short with internodes up to 5 cm, often only a few millimeters long. Long colonizing rhizomes develop in water, ferns growing on emerged stands form mainly shoots with short internodes.

