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Description of six new species of *Lemnaceae*

by

Elias LANDOLT

Our taxonomical investigations carried out in the *Lemnaceae* revealed several new taxa occurring within the family. Their description is presented below.

Two new *Wolffiella* and two new *Wolffia* species are quite easily recognizable; on the other hand, the two new *Lemna* species which both belong to the *Lemna minor* group are most difficult to identify. In view of the pronounced variation of the particular characteristics, the morphological differences (occurring between these taxa) are not very clear. The species delimitation was partly based upon geographical and ecological data; further studies in this respect are required.

1. *Lemna ecuadoriensis* sp. nov.

Lemnae obscurae valde affinis sed differt frondibus angustioribus (1 1/2 - 2 partibus longioribus quam latibus), radicibus brevioribus. Fructus incogniti. Habitat in Ecuador.

Type collection: Ecuador, Prov. El Oro, between Machala and Santa Rosa, 300 ft.; in a drainage ditch. leg. T. Plowman, L. Jacobs and E.W. Davis 4609; December 2, 1974. Holotype: U. Isotypes: F, GH.

L. ecuadoriensis is very similar to *L. obscura* but its fronds are generally narrower, $1 \frac{1}{2}$ - 2 times as long as wide (*L. obscura*; $1 \frac{1}{5}$ - $1 \frac{2}{3}$) and the papule at apex seems to be still more prominent; the fronds are dark red underneath and the roots relatively short (up to 1,5 cm); flowers and fruits are not known.

The species is solely known from the type locality in Ecuador; it is therefore difficult to decide which features are diagnostically relevant and how large the whole variation specter is. The taxon might be considered as a variant of *L. obscura*; however, the next station of *L. obscura* is more than 2000 miles apart in Mexico and climatic conditions at the type locality are different from those occurring within the main distribution area of *L. obscura*. The climate at Machala (Ecuador) is warm throughout the whole year and shows a very pronounced dry season; on the contrary, the climate of Southeastern North America where *L. obscura* has its optimum is cool during winter time and has a high rainfall during the vegetation period. It seems reasonable to describe this collection provisionally as a separate unit. More material from the region is desirable.

2. *Lemna japonica* sp. nov.

Lemnae minori valde affinis sed frondibus subtus saepe pigmentatis et gibbosis differt. Fructus incogniti. Habitat in Japonia, Sina orientalis et Korea.

Type collection: Japan, Kyushu, Fukuoka, Mizumaki-machi; leg. O. Okutomi; October 19, 1969. Holotype: ZT; ETH No.: 7182.

The species combines characteristics of *L. minor* and *L. turionifera*. It looks similar to *L. minor* but under certain conditions it may turn red and slightly gibbous underneath. Some strains can form turion - like fronds which are distinguished from the turions of *L. turionifera* by the small roots and the ability of forming still new turions - like fronds at the resting stage. The flowers are similar to those of *L. turionifera*, the fruits are unknown. The species has a more or less closed distribution area in East Asia. It grows in China (southwestwards to Yunnan), Korea and Japan. To the North the taxon is replaced by *L. turionifera*. The next stations of *L. minor* are in



Fig. 1. *Lemna ecuadoriensis* from type locality. a) Transparent sight (x 12).
b) Dried specimens from above and from below (x 6).

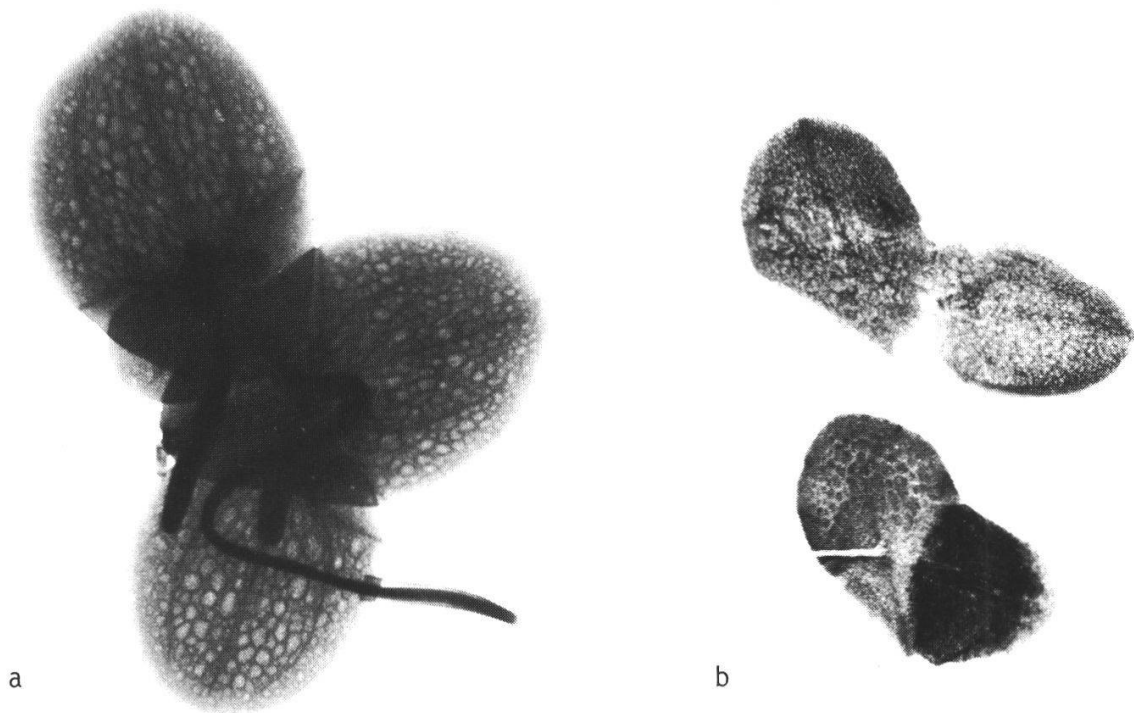


Fig. 2. *Lemna japonica* from type locality. a) Transparent sight (x 12).
b) Dried specimens from above and from below (x 6).

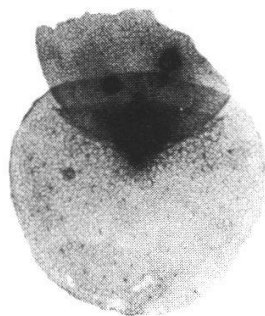
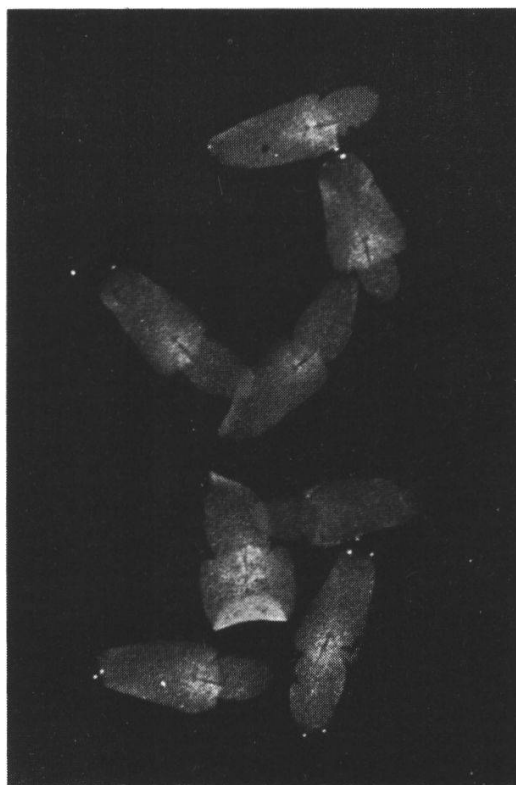


Fig. 3. *Wolffiella rotunda* from type locality. Transparent sight; the upper frond shows two flowers (x 12).



a



b

Fig. 4. *Wolffiella neotropica* from type locality. a) Transparent sight (x 12).
b) Living specimens from above (x 3).

Western Himalaya. The climatic conditions of the locality of *L. japonica* are generally similar to those of *L. minor*; however, *L. japonica* often grows as well under warmer conditions than does *L. minor*.

3. *Wolffiella rotunda* sp. nov.

Frondes summa aqua natantes subrotundae vel ovaes, 1-3 mm longae et latae, sine cellulis pigmentiferis et sine lacunis aërenchymaticis distinctis. Stomata plus quam 100. Angulus sacculi gemmiferi 90°-100°. Pariet inferior sacculi non elongatus cum fasciculo cellularum elongatum in medio posito. Flores 1 vel 2 pro fronde. Fructus incogniti. Habitat in Zimbabwe (Rhodesia).

Type collection: Zimbabwe, Distr. Urungwe, Zambesi Valley, alt. 1500 ft., West end of Kariba Gorge.; leg. H. Wild 4264; November 25, 1953. Holtype: SRGH. Isotypes: B, K, LISU, MO, PRE, S.

The fronds are floating on the surface of the water, 1 - 2 cohering together, circular to ovate, 1-3 mm in diameter; with more than 100 stomata on the upper side; margin of fronds entire; no papules and no pigment cells present; air spaces indistinct; angle of the pouch 90°-100°; track of longer cells in the middle of the lower wall of the pouch situated; lower wall not prolonged downwards; flowers one or two on the upper side of the frond; fruits not known.

The species, only known from the type locality in Zimbabwe forms morphologically a connection between the group of *Wolffiella hyalina* (genus *Pseudowolffia* Hart. & Plas) and *Wolffiella Welwitschii* (genus *Wolffiopsis* Hart. & Plas).

4. *Wolffiella neotropica* sp. nov.

Frondes parte proxima summa aqua natantes, parte distante inundatae, ovaes vel linguaeformes, 2-8 mm longae, 1,5-5 mm latae, cum cellulis pigmentiferis, sine lacunis aërenchymaticis distinctis. Stomata 20-35. Angulus sacculi gemmiferi 100°-120°. Pariet inferior sacculi non elongatus, cum fasciculo cellularum elongatarum in submedio posito. Flores incognitae. Fructus incogniti. Habitat in Brasilia et Surinam.

Type collection: Brazil, Rio de Janeiro, Recreio Bandeirantes, Canal das Tachas; leg. F. Segadas-Vianna; November 25, 1969. Holotype: ZT; ETH No. 7225.

Fronds floating with the basal part on the surface of the water, with the distal part submerged, 2 - 3 cohering together, ovate to wide tongue shaped, rounded at apex, 2-8 mm long and 1,5-5 mm wide, 1 1/4 to 3 times as long as wide; with 20-35 stomata on the upper side; margin of fronds entire; with brown pigment cells (visible only on dead fronds); no papules present; air spaces indistinct; angle of the pouch 100°-120°; track of longer cells near the middle of the lower wall situated; lower wall not prolonged downwards; flowers and fruits unknown.

The species, known from several places in Brazil and Surinam, differs from its closest related species *W. Welwitschii* and *W. lingulata* by the high number of stomata and the lack of distinct air spaces.

5. *Wolffia elongata* sp. nov.

Frondes parte proxima sub summa aqua natantes, parte distante inundatae, cylindratae, 1-2,5 mm longae et 0,3-0,6 mm crassae, sine cellulis pigmentiferis. Stomata 0-4. Frondes iuveniles angulo acuto excrescentes. Flores incognitae, fructus incogniti. Habitat in Colombia septentrionale et Curaçao.

Type collection: Colombia, Depto. Atlantico, en los alrededores de Barranquilla; leg. G. Guiterrez and F.E. Barkley, 18 C 006; January 1, 1948.

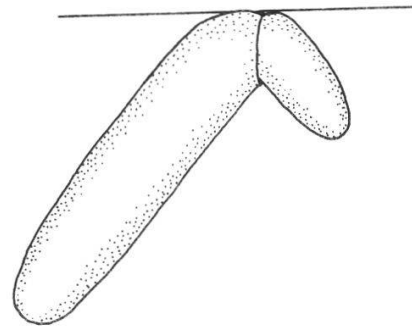
Holotype: COL. Isotypes: S, US.

Fronds floating with the basal part near the water surface, with the distal part submerged, cylindrical, 1-2,5 mm long and 0,3-0,6 mm thick; no pigment cells present; stomata very few (0-4) on the upper side near the base; daughter fronds emerging from the mother frond in a acute angle (the daughter fronds of all other species emerge horizontally); flowers and fruits unknown.

The species is known from a few places in northern Colombia and from Curaçao where it often grows together with *W. columbiana* and *L. aequinoctialis*. It is distinct from any other *Wolffia* species.

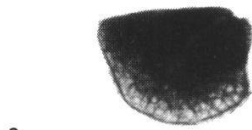


a

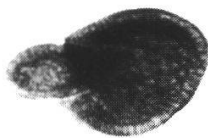


b

Fig. 5. *Wolffia elongata* from type locality. a) Transparent sight (x 24).
b) Drawing of a floating specimen (imaginable situation) (x 18).



a



b



c

Fig. 6. *Wolffia angusta* from type locality. a) Transparent sight: side view (x 24). b) Transparent sight: partly from above (x 24). c) Living specimens from above (x 24).

6. *Wolffia angusta* sp. nov.

Frondes summa aqua natans, cumbulaeformes cum magno latitudine in summa aqua, 0,5-0,8 mm longae et 0,2-0,5 mm latae, 1 2/3 - 2 1/2 partibus longiores quam latae, 2 - 3 partibus altiores quam latae, superficie albivirides, margine virides. Stomata 8-25. Habitat in Australia.

Type collection: Australia, New South Wales, northwest of New Castle, ca. 8 km west of Seaham; leg. B.G. Briggs and L.S. Johnson, NSW 118434; March 15, 1970. Holotype: ZT; ETH No. 7274. Isotype: NSW.

Fronds floating on the surface of the water, boatlike, with the biggest width near the surface, 0,5-0,8 mm long and 0,2-0,5 mm wide, 1 2/3 - 2 1/2 times as long as wide, 2 - 3 times as deep as wide, whitish green on the upper side with intensely green margin. Stomata 8-25; flowers and fruits as in the group of *W. arrhiza*.

The species is known from all states of continental Australia where it very often grows together with *Spirodela punctata*. It belongs to the group of *W. arrhiza*; it is distinguished from the nearest related *W. globosa* by the narrower and deeper fronds, from *W. australiana* by the smaller size and the fewer stomata.

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