New combinations and names in Lysimachia (Myrsinaceae) for species of Anagallis, Pelletiera and Trientalis

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**Abstract**

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New combinations are proposed for species of *Anagallis*, *Pelletiera* and *Trientalis* in accordance with the results of phylogenetic analyses of the *Lysimachia* complex, based on molecular and morphological data. These three genera as well as *Glaux* and *Asterolinon*, for the species of which names in *Lysimachia* are already available, have been found to be derived, specialized groups that have evolved within *Lysimachia*. The present classification therefore does not reflect our current understanding of evolutionary relationships within the *Lysimachia* complex. Merging all the genera in *Lysimachia* is here considered better than splitting the latter into several smaller genera. For *Anagallis crassifolia* and *A. filifolia* new names are validated and for *A. alternifolia* and *A. pumila* the names change since their epithets have already been used in *Lysimachia*. Lectotypes are selected for *A. filifolia*, *A. filiformis*, *A. kingaënsis*, *A. monelli*, *A. sclibentii*, *A. serpens* and *Pelletiera verna*, and a neotype is designated for *A. foemina*.

Additional key words: *Asterolinon*, *Glaux*, systematics, taxonomy, classification, relationships

**Introduction**

*Anagallis* L. has always been considered a genus closely related to *Lysimachia* L. and already Linnaeus (1753) had detected the morphological resemblance between the two, describing *Lysimachia tenella* L., which was later (Linnaeus 1771) changed to *Anagallis tenella* (L.) L. More recently, Anderberg & Ståhl (1995) commented the striking similarity of *Anagallis arvensis* L. and *Lysimachia serpyllifolia* Schreb., and Källersjö & al. (2000) pointed out that *Anagallis arvensis* is in several respects very similar to *Lysimachia nemorum* L. and a few other *Lysimachia* species, being distinguished merely by colour of the corolla and mode of capsule dehiscence. Källersjö & al. (2000) also stated that *Asterolinon Hoffmanns.* & Link and *Pelletiera A. St.-Hil.* are very similar to each other, but also that they share a number of derived features with other members of the tribe *Lysimachiaeae*. Like *Anagallis tenella*, *Asterolinon linum-stellatum* (L.) Duby was initially described in *Lysimachia* by Linnaeus (1753), and *Asterolinon* has also more recently been included in that genus (Leblebici 1978).

During the last years, the monophyly of *Lysimachia* has been questioned following several phylogenetic analyses. Källersjö & al. (2000) found, in analyses of morphological and molecular chloroplast data, *Anagallis arvensis* and *Lysimachia nemorum* as sisters and both as sister group to a few other *Lysimachia* species and *Glaux* L., indicating that *Lysimachia* was not monophyletic as circumscribed at that time. Analyses of ITS data (Martins & al. 2003) supported this conclusion and they also showed *Asterolinon* and *Pelletiera* to be nested within *Lysimachia*. The placement of *Glaux* embedded in *Lysimachia* was confirmed by combined analyses of chloroplast and ITS data by Hao & al. (2004). Based on the analyses by Källersjö & al. (2000), Martins & al. (2003) and Hao & al. (2004), Banfi & al. (2005) merged *Glaux* with *Lysimachia* and made the formal nomenclatural recombination.
Our own, more recent analyses of ITS data, combined chloroplast data, and combined ITS and chloroplast data for an extended sampling of Anagallis, Asterolinon, Pelletiera and Trientalis L., and a large number of Lysimachia species (Manns & Anderberg 2005) show that Anagallis, Asterolinon, Pelletiera and Trientalis are derived groups evolved from ancestors within Lysimachia. The analyses also show that none of the genera Anagallis, Asterolinon or Pelletiera are monophyletic. Furthermore, analyses of ITS data and chloroplast data alone suggest different and conflicting placement of Trientalis, indicating its hybrid origin (Manns & Anderberg 2005). The conflicting signals in the different data sets, with regards to Trientalis, was shown to have negative influence on the support value for Lysimachia ciliata L. and L. quadrifolia L. as sister group to remaining Lysimachia (including also Anagallis, Asterolinon and Pelletiera). Consequently, the present generic circumcision does not account for the recent discoveries regarding evolutionary history of the Lysimachia generic complex, and thus a number of nomenclatural changes are necessary to meet the demand for strictly monophyletic taxa.

It may be argued that the genera should be maintained as presently circumscribed, as they can be separated from Lysimachia on distinct morphological characters: Anagallis having circumsissile capsules; Asterolinon with reduced flowers, with sepals much longer than petals, and non-persisting capsule valves, characters shared with Pelletiera, which is distinguished from Asterolinon solely by having chorio-petalous trimerous instead of pentameros sympetalous corolla; and Trientalis with hexa- or heptameros corolla and thin disintegrating capsule. However, if the distinct morphological features of Anagallis, Asterolinon, Trientalis and Pelletiera are used as arguments to preserve these at generic rank, none but Trientalis would represent monophyletic groups, and Lysimachia would remain paraphyletic.

The type of Anagallis, as well as the species of Asterolinon and Pelletiera belong to the same clade as the species of Lysimachia sect. Lerouxia, i.e. L. nemorum and L. serpyllifolia. This shows that the diagnostic characters of each of these genera as outlined above are found in one and the same clade, thus severely weakening their value to diagnose genera. To achieve monophyletic groups, a new genus would have to be proposed for Lysimachia nemorum and L. serpyllifolia, together with Asterolinon adoënse Kunze. Furthermore, Pelletiera would have to be transferred to Asterolinon (type: A. linum-stellatum), Anagallis (type: A. arvensis) delimited to A. arvensis, A. foemina Mill., and A. monelli L., and as a consequence Centunculus L. re-established for all other Anagallis. The circumsissile capsules would no longer diagnose Anagallis, as it would also be found in all Centunculus.

A second alternative would be to include Lysimachia nemorum, L. serpyllifolia, Asterolinon and Pelletiera in Anagallis. This would, however, still require re-establishment of Centunculus if only strongly supported clades (Anderberg & al. 2007b; Manns & Anderberg 2005) are to be considered. Lysimachia is, among other genera in Myrsinaceae, recognized by its herbaceous habit and entire leaf margins, but also by the presence of oil-producing trichomes in various places on the corolla and the anther filaments (Anderberg & al. 2007b). It is, however, difficult to establish morphological characters to distinguish between different subgroups within Lysimachia and the morphological distinctiveness of these subgroups is not very high. Furthermore, the characters used to recognize Lysimachia are also present in Anagallis and to large extent also in Asterolinon, Pelletiera and Trientalis. Consequently, proposal of new genera for some Lysimachia (e.g. L. nemorum and L. serpyllifolia), or transfer of L. nemorum and allied taxa to Anagallis would inevitably result in poorly diagnosed genera. Choosing among alternatives, we find it better to merge the smaller segregate genera with Lysimachia, rather than splitting Lysimachia further. A consequence is that a number of new combinations must be made.

The number of names in Anagallis is considerable, but many have been considered to be synonyms. New combinations are here validated for species recognized in modern floras (Ferguson 1972; Kupicha 1983; Peltier 1981; Taylor 1958a), and in the revision of Anagallis in tropical East Africa by Taylor (1955, 1958b). In his revision, Taylor presents convincing arguments for delimitation of, and synonyms to, variable and problematic taxa. These species delimitations were found adequate in a morphological study of Anagallis and closely related genera (Manns & Anderberg 2007a). Type specimens, or photos of type specimens, were investigated for all names, except for Anagallis ovalis and A. tsaratananae. For some species valid names in Lysimachia already exist, Anagallis alternifolia (= L. buxifolia Molina), A. tenella (= L. tenella L.), Asterolinon linum-stellatum (= L. linum-stellatum L.), and A. adoënse (= L. adoënse (Kunze) Klatt), and they are not listed below.

To the prevailing description of Lysimachia, a few characteristics referring to capsule dehiscence as well as colour and size of the corolla and corolla lobes need to be added to accommodate also the amended circumcision.

Description. — Perennial or annual herbs, or rarely shrubs. Leaves alternate, opposite, or sometimes whorled, entire. Flowers solitary in axils of upper leaves, in panicles or racemes, sometimes head-like, sometimes on curved pedicels. Calyx deeply lobed; lobes usually 5 (or rarely 3, or 6–9). Corolla white or yellow, rarely pink, red, blue or greenish, rotate or campanulate, deeply 5 (or rarely 3, or 6–9)-lobed; corolla lobes longer or sometimes shorter than calyx; contorted in bud. One species apetalous with pink calyx. Stamina with anther filaments free or connate into a ring or tube at base and ± adnate to corolla tube; anthers basifixed, dorsi fixed or versatile opening by apical pores or by base and ± adnate to corolla tube; anthers basifixed, anther filaments free or connate into a ring or tube at base and ± adnate to corolla tube; anthers basifixed, dorsi fixed or versatile opening by apical pores or by lateral slits. Capsule subglobose, opening with united valves or with valves falling apart, or a lid, rarely disintegrating or indehiscent.

New names and combinations


Note. — Anagallis barbata was treated as a variety of A. pumila by Taylor (1955, 1958b), but raised to species rank by Kupicha (1983). Here we follow Kupicha, although it must be pointed out that the distinction between Anagallis pumila and A. barbata is not entirely clear and intermediates between the two taxa are not uncommon (Taylor 1955; Manns pers. obs.).


Note. — No information on where type material of Anagallis filiformis was deposited is provided in the protologue. Schlechtendal was in 1826 active in Berlin (B) and most likely deposited type material there, which is now destroyed. However, when he came to Halle in 1833 he brought collections, including type material, with him (Uwe Braun [HAL], Pers. comm.). The lectotype selected here is from material that can be linked to the protologue of A. filiformis based on information supplied on the original label, although the collector’s name [i.e. Sellow] is not written on the label.

Note. — Based on molecular and morphological data (Manns & Anderberg 2007b), A. foemina is given species rank although it is sometimes considered a sub-species of A. arvensis (Marsden-Jones & Weiss 1938; Taylor 1955; Kollmann & Feinbrun 1968). Molecular data show A. foemina to be closer to A. monelli than to A. arvensis (Manns & Anderberg 2007b). However, Miller (1768) does not supply any information on type material and no specimen in the Miller collection, held at the Natural History Museum herbarium (BM), is labelled as or can be determined to A. foemina. Therefore, we have chosen to select a specimen in the Swedish Museum of Natural History (S) as neotype. This specimen was also used as voucher for DNA sequences in Manns & Anderberg (2007b).


Note. — Ali (1976) suggested Herb. Linn. 208.2 as type specimen for Anagallis monelli. However, this specimen has “Algir” written near the base of the sheet, which links it with a batch of specimens sent to Linnaeus by Erik Brander, which did not reach Sweden until 1756. As this post-dates the publication of the name, it cannot be original material (Charlie Jarvis (BM), pers. comm.). Instead, we suggest Hort. Cliff. 52.2 as lectotype of Anagallis monelli. Linnaeus came in contact with this specimen during his work with Hortus Cliffortianus (Linnaeus 1737), and also refers to it in Species Plantarum (Linnaeus 1753).


Note. — In contrast to Taylor (1955), we do not recognize any subspecies within this species. The proposed morphological difference, i.e. opposite versus alternate leaves, between subsp. *serpens* and subsp. *meyeri-johannis* cannot be confirmed (U. Manns, pers. obs.). The leaves are always alternate, although sometimes seemingly opposite, and can vary in a single individual.


Note. — The type specimen of *Anagallis tsaratananae* has not been localized by the Paris herbarium (P). However, although Peltier (1981) refers to *Perrier de la Bâthie 6562* as type specimen, another specimen (i.e. Humbert 18341) (P, paratype) is also cited in the protologue, to specify the habitat for *A. tsaratananae*. This other specimen has been investigated and found to be in agreement with the description of *A. tsaratananae*. Since both specimens were available to Peltier, when he described *A. tsaratananae* there is, in our opinion, no reason to believe that the identity of the type specimen is incorrect.


Note. — The new name refers to the distribution of this species in the western Mediterranean region.


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