Comments on the Lythraceae Excel datasheet that might be helpful in scoring characters or explaining my usage.

Adenaria: Our latest phylogeny, not yet published, would suggest that Adenaria and Pehria should be considered a single genus. For the moment, they are treated separately.

Ammannia: This genus, now including the previously recognized genera Nesaea, Hionanthera, and Crenea (Crenea in review for publication and morphologically the most distant from Ammannia senu stricto) are all nested within Ammannia phylogenetically. Ammannia sensu lato is thus the most variable of all the genera. The coding for Ammannia includes Nesaea and Hionanthera, already renamed in Ammannia, but not Crenea because it is being submitted, not yet published in Ammannia.

Lythrum includes Peplis, but they are quite different morphologically. I gave the character states of Lythrum alatum. Cuphea also presents the problem of the example C. hyssopifolia being in one clade, and taxa of other clades differing. Tube length ranges from 4 – 30 or more.

Punica protopunica – I have no specimen. The information came from the literature.

Characters of Major Group and Minor Group – Is this referring to taxonomic classification? If so, the subfamilial classification of the Lythraceae is not used. being based on an inaccurate character and artificial. My co-authors and I have a new family level molecular/morphological phylogeny with all genera represented that I am now beginning to write up. A new clade-based classification is part of the manuscript, so I don’t see the value of citing one from the1880’s.

Char. 1 – Nature of fruit – prevalently dry dehiscent capsules, thickness of wall varies but I have scored it as either thin-walled, being papery thin to moderately thin with a few more layers than papery vs. thick walled, with capsule being very slightly fleshy or thick, drying as a hardened shell. Those called berries are very thick-walled, fleshy, unusual, i.e. Punica, Sonneratia, or unique as in the horny Trapa.

Char. 2 and 3 –Ovule and seed number: Numbers given per capsule or berry (i.e., per fruit). The seed number I am supplying is the variation in seed number per capsule for species with seeds mostly less than one-hundred and more approximate numbers for genera with high numbers of tiny seeds per capsule, although I have counted seed numbers in capsules of a few specimens for each genus which have seeds numbering in the hundreds. In Cuphea where seeds in most species are in the tens or less, a very few undeveloped ovules are seen, but why they are undeveloped could be due to genetic failure or lack of fertilization, ecological reasons, so I wonder why this character is chosen.

In Ammannia s.s., there are high seed numbers. Now that Hionanthera is in synonomy of Ammannia, the numbers include only 2-5 seeds/capsule; also in syn. is Nesaea with high numbers like Ammannia and soon will be Crenea, to be included in Ammannia with ca. 500 seeds/capsule.

In Punica, I only have counts for cultivated P. granatum. The fruit of P. protopunica is much smaller, so fewer seeds. The measurement for P. granatum given is for the seed body minus the juicy outer sarcotesta.

Char. 3 – Nearly all seeds in the Lythraceae are hard due to a hard inner pellicle of lignified cells formed by the inner layer of the outer integment and adjoining outer layer of the inner integment. This character state is, I believe a synapomorphy for Lythraceae, Onagraceae, and Combretaceae. In aquatic genera, seeds tend to be membranous, and in Punica, pomegranate, the outermost seed layers are fleshy, but there is still an inner hard pellicle. Some genera have modest wings, Diplusodon, Galpinia, Lagerstroemia, Lafoensia and Physocalymma mainly, and so the seed could be called membranous, although the seed body is firm, unbending.

Char. 6 – By fusion of filaments, I assume this means fused to each other or bundled. In the Lythraceae, all filaments are inserted individually, free from each other.

Char. 7. – The anthers of the Lythraceae are all biloculate (2 thecae) and each locule splits longitudinally the length of the locule. Variation is in the length of the locules, some very long, in which case somewhat curved, really more just crowded in the bud, in other cases short, nearly orbicular and not crowded or curved in the bud. Is there a special situation in Myrtales that calls for this adding this character? I think the character probably doesn’t apply in the Lythraceae.

Char. 10 – Merosity is extremely variable in the Lythraceae. It mostly can be deduced, but sometimes not with certainty, when floral parts are numerous and the number of parts of sepals, petals, stamen numbers, and ovary locules, differ to the point that no basic number can be determined, as in Punica, or where two numbers seem to be equally represented and in Ginoria where there are 4-merous and 6-merous species. In Ginoria, however, phylogenetic relationships indicate that 4-merous was probably the basic merosity.

Char. 11 – Pollination. Very little published at the generic level and quite scattered. Most likely nearly all the genera are promiscuously visited by a variety of small insects including butterflies and especially small bees; with larger flowers attract large bees, hummingbirds, and some attract bats. Apis and Trigona bees are especially common to nearly all Lythraceae. Hummingbirds visit Cuphea (even smaller flowered species) and other genera: bats visit the genera with large flowers and lots of exserted stamens.

Char. 12 – Width of the *corolla* is confusing to me. Is it referring to the width of the hypanthium (cup or floral tube) at its margin, and not to the petals? The corolla in the Lythraceae consists of the petals that are independently inserted at the margin of the hypanthium and alternating with the sepals (calyx lobes). I have recorded the widest width of the hypanthium at its margin, basically at the level of the sinuses of the sepals.

Char. 13 – Hypanthium length in the Lythraceae can be measured from tip of sepal to base of ovary –or all the way to the pair of bracteoles (prophylls) at the first internode when the length of the flower appears externally to extend that far because of continuation of the coloration of the color etc. The portion from the base of the ovary to the pair of bracteoles in the Lythraceae, for me is the epipodium, part of a modified pedicel. The hypanthium measurements here are strictly for the floral cup or floral tube, from apex of sepal to the base of the ovary in this superior-ovary family. They are for the full length of the cup or tube, excluding any extension below the base of the ovary and do not include the epipodium if it is present.

For measurements in genera with small flowers of a few mm length, I have no exacting way of measuring an average, and not enough time to do a meaningful jos – also it would probably not worth the time for this ordinal level study, so no averages are given on most genera.You could take an average of the range, if necessary.

Finally, just a few comments, since Eve asked back in February if we had any suggestions or comments:

I didn’t see some characters I expected to see, but am not sufficiently familiar with details in the other families to judge what should or should not be included. However, I would have guessed some of these characters would be interesting and important in the evolution and radiation of the order: ovary position (quite varied in the Lythraceae, not just superior), placentation type, presence of dispersal characteristics of the seeds, multiplication of stamen numbers, presence of pollen pseudocolpi (Kriebel et al. PlosOne publ. Dec. 6, 2017, investigated pollen every which way in Myrtales and found pollen pseudocolpi, particularly of interest). Lythraceae occupy practically every kind of ecological niche except really cold ones and their habit and morphology reflect evolution directed to different habitats.

There are some anatomical and embryological characters that help at the family level, but maybe not sufficiently covering all families.

It will be exciting to see all this put together phylogenetically and what new insights appear. I am pleased to have been able to contribute. Let me know if I have misinterpreted the “groups” and need to add something more there.

With best wishes,

Shirley