

THE VASCULAR PATTERN OF THE FLOWERS OF *SEDUM ANACAMPSEROS* (CRASSULACEAE)

H. THART

Vakgroep Populatie- en Evolutiebiologie Rijksuniversiteit Utrecht, Padualaan 8, 3548 CH Utrecht

The *Sedum telephium* group (= *Hylotelephium* Ohba, *Sedum* L. subgen. *Telephium* (S. F. Gray) Clausen, *S. sect. telephium* S. F. Gray) is generally considered to be a distinct and natural group. However, its taxonomic position is still rather controversial (CLAUSEN 1975, OHBA 1977, 1978). All species of this group have a short, fleshy caudex and often thickened, tuberous roots, hapaxanth flowering shoots with flat leaves, and a corymbose inflorescence. The flowers have stipitate or attenuate carpels. It is assumed that the species of the *S. telephium* group are further characterized by flowers with a primitive vascular pattern (l.c.). The flowers of *S. sieboldii* Sweet ex Hook., *S. spectabile* Boreau, *S. tartarinowii* Maxim., *S. telephioides* Michx. and *S. telephium* L. (= *S. maximum* (L.) Hoffm.) have six independent whorls of traces departing from the stele (WASSMER 1955, QUIMBY 1971).

Two species of the *S. telephium* group, *S. telephium* and *S. anacampseros* L. are native to Europe. *S. anacampseros* is endemic to the mountains of southern Europe. It occurs in the Pyrenees, SW Alps and the Apennines (WEBB 1964). Although *S. anacampseros* resembles the other species of the *S. telephium* group in gross morphology it differs notably in some aspects of the flower as well as in its hibernating, creeping and rooting, leafy non-flowering shoots (PRAEGER 1921, FRÖDERSTRÖM 1930). The carpels of *S. anacampseros* are strongly stipitate (fig. 1*f–h*) and in this respect resemble the other species of the *S. telephium* group. However, in contrast to the flowers of the five species mentioned above the flowers of *S. anacampseros* have only four whorls of traces departing from the stele (fig. 1*a–g*). The dorsimedial traces of the carpels fuse with the combined traces of the petals and epipetalous stamens, and the lateral traces of the carpels unite with the traces of the episepalous stamens (fig. 1*d–f*). The vascular pattern of the flowers of *S. anacampseros* agrees with group three of Quimby's system, which is the most common within the genus *Sedum* and most probably throughout the Crassulaceae (QUIMBY 1971).

In other features the structure and vascular pattern of the gynoecium of the flowers of *S. anacampseros* differs from that of the *Sedum* species belonging to Quimby's group three as well as from the other species of the *S. telephium* group. The sterile, basal part of the lumina of carpels of *S. anacampseros* descends through the constriction at the base of the carpels into the receptacle (fig. 1*d–h*). In *S. sieboldii*, *S. spectabile* and *S. telephium* the lumina do not extend below the basal constriction of the carpels or the terminal vascular reticulum

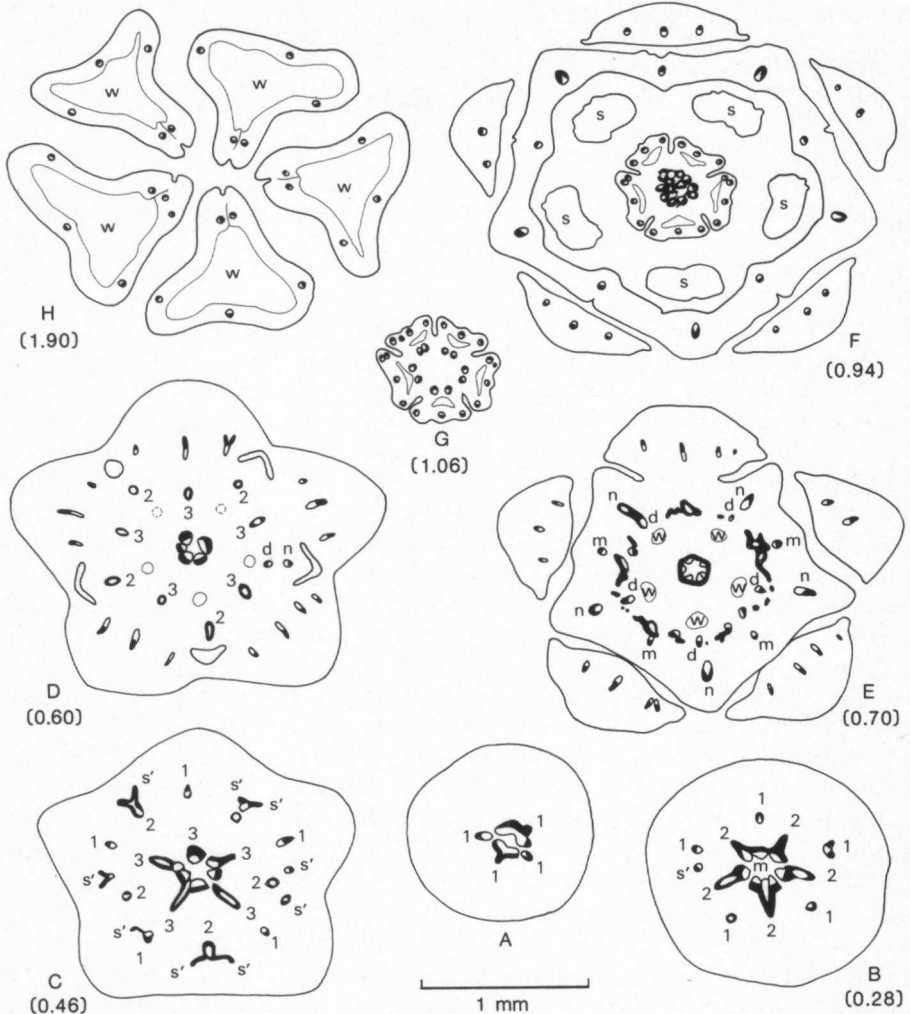


Fig. 1. Transverse sections through a flower of *Sedum anacampseros* L. The numbers in brackets indicate the distance from each section to the first section in mm. — Phloem black. — Xylem white. — The traces of whorl 1, 2 and 3 are indicated accordingly. — d, dorsal traces of the carpels. — m, traces of the episepalous stamens. — n, traces of the epipetalous stamens. — s, squamae. — s', lateral traces of the sepals. — w, lumen of the carpels.

of the stele. On the other hand, the flowers of the *Sedum* species with semi-inferior ovaries and a vascular pattern that agrees with Quimby's group three, always have sessile carpels (WASSMER 1955, QUIMBY 1971). In *S. anacampseros* the placental bundles (whorl 4) depart from the stele just below the terminal vascular reticulum (fig. 1f). They arise in pairs and each pair supplies the placenta of one carpel. In some cases the bundles of one pair are partly fused near their origin. In *Sedum* the two placental bundles of the carpels each combine

with the adjacent placental bundle of the neighbouring carpels to form traces situated in the radii of the sepals (WASSMER 1955, QUIMBY 1971). On the other hand, in *Umbilicus* DC. and *Sinocrassula* Berger the two placental bundles of each carpel unite at the base of the carpel forming a short (sometimes imperfect) ventrimedian trace (WASSMER 1955). The *S. telephium* group occupies an intermediate position between *Sedum* and *Umbilicus*. In *S. sieboldii*, *S. spectabile* and *S. telephium* each placental bundle fuses with the corresponding lateral trace of the same carpel. The two combined placental and lateral traces of each carpel depart from the stele independently.

The peculiarities of the morphology and anatomy of the flowers of *S. anacampseros* emphasize the eccentric position of the species within the *S. telephium* group. On the other hand the tendency to form a ventrimedian placental trace clearly separates the species of the *S. telephium* group from the other species of *Sedum*. The advanced vascular pattern of the flowers of *S. anacampseros* supports Fröderström's hypothesis that this endemic species evolved from *S. telephium* (FRÖDERSTRÖM 1930). The chromosome numbers of the species also support this view. *S. anacampseros* has the basic number $X = 18$ which is most certainly of secondary origin, whereas *S. telephium* has the primary number $X = 12$.

The difference between the vascular patterns of the flowers of *S. anacampseros* and the other species of the *S. telephium* group reflects to some extent the variation in the floral vasculature found within the genus *Sedum* and obscures the apparent distinctness of both taxa. Consequently it seems preferable not to classify the *S. telephium* group as a distinct genus.

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