

TRIBAL REVISIONS IN THE ASTERACEAE. IX.

THE RELATIONSHIP OF ISCHNEA.

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The genus Ischnea of the alpine regions of New Guinea was originally described by Ferdinand v. Müller (1889) on the basis of a single rather widely distributed species. The lack of a pappus obscured the relationships of the genus and it was placed close to Cotula L. in the tribe Anthemideae. More recently Mattfeld (1929a, 1929b, 1937, 1940) has added four species to the genus, and in addition he suggested that Ischnea was more closely related to the primarily subantarctic genus Abrotanella Cass. which has also been placed in the Anthemideae. The present study indicates the need for much revision in the concepts regarding Ischnea.

A survey of the Anthemideae has shown that all unquestioned members of the tribe have a pollen with an internally elaborated exine, they have truncated tips on the style branches, they have exothecial cells with thickenings mostly on the lateral walls, and they have large capitate glands on their corollas. On the basis of these characters many genera with sterile disk achenes are excluded from the Anthemideae, including Ischnea and Abrotanella.

The relationships of Ischnea cannot now be sought in Cotula which belongs to the Anthemideae. Ischnea does share a number of characters with Abrotanella, however. Both have 1-2 series of phyllaries, flat or only slightly keeled anther appendages, and glabrous corollas. Abrotanella differs, though, in its dense habit and thick corolla tissue with distinct median laticifers in the lobes. The corolla of Abrotanella is like those of most members of the Senecioneae but very different from that of Ischnea.

A review of the Compositae has shown the closest comparison to Ischnea is in the genus Crocidium Hook. of Western North America. The latter genus has also been placed in the Senecioneae. Both Ischnea and Crocidium are small rather erect slender or short stemmed, herbaceous plants having narrowly oblong to linear alternate leaves. The heads are borne singly on slender scapes and the uniseriate phyllaries are rather ovate with overlapping margins. In both genera the glabrous corollas have thin rather ovate lobes without median laticifers, and the basal tube is delimited from the limb internally by a narrow annulus of small quadrate cells. The exothecial cells have thickenings primarily on the transverse walls. Both genera also show rather

distinctive mucilage setae on their achenes. Chromosome counts of $n = 9$ have been reported for Crocidium multicaule (Ornduff et. al, 1963) and for Ischnea elachoglossa (Borgmann, 1964). More detailed examination of some characters is instructive.

Anther appendages. The appendages of Crocidium are very broadly ovate and somewhat keeled. The appendages of Ischnea are much smaller but are concave abaxially and have ornate thickenings in the cell walls similar to those in Crocidium.

Style branches. The branches of both Ischnea and Crocidium show distinct enlargement. In Ischnea there is a large subapical ring with the nonfunctional branches represented by only a small bilobed papillose tip. Such reduced forms of styles associated with sterile disk achenes can look very different from styles of related genera. Crocidium has the outermost disk achenes often fertile and has no such modified styles. The style branches are very short and broad with distinct lateral stigmatic lines. The appendages are short-wedge-shaped and the inside surface is smooth. The style branch of Crocidium is a type more often seen in the tribe Astereae.

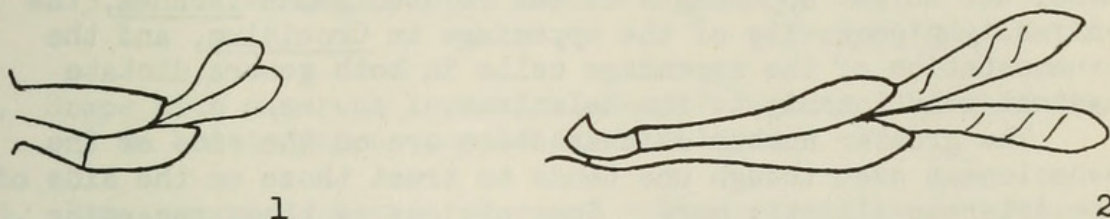
Pappus. A pappus is supposedly lacking in Ischnea, but a few very vestigial setae are said to occur on the disk achenes of I. latifolia Mattfeld. A pappus is present in both species of Crocidium but is lacking from the ray flowers of C. pugetensis St. John.

Mucilage setae. The achenes of Ischnea are rather asymmetrical without a distinct carpopodium. Achenes of Crocidium are symmetrical with one or two rows of more distinct cells at the base. The achenes of Ischnea are usually distinct from those of Crocidium by being glabrous, but the species described below has mucilage setae very similar to those already noted in Crocidium by St. John (1928). These setae consist of broad cells in two rows which split when water is applied and out of which comes a swelling mass of mucilage. The setae are rather distinctive but setae of the same type are found elsewhere in the Asteraceae in some genera such as Chaetanthera Ruis & Pavon of the tribe Mutisieae. The function of such setae would seem to be to furnish an anchor in any place where the achene first contacts water. It is not obvious why the seta type is found in two such isolated groups of the family.

The essential confirmation of the relationship of Ischnea and Crocidium leaves a question as to the proper tribal position. Crocidium has usually been placed in the Senecioneae, and the two genera have the simple involucre and glabrous corollas that have been used extensively in this series of studies to delimit that tribe. Nevertheless, Ornduff and his coauthors (1963) have

called attention to the style branch and chromosome number of Crocidium which suggest relationship to the tribe Astereae.

The present series of studies has consistently shown the Senecioneae and Astereae to be closely related tribes but always clearly distinct. A more careful evaluation is necessary of the seemingly intermediate nature of Ischnea and Crocidium remembering that no one character is totally reliable.



Figures 1-2. Mucilage hairs. 1. Ischnea. 2. Crocidium.

The styles of Crocidium are precisely the general type that has been used to distinguish most members of the Astereae. The chromosome number $n = 9$ is also very common in the Astereae (Raven, et al., 1960) but is very rare in the Senecioneae (Ornduff, et al., 1963; Toman, et al., 1968). Ischnea and Crocidium differ from most Astereae by the glabrous corollas. Only Solenogyne of a very distinctive group of the Astereae has been seen with similarly glabrous corollas. The Astereae all have flat anther appendages, and none have exothecial cells of the type in Ischnea and Crocidium. The exothecium of Hinterhubera Schultz Bip. ex Wedd. comes closest in its elongate cells with thickenings at the ends, but that genus is totally Asterean in all other respects. No Astereae have a single series of phyllaries, the multiple series are usually highly developed and distinctive. Setae of achenes in the Astereae are in all known cases slender and often with hooked tips, unlike those of Ischnea and Crocidium.

In contrast, glabrous corollas and a single series of phyllaries are rather characteristic of the Senecioneae and similar anther appendages and exothecial cells do occur in a few members of the tribe. One genus of the Senecioneae, Brachyglottis Forst. of New Zealand, has a large erect semiwoody habit, branching inflorescence, and a chromosome number of $n = 30$ (Hair & Beuzenberg, 1959), but presents flower structure amazingly similar to Ischnea and Crocidium. The corollas are of the same shape and structure and even have the annulus at the base of the limb. Also, the achenes have setae that are similar in shape, having broad cells, but they do not split when wet and the contents of broken cells do not swell or change shape in water. Brachyglottis does demonstrate the presence of rather similar corolla and seta types in an indisputable member of the tribe Senecioneae.

Bentham (1873) notes the habit resemblance of Crocidium to Baeria Fisch. & Mey. of the tribe Helenieae, a comparison that the anther form in Crocidium seems to favor. Certainly, the anther appendage and exothecial cells of Crocidium present many problems in relating the genus to either the Senecioneae or Astereae, or in treating it as intermediate between them. Still, the non-grandular corollas, the different achenes and the strictly alternate leaves of Crocidium are unlike Baeria and its relatives. Also, the anther appendages of the related genus Ischnea, the only slight concavity of the appendage in Crocidium, and the ornamentation of the appendage cells in both genera dictate against relationship to the Helenieae.

The greater number of characters are on the side of the Senecioneae even though one tends to trust those on the side of the Astereae slightly more. Some obvious problems regarding relationships remain, but one can conclude that Ischnea and Crocidium are isolated relicts of a distinctive line of evolution deserving recognition as a subtribe.

Crocidiinae, subtribus nova Senecionarum. Plantae herbaceae parvae. Folia alternata, laminis plerumque elongatis angustatis. Inflorescentiae scaposae monocephalae; squamae involucri 1-seriatae; corollae glabrae; corollae disci inferne anguste tubulares, limbis late campanulatis, annulis distinctis interioribus ad bases filamentarum, lobis latis non incrassatis sine lacticiferis mediis; appendices antherarum abaxialiter parum vel distincte concavae; setae achaeniorum mucilagiferae. Chromosomatum numerus $X = 9$.

Typical genus, Crocidium Hook.

The tribe consists of two genera which can be distinguished most readily by their styles. Disk styles of Crocidium are functional with distinct broad branches. Disk styles of Ischnea are non-functional and unbranched without stigmatic surfaces.

Two species are presently recognized in Crocidium. These can be distinguished by the following key based on characters given by St. John (1928).

1. Ray achenes with scaberulous pappus, early deciduous; disk with pappus scarcely exceeding the corolla tube; corolla tube short and cylindrical, 1.0-1.6 mm long, limb 1.4-1.6 mm long with reflexed lobes; stamens and style tips well exerted from throat

C. multicaule Hook.

1. Ray achenes without pappus; disk flowers with pappus as long as the corollas; disk corolla tube very slender and almost filiform, 1.5-4.0 mm long, limb 2.2 mm long with erect or slightly spreading lobes; stamens and styles well included in corolla

C. pugetense St. John

The genus Ischnea contains six known species including one previously undescribed. The species can be distinguished by the following key.

1. Disk corollas with 4 lobes.

2. Scape with only 2 subopposite leaves near middle; basal leaf blades 3-6 mm broad; vestigial disk achenes with 3 minute unequal pappus setae

I. latifolia Mattf.

2. Scape with numerous leaves; blades of basal leaves less than 3 mm broad; pappus completely lacking.

3. Rays exserted; leaves of scape entire; petioles of basal leaves glabrous

I. keysseri Mattf.

3. Rays included; leaves of scape dentate; petioles of basal leaves with long dense fuscous cilia

I. korythoglossa Mattf.

1. Disk corollas with 5 lobes.

4. Leaves of scape trilobed; achenes bearing small mucilage setae

I. brassii n. sp.

4. Leaves of scape entire; achenes glabrous.

5. Leaves narrowly linear to filiform, 3-6 cm long; involucre ca. 5 mm high; rays ca. 4 mm long; head with ca. 19 rays, 30-35 disk flowers

I. elachoglossa F.v.Müll.

5. Leaves with small spatulate tip, 1-2 cm long; involucre 3.0-3.5 mm high; rays 2.5-3.0 mm long; heads with ca. 16 rays and ca. 15 disk flowers

I. spathulata Mattf.

Ischnea brassii H.Robinson & R.D.Brettell, sp. nov.

Plantae herbaceae erectae parvae 7-10 cm altae praeter achaenia glabrae. Folia basilaria 6-10 linearia 2.5-4.0 cm longa 1 mm lata sensim ad apices 2 mm lata. Folia scaporum 6-8 trilobata 6-10 mm longa 1 mm lata, lobis lateralibus angustis 1-2 mm longis. Capitula ca. 1 cm lata; squamae involucris 8 uniseriatae ovatae obtuse acutae 4 mm longae 2 mm latae; radii 12-15 flavi 2.5 mm longi 1.0 mm lati, achaeniis 3 mm longis 1 mm latis sparsim setiferis, setis latis mucum emittentibus; flores discoideorum ca. 12, corollis 5-lobatis 2.0 mm longis, tubis 0.7-0.8 mm longis. Grana pollinis ca. 20 μ diam.

Type: NEW GUINEA: Eastern Highlands District: Mt. Wilhelm, east slopes, alt. 4080 m, on moist ground in long-grass community of alpine grasslands; flowers yellow. June 26, 1959. L.J.Brass 30165 (Holotype US).

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