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IRIS TENUIS S. WATS., A NEW TRANSFER TO THE SUBSECTION EVANSIA

LEE W. LENZ

In northern Oregon, not far from Mount Hood in the Cascade Range, there is found a small iris which has generally been included within the series *Californicae*. This species, *Iris tenuis*, occurs along the Clackamas River and its tributary, Eagle Creek, and so far as is known is endemic to Clackamas County where it is found growing in cool shady spots in moist soil or leaf mold. R. C. Foster (1937) and Dykes (1913) both cite sheets of a plant collected by L. F. Henderson in Washington County, Oregon, in 1884. The precise locality where these plants were gathered is not given and no recent collections from that county are known.

The ecological habitat where *I. tenuis* is found is quite different from that occupied by any of the *Californicae*. As Starker (1935) wrote, the species is very often found among the dense undergrowth that covers the canyon floor. However, in another area, not further identified, he reports finding it in abundance on a gently sloping hillside quite free from underbrush except for a few rhododendrons and hazel bushes. Here the Douglas Fir trees were from three to four feet in diameter and "the iris covered the forest floor like grass on any lowland meadow." In this locality the plants were growing in leaf mold and decaying moss.

That *Iris tenuis* does not rightfully belong with the *Californicae* has been suspected by numerous workers, and Dykes (1913) wrote that "it is at once distinguished from all other irises from Western America by its deeply forked stems." R. C. Foster (1937) likewise recognized it as foreign to the group but he did not remove it from the *Californicae*. Clarkson (1955) stated, "it clearly does not belong in the subsection with the other members of the *Californicae*" and in his treatment of the Oregon species he excluded it from that group. The present author (Lenz, 1958) has likewise excluded it from the *Californicae*.

Cytologically it has been shown (Simonet, 1934; R. C. Foster, 1937; Lenz, 1950; Clarkson, 1955; Smith and Clarkson, 1956) that the *Californicae* (*sensu* Clarkson, 1955; Lenz, 1958) are all uniformly $2n=40$ whereas *I. tenuis* has been shown to be $2n=28$ (Simonet, 1934; Smith and Clarkson, 1956). On the basis of the inclusion of *I. tenuis* within the *Californicae* the series would then appear to possess two basic chromosome numbers, $2n=40$ and $2n=28$. As pointed out by several investigators (Dykes, 1913; R. C. Foster, 1937; Lenz, 1958), the nearest relatives of the *Californicae* are the Eurasian *Sibiricae* which also have been shown (Simonet, 1932, 1934) to have two basic chromosome numbers: *I. delavayi*, *I. wilsonii*, *I. forrestii*, *I. chrysographes*, *I. bulleyana* and *I. clarkei* with $2n=40$, and *I. sibirica* and *I. orientalis* with $2n=28$. Mainly on the basis of parallelism in chromosome numbers Simonet (1934) united *I. tenuis*, *I. sibirica*, *I. orientalis*, and *I. prismatica* into the subsection *Sibiricae* with a basic chromosome number of $x=7$. Simonet then united the remaining members of the *Californicae*, i.e., all those species now recognized by Clarkson (1955) and Lenz (1958) as belonging to that series, with the 40 chromosome members of the *Sibiricae* into a new subsection, *Chrysographes*. As R. C. Foster

(1937) clearly pointed out, this alignment of the species almost completely disregards morphological characters and geographical distributions.

Concerning the possible affiliations of *I. tenuis* with other members of the genus, R. C. Foster (1937) noted that the broad pale green leaves were much like those of a giant *I. cristata*, a member of the subsection *Evansia*. Clarkson (1955) likewise noted certain morphological similarities between the two but he was impressed with the differences in chromosome numbers between the two, *I. cristata* having $2n=36$ compared with *I. tenuis* with $2n=28$. More recently Clarkson (1958) has erected a new subsection, the *Oregonae*, for this species, saying only, "Regardless of origin, *I. tenuis* is sufficiently distinct, morphologically, cytologically, and geographically, to warrant erection of a new subsection which is accordingly proposed." Clarkson (1959) subsequently reduced the category from section to series because Lawrence (1953) had earlier pointed out that *Apogon* as a sectional name is invalid and cannot be used but that it was valid as a subsection name as used by Bentham. Thus Lawrence changed the subdivisions of section *Apogon* to series of subsection *Apogon*.

Apparently none of these workers noted the similarities between *I. tenuis* and the Japanese *I. gracilipes*, another member of the *Evansia*. Morphologically and ecologically, the three species, *I. cristata*, *I. gracilipes*, and *I. tenuis*, have much in common (see Table 1). They are all plants of moist cool shady woods where they grow in rich soil or very often in the layer of leaf mold and moss which covers the forest floor. All three possess long, slender, wiry rhizomes which creep through the leaf mold and over the rocks, rooting only sparingly. One of the striking characteristics which these three species have in common is the unique manner in which they produce their flower stems away from the fan of leaves. The three species are all deciduous and in the spring three small growths will usually be found at the ends of the branches of the rhizomes. The center growth comes from the base of the past season's fan of leaves and from it emerges the flowering stem devoid of leaves except for those on the flower stem itself. The two or more side growths give rise to slender rapidly growing rhizomes which later produce fans of leaves some little distance from the flowering stem. This is very well shown in figure 4. Because the area at the base of the fan of leaves is somewhat larger in size than the diameter of the rest of the rhizome, old rhizomes often present a beaded or knotted appearance, the enlargements representing previous seasons' terminal growths.

The species of the *Evansia* are also known as the Crested Irises because of the prominent cockscomb-like crest present on the haft of the sepal of most of the members of the subsection. The name *Evansia* was first used by Salisbury in 1812 (Trans. Hort. Soc. 1: 303) as a generic epithet for a plant earlier described by Thunberg (Trans. Linn. Soc. 2: 327, 1791) as *Iris japonica*. Feeling that his plant was sufficiently distinct to be given generic status, Salisbury called it *Evansia chinensis*. The name *Evansia* was first validly used as a subsection by Bentham in 1882 (Benth. and Hook. Gen. Pl. 3: 687). Included within the group at the present time are the following species: *I. confusa* Sealy, *I. cristata* Soland, *I. formosana* Ohi, *I. gracilipes* Gray, *I. lacustris* Nutt, *I. milesii* M. Foster, *I. pseudo-rossi* Chien, *I. speculatrix* Hance, *I. tectorum* Maxim, and *I. waltii* Baker.

Whether this is phylogenetically a natural grouping or not, it is impossible to say at the present time. As Dykes (1913) wrote: "With the exception of the crest on the blade of the falls which is the distinguishing mark of the section there is probably no other character in which all plants here grouped together agree." Nevertheless, within the group it would appear that *I. gracilipes*, *I. tenuis*, *I. cristata*, and *I. lacustris* all possess a number of characters in common and most probably represent a natural

FIG. 1. *Iris tenuis*. a. general habit of flowering stalk; b. fan of leaves at time of flowering; c. flower from above; d. spathe valves; e. style branch; f. sepal. a, b, c, approx. $\times \frac{1}{2}$; c, d, e, f, approx. $\times 1$.

TABLE 1

	<i>I. tenuis</i>	<i>I. gracilipes</i>	<i>I. cristata</i>
Leaves	Ensiform, acute, pale green, scarious margins to 3.5 dm. long, 1.5 cm. wide, nerves prominent	Ensiform, to 3 dm. long at maturity, nerves prominent	Broadly ensiform, light green or yellowish-green, few sub-prominent nerves, to 2.5 dm. long, 2.5 cm. wide
Flowering Stem	Slender, deeply 1-2 branched, 2-3 flowering heads, 1-2 cauline leaves, leafy bract at bifurcation	Usually 2 branches, slender with leafy bract at bifurcation	Stem unbranched, 2-3 cauline leaves
Spathes	Subequal, opposite, membranaceous and scarious margined 2-3 cm. long, 5 mm. wide, lanceolate acuminate, 1-flowered	1 only, lanceolate, membranaceous, scarious	Broadly lanceolate, acuminate, opposite, equal or outer sometimes shorter, 1-2-flowered
Pedice	Very slender, 0.4-1 cm. long	Very short	0.7-1.8 cm. long, slender
Perianth tube	Very short, infundibuliform	Short, about 1.25 cm. long, funnelform	Filiform, gradually widening toward top, 4.5-6.8 cm. long
Sepals	Oblong spatulate, bluntly rounded and deeply notched, white, sometimes bluish tinged	Obovate, about 2.5 cm. long, deeply and widely emarginate, light lavender blue	Obovate to spatulate, bluntly rounded at apex, to 4.5 cm. long, 1.5 cm. wide, lavender or purplish, sometimes white
Crest	Prominent central ridge often yellow or yellowish	Wavy linear crest, minute fimbriate crest	Toothed orange and white crest
Style Crests	0.7 cm. long, broadly obovate, erose	1 cm. long, fimbriated	0.7 cm. long, semi-ovate, crenate
Stigma	Triangular, acuminate	Triangular, tongue-shaped	Rounded, entire, oblong

grouping. The one character which does show considerable variation within the group is the extent of the crest which is presumably the single character that in the past has held the *Evansias* together. *Iris cristata* and *I. lacustris* both have a fimbriate crest on the haft of the sepal, *I. gracilipes* has a "wavy linear crest" or "prominent orange ridge," whereas *I. tenuis* has only a prominent ridge on the fall without any indication of its being serrate or fimbriate. That there may be some variation in the development of the crest within a single species is indicated by the situation which exists in *I. wattii*. This species is known to have forms with distinctly fimbriated crests whereas other collections show only low crests which are entire. It is probable that the only form of *I. wattii* now in cultivation is the one with the entire crests.

The cytological situation within the *Evansia* is not sufficiently understood to permit a discussion of possible relationships within the group at the present time. *Iris cristata* and *I. lacustris* are certainly phylogenetically closely related and Dykes (1913) originally considered the latter as a variety of *I. cristata* but later (1924) he accorded it specific standing, a course that has been followed by later workers (Small, 1924; R. C. Foster, 1937; Fernald, 1950), yet the chromosome numbers of the two are quite different, *I. cristata* having $2n=32$ and *I. lacustris* $2n=42$. The known chromosome numbers reported for the *Evansias* are listed in Table 2.

TABLE 2

Species	n	2n	Reported by
<i>I. confusa</i> (as <i>I. wattii</i>)		30	Simonet, 1934a Snoad, 1952
<i>I. cristata</i>	12	32	Longley, 1928 Simonet, 1934a R. C. Foster, 1937
<i>I. formosana</i>		28	Yasui, 1939
<i>I. gracilipes</i>	18	36	Kazao, 1929 Simonet, 1934
<i>I. japonica</i>	17, 18	34, 54	Simonet, 1932 Kazao, 1929
<i>I. lacustris</i>		42	Simonet, 1934
<i>I. milesii</i>		26	Simonet, 1932
<i>I. speculatrix</i>		44	Snoad, 1952 Lenz, 1959
<i>I. tectorum</i>		24	Sakai, 1952
		28	Simonet, 1934a
<i>I. tenuis</i>		28	Simonet, 1934a Smith and Clarkson, 1956
<i>I. wattii</i>		30	Lenz, 1959

The extent to which interspecific hybridization is possible with the *Evansias*, or the role which it may have played in the evolution of the group is unknown. Several presumed garden hybrids have been reported but only one of them has been studied cytologically, that one, *Iris* Paltec, which resulted from a cross between *I. tectorum* and a diploid tall bearded iris, is well known and is often seen in modern collections. Another hybrid of similar parentage was reported by Lenz (1956) but the plants perished after blooming and before they had been studied cytologically. At the present time no hybrid is known involving *Iris tenuis*.

Excluding *I. tenuis* from the discussion for the time being, the remaining members of the *Evansia* present an interesting example of what is perhaps the best known

of all discontinuous floras, that of temperate eastern Asia and temperate eastern North America. According to Fernald (1931) the identity, or close similarity, of angiospermous genera of these areas was recognized as early as 1750 by Halen, a

FIG. 2. Distribution of *Iris*, subsection *Evansia*.¹

student of Linnaeus. These two widely separated geographic areas share scores of genera or subgenera in common, many of them having been pointed out by Fernald (1918, 1931). Included in the list are the tulip tree, *Liriodendron tulipifera* with two living areas, one from New England to the Great Lakes and south to the Gulf of Mexico, and the other (var. *chinense*) in China. Other examples given by Fernald include *Symphlocarpus*, *Magnolia*, *Menispermum*, *Polyphyllum*, *Panax*, *Phryma*, and *Diphylleia*.

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A less common although not unknown discontinuous distribution is that between northwestern America and southeastern United States. Here we find *Pachystima* with two species, one the Oregon Boxwood, *P. myrsinites*, distributed from Butte and Siskiyou counties in California north to British Columbia and east to the Rocky Mountains. The second species, *P. canbyi*, is found in the mountains of Virginia and West Virginia and in Kentucky and Ohio.

FIG. 3. Distribution of the genus *Dicentra*.

A number of genera are known with species in both temperate Asia and western North America. Included here is *Boschniakia* of the *Orobanchaceae* with *B. tuberosa* being found from the San Jacinto, San Bernardino and San Gabriel mountains of southern California north to British Columbia; another species, *B. hookeri*, is found in the coastal mountains of Washington and extends south perhaps as far as Cali-

ifornia. In Asia *B. rossica* is found in Japan and *B. himalaica* in the Himalayan region. In the *Umbelliferae* the genus *Glehnia* has one species, *G. leiocarpa*, which is found from Curry County, Oregon, north to Alaska, and another species, *G. littoralis*, which occurs in China, Korea, and Japan.

Plant groups with discontinuous distributions involving the three areas of temperate Asia, eastern United States and Canada, and northwestern America, although relatively rare, are known. The genus *Oplopanax* with three species is one example. The Devil's Club, *O. horrida*, is known from Ontario and Michigan west to Oregon and north to Alaska. *Oplopanax elatus* is found in Korea and *O. japonicus* in Japan. Another genus is *Dicentra* with some 15 species of which *D. cucularia* is found from

FIG. 4. *Iris cristata*.

the Gaspé peninsula east to North Dakota and eastern Kansas and south to Georgia and Alabama. The variety *occidentalis* is found in Idaho, Oregon, and Washington. *Dicentra canadensis* is found from Nova Scotia to Michigan and south to North Carolina, Missouri, and Nebraska; *D. chrysantha* and *D. formosana* are native to western America and *D. spectabilis*, the well-known Bleeding Heart, is a native of Japan. Perhaps the genus most closely approximating the distribution of the Evansias (including *I. tenuis*) is *Clintonia* in the *Liliaceae*. In this genus *C. borealis* and *C. umbellata* are found in eastern North America, *C. andrewsiana* and *C. uniflora* in western United States, Canada, and Alaska, and *C. udensis* and *C. alpina* in Asia (see figure 3).

According to Axelrod (1950) the Arcto-Tertiary Flora was dominated by temperate hardwood-deciduous and conifer forest species whose nearest living counterparts survive largely in the temperate parts of North America and Asia. In western America the closest modern equivalents are to be found in the Coast, Sierra-Cascade, and Rocky Mountain forests, whereas in eastern United States the present day plants are confined to areas of summer moisture. The Asian element comprised groups now

indigenous to eastern Asia where the climatic situation is similar to that found in eastern North America. According to Axelrod these three elements are known as having been in close association at many localities. He believes that intimate and regular association of their species suggests a rather generalized forest in the Miocene with a relatively uniform temperate climate over the lowland regions. Based on the fact that *I. cristata*, *I. gracilipes*, and *I. tenuis* are today plants of moist temperate forest habitats it might be postulated that the prototypes of these species were members of this Miocene forest association which later became separated into the three distinct areas known today, each of them containing irises which have since evolved into the distinct species known today.

CONCLUSIONS

From the morphological, ecological, and geographical evidence presented it seems best to consider *I. tenuis* as a member of the subsection *Evansia*, section *Apogon*, of *Iris*, with closest affinities to *I. gracilipes* of Japan and *I. cristata* of eastern North America. It is postulated that the prototypes of these species were at one time elements found in the Arcto-Tertiary Flora of Miocene time. The nearest living counterparts of this flora are today found in temperate area forests of eastern Asia, western North America, and eastern United States, each area of which possesses one or more species of iris belonging to the *Evansia* subsection of the genus.

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