A REVISION OF THE GENUS CERASTIUM (CARYOPHYLLACEAE) IN MEXICO AND CENTRAL AMERICA

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ABSTRACT

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Cerastium, a genus of the subfamily Alsenoideae of of the family Caryophyllaceae, is one which, at least in America, has had little taxonomic attention in recent years. There is, therefore, room for improvement in our general understanding of the group.

The present study was conducted to increase the understanding of the genus from the part of North America in which it is perhaps least well known; Mexico and Central America. Through the study of more than 1200 herbarium specimens on which morphological observations were made as well as the study of the pertinent literature, a taxonomic realignment of the species has been attempted. Although some speculation has been brought forth as to the possible relationships within the group, the emphasis has been on defining the 17 species and describing their habitats and areas of occurrence.

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INTRODUCTION

Cerastium, a genus of Caryophyllaceae known commonly in English as "mouse-eared chickweed", is of virtually worldwide distribution and has its center of diversity in Eurasia. The number of species included varies from author to authoc (Lawrence, 1951: ca. 100; Pax and Hoffman, 1934: 40-100; Willis, 1973: 60). It is represented in Mexico and Central America by 17 species, all but two of which are native. Among the other genera of the Caryophyllaceae and particularly of the Alsinoideae, the subfamily to which Cerastium belongs, it is most often confused with Stellaria, the closest relative (Pax and Hoffman, 1934). One of the species in this study, Cerastium texanum, has even been described as a species of that genus (Stellaria montana). Cerastium can also be confused with the genus Arenaria.

Cerastium is in many respects a difficult genus. The species are often poorly delimited, and this has resulted in the publication of many names which have subsequently been reduced to synonomy. In the Mexican and Central American species, however, the overlap in characters is not extreme, although in some of the species found also in

the United States and Canada, the separation there becomes less distinct.

The literature concerning Cerastium in Mexico and Central America consists primarily of lists of species, with descriptions of new ones, collected on a single expedition, by a particular collector on several expeditions, or by several collectors from a given region (Briquet, 1911; Britton, 1888; Greenman, 1904; Hemsley, 1878; Presl, 1831; Robinson, 1900; Robinson, 1904; Schlechtendal, 1838; Schlechtendal and Chamisso, 1830; Schultz, 1862; Sessé and Mociño, 1894; Standley, 1937; Standley and Steyermark, 1940; Standley and Steyermark, 1944; and Watson, 1888).

Robinson (1894, 1897) attempted to list all of the North American species of Cerastium and in 1873 Rohrbach tried something similar for both North and South America. The ultimate in ambitious effort in this respect was, however, Grenier (1841) who prepared a monograph of the genus on a worldwide scale. When writing his monograph, Grenier (1941) was apparently unaware of several of the species which had been described from Mexico in the years preceding his work and therefore failed to discuss them. Also, Grenier was a lumper par excellence. For example, into Cerastium mutabile he lumped the now generallly recognized species C. arvense, C. orithales and C. alpinum. In his preface he attempted to explain this policy of

lumping (as translated from the French by Williams, 1899):

> "According as the bias of synthesis or analysis predominates in the minds of those concerned in the study of fixation of species, you will find their number diminish or increase with the examination of material. From this proceeds two schools, of which one seems to be bent on the multiplication of species, whilst the other, urged by the contrary tendency, seeks to restrict the number. In observing what goes on around us among certain species of animals and plants, in reflecting on the numerous modifications which domestication, climate, the action of the sun, etc., have on species; I have considered that it would be better to err by excess of reduction than of multiplication, persuaded, moreover, that in doing so, one would burden science less, and that there would never fail men who have an opposite tendency to mine. I have always tried to distinguish carefully the forms known to me; and if in this memoir of mine they are not described as species, they will be found under varieties, so that others, if they have sufficient reason, may raise them to the rank of species."

His point is well taken but to go to the extreme and lump too many variants together into a large unnatural species also causes problems. Instead of burdening science, one gives it too little with which to work.

In recent years floras of certain regions in Mexico and Central America have been written, some of which treat various species of Cerastium. These include Beaman (1979) and Sanchez S. (1968) for the Valley of Mexico, Shreve and Wiggins (1964) for the deserts of

Sonora and Baja California, Standley (1937) for Costa Rica and Standley and Steyermark (1946) for Guatemala.

The present study was carried out at the suggestion of Dr. John H. Beaman that taxonomic reinterpretation and in some cases nomenclatural revision might be necessary for Cerastium in Mexico and Central America. As is often the case with the genus as a whole, confusion has arisen in several instances as to the correct naming of species. In other cases taxa here described for the first time had not been previously recognized because no one had looked at specimens in the quantity available in this study. The major purpose of this study has been to improve the understanding and to facilitate the identification of species in a poorly known group found in an area not yet well studied. It should be noted that the major emphasis of the study has been a taxonomic revision and that the discussions on phylogeny and phytogeography should be considered as more or less extra sojourns into speculation. In looking for differences between species only externally visible morphological characters were used. Primarily because of lack of time neither cytological nor biochemical characters were investigated. Further work in these areas may further improve the systematics of Cerastium.

PHYLOGENY

The genus Cerastium in Mexico and Central America is readily divisible into three groups. The first, the C. sordidum group, represented by three species, C. sinaloense, C. sordidum and C. texanum, is distinct in that it can be characterized by having straight capsules with revolute teeth, crowded spatulate basal leaves (but no basal rosette) and sparse lanceolate upper leaves. The second group, that centered about C. arvense (which itself is not found as far south as Mexico), including C. orithales, and C. ramigerum, is unified by such characters as few flowers, dense glandular pubescence (sub-reflexed on the pedicels), perennial habit without a basal rosette and a chromosome number of $2n = 36$. The last and largest group of Mexican and Central American Cerastium species, the C. nutans group, is diverse but each species lacks the necessary characters to be included in either of the other two groups. The species are annual or perennial, basal rosettes are often present, they usually lack reflexed hairs, are often at least somewhat lanate and have a chromosome number of $2n = 34$. These species include C. barberi, C. brachypodum, C. cuchumatanense,

C. guatemalense, C. juniperorum, C. madrense, C. nutans, C. purpusii, C. tolucense and C. vulcanicum.

Since it seems fairly certain that these three groups are in fact distinct, their apparent evolutionary development in Mexico and Central America will be discussed separately. These discussions are, of course, highly tentative and in no way reflect any certain evolutionary pathways. They merely indicate what appear to be fairly likely pathways.

It should also be noted here that the following discussions might be questioned in the light of the theories on "catastrophic selection" in peripheral populations as a primary source of speciation (Lewis, 1962). This is particularly true of such discussions as that below on the probability of the derivation of Cerastium vulcanicum from a C. brachypodum-like form since C. vulcanicum is found on the periphery of the geographic range of C. brachypodum. However, the peripheral populations discussed by Lewis are ecologically peripheral. There is a tendency to view the geographic periphery of a species as the only such source of further speciation but it seems to me that the geographic periphery is in this respect only a large and conspicuous ecological periphery and that, in the mountainous situations in which Cerastium is found in Mexico and Central America, altitudinal and other ecological factors are equally if

not more important in determining "peripheral" areas. Therefore, as in the case mentioned above, a species (in this case C. vulcanicum) might be more likely to develop from the ecological periphery of a sympatric species (a C. nutans precursor) than from the geographic periphery of another (a C. brachypodum precursor).

Cerastium sordidum Group

This group probably originated in northwestern Mexico as there are no species referable to it farther north. From whence it came is highly conjectural but it has more characters in common with the Cerastium nutans group than with the C. arvense group. Chromosome counts would be very useful to aid in this discussion but material is unavailable.

Within the group itself, Cerastium sordidum has more generalized characters than C. texanum or C. sinaloense (see Tables 1 and 2). Because the range of C. sordidum overlaps that of C. texanum and comes fairly close to that of C. sinaloense, it is likely that C. sordidum or some similar and no longer extant form was ancestral to both of these species.

Cerastium arvense Group

Cerastium orithales and C. ramigerum bear considerable resemblance to C. arvense, a common and diverse species probably not occurring south of the southern

TABLE 1. Generalized vs. advanced characters in the Cerastium sordidum group.

Generalized	Advanced
1. Plant not thin stemmed and matted	1. Plant thin stemmed and matted
2. Plant remaining green	2. Leaves, sepals, etc. soon becoming light orange-brown
3. Flowers few per cyme	3. Flowers many per cyme
4. Flowers intermediate in size (petals 5.0-8.0 mm long)	4. Flowers either large or small (petals less than 5.0 mm or greater than 8.0 mm long)
5. Pedicels greater than 10.0 mm long	5. Pedicels less than 10.0 mm long
6. Petals usually only slightly exserted beyond the calyx	6. Petals well exserted
7. Capsules well exserted beyond the calyx	7. Capsules not much exserted

TABLE 2. Tabulation of generalized and advanced states for the Cerastium sordidum group assigning a value of 0 to generalized states and 1 to advanced states. A value of 0.5 is intermediate.

Species	Character							Summary
	1	2	3	4	5	6	7	
Cerastium sinaloense	0	0	1	1	0	1	0	3.0
Cerastium sordidum	0	0	0.5	0	0	0	0	0.5
Cerastium texanum	1	1	1	1	0.5	0	1	5.5

United States. All three species bear few flowers per cyme, have subreflexed hairs, are perennial and have a chromosome number of 2n = 36 (C. arvense has also been recorded as having chromosome numbers of 2n = 38 and 72).

Since the two Mexican species in this group are essentially geographically sympatric and far removed from the range of their probable ancestor, C. arvense, it is probable that one has derived from the other or at least that one more closely approaches the common ancestor of both. Cerastium arvense is a plant of open meadows, including subalpine but usually not alpine meadows. Cerastium ramigerum is also a plant of open areas, although in its case these are almost exclusively alpine meadows. Cerastium orithales is a species of pine woodlands. Cerastium arvense has quite large petals as does C. orithales but not C. ramigerum. The capsule and pedicel lengths in C. arvense are also more closely approached by C. orithales than by C. ramigerum. Cerastium arvense also bears some characters not found in either C. orithales or C. ramigerum, the most prominent of which are scarious margined bracts and axillary fascicles of short sterile shoots.

In general, except for the habitat differences, Cerastium orithales has more of the characters of C. arvense than does C. ramigerum, and it therefore is probably the one more closely approaching an ancestral

species which, in turn, was derived from a C. arvense precursor.

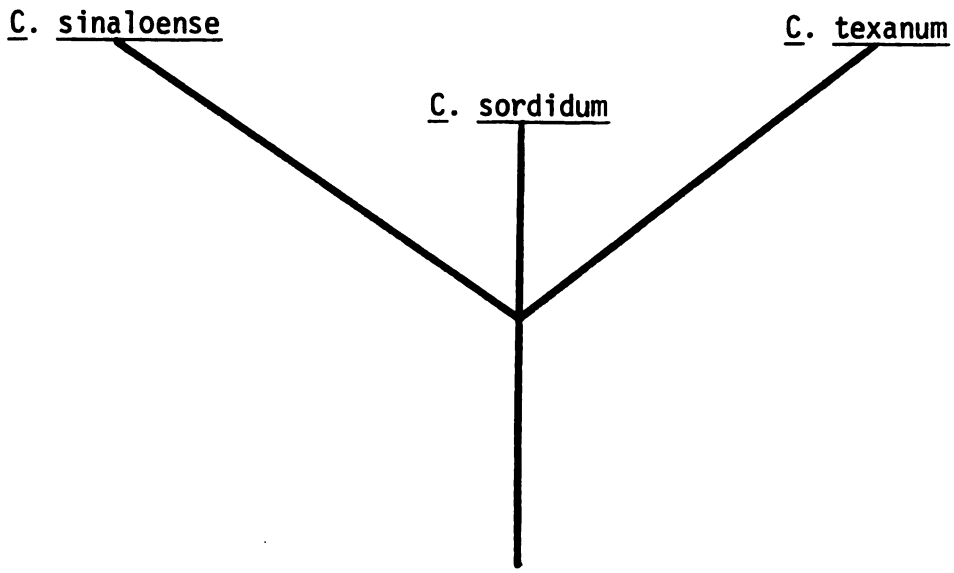
Figure 1 summaries the probable phylogenetic relationships in the Cerastium arvense and C. sordidum groups.

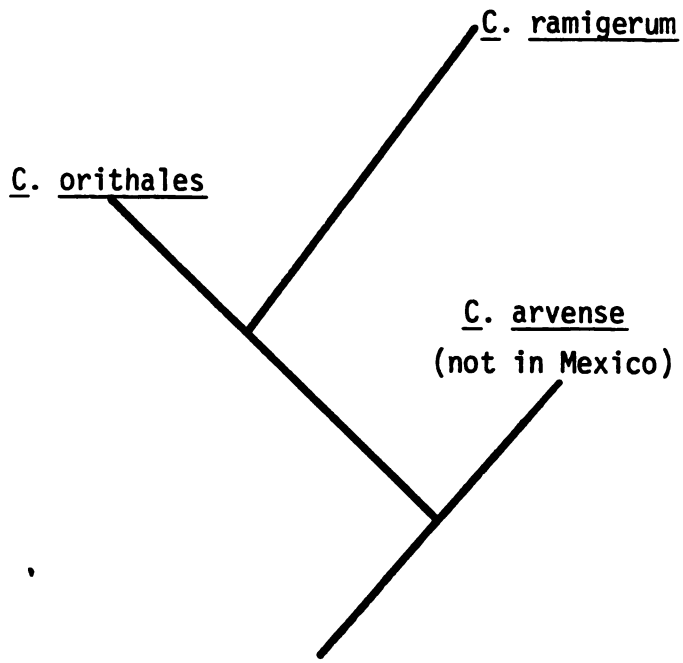
Cerastium nutans Group

In order to better understand the interspecific relationships within the group, the numerical method proposed by Whiffen and Bierner (1972) for producing a Wagner tree was used. This method consists of the following ten steps (quoted directly):

1. List all characters to be used, with their two states.
2. Arbitrarily designate one state as 0 and the alternate state as 1; intermediate states may be designated as 0.5 if desired.
3. Draw up a table of designated states of each character for each taxon. Taxa showing both states of a given character may be given the designation 0.5 for that character, if desired.
4. Estimate the differences between taxon and all others in turn as the sume over all characters of the absolute values of the differences between the states of a given character for the two given taxa. Put more simply, this is, in fact, the number of characters for which the two taxa exhibit different states.
5. Draw up a table of the differences between taxa as found in step 4.
6. Designate one taxon as the most primitive (ancestral).
7. From the table in 5, list the taxa of the absolute difference from the taxon found in 6, starting with the least, and ending with the most, different.

Figure 1. Probable phylogenetic relationships within the *Cerastium sordidum* and *C. arvense* groups.


C. sinaloense
C. texanum
C. sordidum


C. ramigerum
C. orithales
C. arvense
(not in Mexico)

8. Take the first taxon from the list in 7, and add it to the forming tree above the taxon found in 6, and connect the two with a line. Lines joining two taxa will be referred to as the pathway between these taxa.
9. Take the next taxon from 7 and, using the table from 5, find which of the taxa already in the tree is most similar (least different), and connect the former by a new pathway immediately below the taxon already in the tree. If in the first part of this step, two taxa have the same absolute difference from a taxon found in 6, place first the one which is most closely related to any one of the taxa already in the tree.
10. For as long as there are taxa available from 7, repeat step 9.

Tables 3, 4 and 5 are those mentioned in steps 3, 4 and 5, respectively, as applied to the Cerastium nutans group. Although it is not a prerequisite of the Whiffen-Bierner method, the characters in Table 3 have been listed with respect to their probable generalized or advanced states.

In constructing a tree using this method and the data in the three tables, one comes up with the phylogeny in Figure 2. However, a phylogeny which better matches the general impression I have for the relationships within the group on the basis of morphological characters is shown in Figure 3. This figure was arrived at by excluding the possibility of pathways in Figure 2 between species separated by large geographic distances. Only two points are at variance with my impressions. The figure shows Cerastium cuchumatanense, an annual, small petaled

TABLE 3. Generalized vs. advanced characters in the *Cerastium nutans* group.

	Generalized		Advanced
1.	Plants annual	1.	Plants perennial
2.	Branching throughout	2.	Branching only at the base
3.	Lanate pubescence absent	3.	Lanate pubescence present
4.	Glandular pubescence present	4.	Glandular pubescence absent
5.	Basal rosette absent	5.	Basal rosette present
6.	Leaves shorter than the internodes	6.	Leaves longer than the internodes
7.	Cauline leaves varying in length (largest below)	7.	Leaves ± similar throughout
8.	Leaves acute	8.	Leaves acuminate
9.	Flowers many per cyme	9.	Flowers few per cyme
10.	Pedicels greater than 10.0 mm long	10.	Pedicels less than 10.0 mm long
11.	Flowers not particularly large (petals less than 8 mm long)	11.	Flowers very large (petals more than 9 mm long)
12.	Capsules well exserted beyond the the calyx	12.	Capsules not well exserted

TABLE 4. Tabulation of generalized and advanced states for the Cerastium nutans group assigning a value of 0 to generalized states and 1 to advanced states. A value of 0.5 is intermediate.

Species	Character												Summary
	1	2	3	4	5	6	7	8	9	10	11	12	
Cerastium barberi	1	1	0	1	0	0	1	0	1	0	0	0	5.0
Cerastium brachypodum	0	0	0	0	0	0	1	0	0.5	1	0	0	2.5
Cerastium cuchumatanense	0	1	0	0	0	0.5	1	0	1	1	0	1	5.5
Cerastium guatemalense	1	0	0	0	0	0	1	1	0.5	0	0	0	3.5
Cerastium juniperorum	1	1	0	0	0	0	1	0	1	0	1	0	5.0
Cerastium madrense	1	1	1	0	1	0	0	0	0.5	0	1	0	5.5
Cerastium nutans	0	0	0	0	0	0	0	0.5	0.5	0	0.5	0	1.5
Cerastium purpusii	1	1	1	1	1	1	1	0	1	1	1	0.5	10.5
Cerastium tolucense	1	1	1	0.5	1	0	1	0	0.5	0	1	0	7.0
Cerastium vulcanicum	1	0	1	0	0.5	0	1	0	0.5	0	0	0	4.0

TABLE 5. Computed differences between the species in the *Cerastium nutans* group [see step 4 of the Whiffen and Bierner (1972) method, Phylogeny section].

Species	Species									
	1	2	3	4	5	6	7	8	9	10
1. *Cerastium barberi*	0	4.5	4.5	3.5	2.0	5.5	5.5	5.5	4.0	4.0
2. *Cerastium brachypodum*		0	3.0	3.0	4.5	6.5	6.0	6.0	7.5	6.5
3. *Cerastium cuchumatanense*			0	6.0	4.5	6.5	6.0	6.0	7.5	6.5
4. *Cerastium guatemalense*				0	3.5	6.0	3.0	9.0	5.5	2.5
5. *Cerastium juniperorum*					0	3.5	4.5	4.4	3.0	4.0
6. *Cerastium madrense*						0	5.0	5.0	1.5	3.5
7. *Cerastium nutans*							0	10.0	6.5	4.5
8. *Cerastium purpusii*								0	3.5	6.5
9. *Cerastium tolucense*									0	3.0
10. *Cerastium vulcanicum*										0

Figure 2. Wagner tree resulting from the unmodified use of the Whiffen and Bierner (1972) method. Cerastium nutans group.

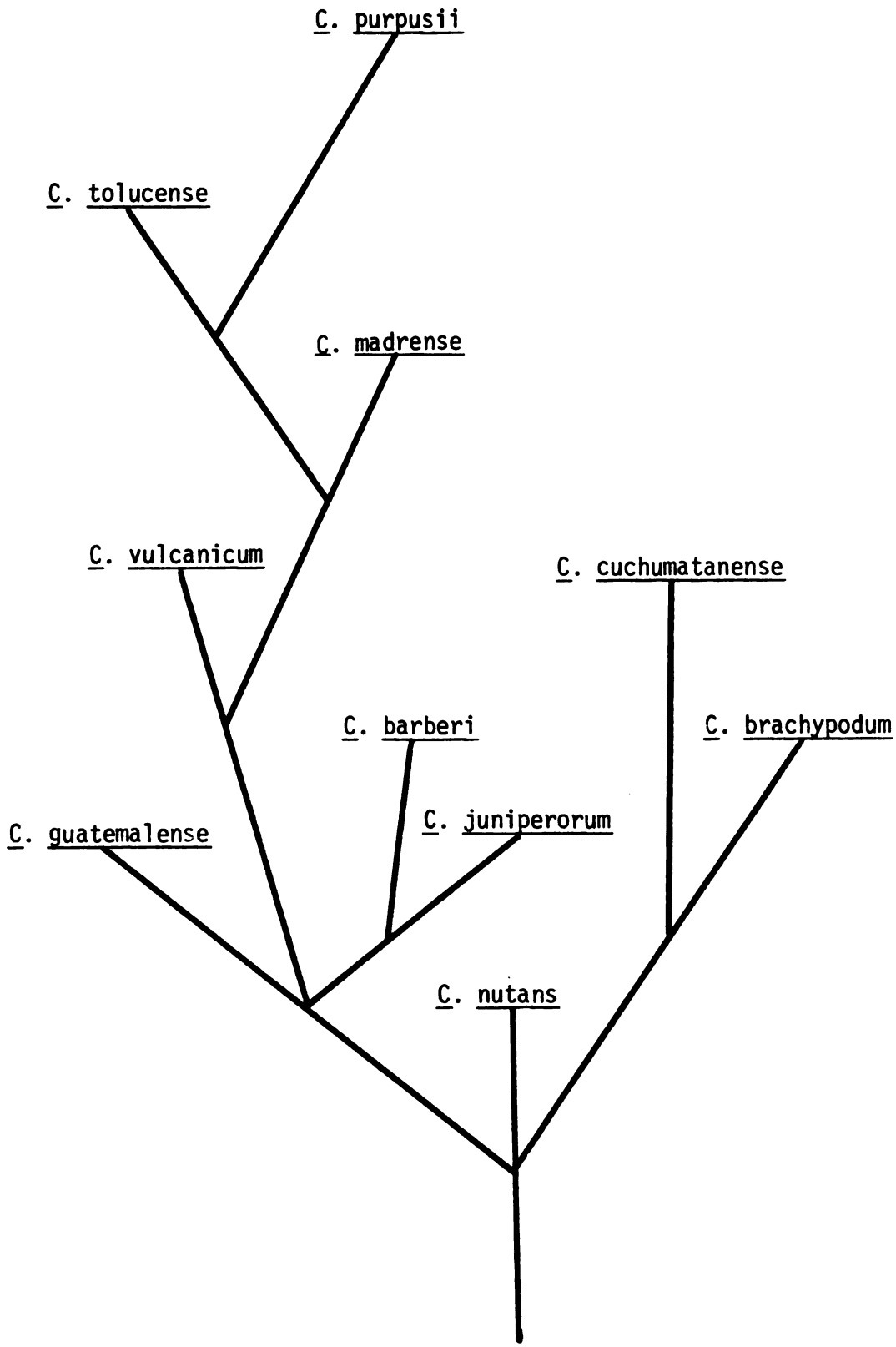
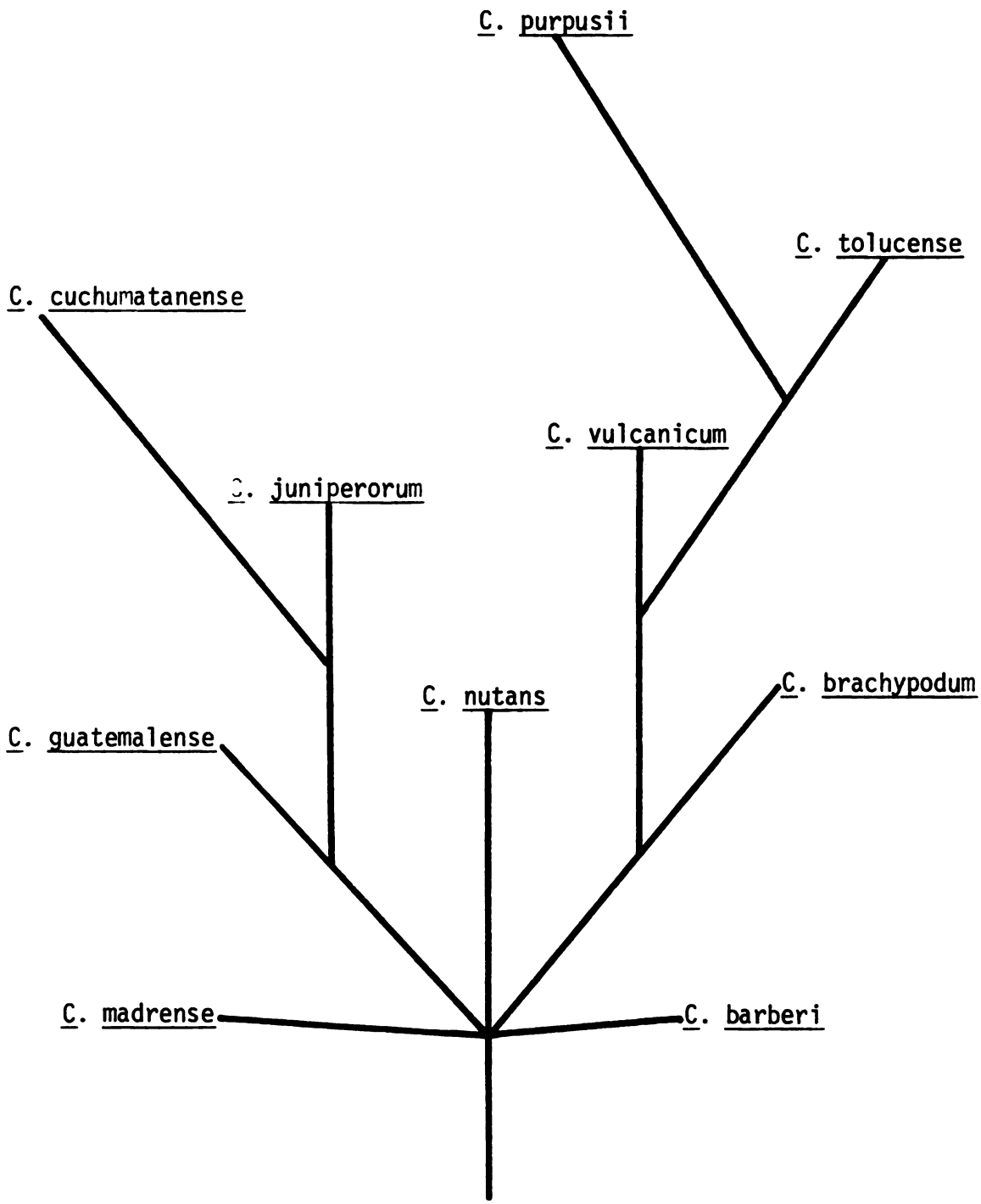

C. purpusii
C. tolucense
C. madrense
C. vulcanicum
C. cuchumatanense
C. barberi
C. brachypodum
C. juniperorum
C. guatemalense
C. nutans

Figure 3. Wagner tree resulting when the Whiffen and Bierner (1972) method is modified by cancelling all pathways between non-sympatric species. Cerastium nutans group.


C. purpusii
C. tolucense
C. cuchumatanense
C. vulcanicum
C. juniperorum
C. nutans
C. brachypodum
C. guatemalense
C. madrense
C. barberi

species as arising from something akin to C. juniperorum, a perennial with very large petals. One would surmise that it is more likely that C. cuchumatanense arose from C. nutans-like plant because it more closely approaches C. nutans in these characters. However, it may be that there is some truth in the relationship between C. juniperorum and C. cuchumatanense since, while both C. nutans and C. juniperorum are found in western Guatemala as is C. cuchumatanense, C. cuchumatanense and C. juniperorum are both fairly much restricted to the Sierra de los Cuchumatanes, an area in which C. nutans has never been collected. It is also true, however, that, although C. nutans has never been collected in the Sierra de los Cuchumatanes, it, or its ancestor, may in fact occur there or have occurred there in the past.

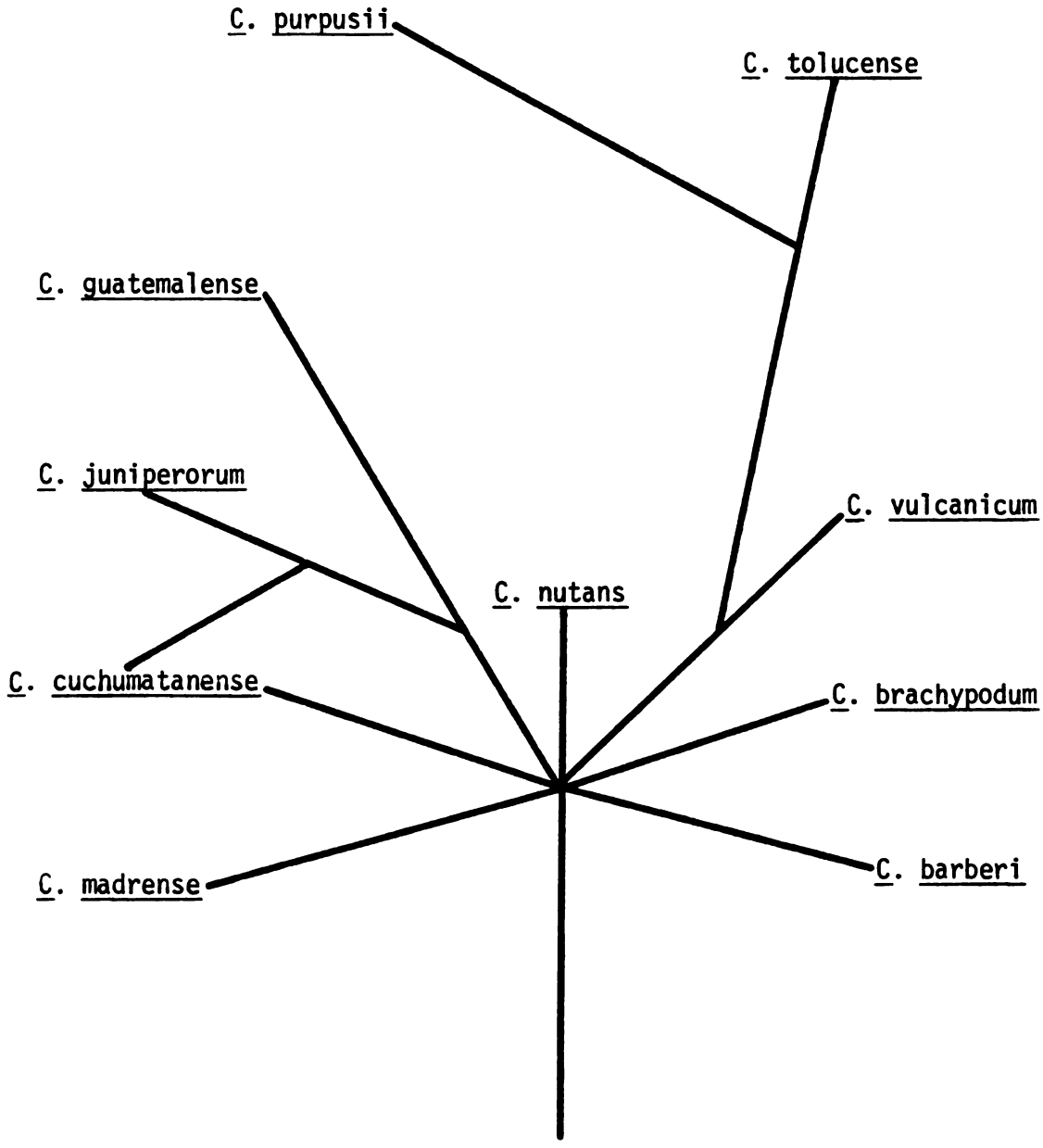
The other variance from the "gestalt" phylogeny is the relationship shown in Figure 3 between Cerastium brachypodum and C. vulcanicum showing the former as being ancestral to the latter. It seems to me that, if a C. nutans precursor is indeed ancetral to all of the other species in the C. nutans group, it is more likely to be ancestral to C. vulcanicum than is C. brachypodum. However, there is too little evidence one way or the other.

Taking these two conclusions into account, the most likely phylogeny for the Mexican and Central American

species of the Cerastium nutans group is given in Figure 4. In this figure it can be seen that the C. nutans group diverges from a C. nutans precursor in five (possibly six) directions, three (possibly four) of which have resulted in a single species. Cerastium barberi has diverged through the development of a perennial habit, the loss of virtually all pubescence, the reduction of flower number per cyme and a reduction in branching. Cerastium brachypodum differs from C. nutans almost exclusively in flower size and pedicel length, both of which are smaller in C. brachypodum. Cerastium madrense is the result of the gaining of a perennial habit and the formation of a basal rosette accompanying that gain, the formation of lanate pubescence on the rosette and lower stem and the loss of branching except at the base.

The other two directions of divergence have been toward Cerastium guatemalense and C. juniperorum and toward C. vulcanicum, C. tolucense and C. purpusii. In Guatemala, C. guatemalense diverged from a fairly small flowered C. nutans-like ancestor by developing a perennial habit and long, narrow, acuminate leaves, losing its variation in leaf size on any given plant and developing fewer flowers per cyme. From some stage in the development of this species, C. juniperorum diverged primarily by developing very large flowers. It bears all of the characters separating C. guatemalense from

Figure 4. Most probable phylogenic relationships within the Cerastium nutans group.


C. purpusii
C. tolucense
C. guatemalense
C. juniperorum
C. vulcanicum
C. nutans
C. cuchumatanense
C. brachypodum
C. madrense
C. barberi

C. nutans except the acuminate leaves. It is possible that C. cuchumatanense was derived from some C. juniperorum-like plant (see above).

The trends occurring in the Cerastium vulcanicum-C. tolucense-C. purpusii line among the volcanoes of central Mexico lead mostly to the development of perennial caespitose habit and lanate pubescence and the loss of glandular pubescence. First of all, C. vulcanicum separated from a nutans-like plant through the general reduction in size and the production of lanate pubescence. Flower size was reduced but glandular pubescence was retained. From somewhere along this line, after the development of lanate pubescence but probably before the reduction of flower size, C. tolucense developed. It has fairly large flowers and is intermediate in the degree of glandular pubescence, that character being sometimes present and sometimes not. The latest stage in this line is C. purpusii which has become very caepitose and lanate and has lost completely any vestige of glandular pubescence. It is certainly derived from some plant very similar to C. tolucense.

Although the scope of this work, being limited to the Mexican and Central American species of Cerastium, is too narrow to allow for comments on my part on the naturalness of the system of subgenera and sections in use since 1824 (de Candolle, 1824) some mention of it seems to be in

order. Pax and Hoffmann (1934) describe the system well. They divide the genus into two subgenera, Dichodon and Eucerastium (= Cerastium). Dichodon is characterized by three (rarely four or five) styles and capsules with upright, sometimes rolled teeth. Cerastium is described as having five styles. Cerastium is then divided into the sections Orthodon with elongate, straight or recurved capsule teeth and Strephodon with elongate teeth which are never recurved but are always spirally rolled up. Brett (1952) states that the section Orthodon usually has $2n = 36$ while Strephodon has $2n = 38$.

The Mexican and Central American species, all having five styles, are obviously in the subgenus Cerastium. While Pax and Hoffman list Cerastium arvense (and therefore presumably C. orithales and C. ramigerum though they are not themselves mentioned in that work) in the section Orthodon, they make no mention of any other native species treated in this paper. Robinson (1894), however, lists C. nutans and C. brachypodum as also being in section Orthodon and he treated C. texanum as being in the section Strephodon. If the latter assignment is correct, C. sinaloense and C. sordidum would also be in that section. However, the presence of revolute capsule teeth in these three species casts some doubt on their being placed in section Strephodon since Pax and Hoffmann state that its members never have revolute teeth. Cerastium

glomeratum and C. triviale, the introduced species, are treated as being in the section Orthodon.

PHYTOGEOGRAPHY

Cerastium, at least in North America, is essentially a plant of cool temperate to boreal regions and can apparently survive in the tropics only at higher elevations. It is fairly certain that the genus, which probably originated in Eurasia, entered Latin America from the north probably along the Sierra Madre Occidental. In Mexico and Central America it has had three major areas of diversification; one in the Sierra Madre Occidental of northwestern Mexico and the adjacent United States where such species as C. barberi, C. madrense, C. sinaloense, C. sordidum and C. texanum probably originated, another in the Trans-Mexican Volcanic Belt (Clausen, 1959) where C. orithales, C. purpusii, C. ramigerum, C. tolucense and and C. vulcanicum presumably arose and the last in western Guatemala with the probable origins of C. cuchumatanense, C. guatemalense and C. juniperorum.

It is interesting to note that, excluding for the moment one anomalous specimen of Cerastium guatemalense from Costa Rica, there is a gap of several hundred kilometers between Guatemala (the southernmost limit of native Cerastium in Central America), and the northern

Andes where the genus again becomes quite common as it is throughout much of that mountain range. Not only is this visible at the generic level, it is also true that while C. arvense is found north of Mexico and two species allied with it (C. orthales and C. ramigerum) are found in the vicinity of Mexico City, there are also species related to it and often even listed as conspecific with it in South America, at least 2700 km from Mexico City and 3300 km from the nearest location for C. arvense itself in the southern United States. Long distance dispersal is the only likely reason for the disjunct distribution of this group.

The probable reason for the paucity of native Cerastium species in most of Central America is the scarcity of high mountains in that region. When C. nutans or its precursor (let us here call it C. nutans for the sake of brevity, understanding that it may not have been C. nutans as it exists today) moved southward through the uplands of central Mexico, it did so at the moderate elevations (mostly 2000-3000 m) to which it was adapted and which were common there. When it eventually reached the Trans-Mexican Volcanic Belt, a region of very high volcanic peaks primarily in Michoacan, México, Distrito Federal, Puebla and Veracruz, it was able to radiate in the alpine areas there into the present species of C. vulcanicum, C. tolucense and C. purpusii. Still

further southward the altitudes diminished again until the relatively low Isthmus of Tehuantepec was reached. Only C. nutans was able to jump over this gap.

Once over the Isthmus of Tehuantepec, Cerastium nutans again came to high altitude areas among the volcanoes and other mountain ranges of Chiapas and Guatemala. These areas were unoccupied by species of Cerastium since the alpine species of central Mexico had been effectively stopped by the Isthmus and C. nutans was again able to radiate into the high mountain species C. guatemalense, C. juniperorum and C. cuchumatanense.

To the south of Guatemala the area of sufficient elevation for native Cerastium species rapidly decreases. In Honduras the highest areas (the only ones over 2500 m, essentially the lowest for the Guatemalan high mountain species) are in the Cordillera de Merendón, only about 15 km from the Guatemalan border. The mountains exceeding even 2000 m (almost the lowest elevation for C. nutans) are very sporadic in Honduras. The areas over 2000 m in Nicaragua, the next country along the line are even fewer being limited to the Cordillera de Dipilto and the Cordillera de Jalapa on the Honduras border. It is not surprising therefore that none of the C. nutans derivatives ranged any further south than Guatemala.

The Cordillera Central and Cordillera de Talamanca, extending from the southern end of Lake Nicaragua in

Costa Rica to western Panama, are, however, high enough in some areas to sustain any of these Cerastium nutans group species assuming all other factors are equal. These mountains are for the most part over 2000 m high and frequently extend up to well over 3000 m (Cerro Convenco, 3452 m; Volcán Irazú, 3452 m; Volcán de Turrialba, 3421 m; Cerro Cuerici, 3540 m; Cerro Chirripó Grande, 3837 m; Cerro Durika, 3296 m; Cruz del Obispo, 3099 m; Pico Blanco, 3565 m; Cerro Pando, 3162 m; Volcán de Chiriquí, 3374 m). But the C. nutans group (with the possible exception of C. guatemalense, a collection of which is labelled as having been collected along the upper Rio Talari, San José Province (Burger & Gomez 8216) does not occur in these mountains. The reason for the failure of the group to have invaded these cordilleras is probably, although not necessarily, the lack of areas of sufficient altitude in the 750 km between Guatemala and Costa Rica already alluded to. Some other factor (temperature, rainfall, etc.) may also have had some effect. These cordilleras do, however, make up a major part of the ranges of the two introduced species of Cerastium, C. glomeratum and C. triviale.

Between Volcán de Chiriquí, in western Panama at the end of the Cordillera de Talamanca, and the Colombian border the elevations drop off even more until only scattered low mountain ranges are left. These do not

support even the introduced species. Although the genus has also been able to disperse to South America (presumably from North America) and has become highly speciated in the Andes, the founder populations in that area apparently were from a source other than the Cerastium nutans group.

A discussion of any group of plants found at very high elevation would not be complete without some mention of the effects of glaciation. White (1962) examined the glacial sequence on Ixtaccihautl and found evidence of three major advances of the ice sheets on that mountain; one during the Tomicoxco substage (early Wisconsin) resulting in the Nexcualango Till, one during the Diamantes substage (mid to late Wisconsin) resulting in the Hueyatlaco Till and one pre-Wisconsin advance. Only during the pre-Wisconsin advance, which deposited glacial till as low as 2450 m, would the climate have had sufficient effect on the vegetation to allow for the presence of alpine Cerastium species between some of the mountains that they now inhabit. The other two glacial advances probably would not have had this effect (the Nexcualango Till reaches down to about 3000 m and the Hueyatlaco Till to a minimul altitude of about 3000 m but usually not lower than 3400-3500 m).

CHROMOSOME NUMBERS

Chromosome numbers published for species of *Cerastium* (Bolkhoviskikh, *et al.*, 1969; Löve, 1972, 1975a, 1975b, 1978; Moore, 1970, 1971, 1977) range from $2n = 34$ to $2n = 180$. By far the greatest number of these are multiples of $n = 18$ ($2n = 36$, 54, 72, 90, 108, 126, 144, 162 and 180). Brett (1952), on the basis of a cytological study of *C. semidecandrum* in $2n = 36$, stated that because of the presence of four nucleolar organizing chromosomes $2n = 36$ is probably tetraploid although $2n = 18$ species are not known. She therefore came to the conclusion that, for these species (those in the section *Orthodon*), the basic chromosome number is probably $x = 9$. She also mentioned that the species in the section *Strephodon* are mostly $2n = 38$ or multiples thereof and stated that the basic number for these is probably $x = 19$. She made no mention of any $2n = 34$ species.

The Mexican and Central American species of *Cerastium* for which counts have been made are listed following the individual species descriptions. Looking at these counts, it can be seen that the native species can be readily separated into two groups, those with $2n = 34$ and those

with 2n = 36. These groups on morphological grounds fit nicely into the above mentioned Cerastium nutans and C. groups respectively. Some question arises about the position of C. nutans in this scheme since Söllner (1952, 1954) listed the chromosome number as 2n = 35-36. However, it seems possible that Söllner was incorrect because C. nutans seems to fit so well with the other species in the C. nutans group and because Beaman et al. (1962) listed a count of 2n = 34 for a Cerastium sp. which is indeed C. nutans. It is also true, however, that Söllner did not use Mexican and Central American material for his count and it is possible that he was correct for the Canadian material he used.

The chromosome number for Cerastium arvense, not listed elsewhere in this paper because it is not itself found in Mexico or Central America has been variously listed as 2n = 36, 38 or 72 (Blackburn and Morton, 1957; Brett, 1952, 1955; Favarger, 1969; Favarger and Küpfer, 1968; Küpfer, 1969, 1974; Löve, 1972, 1975a, 1975b, 1978; Rohweder, 1937; Söllner, 1950, 1952; Taylor and Mulligan, 1968 and Ugborogho, 1973).

Beaman et al. (1962) published the only known chromosome counts for several of the Mexican and Central American species of Cerastium. After study of the voucher specimens for these counts, it has become apparent that some revisions of determinations are in order. Beaman

3745 and Beaman 3896, recorded as C. brachypodum, are specimens of what is now recognized as C. cuchumatanense. Beaman 3436 and Beaman 3508, reported as C. orithales, are C. ramigerum. Beaman 3711, listed as Cerastium sp., is C. nutans.

POLLINATION

Little opportunity presented itself during the preparation of this paper for the study of the pollination mechanisms in Mexican and Central American species of Cerastium. Even though a field collecting trip was undertaken in the summer of 1978, no definite pollinators were observed and therefore the only recourse is in speculation.

Looking at the general trend toward increase in petal size in the Cerastium nutans group (excepting C. brachypodum and C. vulcanicum), assuming that C. nutans is indeed the basal species, one would tend to think that these plants are either developing outcrossing (if their ancestors had been predominantly self-fertilizing) or evolving to attract new sorts of pollinators which are attracted to larger petals (if the ancestors had themselves been outcrossing). Since the pollen-ovule ratio in C. nutans is fairly low (about 250) the former possibility seems the more likely because low pollen-ovule ratios are usually an indication of self-fertilization, in this case probably facultative autogamy (Cruden, 1977). Although no accurate counts for the other species were

made, quick estimates suggest that, while no species had a high enough ratio to indicate strict xenogamy (on the order of 5000-7000 according to Cruden), the large flowered species tended to have somewhat higher ratios than did C. nutans. Therefore is the assumptions already stated regarding primitive and advanced species are correct the general trend at least in the C. nutans group seems to be the relatively rare one from self-fertilization to at least facultative cross-fertilization; the development of larger petals is probably an inducement to insect pollinators. However, as this trend is extremely rare, these circumstances might be taken as an indication of the advanced rather than the primitive nature of C. nutans.

What the pollinators are is unknown. The flowers are not brightly colored as are most bird, butterfly and bee pollinated flowers and they are clearly not adapted to wind pollination. I would say that the probable pollinators for those species which are not self-fertilizing are small flies or wasps, some of which I have seen in the vicinity of Cerastium plants, though never on the plants themselves.

DISPERSAL

The actual dispersal mechanism for the seeds of Cerastium was not discovered during the course of this study. It is clear, however, that, at least in the cases of the species found only in the alpine regions of various mountains separated by large distances, the mechanism must be one that has been capable of moving the seeds over those distances. This would essentially rule out all but wind and bird dispersal.

The small size of Cerastium seeds makes bird dispersal unlikely though not impossible; the seeds are too small to be of interest to most birds. I have never seen a bird, or any other animal, using Cerastium seeds at a food source. The seeds have no bristles or hooks and are not sticky, so external attachment to birds is likewise improbable. This leaves wind as the probable mechanism for the dispersal of these seeds, as is also indicated by the fact that larger distances have been traversed between mountains when the species was dispersing from east to west (with the prevailing winds) than in the opposite direction. An example of this is C. tolucense which has been able to spread from Nevado de Toluca in

México westward all the way to Cerro Tancitaro in western Michoacan (about 280 km) but has been unable to makde the jump from Ixtaccihuatl-Popocatepetl eastward to Pico de Orizaba (150 km) or even Malinche (80 km).

The breeding system apparently occurring in the Mexican and Central American species of Cerastium also enhances their chances of long-distance dispersal. Baker (1955) stated that "with self compatible individuals a single propagule is sufficient to start a sexually reproducing colony, making its establishment much more likely than if the chance growth of two self-incompatible yet cross-compatible individuals sufficiently close together spatially and temporally is required." From the pollen/ovule ratio information it seems that the Mexican and Central American species are either primarily self-pollinating or at least self-compatible even if predominantly outcrossing and therefore, along with the assumption that they are wind dispersed, they are prime candidates for long-distance dispersal.

The idea stated above about the wind dispersal of these plants may be appropriate for those species found in alpine and subalpine areas where there are often strong winds blowing, e.g. Cerastium cuchumatanense, C. purpusii and C. ramigerum, but what of the forest species? Even though they inhabit forest situations and are therefore supposedly protected from the wind to some extent, many

of these have also been able to make large jumps between mountains. For the reasons given above, I can still see no likely major dispersal mechanism other than wind. The long-range dispersal of some of these forest species such as C. nutans and C. brachypodum can be explained by the wide range of habitats and elevations acceptable to them; they are able to spread widely by shorter jumps or even by virtually continuous dispersal through the slightly lower elevations between mountains. Cerastium nutans and C. brachypodum as well as C. guatemalense, C. tolucense and C. vulcanicum, might also have been able to spread because of the fact that their habitats include meadows above timberline, where strong winds blow, as well as woodlands below timbeline.

It is interesting to note that the two strictly forest species, Cerastium juniperorum and C. orithales have, on the average, larger seeds than do the species of high open areas C. ramigerum and C. cuchumatanense. Perhaps some form of animal dispersal comes into play with these species (C. juniperorum, however, is limited to the Sierra de los Cuchumatanes of Guatemala and has apparently not undergone any long distance dispersal).

The discussion of the dispersal of Cerastium seeds by a single agent is undoubtedly somewhat artificial. The true mechanism probably includes several agents, any one of which might serve to a greater or lesser extent, to

move seeds from one place to another.

SPECIMENS EXAMINED

This study is based primarily on an examination of approximately 1200 specimens from the following herbaria (abbreviations given are those listed in Holmgren and Keuken, 1974): California Academy of Sciences (CAS), University of Colorado (COLO), Dudley Herbarium of Stanford University (DS), Escuel Nacional de Ciencias Biológicas (ENCB), Field Museum of Natural History (F), Gray Herbarium (GH), Lundell Herbarium (LL), University of Michigan (MICH), Missouri Botanical Garden (MO), Michigan State University (MSC), New York Botanical Garden (NY), University of Texas (TEX), University of California, Berkeley (UC), United States National Herbarium (US) and University of Wisconsin (WIS).

These specimens were first grouped into distinct sets according to gross morphological similarities and with as little reference to previous identifications as possible. In some cases, particularly in the set of specimens here referred to as Cerastium nutans, considerable variation existed within a group. However, such a group was always held together by the presence of intermediate specimens. Most of these sets of specimens corresponded well to a

previously described species and these species were retained. In two cases (C. cuchumatanense and C. sinaloense), however, this was not true and further study was undertaken. In each of these two cases the number of specimens was small enough to allow for substantial numbers of measurements which were made on all of the specimens involved and t-tests were run on various characters to see whether the groups in question were significantly different in these characters from the previously described species which they most closely resembled. In both cases these tests seemed to warrant the description of new species.

A third species (Cerastium tolucense) described as new in this study had been previously recognized by various authors and collectors, but because of nomenclatural confusion had never been validly described.

After the species delimitations were determined, species descriptions were prepared without significant reference to previous descriptions. In many cases the number of specimens of a given species was too great to make measurements (e.g. of leaf length) feasible on all. In such cases the specimens were examined to determine the largest and smallest measurements for the character in question so that a range could be determined. Because certain character measurements (e.g. seed diameter, for which the seeds had to be removed from the capsules) would

have resulted in considerable damage to the specimens, only a small number of measurements were made in these cases. After the descriptions were completed, the key to the taxa was prepared. This was also made without substantial reference to previous keys.

All measurements were made using a millimeter rule. Flower parts and pubescence characters were examined under dissecting microscope magnification (7 to 30 X).

TAXONOMIC TREATMENT

Cerastium Linnaneus

Cerastium Linnaeus, Sp. Pl., ed. 1, p. 437. 1753. *Centunculus* Adanson, Fam. 2: 256. 1763. *Prevotia* Adanson, Fam. 2: 256. 1763. *Moenchia* Ehrhart, Beitr. 2: 177. *Quaternella* Ehrhart, Betr. 4: 149. 1789. *Doerriena* Borkhausen *in* Rhein, Magaz. 2: 528. 1793. *Myosotis* Tournefort *ex* Moench, Meth., p. 224. 1794. *Esmarchia* Reichenbach, Fl. Germ. Excurs., p. 793. 1832. *Dufourea* Grenier, Act. Soc. Linn. Bord., p. 25. 1837. *Doerriera* Steudel, Nom., ed. 2, 1: 522. 1840. *Prevoita* Steudel, Nom., ed. 2, 2: 394. 1840. *Dichodon* Bartling *ex* Reichenbach, Nom., p. 205. 1841. *Pentaple* Reichenbach, Ic. Fl. Germ. 37: 227. 1841. *Leucodonium* Opiz, Seznam, p. 59. 1852. (Synonymy according to Jackson, 1895 and Pax and Hoffmann, 1934.)

Plant herbaceous, low and caespitose to fairly tall and erect, often ascending. Annual or perennial. Stems almost always pubescent, either glandular or not. Leaves variously linear to elliptic or sptaulate, opposite, exstipulate, entire, acuminate, acute or obtuse, variously

pubescent, usually without a petiole. Basal rosette present or lacking. Cauline leaves few to many, usually shorter than the basal leaves when the latter are present. Inflorescence invariably a cyme, either compact or loose. Flowers various in size, from very small (sepals 2.5 mm long) to larger (sepals over 8.0 mm long). Petals shorter than to more than twice the length of the sepals. Sepals 5, rarely 4, lanceolate to elliptic, acute, scarious margined, usually pubescent. Petals 5, rarely 4 or absent, usually white, variously bifid. Stamens 10, rarely 5 or 4, shorter than the petals. Carpels 5, rarely 4 or 3, ovary superior. Styles 5, rarely 4 or 3, opposite the sepals. Capsules usually well exserted beyond the calyx at maturity, opening apically by twice as many teeth as there were styles. Seeds many, small (0.3-1.2 mm in diameter), variously tuberculate.

In Mexico and Central America only the most frequent numbers of flower parts are found, i.e., 5 sepals, 5 petals, 10 stamens and 5 styles.

Fifty to 150 species worldwide.

TYPE SPECIES: Cerastium arvense Linnaeus, lectotype of Britton and Brown (1913).

The name Cerastium is derived from the Greek "cerastes" meaning "horned," in reference to the shape of the capsule.

Key to the Species and Varieties of *Cerastium* in Mexico and Central America

1. Capsules straight, teeth revolute; leaves crowded, large and broadly spatulate near the base of the plant (no rosette leaves), few (2-25, usually fewer than 10), lanceolate above
    2. Petals large, 10.0-17.5 mm long, usually greater than 14.0 mm; Pacific side of the Sierra Madre Occidental..... 1. *Cerastium sinaloense*
    2. Petals smaller, not more than 8.0 mm long; Chihuahuan-Sonoran Sierra Madre (also Baja California)
        3. Stems very slender; leaves, sepals, etc. soon turning light orange-brown; cyme 8-25 flowered; flowers small, petals 4.1-5.4 mm long; capsules short, 4.2-6.8 mm long, barely exserted beyond the calyx.. 3. *Cerastium texanum*
        3. Stems not particularly thin; leaves, sepals, etc. remaining green; cyme 3-10 flowered; flowers larger, petals 5.5-7.8 mm long; capsules longer, 8.0-13.4 mm long, well

exserted beyond the calyx.....

2. Cerastium sordidum

1. Capsules curved, teeth not revolute; spatulate lower leaves sometimes present, but these usually rosette leaves — if not, then upper leaves usually not os sparse

    4. At least some lanate pubescence present, usually best seen at the nodes and on the rosette leaves (when present) and lower cauline leaves (this is sometimes hard to see on old specimens of Cerastium vulcanicum)

        5. Sepals, pedicels and usually the upper part of the stem glandular-pilose

            6. Plants regularly branching above the base; basal rosette usually lacking; cyme usually ± many flowered; petals usually less than, equal to or only slightly exceeding the sepals; annual

                7. Plants usually fairly large (over 25 cm tall); internodes longest just below the inflorescence, becoming shorter toward the base; pedicels fairly long, 18.0-30.0 mm long; petals usually equal to or only slightly exceeding the sepals, white; seeds 0.7-1.0 mm in diameter;

northwestern Mexico (Chichuahua, Durango and Sonora) and the southwestern United States.....

12. Cerastium nutans

7. Plants smaller (6-30 cm tall); internodes ± equal throughout; pedicels short, 5.2-15.4 mm long; petals shorter than the sepals (except on Pico de Orizaba and Cofre de Perote and sometimes on Ixtaccihuatl and Popocatepetl), white or more often, pale green; seeds 0.5-0.7 mm in diameter; volcanoes of central Mexico (Distrito Federal, México, Puebla, Tlaxcala and Veracruz; possibly Guatemala).....

15. Cerastium vulcanicum

6. Plants branching usually only at the base; basal rosette almost always present; cyme relatively few (1-13) flowered; petals usually considerably exceeding the sepals; perennial

8. Plants usually fairly large (15-35 cm tall); cauline leaves few (usually 2-3 pairs); pedicels longer, the lower ones 18.0-32.0 mm long; sepals

lanceolate; seeds 0.9-1.3 mm in diameter; Sierra Madre Occidental of Chihuahua and Durango.....

6. Cerastium madrense

8. Plants smaller, usually less than 20 cm tall; cauline leaves more numerous, closer together (though still usually shorter than the internodes); pedicels shorter, though sometimes to 25.0 mm long; sepals elliptic; seeds 0.7-0.9 mm in diameter; volcanoes of central Mexico (Distrito Federal, México, Michoacan and Puebla).....

9. Cerastium tolucense

5. Plants nowhere glandular pubescent

9. Plant low, caespitose; internodes usually shorter than the leaves; cymes dense, flowers crowded at the apex of each fertile branch; pedicels usually shorter, less than 10.0 mm long; capsule broader...

8. Cerastium purpusii

9. Plant not very caespitose; internodes usually longer than the leaves; cymes looser; pedicels usually longer, to 25 mm

long; capsules less broad.....
9. Cerastium tolucense

4. Lanate pubescence lacking

10. Plants glabrous or only very sparsely pilose, hairs on the pedicel subreflexed; western Chihuahua..... 6. Cerastium barberi

10. Plants ± densely pubescent

11. Pedicels short, the lowermost (longest) usually less than 10.0 mm long

12. Glandular hairs few or lacking; flowers usually many, very densely crowded at the apex of each fertile branch; introduced species

12. Bracts scarious margined; flowers larger, sepals usually 4.3-6.3 mm long; capsules longer, 7.0-11.6 mm long, seeds larger, 0.5-0.7 mm in diameter; perennial.....
17. Cerastium triviale

13. Bracts herbaceous; flowers smaller, sepals 2.8-4.5 mm long; capsules shorter, 5.0-9.0 mm long; seeds smaller, 0.3-0.4 mm in diameter; annual.....
16. Cerastium glomeratum

12. Glandular hairs predominant, at least on the sepals and pedicels; flowers not densely crowded, or if crowded, then flowers few; native species
    14. Petals shorter than the sepals
        15. Plant larger, usually over 10.0 cm tall; leaves ± similar throughout; lowermost flower well above the ground.....
7a. Cerastium brachypodum var. brachypodum
        15. Plants smaller, usually less than 10.0 cm tall; lower leaves often ± spatulate; lowermost flower near ground level.....
7b. Cerastium brachypodum var. axillare
    14. Petals longer than the sepals
        16. Leaves often ± erect, close to the stem; pedicels with short, dense, subreflexed hairs; flowers nodding; petals larger, 6.4-10.4 mm long; capsules longer, 7.0-10.7 mm long, well exserted beyond the calyx; perennial; volcanoes of central Mexico

(México, Puebla, Tlaxcala and Veracruz).....

5. Cerastium ramigerum

16. Leaves more spreading; pedicel hairs not reflexed; flowers not nodding; petals shorter, 4.0-7.0 mm long, often barely exserted beyond the calyx; annual; Sierra de los Cuchumatanes, Guatemala.....

8. Cerastium cuchumatanense

11. Pedicels longer, usually more than 10.0 mm long

17. Cymes few (1-8) flowered; flowers large, sepals 5.8-7.6 mm long, petals 9.5-18.5 mm long; capsules longer, 12.0-17.0 mm long

18. Plants very slender, propped up by the surrounding vegetation; pedicels with short, dense, subreflexed hairs; volcanoes of central Mexico (Mexico, Puebla and Veracruz).....

4. Cerastium orithales

18. Plants ± free standing; pedicel hairs not reflexed; Sierra de los

Cuchumatanes, Guatemala.....

10. Cerastium juniperorum

17. Cymes usually many (to 40 but usually somewhat fewer) flowered; flowers smaller, sepals 2.9-6.2 mm long, petals 3.6-10.3 mm long; capsules shorter, 6.0-13.2 mm long

19. Leaves acuminate; leaves ± similar in size throughout; perennial; volcanoes of Guatemala.....

9. Cerastium guatemalense

19. Leaves not acuminate (except in a form found in central Mexico); leaves largest at the base, smaller upward; annual.....

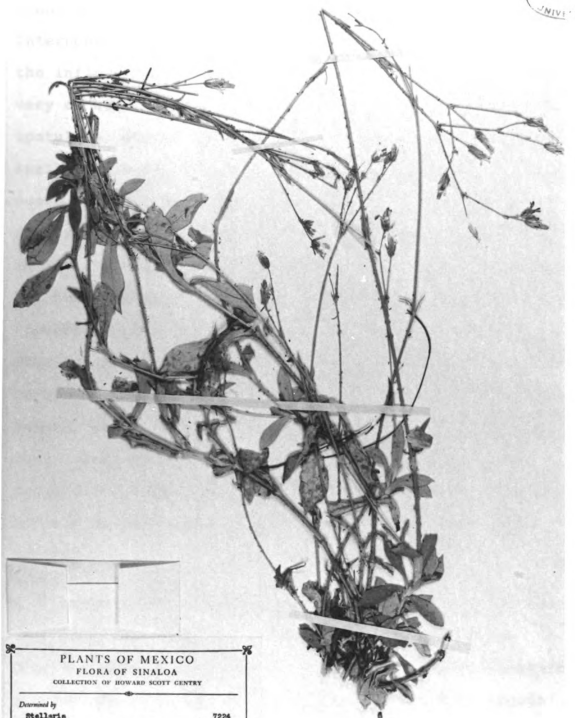
12. Cerastium nutans

1. Cerastium sinaloense D.A. Good, sp. nov.

TYPE: MEXICO: SINALOA: Los Pucheros, Sierra Surotato, alt. 5500-6500 ft, Gentry 7224, 17-24 March 1945 (GH!, holotype; F!, US!. isotypes). (Figure 5)

Planta perennis. Caules usque ad 40 cm alti, basi ramosi. Rami erecti, glandulo-pilosi. Internodia basi brevissima, longissimascentia versus inflorescentiam. Rosula basalis absens sed folia infima aggregatissima, magna, 30.0-65.0 mm longa, 7.2-18.2 mm lata, spathulata, acuta. Felia superiora pauca (1-3 paribus per ramo), parviora, 4.0-28.7 mm longa, 1.2-7.6 mm lata, lanceolata ad ovata, acuta. Omnia folia plus minusve pilosa. Cymae 2-8 floribus, apertae. Pedicelli longi, infimes 15.0-30.0 mm longi, superi 5.0-10.0 mm longi, glandulo-pilosi, non natantes ubi fructificantes. Sepala lanceolata ad late lanceolata, 4.0-7.2 mm longa, 1.1-2.0 mm lata, acuta, practer apicem scario-marginata, glandulo-pilosa. Petala maxima, 10.0-17.5 mm longa, bifida crica 1/8 longitudinis, alba. Filamenta 6.4-7.0 mm longa. Antherae 1.1 mm longae. Styli 4.7-5.5 mm longi. Capsulae 11.2-14.2 mm longae, 2.8-3.3 mm latae, rectae, dentibus recurvatis. Semina 0.5-0.6 mm diametro, tuberculata. Chromosomatum numerus non cognitus.

Figure 5. Holotype of Cerastium sinaloense D. A. Good, sp. nov.



PLANTS OF MEXICO
FLORA OF SINALOA
COLLECTION OF HOWARD SCOTT GENTRY

Determined by **Stellaria** No. 7224

Locality Las Pilarcitas, Sierra Surutato. March 17-24, 1945
Pensaco.
Habitat Pine-oak pinetum; mossy soil on rocks, canyon.
Elev. 5500-6500 feet.
Vernacular

Viscid herb.

Cerastium

Cerastium sinaloense Gand. HOLOTYPE
Det. David Reed 16 Feb. 1979

Plant perennial. Stems to 40 cm tall, erect, branching basally. Branches erect, glandular-pilose. Internodes very short basally, becoming very long toward the inflorescence. Basal rosette absent but lower leaves very crowded, large, 30.0-65.0 mm long, 7.2-18.2 mm wide, spatulate, acute. Upper leaves few (1-3 pairs per branch), smaller, 4.0-28.7 mm long, 1.2-7.6 mm wide, lanceolate to ovate, acute. All leaves ± densely pilose. Cymes 2-8 flowered, open. Pedicels long, the lower ones 15.0-30.0 mm long, the upper ones 5.0-10.0 mm long, glandular-pilose, not hooked when in fruit. Sepals lanceolate to broadly lanceolate, 4.0-7.2 mm long, 1.1-2.0 mm wide, acute, scarious margined except at the apex, glandular-pilose. Petals large, 10.0-17.5 mm long, bifid about 1/8 of their length, white. Filaments 6.4-7.0 mm long, anthers 1.1 mm long. Styles 4.7-5.5 mm long. Capsules 11.2-14.2 mm long, 2.8-3.3 mm wide, straight, teeth revolute. Seeds 0.5-0.6 mm in diamter, tuberculate. Chromosome number unknown.

HABITAT AND DISTRIBUTION: Cerastium sinaloense has been collected only from the pine-oak forests of the Sierra Surotato, northern Sinaloa, near Rosario, southern Sinaloa and in the Sierra de Manantlán, Jalisco (though there is some question as to the true identity of that collection). It is found at relatively low elevations, having been collected at between 1680 and 2250 m. (Figure 6)

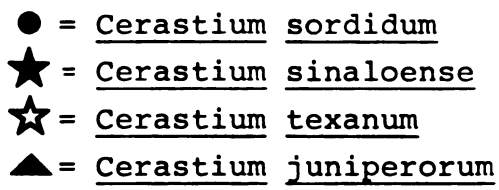
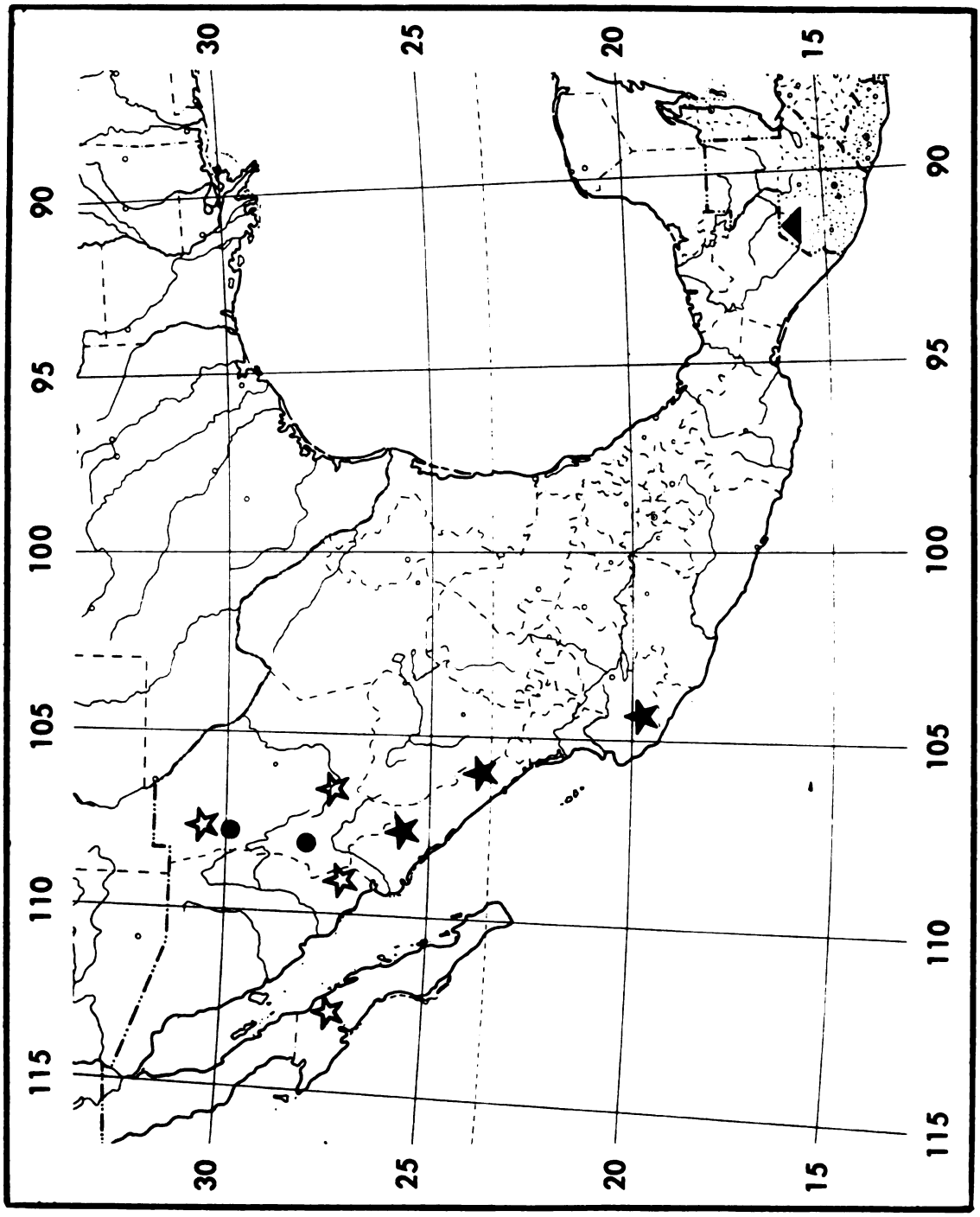


Figure 6. Distribution in Mexico and Central America of: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SPECIMENS EXAMINED: MEXICO: JALISCO: Sierra de Manantlán (25-30 km southeast of Autlán), along lumber roads 5 km east of the road crossing called "La Cumbre" between El Chante and Cuzalapa, alt. 2000-2250 m, McVaugh 23172, 19-22 March 1965 (ENCB, MICH). SINALOA: East slope of Sierra Madre Occidental, 2.2 mi east of El Palmita, ca. 47 mi east of Concordia on Mexico 40, Municipio de Rosario, alt. ca. 6450 ft, Breedlove 1710, 31 January 1962 (DS, MICH). Sierra Surotato, near settlement of Los Ornos along the road to Surotato, 53 mi east of Mocorito, alt. ca. 5800 ft, Breedlove 15559, 27 March 1967 (MO, MSC). Near the settlement of El Triguito along the road from Los Ornos to Surotato, Sierra Surotato, alt. ca. 6200 ft, Breedlove 16474, 23 February 1969 (MSC). Sierra Surotato, below Buenas Juntas, 5 mi northwest of Los Ornos along road to Mocorito, Municipio de Sinaloa y Vela, alt. ca. 5800 ft, Breedlove 19194, 6 March 1971 (MSC). Sierra Surotato, 5 mi northeast of La Cienega along road to Santa Rita, Municipio de Badiraguato, alt. ca. 7000 ft, Breedlove 19261, 8 March 1971 (MO, MSC). Los Pucheros, Sierra Surotato, alt. 5500-6500 ft, Gentry 7224, 17-24 March 1945 (GH, holotype; F, US, isotypes). Los Puncheros, Sierra Surotato, alt. 5500-6500 ft, Gentry 7234, 17-24 March 1945 (GH). Along Highway 40, ca. 6 mi west of Las Palmitas, alt. ca. 7500 ft, Norris, Peterson, Dowty, Nelson & Selva 20466, 25

December 1971 (CAS, MO). 4-8 mi west of El Palmito on the Durango-Mazatlán Highway, Oatman & Rowlett s.n., 28 January 1964 (TEX).

Three specimens, one from the Sierra Surotato of Sinaloa (Gentry 7234), one from Las Palmitas in southern Sinaloa (Norris, Peterson, Dowty, Nelson & Selva 20466) and the last from the Sierra Manantlan of Jalisco (McVaugh 23172), while obviously related to Cerastium sinaloense, C. sordidum and C. texanum by the presence of straight capsules with revolute teeth, are atypical of C. sinaloense in that they have flowers that are far smaller than those of C. sinaloense proper. They do, however, match C. sinaloense far more closely in general habit than they do the other two species in the group. Whether they merely represent variation within the species or are in fact specimens of a fourth and as yet unnamed species in the group is not discernible from the limited material at hand.

2. Cerastium sordidum Robinson

Cerastium sordidum Robinson, Bot. Gaz. 30: 58: 1900. Cerastium longepedunculatum var. sordidum Briquet, Annuaire Conserv. Jard. Bot. Genève 13 & 14: 381. 1911: TYPE: MEXICO: CHIHUAHUA: Sierra Madre 8 km southeast of Colonia Garcia, alt. ca. 2310 m, Townsend & Barber 40, 30 May 1899 (GH!, holotype; F!, MO!, MSC!, TEX!, UC!, US!,

isotypes).

Plant perennial. Stems to 40 cm tall, usually much less, erect or ascending, branching primarily at the base but sometimes above. Branches erect or ascending, sparsely glandular-pilose. Leaves mostly crowded basally with very short internodes, these becoming longer toward the inflorescence. Lower leaves 18.0-35.0 mm long, 6.0-14.0 mm wide, ovate to spatulate, acute, glandular-pilose. Upper leaves few, much shorter than the corresponding internodes, 9.0-19.0 mm long, 1.0-2.5 mm wide, linear to lanceolate, acute, glandular-pilose. Basal rosette lacking, Cymes ± open, but relatively small, 3-10 flowered. Lower pedicels 10.0-20.0 mm long, upper ones 4.0-10.0 mm long, glandular-pilose, not hooked when in fruit. Sepals ovate, 3.0-5.7 mm long, 1.2-1.8 mm wide, acute, narrowly scarious margined. Petals 5.5-7.8 mm long, bifid about 1/8 of their length, white. Filaments 4.6-6.3 mm long, anthers 1.0 mm long. Styles 3.0-3.3 mm long. Capsules 8.0-13.4 mm long, 2.2-3.0 mm wide, straight, teeth revolute. Seeds red-brown, densely tuberculate, 0.6-0.8 mm in diameter. Chromosome number unknown.

HABITAT AND DISTRIBUTION: The only specimen seen bearing any mention of habitat was Spaulding, Martin & Wiseman s.n. which listed "spruce stand." The species has

been collected in Mexico only in Chihuahua. It is also known from the pine forests of the Chiricahua and Santa Rita Mountains of Arizona (Kearney and Peebles, 1969).

SPECIMENS EXAMINED: MEXICO: CHIHUAHUA: Mojarachic, Knobloch 5037, 6 March 1936 (F, MSC). El Rialito spruce stand, 5 km south southwest of San Juanito, alt. ca. 2400 m, Spaulding, Martin & Wiseman s.n., 13 May 1974 (ENCB). In the Sierra Madre 8 km southeast of Colonia Garcia, alt. ca. 2310 m, Townsend & Barber 40, 30 May 1899 (GH, holotype; F, MO, MSC, TEX, UC, US, isotypes).

Briquet (1911) made the statement that Cerastium sordidum is not separable from C. longepedunculatum (a synonym for C. nutans) and therefore brought forth the name C. longepedunculatum var. sordidum. He stated that "il existe en effet tous les intermédiaires à corolle reduite, parfois même nulle" (in fact there exist all intermediate forms in regard to reduced corolla, occasionally even none at all). While I have never seen a specimen with no corolla at all, the rest of the statement is quite true, as far as it goes. Cerastium nutans, in fact, varies considerably in corolla length. If this were the primary distinguishing factor between the two species, I would agree with his diagnosis. However, as such characters as the straight, reflex-toothed capsule and the general growth habit (it is perennial)

of C. sordidum are of more predominant concern, there is no reason to believe that C. sordidum and C. nutans are conspecific.

Briquet mentions three specimens from Oaxaca (Galeotti 4410, Galeotti 4428 and Jurgensen 15) as being ascribable to Cerastium longepedunculatum var. sordidum. Although I have not seen these specimens, no other indication of any plant resembling the C. sordidum of Chihuahua has been found south of Jalisco (C. sinaloense). It is therefore likely that Briquet was mistaken about the identity of these three specimens and that they were actually C. nutans.

Robinson (1900) indicated that the type specimen of this species (Townsend & Barber 40) had five stamens, but I have observed ten. I also consider the entire margin of the sepals to be more or less scarious rather than just the sepal apices as he recorded.

3. Cerastium texanum Britton

Cerastium texanum Britton, Bull. Torrey Bot. Club 15: 97. 1888. TYPE: not seen, STATE UNKNOWN: "Hills, Blanco," Wright, Mexican Boundary Survey Collection no. 69, March, April (NY?, holotype).

Stellaria montana Rose, Contr. U. S. Natl. Herb. 1: 93. 1891. TYPE: not seen, MEXICO: SONORA: Alamos Mountain, Palmer s.n., (US, holotype).

Plant perennial. Stems very slender, erect or ascending, much branched basally, not so above, 15-35 mm high, sparsely glandular-pilose. Internodes nowhere long (to 60 mm) but longest toward the inflorescence, almost non-existent at the base. Basal rosette lacking but lower leaves very crowded, large, 8.0-55.0 mm long, 3.0-16.0 mm wide, broadly spatulate, acute or obtuse, sometimes acuminate, very sparsely pilose, often turning pale orange-brown with age. Upper leaves few or lacking, small, 4.0-8.0 mm long, 1.0-2.0 mm wide, linear to lanceolate, pilose. Cymes very open and loose, 8-25 flowered. Pedicels 5.1-18.0 mm long, the lowest ones the longest, very slender, glandular-pilose. Sepals lanceolate to ovate, 3.0-5.1 mm long, 1.0-1.2 mm wide, glandular, scarious margined except at the apex, turning light orange-brown when in fruit. Petals 4.1-5.4 mm long, narrow, bifid about 1/8 of their length, white. Filaments 4.5 mm long, anthers 0.4 mm long. Styles 1.2 mm long. Capsules small, only slightly exserted beyond the calyx, 4.2-6.8 mm long, 1.8-2.1 mm wide, straight, teeth revolute. Seeds red-brown, 0.4-0.6 mm in diameter, densely tuberculate. Chromosome number unknown.

HABITAT AND DISTRIBUTION: Found in moist places near water courses in cañons (Tidestrom and Kittel, 1941) or in open oak woods (Correll and Johnston, 1970). The only

specimens from Mexico seen in this study with habitat data say "igneous rocky canyon slope in pine-oak forest" (Gentry 7991) and "talus slope" (Moran 20425). Cerastium texanum is found at lower elevations than any other native Cerastium species in Mexico or Central America, having been collected at between about 1275 and 1980 m in Baja California, Chihuahua and Sonora. North of Mexico this species is found north to Coconino and Apache Counties, Arizona (Kearney and Peebles, 1969) and the Edwards Plateau of Texas (Correll and Johnston, 1970).

SPECIMENS EXAMINED: MEXICO: BAJA CALIFORNIA SUR: San Julio Cañon, Brandegee s.n., 20 April 1889 (UC). Lower north slope of Volcán las Tres Vírgenes, alt. ca. 1275 m, Moran 20425, 12 April 1973 (ENCB, LL, MO). CHIHUAHUA: Arroyo Hondo, Sierra Charuco, alt. 4500-5500 ft, Gentry 7991, 16-30 April 1948 (US). Puerta de San Diego, alt. ca. 6500 ft, Hartman 593, 12 April 1891 (CAS, F, GH, NY, UC). SONORA: San Bernardo, Río Mayo, Gentry 1252, 31 January 1935 (GH). Sierra de los Alamos, Palmer 293, 25 March-8 April 1890 (MICH, UC, US). Arroyo in Sierra de Alamos, in vicinity of Alamos, Rose, Standley & Russell 12975, 17 March 1910 (NY, US).

4. Cerastium orithales Schlechtendal

Cerastium orithales Schlechtendal, Linnaea 12: 209. 1838. Cerastium arvense var. orithales (Schlechtendal) Rohrbach, Linnaea 37: 305. 1873. TYPE: not seen, "in regione subnivale montis Orizaba," Schided s.n., September (HAL?, holotype).

Cerastium mutabile var. arvense f. angustatum Grenier, in part, Monogr. Cerast., p. 68. 1841. TYPE: not seen, "Hab. in Americâ boreali; in siberiâ (DC. herb); in Pyrenaeis (Grenier); in alpibus; (ex nonullis bot. hortis etiam habui)".

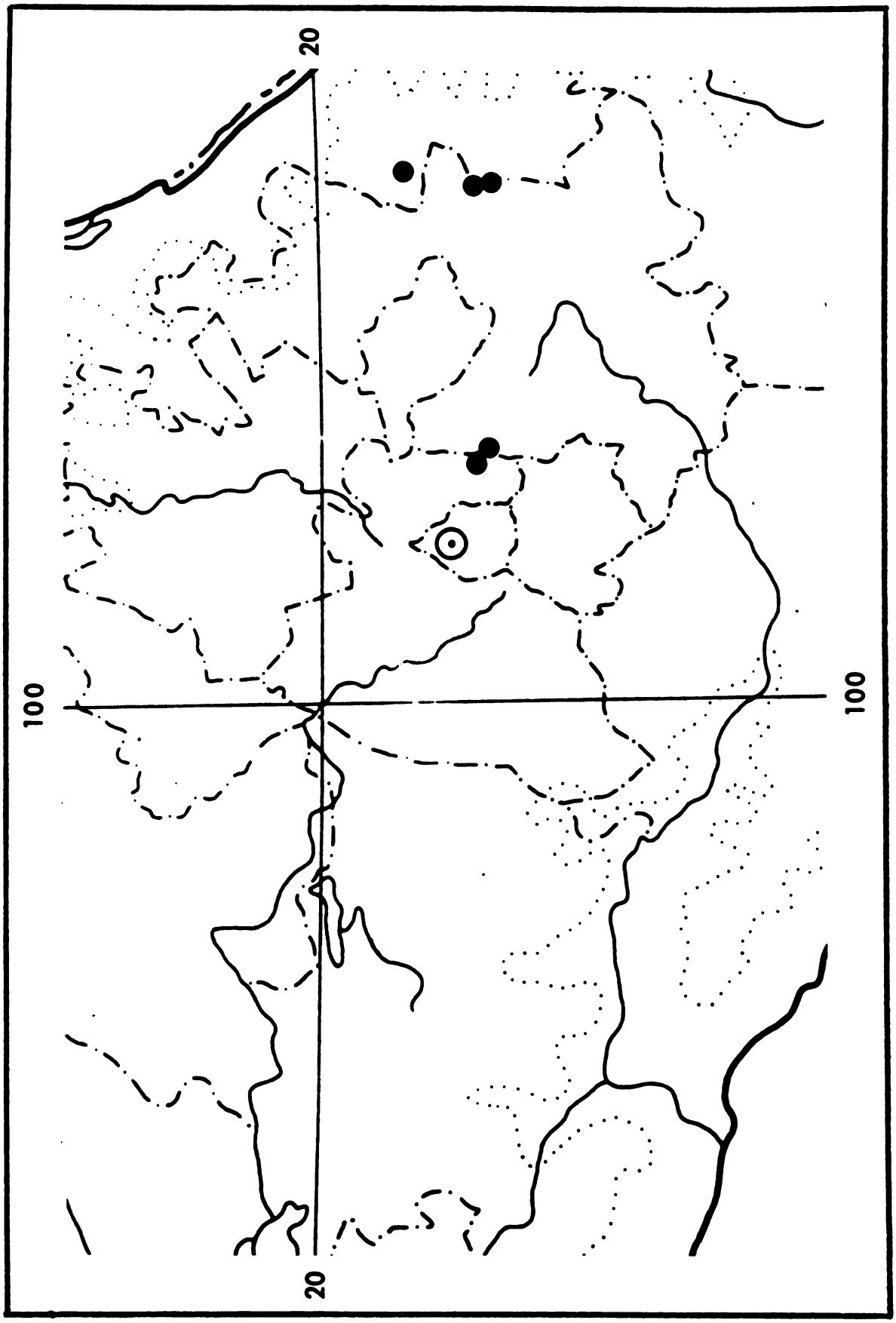
Plant perennial. Stems 15-50 cm tall, branched at the base or not, never branched above. Branches very slender, usually "climbing" on nearby grasses, ± densely short glandular-pilose. Internodes much longer than the adjacent leaves near the inflorescence, gradually becoming shorter basally until the leaves become densely clustered. Basal rosette lacking. Leaves ± similar throughout, sometimes smaller just below the inflorescence, linear to lanceolate, 15.0-25.0 mm long, 2.0-4.0 mm wide, acute, densely short glandular-pilose. Cymes 1-6 flowered, bracts not scarious margined. Pedicels various, 7.2-30.0 mm long, densely pubescent with short glandular sub-reflexed hairs. Sepals lanceolate to broadly lanceolate or ovate, 6.0-7.5 mm long, 2.0-3.0 mm wide, acute

scarious margined except at the apex, glandular-pilose. Petals large, 12.0-18.5 mm long, bifid about 1/4 of their length, white. Filaments 6.1-7.3 mm long, anthers 0.8 mm long. Styles 4.0-4.9 mm long. Capsules 13.5-17.0 mm long, 2.6-3.2 mm wide, curved. Seeds 0.9-1.2 mm in diameter, apparently only sparingly tuberculate, dark red-brown. Chromosome number 2n = 36 (Beaman et al., 1962).

HABITAT AND DISTRIBUTION: This species, known commonly within its range as "nube sylvestrc," is found at altitudes of between 3600 and 4100 m on Ixtaccihuatl, Pico de Orizaba, Sierra Negra and Cofre de Perote. The species is restricted in habitat to the grassy floors of open forests (almost invariably Pinus hartwegii forests) just below timberline. Specimens were collected by the author on Cofre de Perote in open meadows (Good 1019), but these meadows were the result of the recent clear-cutting of the native pine forest. (Figure 7)

SPECIMENS EXAMINED: MEXICO: MEXICO: Joya de Alcalican, extremo Sur del Intaccihuatl, alt. ca. 3900 m, Aldana A. 47, 13 November 1977 (ENCB). Ixtaccihautl, northwest side of mountain above San Rafael, alt. ca. 3810 m, Beaman 2844, 16 July 1959 (GH, MSC, TEX, UC, US). PUEBLA: Sierra Negra (adjacent to Pico de Orizaba), west

Figure 7. Distribution in Mexico and Central America of Cerastium orithales.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side of mountain, alt. ca. 3880 m, Beaman 2523, 10 September 1958 (F, GH, MSC, UC). Pico de Orizaba, north of Alberque Piedra Grande, alt. ca. 3950 m, Beaman 3643, 14, July 1960 (GH, MSC, UC, US). Pico de Orizaba, north side of mountain, ca. 3 km southeast of Villa Hidalgo, alt. ca. 3780 m, Beaman 3649, 15 July 1960 (ENCB, GH, MSC, TEX, UC, US). Along the road down the east side of the Paso de Cortés, alt. ca. 3660 m, Good 1018, 24 July 1978 (MSC). North side of Pico de Orizaba, Murry 64, 7 December 1971 (MSC). Mt. Orizaba, alt. ca. 12,000 ft, Pringle 8551, 26 July 1901 (ENCB, F, GH, MICH, MO, MSC, NY, UC, US). VERACRUZ: Cofre de Perote, above Los Pescados, Balla & Gourlay B4593, 24 May 1938 (MICH, MSC, UC). Cofre de Perote, east side of mountain, alt. ca. 3930 m, Beaman 2159, 6 August 1958 (F, MSC, UC). Ladera este del Cofre de Perote, alt. ca. 4000 m, Dorantes L. 331, 28 August 1971 (CAS, GH). Cofre de Perote, alt. ca. 3900 m, Good 1019, 26 July 1978 (MSC). Cofre de Perote, alt. ca. 3770 m, Good 1019, 26 July 1978 (MSC). Cofre de Perote, Nelson 28, 1893 (US). STATE NOT KNOWN: Mt. Orizaba, alt. 13,000-13,400 ft, Nelson 283, 18 March 1894 (US). Ixtaccihuatl, alt. 11,000-12,000 ft, Purpus 268, March-July 1903 (GH, MO, UC, US). Citlaltepetl, Purpus 2803, September 1907 (F, GH, MO, NY, UC, US). Mt. Orizaba, Rose & Hay 5737, 25-26 July 1901 (US). Mt. Orizaba, Rose & Hay 5756, 25026 July 1901 (US). Mt. Orizaba, alt. ca.

13,000 ft, Seaton 236, 7 August 1891 (F, GH, NY, US).

5. Cerastium ramigerum Bartling in Presl

Cerastium ramigerum Bartling in Presl, Rel. Haenk. 2: 16. 1831. TYPE: MEXICO: STATE NOT KNOWN: Haenke s.n., (PR-photograph in MICH!).

Cerastium lithophilum Greenman, Zoe 5: 183. 1904. TYPE: MEXICO: Mt. Ixtaccihuatl, Purpus 231, July 1903 (GH!, UC! syntypes; MO!, US!, isotypes).

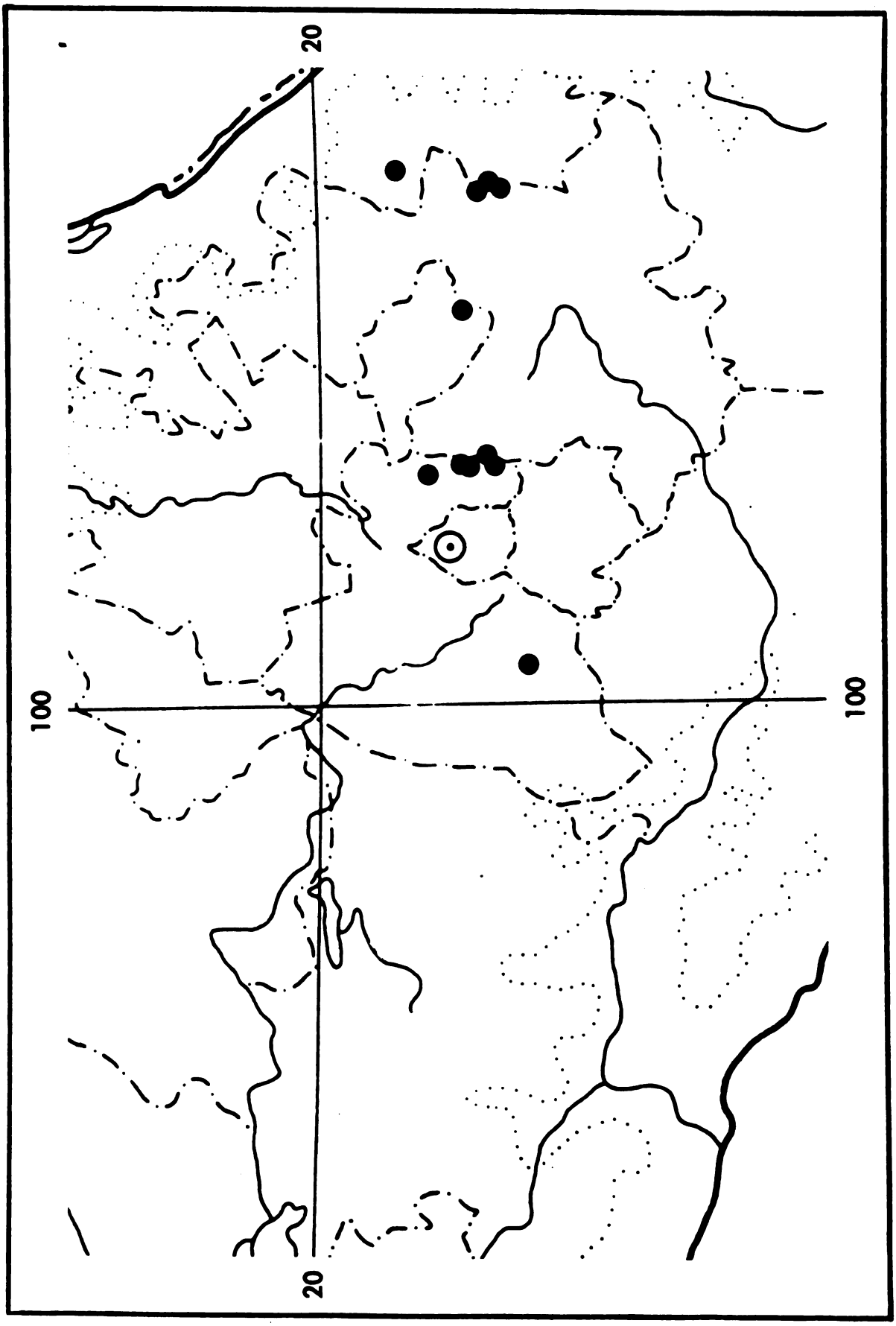
Plant perennial. Stems 5-25 cm tall, often much branched at the base, sometimes above. Sometimes ± caespitose. Branches glandular-pilose. Internodes very long just below the inflorescence, very short basally, grading in between. Leaves ± similar throughout, lanceolate to broadly lanceolate, often erect and close to the stem, 10.0-30.0 mm long, 3.0-6.0 mm wide, acute, glandular-pilose. Basal rosette lacking. Cymes 1-8 flowered, bracts not scarious margined. Pedicels short, 2.2-10.6 mm long, densely pubescent with short glandular subreflexed hairs; flowers nodding. Sepals lanceolate, 4.1-5.8 mm long, 1.6-2.2 mm wide, acute, scarious margined except at the apex. Petals 6.4-10.3 mm long, bifid about 1/3 of their length, white. Filaments 3.6-4.0 mm long, anthers 0.3 mm long. Styles 1.2-1.6 mm long. Capsules 7.0-10.7 mm long, 2.0-2.4 mm wide, curved.

Seeds 0.5-0.7 mm in diameter, light brown, tuberculate. Chromosome number 2n = 36 (Beaman et al., 1962).

HABITAT AND DISTRIBUTION: This is a species of very high elevations (the altitudes listed on herbarium specimens ranging from 3660 to 4720 m) on Nevado de Toluca, Ixtaccihuatl, Popocatepetl, Tlaloc, Malinche, Pico de Orizaba and Cofre de Perote in the states of México, Puebla, Tlaxcala and Veracruz. It is restricted to the high alpine meadows and barrens on those mountains and is sometimes found approaching the upper limit of vascular plants. One collection from Orizaba (Swan s.n.) bears the phrase "in forests only" but this habitat is atypical. (Figure 8)

REPRESENTATIVE SPECIMENS: MEXICO: MEXICO: Nevado de Toluca, shore of large lake in the crater, alt. ca. 4140 m, Beaman 1878, 26 July 1958 (F, GH, MICH, MSC, NY, TEX, UC, US). Tlaloc, near summit of mountain, alt. 4100-4140 m, Beaman 2333, 22 August 1958 (GH, MSC, NY, TEX, US). Ixtaccihuatl, south side of mountain, alt. ca. 4410 m, Beaman 2550, 16 September 1958 (MICH, MSC, NY). Nevado de Toluca, on south wall of crater, alt. ca. 4230 m, Beaman 3436, 2 July 1960 (ENCB, F, GH, MSC, NY, TEX, UC, US). Ixtaccihuatl, south side of mountain at La Joya, alt. 3990 m, Beaman 3508, 7 July 1960 (GH, MSC). Nevado de Toluca, above puebla Graecis toward Lago del Sol, alt. ca. 12,000 ft, Bell & Duke 16748, 25 August 1959 (MO).

Figure 8. Distribution in Mexico and Central America of Cerastium ramigerum.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Municipio Amecameca, slopes of Popocatepetl between 10,000 and 12,000 ft, Gilly & Dodds 20, 4 July 1943 (MICH, MSC). Southwest slope of Ixtaccihuatl, 5-6 km north of Paso de Cortés, Iltis, Koeppen & Iltis 1019a, 16 August 1960 (MSC). Pedientes de Volcán Popocatepetl, ca. 25 km al sudeste de Amecameca, mas adelante que del alberque, alt. ca. 4000 m, Koch 7467, 14 May 1974 (CAS, ENCB). Near small stream through Cañada Alcalicán, La Joya side of Ixtaccihuatl, alt. ca. 3850 m, Murry 48, 18 November 1971 (MSC). Vertiente sud del Intaccihuatl, cerca de la Retransmisora de Televisión alt. ca. 3850 m, Rzedowski 19799, 20 May 1965 (ENCB). PUEBLA: North side of Popocatepetl, above timberline, Beaman 1727, 11 September 1957 (GH, MSC). Ixtaccihuatl, south side of mountain, ca. 7 km north of Paso de Cortés, alt. ca. 4300 m, Beaman 2875, 19 July 1959 (MSC). Popocatepetl, north side of mountain ca. 5 km south of Paso de Cortés, alt. ca. 4100 m, Beaman 2883, 20 July 1959 (GH, MSC). Pico de Orizaba, north side of mountain at Alberque Piedra Grande, alt. ca. 4275 m, Beaman 3631, 14 July 1960 (GH, MSC). Popocatepetl, north side of mountain near Tlamacas, alt. ca. 4000 m, Beaman 4213, 24 August 1960 (GH, MSC, US). Ixtaccihuatl, south side of mountain on the south side of Cerro Amacuilecatl, alt. ca. 4300 m, Beaman 4233, 2 September 1960 (MSC). TLAXCALA: Malinche, crest of north rim of crater, alt. 4400-4450 m, Beaman 2241, 10 August 1958

(MICH, MSC, TEX, UC, US). VERACRUZ: Pico de Orizaba, south side of mountain, north of Cueva del Muerto, Beaman 1765, 21 September 1957 (GH, MSC, US). Cofre de Perote, east side of mountain, alt. ca. 3930 m, Beaman 2158, 6 August 1958 (GH, MSC, NY, TEX, US). Pico de Orizaba, northeast side of mountain, alt. ca. 4250 m, Beaman 2276, 16 August 1958 (MICH, MSC, UC, US).

6. Cerastium barberi Robinson

Cerastium barberi Robinson, Proc. Boston Soc. Nat. Hist. 31: 266. 1904. TYPE: MEXICO: CHIHUAHUA: In the Sierra Madres near Colonia García, Townsend & Barber 453, 27 June 1899 (GH!, holotype; MO!, US!, isotypes).

Plant perennial. Stems 10-35 cm tall, sometimes branched basally. Branches erect, glabrous or only extremely sparsely pilose. Internodes quite long just below the inflorescence, grading to very short at base. Leaves linear to lanceolate, 8.0-20.0 mm long, 1.0-3.5 mm wide, acute, virtually glabrous. Cymes 1-6 flowered, bracts not scarious margined. Pedicels 2.0-14.6 mm long, hooked in fruit, almost glabrous or with very short reflexed hairs. Sepals lanceolate to ovate, 4.5-5.0 mm long, 1.1-1.7 mm wide, acute, scarious margined, glabrous or with a few ciliate hairs on the margin of the base. Petals 5.5-6.5 mm long, bifid about 1/4 of their length,

white. Filaments 5.0-6.5 mm long, anthers 0.7 mm long. Styles 2.0-2.2 mm long. Capsules 8.0-10.0 mm long, 2.3-3.1 mm wide, curved. Seeds 0.8-1.0 mm in diameter, tuberculate. Chromosome number unknown.

HABITAT AND DISTRIBUTION: This species is known primarily from two collections both apparently made on the same expedition in the same place, in the Sierra Madre Occidental near Colonia García, Chihuahua. The altitude for at least one of the collections was about 2290 m, but no other habitat information is available. Another specimen, collected at Yepáchic, Chihuahua, also appears to be referable to Cerastium barberi although it is more pubescent than the others (it is still less pubescent than other species of Cerastium). (Figure 9)

SPECIMENS EXAMINED: MEXICO: CHIHUAHUA: Near Colonia García, Nelson 6167, 21 June-29 July 1899 (GH, US). Yepáchic, Pennington 49, 16 July 1970 (TEX). In Sierra Madres near Colonia García, alt. ca. 7500 ft, Townsend & Barber 453, 27 June 1899 (GH, holotype, MO, US, isotypes).

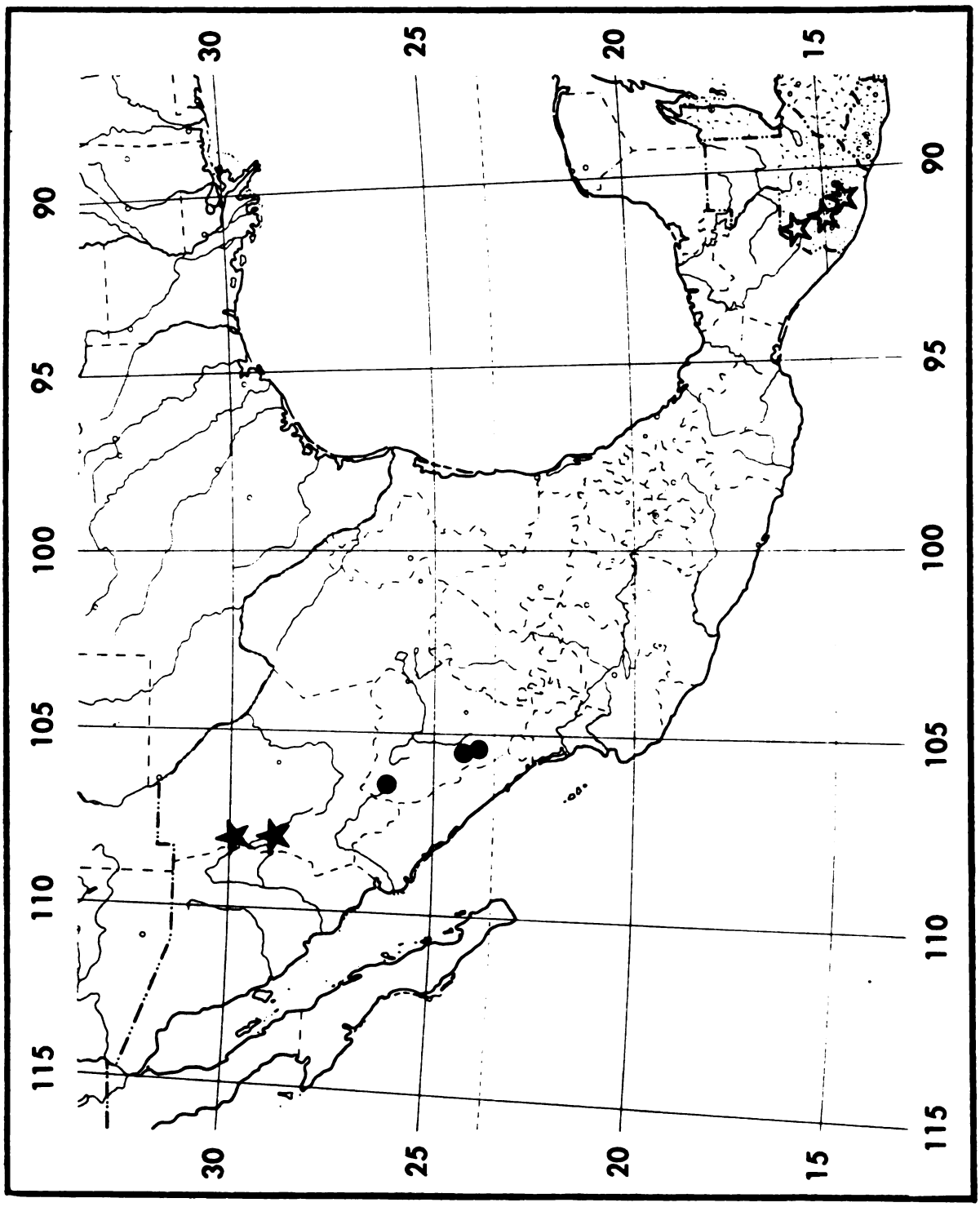
In the original description of Cerastium barberi, Robinson (1904) stated that it had only three styles rather than five, the usual condition in Cerastium. However, I have observed that the type specimen (Townsend & Barber 453) does in fact have five styles.

Figure 9. Distribution in Mexico and Central America of:

★ = Cerastium barberi

☆ = Cerastium cuchumatanense

● = Cerastium madrense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Robinson also noted this observation on one of the isotypes, probably after the description had been published.

7a. Cerastium brachypodum (Engelmann ex Gray) Robinson var. brachypodum

Cerastium brachypodum (Engelman ex Gray) Robinson, Proc. Amer. Acad. Arts 29: 277. 1894. Cerastium nutans var. brachypodum Engelmann ex Gray, Man., ed. 5, p. 94. 1867. TYPE: not seen, "w. Illinois and southwestward."

Cerastium nutans var. genuinum (lusus 2) Rohrbach, Linnaea 37: 289. 1873. TYPE: not seen, "Habitat in media parte totus fere Americae borealis usque ad fines Mexicanos."

Plant annual. Usually diffuse, branches few to many, usually ± erect but sometimes decumbent. Stems to 40 cm high but usually less than 20 cm, very small in alpine and other harsh environments, glandular-pilose, often very viscid. Leaves usually similar throughout, lanceolate to elliptic, 7.0-21.0 mm long (usually shorter than the adjacent internode), 1.2-6.0 mm wide, acute, rarely obtuse, ± glandular-pilose. Basal rosette lacking. Cymes 5-30 flowered, bracts not scarious margined. Pedicels short, 2.1-7.2 mm long, glandular-pilose. Sepals lanceolate, 3.2-5.8 mm long, 1.0-1.8 mm wide, acute, scarious margined except at the apex, viscid-glandular.

Petals shorter than the sepals, 3.0-4.5 mm long, bifid about 1/4 of their length, white. Filaments 2.6-3.2 mm long, anthers 0.3 mm long. Styles 1.0-1.2 mm long. Capsules 6.3-12.8 mm long, 2.0-2.8 mm wide. Seeds 0.4-0.7 mm in diameter, light brown, tuberculate. Chromosome number unknown.

HABITAT AND DISTRIBUTION: A plant of varied habitat. In Mexico it has been collected at altitudes ranging from about 2000 to over 3800 m in such habitats as Pinus and Populus woodlands and alpine and subalpine meadows. It is often a species of disturbed areas such as trails and roadsides. Found in the United States and Canada north to southeastern Virginia, Tennessee, Illinois, North Dakota, Alberta and Washington (Fernald, 1950), it ranges into Mexico as far south as the state of Mexíco. It has been collected in the states of Chihuahua, Coahuila, Durango, México, Nuevo León, Queretaro, San Luis Potosí, Tamaulipas and Zacatecas. (Figure 10)

SPECIMENS EXAMINED: MEXICO: CHIHUAHUA: Majalca, LeSueur 624, 24 June 1936 (F, GH, MO TEX, UC, US). Santa Eulalia, Cerro del Cuesto, Lopez 70, 12 September 1948 (GH). Southwestern Chihuahua, Palmer s.n., August-November 1885 (US). DURANGO: Ibana G. 332 (US). Tejamen, Palmer 542, 21-27 August 1906 (GH, US). HIDALGO: Sierra de Pachuca, alt. ca. 10,000 ft, Pringle 7907,

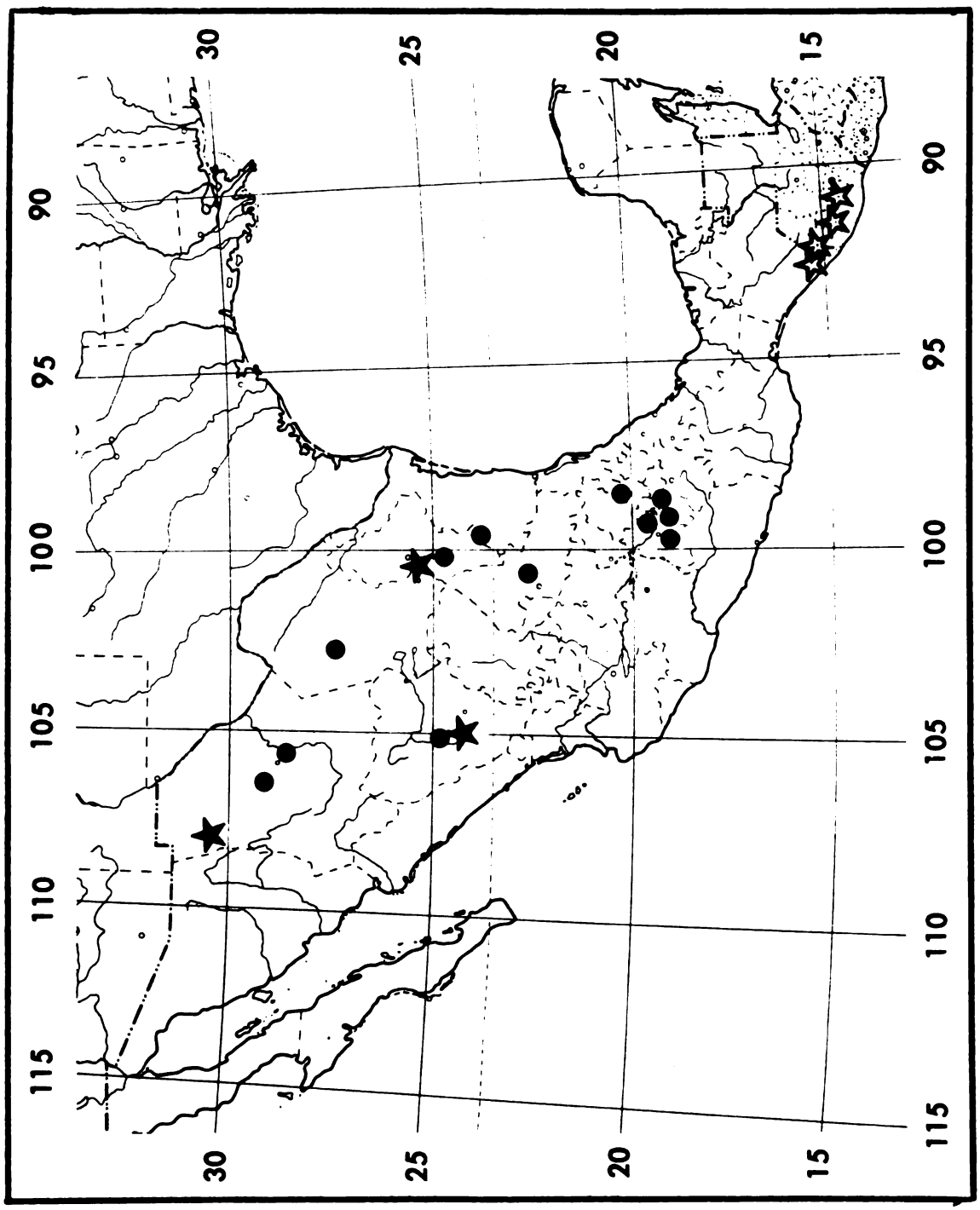
Figure 10. Distribution in Mexico and Central America of:

● = *Cerastium brachypodum* var. *brachypodum*

★ = *Cerastium brachypodum* var. *axillare*

☆ = *Cerastium guatemalense*

(there is also one collection of *C. guatemalense* from Costa Rica)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6 October 1899 (GH, US). Sierra de Pachuca, alt. ca. 10,000 ft, Pringle 11321, 23 August 1902 (ENCB, F, GH, US). COAHUILA: Municipio de Ocampo, Sierra Maderas del Carmen, at Ojo del Negro below and west of Campo O, alt. ca. 2100 m, Riskind & Patterson 1801, 26 May 1975 (LL). Municipio de Ocampo, Sierra Maderas del Carmen, between Campo O and Campo 5, Riskind & Patterson 1838, 29 May 1975 (LL). Municipio de Ocampo, Sierra Maderas del Carmen, between Campo O and Campo 5, Riskind & Patterson 1839a, 29 May 1975 (LL). MEXICO: Mexico City, Toluca road, MacDaniels 506, 7 September 1935 (F). Cañada Alcalicán, La Joya side of Ixtaccihuatl, alt. ca. 3850 m, Murry 47, 18 November 1971 (MSC). On the road to Nevado de Toluca, alt. ca. 3540 m, Murry 52, 19 November 1971 (MSC). NUEVO LEON: Peña Nevada, 26 mi northeast of Doctor Arroyo (62 mi northeast of Matahuala), west side of mountain known locally as Pichacho Onofre, alt. ca. 3230 m, Beaman 2715, 4 July 1959 (GH, MSC). Cerro Potosí, just below summit, alt. 3750-3800 m, Good 1002, 13 July 1978 (MSC). Cerro Potosí, first switchback below the microwave tower on east side of mountain, Good 1003, 14 July 1978 (MSC). Cerro Potosí, just above timberline, Good 1004, 14 July 1978 (MSC). Peña Nevada, alt. ca. 3000 m, Good 1005, 17 July 1978 (MSC). Peña Nevada, alt. ca. 3200 m, Good 1006, 17 July 1978 (MSC). Peña Nevada, alt. ca. 3500 m, Good 1007, 17 July 1978 (MSC). Cerro Potosí, west of

Monterrey at microwave station, Lewis 138, 2 August 1975 (LL). Cerro Potosí, Municipio de Galeana, above timberline, Mueller 2245, 21 July 1935 (F, GH, MICH, MO). Cerro Potosí, alt. ca. 12,000 ft, Schneider 970, 4 August 1938 (F, GH, MICH, MO, NY). QUERETARO: Cerro Zamorano, 1 km southwest of the cumbre, alt. ca. 3100 m, McVaugh 466, 13 November 1971 (ENCB). SAN LUIS POTOSI: Alvarez, Orcutt 1763, December 1924 (US). Alvarez, Palmer 124, 5-10 September 1902 (NY, US). Sierra de Alvarez, cerca de Puerto Huerta, alt. ca. 2300 m, Rzedowski 4118, 3 September 1954 (ENCB, MSC). Convalli San Louis Potosí, Schaffner 143, 1876 (GH). TAMAULIPAS: Between Marcella and Hermosa, Stanford, Lauber & Taylor 2650A, 22 July 1949 (NY, US). ZACATECAS: Alt. ca. 7000-8000 ft, Purpus 415, December 1903 (MO, UC, US).

There has apparently been some misunderstanding as to the correct citation for the original description of this species. The most often cited publication of the binomial is the Memoirs of the Torrey Botanical Club 5: 150 (1894) in a list of North American Caryophyllaceae compiled by N. L. Britton. This, however, was published in December of 1894 and was antedated by the publication of the binomial by B. L. Robinson in Proceedings of the American Academy of Arts and Sciences 29: 277 (1894) published in May of the same year. Robinson stated that he used the name as opposed to Cerastium nutans var.

brachypodum at the "suggestion of Dr. N. L. Britton." He went on to state that "certainly, the more restricted geographical range and the absence of connecting forms indicates its distinctness from C. nutans." This statement certainly holds for the Mexican specimens.

Certain specimens of this species from northern Mexico vary somewhat from the others in that they are much lower and more caespitose and have a basal clump of larger and more spatulate leaves. They also appear to have less stem between the ground and the lowest flowers than do the majority of specimens. Specimens of this sort have been described from the Trans-Pecos Mountains of Texas by Correll (1966) as C. axillare, but I cannot see enough difference to warrant this separation into different species. It would therefore be to the point to give varietal status to the group. I therefore recognize these plants as the following variety.

7b. Cerastium brachypodum var. axillare (Correll) D.A. Good, comb. nov.

Cerastium axillare Correll, Brittonia 18: 308. 1966. TYPE: not seen, UNITED STATES: TEXAS: Jeff Davis County, Little Aguja Canyon, Buffalo Trail Scout Camp Area, Davis Mountains, Correll & Ogden 25069, (LL, holotype).

HABITAT AND DISTRIBUTION: This variety is known in the United States only from the Trans-Pecos of Texas. In Mexico it has been collected in Chihuahua, Coahuila and Durango. No habitat information was given on any of the Mexican specimens but Correll and Johnston (1970) list "open forested slopes, rocky hills and grasslands in the mountains."

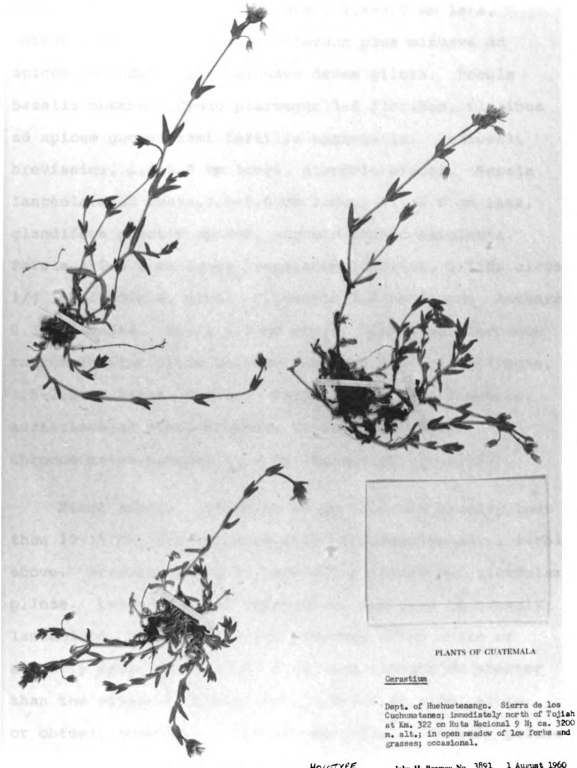
SPECIMENS EXAMINED: MEXICO: CHIHUAHUA: 10-15 mi southwest of Nueva Casas Grandes, Correll & Johnston 21694, 9 May 1954 (LL). Puerta de San Diego, alt. ca. 6500 ft, Hartman 637, 14 April 1891 (GH, NY, US). COAHILA: 45 mi east of Saltillo, Palmer s.n., July 1880 (GH). DURANGO: Otinapa, Palmer 375, 25 July-5 August 1906 (F, GH, MO, NY, UC, US).

8. Cerastium cuchumatanense D.A. Good, sp. nov.

TYPE: GUATEMALA: HUEHUETENANGO: Sierra de los Cuchumatanes, immediately north of Tojiah at km. 322 on Ruta Nacional 9N, alt. ca. 3200 m, Beaman 3891, 1 August 1960 (MSC!, holotype; GH!, TEX!, US!, isotypes). (Figure 11)

Planta annua. Caules usque ad 25 cm alti autem plerumque minus quam 10-15 cm, plerumque basi profuse ramosi, rar superni. Rami erecti vel saepius ascendentes, glandulo-pilosi. Folia omnia similaria, anguste ad late lanceolata, foliis in ramis sterilibus saepe ovatis vel

Figure 11. Holotype of Cerastium cuchumatanense D. A. Good, sp. nov.



PLANTS OF GUATEMALA

Cerastium

Dept. of Huehuetenango. Sierra de los Cuchumatanes; immediately north of Tojiah at Km. 322 on Ruta Nacional 9 N; ca. 3200 m. alt.; in open meadow of low forbs and grasses; occasional.

John H. Beaman No. 3891 1 August 1960

Beal-Darlington Herbarium
MICHIGAN STATE UNIVERSITY

HOLOTYPE

Cerastium cuchumatanense Good

Det. David Good 16 Feb. 1970

MICHIGAN STATE UNIVERSITY HERBARIUM

leviter spathulatis, 6.0-11.2 mm longa (internodis centiguis longiera vel breviera), 1.8-3.0 mm lata, integra, acuta vel obtusa, interdum plus minusve ad apicem rotundata, plus minusve dense pilosa. Rosula basalis absens. Cymae plerumque 3-8 floribus, floribus ad apicem quoque rami fertilis aggregatis. Pedicelli brevissimi, 1.2-5.0 mm longi, glandulo-pilosi. Sepala lanceolata ad ovata,3.0-5.0 mm longa, 1.1-1.6 mm lata, glandifera practer apicem, anguste scario-marginata. Petala 4.2-6.2 mm longa, sepalorum longiora, bifida circa 1/4 longitudinis, alba. Filamenta 3.0 mm longa. Antherae 0.3 mm longae. Styli 1.3 mm longi. Capsulae plerumque tantum leviter ultra calycem exsertae 4.0-7.0 mm longae, 1.6-2.2 mm latae, curvae. Semina 0.6-0.9 mm diametro, aurantiaca ad rubro-brunnea, dense tuberculata. Chromosomatum numerus 2n = 34 (Beaman et al., 1962).

Plant annual. Stems to 25 cm tall but usually less than 10-15 cm, branching usually profusely basally, rarely above. Branches erect or more often ascending, glandular-pilose. Leaves similar throughout, narrowly to broadly lanceolate, those on sterile branches often ovate or slightly apatulate, 6.0-11.2 mm long (longer or shorter than the adjacent internodes), 1.8-3.0 mm wide, acute or obtuse, sometimes ± rounded apically, ± densely pilose. Basal rosette lacking. Cymes usually 3-8 flowered, the flowers crowded at the end of each fertile branch.

Pedicels very short, 1.2-5.0 mm long, glandular-pilose. Sepals lanceolate to ovate, 3.0-5.0 mm long, 1.1-1.6 mm wide, glandular. Margin narrowly scarious except at the apex. Petals 4.2-6.2 mm long, longer than the sepals, bifid about 1/4 of their length, white. Filaments 3.0 mm long. Anthers 0.3 mm long. Styles 1.3 mm long. Capsules usually only barely exserted beyond the calyx, 4.0-7.0 mm long, 1.6-2.2 mm wide, curved. Seeds 0.6-0.9 mm in diameter, orange to red-brown, densely tuberculate. Chromosome number 2n = 34 (Beaman et al., 1962).

HABITAT AND DISTRIBUTION: Cerastium cuchumatanense is a species primarily of the high llanos of the Sierra de los Cuchumatanes, Guatemala but is also found on the Tecum Umán Ridge and above timberline on Volcán de Agua and Volcán Actenango, also in Guatemala. It is restricted to the subalpine meadows above about 2700 m. There may be some preference for moist sites.

SPECIMENS EXAMINED: GUATEMALA: CHIMALTENANGO: Volcán Acatenango, northwest side of peak, alt. ca. 3825 m, Beaman 3271, 16 August 1959 (MSC). HUEHUETENANGO: Sierra de los Cuchumatanes, al Chémal at km. 316.8 on Ruta Nacional 9 N, alt. ca. 331 m, Beaman 3089, 4 August 1959 (GH, MSC). Sierra de los Cuchumatanes, between Tojiah and Chémal at km 319.5 on Ruta Nacional 9 N, alt. ca. 3380 m, Beaman 3745, 29 July 1960 (MSC). Sierra de

los Cuchumatanes, immediately north of Tojiah at km. 322 on Ruta Nacional 9 N, alt. ca. 3200m, Beaman 3891, 1 August 1960 (GH, MSC, TEX, US). Sierra de los Cuchumantanes, immediately north of Tojiah at km. 322 on Ruta Nacional 9 N, alt. ca. 3200 m, Beaman 3896, 1 August 1960 (MSC, holotype; GH, TEX, US, isotypes). Sierra de los Cuchumatanes, large meadow 7 mi north of Santa Eulalia along road to San Mateo Ixtatán, Municipio de Santa Eulalia, Alt. ca. 9100 ft, Breedlove 11521, 6 August 1965 (DS, LL, MICH, US). Sierra de los Cuchumatanes, on road from Huehuetenango to San Juan Ixcoy, south of road to Todos Santos Cuchumatanes, alt. ca. 3450 m, Good 1022, 3 August 1978 (MSC). Sierra de los Cuchumananes, scree slope 2 km north of km. 299 on road to San Juan Ixcoy, alt. ca. 3350 m, Good 1023, 3 August 1978 (MSC). Sierra de los Cuchumatanes, open llano to the west of road to San Juan Ixcoy, alt. ca. 3600 m, Good 1026, 4 August 1978 (MSC). Sierra de los Cuchumatanes, between Paquix and Llanos San Miguel, road to San Juan Ixcoy, alt. ca. 3300 m, Molina R. 21242, 17 November 1967 (F, NY). Chémal, Sierra de los Cuchumatanes, alt. ca. 4000 m, Molina R. & Molina 26415, 13 September 1971 (F). Between Capzin and km. 143 on way to San Juan Ixcoy, Sierra de los Cuchumatanes, alt. ca. 3100 m, Molina R. & Molina 26446, 13 September 1971 (F). Region of Chémal, Sierra de los Cuchumatanes, alt. ca. 3300 m, Standley 81085, 28

December 1940 (F). Between Tojquia and Chémal, Sierra de los Cuchumatanes, alt. 3700-3750 m, Steyermark 50237, 7 August 1942 (F, US). SACATEPEZUES: Volcán de Agua, summit of south rim of crater, alt. ca. 3760 m; Beaman 2918, 31 July 1959 (MSC). Volcán de Agua, on floor of crater, alt. ca. 3670 m, Beaman 2946, 31 July 1959 (CH, MSC). Upper slopes of Volcáno Agua, near crater, alt. ca. 3600 m, Harmon 3669, 9 August 1970 (ENCB). TOTONICAPAN: On the Tecum Umán Ridge at km. 154 on Ruta Nacional 1, ca. 20 km east of Tonicapan, alt. ca. 3340m, Beaman 4183, 14 August 1960 (CH, MSC, UC, US). 4.5-5 mi southeast of Totonicapán, alt. 9600-9800 ft, Webster, Miller & Miller 11781A, 27 June 1962 (F).

The general concensus to date (Beaman, 1979; Beaman et al., 1962; Standley and Steyermark, 1946) has been that the specimens listed above are referable to Cerastium brachypodum. This seems to be based almost solely on the fact that both C. brachypodum and C. cuchumantanense have unusually short pedicels. This, however, is where the similarity ends. Standley and Steyermark in fact state that "more ample specimens may show the Guatemalan plant to be an undescribed species, since it does not appear to be referable to any other species known from Mexico."

There is a gap of approximately 980 km between the southern limit of Cerastium brachypodum near Nevado de Toluca, México and the Sierra de los Cuchumatanes, Guatemala, the northernmost limit of C. cuchumatanense. Ecologically, while the distributions of the two species overlap with both being found in high mountain meadows, C. brachypodum has a much wider range of habitats. It is often found in woodlands and other situations in which C. cuchumatanense has never been collected.

For these reasons and because of the morphological differences listed in Table 6, I have no doubt that the Guatemalan specimens are indeed distinct from Cerastium brachypodum.

9. Cerastium guatemalense Standley

Cerastium guatemalense Standley, Field Mus. Nat. Hist. Bot. Ser. 17: 244. 1937. TYPE: GUATEMALA: CHIMALTENANGO: Volcán de Agua, Johnston 816, 22 July 1937 (F!, holotype).

Plant perennial. Stems to 45 cm tall, often ± much branched basally and otherwise. Branches erect or ascending, densely glandular-pilose. Internodes ± equal except at the base, where shorter. Leaves ± similar throughout or the lower ones somewhat shorter, linear to lanceolate, long, widest at the base, narrowing to an attenuate tip, 15.0-48.0 mm long, 2.0-5.0 mm wide,

TABLE 6. Morphological differences between *Cerastium brachypodum* and *C. cuchumatanense*.

C. brachypodum	*C. cuchumatanense*
1. Plants often fairly large (to 40 cm tall)	1. Plants never more than 25 cm tall, usually much smaller
2. Branching usually not basal	2. Branching almost all basal
3. Internodes longer, upper ones 18-74 mm long (X = 32.7, s = 14.7)	3. Internodes shorter, upper ones 9-30 mm long (X = 22.9, s = 10.9)
4. Pubescence often very viscid	4. Pubescence less viscid
5. Leaves longer, 7-21 mm long (X = 14.6, s = 4.4)	5. Leaves shorter, 6-11 mm long (X = 8.7, s = 2.6)
6. Leaf length/width ratio greater (X = 5.5, s = 2.9)	6. Leaf length/width ratio less (X = 3.4, s = 1.0)
7. Cymes 5-30 flowered	7. Cymes 3-8 flowered
8. Cyme large and ± open	8. Cyme small, flowers crowded
9. Pedicels longer, 2.1-7.2 mm long (X = 4.5, s = 1.4)	9. Pedicels shorter, 1.2-5.0 mm long (X = 2.8, s = 1.2)
10. Sepal length/width ratio greater, 2.4-4.8 (X = 3.4, s = 0.7)	10. Sepal length/width ratio less, 2.7-3.6 (X = 3.0, s = 0.3)
11. Sepal margins broadly scarious	11. Sepal margins more narrowly scarious
12. Sepals more narrowly acute	12. Sepals less narrowly acute
13. Petals shorter than the sepals, 3.0-4.5 mm long (X = 3.8, s = 0.5)	13. Petals longer than the sepals, 4.2-6.2 mm long (X = 5.2, s = 0.8)
14. Capsules longer, exserted well beyond the calyx, 6.3-12.8 mm long (X = 9.3, s = 1.8)	14. Capsules shorter, little exserted beyond the calyx, 4.0-7.0 mm long (X = 5.4, s. 1.0)
15. Seeds smaller, 0.4-0.7 mm in diameter (X = 0.6, s = 0.1)	15. Seeds larger, 0.6-0.9 mm in diameter (X = 0.8, s = 0.1)
16. Seeds less densely tuberculate	16. Seeds more densely tuberculate

glandular-pilose, particularly on the lower surface. Basal rosette lacking. Cymes 3-40 flowered, usually 3-15. Bracts not scarious margined. Lowermost (longest) pedicels 14.0-35.0 mm long, upper ones shorter, all ± hooked in fruit, glandular-pilose. Sepals lanceolage, 4.4-6.0 mm long; 1.0-1.7 mm wide, acute, scarious margined except at the apex, glandular. Petals 6.0-7.1 mm long, bifid about 1/8 of their length, white. Filaments 3.2-3.5 mm long, anthers 0.3 mm long. Styles 1.9-2.1 mm long. Capsules 7.8-11.8 mm long, 2.0-2.8 mm wide, curved. Seeds tuberculate, 0.8-1.0 mm in diameter. Chromosome number unknown.

HABITAT AND DISTRIBUTION: This species is found in open pine forests and adjacent subalpine meadows between 2130 and 4400 m altitude on the following Guatemalan volcanoes: Volcán de Actenango, Volcán de Agua, Volcán de Fuego, Volcán Santa María, Volcán Santo Tomas, Volcán Tacaná and Volcán Tajumulco. Outside of Guatemala, three collections have been made: Stevens, Donoghue & Scott 2427 from the Chiapas side of Volcan Tacana, Breedlove 40315 from Cerro Mozotal, Chiapas and Burger & Gomez P. 8216 from Department San José, Costa Rica. This last specimen is an example of a considerably disjunct population.

SPECIMENS EXAMINED: COSTA RICA: SAN JOSÉ: Along the trail to the Valle de los Leones and in the lower part of the Valle de los Conejos along the upper Río Talari, alt. 3250-3450 m, Burger & Gomez P. 8216, 21-23 August 1971 (F, MO). GUATEMALA: CHIMALTENANGO: Volcán de Fuego, north side of mountain on Meseta, alt. ca. 3500 m, Beaman 4041, 6 August 1960 (GH, MSC). Slopes of Volcán de Acatenango, above Las Calderas, alt. 2700-2900 m, Standley 61872, 3 January 1939 (F). Slopes of Volcán de Actenango, above Las Calderas, alt. 2700-2900 m, Standley 61893, 3 January 1939 (F). QUETZALTENANGO: Volcán Santa María, near summit of mountain, alt. ca. 3770 m, Beaman 4134, 12 August 1960 (MSC). Summit of Volcán Santa María, alt. ca. 12,400 ft, Skutch 834, 26 July 1934 (F, GH, US). Volcán Santa María, upper north-east facing slopes to summit of volcano, alt. 3000-4200 m, Steyermark 34153, 13 January 1940 (F). Volcán Santo Tomas, alt. 3000-3300 m, Steyermark 34882, 24 January 1940 (F). SACATEPEQUEZ: Volcán de Augua, above Santa María, alt. 7000-8000 ft, Bell & Duke 16967, 6 October 1959 (MO). North slope of Volcán Agua, alt. ca. 2900 m, Harmon 2565, 8 September 1970 (ENCB). Volcán de Agua, Johnston 816, 22 July 1937 (F, holotype - specimen and photograph). Slopes of Volcán de Agua above Santa María de Jesus, alt. 2250-3000 m, Standley 65268, 11 February 1939 (F). SAN MARCOS: Volcán Tajumulco, east side of

peak, at timberline, alt. ca. 4050 m, Beaman 3176, 9 August 1959 (GH, MSC). Between San Sebastián and summit to Volcán Tajumulco, alt. 3800-4600 m, Steyermark 35517, 13 February 1940 (F). Between Sibinal and summit of Volcán Tacaná, lower slopes above ridge of La Vega, alt. 2500-4400 m, Steyermark 36088, 19 February 1940 (F). MEXICO: CHIAPAS: On the north and west slope of Cerro Mozotal below the microwave tower along the road from Huixtla to El Porvenir and Siltepec, Municipio de Motozintla de Mendoza, alt. ca. 3000 m, Breedlove 40315, 19 September 1976 (DS). On southeast slope of Volcán Tacaná, alt. ca. 3550 m, Stevens, Donoghue & Scott 2427, 14 July 1976 (MSC).

10. Cerastium juniperorum Standley & Steyermark

Cerastium juniperorum Standley & Steyermark, Field Mus. Nat. Hist., Bot. Ser. 23: 51. 1944. TYPE: GUATEMALA: HUEHUETENANGO: Alpine areas in the vicinity of Tuminá, Sierra de los Cuchumatanes, alt. 3400-3500 m, Steyermark 48413, 7 July 1942 (F!, holotype).

Plant perennial. Stems to 40 cm tall with little branching except sometimes at the base. Branches densely glandular-pilose, almost villous in places. Leaves ± similar throughout, lanceolate to almost ovate, 10.0-33.0 mm long, 1.5-9.0 mm wide, acute, densely pilose tending

toward villous when young. Upper few internodes much longer than the leaves, gradually shortening to much shorter than the leaves, creating, in some cases, a basal clump. Basal rosette lacking. Cymes 3-8 flowered, bracts not scarious margined. Pedicels 10.2-36.0 mm long, the lower ones being the longer, very densely glandular-pilose, somewhat hooked in fruit. Sepals lanceolate to ovate, 5.8-7.6 mm long, 1.8-2.2 mm wide, acute, scarious margined except at the apex, sparsely glandular-pilose. Petals large, 9.5-14.5 mm long, bifid about 1/4 of their strength, white. Filaments 5.5-6.0 mm long, anthers 0.9 mm long. Styles 3.7-4.0 mm long. Capsules 12.0-16.1 mm long, 2.0-2.4 mm wide, curved. Seeds dark red-brown, tuberculate, 1.0-1.2 mm in diameter. Chromosome number 2n = 34 (Beaman et al., 1962).

HABITAT AND DISTRIBUTION: Cerastium juniperorum has has perhaps the most limited range of any species of Cerastium in Mexico or Central America. It is restricted to a few square kilometers in the Sierra de los Cuchumantanes, in northwestern Guatemala, where it is not uncommon in pine and juniper forests at elevations of between 3050 and 3700 m.

SPECIMENS EXAMINED: GUATEMALA: HUEHUETENANGO: Sierra de los Cuchumatanes at km. 311 on Ruta Nactional 9 N (between Paquix and Chémal), alt. ca. 3360 m, Beaman

2973, 2 August 1959 (GH, MSC, TEX, UC, US). Sierra de los Cuchumatanes, between Tojiah and Chémal at km. 320 on Ruta Nacional 9 N, alt. ca. 3365 m, Beaman 3748, 29 July 1960 (ENCB, GH, MSC, TEX, UC, US). Sierra de los Cuchumatanes, ca. 3 km south of road between Llano de San Miguel and Todos Santos, from a point 2.5 km west of Llano de San Miguel, near highest point in Cuchumatanes, alt. ca. 3680 m, Beaman 3974, 2 August 1960 (MSC). Sierra de los Cuchumatanes, side of cliff 2 km north of km. 299 on road to San Juan Ixcoy, alt. ca. 3350 m, Good 1024, 3 August 1978 (MSC). Sierra de los Cuchumatanes, along road to Todos Santos, alt. ca. 3050 m, Good 1025, 4 August 1978 (MSC). Along road in region of Chémal, Sierra de los Cuchumatanes at km. 36, alt. ca. 3300 m, Standley 81640, 31 December 1940 (F). Along road in region of Chémal, Sierra de los Cuchumatanes at km. 36, alt. ca. 3300 m, Standley 81687, 31 December 1940 (F). Near Tunimá, Sierra de los Cuchumatanes, alt. 3300-3500 m, Steyermark 48262, 6 July 1942 (F, US). Alpine area in vicinity of Tunimá, Sierra de lost Cuchumatanes, alt. 3400, 3500 m, Steyermark 48389, 7 July 1942 (F). Alpine areas in vicinity of Tunimá, Sierra de los Cuchumatanes, alt. 3400-3500 m, Steyermark 48413, 7 July 1942 (F, holotype - specimen and photograph). Between Tojquiá and Caxin bluff, summit of Sierra de los Cuchumatanes, alt. ca. 3700 m, Steyermark 50192, 6 August 1942 (F).

Standley and Steyermark (1944), in their original description of this species, stated that it is perhaps only an extreme form of Cerastium guatemalense but that the latter species has a much smaller calyx and that its cauline leaves are much narrower. These are indeed outstanding differences between the two species, but they are only two of many. Some of these differences are listed in Table 7, and appear sufficient to warrant recognition of both species.

11. Cerastium madrense Watson

Cerastium madrense Watson, Proc. Amer. Acad. Arts 23: 269. 1888. TYPE: MEXICO: CHIHUAHUA: On cool summits of the Sierra Madre, Pringle 1504, 7 October 1887 (GH!, holotype).

Plant perennial. Stems 15-35 cm tall, much branched from the base, not so above, erect, glandular-pilose, often ± lanate near the base. Basal rosette prominent. Basal and sterile leaves oblanceolate, obovate or spatulate, 10.0-60.0 mm long, 4.0-12.0 mm wide, acute, lanate, particularly basally and beneath. Cauline leaves much smaller, 8.0-20.0 mm long, 2.0-5.0 mm wide, lanceolate, acute, pilose, tending toward lanate particularly toward the base of the plant, much shorter than the rather long internodes (upper internodes 29.0-

TABLE 7. Significant ($p < .05$) differences between *Cerastium guatemalense* and *C. juniperorum*.

C. guatemalense	*C. juniperorum*
1. Found on various volcanoes in Guatemala, not on the Sierra de los Cuchmatanes	1. Found only on the Sierra de los Cuchumatanes
2. Found sometimes in open areas	2. Found only in pine or juniper forest
3. Plants more branched	3. Plants less branched
4. Internodes becoming abruptly shorter near the base	4. Internode length gradually decreasing toward the base
5. Leaves narrower, 2.0-5.0 mm wide (X = 3.2, s = 0.8)	5. Leaves broader, 1.5-9.0 mm wide (X = 4.8, s = 1.2)
6. Leaf length/width ratio greater (X = 7.5, s = 1.6)	6. Leaf length/width ratio less (X = 4.4, s = 1.2)
7. Leaf tip acuminate	7. Leaf tip acute
8. Uppermost internode length/ uppermost leaf length ratio less (X = 2.4, s = 0.6)	8. Uppermost internode length/ uppermost leaf length ratio greater (X = 3.4, s = 0.8)
9. Sepals shorter, 4.4-6.0 mm long (X = 5.2, s = 0.6)	9. Sepals longer, 5.8-7.6 mm long (X = 6.4, s = 0.4)
10. Sepals narrower, 1.0-1.7 mm wide (X = 1.3, s = 0.3)	10. Sepals broader, 1.8-2.2 mm wide (X = 1.9, s = 0.2)
11. Sepal length/width ratio greater (X = 4.2, s = 0.6)	11. Sepal length/width ratio less (X = 3.5, s = 0.3)
12. Petals shorter, 6.0-7.1 mm long (X = 6.5, s = 0.6)	12. Petals longer, 9.5-14.5 mm long (X = 11.1, s = 0.2)
13. Petal notch shallower (about 1/8 of the petal length)	13. Petal notch deeper (about 1/4 of the petal length)
14. Capsules shorter, 7.8-11.8 mm long (X = 10.2, s = 1.2)	14. Capsules longer, 12.0-16.1 mm long (X = 14.5, s = 2.1)
15. Seeds smaller (0.8-1.0 mm in diameter)	15. Seeds larger (1.0-1.2 mm in diameter)

85.0 mm long). Cymes 4-13 flowered, large, open. Bracts not scarious margined. Pedicels very long, the lowermost (longest) 18.0-32.0 mm long, the upper ones 5.0-10.0 mm long, glandular-pilose, apically hooked when in fruit. Sepals lanceolate, 4.5-6.2 mm long, 1.2-1.8 mm wide, acute, scarious margined except at the apex, glandular-pilose. Petals large, 7.8-11.1 mm long, bifid about 1/5 of their length, white. Filaments 6.0-6.2 mm long, anthers 0.8 mm long. Styles 4.0-4.2 mm long. Capsules 7.6-11.9 mm long, 2.1-3.0 mm wide, curved. Seeds dark brown, 0.9-1.3 mm in diameter, densely tuberculate. Chromosome number unknown.

HABITAT AND DISTRIBUTION: As far as can be discerned from the specimens at hand, Cerastium madrense Watson is found in moist Pinus and Quercus forests at altitudes of between 2600 and 3200 m in the states of Chihuahua and Durango.

SPECIMENS EXAMINED: MEXICO: CHIHUAHUA: Cool summits of the Sierra Madres, Pringle 1504, 7 October 1887 (CH, holotype). DURANGO: North slopes of Cerro Huehueto (Huehuento), south of Huachicheles, ca. 75 mi west of C. Durango, alt. 2900-3150 m, Maysilles 7241, 2 July 1950 (MICH). North slope of Cerro Huehueto (Huehuento), ca. 75 mi west of C. Durango, alt. 2900-3150 m, Maysilles 7250, 2 July 1950 (NY). North slopes of Cerro Huehueto

(Huehuento), south of Huachicheles, ca. 75 mi west of C. Durango, alt. 2900-3150 m, Maysilles 7276, 2 July 1950 (DS, MICH, TEX). San Luis del Río, 51 road miles northwest of Coyotes, (F, GH, NY, US).

12. Cerastium nutans Rafinesque

Cerastium nutans Rafinesque, Prec. Decouv., p. 36. 1814. Cerastium nutans var. genuinum Rohrbach (lusus 1), Linnaea 37: 289. 1873. TYPE: not seen, "En Pensylvanie".

Cerastium longepedunculatum Muhlenberg (nom. nud.), Cat., p. 47. 1813. TYPE: not seen, "Pens.".

Cerastium apricum Schlechtendal (with varieties angustifolium and brachycarpum), Linnaea 12: 208. 1838. Cerastium nutans var. apricum Rohrbach, Linnaea 37: 290. 1873. Cerastium longepedunculatum var. apricum Briquet, Annuaire Conserv. Jard. Bot. Geneve 13 & 14: 381. 1911. TYPE: not seen, "Jalapam," Schiede s.n., May, June (HAL?, holotype).

Cerastium ripartianum Schultz, Flora 45: 458. 1862. TYPE: not seen, "Hab. in Mexico, unde cl. Schaffner, absque nomine, misit."

Cerastium cuspidatum Hemsley, Diag. Pl. Nov., p. 21. 1878. TYPE: not seen, "In Convalle Mexici," Schaffner 60, (K, holotype).

Cerastium sericeum Watson, Proc. Amer. Acad. Arts 20: 354. 1885. TYPE: not seen, UNITED STATE: ARIZONA:

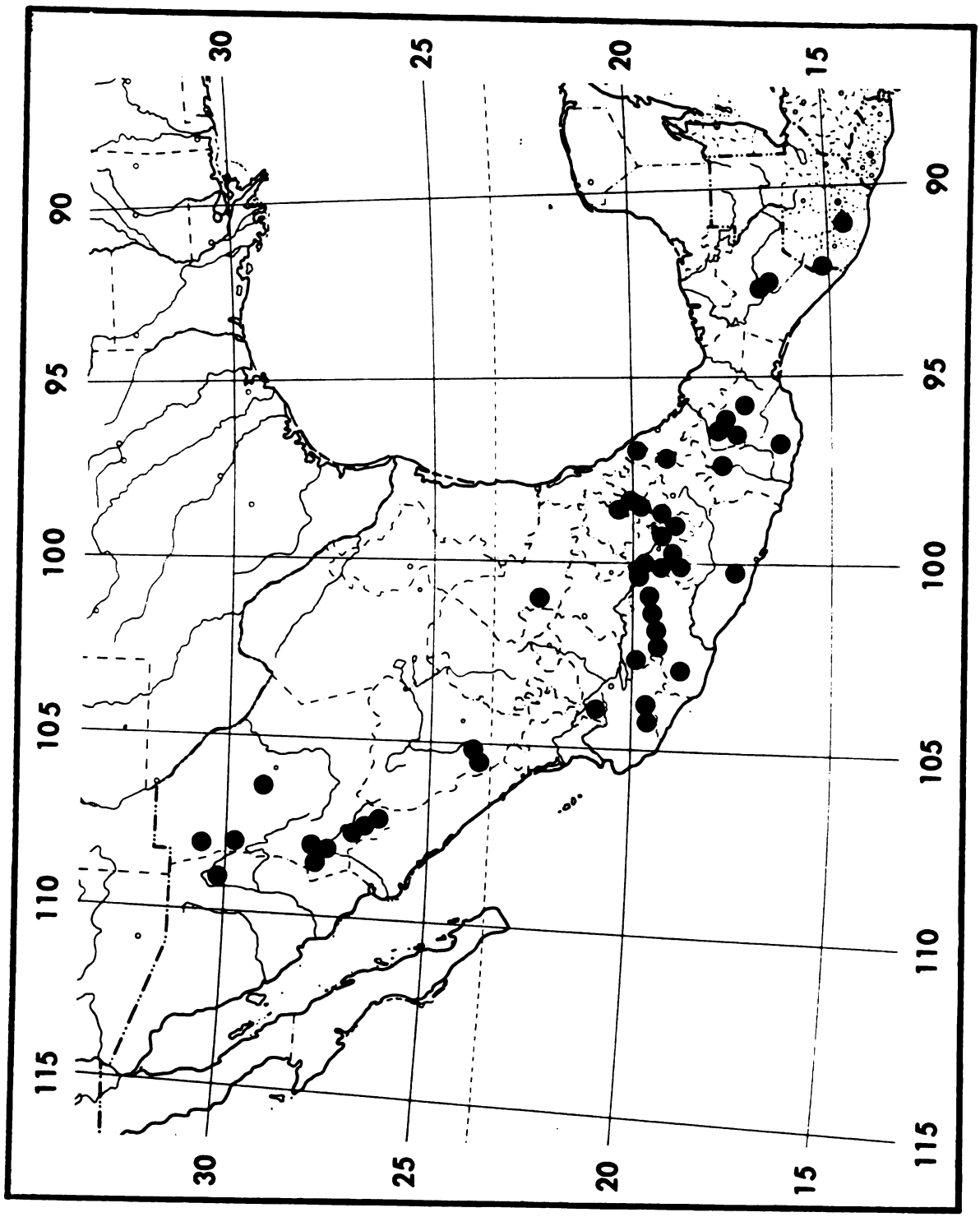
"Huachuca Mountains, 8000 ft", Lemmon and Lemmon s.n., 1882 and "Santa Rita Mountains", Pringle s.n., 1884.

Plant annual. Stems 15-50 cm tall, often much branched. Branches erect or decumbent, pilose, usually ± glandular pilose, sometimes ± lanate below. Internodes longest just below the inflorescence, gradually shorter toward the base, usually longer than, though sometimes shorter than, the leaves. Leaves largest near the base of the plant, gradually smaller upward, lanceolate to ovate or spatulate, 7.0-60.0 mm long, 2.0-25.0 mm wide, acute or obtuse, often somewhat thin, pilose or glandular-pilose. Basal rosette lacking. Cymes 2-25 flowered, bracts not scarious margined. The lowest pedicels the longest, 11.0-37.0 mm long, upper ones shorter, distally hooked when in fruit, glandular-pilose. Sepals lanceolate to ovate, 2.9-6.2 mm long, 0.8-1.8 mm wide, acute, scarious margined, glandular-pilose. Petals shorter than to much longer than the sepals (the petal to sepal length ratio being 0.95-1.95), 3.6-10.3 mm long, bifid about 1/4 to 1/3 of their length, white. Filaments 2.5-4.0 mm long, anthers 0.3 mm long. Styles 2.0-3.0 mm long. Capsules 6.0-13.2 mm long, 1.5-3.4 mm wide, curved. Seeds 0.7-1.0 mm in diameter, tuberculate. Chromosome number 2n = 34 (Beaman et al., 1962) or 35-36 (Söllner, 1952, 1954).

HABITAT AND DISTRIBUTION: Cerastium nutans is the most widely distributed species of Cerastium in Mexico. It has been collected throughout the upland areas (1700-3660 m) of Mexico except in the northeast (collections have been made in Chiapas, Chihuahua, Distrito Federal, Durango, Guerrero, Hidelgo, Jalisco, México, Michoacan, Morelos, Oaxaca, Puebla, San Luis Petosí, Sonora and Veracruz) and in western Guatemala (Chimaltenango and San Marcos). North of Mexico, it is found north to southwestern Quebec and British Columbia (Fernald, 1950). The habitat of the species includes mostly such areas as roadsides, woodlands and rocky hillsides below timberline. (Figure 12)

REPRESENTATIVE SPECIMENS: GUATEMALA: CHIMALTENANGO: Sierra Santa Elena, bei Tecpam Guatemala, Seler 2362, 27 September 1896 (CH). SAN MARCOS: Volcán Tacaná, east side of mountain at La Haciendita, alt. ca. 3375 m, Beaman 3188, 11 August 1959 (GH, MSC). MEXICO: CHIAPAS: Slopes on southeast side of Zontehuitz near summit, Municipio de Chamula, alt. ca. 9400 ft, Breedlove 6703, 30 July 1964 (DS, F). Tenejapa Center Municipio de Tenejapa, alt. ca. 6600 ft, Breedlove 10742, 11 July 1965 (DS, ENCB, LL). Near summit of Volcán Tacaná, Municipio de Union Juárez, alt. ca. 2200 m, Breedlove 26694, 30 July 1972 (DS). Near the summit of Chuchil Ton, northeast of Bochil, Municipio de San Andres Larranizar, alt. ca. 2700 m, Breedlove 26786, 3 August 1972 (DS, LL, MO).

Figure 12. Distribution in Mexico and Central America of Cerastium nutans.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Near crest of ridge in paraje of Banabil, Municipio de Tenejapa, alt. ca. 9100 ft, Breedlove & Raven 12966, 10 October 1965 (DS). On Mex. 190, 14 mi west of San Cristobal, alt. ca. 6000 ft., Kral 25345, 5 August 1965 (ENCB). In the paraje Sek'emtik, Municipio de Zinacantán, alt. ca. 6000 ft, Laughlin 1236, 12 July 1966 (DS, ENCB, WIS). In Paraje Pahal Ton, Municipio de Tenejapa, alt. ca. 8200 ft, Ton 640, 20 January 1966 (GH, LL, MSC). CHIHUAHUA: Municipio de Bocoyna, west side of Laguna Arareco, southeast of San Ignacio and Creel, alt. ca. 7200 ft, Bye 2304, 8 July 1972 (COLO). 4 mi southwest of Villa Matamoros, alt. 6000-6300 ft,. Correll & Gentry 22823, 5 October 1959 (LL). Mojarachic, Knobloch 5750, 30 September 1939 (MSC). Mojarachic, Knobloch 5915, 5 August 1939 (MSC). Majalca Cañon, LeSueur 466, 18-20 August 1935 (F, GH, TEX). Mt. Mohinera, Nelson 4894, 1 September 1898 (GH, US). Foothills of the Sierra Madres near Colonia Juárez, Nelson 6122, June 1899 (GH, US). "Barranca Colorad", Sierra Gazachic, 35 km southwest of Minaca, alt. 2200-2300 m, Pennell 18922, 16-17 September 1934 (GH).Barberigame, alt. 5000-6000 ft, Pennington 25, 13 July 1955 (TEX). Norogachi, alt. ca. 5000 ft, Pennington 643, 15 July 1955 (TEX). Cerro Moninora, 10 mi south of Guadeloupe y Calvo, alt. 2300-2400 m, Straw and Forman 1960, 11 August 1973 (MICH). Near Colonia García in the Sierra Madres, alt. ca. 7300 ft,

Townsend & Barber 160, 25 July 1899 (F, GH, MICH, MO, MSC, NY, TEX, UC, US). Canyon of "Little Strawberry Creek" 12 km east of Colonia Pacheco on the road to Colonia Juárez, alt. ca. 1900 m, Wilson & Johnston 8516, 31 July 1972 (LL). Sante Fe, Borgeau s.n., 25 July 1865-1866 (GH). 2 km south southwest of La Cima, on old Hwy. 95, on top of Serjana de Ajusco, ca. 1 km north of the Morelos border, Iltis, Koeppen & Iltis 208, 12-14 July 1960 (MICH). Lemas, Lyonnet 147, August 1927 (MO). Along the road up the Cañada de Río Magdelina near the 4th dynamo, alt. ca. 3000 m, Murry 10, 6 October 1971 (MSC). Ca. 1 mi beyond the south entrance to Desierto de los Leones National Park, alt. ca. 3000 m, Murry 14, 8 October 1971 (MSC). Near Puerto los Cruces, alt. 3100-3200 m, Murry 15, 8 October 1971 (MSC). Ca. 5 mi from the north entrance to Desierto de los Leones National Park, alt. ca. 3000 m, Murry 20, 8 October 1971 (MSC). Contreras, Orcutt 3504, 9 August 1910 (F, MO). Near Eslava, alt. ca. 8000 ft, Rusby 134, 19 July 1910 (NY, US). Al sur del Xitle, Rzedowski 1756, 15 September 1952 (ENCB). Cañada de Contreras, alrededores del 40 dinamo, alt. ca. 3000 m, Rzedowski 20411, 5 August 1965 (ENCB, MSC). Cuajimalpa, Salazar s.n., August 1913 (US). Río de la Magdalena, between Contreras and the 2nd dynamo, Sharp 4425, 23 July 1944 (GH, NY). Tlaltepec, alt. ca. 2900 m, Ventura A. 1758, 7 July 1976 (ENCB). Santa Cecelia, alt. ca. 2600 m,

Ventura A. 2879, 2 July 1977 (ENCB). Ca. 5 mi north of railroad at Coyotes (45 airline mi west of C. Durango), west facing slopes of broad arroyo, tributary to Rio del Presidio, alt. 2400-2500 m, Maysilles 7118, 28 June 1950 (NY). El Salto, alt. 2540-2600 m, Pennell 18317, 28 August 1934 (GH). Area ca. 10-15 mi west of El Salto on Hwy. 40, alt. ca. 8500 ft, Wiens 3495, 23 July 1963 (COLO). GUERRERO: Near Toro Muerto, Distrito Mina (Galeana), Hinton 11231, 22 January 1938 (GH, MICH, NY, US). Vertiente sudoeste del Cerro Teotepec, Municipio de Tlacotepec, alt. ca. 3400 m, Rzedowski & McVaugh 206, 29 January 1965 (ENCB, MICH). HIDALGO: 1 km ESE de Zacualtipán, Municipio de Zacuatipan, alt. ca. 1900 m, Mores 213, 18 May 1977 (ENCB). 1 km al SSW de Real del Monte, alt. ca. 2900 m, Medina 1413, 3 June 1976 (ENCB). El Bordo, 3.5 km al NNW de Pachuca, alt. ca. 2750 m, Medina 1514, 8 August 1975 (ENCB). Distrito Pachuca, Municipio Mineral del Chico, below Parque Nacional El Chico, Moore 1554, 17 October 1946 (GH, UC). Distrito Tulancingo, Municipio Metepec, between Agua Blanca and Apulco, alt. 2000 m, Moore 2085, 19 November 1946 (GH). Sierra de Pachuca, Rose & Ray 6342, 21-22 July 1901 (US). Real del Monte, Rose, Painter & Rose 8702, July 1905 (GH, NY, US). Between Somoriel and Las Lajas, Rose, Painter & Rose 9171, 5 August 1905 (GH, US). Cerro del Xihuingo, alt. ca. 2700 m, Ventura A. 1849, 20 July 1976 (ENCB).

Cerro de Santa Ana, alt. ca. 2850 m, Ventura A. 2297, 13 October 1976 (ENCB). JALISCO: Nevado de Colima, alt. ca. 2400 m, Diaz L. 7749, 24 March 1977 (ENCB). Chuchilla, northeast side of Volcano Colima, Goldsmith 67, 22 July 1905 (GH). Nevado de Colima (Nevado de Zapotlán), a few mi south of Ciudad Guzmán (Zapotlán), alt. ca. 3080 m, Gregory & Eiten 287, 2 July 1956 (GH, MICH, MO, MSC, NY). Cerro de Tequila, cerca de Tequila, alt. ca. 2750 m, Villarreal de Puga 1637, 11 August 1968 (ENCB). In mountains east of Mamantlán, ca. 15 mi south southeast of Autlán by way of Chante, alt. ca. 8300 ft, Wilbur & Wilbur 1882, 27 July 1949 (MICH). MEXICO: 10 km al este de Amecameca, alt. ca. 3000 m, Angel G s.n., 13 September 1977 (ENCB). Between kms 74 and 75 on the Amecameca-Popocatepetl road, alt. ca. 3200 m, Beaman 2030, 2 August 1958 (MSC). Villa Alpina, municipio de Naucalpan, alt. ca. 3200 m, Casas V. 163, 24 November 1974 (ENCB). On road to Sultepec, 2.3 mi north of Raices or 2 mi south of intersection of road to Raices and road to Temascaltepec, alt. ca. 2970 m, Denton 1877, 25 July 1972 (ENCB, UC). Distrito Temascaltepec, El Crucero, alt. 2880 m, Hinton 868, 14 June 1932 (MO). 1/2 km al este de la Presca Iturbide, alt. ca. 3200 m, López V. 29, 2 October 1976 (ENCB). 15 on the Amecameca-Popocatepetl road, alt. ca. 3250 m, Murry 29, 11 October 1971 (MSC). 0.5 mi east of the México-Michoacan border

on Rte. 15, alt. ca. 2830 m, Murry 57, 24 November 1971 (MSC). Laguna de Santiago Tilapo, alt. ca. 2600 m, Patiño S. 174, 20 July 1974 (ENCB). 3 km al sudoeste de Tlalmanalco, sobre el camino a Santo Tomas Atzingo, alt. ca. 2500 m, Pineda 479, 25 August 1968 (MSC). Salto de Agua, Purpus 1668, November 1905 (F, GH, NY, UC, US). Northwest slopes of Nevado de Toluca, 10 km (by road) southwest of junction of roads to Sultepec and Temascaltepec on Hwy. 130 to Temascaltepec or 27 km (by road) southwest of Toluca, alt. ca. 3000 m, Roe, Roe & Mori 273, 16 July 1965 (ENCB, MICH, US, WIS). Near Tultenango, Rose & Hay 5433, 13 July 1901 (GH, US). Near Cima, Rose & Painter 7173, 19 September 1903 (NY, US). Nevado de Toluca, Rose & Painter 7922, 15 October 1903 (GH, NY, US). Cerro Venacho, cerca de Amecameca, alt. ca. 2600 m, Rzedowski 429, 16 December 1951 (ENCB). 5 km al noroeste de Cahuacan, sobre el camino a Villa de Carbon, alt. ca. 2650 m, Rzedowski 18301, 21 June 1964 (ENCB). Cerro de Sacromonte, cerca de Amecameca, alt. ca. 2450 m, Rzedowski 24203, 6 August 1967 (ENCB). Rio Frio, alt. ca. 3000 m, Vasquez 63, 8 September 1962 (ENCB). Sudeste de San Pedro Nexapa, a 2 km del pueblo, alt. ca. 2650 m, Villegas D. 445, 2 August 1964 (ENCB). MICHOACAN: Cerro Azul, Morelia, Arsène 5523, 4 August 1910 (NY). Loma Santa María, near Morelia, alt. ca. 1900 m, Arsène 5544, 7 August 1910 (MO, NY, US). At the

southwest side of Cerro San Andres, ca. 12 km (straight line distance) north of Ciudad Hidalgo, alt. ca. 3100 m, Beaman 4318, 6 September 1960 (GH, MSC, NY, TEX, UC, US). East of crest on Hwy. 15, 2.4 mi northwest of Pino Gordo, southwest of Morelia, alt. ca. 9700 ft, Bell & Duke 16721, 22 August 1959 (MO). Los Azufres, cerca de Ciudad Hidalgo. Los Azufres, Diaz L. 16, 18 July 1957 (MSC). Cerro Santa Maria, 8-10 km southwest of Jiquilpan and ca. 5 km northeast of Quitupan, alt. ca. 2000 m, Feddema 231, 8-9 July 1959 (MICH). Distrito Coalcomán, Barroloso, ca. 2700 m, Hinton 15095, 10 August 1934 (ENCB, GH, LL, MO, NY, US). Municipio Tancitaro, Mt. San Miguel, alt. ca. 6700 ft, Leavenworth & Hoogstraal 1079, 21 July 1941 (F). Cerro Tancitaro, alt. ca. 10,000 ft, Leavenworth & Hoogstraal 1119, 22 July 1941 (CAS, F, GH, MICH, MO, NY). Near the microwave tower on Cerro Burro, 7 mi south of Opopeo, alt. ca. 3170 m, Murry 59, 25 November 1971 (MSC). On north side of Hwy. 15, 4 mi west of Ciudad Hidalgo, alt. ca. 7200 ft, Rodman & Schnell 12, 17 June 1968 (GH). Southwest shore of Lake Patzcuaro, alt. ca. 2200 m, Schery 141, 15 July 1941 (MICH, MO, US). Along Hwy. Mex. 15, ca. 20 mi west of Morelia, alt. ca. 7600 ft, Watkins, Dunn & LeDoux 639, 27 July 1975 (ENCB). MORELOS: Toro, Fisher 259, 5 August 1924 (DS, F, MO, US). Along Rte. 95, 12 mi north of Cuernavaca toward Mexico City, Powell & Edmondson 732, 16 August 1961 (F, MICH,

TEX). Lagunas de Zempoala, alt. ca. 2775 m, Villamar s.n. 14 June 1964 (ENCB, MSC). OAXACA: Llano de las Flores on the Oaxaca-Valle Nacional highway 20 km east of Ixtlán, alt. ca. 2870 m, Beaman 3711, 22 July 1960 (GH, MSC, US). 19 km southwest of Sola de Vega along the road to Puerto Escondido, alt. ca. 7000 ft, Breedlove 12294, 30 August 1965 (DS, ENCB, MICH, MSC). Las Sedas a la Carbociera, alt. ca. 2500 m, Cacizatti & Gonzalez 391, August 1897 (GH). Cerro Nate, 3.5 km al sudeste de Magdalena Jicotlan, Municipio de Tlapiltepec, alt. ca. 2450 m, Cruz C. 2038, 4 August 1968 (ENCB, MSC). Cerro del Camello, 2 km al Sur de Topelmeme de Morelos, alt. ca. 2250 m, Cruz C. 2185, 25 August 1968 (ENCB). Vicinity of Zempoaltepetl, around Indian altars at the summit, alt. ca. 3396 m, Hallberg 739, 23 July 1950 (MICH). Mountains along Rte. 175, 12 km north, Nelson 1120, 1894 (US). 18 mi southwest of the city of Oaxaca, alt. 7500-9500 ft, Nelson 1381, 10-20 September 1894 (GH, US). Along Rte. 175 toward Ixtlán, 12 mi northeast of Oaxaca, Powell & Edmondson 680, 14 August 1961 (F, MICH, TEX). Sierra de San Felipe, Pringle 5868, 8 June 1894 (GH, MICH, US). Cerro Verde, in the vicinity of San Luis Tultitlanapa, Puebla, Purpus 3312, July 1908 (F, GH, MO, NY, UC, US). West slope of Sierra Madre del Sur, 35 km south of Juchatengo on road to Zimatlan at km. 178, alt. ca. 1700 m, Roe, Roe & Mori 570, 25 July 1965 (F,

WIS). Smith 51, 27 June 1894 (GH). PUEBLA: A few mi west of San Martin Texmelucán, toward Río Frío, alt. 6000-8000 ft, Manning & Manning 53703b, 1 August 1953 (GH). Vicinity of San Luis Tultitlanapa, Purpus 2720a, June 1908 (F, GH, MO, NY, UC, US). SAN LUIS POTOSI. Region of San Luis Potosí, alt. 6000-8000 ft, Parry & Palmer 47, 1878 (GH, NY, US). SONORA: Puerto de los Aserraderos, region of the Río de Bavispe, Phillips 409, 6 August 1940 (GH, MICH). Between Las Lierritas and El Tigre, region of the Rio de Bavispe, Phillips 672, 22 August 1940 (GH, MICH). VERACRUZ: Mt. Orizaba, Sierra Negra, alt. ca. 11,8000 ft, Balls & Gourlay B4436, 5 May 1938 (MICH, UC). Encino Gacho, Municipio de Las Vigas, alt. ca. 2300 m, Ventura A. 7186, 18 October 1972 (ENCB).

Not only is Cerastium nutans the most widely distributed species of the genus in Mexico, it is also the most diverse. Some attemt might be made to use this diversity to define varieties, but in most cases the material in this study showed too much intergradation between the extremes and there was often too little material available on which to base sound judgment on such a question. I will therefore content myself with describing the variation without assigning to it any taxonomy.

The "basic" Cerastium nutans specimen is a rather large, robust, much branched plant with fairly thin

lanceolate to ovate leaves. It has quite long pedicels (the lower ones usually over 17 mm long) and moderately sized sepals ($.0-5.0 mm long). The petals are usually equal to or slightly longer than the sepals. This "normal" form is found from western Guatemala up through the central highlands of Mexico (excluding the northeast) and into the United States and Canada.

From specimens of the sort described above, the species varies to some degree in several characters. In the Sierra Madre Occidental of western Mexico and the Trans-Mexican Volcanic Belt there is a tendency for the petals to increase considerably in length, reaching twice the length of the sepals. This tendency is also seen in some parts of the United States (Correll and Johnston, 1970).

In central and southern Mexico, particularly in Michoacan, specimens have been collected which have generally shorter pedicels (13.0-19.0 mm long) and slightly smaller flowers than usual. These characters combine to give the plants to some extent the aspect of Cerastium brachypodum with which these specimens have often been confused. However, they are clearly not that species because, even in these characters, the plants much more closely approach C. nutans.

Apparently restricted to the high mountains of Jalisco and Guerrero is a variant which is usually fairly

Apparently restricted to the high mountains of Jalisco and Guerrero is a variant which is usually fairly small and has rather small pale rhomboidal leaves covered with distinctively long glandular-pilose pubescence. Its pedicels are short (12.0-23.0 mm long) and it has fairly large petals (5.2-7.1 mm long). In northern Oaxaca a similar set of specimens has been collected but these have elliptical leaves and lack the distinctive pubescence mentioned above. Also in central Mexico can be found plants with very narrow attenuate leaves and small flowers.

In northwestern Mexico there are two variants on the "basic" Cerastium nutans. The first, found in western Chihuahua and eastern Sonora, is characterized by very small flowers (sepals 2.9-4.0 mm long, petals 3.9-4.0 mm long), short, broad capsules (6.0-8.6 mm long, 1.8-2.8 mm wide) and long, linear to lanceolate leaves (the length to width ratio averaging 11.5 as opposed to 4.4 for all other specimens of C. nutans). The other variant has different amounts of lanate pubescence on the lower parts of the stem and the lower leaves. This group is indeed probably referable to the binomial C. sericeum, a species described from the Huachuca and Santa Rita Mountains of Arizona (Watson, 1885). Aside from the lanate pubescence, Watson stated that the species is easily distinguishable from C. nutans in that its "seeds

are twice larger and more coarsely tuberculate." Kearney and Peebles (1939), however, stated that "intergradation in pubescence [between C. sericeum and C. nutans] is complete in Arizona specimens" and therefore described the group as a variety of C. nutans (C. nutans var. obtectum). This situation is also seen in Mexican specimens in which the group varies from extremely basally lanate (Knobloch 5915) through less lanate (Ibana G. 416 and Knobloch 5750) to only slightly lanate (Townsend & Barber 160, Phillips 672 and Nelson 6122). Kearney and Peebles also stated that "the two forms are not constantly distinguishable by the seed characters mentioned by Robinson (1897)." In Mexico, specimens showing lanate characters are found in Chihuahua, eastern Sonora and Durango.

13. Cerastium purpusii Greenman

Cerastium purpusii Greenman, Zoe 5: 183. 1904. TYPE: MEXICO: STATE NOT KNOWN: Mt. Ixtaccihuatl, Purpus 472, 1903 (GH!, UC!, syntypes; MO!, US!, isotypes).

Cerastium molle Bartling in Presl, Rel. Haenk. 2: 17. 1831. (Non Cerastium molle Villars, Hist. Pl. Dauphine 3: 644. 1789). TYPE: MEXICO: STATE NOT KNOWN: Haenke s.n., (PR-photo in MICH!).

Cerastium lanuginosum Sesse & Mocino, Fl. Mex., ed. 2, p. 118. 1894. (Non Cerastium lanuginosum Willdenow

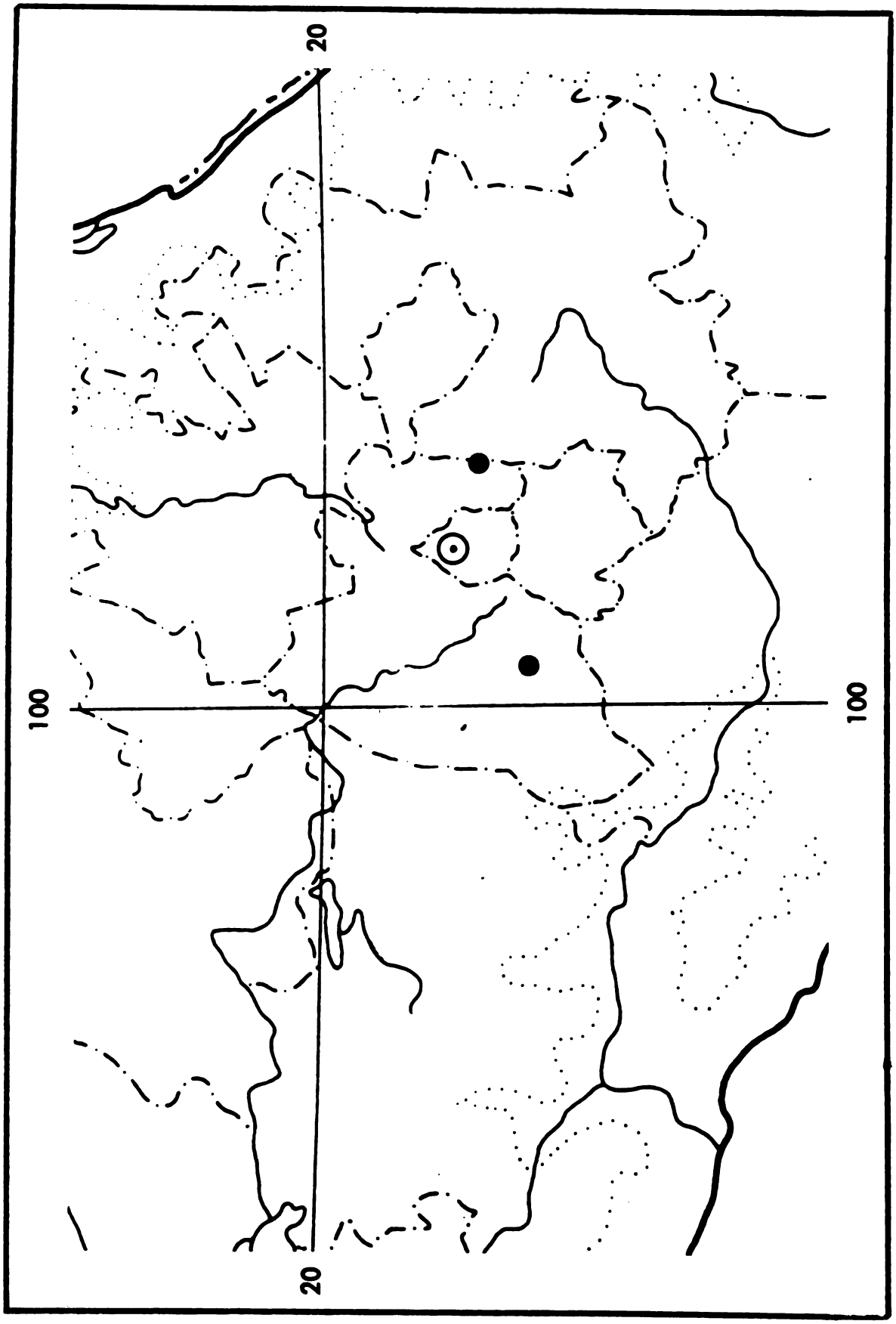
ex Reichenbach, Fl. Germ. Exurs, p. 797. 1832). TYPE: MEXICO: MÉXICO: not seen, "Habitat in Vulcano Tolucae."

Plant a short-lived perennial, low, dense, caespitose. Stems to 20 cm tall, usually less than 10 cm, much branched at base, not otherwise. Branches pilose to lanate. Internodes usually, though not always, shorter than the leaves. Cauline leaves broadly lanceolate to ovate, 5.0-15.0 mm long, 2.0-6.0 mm wide, often largest just below the inflorescence, usually acute, pilose to lanate. Basal rosette often present. Basal leaves larger, to 35.0 mm long and 10.0 mm wide, lanate, acute, lanceolate to spatulate. Cymes 1-10 flowered, flowers ± densely crowded at the apex of each branch. Bracts not scarious margined. Pedicels less than 10.0 mm long, pilose. Sepals 4.2-7.8 mm long, 1.3-1.8 mm wide, lanceolate, acute, pilose, never glandular, margins narrowly scarious except at the apex. Petals 6.0-10.6 mm long, bifid about 1/8 to 1/4 of their length, white. Filaments 4.5-6.7 mm long, anthers 0.7 mm long. Styles 3.0-3.3 mm long. Capsules 7.2-10.3 mm long, 2.5-3.0 mm wide, only slightly curved. Seeds 0.7-0.9 mm in diameter, densely tuberculate. Chromosome number $2n = 34$ (Beaman et al., 1962).

HABITAT AND DISTRIBUTION: Cerastium purpusii is one of the species of Cerastium living at the highest altitudes of any in Mexico, being found only in high, wet alpine meadows at altitudes of between 3650 and 4610 m on Nevado de Toluca and Ixtaccihuatl. (Figure 13).

REPRESENTATIVE SPECIMENS: MEXICO: MEXICO: Nevado de Toluca, near large lake in the crater, alt. ca. 4140 m, Beaman 1680, 7 September 1957 (GH, MSC, US). Nevado de Toluca, shore of large lake in the crater, alt. ca. 4140 m, Beaman 1882, 26 July 1958 (F, GH, MICH, MSC, NY, TEX, UC, US). Nevado do de Toluca, summit of third highest point on the south rim of the crater, alt. ca. 4430 m, Beaman 1917, 27 July 1958 (MSC). Nevado de Toluca, summit of east rim of crater, alt. ca. 4170 m, Beaman 2463, 6 September 1958 (GH, MSC). Cratère du Nevado de Toluca, Diguet s.n., November 1907 (MICH). Nevado de Toluca, rim of crater, alt. ca. 14,600 ft, Hodgson, Hodgson & Healey 5607, 23 July 1938 (GH). Nevado de Toluca, Huerta M. s.n., 4 August 1962 (MSC). Nevado de Toluca, alt. 13,000-15,000 ft, Pringle 5328, September 1892 (GH). Nevado de Tolucs, Rose & Painter 7982, October 1903 (GH, NY, US). Vertiente norte del Nevado de Toluca, alt. ca. 3650 m, Rzedowski 22855, 6 August 1966 (DS, ENCB, MICH, MSC, TEX, WIS). Ixtaccihuatl,

Figure 13. Distribution in Mexico and Central America of *Cerastium purpusii*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in cirque ca. 5 km northeast of Pies, alt. ca. 4370 m, Beaman 3487, 6 July 1960 (MSU).

The outstanding difference between the species of Cerastium purpusii from Nevado de Toluca and those from Ixtaccihuatl is the fact that the flowers of the Toluca specimens are much larger, more closely approaching those of the sympatric populations of C. tolucense. Since this is the case and since C. purpusii probably arose from C. tolucense of some similar plant, the most probable original location for C. purpusii is on Nevado de Toluca. The primary non-physiological reproductive barrier between the two species seems to be altitudinal, with C. purpusii being found usually much higher than C. tolucense.

The name of this species was originally published in 1904 as Cerastium purpusi but is correctly spelled C. purpusii.

The binomial Cerastium molle Bartling in Presl, commonly used for the species here described as C. tolucense, was actually originally used for this species. However, since Villars used the name C. molle in 1789 (42 years before Bartling used it), Bartling's name is not acceptable.

The name Cerastium lanuginosum was published in 1894 by Sessé and Mociño for a plant bearing the

description of C. purpusii. The statements in its original description "folia lanata" (leaves lanate), "caulis.....subtomentosus" (stem subtomentose), "petala apice tantum bifida, calycibus dimidio loniora" (petals apically somewhat bifid, with calyx half as long), "pedunculi terminalis, conterti" (peduncles terminal, crowded), "caulis.....bipollicaris" (stem about 5.4 cm) and "capsulae subrotundae" (capsules subrotund) lead without any doubt to. C. purpusii rather than to any of the other seven species of Cerastium likely to be found in the vicinity of Nevado de Toluca, the type locality. Furthermore, although no type specimen was listed, a specimen seen in this study and obviously seen by Sessé and Mociño (Sessé, Mociño, Castillo and Maldonado 1012, F) was labeled as C. lanuginosum and is in fact C. purpusii.

On comparing the dates of publication of the two binomials, it becomes apparent that Cerastium languinosum antedates C. purpusii by ten years. However, the fact that the binomial C. lanuginosum Willdenow ex Reichenbach (probably synonymous with C. alpinum Linnaeus) was published in 1832, 62 years before the Sessé and Mociño publication, invalidates its use for the Mexican species.

14. Cerastium tolucense D.A. Good, sp. nov.

TYPE: MEXICO: MEXICO: Nevado de Toluca, north side of mountain, 0.7 mi east of point where road goes above timberline, alt. ca. 3985 m, Beaman 1921, 28 July 1958 (MSC!, hologype; GH!, MICH!, TEX!, US!, isotypes). (Figure 14)

Planta perennis. Caules usque ad 35 cm alti sed plerumque minus quam 20 cm, erecti vel ascendentes. Planta basi profuse ramosa, non superne. Rami pilosi ad lanati, praesertim lanati basi et ad nodos. Internodia longissima proxime infra inflorescentiam, plerumque (praeter aliquot specimenes juvenes) multo longiores quam folios. Folia caulina plerumque parva, 5.0-30.0 mm longa, 1.0-5.5 mm lata, linearia ad lanceolata, acuta, plus minusve lanata. Rosula basalis praesens. Folia basalia grandiora, usque ad 60.0 mm longa et 10.0 mm lata, lanceolata ad late elliptica, acuta vel obtusa, plerumque dense lanata, praesertim basi. Cymae 1-12 floribus. Bracteae non scario-marginatae. Pedicelli usque ad 25.0 mm longi, plerumque brevissimi, pilosi, interdum glandulo-pilosi. Sepala 3.4-6.5 mm longa, 1.0-2.0 mm lata, elliptica, acuta, praeter apicem scario-marginata. Petala 4.5-11.6 mm longa, bifida circa 1/8 ad 1/4 longitudinis, alba. Filamenta 4.0-7.0 mm longa. Antherae 0.7 mm longae. Styli 3.0-4.0 mm longi.

Figure 14. Holotype of *Cerastium tolucense* D. A. Good, sp. nov.

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Cerastium toluconse Good HOLOTYPE

Det. David Good 16 Feb. 1979

MICHIGAN STATE UNIVERSITY HERBARIUM

PLANTS OF MEXICO

Cerastium nolla Bartl.

State of Mexico. Nevado de Toluca; north side of mtn. 0.7 mi. east of point where road goes above timberline; ca. 3985 m. alt grassy ravine in alpine meadow; abundant in a local area.

John H. Beaman No. 1921 28 July 1958

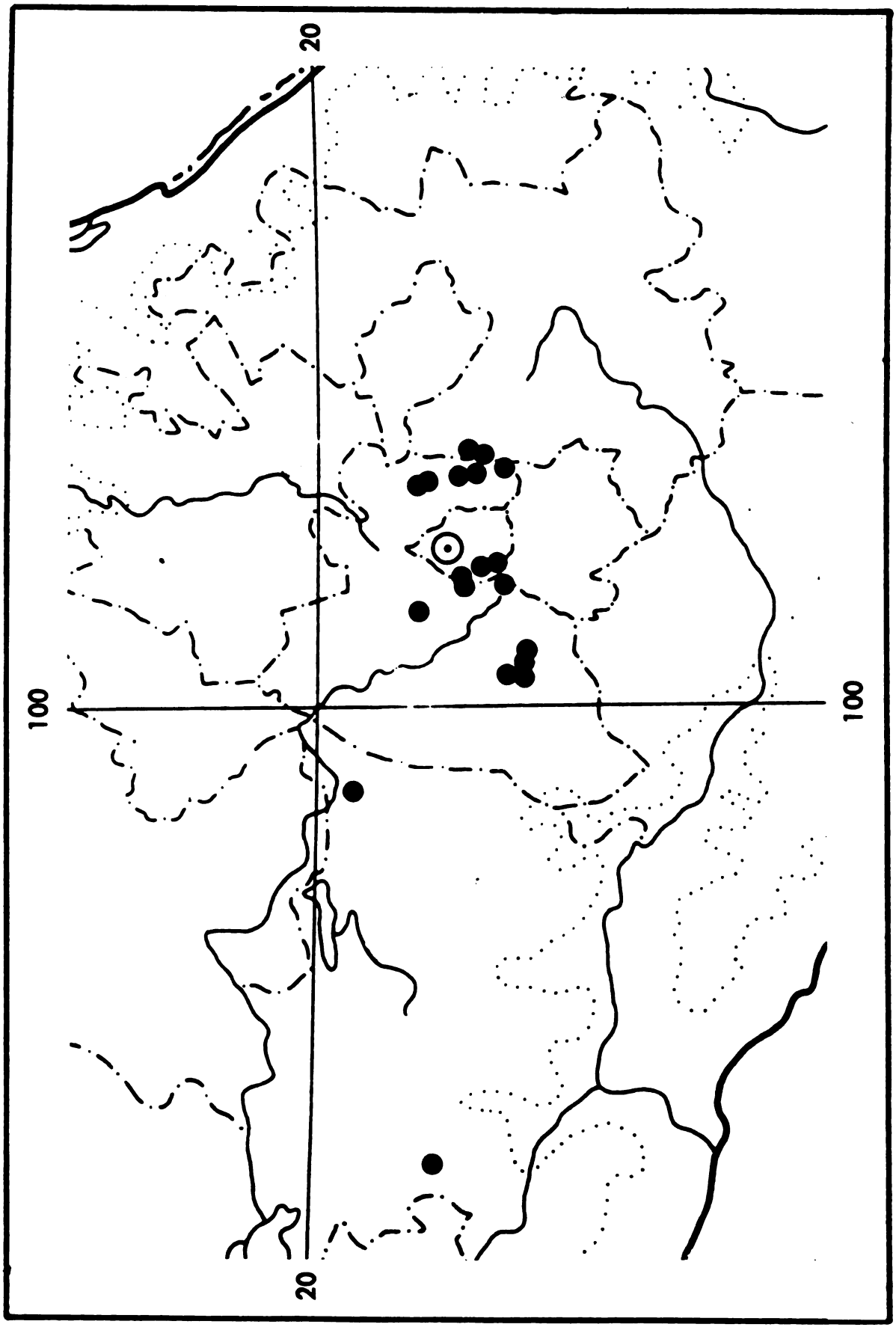
Capsulae 6.0-9.0 mm longae, 2.1-2.8 mm latae, curvae. Semina 0.7-0.9 mm diametro, tuberculata. Chromosomatum numerus 2n = 34 (Beaman et al., 1962).

Plant perennial. Stems to 35 cm high but usually less than 20 cm, erect or ascending. Plant much branched at base, not so above. Branches pilose to lanate, the latter particularly basally and at the nodes. Internodes longest just below the inflorescence, almost always (except in some young specimens) much longer than the leaves. Cauline leaves usually small, 5.0-30.0 mm long, 1.0-5.5 mm wide, linear to lanceolate, acute, ± lanate. Basal rosette present. Basal leaves larger, to 60.0 mm long and 10.0 mm wide, lanceolate to widely elliptic, acute or obtuse, often though not always, densely lanate, particularly basally. Cymes 1-12 flowered, Bracts not scarious margined. Pedicels to 25.0 mm long, usually shorter, pilose, sometimes glandular-pilose. Sepals 3.4-6.5 mm long, 1.0-2.0 mm wide, elliptic, acute, scarious margined except at the apex. Petals 4.5-11.6 mm long, bifid about 1/8 to 1/4 of their length, white. Filaments 4.0-7.0 mm long, anthers 0.7 mm long. Styles 3.0-4.0 mm long. Capsules 6.0-9.0 mm long, 2.1-2.8 mm wide, curved. Seeds 0.7-0.9 mm in diameter, tuberculate. Chromosome number 2n = 34 (Beaman et al., 1962).

HABITAT AND DISTRIBUTION: Cerastium tolucense is a species of fairly high mountains (3000-4000 m, sometimes as low as 2500 m) in central Mexico. It has been collected in the mountains of Distrito Federal, Mexico, Michoacan and Puebla. Its habitat includes both alpine meadow and, at slightly lower elevations, open Pinus forest. (Figure 15)

REPRESENTATIVE SPECIMENS: MEXICO: DISTRITO FEDERAL: Top of Cerro Ajusco, alt. ca. 3937 m, Beaman 2773, 12 July 1959 (GH, MSC, US). Cerro Coyotes, cerca de Contreras, Paray 300, June 1952 (ENCB). Llano Grande, cerca del Desierto de los Leones, alt. ca. 3250 m, Rzedowski 20496, 26 August 1965 (ENCB). Entre el Llano del la Cieneguilla y el Cerro San Miguel, Sierra de las Cruces, alt. ca. 3600m, Rzedowski 23887, 9 July 1967 (MSC). MEXICO: Nevado de Tolucs, north side of mountain 0.7 mi east of point where road goes above timberline, alt. ca. 3985 m, Beaman 1921, 4 September 1958 (MSC, holotype; GH, MICH, TEX, US, isotypes). Telapón (north of Ixtaccihuatl), south side of mountain, alt. 3450-3650 m, Beaman 2431, 4 September 1958 (GH, MSC, TEX, UC, US). Ixtaccihatl, south side of mountain between Zltzomoni and La Joya, 0.7 km south of La Joya, alt. ca. 3980 m, Beaman 3495, 7 July 1960 (GH, MSC). Park area at junction of road to Temascaltepec and road to Nevado de Toluca, alt. ca. 10,500 ft, Dunn, Bennett, Wieder & Torke

Figure 15. Distribution in Mexico and Central America of *Cerastium tolucense*.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22518, 30 July 1977 (MO). Vertiente oeste del Ixtaccihuatl, alt. ca. 3800 m, Espinosa 6, 3 August 1958 (CAS, ENCB, MSC). Cerro Tláloc, municipio de Ixtapaluca, alt. ca. 3950 m, Flores M. 283, 31 July 1978 (ENCB). Alrededores de la Rancheria El Capulín, Municipio de Tecaltitlán, alt. ca. 3000 m, García S., 6 July 1968 (MSC). Distrito Temascaltepec, Mesón Viejo, Hinton 8346, 10 November 1935 (GH, LL, NY). Paso de Cortés, alt. ca. 3775 m, Murry 32, 11 October 1971 (MSC). Nevado de Toluca, Nelson 15, 9 September 1893 (US). La Marquesa, municipio de Lerma, alt. ca. 3000 m, Piña C. 79, 30 November 1975 (ENCB). Nevado de Toluca, alt. 13,000-15,000 ft, Pringle 5328, September 1892 (GH). Río Frío, 15 km. Río Frío-Estación Forestal Zoquiapan, alt. ca. 3500 m, Rodriguez, García & García 1291, 16 August 1974 (CAS). Nevado de Toluca, alt. ca. 4200m, Roe, Roe & Mori 321, 17 July 1965 (ENCB, F, MICH, NY, WIS). Nevado de Toluca, Rose & Painter 7954, 16 October 1903 (US). Vertiente sudoeste del Ixtaccihuatl, 4 km al norte de la Estación Retranmisora, alt. ca. 3800 m, Rzedowski 20149, 15 July 1965 (CAS, ENCB, MSC). Vertiente noroeste del Ixtaccihuatl, en la región de Peñas Cuatas (Yautepeme), alt. ca. 4000m, Rzedowski 21790, 30 December 1965 (ENCB, MSC). Palomas, Municipio de Iturbide (Santiago Tlazala), alt. ca. 3400 m, Rzedowski 25912, 18 July 1968 (MSC). Alrededores de la Presa

Iturbide, alt. ca. 3300 m, Rzedowski 28562, 19 August 1971 (ENCB). Alrededores del Llano de la Horca, alt. ca. 3350 m, Rzedowski 31665, 1 January 1974 (ENCB). MICHOACAN: Summit of Cerro San Andrés, ca. 12 km (straight line distance) north of Ciudad Hidalgo, alt. 3589 m, Beaman 4278, 6 September 1960 (GH, MSC, UC, US). Municipio Tancitaro, Cerro Tancitaro, alt. ca. 12,600 ft, Leavenworth 278, 17 July 1940 (F, GH, MO, NY). PUEBLA: Ixtaccihuatl, south side of mountain, ca. 6 km north of Paso de Cortés, alt. ca. 3900 m, Beaman 2871, 18 July 1959 (MSC). In Paso de Cortés near power substation, alt. ca. 3700 m, Beaman 4227, 27 August 1960 (GH, MSC). Estación Forestal San Juan Tetla, pasndo límite de árboles, alt. ca. 4100 m, Boenge 912, 7 October 1968 (CAS).

Considerable variation can be seen among the specimens studies. Many of these appear to have no apparent geographical or ecological correlation and may therefore be merely an indication of the substantial internal variation within the species in any single area. Other variation is probably correlated with the habitat from which the specimen was collecte (i.e., the specimens collected in alpine meadows are for the most part much more densely pubescent than those found in forest situations, but there are exceptions).

Some variation appears to be geographically correlated, with specimens from different areas appearing morphologically different, and might therefore help to indicate a very tentative history of the dispersal of this species. A prime example of this is general flower size, particularly petal length.

Cerastium tolucense is essentially restricted to the areas of central Mexico over 3000 m in altitude which, according to Millares and Escribano (1966), are found around Hevado de Toluca in southern México, southwestern Distrito Federal, southeastern México (around Telapón, Ixtaccihuatl and Popocatepetl), southern Tlaxcala (Malinche) and west-central Veracruz (Cofre de ferote and Pico de Orizaba). Other small areas of such altitude are found in Michoacon (Cerro San Andrés and Cerro Tancitaro). On looking at flower size of the plants in each of these areas, it can be seen that significant differences exist ($P < .05$) and that the plants with the smallest flowers are found in Ixtaccihuatl-Popocatepetl area. Plants with slightly larger flowers occur in southwestern Distrito Federal and adjacent México, plants with still larger ones on Nevado de Toluca, Palomas and Cerro San Andrés and the plants with the largest flowers on Cerro Tancitaro at the westernmost limit of the species. Because the center of diversity and hence the probable area of origin is in the

México-Distrito Federal region, the Michoacan populations probably arose through long distance dispersal from somewhere in that area; probably from Nevado de Toluca since its specimens match those of the Michoacan areas most closely.

It now remains to look into the dispersal of the species between the various areas in this central México-Distrito Federal region. Two possibilities come to mind: the first is that the small flowered condition is primitive and that the species originated in the Ixtaccihuatl-Popocatepetl area and spread from there to the Distrito Federal area and hence to Nevado de Toluca. The other is that larger flowers are primitive and that Nevado de Toluca was the place of origin from which the species spread eastward to Ixtaccihuatl-Popocateptl. In either case, the Palomas populations were probably derived from those of Nevado de Toluca as is indicated by the closer correlation of flower size with those populations than with those of southwestern Distrito Federal.

The greater abundance of glandular hairs on the sepals of the Ixtaccihuatl-Popocatepetl specimens than on those from Nevado de Toluca might indicate a derived condition since the Tancitaro and San Andrés populations, which fairly certainly were derived from the Nevado de Toluca plants, are also more glandular.

This is evidence for a Nevado de Toluca origin for the species. However, since Cerastium tolucense is probably derived from a vulcanicum-like ancestor, the glandular condition might be considered primitive, indicating that the Ixtaccihuatl-Popocatepetl area is the ancestral site.

A possible misinterpretation arising from this discussion might be that it suggests single arrivals in the various areas. This is almost certainly untrue; there probably have been in fact numerous and repeated introductions into each area from those closest to it and fewer, as with any "island" situation (MacArthur and Wilson, 1967), from those farther away.

Although the name Cerastium molle Bartling in Presl has been used in the past for this species, examination of a photograph of the type for that name indicates that it is instead referable to what is here recognized as C. purpusii. Because of this confusion, no description has been published for this species and I therefore describe it here as C. tolucense.

15. Cerastium vulcanicum Schlechtendal

Cerastium vulcanicum Schlechtendal, Linnaea 12: 208. 1838. TYPE: MEXICO: "In regione subnivale montis Orizaba," Schiede 508, September (HAL, holotype — MSC photograph no. 3868!)

Cerastium micropetalum Greenman, Zoe 5: 183. 1904. TYPE: MEXICO: STATE NOT KNOWN: Mt. Ixtaccihuatl, Purpus 473, 1903 (GH!, UC!, syntypes; MO!, US!, isotypes).

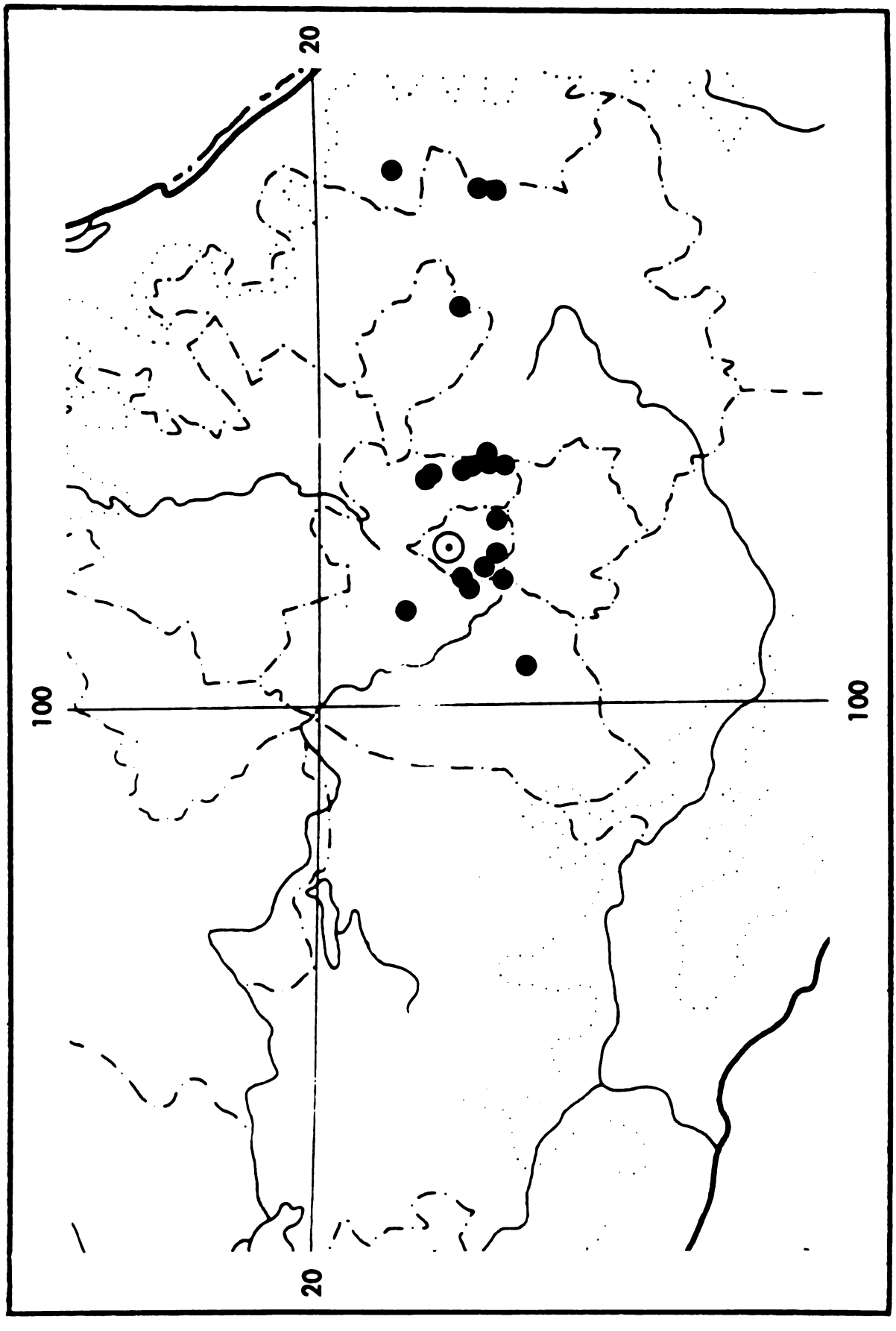
Plant annual or short-lived perennial. Stems 6-30 cm tall, very much branched, often tangled, sometimes ± caespitose. Branches erect or decumbent, usually leafy, glandular-pilose above, sparsely to densely lanate or villous toward the base. Internodes longer than or shorter than the leaves, mostly ± similar throughout except at the extreme base, where shorter. Leaves ± similar throughout, linear to broadly lanceolate, 10.0-40.0 mm long, 2.0-710 mm wide, acute, pilose to lanate, the latter particularly at the leaf base and on the margins, leaves generally more lanate toward the base of the plant, often lost in very old plants. Basal rosette usually lacking. Cymes many flowered, plant often mostly inflorescence. Bracts not scarious margined. Pedicels 5.2-15.4 mm long, slender, densely glandular-pilose. Sepals braodly lanceolate to ovate, 3.5-4.8 mm long, 0.8-1.2 mm wide, acute, scarious margined, glandular-pilose. Petals usually shorter than the sepals, 3.0-4.8 mm long, sometimes longer than the sepals (on Pico de Orizaba), to 5.2 mm long, bifid about 1/4 of their length, white to pale green. Filaments 2.6-3.4 mm long, anthers 0.2 mm long. Styles 1.3-1.6 mm long. Capsules 5.0-9.0 mm long, 1.8 mm wide, curved. Seeds

brown, 0.5-0.7 mm in diameter, lightly tuberculate. Chromosome number 2n = 34 (Beaman et al., 1962).

HABITAT AND DISTRIBUTION: Cerastium vulcanicum is primarily a species of alpine and subalpine meadows and disturbed sites (roadsides, etc.) in pine or fir forests at altitudes of 2900 to 4210 m in Distrito Federal and the states of México, Puebla, Tlaxcala and Veracruz. There is one collection of what appears to be C. vulcanicum in northwestern Guatemala. (Figure 16)

REPRESENTATIVE SPECIMENS: GUATEMALA: HUEHUETENAGO: Sierra Cuchumatanes, alt. ca. 10,800 ft, Skutch 1219, 14 September 1934 (F, GH). MEXICO: DISTRICTO FEDERAL: Km. 42 de la Carretera Federal a Cuernavaca, Arrington 11, 19 July 1964 (MSC). Cañada de Contreras, entre 30 y 40 Dinamo, alt. ca. 3100 m, Garcia s.n., 28 August 1965 (ENCB). Lomas de Santa Fe, Lyonnet 147, August 1927 (GH, NY, US). Volcán Xitle, Matuda s.n., 17 September 1950 (CAS). Cañada del Rio Magdelina (sic.) near the 4th dynamo, alt. ca. 3100 m, Murry 12, 6 October 1971 (MSC). Ajusco, Orcutt 3702, 20 August 1910 (F, GH, MO, US). Tlaltepec, San Pablo, alt. ca. 2900 m, Ventura A. 1534, 6 June 1976 (ENCB). MEXICO: Nevado de Toluca, north side of mountain 2.0 mi east of point where road goes above timberline, alt. ca. 4020m, Beaman 1937, 28 July 1958 (F, GH, MICH, MSC, TEX, UC, US). Near km. 72 on the

Figure 16. Distribution in Mexico and Central America of Cerastium vulcanicum. (There is also one collection of C. vulcanicum from Guatemala.)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Amecameca-Popocatepetl road, alt. ca. 3000 m, Beaman 2132, 4 August 1958 (GH, MSC, UC). 3 km north of Paso de Cortés on road to Ixtaccihuatl, alt. ca. 3800 m, Beaman 3610, 11 July 1960 (GH, MSC, TEX, UC), US). Telapón, alt. ca. 3400 m, Beenge 574, 5 July 1967 (CAS). Llano Grande, Municipio de Zequiapán, cerca de Río Frío, alt. ca. 3200 m, Cruz C. 1261, 16 September 1966 (ENCB, MICH, MSC). Vertiente oeste del Ixtaccihuatl, Espinosa s.n., 3 August 1958 (ENCB). La Cima, Kunze 23764, August 1904. In park area, Llano Grande on Rt 150/190, east of Mexico City, alt. ca. 3150 m, Murry 43, 15 October 1971 (MSC). At km. 19 on the Amecameca-Popocatepetl raod, alt. ca. 3250 m, Murry 44, 18 November 1971 (MSC). Near Salazar, Rose & Painter 7040, 14 September 1903 (GH, NY, US). Vertiente sudoeste del Ixtaccihuatl, 4 km al norte de la Estación Retransmisora, alt. ca. 3800 m, Rzedowski 20164, 16 July 1965 (ENCB, MSC). Palomas, Municipio de Iturbide (Santiago Tlazala), alt. ca. 3400 m, Rzedowski 25916, 18 July 1968 (MSC). PUEBLA: Pico de Orizaba, west side of Cerro Colorado, alt. ca. 3860 m, Beaman 2486, 9 September 1958 (GH, MSC, TEX, UC, US). Ca. 1.5 km east of the Paso de Cortes, alt. ca. 3580 m, Beaman 2897, 21 July 1959 (MSC). North slope of Pico de Orizaba, alt. ca. 3900 m, Murry 65, 7 December 1971 (MSC). Orizaba, alt. ca. 13,500 ft, Pringle 8559, 14 August 1901 (ENCB, F, GH, MICH, MO, MSC, NY, UC, US). TLAXCALA: Ladera

noreste de la Malinche, entre Apizaco y Huamantla, alt. ca. 3750 m, Ern 95, 10 September 1968 (ENCB). VERACRUZ: West slope of Barranca de Mala Cara, south southeast of peak of Orizaba, alt. ca. 4210 m, Clausen s.n., 24 August 1955 (NY). Ladera este del Cofre de Perote, alt. ca. 3750 m, Dorantes L. 346, 28 August 1971 (CAS, GH).

16. Cerastium glomeratum Thuillier

Cerastium glomeratum Thuillier, Fl. Paris, ed. 2, p. 226. 1799. TYPE: not seen, "Se trouve dans le bois de Boulogne; à Vinnecennes et ailleurs."

Cerastium viscosum Linnaeus (nom. ambig.), Sp. Pl., ed. 1, p. 437. 1753. TYPE: not seen, "Habitat in Europae pratis macilentis."

Cf. Jalas et al. (1964).

Plant annual. Stems ascending or erect, sometimes caespitose, 2.5-30 cm tall, very much branched at the base, little otherwise. Branches pilose. Internodes usually longer distally than basally, longer or shorter than the leaves. Leaves ± similar throughout, perhaps slightly smaller above, broadly elliptic to orbicular or spatulate, 5.0-20.0 mm long, 3.0-12.0 mm wide, obtuse, pilose. Basal rosette lacking. Cymes many flowered, flowers very crowded terminally. Pedicels very short, 1.0-5.0 mm long, pilose, sometimes slightly glandular.

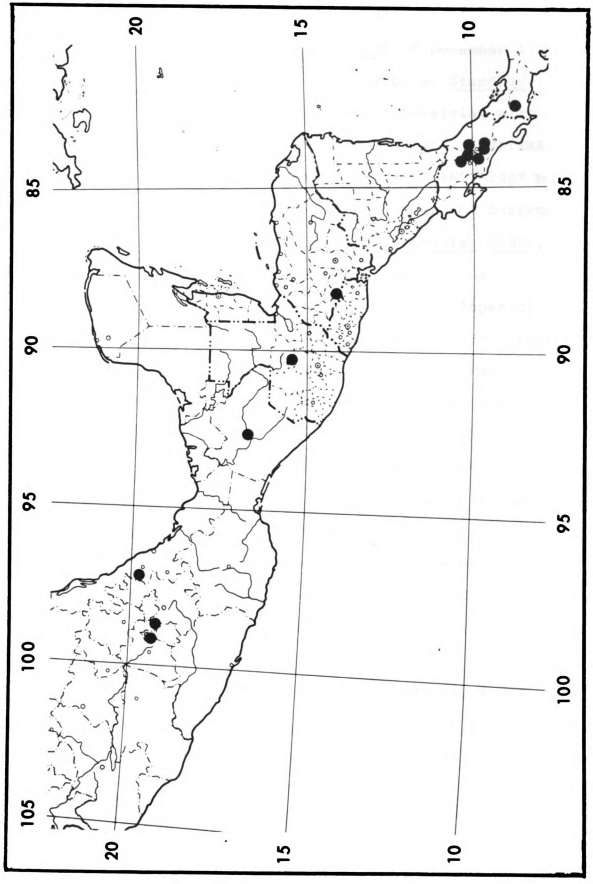
Sepals lanceolate, 2.8-5.1 mm long, 0.5-1.6 mm wide, acute, scarious margined, pilose, sometimes glandular. Petals shorter than or equal to the sepals, bifid about 1/4 of their length, white. Filaments, 1.8-2.3 mm long, anthers 0.1 mm long. Styles 0.8-1.1 mm long. Capsules 5.0-8.8 mm long, 1.3-1.8 mm wide, curved. Seeds 0.3-0.4 mm in diameter, finely tuberculate. Chromosome number $2n = 72$ (Blackburn and Morton, 1957; Brett, 1952; Brett, 1955; Favarger, 1969; Cadella and Kliphuis, 1966; Heiser and Whittaker, 1948; Huynh, 1965; Loeve and Kjellquist, 1974; Löve and Löve, 1956; Rohweder, 1937; Roweder, 1939; Söllner, 1952; Söllner, 1954). No counts have been published for Mexican or Central American material.

HABITAT AND DISTRIBUTION: Cerastium glomeratum and C. triviale are the only two introduced species of Cerastium in Mexico and Central America, having come originally from Europe. While native to Europe, C. glomeratum has become established almost worldwide and is found in North America from Florida, Texas and California north to southeastern Massachusetts, New York, Ohio, Illinois, South Dakota and British Columbia (Fernald, 1950) as well as in central Mexico (Distrito Federal, Hidalgo, México, Michoacan and Veracruz), southern Mexico (Chiapas), Guatemala (Alta Verapaz, Chimaltenango, Guatemala, Huehuetenango, Jalapa, Quetzaltenango, Quiche, Sactepéquez, San Marcos and

Solola), Honduras (Intibucá), Nicaragua (Matagalpa), Costa Rica (Algiuela, Cartago and San José) and Panama (Chiriquí). It is found in a variety of habitats at elevations of anywhere from 1200 to 3700 m. Such habitats include roadsides, fields, woodlands, volcanic rocks, cornfields, gardens, etc. (Figure 17)

REPRESENTATIVE SPECIMENS: COSTA RICA: ALAJUELA: Region of Zarcero, Guadeloupe de Zarcero, alt. ca. 4500 ft, Smith A366 14 September 1937 (F). CARTAGO: Brenes s n., 1906 (NY). Volcán de Turrialba, alt. ca. 2600 m, Pittier 7556, January 1899 (NY, US). Birris, south slope of Volcán de Irazú, Standley 35438, 23 February 1924 (US). Along the Río Reventado, north of Cartago, alt. 1460-1650 m, Standley & Valerio 49511, 26 February 1926 (US). SAN JOSE: La Palma, alt. ca. 1600 m, Standley 38043, 17 March 1924 (US). Las Nubes, alt. 1500-1900 m, Standley 38344, 20-22 March 1924 (US). Near Laguna de la Escuadra, northeast of El Copey, alt. 2000-2200 m, Standley 41996, 16 December 1925 (US). Finca La Cabana, 3 km west of Rancho Redonde, Hwy. 6, alt. ca. 1800 m, Weston, Weston & Weston 4866, 20 May 1967 (UC). GUATEMALA: ALTA VERAPAZ: Coban, von Tuerckheim 1334, January 1888 (GH, NY, US). Chichen, von Tuerckheim 8374, May 1903 (GH, NY, US). CHIMALTENANGO: Chichavac, alt. 2400-2700 m, Skutch 300, 1 March 1933 (US). Cerro de Tecpam, region of Santa

Figure 17. Distribution in Mexico and Central America of Cerastium glomeratum. (There is also one collection of C. glomeratum from Guadeloupe Island, Baja California.)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Elena, alt. ca. 2700 m, Standley 58679, 4 December 1938 (F). Above Las Calderas, alt. 1800-2100 m, Standley 59998, 15 December 1938 (F). North of Patzicia, alt. ca. 1800 m, Standley 60918, 26 December 1938 (F). GUATEMALA: Volcán de Pacaya, above Las Calderas, alt. 1800-2400 m, Standley 58364, 30 November 1938 (F). South of Guatemala, on road to Amatitlán, alt. ca. 1380 m, Standley 62856, 18 January 1939 (F). HUEHUETENANGO: Sierra de los Cuchumatanes, ca. 28 mi from Huehuetenango, slopes of Cerro Chemál, Hawkes, Hjerting & Lester 1769, 30 October 1958 (F). Sierra de los Cuchumatanes between Paquix and Llanos San Miguel, road to San Juan Ixcoy, alt. ca. 3300 m, Molina R. 21235, 17 November 1967 (F, NY). El Mirandor, at the summit of the road leading from Huehuetenango to Sierra de los Cuchumatanes, alt. ca. 3300 m, Standley 81835, 31 December 1940 (F). JALAPA: On summit of Montana Miramundo, between Jalapa and Mataquescuintla, alt. 2000-2500 m, Steyermark 32611, 4 December 1939 (F). QUETZALTENANGO: Quetzaltenango Experimental Station, alt. ca. 2500 m, Molina R. & Molina 26925, 6 November 1971 (F). Cerro la Pedrera, south of Quetzaltenango, alt. ca. 2400 m, Standley 65520, 18 February 1939 (F). Olintepeque, alt. ca. 2415 m, Standley 66002, 20 February 1939 (F, MICH). San Mateo, alt. ca. 2520 m, Standley 66049, 22 February 1939 (F). Cumbre de Tuilacán, southwest of San Martin Chile Verde,

alt. ca. 2400 m, Standley 67833, 8 March 1939 (F). Vicinity of Zunil, alt. ca. 2280 m, Standley 83216, 13 January 1941 (F). Mountains southeast of Palestina, on old road to San Juan Ostuncalco, alt. 2550-2850 m, Standley 84203, 21 January 1941 (F). Along Río Samala, near Santa Maria de Jesus, alt. 1500-1650 m, Standley 84703, 25 January 1941 (F). Above Fuentes Georginas, Zunil, alt. ca. 2500 m, Steyermark 34466, 20 January 1940 (F). Barranca Buena Vista, Cuesta el Caracol, Sierra Madre Mountains, about 5 km northeast of San Juan Ostuncalco, alt. 2800-2900 m, Williams, Molina R. & Williams 22804, 11 December 1962 (F). QUICHE: South of Chichicastenango, alt. 1830-1880 m, Standley 62390, 11 January 1939 (F). SACATEPEQUEZ: Volcán de Agua, above Santa Maria, alt. 7000-8000 ft, Bell & Duke 16969, 6 October 1959 (MO). Above Pastores, alt. ca. 1680 m, Standley 60844, 23 December 1938 (F). SAN MARCOS: San Rafael, Kellerman s.n., 3 February 1907 (US). Barrances south and west of town of Tajumulco, northwest slopes of Volcán Tajumulco, alt. 2300-2500 m, Steyermark 36535, 25 February 1940 (F). Above Río Tacana, near San Antonio, alt. ca. 2700 m, Standley 66169, 22 February 1939 (F). Along road between San Sebastián at km. 21 and km. 8, 8-18 km northwest of San Marcos, alt. 2700-3800 m, Steyermark 35673, 15 February 1940 (F). SOLOLA: Near María Tecúm, Sierra Madre Mountains, ca. 10-12 km

northwest of Los Encuentros, alt. ca. 3000 m, Williams, Molina R., Williams, Gibson & Laskowski 27319, 5 January 1965 (F). HONDURAS: INTIBUCA: Vicinity of La Esperanza and Intibuca, alt. 1500-1600 m, Standley 25434, 31 January-12 February 1950 (F). MEXICO: BAJA CALIFORNIA: Guadeloupe Island, alt. ca. 700 m, Moran 17304, 13 April 1970 (ENCB, LL). CHIAPAS: North and west slope of Cerro Mozotal below the microwave tower along the road from Huixtla to El Pervenir and Siltepec, Municipio de Motozintla de Mendoza, alt. ca. 3000 m, Breedlove 40319, 19 September 1976 (DS, MO). North end of San Cristobal las Casas, alt. ca. 7100 ft, Breedlove & Raven 8264, 22 January 1965 (DS). In Paraje Pahal Ton, Municipio de Tenejapa, alt. ca. 8200 ft, Ton 640, 20 January 1966 (DS, NY). DISTRICO FEDERAL: Ladera oriental del Cerro Ajusco, alt. ca. 3250 m, Arredondo 69, 11 December 1977 (ENCB). Cañada de Contreras, cerca del 40 dinamo, alt. ca. 3100 m, Holguin s.n., 21 March 1965 (ENCB). Along the road up the Cañada del Río Magdelina near the 4th dynamo, alt. ca. 3000 m, Murry 11, 6 October 1971 (MSC). Near Puerto los Cruces, alt. 3100-3200 m, Murry 16, 8 October 1971 (MSC). Near the entrance to the Jardín Botanico in Mexico City, alt. ca. 2600 m, Murry 21, 8 October 1971 (MSC). Along the sides of the street in the town of Ajusco, alt. ca. 3000 m, Murry 22, 9 October 1971 (MSC). North slope of Cerro Ajusco, alt. ca. 3000 m,

Murry 24, 9 October 1971 (MSC). Al sur de Xitle, Pedregal de San Angel, Rzedowski 1901, 12 October 1952 (ENCB). HIDALGO: Peñas Largos (cerca de Tezuantla), alt. ca. 2900 m, Medina 1308, 23 March 1976 (ENCB). 0.5 km al norte de Cerezo, Municipio de Pachuca, alt. ca. 2800 m, Medina 1785, 7 November 1976 (ENCB). One mi west of the La Estanzuela turnoff, El Chico National Park, alt. 2900 m, Murry 7, 3 October 1971 (MSC). Parte alta del Cerro Xihuingo, alt. 3000-3200 m, Rzedowski 31493, 7 October 1973 (ENCB). Cerro de las Ventanas, 6 km al norte de Pachuca, alt. ca. 2960 m, Rzedowski 34586, 12 December 1976 (ENCB). MEXICO: 0.5 km south of San Juan Tzacualoya, alt. ca. 2440 m, Elias 414, 30 September 1972 (ENCB). Ocotepec, Distrito Temascaltepec, alt. ca. 1500 m, Hinton 2888, 12 July 1932 (GH, NO, NY, US). Comunidad, Distrito Temascaltepec, Hinton 4199, 5 July 1933 (NY, US). Just south of Amecameca, alt. ca. 2500 m, Murry 51, 18 November 1971 (MSC). 0.5 mi east of the México-Michoacan border on Rte. 15, alt. ca. 2830 m, Murry 56, 24 November 1971 (MSC). 2 km al noreste de Tlalmanalco, alt. ca. 2450 m, Pineda R. 636, 5 December 1968 (MSC). Fraccionamiento La Herradura, Municipio de Huixquilucan, alt. ca. 2400 m, Rzedowski 25130, 12 September 1967 (ENCB). Cerro Sacramente, cerca de Amecameca, alt. ca. 2600 m, Rzedowski 29048, 4 August 1972 (ENCB). 8 km al este de Coatlinchán, alt.

ca. 2600 m, Rzedowski 34573, 7 November 1976 (ENCB). MICHOACAN: Near the microwave tower on Cerro Burro, 7 mi south of Opopeo, alt. ca. 3170 m, Murry 58, 25 November 1971 (MSC). 14 km west of Mil cumbres overlook, alt ca. 3675 m, Murry 62, 30 November 1971 (MSC). At km. 80, 10 km west of the México border, alt. ca. 2550 m, Murry 63, 1 December 1971 (MSC). VERACRUZ: La Joya, alt. ca. 2100 m, Ventura A. 11061, 13 March 1975 (ENCB). NICARAGUA: MATAGALPA: Road to La Fundadora, cloud forest area north of Santa María de Ostuma, Cordillera Central de Nicaragua, alt. 1300-1500 m, Williams, Molina R. & Williams 24948, February 1963 (F, NY). PANAMA: CHIRIQUI: Vicinity of Boquete, Finca Collins, "El Velo," alt. ca. 6150 ft, Stern, Eyde & Ayensu s.n., 11 March 1963 (MICH, US).

Cerastium glomeratum was originally described in 1753 by Linnaeus as C. viscosum. However, on studying photographs of the specimens in question, it becomes apparent that the type specimen of this species and that of C. vulgatum, described in 1762, were somehow reversed in the Linnaean herbarium (i.e., the type description of one matches the type specimen of the other). This has resulted in sufficient confusion to warrant both names being declared ambiguous. Cerastium viscosum then becomes C. glomeratum and C. bulgatum becomes C. triviale (see below). Jalas et al. (1964) and many others,

particularly in the last several years, have adopted this nomenclature.

17. Cerastium triviale Link

Cerastium triviale Link, Enum. Hort. Berol. 1: 433. 1821. Cerastium fontanum subsp. triviale (Link) Jalas, Arch. Soc. Zool.-Bot. Fenn. 'Vanamo' 18: 63. 1963. TYPE: not seen.

Cerastium vulgatum Linnaeus (nom. ambig.), Sp. Pl., ed. 2, p. 627. 1762. TYPE: not seen, "Habitat in Scaniae & Europae australioris pratis, areis."

Cerastium caespitosum Gilibert (nom. ambig.), Fl. Lithuan. 2: 159. 1781. TYPE: not seen. Lithuania.

Cerastium holosteoides Fries (nom. ambig.), Novit., ed. 2, p. 126. 1823. TYPE: not seen.

Cf. Cerastium fontanum subsp. triviale (Link) Jalas in Jalas et al., (1964).

Plant weakly perennial. Much branched, mostly basally. Often caespitose. Branches 10-25 cm long, decumbent, ± long-pilose. Internodes longest just below the inflorescence, shorter below. Leaves ± similar throughout, ovate to spatulate, 7.0-30.0 mm long, 3.0-10.0 mm wide, acute, sometimes obtuse, pilose. Basal rosette lacking. Cymes usually quite dense, few to many flowered. Bracts with scarious margins. Pedicels short,

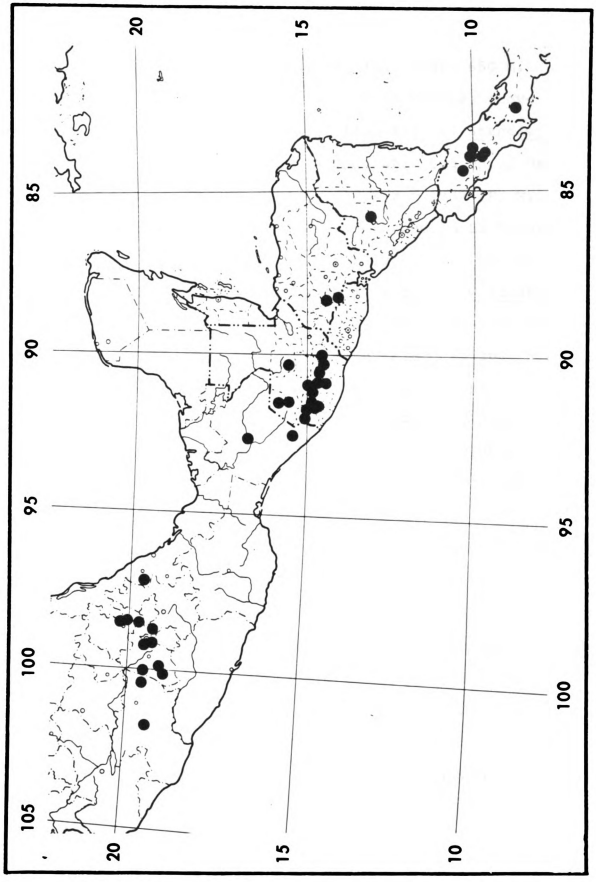
2.2-8.4 mm long, long-pilose. Sepals lanceolate, 4.3-6.2 mm long, 1.0-1.6 mm wide, scarious margined, acute, pilose. Petals slightly shorter to slightly longer than the sepals, bifid about 1/3 of their length, white. Filaments 3.7-4.0 mm long, anthers 0.3 mm long. Styles 1.8-2.2 mm long. Capsules 7.0-11.6 mm long, 2.1-3.0 mm wide, curved. Seeds 0.5-0.7 mm in diameter, red-brown tuberculate. Chromosome number 2n = 72 (Blackburn and Morton, 1957), 110 (Heitz, 1926), 126 (Blackburn and Morton, 1957; Hagerup, 1944), 136 (Brett, 1950); 137-147 (Brett, 1955), 140 (Taylor and Mulligan, 1968), 144 (Blackburn and Morton, 1957; Heiser and Whittaker, 1948; Favarger, 1969; Löve, 1972; Tischler, 1937), 160 ± 2 (Favarger and Küpfer, 1968) or 180 (Blackburn and Morton, 1957). Counts have not been published for Mexican or Central American Material.

HABITAT AND DISTRIBUTION: Although native to Europe, this species has become naturalized in North America throughout temperate and subarctic Canada and the United States (Hitchcock et al, 1964) and in Central Mexico (Distrito Federal, México, and Veracruz), southern Mexico (Chiapas), Guatemala (Alta Verapaz and Baja Verapaz), Honduras (Morazan), Costa Rica (Alajuela, Cartago, Heredia and San José) and Panama (Chiriquí). In habitat, the species ranges from roadsides and open meadows through brushy and wooded areas to cloud forests at

altitudes of about 1400 to 3700 m. (Figure 18)

SPECIMENS EXAMINED: COSTA RICA: ALAJUELA: In and around Zarcero, Canton Alfaro Ruiz, Hwy. 15, Weston, Weston & Weston 2110, 3 September 1966 (UC). CARTAGO: Cerca de la cima del Volcán Irazu, Jimenez 140, 18 July 1959 (F). El Muneco, south of Navarro, alt. ca. 1400 m, Standley 33494, 8-9 February 1924 (US). South slope of Volcán de Turrialba, near the Finca del Volcán de Turrialba, alt. 2000-2400 m, Standley 34945, 22 February 1924 (US). South slope of Volcán de Turrialba, near Finca del Volcan de Turrialba, alt. 2000-2400 m, Standley 35276, 22 February 1924 (US). La Estrella, Standley 39250, 26-27 March 1924 (US). Vicinity of Orosí, Standley 39264, 30 March 1924 (US). El Muneco, alt. 1400-1500 m, Standley & Torres R. 51214, 6-7 March 1926 (US). Within a 1 km radius of Sanitorio Duran, Volcán Irazú, alt. 2300-2450 m, Weston, Weston & Weston 2360, 16-17 September 1966 (UC). HEREDIA: En el Desengano, Orozco 196, 17 June 1938 (F). Cerros de Zurquí, northeast of San Isidro, alt. 2000-2400 m, Standley & Valerio 50601, 3 March 1926 (US). Up to 1 km from church and school, Vara Blanca, Hwy. 9, alt. ca. 1800 m, Weston, Weston & Weston 4878, 24 May 1967 (UC). SAN JOSE: Las Nubes (Coronado), Orozco 273, 27 August 1938 (F). Cerro de Piedra Blanca, above Escasú, Standley 32481, 31 January 1924 (US). Zurquí, Standley & Valerio 48262, 13

Figure 18. Distribution in Mexico and Central America of Cerastium triviale.


105
100
95
90
85
20
15
10

February 1926 (US). GUATEMALA: ALTA VERAPAZ: Mountains east of Tactic, on road to Tamahu, alt. 1500-1650 m, Standley 71180, 9 April 1939 (F). Near Tactic, above the bridge across Río Frío, alt. 1400-1500 m, Standley 90370, 30 March 1941 (F). BAJA VERAPAZ: Region of Patál, alt. ca. 1600 m, Standley 69597, 30 March 1939 (F, NY). HONDURAS: MORAZAN: Rancho Quebrado, road to El Rosario, San Juancito, Carlson 2625, 3 March 1952 (F). Mountains above San Juancito, alt. ca. 2000 m, Merrill, Williams & Molina R. 15674, 22 February 1949 (F, GH). Montaña de la Tigra al sudoeste de San Juancito, alt. ca. 2000 m, Molina R. 12728, 11 June 1963 (F, LL, NY). Montaña de la Tigra, alt. ca. 2000 m, Molina R. 14490, 13 July 1964 (F). Mountains above San Juancito, alt. ca. 2200 m, Williams, & Melina R. 14693, 20 February 1948 (F, GH). Montaña de la Tigra, sudoeste de San Juancito, alt. ca. 2000 m, Williams & Molina R. 17091, 5 February 1950 (F, GH, MO). MEXICO: CHIAPAS: Northeast slope of Zontehuitz near summit, Municipio de San Cristobal las Casas, alt. ca. 9300 ft, Breedlove 14031, 1 November 1965 (DS, F, LL, MICH, US). DISTRITO FEDERAL: Puerto de las Cruces, alt. ca. 3100 m, Rzedowski 34297, 29 July 1976 (ENCB). MEXICO: Between kms. 76 and 77 on the Amecameca-Popocatepetl road, alt. ca. 3250 m, Beaman 2062, 2 August 1958 (MSC). Km. 15 of the Amecameca-Popocatepetl road, alt. ca. 3250 m, Murry 30, 11 October 1971 (MSC). Km. 19

on the Amecameca-Popocatepetl road, alt. 3250 m, Murry 44, 18 November 1971 (MSC). VERACRUZ: Las Vigas, Nelson 14, June 1893 (US). Balsequillo, Municipio de Perote, alt. ca. 2350 m, Ventura R. 7386, 13 November 1972 (ENCB). PANAMA: CHIRIQUI: Volcan de Chiriquí, alt. 3500-4000 m, Woodson & Schery 472, 13-15 July 1940 (GH, MO, US).

As has already been discussed (see Cerastium glomeratum) the oldest name for this species, C. vulgatum, is ambiguous and therefore invalid. Two of the other four names listed above have also been used interchangably between C. triviale and C. glomeratum (C. caespitosum and C. holosteoides). This leaves the names C. triviale and C. fontanum subsp. triviale.

Although there is considerable backing especially in Europe behind the inclusion of Cerastium triviale in the larger species C. fontanum, as far as this study is concerned the name used is of little importance and since the decision between them calls for a taxonomic decision that could only be intelligently made after study of European material, I will here retain the older and shorter name, C. triviale, but stress the fact that this choice is not made on the basis of systematic investigation.

EXCLUDED SPECIES

Two type specimens seen in this study, those of Cerastium fasciculatum Bartling in Presl and C. stellarioides Mociño ex Seringe in de Candolle, were labelled as having been collected in Mexico (the type of C. stellarioides is a drawing). However, in the original description (de Candolle, 1824), C. stellarioides is listed as being found "in America bor. circa Nutka" so that either the label on the specimen is in error or it is not the type specimen of this species and the illustration is actually one of some other Mexican species, probably a large-flowered C. nutans.

No other specimen even remotely resembling the type specimen of C. fasciculatum was seen in this study and it is therefore very unlikely that species is found here. Although both the type specimen and the original description (Presl, 1831) list "Mexico" as the collection locality, Fenzl, on the type specimen, noted "Verosimiliter pl. chilensis non Mexicana!" (probably a Chilean plant, not Mexican).

LITERATURE CITED

LITERATURE CITED

Baker, H.G. 1955. Self-compatibility and establishment after "long-distance" dispersal. Evolution 9: 347-348.

Beaman, J.H., D.C.D. de Jong and W.P. Stoutamire. 1962. Chromosome studies in the alpine and subalpine floras of Mexico and Guatemala. Amer. J. Bot. 49: 41-50.

Beaman, J.H. 1979. Cerastium in Rzedowski, G.C. and J. Rzedowski, eds. Flora Fanerogámica del Valle de México, vol. 1. México Compañia Editorial Continental. 403 pp.

Blackburn, K.B. and J.K. Morton. 1957. The incidence of polyploidy in the Caryophyllaceae of Britain and Portugal. New Phytol. 56: 344-351.

Bolkhovskikh, Z., V. Grif, T. Matvejeva and O. Zakharyeva. 1969. Chromosome numbers in flowering plants. Acad. Sci. USSR. 926 pp.

Brett, O.E. 1950. Chromosome numbers of Cerastium species. Nature 166: 446-447.

_____. 1952. Basic chromosome numbers in the genus Cerastium. Nature 170: 251-252.

_____. 1955. Cytotaxonomy of the genus Cerastium. I. Cytology. New Phytology. 54: 138-148.

Briquet, J. 1911. Decades plantarum novarum vel minus cognitarum. Annuaire Conserv. Jard. Bot. Genève 13 & 14: 369-389.

Britton, N.L. 1888. New and noteworthy American phanerogams. I. Bull. Torrey Bot. Club 15: 97-104.

_____. 1894. Caryophyllaceae, in List of the Pteridophyta and Spermatophyta growing without cultivation in northeastern North America. Mem. Torrey Bot. Club 5: 148-153.

_____ and A. Brown. 1913. An Illustrated Flora of the Northern United States, ed. 2, vol. 2, New York. New York, Scribner & Sons. 735 pp.

Candolle, A.P. de. 1824. Prodromus systematis naturalis regni vegetabilis, vol. 1. Paris, Treuttel and Würtz. 423 pp.

Clausen, R.T. 1959. Sedum of the Trans-Mexican Volcanic Belt. Ithaca, Comstock Publishing Associates. 380 pp.

Correll, D.S. 1966. Some additions and corrections to the flora of Texas. II. Brittonia 18: 306-310.

_____ and M.C. Johnston. 1970. Manual of the Vascular Plants of Texas. Renner Research Reports 6: 1-1881.

Cruden, R.W. 1977. Pollen-ovule ratios: a conservative indicator of breeding systems in flowering plants. Evolution 31: 32-46.

Favarger, C. 1969. De caryologia Cerastiorum specierum aliquot imprimis in Peninsula Balcania crescentium. Acta Bot. Croat. 28. 63-74.

_____ and P. Küpfer. 1968. Contribution a la cyto-taxinomie de la flore alpine des Pyrénées. Collect. Bot. 7: 325-352.

Fernald, M.L. 1950. Gray's Manual of Botany, ed. 8. New York, American Book Co. 1632 p.

Fries, E.M. 1823. Novit Florae Suecicae. Lundae. 122 pp.

Gadella, T.W.J. and E. Kliphuis. 1966. Chromosome numbers of flowering plants in the Netherlands. II. K. Acad. Wetenschap. Amsterdam Proc. Ser. C. 70: 7-20.

Gilibert, J.E. 1781. Flora lithuanica inchoata. Grodnae. 243 pp.

Gray, A. 1867. Manual of the Botany of the northern United States, Including the District East of the Mississippi and North of North Carolina and Tennessee. New York, Ivison and Blakeman. 703 pp.

Greenman, J.M. 1904. New species of Mexican plants. Zoe 5: 183-187.

Grenier, C. 1841. Monographia de Cerastio. Vesontione, ex typis Outhenin-chalandre filei. 102 pp.

Hagerup, O. 1944. Notes on some boreal polyploids. Hereditas 30: 152-160.

Heiser, C.B. and T.W. Whittaker. 1948. Chromosome number, polyploidy and growth habit in California weeds. Amer. J. Bot. 35: 179-186.

Heitz, E. 1926. Der Nachweis der Chromosomen. Vergleichende Studien über ihre Zahl, Grosse und Form im Pflanzenreich. I. Z. Bot. 18: 625-681.

Hemsley, W.B. 1878. Diagnoses plantarum novarum vel minus cognitarum Mexicanarum et Centrali-Americanarum. London, Taylor and Francis. 56 pp.

Hitchcock, C.L., A. Cronquist, M. Ownbey and J.W. Thompson. 1964. Vascular Plants of the Pacific Northwest, pt. 2, Seattle, Univ. of Washington Press. 597 p.

Holmgren, P.K. and W. Keuken. 1974. Index Herbariorum, pt. 1, The Herbaria of the World. Utrecht, Oosthoek, Scheltema and Holkema. 397 pp.

Huynh, K.L. 1965. Contribution a l'etude caryologique et embryologique des Phanerogames du Perou. Schweiz. Naturf. Ges. 85: 1-178.

Jackson, B.D. 1895. Index Kewensis, pt. 1. Oxford, The Clarendon Press, 1268 pp.

Jalas, J. 1966. Notes on Cerastium L., subsect. Perennia Fenzl (Caryophyllaceae). Arch. Soc. Zool.-Bot. Fenn. "Vanamo" 18: 57-65.

_____, P.D. Sell and F.H. Whitehead. 1964. Caryophyllaceae in Tutin, T.G., V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb, eds. Flora Europaea, Vol. 1. Lycopodiaceae to Platanaceae. Cambridge, Cambridge Univ. Press, pp. 136-145.

Kearney, T.H. and R.H. Peebles. 1939. Arizona plants: new species, varieties and combinations. J. Wash. Acad. Sci. 29: 474-492.

_____. 1969. Arizona Flora. Berkeley, Univ. California Press. 1085 pp.

Küpfer, P. 1969. Recherches cytotaxinomiques sur la flora des montagnes de la Peninsule Iberique. Bull. Soc. Neuchâteloise Sci. Nat. 92: 31-48.

_____. 1974. Recherches sur les liens de parente entre la flore orophile des Alpes et celle des Pyrenees. Boissiera 23: 1-322.

Lawrence, G.H.M. 1951. Taxonomy of Vascular Plants. New York, MacMillan Publ. Co. 823 pp.

Lewis, H. 1962. Catastrophic selection as a factor in speciation. Evolution 16: 257-271.

Link, H.F. 1821. Enumeratio plantarum horti regii botanici Berolinensis altera, vol. 1 Berolini, G. Reimer. 458 pp.

Linnaeus, C. 1753. Species plantarum, ed. 1. Holmiae, impensis Laurentii Salvii. 1200 pp.

_____. 1762. Species plantarum, ed. 2. Holmiae, impensis Laurentii Salvii. 1684 pp.

Loeve, A. and E. Kjellquist. 1974. Cytotaxonomy of Spanish plants. III. Dicotyledons: Salicaceae-Rosaceae. Lagascalia 4: 3-32.

Löve, A., ed. 1972. IOPB chromosome number reports XXXV. Taxon 21: 161-166.

_____, ed. 1975a. IOPB chromosome number reports XLVII. Taxon 24: 143-146.

_____, ed. 1975b. IOPB chromosome number reports XLIX. Taxon 24: 501-516.

_____, ed. 1978. IOPB chromosome number reports LIX. Taxon 27: 53-61.

_____ and D. Löve. 1956. Cytotaxonomical conspectus of the Icelandic flora. Acta Hort: Gothob. 20: 65-291.

MacArthur, R.H. and E.O. Wilson. 1967. The Theory of Island Biogeography. Princeton, Princeton Univ. Press. 203 pp.

Millares, J.H. and A.C. Escribano. 1966. Atlas Porrua de la Republica Mexicana. Mexico, Editorial Porrua, S. A. 23 pp.

Moore, R.J. 1970. Index to plant chromosome numbers for 1968. Utrecht, International Bureau for Plant Taxonomy and Nomenclature of the International Association for Plant Taxonomy. 115 pp.

_____. 1971. Index to plant chromosome numbers for 1969. Utrecht, A. Oosthoek's Uigtgeversmaatschappij N. V. 112 pp.

_____. 1977. Index to plant chromosome numbers for 1973-1974. Utrecht, Bohn, Scheltema and Holkema. 255 pp.

Mühlenberg, H. 1813. Catalogus plantarum Americae Septentrionalis, huc usque cognitarum indigenarum et circurum. Lancaster, Pa., W. Hamilton. 112 pp.

Pax, F. and K. Hoffmann. 1934. Caryophyllaceae in Engler, A. and K. Prantl, Die Naturlichen Pflanzenfamilien. Band 16C. Leipzig, W. Engelmann. pp. 227-367.

Presl, C.B. 1831. Reliquiae Haenkeanae, vol. 2.

Rafinesque, C.S. 1814. Precis des Decouvertes et Ravaux Somiologiques de C.S. Rafinesque. Palerme, Royale Typographie militaire. 55 pp.

Reichenbach, H.G.L. 1832. Flora germanica excursiora. Lipsiae, Cnobloch. 878 pp.

Robinson, B.L. 1894. The North American Alsineae. Proc. Amer. Acad. Arts 29: 273-313.

_____, ed. 1897. Synoptical Flora of North America, vol. 1. New York, American Book Co. 506 pp.

_____. 1904. New Spermatophytes of Mexico and Central America. Contr. Gray Herb. 27: 265-271.

Rohrbach, P. 1873. Beiträge zur Systematik der Caryophyllinen. Linnaea 37: 183-312.

Rohweder, H. 1937. Versuch zur Erfassung der mengenmässigen Bedeckung des Darss und Zingst mit polyploiden Pflanzen. Ein Beitrag zur Bedeutung der Polyploidie bei der Eroberung neuer Lebensräume. Planta 27: 501-549.

_____. 1939. Weitere Beiträge zur Systematik und Phylogenie der Caryophyllaceen unter besonderer Berucksichtigung der karyologischen Verhalnisse. Beih. Bot. Centralbl., Abt. B. 59: 1-58.

Rose, J.N. 1891. List of plants collected by Dr. Edward Palmer in 1890 in western Mexico and Arizona. Contr. U.S. Natl. Herb. 1: 1-127.

Sanchez, S., O. 1968. La Flora del Valle de Mexico, ed. 1. Mexico, Editorial Herrero. 519 pp.

Schlechtendal, D.F.L. von. 1838. De plantis Mexicanis a G. Schiede, M. Dr., Car. Ehrenbergio allisque, collectis nuntium adfert D.F.L. Schlechtendal. Linnaea 12: 201-210, 265-343, 556-574.

_____ and A.D. de Chamisse. 1830. Plantarum mexicanum a cel. viris Schiede et Deppe collectarum recensio brevis. Linnaea 5: 72-174, 206-236, 492-496.

Schultz, F. 1862. Diagnosis novae Cerastii generis. Flora 45: 458-459.

Sessé, M. and J.M. Mociño. 1894. Flora Mexicana, ed. 2. Mexico, Oficina Tipographica de la Secretaria de Fomento. 240 pp.

Shreve, F. and I.L. Wiggins. 1964. Vegetation and Flora of the Sonoran Desert, vol. 1 Stanford, Stanford Univ. Press. 840 pp.

Söllner, R. 1950. Polyploidie interspecifique chez Cerastium arvense L., et nombres chromosomique de quelques autres Cerastium. Experimentia 6: 335-337.

_____. 1952. Nouvelle contribution a la cytotaxinomie du genra Cerastium. Experimentia 8: 104-105.

_____. 1954. Recherches cytotaxinomiques sur le genre Cerastium. Ber. Schweiz. Bot. Ges. 64: 221-354.

Standley, P.C. 1937. Flora of Costa Rica, pt. 1. Field Mus. Nat. Hist. Bot. Ser. 18: 1-1616.

_____ and J.A. Steyermark. 1940. Studies of Central American plants. II. Field Mus. Nat. Hist., Bot. Ser. 22: 324-396.

_____. 1944. Studies of Central American plants. IV. Field Mus. Nat. Hist., Bot. Ser. 23: 30-109.

_____. 1946. Flora of Guatemala, pt. 4. Fieldiana, Bot. 24: 1-502.

Taylor, R.L. and G.A. Mulligan. 1968. Flora of the Queen Charlotte Islands, pt. 2. Cytological Aspects of the Vascular Flora. Ottawa, Queen's Printer, 148 pp.

Thuillier, J.L. 1799. La Flore des Environs de Paris. Paris, Desaint. 550pp.

Tidestrom, I. and T. Kittell. 1941. A Flora of Arizona and New Mexico. Washington, Catholic Univ. of America Press. 897 pp.

Tischler, C. 1937. Die Halligenflora der Nordsee im Lichte cytologischer Forschung. Cytologia, Fujii Jub. Vol.: 162-170.

Ugborogho, R.E. 1973. North American Cerastium arvense L. I. Cytology. Cytologia 38: 5559-566.

Villars, D. 1799. Histoire des plantes du Dauphine, vol. 3. Grenoble, chez l'auteur. 1091 pp.

Watson, S. 1885. Descriptions of some new species of plants, chiefly from our western territories. Proc. Amer. Acad. Arts. 20: 324-378.

_____. 1888. Some new species of Mexican plants, chiefly of Mr. C.G. Pringle's collection in the mountains of Chihuahua in 1887. Proc. Amer. Acad. Arts 23: 249-287.

Whiffen, T. and M. W. Bierner. 1972. A quick method for computing Wagner trees. Taxon 21: 83-90.

White, S.E. 1962. Late Pleistocene glacial sequence for the west side of Ixtaccihuatl, Mexico. Geol. Soc. Amer. Bull. 73: 935-958.

Williams, F.N. 1898. Critical notes on some species of Cerastium. J. Bot. 36: 341-344, 382-387.

Willis, J.C. 1973. A Dictionary of the Flowering Plants and Ferns, ed. 8. Revised by H.K. Airy Shaw. Cambridge, The Univ. Press. 1245 pp.