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## MONOGRAPH OF ROSA IN NORTH AMERICA. V. SUBGENUS HESPERHODOS<sup>1, 2</sup>

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The subgenus *Hesperhodos* Cockerell ex Rehder of the genus *Rosa* includes a small number of species endemic to southwestern North America. Only four species have been proposed, *R. minutifolia* Engelm., *R. mirifica* Greene, *R. stellata* Wooton, and *R. vernonii* Greene, and these species as well as a consideration of the infrageneric status of the group will be discussed in this study.

### INFRAGENERIC STATUS

Based on *Rosa minutifolia*, Crèpin (1889a) erected the section *Minutifoliae* and defined it as having few, small, incised leaflets, bractless pedicels, pinnate and erect sepals, narrow stipules with dilated and divergent auricles, and few, basally inserted achenes. Crèpin recognized 14 other sections in the subgenus *Eurosa* (= subg. *Rosa*) and, although he made no suggestion regarding the relationship of the new section to these, his arrangement: *Pimpinellifoliae* DC., *Luteae* Crèp., *Sericeae* Crèp., *Minutifoliae* Crèp., suggests a sequence of what he believed to be allied sections. In his revised classification of *Rosa* based on anatomical data, *Parmentier* (1898) maintained Crèpin's *Minutifoliae*, but proposed a derivation of the section from the *Cinnamomeae* as a minor branch.

In this century the section *Minutifoliae* has been incorporated into others as well as elevated to subgenus or genus. Baker (1905) and Schwertschlager (1910) included it with the *Spinosissimae* Thory (= *Pimpinellifoliae*). Even though members of these sections have several features in common (Engelmann, 1882; Baker, 1902), these are, according to Boulenger (1937), examples of parallel evolution in

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<sup>1</sup> Other parts in this series include: I. *R. acicularis*, Brittonia **11**: 1-24. 1959; II. *R. foliolosa*, Southwest. Nat. **3**: 145-153. 1959. III. *R. setigera*, Southwest. Nat. **3**: 154-174. 1959; and IV. *R. × dulcissima*, Brittonia **14**: 65-71. 1962.

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the genus rather than indications of close affinity. Baker (1905) also included typical species of the sections *Caninae*, *Luteae*, and *Cinnamomeae* in his concept of the *Pimpinellifoliae* which, I think, illustrates a poor understanding of sectional classification in *Rosa*. Herring (1925), however, concluded that *Minutifoliae* and *Pimpinellifoliae* are distinct but related sections separated respectively by the basal insertion of the achenes and the pinnate sepals in *Minutifoliae*, and by the basiparietal insertion of the achenes and the entire sepals in *Pimpinellifoliae*.

Following an examination of the species in the field, Cockerell (1913) judged that a rank above that of section was required for the *Minutifoliae*. He gave no evidence, however, to support his proposal that the group should be recognized as either the genus or subgenus *Hesperhodos*. The first data in support of this view were presented by Hurst (1928) who concluded on the basis of a gametic chromosomal analysis that the section should be treated as a distinct genus. According to Hurst, *R. minutifolia* as well as *R. persica* Michx., *R. microphylla* Roxb. (= *R. roxburghii* Tratt.) and *R. bracteata* Wendl. do not correspond to any of the basic diploid septets in *Rosa* and must, therefore, be recognized as belonging to four different genera. Erlanson (1931) questioned this theory and she showed conclusively that there is no cytological basis for Hurst's septet analysis. Elsewhere, Hurst (1929) reported that he was unable to cross *Hesperhodos minutifolia* with *Rosa* which he thought substantiated his earlier conclusion, but long before, Cockerell (1913) noted a successful hybridization between *R. stellata* Wooton (a subspecies of *H. minutifolia* sensu Hurst) and an unnamed species of *Rosa* s. s.

Largely because of the unusually wide orifice of the hypanthium, Boulenger (1937) also recognized *Hesperhodos*. While this is a rare character in *Rosa*, it is typical of *R. roxburghii* which was assigned to *Platyrrhodon* by Hurst (1928), but Boulenger retained the species in *Rosa*. He also emphasized the similar leaf morphology of *Hesperhodos* with that of *Alchemilla*, *Horkelia*, and *Potentilla*, striking similarities which might be considered examples of parallel development in the *Rosaceae*. To these can be added the similar leaf morphology of *Hesperhodos* and members of *Rosa* sect. *Pimpinellifoliae*. Without discussion, Rehder (1940, 1949) adopted Cockerell's (1913) subgeneric rank for *Hesperhodos*.

The data presented since Crépin to establish the infrageneric position of the *Minutifoliae* or *Hesperhodos* group are not convincing. It now remains to summarize the existing evidence, to present several new features, and from these to suggest the most applicable rank.

#### *Gross Morphology.*

In common with a majority of the species of *Rosa*, the taxon consists of woody perennials having alternate, pinnate leaves with adnate stipules and serrated leaflets, and perfect flowers of numerous stamens and pistils with the latter inserted at the bottom of well-developed hypanthia. Characteristics which suggest an isolated position for the taxon are the small, often incised leaflets, the thick, cupulate hypanthia each having a broad orifice, and the long, non-angular achenes. Generally, but not universally, the leaflets of *Rosa* species are larger and only serrated, the hypanthia are thinner-walled, contracted apically, and the achenes are  $\pm$  angular.



*Pollen Morphology.*

Following a study of pollen from a limited number of *Rosa* species, Crépin (1889b) and Parmentier (1898) reported no difference in morphology and later Wodehouse (1935) and Erdtman *et al.* (1961) again noted that different species of *Rosa* are palynologically alike. None examined pollen of the species under review.

Acetolyzed grains of *R. minutifolia* and all subspecific taxa of *R. stellata* were examined and found to be subspheroidal (subprolate),  $23.6\text{--}27.9\ \mu$  (E)  $\times$   $20.1\text{--}24.6\ \mu$  (P), 3-colporoidate, with colpi long (ca.  $18\ \mu$ ), narrow, and slightly constricted equatorially with the delimiting exine somewhat thickened and irregular, ora about  $2\ \mu$  high and delimited by a diffuse, irregularly outlined, thin (nexinous?) area, apocolpium ca.  $4\ \mu$  in diameter, sexine thin (less than  $1\ \mu$ ), O-L pattern, finely reticulated, and nexine about  $\frac{2}{3}$  thickness of sexine. Pollen of all taxa was indistinguishable and the description is by and large applicable to all species of *Rosa* with the exception of one characteristic, namely, the sculpturing of the sexine. For *R. minutifolia* and *R. stellata* the outer surface of the pollen is finely reticulated, whereas the sculpturing for all others examined (including species of the sections *Cinnamomeae*, *Synstylae*, *Caninae*, *Indicae*, *Pimpinellifoliae*) and as described for *R. rugosa* Thunb. (Wodehouse, 1935) and *R. acicularis* Lindl. (Erdtman *et al.*, 1961) is finely striated. Since this survey includes pollen of *R. pimpinellifolia* L. the results support Boulenger's (1937) opinion of parallelism between the sections *Pimpinellifoliae* and *Minutifoliae* rather than of close affinity.

*Stem Anatomy.*

After a survey of stem anatomy in roses Parmentier (1898) reported that members of the sections *Minutifoliae* and *Microphyllae* alone possess bast fibers. Moreover, he found that the pericycle of *R. minutifolia* consisted of short, ovate cells, whereas for all other *Rosa* examined these cells were elongate and fusiform. These data also suggest an isolated position for the taxon.

*Chromosome numbers.*

Hurst (1928) reported *R. minutifolia* with  $n = 7$  and  $2n = 14$ , numbers confirmed by Erlanson (1932) who also found the same somatic numbers for *R. mirifica* Greene and *R. stellata* Wooton. To these are now added numbers for *R. stellata* subsp. *mirifica* collected 0.3 miles S. of High Rolls, Otero Co., New Mexico (Lewis 5527), having  $2n = 14$  for five individuals and  $2n = 16$  for one plant. Trisomics are rare in *Rosa*, but Erlanson (1929) also recorded this number for *R. pyrifera* Rydb. (= *R. woodsii* Lindl.) and *R. blanda glandulosa* Schuette (= *R. blanda* Ait.) from among plants with typical diploid numbers. These counts are in agreement with those for all other *Rosa* species studied which, with the exception of the few aneuploid individuals, are based on  $x = 7$ .

Do these data aid in evaluating the most satisfactory rank for the taxon? They show that it can be distinguished from most other *Rosa* by several well-marked gross morphological features unquestionably greater in number and in kind than are presently known for differentiating the species into sectional groupings. More-



over, observed differences in pollen and cells of the stem emphasize the need to recognize the group above that of section. But the chromosomes of this taxon are similar in number to those of *Rosa*, successful hybridization has been reported between one species of this taxon and a "true" rose, and many gross morphological and palynological characters are common to both and not common elsewhere in the family. On weighing these differences and similarities, I suggest a rank of subgenus for this taxon.

#### THE SPECIES

##### *Gross Morphology.*

In the subg. *Hesperhodos*, *R. minutifolia* is separable from the other species by having very small, 5- to 7-foliolate leaves, pilose floral branches with brown, pubescent thorns, and tomentose hypanthia with many, long prickles. Under the oldest name of *R. stellata*, the remaining taxa form a complex of closely allied populations characterized by stellate hairs or gland-tipped bristles on their floral branches. Greene (1910) described *R. vernonii* as distinct from *R. stellata*, but Rydberg (1918) later placed the species in synonymy under *R. stellata*. Greene also segregated those plants lacking stellate hairs as *R. mirifica*, a procedure followed by Rydberg (l. c.), but Cockerell (1914) reduced the species to a variety of *R. stellata* and this status was later accepted by Rehder (1927, 1940, 1949).

Greene (1910) separated *R. mirifica* from *R. stellata* by the following criteria:

	<i>stellata</i>	<i>mirifica</i>
(1) growing stems	stellate-tomentose by trichomes around short murications	without trichomes around the many, short, often gland-tipped prickles
(2) leaflets	small mostly 3, sometimes 4 or 5 pubescent pustulate-roughened above	twice size of <i>R. stellata</i> commonly 5 glabrous not pustulate or roughened above
(3) stipules	short, surpassed by large foliaceous auricles	long, their small auricles not notably foliaceous

In order to test the value of these, eight collections (each consisting of about 10 plants) were collected in New Mexico and analyzed.

Using only floral branch indumenta, three of the mass collections could be placed with *R. stellata* and three collections with *R. mirifica*. The remaining two collections consisted of plants combining some expressions supposedly confined to each species. As an illustration of the kind of stem indumentum typical of *R. stellata*, Fig. 1 shows a portion of the branch covered with short murications (gland-like excrescences) having stellate hairs and long, basally-pubescent, broad-based thorns usually paired below the stipules. Sometimes there are more than two thorns and occasionally they are internodal. Infrequently short, gland-tipped bristles with



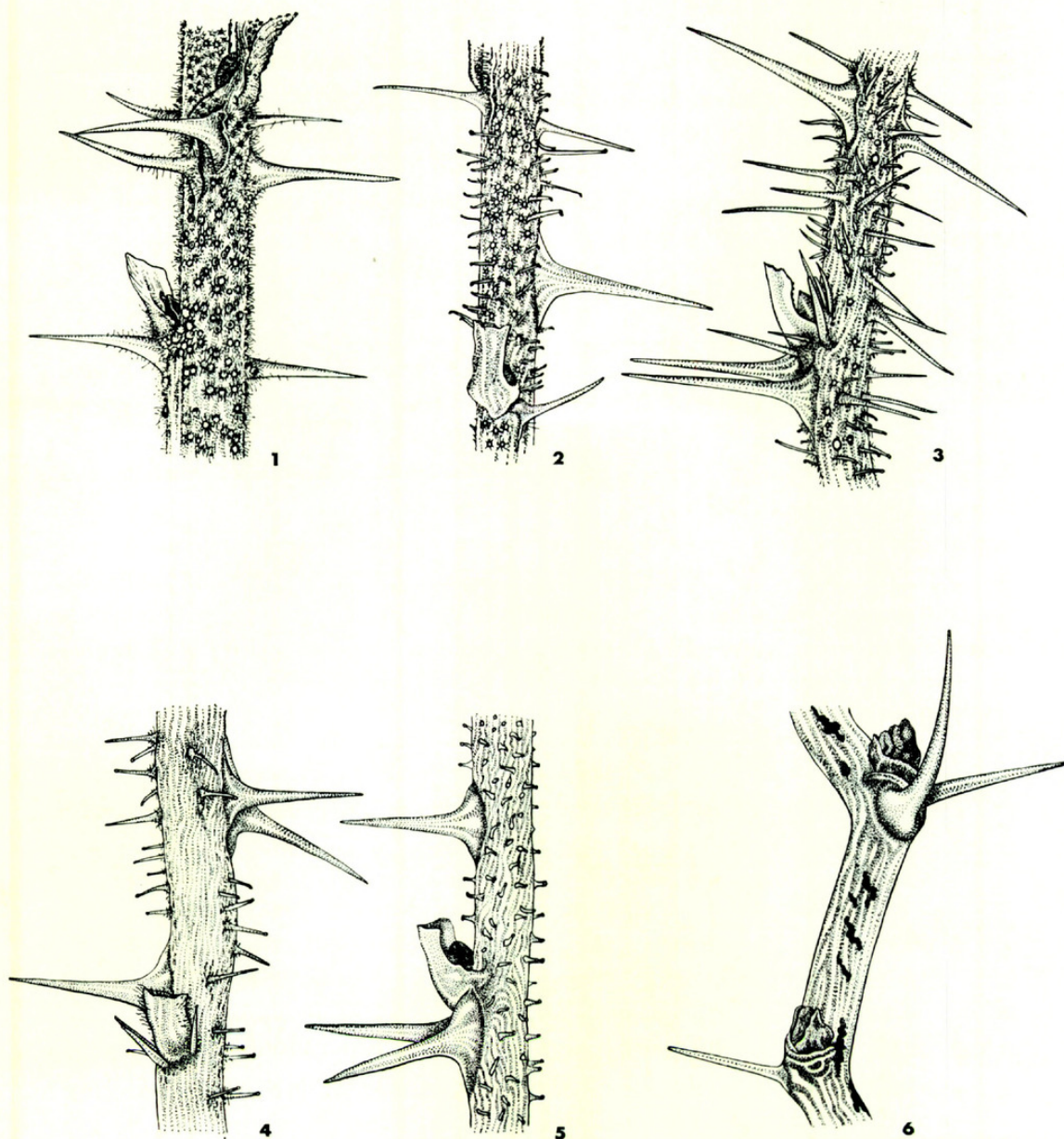


Fig. 1-6. Floral branches showing variations in indumentum for individuals of the *R. stellata* complex, 4 × Figs. 1-3. *R. stellata* Wooton subsp. *stellata* (Lewis 5521, 5523, 5519, respectively). Figs. 4-5. *R. stellata* subsp. *mirifica* (Greene) W. H. Lewis (Lewis 5529, 5527, respectively). Fig. 6. *R. stellata* subsp. *mirifica* var. *erlansoniae* W. H. Lewis (Hinckley 18).



Table 1. Expressions for five characters involving eight mass collections and two types of the *R. stellata* complex.

Character		Expression					Taxon and Collection	
		<i>stellata</i> (-) <sup>a</sup>						
Leaflet number	three	syntype	5521	5522	5523	5519 <sup>b</sup>		
Leaflet size	< 10 mm. long & 6 mm. wide	—	—	±	±	—		
Leaflet indumentum	pubescent	—	+	+	+	—		
Leaflet texture	roughened	—	±	—	—	+		
Stipule/auricle	stipule shorter than auricle or about equal	—	—	±	±	+		
		<i>mirifica</i> (+) <sup>a</sup>						
Leaflet number	five	isoelectype	5527	5532	5534	5529 <sup>b</sup>		
Leaflet size	> 10 mm. long & 6 mm. wide	±	±	—	±	—		
Leaflet indumentum	glabrous	+	+	—	+	+		
Leaflet texture	smooth	±	±	+	—	—		
Stipule/auricle	stipule long (ca. 6 mm.), auricle short (ca. 3 mm.)	±	+	+	±	+		
		+	±	+	+	—		

<sup>a</sup> Expressions typical of *R. stellata* (—) and those typical of *R. mirifica* (+) while ± represents both expressions on the same plant or for different plants of the same mass collection or for both.

<sup>b</sup> Atypical mass collections based on floral stem indumentum.

basal hairs are also found. That this characteristic indumentum is not universal for the species is obvious on comparing it with the indumentum from a plant of a second collection (Fig. 2). In this instance, the murications having stellate hairs are fewer, the bristles, either gland-tipped or lacking glands, are more numerous and vary in size, and they either possess basal hairs or they are glabrous. For plants of a third mass collection, the stem murications are even fewer and some possess stellate hairs while others do not; in addition, the frequency and variation of inter-nodal bristles and prickles is much greater (Fig. 3).

Branches of typical individuals of *R. mirifica* lack pubescence and murications, but they are covered with many gland-tipped bristles and long nodal and inter-nodal thorns (Fig. 5). This kind of indumentum may vary. Bristles and prickles differ in size, some are gland-tipped while others are not, usually they are glabrous, but rarely do they possess basal hairs (Fig. 4) similar to *R. stellata*. Even for this limited sample, a fairly complete range of kinds of indumenta exist from those having numerous murications with stellate hairs characteristic of *R. stellata* to those having very few gland-tipped bristles, no murications, and glabrous branches typical of *R. mirifica*.



The latter expressions represent dominant extremes in the populations and although the number of individuals varying from such characterizations are fewer, they do represent significant elements in the complex as a whole. The sample illustrates that some plants of both populations have varying amounts of pubescence on their floral branches and are not just glabrous or pubescent. The sample also shows that plants having many internodal gland-tipped bristles are found in both populations and are not confined to one or to the other. Unless a meaningful separation on the basis of floral branch indumentum is to be found, obviously the basis of discontinuity between the populations must be redefined and of necessity be considered in a more restricted form. One minor characteristic only appears to hold up, i. e., the presence of stellate-like hairs on short murications for *R. stellata* and the absence of these murications and hairs for *R. mirifica*. Yet for *R. stellata* (Fig. 3) these may be very few in number so even this criterion must be used with caution.

Using Greene's (1910) other diagnostic characteristics, what separation has been found possible for these eight mass collections? Considering first the syntype of *R. stellata* (Wooton 126, MO), I have shown in Table 1 that this individual matches precisely Greene's description. On the other hand, the isoelectotype of *R. mirifica* (Wooton 193, MO) prominently differs from the type description by having commonly three rather than five leaflets per leaf and somewhat roughened leaflet surfaces even though these were described as smooth. Among the mass collections determined as *R. stellata* by their floral branch indumentum, all possess one or more expressions of leaf and stipule morphology supposedly typical of *R. mirifica*. Significantly, all "distinguishing" characters are involved but most commonly leaflet number and size. The same is true for those collections determined as *R. mirifica*: all include plants expressing some characteristic which should be confined to *R. stellata*, but notably leaflet number, size and indumentum. In summary of the data outlined in Table 1, one finds that for:

- R. stellata*, leaflet number— $\frac{1}{3}$  plants are *R. mirifica* in expression
- leaflet size—all plants are *R. mirifica* in expression
- leaflet indumentum— $\frac{1}{3}$  plants are *R. mirifica* in expression
- leaflet texture— $\frac{1}{6}$  plants are *R. mirifica* in expression
- stipule/auricle— $\frac{1}{3}$  plants are *R. mirifica* in expression
  
- R. mirifica*, leaflet number— $\frac{1}{3}$  plants are *R. stellata* in expression
- leaflet size— $\frac{2}{3}$  plants are *R. stellata* in expression
- leaflet indumentum— $\frac{1}{2}$  plants are *R. stellata* in expression
- leaflet texture— $\frac{1}{6}$  plants are *R. stellata* in expression
- stipule/auricle— $\frac{1}{6}$  plants are *R. stellata* in expression

The above shows that all five criteria are unreliable for separating the populations into two taxa. Clearly Greene's (1910) assumption of their value was premature.

Elimination of these characters leaves only the presence or absence of stellate-like hairs on the floral branches as the discontinuous characteristic by which the populations may be distinguished, although, as I have outlined above, even this



feature is somewhat variable. Transferring these results to a practical and meaningful classification requires, in my opinion, a subspecific (subspecies or variety) rather than a specific rank for populations named *R. stellata* and *R. mirifica*.

#### *Distribution.*

Species of the subg. *Hesperhodos* are endemic to two widely separated areas of North America (Fig. 7): *R. minutifolia* to western Baja California Norte, and the *R. stellata* complex to south-central New Mexico and far western Texas. In New Mexico, the latter is found at altitudes of 5,000 feet or higher on two north-south ranges—the San Andres range, including the Organ Mountains to the west, and the Sacramento range, including the Sierra Blanca Mountains, to the east. Between these ranges is the xeric Tularosa Valley supporting little vegetation and no roses under conditions perhaps best illustrated by the existence there of the White Sands National Monument. On the mountain slopes plants typical of *R. stellata* are found only on the San Andres range, whereas those typical of *R. mirifica* are confined to the Sacramento Mountains. Even so-called atypical plants are known only on mountain ranges inhabited by typical plants of each species.

In Texas, *R. stellata* s. s. is not known, but *R. mirifica* is found on an extension of the Sacramento range called the Guadalupe Mountains as well as further to the south. The greatest variability of the taxon is in this area and a distinct variety (Fig. 6), apparently confined to McKittrick Canyon, will be described.

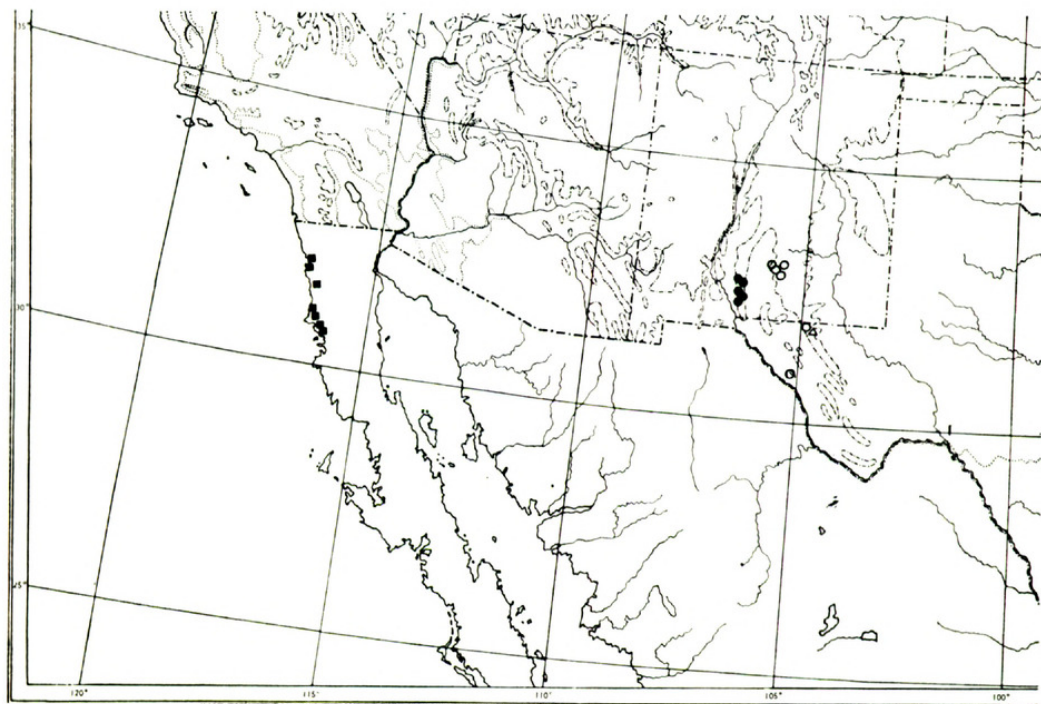


Fig. 7. Distribution of *R. minutifolia* Engelm. (■) and the *R. stellata* Wootton complex as subsp. *stellata* (●), subsp. *mirifica* (Greene) W. H. Lewis var. *mirifica* (○), and subsp. *mirifica* var. *erlansoniae* W. H. Lewis (△).



On the basis of gross morphological and supporting distributional data, the populations of the *R. stellata* complex are divisible into two subspecies as *R. stellata* subsp. *stellata* and *R. stellata* subsp. *mirifica*.

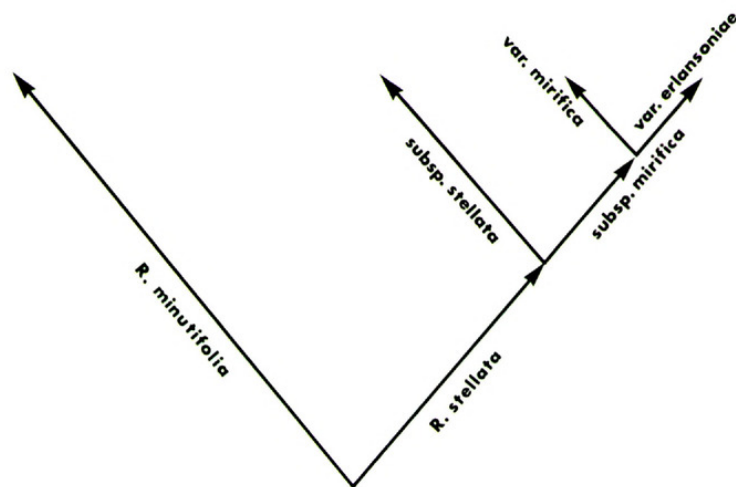
*Phylogeny.*

The existence in the San Andres and Sacramento Mountains of plants with some floral branch characteristics similar to one another, but not typical of the subsp. *stellata* and subsp. *mirifica*, respectively, suggests that the two subspecies are not effectively isolated and that a gene exchange is possible or has recently taken place. Yet the intervening and formidable desert makes such a possibility unlikely. Assuming that the present day populations were continuous in distribution under more favorable circumstances, the original population was probably more homogeneous and was not characterized by either of the forms known today. Thus the tomentose-woolly stellate-like hairs which now typify stems of one population and the concentrated gland-tipped bristles and glabrous stems of the other would be the specialized products of isolation. However, the atypical elements of each population today are so similar that they nearly bridge the gap between the two subspecies. This phenomenon could be explained if in fact the near-intermediate, less distinctive stem indumentum approached that of the original population which is still represented on both mountain ranges by plants possessing original indumental characteristics. Only occasionally would the necessary recombinants come together to produce an individual with the "ancient" now atypical phenotype for indumentum. Providing that this hypothesis is correct, I suspect that such individuals will become even fewer as the two separate populations evolve along distinct pathways. Ultimately, with the loss in both populations of somewhat similar indumental characteristics and possibly by the selection of others, the specialization may eventually be recognized taxonomically above that of subspecies.

This evolution is probably a micro-example of what has taken place in earlier times for the subgenus as a whole, i. e., the species were at one time more homogeneous and were continuous in distribution. Today there are only two remnants of this population. One survives only along the Pacific coast of Baja California Norte, and the other is found about 600 miles to the east on certain mountain ranges of New Mexico and Texas. The geologic history of the southwest is ideal for explaining such discontinuities and isolations, and it is quite conceivable that following major disruptions in that region during Cretaceous and Tertiary times a more widespread phylad split into several segments and survived (with migration?) only in two small, widely disjunct areas. The existence of species populations in Baja California from what are believed to be ancient stocks is not uncommon to the peninsula with the most closely allied species far to the east and unknown in adjacent areas of Mexico and California (e. g., *Hedyotis* subg. *Edrisia*; Lewis, 1962).



The phylogeny of the taxa is summarized by the following sketch.



How old the species are is unknown for there is no fossil evidence (Cockerell, 1913) contrary to the reference by Hurst (1929). The primitiveness of the subgenus has been widely suggested (Cockerell, 1913; Hurst, 1928) and certain unique characteristics not known elsewhere in *Rosa* or confined to species endemic to areas of southern Asia support this proposal.

#### SYSTEMATIC TREATMENT

Collections of the subgenus *Hesperhodos* have been examined from ARIZ, GH, K, MEXU, MICH, MO, MONT, NEB, S, SMU, SRST and US. To the directors and curators of these herbaria I express my sincere thanks for the opportunity of studying material under their charge. My collections are deposited with MO and duplicates have been distributed to MICH or SMU.

*ROSA* subg. *HESPERHODOS* Cockerell ex Rehder, *Cult. Trees & Shrubs*, ed. 2, 451. 1940. Type: *R. stellata* Wooton.

sect. *Minutifoliae* Crépin, *J. Roy. Hort. Soc.* **11**: 226. 1889. Type: *R. minutifolia* Engelm.

sect. *Spinosissimae* sensu Baker, *J. Linn. Soc., Bot.* **37**: 74. 1905, pro parte, non DC.

subg. or genus *Hesperhodos* Cockerell, *Nature* **90**: 571. 1913.

*Hesperhodos* Cockerell ex Hurst, *Zeitschr. Indukt. Abst. Vererb. suppl.* **2**: 902. 1928.

Shrubs with prickly stems 0.5 to 1.3 m. long; leaflets small, 3-7, incised-serrate; stipules adnate with divergent, often broad auricles; flowers solitary, peduncles without bracts; sepals erect after flowering, persistent, the outer pinnate with spreading appendages; hypanthia cupulate, thick-walled, bristly, with broad orifices; achenes few to ca. 15, oval, to 5 mm. long, borne at the base of hypanthia; styles free, included, persistent; pollen small, subprolate, 3-colporoidate, sexine finely reticulated; diploid species ( $x = 7$ ).



Two species endemic to xeric regions of southwestern North America.

KEY TO THE TAXA

- a. Leaves 5-7-foliolate; leaflets very small, to 7 mm. long & 4 mm. wide; young floral branches with brown, pubescent thorns; hypanthia tomentose, densely covered with long, fine prickles; Baja California Norte. ....1. *minutifolia*
  - b. Petals pink. ....1a. f. *minutifolia*
  - bb. Petals white. ....1b. f. *albiflora*
- aa. Leaves 3-5-foliolate; leaflets usually larger, 7-20 mm. long & 4-17 mm. wide; young floral branches with white to yellow, occasionally puberulent thorns; hypanthia glabrous or puberulent, with scattered, short bristles; New Mexico & Texas. ....2. *stellata*
  - b. Floral branches tomentose-woolly with long stellate hairs originating from many, short murications or obsolete gland-tipped bristles; internodal prickles few; infrequently branches pubescent with short hairs originating from internodal prickles and with fewer murications; San Andres Mts., New Mexico. ....2a. subsp. *stellata*
  - bb. Floral branches glabrous with many internodal gland-tipped bristles and prickles and no murications, less commonly pubescent with basal hairs on internodal prickles; Sacramento Mts., New Mexico and in Texas. ....2b. subsp. *mirifica*
    - c. Floral branches  $\pm$  straight, densely covered with internodal bristles. ....2b $\alpha$ . var. *mirifica*
    - cc. Floral branches angled at nodes, devoid of internodal bristles or rarely with few. ....2b $\beta$ . var. *erlansoniae*

1. *R. MINUTIFOLIA* Engelm. in Parry, Bull. Torr. Bot. Club **9**: 97. 1882.

Shrub with numerous usually decumbent stems to 1.5 m. long; floral branches pubescent, densely armed with scattered, slender, long, broad-based thorns and with smaller prickles which when young are pubescent at the base and reddish-white, and with age, glabrate and gray-brown; leaves 5-7 foliolate; leaflets oval or sub-orbicular, 2-7 mm. long and 1-4 mm. wide, pubescent above and below, eglandular, margin incised, single or biserrate, often gland-tipped; petioles pubescent, occasionally glandular-hispid; stipules adnate, 5 mm. long or less, pubescent, glandular-dentate, auricles short, spreading; flowers solitary and terminal on short floral branches; peduncles short, to 5 mm. long, tomentose, bristly; sepals ovate, caudate, often with foliaceous gland-tipped lobes, broad-based, 6-10 mm. long, tomentose within, pubescent and usually bristly without, in fruit persistent and erect; petals suborbicular, deep rose to white (in f. *albiflora*), 10-15 mm. long; at maturity hypanthia globose, tomentose, densely covered with long, pubescent bristles; anthesis usually January-April; chromosome number  $2n = 14$ .

1a. *R. MINUTIFOLIA* Engelm. f. *MINUTIFOLIA*.

*Hesperhodos minutifolia* (Engelm.) Hurst, Zeitschr. Indukt. Abst. Vererb. Suppl. **2**: 902. 1928.

Type: MEXICO, Baja California Norte, All Saints' Bay, near Ensenada, Parry and Jones s. n., 11 April 1882 (holotype, MO).

MEXICO: Baja California Norte, 9.8 miles N. of Colonia Guerrero, Straw & Ownbey 526 (MEXU); [near] El Rosario, Brandegee s. n., 20 May 1889 (GH), Bravo s. n., 15 Nov. of *R. mirifica*.



1956 (MEXU); Ensenada, *Anthony* 189 (GH, K, MEXU, MO, US), *Jones* 3697 (MO, US), *Orcutt* s. n., 31 Jan. 1889 (MO); 50 miles S. of Ensenada, *Dressler* 482 (GH, MO); 8 miles N. of Hamilton Ranch, *Shreve* 6427 (ARIZ, MICH); Rancho Piedra Roja, Santo Domingo, *Galligas* (?) s. n., 23 Febr. 1925 (MEXU, US); 7 miles N. of Rio Santo Domingo, *Ferris* 8525 (MICH, US); San Quentin [Bay], *Palmer* 619 (GH, K, MICH, S, US); near San Quentin, about 110 miles S. of border, *Nelson & Goodman* 7103 (US); N. of San Quentin, San Antonio Cañon, *McKeever* 29 (US); San Telmo, *Orcutt* s. n., 18 Apr. 1886 (MO); 21 miles S. of Santo Tomás, *Wiggins* 4272 (GH, MICH, SMU, US); Todos Santos Bay, *Orcutt* s. n., 12 Apr. 1882 (MICH, MO), *Parry & Co.* s. n., Apr. 1882 (GH), *Pringle* 14504 (K, MO, US), *Pringle* s. n., 12 Apr. 1882 (GH).

- 1b. *R. MINUTIFOLIA* Engelm. f. **ALBIFLORA** W. H. Lewis, f. nov.  
 Petala alba. Petals white.

Type: MEXICO, Baja California Norte, Todos Santos Bay, near Ensenada, *Erlanson, Emerson, and Beadle* s. n., 1 April 1931 (holotype, MO; isotype, GH). The type collection is named *R. minutifolia* Engelm. var. *alba*, n. var., but to my knowledge the variety remains unpublished.

The white petaled form is said by Cockerell (1941) to be "not uncommon" and to form large patches around Ensenada and southward. Cockerell refers this variant to a listing by Gravereaux (1902) as "*R. minutifolia* f. *alba*," yet Gravereaux was listing not *R. minutifolia*, but rather a variety and form *R. multiflora* Thunb., viz., on page 155, section 1. *Syntylae, Rosa multiflora* ses variétés et ses hybrides, followed on page 156 with var. *minutifolia alba*. This suggests that Cockerell failed to read the previous page and so to properly associate the variants with *R. multiflora*, an opinion strengthened by the fact that Gravereaux had already listed the section *Minutifoliae* and *R. minutifolia* on page 49.

2. *R. STELLATA* Wooton, Bull. Torr. Bot. Club **25**: 152. 1898.

Shrub with numerous, upright or rarely trailing stems, 0.4-1.5 m. long; floral branches  $\pm$  straight or infrequently angled (in var. *erlansoniae*), armed with long, white to yellow, broad-based, glabrous or puberulent basally, infrastipular and often internodal thorns, and covered with stellate hairs on mucronate axes (in subsp. *stellata*), or lacking hairs or with few, but possessing many small bristles and prickles commonly gland-tipped (in subsp. *mirifica*), or these few or absent (in var. *erlansoniae*); leaves 3-5 foliolate; leaflets cuneate-obovate, rounded or truncate at apex, 7-20 mm. long and 4-17 mm. wide, glabrous to pubescent, eglandular, with 5-12 serrations per leaflet, commonly all above the middle, obtuse or rounded, singly or biserrated, often gland-tipped; petioles glabrous or pubescent, but often glabrate, sometimes with few bristles; stipules adnate one-half or more, 5-10 mm. long, with auricles spreading, entire or glandular-dentate, glabrous or pubescent; flowers solitary, terminal; peduncles short, 10 mm. long or less, glabrous, eglandular or sparingly glandular-hispid; sepals ovate-lanceolate, broad-based, 12-20 mm. long, 2-3 lobed or occasionally more, entire or serrated, often glandular margined, tomentose within, usually bristly and puberulent or pubescent without, eglandular or glandular-hispid, in fruit persistent and erect; petals obovate, 22-30 mm. long and 20-25



mm. wide; at maturity hypanthia irregularly spheroidal, 12-20 mm. in diameter, glabrous or occasionally puberulent, with scattered bristles often gland-tipped; anthesis April-September; chromosome number  $2n = 14(16)$ .

2a. *R. STELLATA* Wooton subsp. *STELLATA*.

*Hesperhodos minutifolia* Engelm. subsp. *stellata* (Wooton) Hurst, Zeitschr. Indukt. Abst. Vererb. Suppl. **2**: 902. 1928.

*H. stellatus* (Wooton) Boulenger, Bull. Jard. Bot. État Brux. **14**: 234. 1937.

Lectotype: NEW MEXICO, Dona Ana Co., Organ Mountains, near the Cueva, Wooton s. n., 30 April 1893 (US), on a dry, rocky hillside at an altitude of about 5,000 feet. Syntype: same locality, Wooton 126, 10 July 1897 (MO) (isosyntypes, GH, K).

NEW MEXICO, Dona Ana Co.: Organ Mountains, Wooton s. n., 29 April 1899 (US), 6 May 1900 (MO, MONT), 26 May 1905 (ARIZ, MICH, US), Wooton & Standley s. n., 10 July 1897 (US), 28 Sept. 1902 (US), 23 Sept. 1906 (US); San Andres Mountains, Ash Canyon, Hershey s. n., 8 May 1936 (NEB), Parker 2475, 2475a (ARIZ), Ash Spring, Wooton s. n., 23 Sept. 1912 (US), 24 May 1913 (US), Ropes Springs, Lewis 5519, St. Nicholas Canyon, Lewis 5521; New Mexico State University (cultivated, originally Organ Mountains), Lewis 5522, 5523.

Less variable than the following subspecies, the subsp. *stellata* nevertheless may occasionally have many internodal bristles rather than few or none, and stellate hairs from muricate axes may be rare rather than common (e.g., Lewis 5519).

2bα. *R. STELLATA* Wooton subsp. **MIRIFICA** (Greene) W. H. Lewis, stat. nov., var. *MIRIFICA*.

*R. mirifica* Greene, Leaf. Bot. Obs. **2**: 62. 1910.

*R. vernonii* Greene, Leaf. Bot. Obs. **2**: 63. 1910.

*R. stellata* Wooton var. *mirifica* (Greene) Cockerell, Gard. Chron., ser. 3, **55**: 50. 1914.

*Hesperhodos minutifolia* Engelm. subsp. *mirifica* (Greene) Hurst, Zeitschr. Indukt. Abst. Vererb. Suppl. **2**: 903. 1928.

*H. mirificus* (Greene) Boulenger, Bull. Jard. Bot. État Brux. **14**: 236. 1937.

Lectotype: NEW MEXICO, Otero Co. (as Lincoln Co.), White Mountains, 2 miles west of the Mescalero Agency, Wooton 193, 22 July 1897 (US), at an altitude of about 6,000 feet (isolectotype, MO). Syntype: NEW MEXICO, Otero Co., Sacramento Mountains, Fresno, Wooton s. n., August 1897 (US).

It was on the basis of the lectotype that Greene (1910) distinguished *R. mirifica* from *R. stellata*. Not all specimens distributed under the lectotype's collector and number (Wooton 193), however, are typical of the subsp. *mirifica*, for one, having a different locality (near Blozer's Hill, White Mountains, ARIZ) has pubescent bristles on the floral branches. Other individuals with pubescent bristles are indicated by an asterisk under specimens examined.



NEW MEXICO. Otero Co.: Alamo National Forest, head of Río Fresnal, *Barlow s. n.*, 12 Aug. 1911 (MO); near Cloudercroft, *Slater s. n.*, Aug. 1915 (US); 5.3 miles W. of Cloudercroft, *Lewis 5529\**; 0.3 miles S. of High Rolls, *Lewis 5527*; 2 miles S. of High Rolls, *Dice s. n.*, 19 July 1927 (MICH)\*; 2.5 miles W. of Mescalero, *Lewis 5534*; 1.5 miles below Mountain Park, *Hinckley 6512* (ARIZ); Fresnal, *Wooton s. n.*, Aug. 1897 (US), 21 July 1899 (MONT, US); Fresnal Canyon, nr. Mountain Park, *Rehder 390* (GH, K)\*, 334 (GH)\*; along Tularosa Creek, *Wooton s. n.*, 18 Aug. 1899 (US). TEXAS. Culberson Co.: Guadalupe Mountains, West Dog Canyon, *Warnock 12076* (SMU, SRST), Guadalupe Mountains, *Bailey 421* (US, holotype of *R. vernonii* Greene)\*. Hudspeth Co.: Eagle Mountains, ca. 35 miles S. E. of Sierra Blanca, *Waterfall 6719* (GH, MO, SMU, SRST).

2bβ. *R. STELLATA* Wooton subsp. *MIRIFICA* (Greene) W. H. Lewis var. **ERLANSONIAE** W. H. Lewis, var. nov.

*Hesperhodos vernoni* sensu Boulenger, Bull. Jard. Bot. État Brux. **14**: 237. 1937, non *Rosa vernonii* Greene (1910).

A varietate typica ramulis floriferis nodis angulatis, palliole viridibus sine setis aculeisque internodialibus, interdum sparsum setosis aculeatisque et glabris differt.

Differs from the typical variety by having floral branches angled at nodes, pale green, devoid of internodal bristles and prickles or sometimes sparsely bristly and prickly, and glabrous.

Type: TEXAS, Culberson Co., Guadalupe Mountains, North McKittrick Canyon, *Moore and Steyermark 3540*, rocky stream bed, altitude 1,800 m. (holotype, MICH, Fig. 21 in Boulenger [1937]; isotypes, GH, MO).

TEXAS. Culberson Co.: Guadalupe Mountains, North McKittrick Canyon, *Correll 13950* (SMU), *Hinckley [ & Hinckley] 18* (MO, SMU, SRST, US), *McVaugh 7412* (MICH, SMU); Guadalupe Mountains, between North and Main McKittrick Canyons, *McVaugh 7407* (MICH, SMU).

Boulenger (1937) recognized *R. vernonii* as distinct from *R. stellata* s. s. based not on the type of the former species which he did not examine, but rather on material of *Moore & Steyermark 3540*. Both collections originated in the Guadalupe Mountains of Texas and very probably this misled Boulenger into assuming their similarity. Actually, *R. vernonii* is a pubescent form of *R. stellata* subsp. *mirifica* var. *mirifica* (*Hesperhodos mirificus* Boulenger), whereas *Moore & Steyermark 3540* represents the newly described var. *erlansoniae*, named for Dr. Eileen W. Erlanson MacFarlane who pioneered the revision of the North American species of *Rosa*.

#### Summary.

Populations of *Rosa* subg. *Hesperhodos* are separable by geographical and morphological characteristics into two species, *R. minutifolia* and *R. stellata*. The former is relatively homogeneous, while the latter consists of a complex population divided geographically and morphologically into two groups, the subsp. *stellata* and *mirifica* including the rare var. *erlansoniae*.



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