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STUDIES IN THE BORAGINACEAE, XII

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1. TRIGONOTIS IN SOUTHWESTERN CHINA

THE GENUS *Trigonotis* has its greatest concentration of species and its most important center of endemism in the mountainous country of southwestern China. The present paper represents the first attempt to classify and distinguish the numerous species of the genus in that area. It is concerned with those known from Hupeh, Szechuan, Yunnan, Kweichow and Kwangsi. For its preparation I have studied the specimens of the genus preserved at the Gray Herbarium (G), the New York Botanical Garden (NY) and the Royal Botanic Garden at Edinburgh (Edinb). I have also had available for this study some critical notes on the Indian species which I made several years ago at Kew.

With the exception of one widely distributed weedy species, *T. peduncularis*, the species of *Trigonotis* in southern China are all evidently distinct from those in the region to the northward. For my work this has been fortunate for I have escaped becoming involved in the problems of classification still enveloping these northern congeners. The northern species are in great need of revision. They are so poorly understood that a number of them, even recently, have been described under the genus *Omphalodes*. The most useful work on the northern species is contained in the synopsis of the Corean and Japanese species by Nakai, Tokyo Bot. Mag. 31: 215-218 (1917) and in the critical

Cryptantha (§ **OREOCARYA**) **Grahamii**, sp. nov., perennis caespitosa; caudice denso breviter ramoso e radice crasso lignoso oriente; caulibus 1-2 dm. altis erectis setosis et adpresse pubescentibus supra medium fertilibus; foliis viridibus utrinque pilis minutis inconspicuis vestitis et setis ca. 2 mm. longis (e basi pustulata orientibus) horridis, basalibus 3-4.5 cm. longis supra medium in laminam lanceolato-ovatum 5-10 mm. latam explanatis apice rotundis vel obtusis, caulinis oblanceolatis vel oblongis medis 2-2.5 cm. longis 6-7 mm. latis obtusis; inflorescentia elongata laxa; cymulis laxis 3-10-floribus setosis bracteis foliaceis suffultis; calycibus abundanter setosis et pubescentibus ad anthesim ca. 7 mm. longis, lobis lineari-lanceolatis acutis fauces corollae 0.5-1 mm. superantibus; pedicellis gracilibus 0.5-1 mm. longis; corolla alba conspicua, limbo patente 12-16 mm. lato, lobis rotundis ca. 5 mm. latis et longis, tubo cylindrico 5-6 mm. longo 1-1.3 mm. crasso; ovulis 4; nuculis ignotis.

UTAH. Uinta County: bench west of Green River north of mouth of Sand Wash, 4500 ft. alt., fl. white, May 28, 1933, *Edward H. Graham 7924* (TYPE, Gray Herb.) and 7927 (G); east slope of Big Pack Mt., west of Willow Creek near Thome Ranch, 5400 ft., on light-colored slate bench, fl. white, May 23, 1935, *Graham 8962* (G); shale breaks east of Willow Creek, 5 mi. north of Agency Draw, 5500 ft., fl. white, fragrant, *Graham 8937* (G).

A very distinct and readily recognizable species. Its conspicuous white corollas are the largest known in the genus. The immature nutlets appear to be smooth and rather similar to those of *C. confertiflora* (Greene) Payson. I can suggest no close relative for this remarkable new species.

The species is named for Dr. Edward H. Graham of the Carnegie Museum of Pittsburgh who discovered it during his intensive botanical investigation of the Uinta Basin of northeastern Utah. It is eminently fitting that his name should be associated with this remarkable endemic of the region he has studied so thoroughly.

Cryptantha (§ **KRYNITZKIA**) **Hooveri**, sp. nov., herbacea annua 5-15 cm. alta laete viridis; caulibus solitariis vel pluribus erectis vel non rariter basim versus subdecumbentibus gracilibus 0.5-1.2 mm. crassis strigosis infra medium simplicibus supra medium breviter ascendenterque ramosis; ramulis floriferis 1-2.5 cm. longis; foliis ascendentibus crassulis firmis pilis rigidis adpressis (vel in foliis supremis pilis ascendentibus) vestitis, subtus prominenter costatis abundanter pustulatis, supra sparse pustulatis; foliis basalibus caulibus ramorumque evidenter oppositis 10-25 mm. longis angustissime spathulatis apicem obtusam versus 0.9-2.2 mm.

latis, margine saepe subplanis; foliis caulinis ramulisque mediis et superioribus alternis sublinearibus 1 mm. latis 1-2 cm. longis apice acutis margine revolutis; inflorescentia elongata dense thyrsoida vel paniculata; floribus in axillis foliorum glomerulatis vel solitariis haud scorpioideis; calycibus fructiferis elongatis subsessilibus 4-5 mm. longis tarde deciduis; lobis calycis maturi linearibus in costa setis flavescensibus 2-3 mm. longis munitis et in marginibus dense ascenderentibus villosis; corolla inconspicua tubulosa 2-2.5 mm. longa ad anthesim calycem ca. 3 mm. longam vix superante; nuculis 4 homomorphis (nucula adaxillari subpersistenti?) triangulari-ovatis ca. 1.3 mm. longis ca. 0.9 mm. latis lucentibus, apice acutis, basi late truncatis, margine acutis minime incrassatis, dorso convexis prominenter papillatis, ventre obtuse angulatis sparse tuberculatis $\frac{3}{4}$ longitudinis ad gynobasim angustum ca. 1 mm. longam afixis sulco infra medium in areolam deltoideam abrupte dilatatis; stylo nuculas vix superante.

CALIFORNIA: eight miles west of Chowchilla, Madera Co., a single colony in dry coarse sand, May 7, 1935, *R. F. Hoover 558* (TYPE, Gray Herb.); Gobin Ranch, about 13 mi. east of Waterford, Stanislaus Co., in coarse sand on a flat among rolling hills, May 2, 1936, *Hoover 1103* (G); sand hills east of Antioch, Contra Costa Co., April 16, 1908, *Heller 8888* (G).

I can suggest no close relative for this very distinct species. The peculiar inflorescence, characterized by a complete lack of scorpioid cymes, is unique among the North American species of the genus. The nutlets though not aberrant are distinctive and I believe the species can be recognized from them alone. The corollas are very small and possibly may be cleistogamic though the corollas surmounting the ripening ovary have their tiny lobes expanded and not permanently closed as in the indubitably cleistogamic flowers of the South American section *Eucryptantha*.

I have associated with this unusual species the name of Mr. Robert F. Hoover of Modesto, Calif., to whom I am indebted for the excellent specimens here described. The material was collected by Mr. Hoover during botanical trips about the San Joaquin Valley made in furtherance of his study of the floristics of that region. It is a pleasure to associate his name with this remarkable addition to the known flora of that interesting area.

Cryptantha corollata (Johnston), comb. nov. *C. decipiens* var. *corollata* Johnston, *Contr. Gray Herb.* 74: 61 (1925); Johnston in Munz, *Man. So. Calif. Bot.* 428 (1935).

Since this plant of the drier inner Coast Ranges of California was first

distinguished over ten years ago I have seen many collections of it. Among the scores of specimens studied I have found none that give any indication that *C. corollata* and *C. decipiens* intergrade in any way, or that their geographical ranges overlap or even approach one another closely. The plant I distinguished as *corollata* is very constant and readily identifiable and has a range that is eminently natural. I now believe it should be given specific recognition.

Hackelia brachytuba (Diels), comb. nov. *Paracaryum brachytubum* Diels, Notes Royal Bot. Gard. Edinburgh 5: 168 (1912). *Lappula Dielsii* Brand in Fedde, Repert. 14: 147 (1915). *Hackelia Dielsii* (Brand) Johnston, Contr. Gray Herb. 68: 45 (1923).

The type of *P. brachytubum* came from the Tali Valley (*Forrest 4474*) that of *L. Dielsii* from the Likiang Range (*Forrest 2255*), also in Yunnan. They are evidently conspecific.

Trigonotis sericea (Maxim.), comb. nov. *Omphalodes sericea* Maximowicz, Bull. Acad. Sci. St. Pétersb. 17: 453; Mém. Biol. 8: 558 (1872).

This species is evidently a relative of *T. Icumae* (Maxim.) Makino, *T. radicans* Maxim. and *T. myosotideae* Maxim. and not a member of the genus *Omphalodes* as it has been accepted for so long.

Antiotrema Dunnianum (Diels) Handel-Mazzetti, Anzeiger Akad. Wiss. Wien 57: 239 (1920). *Cynoglossum Dunnianum* Diels, Notes Royal Bot. Gard. Edinburgh 5: 168 (1912). *Cynoglossum Cavaleriei* Léveillé in Fedde, Repert. 12: 534 (1913) and Cat. Seu-Tchouen, tab. 5 (1918). *Henreyettana mirabilis* Brand in Fedde, Repert. 26: 171 (1929).

The type of *C. Cavaleriei* (*Cavalerie 2117*) has its flowers at anthesis and shows no fruit. It is a mediocre specimen but one clearly conspecific with the type of *A. Dunnianum*. Léveillé had other collections of the species, *Bodinier 1579* and *2160*, which do possess mature fruit but these were not associated by him with his *C. Cavaleriei*. They are in fact the basis upon which he reported, *Bothriospermum Kusnezowii* from Kweichow, Fl. Kouy-Tchéou 52-53 (1914).

In his recent treatment of this remarkable plant, Handel-Mazzetti, Symb. Sin. 7: 825 (1936), is incorrect in stating that the nutlets and embryo are "erect." As I have already indicated, Contr. Gray Herb. 75: 44-45 (1925), the nutlets and embryos are in fact inverted in *Antiotrema*. This is a very unusual condition in the Boraginaceae and is found in only two other genera of the family.