

Taxonomic Studies in the Compositae of Thailand 11.
Vernonia Schreb. Sect. *Strobocalyx* Bl.

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Abstract *Vernonia* sect *Strobocalyx* in Thailand is taxonomically examined. Two species of woody climbers and 3 species of shrubs and trees are recognized in the section. They are *Vernonia elliptica*, *V. solanifolia*, *V. parishii*, *V. arborea* and *V. volkameriifolia*.

Key words : Compositae, taxonomy, Thailand, *Vernonia* sect. *Strobocalyx*.

Twenty eight species of Thai *Vernonia* are enumerated by Kerr (1936). Some of them could be considered to be members of Sect. *Decaneurum* by the features of the achenes and pappus as already reported in my previous paper (Koyama, 1993).

In the present part of this studies, Sect. *Strobocalyx* Bl. is taxonomically examined. As already pointed out by Koster (1935), the features of the achenes and pappus can be considered to be important to recognize the sections. Having new materials at hand, a detailed observation of involucre scales reveals that the size of the involucre scales is a diagnostic for the section. As a result, two species of shrubby climbers and three species of shrubs and trees can be considered to be members of Sect. *Strobocalyx* by the features of involucre scales in addition to those of achenes and pappus.

Enumeration of species

- A. Shrubs or trees.
 - B. Trees more than 10 m tall; involucre ca. 3 mm high. *V. arborea*
 - B. Shrubs or trees; involucre ca. 5 mm high.
 - C. Trees 3–5 m tall; leaves obovate or obovate-oblong, entire or subserrate, 25–50 cm long, 10–20 cm wide, nearly glabrous above, pubescent beneath.
..... *V. volkameriifolia*
 - C. Shrubs 2–3 m tall; leaves oblong or oblanceolate, 15–30 cm long, 5–8 cm wide, subglabrous above, densely pubescent beneath..... *V. parishii*
- A. Shrubby climbers.
 - B. Involucre tubular, 4–5 mm high, the bracts 4-seriate, nearly glabrous or silk hairy. *V. elliptica*
 - B. Involucre campanulate, 4 mm high, the bracts 3-seriate, densely wool hairy.

..... *V. solanifolia*

1. *Vernonia elliptica* DC. in Wight, Contrib. Bot. Ind.: 5 (1834); Kerr, Fl. Siam. Enum. **2**(3): 239 (1936).

Vernonia elaeagnifolia DC., Prodr. **5**: 22 (1836).

Habitat: on thickets near streams, in old clearings or edges of evergreen forests, 100–800 m, and mangrove swamps.

Shrubby climbers; branches long woody, finely grooved, petioles and inflorescence hoary. Leaves petiolate, oblong, linear-oblong or elliptic-lanceolate, 4–10 cm long, 2–6 cm wide, quite entire, obtuse or acute, glabrous and reticulate above, pale and densely silky beneath; petioles slender, to 1.2 cm long. Heads ca. 0.5 cm across, many in narrow terminal short loose panicles at the end of the rigid divaricating branches, all pedicelled; involucre tubular, 4–5 mm high, the bracts 4-seriate, imbricate, ovate, obtuse, nearly glabrous or silk hairy. Flowers in January to March, 3–5 per head, corollas purple, glabrous. Achenes irregularly 5-angular, ca. 2 mm long, very few pilose, glandular. Pappus whitish tawny, 2-seriate, the outer ca. 0.2 mm long, persistent, the inner 6 mm long.

Specimens examined. **N** Chiang Mai: Chiang Mai (3-1911 Kerr 1693 BOGOR, C, L, P). Lamphum: Ban Mae Mae (Bjornland & Schumacher 643 BKF). **NE** Loei: Si Than (Suvarnakoset 1300 BKF, TNS, US; 2-1959 Bunpheng BKF, TNS; 2-1946 Thanom 84 S). **E** Chaiyaphum: Chaiyaphum (1-1931 Kerr 19950 BK). Nakhon Ratchasima: Korat (3-1958 Sorensen *et al.* 2164 BKF, C). Si Sa Ket: Kanchhalak (4-1966 Prayad 228 US). **SW** Ratchaburi: Thaphra (2-1965 Sakol 371 US). **C** Nakhon Nayok: Khao Yai National Park (2-1966 Iwatsuki & Fukuoka T-7373 BKF, KYO, TNS; 1-1985 Konta *et al.* T-49085 KYO, L, TNS). Krung Thep M. N.: Bangkok (?-1859 Schomburgk 116 P; ?-1899 Zimmermann 101 L, MO, P, S, US; 1-1922 Smith 268 BK; 3-1927 Lakshnakara 308 BK), Raminthra (2-1983 Koyama & Terao T-33716, T-33717, T-32866 KYO). Saraburi: Sahm Lahn forest (2-1975 Maxwell 75-152 L). **SE** Chanthaburi: Kao Sabap (2-1935 Seidenfaden 2674 C), Khao Soidao (2-1966 Iwatsuki & Fukuoka T-7314 BKF, KYO, TNS), Chantaboon (?-1936 Vesterdal 5G C), Sriracha (2-1914 Collins 325 US). Rayong: Ban Pe (2-1930 Put 2771 BK). Trat: Khlung (1-1958 Sorensen *et al.* 531 BKF, C), Koh Chang (2-1900 Schmidt 481 C, S; 1-1922 Smith 298 BK; 2-1955 Sanan 13 BKF, TNS, US; 6-1955 Sangkachand 417 BKF, TNS, US). **PEN** Chumphon: Paknam (2-1968 Vacharapong 008 US). Nakhon Si Thammarat: Chawang (5-1955 Thavorn 180 BKF, TNS, US), Kapiat (3-1957 Thavorn 1002 BKF, TNS, US). Surat Thani: Takanawn (3-1927 Kerr 12344 BK).

Distr.: India or. (Maheshwari 5607 L), Tenasserim prov. (Falconer 480 L), Burma (Meebold 14014 S), Singapore, Cochin-China and Malaysia.

2. *Vernonia solanifolia* Benth. in Hooker, Lond. Journ. Bot. **1**: 486 (1842);

Kerr, Fl. Siam. Enum. **2**(3): 243 (1936).

Habitat: In savannas by stream or in evergreen forests, 600–1250 m.

Shrubby climbers, to 1.5 m long or subarborescens 0.6–2.0 m tall, very variable; branches, leaves and inflorescences usually densely soft woolly. Leaves petiolate, ovate-oblong, elliptic, lanceolate, 8–18 cm long, 4–12 cm wide, obtuse or acute, entire or sinuate-toothed, base rounded or cordate, usually densely hairy on both surfaces, but some nearly glabrous; petioles thick, 1.5–2.5 cm long; the hairs may be caducous in accordance to the season. Heads ca. 1 cm across, many in open terminal panicles; involucre campanulate, 4 mm high, the bracts 3-seriate, imbricate, ovate, obtuse, densely woolly hairy. Flowers in February to April, 3–5 per head; corolla white or lilac, glabrous. Achenes 8–10-ribbed, 3 mm long, very few pilose, glandular. Pappus whitish or tawny, 2-seriate, the outer 0.8 mm long, persistent, the inner 6.0 mm long.

Specimens examined. **N** Lampang: Me Tua (1-1925 Winit 1262 BK, BKF). Mae Hong Son: Khun Youm (Nimanong & Phusomsaeng 1813 A, BKF). Nan: Ban Tin (3-1921 Kerr 4982 A, BK). **NE** Loei: Phu Kradung (2-1931 Kerr 20129 BK, L; 4-1955 Smitinand 2495 US), Dan Sai (3-1924 Kerr 8816 A, BK). **E** Chaiyaphum: Hin Ngom (2-1963 Adisai 382 BK, US), Pu Kio (2-1931 Kerr 20226 BK). Nakhon Ratchasima: Khao Yai (3-1965 Kasem 444 BK, US).

Distr.: Yunnan (11-1947 Feng 13296, 13867 A; 11-1936 Wang 80678 A), Kwangchow (Ting & Shi 1369 BKF), Kwangtung (Lau 797 SING), Hong Kong (Wright 273 L), Hainan (Lei 353 BOGOR, L, SING), Tonkin (2-1886 Balansa 881 P; 3-1888 Balansa 3015, 3031 P; 2-1931 Poilane 18984 P; 4-1936 Poilane 25831 P; 1-1938 Poilane 27047 P; Alleizette L), Indo-China (Petelot 2089 BOGOR), Annam (5-1924 Poilane 11294 P; 6-1924 Poilane 10851 P; 3-1927 Poilane 13628 P; 3-1941 Poilane 32291 P), Laos (12-1917 Mieville 37200 P; 3-1932 Poilane 20409 P; 4-1932 Poilane 20674 P), Cambodia (6-1909 Alleizette P) and Thailand.

3. *Vernonia arborea* Buch.-Ham. in Tran. Linn. Soc. **14**: 218 (1824); Kitam. in Acta Phytotax. Geobot. **24**: 13 (1969).

Trees evergreen, 10–15 m tall, 10–25 cm across at DBH; branches, leaves and inflorescences usually densely rusty pubescent, sometimes glabrous or glabrescent. Leaves petiolate, sub-coriaceous, entire, elliptic ovate or ovate-oblong, 10–18 cm long, 3–6 cm wide, acute or shortly acuminate, base rounded or cuneate, glabrous or pilose on nerves above, glabrous or rusty hairy beneath; petioles 1.5–3.5 cm long. Heads ca. 1 cm across, many in open terminal panicles; involucre broadly campanulate, 3 mm high, the bracts 4-seriate, imbricate, oblong, obtuse, pubescent. Flowers in June to August, 3–5 per head; corolla lilac, glabrous. Achenes irregularly 5-angular, 2 mm long, sparsely pilose. Pappus whitish, 2-seriate, the outer 0.5 mm long, persistent, the inner 7.0 mm long.

Two varieties can be recognized in Thailand. Var. *arborea* is distinguished by

having leaves glabrous beneath except on nerves from var. *javanica* which is characterized by having leaves uniformly pubescent beneath. The shape of leaves is variable in our materials, though it has been taken by Grierson (1980) as a key character for these two varieties.

var. **arborea**

V. wallichii Ridl. in Journ. F. M. S. Mus. **10**: 144, 145 (1920); Kerr, Fl. Siam. Enum. **2**(3): 245 (1936).

Habitat: Along pathes or edges of forests and in second growth forests and scattered by the stream in evergreen forests, 40–400 m.

Leaves glabrous beneath except on nerves.

Specimens examined. **PEN** Krabi: Nang Yon (8-1964 Sangkhachand 1010 BKF, C). Nakhon Si Thammarat: Khao Khao (8-1967 Shimizu *et al.* T-8176 BKF, KYO, L, TNS), Khiri Wong (7-1951 Smitinand 755 BKF, GH, TNS), Thungsong (7-1929 Rabil 188 BK). Narathiwat: Waeng (11-1962 Sangkhachand 885 BKF, C, L, P), Nikhom Waeng (10-1966 Prayad 494 BK, US). Phangnga: Khao Nang Hong (8-1967 Shimizu *et al.* T-8027 KYO), Khao Lak National Park (9-1982 Shimizu *et al.* T-29229 KYO). Phatthalung: Kao Boo to Kao Yah National Park (Maxwell 86-520 BKF). Ranong: Bang Lampoo (9-1982 Shimizu *et al.* T-29269 KYO), Phal Phahad beach (12-1979 Shimizu *et al.* T-26360 KYO), Kam Puan (8-? Santisuk 1249 A, BKF), Khlong Nakha W. S. (7-1979 Niyomdham *et al.* 358 BKF, KYO; 12-1979 Shimizu *et al.* T-26501, T-26502, T-26503 BKF, KYO; 9-1982 Shimizu *et al.* T-29309 KYO), Ranong (8-1973 Pochanart 427 KYO, P). Songkla: Ban Prakawp (7-1928 Kerr 15847 BK). Surat Thani: Bang Bao (8-1955 Smitinand 2860 BKF, TNS, US), Surat Thani (8-1975 Prapat 54 BKF, C, KYO). Songkhla: Ko Hong hill (Maxwell 84-176 BKF). Takuapah: 15 km N of the city (9-1972 Larsen *et al.* 30935 L). Trang: Khao Chong (8-1975 Maxwell 75-739 L), Trang (9-1903 Fox 381 SING). Yala: Baho (Dechakaisaya 8 BKF), Banang Sta (7-1923 Kerr 7276 A, BK, L), Yala (1-1931 Put 3655 BK).

var. **javanica** (Bl.) C. B. Clarke

Comp. Ind.: 23 (1876); Koster in Blumea **1**: 386 (1935). — *Eupatorium javanicum* Bl., Bijdr.: 903 (1826). — *Vernonia javanica* DC., Prodr. **5**: 22 (1836); Kerr, Fl. Siam. Enum. **2**(3): 240 (1936).

‘*Vernonia javanica* var. *mollissima*’: Kerr, Fl. Siam. Enum. **2**(3): 240 (1936).

Habitat: In or edge of secondary evergreen forests, 100 m.

Leaves uniformly hairy beneath.

Specimens examined. **PEN** Nakhon Si Thammarat: Khiansa (3-1956 Sanarn 768 BKF, US). Ranong: La-un (1-1929 Kerr 16477 BK). Surat Thani: Nasarn (7-1948 Sanarn 333 BKF, US), Bang Bao (8-1955 Suvarnakoset 865 BKF, TNS, US), Kanchanadit (7-1927 Kerr 13034 BK). Yala: Banang Sta (7-1923 Kerr 7381 A, 8-1923 Kerr 7709 A).

Distr. (of two varieties): Silhet (Hooker & Thomson 15 A: var. *arborea*), Assam

(Genkins AAU: var. *arborea*), Trengganu (9-1955 Sinclair & Salleh 40742 L: var. *arborea*), Bengal (Jenkins AAU: var. *arborea*), Tenasserim & Andamans (Helfer 3103 P: var. *arborea*), Burma (Kingdon-Ward 22033 A: var. *javanica*), Tonkin (1-1887 Balansa 3077 P; 11-1888 Balansa 3040 P; 6-1918 Chevalier 37841 P: var. *arborea*), Thailand, Indochina (Petelot 2132, 6624 A; 9-1917 Chevalier 38148 P: var. *arborea*), Annam (10-1931 Poilane 19779 P; 9-1940 Poilane 30322 P: var. *arborea*) and Indonesia.

4. *Vernonia parishii* Hook. f. Fl. Brit. Ind. **3**: 240 (1881); Kerr, Fl. Siam. Enum. **2**(3): 241 (1936).

'*Vernonia arborea* var. *javanica*': Kitam. in Acta Phytotax. Geobot. **24**: 14 (1969), p.p.

Habitat: Pathsides in dry, mixed or hill evergreen forests, 250–1400 m.

Shrubs, 1.5–3.0 m tall, lower part of stem woody, at most 5 cm in diameter; branches, leaves and inflorescences densely pubescent. Leaves shortly petioled, oblong to oblanceolate, 15–30 cm long, 5–8 cm wide, usually entire or obscurely toothed, sometimes finely serrate (Rock 2736), base attenuate; reticulate, minutely pubescent and densely pilose on nerves above, densely pubescent beneath. Heads ca. 1 cm across, many in a terminal branched panicle; involucre campanulate, ca. 5 mm high, the bracts 5-seriate, imbricate, ovate, acute or acuminate, silk hairy. Flowers in January to March, 6–8 per head, corollas reddish purple. Achenes irregularly 10-ribbed, 2.5 mm long, glandular, sparsely pilose. Pappus whitish or whitish tawny, 2-seriate, the outer ca. 0.5 mm long, persistent, the inner ca. 7.0 mm long.

Specimens examined. **N** Chiang Mai: Doi Chiang Dao (12-1937 Put 4527 BK, L, P), Doi Inthanon (2-1979 T. Koyama *et al.* 15579 BKF, KYO; 10-1979 Shimizu *et al.* T-18953 KYO; 12-1984 Mitsuta *et al.* T-46455 KYO), Doi Suthep (3-1905 Hosseus 458 C, L, MO, P; 3-1959 Sorensen *et al.* 7067 C; 3-1965 Tagawa & Yamada T-13 BKF, KYO; 10-1979 Shimizu *et al.* T-18739, T-18742 KYO; 2-1983 Koyama *et al.* T-33630 KYO, L), Hod (Nimanong & Phusomsaeng 1729 A, BKF), Mae Tamang Reforestation Unit (12-1984 Koyama *et al.* T-39776 KYO), Route 109 from Fang to Chiang Rai (2-1983 Koyama *et al.* T-33472 KYO), Pang Tawn (4-1881 Put 3830 BK). Chiang Rai: Ban Nong Lu (2-1962 Matsuoka KYO), Doi Tung (2-1984 Koyama *et al.* T-33540 KYO). Lampang: Doi Khun Tan (12-1984 Koyama & Phengklai T-39152 KYO), Huay Maesan (1-1983 Koyama *et al.* T-31962 KYO). Mae Hong Son: Muang Sroi fall (1-1983 Koyama *et al.* T-32677 KYO). **SW** Kanchanaburi: Sai Yok (12-1961 Larsen 8570 C), Hat Phalom (12-1961 Phengklai 303 BKF, 29672 KYO).

Distr.: India or. (Stocks 130 L), Yunnan (Henry 11721 NY; 3-1922 Rock 2736 A), Burma (3-1975 Maxwell 75-327 L), Laos (Massie: Thorel P; 1-1932 Poilane 20342 P; 4-1949 Vidal 848B P) and Thailand.

5. *Vernonia volkameriifolia* DC. subsp. *siamica* (Hoss.) H. Koyama stat. nov.

Vernonia volkameriifolia DC. var. *siamica* Hoss. in Bot. Centralbl. Beih. **28**(2): 456 (1911).

'*Vernonia volkameriifolia*': Kerr, Fl. Siam. Enum. **2**(3): 244 (1936); Kitam. in Acta Phytotax. Geobot. **24**: 17 (1969).

Var. *siamica* was described as differing from the type in having larger leaves with curved teeth at the margin and dense inflorescens. Kerr (1936) recognized these two varieties of the species in the flora of Thailand.

Considering the variation of leaf margin and of inflorescences in size, these characters can be evaluated as a simple variation with normal state of distribution having new materials at hand. On the other hand, var. *siamica* is observed to have larger head than the type variety does. The head of var. *siamica* has 7–9 florets, while that of the type variety 4–5 florets. The flower number per head is usually considered to be constant in almost all Compositae species which have small number flower per head. Achenes in our variety is longer, 4.5–5.0 mm long, than those in the type variety, 3.5–4.2 mm long. Leaves in our variety have erect hairs, while those in the type variety adpressed short hairs. Generally, glands of leaf beneath are conspicuous in the type variety. In addition, var. *siamica* is confined to the southern parts in the distribution range of the species. Var. *siamica*, therefore, can be thought to be morphologically and geographically differentiated as a subspecies.

Trees evergreen, 3–6 m tall, 10–15 cm across at DBH; branches and inflorescences pubescent or tomentose. Leaves petiolate, sub-coriaceous, ovate or obovate-oblong or lanceolate, 25–50 cm long, 10–20 cm wide, acute or obtuse, base attenuate, entire or sub serrate, nearly glabrous above, patent pilose, glandular beneath; petioles 0.5–3.0 cm long. Heads ca. 1.5 cm across, many in broad panicles as shown in Fig. 1; involucre broadly campanulate, ca. 8 mm high, the bracts 5-seriate, imbricate, ovate or oblong, puberulous. Flowers January to March, 8–9 per head, corollas pale purplish, styles pale purple, anthers brownish. Achenes irregularly 10-ribbed, 4.5–5.0 mm long, sparsely silk hairy. Pappus 2-seriate, whitish, the outer 0.7 mm long, persistent, the inner 9.0 mm long.

Habitat: In hill evergreen forests, bamboo rich evergreen forests on limestones or old clearings of deciduous forests, 800–2000 m.

Specimens examined. N Chiang Mai: Doi Chang (10-1979 Shimizu *et al.* T-18673 BKF, KYO, T-20140 L, TNS), Doi Chiang Dao (1-1975 Geesink *et al.* 8160 BKF, KYO, L; 3-1979 Koyama *et al.* 15595 AAu, BKF, KYO; 10-1979 Shimizu *et al.* T-20886 BKF, KYO, L, TNS; 2-1983 Koyama *et al.* T-33277, T-33285 KYO, T-33284 KYO, L, TNS), Doi Inthanon (Garrett 617 BKF, L, P; Bunchuai 1397 BKF, L, P), Doi Pui (3-1965 C. C. & C. H. 351 BKF, TNS; 12-1965 Iwatsuki & Fukuoka T-3240 KYO; 9-1971 Murata *et al.* T-15339 KYO; 10-1979 Shimizu *et al.* T-18605 BKF, KYO, L; 2-1982 Koyama *et al.* T-33616 KYO; 11-1984 Koyama *et al.* T-49522 KYO), Doi Suthep (12-1904 Hosseus 227 L, P; 1-1909 Kerr 523 P; 12-1948 Soradet 344 BKF, A, US; 11-1958 & 1, 2-1959 Sorensen *et al.* 6041 C, 6042, 6604, 6905

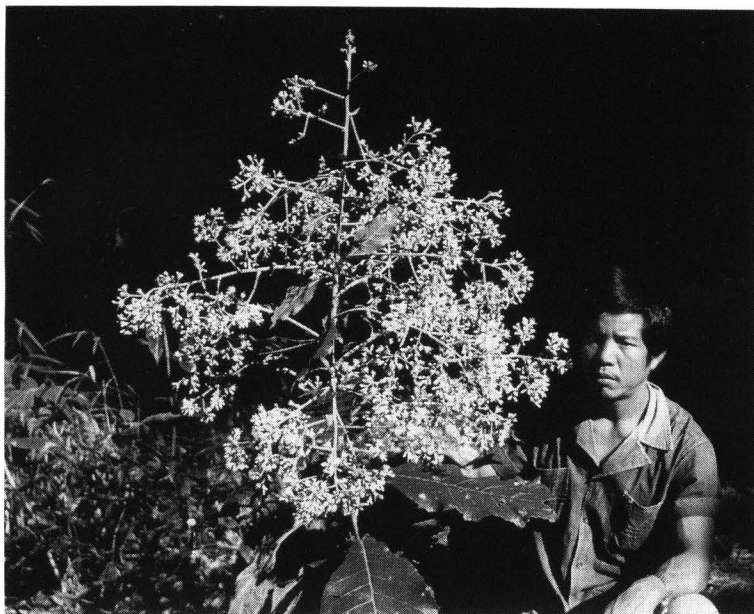


Fig. 1. Inflorescence of *Vernonia volkameriifolia* subsp. *siamica* which is broad panicle, about 1 m long and wide, was collected on 2nd January, 1985, at the higher elevation of Doi Khun Tan, ca. 1000–1250 m alt., Lampang, northern Thailand. Voucher specimen: Koyama & Phengklai T-39196. The tree is up to 5 m tall; flowers are pale purple.

BKF, C; 2-1958 Ogawa & Yoda OCUBE 212-59, 212-66 KYO; 1-1969 Nooteboom c.s.701 BKF, C, L; 3-1965 Tagawa & Yamada T-85 KYO; 1-1994 Fukuoka & Koyama T-62065 TNS), Mae Sa Mai valley (1-1977 Anderson 4182 MO), Pha Hom Pok (2-1958 Sorensen *et al.* 1578 BKF, C; 9-1967 Iwatsuki *et al.* T-9565-bis KYO; 2-1983 Koyama *et al.* T-33452 KYO), Mae Sao Watershed Management Station (2-1983 Koyama *et al.* T-33373 KYO), Mae Taeng (5-1977 Santisuk 1067 A). Lampang: Doi Khun Tan (12-1984 & 1-1985 Koyama & Phengklai T-39091 KYO, L, T-39196 KYO, L, TNS). Mae Hong Son: Kiewlorn (1-1983 Koyama *et al.* T-32615, T-32617 KYO, TNS).

Distr. (of species): Darjeeling (4-1960 Hara *et al.* 5394 KYO), E-Nepal (Hara *et al.* 6306415, 6306416, 6306417 KYO), Bhutan (11-1958 Nakao 498 KYO, TI; 4-1967 Hara *et al.* 1967 KYO), Manipur (2-1946 Bullah 916 TNS: ssp. *siamica*), Burma (12-1959 McKee 5917 P: ssp. *siamica*; 4-1938 Dickason 7278 A, 3-1948 & 3-1949 Kingdon-Ward 17042, 18430 NY), Yunnan (1915 Cavalerie 4352 P; Anty 169 P: ssp. *siamica*; 12-? Henry 11632A TNS), Kweichow (Cavalerie 4352, 4576 P: ssp. *siamica*), Tonkin (1-1931 Poilane 18776 P: ssp. *siamica*) and Thailand (ssp. *siamica*).

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