

Taxonomic Studies in the Compositae of Thailand 16. *Vernonia* sects. *Xipholepis* and *Claotrachelus*

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Abstract The taxonomy of *Vernonia* sects. *Xipholepis* and *Claotrachelus* was examined. Six species of sect. *Xipholepis* and one of sect. *Claotrachelus* are enumerated in this paper. Of them, three species are described as new to science from Thailand and one species is newly recorded from Thailand. The chromosome number is reported of four species in this paper: *Vernonia doichangensis* $2n=54$, *V. ngaoensis* $2n=36$, *V. silhetensis* var. *subserrata* $2n=54$ and *V. squarrosa* var. *orientalis* $2n=18$.

Key words: Compositae, taxonomy, Thailand, *Vernonia* sects. *Xipholepis* and *Claotrachelus*

Introduction

As mentioned in my previous paper (Koyama, 2003), four sections of *Vernonia* have been taxonomically studied and 19 species have been enumerated. Another two sections, sects. *Xipholepis* and *Claotrachelus*, are taxonomically reviewed in this paper. Sect. *Xipholepis* is characterized by having achenes with 10 ribs, outer pappus filiform and caducous, and the apex of the phyllaries strongly pointed. Sect. *Claotrachelus* is also characterized by having achenes with 4 or 5 angles, a pappus of flattend setae and involucre with linear-lanceolate phyllaries.

Observation and Result

Sect. *Xipholepis* of Thailand is subdivided into three groups, the *squarrosa* group, *bracteata* group and *roxburghii* group. The *Squarrosa* group is represented by *V. squarrosa*, in which the phyllaries are more than 100 per head. The *Bracteata* group is represented by *V. silhetensis* and *V. ngaoensis*. *Vernonia ngaoensis* is a local species confined to the area close to Ngao waterfall. The *Roxburghii* group comprises three species, *V. roxburghii*, *V. doichangensis* and *V.*

namnaoensis. The last species is confined to Nam Nao National Park.

Key to sections

- I. Achenes 10-ribbed; pappus filiform capillaries. Sect. *Xipholepis* [1–6]
- I. Achenes 4 angled; pappus of flattend setae. Sect. *Claotrachelus* [7]

Sect. *Xipholepis* (Steetz) Benth. in Benth. et Hook., Gen. Pl. 2: 229 (1873–76).

Key to species

1. Heads sessile, solitary, terminal, and axillary. 6. *V. squarrosa*
1. Heads pedunculate, 1–6 cm long. 2
2. Inflorescences loosely corymbose. 3
2. Inflorescences compound racemose. 4
3. Receptacle more or less smooth, alveolus very shallow, glabrous; achenes glabrous. 5. *V. silhetensis* var. *subserrata*
3. Receptacle alveolate, fine hairy along ridge of alveolus; achenes pilose, sparsely glandular-punctate. 2. *V. ngaoensis*
4. Receptacle alveolate, glabrous; achenes glabrous. 1. *V. doichangensis*

4. Receptacle hairy or fimbriate; achenes pilose and glandular punctate. 5
 5. Receptacle crispy hairy; heads ca. 12 mm across. 3. *V. namnaoensis*
 5. Receptacle fimbriate; heads 20–25 mm across. 4. *V. roxburghii*

1. *Vernonia doichangensis* H. Koyama, sp. nov.

Haec species *Vernonia roxburghii* affinis est, sed ad *V. roxburghii* achenium et receptaculum glabrum.

Suffrutescent, perennial herbs from woody rhizomes. *Stem* erect, 0.5–2 m tall, rigid, finely striate, shortly pubescent throughout, branched above; branches ending in inflorescences. *Petiole* at most ca. 5 mm long. *Leaves* elliptic to oblanceolate, 7–15 cm long, 2–5.5 cm wide, apex acute or acuminate, base cuneate, margin subentire or remotely serrulate, upper surface somewhat scaberulous, glandular punctate, lower surface shortly pubescent, glandular punctate. *Inflorescences* compound racemose, few to many heads; peduncles to 1.5 cm long. *Heads* discoid, ca. 2 cm across; receptacle alveolate, glabrous; *involucre* narrowly campanulate, ca. 12 mm tall; *phyllaries* in 6 series, imbricate, margins woolly hairy, apex rigidly mucronate, outer phyllaries ovate, apex acuminate, spreading, often shortly recurved above, inner phyllaries lanceolate, erect and appressed, apex acute, woolly hairy, glandular punctate on dorsal surface of upper half. *Flowers* September to January, ca. 34 per head; *corolla* reddish or purplish violet, lilic or purple, ca. 10 mm long; tube ca. 5 mm long, glandular punctate, with colleters. *Achenes* oblong, pale brown, ca. 5 mm long, 10-ribbed, glabrous; *pappus* straw colored, in 2 series, inner series ca. 8 mm long; outer pappus filiform, caducous, few, 1.5–3 mm long. Chromosome number $2n=54$.

Habitat: wet or boggy slopes in open pine-oak forests and pine-dipterocarp forests, 1000–1500 m alt.

Type collection. Thailand [N] Prov. Chiang Mai: Southwestern part of Doi Chang, Mae Taeng Distr. (Oct. 24, 1979, T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & T. Santisku T-

20693 KYO-holotype).

Other specimens examined. Thailand [N] Prov. Chiang Mai: Southwestern part of Doi Chang, Mae Taeng Distr. (10-1979, T. Shimizu *et al.* T-20678 KYO), North of Ban Om Koi, Bo Luang Tableland, Om Koi Distr. (10-1979, T. Shimizu *et al.* T-19059 KYO, TNS), North of Maetuen Watershed Improvement Station, Bo Luang Tableland, Om Koi Distr. (10-1979, T. Shimizu *et al.* T-19330, T-19384, T-26705 KYO, TNS), lower elevation of Doi Inthanon, Mae Cham Distr. (1-1983, H. Koyama *et al.* T-32151 KYO), Mae Sa Nam, Hod Distr. (1-1983, H. Koyama *et al.* T-32394, T-32399 KYO), Doi Maeya, Maetaeng Distr. (1-1983, H. Koyama *et al.* T-32804, T-32815 KYO, TNS, T-32818 KYO). Prov. Mae Hongson: East of Ban Mah Pin, Pai Distr. (10-1979, T. Shimizu *et al.* T-20136 KYO, T-20137 KYO, TNS).

Distribution: China (Yunnan: Tien-sin, ?-1921, R. P. Maire *s.n.* P) and Thailand.

Notes: This species is similar to *Vernonia roxburghii*, but is different from it in having glabrous achenes and receptacles.

2. *Vernonia namnaoensis* H. Koyama, sp. nov.

Haec species *Vernonia doichangensis* affinis est, sed ab *V. doichangensis* achenium et receptaculum pilosum facile distinguitur.

Suffrutescent, perennial herbs from woody rhizomes. *Stem* erect, ca. 130 cm tall, branched above; branches ending in inflorescences. *Petiole* 2–5 mm long. *Leaves* obovate, 15–17 cm long, 4–6 cm wide, apex acute, base attenuate, margin dentate, upper surface somewhat scaberulous, lower surface pubescent, glandular punctate. *Inflorescences* compound racemose; peduncles to 2 cm long. *Heads* discoid, campanulate, ca. 12 mm across; receptacle crispy hairy; *involucre* subglobose, ca. 8 mm tall; *phyllaries* in 5 series, imbricate, outer phyllaries linear-lanceolate, apex acuminate, rigidly mucronate, glandular punctate and hairy on back and at margin. *Flowers* December, ca. 23 per head; *corolla* purplish, ca. 8 mm long; tube ca. 4 mm long, glandular punctate. *Achenes* oblong, ca. 4 mm long, 10-ribbed,



Fig. 1. Holotype specimen of *Vernonia doichangensis* H. Koyama, sp. nov.
Thailand [N] Prov. Chiang Mai: Southwestern part of Doi Chang, Mae Taeng Distr. (Oct. 24, 1979, T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & T. Santisuk T-20693).



Fig. 2. Holotype specimen of *Vernonia nannaensis* H. Koyama, sp. nov.
Thailand [NE] Prov. Phetchabun: Nam Nao National Park, Nam Nao Distr. (Dec. 27, 1982, H. Koyama,
H. Terao & T. Wongprasert T-311840).

ribs light yellow, space between ribs brown, sparsely pilose, glandular punctate; *pappus* caducous with group, in 2 series, inner series ca. 7 mm long; outer *pappus* filiform, caducous, few, ca. 1.5 mm long.

Habitat: open grasslands at edge of Bamboo thickets, 900 m alt.

Type collection. Thailand: [NE] Prov. Phetchabun: Nam Nao National Park, Nam Nao Distr. (Dec. 27, 1982, H. Koyama, H. Terao and T. Wongprasert T-311840 KYO-holotype).

Notes: This species is similar to *Vernonia doichangensis*, but is different from it in having smaller heads, hairy achenes and receptacles.

3. *Vernonia ngaoensis* H. Koyama, sp. nov.

Haec species *Vernonia silhetensis* affinis est, sed ab *V. silhetensis* achenium et receptaculum pilosum facile distinguitur.

Perennial herbs from woody rhizomes. *Stem* erect, 0.5–1.2 m tall, finely striate, shortly pubescent throughout, branched above; branches ending in inflorescences. *Petiole* nearly absent, to 10 mm long. *Leaves* rather coriaceous, elliptic to oblanceolate, 6–19 cm long, 1.5–5 cm wide, apex acute to acuminate, base narrowed into petiole, margin serrulate, upper surface dark green, somewhat scaberulous, glabrate except for fine hairs on midribs and at margins, lower surface light green, finely glandular punctate, pubescent along veins; leaves of inflorescences abruptly smaller, linear lanceolate. *Inflorescences* loosely corymbose, few to several heads; peduncles stout, 1–6 cm long. *Heads* discoid, 2.5–3.5 cm across; receptacle alveolate, fine hairy along ridge of alveolus; *involucre* subglobose, 10–15 mm tall; *phyllaries* in 8 series, green with maroonish tips, imbricate, linear-lanceolate, appressed, apex acuminate, rigidly mucronate, slightly pubescent with few glands, apex of outer *phyllaries* shortly reflexed. *Flowers* October to February, ca. 80 per head; *corolla* whitish violet, violet or purple, ca. 13 mm long; tube ca. 7 mm long, glandular punctate. *Achenes* oblong, ca. 4.5 mm long, 10-ribbed, pubescent, sparsely glandular punctate; *pappus* whitish, in 2 series,

inner series ca. 11 mm long, ca. 28 capillaries per achene; outer *pappus* filiform, caducous, few, ca. 1 mm long. Chromosome number $2n=36$.

Habitat: open grassy slopes along stream close to waterfall, 50–160 m alt.

Type collection. Thailand [PEN] Prov. Ranong: Ngao Waterfall, 20 km S of Ranong, Muang Distr. (Dec. 8, 1979, T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & C. Niyomdham T-26543 KYO-holotype).

Other specimens examined. Thailand. [PEN] Prov. Ranong: Ngao Waterfall, Muang Distr. (12-1974, S. Indrapong 84 BKF, C, L; 2-1983, H. Koyama *et al.* T-33720 KYO; 1-1987, Maxwell 87-88 A).

Distribution: Endemic to Thailand.

Notes: This species is similar to *Vernonia silhetensis*, but is different from it in having hairy achenes and receptacles.

4. *Vernonia roxburghii* Less. in Linnaea, 6: 674 (1831); Dunn in Journ. Linn. Soc. 39: 503 (1911); Gagnep. in Lecomte, Fl. Gen. de l'Indo-Chine, 3: 482 (1924). Type from India.

Vernonia aspera Ham. in DC., Prodr. 5: 31 (1836). — *Eupatorium asperum* Roxb., Flor. Ind. ed. 2, 3: 415 (1832). [Wall. Cat. 2922]

Vernonia thorelii Gagnep. in Bull. Museum, Paris: 492 (1919). Type from Laos (Bassac: Thorel 2686 P).

Suffrutescent, perennial herbs from woody rhizomes. *Stem* erect, to 1.5 m tall, rigid, shortly pubescent, branched above; branches ending in inflorescences. *Petiole* nearly absent, to 5 mm long. *Leaves* obovate to oblanceolate, 6–20 cm long, 1.5–6 cm wide, apex acute or acuminate, base cuneate, margin subentire or remotely serrulate, upper surface scaberulous, lower surface shortly pubescent, especially on midrib and glandular punctate. *Inflorescences* compound racemose; peduncles stout, to 2.5 cm long. *Heads* discoid, 2–2.5 cm across; receptacle fimbriate; *involucre* campanulate, 8–12 cm tall; *phyllaries* in 5 series, imbricate, pubescent on dorsal surface and at margin, outer *phyllaries* oblong, spreading, often shortly recurved above, apex acuminate,



Fig. 3. Holotype specimen of *Vernonia ngaensis* H. Koyama, sp. nov.

Thailand [P] Prov. Ranong: Ngao Waterfall, 20 km S of Ranong, Muang Distr. (Dec. 8, 1979, T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & C. Niyomdham T-26543).



Fig. 4. *Vernonia roxburghii* Less.
Thailand [N] Prov. Chiang Mai: Doi Chiang Dao Wildlife Sanctuary (2-1983, H. Koyama *et al.* T-33161).

rigidly mucronate, inner phyllaries oblanceolate, erect and appressed, pubescent and glandular punctate on upper half of dorsal surface, apex acute. *Flowers* September to November, ca. 30 per head; *corolla* reddish or purplish violet, lilic or purple, 9 mm long; tube 4 mm long, glandular punctate, with colleters. *Achenes* oblong, pale brown, ca. 5 mm long, 10-ribbed, sparsely pilose and glandular punctate; *pappus* whitish, in 2 series, inner series ca. 8 mm long; outer pappus filiform, caducous, few, ca. 1 mm long.

Habitat: bamboo thickets, and pine and dipterocarp forests, 600–1100 m alt.

Specimens examined. Thailand [N] Prov. Chiang Mai: Doi Chiang Dao (2-1983, H. Koyama *et al.* T-33165 KYO; 12-1984, H. Koyama & C. Phengkhai T-39833 KYO), Fang to Chiang Rai along route 109 (2-1983, H. Koyama *et al.* T-33474 KYO). [NE] Prov. Phetchabun: Nam Nao National Park (12-1982, H. Koyama *et al.* T-31840 KYO). [E] Prov. Ubon Ratchathani: Nachaluay Distr. (12-1982, H. Koyama *et al.* T-30763 KYO).

Distribution: Nepal (11-1982, H. Tabata *et al.* 14491 KYO), E-Bengal (Griffith 3096 L, S), Manipur (10-1945, Bullock 132 L), Burma (11-1908, J. H. Lace 4397 KYO; 1-1921, J. F. Rock 822 US; 10-1945, Belcher 822 S, US; 10-1948, F. Kingdon-Ward 18238 NY; 11-1948, F. Kingdon-Ward 18275 A, NY; 10-1949, F. Kingdon-Ward 18957 NY), Yunnan (Mengtze: A. Henry 9131 MO; 12-1932, H. T. Tsai 51391 A; 9-1934, H. T. Tsai 61986 A; 4-1936, C. W. Wang 73019 A; G. Forrest 9547 A), Kwangsi (10-1933, A. N. Steward & Cheo 1127 S), Hainan (12-1932, C. I. Lei 314 KYO, L; 12-1933, S. K. Lau 2847 S; 3-1936, S. K. Lau 25891 KYO; 11-1933, C. W. Wang 35026 S), Kweichow (10-1930, Y. Tsiang 4389, 7344 NY), Tonkin (1-1886, B. Balansa 862 P; 5-1908, Alleizette *s.n.* L; 11-1913, Chevalier 29111 P; 12-1935, M. Poilane 25079 P; 2-1936, M. Poilane 25179 P), Laos (Bassac: Thorel 2686 P-type of *V. thorelii*), Thailand and Annan (2-1916, Chevalier 30595 P; 11-1923, M. Poilane 8671, 8723 P; 11-1946, M. Poilane 35558 P; ?-18??, L. Pierre *s.n.* NY).

5. *Vernonia silhetensis* (DC.) Craib ex Kerr, Fl. Siam. Enum. 2 (3): 243 (1936); Hand.-Mzt., Symb. Sin. Pt. 7: 1084 (1936); Kitam. in Acta Phytotax. Geobot. 24: 16 (1969). — *Decaneurum silhetensis* DC., Prodr. 5: 67 (1836). Type from Prov. Silhet ad montes Pundua.

var. *subserrata* (Hoss.) Craib ex Kerr, Fl. Siam. Enum. 2 (3): 243 (1936). — *Vernonia bracteata* var. *subserrata* Hoss. in Bot. Centralb. Beih. 28 (2): 455 (1911). Type from Doi Suthep (Hosseus 424a), Thailand.

Vernonia bracteata Wall. ex C. B. Clarke, Comp. Ind., 17 (1876). Type from Khasi.

Vernonia spirei Gandoger in Bull. Soc. Bot. France: 194 (1907). Type from Laos (?-1902, Spire 490 P).

Vernonia silhetensis sensu Kerr, Fl. Siam. Enum. 2 (3): 243 (1936), p. p.

Perennial herbs from woody rhizomes. *Stem* erect, to 1 m tall, shortly pubescent, finely striate, branched above; branches ending in inflorescences. *Petiole* nearly absent, to 5 mm long. *Leaves* rather coriaceous, elliptic to narrowly lanceolate, 5–16 cm long, 1–4 cm wide, apex acute or acuminate, base narrowed to petiole, margin remotely serrulate, upper surface scaberulous, sparsely glandular punctate, lower surface densely glandular punctate, pubescent along veins. *Inflorescences* terminal, loosely corymbose, few to several heads; peduncles stout, to 5 cm long. *Heads* discoid, 2–3 cm across; receptacle more or less smooth, alveolus very shallow, glabrous; *involucre* subglobose, 12–15 mm tall; *phyllaries* in 6 series, imbricate, ovate to oblong, apex acuminate, rigidly mucronate, densely glandular punctate on dorsal surface, outer phyllaries of 3 series pubescent, largely reflexed, inner phyllaries rather glabrous except glandular punctate, usually not reflexed. *Flowers* September to November, ca. 100 per head; *corolla* whitish violet or purple, ca. 11 mm long; tube ca. 6 mm long, glandular punctate, with colleters. *Achenes* oblong, ca. 4 mm long, 10-ribbed, glabrous; *pappus* whitish, in 2 series, inner series ca. 10 mm long; outer pappus filiform, caducous, few, 1–2 mm long. Chromosome



Fig. 5. *Vernonia silhetensis* (DC.) Craib ex Kerr var. *subserrata* (Hoss.) Craib ex Kerr.
Thailand [NE] Prov. Loei: Phu Kradung National Park (11-1979, T. Shimizu *et al.* T-22959).

number $2n=54$.

Habitat: open grasslands, rocky hills, in mixed forests with pine, oak and dipterocarps or clearings in hill evergreen forests on hills, 500–1500 m alt.

Specimens examined. Thailand [N] Prov. Chiang Mai: Doi Chiang Dao (Put 311, 4458 BK; 12-1955, Suvarnakoset 973 BKF, TNS, US; 7-1955, Bunchuay 297 BKF, TNS; 11-1984, H. Koyama *et al.* T-39710, T-39736 KYO, L; 12-1983, N. Fukuoka & M. Ito T-35159-bis KYO, T-35168, T-35208 KYO), Doi Inthanon (12-1965, M. Tagawa *et al.* T-2303 KYO; 10-1971, G. Murata *et al.* T-15497 BKF, KYO, T-15498 BKF, KYO, P; 8-1988, H. Koyama T-61104 KYO), Doi Suthep (10-1979, T. Shimizu *et al.* T-18726 BKF, KYO, T-18744 KYO; 10-1920, J. F. Rock 104, 127 US; 10-1982, F. Konta *et al.* T-29740 KYO, T-29741 A, KYO), Ban Ta Fang (10-1971, Vidal 5337 AAU, BKF, L, P), Mae Tamang Reforestation (11-1984, H. Koyama *et al.* T-39671 KYO, T-39760 KYO, L; 12-1984, H. Koyama T-39781 KYO, L, TNS, T-39884 KYO, L), Mae Sa Nam (1-1983, H. Koyama *et al.* T-32383 KYO). Prov. Lamphun: Ban Khun Tan to Doi Khun Tan (9-1967, M. Tagawa *et al.* T-9099 BKF, KYO, T-9141 KYO; 1-1985, H. Koyama & C. Phengklai T-39197 KYO, L, T-39153, T-39201, T-39582 KYO). Prov. Mae Hong Son: Pai (10-1979, T. Shimizu *et al.* T-20099, T-20112 KYO, T-20113 BKF, KYO, L). [NE] Prov. Khon Kaen: Nam Nao National Park (10/11-1979, T. Shimizu *et al.* T-18270 KYO, T-22531 BKF, KYO, L). Prov. Loei: Phu Kradung (8-1948, Bunpheng 195 BKF, TNS; 11-1958, Sorensen *et al.* 6227 C; 10-1967, Prayad 1076 US; 11-1970, Charoenpol *et al.* 4855 AAU, C; 11-1965, M. Tagawa *et al.* T-486 KYO, L, T-902 KYO; 11-1979, T. Shimizu *et al.* T-22724, T-22803, T-22965, T-22998, T-23132 BKF, KYO, T-22618, T-22730, T-22814, T-22959, T-23018 BKF, KYO, L; 12-1982, H. Koyama *et al.* T-31260, T-31290, T-31296, T-31330, T-31340 KYO; 8-1988, H. Takahashi & M. Tamura T-60557 KYO; 9-1988, H. Koyama T-61566 KYO; 9-1988, H. Takahashi T-63406, T-63528 KYO), Wang Saphung (7-1948, Dee 150 BKF, US), Phu

Ruea (T. Smitinand 10149 BKF). Prov. Phetchabun: Nam Nao National Park (12-1982, H. Koyama *et al.* T-31753, T-31841 KYO).

Distribution: Assam (W. Griffith *s.n.* AAU, 3104 L, S; Hooker & Thomson *s.n.* A, L, NY, S, US; Schlagintweit 279 S; 11-1907, Meebold 5878 S), Yunnan (A. Henry 12498 A, TNS; 9-1938, T. T. Yue 17765 A; 7-1936, C. W. Wang 77316 A; 9-1947, K. M. Feng 11995 A-var. *subserrata*), Hupeh (A. Henry 7187 A; 9-1934, H. C. Chow 1545 NY-var. *subserrata*), Burma (9-1934, Malaise 490 S-var. *subserrata*), Laos (5-1919, A. Chevalier *s.n.* P-var. *subserrata*), Thailand (var. *subserrata*) and Cambodia (10-1928, M. Poilane 16206 P; Alleizette *s.n.* L-var. *subserrata*).

Notes: Var. *silhetensis* is characterized by serrulate margin of the leaves and by the shorter inflorescence. Some specimens cited by Kerr (1936) as var. *silhetensis* can be identified as *Vernonia calcarea* by features of the involucre, as already reported in my previous paper (Koyama, 2003). Var. *silhetensis* is confined to Assam Himalaya.

6. *Vernonia squarrosa* (D. Don) Less. in *Linnaea*, **6**: 627 (1831). — *Acilepis squarrosa* D. Don, *Prodr. Fl. Nepal.*: 169 (1825). Type from Nepal.

Vernonia rigiophylla DC., *Prodr.* **5**: 15 (1836). Type from Nepaulia ad Bechiaio et Hethaura.

Vernonia teres Wall. ex DC., *Prodr.* **5**: 15 (1836): Dunn in *Journ. Linn. Soc.* **39**: 503 (1911). Type from India orient.

var. *orientalis* Kitam. in *Acta Phytotax. Geobot.* **24**: 16 (1969). Type from Thailand (Prov. Lampang: Ban Khun Tan to Doi Khun Tan, 9-1967, M. Tagawa *et al.* T-9103 KYO-holotype).

Vernonia roxburghi sensu Kerr, *Fl. Siam. Enum.* **2** (3): 242 (1936).

Vernonia squarrosa sensu Kerr, *Fl. Siam. Enum.* **2** (3): 244 (1936).

Suffrutescent, perennial herbs from woody rhizomes. *Stem* erect, 0.6–1 m tall, rigid, shortly pubescent, branched above; branches ending in in-



Fig. 6. *Vernonia Squarrosa* (D. Don) Less. var. *orientalis* Kitam.
Thailand [SW] Prov. Kanchanaburi: Rinthin forest (11-1979, T. Shimizu *et al.* T-21892).

florescences. *Petiole* nearly absent, very rough. *Leaves* obovate to oblanceolate, 4.5–9 cm long, 1–5.5 cm wide, apex acute or acuminate, base cuneate, margin subentire or remotely serruate, upper surface scaberulous, lower surface shortly pubescent, especially on midrib. *Inflorescences* solitary, terminal and axillary; peduncles stout, nearly absent. *Heads* discoid, 2–2.5 cm across; receptacle alveolate, glabrous; *involucre* campanulate, ca. 1.5 cm tall; *phyllaries* in 10 series, imbricate, appressed, woolly hairy on back and at margin, subulate to narrow oblong, apex acuminate, rigidly mucronate, glandular punctate on dorsal surface. *Flowers* September to November, ca. 100 per head; *corolla* reddish or purplish violet, lilic or purple, ca. 10 mm long; tube ca. 6 mm long, glandular punctate, with colleter. *Achenes* oblong, pale brown, ca. 3 mm long, 10-ribbed, pilose and glandular punctate; *pappus* whitish, in 2 series, inner series 8–9 mm long; outer pappus filiform, caducous, few, 1–1.5 mm long. Chromosome number $2n=18$.

Habitat: grassy or boggy slopes in open mixed deciduous forests with pine and oak, dry dipterocarp forests or in savannas, near rocks in loamy soil near streams, 50–1300 m alt.

Specimens examined. Thailand [N] Prov. Chiang Mai: Doi Chiang Dao Wildlife Sanctuary (2-1983, H. Koyama *et al.* T-33161 KYO), Doi Inthanon (11-1965, Prayad 9, 44 BK, US; 12-1965, M. Tagawa *et al.* T-2217, T-2218 KYO; 10-1971, G. Murata *et al.* T-15425 BKF, KYO, P; 12-1969, Beusekom & Phengkklai 2301 AAU), Doi Suthep (10-1909, Kerr 828 P; 9-1948, native 192 BKF, US; 10-1958, Sorensen *et al.* 5392 C), Ping Khong (10-1961, Yoda OCKUBE 896 KYO), 50 km N of Chiang Mai (2-1958, Sorensen *et al.* 1349 C), Mae Sariang to Chom Thong (9-1967, K. Iwatsuki & N. Fukuoka T-10397 KYO), Bo Luang Tableland (10-1979, T. Shimizu *et al.* T-19110 KYO, T-19057 BKF, KYO, L, T-19331, T-20141 BKF, KYO), Om Koi along route 1099 (1-1983, H. Koyama *et al.* T-32251 KYO), 12 km of Amphoe Hot (9-1958, Sorensen *et al.* 5191 C), Pine Improvement Center (1-1983, H. Koyama *et al.* T-32388 KYO),

Huay Maelid Bridge (1-1983, H. Koyama *et al.* T-32454 KYO), Hod to Mae Sa Nam along route 108 (1-1983, H. Koyama *et al.* T-32187 KYO), Mae Tho (1-1983, H. Koyama *et al.* T-32328 KYO). Prov. Lamphun: Me Li (Winit 1515 BKF). Prov. Lampang: Ban Khun Tan to Doi Khun Tan (9-1967, M. Tagawa *et al.* T-9103 KYO-type of var. *orientalis*; 12-1984, H. Koyama & C. Phengkklai T-39155 KYO, L, T-39904 KYO; 1-1985, H. Koyama & C. Phengkklai T-39001 KYO). Prov. Mae Hong Son: Ban Nam Kat (10-1979, T. Shimizu *et al.* T-20080 BKF, KYO, L), Sukhothai (2-1958, H. Ogawa *et al.* 202-159 KYO), Pai Wildlife Sanctuary (1-1983, H. Koyama *et al.* T-32609 KYO). Prov. Nakhon Sawan: Wang Chao, Raheng (10-1904, Hosseus 50 L, MO, P). Prov. Phrae: Den Chai (9-1929, Vesterdal 396 C, SING), Mae Ban to Den Chai (9-1929, Franck *s.n.* C, L), Me Ban to Phrae (10-1929, Franck *s.n.* C, L). [NE] Prov. Khon Kaen: Phu Khieo Game Reserve (11-1984, G. Murata *et al.* T-50086 KYO). Prov. Loei: Sitthan (T. Smitinand 231 BKF). Prov. Mukdahan: Dongman village (12-1982, H. Koyama *et al.* T-30901, T-30934, T-31777 KYO). Prov. Phetchabun: Nam Nao National Park (10-1979, T. Shimizu *et al.* T-18263, T-18271 KYO, T-18272 KYO, L; 11-1979, T. Shimizu *et al.* T-22532 BKF, KYO, T-22533 BKF, KYO, L; 12-1982, H. Koyama *et al.* T-31676, T-31737, T-31837 KYO; 10-1984, G. Murata *et al.* T-51568 KYO), Khao Phadaeng (8-1982, T. Shimizu *et al.* T-28614, T-28635 KYO). Prov. Sakon Nakhon: Phu Phan National Park (Ploenchit 1938 BKF; 11-1984, G. Murata *et al.* T-49821 KYO; 11-1984, G. Murata & C. Phengkklai T-50355, T-50372, T-50415, T-50438 KYO). [E] Prov. Chaiyaphum: Kang Khro (10-1965, Sakol 662 BK, US). Prov. Nakhon Ratchasima: Korat (12-1928, Put 2175 A, BK; 10-1931, Put 4239 BK). Prov. Surin: Surin (C. Phengkklai *et al.* 3595 BKF). [C] Prov. Lop Buri: Lam Norai (T. Smitinand 12035 BKF). [SE] Prov. Chon Buri: Khao Khieo (6-1975, Maxwell 75-626 L). [SW] Prov. Kanchanaburi: Srisawat (11-1971, Beusekom *et al.* 3804 BKF, C, KYO, L, MO), Linthin forest (11-1979, T. Shimizu *et*



Fig. 7. *Vernonia pulicarioides* Gagnep.
Indochine: Dalat (1-1924, F. Evrard 1057).

al. T-21892 BKF, KYO, L, T-21948 KYO), 50 km NW of Sai Yok along route 323 (1-1983, H. Koyama *et al.* T-32909 KYO). Prov. Ratchaburi: Kanburi, Kao Tawng (10-1938, A. F. G. Kerr 19775 L). Prov. Uthai Thani: Uthai Thani (C. Phengklai 3993 BKF).

Distribution (of species): Kumaon (Strachey & Winterbottom 10 A, P-var. *squarrosa*), Nepal (9-1967, Banerjee *et al.* 2879 US; 10-1967 Banerjee *et al.* 3039 US-var. *squarrosa*), India orient (W. Griffith *s.n.* AAU-var. *squarrosa*), Sikkim (Hooker *s.n.* A-var. *squarrosa*), Bengal (Biwas 2130 A-var. *squarrosa*), Burma (1-1948, Khaut 1 A; 1-1964, H. Kanai 6401002 TNS-var. *squarrosa*), Yunnan (11-1890, M. Leduc *s.n.* P; A. Henry 9504 MO, US, A. Henry *s.n.* NY-var. *squarrosa*), Laos (Massie *s.n.* A, P; 9/11-1917, Chevalier 37105 P-var. *orientalis*), Thailand (var. *orientalis*), Cambodia (T. Kira *et al.* 37, 38 KYO-var. *orientalis*) and Annan (10-1924, M. Evrard 1474, 1576 P; 12-1924, M. Evrard 2189 P; 1-1925, M. Poilane 11639 P; 10-1932, M. Poilane 21167 P; 9-1940, M. Poilane 30432 P; 11-1967, J. Dournes *s.n.* P-var. *orientalis*).

Sect. *Claotrachelus* Zoll. et Mor. in Nat. en Gen. Arch. Neerl. Ind. 2: 565 (1845).

7. *Vernonia pulicarioides* Gagnep. in Lecomte, Fl. Gen. de l'Indo-Chine, 3: 482 (1924). — *Pulicaria annamica* Gagnep. in Bull. Soc. Bot. France, 68: 121 (1921). Type from Annam.

Perennial herbs from woody rhizomes. *Stem* stout, erect, to 30 cm tall, soft pubescent, branched above; branches ending in inflorescences. *Leaves* sessile, oblong to oblanceolate, 4–7 cm long, 5–20 mm wide, apex acute, base subcordate, margin subentire or remotely serrulate, upper surface sparsely soft pubescent, lower surface soft pubescent and glandular punctate. *Inflorescences* solitary or few, terminal; peduncles stout, 0.5–2 cm long. *Heads* discoid, 2–3 cm across; receptacle alveolate, glabrous; *involucre* subglobose, ca. 1.5 cm tall; *phyllaries* in 5 series, imbricate, linear-lanceolate, apex acuminate, rigidly mucronate, silky straight hairy on dorsal

surface, spreading, often recurved above. *Flowers* January to March, ca. 70 per head; *corolla* reddish or purplish violet, lilic or purple, ca. 9 mm long, white pilose on lobes; tube ca. 4 mm long. *Achenes* oblong, 4-angular, brown, ca. 3 mm long, short pubescent; *pappus* not of capillaries, but of flattened setae, whitish, in 2 series, inner series ca. 8 mm long; outer pappus flattened setae, few, 2–5 mm long.

Habitat: in dipterocarp forests, 1050–1150 m alt.

Specimens examined. Thailand [N] Prov. Chiang Mai: Omkoi, along route 1099 (1-1983, H. Koyama *et al.* T-32270 KYO).

Distribution: Burma (Southern Shan States: 9-1934, Malaise 489 S), Laos (2-1932, M. Poilane 20073 P) and Annan (2-1914, A. Chevalier 30672, 30847 P; 1-1924, F. Evrard 1057 P).

Notes: This is the first record from Thailand for this species.

Acknowledgements

Specimens examined are kept in the Harvard University Herbaria (A), Smithsonian Institution (US), U.S.A., Aarhus University (AAU), Denmark, Kyoto University (KYO), National Science Museum, Tokyo (TNS), Japan, in the Museum of Natural History at Copenhagen (C), Denmark, at Leiden (L), Netherlands, at Bangkok (BK, BKF), Thailand, at Paris (P), France, at Stockholm (S), Sweden, in the Botanical Gardens of Missouri (MO), and of New York (NY), U.S.A. and of Singapore (SING).

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- The other references in the text are cited in the list of synonymy.