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Originals

Morphological, Phenological and Taxonomical Studies on *Euphorbia lasiocaula* and *E. sinanensis* (Euphorbiaceae)

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Morphology, phenology, habitat, distribution and taxonomy of *Euphorbia lasiocaula* Boiss. (*E. pekinensis* sensu Maxim., non Rupr.) were studied in fields and herbaria. Two groups were recognized in the species. One flowers in spring (rarely in summer on lateral shoots), and the other flowers in summer to fall. We call the former E type (early flowering type) and the latter L type (late flowering type). The L type has the tall and hairy main stems and black seeds, and it occurs on forest margin or in grassland. The E type has the short and glabrous or hairy main stems and brown seeds, and occurs in deciduous forests or on forest margin, and also found on open grounds in limestone area. The L type is distributed in China, Korea and Japan (except Hokkaido), while the E type is restricted to central and northern Honshu in Japan. The L type is referable to *E. lasiocaula* and the E type to *E. pekinensis* f. *sinanensis* Hurusawa. We regard the two types as separate species and propose a new combination for the latter, *E. sinanensis* (Hurusawa) T. Kurosawa et H. Ohashi.

Euphorbia lasiocaula Boiss. is generally treated as a synonym of *E. pekinensis* Rupr. in the recent references on floras of Japan (Ohwi 1965a, 1965b, Hurusawa 1982, Kitagawa 1983), but as described by Hurusawa (1954), it differs from the latter in the shape of verrucae on capsule and in the pattern of branchings. In this paper, we use *E. lasiocaula* for the name of plants we studied.

Euphorbia lasiocaula is a perennial herb with one or several caespitose shoots from a thick rhizome. It generally grows in grassy places in low and medium altitude of Honshu, Shikoku and Kyushu in Japan. The species can be classified into the section Tithymalus of subgenus Esula in Webster's system (1967) in having the round, entire cyathial glands without petaloid appendages. It is similar to *E. pekinensis* Rupr., *E. adenochlora* Morr. et Decne., *E. togakusensis* Hayata, *E. watanabei* Makino and *E. jolkinii* Boiss., but is separated from them by its smaller capsules with obtuse verrucae. *Euphorbia lasiocaula* is very polymorphic as pointed out first by Franchet and Savatier (1875). Hara (1935, 1954) and Hurusawa (1940, 1954) recognized polymorphic natures of this species under various names (see taxonomic treatments in this paper) by dividing it into many infraspecific taxa.

During floristic studies in Miyagi Prefecture of northern Japan, we noted two forms of *E. lasiocaula*. We have examined a number of living plants of the species in fields at several localities near Sendai and herbarium specimens of the species in various herbaria. Through these studies, we could recognize the two forms as two different types in *E. lasiocaula*. In this paper, we will describe morphological, ecologi-

cal and geographical differences between these two types of *E. lasiocaula* and discuss taxonomic relations between them.

Materials and Methods

Field studies have been done at several places near Sendai in Miyagi Prefecture. We have examined 652 aerial shoots bearing reproductive organs from 12 populations of *Euphorbia lasiocaula* in 1989 for studies on variations of hairiness and stem length. Observations for flowering periods have been done on 110 reproductive aerial shoots at intervals of every 9 to 12 days from March to November in 1990 in five populations where we made comparative morphological studies. Due to difficulty of recognition of each individual plant in fields as well as in herbaria, aerial shoots have been used as the basic unit instead of the individual plant in this study. Detailed localities and habitats for these studies are shown in Table 1.

Specimens of the following herbaria have been examined: Biological Institute, Faculty of Science, Tohoku University (TUS); Botanical Garden, Faculty of Science, Tohoku University (TUSG); University Museum, University of Tokyo (TI); National Science Museum, Tokyo (TNS); Makino Herbarium, Tokyo Metropolitan University (MAK); Biological Institute, Faculty of Liberal Arts, Shinshu University (SHIN); Biology Department, Aichi Kyoiku University (AICH); and Department of Botany, Faculty of Science, Kyoto University (KYO). Specimens collected in Japan examined for this study are listed in Appendix at the end of this paper.

Table 1. Localities, habitats and number of shoots examined

Type	Name of population	Locality	Altitude	Habitat	No. of shoots examined (Morphology)	(Phenology)
E type	Bessho 2	Daiwa-cho, Bessho	ca. 100 m	Sunny slope between road and forest margin	122	0
	Tanoiri	Sendai-shi, Tanoiri	ca. 130 m	Sunny slope between road and forest margin	52	0
	Aoba-yama	Sendai-shi, Aoba-yama	ca. 140 m	Deciduous forest of *Quercus serrata*	19	16
	Sawato	Murata-machi, Sawato	ca. 160 m	Sunny slope between road and forest margin	145	20
	Uchida	Murata-machi, Uchida	ca. 240 m	Deciduous forest of *Quercus serrata*	37	21
	Takadate-yama	Natori-shi, Takadate-yama	ca. 170 m	Deciduous forest of *Quercus serrata*	56	0
	Daimachi	Marumori-cho, Daimachi	ca. 40 m	Forest margin	3	0
					Total 404	Total 57
L type	Bessho 1	Daiwa-cho, Bessho	ca. 100 m	Roadside from light *Pinus densiflora* forest to open grassland	88	0
	Aoba	Sendai-shi, Aoba	ca. 200 m	Sparse *Pinus densiflora* forest with *Miscanthus sinensis*	60	34
	Tarumizu	Natori-shi, Tarumizu	ca. 230 m	Sunny grassy roadside and forest margin	73	22
	Gosha-yama	Natori-shi, Gosha-yama	70–250 m	Sunny grassy roadside and forest margin	15	0
	Hachiman	Iwanuma-shi, Hachiman	ca. 60 m	Sunny slope between road and forest margin	28	0
					Total 248	Total 53

Results

Flowering period The reproductive aerial shoot is composed of the main stem, the terminal pleiochasium and lateral pleiochasia at the terminal of lateral branches from the axils of upper stem leaves on the main stem. We defined the flowering period of the aerial shoot as from the beginning of flowering of

Table 2. Beginning of flowering periods in E type (*Euphorbia sinanensis*; total number N=57) and L type (*E. lasiocaula*; N=53) in 1990

Period	Interval (day)	E type (*Euphorbia sinanensis*)			L type (*E. lasiocaula*)		
		No. of shoot beginning to flower (n)	Rate of shoot beginning to flower (n/N)	Rate of shoot beginning to flower per day (n/N/day)	No. of shoot beginning to flower (n)	Rate of shoot beginning to flower (n/N)	Rate of shoot beginning to flower per day (n/N/day)
before Mar. 17	–	0	0 (%)	0 (%)	0	0 (%)	0 (%)
Mar. 17–Mar. 27	10	1	1.8	0.18	0	0	0
Mar. 27–Apr. 8	12	5	8.8	0.73	0	0	0
Apr. 8–Apr. 18	10	8	14.0	1.40	0	0	0
Apr. 18–Apr. 27	9	7	12.3	1.36	0	0	0
Apr. 27–May 7	10	29	50.9	5.01	0	0	0
May 7–May 16	9	4	7.0	0.78	0	0	0
May 16–May 26	10	1	1.8	0.18	0	0	0
May 26–Jun. 5	10	1	1.8	0.18	0	0	0
Jun. 5–Jun. 16	11	1	1.8	0.16	0	0	0
Jun. 16–Jun. 26	10	0	0	0	10	18.9	1.89
Jun. 26–Jul. 5	9	0	0	0	14	26.4	2.94
Jul. 5–Jul. 16	11	0	0	0	20	37.7	3.43
Jul. 16–Jul. 26	10	0	0	0	9	17.0	1.70
Jul. 26–Aug. 7	12	0	0	0	0	0	0
after Aug. 7	–	0	0	0	0	0	0

the first cyathium to the end of flowering of the last cyathium on the reproductive aerial shoot. There occur cyathia on some lateral shoots branching from the axil of middle or lower part of the main stem, or from the axil of the bract at the end of pleiochasia of the main stem. The cyathia of these shoots begin to flower after the first flowering period and succeeding vegetative growth. We separate, therefore, the second flowering period of such cyathia on these shoots from the first flowering period of them on the main stem, because there is often a long interval between both flowering periods.

Two distinct groups are recognized by the different patterns of flowering periods. A group of plants begins to flower from the middle of March to the middle of June, but most frequently from the end of April to the beginning of May; the other group begins to flower from the middle of June to late July. We call the former group E type (early flowering type) and the later L type (late flowering type) in this paper (Table 2, Fig. 1). The flowering periods of them are usually not overlapped, but in the E type the above-mentioned cyathia of the second flowering period flower in August (Fig. 2).

Stem length Together with the differences in flowering period between E and L types, a clear difference was found in height of plants in the populations near Sendai (Fig. 3). We measured the height of plants by length of the main stem at the stage after the first cyathia of the branches (Webster 1967) are in the fruit stage or after the second cyathia of the branches (Webster 1967) begin to flower, because the stem usually stops its growth at and after these stages.

The E type has a shorter stem (ranging from 8.0 cm to 66.5 cm long, the mean length 26.7 cm, SD 8.7), while the L type has a longer stem (ranging from 32.5 cm to 203 cm long, the mean length 113.0 cm, SD 39.7). The range of the stem length between 32.5 cm to 66.5 cm is occupied by both groups, but there is a statistically highly significant difference ($p<0.0001$)

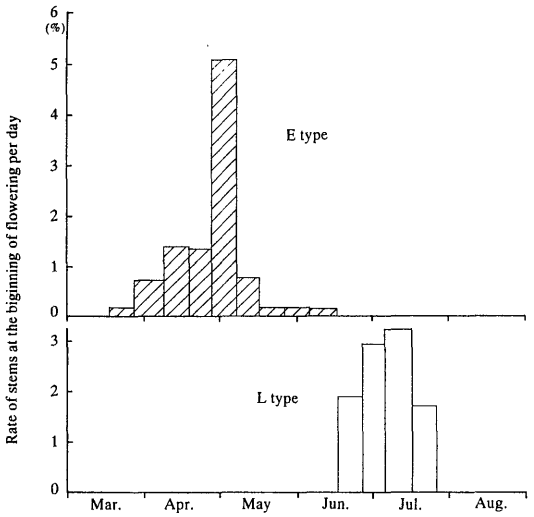

Fig. 1. Seasonal changes of beginning of flowering periods in E type (*Euphorbia sinanensis*, total number N=57) and L type (*E. lasiocaula*, N=53) in 1990 based on table 2.

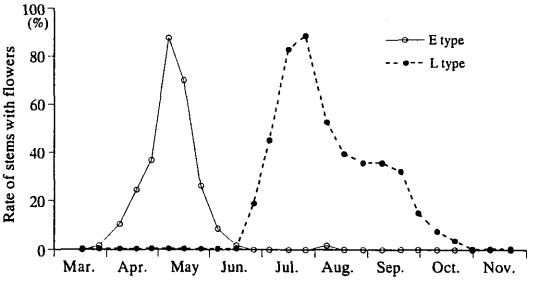

Fig. 2. Seasonal changes of rate of stems with flowers of E type (*Euphorbia sinanensis*, total number N=57) and L type (*E. lasiocaula*, N=53) in 1990.

between the two groups using the t-test.

Hairiness of the stem and the undersurface of leaves Stem hairs tend to fall out after summer especially in the L type, but they remain on a part just below the nodes. We judged the degree of stem hairiness by observation on this part. Three classes of hairiness state, i. e., glabrous, sparsely hairy and densely hairy were artificially distinguished by the degree of density.

The states of hairiness on the undersurface of leaves (including stem leaves, verticillate leaves and bract leaves) do not change at the different growth stages. However, upper leaves tend to be less hairy than the lower ones in the E and L types. We judged the degree of hairiness by observing the most densely hairy stem leaf or verticillate leaf. The degree were divided into three classes of hairiness, i. e., glabrous, hairy on midrib, and hairy on midrib and blade.

The E type usually has glabrous or sparsely hairy stems and hairy leaves on the midrib and blade of the undersurface. The L type has densely hairy stems and mostly glabrous or hairy leaves on the midrib of the undersurface. Most of the E type and the L type are easily distinguishable by combination of these characters as shown in Table 3. However, plants with densely hairy stems and hairy leaves on the midrib and blade of the undersurface occur in both types, but they are easily distinguishable whether they belong to the E or L type by the differences of the flowering period and stem length treated above.

Seed morphology Mature seeds of the E and L types are broadly ellipsoid, about 2.0 mm long and 1.8 mm wide. Color of the seed is different between the two types, i.e. the E type is brown and the L type is black.

Habitat It is found that the E type and the L type have somewhat different preferences for habitat. The E type plants and the L type plants were found on margin of forests, but the E type plants often occur in deciduous forests and the L type plants are found in grasslands. On the contrary, the E type was not found in grasslands densely covered by tall herbs such as *Miscanthus sinensis* Anderss. or others and the L type was not found in forests.

Distribution Based on the morphological and phenological differences mentioned above, the E type and the L type are easy recognizable in herbarium specimens collected from various regions. The E type is confined to the central and northern Honshu in Japan, whereas the L type is distributed widely in

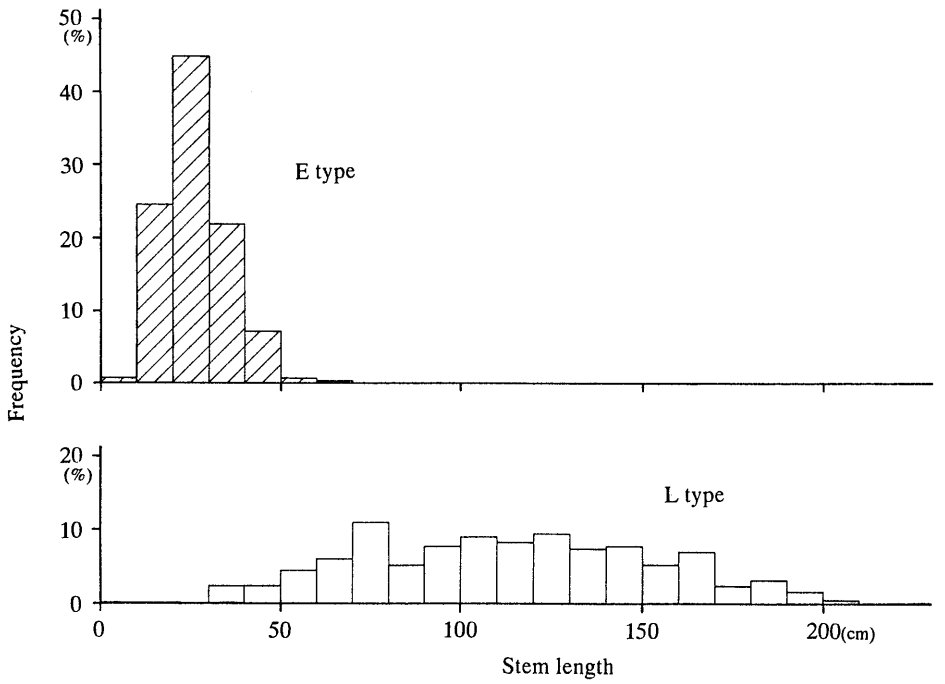

Fig. 3. Stem length of E type (*Euphorbia sinanensis*, total number N=404) and L type (*E. lasiocaula*, N=248) observed in 1989.

Table 3. Distribution of hairiness patterns between the E type (*Euphorbia sinanensis*) and the L type (*E. lasiocaula*) in 1989

Undersurface of leaf / Stem	Glabrous		Hairy on midrib		Hairy on midrib and blade		Total	
	E type	L type	E type	L type	E type	L type	E type	L type
Glabrous	26	0	1	0	241	0	268	0
Sparsely hairy	1	0	0	0	105	0	106	0
Densely hairy	0	123	0	93	30	32	30	248
Total	27	123	1	93	376	32	404	248

China, Korea and Japan, except Hokkaido. Distributions of them in Japan are shown in Fig. 4.

Discussions

Two types of plants are recognized in *Euphorbia lasiocaula*. The E type has a shorter stem with brown seeds and flowers in spring (rarely in summer on the lateral shoot), while the L type has a taller stem with black seeds and flowers in summer to fall.

We found one herbarium specimen of the E type with flowers labeled as collected in fall. This is Hida s. n. (TI) collected on September 5, 1937 in Mt. Kirigamine, Shinano Prov., but the date of collection on the label of this specimen appears to be erroneous because all the leaves of the specimen are young and do not match other herbarium specimens collected in fall. There are a few flowering or after flowering specimens collected in spring as so labeled, though

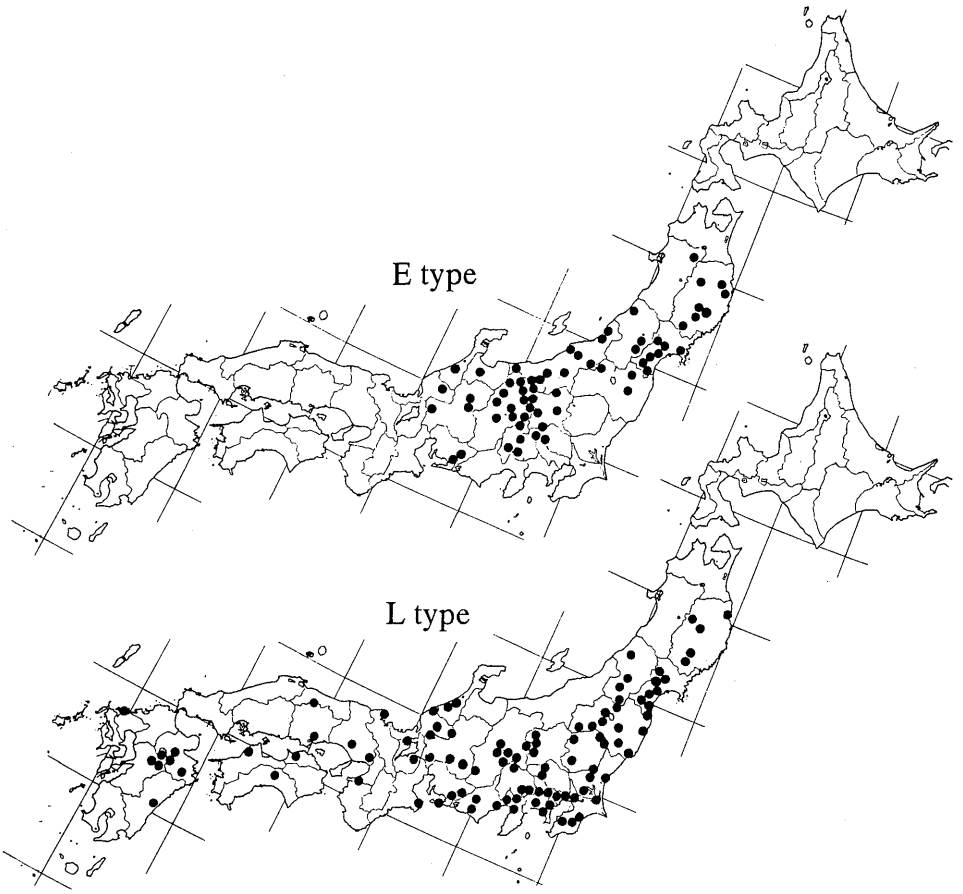

Fig. 4. Distributions of E type (*Euphorbia sinanensis*) and L type (*E. lasiocaula*) in Japan.

they are referable to the L type. They are Hashimoto s. n. (TI) collected on Apr. 16, 1952 at Kankaiji, Beppu-shi, Ohita Pref., Hurusawa s. n. (TI) collected on 1 Apr. 1937 at Mt. Kanou-zan, Kimitsu-gun, Kazusa Prov., and Hurusawa s. n. (TI) collected on 2 Apr. 1937, at Akimoto-mura, Kimitsu-gun, Kazusa Prov. We judged, however, Hurusawa s. n. were collected in summer and Hashimoto s. n. in fall. These specimens must be labeled with erroneous date because their growing stages are entirely different from those of other specimens we have examined so far.

The L type is referable to *Euphorbia lasiocaula* Boissier, because, according to the original description, the species has a pilose stem and its habit resembles *E. esula* L. The type specimen was collected in Nagasaki. Also, *Galarhoeus lasiocaulus* var. *sinanensis* f. *nikoensis* Hurusawa is referable to the L type, i. e., *E. lasiocaula*.

The type specimens of *E. pekinensis* var. *genuina* f. *sinanensis* Hurusawa and *G. lasiocaulus* var. *sinanensis* f. *miyagiensis* Hurusawa are the E type. Hurusawa (1954) pointed out that f. *miyagiensis* has less hairy stems, spathulate stem leaves with an attenuate base, rhombic-oblong verticillate leaves with an acuminate apex and suborbicular bract leaves, while f. *sinanensis* has hirtellous or partly glabrescent stems, oblong stem leaves with a wide-cuneate base, oblong verticillate leaves with an acuminate-acute apex and elongate-subtriangular bract leaves. However, as degree of the stem hairiness and shape of

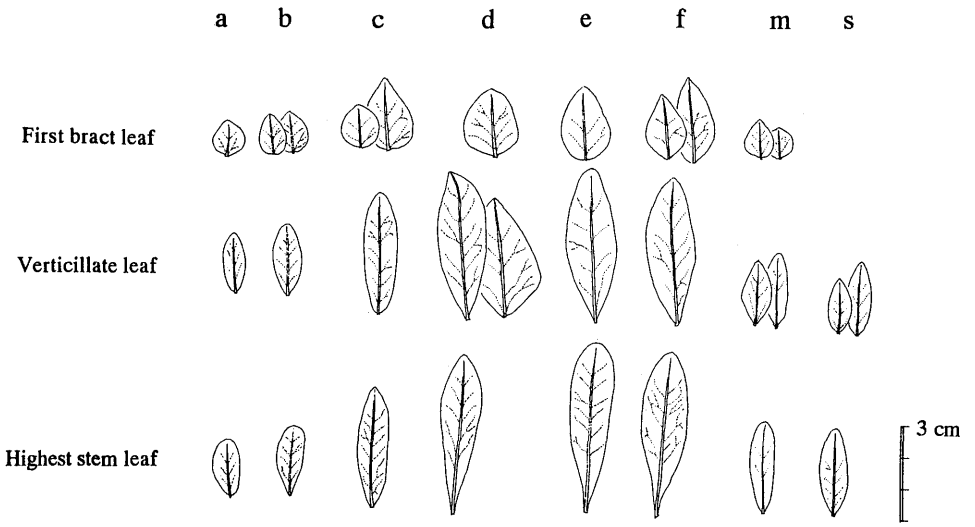

Fig. 5. Variation of leaf shapes of E type (*Euphorbia sinanensis*). a–f. Sawato population (T. Kurosawa 4209, 4213, 4212, 4194, 4207, and 4180); m. lectotype of *Galarhoeus lasiocaulus* f. *miyagiensis* (S. Tamaki 119); s. lectotype of *E. pekinensis* f. *sinanensis* (T. Sawada s. n.).

leaves vary greatly, f. *miyagiensis* and f. *sinanensis* cannot be distinguished by these characters. Table 3 shows variation of the stem hairiness, and figure 5 shows ranges of variation of leaf shapes within Sawato population and the lectotypes of f. *miyagiensis* and f. *sinanensis*. Hurusawa (1954) also pointed out that the cyathia of f. *miyagiensis* are smaller than those of f. *sinanensis*. The type specimens of f. *miyagiensis* were not pressed strongly, so they appear to become smaller than those of f. *sinanensis*. *E. pekinensis* f. *sinanensis* and *G. lasiocaulus* f. *miyagiensis* are not separable forms.

Galarhoeus lasiocaulus var. *pseudo-lucorum* was described by Hurusawa (1954). The types of var. *pseudo-lucorum* were collected by S. Okuyama in Prov. Echigo, between Mase and Urahama on 7 July 1943 ("prov. Echigo, Urahama (H. Okuyama, 1943)" in the original description). They belong to the E type. The plants called "Hayazaki-takatoudai" by Tobe et al. (1987) are recorded in Gunma Prefecture in central Honshu. These are the E type. The plant illustrated on plate 18 and called "Haru-taigeki (*Euphorbia* sp.)" in Makino (1910) is also regarded to be the E type.

The E type has been recognized as a variety (Hurusawa 1954, 1982) or a form (Hurusawa 1940, Hara 1954) of *E. lasiocaula* (or *E. pekinensis* in the sense of Maximowicz). It is distinct from *E. lasiocaula* morphologically and phenologically. Distribution and habitat are also different between them. We regard, therefore, the E type as a distinct species, and propose a new name for the E type, i. e., *E. sinanensis* (Hurusawa) T. Kurosawa et H. Ohashi.

Taxonomic treatments

Key to the species

Flowering in summer to fall; stems hairy, (5–) 50–190 (–210) cm long; seeds black .....

1. Flowering in summer to fall; stems hairy, (5–) 50–190 (–210) cm long; seeds black .... *Euphorbia lasiocaula*

1. Flowering in spring (rarely flowering in summer on lateral shoots); stem glabrous or hairy, (5–) 10–50 (–110) cm long; seeds brown .... *Euphorbia sinanensis*

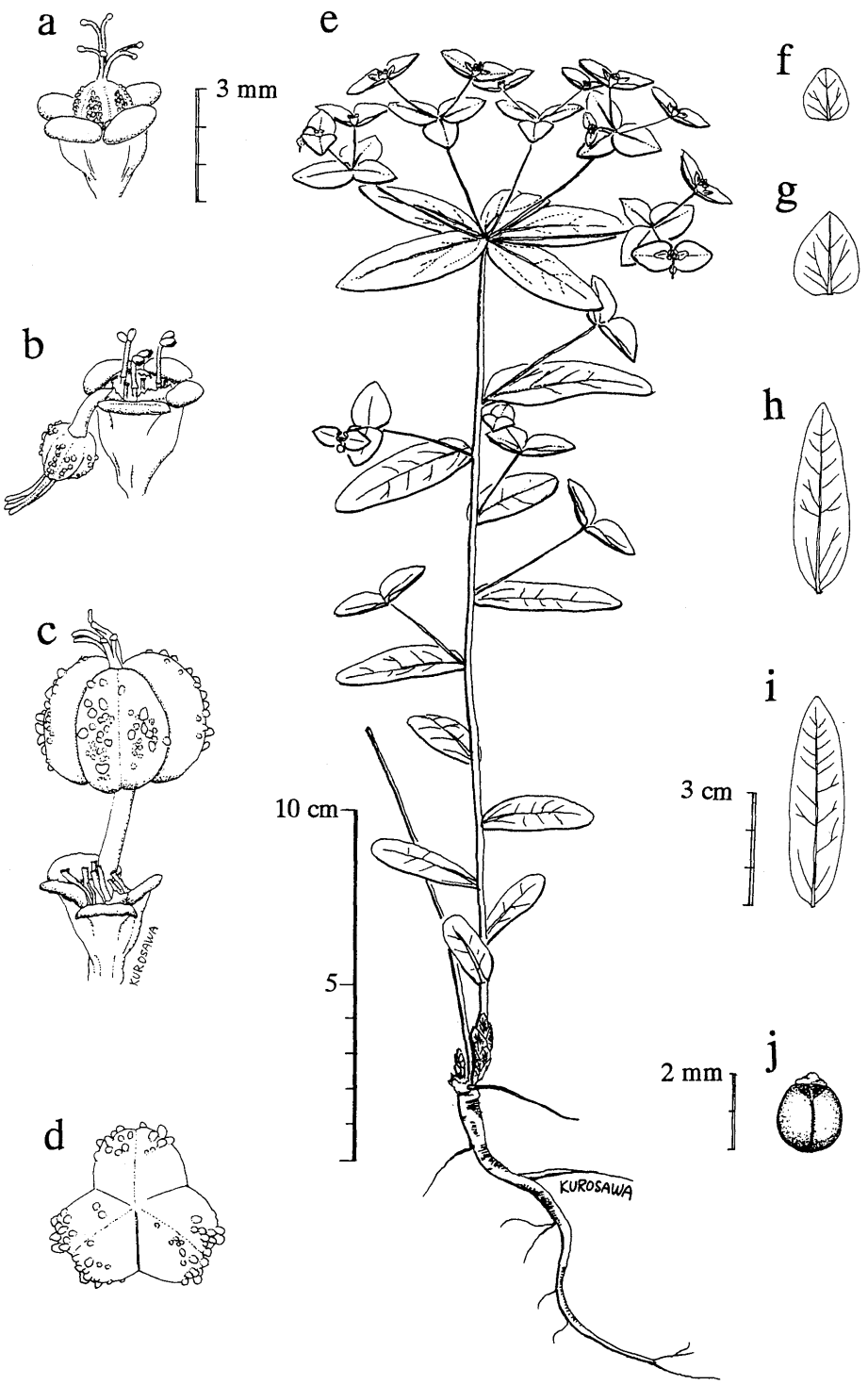

Fig. 6. *Euphorbia sinanensis*. a. cyathium in female stage; b. cyathium in male stage; c. cyathium in fruit stage; d. upper view of capsule (styles omitted); e. habit; f. second bract leaf; g. first bract leaf; h. verticillate leaf; i. stem leaf; j. seed. Drawn from T. Kurosawa 5091 (a, c, d), T. Kurosawa 5092 (b, e, f–i), and Y. Tateishi 9367 (j).

Euphorbia lasiocaula Boissier in DC., Prodr. **15**(2): 1266 (1866); Miquel in Ann. Mus. Bot. Lugd.-Bat. **3**: 126 (1867); Fr. et Sav., Enum. Pl. Jap. **1**: 421 (1875) & **2**: 485 (1879). Type designated by Miquel (1867): prope Nagasaki (Siebold).

E. onoei Fr. et Sav., l. c. **1**: 421 (1875) & **2**: 486 (1879). Type: "in insula Nippon, unde habuit, ex bot. Jap. Ono, Dr. Savatier (n. 2483)".

E. pekinensis var. *onoei* (Fr. et Sav.) Makino in J. Jpn. Bot. **3**: 8 (1926).

E. pekinensis var. *genuina* Hurusawa f. *lasiocaula* (Boiss.) Hurusawa in J. Jpn. Bot. **16**: 635, fig. 32 & 33 (1940).

Tithymalus pekinensis (Rupr.) Hara var. *onoei* (Fr. et Sav.) Hara, Enum. Sperm. Jap. **3**: 55 (1954), excl. f. *sinanensis*; Sugimoto, Keys Herb. Pl. Jap. I, Dicot. 316 (1965).

Galarhoeus lasiocaulus (Boiss.) Hurusawa var. *lasiocaulus* f. *lasiocaulus*: Hurusawa in J. Fac. Sci. Univ. Tokyo, III, **6**: 263 (1954).

G. lasiocaulus var. *lasiocaulus* f. *vulgaris* Hurusawa, l. c. 264 (1954), sphalm. f. *vulgaris* (Hara) Hurusawa, comb. nov. Type: Prov. Musashi, Kobotoke (K. Hisauti, 1934).

G. lasiocaulus var. *lasiocaulus* f. *densifolius* Hurusawa, l. c. 264 (1954), sphalm. f. *densifolius* (Hara) Hurusawa, comb. nov. Type: Prov. Sagami, Yokohama (K. Hisauti, 1934).

G. lasiocaulus var. *sinanensis* (Hurusawa) Hurusawa f. *nikoensis* Hurusawa, l. c.: 267 (1954). Types: Prov. Kodzuke, Nikko, Senjogahara (I. Hurusawa, Jul. 1944, TI).

E. pekinensis auct. non Rupr.: Maxim. in Bull. Acad. Sci. St. Petersb. **29**: 198 (1883); Hayata in J. Coll. Sci. Imp. Univ. Tokyo **20**: 68, fig. J (1904); Ohwi, Fl. Jap. 593 (1953); l. c. ed. Engl. 593 (1965); l. c. ed. rev. 840 (1965); Hurusawa in Satake et al., Wild Flow. Japan Herb. Pl. **2**: 226, pl. 221-2 (1982); Kitagawa, Ohwi New Fl. Jap. 948 (1983).

E. pekinensis var. *japonensis* Makino, Icon. Pl. Jap. Correct.: 3 (1925), nom. nud.; Makino, Illust. Fl. Jap. 375, pl. 1124 (1940); Kitamura et Murata, Col. Illust. Herb. Pl. Jap. (Choripetalae) 80, pl. 19-156 (1964).

G. pekinensis (Rupr.) Hara f. *vulgaris* Hara & f. *densifolius* Hara in J. Jpn. Bot. **11**: 386, fig. 14A, B (1935), nom. nud.

T. pekinensis var. *onoei* f. *densifolius* Hara: Illegitimate name made by Sugimoto, l. c. 316 (1965).

T. pekinensis var. *onoei* f. *nikoensis* Hurusawa: Illegitimate name made by Sugimoto, l. c. 316 (1965).

Japanese name: Takatoudai.

Euphorbia sinanensis (Hurusawa) T. Kurosawa et H. Ohashi, stat. nov. (Fig. 6)

E. pekinensis Rupr. var. *genuina* Hurusawa f. *sinanensis* Hurusawa in J. Jpn. Bot. **16**: 636, figs. 34 & 35 (1940). Lectotype designated by Hurusawa (1954): Prov. Shinano, Iidzunahara (T. Sawada s. n. May 18, 1922, TI). The lectotype was cited as "Prov. Shinano, Idzunaga-hara (T. Sawada, 1922)"by Hurusawa (1954).

Tithymalus pekinensis (Rupr.) Hara var. *onoei* (Fr. et Sav.) Hara f. *sinanensis* (Hurusawa) Hara, Enum. Sperm. Jap. **3**: 55 (1954); Honda, Nom. Pl. Jap. ed. rev. 139 (1957); Sugimoto, Keys Herb. Pl. Jap. I, Dicot. 316 (1965).

Galarhoeus lasiocaulus (Boissier) Hurusawa var. *sinanensis* (Hurusawa) Hurusawa f. *sinanensis*: Hurusawa in J. Fac. Sci. Univ. Tokyo, III, **6**: 265 fig. 27 (1954).

G. lasiocaulus var. *sinanensis* f. *miyagiensis* Hurusawa, l. c. 265 (1954). Lectotype designated here: Prov. Rikuzen, Sendai (S. Tamaki 119, May 28, 1913 TI). "S. Tamaki, 1913", as cited by Hurusawa (1954) in the original description, is composed of two specimens in TI; S. Tamaki 119 and S. Tamaki 120. Both specimens agree well with the original description, and S. Tamaki 119 is definitely determined by Hurusawa as f. *miyagiensis*, but the other specimen, S.

Tamaki 120, has nothings written by Hurusawa. The former, S. Tamaki 119, is selected here as the lectotype.

G. lasiocaulus var. *pseudo-lucorum* Hurusawa, l. c. 267 (1954). Lectotype designated here: Prov. Echigo, Mase-Urahama (S. Okuyama 7860, Jul. 7, 1943 TI). The type specimens were cited erroneously as "prov. Echigo, Urahama (H. Okuyama, 1943)" in the original description. The type specimens is composed of three specimens in TI; S. Okuyama 7859, 7859b, 7860. All specimens agree well with the original description.

T. pekinensis var. *pseudo-lucorum* (Hurusawa) Honda, l. c. 387 (1957); Sugimoto, l. c. 316 (1965).

E. lasiocaula auct. non Boiss.: Fr. & Sav. Enum. Pl. Jap. **1**: 421 (1875), p. p.

T. pekinensis var. *onoei* f. *miyagiensis* Hurusawa: Illegitimate name made by Sugimoto, l. c. 316 (1965).

E. pekinensis var. *sinanensis* (Hurusawa) Hurusawa in Satake et al., Wild Flow. Japan Herb. Pl. **2**: 227 (1982), comb. nud.

A perennial herb. Roots and rhizome thick. Stems deciduous, solitary to several from a rhizome, erect, (5–) 10–50 (–110) cm long glabrous or pubescent, rarely with lateral shoots at middle and lower parts, Leaves sessile, exstipulate; stem leaves 1 to 20, alternate, spathulate, elliptic or narrowly elliptic, entire or serrulate, acute or obtuse at apex, attenuate to cuneate at base, usually pilose on undersurface, (1.5–) 2.5–6.0 (–10.7) cm long, 0.5–1.5 (–2.4) cm wide; verticillate leaves (3–) 5 (–8), elliptic to rhombic, entire or serrulate, acute or obtuse at apex and base, usually pilose on undersurface, (1.4–) 2.5–5.0 (–9.7) cm long, 0.4–1.5 (–2.5) cm wide; the first bract leaves 2 or 3 (or rarely more), ovate to widely ovate; other bract leaves 2, widely ovate. Cyathia in terminal and some lateral pleiochasia; involucre ca. 2 mm diameter, ca. 2 mm high; glands 4 or 5, without appendages, transversely elliptic, green or reddish but dark brown or dark purple in specimens, ca. 1.5 mm across; lobes irregularly toothed; bracteoles oblanceolate, fringed. Capsules obloid, ca. 3.5 mm across, with 6 longitudinal series of obtuse verrucae, glabrous or pilose. Seeds carunculate, smooth, brown, broadly ellipsoid, ca. 2 mm long, ca. 1.8 mm wide. Flowering in spring (rarely in summer on lateral shoots).

Habitat: In deciduous forests, on forest margins, or on open rocky places in limestone areas (Mt. Ureira-san in Iwate Pref., Mt. Futago-yama in Gunma Pref. and so on) of hills or mountains.

Distribution: Endemic to Japan; central and northern Honshu.

Japanese name: Shinano-taigeki.

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Appendix: Specimens examined

Euphorbia lasiocaula Boiss. of Japan

IWATE: Hanamaki-shi, Nishimiyanome (K. Hara et al. 35, 23 Aug. 1983, fl. TUS); Mt. Iwate-san (Y. Ikegami 24911, 14 Aug. 1953, fl. TI); Mizusawa-shi (H. Iwabuchi, 13 Jul. 1930, fl. TUS); Morioka-shi (Y. Kudo, 18 Jul. 1910, fl. MAK); Taneichi-machi, Nakano-kaigan (M. Takahashi, 2 Aug. 1973, fl. TI).

YAMAGATA: Bansei (M. Kato, 18 Aug. 1935, fr. KYO); Fujishima-machi (M. Kato, 10 Jun. 1937, fl. TNS); Imaizumi (M. Kato, 7 Jul.? 1934, fl. KYO); Karuizawa-goe (S. Okuyama, 4 Aug. 1935, fl. TNS).

MIYAGI: Kakuda-shi, Takase-tohge (J. Iketsu & Y. Endo 705, 26 Jul. 1986, fl. TUS); Murata-machi, Taniyama (S. Ogawa & H. Sakai 188, 10 Aug. 1984, fl. & fr. TUS); Naruko-cho, Kawatabi (J. Iketsu 1606, fl. TUS), (K. Sugawara, 30 Aug. 1957, fl. TUSG), (K. Sugawara, 13 Sep. 1963, fr. TUSG); Natori-shi, Mt. Gosha-yama (T. Kurosawa 872, 16 Aug. 1988, fl. & fr. TUS); Natori-shi, Ohsawa (Y. Tateishi 9451, 24 Jul. 1983, fl. TUS), (Y. Tateishi 9493, 7 Aug. 1983, fl. TUS), (Y. Tateishi & H. Hoshi 11072, 10 Sep. 1986, fl. & fr. TUS); Natori-shi, Tarumizu (T. Kurosawa 2499, 9 Sep. 1989, fl. TUS); Sendai-shi (K. Suzuki 149, 8 Aug. 1980, fl. TUS), (A. Kimura & M. Kobayashi, 21 Jul. 1948, fl. & fr. TUS); Sendai-shi, Dainohara (K. Ogura, 7 Jul. 1914, fl. TI); Sendai-shi, Hachiman (A. Kimura, 11 Jul. 1950, fl. TUS); Sendai-shi, Mt. Izumiga-take (H. S. Ogura 1064, 9 Aug. 1972, fl. TUS); Sendai-shi, Kameoka (H. Ohashi 11380, 5 Aug. 1984, fl. TUS); Sendai-shi, Kitayama (K. Ogura, 14 Jul. 1915, fl. TI); Sendai-shi, Kunimi-tohge (Y. Endo 957, 2 Sep. 1981, fl. TUS), (H. Ohashi 8414, 5 Aug. 1982, fl. TUS); Sendai-shi, Sahoyama (H. Ohba 718079, 28 Aug. 1971, fl. TUSG); Shikama-mura Ohjohji (Y. Endo 956, 21 Jul. 1981, fl. TUS); Shiogama (collector unknown, 9 Sep. 1906, fl. MAK); Shiroishi-shi (Y. Ueno 29774, 12 Aug. 1976, fl. TUS); Shiroishi-shi, Fukaya (S. Aiba, 22 Aug. 1982, fl. TUS); Shiroishi-shi, Ohtakasawa (Y. Ueno 12034, 14 Aug. 1973, fl. TUS); Taiwa-cho, Bessho (T. Kurosawa 2524, 5 Oct. 1989, fr. TUS); between Watari-cho and Yamamoto-cho, Shihou-zan (J. Iketsu 866, 23 Sep. 1986, after fr. TUS).

FUKUSHIMA: Aidzuwakamatsu-shi (T. Nemoto & H. Hoshi 1699, 17 Jul. 1983, fl. TUS); Mt. Azuma-yama (S. Okamoto, 28 Aug. 1938, fl. & fr. KYO); Egawa-mura, Yunokami (H. Kanai et al., 25 Aug. 1964, fl. TI); Hinoemata to Mt. Aizukomaga-take (H. Ohba 10396, 22 Jul. 1962, fl. TUSG); Ishikawa-machi, Shiozawa (H. Iketani 1115, 29 Aug. 1983, fl. TUS); Iwaki-shi, Ogawa-machi, Eda (T. Nemoto 539, 3 Aug. 1980, fl. TUS); Namie-machi (Y. Tateishi et al. 10550, 9 Jul. 1985, fl. TUS); Nishishirakawa-gun, Saigou (S. Suzuki, 8 Jun. 1932, fl. KYO); Sukagawa-shi (R. Endo, 26 Jul. 1913, fl. TUS); Tajima-machi, Tazawa (collector unknown, 15 Sep. 1931, after fr. TNS).

TOCHIGI: Nasu-shi (G. Murata 18380, 10 Aug. 1963, fl. KYO); Nikko-shi, Senjoga-hara (I. Hurusawa, Jul. 1944, fl. TI – **Type** of *Galarhoeus lasiocaulus* var. *sinanensis* f. *nikoensis*), (H. Ito, 1931, fl. TI), (S. Kitamura, 6 Aug. 1960, fl. KYO); Numanoi (S. Kitamura, 25 Jul. 1969, fl. KYO).

GUNMA: (S. Okuyama, 3 Jul. 1949, fl. TNS); south of Mt. Asamakakushi-yama (H. Hara, 19 Aug. 1929, fl. TI); Kusatsu (S. Sakaguti, 29 Jul. 1934, fl. KYO); Mt. Myogi-san (Y. Ikegami 16783, 5 Aug. 1951, fl. TI).

IBARAKI: Ami-machi, Fukuda (E. Miki 2661, 20 Jul. 1987, fl. KYO); Mt. Buccho-san (C. Ohkawa, 13 Jul. 1952, fl. TNS); Itako-machi (T. Kawahara 5635, 27-29 Aug. 1989, fr. TI); Naka-gun, Sawa (N. Okada, 17 Jul. 1904, fl. TI); Mt. Tsukuba-san (Y. Tateishi & K. Sato 9847, 16 Sep. 1983, fl. TUS).

SAITAMA: Chichibu, foot of Mt. Bukou (M. Tagawa, 9 Jul. 1930, fl. KYO); Nagatoro-machi, Mt. Hodo-san (Y. Ikegami 20985, fl. & fr. TI).

CHIBA: Chosei-gun, Toyoda (Y. Tamura, 25 Jul. 1938, fl. TI); Ichikawa-shi, Horinouchi-Omachi (M. Ohsawa 1291, 5 Aug. 1962, fl. TUSG); Kamagaya-shi (M. Ohsawa, 6 Aug. 1961, fl. TUSG); Kimitsu-gun, Akimoto (I. Hurusawa, 2 Apr. 1937, fl. TI); Kimitsu-gun, Kanou-zan (I. Hurusawa, 1 Apr. 1937, fl. TI); Mobara-shi (Y. Narita, 6 Jul. 1924, fl. TI).

TOKYO: Minamitama-gun, Asakawa (H. Kanai, 4 Aug. 1954, fl. TI); Hachiohji-shi, Mejirodai (S. Serizawa 14120, 20 Jun. 1971, fl. AICH); Inokashira (I. Hurusawa, Jun. 1938, fl. & fr. TI); Meguro (I. Hurusawa, Aug. 1946, fl. TI); near Shakujii-koen Park (I. Hurusawa, 14 Jun. 1939, after fl. TI).

KANAGAWA: Enoshima (S. Momose, 7 Oct. 1931, fl. TSUG); Hatano-shi, Mt. Ohyama (N. Fukuoka, 18 Aug. 1962, fl. & fr. KYO); Yokohama (K. Hisauchi, 6 Jul. 1919, fl. TI).

YAMANASHI: Kawaguchiko-machi, Yakemaga-hara (N. Kurosaki 3484, fr. KYO); Takane-cho, Kiyosato (M. Mizushima et al., 20 Jul. 1964, fl. TUS); Tsuru-shi (K. Iwatsuki 5202, 6 Sep. 1960, fl. KYO).

NAGANO: Karuizawa-machi, Kutsukake (T. Makino, Aug. 1934, fl. MAK); Karuizawa-kogen (H. Hara, 26 Aug. 1929, fl. TI); Mt. Nyugasa-yama (K. Hasegawa, 24 Jul. 1964, fl. TI); Shioziri-shi (C. Kimura, 19 Jul. 1956, fl. TUS); Tatsuno-machi, Yamaguchi (H. Yokouchi, 10 Jul. 1980, fl. TNS); Mt. Yatsuga-take (K. Hisauti, 5 Aug. 1927, fl. TUS); Suwa-shi, Suwa (H. Tobita, 2 Jul. 1933, fl. KYO); Yamaguchi-mura (K. Wada, 4 Aug. 1981, fl. SHIN).

SHIZUOKA: Mt. Ashitaka-yama (H. Kanai 5959, 1954, fl. TI); Fujinomiya-shi, Kakesubata (K. Murata 1279, 8 Jul. 1977, fl. KYO); Fukuroi-machi (G. Hashimoto 57, 24 Jul. 1932, fl. TI); Gotenba (M. Hiroe 17714, 7 Aug. 1965, fl. KYO), (I. Hurusawa, Aug. 1948, fl. TI); Okitsu (A. Iwamoto, 7 Aug. 1933, fl. TNS); Toyooka-mura (G. Murata, 9 Aug. 1978, fl. KYO).

AICHI: Mt. Houraiji-san (N. Kinashi, 1 Jun. 1923, fl. KYO); Shinjo-shi, Tomioka (S. Serizawa 52482, 31 Jul. 1989, fl. AICH); Tahara-cho (S. Serizawa 52205, 1 Jul. 1989, fl. AICH).

GIFU: Ena-shi, Nakanokata (S. Serizawa 56365, 23 Aug. 1990, after fr. AICH); Imazu-cho, Tochu-dani (T. Kodama 13155, 29 Aug. 1972, fl. KYO); Kasuga-mura, Mt. Ibuki-san (H. Takahashi 6079, 13 Aug. 1982, fl. KYO); Toki-shi (S. Serizawa 55744, 27 Jun. 1990, fl. AICH).

ISHIKAWA: Komatsu-shi (Y. Sugie 1221, 17 Jul. 1986, fl. KYO); Tatsunokuchi-machi (G. Masamune 12437, 4 Sep. 1960,

fl. TUS).

FUKUI: Itoshiro (K. Shioda, 7 Aug. 1923, fl. TI); Sakai-gun, Ojima (Y. Hori 149, 28 Jun. 1953, fl. TNS); Katsuyama-shi, Kabekura (T. Wakasugi 35629, 16 Jun. 1992, fl. TUS); Ohno-shi, Rokuroshi (G. Murata & T. Shimizu 303, 22 Aug. 1954, fl. KYO).

SHIGA: Ibuki-cho, Mt. Ibuki-san (M. Hiroe 6229, 29 Jul. 1950, fl. & fr. KYO), (S. Kitamura & G. Murata, 7 Jul. 1963, fl. & fr. KYO), (G. Koidzumi, 4 Sep. 1921, fl. KYO & TNS), (G. Koidzumi, 26-27 Jun. 1922, fl. KYO), (N. Kurosaki 6488, 22 Sep. 1974, fl. & fr. KYO), (T. Shimizu, 7 Oct. 1954, fl. KYO), (T. Shimizu 539, 10 Jun. 1956, fl. KYO).

MIE: Toba-shi (T. Magofuku 207, 15 Oct. 1931, fl. TI).

KYOTO: Tango-cho, Kyoga-misaki (K. Hiroe 85, 23 Aug. 1977, fr. KYO).

Between OSAKA and WAKAYAMA: Between Sennan-gun and Sakaidani (M. Hiroe 14034, 26 Jun. 1960, fl. KYO).

HYOGO: Kasai-shi, Houjou, Higashi-takamuro (H. Imai 533, 16 Aug. 1985, fl. & fr. TUS); Nishinomiya-shi, riverside of lower Muko-gawa River (T. Shimizu 82-14, 20 Jun. 1982, fl. KYO); Takarazuka (Z. Yoshino, 21 Jul. 1934, fl. & fr. KYO).

OKAYAMA: Mt. Hiruzen (M. Hotta, 29 Jul. 1962, fl. SHIN); Okayama (S. Kitamura, 2 Jul. 1963, fl. & fr. KYO).

KAGAWA: Takase-cho (Y. Maki, 19 Jun. 1968, fl. TNS).

EHIME: Matsuyama-shi, Hatadera (O. T. Kui 10, 25 Oct. 1954, after fr. KYO).

KOCHI: Nagaoka-gun (Y. Momiyama, 20 Jul. 1957, fl. TI).

SAGA: Genkai-cho (T. Baba, 2 Aug. 1970, after fr. TNS).

OHITA: Beppu-shi, Kankaiji (T. Hashimoto, 16 Apr. 1952, fl. TI); Chinda (S. Saito, 28 Oct. 1926, fl. TI); Mt. Kuju (S. Kitamura, 1 Aug. 1944, fl. KYO); Yufuin-cho, Mt. Kuraki (G. Murata 45629, 7 Aug. 1985, fl. KYO).

KUMAMOTO: Aso-machi Otohime (K. Deguchi 6997, 14 Jul. 1987, fl. KYO); Ichinomiya-machi (S. Serizawa 52274, 8 Jul. 1989, fl. AICH); Okuni-machi (H. Kamata, 10 Jul. 1940, fl. KYO).

MIYAZAKI: Takanabe-cho, Machida (J. Murata 15095, 25 May 1983, fl. TI).

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AKITA: Kadzuno-shi, Ohyu, Kuromori (J. Takada, 3 Jul. 1978, fr. TUS).

IWATE: Esashi-shi, Ide (H. Iwabuchi 5317, 9 May 1937, fl. TUS); Ichinoseki-shi, Mukaiyama (Y. Chiba, 1 Jun. 1910, fl. MAK); Iwaizumi-cho, Mt. Ureira-san (Y. Tateishi et al. 12430, 8 Jul. 1987, after fr. TUS); Iwate-gun, Kuroishi (Sawada, 4 Jun. 1905, fl. MAK); Kamihei-gun, Miyamori-mura, Miyamori (T. Shimizu, 3 Jul. 1972, after fr. SHIN); Shimohei-gun, Akka-mura, Motomura (T. Shimizu, 13 Jun. 1957, fl. SHIN); Waga-gun, Tannai (S. Sasamura, 2 Jul. 1954, fl. MAK).

YAMAGATA: Kaminoyama-shi, Mt. Kokuzo-yama (H. Iketani & H. Hoshi 760, 17 Jun. 1983, fr. TUS); Ohta-shinden (S. Okayama, 3 May 1946, fl. TNS); near Yamagata-shi (Y. Yuki 7953, May 1934, fl. KYO).

MIYAGI: Ishinomaki-shi, Minato (M. Ito & A. Soejima 633, 30-31 May 1989, fl. MAK); Kurokawa-gun, Miyatoko (K. Ogura, 15 May 1915, fl. TI); Marumori-machi (S. Mori 5670, 22 Apr. 1989, fl. TUS), (S. Mori 5671, 1 May 1989, fl. TUS); Murata-machi, Sawato (T. Kurosawa 4178 to 4224, 15 May 1990, fl. & fr. TUS), (T. Kurosawa 5091 & 5092, fl. & fr. TUS); Murata-machi, Uchida (T. Kurosawa 4225 to 4249, 5 Jun. 1990, fr. TUS); Natori-shi, Medeshimakasajima, Kuragami (T. Kurosawa & J. Iketsu 190, 5 May 1988, fl. TUS); Natori-shi, Ohsawa (Y. Tateishi 9367, 19 Jun. 1983, fr. TUS), (Y. Tateishi et al. 10101, 13 May 1984, fl. TUS), (Y. Tateishi et al. 10190, 6 Jun. 1984, fl. TUS); Sendai-shi (E. Iishiba 15, 16 May 1920, fl. TI), (S. Tamaki 119, 28 May 1913, fl. TI – **Lectotype** of *Galarhoeus lasiocaulus* var. *sinanensis* f. *miyagiensis*), (S. Tamaki 120, 8 May 1913, fl. TI); Sendai-shi, Akiu (H. Ohashi 3098, 20 Jun. 1961, fr. TI); Sendai-shi, Asahigaoka (T. Nemoto & T. Naito 4321 & 4324, 21 May 1988, fl. TUS), (T. Nemoto & T. Naito 4289, 11 Jun. 1988, fr. TUS); Sendai-shi, Ayashi (C. Kimura et al., 21 May 1981, fl. TUS); Sendai-shi, Ayashi, Saikachi-numa (K. Sohma 655, 1 May 1966, fl. TUS); Sendai-shi, Itabashi (H. Ohashi et al. 11303, 4 May 1985, fl. TUS); Sendai-shi, Kaminohara (H. Ohashi 3247, 20 Jun. 1961, after fr. TUS): Sendai-shi, Nanakita (E. Iishiba, 15 May 1915, fl. KYO); Sendai-shi, Tanoiri (T. Kurosawa 2016, 14 Apr. 1989, fl. TUS) Sendai-shi, Yagiyama to Taihaku-san (H. Ohashi, 3 May 1961, fl. TUS); Shiroishi-shi, Obarazaimokuiwa (T. Houya 1144, 28 May 1978, fl. TUS).

FUKUSHIMA: Fukushima-shi (collector unknown, 25 Apr. 1912, fl. MAK); Funehiki-machi (collector unknown, 14 May 1911, fl. MAK); Nishiaidzu-machi, Houkawa (T. Kurosawa et al. 4173, May 1989, fl. TUS).

GUNMA: Mt. Akagi-yama, Mt. Jizodake (M. Mizushima, 18 Jun. 1956, fl. MAK); Matsuida-machi, Yokokawa (H. Ohba et al., 28 May 1977, fl. TUSG); Nakazato-mura, Mt. Futago-yama (J. Murata 1852, 4 Jun. 1976, fl. TI); Mt. Tanigawa-dake (I. Hurusawa, Jul. 1949, fl. TI); Tsumagoi-mura (K. Masuda, 14 Jun. 1987, fl. KYO).

SAITAMA: Mt. Bukou-san (S. Kurosawa, 24 May 1953, fl. TI); Ohtaki-mura, Mt. Shiraishi-yama (T. Morita, 19 May 1957, fl. MAK).

YAMANASHI: Kajikazawa (T. Sato 5775, 11 Jun. 1939, fl. TI); Katsuyama-shi (S. Watanabe, 20 May 1962, fr. KYO); Kiyosato-mura (K. Hisauchi, Jun. 1936, fl. TI); Ontake (B. Hayata, 20 Jun. 1903, fl. TI).

NIIGATA: Hirokami-mura (S. Iwata, Jul. 1913, fl. MAK); Iwahune-gun, Hayakawa (Togashi & Yamazaki, 12 May 1962, fl. TI); Higashikanbara-gun, Higashikawa-mura, Awase (Y. Ikegami 12411, 4 Jun. 1949, fl. TI); Kariwa-gun, the top of Mt. Kurohime-yama (collector unknown, 9 Jul. 1944, fr. MAK); Mase to Urahama (S. Okuyama 7860, 7 Jul. 1943, fr. TI – **Lectotype** of *Galarhoeus lasiocaulus* var. *pseudo-lucorum*); (S. Okuyama 7859 & 7859b, 7 Jul. 1943, fr. TI); Matsunoyama-machi (collector unknown, Aug., after fr. MAK); Murakami-shi, Senami-machi (N. Fukuoka, 30 Apr. 1960, fl. KYO); Nakauonuma-gun, Kiyotsu-kyo (S. Iwano 6782, 6 Jun. 1951, fl. TUS); Nishikubiki-gun, Mt. Kurohime-yama (Y. Ikegami 24119, 26 Jul. 1953, fl. & fr. TI), (S. Iwano 2465, 27 Jul. 1947, fr. TUS); Tagami-machi, Ohsawa (Y. Ikegami 12548, 12 Jun. 1949, fr. TI); Yahiko-mura Mt. Yahiko-yama (T. Yamazaki, 31 May 1982, fl. & fr. TI).

NAGANO: Iiyama-shi (M. Mizushima, 4 Jun. 1957, fl. MAK); Iidzunahara (T. Sawada, 18 May 1922, fl. TI – **Lectotype** of *Euphorbia pekinensis* var. *genuina* f. *sinanensis*); Karuizawa-machi, Mt. Sekison-zan (H. Sakai 84204, 24 Jun. 1984, fl.

TUS); Mt. Kirigamine (H. Hida, 5 Sep. 1937, fl. TI); Kitaazumi-gun, Kitashiro, Happo-one (M. Mizushima, 18 Jul. 1956, fl. MAK); Matsumoto-shi, Asama-onsen to Misuzu Lake (M. Takahashi 350, 18 May 1979, fl. TUS); Minamimaki-mura, Nobeyama (T. Ikeda, 6 Jun. 1986, fl. TUS); Miyata-mura, Nakagoshi (T. Baba, 6 Jun. 1982, after fr. SHIN); Nagano-shi (M. Mizushima, 25 Sep. 1964, fl. KYO); Suwa-shi, Mt. Kirigamine (T. Makino, 4 Jul. 1937, fl. MAK), (S. Iwano 8112, 6 Aug. 1952, fr. TUS); Saku-machi (T. Ikeda, 29 May 1987, fl. TUS); Sanada-machi, Sugadaira (S. Serizawa 20932, 23 Jun. 1974, fr. AICHI); Shiga-mura, Aida (H. Yokouchi, 5 May 1982, fl. SHIN); Shimominochi-gun, Ohta, Kozakai (M. Mizushima, 2 Jun. 1954, fl. MAK); Mt. Togakushi-yama (O. Shimoda 33, 22 Jun. 1981, fl. TUS); Yamagata-mura, Karasawa (H. Kiyosawa, 12 May 1981, fl. SHIN); Yamanouchi-machi, Shiga-kougen (S. Fujisawa, summer in 1951, fl. KYO).

AICH: Shinshiro-shi, Nakauri, Maruyama (S. Serizawa 54958, 22 May 1990, fr. AICH), (S. Serizawa 54728, 30 Apr. 1990, fl. AICH); Yanai (K. Yorii, 29 Apr. 1955, fl. KYO).

GIFU: Kasuga-mura, Sasamata to Mt. Ibuki-san (H. Takahashi & H. Takano 7356, 8 May 1983, fl. KYO); Osaka-cho, Ohoro (H. Nagase, 28 May 1989, fl. KYO); Takayama-shi, Maehara (S. Serizawa 55411, 9 Jun. 1990, fl. AICH); Takayama-shi, Urushigaito (G. Murata et al. 67076, 2 Jul. 1987, fl. KYO), (S. Serizawa 55401 to 55407, 9 Jun. 1990, fl. AICH), (S. Serizawa 55398-1 to 55398-5, 9 Jun. 1990, fl. AICH).

TOYAMA: Yatsuo-machi, Fukaya (collector unknown, 20 Apr. 1903, fl. MAK).

ISHIKAWA: Tatsunokuchi-machi (T. Fukui, 22 Jun. 1968, fr. MAK).

FUKUI: Mt. Kyogadake (Z. Tashiro, 21 Jun. 1937, fr. KYO).

黒沢高秀，大橋広好：**タカトウダイとシナノタイゲキの分類の再検討**

仙台市近郊でフロラ調査を行ったところ，広義のタカトウダイに春に咲く早咲き型（ただし，まれに花後に分枝して，その枝先の花が夏に咲くことがある）と夏から秋に咲く遅咲き型の二型があることに気づいた．前者をEタイプ（Early flowering type），後者をLタイプ（Late flowering type）と呼ぶこととし，これらのタイプの形態，花期，生育環境，分布を調査した．Lタイプは林縁や草原に生育し，その茎は有毛で植物体は背が高く，種子が黒色であるのに対し，Eタイプは落葉樹林や林縁，石灰岩上に生育し，茎が無毛から有毛で植物体は背が低く，種子が褐色である．また，Lタイプは中国，朝鮮，日本（北海道を除く）に分布しているのに対し，Eタイプは日本固有で本州中北部のみに分布している．Lタイプは狭義のタカトウダイに当たる．タカトウダイに対しては，これまで *E. pekinensis* Rupr. という学名が適用されてきたが，古沢（1954）が指摘したようにタカトウダイと *E. pekinensis* は果実にあるいぼ状突起の形や分枝が異なるので，*E. lasiocaula* Boiss. を用いなければならない．Eタイプはシナノタイゲキに当る．シナノタイゲキは今までタカトウダイの変種あるいは品種として扱われていたが，形態，生態，分布が明瞭に異なるので別種と考えられる．そこで，シナノタイゲキに対して新学名 *E. sinanensis*(Hurusawa) T. Kurosawa et H. Ohashi を提案した．なお，シナノタイゲキは地域によってエチゴタイゲキ，ミヤギタカトウダイ，ケナシタカトウダイ，ハヤザキタカトウダイなどと呼ばれている．また，草木図説でハルタイゲキとされていた植物はシナノタイゲキであった．