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Arisaema maekawae, a New Species of the *Arisaema serratum* Group (Araceae) from Japan

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Arisaema maekawae J. Murata & S. Kakishima, a new species of the *Arisaema serratum* group (Araceae), is described from Japan. This species is most similar to *A. angustatum* but distinct in the ventrally whitish and somewhat verrucose spathe blade and in the thick cylindrical spadix appendage.

Key words: Araceae, *Arisaema*, Japan, new species

Of the 15 sections recognized in the most recent monograph of the genus *Arisaema* (Gusman & Gusman 2006), section *Pistillata* (Engl.) Nakai is the largest in number of species and has the most species endemic to Japan (27 out of 33 species enumerated in Gusman & Gusman (2006)). In their treatment *A. serratum* (Thunb.) Schott was broadly circumscribed, as in Ohashi & Murata (1980) and Ohashi (1982). The broad circumscription is convenient for identification of specimens, but not suitable for describing the diversity of Japanese *Arisaema*. In the forthcoming treatment for the Flora of Japan, the senior author (Murata) therefore intends to recognize *A. serratum* as a complex (*A. serratum* group) consisting of narrowly defined species that are morphologically distinct from each other. Although most species are named, one unnamed species remains, although it was recognized as such by Sugimoto in 1973. It is here named and described on the basis of its distinct morphology as *A. maekawae* J. Murata et S. Kakishima.

Materials and Methods

The morphology and flowering of *A. maekawae* and other nearby species of *Arisaema* were observed in the field from April to July in 2006 and 2007. Living collections and herbarium specimens were gathered for further observation. Live specimens were cultivated in the Botanical Gardens, The University of Tokyo, and the herbarium specimens are stored in the Herbarium, The University of Tokyo (TI). The specimens, localities and number of specimens analyzed are enumerated in Table 1. Because measurements did not significantly differ between live and dry specimens, they are treated altogether. Thirteen morphological characters were measured (Fig. 1).

Species of *Arisaema* are paradioecious herbs (Nakai 1929) that change sex depending on their size (Kinoshita 1986). As they frequently show sexual dimorphism (Murata 1986) we analyzed staminate and pistillate plants separately. To compare morphological characters comprehensively, principal component analysis was performed using Mac

TABLE 1. Species, locality and number of specimens examined. Numbers given in parentheses indicate those measured on dry specimens.

Locality	Number of specimens examined		
	Staminate	Pistillate	Total
Arisaema maekawae			
Yamanashi Pref., Minamikoma-gun, Minobu-cho	16+(10)	13+(6)	29+(16)
Yamanashi Pref., Minamikoma-gun, Manbu-cho	0	(3)	(3)
Shizuoka Pref., Shizuoka-City,	(3)	0	(3)
Nagano Pref., Shimoina-gun, Seinaiji-mura	(1)	(1)	(2)
Arisaema angustatum			
Shizuoka Pref., Izu-City	42	27	69

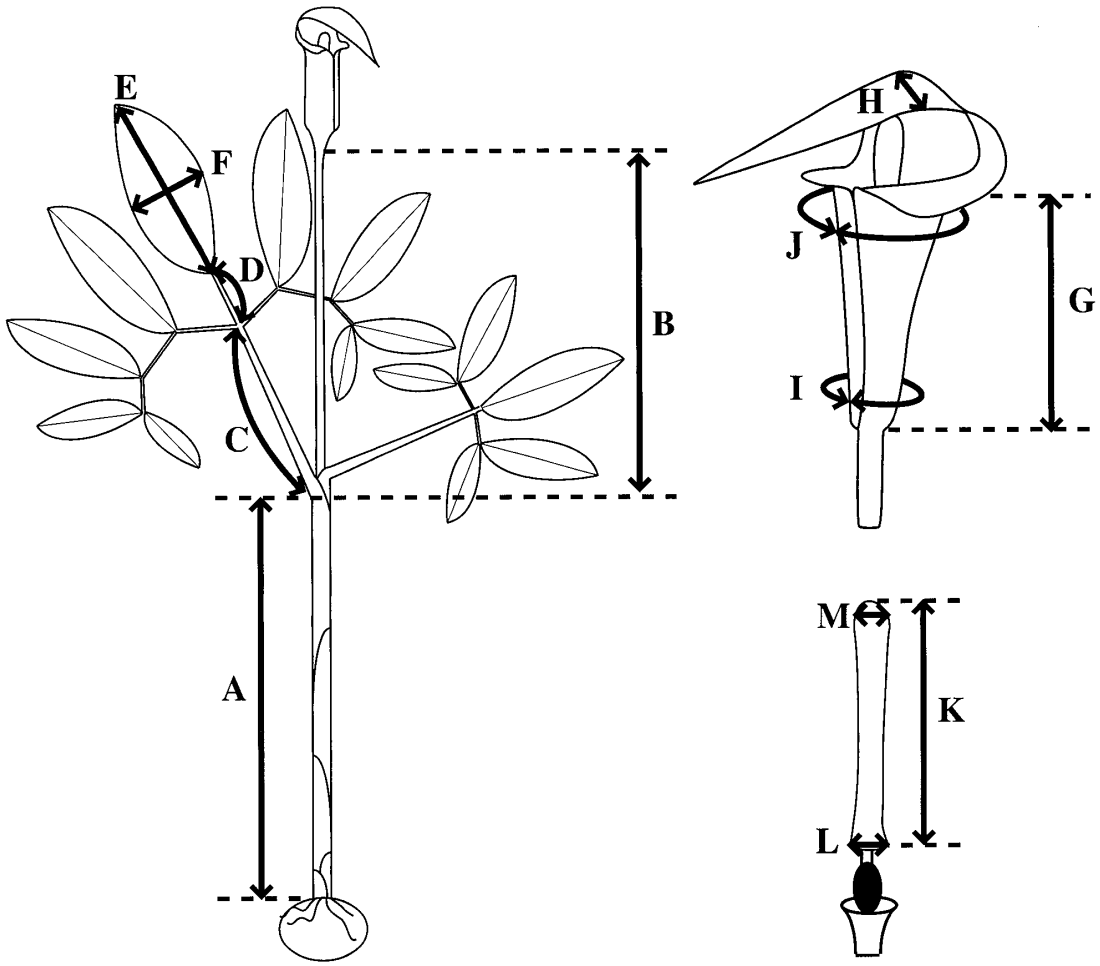

FIG. 1. Morphological characters examined. A: length of pseudostem, B: length of peduncle, C: length of petiole of upper leaf, D: length of petiolule of terminal leaflet, E: length of terminal leaflet, F: width of terminal leaflet, G: height of spathe tube, H: width of spathe blade, I: circumference of spathe tube, J: circumference of mouth of spathe tube, K: height of spadix appendage, L: width of spadix appendage at base, M: width of spadix appendage at apex.

multivariate analysis Ver. 1.0b software (Esumi Co., Tokyo, Japan). To compare variation in morphological features, we calculated ratios for each character. The significance of these characters was checked using the Mann-Whitney *U*-test ($P < 0.01$). The analyses were performed using Kaleida Graph Ver. 4.0 software (Synergy Software, Reading, PA, USA).

Results and Discussion

Arisaema maekawae has the common characteristics of "Subgroup 3" of the *A. serratum* group (Murata 1995); pseudostem with reddish markings, occasionally verrucate or papillate green spathe with inner surface lacking longitudinal raised veins, and cylindrical (neither capitate nor clavate) spadix appendage occasionally curved forward apically. The spathe unfolds before or simultaneously with the leaf blade.

In "Subgroup 3" of the *A. serratum* group *A. maekawae* is similar to *A. yamatense* (Nakai) Nakai and *A. angustatum* Franch. & Sav. The inner surface of the spathe of *A. maekawae* is not as papillate as *A. yamatense*, but is slightly or weakly verrucate. *Arisaema maekawae* is also distinct in its cylindrical upright spadix appendage. *Arisaema yamatense* has the spadix appendage curved forward and tapered to a small apical knob.

Arisaema maekawae is more similar to *A. angustatum*, with which it sometimes grows. The inner surface of the spathe blade of *A. maekawae* is paler than in *A. angustatum* and occasionally weakly verrucose. Principal component analysis on 13 morphological characters (Fig. 2) shows that the two species differ morphologically, especially in pistillate individuals. The value for the shape of the spadix appendage (width/height) is significantly larger for *A. maekawae* than for *A. angustatum* (Fig. 3).

Arisaema maekawae is distributed in Yamanashi, Shizuoka and Nagano prefectures (Fig. 5). It blooms from early April to early June.

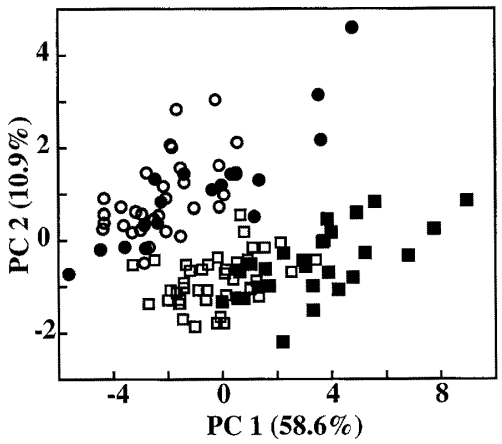

FIG. 2. Principal components analysis of *Arisaema maekawae* (staminate ○, pistillate ●) and *A. angustatum* (staminate □, pistillate ■) using 13 morphological characters shown in Fig. 1. First two principal components explain 69.5% of total variation. First component (PC1) explains 58.6% of total variation and represents size of individuals. Second component (PC2) explains 10.9% of total variation. Apical width of spadix appendage, width of terminal leaflet and height of spathe tube mainly contribute to PC2.

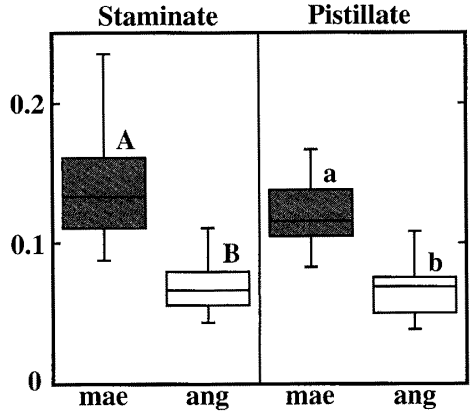

FIG. 3. Variation in shape of spadix appendage of *Arisaema maekawae* and *A. angustatum* indicated as apical width / height. Capital and small letters represent significant difference in staminate and pistillate individuals, respectively. Species are indicated by abbreviations, mae: *A. maekawae*, ang: *A. angustatum*.

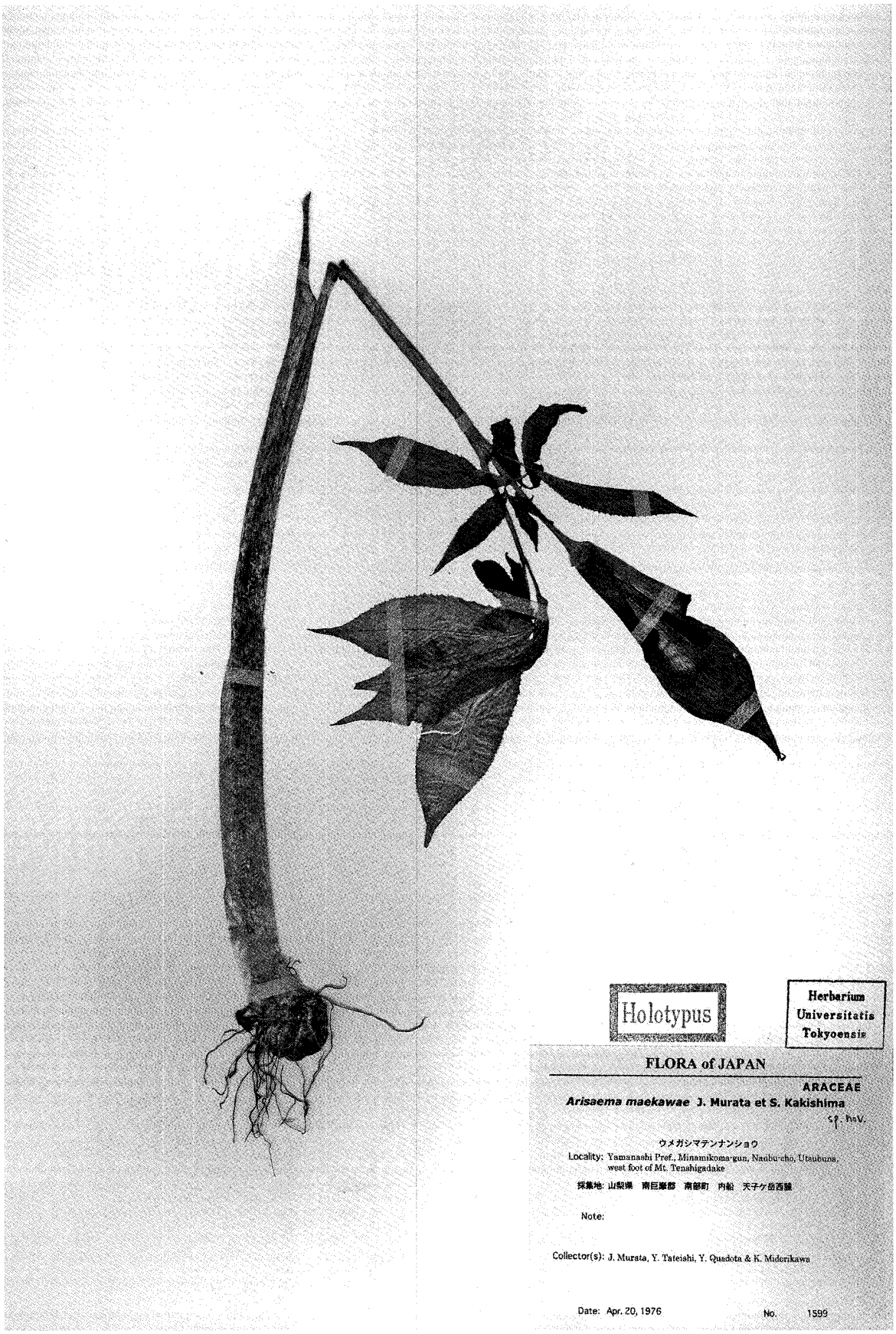

FIG. 4. Holotype specimen of *Arisaema maekawae* (TI).

Arisaema maekawae J. Murata & S. Kakishima, **sp. nov**.

Arisaema umegashimense F. Maek. ex Sugim., Key. Herb. Pl. Jap. Monocot.: 246 (1973), nom. nud.

A. angustato simile sed spathae lamina intus pallescenti ver glaucescenti, aliquantum verrucato, appendice spadicis crassiore differt.

Typus. JAPAN. Yamanashi Pref., Minamikoma-gun, Nanbu-cho, Utsubuna, west foot of Mt. Tenshigadake, 20 Apr. 1976, *J. Murata, Y. Tateishi, Y. Quadota & K. Midorikawa 1599* (holo- TI, Fig. 4).

Paradioecious herbs, to 80 cm tall. *Tuber* depressed globose, 2–10 cm wide; phyllotaxis spirodistichous. *Leaves* 2 or 1; pseudostem 10–50 cm long, mouth narrowly expanded, collar-like; petiole 3–19 cm long; blade pedately 7–15 -foliolate; rachis 2.5–9 cm long; leaflets lanceolate or narrowly elliptic to elliptic, base cuneate, margin entire to serrate, apex acuminate, green; terminal leaflet petiolulate, 5.5–17 cm long, 1–6.5 cm wide. *Inflorescence* unfolding simultaneously with leaf blade; peduncle 3–19 cm long; spathe pale green; tube 3–6 cm long, cylindrical, occasionally farinose, mouth narrowly reflexed; blade obovate, apex acuminate, 3–8 cm long, 2–4.5 cm wide, without raised veins, faintly rugose or papillate inside and on margins, without distinct longitudinal white stripes. *Spadix* unisexual; appendage cylindrical, upright, 2.5–6 cm long, 2–7 mm wide at apex, basally truncate and stipitate. *Staminate flowers* of 2 or 3 fused stamens, anthers dehiscing by short slits to pores. *Ovaries* congested, green, bottle-shaped.

Japanese name. Umegashima-ten'nansho.

Distribution. Japan: Central Honshu (Shizuoka, Yamanashi and Nagano Prefs.) (Fig. 5).

Other specimens examined. JAPAN. Shizuoka Pref.: Shizuoka-city, along the Abe river, en route from Umegashima-onsen to Sekino-sawa, 10 May 1975, *Y. Kamijo 101* (TNS 014802); Haibara-gun, Honkawane-cho, from Kanzo to Nagashima, 3 May 1973, *R. Matsunami & F. Konta 1581* (TNS 31744); Sizuoka-shi, Umegashima-onsen, Ohtaki, 3 May 1975, *H. Koyama et al. 4344* (TNS 331027); Shizuoka-city, along the Yomogi-zawa, 18 May 1975, *F. Konta, T. Sugiyama & E. Miki 66* (TNS 014811); Abe-gun, Umegashima-mura, Umegashima spa-Abetooge, alt. 1250–1400 m, 18 Jun. 1979, *H. Ohashi & J. Murata 1944* (TI); Fujinomiya-city, from Mt. Tenshi to Saori, alt. 600 m, 29 Apr. 1956, *H. Kanai s.n.* (TI). —Yamanashi Pref.: Minamikoma-gun, Nanbu-machi, W. side of Mt. Tenshi, alt. 1000m, Cult. : Bot. Gard. Koishikawa, Tokyo, 4 May 1979, *J. Murata 7294* (TI); Minamikoma-gun, Minobe-cho, Ooshiro-Abe-touge, alt. 500–900 m, 24 Apr. 1986, *J. Murata et al. s.n.* (TI); Minamikoma-gun, Nanbu-machi, Kozori, Cult.: Bot. Gard. Univ. Tokyo, 6 May 1982, *J. Murata s.n.* (TI). —Nagano Pref.: Shimo-ina-gun, Seinaiji-mura, Seinaiji-toge, ca. 1190m alt., 7 Jun. 1983, *T. Yahara et al. 6825* (TI 1343670)

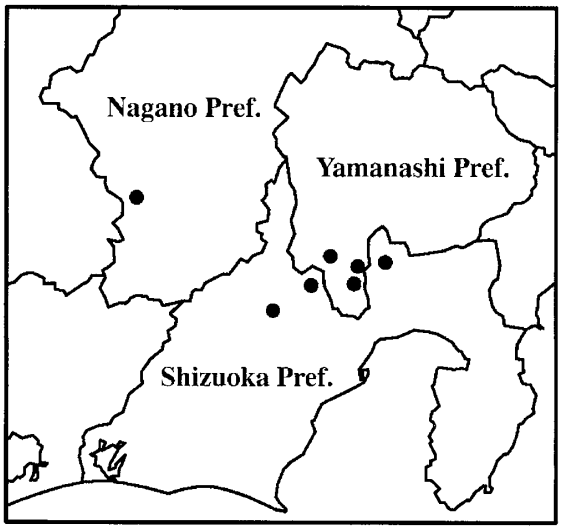

FIG. 5. Distribution of *Arisaema maekawae*.

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References

Gusman, G. & L. Gusman 2006. The Genus *Arisaema*. Second revised and updated edition. A. R. G. Gantner Verlag, Ruggell.

Kinoshita, E. 1986. Size-sex relationship and sexual dimorphism in Japanese *Arisaema* (Araceae). Ecol. Res. 1: 157–171.

Murata, J. 1986. Comments on taxonomic characters and the taxonomy of Japanese *Arisaema* (Araceae). (2) Length of the peduncle and the number of ovules — with special reference to *A. undulatifolium* and *A. kishidae*. Acta Phytotax. Geobot. 37: 27–41.

Murata, J. 1995. Diversity in the *Arisaema serratum* group. Acta Phytotax. Geobot. 46 (2): 185–208. (in Japanese)

Ohashi, H. 1982. *Arisaema. In*: Satake, Y., J. Ohwi, S. Kitamura, S. Watari & T. Tominari (eds.), Wild Flowers of Japan. Herbaceous Plants. I pp. 128–137. Heibonsha, Tokyo. (in Japanese)

Ohashi, H. & J. Murata. 1980. Taxonomy of the Japanese *Arisaema* (Araceae). J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 12: 281–336.

Nakai, T. 1929. Conspectus specierum *Arisaematis* Japono-Koreanarum. Bot. Mag. Tokyo 48: 524–540 & 563–572.

Sugimoto, J. 1973. Keys to Herbaceous Plants of Japan II, Monocotyledoneae. Inoue Book Co., Tokyo. (in Japanese)

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