

Introduction to the Plants of *Arisaema* Recently Recognized From Japan

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Japan is a center of diversity for *Arisaema* where there are recognized more than 30 species out of the total 150 for the whole genus. Since Thunberg (1792) and Blume (1836), Japanese species of *Arisaema* have been treated by many authors. The most comprehensive description written in English is Koyama (1965), compiled in the English translation of Ohwi's *Flora of Japan* where 46 species and 4 varieties are enumerated. Ohashi and Murata (1980) thoroughly revised Japanese species and recognized 25 species including 5 sub-species, 6 varieties and 5 forms; a key to the species and complete synonymy were given.

Taxonomic problems of *Arisaema seratum* (Thunb.) Schott in a wide sense was discussed but has not yet been solved. Delimitation of the species in Ohashi (1982) is based on this revision; up-to-date descriptions (in Japanese) and colored photographic plates were provided for each species. After Ohashi and Murata (1980), systematic studies have been continued and new taxa, which were not included in Ohashi (1982) were added by Serzawa (1980a, 1980b, 1981a, 1981b, 1982a, 1982b, 1986), Murata (1983, 1984, 1985, 1986a, 1986b) and Murata and Ohno (1989). Most of them are rare taxa with very limited distribution ranges. This paper aims to introduce these new taxa with photographs and short notes. A key to all Japanese taxa is provided as a synopsis.

This key is not aimed for identification of specimens but for understanding diversity among the species of Japanese *Arisaema*; some characters used in the key are difficult to examine in the herbarium specimens. An attempt is made to cluster putatively closely related species. Intraspecific taxa are omitted. Photographs taken in the wild habitat or cultivated condition in the Botanical Gardens, University of Tokyo. Voucher specimens indicated are preserved in the Herbarium, University of Tokyo (TI).

Diagnostic Key to the species of Japanese *Arisaema*

1. Spadix appendix sessile at base. Phylotaxis 2/5
2. Leaves 2. Spadix with horn-like sterile flowers (always female inflorescences but occasionally male ones). Auxillary buds with accessory buds. (sect. *Clavata* Engler)

3. Spadix appendix within the spathe, cylindrical, obtuse
A. heterocephalum Koidz
3. Spadix appendix long exerted from the spathe, filiforme at apex
A. negishii Makino
2. Leaf 1. Spadix usually without horn-like sterile flowers. Auxillary buds solitary.
(sect. *Tortuosa* Engler)
4. Pollin grains granulate between spinules (subsect. *Tortuosa*). Spadix bisexual or male. Terminal leaflet much smaller than adjacent lateral ones
A. heterophyllum Blume
4. Pollin grains smooth between spinules (subsect. *Flagellarisaema* (Nakai) J. Murata) Spadix unisexual. Terminal leaflet not smaller than adjacent lateral ones
5. Spathe-blade with white T-shaped mark inside; $2n=56$
A. kiushianum Makino
5. Spathe-blade without white T-shaped mark inside; $2n=28$ (rarely 42)
A. thunbergii Blume
1. Spadix appendix stiptate. Phylotaxis spirodistichous (ca. 1/2) (sect. *Pedatisecta*)
6. Leaflets always 3, sessile. Leaves 2, of equal size
7. Leaflets papillose on margin. Spathe blade leaf-like. Plants stoloniferous after anthesis. $2n=72$ ($X=12$)
A. ternatipartitum Makino
7. Leaflets entire. Spathe blade saccate-galeate. Plants without stolons. $2n=28$ ($X=14$)
A. ringens (Thunb.) Shott
6. Leaflets more than (3-) 5 (if 3, lateral leaflets petiolate). Leaves 1 or 2 (if 2, lower one distinctly larger than upper one) rather thick, lusterous above, entire
8. Spathe with longitudinal white stripes rising on outer surface. Auxillary buds usually (2-) 3 in each node so that (2-) 3 tuberlets occur side by side. Basic chromosome number $X=13$.
A. ovale Nakai

8. Spathe without longitudinal white stripes. Auxillary buds always one in each node so that tuberlets are solitary. Basic chromosome number $X=14$ (except a race of *A. serratum* in Hachijo Is.)
9. Leaves more or less palmate (rachises adjacent to terminal leaflet slightly developed). Leaflets 5 (-7)
10. Spathe small and slender, less than 10 (-13) cm long, 2 (-3) cm wide when open. Anther cells not fused.
A. longipedunculatum M. Hotta
10. Spathe large and thick, usually more than 10 cm long, 3 cm wide when open. Anther cells not fused.
11. Leaflets usually 5. Spathe opening distinctly earlier than leaves (*A. nikoense* complex)
12. Mouth of pseudostem (imbricate petiole sheathes with fused margins) narrowly recurving into undulating membranous collar
A. aprile J. Murata
12. Mouth of pseudostem tightly embracing peduncle and not recurving
13. Leaves usually 2. *A. nikoense* Nakai
13. Leaves usually 1. *A. ishizuchiense* Murata
11. Leaflets 5-7. Inflorescence opening simultaneously with or later than leaves
14. Terminal leaflet much smaller than adjacent lateral ones
A. ogatae Koidzumi
14. Terminal leaflet not smaller than adjacent ones
15. Spathe blade ovate with 5 white longitudinal lines
A. sachalinense (Miyade et Kudo) J. Murata
15. Spathe blade deltoid-ovate with more than 7 white longitudinal lines
A. minamitanii Serizawa

9. Leaves pedate, rachises adjacent to terminal leaflet well developed. Leaflets usually more than 7, rarely (3-) 5-7 in *A. sazensoo* and *A. sikokianum*)
16. Ovules more than 10 (in average) per ovary. Spathe opening distinctly earlier than leaves (except *A. kawashimae*). *A. undulatifolium* complex.
17. Spathe opening earlier than leaves, without tuberlets.
18. Spathe narrowly recurved at mouth, blade deltoid, acuminate
A. minus (Serizawa) J. Murata
18. Spathe usually widely recurved at mouth, blade ovate to oblong-ovate, acute
A. undulatifolium Nakai
17. Spathe opening simultaneously with leaves with many tuberlets
A. kawashimae Serizawa
16. Ovules less than 8 (on average) per ovary. Spathe opening later than leaves (except some races of *A. serratum*)
19. Spathe blade caudate into thread-like tail
20. Spathe semi-translucent. Leaflet cuspidate *A. tosaense* Makino
20. Spathe not translucent. Leaflet acute to acuminate
21. Psudostem less than 2.5 times longer than petiole. Spathe purplish
A. kishidae Makino ex Nakai
21. Psudostem more than 2.5 times longer than petiole. Spathe usually green
A. ehimense J. Murata et Ohno
(also consult with *A. maximowiczii* (Engler) Nakai)
19. Spathe blade acute to acuminate, rarely cuspidate to caudate
22. Psudostem less than 2.5 (-3) times longer than petiole
23. Leaflets ovate to broadly ovate or widely elliptic. Spathe blade thick in texture, rather leathery

24. Spathe blade widely ovate, ovate to oblong-ovate, fornicate, acute to acuminate, distinctly declined
25. Spathe blade longer than tube *A. sazensoo* Blume ex Makino
25. Spathe blade shorter than tube *A. kuratae* Serizawa
24. Spathe blade obvate, not fornicate, cuspidate, erect or ascending
A. sikokianum Fr. et Sav.
23. Leaflets lanceolate to narrowly oblong. Spathe blade thin, herbaceous
26. Spathe blade cucullate *A. cucullatum* M. Hotta
26. Spathe blade long acuminate, not cucullate. *A. seppikoense* Kitamura
22. Pseudostem less than 3 times longer than petiole
27. Spathe blade papillose inside, or spadix appendix creased in upper part
28. Spathe blade papillose spadix appendix smooth
A. yamatense (Nakai) Nakai
28. Spathe blade smooth, spadix appendix creased in upper part
A. abei Serizawa
27. Spathe smooth except margin. Spadix appendix smooth
29. Leaf 1.
(also consult with *A. serratum* complex)
30. Spathe blade cuspidate to caudate
31. Spadix appendage less than 1.5 mm wide *A. unzensae* Serizawa
31. Spadix appendage more than 1.5 mm wide
A. maximowiczii (Engler) Nakai
30. Spathe blade gradually narrowed to apex
spathe-blade oval to orbicular-ovate

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| 32. Spathe blade narrowly deltoid | <i>A. monophyllum</i> Nakai |
| 32. Spathe blade deltoid ovate | <i>A. iyoanum</i> Makino |
| 29. Leaves 2. | <i>A. serratum</i> complex |

Note: Descriptions, pictures, and map follow on pp. 37-43 of the original. Sorted list of species described below.

Species described

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|--------------------------|--------------------------|---------------------------|
| <i>A. abei</i> | <i>A. kuratae</i> | <i>A. sachalinense</i> |
| <i>A. aprile</i> | <i>A.</i> | <i>A. sazensoo</i> |
| <i>A. cucullatum</i> | <i>longipedunculatum</i> | <i>A. seppikoense</i> |
| <i>A. ehimense</i> | <i>A. maximowiczii</i> | <i>A. sikokianum</i> |
| <i>A. heterocephalum</i> | <i>A. minamitanii</i> | <i>A. ternatipartitum</i> |
| <i>A. heterophyllum</i> | <i>A. minus</i> | <i>A. thunbergii</i> |
| <i>A. ishizuchiense</i> | <i>A. monophyllum</i> | <i>A. tosaense</i> |
| <i>A. iyoanum</i> | <i>A. negishii</i> | <i>A. undulatifolium</i> |
| <i>A. kawashimae</i> | <i>A. nikoense</i> | <i>A. unzense</i> |
| <i>A. kishidae</i> | <i>A. ogatae</i> | <i>A. yamatense</i> |
| <i>A. kiushianum</i> | <i>A. ovale</i> | |
| | <i>A. ringens</i> | |