Phytotaxa 161 (4): 270–282
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.161.4.2

Aspidistra paucitepala (Asparagaceae), a new species with occurrence of the lowest tepal number in flowers of Asparagales

NIKOLAY A. VISLOBOKOV[1,2*], DMITRY D. SOKOLOFF[1], GALINA V. DEGTJAREVA[1], CARMEN M. VALIEJO-ROMAN[3], ANDREY N. KUZNETSOV[2,4] & MAXIM S. NURALIEV[1,2]

[1]*Faculty of Biology, M.V. Lomonosov Moscow State University, 1, 12, Leninskie Gory, 119234 Moscow, Russia; e-mail: n.vislobokov@gmail.com*
[2]*Joint Russian-Vietnamese Tropical Scientific and Technological Center, CauGiay, Hanoi, Vietnam*
[3]*A.N. Belozersky Institute of Physico-Chemical Biology, M.V. Lomonosov Moscow State University, Moscow 119234, Russia*
[4]*A.N. Severtsov Institute of Ecology and Evolution of Russian Academy of Sciences, Leninsky 33, Moscow, Russia*
**Author for correspondence*

Abstract

The genus *Aspidistra* (Asparagaceae) shows strong variation of flower groundplan. We add further evidence of this variation describing a new species, *Aspidistra paucitepala* from southern Vietnam that has flowers with 2-4 tepals, 2-4 stamens and a gynoecium with unilocular ovary. Bisexual flowers with three tepals and three stamens are extremely rare among monocots with biotic pollination. Compared with typical trimerous pentacyclic monocot flowers, they can be either interpreted as trimerous and tricyclic or as 1.5-merous (at least in perianth and androecium) and pentacyclic. Both interpretations imply floral features unusual for 'higher' Asparagales. *Aspidistra paucitepala* resembles recently described *A. brachystyla* from northern Vietnam in narrow funnel-shaped to nearly tubular perianth with very small lobes and short cylindrical pistil with stigma located below the level of anthers. As species of the taxonomically diverse genus *Aspidistra* are frequently observed in the field without reproductive structures and cannot be properly identified, a need for DNA barcoding approach is obvious. We present preliminary data showing that plastid *psb*A-*trn*H and nuclear 5S-NTS regions could be useful for DNA barcoding of *Aspidistra*.

Key words: *Aspidistra*, taxonomy, flower merism, DNA barcoding, Southern Vietnam

Introduction

The genus *Aspidistra* Ker Gawler (1822: 628) (Asparagaceae) contains about 120 species with centre of diversity in southern China and northern Vietnam, including over 50 species from Vietnam (Tillich 2008, Averyanov & Tillich 2012, 2013a,b, Tillich & Averyanov 2012, Tillich & Leong-Škorničková 2013, Vislobokov *et al.* 2013). Species of *Aspidistra* are common herbs in forests of Southeast Asia. Despite rapid discovery of new species during several previous decades (e.g. Tillich 2005, 2006, Tillich *et al.* 2007, Tillich & Averyanov 2008) *Aspidistra* is still a quite unexplored genus. In particular, only scattered (and somewhat controversial) data on reproductive biology are available (Wilson 1889, Kato 1995, Conran & Bradbury 2007, Vislobokov *et al.* 2013).

Natural range of the genus extends from India to Malaysia and Japan, but only a few species are known from the southern part of its distribution area. *Aspidistra larutensis* De Wilde & Vogel (2006: 126), which is reportedly synonymous to *A. longifolia* Hooker (1892: 326) (Phonsena & De Wilde 2010) or *A. hainanensis* Chun & How (1977: 114) (Tillich & Averyanov 2012), is the southernmost member of the genus (De Wilde & Vogel 2006). Also, there are a few species in southern Vietnam, such as *A. carnosa* Tillich (2005: 318), *A. stricta* Tillich (2005: 322), *A. minutiflora* Stapf (1903: 113) (Tillich 2008), *A. phanluongii* Vislobokov in Vislobokov *et al.* (2013: 349) and others. In this paper, we describe a further new species from southern Vietnam, with uncommon flower structure.

Species of *Aspidistra* are common and sometimes abundant in some types of forest ecosystems in SE Asia. During field explorations of flora and vegetation, members of this taxonomically diverse genus are frequently

 Accepted by Lorenzo Peruzzi: 25 Jan. 2014; published: 3 Mar. 2014

In patterns of variation of flower groundplan, *A. paucitepala* partially resembles species of *Potamogeton* Linnaeus (1753: 126) (Potamogetonaceae: Alismatales) that are quite distantly related to *Aspidistra* and have completely different floral biology. In *Potamogeton*, there are usually four tepals, four stamens on the radii of tepals and four carpels alternating with tepals. Less common, along with other types, are flowers with three tepals and three stamens on the same radii, alternating with three carpels (Charlton & Posluszny 1991, Lock *et al.* 2009). All interpretative problems outlined above for *A. paucitepala* can be also applied for *Potamogeton*.

As a final speculation, we could discuss a possibility that flowers behave as three-whorled in all members of the genus *Aspidistra*. One can imagine a perianth of 3+3 relatively narrow tepals, so that outer whorl tepals are situated only slightly outside the inner whorl tepals. In such a situation, a two-whorled trimerous perianth could be transformed into a single-whorled hexamerous perianth, with subsequent developmental and evolutionary flexibility in merism. Consider aestivation pattern in a flower of *Aspidistra petiolata* Tillich (2005: 321) with six tepals illustrated by Tillich (2005). Here, two tepals appear to occupy an outer position relative to three other tepals and a sixth tepal has an innermost position. If this aestivation reflects a developmental pattern, the perianth cannot be regarded as trimerous. Also, tepal aestivation is sometimes valvate in *Aspidistra* (a character that requires further investigation in the genus), which makes recognizing a two-whorled perianth problematic. As pointed out by Ronse De Craene (2010) using examples from eudicots, trimery and hexamery can become superficially similar, and hexamery has often been confused with trimery. Endress (2014), when reviewing multicarpellate gynoecia in angiosperms, mentioned a possible way of (apparent) increasing the carpel number in one whorl is by 'compression' of two whorls to the same level, so that they simulate a single whorl. This is somewhat similar to the hypothetic scenario we discuss for the perianth of *Aspidistra*.

Acknowledgments

We are grateful to H.-J. Tillich for helpful comments, to N.A. Grigoreva and N.S. Lazareva (Botanical Garden of Moscow State University) for cultivation of plants, to S.P. Kuznetsova for help in field collection of samples and to M.V. Remizowa for discussion. Funding from the Russian Foundation for Basic Research is gratefully acknowledged (projects 12-04-31073 and 12-04-33050).

References

Arnautov, N. & Bogner, J. (2004) *Aspidistra locii* (Convallariaceae), an unusual new species from Vietnam *Willdenowia* 34: 203–208.
http://dx.doi.org/10.3372/wi34.34119

Averyanov, L.V. & Tillich, H.-J. (2012) New taxa of *Aspidistra* (Asparagaceae) from central Vietnam. *Turczaninowia* 15: 5–10.

Averyanov, L.V. & Tillich, H.-J. (2013a) *Aspidistra albopurpurea*, *A. khangii*, *A. lubae* and *A. stellata* spp. nov. (Asparagaceae, Convallariaceae s.s.) from Indochina. *Nordic Journal of Botany* 31: 1–9.
http://dx.doi.org/10.1111/j.1756-1051.2013.00273.x

Averyanov, L.V. & Tillich, H.-J. (2013b) *Aspidistra truongii* – a new species of Asparagaceae (Convallariaceae s.str.) from southern Vietnam. *Taiwania* 58: 108–111.

Bergeron, J. & Drouin, G. (2008) The evolution of 5S ribosomal RNA genes linked to the rDNA units of fungal species. *Current Genetics* 54: 123–131.
http://dx.doi.org/10.1007/s00294-008-0201-2

Brauchler, C. & Ngoc, L.H. (2005) *Aspidistra renatae* (Ruscaceae), a new species from central Vietnam. *Blumea* 50: 527–529.
http://dx.doi.org/10.3767/000651905x622798

Charlton, W.A. & Posluszny, U. (1991) Meristic variation in *Potamogeton* flowers. *Botanical Journal of the Linnean Society* 106: 265 –293.
http://dx.doi.org/10.1111/j.1095-8339.1991.tb02295.x

Choob, V.V. (2010) *The role of positional information in regulation of development of floral organs and leaf series of shoots*. Binom, Moscow, 263 pp.

Choob, V.V. & Yurtseva, O.V. (2007) Mathematical modeling of flower structure in the family Polygonaceae. *Botanichesky Zhurnal* 92: 114–134.

Chun, W.Y. & How, F.C. (1977) *Aspidistra* Ker Gawl. *In:* Anonymous (Institute Botany of Guangdong Province), *Flora Hainanica* 4. Science Press, Beijing, pp. 114–115.

Conran, J.G. & Bradbury, J.H. (2007) Aspidistras, amphipods and Oz: niche opportunism between strangers in a strange land.

Plant Species Biology 22: 41–48.
http://dx.doi.org/10.1111/j.1442-1984.2007.00174.x
Cox, A.V., Bennett, M.D. & Dyer, T.A. (1992) Use of the polymerase chain reaction to detect spacer size heterogeneity in plant 5S-rRNA gene clusters and to locate such clusters in wheat (*Triticum aestivum* L.). *Theoretical and Applied Genetics* 83: 684–690.
http://dx.doi.org/10.1007/bf00226685
Degtjareva, G.V., Logacheva, M.D., Samigullin, T.H., Terentieva, E.I. & Valiejo-Roman, C.M. (2012) Organization of chloroplast *psb*A-*trn*H intergenic spacer in dicotyledonous angiosperms of the family Umbelliferae. *Biochemistry (Moscow)* 77: 1056–1064.
http://dx.doi.org/10.1134/s0006297912090131
De Wilde, W.J.J.O. & Vogel, A. (2006) A new species of *Aspidistra* (Convallariaceae) from Perak, Peninsular Malaysia. *Folia Malaysiana* 6: 125–130.
Endress, P.K. (1994) *Diversity and evolutionary biology of tropical flowers.* Cambridge University Press, Cambridge, 420 pp.
Endress, P.K. (1995) Major traits of monocot flowers. *In*: Rudall, P.J., Cribb, P.J., Cutler, D.F. & Humphries, C.J. (eds.) *Monocotyledons: systematics and evolution.* Royal Botanic Gardens, Kew, pp. 43–79.
Endress, P.K. (2011) Evolutionary diversification of the flowers in angiosperms. *American Journal of Botany* 98: 370–396.
http://dx.doi.org/10.3732/ajb.1000299
Endress, P.K. (2014) Multicarpellate gynoecia in angiosperms: occurrence, development, organization and architectural constraints. *Botanical Journal of the Linnean Society* 174: 1–43.
http://dx.doi.org/10.1111/boj.12099
Fang, D., Yen, K.C. & Zeng, L. (1993) Two new species of *Aspidistra* (Liliaceae) from Guangxi, China. *Acta Phytotaxonomica Sinica* 31: 180–183.
Filipowicz, N., Nee, M.H. & Renner, S.S. (2012) Description and molecular diagnosis of a new species of *Brunfelsia* (Solanaceae) from the Bolivian and Argentinean Andes. *Phytokeys* 10: 83–94.
http://dx.doi.org/10.3897/phytokeys.10.2558
Fukuhara, T., Nagamasu, H. & Okada, H. (2003) Floral vasculature, sporogenesis and gametophyte development in *Pentastemona egregia* (Stemonaceae). *Systematics and Geography of Plants* 73: 83–90.
González Gutiérrez, P.A., Köhler, E. & Borsch, T. (2013) New species of *Buxus* (Buxaceae) from northeastern Cuba based on morphological and molecular characters, including some comments on molecular diagnosis. *Willdenowia* 43: 125–137.
http://dx.doi.org/10.3372/wi.43.43115
Hall, T.A. (1999) BioEdit: a user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. *Nucleic Acids Symposium Series* 41: 95-98.
Hayata, B. (1912) *Icones plantarum formosanarum nec non et ontributions ad floram formosanam. 2*, Government of Formosa, Taihoku, 156 pp.
http://dx.doi.org/10.5962/bhl.title.24988
Hooker, J.D. (1892) *Flora of British India* 6. Gilbert & Rivington, London, 793 pp.
Kato, M. (1995) The *Aspidistra* and the amphipod. *Nature* 377: 293.
http://dx.doi.org/10.1038/377293a0
Ker Gawler, J.B. (1822) *Botanical Register* 8. S. Gosnell, London, t. 628.
La Frankie, J.V. (1986) Transfer of the species of *Smilacina* to *Maianthemum* (Liliaceae). *Taxon* 35: 584–589.
http://dx.doi.org/10.2307/1221922
Lang, K.Y. (1981) New taxa of the genus *Aspidistra* from China. *Acta Phytotaxonomica Sinica* 19: 379–385.
Lang, K.Y. & Zhu, Z.Y. (1982) New taxa of the genus *Aspidistra* (Liliaceae) from Sichuan. *Acta Phytotaxonomica Sinica* 20: 485–488.
Lang, K.Y. & Zhu, Z.Y. (1984) New taxa of the genus *Aspidistra* (Liliaceae) from Sichuan. *Acta Botanica Yunnanica* 6: 385–388.
Larsen, K. (1961) Studies in the flora of Thailand. Liliaceae, Triuridaceae, Trilliaceae, Iridaceae, Polygonaceae. *Dansk Botanisk Arkiv* 20: 37–54.
Li, G.Z. & Tang, S.C. (2002) New taxa of *Aspidistra* Ker-Gawl. from Guangxi, China. *Guihaia* 22: 289–291.
Liang, S. & Tamura, M.N. (2000) *Aspidistra. In*: Wu, Z.Y. &. Raven, P.H. (eds.) *Flora of China* 24. Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis, pp. 240–250.
Lin, C.-R. & Liu, Y. (2011) *Aspidistra longituba* (Ruscaceae), a new species from Guangxi, China. *Annales Botanici Fennici* 48: 519–521.
http://dx.doi.org/10.5735/085.048.0614
Lin, C.-R., Xu, W.-B. & Liu, Y. (2011) *Aspidistra albiflora* sp. nov. (Asparagaceae) from southwestern Guangxi, China. *Nordic Journal of Botany* 29: 443–446.
http://dx.doi.org/10.1111/j.1756-1051.2011.01257.x
Linder, H.P. & Rudall, P.J. (2005) Evolutionary history of Poales. *Annual Review of Ecology, Evolution, and Systematics* 36: 107–124.
http://dx.doi.org/10.1146/annurev.ecolsys.36.102403.135635
Linnaeus, C. (1753) *Species Plantarum.* Impensis Laurentii Salvii, Stockholm, 1200 pp.

Liu, Y., Kono, Y., Lin, C.-R., Xu, W.-B. & Peng, C.-I. (2011) *Aspidistra erecta* (Asparagaceae), a new species from limestone areas in Guangxi, China. *Botanical Studies* 52: 367–373.
http://dx.doi.org/10.1186/1999-3110-54-43

Lock, I.E., Ashurkova, L.D., Belova, O.A., Kvasha, I.G., Chashkina, N.B., Remizowa, M.V. & Sokoloff, D.D. (2009) A continuum between open and closed inflorescences? Inflorescence tip variation in *Potamogeton* (Potamogetonaceae: Alismatales). *Wulfenia* 16: 33–50.

Motohashi, K., Araki, I. & Nakashima, C. (2008) Four new species of *Phyllosticta*, one new species of *Pseudocercospora*, and one new combination in *Passalora* from Japan. *Mycoscience* 49: 138–146.
http://dx.doi.org/10.1007/s10267-007-0395-z

Narita, M. & Takahashi, H. (2008) A comparative study of shoot and floral development in *Paris tetraphylla* and *P. verticillata* (Trilliaceae). *Plant Systematics and Evolution* 272: 67–78.
http://dx.doi.org/10.1007/s00606-007-0642-y

Phonsena, P. & De Wilde, W.J.J.O. (2010) The genus *Aspidistra* Ker-Gawl. (Asparagaceae/Ruscaceae) in Thailand. *Thai Forest Bulletin (Botany)* 38: 48–58.

Pornpongrungrueng, P., Borchsenius, F. & Gustafsson, M.H.G. (2009) Relationships within *Blumea* (Inuleae, Asteraceae) and the utility of the 5S-NTS in species-level phylogeny reconstruction. *Taxon* 58: 1181-1193.

Remizowa, M.V., Sokoloff, D.D. & Kondo, K. (2007) Evolution of single-whorled perianth in Trilliaceae: Suppression versus loss of inner perianth whorl. *In*: Belousov, L.V. (ed.) *Cellular, Molecular and Evolutionary Aspects of Morphogenesis*. KMK Scientific Press, Moscow, pp. 132–134.

Remizowa, M.V., Sokoloff, D.D. & Rudall, P.J. (2010) Evolutionary history of the monocot flower. *Annals of the Missouri Botanical Garden* 97: 617–645.
http://dx.doi.org/10.3417/2009142

Ronse De Craene, L.P. (2010) *Floral diagrams: an aid to understanding flower morphology and evolution*. Cambridge University Press, Cambridge, 458 pp.
http://dx.doi.org/10.1017/cbo9780511806711

Ronse De Craene, L.P. & Smets, E. (1994) Merosity in flowers: definition, origin, and taxonomic significance. *Plant Systematics and Evolution* 191: 83–104.
http://dx.doi.org/10.1007/bf00985344

Ronse De Craene, L.P. & Smets, E. (1995) The androecium of monocotyledons. *In*: Rudall, P.J., Cribb, P.J., Cutler, D.F. & Humphries, C.J. (eds.) *Monocotyledons: Systematics and Evolution*. Royal Botanic Gardens, Kew, pp. 243-254.

Rudall, P.J., Cunniff, J., Wilkin, P. & Caddick, L.R. (2005) Evolution of dimery, pentamery and the monocarpellary condition in the monocot family Stemonaceae (Pandanales). *Taxon* 54: 701–711.
http://dx.doi.org/10.2307/25065427

Sang, T., Crawford, D.J. & Stuessy, T.F. (1997) Chloroplast DNA phylogeny, reticulate evolution, and biogeography of *Paeonia* (Paeoniaceae). *American Journal of Botany* 84: 1120-1136.
http://dx.doi.org/10.2307/2446155

Stapf, O. (1903) An enumeration of all the plants known from China Proper, Formosa, Hainan, Corea, the Luchu Archipelago, and the Island of Hongkong, together with their Distribution and Synonymy XV. *Botanical Journal of the Linnean Society* 36: 73–136.
http://dx.doi.org/10.1111/j.1095-8339.1903.tb00817.x

Steenis, C.G.G.J.v. (1982) *Pentastemona*, a new 5-merous genus of Monocotyledons from North Sumatra (Stemonaceae). *Blumea* 28: 151-163.

Takahashi, H. (1994) A comparative study of floral development in *Trillium apetalon* and *T. kamtchaticum* (Liliaceae). *Journal of Plant Research* 107: 237–243.
http://dx.doi.org/10.1007/bf02344250

Tang, S. & Liu, Y. (2003) *Aspidistra guangxiensis* (Convallariaceae), a new species from China. *Novon* 13: 480–482.
http://dx.doi.org/10.2307/3393385

Tang, S., Shu, H. & Li, G. (2003) ITS sequences of 8 *Aspidistra* species and its phylogenetic significance. *Journal of Guangxi Normal University (Natural Science)* 21: 86–90.

Tate, J.A. & Simpson, B.B. (2003) Paraphyly of *Tarasa* (Malvaceae) and diverse origins of the polyploid species. *Systematic Botany* 28: 723–737.

Tillich, H.-J. (2008) An updated and improved determination key for *Aspidistra* Ker-Gawl. (Ruscaceae, Monocotyledons). *Feddes Repertorium* 119: 449–462.
http://dx.doi.org/10.1002/fedr.200811174

Tillich, H.-J. & Averyanov, L.V. (2008) Two new species and one new subspecies of *Aspidistra* Ker-Gawl. (Ruscaceae) from Vietnam. *Feddes Repertorium* 119: 37–41.
http://dx.doi.org/10.1002/fedr.200711143

Tillich, H.-J. (2005) A key for *Aspidistra* (Ruscaceae), including fifteen new species from Vietnam. *Feddes Repertorium* 116: 313–338.
http://dx.doi.org/10.1002/fedr.200511076

Tillich, H.-J., Averyanov, L.V. & Dzu, N.V. (2007) Six new species of *Aspidistra* (Ruscaceae) from Northern Vietnam. *Blumea*

52: 335–344.
http://dx.doi.org/10.3767/000651907x609070
Tillich, H.-J. (2006) Four new species in *Aspidistra* Ker-Gawl. (Ruscaceae) from China, Vietnam and Japan. *Feddes Repertorium* 117: 139–145.
http://dx.doi.org/10.1002/fedr.200511091
Tillich, H.-J. & Averyanov, L.V. (2012) Four new species of *Aspidistra* Ker-Gawl. (Asparagaceae) from China and Vietnam with a comment on *A. longifolia* Hook.f. and *A. hainanensis* W.Y.Chun & F.C.How. *Gardens' Bulletin Singapore* 64: 201–209.
Tillich, H.-J., Leong-Škorničková, J. (2013) *Aspidistra jiewhoei* (Asparagaceae), a new species from north Vietnam. *Gardens' Bulletin Singapore* 65: 101–105.
Utech, F.H. & Kawano, S. (1976) Biosystematic studies on *Maianthemum* (Liliaceae-Polygonatae). *Botanical Magazine (Tokyo)* 89: 145–157.
http://dx.doi.org/10.1007/bf02488338
Vislobokov, N.A., Kuznetsov, A.N. & Sokoloff, D.D. (2013) A new species of *Aspidistra* (Ruscaceae s.l., Asparagales) from southern Vietnam, field observations on its flowering and possible pollination by flies (Phoridae). *Plant Systematics and Evolution* 299: 347–355.
http://dx.doi.org/10.1007/s00606-012-0725-2
Wan, Y. (1984) New species of Liliaceae from Guangxi. *Bulletin of Botanical Research (North-East Forest Institute of Harbin)* 4: 165–171.
Wan Y. & Huang, C.C. (1987) New species of the genus *Aspidistra* from Guangxi. *Guihaia* 7: 217–224.
Wiggers, F.H. (1780) *Primitiae Florae Holsaticae*. Litteris Mich. Frider., Kiliae, 114 pp.
Yurtseva, O.V. & Choob, V.V. (2005) Types of flower structure and pathways of their morphological transformation in Polygonaceae: The preliminary data for the model of floral development. *Byulleten' Moskovskogo Obshchestva Ispytatelei Prirody, Otdel Biologicheskiy (Bulletin of Moscow Society of Naturalists, Biological Series)* 110(6): 40–52.

APPENDIX. Accessions of *Aspidistra* used in molecular study and GenBank accession numbers. Voucher herbarium specimens are deposited in MW.

Taxon	Locality and collection date	Collectors and collection number	GenBank accession number, 5S-NTS	GenBank accession number, *psb*A-*trn*H
Aspidistra sp. 1	Vietnam, Lam Dong prov., Bao Lam distr., Loc Bac municipality, 12 km WNW from Loc Thang town, N 11° 43' 26", E 107° 42' 43', 30 Apr. 2012	*A.N. Kuznetsov, S.P. Kuznetsova, M.S. Nuraliev 637*	KF465787	KF465795
Aspidistra sp. 1	as above	*A.N. Kuznetsov, S.P. Kuznetsova, M.S. Nuraliev 637a*	KF465788	KF465796
Aspidistra sp. 1	as above	*A.N. Kuznetsov, S.P. Kuznetsova, M.S. Nuraliev 637b*	KF465789	KF465797
Aspidistra sp. 2	Vietnam, Dong Nai Prov., Vinh Cuu Distr., 50 km NNE from Bien Hoa, Dong Nai reserve, Ma Da forest district, N 11˚ 22' 43,7", E 107˚ 03' 41,1", 22 Nov. 2011	*N.A. Vislobokov P221111*	KF465784	KF465792
A. paucitepala	Vietnam, Lam Dong prov., Bao Lam distr., Loc Bac municipality, 12 km WNW from Loc Thang town, N 11° 43' 15", E 107° 42' 45", 30 Apr. 2012	*A.N. Kuznetsov, S.P. Kuznetsova, M.S. Nuraliev 638*	KF465790	KF465798
A. paucitepala	Vietnam, Lam Dong prov., Bao Lam distr., Loc Bac municipality, 12 km WNW from Loc Thang town, N 11° 43' 27", E 107° 42' 58", 06 Apr. 2013	*A.N. Kuznetsov, S.P. Kuznetsova, M.S. Nuraliev 771*	KF465791	KF465799
A. phanluongii	Vietnam, Dong Nai Prov., Vinh Cuu Distr., 50 km NNE from Bien Hoa, Dong Nai reserve, Ma Da forest district, N 11˚ 22' 43,7", E 107˚ 03' 41,1", 18 Dec. .2011	*N.A. Vislobokov 09*	KF465786	KF465794
A. phanluongii	as above	*N.A. Vislobokov 024*	KF465785	KF465793