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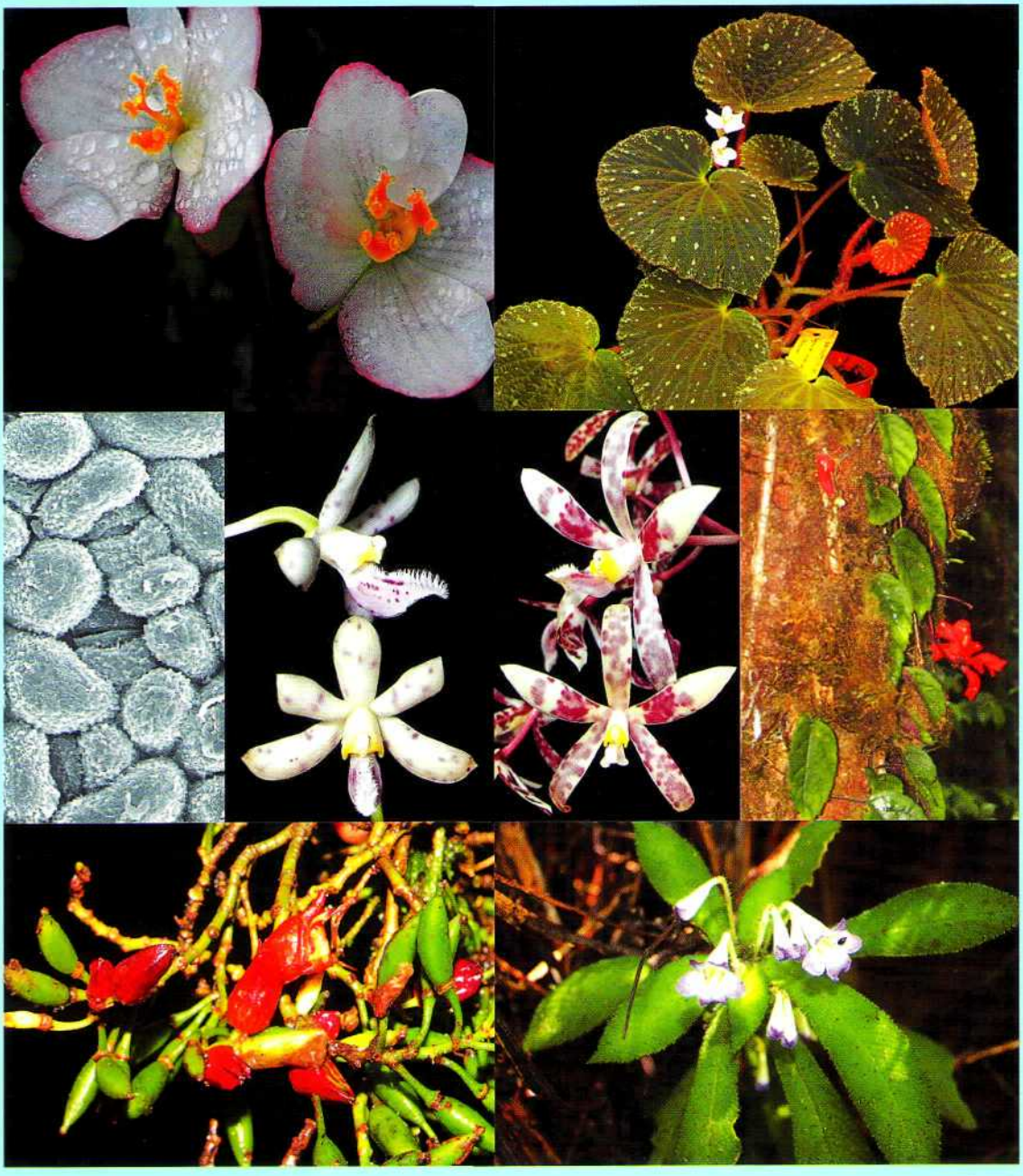

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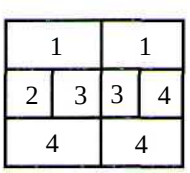

Cover images: 1. *Begonia holosericeoides* (female flower and habit) (Begoniaceae; Ardi *et al.); 2.* Abaxial cuticles of *Alseodaphne rhododendropsis* (Lauraceae; Nishida & van der Werff); *3. Dipodium puspitae, Dipodium purpureum* (Orchidaceae; O'Byrne); 4. *Agalmyla exannulata, Cyrtandra coccinea* var. *celebica, Codonoboea kjellbergii* (Gesneriaceae; Kartonegoro & Potter).

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CONSERVATION STATUS OF AMORPHOPHALLUS DISCOPHORUS BACKER & ALDERW. (ARACEAE) IN JAVA, INDONESIA

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ABSTRACT
YUZAMMI, WITONO, J. R. & HETTERSCHEID, W. L. A. 2014. Conservation status of *Amorphophallus discophorus* Backer & Alderw. (Araceae) in Java, Indonesia. *Reinwardtia* 14 (1): 27 − 33. — *Amorphophallus discophorus* Backer & Alderw. is one of the Javan endemic aroid species. This species is locally endemic to the slopes of Mount Wilis in Kediri Regency (East Java) at elevations between 600–1300 m. Poorly known species like *A. discophorus* could easily become extinct if not distinguished from other species, such as *A. muelleri*, that are used for commercial purposes. The conversion of natural forests for agriculture over the last decade has resulted in a loss of suitable habitat for this species. Several field trips undertaken to locate natural populations of this species have proved unsuccessful. Based on these field exercises, *A. discophorus* is regarded as presumed extinct in the wild.

Key words: *Amorphophallus discophorus*, Araceae, East Java, extinct, Mount Wilis.

ABSTRAK
YUZAMMI & WITONO, J. R. & HETTERSCHEID, W. L. A. 2014. Status konservasi *Amorphophallus discophorus* Backer & Alderw. (Araceae) di Jawa, Indonesia. *Reinwardtia* 14 (1): 27 − 33. — Salah satu jenis endemik yang berasal dari Jawa adalah *Amorphophallus discophorus* Backer & Alderw. Jenis ini merupakan jenis endemik yang ditemukan di lereng Gunung Wilis di Kabupaten Kediri, Jawa Timur pada ketinggian antara 600 – 1300 m. Pengetahuan dan pengenalan jenis *A. discophorus* sangat sedikit diketahui dan hal ini sangat mudah menjadikannya punah apabila tidak dapat membedakannya dengan jenis lain seperti *A. muelleri*, yaitu jenis yang telah lama dimanfaatkan untuk tujuan komersial. Dalam dekade terakhir banyak sekali ditemukan alih fungsi hutan menjadi lahan pertanian sehingga menyebabkan habitat yang sesuai untuk jenis ini menjadi hilang. Beberapa studi lapangan telah dilakukan untuk mengetahui populasi jenis ini di alam dan hasilnya tidak menemukan satupun jenis ini di habitat aslinya. Berdasarkan studi lapangan tersebut maka dapat dikatakan bahwa jenis ini telah punah di alam.

Kat**a Kunci**: *Amorphophallus discophorus*, Araceae, Jawa Timur, Gunung Wilis, punah.

INTRODUCTION

The genus *Amorphophallus* (Araceae – Thomsonieae) was established by Blume (1836-1837) and fully revised by Engler (1911). Since then, several authors, for example, Bogner *et al.* (1985); Hetterscheid (1994), and Hetterscheid and Ittenbach (1996), have partly reviewed or discussed the genus and have described some new species (Yuzammi, 2009).

This genus comprises *ca*. 200 species, distributed from West Africa, the subtropical eastern Himalayas throughout subtropical and tropical Asia into the tropical western pacific and north-east Australia (Sedayu *et al*., 2010; Boyce *et al*., 2012), of which 25 species (12.5%) are recorded for Indonesia. About 17 species (68%) of Indonesian *Amorphophallus* are endemic, of which eight species occur in Sumatera, five species occurs in Java, three species occurs in Kalimantan and one species occurs in Sulawesi (Hetterscheid & Ittenbach, 1996).

Within the Indonesian Archipelago, Java is floristically the best known. It was the first large Malesian area to be botanically explored. The immense anthropogenic pressures on the flora of Java have directly resulted in the degradation of plant diversity of this island, largely because of the extensive land conversion over many decades.

The genus *Amorphophallus* is characterized as having a spadix consists of unisexual flowers, female flowers towards the base and male towards

the apex and a spathe divided into a limb and convolute lower tube (Mayo *et al*., 1997). The spadix usually consists of numerous flowers that are sessile and very small. The female zone lies below the male zone and the appendix is located above the male zone. In general, the anthesis of female flowers is earlier than male flowers therefore the opportunity for self-pollination is limited. The pollination of species of *Amorphophallus* usually depends on insect pollinators such as beetles.

There are eight species of *Amorphophallus* known to occur in Java, namely, *A. annulifer* Hett., *A. decus-silvae* Backer & Alderw., *A. discophorus* Backer & Alderw., *A. muelleri* Blume, *A. paeonii-folius* (Dennst.) Nicolson, *A. sagittarius* Steenis, *A. spectabilis* (Miq.) Engl. and *A. variabilis* Blume. Of these eight species, the following five are recognized as endemic: *A. annulifer, A. decus-silvae, A. discophorus, A. sagittarius* and *A. spectabilis* (Yuzammi, 2009).

It is mentioned in the protologue (Alderwerelt van Rosenburgh, 1920) that the species had only been found in Mount Wilis, Kediri Regency, East Jawa (Hetterscheid & Ittenbach, 1996; Yuzammi, 2009). The rapid development of the area surrounding of Mount Wilis has threatened the natural populations of *A. discophorus*. Several recent field studies failed to locate natural populations of *A. discophorus*. This study of *A. discophorus* was funded by the Incentive Programs of Researchers and Engineer – Indonesian Institute of Sciences to the first and second authors. The remaining endemic species will be studied under other schemes.

DESCRIPTION

AMORPHOPHALLUS DISCOPHORUS Backer & Alderw., Bull. Jard. Bot. Buitenz. 3rd ser., vol. 1 (1920) 371; Backer, De Trop. Nat. 9(1) (1920) 23, figs. 5, 6; Bakhuizen v.d. Brink, Fl. of Java vol. 3 (1968) 112. — Syntypes: *Backer* nrs. 11463bis, 11470, 11563 (BO, all), Indonesia, Java, Mt. Wilis (eastern ridges, above Kediri), alt. 1200-1300 m., 11 - 15 February 1914.

Tuber depressed-globose. *Leaf* solitary; petiole 80 – 120 cm long, green with dark brown and greyish spots, the basal part rugose; *lamina ca*. 100 – 150 cm in diam; *terminal segments* elliptic or oblong-lanceolate, up to *ca*. 20 cm long, *ca.* 6 cm in diam, long acuminate, base abruptly and long decurrent. *Inflorescence* solitary, long peduncled; *peduncle* 80 – 150 cm long, rest as petiole; *spathe* ovate, *ca.* 15 – 20 cm long, *ca.* 7.5 – 14 cm in diam, acute or obtuse, sometimes shortly apiculate, outside base dull dark green with scattered whitish dots, upper part dirty greyish purple with scattered, faint paler dots, the margin darker, inside base pale yellowish green, then a narrow zone of purple with a distinct greyish waxy layer, the limb glossy dark maroon, base within with small, conical, obtuse verrucae. *Spadix* sessile, shorter or slightly longer than spathe, *ca*. 14 – 20 cm long; *female zone* cylindric, *ca.* 3 – 4 cm long, *ca*. 1.5 cm in diam, flowers congested; *male zone* obconic with a central, disciform swollen part, *ca*. 2 – 2.5 cm long, *ca*. 1 cm in diam at the base and 1.3 cm at the top, disc *ca.* 2 cm in diam, top roofed against the base of the appendix, flowers congested; *appendix* sessile, elongate conic, base truncated, broadly expanded (annuliform) and concave, *ca*. 10 – 15 cm long, *ca*. 2 – 3.5 cm in diam at the middle, surface verruculate, cream, yellowish green or dirty purple with a yellowish base, top obtusish or acutish, producing a heavy gas-like smell at female anthesis. *Ovaries* depressed or obovate, subcircular or angulate in cross section, 3 – 4 mm in diam, *ca*. 2 mm long, depressed in the middle, lower half yellowish green, upper half blackish purple and with a grooved surface, 2-locular, one basal ovule per locule; *style* 1 – 2 mm long, *ca*. 1 mm in diam at the base, dark purple; *stigma* conical, obtuse, *ca*. 1 mm high, *ca*. 1 mm in diam, bright yellow or brown, shalowly 2-lobed, lobes obtuse, surface echinulate; *male flowers* consisting of 3 – 4 stamens; *stamens ca*. 2.5 mm long; *filaments ca*. 1.5 mm long, connate; *anthers* truncate or slightly rounded, *ca*. 1 mm long, *ca*. 1 – 2 mm in diam, yellow, pores apical, elongate. Pollen striate. Fruits red.

Distribution. *Amorphophallus discophorus* is locally endemic species as cited in type specimen and only found around Mount Wilis, East Java, Indonesia at secondary forest, 600 – 1.300 m alt.

Additional specimens. *Hetterscheid H. AM.* 537 (L), Central Java, Mt. Wilis (orig. coll. Sizemore & Hambali 95-005, cult. in Leiden Bot. Garden).

Notes. In nearly all respects, *A. discophorus* resembles *A. annulifer* Hett. from West Java. The latter species lacks the disc in the male zone and in large specimens the appendix is much longer than the spathe. From the syntypes, only Backer 11463bis could be located in BO. Unfortunately in this specimen the entire male zone is destroyed.

RESULT AND DISCUSSION

Amorphophallus discophorus can be distinguished from others Javanese *Amorphophallus* by having swollen disc-like in male zone. It means that something with a round shape resembling a flat

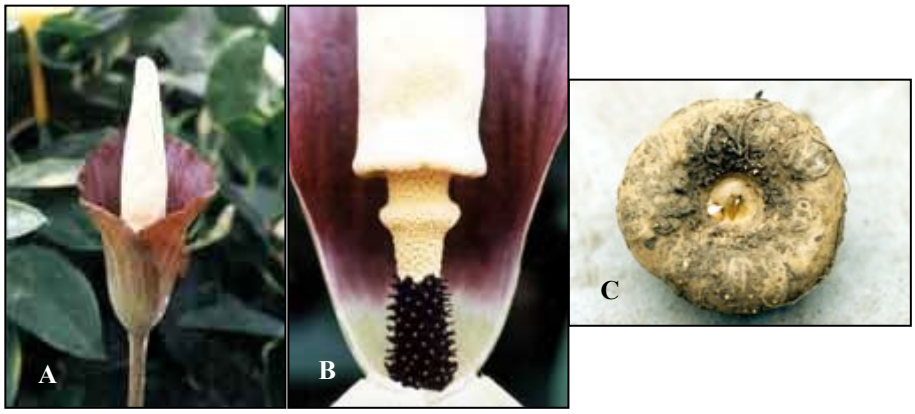

Fig. 1. *Amorphophallus discophorus*: inflorescence (A), spadix with swallon disc-like in male zone, a part of spathe removed (B), tuber (C). (Photo: Wilbert Hetterscheid).

circular plate about in the middle of male zone.

According to the protologue *A. discophorus* only occurs in the area surrounding Mount Wilis. Mount Wilis is an inactive volcano at an altitude 2.563 m asl (Anonymous, 2013). The peak of Mount Wilis is shared by six regencies namely Kediri Regency (the eastern part of Mount Wilis), Tulungagung Regency (the southeast part of Mount Wilis), Trenggalek Regency (the southern part of Mount Wilis), Ponorogo Regency (the western part of Mount Wilis), Madiun Regency (the northwest part of Mount Wilis) and Nganjuk Regency (the northern part of Mount Wilis). Five of six regencies (excluding Trenggalek Regency) located at the slopes of Mount Wilis have been explored (Table 1) in an effort to find *A. discophorus*.

The first fieldwork conducted in 1998–1999 in the foot hills of Mount Wilis at Kediri Regency failed to find *A. discophorus*. Ten years later, a second round of fieldwork was conducted at two locations on the slope of Mount Wilis at Kediri Regency. The areas are managed by BKPH (Division of Forest Management Unit) Kediri and KPH (Forest Management Unit) Kediri and are located at Badut Village and Ampel Gading Village in Mojo District, Kediri Regency at an altitude of 727 – 835 m. It was also not possible to encounter the species during the second attemp. In the following year, another field work was carried out at Parang Village, Banyakan District in Kediri Regency at an elevation of 500 – 900 m asl. It was also unsuccessful.

In 2010, the fieldwork was undertaken in a location managed by BKPH Wilis Barat, KPH Lawu Ds (Wagir Lor Village, Ngebel District, Ponorogo Regency at an altitude of 753-800 m) in both secondary and disturbed primary forests. However, it was also unsuccessful. In 2011, subsequent work was conducted in Nganjuk Regency and Madiun Regency. The latest fieldwork was conducted in April 2013 in Madiun Regency. None of the field studies were successful.

The failure to locate *A. discophorus* in the wild is probably caused by several factors. Firstly, most of secondary forest on the slopes of surrounding Mount Wilis has been converted into plantations such as timber, cassava and maize plantations in the last decades. These plantations are still in operation and it is here concluded that the land conversion probably damaged the habitat of the species.

Secondly, the forest fire destroyed the forests on the slopes of Mount Wilis in 2009. Roqib (2009) mentioned that the fire started at RPH Sugihan, KPH Kediri in Kediri Regency at the elevation of 1.200–1.300 m. The fire continued to spread up to BKPH North Wilis and KPH Lawu. The fire has destroyed at least 90 ha of the slope of Mount Wilis. In the following years several forest fires occurred on Mount Wilis. In 2012, for example, a forest fire destroyed the forests on the western slope of Mount Wilis. This time the fire occurred in BKPH Dungus, Madiun Regency (Efendi, 2012). Forest fires that occurred on the slopes of Mount Wilis have damaged forest land and left the land in a critical condition. Futhermore, Mayo *et al.* (1997) mentioned that fire is very destructive and the removal of the forest favours the invasion of weedy plants which prevent the regeneration of the great majority of forest inhabiting Araceae. In this case, the fires not only burnt all of the growing plants of *A. discophorus*, but it also damaged tubers of this species.

Finally, the inadequate knowledge of local people of the distinguishing features of *A. discopho-*

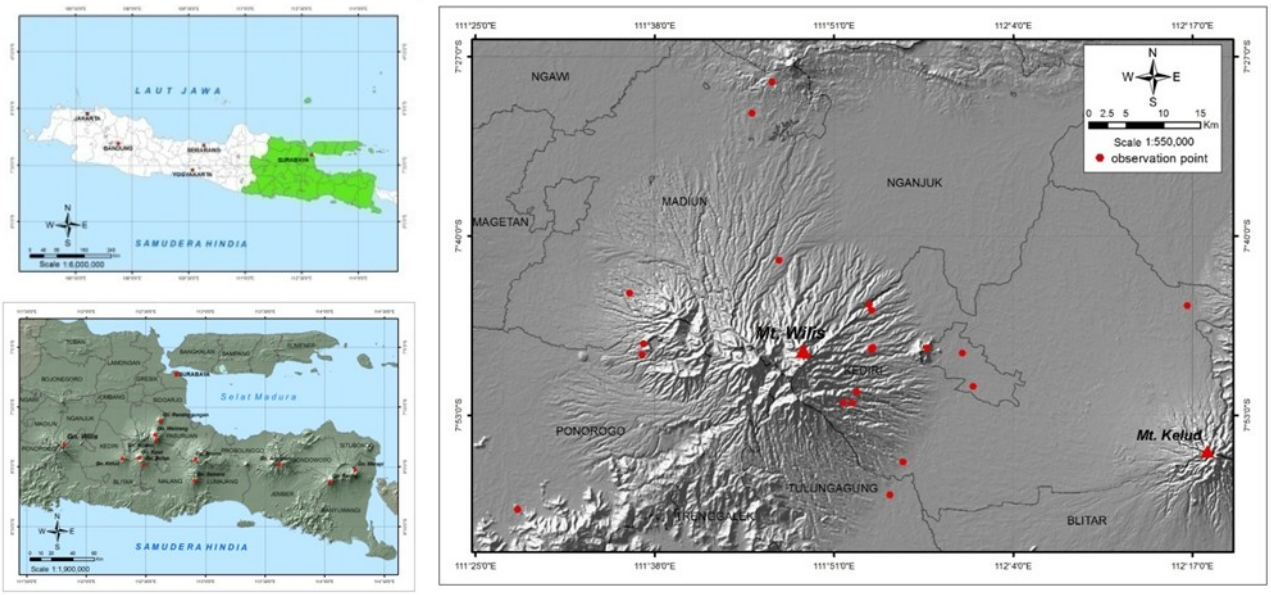

Fig. 2. Left – Java map (above) and East Java map (below); Right –The localities of fieldwork surrounding of Mount Wilis (red dots).

Fig. 3. Slope of Mount Wilis at Kediri Regency, East Java. Almost all of the secondary forest has been destroyed.

rus meant that it has been mistakenly harvested as of *A. muelleri*, its commercially grown relative. Apparently, the tuber size of *A. discophorus* is similar to *A. muelleri*. People who live on the slopes of Mount Wilis and surrounding areas mention that excessive harvesting of porang (*A. muelleri*) and other related species were carried out from 2007–2009. All tubers of *Amorphophallus* were sent directly to Surabaya and then processed into flour for export purposes. It is assumed that only tubers of *A. muelleri* were selected and processed, whereas tubers of other species (including *A. discophorus*) were removed and discarded. Flour of *A. muelleri* is known as the most valuable flour due to of its high glucomannan content (Sumarwoto, 2007). Nowadays, *A. muelleri* is cultivated in plantations in certain locations in East Java as the demand for flour of the species has increased.

CONCLUSION

Based on the field observations, *A. discophorus* is presumably extinct or, at the very least, locally extinct. Further searches for and field studies of natural populations of *A. discophorus* are required to clarify the conservation status of the species. Recommended localities that should be searched include the Trenggalek Regency, Tulungagung Regency and some areas in Kediri Regency.

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Table 1. Fieldwork localities to assess *A. discophorus* population surrounding Mount Wilis in East Java .

No	Localities	No. of Population	Year	Latitude	Longitude	Altitude (m asl)
1.	Badut Village, Mojo District, Kediri Regency, East Java	0	2009	S: 07° 51′ 19.0″	E: 111° 52′ 40.2″	735
2.	Ampel Village, Mojo District, Kediri Regency, East Java	0	2009	S: 07° 52′ 07.1″	E: 111° 52′ 21.0″	727
3.	Block 164A, RPH Kediri, KPH Kediri, Ampel Village, Mojo District, Kediri Regency, East Java	0	2009	S: 07° 52′ 05.9″	E: 111° 51′ 43.0″	835
4.	Jeli Village, Karangrejo District, Tulung Agung Regency, East Java	0	2009	S: 07° 58′ 47.7″	E: 111° 55′ 03.9″	105
5.	Padas Village, Dagangan District, Madiun Regency, East Java	0	2009	S: 07° 44′ 09.2″	E: 111° 36′ 11.8″	315
6.	Klepu Hamlet, Parang Village, Banyakan District, Kediri Regency, East Java	0	2010	S: 07° 48′ 10.50″	E: 111° 53′ 44.52″	585
7.	Goliman Hamlet, Parang Village, Banyakan District, Kediri Regency, East Java	0	2010	S: 07° 48′ 06.46″	E: 111° 53′ 50.82″	500
8.	Goliman Hamlet, Parang Village, Banyakan District, Kediri Regency, East Java	0	2010	S: 07° 48′ 14.94″	E: 111° 53′ 43.80″	900
9.	Ngebek lake, Wangir Lor Village, Ngebel District, Ponorogo Regency, East Java	0	2010	S: 07° 47′ 49.91″	E: 111° 37′ 12.02″	753
10.	Wangir Lor Village, Ngebel District, Ponorogo Regency, East Java	0	2010	S: 07° 48′ 36.72″	E: 111° 37′ 5.41″	800
11.	Pasar Kandangan, Kediri Regency, East Java	0	2011	S: 07° 45′ 41″	E: 112° 16′ 38″	349

Table 1. Fieldwork localities to assess *A. discophorus* population surrounding Mount Wilis in East Java (continued)

12.	Ngudikan Village, Wilangan District, Nganjuk Regency, East Java	0	2011	S: 07° 33′ 744″	E: 111° 50′ 224″	76
13.	Mancon Village, Wilangan District, Nganjuk Regency, East Java	0	2011	S: 07° 33′ 719″	E: 111° 49′ 274″	81
14.	Sudimoro Harjo Village, Wilangan District, Nganjuk Regency, East Java	0	2011	S: 07° 40′ 106″	E: 111° 47′ 002″	311
15.	Krajan Hamlet, Siwalan Village, Sawahan District, Nganjuk Regency, East Java	0	2011	S: 07° 41′ 924″	E: 111° 47′ 541″	394
16.	Kebun Agung Village, Sawahan District, Nganjuk Regency, East Java	0	2011	S: 07° 41′ 428″	E: 111° 48′ 586″	317
17.	Kebun Agung Village, Sawahan District, Nganjuk Regency, East Java	0	2011	S: 07° 41′ 450″	E: 111° 48′ 740″	296
18.	Kuncir Hamlet, Kuncir Village, Ngetos District, Nganjuk Regency, East Java	0	2011	S: 07° 41′ 655″	E: 111° 50′ 666″	176
19.	Sumberbendo Village, Saradan District, Madiun Regency, East Java	0	2013	S: 07° 28′ 50″	E: 111° 46′ 31″	305
20.	Klangan Village, Saradan District, Madiun Regency, East Java	0	2013	S: 07° 31′ 07″	E: 111° 45′ 04″	376
21.	Padas Village, Dagangan District, Madiun Regency, East Java	0	2013	S: 07° 59′ 51″	E: 111° 28′ 05″	318

INSTRUCTION TO AUTHORS

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