



Typification of Angiospermae described from the Bonin Islands 1: Metachlamydeae

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Abstract

During the preparation of a database of plant specimens from the Bonin Islands, Japan, we found several cases in which type material for taxa described from the islands was uncertain. This is either because specimens were not cited, because cited specimens in protologues include multiple collections, or because the citations contained ambiguous locality and/or collector data. Thus, many Bonin Islands species require typification. Here, lectotypes are newly designated or reconfirmed for 10 taxa, based on the herbarium materials of Metachlamydeae at the Botanical Gardens section of TI Herbarium, the University of Tokyo.

Key words: Apocynaceae, Asteraceae, Convolvulaceae, Ericaceae, Loganiaceae, Myrsinaceae, Ogasawara, Rubiaceae, Sapotaceae, typification, nomenclature

Introduction

The Bonin Islands, also known as Ogasawara-Shoto, are an archipelago of subtropical islands situated in the Pacific Ocean, approximately 1000 km south of Tokyo, Japan. They consist of more than 30 islands arranged in four island-groups: the Mukojima, Chichijima, Hahajima, and Iwotoh (Volcanic) islands, from north to south. The Bonin Islands are volcanic in origin, having been formed from boninite or dacite that rose from the Pacific basin floor, and have never been connected to another landmass (Ishizuka 2008). Despite being small islands without high mountains (total area 106 km²: the highest elevation 804 m on Kita-Iwotoh, the second highest elevation 463 m on Hahajima), ca. 500 species of vascular plants, including many endemic species of spermatophytes (Gymnospermae: one sp., Monocotyledoneae: 36 spp., Archichlamydeae: 53 spp. and Metachlamydeae: 39 spp.; Ono & Kobayashi 1985) and pteridophytes (over 20 spp.; Ohba 1971), have been recorded. Several groups (*Pittosporum*, *Crepidiastrum*, *Callicarpa*, *Machilus* and *Symplocos* etc.) have diversified through adaptive radiation across the islands (Ito 1998). Consequently, the Bonin Islands have been called the "Galapagos of the Orient" and were designated a Natural World Heritage site in 2011. However, many endemic species are now endangered, and a few have already become extinct due to recent human activities (Toyoda 1983). To gain a better understanding of the flora of the islands, we initiated the "Oceanic Islands Plant Specimen Database" in cooperation with four Japanese herbaria (KAG, MAK, RYU, and TI). During this work, we became aware of several plant taxa that were not typified.

According to the expedition records (Bongard 1837; Hooker & Arnott 1841; Kittlitz 1844), a British expedition in 1827 was the first botanical research and gathered several specimens on Chichijima, some of which are now kept at the Kew Herbarium. Botanists from Russia and the United States conducted explorations, Russia in 1828 and 1854 and the U.S. in 1854 (Wilson 1919; Nakai 1928a). In 1879, a Japanese

botanical research team from Tokyo Imperial University (the University of Tokyo) made a large collection that was deposited in the University Herbarium, with duplicates sent to C.J. Maximowicz (1827–1891, St. Petersburg, Russia) for identification (Tuyama 1941). Since then, the flora of the Bonin Islands has been intensively investigated by Japanese botanists, and many new species were described before World War II. However, in some cases, the types of the described taxa were either not designated or incorrectly cited in their protologues. An illustrated field guide (Toyoda 1981) written by the Bonin Islands Forestry office staff was significant in identifying specimens for lectotypification, as it included protologue citations and enumerated the type specimens of most endemic species in the Bonin Islands. However, validity of some typifications in Toyoda (1981) remains doubtful, because he did not specify collection date of all specimens. Therefore, a careful reexamination of the type specimens based on the current International Code of Botanical Nomenclature (ICBN Vienna code in 2005; McNeill *et al.* 2006) is required.

After a thorough investigation of related literature and herbaria, we clarified several nomenclatural problems of Metachlamydeae species, although those of Archichlamydeae are currently under investigation. Here, lectotypes of 10 taxa, five of whom are endemic to the Bonin Islands, are designated or reconfirmed with notes on the reason for our decisions. The images of all specimens from the Bonin Islands kept in TI, including the newly designated lectotype and other types, are contained in the database of the University of Tokyo Herbarium (TI: see URL).

Materials and methods

Many candidate type specimens of the names of taxa described from the Bonin Islands are kept at TI, the Kyoto University Herbarium (KYO) or both, as the initial taxonomic studies were mainly conducted by the botanists of these herbaria. In TI, the specimens of Pteridophyta, Gymnospermae and Metachlamydeae are kept in the Botanical Gardens section, and those of Archichlamydeae and Monocotyledoneae are in the University Museum section, respectively. In this paper, we first investigated all Metachlamydeae specimens from the Bonin Islands at TI and KYO, paying special attention to the label data and the handwritings of the identifier, in reference to protologues, type citations in Toyoda (1981) and other related literature following the ICBN (McNeill *et al.* 2006). As the result, 10 untypified taxa were revealed.

In the course of our investigation, we identified the handwritings of J. Matsumura and R. Yatabe based on Tuyama (1941), and examined those of B. Hayata, G. Koidzumi, T. Nakai and T. Tuyama by comparing their handwriting on other specimen labels with their writings. Of these, T. Tuyama was sometimes spelled “T. Tsuyama” on the specimen labels filled by himself. When we cite some sentences from the protologue, we kept the original sentences as they were, even if they included English words that were incorrectly spelled or translated by old style Japanese pronunciation. For the literature and labels that were written only in Japanese, we translated them into English if necessary. For type material deposited at TI, the specimen number in the TI database is indicated below.

Typification and taxonomy

Taxa are arranged by family, following the APG III system (APG III 2009). Names accepted in the Flora of Japan (Iwatsuki *et al.* 1993–1995) are shown in bold face.

Ericaceae

Rhododendron boninense Nakai (1920: 324)

Lectotype (designated here)—JAPAN: Bonin Chichijima Tsutsuji-yama: 8 July 1920, *T. Nakai s.n.* (TI [43237a]!; isolectotype: TI [43237b]!).

Distribution: Japan (Chichijima in the Bonin Islands).

Rhododendron boninense was described as a new taxon in Japanese, without citation of specimens (Nakai 1920). In the description of morphological characters of the species, Nakai mentioned that he examined withered flowers with stamens and a pistil because the flowering season was over. The following year, the species was redescribed in Latin based upon specimens collected from Tsutsuji-yama on Chichijima by T. Nakai and H. Toyoshima (Nakai 1921). Toyoda (1981) and Yamazaki (1996) considered that the Nakai's (1921) description of the species was valid and recognized the specimen with flowers (*H. Toyoshima s.n.*, 1921, TI) as the holotype of the species. However, ICBN Art 36.1. states that after 1 January 1935 the name of a new taxon must be accompanied by a Latin description or diagnosis or by a reference to a previously and effectively published Latin description or diagnosis (McNeill *et al.* 2006). Conversely, names with a description or diagnosis written in Japanese are valid before 1935. Therefore, the valid publication of this taxon is not Nakai (1921) but Nakai (1920). In this case, no claim can be made that the specimen collected by H. Toyoshima in 1921 is the holotype. The specimen (*T. Nakai s.n.*, 8 July 1920, TI) collected in Tsutsujiyama on Chichijima, which consists of two branches with withered flowers, is consistent with the original description in Japanese (Nakai 1920). Therefore, we choose the larger of the two branches as the lectotype.

Primulaceae (Myrsinaceae)

Rapanea maximowiczii Koidz. (1918: 250) var. ***okabeana*** (Tuyama) T. Yamazaki (1993: 77)

R. okabeana Tuyama (1938a: 465–466).

Manglilla okabeana (Tuyama) Nakai (1943: 135); Nakai (1941: 525 & 527)[*nom. nud.*].

Myrsine okabeana (Tuyama) E. Walker (1954: 250).

Lectotype (designated here) —JAPAN: Bonin Chichijima Takeda-bokujyo: 1 Mar. 1938, *T. Tuyama s.n.* (TI [43381]!; isolectotype: TI [43382]!).

Distribution: Japan (Bonin Islands).

In the protologue of *Rapanea okabeana*, Tuyama (1938a) cited “Spec. exam. Bonin: Titizima in silvis siccis in Takeda-bokuzyo (leg. M. Okabe, Oct. 1936); ibidem (leg. T. Tuyama, Mart. 2, 1938—Typus in Herb. Univ. Imp. Tokyo)”. Later Walker (1954) published a new combination, *Myrsine okabeana* (Tuyama) E. Walker with the citation “Type: Takasi Tuyama, Mar. 2 [!],¹⁵⁾ 1938 in ‘Bonin: Titizima in silvis siccis in Takeda-bokuzo,’ in the University of Tokyo herbarium”. In the annotation ¹⁵⁾ of the citation, he also noted “In my examination of specimens in Tokyo I found none dated Mar. 2, but did find one dated Mar. 1. This is apparently a duplicate of the specimen kindly sent me by the collector and discussed in my revision (29, p. 206)”. Toyoda (1981) cited the specimen (*T. Tuyama s.n.*, 1938, TI) as the type, without a collection date. We could not find the specimen cited as the type in the protologue. However, two duplicated specimens (1 Mar. 1938, *T. Tuyama s.n.*), collected at Takeda-bokujyo, Chichijima Island, were found at TI. Following the ICBN Art. 9.15., the specimen selected here as the lectotype of this taxon (TI database number: 43381) consists of a solitary branch, eliminating possible confusion from multiple gatherings (ICBN Art. 8.3.).

Sapotaceae

Planchonella obovata (R.Br.) Pierre (1890: 35) var. ***dubia*** (H.Hara) T. Yamazaki (1993: 98)

Sideroxylon dubium Koidz. ex Nakai (1928b: 7) [*nom. nud.*]; Nakai (1930: 261) [*nom. nud.*].

Pouteria obovata (R.Br.) Baehni (1942: 324–326) var. *dubia* H.Hara (1948: 100).

Planchonella obovata (R.Br.) Pierre (1890: 35) var. *dubia* (H.Hara) Hatusima (1973: 30) [*comb. nud.*].

Lectotype (designated here) —JAPAN: Bonin Chichijima: Jan. 1918, *S. Nishimura 31* (TI [43571a]!; isolectotypes: TI [43571b]! and TI [43571c]!). Original material—JAPAN: Bonin Chichijima Takeda-bokujyo: 1 July 1917, *S. Nishimura s.n.* (KYO!).

Distribution: Japan (Bonin Islands, Daito Islands).

Nakai (1928b, 1930) first reported this taxon as “*Sideroxylon dubium* Koidzumi”, but this name was *nomen nudum*. Hara (1948) validly published *Pouteria obovata* (R.Br.) Baehni var. *dubia* H.Hara, with a short description

consisting of two Latin words, and cited the name of *S. dubium* Koidz. ex Nakai (1928b). Hara (1984) did not cite any specimens, but circumstantial evidence suggests that the specimens annotated by G. Koidzumi before 1928 should be considered original material for this variety. In each of TI and KYO, a specimen identified as “*Sideroxylon dubium* Koidzumi” with the handwriting of G. Koidzumi was found. When Hara (1948) published the name, he was a professor at TI. Therefore, the largest of three branches of the specimen at TI (*S. Nishimura 31*, January 1918) is selected as the lectotype.

Apocynaceae

Trachelospermum gracilipes Hooker (1882: 668) var. *liukiense* (Hatus.) Kitamura (1962: 148).

Distribution: Japan (Bonin Islands, Ryukyu Islands, Yakushima), Taiwan (Lanyu Island).

= *T. jasminoides* Lemaire (1851: pl. 61) subsp. *foetidum* Matsumura & Nakai (1908: 153)

T. foetidum (Matsum. & Nakai) Nakai (1922: 21–22).

Lectotype (designated here) —JAPAN: Bonin Hahajima Chibusaya-yama: 6 Aug. 1905, *H. Hattori s.n.* (TI [44050]!).

In the first publication of *Trachelospermum jasminoides* Lem. subsp. *foetidum* Matsum. & Nakai (1908) and its subsequent treatment by Nakai (1922), no specimen was cited and no information on a collector or locality was provided. But Nakai (1922) cited “*T. jasminoides*, (non Lemaire) in Hattori (1908)”. Hattori (1908), which was published in June, was based on the specimens gathered by H. Hattori in the Bonin Islands in 1905. In relation to this publication, we found one specimen (*H. Hattori s.n.*, 6 Aug. 1905) at TI. Because there are no other expedition records of the botanical research in the Bonin Islands from 1906 to 1911 (Tuyama 1970; Nakai 1928b), and because Matsumura & Nakai (1908) was published on November, Matsumura & Nakai (1908) must have been based on the Hattori’s specimen at TI. Thus, although this specimen contains neither J. Matsumura’s nor T. Nakai’s handwritten labels on it, it is considered as the original material of this taxon and is designated as the lectotype.

Loganiaceae

Geniostoma glabrum Matsumura (1901: 41)

Lectotype (designated here) —JAPAN: Bonin: without date, without collector’s name “33. Bonin Max” (TI [44046a]!); isolectotype: TI [44046b]!). Syntypes—JAPAN: Bonin: 9 Dec. without year, without collector’s name (TI [44047]!); Bonin: without date, without collector’s name (TI [44048]!).

Distribution: Japan (Bonin Islands).

= *G. kasyotense* Kanehira & Sasaki (1934: 400–401).

In the protologue of *Geniostoma glabrum*, Matsumura (1901) cited a single specimen as “Hab. ins. Bonin (K. Sawada et T. Uchiyama)”. Toyoda (1981) cited the specimen (*Sawada and Uchiyama s.n.*, 1879, TI) as the type. However, no specimens that have these two collectors’ names on the label have been found in any herbaria. One of the collectors, T. Uchiyama, was known as an assistant in the Japanese botanical research team of Tokyo Imperial University, which conducted field expeditions in the Bonin Islands in 1879 (Nakai 1928a). Most specimens collected during the expedition lack information about locality, collection data and collectors on the label (Tuyama 1941). However, a decision as to whether the specimens were actually collected in 1879 can be made based on the label data and the handwritings of the identifier. For example, the abbreviation “Max”, on labels and in descriptions, indicates specimens whose duplicates were sent to C.J. Maximowicz (Tuyama 1941). Three specimens, which were labelled with J. Matsumura’s handwriting as “*Geniostoma glabrum* Matsum.”, were kept at TI and one of them was marked with R. Yatabe’s handwriting “33. Bonin Max”. As J. Matsumura worked at TI and R. Yatabe was one of the major members of the 1879 Japanese botanical research team, we choose the one with flowers of two branches of this specimen (“33. Bonin Max”) as the lectotype.

Rubiaceae

Psychotria boninensis Nakai (1927: 560).

P. macrophylla Hayata (1920: 62) [*nom. illeg. non P. macrophylla* Ruiz & Pav. (1799: 56)].

Lectotype (designated here)—JAPAN: Bonin Chichijima Futago-yama: 22 July 1905, *H. Hattori s.n.* (TI [44077]!). Syntypes—JAPAN: Bonin Chichijima Renjyudani: 14 July 1905, *H. Hattori s.n.* (TI [44078]! and TI [44079]!); Bonin Chichijima Asahi-yama: 25 July 1905, *H. Hattori s.n.* (TI [44080]!).

Distribution: Japan (Bonin Islands).

This taxon was first published validly as *Psychotria macrophylla* Hayata, with the citation “Chichijima, leg. H. Hattori. 1905” (Hayata 1920). However, this name was illegitimate because it is a later homonym of “*P. macrophylla* Ruiz & Pav. (1799)”. Therefore, Nakai (1927) published a new name *P. boninensis* for this taxon, citing three synonyms: *P. serpens* (non Linnaeus) Hattori (this name is nomen nudum), *P. macrophylla* Hayata (1920) and *P. serpens* L. var. *macrophylla* Koidz. (1918). The latter two names have the same epithet “*macrophylla*” but they are considered to represent different taxa because Hayata (1920) did not cite the name of *P. serpens* L. var. *macrophylla* Koidz. We consider that the basionym of *P. boninense* Nakai is *P. macrophylla* Hayata not *P. serpens* L. var. *macrophylla* Koidz.. Therefore, the specimen (*T. Nakai s.n.*, 1920, TI), which Toyoda (1981) regarded as the type of this taxon, is inappropriate. In TI, we found four specimens that were collected by H. Hattori in 1905 and that were identified as *P. macrophylla* Hayata with B. Hayata’s handwriting. It is considered that these specimens are multiple gatherings collected on different days in July 1905 and syntypes of this taxon. Of the four specimens, we selected the specimen (*H. Hattori s.n.*, 22 July 1905), which also included the identification as *P. boninensis* Hayata (nom. nud.) with B. Hayata’s handwriting, as the lectotype.

= *Psychotria serpens* L. (1771: 204–205) var. *macrophylla* Koidz. (1918: 135)

Lectotype (designated here) —JAPAN: Bonin Chichijima Sakai-ura: April 1915, *S. Nishimura 563* (TI [44076]!).

Original materials—JAPAN: Bonin Chichijima Sakai-ura: May 1914, *S. Nishimura 333* (TI [44075]!).

No specimens were cited in the protologue of *Psychotria serpens* L. var. *macrophylla* Koidz. (1918). We found only two specimens collected before 1918, identified with G. Koidzumi’s handwriting as “*Psychotria serpens* L. var. *macrophylla* Koidzumi” at TI. Because G. Koidzumi was based at TI when he published the name, the TI specimens are appropriate for the type of this taxon (ICBN Art. 9A.4.). Of the two, we selected the specimen (*S. Nishimura 563*, April 1915), which also has the Japanese name with G. Koidzumi’s handwriting on the label, as the lectotype.

Convolvulaceae

Evolvulus boninensis Maekawa & Tuyama (1938: 571–572)

Lectotype (designated here)—JAPAN: Bonin Imohtojima: 11 Jun. 1938, *T. Tuyama s.n.* (TI [43978]!; isolectotypes: TI [43976]!, TI [43977]! and TI [43979]!). Paratype—JAPAN: Bonin Mukohjima: 17 Oct. 1934, *M. Okabe s.n.* (TI [43975]!).

Distribution: Japan (Bonin Islands).

In the protologue of *Evolvulus boninensis*, Tuyama (1938b) assigned the specimen deposited in TI “Imohtozima; leg. T. Tuyama, Jul. 11, 1938” as the type. We could not find this, but did find four duplicate specimens collected by T. Tuyama on Imohtojima Island dated on 11 June 1938 (their labels were written in Kanji characters). Because one of these specimens was consistent with a photo in the protologue, Tuyama (1938b) must have mistaken the collection date in writing the label of the type specimens. We selected the photographed specimen as the lectotype.

Asteraceae

Erechtites hieraciifolius (L.) Raf. ex DC. (1838: 294) var. *cacalioides* (Fish. ex Spreng.) Grisebach (1864: 381).

Distribution: a native of tropical America, invasive in other tropical regions.

= *Senecio muninensis* Koidzumi (1919: 218–219)

Lectotype (designated here)—JAPAN: Bonin Chichijima Susaki: 21 Mar. 1917, *S. Nishimura 4* (TI [39895]!).

Syntypes—JAPAN: Bonin Chichijima Susaki: 15 Dec. 1912, *S. Nishimura 124* (TI [39899]!); Bonin Chichijima

Susaki: May 1915, *S. Nishimura 561* (TI [39896]!); Bonin Chichijima Oomura: Mar. 1912, *B. Kawate Hei8* (TI [39897]!); Bonin Chichijima Susaki: 21 Mar. 1917, *S. Nishimura s.n.* (KYO!).

In the protologue of *Senecio muninensis*, Koidzumi (1919) cited four specimens as “Bonin: incl. Chichishima (lg. S. Nishimura! no. 4, III. 21, 1917; no. 24, I. 12, 1915; no. 561, V. 1915) (lg. B. Kawate! no. 8, III. 1912)”. Three of these specimens were identified as bearing Koidzumi’s handwriting and are housed at TI. We could not find the second specimen “no. 24, I. 12, 1915”, however, another specimen (*S. Nishimura 124*, “1. 12. 15.”) was also found at TI. After comparison with other Nishimura’s specimens, we found that the numbers of “1. 12. 15.” indicated “the first year of the Taisho Era (= 1912), December 15”. Thus, Koidzumi (1919) must have misread “no. 124, 1 (1912). 12 (XII). 15 (15th)” as “no. 24, I. 12th, 1915” for the second specimen. Aside from these specimens, we found one without a collector’s number (Bonin Chichijima Susaki, *S. Nishimura s.n.*, 21 March 1917) at KYO, which was collected on the same date as the specimen cited first in the protologue. It most likely corresponds to the specimen “21 mars 1917 S. Nishimura” cited by Kitamura (1934), who recorded this name as a synonymy for *Erechtites hieracifolius* var. *cacalioides*. This specimen lacks a collector’s number, but is probably a duplicate specimen found at TI. Of the four original specimens at TI, G. Koidzumi identified one specimen as *Senecio muninensis*, but the others had been previously identified as a different taxon and revised by Koidzumi. Thus, we select the former specimen (*S. Nishimura 4*, 21 March 1917) as the lectotype.

Erechtites valerianifolius DC. (1838: 295).

Distribution: a native of tropical America, invasive in other tropical regions.

= *Senecio boninsimae* Yatabe (1893: 1–3)

Lectotype (designated here)—*Bot. Mag.* (Tokyo) vol. 7, plate II. 1893.

No specimens were cited in the protologue of *Senecio boninsimae*, but one detailed drawing (plate II) was provided. Kitamura (1934) recorded this name as a synonym for *Erechtites valerianifolius* DC., citing “Bonin (S. Nishimura)”. The specimens collected by S. Nishimura were found at TI, but specimens collected before 1893 have not been found in any herbaria. Because we have not found adequate specimens that could serve as the type of this taxon in any herbaria, “plate II” should be regarded as the lectotype (ICBN Art. 9.2.).

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