Typifications in the genus *Arundo* (Poaceae, *Arundinoideae*)

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Abstract. The typification of the names *A. micrantha*, *A. donaciformis*, *A. formosana*, *A. formosana* var. *gracilis* (currently *A. formosana* subsp. *gracilis*), *A. parviflora* (a heterotypic synonym of *A. formosana*), *A. bifaria*, and *A. donax* var. *coleotricha* (these two as heterotypic synonyms of *A. donax*) is discussed. The "types" of these names were previously indicated as "holotypes" in 2012 and 2017. However, the type of indication was ineffective in all cases according to the International Code of Nomenclature for algae, fungi, and plants (*ICN*, *Shenzhen Code* of 2018). We propose here the effective lectotypification of these five names, along with data on the gatherings and syntypes used to describe these taxa. The name *A. micrantha* is lectotypified using a specimen collected by Desfontaines and preserved at P. The lectotype of *A. donaciformis* is selected from a specimen collected by Jean Honoré Perreymond in southern France and kept at AV (Muséum Requien). *Arundo formosana* and *A. formosana* var. *gracilis* are typified from original specimens preserved in the Hackel Herbarium at W. The lectotype of the name *A. parviflora* is designated from a specimen preserved at US. Finally, a second-step lectotypification is made for the name *A. bifaria* with the lectotype preserved at LD, and the lectotype of *A. donax* var. *coleotricha* is selected from a specimen preserved at W.
Keywords: *Arundineae*, *Gramineae*, lectotype, Mediterranean Basin, nomenclature, reed plant, syntype, typification.

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Introduction

Arundo L. is small genus of *Poaceae* (subfamily *Arundinoideae*; tribe *Arundineae*) and a group of tall rhizomatous perennial reeds (Conert, 1961, 1966; Renvoize, 1981; Barker *et al*., 1995; Hsiao *et al*., 1998; Kellogg, 2015, Hardion *et al*., 2017a).

The genus contains five species in tropical Eurasia. Two species, *A. formosana* Hack. and *A. donax* L., are natively distributed in Western and Central Asia. *Arundo formosana* is endemic from Taiwan and the Ryukyu Islands (Hardion *et al*., 2017b; Feng *et al*., 2021). Three congeners are widespread in the Mediterranean Basin, *A. plinii* Turra, *A. micrantha* Lam., and *A. donaciformis* (Loisel.) Hardion *et al*. (based on *Calamagrostis donaciformis* Loisel.). These three species can be distinguished from *A. donax* by their thinner rhizomes, which have a parenchymous cross section with a small lumen (hole) in the center, unlike the solid rhizome cross section of *A. donax*, which lacks a central lumen (Danin & Naenny, 2008; Hardion *et al*., 2012b; Jiménez-Ruiz *et al*., 2021; Ngernsaengsaruay *et al*., 2023).

The cosmopolitan *Arundo donax* is considered to be one of the worst invasive plants in the world (Jiménez-Ruiz *et al*., 2021; Goolsby *et al*., 2023). This giant reed has been used by humans for a multitude of uses (Zhang *et al*., 2016; Verlaque *et al*., 2024), e.g., in light construction (Ngernsaengsaruay *et al*., 2023). Reeds for woodwind musical instruments are still made from the culms, and no satisfactory substitutes have been developed. This grass has also been used as a source of cellulose for rayon and is considered as a source of paper pulp (Perdue, 1958). This species has been recognized as native to subtropical Eurasia (including the Mediterranean Basin, Middle East, Northern India and East Asia), but the ancient dispersion of a robust, polyploid (Hardion *et al*., 2011, 2013; Bucci *et al*., 2013) and non-fruiting clone is hypothesized from the Middle East to the west, leading to its invasion throughout the Mediterranean Basin (Hardion *et al*., 2014). Several heterotypic synonyms are

known for *A. donax*, this article deals with the typification of two of them, *A. bifaria* Retz., and *A. donax* var. *coleotricha* Hack.

Regarding *A. formosana*, Conert (1961) recognized three varieties in this species based on morphological characters: var. *formosana*, var. *gracilis* Hack., and var. *robusta* Conert. However, the infraspecific taxonomy has largely been ignored (e.g. Huang *et al*., 2000; Wu *et al*., 2006). Most recently, Hardion *et al*. (2017b) recognized three taxa, two varieties and one subspecies in *A. formosana*: var. *formosana*, var. *robusta*, and subsp. *gracilis* (Hack.) Hardion *et al*.

From the nomenclatural point of view, Danin (2004) and Hardion *et al*. (2012a, 2012b, 2017b) undertook extensive revisions on the names of the Mediterranean taxa and the Taiwanese endemic *A. formosana* complex. Unfortunately, the type indications published by these authors for the names *A. micrantha*, *A. donaciformis*, *A. formosana*, *A. formosana* subsp. *gracilis*, and *A. parviflora* Ohwi (a heterotypic synonym of *A. formosana* s.str.) are uneffective in all cases according to the International Code of Nomenclature for algae, fungi, and plants (*ICN*, *Shenzhen Code* of 2018; Turland *et al*., 2018). For these names, a gathering is mentioned in the respective protologues. In this sense, if, prior to 1958, a single gathering (but not a single specimen) is indicated as the basis of a new taxon but without the word type (as is the case with all these names), there will be a holotype only if it can be established that the author used no other element and if the gathering is represented by a single specimen, because the specimens that comprise the gathering are syntypes (Art. 40 Note 1) (see McNeill, 2014; Turland *et al*., 2018).

Therefore, the corresponding nomenclatural types for these names remain to be designated.

Materials and Methods

The protologues of *Arundo micrantha*, *A. donaciformis*, *A. formosana*, *A. formosana* var. *gracilis*, *A. parviflora*, *A. bifaria*, and *A. donax* var. *coleotricha* were analyzed to identify original material pertinent to the typifications. The taxonomic identity of the proposed types was verified against the traditional concept and current use of the names. In the following account herbarium acronyms follow Thiers (2025 [continuously updated]). The typification of these seven names aligns with the rules and recommendations of the International Code of Nomenclature for algae, fungi, and plants (*ICN* or *Shenzhen Code*, Turland *et al*., 2018). Homotypic synonyms are indicated by the symbol (≡) and heterotypic synonyms by the symbol (=). The names in current use are formatted in bold italics.

Results and Discussion

Arundo micrantha Lam.

Hardion *et al*. (2012a) reported the type of *A. micrantha* as: "Typus: 'Ex AFRICA': *Desfontaines s.n.* (holo-: P-LA [P00564266]!; iso-: B [W02223]!, G [G00074067]!, K [K000366972]!, MPU [015598]!, P [P00307101]!)", and in a separate publication, as: "Holotype: Africa, *Desfontaines s.n.* (P-LA!; isotypes: B!, G!, K!, MPU!, P!)" (Hardion *et al*., 2012b).

These specimens had been selected by Danin (2004) as the type material of *Arundo mauritanica* Desf. (nom. illeg.; non Poiret in Voy. Barb. 2: 104. 1789 [currently ≡ *Ampelodesmos mauritanicus* (Poir.) Durand & Schinz]), as a heterotypic synonym of *A. mediterranea* Danin, as: "Holotype: 'Herbier de la flore atlantique, donné au Muséum par M. Desfontaines' (P-00307101 [photo!]; probable isotypes: [Algeria], "ex herbario Desfontaines" (MPU!); 'ex herbario Desfontaines' (K [a fragment of panicle donated by Mr Desfontaines in 1818]!); '*Arundo mauritanica* Fl. Atl. distincta ab *A. donax* L. Alger Desf.', '*Arundo mauritanica* Desf.' [both in handwriting of A.-P. de Candolle, approved by Briquet, who added that this is an original of Desfontaines] (G!)" (see also Hardion *et al*. (2012a) for the name *Arundo mauritanica*).

However, according to Art. 9.1 of the *ICN*, "a holotype […] is the one specimen or illustration either *(a)* indicated by the author(s) as the nomenclatural type or *(b)* used by the author(s) when no type was indicated". In the protologue of *A. micrantha*, Lamarck (1791) indicated: "1087. ARUNDO *micrantha*. / A. [Arundo] calycibus unifloris acuminatis, panicula erecta densa flavescente, vaginis ore pilosis. / E Barbaria. *Comm.* [communicavit] *D.* [dedit] *Desfontaines*."

Lamarck did not indicate a type but a specific gathering in the protologue. According to Art. 40 Note 2 “Mere citation of a locality does not constitute mention of a single specimen or gathering. Concrete reference to some detail relating to the actual type is required, such as the collector’s name, collecting number or date, or unique specimen identifier”. In the protologue, Lamarck indicated the locality, as “Barbaria” (Barbaria was the name formely used to refer the region of North Africa, the area of Morocco, Algeria, Tunisia, and Libya), and the collector name, as “Desfontaines”. René Louiche Desfontaines (1750–1833) was a French botanist, professor at the Jardin des Plantes in Paris. Parts of the personal herbarium of this author is now preserved at BM, C, CGE, FI (acquired via Webb) LIV, MPU and P (incl. PC, P-DESF, P-JU and P-LA) (Stafleu & Cowan, 1976: 627–628).

Hardion *et al*. (2012a, 2012b) therefore considered that the specimen preserved in P-LA (barcoded P00564266) was the only material (“the one specimen” according to Art. 9.1) used by Lamarck to describe his species because in the protologue (clearly) “no type was indicated”. These considerations as holotypes were a common practice in the past for many years, and was even the subject of “inadvertent lecto- (or neo-) typifications” (in the sense that Prado *et al*. (2015) gives to the word “inadvertent”). However, as was published by McNeill (2014) “If, prior to 1958, a single gathering (but not a single specimen) is indicated as the basis of a new taxon but without the word type, there will be a holotype only if it can be established that the author used no other element and if the gathering is represented by a single specimen—because the specimens that comprise the gathering are syntypes (Art. 40 Note 1)”.

As was mentioned by Hardion *et al*. (2012a, 2012b), and also by Danin (2004), the specimens collected by Desfontaines and preserved at B, G, K, MPU, and P (with codes and barcodes B-W-02223, G00074067, K000366972, MPU015598, and P00307101) can be considered as duplicates of the specimen P-LA (with barcode P00564266). Therefore, the gathering mentioned by Lamarck in the protologue of *A. micrantha* contains at least six specimens that can be treated as syntypes (see Art. *ICN* 9.6 and Art. 40 Note 1).

Unfortunately the “type” indication of *A. micrantha* (Hardion *et al*., 2012a, 2012b) does not constitute an effective typification and neither can the term “holotype” be corrected to lectotype by application of the Art. 9.10, because “A misused term may be corrected only if the requirements of Art. 7.11 (for correction to lectotype, neotype, and epitype) are met and Art. 40.6 (for correction to holotype) does not apply” (see Art. 9 Note 6).

The sheet B-W-02223 bears two inflorescence fragments and is annotated on the sheet “A. mauritanica. 1.” and “Desfontaines. W.”. In the folder is a handwritten label annotated as “Triandria Digynia / Arundo mauritanica / culmo fruticoso, floribus / paniculatis, calycibus sub- / trifloris, gluma exhiven subaristata Desf. atl. 1. p 106 / Habitat in Algeria Ъ.”.

The sheet MPU015598 bears only an inflorescence and a handwritten label, annotated as “Arundo mauritanica / ex herbario D. Desfontaines”

The sheet K000366972 bears an inflorescence fragment and a label annotated as “Arundo mauritanica Desf. fl. Atl. 1. p. 106 – Pers. / Synops. 1. p. 102. 5p. 2 – non Poiret Trin. Barb. / A. micrantha Lam Dict. / Echantillon (fragment du panicula) rapporte de Barbaria / par M. Desfontaines est arrivée parlui en Janvier 1818.”.

The sheet G00074067 bears an inflorescence and two relevant handwritten labels: 1) “Arundo mauritanica Desf. / ----- micrantha Lam. / (Scripsis A.P.DC.) / (original de Desfontaines)” and 2) “Arundo mauritanica. Fl. Atl. / Distincta ab A. donax L. / Alger Desf.”.

The sheet preserved at P, with 2-D code P00307101, bears a well-preserved and complete specimen, three stems, two of them with inflorescences, and a label “Herbier de la Flore Atlantique / donné au Muséum, par M. Desfontaines. / Nº. / Arundo mauritanica” (Figure 1).

Finally, the sheet preserved in the Lamarck herbarium at P-LA, with 2-D code P00564266, bears an inflorescence and three handwritten labels: 1) “~~an Arundo donax?~~ / ex afr. / D. Desfontaines”, 2) “Arundo micrantha. Lam. / ill. gen. / Arundo mauritanica Desf. / ex Africa.”, and 3) “Arundo (Donax) mauritanica Des. / Sp. pl. T. 146” (Figure 2).

In conclusion, we consider necessary an effective typification of the name *Arundo micrantha*. We designate the specimen preserved at P with 2-D code P00307101 as the lectotype of the name. Undoubtedly this specimen is the most complete and informative material, more so than the specimen preserved in Lamarck’s own herbarium (P-LA 2-D code P00564266) which includes only one inflorescence. The specimen P00307101 contains diagnostic features such as stem nodes, sheaths, limbs and glumes glabrous, lemma with hairs perpendicularly inserted, and spikelets with 1(2) florets.

On the other hand, as there is no reason to consider all the specimens mentioned above (at P, B, G, and MPU) as belonging to different gatherings, the rest of the specimens that are part of the gathering cited in the protologue are isolectotypes.

Arundo micrantha Lam., Tabl. Encycl. 1: 196. 1791

Lectotype (**designated here**): "Barbaria", s.d., *Desfontaines s.n.*, P (2-D code P00307101) (Figure 1). Isolectotypes: B-W-02223, G00074067, K000366972, MPU015598, P-LA 2-D code P00564266 (Figure 2).

Arundo donaciformis (Loisel.) Hardion *et al*.

The protologue of *Calamagrostis donaciformis* Loiseleur-Deslongchamps (1828: 53) consists of a description in Latin "3 CALAMAGROSTIS DONACIFORMIS. Lois. / C. [Calamagrostis] foliis lanceolato-linearibus, panicula amplissima (patente?), palea exterior acuminato-subaristata glumis sublongiori, interiori membranácea duplo minori apice 2-dentata, pilis gluma paulo brevioribus" followed by a short diagnosis "*Altitudine caulis et amplitudine paniculae Arundinem Donacem fere aemulatur, florum colore ad Phragmitem accedit*", and two comments: 1) "Flores e viridi fusco-purpurascentes; septembri." and 2) "Secus vias et in locis siccis circa Forum Julii invenit D. Perreymond. Ч".

Hardion *et al*. (2012b) indicated the type as: "Holotype: France. Fréjus, *Perreymond s.n.* (AV!; isotype: MARS [no. MARS00004]!)". However, Loiseleur-Deslongchamps (1828: 53) mentioned a gathering, as "Secus vias et in locis siccis circa Forum Julii invenit D. Perreymond"; "Forum Julii" is the Latin name of a Gallo-Roman town that became Fréjus (Var, Provence-Alpes-Côte d'Azur, a region in SE France), and Jean Honoré Perreymond (1794-1843) was a French botanist. This gathering is composed of at least two specimens, preserved in the personal herbarium of Loiseleur-Deslongchamps in the Muséum Requien at AV and the herbarium at MARS. Therefore, the "type" indication by Hardion *et al*. (2012b) does not constitute an effective typification for the same reasons given above (for the name *Arundo micrantha*) (see e.g., *ICN* Art. Art. 9.1 and Art. 7.11).

There are two relevant specimens of this species preserved in the personal collection of Loiseleur-Deslongchamps in the herbarium of the Muséum Requien de Avignon (AV, France). Unfortunately this material is unnumbered and has no herbarium code. The first sheet (code 2024.0.32.98.1) bears a complete specimen, two stems with leaves and inflorescences, and two handwritten labels. On the most relevant label is annotated: "Calamagrostis Donaciformis. / 56 Arundo Plinii. Bertol. / […] mauritanica? / Fréjus […]" (Figure 3). At least part of this label is written by Perreymond (the spelling of the name of the French town "Fréjus" has been compared with an original handwritten label signed by Perreymond and preserved in a sheet in the Harvard University Herbaria, sheet with barcode 01690615; image available at s3.amazonaws.com/huhspecimenimages/JPG-Preview/01690615.jpg). A second sheet at AV (code 2024.0.32.98.2) bears three stems with inflorescences and a large handwritten label (see Figure 4).

The sheet preserved in the Herbarium of Aix-Marseille University (Marseille, France), with barcode MARS00004, bears a specimen composed of a leaf, a fragment of a leaf and several inflorescence fragments. This specimen is a duplicate of the original material preserved in AV. This duplicate was made by one of the authors of this work (LH) in the presence of the curator of the AV herbarium. The sheet contains several printed labels (at the top) indicating that it is duplicate material of a specimen of AV, and at the bottom of the sheet a copy (in color) of each of the labels on the sheets of original material kept at AV (each of these labels belongs to one sheet, in total three labels). We have not been able to locate any other specimen that could be part of the gathering cited in the protologue in the consulted herbaria (e.g., at B, G, NA, P). We designate as the lectotype of the name *Arundo donaciformis* the specimen at AV (Muséum Requien, with code 2024.0.32.98.1), the duplicate material at AV (with code 2024.0.32.98.2) and MARS, with barcode MARS00004, are therefore isolectotypes.

Arundo donaciformis (Loisel.) Hardion, Verlaque & B. Vila, Taxon 61: 1222. 2012.
≡ *Calamagrostis donaciformis* Loiseleur-Deslongchamps (1828: 53) [basionym]

Lectotype (**designated here**): [France, Provence-Alpes-Côte d'Azur, Var], Fréjus ["circa Forum Julii" in the protologue], s.d., *Jean Honoré Perreymond s.n.*, AV (code 2024.0.32.98.1) (Figure 3). Isolectotypes: AV (code 2024.0.32.98.2) (Figure 4), MARS (barcode MARS00004).

Arundo formosana Hack.

Hardion *et al*. (2017b) recognize two varieties and two subspecies in *A. formosana*: var. *formosana* and var. *robusta* Conert, and *A. formosana* subsp. *gracilis*, based on *A. formosana* var. *gracilis*. The holotype of *A. formosana* var. *robusta* is a specimen from Taiwan (Tamsui, sand hills, June 1881, *Hancock 8*) preserved at K with barcode K000859988 [duplicate K000859987?]) (see Conert (1961: 35).

The protologue of *Arundo formosana* consists of a complete description in Latin of the plant followed by the provenance and a collector name: "Prope Shinchiku leg. Makino", and a diagnosis (Hackel, 1899: 724).

Hardion *et al*. (2012b) indicated the type of this name as "*Arundo formosana* Hack. in Bull. Herb. Boiss. 7: 724. 1899 – Holotype: Taiwan. Shinchiku, 24 November 1896, *Makino 322* (W; isotype: US)", and a few years later they repeated this indication of type (Hardion *et al*., 2017b), as: "*Arundo formosana* Hack. in Bull. Herb. Boiss. 7: 724. 1899 – Type: Taiwan. Prope Shinchiku, 24 November 1896, Makino 322 (holotype: W!; isotype: US!)". These two indications do not constitute an effective type designation (*ICN* Art. 9.1 and Art. 7.11, and see previous comments on the name *A. micrantha*).

In the protologue indicated a gathering collected in "Prope Shinchiku" by "Makino", and all specimens in this collection are therefore syntypes. As indicated by Hardion *et al*. (2012b, 2017b), there are two relevant specimens preserved at W and US herbaria, which are part of the gathering mentioned in the protologue.

The sheet with code W-1916-0034625 bears a complete and well-preserved specimen, and a handwritten label by Hackel, annotated as: "Ex coll. J. Matsumura. / No. 322. / ex parte Arundo formosana Hack. / Hab. Shinchiku, Formosa. / Legit Makino, Nov. 24, 1896" (Figure 5). The sheet with code US no. 00156918 bears two stems, with leaves and an inflorescence (as reported in the original label this specimen is a fragment of the specimen at W), and a label: "ex Hackel herb / ex Herb. Musei Hist. Natur. Vindob. / (Botanische Abteilung des Naturhist. Museums, Wien) / Hackel script / Arundo formosana Hack / Formosa, pr. Shinchiku / 314 / nov. 24, 1896 / Makino 322 / ex parte".

We designate as the lectotype of *A. formosana* the specimen W-1916-0034625, the most complete and informative material.

Arundo formosana Hack., Bull. Herb. Boissier 7: 724. 1899 var. ***formosana***

Lectotype (**designated here**): [Taiwan] "Formosa", pr. Shinchiku, 24 Nov 1896, *Makino 322*, W (code W-1916-0034625) (Figure 5). Isolectotype: US no. 00156918.

= *Arundo parviflora* Ohwi, Repert. Spec. Nov. Regni Veg. 36: 40. 1934

Lectotype (**designated here**): Japan (Taiwan under Japanese rule). prov. Takaoshu, inter Matsuyama et Aderu in Chippongoe, 7 May 1933, *J. Ohwi 1597*, US (no. 00139588) (Figure 6). Isolectotype: KYO.

Note: In the protologue of *Arundo parviflora* a concrete gathering was mentioned "Hab.: Formosa: inter Matsuyana et Aderu in Chippongoe, prov. Takaoshu" (J. Ohwi n. 1597). Hardion *et al*. (2012b) indicated the type of this name as: "Holotype: Japan. Shikoku, Mai 1933, *Ohwi 1597* (US)", and a few years later the "holotype" was changed by a specimen preserved at KYO, as "Type: Japan (Taiwan under Japanese rule). prov. Takaoshu, inter Matsuyama et Aderu in Chippongoe, 7 May 1933, *Ohwi 1597* (holotype: KYO! photograph; isotype: US!)". Unfortunately, neither of these two type indications are effective (*ICN* Art. 9.1 and Art. 7.11). The gathering mentioned in the protologue (J. Ohwi n. 1597) contains at least two specimens, at KYO and US, which are therefore syntypes (see *ICN* Art. 9.6 and Art. 40 Note 1). We designate as the lectotype of the name *Arundo parviflora* the specimen at US, the specimen at KYO is therefore an isolectotype.

Arundo formosana var. ***gracilis*** Hack.

The protologue of *Arundo formosana* var. *gracilis* consists of a brief description "Culmus superne valde ramosus gracilis, folia ramorum 10 cm. Lg. 0,5 cm. Lt., panicula 10 cm. Lg., spiculae 4 mm. Lg., arista

ex apice integro 1.5 mm. Lg., recta, pili glumam florentem subaequantes", followed by the provenance and a collector name, as "Prope Kelung leg. Makino" (Hackel, 1899: 724).

Hardion *et al*. (2017b) modified the rank of this taxon as a subspecies, and indicated the type as: "Type: Taiwan. Propre Kelung, *Makino 322* (holotype: W!; isotype: US!)". Unfortunately, as menioned above, this type indication is ineffective (*ICN* Art. 9.1 and Art. 7.11, see previous comments on the name *A. micrantha*).

We have found two relevant specimens belonging to the gathering cited in the protologue (Prope Kelung leg. Makino). The sheet with code W-1916-0034626 bears a well-preserved specimen, stems, with leaves and inflorescences, and a handwritten label by Hackel, annotated as: "Ex coll. J. Matsumura. / No. 322. / Arundo formosana Hack. / ex parte / var. gracilis / Hab. Kelung, Formosa / Legit Makino" (Figure 7). On the other hand, the sheet with code US no. 00156919 is a poor fragment, with leaves and an inflorecence (as reported in the original label this specimen is a fragment of the specimen at W), and a label: "ex Hackel heb / ex Herb. Musei Hist. Natur. Vindob. / (Botanische Abteilung des Naturhist. Museums, Wien) / From Hackel Herbarium / Hackel script / Arundo formosana var. gracilis / Hack / Formosa, pr. Kelung. / 315 [no date] / Makino 322 / ex parte".

We designate as lectotype of *A. formosana* var. *gracilis* the most complete specimen preserved at W, with code W-1916-0034625. The specimen at US is therefore an isolectotype.

Arundo formosana subsp. ***gracilis*** (Hack.) Hardion, Verlaque & B.Vila, Bot. J. Linn. Soc. 183: 246. 2017

≡ *A. formosana* var. *gracilis* Hack.. Bull. Herb. Boissier 7: 724. 1899 [basionym]

Lectotype (**designated here**): [Taiwan] "Formosa", pr. Kelung, 24 Nov 1896, *Makino 322*, W (code W-1916-0034626) (lectotype, designated here) (Figure 7). Isolectotype: US no. 00156919.

Typification of two synonyms of *Arundo donax* L.

We analyzed three of the main synonyms of *Arundo donax*; *A. bifaria*, *A. bengalensis*, and *A. donax* var. *coleotricha*.

The protologue of *A. bifaria* Retz. consists in a diagnosis followed by a complete description, and the provenance "*Habitat* ad margines stagnorum et sossarum in India Orientali. *Cel*. König dedit." and "Malabaris *Nana Cadhi*, ad tecta usurpatur, minus bene licet tegat. *Cel*. König".

Fischer (1932: 74) indicated that a type of this name is preserved in the "Koenig collection in the Lund Herbarium", as "314. *Arundo Donax* Linn., det. C.E.H. / Arundo bifaria. Kön. / Type of *Arundo bifaria* Retz. Obs. iv. 21.".

On the other hand, Ngernsaengsaruay *et al*. (2023: 4 and figure 6) has been indicated a "lectotype" for this name, as "Type: India, s.d., Wight 1748 (Wight collection, East India Company Herbarium 5018A) (lectotype K-W [K001104515!], isolectotypes BM [BM000949265!], E [E00576404!, E00576405!, E00576406!, E00576407!], K [K000032473!], designated here)". However, this designation is ineffective being contrary to *ICN* Art. 9.3 because the specimen barcoded K001104515 is not original material (see also *ICN* Art. 9.4) used by Retzius to describe his species. The specimen K001104515 was collected by Robert Wight and is a post-protologue collection. Wight born in 1796, ten years after the publication of the protologue by Retzius.

Delving into the type designation by Fischer, we have found two original specimens for this name (*A. bifaria*) at LD (barcodes LD1212905 and LD1212965). The sheet LD1212905 bears two stems, with inflorescencse and leaves, and is annotated (on back of sheet) as "Arundo bifaria / Kön". The sheet bears also two revised labels "Arundo donax L. / Determinavit C. E. Hubbard 26/X/1929" and "Type of Arundo bifaria [Retz. Obs.] iv-21 / Determinavit Fischer 15/VIII/1930" (Figure 8).

The sheet LD1212965 bears an inflorescence and a leaf, and is annotated (on back of sheet) "24 Ar. Bifaria S. V / ~~Kön~~ / Bifaria sec Retz herb [handwritten by C. A. Agardh?]" and "Arundo(?)" (corner torn off) [handwritten by Retz?].

There are several duplicates preserved at K, BM, and C. The sheet at K, barcode K000032474. This specimen bears three inflorescence fragments and two labels: 1) "Arundo bifaria Retz. / India: Koenig. / Ex Hb. Retz." and 2) "Arundo Donax L. / Detrminavit C. E. Hubbard 26/X/1929". The sheet

at BM, barcode BM000959465, bears a stem with the inflorecence and leaves, and a label annotated as "Ind. Orient. Koenig".

There are five relevant sheets at C. The sheet barcoded C10016771 bears a complete inflorescence and a leaf, and is annotated (on back of sheet) "Arundo bifaria / nana / Koenig / India. / D. Banks.". The sheet barcoded C10016769 bears a inflorescence fragment and a leaf, and is annotated (on back of sheet) "Arundo nana (epithet crossed out) bifaria / Arundo nana / nana Tamul. / benghalensis Wild. / K. [Koenig]". The sheet barcoded C10016768 bears a stem with inflorescence and leaves, and is annotated (on back of sheet) "ex India orientalis / Arundo nana / Nana Tamul. / Arundo bifaria Retz. / K. [Koenig]". The sheet barcoded C10016770 bears only an inflorescence, and is annotated (on back of sheet) "Arundo bifaria / K. [Koenig] / D. Rottb. Finally, the sheet barcoded C10016768 bears a stem with an inflorescence and leaves, and is annotated (on back of sheet) "Arundo bifaria / nana panicula oblonga coarctata. Foliis bifarius patentissimis brevibus / colitur pro sepes hortorum Nana / Tschedhi Tamulorum / Koenig".

Fischer's indication (1932) certainly constitutes an effective lectotype designation. However, the typification proposed by this author may be further narrowed to a single specimen by a "second-step" lectotypification according to art. 9.17 of the *ICN*.

Hardion *et al*. (2012b) mentioned as the "holotype" of the name *Arundo bengalensis* a specimen preserved at LD, as: "Holotype: India, Bengala, *König s.n.* (LD)". We have found only a specimen at LD annotated as *Arundo bengalensis*. The sheet with barcode LD1212845 bears only an inflorescence, and two revised labels: 1) "Type of Arundo bengalensis Retz. / Obser. Bot. V, p. 20 (1789) / This name is written by Retzius himself / in the back of the sheet / T. Norlindh / 31-X-1987", and 2) "Saccharum bengalense Retz. Obs. V. 16 / = S. munya Resch. / Determinavit C. Tischer / 13-VIII-1930". On back of the sheet is annotated "Arundo bengalensis n. / Retzius scripsit / Kön". However, this specimen is the lectotype of the name *Saccharum bengalense* Retz. (see Fischer, 193), currently *Tripidium bengalense* (Retz.) H. Scholz.

Ngernsaengsaruay *et al*. (2023: 4 and figure 7) mentioned a "lectotype" for the name *A. bengalensis*, as "Type: India, Bengal, 1820, *Wallich Cat. 5018D (East India Company Herbarium 5018D)* (lectotype K-W [K001104517!], designated here)". However, this lectotype designation is ineffective being contrary to *ICN* Art. 9.3 because the specimen barcoded K001104517 is not original material (see also *ICN* Art. 9.4) used by Retzius to describe his species. The specimen K001104517 was collected by Nathaniel Wolff Wallich in 1820, therefore a post-protologue collection. Wallich born in 1786, the same year in which Retzius published his species.

On the other hand, the protologue of *Arundo donax* var. *coleotricha* Hack. includes a brief diagnosis ("differt a tipo foliorum vaginis, saltem in ramis foliiferis, densiuscule villosi. Panicula ampla, ad 60 cm. longa") and a locality and collector, as "Tamsui (Makino)". We have found four specimens belonging to the gathering (Makino 343) mentioned in the protologue, preserved at W (two sheets), US, and TI.

The sheet W19160034630 bears a stem with leaves and inflorescence and an original label annotated as "Esx. coll. J. Matsumura. / Co. 343. Arundo Donax L. / var. / coleotricha Hack. / Hab. Tamsui, Formosa. / Leg. Makino". The sheet W19160034629 bears a stem only with leaves, and a label "Arundo Donax v. coleotricha / J. Matsumura N. 343" (Figure 9).

There are also two duplicates belonging to this gathering (Makino 343) preserved at US (barcode 00156917) and TI.

Arundo donax L., Sp. Pl.: 81. 1753

Lectotype (designated by Renvoize in Regnum Veg. 127: 21. 1993: Herb. A. van Royen, 912.356-93.
= *Arundo bifaria* Retz., Observ. Bot. 5: 21. 1786

Lectotype [first-step] designated by Fischer (1932: 74) and **[second-step] designated here**: "314. *Arundo Donax* Linn., det. C.E.H. / Arundo bifaria. Kön." [in the Koenig collection in the Lund Herbarium] LD barcode LD1212905 (Figure 8). Probable isolectotypes: LD1212965, K000032474, BM000959465, C10016771, C10016769, C10016768, C10016770, C10016768.
= *Arundo bengalensis* Retz., Observ. Bot. 5: 20. 1786

Type: original material not found.
= *Arundo donax* var. *coleotricha* Hack., Bull. Herb. Boissier 7: 724. 1899

Lectotype (designated here): Taiwan [Formosa], Tamsui, s.d., *Makino 343*, W (barcode W19160034630) (Figure 9). Isolectotypes: W19160034629, US 00156917, TI.

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Authorship contribution

PPFG, Conception, design, nomenclatural analysis, analysis and selection of plant materials, and writing; LH: Analysis of herbarium sheets, taxonomic revision, and text review.

Conflict of interest

None.

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Figure 1. Lectotype of *Arundo micrantha* Lam. (P, 2-D code P00307101). (Photography by courtesy of the herbarium P, reproduced with permission.)

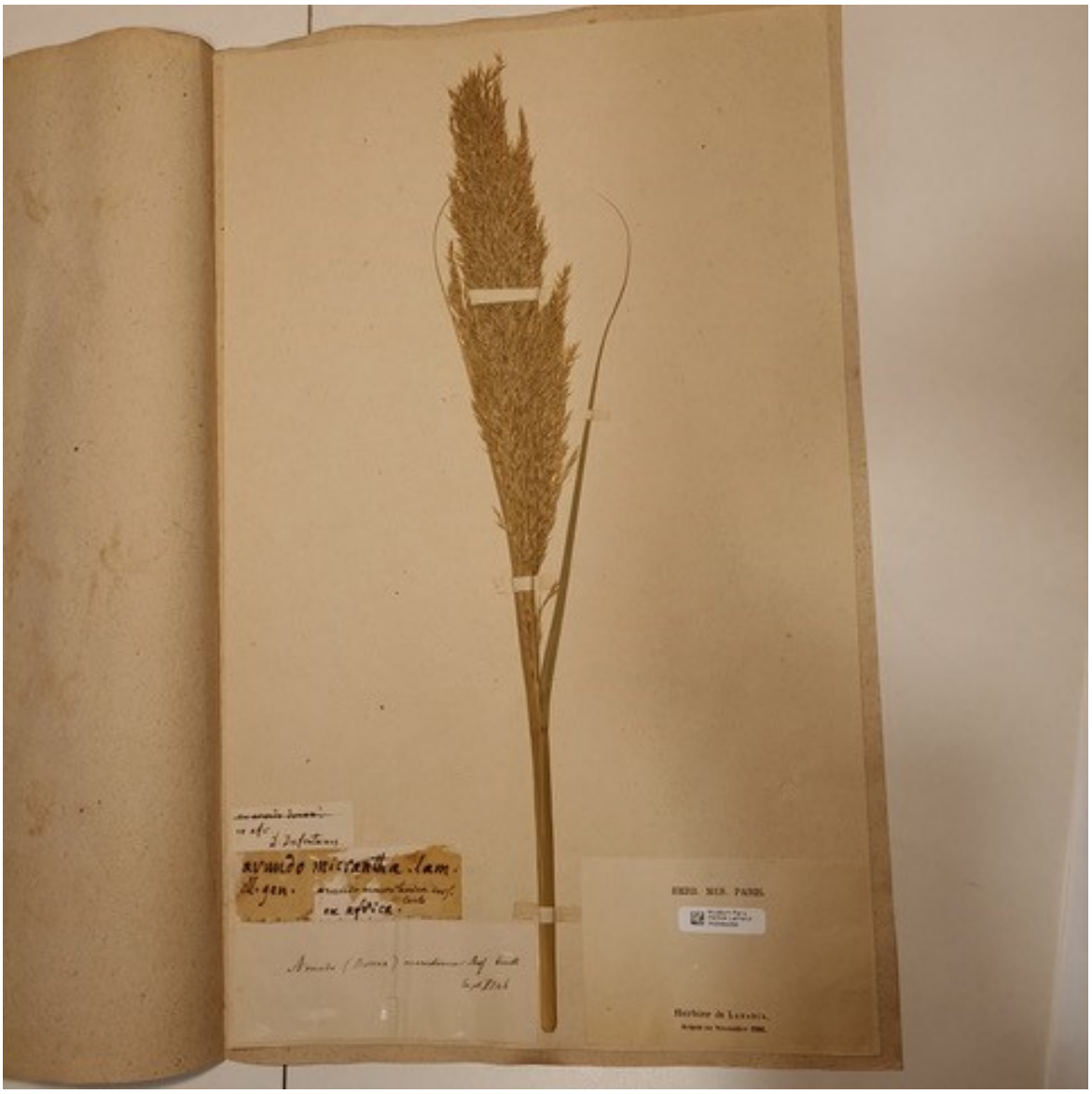

Figure 2. Original material of *Arundo micrantha* Lam. (P-LA, 2-D code P00564266). (Photography by courtesy of the herbarium P, reproduced with permission.)

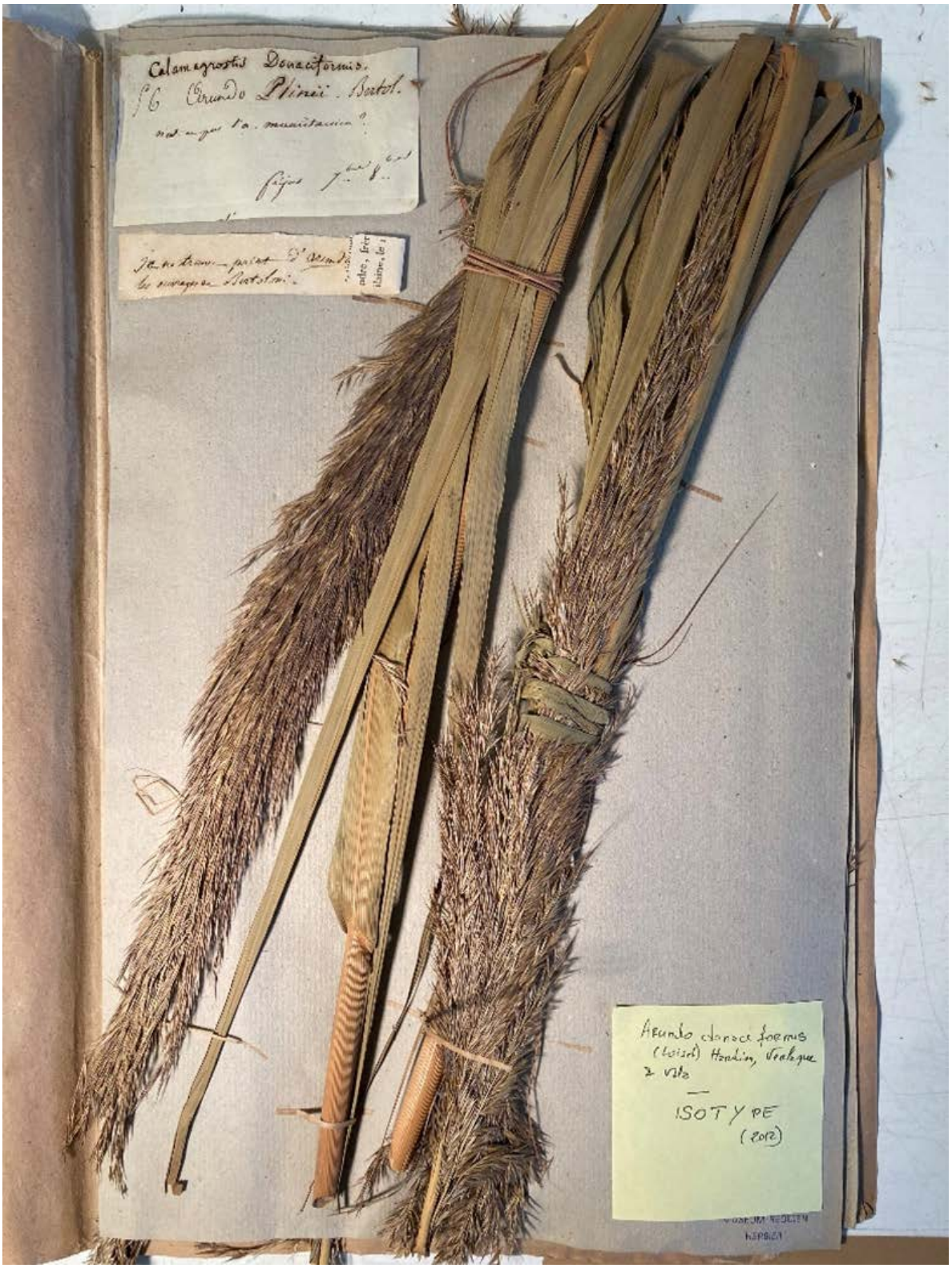

Figure 3. Lectotype of *Arundo donaciformis* (Loisel.) Hardion et al. (AV, code 2024.0.32.98.1). (Photography by courtesy of the herbarium AV, reproduced with permission.)

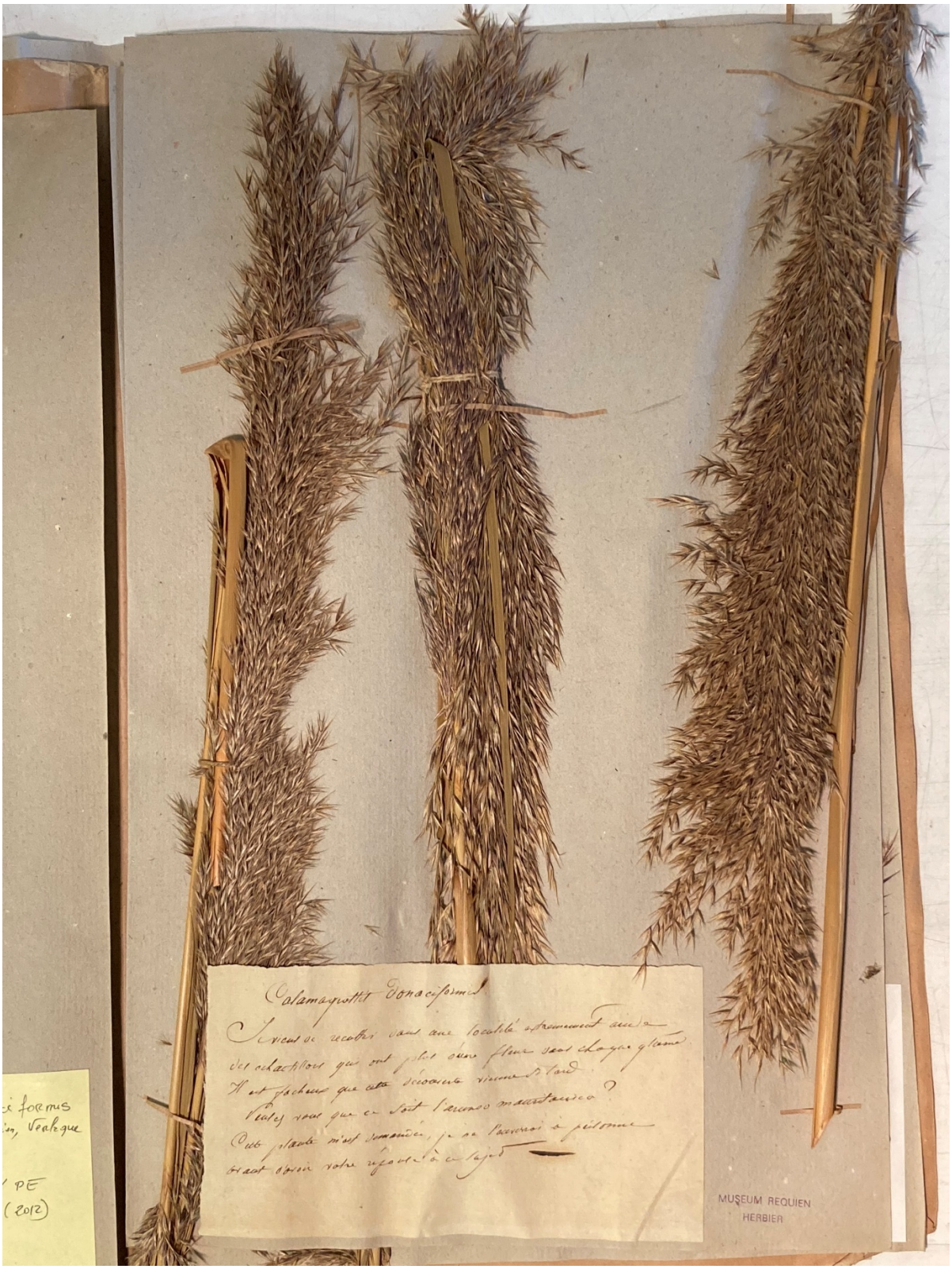

Figure 4. Isolectotype of *Arundo donaciformis* (Loisel.) Hardion et al. (AV, code 2024.0.32.98.2). (Photography by courtesy of the herbarium AV, reproduced with permission.)

Figure 5. Lectotype of *Arundo formosana* Hack. (W, code W-1916-0034625). (Photography by courtesy of the herbarium W, reproduced with permission.)

Figure 6. Lectotype of *Arundo parviflora* Ohwi (US, no. 00139588). (Photography by courtesy of the herbarium US, reproduced with permission.)

Figure 7. Lectotype of *Arundo formosana* subsp. *gracilis* (Hack.) Hardion, Verlaque & B.Vila (W, code W-1916-0034626). (Photography by courtesy of the herbarium W, reproduced with permission.)

Figure 8. Lectotype of *Arundo bifaria* Retz. (LD barcode LD1212905). (Photography by courtesy of the herbarium LD, reproduced with permission.)

Figure 9. Lectotype of *Arundo donax* var. *coleotricha* Hack. (W no. W19160034630). (Photography by courtesy of the herbarium W, reproduced with permission.)