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Typification of names of *Clusiaceae* based on material collected by August Weberbauer in Peru

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Abstract: August Weberbauer was a German botanist who worked for most of his life in Peru. Many species have been described based on specimens collected by him, which were mainly deposited in the Berlin herbarium (B). After the bombing of the Berlin herbarium during World War II, it was assumed that most of these types had been destroyed, duplicates rarely existed and neotypes had to be designated. However, during visits to Peruvian herbaria we rediscovered some overlooked duplicates of specimens of *Clusiaceae*. In the present paper, we designate lectotypes of ten names based on these Weberbauer collections and report additional duplicates found in the herbarium G. Some former incorrect typifications are corrected, and the problem of destroyed types in herbarium B, often known mainly from photos made by J. F. Macbride, is briefly discussed.

Key words: August Weberbauer, Berlin herbarium, *Chrysochlamys*, *Clusia*, *Clusiaceae*, nomenclature, Peru flora, *Tovomita*, typification

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Introduction

August Weberbauer was a German botanist, naturalist and university professor. He was born in Breslau on 26 November 1871 and died on 16 January 1948 in Lima (Peru). A few years after obtaining his doctorate degree at the University of Berlin, Germany (under the supervision of A. Engler [Stafleu & Cowan 1988]), Weberbauer made his first journey to Peru, where he stayed for four years and made more than 5000 plant collections (Garcia 1949). In 1908, he travelled again from Germany to Peru and was named Director of the Parque Zoológico y Botánico de Lima. In 1911 Weberbauer published a study about the Peruvian flora (Weberbauer 1911) and began to work

on the first edition of his phytogeographical map, which was published 12 years later (Weberbauer 1923). In the following years, he worked at the Universidad Nacional Mayor de San Marcos and at the Estación Experimental Agrícola de la Molina, and continued to do field work in Peru until 1947 (Garcia 1949).

During the last years of his life, in spite of his advanced age and his poor state of health, Weberbauer was working at the University of San Marcos to finish the second edition of his phytogeographical map (Garcia 1949). His importance for the development of Peruvian botany was recognized by the bestowal of the “Orden El Sol del Perú”, the designation of several species names in his honour, as well as herbarium collections and even elementary schools.

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During a period of approximately 35 years (1901–1905, 1908–1939), Weberbauer collected more than 8000 specimens in Peru, most of which were deposited in the Berlin herbarium (B) (Staffleu & Cowan 1988; León 2002; Luteyn & al. 2008; herbarium codes according to Thiers 2018+). A large part of the collection of the Berlin herbarium was destroyed during World War II in the night of 1–2 March 1943, including most of the collections of Weberbauer and the entire collection of *Clusiaceae* (Hiepkö 1987; BGBM data portal 2018). After World War II, botanists often considered nearly all type material of *Clusiaceae* collected by Weberbauer as destroyed (Pipoly 1997), and sometimes photographs deposited in the herbarium of the Field Museum of Natural History in Chicago (F) were considered as type material (see below), although these photographs are not part of the original material because they did not exist when the names were published (see also Luteyn & al. 2008 for such incorrect typifications in *Ericaceae*). Destroyed type material of the Berlin Herbarium was later frequently considered as holotypes (e.g. Luteyn & al. 2008; Burke & Michelangeli 2013), although evidence that the respective taxon description was based on a single element is usually lacking. As McNeill (2014) recently made clear: “If, prior to 1958, no specimen is indicated in the protologue, there will be a holotype only if it can be shown that a single specimen (or illustration) was the only element upon which the validating description or diagnosis was based [...] If, prior to 1990, a single gathering (but not a single specimen) is indicated as the type of the name of a new taxon, there will be a holotype only if the gathering is represented by a single specimen (see above).”

Fortunately, most type material in the Berlin herbarium was photographed by J. F. Macbride before WW II. However, he did not photograph all duplicates, as we know from type material of monocotyledons that survived WW II: for example, duplicates of gatherings of *Paepalanthus sellowianus* Körn. and *P. weberbaueri* Ruhland (*Eriocaulaceae*) were not photographed by Macbride (N. Hensold, pers. comm.). Macbride’s photographs of destroyed Berlin types cannot therefore be considered as evidence that only one specimen of a particular gathering was originally present in that herbarium.

In recent years, a few taxonomists have designated lectotypes of names of taxa based on specimens collected by Weberbauer (León & al. 2006; Luteyn & al. 2008; Burke & Michelangeli 2013; Lagomarsino & Santamaría-Aguilar 2015). These authors had encountered duplicates of specimens destroyed in Berlin in Peruvian herbaria. Evidently, botanists should visit Peruvian herbaria routinely before making decisions about typification of names that were published based on collections of Weberbauer.

To avoid the incorrect proposals of neotypes, and also to properly typify some names in *Clusiaceae* with partly incorrect typifications, we here designate lectotypes that are duplicates of collections of Weberbauer deposited mainly in Peruvian herbaria.

Material and methods

For this study we consulted the collections of the herbaria MOL and USM in Peru; F in the U.S.A.; and G in Switzerland. In addition to visiting these herbaria, we consulted the online databases of JSTOR Global Plants (<https://plants.jstor.org>), the Smithsonian National Museum of Natural History (<https://collections.nmnh.si.edu/search/botany>), the Botanischer Garten und Botanisches Museum Berlin (<http://search.biocase.org/bgbm/index>) and the Muséum national d’Histoire naturelle (<https://science.mnhn.fr/institution/mnhn/search>) in search of images and duplicates of the material cited by Engler (1923, 1925). We provide links to access the images of specimens cited throughout the paper, when such images are available online.

When duplicates were found, we designate as the lectotype the one in the best state of conservation and with the greatest number of diagnostic characters. Therefore, we prioritized specimens with staminate flowers, because in general these provide more useful characters in *Clusiaceae* than female flowers. If duplicates were considered equally well conserved and informative, we preferred to designate as lectotypes specimens deposited in Peruvian herbaria.

Results and Discussion

Lectotypification of names of taxa described by Engler (1923, 1925)

There is no evidence that Engler used any of the duplicates of Weberbauer housed in Peruvian herbaria, because no annotations from his hand can be found on these specimens. Engler (1923) did not explicitly state that he used only the material from the Berlin herbarium for his descriptions, but at that time it was not a practice to send duplicates from European herbaria to those in South America. However, because it is not possible to establish without doubt that Engler used only specimens deposited in B, or that he used only a single specimen, we consider that there are no holotypes for names published by Engler (1923, 1925), but rather syntypes, in accordance with Art. 9.6 and Art. 40 Note 1 of the *International Code of Nomenclature for algae, fungi, and plants* (Turland & al. 2018).

Chrysochlamys weberbaueri Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 8. 1923. – **Lectotype (designated here):** Peru, Dep. San Martín, cerros ao norte de Moyobamba, 1000 m, 27 Aug 1904, *Weberbauer 4658* (MOL 0001050!; isolectotype: G 00355178! [<https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00355178>]). – Syntype: *Weberbauer 4658* (B [destroyed, photograph at F! negative no. 9224 <https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009224>]).

Clusia carinata Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 3. 1923. – **Lectotype (designated here):** Peru, Dep. San Martín, Prov. Moyobamba, cerros ao norte de Moyobamba, 1000–1100 m, 27 Aug 1904, *Weberbauer 4629* (MOL 0001410!; isolectotype: G G00355148! [https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00355148]). – Syntype: *Weberbauer 4629* (B [destroyed, photograph at F! negative no. 9182 https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009182]).

Oedematopus congestiflorus Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 6. 1923 ≡ *Clusia engleriana* Pipoly in Sida 17: 766. 1997 [non *Clusia congestiflora* Cuatr. in Revista Acad. Colomb. Ci. Exact. 8: 52. 1950]. – **Lectotype (designated here):** Peru, Sandia, 2300–2400 m, fruiting, 28 Mar 1902, *Weberbauer 624* (USM accession no. 170363!). – Syntype: *Weberbauer 624* (B [destroyed, photograph at F! negative no. 9177 – https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009177]).

Pipoly (1997) proposed the new name *Clusia engleriana* for *Oedematopus congestiflorus* (non *C. congestiflora* Cuatr.), and placed this species in *C.* sect. *Oedematopus* (Planch. & Triana) Pipoly. Pipoly (1997) accepted the material deposited in herbarium B (destroyed during the World War II) as the holotype of *O. congestiflorus*, and incorrectly treated the photograph (deposited in herbarium F) of the destroyed Berlin specimen as an isotype. However, the photograph cannot be an isotype because it is not a duplicate of a holotype specimen (Turland & al. 2018: Art. 9.5), and it is not eligible as a lectotype because, as mentioned above, it is not part of the original material of the name.

Pipoly probably saw only the photograph of the destroyed specimen formerly deposited in B, and therefore could not observe details of the reproductive structures. Through the examination of the extant material deposited in the herbarium USM, we concluded that *Clusia engleriana* should actually be included in *C.* sect. *Anandroyne* Planch. & Triana, because its staminodes lack antherodes and are deciduous after anthesis, and its stigmas are borne on elongated styles.

Oedematopus weberbaueri Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 6. 1923 ≡ *Clusia hylaeae* Pipoly in Sida 17: 766. 1997 [non *Clusia weberbaueri* Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 4. 1923]. – **Lectotype (designated here):** Peru, Loreto, Moyobamba, 800–900 m, ♀, 14 Aug 1904, *Weberbauer 4526* (USM accession no. 170643!; isolectotype: G!). – Syntype: *Weberbauer 4526* (B [destroyed, photograph at F! negative no. 9178 https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009178]).

Pipoly (1997) made the same mistake as in the case of *Clusia engleriana* (see above), when considering the photograph of the destroyed specimen of B as an isotype. We found duplicates of *Weberbauer 4526* at the herbaria G and USM, and designate the material of herbarium USM as the lectotype.

Clusia lorentensis Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 5. 1923. – **Lectotype (designated here):** Peru, Dep. Loreto, Prov. Moyobamba, 800–900 m, 9 Sep 1904, *Weberbauer 4696* (G 00355090! [https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00355090]). – Syntype: *Weberbauer 4696* (B [destroyed, photograph at F! negative no. 9191 https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009191]).

Clusia riojensis Engl. in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 21: 203. 1925. – **Lectotype (designated here):** Peru, Prov. Chachapoyas, north Moyobamba, without date, *Weberbauer 4457* (G 00355313! [https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00355313]). – Syntype: *Weberbauer 4457* (B [destroyed, photograph at F! negative no. 9197 https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009197]).

Clusia sandiensis Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 2. 1923. – **Lectotype (designated here):** Peru, Sandia, 2100–2400 m, 21 Mar 1902, *Weberbauer 573* (G 00355316! [https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00355316]). – Syntypes: *Weberbauer 573* (B [destroyed, photograph at F! negative no. 9198 https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009198]); Peru, Sandia, 2100–2400 m, 20 Mar 1902, *Weberbauer 565* (B [destroyed]).

Clusia tarmensis Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 5. 1923. – **Lectotype (designated here):** Peru, Depart. Junin, Prov. Tarma, La Merced en el vale Chanchamayo, 1000 m, Dec 1902, *Weberbauer 1895* (USM accession no. 170653!). – Syntype: *Weberbauer 1895* (B [destroyed, photograph at F! negative no. 9202 https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009202]).

Clusia weberbaueri Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 4. 1923. – **Lectotype (designated here):** Peru, Dep. Junin, Prov. Tarma, entre Huacapistana y Palca, 1900–2000 m, 6 Jan 1913, *Weberbauer 1978* (USM accession no. 170360!). – Syntype: Peru, Dep. Junin, Prov. Tarma, 7 Jan 1913, *Weberbauer 1999* (B [destroyed, photograph at F! negative no. 9207 https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009207]).

Engler (1923) described *Clusia weberbaueri* based on staminate (*Weberbauer 1999*) and pistillate (*Weberbauer 1978*) plants. Since we did not find staminate material, we designate the pistillate material as lectotype.

Tovomita chachapoyasensis Engl. in Bot. Jahrb. Syst. 58(Beibl. 130): 7. 1923. – **Lectotype (designated here):** Peru, Dep. Amazonas, Prov. Chachapoyas, Molinopampa, 2000–2300 m, ♂, 18 Jul 1904, *Weberbauer 4340* (USM accession no. 170652!). – Syntypes: Peru, Dep. Amazonas, Prov. Chachapoyas, Molinopampa, 2000–2300 m, ♀, without date, *Weberbauer 4336* (B [destroyed, photograph at F! negative no. 9208

<https://plants.jstor.org/stable/10.5555/al.ap.specimen.f0bn009208>], G 00386353! [<https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00386353>], USM accession no. 170642!).

Tovomita chachapoyasensis was described by Engler (1923) using staminate (*Weberbauer 4340*) and pistillate (*Weberbauer 4336*) specimens. Although the extant pistillate material deposited in G and USM has more leaves, the staminate material provides a larger number of taxonomically useful characters. The syntypes show that *T. chachapoyasensis* belongs to *Clusia* sect. *Anandrogynae*; the large external pair of sepals enveloping the other parts of the floral bud, a typical attribute of *Tovomita*, is absent in the flowers of the syntypes of *T. chachapoyasensis*. More studies are necessary to verify if *T. chachapoyasensis* should be transferred to *Clusia* as a new combination or synonymized under the name of a species already described. The type specimens have many similarities with *C. engleriana*, for example, a species originally also described by Engler (1923, as *Oedematopus congestiflorus*) and lectotypified in this paper (see above).

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