UREDINALES OF GUATEMALA BASED ON COLLECTIONS BY E. W. D. HOLWAY

IV. Puccinia on Carduaceae, Form-genera, and Index

J. C. Arthur

The preceding parts of this account of Guatemalan rusts were published in this journal (June, 1918, pp. 325–336; October, 1918, pp. 420–446; November 1918, pp. 462–489). With the present concluding part an index both to rusts and hosts is provided to facilitate ready reference.

The composites of the tropics are both numerous and diversified. In many of the genera are intergrading forms. The composite rusts are also numerous and in many cases most difficult to delimit, often showing variations comparable with those of the hosts. The material of this part has been reviewed and, when required, critically studied by Professor H. S. Jackson, who has drawn up the diagnoses for the eight new species. The composite collections of Professor Holway from Costa Rica were studied at the same time and the results published in a paper by the writer on the Costa Rican rusts in Mycologia (**10**: 111–154. 1918).

The species here remaining in form-genera are not so numerous as is usually the case with tropical rusts. All but two or three of them evidently belong to the Aecidiaceae, and the other stages can be expected to turn up before very long.

For this fine showing of Guatemalan rusts chief credit is due to Professor E. W. D. Holway, who has given abundantly of his time and private means to carry out the explorations, and who has also co-operated in the study of the material. Grateful acknowledgment is also to be made to the officers and mycologists of the Purdue University Agricultural Experiment Station who have provided facilities for making the microscopic examinations and have assisted in the studies.

178. Puccinia insulana (Arth.) Jacks. & Holw. (on Carduaceae).

Vernonia sp., Retalhuleu, Feb. 26, 1916, O, II_1, II_2, III, *537*.

The species has been known heretofore from the West Indian islands

on *V. albicaulis* and *V. longifolia* under the name *Argomyces insulanus* Arth., and is now reported for the first time from the continent.

179. PUCCINIA ERRATICA Jacks. & Holw. (on Carduaceae).

Vernonia Schiedeana Less., Guatemala City, Feb. 15, 1916, O, I, II, III, *494*; same, Feb. 8, 1917, O, I, ii, III, *841*; Chinautla, Dept. Guatemala, Feb. 12, 1916, O, I, ii, iii, *480*; Moran, Dept. Amatitlan, Dec. 22, 1916, I, II, iii, *621*.

The aecia of this species were described as *Dietelia Vernoniae* Arth. (Bot. Gaz. 40: 198. 1905), afterward transferred to the genus Endophyllum, as *E. Vernoniae* Arth. (N. Am. Flora 7: 126. 1907), from a Mexican specimen thought to be on *Vernonia Deppeana*, but which on careful comparison with the Guatemalan material seems to be *V. Schiedeana*. Re-examination of the type of *E. Vernoniae*, furthermore, reveals a few urediniospores and teliospores which agree perfectly with the present material. Further confirmation of the long-cycle character of the rust was found on a specimen of *V. Schiedeana* collected by C. G. Pringle at Cordoba, Mexico, no. *6080*, in the phanerogamic collection of the New York Botanical Garden, which gave all the spore forms, although the teliospores are a little shorter and broader than usual, doubtless due to the more mature character of the host.

The species is Eriosporangium-like, and the absence of a peridium in the aecia and the deciduous sculpturing of the aeciospores are in accordance with the early ideas regarding that genus, as well as the thin-walled spores, which germinate upon maturity. A new name has been chosen for this species, owing to the priority of the very dissimilar *Puccinia Vernoniae* Schw., founded in 1832.

180. PUCCINIA NOTHA Jacks. & Holw. (on Carduaceae).

Vernonia leiocarpa DC., San Rafael, Dept. Guatemala, Jan. 7, 1915, III, *21*; Solola, 7000 feet alt., Jan. 28, 1915, I, II, III, *148*; Guatemala City, Feb. 15, 1916, III, *495*, intermixed with another species; March 17, 1916, III, *585a*, being intermixed with, and separated from the type collection of *P. rata*; Volcan de Agua, Dept. Sacatépequez, March 4, 1916, III, *550*; Quezaltenango, Jan. 16, 1917, I, II, III, *732*; Huehuetenango, Jan. 21, 1917, I, II, III, *759*.

Vernonia Shannoni Coult. (?), Quezaltenango, Jan. 31, 1917, III, *814*.

In the collection from Quezaltenango, no. *732*, the telia are about equally abundant on both surfaces of the leaf and the teliospores have shorter pedicels than in the other collections. The species is nearest to *P. idonea*.

181. PUCCINIA RATA Jacks. & Holw. (on Carduaceae).

Vernonia leiocarpa DC., Guatemala City, Feb. 13, 1916, ii, III, *490*; same, Feb. 15, 1916, II, III, *495a*, intermixed with *P. notha*; same, March 17, 1916, II, III, *585*, intermixed with *P. notha*; Mendez, Dept. Guatemala, Feb. 13, 1917, III, *860*.

A species readily separable from others at present known on Vernonia by the paraphysate uredinial sori and tuberculate teliospores. On some leaves it is accompanied by *P. notha*, from which it may be distinguished by the position on the under surface of the leaf, the paraphysate sori, the dark-colored urediniospores and tuberculate teliospores. No aecia have yet been found. The species is known only from Guatemala.

182. PUCCINIA IDONEA Jacks. & Holw. (on Carduaceae).

Vernonia trifloscula H.B.K., Chinautla, Dept. Guatemala, Feb. 12, 1916, ii, III, *481*; Escuintla, Feb. 17, 1916, II, iii, *498*; same, II, III, *499*; Panajachel, Dept. Solola, Jan. 3, 1917, ii, III, *670*.

The type selected for this species was collected in Costa Rica, on *Vernonia trifloscula* H.B.K., at San José, Jan. 18, 1916, by E. W. D. Holway *445*. No pycnia were found in either the Costa Rican or Guatemalan collections, and the nature of the complete life cycle remains uncertain. The species is similar to *P. notha*, but has smaller and narrower urediniospores, with hemispherical and closely set projections on the teliospores.

183. PUCCINIA PRAEALTA Jacks. & Holw. (on Carduaceae).

Vernonia trifloscula H.B.K., Mazatenango, Dept. Suchitepequez, Feb. 21, 1916, II, III, *510*.

A very distinct species for which the aecia are not known, separable from all others on the genus Vernonia by the very deep-seated and strictly epiphyllous sori. The gross appearance is that of a microform. It occurs also in Costa Rica.

184. PUCCINIA INAEQUATA Jacks. & Holw. (on Carduaceae).

Vernonia patens H.B.K., Sanarate, Dept. Guatemala, Feb. 10, 1916, II_2, III, *470*; Escuintla, Feb. 17, 1916, O, II_1, II_2, III, *502*; Mazatenango, Feb. 22, 1916, II_2, *513*; Retalhuleu, Feb. 26, 1916, O, II_1, *534*; Agua Caliente, Dept. Guatemala, Feb. 10, 1917, II_2, III, *851*.

The same rust was also found on *V. patens* from Guatemala, in the phanerogamic herbarium at the New York Botanical Garden, showing uredinia and telia, having been collected at Santa Rosa, February, 1893, by Heyde & Lux *4524*. It is a long-cycle species with all spore forms, not known outside of Guatemala.

185. PUCCINIA DISCRETA Jacks. & Holw. (on Carduaceae).

Vernonia Deppeana Less., San Felipe, Dept. Retalhuleu, Jan. 14, 1917, O, III, *721*; Colomba, Dept. Quezaltenango, Feb. 2, 1917, *818*.

Type is on *Vernonia Deppeana* Less, San José, Costa Rica, collected by E. W. D. Holway, Dec. 15, 1915, no. *260*. The rust has a characteristic gross appearance and usually occurs on the leaves of the terminal shoots of young plants. It is a short-cycle micro-form with pycnia.

186. PUCCINIA PAUPERCULA Arth. (on Carduaceae).

Elephantopus spicatus Juss., Mazatenango, Dept. Suchitepequez, Feb. 21, 1916, *510A*; same, Feb. 25, 1916, *530*.

A short-cycle species known heretofore only from Mexico and Costa Rica.

187. PUCCINIA CONOCLINII Seym. (on Carduaceae).

Ageratum conyzoides L., San Felipe, Dept. Retalhuleu, Jan. 12, 1917, II, *697*.

Ageratum corymbosum latifolium (DC.) Robinson, Chinautla, Dept. Guatemala, Feb. 12, 1916, II, iii, *482*; Moran, Dept, Amatitlan, Dec. 22, 1916, II, III, *623*.

Ageratum rugosum Coult., Antigua, Dept. Sacatépequez, Jan. 12, 1915, II, III, *74*.

Eupatorium collinum DC., Guatemala City, Dec. 23, 1916, II, III. *627*; Huehuetenango, Jan. 21, 1917, ii, III, *757*.

Eupatorium glandulosum H.B.K. (?), Quezaltenango, Jan. 31, 1917, ii, III, *810*.

Eupatorium Neaeanum DC., Solola, Jan. 27, 1915, II, III, *131*.

Eupatorium pycnocephaloides Robinson, Volcan de Agua, Dept. Sacatépequez, Jan. 13, 1915, II, III, *83*; same, March 7, 1916, II, III, *564*; Solola, 7000 feet alt., Jan. 28, 1915, II, III, *144*; Quezaltenango, Jan. 18, 1917, II, III, *750*, Huehuetenango, Jan. 23, 1917, II, III, *774*.

Eupatorium pycnocephaloides glandulipes Robinson, Totonicapam, Jan. 24, 1915, ii, III, *106*.

Eupatorium pycnocephalum Less., Solola, Jan. 29, 1915, II, III, *153*; Antigua, Dept. Sacatépequez, March 2, 1916, II, III, *549*: San Felipe, Dept. Retalhuleu, Jan. 13, 1917, II, 713.

Eupatorium sp., Guatemala City, Dec. 23, 1916, II, III, *629*; San Felipe, Dept. Retalhuleu, Jan. 14, 1917, II, *717*; Aguas Amargas, Dept. Quezaltenango, Jan. 30, 1917, II, III, *801*.

This long-cycle rust is imperfectly known. It is presumable that the species possesses aecia as well as pycnia, although neither have yet been seen. This is the more likely as no rust on Eupatorium or its close allies has yet been found with pycnia associated with the uredinia. For a time it was supposed that the aecia on Eupatorium from Mexico and Central America, having apically thickened walls, belonged with this species, and since 1906 the combination has often been called "*Puccinia rosea*." By the observations of Prof. Holway, coupled with data regarding distribution, it now seems reasonably certain that the aecia in question are heteroecious, and belong with a grass species (see no. 117).

The rust was collected by Kellerman on *Ageratum conyzoides*, at Mazatenango, Feb. 28, 1905, II, *4346*, *5373*, and at San Felipe, Feb. 4, 1906, II, *5446* (Kellerm. Fungi Sel. Guat. *7*); and on *Eupatorium pycnocephalum*, at Guatemala City, Feb. 1, 1905, II, iii, *5312*. The three collections were reported by Kern in Journ. Myc. *l.c.*

188. **Puccinia Hodgsoniana** Kern sp. nov. (on Carduaceae).

Eupatorium Schultzii Schnitt., forma *erythranthodium* Robinson, Agua Caliente, Dept. Guatemala, Feb. 10, 1917, II, III, *853*.

Eupatorium Schultzii ophryolepis Robinson, San Lucas Toliman, 7000 feet alt., Dept. Solola, Feb. 3, 1915, II, III, *187*; Quezaltenango, Jan. 18, 1917, II, III, *744*; Agua Amargas, Dept. Quezaltenango, Jan. 30, 1917, II, III, *804*.

Eupatorium Schultzii velutipes Robinson, San Lucas Toliman, 5100 feet alt., Dept. Solola, Feb. 2, 1915, II, iii, *170*; Guatemala City, March 17, 1916, II, *587*.

Uredinia hypophyllous, scattered, round, 0.3–0.5 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; urediniospores globoid to obovoid, 19–26 by 24–30 μ; wall chestnut-brown, 1.5–2.5 μ thick, moderately and finely echinulate, the pores 2, near the hilum, or rarely 3, all near the hilum or one of the three near the apex.

Telia chiefly hypophyllous, scattered, small, round, 0.5–0.8 mm. across, early naked, pulverulent, blackish-brown, ruptured epidermis inconspicuous; teliospores oblong or ellipsoid, 24–29 by 40–45 μ, rounded or obtuse above, rounded below, scarcely constricted at septum; wall chestnut-brown, 3–4 μ thick, lighter colored and thicker at apex, 5–9 μ, equally thickened over pore of lower cell, closely and prominently verrucose; pedicel colorless, once to twice length of spore, sometimes attached obliquely.

The type of the species is a collection by Kellerman *6087*, made Feb. 6, 1907, on Volcan Acatenango, 6000 feet alt., Dept. Sacatépequez, on *Eupatorium phoenicolepis guatemalensis* Robins., the host being determined by J. M. Greenman, and the name of the fungus attached by Dr. F. D. Kern.

189. **Puccinia solidipes** Jacks. & Holw. sp. nov. (on Carduaceae).

Eupatorium tubiflorum Benth., San Rafael, 7000 feet alt., Dept. Guatemala, Jan. 7, 1915, ii, III, *18*; Volcan de Agua, Dept. Sacatépequez, March 4, 1916, ii, III, *557* (type); Zunil, Dept. Quezaltenango, Jan. 28, 1917, ii, III, *793*.

Uredinia hypophyllous, scattered, or somewhat gregarious, round, small, 0.1–0.3 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis barely noticeable; urediniospores globoid or obovoid, 23–29 by 26–32 μ; wall dark cinnamon-brown, thin, 1–1.5 μ, closely and finely echinulate, the pores 2, sometimes 3, approximately equatorial.

Telia amphigenous, scattered, 0.5–1 mm. across, early naked, somewhat pulverulent, blackish-brown, ruptured epidermis barely noticeable; teliospores broadly ellipsoid, 30–35 by 38–45 μ, rounded at both ends, slightly constricted at septum; wall chestnut-brown, rather thick, 2.5–4 μ, slightly thicker above by a lighter umbo, 5–6 μ; pedicel colorless, persistent, the wall thickened often nearly obliterating the lumen, the surface granulose at base, twice to thrice length of spore, 6–7 μ in diameter.

This species differs conspicuously from *P. inanipes* Diet. & Holw., with which it has been confused, by having urediniospores of the usual globoid or obovoid form, while in *P. inanipes* they are strongly flattened above and below, forming an oblate spheroid, and also by the

solid, or nearly solid, pedicels of the teliospores, caused by the greatly thickened walls, as well as by minor characters.

The same rust on the same host was collected by Kellerman at Volcan de Atitlan, Dept. Solola, Feb. 16, 1906, ii, III, *5314*, and was reported by Kern in Mycologia *l.c.*, under the name *P. inanipes* It was collected by Prof. Holway on the same host at Patzcuara, Mexico, Oct. 17, 1898, *3007*, Oct. 19, 1898, *3232*, and Oct. 10, 1899, *3600*. These three collections bear uredinia but no telia. These specimens were collected for the *Aecidium roseum* Diet. & Holw., which they bear in abundance, while the uredinia are less conspicuous. The aecia were also taken at the same locality and time on other species of Eupatorium, and are believed to be heteroecious (see no. 117). The characters for the uredinial sorus, given above, are drawn from the Mexican material, the other characters from the Guatemalan material.

190. **Puccinia basiporula** Jacks. & Holw. sp. nov. (on Carduaceae).

Eupatorium Mairetianum DC., Quezaltenango, Jan. 16, 1917, II, III, *733*; same, Jan. 31, 1917, II, III, *808*; same, Feb. 4, 1917, II, *837*.

Eupatorium Mairetianum adenopodum Robinson, Cerro Quemado, Dept. Quezaltenango, Jan. 21, 1915, ii, III, *98* (type).

Uredinia hypophyllous, scattered, round, small, 0.2–0.3 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid, sometimes flattened at hilum, 21–24 μ in diameter; wall cinnamon-brown, thin, 1–1.5 μ, closely and finely echinulate, pores 2, near the hilum, often indistinct.

Telia chiefly hypophyllous, scattered, round, small, 0.3–0.5 mm. across, early naked, somewhat pulverulent, blackish-brown, ruptured epidermis inconspicuous; teliospores ellipsoid, 23–26 by 32–35 μ, rounded at both ends, slightly constricted at septum; wall chestnut-brown, 1.5–2.5 μ, thickened at apex and over pore of lower cell to 5 μ, closely and distinctly verrucose; pedicel colorless, firm, 7 μ thick, once and a half to twice length of spore, often attached obliquely, the wall thin.

The species was collected by Kellerman, on *E. rafaelense* Coult., at Volcan de Cerro Quemado, Feb. 8, 1906, III, *5449*, and reported by Kern in Journ. Myc. *l.c.*, under the name of *P. Conoclinii*, and likewise issued in Kellerm. Fungi Sel. Guat. *14*.

191. PUCCINIA TOLIMENSIS Mayor (on Carduaceae).

Eupatorium pansamalense Robinson, Agua Amargas, Dept. Quezaltenango, Jan. 30, 1917, *802*.

Eupatorium sp., San Rafael, Dept. Guatemala, Jan. 7, 1915, *22*; Aguas Amargas, Dept. Quezaltenango, Jan. 30, 1917, *806*.

A short-cycle South American species not before reported from North America.

192. PUCCINIA BACCHARIDIS Diet. & Holw. (on Carduaceae).

Baccharis glutinosa Pers., Chinaulta, Dept. Guatemala, Jan. 17, 1915, O, I, ii, *91*; Panajachel, Dept. Solola, Jan. 30, 1915, 0, i, II, III, *158*.

A long-cycle rust, with all spore forms, placed in the North American Flora (7: 213) under the genus Eriosporangium, as *E. punctato-striatum* (Diet. & Neg.) Arth.

193. PUCCINIA EXORNATA Arth. (on Carduaceae).

Baccharis rhexioides H.B.K., San Lucas Toliman, 5100 feet alt., Dept. Solola, Feb. 2, 1915, O, I, ii, III, *174*; Guatemala City, Feb. 8, 1916, 0, i, II, III, *462*; Mendez, Dept. Guatemala, Feb. 13, 1917, O, I, II, III, *863*.

The aeciospores and urediniospores of this collection are somewhat narrower, and the former thinner-walled, than in the type material. The type collection was made by Kellerman at Guatemala City, on *B. thesioides* H.B.K., Feb. 2, 1905, O, I, II, III, *5368*. The present collections are the first made since the original one was taken.

194. PUCCINIA ANCIZARI Mayor (on Carduaceae).

Baccharis lancifolia Less., Cerro Quemado, Dept. Quezaltenango, Jan. 21, 1915, O, I, III, *103*; Tecpan, Dept. Chinaltenango, Jan. 1, 1917, 0, i, III, *660*.

This long-cycle species is without uredinia. It was described by Mayor in 1913 from material collected in Colombia on *Baccharis nitida*, and is now first reported from North America.

195. PUCCINIA BACCHARIDIS-MULTIFLORAE Diet. & Holw. (on Carduaceae).

Baccharis serraefolia DC., Solola, Jan. 25, 1915, II, *115*; same, 6000 feet alt., Jan. 27, 1915, II, *123*; Huehuetenango, Jan. 23, 1917, II, *770*.

Baccharis sp., Guatemala City, Jan. 9, 1917, II, *687*; Quezaltenango, Jan. 16, 1917, II, *731*.

A long-cycle species possessing pycnia, uredinia, and telia, heretofore reported only from Mexico, and on other species of hosts.

196. PUCCINIA OAXACANA Diet. & Holw. (on Carduaceae).

Conyza asperifolia (Benth.) Benth. & Hook. (*Baccharis hirtella* DC.), San Rafael, Dept. Guatemala, Jan. 7, 1915, I, *32*; same, Jan. 9, 1915, ii, III, *46*; Colomba, Dept. Quezaltenango, 3 Feb., 1917, III, *826*.

The aecia in no. *32* of this long-cycle rust are not in small groups on the leaves, as usually seen, but on the axillary buds, causing them to become greatly hypertrophied, making an etiolated mass 1–2 cm. long, and thickly covered with the aecia. The rust is often listed as *Eriosporangium oaxacanum* (Diet. & Holw.) Arth.

197. PUCCINIA NOCCAE Arth. (on Carduaceae).

Lagascea suaveolens H.B.K., Guatemala City, Jan. 3, 1915, II, *12a*; same, Feb. 8, 1916 II, *463*; Solola, 6000 feet alt., Jan. 30, 1915, II, iii, *155*.

A long-cycle rust, whose primary form is unknown. Heretofore it has been recorded only from Mexico.

198. PUCCINIA CALEAE Arth. (on Carduaceae).

Calea Zacatechichi Schlecht., Antigua, Dept. Sacatépequez, Dec. 28, 1916, III, *643*.

Calea Zacatechichi macrophylla Robins. & Greenm., Guatemala City, Jan. 1, 1915, ii, III, *7*; Chinaulta, Dept. Guatemala, Jan. 17, 1915, III, *89*; Solola, Jan. 27, 1915, III, *132*.

Calea sp., Panajachel, Dept. Solola, Jan. 3, 1917, III, *675*.

A long-cycle rust, with all spore forms, known heretofore only from Mexico.

199. **Puccinia ordinata** Jackson & Holw. sp. nov. (on Carduaceae).

Calea insignis Blake, Quezaltenango, Jan. 31, 1917, *817*.

Calea integrifolia (DC.) Hemsl., Solola, 7000 feet alt., Jan. 28, 1915, *145*; Zunil, Dept. Quezaltenango, Jan. 28, 1917, *790*.

Telia chiefly hypophyllous, crowded and confluent opposite discolored sunken spots 1–1.5 mm. across, early naked, pulvinate, blackish becoming cinereous by germination, ruptured epidermis noticeable; teliospores oblong-cylindric, 16–19 by 45–70 μ, rounded or obtuse above, narrowed below, slightly constricted at septum; wall cinnamon-brown, darker above, 1–2 μ thick, much thicker at apex, 6–12 μ, smooth; pedicel colored like the spore, short.

A short-cycle rust in which the pycnia are probably not formed. It resembles P. *Synedrellae* on the nearly related host *Tridax procumbens*, but with spores half as much larger.

200. PUCCINIA GYMNOLOMIAE Arth. (on Carduaceae).

Gymnolomia microcephala Less., Volcan de Agua, Dept. Sacatépequez, March 4, 1916, II, III, *556*; Mendez, Dept. Guatemala, Feb. 13, 1917, II, III, *861*.

Hymenostephium cordatum (Hook. & Arn.) Blake, San Felipe, Dept. Retalhuleu, Jan. 12, 1917, II, *692*; Colomba, Dept. Quezaltenango, Feb. 3, 1917, II, *828*.

Hymenostephium sp., Antigua, Dept. Sacatépequez, Dec. 28, 1916, II, III, *652*.

A long-cycle rust that probably possesses pycnia and aecia, which, however, have not yet been collected.

201. **Puccinia semota** Jackson & Holway sp. nov. (on Carduaceae).

Gymnolomia subflexuosa Benth., Solola, Jan. 28, 1915, *146*.

Pycnia unseen, probably not formed.

Telia hypophyllous, crowded in small confluent groups 1–2 mm. across, round, 0.3–0.5 mm. in diameter, early naked, pulvinate, dark chestnut-brown, ruptured epidermis inconspicuous, teliospores clavate, 13–18 by 48–58 μ, rounded above, somewhat narrowed below, slightly constricted at septum; wall golden-brown, thin, 1 μ, thickened above, 4–10 μ, smooth; pedicel colorless, short, one third length of spore or less.

A short-cycle rust of the general appearance of *P. Silphii*.

202. PUCCINIA COGNATA Syd. (on Carduaceae).

Verbesina Fraseri Hemsl., Antigua, 5300 feet alt., Dept. Sacatépequez, Jan. 12, 1915, 0, i, ii, III, *73*; Guatemala City, Feb. 8, 1916, II, III, *464*; same, Dec. 20, 1916, II, III, *604*.

Verbesina Holwayi Robinson, Quezaltenango, Jan. 20, 1915, ii, III, *96B*; same, Jan. 17, 1917, III, *738* (with *Coleosporium Verbesinae*).

Verbesina sublobata Benth., San Lucas Toliman, Dept. Solola, Feb. 2, 1915, II, *175A*, *180*.

Verbesina sp., Solola, Jan. 27, 1915, II, *135*; San Lucas Toliman, Dept. Solola, Feb. 2, 1915, II, III, *177*; Mazatenango, Dept. Suchitepequez, Feb. 22, 1916, II, *523*.

A long-cycle species, showing much variability in size and appearance of the teliospores. It was collected by Kellerman on *V. Fraseri*, at Guatemala City, Feb. 1, 1905, ii, III, *4324*, and at Laguna, Lake Amatitlan, January, 1906, ii, III, *5412*, and reported by Kern in Journ. Myc. *l.c.*

203. PUCCINIA AFFINIS Syd. (on Carduaceae).

Verbesina perymenioides Schultz Bip., Guatemala City, Jan. 1, 1915, ii, III, *6*; Laguna, Lake Amatitlan, Feb. 8, 1915, II, *200*.

Neither pycnia nor aecia have yet been seen in connection with this species. It was collected by Kellerman on an undetermined species of Verbesina, appearing very similar to *V. perymenioides*, at Laguna, Lake Amatitlan, Jan. 20, 1906, II, III, *5455*, and reported by Kern in Journ. Myc., under the name of *P. Ximenesiae* Long, a very similar species.

204. PUCCINIA MELAMPODII Diet. & Holw. (on Carduaceae).

Melampodium divaricatum (Rich.) DC., Mazatenango, Dept. Suchitepequez, Feb. 22, 1916, *515*.

A short-cycle leptoform rust, rarely collected. It is known from the type locality in central Mexico, and by a previous collection from Guatemala, seen in the cryptogamic herbarium of the New York Botanical Garden, on the same host, made in Dept. Escuintla, March, 1890, by J. Donnell Smith.

205. PUCCINIA TITHONIAE Diet. & Holw. (on Carduaceae).

Tithonia diversifolia (Hemsl.) A. Gray, San Rafael, Dept. Guatemala, Jan. 10, 1915, II, iii, *65*; same, Jan. 12, 1915, II, *60*; San Felipe, Dept. Retalhuleu, Jan. 12, 1917, II, *701*.

Tithonia rotundifolia (Mill.) Blake (*T. tagetiflora* Desf.), Mazatenango, Feb. 21, 1916, II, III, *514*; San Antonio, Dept. Suchitepequez, Feb. 24, 1916, II, *526*; San Felipe, Dept. Retalhuleu, Jan. 12, 1917, II, *696*; same, Jan. 14, 1917, II, *715*.

Tithonia scaberrima Benth., Quezaltenango, Jan. 16, 1917, II, *729*.

Tithonia tubaeformis Cass., Antigua, Dept. Sacatépequez, Jan. 11, 1915, II, *70*; Guatemala City, Dec. 20, 1916, II, III, *606*.

A long-cycle rust, similar to *P. Helianthi* Schwein, whose first stage is unknown. It was described from Mexico on *T.* "*cubiflora*," an error for *T. tubaeformis*. The first named host has not before been reported. The species was collected by Kellerman on *T. tubaeformis*, at Guatemala City, Feb. 3, 1905, II, III, *4328*, and at Laguna, Lake Amatitlan, Jan. 30, 1906, II, III, *5425*, and reported by Kern in Journ. Myc. *l. c.* No. *5425* was also issued in Kellerm. Fungi Sel. Guat. *18*.

206. PUCCINIA GNAPHALII (Speg.) P. Henn. (on Carduaceae).

Gnaphalium rhodanthum Schultz Bip., Volcan de Agua, Dept. Sacatépequez, March 7, 1916, II, *578*.

A long-cycle species, for which the primary stage is not known. Only uredinia have been taken in North America up to the present time.

207. PUCCINIA GNAPHALIATA (Schwein.) Arth. & Bisby (on Carduaceae).

Gnaphalium sp., Guatemala City, Dec. 20, 1916, I, *610*; Antigua, Dept. Sacatépequez, Dec. 28, 1916, I, *655*.

A widespread, long-cycle species, having no uredinia, and not before reported south of Mexico. It is usually listed under the synonymous name *P. investita* Schwein.

208. PUCCINIA MELANTHERAE P. Henn. (on Carduaceae).

Melanthera nivea (L.) Small, Antigua, 5300 feet alt., Dept. Sacatépequez, Jan. 11, 1915, ii, III, *69*.

This long-cycle rust is now first reported from North America. A collection by E. Ule, from Brazil, 1885, is issued in Rab.-Paz. Fung; Europaei *4325*. It probably possesses pycnia and aecia, but they have not yet been seen.

209. **Puccinia cornuta** Jacks. & Holw. sp. nov. (on Carduaceae).

Notoptera brevipes (Robinson) Blake, Guatemala City, Feb. 15, 1916, O, I, III, *493*; same, Feb. 8, 1917, O, I, III, *846* (type).

Pycnia mostly epiphyllous, along the veins on yellowish areas, conspicuous, dark brown, subepidermal, globoid, 75–100 μ in diameter.

Aecia hypophyllous along the veins, scattered on yellowish areas 10–15 mm. across, long cylindric and slightly curved, 0.1 mm. in diameter, 2–3 mm. long, soon breaking up into cylindrical fragments; peridium dirty brown, dehiscent by fragmentation; peridial cells light cinnamon-brown, narrowly rhomboidal, 7–10 by 42–55 μ, somewhat overlapping, the wall 2 μ thick; aeciospores angularly globoid or oblong, 15–26 by 26–40 μ; wall yellowish to pale golden-brown, thin, 1 μ, thicker above up to 7 μ, rather coarsely and closely verrucose above, smooth below.

Telia mostly hypophyllous, arising from the veins and following the aecia on the same discolored areas, giving a dendritic appearance, 0.2–0.5 mm. across, early naked, prominent, chocolate-brown or blackish, ruptured epidermis inconspicuous; teliospores ellipsoid, 23–26 by 32–40 μ, rounded at both ends, slightly or not constricted at septum; wall dark chestnut-brown, 2.5–3 μ thick, closely and prominently verrucose; pedicel colorless, twice to thrice length of spore.

A conspicuous rust of most unusual appearance. The remarkably long, brown aecia look like those of some Gymnosporangium, but show no tendency to slit longitudinally. At first sight they seem like ex-

traneous objects. The dendritic distribution of the blackish, loose telia is also very striking.

210. **Puccinia Trixitis** (Kern & Kellerm.) comb. nov. (on Carduaceae).

Trixis frutescens P. Br., Antigua, 5300 feet alt., Dept. Sacatépequez, Jan. 11, 1915, II, III, *71*; same, March 9, 1916, II, III, *581*; Solola, Jan. 25, 1915, II, iii, *108*; near Santa Maria, Dept. Quezaltenango, Jan. 15, 1917, II, *725*.

This rust was published as *Uredo Trixitis* Kern & Kellerm. founded on a collection made at San Lucas, Dept. Solola, Feb. 15, 1906, Kellerman *5432* (Journ. Mycol. 13: 26. 1907). It was issued as Kellerm. Fungi Sel. Guat. *20*. The beginning stage in the life cycle of the species is yet to be discovered.

211. **Puccinia Schistocarphae** Jacks. & Holw. sp. nov. (on Carduaceae).

Schistocarpha platyphylla Greenm., San Rafael, Dept. Guatemala, Jan. 9, 1915, *42* (type); Volcan de Agua, Dept. Sacatépequez. Jan. 13, 1915, *85*; same, March 7, 1916, *571*.

Schistocarpha sp., Aguas Amargas, Dept. Quezaltenango, Jan. 30, 1917, III, *799*; road between Colomba and Quezaltenango, Feb. 4, 1917, III, *834*.

Telia hypophyllous, crowded over areas 0.5–2 mm. across, early naked, compact, very light yellowish-brown, becoming cinereous by germination, ruptured epidermis inconspicuous; teliospores oblong, 16–22 by 39–55 μ rounded at both ends, or slightly narrowed below, slightly constricted at septum; wall colorless or very light golden-brown, 1–1.5 μ thick, thicker above, 5–9 μ, smooth; pedicel colorless, short.

No pycnia were found with this short-cycle, leptoform rust, and doubtless none are formed.

212. PUCCINIA PROBA Jacks. & Holw. (on Carduaceae).

Zexmenia elegans Schultz Bip., Mulua, between Mazatenango and Retalhuleu, Feb. 26, 1916, O, II, III, *531*; San Felipe, Dept. Retalhuleu, Jan. 12, 1917, II, III, *689*, *698*, *700*; same, Jan. 13, 1917, II, III, *714*.

Zexmenia frutescens (Mill.) Blake, Solola, Jan. 25, 1915, ii, III, *109*; Quirigua, March 22, 1916, O, II_1, II_2, III, *601*

Zexmenia Salvinii Hemsl., Guatemala City, Feb. 8, 1917, II, *847*.

A long-cycle rust, having pycnia, uredinia, and telia. It also occurs in Costa Rica.

In the phanerogamic herbarium at the New York Botanical Garden two additional collections from Guatemala were found, both given as on *Z. costaricensis* (= *Z. frutescens* Blake), one from Cubelquitz, Dept. Alta Vera Paz, Nov. 1900, H. von Türckheim *7746*, and the other from Los Amates, Feb. 6, 1905, C. C. Deam *302*. In the phanerogamic herbarium of the Field Museum sheet no. 194857, bearing *Zexmenia elegans Kellermanii* Greenm., shows this rust, II, III. The collection was made at Los Amates, Jan. 17, 1905, Kellerman *5332*.

213. **Puccinia inaudita** Jacks. & Holw. sp. nov. (on Carduaceae).

Zexmenia leucactis Blake, Escuintla, Feb. 19, 1916, O, I, III, *505*; San Felipe, Dept. Retalhuleu, Jan. 12, 1917, O, I, III, ii, *693* (type); Colomba, Dept. Quezaltenango, Feb. 3, 1917, O, I, ii, iii, *823*.

Zexmenia longipes Benth., Guatemala City, Dec. 23, 1916, O, I, ii, III, *628*.

Pycnia chiefly epiphyllous, usually numerous, on raised spots 0.5–1.5 mm. across, conspicuous, subepidermal, deep-seated, flask-shaped, 125–160 μ broad by 160–190 μ high.

Aecia amphigenous, few in groups opposite or among the pycnia, cylindric, 0.2–0.3 mm. broad by 1–2.5 mm. long; peridium whitish, membranous, becoming deeply lacerate; peridial cells in face view angularly ellipsoid or polyhedral, 20–30 by 45–55 μ, the wall uniformly thin, 1–1.5 μ, very finely and closely verrucose-rugose; aeciospores angularly ellipsoid or globoid, 16–24 by 24–32 μ; wall pale cinnamon-brown, 1.5–2.5 μ thick, coarsely tuberculate with colorless markings giving the appearance of reticulations.

Uredinia hypophyllous, scattered, round or oval, 0.2–0.4 mm. across, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis evident; urediniospores ellipsoid or obovoid, 19–21 by 24–29 μ; wall golden-brown, rather thick, 2 μ, moderately echinulate, the pores 3–4, scattered.

Telia hypophyllous, scattered, round, 0.5–0.8 mm. in diameter, early naked, pulvinate, whitish, ruptured epidermis inconspicuous; teliospores oblong or fusiform-oblong, 16–19 by 42–64 μ, rounded or obtuse above, somewhat narrowed below, constricted at septum; wall colorless, uniformly thin, 1–1.5 μ, the pore of lower cell at septum, smooth; pedicel colorless, fragile, equaling the spore or shorter.

The combination of life cycle and morphological characters in this species makes it especially notable. In gross appearance the very long and delicate aecia together with the small, pale telia easily distinguish it from other forms on Zexmenia and nearly related hosts.

214. PUCCINIA ENCELIAE Diet. & Holw. (on Carduaceae).

Simsia Holwayi Blake, Agua Caliente, Dept. Guatemala, Feb. 10, 1917, II, III, *854*.

Simsia polycephala Benth., Moran, Dept. Amatitlan, Dec. 22, 1916, II, *624*.

Simsia sericea (Hemsl.) Blake (*Encelia sericea* Hemsl.), San Rafael, Dept. Guatemala, Jan. 11, 1915, II, *63*; Volcan de Agua, Dept. Sacatépequez, Jan. 12, 1915, II, *79*; Antigua, Dept. Sacatépequez, March 2, 1916, II, III, *548*.

A long-cycle rust possessing pycnia, uredinia, and telia. It occurs from southern California southward through Mexico and Central America.

215. PUCCINIA DOLORIS Speg. (on Carduaceae).

Erigeron bonariensis leiothecus Blake, San Rafael, 7000 feet alt., Dept. Guatemala, Jan. 8, 1915, *39*.

Erigeron Deamii Robinson, Solola, 7000 feet alt., Jan. 25, 1915, *112*.

Erigeron sp., Guatemala City, Jan. 10, 1917, *686*; Huehuetenango, Jan. 24, 1917, *776*.

A short-cycle species, occurring also in Costa Rica and South America. The teliospores are very small.

216. **Puccinia coreopsidis** Jacks. & Holw. sp. nov. (on Carduaceae).

Coreopsis mexicana (DC.) Hemsl., Guatemala City, Jan. 1, 1915, III, *5*; same, Dec. 21, 1916, ii, III, *613*; San Rafael, 7000 feet alt., Dept. Guatemala, Jan. 9, 1915, ii, III, *52* (type); Solola, Jan. 30, 1915, ii, III, *154*; near Santa Maria, Dept. Quezaltenango, Jan. 15, 1917, ii, III, *725B*.

Uredinia amphigenous, scattered, circular or oval, 0.1–0.3 mm. across, early naked, pulverulent, cinnamon-brown, the ruptured epidermis evident; urediniospores obovoid, 20–24 by 27–32 μ; wall golden, 1–1.5 μ thick, prominently and sparsely echinulate, the pores 2, superequatorial.

Telia amphigenous, scattered, circular or oval, 0.1–0.3 mm. across, early naked, pulverulent, dark chestnut-brown, the ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 23–29 by 35–45 μ, rounded above, rounded or slightly narrowed below, somewhat constricted at septum; wall dark chestnut-brown, 3–4 μ thick, slightly thicker above, 6–7 μ, strongly and sparsely verrucose; pedicel colorless, twice length of spore.

217. PUCCINIA SPEGAZZINII De Toni (on Carduaceae).

Mikania cordifolia (L.f.) Willd. (?), Guatemala City, Feb. 15, 1916, *496* same, Feb. 8, 1917, *843*; Moran, Dept. Amatitlan, Dec. 22, 1916, *622*.

A common short-cycle, leptoform rust of the tropics.

218. PUCCINIA SENECIONICOLA Arth. (on Carduaceae).

Cacalia calotricha Blake, Volcan de Agua, Dept. Sacatépequez, March 7, 1916, II, *570*.

Cacalia sp., Guatemala City, Dec. 23, 1916, I, II, III, *632*; same, Feb. 8, 1917, II, III, *845*; Huehuetenango, Jan. 23, 1917, II, III, *771*; Zunil, Dept. Quezaltenango, Jan. 28, 1917, I, *794*; Colomba, Dept. Quezaltenango, Feb. 3, 1917, I, II, III, *827*; road between Colomba and Quezaltenango, Feb. 4, 1917, II, *835*, *836*.

Senecio sp., Guatemala City, Jan. 5, 1915, II, III, *10*; San Rafael, Dept. Guatemala, Jan. 9, 1915, ii, III, *47*; Quezaltenango, Jan. 20, 1915, II, *93*, *96A*; same, Jan. 16, 1917, II, *728*; same, Jan. 28, 1917, II, *781*; San Felipe, Dept. Retalhuleu, Jan. 13, 1917, II, *702*; Zunil, Dept. Quezaltenango, Jan. 28, 1917, II, *784*.

A species heretofore imperfectly known, and recorded only from Mexico. Three of Professor Holway's collections show aecia, with globoid or broadly ellipsoid spores, 23–30 by 26–35 μ, the wall colorless, 2–3.5 μ thick, coarsely and thickly verrucose. The rust was also collected by Kellerman, on *Senecio petasioides* Greenm., Volcan de Cerro Quemado, Dept. Quezaltenango, Feb. 8, 1906, II, III, *5418*, and at Volcan de Atitlan, Dept. Solola, Feb. 16, 1906, II, III, *5442*, and also on *S. Warszewiczii* A. Br. & Bouché, Volcan de Cerro Quemado, Feb. 8, 1906, II, *5445*, all being reported by Kern in Mycologia *l.c.*

FORM-GENERA

219. UREDO PALLIDA Diet. & Holw. (on Poaceae).

Tripsacum latifolium Hitchc.

This pale, small-spore rust was collected by Kellerman at Agua Caliente, Dept. Guatemala, Jan. 25, 1908, *7802*. It was also found on phanerogamic specimens of the same host from Nicaragua and Salvador, communicated by Mrs. Agnes Chase, from the National Herbarium.

Heretofore the rust has been known only on *T. lanceolatum* Rupr. (erroneously published as *T. dactyloides*) from Mexico, and on *Zea Mays* L. from Porto Rico.

220. **Uredo Triniochloae** Arth. & Holw. sp. nov. (on Poaceae).

Triniochloa stipoides (H.B.K.) Hitchc., San Rafael, 7000 feet alt., Dept. Guatemala, Jan. 10, 1915, *59*.

Uredinia chiefly epiphyllous, numerous, small, elliptic, 0.2–0.5 mm. long, soon naked, yellowish, pulverulent, ruptured epidermis inconspicuous; paraphyses numerous, erect, clavate or capitate, unusually large, 10–29 by 58–98 μ, the wall yellowish, uniformly thin, 1–2 μ, sometimes slightly thicker above; urediniospores ellipsoid or obovoid, 16–19 by 19–26 μ; wall yellowish to pale cinnamon-brown, thin, about 1 μ, finely and closely echinulate, the pores obscure.

The species is remarkable for its large paraphyses.

221. **Uredo Zeugitis** Arth. & Holw. sp. nov. (on Poaceae).

Zeugites Hartwegi Fourn., San Rafael, 7000 feet alt., Dept. Guatemala, Jan. 9, 1915, *49*.

Uredinia chiefly hypophyllous, scattered, elliptic, small, 0.3–0.5 mm. long, rather tardily naked, cinnamon-brown, ruptured epidermis evident; urediniospores broadly ellipsoid, 19–21 by 23–26 μ; wall cinnamon-brown, moderately thick, 1.5–2.5 μ, finely and closely echinulate, the pores 3, sometimes 4, equatorial.

The host belongs to the tribe Festucaceae, in which no rust identical with this one has been seen.

222. UREDO RUBESCENS Arth. (on Artocarpaceae).

Dorstenia Contrajerva L., Palin, Dept. Amatitlan, Dec. 24, 1916, *634*.

Dorstenia Houstoni L., Mazatenango, Feb. 22, 1916, *520*; San Felipe, Dept. Retalhuleu, Jan. 13, 1917, *708*.

The first record for this rust outside of Porto Rico. No telia have yet been discovered.

223. **Uredo Fuchsiae** Arth. & Holw. sp. nov. (on Onagraceae).

Fuchsia splendens Zucc. (?), Volcan de Agua, Dept. Sacatépequez, March 7, 1916, *563* (type).

Lopezia hirsuta Jacq., Antigua, Dept. Sacatépequez, Dec. 28, 1916, *649* (with some *Puccinia Fuchsiae*).

Uredinia hypophyllous, in small irregular groups 0.5–3 mm. across, round, 0.1–0.2 mm. in diameter, long covered by the epidermis, pulverulent, pale yellow, ruptured epidermis evident; peridium hemispheric, delicate, opening at first by a small pore, later breaking away and exposing the spores, the peridial cells rectangular or rhombic, abutted, the walls colorless, thin, 1 μ, not thickened or sculptured at

the ostiole; urediniospores ellipsoid, 13–16 by 18–24 μ; wall colorless, moderately thick, 1–2 μ, rather inconspicuously echinulate, the pores obscure.

The form of the sorus in this species indicates that the rust may belong under the genus Pucciniastrum. The flat hymenium, the structure of the peridium and its behavior in dehiscence, the pale spores with thin wall and obscure pores, are all features strongly suggesting Pucciniastrum. The spores, as in species of that genus, appear sessile, but fall away as others do that have been found to be primitively catenulate. It is probably a species closely related to *Pucciniastrum pustulatum* (Pers.) Diet., and *P. Circaeae* (Thüm). Speg., both of which are on Onagraceous hosts.

224. Uredo peribuyensis Speg. (on Polygalaceae).

Polygala americana Mill., Guatemala City, Jan. 8, 1917, *682*.

This unconnected uredinial form has an applanate sorus, without paraphyses, and agrees well with the original South American collection. The type is published as on Monninia sp., but a collection, labeled otherwise as published for the type, is given as on Polygala. A third collection, made by C. G. Pringle and communicated by W. G. Farlow, on *P. acicularis*, Santa Eulalia Mts., Chihuahua, Mexico, Nov. 15, 1886, can also be placed under this name, although the spores are more variable in size than either of the other two collections, and have slightly thicker walls.

225. **Uredo Rondeletiae** Arth. & Holw. sp. nov. (on Rubiaceae).

Rondeletia cordata Benth., Guatemala City, Feb. 8, 1917, *842*.

Uredinia hypophyllous, scattered, round, 0.1–0.4 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis evident; peridium and paraphyses none; urediniospores obovoid-reniform, 13–21 by 23–29 μ; wall cinnamon-brown, thin, 1 μ, closely echinulate, the pores obscure.

226. Uredo Plucheae Syd. (on Carduaceae).

Pluchea odorata Cass.

A collection of this rust was made by Kellerman, at Amatitlan, Jan. 25, 1906, *5388*, and reported under the synonymous name of *U. biocellata* Arth. in Journ. Myc. *l.c.*, and thus issued in Kellerm. Fungi Sel. Guat. *19*. The species is also known from southern Florida and from the West Indies.

227. PERIDERMIUM GUATEMALENSE Arth. & Kern (on Pinaceae).

Pinus filifolia Lindl.

Collections were made by Kellerman, at Antigua, Dept. Sacatépequez, Feb. 13, 1905, *4624*, *5324*, *5355*, and reported by Kern in Journ. Myc. *l.c.*, under the name *P. gracile*. No collection of the species other than these is known.

228. AECIDIUM LORANTHI Thüm. (on Loranthaceae).

Psittacanthus calyculatus (DC.) G. Don.

A specimen was taken, Feb. 27, 1902, by William Trelease in Guatemala, no locality given, and reported by Kern in Mycologia, *l.c.* The specimen was seen in the herbarium of the Missouri Botanical Garden, and was labeled "*Aecidium Cookeanum*? on Loranthus." Dr. Trelease was consulted regarding the host, and under date of January 24, 1916, replied: "My impression is that I got specimens of the orange-flowered mistletoe. . . . Your Guatemalan rust is pretty clearly on a Psittacanthus, and very likely on *P. calyculatus*." Type collections of mistletoe rusts have not been available for comparison, but as near as can be told by the meager description this collection should be referred to *A. Loranthi* Thüm. The species has much larger aeciospores than in *Uromyces ornatipes* Arth. It may belong to one of the species published for South America, but no suitable material for comparison is at hand.

229. **Aecidium singulare** (Diet. & Holw.) comb. nov. (on Malpighiaceae).

Byrsonima crassifolia (L.) H.B.K.

The rust was collected by Kellerman at Sierra de las Minas, 2000 feet alt., opposite El Rancho, Dept. Baja Vera Paz, March 10, 1905, *4325*, and reported by Kern in Journ. Myc. *l.c.*, as *A. Byrsonimae* K. & K., and issued in Kellerm. Fungi Sel. Guat. *11*. It was earlier published from Mexico as *Endophyllum singulare* Diet. & Holw. It is very similar to *A. Brysonimatis* P. Henn. from Brazil, and may be identical with it. The species is also known from Nicaragua. The morphological appearance suggests a possible connection with a Cronartium, as its aecial stage.

230. AECIDIUM ALBICANS Arth. & Holw. (on Euphorbiaceae).

Phyllanthus acuminatus Vahl, Escuintla, Feb. 19, 1916, I, *504*; San Felipe, Dept. Retalhuleu, Jan. 13, 1917, O, I, *709*.

The same rust occurs in Costa Rica and on the same host.

231. AECIDIUM GUATEMALENSIS Kern & Kellerm. (on Heliotropaceae).

Heliotropium indicum L.

The type collection was made by Kellerman, at Gualan, 400 feet alt., Dept. Zacapa, March 12, 1905, *4326*, and was described by Kern in Journ. Myc. *l.c.* No additional information has come to hand since the original collection was made.

232. **Aecidium seriatum** sp. nov. (on Euphorbiaceae).

Eumecanthus lancifolius (Schlecht.) Millsp. (*Euphorbia lancifolia* Schlecht.).

Pycnia chiefly hypophyllous, numerous, in groups 1–3 mm. across, punctiform, noticeable, subcuticular, hemispherical, 80–115 μ in diameter by 40–75 μ high.

Aecia hypophyllous, numerous, in more or less evident concentric circles surrounding the central group of pycnia, on spots 1.5–2 cm. across, yellowish below, reddish above, cupulate, 0.3–0.5 mm. in diameter, low, erect; peridium white, the margin irregularly torn; peridial cells nearly rectangular in radial longitudinal section, 15–22 by 18–26 μ, slightly overlapping, the outer wall smooth, transversely striate, 6–8 μ thick, the inner wall closely and prominently verrucose, 3–4 μ thick; aeciospores irregularly globoid, 12–18 μ in diameter; wall colorless, about 1 μ thick, very finely and inconspicuously verrucose, often appearing smooth.

The rust has the appearance of a heteroecious form, although the subcuticular pycnia indicate that it may be an autoecious form. The name is founded on a collection sent from the herbarium of the National Museum, made by H. Pittier, on *Eumecanthus lancifolius* (Schlecht.) Millsp. (*Euphorbia lancifolia* Schlecht.), between Cajval and Chimente, along Cahabor Rio, alt. 200 meters, Dept. Alta Vera Paz, March 4, 1905, *237*.

INDEX TO UREDINALES OF GUATEMALA

(New and newly combined names are in **bold face**)

Index to Hosts for Guatemalan Rusts

PURDUE UNIVERSITY
LAFAYETTE, INDIANA.