

BROOKLYN BOTANIC GARDEN

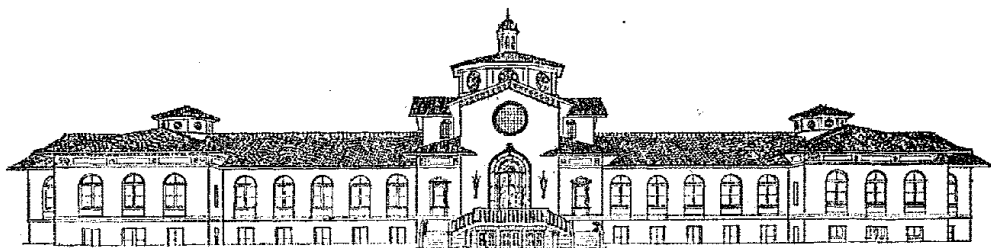
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THE UREDINALES OF OREGON¹

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Since no account of the rusts of any of the states bordering on the Pacific coast is available for reference by the students of the flora of that region, it has seemed desirable to bring together in the form of an annotated list the results of a study of the species occurring in Oregon, which has extended, intermittently, over a period of eight years.

The account is the result of a study begun by the author in 1909 at the Oregon Agricultural College and finally prepared in the form here presented at the Purdue University Agricultural Experiment Station.

On account of the great diversity of conditions the State of Oregon presents a wonderful field for work in any phase of botanical study. The area of the State is approximately 96,000 square miles, an area considerably greater than that included in all the New England states combined. The great range of climatic and topographical features existing in the State offers favorable conditions for the development of a flora not only large in number of species, but very diverse in character. Within the confines of the State is to be found a range in altitude from sea level to perpetually snow-capped mountains. The annual rainfall varies from over 80 inches in some localities to below 10 inches in others, resulting in the development of a flora almost tropical in its luxuriance on the one hand, and one having many of the characteristics of a desert on the other.

The diversity of the Phanerogamic flora which has developed under these conditions offers an especially attractive field for the student of the parasitic fungi. Many species of all groups are to be found especially in those portions of the State having a heavy annual rainfall.

Rusts are found in great profusion in all sections of the State. The first collections of this group made by the writer were accumulated in connection with an effort to obtain general material for class use. The greater part of the collections have been made in connection with local excursions, the primary object of which was recreation.

¹Contribution from the Botanical Department of Purdue University Agricultural Experiment Station.

Many of the collections made by the writer at localities outside of Benton County have been picked up in spare moments on trips taken in connection with Experiment Station or Extension Service duties. During 1914 and 1915, however, a number of special excursions were made primarily for collecting this group of fungi.

In addition to those made by the writer, several hundred collections made by his former associates, assistants and students at the Oregon Agricultural College are included. The greater number of these were collected by Prof. H. P. Barss, Mr. F. D. Bailey and Mr. G. B. Posey. To these have been added a considerable number of records obtained from miscellaneous sources. Several of these were obtained from the herbarium of the New York Botanical Garden, and of the National Museum. A considerable number are in the Arthur Herbarium at the Purdue University Agricultural Experiment Station. The greater number of these were obtained originally from phanerogamic specimens mainly collected and distributed by pioneer botanists of the region, particularly W. C. Cusick, Thomas Howell, J. B. Lieberg and E. P. Sheldon, E. R. Lake and others.

A few collections were made in Oregon by Dr. David Griffiths and associates, most of which were distributed in his "West American Fungi." Mr. E. Bartholomew collected at a few localities in Oregon in 1915 and distributed the specimens in the exsiccati, "Fungi Columbiani" and "North American Uredinales," which he edits. A number of specimens of rusts, the records of which were obtained mainly from the Arthur Herbarium, were made by Moses Craig, at one time botanist at the Oregon Agricultural College. It is evident that he made quite an extensive collection of rusts in Oregon, but the location of his collection at the present time is unknown to the writer.

One of the most interesting collections which it has been the privilege of the writer to examine was made by Dr. J. R. Weir, mainly in the northeastern and southwestern parts of the State. This collection consists of about 130 numbers and was sent to this laboratory for study in 1915 and 1916. Another interesting collection of about 30 numbers was made by Dr. E. P. Meinecke in southwestern Oregon and forwarded to the writer for study.

Approximately thirteen hundred collections have been examined in the preparation of this account and are listed in the following pages. By far the greater number of these, about one thousand, were made in western Oregon, including the Cascade Mountains. Of this number about six hundred were made in the Willamette Valley, four hundred having been collected in Benton County, mostly in the vicinity of Corvallis. Two hundred and fifty are listed from the Cascade mountain region, most of the collections having been made in the vicinity

of Mt. Jefferson or in Hood River County. About sixty collections are recorded from the counties bordering on the coast, only a few of which are from the southern coast counties. Less than three hundred collections have been made in eastern Oregon, almost half of which are from the mountainous region of the northeastern part.

It will be seen from the above summary of the distribution of the collections recorded that only a very small portion of the State has been explored for this group of fungi. Much remains to be done, particularly in southwestern Oregon and in eastern Oregon. The mountains of the Coast Range have been explored only in Benton County, where several collections have been made on Mary's Peak. The coast counties also offer a rich field for the collector. The region around Corvallis in Benton County is the only portion of the State that can be said to have been carefully explored for rusts. Corvallis is situated at the junction of the Willamette River and Mary's River and lies in the edge of the foothills of the Coast Range.

In spite of the fact that the exploration so far conducted is inadequate to furnish a very accurate idea of the rust flora of the State, records for 220 species are brought together in the account which follows. These occur on about 500 different host plants. In connection with the study of the collections 10 species have been found which are believed to be new to science, 8 of which are described in the following pages. A number of European species not previously recorded for North America have also been collected in the State. A large number of unrecorded host plants have been encountered.

The number of species of economic importance found in the State is worthy of mention. All of the grain rusts recorded for North America with the exception of the corn rust (*Puccinia Sorghi*) are known to occur in the State, including the recently discovered *Puccinia glumarum*. All of the rusts troublesome to florist's crops in the greenhouse, including *Puccinia Antirrhini*, are known to occur. The Pacific coast rust of pears and quinces promises to become of considerable economic importance. The large number of forest-tree rusts found in the State offers an especially attractive field for investigation. Many heteroecious species are known to occur whose life history is not yet determined. The rusts occurring on *Salix* are especially in need of investigation.

In the notes given in connection with the account of the species which follows, an effort has been made to summarize the available information on the life history as shown by any culture work which may have been conducted either by American or European authors. Notes on the distribution in North America are given whenever it was considered of sufficient importance. The genera are listed alpha-

betically under each family and the species similarly under the genus. The host plants are also arranged alphabetically under each species.

No attempt has been made to give a full list of synonyms. In general, however, sufficient synonymy is given to show the origin of the specific name used as well as any names which have been in general use. For convenience of reference the specific nomenclature used is that in use in this laboratory, and in general conforms to that used in the "North American Flora." For similar reasons the generic nomenclature follows that proposed by Dr. Arthur, for use in the "North American Flora," except that *Melampsora*, *Puccinia* and *Uromyces*, are retained. In order to follow this system consistently it has been found necessary to establish a number of new combinations.

Under each host is given a list of the specimens examined, with locality, county, date and collector, followed by the collector's number. Numbers between 1000 and 3450 refer to collections in the Oregon Agricultural College Herbarium, if made by members of the botanical staff or by students. If no collector is given it may generally be assumed that the collection was made by the writer. In order to prevent unnecessary repetition, Benton County is not cited following collections made at Corvallis and Philomath. Similarly Hood River County is implied for all collections from Hood River or Mt. Hood and all collections made at Portland are from Multnomah County.

The writer is under great obligations to all those who have contributed specimens for study and especially to those whose names have been mentioned previously. He is also greatly indebted to those botanists who have given so generously of their time in determining host plants. Dr. A. S. Hitchcock and Mrs. Agnes Chase have named most of the grasses. Dr. Theo. Holm and Dr. K. K. Mackenzie have each determined a considerable number of species of *Carex*. Dr. C. R. Ball has named most of the willows. Dr. F. V. Coville and Dr. K. M. Wiegand have each determined several specimens of *Juncus*. Mr. Paul Standley has determined a large number of specimens from miscellaneous families.

Dr. J. C. Arthur and his former associates very kindly determined a considerable number of specimens of the rusts occurring on grasses and sedges, and verified the determinations of others, which the writer sent from Oregon at various times during the period when the collections were being made. The greater part of the collections recorded, however, have been worked over since the writer took charge of the work of this laboratory. During this period it has been his privilege to be able to consult freely with Dr. Arthur and to have the unrestricted use of the collections, catalogues, and manuscript notes on the rusts, which have been accumulated at the Purdue University

Agricultural Experiment Station during the many fruitful years of Dr. Arthur's administration of the department of botany. Without this assistance the preparation of this account in the form presented would not have been possible and the writer takes great pleasure in acknowledging his indebtedness to Dr. Arthur and to the various assistants in this laboratory for any help which they may have given.

COLEOSPORIACEAE

1. *Coleosporium Adenocaulonis* sp. nov.

O. and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, few, scattered on conspicuous angular yellowish spots, small, 0.1–0.2 mm. across, early naked, orange yellow fading to whitish, becoming pulverulent, ruptured epidermis conspicuous; urediniospores globoid to ellipsoid, 18–24 by 23–26 μ , wall light golden brown or colorless, 2–3 μ thick, prominently and moderately verrucose; pores indistinct.

III. Telia unknown.

ON CARDUACEAE:

Adenocaulon bicolor Hook.—Corvallis, Sept. 20, 1914, 1549.

This species is very inconspicuous, developing very small sori on the under side of the leaves on yellowish spots.

2. COLEOSPORIUM MADIAE Cooke, Grevillea 7: 102. 1879.

ON CARDUACEAE: II, III.

Madia citriodora Greene—Mary's Peak, Benton Co., Aug. 15, 1914, 1514.

Madia exigua (Sm.) Greene—Corvallis, July 29, 1914, 1475; Philomath, Aug. 15, 1914, 1516.

Madia glomerata Hook.—Corvallis, Aug., 1889, E. R. Lake, July, 1910, 1159, July 29, 1915, 3241; Portland, Aug. 24, 1915, E. Bartholomew, 5964 (Barth. Fungi Columb. 4910).

Madia racemosa (Nutt.) T. & G.—Corvallis, July, 1910, 1160, Sept. 12, 1910, 1928; Wren, Benton Co., June 26, 1914, 1316, 1317, 1322, 1328; Elk City, Lincoln Co., Aug. 20, 1914, 2538; Philomath, May 10, 1914, 3246.

Madia ramosa Piper—Corvallis, July 29, 1914, 1470.

Madia sativa Molina—Corvallis, Aug. 12, 1910, 1163, July 29, 1914, 1474.

The aecial connection of this very common species has not been demonstrated by cultures and no field observations have been made in Oregon. Judging from distributional data, however, it seems probable that *Peridermium californicum* Arth. & Kern may be genetically connected.

From field observations made by the writer it is evident that in western Oregon this species overwinters in the uredinial stage.

3. COLEOSPORIUM OCCIDENTALE Arth. North American Flora 7: 94. 1907.

ON CARDUACEAE: II.

Senecio triangularis Hook.—Mary's Peak, Benton Co., Aug. 15, 1914, 1518.

This species is known otherwise only from the type collection made in Falcon Valley, Washington, on *S. hydrophiloides* Rydb., by W. N. Suksdorf in 1900.

The aecial connection is not known and no clues are available. The aecia, in common with other species of *Coleosporium* whose life history is known, should be looked for on the leaves of *Pinus* sp. The above collection, however, was made in a region where no pines exist in a radius of several miles. It is probable that this species, in common with some other members of the genus, is capable of being carried over the winter in the uredinial stage.

The only pine-leaf-inhabiting *Peridermium* known to the writer in the present range of this species is *P. montanum* Arth. & Kern, which has been shown to be genetically connected with a *Coleosporium* on *Aster* and *Solidago*, referred to *C. Solidaginis*.

4. COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. Bull. Torrey Club 6: 216. 1878.

Uredo Solidaginis Schw. Schr. Nat. Ges. Leipzig 1: 70. 1822.

Peridermium aciculum Und. & Earle, Bull. Torrey Club 23: 400. 1896.

Peridermium montanum Arth. & Kern, Bull. Torrey Club 33: 413. 1906.

ON PINACEAE: I.

Pinus contorta Dougl.—North slope Mt. Hood, Aug. 7, 1914, 1610.

ON CARDUACEAE: II, III.

Aster conspicuus Lindl.—Hilgard, Union Co., July 10, 1914, 1532; Austin, Grant Co., Aug. 1915, J. R. Weir, 159.

Aster Cuseckii Gray?—Corvallis, Sept. 21, 1914, 1548.

Aster Douglasii Lindl.—Hood River, Aug. 26, 1915, E. Bartholomew, 5972 (Barth. Fungi Columb. 4911); Corvallis, June 29, 1914, G. B. Posey, 1310.

Aster foliaceus frondeus Gray—Hood River, July 22, 1915, 3137; Clatskanie, Columbia Co., May 20, 1914, F. D. Bailey, 2564, Oct. 29, 1914, 2531; Corvallis, June 29, 1914, G. H. Godfrey, 1307.

Aster Hallii Gray—Corvallis, July 29, 1914, 1471; Wren, Benton Co., July 26, 1914, 1318.

Solidago caurina Piper—North slope Mt. Hood, Aug. 7, 1914, 1605.

Solidago elongata Nutt.—Corvallis, July 29, 1915, 3244; Scotts, 7 miles N. of Fort Klamath, Klamath Co., Sept. 20, 1913, E. P. Meinecke, Cr D 7.

Solidago missouriensis Gray?—Sumpter, Baker Co., Aug. 21, 1915, J. R. Weir, 267.

Solidago tolmieana Gray?—Hood River, July 23, 1915, 3254.

The life history of this species was first demonstrated by Clinton (Science N. S. 25: 289. 1907; Ann. Rep. Conn. Exp. Sta. 1906: 320. 1907; 1907: 375. 1908). He successfully infected *Solidago rugosa* with aeciospores of *Peridermium aciculum* on *Pinus rigida*.

The single collection of aecia listed above (1610) agrees with the description of *P. montanum* Arth. & Kern and was collected in the immediate vicinity of *Solidago caurina* (1605). The possibility of genetic relationship was made note of at that time. Hedgcock (Mycologia 4: 144. 1912; Phytopath. 3: 16. 1913) has also made similar observations and more recently (Phytopath. 6: 65. 1916) has cultured this *Peridermium* successfully on *Aster conspicuus*, using aecial material on *Pinus contorta* collected in Montana. Weir and Hubert (Phytopath. 6: 68. 1916) working independently from Hedgcock, with similar aecial material, have also demonstrated by cultures that this *Peridermium* has its uredinia on both *Aster* and *Solidago*, having obtained infection on *A. laevis geyeri*, *S. canadensis* and *S. missouriensis*.

Sydow (Monographia Ured. 3: 621. 1915) suggests that the form on *Aster* in North America is different from *C. Solidaginis* on *Solidago* and should either be united with the Asiatic *C. Asterum* (Diet.) Syd. or that it represents an unrecognized species having a different *Peridermium* as its aecial form. The culture work of Weir and Hubert (l. c.), however, shows that *P. montanum* is genetically connected with uredinia on both *Aster* and *Solidago* and does not lend support to Sydow's view.

While the two species of *Peridermium* included here are widely separated as to range and are morphologically distinguishable, it seems best until further culture work is conducted to recognize but one American species.

UREDINACEAE

5. CALYPTOSPORA COLUMNARIS (Alb. & Schw.) Kühn; Rab.-Wint. Fungi Eur. 3521. 1886. (Hedwigia 26: 28. 1887.)
Accidium columnare Alb. & Schw. Consp. Fung. 121. 1805.
Calyptospora Geoppertiana Kühn, Hedwigia 8: 81. 1869.

ON PINACEAE: I.

Abies grandis Lindl.—Scottsburg, Lane Co., Sept. 1, 1914, G. G. Hedgcock, 20210.

Abies magnifica A. Murr.—Road to Crater Lake, Union Creek, Camp Grant, Klamath Co., Sept. 23, 1913, E. P. Meinecke, Cr D 20.

ON VACCINIACEAE: III.

Vaccinium macrophyllum (Hook.) Piper—Austin, Grant Co., June, 1913, J. R. Weir, 25; Sumpter, Baker Co., June, 1913, J. R. Weir, 24; Silver Creek, Josephine Co., July 28, 1913, E. P. Meinecke, S1 (D6) D1.

Vaccinium myrtilloides S. Wats.—Road to Crater Lake, Union Creek to Camp Grant, Klamath Co., Sept. 23, 1913, E. P. Meinecke, Cr D 19.

Vaccinium ovalifolium Smith—Larch Mt., Multnomah Co., Aug. 1910, 1156; North slope Mt. Hood, Aug. 7, 1914, 1608.

Vaccinium ovatum Pursh—Dothan, Douglass Co., Sept. 8, 1914, G. B. Posey, 1932; Waldo, Josephine Co., Sept. 5, 1916, J. R. Weir, 280; Oregon, April 19–31, 1911, H. D. House.

Vaccinium parviflorum Smith—Whitewater Ranger Station, near Mt. Jefferson, Aug. 12, 1914, H. P. Barss & G. B. Posey, 1750.

Vaccinium scoparium Lieb.?—Mary's Peak, Benton Co., Aug. 15, 1914, 1284.

Specimens of aecia collected in various parts of North America on *Abies balsamea*, *A. concolor* and *A. lasiocarpa* are now referred to this species in the Arthur herbarium.

The life history was first demonstrated by Hartig (Allg. Forst.- u. Jagdzeitg. 289. 1880), who conducted culture investigations using aecia on *Abies pectinata* and telia on *Vaccinium Vitis-idaea*. He obtained successful infection in both directions. Other European investigators, notably Dr. G. Winter, have amply confirmed these results. (Klebahn, Die Wirtsw. Rostpilze 391. 1904.)

In America, Arthur (Mycologia 2: 231. 1910) was the first to culture this species and succeeded in obtaining aecia on *Abies Fraseri* following exposure to infection from telia on *Vaccinium pennsylvanicum* sent by W. P. Fraser from Nova Scotia. Later in the same year Fraser made the first field collection of aecia on *Abies balsamea* (Science 30: 814. 1909) and later (Mycol. 4: 177. 1912; 6: 27. 1914) confirmed Arthur's work by obtaining infection on *Abies balsamea* from telia on *Vaccinium pennsylvanicum*.

6. CHRYSOMYXA WEIRII Jackson, Phytopath. 7: 353. 1917.

ON PINACEAE:

Picea Engelmannii Parry—Whitman Nat. Forest, Oregon, July 17, 1913, J. R. Weir, 271.

This species differs from *C. Abietis* in the narrower, somewhat smaller spores which do not long remain in chains but soon break apart. No evidence of germination has been seen in any of the collections. This is the only American representative of the genus as restricted by Arthur. (Result Sci. Congr. Bot. Vienne 338. 1906.) It is known to the writer otherwise only from single collections from British Columbia and Idaho. It is doubtless not uncommon in the northwest.

7. *CRONARTIUM FILAMENTOSUM* (Pk.) Hedgcock, *Phytopath.* 2: 177. 1912.

Peridermium filamentosum Pk. *Bot. Gaz.* 7: 56. 1882.

Uredo coleosporioides Dietel & Holway, *Erythea* 1: 247. 1893.

Peridermium stalactiforme Arth. & Kern, *Bull. Torrey Club* 33: 419. 1906.

Cronartium coleosporioides Arth. *N. Am. Flora* 7: 123. 1907.

ON PINACEAE: I.

Pinus contorta Dougl.—Scotts, Anna Creek, Klamath Co., May 23, 1912, E. P. Meinecke, used for inoculation on *Castilleja miniata*; Gold Center, June 20, 1914, H. F. Wilson, 1856; North slope Mt. Hood, elev. 3,000–4,000 ft.; Aug. 7, 1914, 3332; Sumpter, Baker Co., May, 1916, J. R. Weir.

ON SCROPHULARIACEAE: II, III.

Castilleja sp.—North slope Mt. Hood, 3,000–4,000 ft., Aug. 7, 1914, 1612, 1615 (collected near 3332); Ashland Toll House, Jackson Co., Sept. 27, 1913, E. P. Meinecke, *Cr D* 22.

Hedgcock (l. c.) was the first to publish a record of connection of *Peridermium filamentosum* with a *Cronartium* on *Castilleja* by cultures. He considered this distinct, however, from *Cronartium coleosporioides*, which Meinecke had cultured in 1911 (*Phytopath.* 3: 167–168. 1913) and shown to have for its aecial form *P. stalactiforme*. Meinecke's culture material was collected in Klamath Co., Oregon.

Further culture work has been carried on by Weir and Hubert (*Jour. Agr. Research* 5: 781–785. 1916) in which it is shown that the gall-forming *Peridermium* on *Pinus contorta* which has previously been commonly referred to *P. Harknessii* Moore is but a form of *P. filamentosum*.

All the records of the aecial stage given above are of the gall-forming type. The Hood River material was collected in the immediate vicinity of the telial form on *Castilleja*.

8. *CRONARTIUM PYRIFORME* (Pk.) Hedgc. & Long, *Alt. Stage Peridermium pyriforme* 3, 1914.

Peridermium pyriforme Peck, *Bull. Torrey Club* 6: 13. 1875.

Cronartium Comandrae Peck, Bull. Torrey Club 11: 50. 1884.

Peridermium Betheli Hedgc. & Long, Phytopath. 3: 251. 1913.

ON PINACEAE: I.

Pinus ponderosa Dougl.—Hood River Co., May 10, 1910, 3333; Sumpter, Baker Co., May, 1916, J. R. Weir.

ON SANTALACEAE: II, III.

Comandra umbellata (L.) Nutt.—Corvallis, June 20, 1909, E. R. Lake, 3068, July 24, 1914, 2510, Road to Ashland toll house, Jackson Co., Sept. 27, 1913, E. P. Meinecke, Cr D 23; Hood River Co., June 20, 1914, 1995, July 22, 1915, 3143; Dufur, Wasco Co., June 30, 1914, 1337; Indian Creek, Malheur Co., Sept. 16, 1897, E. P. Sheldon, 8934.

The collection of aecia on *Pinus ponderosa* made at Hood River consisted of a large fusiform gall at the base of the trunk of a young tree about 2 inches in diameter. The gall entirely encircled the tree which was noticeably stunted from the effects of the parasite. The foliage also showed a distinct yellow cast.

The life history of this common and widespread species was first demonstrated by Hedgcock and Long (l. c.). They succeeded in obtaining the development of uredinia on *Comandra umbellata* by exposing them to infection from aecia on *Pinus ponderosa* collected in Washington and California and on *Pinus pungens* from Pennsylvania. In a later publication the authors (Bull. U. S. Dept. Agr. 247: 1-20. 1915) discuss the economic importance of this fungus as a disease of pines and record in detail the results of extensive culture work.

9. HYALOPSORA ASPIDIOTUS (Peck) Magn. Ber. Deuts. Bot. Ges. 19: 582. 1901.

Uredo Aspidiotus Pk. Ann. Rept. N. Y. State Mus. 24: 88. 1872.

ON POLYPODIACEAE:

Phegopteris Dryopteris (L.) Fée—Austin, Grant Co., Aug. 1915, J. R. Weir, 164.

10. HYALOPSORA LAEVIUSCULA (D. & H.) Arth. North Am. Flora 7: 113. 1907.

Uredo laeviuscula Dietel & Holway, Erythea 2: 127. 1894.

ON POLYPODIACEAE:

Polypodium occidentale (Hook.) Maxon—Vicinity of Mt. Jefferson, July 27, 1907, E. R. Lake, 2508; Corvallis, March 25, 1915, G. B. Posey, 2626; Hood River Co., May 16, 1915, 3042; Bridal Veil, Multnomah Co., May 18, 1915, 3025.

Polystichum munitum (Kaulf.) Presl., Mary's Peak, Benton Co., Apr. 23, 1915, G. B. Posey, 3041.

The urediniospores in this species are smooth in all collections as shown by very careful examination with the oil immersion objective.

This species has not previously been recorded on the latter host so far as the writer is aware.

11. *HYALOPSISORA POLYPODII* (DC.) Magn. Ber. Deuts. Bot. Ges. 19: 582. 1901.

Uredo Polypodii DC. Fl. Fr. 6: 81. 1815.

ON POLYPODIACEAE:

Filix fragilis (L.) Underw.—Road to Lost Lake, Hood River Co., July 24, 1915, 3024.

12. *MELAMPSORA* sp.

II. Uredinia amphigenous, chiefly epiphyllous, scattered or occasionally gregarious, round, 0.5–1 mm., early naked, somewhat pulverulent, orange fading to yellowish, ruptured epidermis not conspicuous; uredospores ellipsoid or obovoid, 15–19 by 21–24 μ , wall colorless, uniformly 2.5–3 μ in thickness, moderately to closely verrucose-echinulate; paraphyses numerous, chiefly peripheral, clavate or occasionally capitate, 18–26 by 45–70 μ , wall colorless, usually uniformly 1–2 μ thick, occasionally thickened at apex to 4 μ .

ON SALICACEAE:

Populus alba L.—Sheridan, Yamhill Co., July 7, 1914, H. P. Barss, 1935; Cottage Grove, Lane Co., July 17, 1914, 1933; Philomath, July 20, 1915, 3309.

The only other American collection on this host known to the writer is one in the Arthur herbarium, collected by E. Bethel, Aug. 7, 1913, at San Jose, Cal. These specimens differ from all other North American collections on *Populus*. It seems most probable that this is an introduced European species. Only uredinia are present in American collections and it is quite impossible to assign it to any known species without telial material. A description of the uredinial stage drawn up from the Oregon collections is given for the benefit of those who may have occasion to study this form.

The Oregon collections were all made from low, rapidly growing water sprouts.

13. *MELAMPSORA ALBERTENSIS* Arth. Bull. Torrey Club 33: 517. 1906.

Caeoma occidentalis Arth. Bull. Torrey Club 34: 591. 1907.

ON PINACEAE: I.

Pseudotsuga mucronata (Raf.) Suds.—Southeast Mt. Jefferson, Linn Co., July 3, 1914, F. D. Bailey, 1841; Sumpter, Baker Co., July 20, 1913, J. R. Weir, 275; Corvallis, June 1910.

The life history of this species has been studied by Arthur (Myco-
logia 4: 29 and 59, 1912), who obtained infection resulting in pycnia

and aecia on *Pseudotsuga* by exposing the foliage to infection from germinating telia on *Populus tremuloides* collected in Colorado. Out of four trials, three were successful. No infection was obtained on *Larix*.

It is noteworthy in this connection that all of the northwestern collections have larger spores than specimens from Colorado. The former show spores 20–28 by 24–32 μ while the average of the latter are 16–20 by 19–26 μ . The culture work was conducted with Colorado material, nearly if not all of which was collected in immediate association with *M. albertensis* on *P. tremuloides*. The type of *Caeoma occidentale*, on the other hand, was collected in British Columbia and has larger spores. It seems entirely possible that the northwestern collections may represent a different species and have genetic relationship with some form on *Populus* other than *M. albertensis*.

14. MELAMPSORA ARCTICA Rostr. Medd. Grönland 3: 535. 1888.

ON SALICACEAE:

Salix Bebbiana Sarg.—Sumpter, Baker Co., Aug. 1915, J. R. Weir, 167.

Salix fendleriana And.—Sumpter, Baker Co., June, 1913, J. R. Weir, 8.

Salix lutea Nutt.—Sumpter, Baker Co., June, 1913, J. R. Weir, 4.

Salix sitchensis Sanson—Dothan, Douglass Co., Sept. 8, 1914, G. B. Posey, 3342.

Salix sp.—Scott's, 7 miles from Fort Klamath, Klamath Co., Sept. 20, 1913, E. P. Meinecke, Cr D 6.

It is with considerable hesitation that the above collections have been referred to this species. Only those collections which have small, rather thin-walled uredospores, accompanied by an abundance of thin-walled, clavate paraphyses, are included.

Fraser, working with material collected in Nova Scotia (Mycol. 4: 187. 1912; 5: 238. 1913), has made a cultural study of this species. He succeeded in obtaining infection on *Abies balsamea* with production of pycnia and aecia following exposure to germinating telia from *Salix discolor*.

15. MELAMPSORA BIGELOWII Thüm. Mitth. Forstl. Vers. Oest. 2: 37. 1879.

ON PINACEAE: I.

Larix occidentalis Nutt.—Hood River Co., elevation 4000°, July 23, 1915, 3305, 3365.

ON SALICACEAE: II, III.

Salix Bebbiana Sarg.—Austin, Grant Co., Aug. 1915, J. R. Weir, 162, 163; Sumpter, Baker Co., July 19, 1913, J. R. Weir, 272.

Salix cordata Muhl.—Sumpter, Baker Co., Aug. 1915, J. R. Weir, 167.

Salix Piperi Bebb.—Philomath, Oct. 29, 1911, 3346; The Dalles, Wasco Co., Aug. 26, 1915, E. Bartholomew (Barth. Fungi Columb. 4736).

Salix pseudocordata Anders.—Hilgard, Union Co., July 10, 1914, 1536.

Salix scouleriana Barr.—Corvallis, Sept. 19, 1910, 1165; St. Johns, Multnomah Co., June 23, 1915, W. E. Lawrence, 3347; Austin, Grant Co., Aug. 1915, J. R. Weir, 165; Portland, Aug. 24, 1915, E. Bartholomew (Barth., N. Am. Ured. 1417).

Salix sp.—Calamity, Aug. 1901, Griffiths & Morris (Griffiths, W. Amer. Fungi 341); Crater Lake, Klamath Co., Sept. 22, 1913, E. P. Meinecke, *Cr Pk D* (2) 13; Hood River Co., May 14, 1914, 1509, Aug. 5, 1914, 1483, 1484; Beaverton, Washington Co., July 15, 1914, F. D. Bailey, 1507; Austin, Grant Co., Aug. 25, 1915, J. R. Weir, 262.

The above specimens are tentatively assigned to this species. There are quite certainly not less than four species of *Melampsora* on *Salix* in North America. The characteristics by which they may be separated in the uredinial stages are not well worked out at the present time. The larger spored forms have been included here under *M. Bigelowii*.

Arthur (Jour. Myc. 11: 60. 1905) first established the fact that this rust has its aecia on *Larix*. He succeeded in infecting *Larix decidua* in two trials, by inoculating with basidiospores from germinating telia on *Salix amygdaloides* collected in Wisconsin. This result was later confirmed (Jour. Myc. 13: 194. 1907) with telial material collected in Indiana.

Weir and Hubert (Phytopath. 6: 372. 1916) have succeeded in obtaining infection of this species from *Salix bebbiana* Sarg. collected in Montana on *Larix occidentalis*, and from *S. cordata mackenziana* collected in Idaho on *Larix europea*. The same authors (Phytopath. 7: 109. 1917) have recently repeated the work with the last-named species of *Salix* and obtained infection with development of pycnia and aecia on both *L. occidentalis* and *L. europea*.

16. *Melampsora confluens* (Pers.) comb. nov.

Uredo confluens Pers. Obs. Myc. 1: 98. 1796.

ON GROSSULARIACEAE: I.

Ribes lacustre (Pers.) Poir.—Philomath, May 3, 1913, F. D. Bailey, 1107.

ON SALICACEAE: II, III.

Salix argophylla Nutt.—Freewater, Umatilla Co., June 17, 1913, F. D. Bailey, 1164, Aug. 12, 1915, F. D. Bailey, 3344.

Salix scouleriana Barr.—Cascade Locks, Hood River Co., Aug. 11, 1910, 1178; Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 3345; Hood River Co., July 23, 1915, 3343, 3366; Ashland, Jackson Co., Sept. 10, 1914, 3340, 3341.

Salix sp.—Scott's, 7 miles north of Fort Klamath, Klamath Co., Sept. 20, 1913, E. P. Meinecke, *Cr D 4*, *Cr D 9*; Austin, Grant Co., Aug. 25, 1915, J. R. Weir, 263; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 266; White Pine, Baker Co., July 20, 1913, J. R. Weir, 270; Unity, Baker Co., Aug. 1915, J. R. Weir, 278.

It is impossible to assign with any degree of certainty the collections which should be referred to this combination. Only those collections having small, rather thick-walled spores, accompanied by an abundance of capitate, thick-walled paraphyses, are included. It is possible that some of the collections included under *M. Bigelowii* should be referred here.

No culture work has been conducted in America. A summary of European work has been made by Klebahn (*Die Wirtsw. Rostpilze* 424. 1904).

In addition to the above, aecia have been collected in America on *Ribes saxosum* from Utah, *R. vallicola*, Colorado, and *R. lacustre*, British Columbia.

17. MELAMPSORA LINI (Pers.) Desmaz. Pl. Crypt. (Fasc. 41) 2049. 1850.

Uredo miniata Lini Pers. Syn. Fung. 216. 1901.

ON LINACEAE:

Linum Lewisii Pursh—Blue Mts., 7,000–8,000 ft., eastern Oregon, 1897 (from phanerogamic specimen in Gray Herb. Harvard Univ.); Hermiston, Umatilla Co., May 12, 1915, 2664.

Arthur (*Jour. Myc.* 13: 207. 1907) has shown this species to be autoecious. He sowed basidiospores from *Linum usitatissimum* on the same host and on *L. Lewisii* and obtained the development of pycnia and aecia.

18. MELAMPSORA OCCIDENTALIS Jackson, *Phytopath.* 7: 354. 1917.
ON SALICACEAE: II, III.

Populus trichocarpa Nutt.—Corvallis, Sept. 1909, 1069, Oct. 15, 1912, 1024 (type), March 12, 1916, G. B. Posey; Trail to Sulphur Springs, Benton Co., Nov. 2, 1914, 3369; Scott's, N. of Fort Klamath, Klamath Co., Sept. 20, 1913, E. P. Meinecke, *CrD2*; Clatskanie, Columbia Co., Oct. 6, 1914, F. D. Bailey, 3358, Oct. 29, 1914, F. D. Bailey, 3306; Sumpter, Baker Co., Aug. 21, 1915, J. R. Weir, 265; Medical Springs, Union Co., Aug. 1913, J. R. Weir, 117.

This species differs from all other species of *Melampsora* on *Populus*

in the large size of the urediniospores which are only slightly flattened and are evenly verrucose-echinulate. The teliospores are much longer than those of *M. Medusae* and are thickened at the apex. The character of the telial sori suggests that this species may be closely allied to *M. albertensis*. The sori are much larger as are also both uredinio- and teliospores.

This species may be the same as that recently cultured by Weir and Hubert (Phytopath. 7: 108. 1917), who used telial material from *P. trichocarpa* referred to *M. Medusae* and obtained successful infection on *Larix europea* and *L. occidentalis*. The actual material used for infection and the aecia resulting have not been seen by the writer but telial material sent by Dr. Weir from Montana agrees with the form described above. Aecia from the same locality on *L. occidentalis* agree in general with aecia of *Melampsora Medusae* and *M. Bigelowii*. The walls of the aeciospores are however somewhat thinner, 1-2 μ , and considerably thickened on opposite sides to 3-5 μ . They measure 17-19 by 19-26 μ . Additional culture work, and a careful comparison of the resulting aecia with those of *M. Medusae* would be desirable. In any case, the morphological characters of the uredinial and telial stages are considered sufficient to warrant separation.

19. *Melampsora Piscariae* sp. nov.

O. and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, rounded, 0.3-0.5 mm. across, early naked, somewhat pulverulent, orange yellow fading to whitish, ruptured epidermis conspicuous; urediniospores globoid to ellipsoid, 14-16 by 16-19 μ ; wall colorless, 1.5-2 μ in thickness, finely and closely verrucose-echinulate; paraphyses numerous, intermixed with the spores, capitate, smooth or with an occasional conical echinulate marking, 32-64 μ long; heads 12-18 μ broad, wall uniformly thick, 2.5-4 μ .

III. Telia not seen.

ON EUPHORBIACEAE:

Piscaria setigera (Hook.) Piper (*Eremocarpus setigerus* Benth.)—Corvallis, Sept. 20, 1914, 3308, type.

Known only from the type locality.

This species is referred to the genus *Melampsora* with considerable confidence in spite of the absence of telia, on account of the structure of the sorus, the character of the spores, and the presence of scattered capitate paraphyses.

20. MELAMPSORELLA ELATINA (A. & S.) Arthur, N. Amer. Flora 7:

III. 1907.

Aecidium elatinum Alb. & Schw. Consp. Fung. 121. 1805.

Melampsorella Cerastii (Pers.) Schroet. Krypt. Flor. Schles. 3¹: 366. 1887.

ON PINACEAE: I.

Abies grandis Lindl.—Mary's River, west of Wren, Benton Co., Aug. 2, 1914, 1297; Sumpter, Baker Co., July 20, 1913, J. R. Weir, 276.

Abies lasiocarpa (Hook.) Nutt.—Crater Lake, Klamath Co., Sept. 9, 1916, J. R. Weir, 209; Sumpter, Baker Co., July, 1913, J. R. Weir, 274.

ON CARYOPHYLLACEAE: II, III.

Cerastium vulgatum L.—Corvallis, May 1, 1915, 2667.

Cerastium viscosum L.—Corvallis, June 28, 1915, 3019.

Stellaria borealis Bigel.—Corvallis, April 5, 1914, 1287.

This rust, which is doubtless common throughout the state, is remarkable in that both stages develop from a perennial mycelium. The aecial stage forms large or small witches' brooms on the branches of various species of *Abies*, each leaf of which bears the conspicuous aecia in two rows on the under surface of the leaves.

The life history was first worked out by Fischer (Zeitschr. für Pflanzenkr. 11: 321. 1901) and has been amply confirmed by other European investigators. A summary of this work has been made by Klebahn (Die Wirtsw. Rostpilze 397. 1904).

In America Arthur (Mycol. 4: 58. 1912), using aecial material on *Abies lasiocarpa* collected in Colorado, has succeeded in obtaining infection resulting in uredinia on *Cerastium oreophilum*.

21. MELAMPSOROPSIS PIPERIANA Arthur, N. Amer. Flora 7: 120. 1907.

ON ERICACEAE:

Rhododendron Californicum Hook.—Newport, Lincoln Co., June 2, 1892, A. Isabel Mulford (Specimen in Herb. N. Y. Bot. Gard. and in Herb. J. C. Arthur), May 16, 1914, G. H. Godfrey, 1280; Larch Mt., Multnomah Co., Aug. 1910, 1118; Parmelia Lake, near Mt. Jefferson, July 3, 1914, F. D. Bailey, 1939; Trail to Hanging Valley, near Mt. Jefferson, Aug. 11, 1914, H. P. Barss & G. B. Posey, 1623.

22. MELAMPSOROPSIS PYROLAE (DC.) Arth. Résult Sci. Congr. Bot. Vienne 338. 1906.

Aecidium (?) *Pirolae* DC. Fl. Fr. 6: 99. 1815.

Aecidium conorum Piceae Reess, Abh. Nat. Ges. Halle 11: 102. 1869.

Chrysomyxa Pirolae Rostr. Bot. Centr. 5: 127. 1881.

Peridermium conorum Piceae Arth. & Kern, Bull. Torrey Club 33: 431. 1906.

ON PINACEAE: O, I.

Picea Engelmannii Parry—Sumpter, Baker Co., Sept. 25, 1909, G. G. Hedgcock, 1916.

ON PYROLACEAE: II, III.

Pyrola secunda L.—North slope Mt. Hood, Aug. 7, 1914, 1607; Trail to Elk Meadows, Hood River Co., July 23, 1915, 3061; Columbia Highway, Multnomah Co., Aug. 19, 1916, J. R. Weir, 269.

Pyrola sp.—Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 268.

The genetic relation of this species with *Peridermium conorum* *Piceae* was first suggested by Rostrup (l. c.). So far as the writer is aware the first culture work confirming this observation was made by Fraser (Mycol. 4: 183. 1912), who succeeded in obtaining infection resulting in pycnia and aecia on the cones of *Picea mariana* and *P. canadensis*, following exposure to germinating telia on *Pyrola americana* and *P. elliptica*.

23. *Milesia Polystichii* Wineland n. sp.

O. and I. Unknown.

II. Uredinia hypophyllous, scattered, roundish, 0.2–0.3 mm. across, bullate, brownish yellow, readily dehiscent by a central pore, peridium well developed, cells above polygonal, approximately isodiametric, diameter about 7 μ , cells at the sides elongated to 21 μ , outer walls 2–2.5 μ , inner walls 2.5–3 μ ; urediniospores obovoid, ellipsoid, or oblong, 18–23 by 26–35 μ , wall colorless, 1.5–2.5 μ in thickness, strongly and sparsely echinulate, pores obscure.

III. Telia unknown.

ON POLYPODIACEAE:

Polystichum munitum (Kaulf.) Presl.—Grant's Pass, Josephine Co., Sept. 5, 1916, J. R. Weir, 260 (type).

This species was separated from material referred to *Hyalopsora laeviuscula* in the writer's herbarium by Miss Grace O. Wineland who has been studying the fern rusts of North America in this laboratory.

24. PUCCINIASTRUM ABIETI-CHAMAENERII Kleb. Prings. Jahrb. f. Wiss. Bot. 34: 387. 1900.

ON PINACEAE: I.

Abies grandis Lindl.—Dee, Hood River Co., July 23, 1915, 3355.

Abies lasiocarpa Nutt.—North slope Mt. Hood, 4,500 ft., Aug. 9, 1914, 3295.

ON ONAGRACEAE: II, III.

Chamaenerion angustifolium (L.) Scop.—Bonneville, Multnomah Co., Aug. 11, 1910, 1075; Garden Home, Multnomah Co., Aug. 1911, 1990; Southwest slope Mt. Jefferson, July 3, 1914, F. D. Bailey,

3247; Odell, Hood River Co., Aug. 5, 1914, 1618; Crater Lake, Klamath Co., Sept. 21, 1913, E. P. Meinecke, *Cr Pk D (2) 2*; Portland, Aug. 24, 1915, E. Bartholomew (Barth., N. Am. Ured. 1482).

This species is separated from *P. pustulatum* largely on the basis of culture investigations. All of the culture work has been conducted with the above host species or other members of the same genus or section of *Epilobium*. European investigators have amply demonstrated the connection of this form with aecia on *Abies* (Klebahn, Die Wirtsw. Rostpilze 393. 1904). In America, Fraser, working in Nova Scotia (Mycol. 4: 176. 1912), was the first to conduct culture experiments. He obtained, in three trials, the development of aecia on *Abies balsamea*, from sowings with teliosporic material from *C. angustifolium*. With the aecia thus obtained he sowed back to *Chamaenerion* and obtained uredinia. Weir & Hubert (Phytopath. 6: 373. 1916) conducted similar work with Idaho material and succeeded in obtaining the development of aecia on *Abies lasiocarpa*. The aecia thus obtained were sown back on the telial host (Phytopath. 7: 109. 1917), with the result that uredinia were developed in abundance.

25. PUCCINIASTRUM GALII (Link) Fischer, Ured. d. Schweiz 471. 1904.

Caeoma Galii Link, in Willd. Sp. Pl. 6²: 21. 1825.

ON RUBIACEAE: II.

Galium triflorum Michx.—Corvallis, April 29, 1914, F. D. Bailey, 1992, May 9, 1914, 1991, July 5, 1914, H. P. Barss, 1996, June 29, 1914, G. B. Posey, 1313, July 10, 1915, 3104; Oregon City, Clackamas Co., Aug. 20, 1915, E. Bartholomew, 5934 (Barth. N. Am. Ured. 1679); Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 187.

This species is known to the writer from North America only from the above collections and a specimen collected by J. W. Macoun in British Columbia in 1915, one from Palmer Lake, Colorado, Sept. 6, 1913, by E. Bethel, both in the Arthur Herbarium, and a collection made by Dr. H. Fitzpatrick and the writer at Michigan Hollow Swamp near Ithaca, N. Y., July, 1916. All are on *G. triflorum*. The species is evidently common in western Oregon and if aecia are developed, doubtless occur on *Abies grandis*. Field observations made by the writer, however, would indicate that this rust winters over in the uredinial stage.

26. PUCCINIASTRUM GOODYERAE (Tranz.) Arth. N. Am. Fl. 7: 105. 1907.

Uredo Goodyerae Tranz. Trudi S. Peterb. Obshch. Est. Otd. Bot. 23: 28. 1893.

ON ORCHIDACEAE: II.

Goodyera Menziesii (Lindl.) Morong.—Parmelia Lake, West slope Mt. Jefferson, July 3, 1914, F. D. Bailey, 1627; North slope Mt. Hood, Aug. 9, 1914, 1620.

27. PUCCINIASTRUM MYRTILLI (Schum.) Arth. Résult. Sci. Congr. Bot. Vienne 337. 1906.

Aecidium ? *Myrtilli* Schum. Enum. Pl. Saell. 2: 227. 1803.

Pucciniastrum Vacciniorum (DC.) Dietel, in E.* & P. Nat. Pfl. 11**: 47. 1897.

ON VACCINIACEAE: II.

Oxycoccus macrocarpus (Ait.) Pursh—Astoria, Clatsop Co., Aug. 1916, G. M. Darrow, comm. C. L. Shear 2905.

Vaccinium caespitosum Michx.—Mary's Peak, Benton Co., Aug. 15, 1914, 1517, 1520.

Vaccinium macrophyllum (Hook.) Piper—Whitewater Ranger Station, West slope Mt. Jefferson, Aug. 12, 1914, H. P. Barss & G. B. Posey, 3314; Ashland, Jackson Co., Sept. 10, 1914, 3316.

Vaccinium ovalifolium Sm.—Whitewater Ranger Station, West slope Mt. Jefferson, Aug. 12, 1914, H. P. Barss & G. B. Posey, 3315.

Vaccinium sp.—North slope Mt. Hood, 4,000 ft., Aug. 7, 1914, 1606, 1609; Sucker Creek, Josephine Co., July 27, 1913, E. P. Meinicke, Si (D6) D3.

Clinton (Rep. Conn. Agr. Exp. Sta. 1909-1910: 719. 1911) was the first to show that the aecial stage of this species occurred on *Tsuga canadensis*. He successfully infected *Gaylussacia baccata* by sowing with aeciospores from *Tsuga*, resulting in the development of the typical uredinia of this species.

Fraser in 1912 (Mycol. 5: 237. 1913) confirmed Clinton's work by obtaining the development of aecia on the leaves of *Tsuga canadensis* following sowings from teliosporic material on *Vaccinium canadense*. The same author in 1913 (Mycol. 6: 27. 1914) obtained aecia on *Tsuga canadensis* following sowing of teliosporic material from *Gaylussacia resinosa*. The aecia developed in these experiments are similar to those of *Peridermium Peckii*, but may represent an undescribed form.

No aecia collected in the west have been referred to this species though they doubtless occur on *Abies* or *Tsuga heterophylla*.

28. PUCCINIASTRUM PUSTULATUM (Pers.) Dietel, in E. & P. Nat. Pfl. 11**: 47. 1897.

Uredo pustulata Pers. Syn. Fung. 219. 1801.

ON ONAGRACEAE:

Epilobium adenocaulon Haussk.—Corvallis, Oct. 29, 1911, F. D.

Bailey, 1173, Nov. 4, 1911, F. D. Bailey, 1171, June 18, 1914, F. D. Bailey, 3218, July 29, 1914, 1480; Hilgard, Union Co., July 10, 1914, 1533, 1535, Glendale, Douglass Co., July 17, 1914, 1505, North slope Mt. Hood, Aug. 7, 1914, 1488; Whitewater Ranger Station, West slope Mt. Jefferson, H. P. Barss & G. B. Posey, 3219; Ashland, Jackson Co., Sept. 10, 1914, 3221.

Epilobium brevistylum Barbey—Corvallis, July 14, 1914, G. B. Posey, 3220.

No successful culture work has been conducted with this form, as here interpreted, either in Europe or America. Aecia doubtless occur on species of *Abies*.

From field observations it is quite evident that in western Oregon at least this species overwinters in the uredinial stage.

29. PUCCINIASTRUM PYROLAE (Pers.) Dietel, in E. & P. Nat. Pfl. 1^{1**}: 47. 1897.

Aecidium Pyrolae Pers. Gmel. Syst. Nat. 2: 1473. 1791.

Uredo Chimaphilae Peck, Ann. Rep. N. Y. State Mus. 46: 33. 1893.

ON PYROLACEAE:

Chimaphila umbellata (L.) Nutt. (*C. occidentalis* Rydb.)—Spencer Creek, Klamath Co., 5,000 ft., July 10, 1903, E. B. Copeland, 3714 (Sydow, Ured. 1795); Whitewater Creek along trail to Hanging Valley, Mt. Jefferson, Aug. 11, 1914, H. P. Barss & G. B. Posey, 1908; North slope Mt. Hood, Aug. 7, 1914, 1614.

Pyrola secunda L., Klamath Co., July 10, 1903, E. B. Copeland (Sydow, Ured. 1791).

30. PUCCINIASTRUM SPARSUM (Wint.) E. Fischer, Beitr. Krypt. Schweiz 2²: 469. 1904.

Melampsora sparsa Wint. in Rab. Krypt. Fl. 1¹: 245. 1881.

ON ERICACEAE:

Arbutus Menziesii Pursh—Myrtle Creek, Douglass Co., June 8, 1914, F. D. Bailey, 1837; Glendale, Douglass Co., July 17, 1914, 1298; Ashland, Jackson Co., Sept. 10, 1914, 1838; Corvallis, April, 1911, 3374; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 244.

Arctostaphylos Manzanita Parry—Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 245, 247.

Arctostaphylos nevadensis A. Gray—Northwest slope Mt. Jefferson, Aug. 14, 1914, H. P. Barss & G. B. Posey, 3290.

No aecial collections have been referred to this species in America. Fischer (Cent. für Bakt. 46: 333. 1916) has cultured this species. He used germinating telial material on *Arctostaphylos alpina* and sowed

on species of *Abies* and *Picea*, obtaining the development of pycnia and aecia on *Picea excelsa*. This is the only case in which culture investigations have shown the aecia of *Pucciniastrum* to occur on *Picea*.

31. UREDINOPSIS COPELANDII Sydow, Ann. Myc. 2: 34. Feb. 1904.
Uredinopsis Atkinsonii Magn. Hedwigia 43: 123. Mar. 1904.
Peridermium balsameum Peck, Rept. N. Y. State Mus. 27: 104.
 1875. p.p.

ON PINACEAE: I.

Abies grandis Lindl.—Trail to Sulphur Springs, Corvallis, Benton Co., Nov. 7, 1914, 3339; Corvallis, Feb. 2, 1914, 3300.

Abies nobilis Lindl.—Mary's Peak, Benton Co., Feb. 7, 1914, F. D. Bailey, 3337, Aug. 15, 1914, 3334, 3335, 3336, 3338.

ON POLYPODIACEAE: II, III.

Athyrium cyclosorum Rupr.—Hoover, Linn Co., Aug. 19, 1914, H. P. Barss & G. B. Posey, 3032; Mary's Peak, Benton Co., Aug. 15, 1914, 3033, 3034; Elk City, Lincoln Co., Aug. 20, 1914, 2675; Hood River Co., July 23, 1915, 3031; Grant's Pass, Josephine Co., Sept. 5, 1916, J. R. Weir, 258; Yaquina, Lincoln Co., July 17, 1915, 3035.

There seems to be no good reason for separating *U. Copelandii* Sydow from *U. Atkinsonii*. All gradations in the length of the beak of the urediniospores are found on the above collections. Most of the material has urediniospores with long beaks and some of the collections show spores with both long and short beaks.

Field observations as well as a study of morphological characters would support the view that the aecia commonly referred to *Peridermium balsameum* occurring on *Abies grandis* and *A. nobilis* in western Oregon are genetically connected.

Fraser (Mycol. 5: 236. 1913) has cultured *U. Atkinsonii* by sowing aeciospores of *Peridermium balsameum* on *Aspidium Thelepteris* followed sparingly by the development of uredinia.

32. UREDINOPSIS PTERIDIS Dietel & Holway, Ber. Deuts. Bot. Ges. 13: 331. 1895.

Aecidium pseudo-balsameum Diet. & Holw. Erythea 7: 98. 1899.

Peridermium pseudo-balsameum Arth. & Kern, Bull. Torrey Club 33: 430. 1906.

ON PINACEAE: I.

Abies amabilis (Loud.) Forb.—Whitewater Creek, near Mt. Jefferson, Aug. 11, 1914, H. P. Barss & G. B. Posey, 3294.

Abies grandis Lindl.—Corvallis, Aug. 1910, 3299, May 8, 1909, comm. Clarence D. Learn, April 29, 1914, F. D. Bailey, 3303; Ump-

qua Nat. Forest, near Diston, Lane Co., Oct. 27, 1909, Geo. G. Hedgcock; Philomath, Jan. 6, 1914, 3298; Wren, Benton Co., Aug. 3, 1914, 3296; Ashland, Jackson Co., Sept. 10, 1914, 3297; Mary's Peak, Benton Co., Feb. 7, 1914, G. H. Godfrey, 3301, Aug. 15, 1914, 3302; N. slope Mt. Hood, 4,000 ft., Aug. 9, 1914, 1616.

ON POLYPODIACEAE: II, III.

Pteridium aquilinum pubescens Underw.—Corvallis, Sept. 1909, 1142, July, 1910, 1082, Aug. 1910, 1058, Oct. 6, 1914, 3109; Bonneville; Multnomah Co., Aug. 11, 1910, 1076; Scappose, Columbia Co., July 25, 1911, 1067; North slope Mt. Hood, Aug. 9, 1914, 1617; Ashland, Jackson Co., Sept. 10, 1914, 1993; Portland, Aug. 24, 1915, E. Bartholomew (Barth. N. Am. Ured. 1485); Grant's Pass, Josephine Co., Sept. 5, 1916, J. R. Weir, 259.

This species in all its stages is very common in western Oregon and the association of the infected aecial and telial hosts is everywhere apparent.

From field observations made by the writer and others it has been assumed that *Peridermium pseudo-balsameum* was the aecial stage of this species. Recently Weir and Hubert (Am. Jour. Bot. 4: 328-332. 1917) have conducted cultures showing the genetic connection of this species with aecia on *Abies grandis*. The authors evidently do not consider the aecia identical with *P. pseudo-balsameum*. The description which they give, however, agrees very well with the type of that species.

According to the writer's present interpretation, there are two closely related species of *Peridermium* on *Abies grandis* in western Oregon. One is to be referred to *P. balsameum* and is presumably genetically connected with *Uredinopsis Copelandii* (cf. 31). The other is *P. pseudo-balsameum* and is genetically connected with the species under discussion.

The walls of the aeciospores in *P. balsameum* are considerably thinner than those of *P. pseudo-balsameum*. In the former they are 1-1.5 μ while in the latter they are 2-2.5 μ in thickness.

PUCCINIACEAE

33. EARLEA SPECIOSA (Fr.) Arth. Résult Sci. Congr. Bot. Vienne 341. 1906.

Aregma speciosa Fr. Syst. Myc. 3: 496. 1832.

Phragmidium speciosum Cooke, Grevillea 3: 171. 1875.

ON ROSACEAE:

Rosa gymnocarpa Nutt.?—I, Austin, Grant Co., Aug. 1915, J. R. Weir, 188.

34. GYMNOSPORANGIUM BETHELI Kern, Bull. Torrey Club 34: 459. 1907.

Roestelia Betheli Kern, Bull. Torrey Club 34: 461. 1907.

ON MALACEAE: I.

Crataegus Douglasii Lindl.—Joseph, Wallowa Co., Aug. 19, 1899, C. L. Shear (Ellis & Ev. Fungi Columb. 1480).

ON JUNIPERACEAE: III.

Juniperus occidentalis Hook.—Whitney, Baker Co., Aug. 1915, J. R. Weir, 170.

Another specimen on *Crataegus* sp. indet. from eastern Oregon (ex herb. Ellis) bearing no date is in the Arthur herbarium and has been examined by the writer.

The life history of this species was first demonstrated by Arthur (Jour. Myc. 14: 23. 1908) and later repeatedly confirmed. Telia are otherwise known only on *Juniperus scopulorum* from Colorado, Idaho and Montana. Aecia are known to occur only on *Crataegus* sp. in the Rocky Mt. region and in eastern Oregon and Washington.

35. GYMNOSPORANGIUM BLASDALEANUM (Dietel & Holway) Kern, Bull. N. Y. Bot. Gard. 7: 437. 1911.

Aecidium Blasdaleanum Dietel & Holway, Erythea 3: 77. 1895.

Gymnosporangium Libocedri Kern, Bull. Torrey Club 35: 509. 1908.

ON MALACEAE: I.

Amelanchier florida Lindl.—Eugene, Lane Co., July 11, 1914, G. B. Posey, 3276; Albany, Linn Co., June 11, 1913, D. W. Rumbaugh, 3171; Cottage Grove, Lane Co., June 13, 1913, 3168, June 20, 1913, C. E. Stewart, 3177; Lebanon, Linn Co., Aug. 2, 1913, F. D. Bailey, 3174; Crater Lake, Klamath Co., 7,000 ft., Sept. 4, 1913, E. P. Meinecke, *Cr Pk D 11*; Jackson Co., July, 1914, F. C. Reimer, 1791; Between Albany and Lebanon, Linn Co., June 13, 1913, C. E. Roberts, 1788; Lost Prairie, Sept. 1891, M. Craig; Halsey, Linn Co., June 9, 1913, 3170; Corvallis, July 29, 1915, 3150; Ashland, Jackson Co., Sept. 10, 1914, 3047; N. W. Mt. Jefferson, Whitewater station, Aug. 17, 1914, H. P. Barss & G. B. Posey, 3043, Aug. 28, 1916, H. P. Barss.

Crataegus Douglasii Lindl.—Halsey, Linn Co., June 9, 1913, 3214; Albany, Linn Co., D. W. Brumbaugh, 3212; Cottage Grove, Lane Co., May 21, 1913, 3169, June 14, 1913, 3209; Eugene, Lane Co., May 8, 1913, 3173.

Cydonia japonica Pers.—Eugene, Lane Co., June, 1914, G. H. Godfrey.

Cydonia vulgaris L., Halsey—Linn Co., June 9, 1913, 3166; Irving, Lane Co., 1913, Comm. S. J. Quigley, 1871; Creswell, Lane Co.,

May 5, 1913, Comm. K. V. Miller, 1873; Eugene, Lane Co., Aug. 1912, 1084; Talent, Jackson Co., May 18, 1916, F. C. Reimer.

Pyrus baccata Linn.—Lorane Valley, Lane Co., May, 1915, C. E. Stewart, 3387.

Pyrus communis L.—Kerby, Josephine Co., June 1, 1899, Comm. E. F. Meissner, 1845; Brownsville, Linn Co., May 24, 1913, D. W. Brumbaugh, 1911; Eugene, Lane Co., May 8, 1913, 3172, April 22, 1915, 2620.

Pyrus diversifolia Bong. (*P. rivularis* Dougl.)—Cottage Grove, Lane Co., June 13, 1913, 3175, 3211.

Pyrus ioensis (Wood) Bailey—Cottage Grove, Lane Co., June 13, 1913, 1854; Eugene, Lane Co., May 21, 1913, 3210.

Pyrus malus L.—Eugene, Lane Co., July 10, 1913, J. O. Holt, 1787; Cottage Grove, Lane Co., May 23, 1913, C. E. Stewart, 1913, June 20, 1915, C. E. Stewart, 887.

Sorbus aucuparia Linn.—Cottage Grove, Lane Co., June 13, 1913, 3178; Eugene, Lane Co., June 1, 1914, G. H. Godfrey, 3222.

Sorbus hybrida Linn.—Cottage Grove, Lane Co., May 21, 1913, 3176, June 13, 1913, 3167.

ON JUNIPERACEAE:

Libocedrus decurrens Torr.—Eugene, Lane Co., Feb. 28, 1913, 3213, Feb. 21, 1914, F. D. Bailey, 1675, Mar. 20, 1914, 3070; Breitenbush Hot Springs, Marion Co., Mar. 27, 1915, E. A. Hartley, 2621; Cottage Grove, Lane Co., Mar. 8, 1914, C. E. Stewart, 1888; Ashland, Jackson Co., Sept. 10, 1914, 1839; Corvallis, Mar. 30, 1915, J. G. Corsaut, 901; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 185.

This species is very common in its aecial stage on all the native members of the Malaceae as well as most of the cultivated fruits and ornamental plants belonging to this family which may occur in the range of the incense cedar. There is considerable evidence also that the disease is gradually spreading beyond the natural range of the telial host. Observations made at Corvallis support this view. Previous to 1915 no specimens of this species had been collected in Benton County though careful search had been made many times. The incense cedar does not occur naturally in that locality but is frequently planted for ornament. There are several fine examples on the campus at the Oregon Agr. College. In 1915 a very sparing infection of the aecial stage was found in the vicinity on native hosts only, and the cedar trees on the campus were found to be sparingly infected. Reports of the occurrence on quince have come from Salem, far north of the natural range of the incense cedar. The writer believes that the disease will gradually spread throughout the Wil-

lamette Valley on the incense cedars planted for ornament and, in certain cases, will become a serious menace to cultivated pears and quinces.

The life history of the species was first worked out by Arthur (Mycol. 1: 252. 1909; 4: 57. 1912). He succeeded in showing that aecia occurred on *Crataegus* and *Amelanchier*. The telial material used for the cultures was collected at Eugene, Oregon, by Prof. A. R. Sweetzer. The writer has also studied this species in some detail (Phytopath. 4: 261-269. 1914; Ore. Expt. Sta. Biennial Crop Pest Rep. II: 204-212. 1915) and has reported the results of culture work and field observations. Similar work is also briefly reported by O'Gara (Science N. S. 39: 620-621. 1914). The previous records of the occurrence of this species on *Malus floribundus* Siebold and *Sorbus sambucifolia* Roem. made by the writer (l. c.) should be corrected to read *Pyrus ioensis* and *S. aucuparia* respectively. For the correct determination of these hosts the writer is indebted to Prof. W. W. Eggleston.

This species has since been successfully cultured in the greenhouse on *Pyrus sinensis* by Prof. H. P. Barss. The writer, using aecial material on quince, the result of infection experiments made in 1914, has obtained sparing infection on *Libocedrus* resulting in telia which matured in February 1915. The trees were kept in the greenhouse at the Oregon Agr. College.

36. GYMNOSPORANGIUM HARKNESSIANUM (Ell. & Ev.) Kern, Bull. N. Y. Bot. Gard. 7: 441. 1911.

Roestelia Harknessiana Ell. & Ev. Kern, Bull. Torrey Club 34: 462. 1907.

ON MALACEAE: I.

Amelanchier alnifolia Nutt.—Redmond, Crook Co., July 2, 1914, 1393; Fort Rock, Lake Co., Oct. 10, 1915, Wendover, 3375.

This very interesting species has otherwise been reported only from northern California. The telia form is unknown. In the collection made by the writer listed above, the aecia occurred only on fruits and twigs. There was every evidence that this fungus is perennial. Some of the specimens show fresh aecia on branches having four annual rings, surrounding or extending from cankered areas bearing evidence of old aecial cups. There is slight hypertrophy. The branches are frequently girdled and killed.

37. GYMNOSPORANGIUM JUNIPERINUM (L.) Mart. Fl. Crypt. Erlang. 333. 1817.

Tremella juniperina L. Sp. Pl. 1157. 1753.

ON MALACEAE: I.

Sorbus occidentalis (S. Wats.) Greene—North slope Mt. Jefferson, along trail to Hanging Valley, Aug. 15, 1914, H. P. Barss & G. B. Posey, 1395; Columbia Highway, Multnomah Co., Aug. 19, 1916, J. R. Weir, 279.

ON JUNIPERACEAE: III.

Juniperus sibirica Burg.—North slope Mt. Jefferson, Aug. 26, 1916, H. P. Barss, 3399.

The genetic connection of the forms of this alpine species has been abundantly demonstrated by European investigators, first by Hartig (Lerb. Baum-Kr. 133. 1882), and later by many others. Arthur in 1911 (Mycol. 4: 57. 1912), using telial material from *J. sibirica* collected in Colorado, succeeded in obtaining infection resulting in pycnia only on *Sorbus americana*. The species is known in America only from the Rocky and Cascade Mountains of the United States and Canada.

38. GYMNOSPORANGIUM JUVENESCENS Kern, Bull. N. Y. Bot. Gard. 7: 448. 1911.

ON MALACEAE: I.

Amelanchier sp.—Hurricane Creek, Wallowa Co., July 24, 1897, E. P. Sheldon, 8622.

ON JUNIPERACEAE: III.

Juniperus scopulorum Sarg.—White Pine, Baker Co., Aug. 1915, J. R. Weir, 169.

This species causes witches' brooms on the telial host somewhat similar to the eastern *G. nidus-avis* Thax.

Arthur has repeatedly cultured it, showing that the aecia occur on *Amelanchier* and *Sorbus* (Jour. Myc. 13: 203. 1907; 14: 18. 1908; Mycol. 1: 239. 1909; 4: 195. 1912).

39. GYMNOSPORANGIUM KERNIANUM Bethel, Mycologia 3: 157. 1911.

ON JUNIPERACEAE: III.

Juniperus occidentalis Hook.—Redmond, Crook Co., July 2, 1914, 1392, May 15, 1915, 3390.

The above specimens are somewhat doubtfully referred to this species. The witches' brooms are large and open, sometimes reaching 2-3 feet in diameter. The teliospores are somewhat more tapering at the apex than is typical for the species and average shorter and somewhat narrower, 19-22 by 45-65 μ . The only aecia collected in the vicinity are properly referred to *G. Harknessianum*. There was no very direct field evidence, and unless the above collections represent an undescribed form there is little possibility that the two can be genetically connected. Arthur (Mycol. 4: 62. 1912) has cultured

G. Kernianum on *Amelanchier* but obtained the development of pycnia only. Field observations and collections by Bethel in Colorado indicate strongly that the aecial stage occurs on *Amelanchier*. The *Roestelia*, however, is quite different from *R. Harknessiana*.

40. GYMNOSPORANGIUM KOREAENSE (P. Henn.) Jackson, Jour. Agr. Research 5: 1006. 1916.

Roestelia koreaensis P. Henn. in Warburg, Monsunia 1: 5. 1899.

Gymnosporangium asiaticum Miyabe, Bot. Mag. Tokyo 17: 34. 1903. (Hyponym.)

Gymnosporangium Haraeorum Syd. Ann. Myc. 10: 405. 1912.

Gymnosporangium chinense Long, Jour. Agr. Research 1: 353. 1914.

ON MALACEAE: I.

Pyrus sinensis Lindl.—Portland (Orient), June 11, 1914, 2666.

ON JUNIPERACEAE: III.

Juniperus chinensis L.—Portland (Orient), March 29, 1915, 2668.

This species has been shown by the writer (l. c.) to have been established at Portland (Orient), Oregon, on trees imported from Japan. It has been cultured on *Pyrus sinensis* and *Cydonia vulgaris*.

41. GYMNOSPORANGIUM NELSONI Arth. Bull. Torrey Club 28: 665. 1901.

ON JUNIPERACEAE: III.

Juniperus occidentalis Nutt.—Austin, Grant Co., April, 1916, J. R. Weir, 257.

Juniperus scopulorum Sarg.—Whitman Nat. Forest, Aug. 1915, J. R. Weir, 166.

This species causes conspicuous galls on the branches of *Juniperus*. The aecial stage has been collected on *Amelanchier*, *Cydonia*, *Pera-phyllum*, *Pyrus* and *Sorbus*.

Arthur (Mycol. 4: 61. 1912; 7: 78. 1915) has conducted cultures, using telial material from Colorado. Weir & Hubert (Phytopath. 7: 109. 1917) have recently confirmed these results, using material collected in Montana, on *J. communis* and *J. scopulorum*.

42. GYMNOSPORANGIUM NOOTKATENSIS (Trel.) Arth. Am. Jour. Bot. 3: 44. 1916.

Uredo nootkatensis Trelease, Alaska Harr. Exped. 5: 36. 1904.

Uredo Chamaecyparidis-nutkaensis Tubeuf, Nat. Zeits. Forst.-Landw. 2: 91. 1914.

ON JUNIPERACEAE:

Chamaecyparis nootkatensis (Lamb.) Spach—North slope Mt. Jefferson, trail to Hanging Valley, Aug. 15, 1914, H. P. Barss & G. B.

Posey, 1394; Whitewater Ranger station, Aug. 28, 1916, H. P. Barss; Foot of Mt. Jefferson, Aug. 28, 1916, H. P. Barss.

The material collected by Barss and Posey in 1914 contained teliospores in the uredinia and forms the basis of the transfer of the very interesting and much discussed *Uredo nootkatensis* to *Gymnosporangium*. A full account of the history of this species has been given by Arthur (l. c.). In the collections of 1916 made in the same locality by Prof. Barss, teliospores were found in great abundance with the uredinia, and in many sori predominated. The urediniospores were germinated in this laboratory and the germ tubes found to develop in the usual way for urediniospores.

43. GYMNOSPORANGIUM SORBI (Arth.) Kern, Bull. N. Y. Bot. Gard. 7: 438. 1911.

Aecidium Sorbi Arth. Bull. Torrey Club 33: 521. 1906.

ON MALACEAE: I.

Sorbus occidentalis (S. Wats.) Greene—Whitewater Ranger station, Mt. Jefferson, Aug. 28, 1916, H. P. Barss.

There is little doubt that the suggestion of the genetic relationship of this species with *Gymnosporangium nootkatensis* (cf. 42) originally made by Kern (Science 31: 833. 1910) and later re-affirmed by Arthur (Am. Jour. Bot. 3: 43-44. 1916) will prove to be correct. The above collection extends the range of the aecia to correspond exactly with the range of the known collections of uredinia and is the most southern record.

It seems best, however, for the purpose of this list to retain the above name till actual cultures confirming the prediction have been made.

44. GYMNOSPORANGIUM TUBULATUM Kern, Bull. N. Y. Bot. Gard. 7: 451. 1911.

Roestelia tubulata Kern; in M. E. Jones, Bull. Univ. Mont. 61: 64. 1910.

ON MALACEAE: I.

Crataegus Douglasii Lindl.—Minam River, Wallowa Co., Oct. 5, 1897, E. P. Sheldon, 9061; Wallowa Nat. Forest, Sept. 28, 1910, G. G. Hedgcock, 1944.

The above collections were found in the Arthur herbarium at the Purdue University Experiment Station. The specimens show chiefly foliage infection, though the first-mentioned collection also includes infected fruit.

Weir (Phytopath. 5: 218. 1915) has recently demonstrated by cultures that the telia, which were previously unknown, occur on the twigs of *Juniperus scopulorum* forming irregularly lobed galls. Telia

have been collected only in Idaho and western Montana. Weir and Hubert in 1916 (*Phytopath.* 7: 109. 1917) have confirmed the above results.

45. *KUNKELIA NITENS* (Schw.) Arth. *Bot. Gaz.* 63: 504. 1917.
Aecidium nitens Schw. *Schrift. Nat. Ges. Leipzig* 1: 69. 1822.

ON ROSACEAE:

Rubus nigrobaccus Bailey—Freewater, Umatilla Co., June 27, 1913, F. D. Bailey, 1143.

Rubus vitifolius Cham. & Schlecht. (cult. loganberry)—LaGrand, Union Co., July 20, 1914, C. C. Cate, 1851.

Kunkel's results (*Bull. Torrey Club* 40: 361. 1913; 43: 559. 1916; *Amer. Jour. Bot.* 1: 37. 1914) indicate that two rusts on *Rubus*, both commonly referred to *Gymnoconia interstitialis* or *Caecoma nitens*, occur in North America, one a short-cycled form having the morphology of a *Caecoma*, the other a brachy-form with caecomoid aecia and telia of the type of *Puccinia* (*P. Peckiana* Howe). Arthur (l. c.) has recently based the genus *Kunkelia* on the short-cycled form.

The inclusion of the Oregon collections under *Kunkelia* follows the disposition made of them by Arthur.

46. *NYSSOPSORA ECHINATA* (Lev.) Arth. *Result. Sci. Congr. Bot. Vienne* 342. 1906.

Triphragmium echinatum Lev. *Ann. Sci. Nat. III.* 9: 247. 1848.

ON UMBELLIFERAE:

Ligusticum Cusickii Coult. & Rose—Steins Mts., Harney Co., Aug. 1901, Griffiths & Morris (*Griffiths, W. Am. Fungi* 340).

Ligusticum purpureum Coult. & Rose—North slope Mt. Jefferson, Aug. 13, 1914, H. P. Barss & G. B. Posey, 2540.

47. *PHRAGMIDIUM DISCIFLORUM* (Tode) J. F. James, *Contr. U. S. Nat. Herb.* 3: 276. 1895.

Ascophora disciflora Tode, *Fungi Meckl.* 1: 16. 1790.

ON ROSACEAE:

Rosa sp. cult.—Empire, Coos Co., Oct. 2, 1911, comm. J. R. Brown, 3154; Portland, May 10, 1914, comm. W. C. Dietz, 3156; Eugene, Lane Co., June 1, 1914, G. H. Godfrey, 3147; Sutherlin, Douglass Co., March 9, 1915, comm. Gladys Franz, 2511.

48. *PHRAGMIDIUM IMITANS* Arth. *N. Am. Flora* 7: 165. 1912.

ON ROSACEAE:

Rubus leucodermis Dougl., Philomath, May 10, 1914, 1830.

Rubus neglectus Pk., Ore. Agr. Coll. Pathologium, Corvallis, July 30, 1915, 3027.

Rubus strigosus Michx.—Stream banks, Eastern Oregon, 4,000–5,000 ft. elev., July, 1897, W. C. Cusick, 1729.

49. PHRAGMIDIUM IVESIAE Sydow, Ann. Myc. 1: 329. 1903.

Phragmidium affine Sydow, Ann. Myc. 2: 29. 1904.

ON ROSACEAE:

Potentilla blaschkeana Turcz.—Philomath, June 20, 1910, 1503; Austin, Grant Co., June, 1913, J. R. Weir, 147; Baker Co., June, 1913, J. R. Weir, 17; Sumpter, Baker Co., June, 1913, J. R. Weir, 3; Hilgard, Union Co., July 10, 1914, 1534.

Potentilla glomerata A. Nels.—Andrews, Harney Co., Aug. 1901, Griffiths & Morris (Griffiths, West Am. Fungi 511b).

Potentilla gracilis Dougl.—Corvallis, June 20, 1909, E. R. Lake, 1499, July 29, 1914, 1477; Wren, Benton Co., June 26, 1914, 1323.

Potentilla sp.—Corvallis, June, 1910, 1110, 3149, Aug. 1911, F. D. Bailey, 1071.

50. PHRAGMIDIUM JONESII Dietel, Hedwigia 44: 128. 1905.

ON ROSACEAE:

Ivesia Baileyi S. Wats.—Steins Mts., Harney Co., July 27, 1898, W. C. Cusick, Phan. Herb. 1967. (From specimen in herb. Field Museum 108727.)

51. PHRAGMIDIUM MONTIVAGUM Arth. Torreyia 9: 24. 1909.

ON ROSACEAE:

Rosa gymnocarpa Nutt.—North slope Mt. Hood, Aug. 9, 1914, 1478; Bank of Minam River, Union Co., alt. 5,100 ft., Oct. 4, 1897, E. P. Sheldon, 9053.

Rosa pisocarpa Gray?—Hilgard, Union Co., July 10, 1914, 1537.

Rosa sp.—Trail Creek Cañon, Wallowa Co., May 18, 1897, E. P. Sheldon, 8073; Corvallis, May 1, 1914, 1466, April 25, 1915, G. B. Posey & C. M. Schearer, 3153, April 28, 1915, 3151; North slope Mt. Hood, Aug. 7, 1914, 1619; Mouth of Salmonberry River, Tillamook Co., July 17, 1915, G. VanGundia, 3089.

52. PHRAGMIDIUM OCCIDENTALE Arth.; Earle, in Greene, Pl. Baker. 2: 3. 1901.

ON ROSACEAE:

Rubus parviflorus Nutt.—Wallowa Lake, Wallowa Co., Aug. 1899, C. L. Shear, 952 (Griffiths, W. Am. Fungi 329); Jackson Co., July 9, 1903, E. B. Copeland (Sydow, Ured. 1788); Mt. Hood, Aug. 31, 1901, E. W. D. Holway, Aug. 7, 1914, 1636; Glen Brook, Benton Co., Aug. 1909, 1119; Trail to Hanging Valley, Mt. Jefferson, H. P. Barss & G. B. Posey, 1785; Mary's Peak, Benton Co., Aug. 15, 1914, 1285; Elk City, Lincoln Co., Aug. 20, 1914, 1626; Dothan, Douglass Co., Sept. 8, 1914, 1930; Corvallis, May 4, 1915, 3059; Unity, Baker Co., Aug. 1915, J. R. Weir, 242; Austin, Grant Co., Aug. 1916, J. R. Weir, 238.

53. PHRAGMIDIUM POTENTILLAE (Pers.) P. Karst. Bidr. Finl. Nat. Folk 31: 49. 1879.

Puccinia Potentillae Pers. Syn. Fung. 229. 1801.

ON ROSACEAE:

Potentilla aracnoides Lehm.—Austin, Grant Co., Aug. 1915, J. R. Weir, 161.

Potentilla Hippiana Lehm.—Austin, Grant Co., Aug. 1915, J. R. Weir, 158.

54. PHRAGMIDIUM ROSAE-ACICULARIS Liro, Bidr. Finl. Nat. Folk. 65: 428. 1908.

ON ROSACEAE:

Rosa nutkana Presl.—Bridal Veil, Multnomah Co., May 18, 1915, 3348; Edge of woods on Minam River, Union Co., Aug. 11, 1897, E. P. Sheldon, 8667.

Rosa sp.—Corvallis, July 28, 1914, 3146.

55. PHRAGMIDIUM ROSAE-CALIFORNICAE Dietel, Hedwigia 44: 125. 1905.
ON ROSACEAE:

Rosa gymnocarpa Nutt.—Corvallis, July 29, 1914, H. P. Barss, 1469; Mary's Peak, Benton Co., Aug. 15, 1914, 1512, 1519, 1521; Ashland, Jackson Co., Sept. 10, 1914, 3084.

Rosa nutkana Presl.—Corvallis, July 29, 1914, 1473; Portland, Aug. 23, 1915, E. Bartholomew, 5950 (Barth. N. Amer. Ured. 1626); Hood River, Aug. 26, 1915, E. Bartholomew, 5973 (Barth. Fungi Columb. 4834); Austin, Grant Co., Aug. 1915, J. R. Weir, 157; Bend, Crook Co., Sept. 11, 1916, J. R. Weir, 202.

Rosa pisocarpa Gray—Corvallis, April 5, 1914, 1523.

Rosa sp.—Bonneville, Multnomah Co., Aug. 11, 1910, 1072, Corvallis, Aug. 10, 1911, 3152, Spring 1914, H. C. Gilbert, 3155, Eugene, Lane Co., July 11, 1914, G. B. Posey, 1467; Ashland, Jackson Co., Sept. 30, 1914, 3350; Whitewater Creek, near Mt. Jefferson, Aug. 11, 1914, H. P. Barss & G. B. Posey, 3362.

56. PILEOLARIA TOXICODENDRI (Berk. & Rav.) Arth. N. Am. Flora 7: 147. 1907.

Uromyces Toxicodendri Berk. & Rav. Grevillea 3: 56. 1874.

Pileolaria brevipes Berk. & Rav. Grevillea 3: 58. 1874.

ON ANACARDIACEAE:

Rhus diversiloba T. & G.—Corvallis, April 29, 1914, F. D. Bailey, 1831; Grant's Pass, Josephine Co., Sept. 5, 1916, J. R. Weir, 256; Jim Creek, Wallowa Co., June 14, 1897, E. P. Sheldon, 8279.

57. POLYTHELIS FUSCA (Pers.) Arth. Résult. Sci. Cong. Bot. Vienne 341. 1906.

Aecidium fuscum Pers., in Gmel. Syst. Nat. 2: 1473. 1791.

ON RANUNCULACEAE:

Anemone oregana A. Gray—Mary's Peak, Benton Co., May 23, 1915, 3030.

Anemone quinquefolia L.?—North slope Mt. Hood, Aug. 9, 1914, 1621.

58. PUCCINIA ABSINTHII (Hedw. f.) DC. Fl. Fr. 6: 56. 1815.

Uredo (Puccinia) Artemisii Hedw. f.; DC. in Lam. Encycl. Meth. Bot. 8: 245. 1808.

Puccinia similis E. & E. Bull. Torrey Club 25: 508. 1898.

ON CARDUACEAE:

Artemisia dracunculoides Pursh—Sherman, Sherman Co., July 1, 1914, 2671, May 16, 1915, 2672.

Artemisia frigida Willd.—Bend, Crook Co., Sept. 11, 1916, J. R. Weir, 212.

Artemisia ludoviciana Nutt.—Eastern Oregon, Aug. 1914, H. F. Wilson, 3321; Eugene, Lane Co., July 20, 1914, F. D. Bailey, 1504; Portland, Aug. 21, 1915, E. Bartholomew, 5939 (Barth. Fungi Columb. 5048); Sumpter, Baker Co., June, 1913, J. R. Weir, 91; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 249; Hood River Co., July 22, 1915, 3138.

Artemisia rigida (Nutt.) A. Gray—Eastern Oregon, 3,500 ft. altitude, Sept. 1900, W. C. Cusick, 2504; Lost Valley, Wheeler Co., Sept. 9, 1894, J. B. Lieburg, 888.

Artemisia tridentata Nutt.—Redmond, Crook Co., Sept. 15, 1913, Kirk Whited, 3187, July 2, 1914, 2555; Sherman, Sherman Co., July 1, 1914, 1938; Umatilla, Umatilla Co., July 11, 1914, 1293, May 11, 1915, 3038; Park, Union Co., Oct. 9, 1897, E. P. Sheldon, 9113.

This species, presumably a brachy-form, though no pycnia have yet been observed, is not to be confused with any other species on this host genus. The only other species recognized in North America is *P. conferta* (cf. 90) which is a micro-form.

59. *Puccinia abundans* (Pk.) comb. nov.

Aecidium abundans Pk. Bot. Gaz. 3: 34. 1878.

Puccinia Crandallii Pam. & Hume, Proc. Dav. Acad. Sci. 7: 250. 1899.

Puccinia Kreageri Ricker, Jour. Myc. 11: 114. 1905.

ON CAPRIFOLIACEAE: I.

Symphoricarpos albus (L.) Blake—Head of Applegate Creek, Jackson Co., July 29, 1913, E. P. Meinecke, Cr D (1) 5; Bridal Veil, Multnomah Co., May 18, 1915, 3054, Mary's Peak, Benton Co., May 21, 1915, 3036; Hilgard, Union Co., July 9, 1914, 2546; Hood River, May 14, 1914, 2566, July 21, 1915, 3063; Springbrook, Yamhill

Co., May 14, 1914, F. D. Bailey, 2567; Philomath, April 26, 1914, 2572; Corvallis, April 28, 1915, 2612; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 181.

ON POACEAE: II and III.

Festuca confinis Vasey (*Poa Kingii* S. Wats.)—Steins Mts., Harney Co., July 2, 1896, J. B. Leiberger, 2945.

Festuca idahoensis Elmer—Hilgard, Union Co., July 10, 1914, 1358, 1362; Redmond, Crook Co., July 2, 1914, 1424, 1430.

Festuca rubra L.—Hilgard, Union Co., July 10, 1914, 1366; Mary's Peak, Benton Co., Aug. 15, 1914, 1571, 1573; Newport, Lincoln Co., July 18, 1915, 3207.

Festuca subulata Trin.—Ashland, Jackson Co., Sept. 10, 1914, 1563.

The connection between this common western form on *Festuca* with *Aecidium abundans* was shown by Arthur in 1910 (*Mycologia* 4: 27. 1912). In three trials, using telial material on *F. confinis*, collected in Colorado and Utah, infection resulting in pycnia and aecia on *Symphoricarpos racemosus* was obtained.

60. PUCCINIA ACETOSAE (Schum.) Koern. *Hedwigia* 15: 184. 1876.

Uredo Acetosae Schum. *Enum. Pl. Saell.* 2: 231. 1803.

ON POLYGONACEAE:

Rumex acetosella L.—Maples Station, Tillamook Co., Sept. 15, 1915, F. D. Bailey, 3102; Corvallis, Oct. 19, 1915, G. B. Posey, 3000.

This species has been recorded previously from North America only from Florida on *R. hastatulus* (Holway, *North Am. Ured.* 1: 35. 1906). Specimens on that host referred to this species are in the Arthur herbarium also from S. Carolina and Massachusetts and on *R. acetosella* from Massachusetts, Florida, New York and Indiana. All the specimens bear uredinia only. It is possible that some or all of the material should be referred to *Uromyces Acetosae* Schroet., as the two species are indistinguishable in the uredinial stage.

61. PUCCINIA AMBIGUA (Alb. & Schw.) Lagerh., in Bubak, *Sitz. Ver. Bohm. Ges. Wiss.* 1898, 28: 14. 1898.

Aecidium Galii ambiguum Alb. & Schw. *Consp. Fung.* 116. 1805.

Puccinia difformis Kunze, *Myc. Hefte* 1: 71. 1817.

Allodus ambigua Arth. *Résult Sci. Congr. Bot. Vienne* 345. 1906.

ON RUBIACEAE:

Galium aparine L.—Wren, Benton Co., June 26, 1914, 1330; Ashland, Jackson Co., Sept. 10, 1914, 3096.

This species possesses aecia and telia only in the life cycle. It has been studied by Bubak (l. c.) who found that primary aecia were followed by secondary aecia. Later Treboux (*Flora* 81: 394-404. 1895) repeated this observation and conducted culture work con-

firming Bubak's contention. This species should not be confused with *P. punctata* Lk. (cf. 156) which occurs on the same host from this region.

62. PUCCINIA ANGELICAE (Schum.) Fckl. Symb. Myc. 52. 1869.
(Not *P. Angelicae* E. & E. 1884.)

Uredo Angelicae Schum. Enum. Pl. Saell. 2: 233. 1803.

Puccinia Archangelicae Blytt, Christiania Vid. Selsk. Forhandl. No. 6: 51. 1896.

Bullaria Angelicae Arth. Résult Sci. Congr. Bot. Vienne 346. 1906.

ON UMBELLIFERAE:

Angelica genuflexa Nutt.—Woodburn, Clackamas Co., Sept. 1885, Thomas Howell.

Angelica Lyallii Wats.?—Larch Mt., Multnomah Co., Aug. 10, 1910, 2613.

This species is evidently rare in North America having been reported otherwise only from a single collection from Washington on *A. genuflexa* and one from New York on *A. atropurpurea*. It is a brachy-form though pycnia have not been seen in American collections. This species has smooth teliospores and is easily separable from *Puccinia Ellisii* (cf. 98) on the same hosts from our region, which has verrucose spores.

63. PUCCINIA ANOMALA Rost. Thümen, Flora 1877: 92. 1877.

Puccinia straminis simplex Koern. Land. u. Forstw. Zeit. no. 50. 1865.

Puccinia Hordei Otth. Mitt. Nat. Ges. Bern. 1870: 114. 1871.
(Not *P. Hordei* Fckl. 1860.)

Puccinia simplex Erikss. & Henn. Getreideroste 238. 1896. (Not *P. simplex* Peck. 1881.)

Aecidium Ornithogalum Bubak, Ann. Myc. 3: 223. 1905.

ON POACEAE: II, III.

Hordeum montanense Schribn.—Corvallis, July 26, 1914, 1414.

Hordeum murinum L.—Corvallis, July 8, 1914, G. B. Posey, 1354.

Hordeum nodosum L.—Corvallis, July 26, 1914, 3257.

Hordeum vulgare L.—Corvallis, July 6, 1914, 1683, Aug. 13, 1914, 1691, 1708.

This, the leaf rust of barley, is evidently very common in Oregon, much more so than the collections listed above would indicate. It is evidently not abundant in America except on the Pacific coast. In the Arthur herbarium, specimens on wild barleys are represented only from Oregon, California and Utah. On the cultivated barley specimens are at hand only from California, Iowa and Wisconsin. It is

evidently spreading into the eastern United States as the writer collected it in August, 1916, at Ithaca and Savanna, New York.

Tranzschel has shown that this rust in Russia has its aecia on *Ornithogalum umbellatum* and *O. narbonense* (Mycol. Cent. 4: 70. 1914).

64. PUCCINIA ANTIRRHINI Diet. & Holw. Hedwigia 36: 298. 1897.
ON SCROPHULARIACEAE:

Antirrhinum majus L.—Portland, Aug. 1909, comm. Charles Ladd, 1080, Aug. 28, 1914, comm. P. C. Schmeir, 1914; Salem, Marion Co., July, 1911, comm. Mrs. Lord, 1127; Corvallis, June 26, 1912, 1085, Aug. 1912, 1025.

The snapdragon rust is very common in Oregon both in gardens and in the greenhouse. For a long time it was known to occur only in California. As snapdragons came to be used more commonly in greenhouse culture the rust has gradually spread through the distribution of cuttings, till at the present time it is known to occur in most of the central and eastern states.

65. PUCCINIA ARNICALIS Pk. Bot. Gaz. 6: 227. 1881.
ON CARDUACEAE:

Arnica cordifolia Hook.—Near Aneroid Lake, July 1, 1899, II, E. R. Lake, 1497.

A very distinct species having minutely verrucose teliospores, not thickened at the apex, and is known only from the Rocky mountain and Pacific coast regions.

66. PUCCINIA ASARINA Kunze, in Kunze & Schmidt, Myk. 1: 70. 1817.

Puccinia Asari Link in Willd. Sp. Pl. 6²: 68. 1825.

Dicaeoma asarinum Kuntze, Rev. Gen. Pl. 3: 467. 1898.

ON ARISTOLOCHIACEAE:

Asarum caudatum Lindl.—Portland, Aug. 30, 1915, E. Bartholomew, 5977 (Barth. Fungi Columb. 4840).

This micro-form is known from North America on the above host, otherwise only from California, Idaho and Washington.

67. PUCCINIA ASPERIFOLII (Pers.) Wettst. Verh. Zool.-Bot. Ges. Wien 35: 541. 1885.

Aecidium asperifolii Pers. Obs. Myc. 1: 97. 1796.

Puccinia dispersa Erikss. Zeitsch. f. Pflanzenkr. 4: 257. 1894.

ON POACEAE:

Secale cereale L.—Hood River, June 19, 1914, 1402; Corvallis, July 28, 1914, 1682; Bend, Crook Co., Sept. 11, 1916, J. R. Weir, 243.

The leaf rust of rye is evidently common throughout the state.

This species has its aecia on species of *Anchusa* and *Lycopsis* in Europe as was first shown by De Bary (Monatsber. k. Akad. d. Wiss. Berlin 211. 1866). No aecia referable to this species have been found in America, but Arthur (Mycologia 1: 236. 1909) obtained the development of pycnia on *Lycopsis arvensis* secured from Europe, following exposure to germinating telia on rye collected in Indiana. This culture indicates that the European and American rusts are identical.

68. PUCCINIA ASPERIOR E. & E. Bull. Washb. Lab. 1: 3. 1884.
Puccinia oregonensis Earle, Bull. N. Y. Bot. Gard. 2: 349. 1902.
Allodus oregonensis Arth. Résult Sci. Congr. Bot. Vienne 345. 1906.
Allodus asperior Orton, Mem. N. Y. Bot. Gard. 6: 193. 1916.

ON UMBELLIFERAE:

Leptotaenia dissecta Nutt.—Corvallis, June and July, 1898, M. Craig, April 14, 1899, M. Craig, June, 1910, 2614, March 24, 1914, G. B. Posey, 2665; Mary's River near Wren, Benton Co., June 5, 1915, 2673.

This is one of the most common and conspicuous of rusts, probably widely distributed throughout western Oregon. The type of *P. oregonensis*, the second collection listed, was described as on *Sanicula bipinnata*, which is clearly an error for the above host as was first pointed out by Holway (N. Am. Ured. 14: 93. 1913).

69. PUCCINIA ASTERUM (Schw.) Kern, Mycologia 9: 224. 1917.
Aecidium asterum Schw. Schrift. Nat. Ges. Leipzig 1: 67. 1822.
Aecidium Solidaginis Schw. Schrift. Nat. Ges. Leipzig 1: 68. 1822.
Caeoma asteratum Link in Willd. Sp. Pl. 6²: 51. 1825.
Caeoma (Aecidium) erigeronatum Schw. Trans. Am. Phil. Soc. II. 4: 292. 1832.
Puccinia extensicola Plowr. Brit. Ured. Ustil. 181. 1889.
Puccinia Caricis-Erigerontis Arth. Jour. Myc. 8: 53. 1902.
Puccinia Caricis-Asteris Arth. Jour. Myc. 8: 54. 1902.
Puccinia Caricis-Solidaginis Arth. Bot. Gaz. 35: 21. 1903.

ON CARDUACEAE: I.

Aster sp.—Philomath, May 10, 1914, 1309, 3066; Hilgard, Union Co., July 10, 1914, 3056; Corvallis, May 9, 1914, 3367, 3368, April 31, 1915, W. E. Lawrence, 3048; Hood River, May 14, 1914, 3022; Sumpter, Baker Co., June 1913, J. R. Weir, 85.

Erigeron speciosus DC.—Near Whitewater ranger station, Mt. Jefferson, Aug. 16, 1914, H. P. Barss & G. B. Posey, 3292.

Euthamia occidentalis Nutt.—Mary's River, Benton Co., June 1898, M. Craig.

ON CYPERACEAE: II and III.

Carex athrostachya Olney—Philomath, May 10, 1914, 3286, Corvallis, June 29, 1914, G. B. Posey, 1333.

Carex canescens L.—Hood River, Aug. 5, 1914, 3005.

Carex Deweyana Schw.—Glendale, Douglass Co., Aug. 17, 1914, 1409; Elk City, Lincoln Co., Aug. 20, 1914, 1381, 1383; Philomath, May 10, 1914, 3284; Trail to Sulphur Springs, Benton Co., Nov. 3, 1912, 3288; Corvallis, Apr. 29, 1914, F. D. Bailey, 3283, May 19, 1913, 1193.

Carex festiva Dewey—Newport, Lincoln Co., July 18, 1915, 3279.

Carex Goodenowii J. Gay (*C. vulgaris* E. Fr.)—Hood River, June 20, 1914, 1405.

Carex phyllomanica W. Boot?—Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 226.

Carex praegracilis Boot (*C. marcida* Boot)—Corvallis, May 9, 1914, 3287.

Carex scoparia Schk.—Corvallis, June 24, 1914, F. D. Bailey, 1386.

Carex stipata Muhl.—Sherwood, Washington Co., July 10, 1914, F. D. Bailey, 1355; Hood River, May 14, 1914, 3014; Hubbard, Clackamas Co., May 27, 1914, 3011; Portland, May 19, 1914, F. D. Bailey, 3003; Corvallis, Aug. 10, 1910, 1189, May 9, 1914, 3285, July 29, 1915, 3281; Eddyville, Lincoln Co., Aug. 8, 1915, Hoerner, 3356.

Carex straminea Willd.—Hood River, July 24, 1915, 3280.

Carex subfusca W. Boot.—Corvallis, July 29, 1914, 1444.

Carex sp.—Ashland, Jackson Co., Sept. 10, 1914, 3008; Corvallis, July 29, 1914, 1442; Cottage Grove, Lane Co., July 14, 1914, 1350; Philomath, Jan. 6, 1914, 1180.

In 1901 Arthur (Jour. Myc. 8: 54. 1902) first began culture work showing that aecia which occur commonly on *Aster*, *Solidago* and related hosts are genetically connected with uredinia and telia on various species of *Carex*. The culture work conducted by Arthur is extensive and extends over a period of years from 1901–1914. In this series of culture work aecia have been produced on various species of *Aster*, *Solidago*, *Erigeron*, *Leptilon* and *Euthamia*, using telia from *Dulichium* and from many species of *Carex* from various parts of North America (Jour. Myc. 8: 54. 1902; 11: 58. 1905; 12: 15. 1906; 14: 13. 1908; Bot. Gaz. 35: 15, 21. 1903; Mycol. 1: 233. 1909; 2: 224. 1910; 4: 15, 16. 1912; 7: 70, 81. 1915). Fraser in 1911 (Mycol. 4: 181. 1912) confirms Arthur's results in part by successfully infecting *Aster acuminatus* using telial material from *Carex trisperma* L.

This study has also shown that the species as here considered is a composite form made up of several distinct physiological races.

The species is separable from all other American species of *Puccinia* on *Carex* by the presence of two pores in the upper part of the rather small (12–19 by 16–23 μ) urediniospores and the medium-sized (12–20 by 35–50 μ) teliospores.

The aecia of this species should not be confused with those of *P. stipae* (cf. 166), which occur on the same generic hosts and other *Carduaceae* in the west. In *P. Asterum* the aecia are cupulate, the peridium conspicuous, the spores globoid, nearly colorless and small (11–15 by 13–18 μ). In *P. stipae* the aecia occur on hypertrophied areas, the individual cups are gall-like and open by a central aperture, the peridium is evanescent, the spores are cinnamon brown, globoid, large (21–26 by 22–29 μ). The aecia of the latter species have not been found in Oregon, but doubtless occur abundantly in the eastern part of the state.

70. PUCCINIA ASTERIS Duby, Bot. Gall. 2: 888. 1830.

ON CARDUACEAE:

Aster conspicuus Lindl.—Hilgard, Union Co., July 10, 1914, 1538; Crater Lake, Klamath Co., Sept. 3, 1916, J. R. Weir, 182.

Aster sp.—Corvallis, Aug. 10, 1911, F. D. Bailey, 1175, May 1, 1915, 3050; Austin, Grant Co., June 1913, J. R. Weir, 102.

71. PUCCINIA ATRO-FUSCA (Dudley & Thompson) Holway, Jour. Myc. 10: 228. 1904.

Uromyces atro-fuscus Dudley & Thompson, Jour. Myc. 10: 55. 1904.

ON CYPERACEAE:

Carex Douglasii Boot.—Enterprise, Wallowa Co., July 24, 1897, E. P. Sheldon (from Phan. spec. 8634).

This species possesses amphispores which were first mistaken for the teliospores of a *Uromyces*. It may be distinguished from other *Carex* rusts by the presence of the amphispores together with the normal urediniospores, the latter are 20–26 μ long and thin walled, 1.5–2 μ thick. The aecial connection is unknown. It is known only from the Rocky mountain and Pacific coast regions.

72. PUCCINIA BALSAMORRHIZAE Pk. Bull. Torrey Club 11: 49. 1884.

Trichobasis Balsamorhizae Pk. Bot. Gaz. 6: 276. 1881.

ON CARDUACEAE:

Balsamorhiza deltoidea Nutt.—Corvallis, July 29, 1914, 1472; Hermiston, Umatilla Co., May 12, 1915, 2663.

Balsamorhiza sagittata (Pursh) Nutt.—Hood River, Aug. 11, 1909, 3186; Duffur, Wasco Co., June 19, 1914, 1836.

73. PUCCINIA BICOLOR Ell. & Ev. Bull. Torrey Club 27: 572. 1900.
ON CICHORIACEAE:

Hieracium cinereum Howell—Hood River, July 22, 1915, 3325.

Hieracium Scouleri Hook.—White Pine, Baker Co., June 1913,
J. R. Weir, 7.

Hieracium sp.—Durfur, Wasco Co., June 30, 1914, 1338.

This very distinct micro-form is known otherwise only from the type collection made at Waitsburg, Wash., May 7, 1900, on *H. Scouleri*, by R. M. Horner and distributed in E. & E. Fungi Col. 1570.

74. PUCCINIA BISTORTAE (Strauss) DC. Fl. Fr. 6: 61. 1815.

Uredo Polygoni Bistortae Strauss, Ann. Wett. Ges. 2: 103. 1870.

ON POLYGONACEAE:

Polygonum imbricatum Nutt.—Oregon?, Aug. 1880, Thos. Howell.

Polygonum Newberryi Small—Crater Lake, Klamath Co., Sept. 22, 1913, E. P. Meinecke, *Cr Pk D* (2) 14; N. slope Mt. Jefferson, 2,600 ft., Marion Co., Aug. 16, 1914, H. P. Barss & G. B. Posey, 1793, Aug. 27, 1916, H. P. Barss, 3395.

This species may be distinguished from other North American *Polygonum* rusts by the medium-sized teliospores (16–21 by 26–35 μ) with wall of uniform thickness, without hyaline umbo. It is not known elsewhere in North America on the first mentioned host and otherwise only from Washington on *P. Newberryi*. Aecia are unknown.

75. PUCCINIA BLASDALEI Diet. & Holw. Erythea 1: 248. 1893.

ON ALLIACEAE:

Allium attenuifolium Kellog—Corvallis, June 2, 1915, C. E. Owens, 2681.

Allium acuminatum Hook.—Hood River Co., June 10, 1917, Leroy Childs.

This rust may be distinguished from other *Allium* rusts by the strongly developed stroma in the telial sori, and the tendency to form confluent telia covering large areas on the stems and leaves. The teliospores are large (16–26 by 40–61 μ), thickened to 4–10 μ at the apex.

76. PUCCINIA CALOCHORTI Pk. Bot. Gaz. 6: 228. 1881.

Allodus Calochorti Arth. Résult Sci. Congr. Bot. Vienne 345-1906.

ON LILIACEAE:

Calochortus macrocarpus Dougl.—Redmond, Crook Co., July 21, 1912, Kirk Whited, 3182; Hills near Malheur River, Harney Co., June 6, 1901, W. C. Cusick, 2544; Powder River Mts., Baker Co., Aug. 1896, C. V. Piper, 2460.

All of the above specimens were secured from phanerogamic specimens, the first from the herbarium of the Oregon Agr. College, the others from the herbarium of the N. Y. Botanical Garden. The species is an opsis-form.

77. PUCCINIA CAMPANULAE Carm. Smith's English Flora 5: 365. 1826.

Puccinia Campanulae Fckl. Sym. Myc. 53. 1869.

ON CAMPANULACEAE:

Campanula Scouleri Hook.—Mary's Peak, Benton Co., Aug. 15, 1914, 2559; Hood River, July 24, 1914, 3023.

A comparison of the above collections with European material shows that the rust is identical and should be referred as above. This is a micro-form unrecorded in America so far as the writer is aware, and known otherwise from North America only from collections made by the writer and others, on *C. rotundifolia* at Fall Creek, Ithaca, New York.

78. PUCCINIA CHELONIS Diet. & Holw. Hedwigia 36: 297. 1897.

ON SCROPHULARIACEAE:

Chelone nemorosa Dougl.—Mt. Hood, Sept. 1, 1901, E. W. D. Holway.

A micro-form known otherwise only from Washington on the same host.

79. PUCCINIA CHRYSANTHEMI Roze. Bull. Soc. Myc. Fr. 17: 92. 1900.

ON CARDUACEAE:

Chrysanthemum sinense Sabine—Portland, Nov. 1914, W. H. Dunham, 1986.

The above collection from a greenhouse is the only collection we have seen from Oregon. It is doubtless not infrequent in greenhouses throughout the state. The life history is unknown. This rust is evidently a native of Japan, having been introduced into America and Europe where it has become widespread on cultivated chrysanthemums.

80. PUCCINIA CICHORII (DC.) Bell, in Kickx. Fl. Fland. 2: 65. 1867.

Uredo Cichorii DC. Fl. Fr. 6: 74. 1815.

ON CICHORIACEAE:

Cichorium intybus L.—Corvallis, Sept. 21, 1914, G. B. Posey, 1931.

81. PUCCINIA CICUTAE Lasch, Klotsch. Herb. viv. myc. No. 787. 1845.

Puccinia Cicutae Thüm. Bull. Soc. Imp. des Nat. Moscow 52: 136. 1877.

ON UMBELLIFERAE:

Cicuta occidentalis Greene?—Klamath Falls, Klamath Co., Sept. 8, 1916, J. R. Weir, 223.

Cicuta sp.—Eastern Oregon, June, 1885, T. Howell.

The last-mentioned specimen is from the herbarium of W. G. Farlow. It is marked on *Peucedanum*. The host is clearly *Cicuta* sp.

82. PUCCINIA CIRCAEAE Pers. Roemer's Neues Mag. 1: 119. 1794.

ON ONAGRACEAE:

Circaea pacifica Asch. & Magn.—West of Noon station, Benton Co., Aug. 8, 1914, H. P. Barss, 1296; Hood River, July 24, 1915, 3062; Near Mary's Peak, Benton Co., Aug. 15, 1914, 3263; Sumpter, Baker Co., July 16, 1913, J. R. Weir, 199.

83. PUCCINIA CIRSIII Lasch, in Rabh. Fungi Eur. No. 89. 1859.

Puccinia inclusa Syd. Monog. Ured. 1: 56. 1902.

ON CARDUACEAE:

Cirsium americanum (Gray) Robinson—Wren, Benton Co., June 26, 1914, 1332; Corvallis, May 20, 1915, 3242.

Cirsium edule Nutt.—Elk City, Lincoln Co., Aug. 20, 1914, 2526.

Cirsium undulatum (Nutt.) Spreng.—Sherman, Sherman Co., July 1, 1914, 1966.

84. PUCCINIA CLAYTONIATA (Schw.) Pk. Bull. N. Y. State Mus. 6: 226. 1899.

Caeoma (Aecidium) claytoniata Schw. Trans. Am. Phil. Soc. II. 4: 294. 1832.

Puccinia Mariae-Wilsoni G. W. Clinton; Peck, Bull. Buff. Soc. Nat. Sci. 1: 66. 1873.

Allodus claytoniata Arth. Résult Sci. Congr. Bot. Vienne 345. 1906.

ON PORTULACACEAE:

Claytonia lanceolata Pursh?—Austin, Grant Co., May, 1916, J. R. Weir, 206.

85. PUCCINIA CLEMATIDIS (DC.) Lagerh. Tromsö Mus. Aarsh. 17: 47. 1895.

Aecidium Clematidis DC. Fl. Fr. 2: 243. 1805.

Aecidium Aquilegiae Pers. Icon. pict. IV. 58. 1806.

Puccinia tomipara Trel. Trans. Wis. Acad. Sci. 6: 127. 1885.

Puccinia Agropyri E. & E. Jour. Myc. 7: 131. 1892.

Puccinia cinerea Arth. Bull. Torrey Club 34: 583. 1907.

Puccinia alternans Arth. Mycol. 1: 248. 1909.

Puccinia obliterated Arth. Mycol. 1: 250. 1909.

ON RANUNCULACEAE: I.

Aquilegia formosa Fish.—Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 2573; Hood River, May 14, 1914, 2565, May 9, 1915, 3040; Bridal Veil, Multnomah Co., May 18, 1915, 3051.

Aquilegia truncata Fisch. & Mey.—Pokegama, Jackson Co., July 9, 1903, E. B. Copeland (Sydow, Ured. 1767), E. B. Copeland, 3711 (Rocky Mt. Herb. 45896).

Clematis Drummondii T. & G.—Freewater, Umatilla Co., July 10, 1914, 2562.

Clematis hirsutissima Pursh (*C. Douglasii* Hook.)—Austin, Grant Co., July, 1913, J. R. Weir, 183.

Clematis ligusticifolia Nutt.—Corvallis, Linn Co., Sept. 2, 1914, F. D. Bailey, 2563, Benton Co., May 4, 1915, 3307.

Thalictrum occidentale A. Gray—Corvallis, May 4, 1912, 1147, July 4, 1914, G. B. Posey, 3067, May 4, 1915, 3270; Wren, Benton Co., June 26, 1914, 1331a; White Pine, July, 1913, J. R. Weir, 153; Austin, Grant Co., Aug. 1915, J. R. Weir, 205.

ON POACEAE: II, III.

Agropyron dasystachyum (Hook.) Vasey—Redmond, Crook Co., July 2, 1914, 1432.

Agropyron lanceolatum Scribn. & Sm.—Redmond, Crook Co., July 2, 1914, 1427.

Agropyron spicatum (Pursh) Rydb.—Wren, Benton Co., June 26, 1914, 1320.

Bromus carinatus Hook. & Arn.—Newberg, Yamhill Co., June 8, 1913, F. D. Bailey, 1197; Portland, July 10, 1905, J. J. Davis, Aug. 23, 1915, E. Bartholomew, (Barth. Fungi Columb. 4846); Corvallis, Sept. 10, 1914, 1577; Philomath, May 10, 1914, 3193; Hood River, May 14, 1914, 1587, 1588, 1593; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 207.

Bromus carinatus californicus Shear—Philomath, Jan. 6, 1914, 1148.

Bromus grandis (Shear) Hitchc.—Corvallis, June 4, 1914, 1384.

Bromus hordeaceus L.—Portland, May 21, 1914, 1582.

Bromus hordeaceus leptostachys Beck.—Hood River, May 20, 1914, 1585; Springbrook, Yamhill Co., May 14, 1914, F. D. Bailey, 1594, 1595.

Bromus marginatus Nees.—Hood River, Aug. 6, 1914, 1559, July 27, 1915, 3192; Corvallis, June 24, 1914, G. B. Posey, 1389, June 29, 1914, G. H. Godfrey, 1312; Rose City Park, Portland, Jan. 9, 1914, 1198; Redmond, Crook Co., July 2, 1914, 1422; Hilgard, Union Co., July 10, 1914, 1365.

Bromus secalinus L.—Cottage Grove, Lane Co., July 14, 1914, 1352.

Bromus tectorum L.—Clatskanie, Columbia Co., May 20, 1914, F. D. Bailey, 1581.

Bromus villosus Forsk.—Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 1406.

Bromus vulgaris Shear—Ashland, Jackson Co., Sept. 10, 1914, 1569; Corvallis, Feb. 14, 1914, 3261, July 4, 1914, G. B. Posey, 1418, July 29, 1914, 1443; trail to Sulphur Springs, Benton Co., Nov. 3, 1914, 3195; Mary's Peak, Benton Co., Sept. 15, 1914, 1574.

Elymus condensatus Presl.—Albany, Linn Co., Aug. 1907, D. Griffiths.

Elymus glaucus Buckl.—Wren, Benton Co., June 26, 1914, 1321, 1331; Ashland, Jackson Co., Sept. 10, 1914, 1562, 1564; N. slope Mt. Hood, Aug. 7, 1914, 1556; Mary's Peak, Benton Co., Aug. 15, 1914, 1575; The Dalles, Wasco Co., July 1, 1914, 1341; Garden Home, Multnomah Co., July 20, 1915, 3202; Hood River, June 20, 1914, 1403, Aug. 5, 1914, 3204; Corvallis, Feb. 14, 1914, 3262; June 29, 1914, G. B. Posey, 1304, G. H. Godfrey, 1305, July 29, 1914, 1439, 1440.

Elymus triticoides Buckl.—Columbia River, near mouth of Deschutttes River, Sherman Co., July 29, 1914, M. E. Peck.

Poa ampla Merrill—Hood River, July 22, 1915, 3259.

Puccinella Nuttalliana (Schult.) Hitchc.—Grand Ronde Valley, Union Co., July, 1914.

Sitanion californicum J. G. Smith—N. slope Mt. Jefferson, Aug. 12, 1914, H. P. Barss, 1560.

Sitanion glabrum J. G. Smith—Umatilla, Umatilla Co., July 11, 1914, 1370.

Sitanion jubatum J. G. Smith—Redmond, Crook Co., July 2, 1914, 1428.

Sitanion velutinum Piper—Hood River, July 22, 1915, 3255; Hermiston, Umatilla Co., May 12, 1915, 3179.

This common subepidermal species, as here considered, includes nearly if not all the forms having aecia on Ranunculaceous hosts.

Dietel (Oesterr. bot. Zeitschr. 42: 261. 1892) was apparently the first to culture this species. Klebahn (Die Wirtsw. Rostpilze 292. 1904) has presented a summary of Dietel's work together with that of other European investigators.

In America, Arthur has conducted extensive culture work beginning in 1904, using telial material from various parts of the country, on five different genera of grasses representing ten species, and has successfully cultured them on five genera of Ranunculaceae. His work indicates the presence of a number of well-marked races. (Jour. Myc. 11: 62. 1905, 13: 197. 1907, 14: 15. 1908; Mycologia 1: 246, 248, 249. 1909, 2: 225. 1910, 4: 54. 1912, 7: 73, 82. 1915, 8: 132. 1916.)

This species may be distinguished from other grass rusts having the telia long covered by the epidermis primarily on the urediniospore characters. They are not accompanied by paraphyses, the wall is moderately thin, 1.5–2 μ , pale yellow to cinnamon brown, and the pores are scattered. The telia may or may not be surrounded by stromal hyphae and are rather narrow, 13–24 μ .

86. PUCCINIA CLINTONII Peck, Rept. N. Y. State Mus. 28: 61. 1876.
ON SCROPHULARIACEAE:

Pedicularis bracteosa Benth.?—N. slope Mt. Jefferson, Aug. 16, 1914, H. P. Barss & G. B. Posey, 2545.

Pedicularis racemosa Dougl.—N. slope Mt. Jefferson, 7,000 ft., Aug. 13, 1914, H. P. Barss, 2544.

87. PUCCINIA CNICI Mart. Fl. Mosq. 226. 1817.

Puccinia Cirsii-lanceolati Schroet., Cohn, Krypt. Fl. Schl. 3¹: 317. 1887.

ON CARDUACEAE:

Cirsium lanceolatum (L.) Scop.—Corvallis, Oct. 21, 1911, F. D. Bailey, 1963; Mar. 6, 1914, G. H. Godfrey & F. D. Bailey, 1965; Elk City, Lincoln Co., Aug. 20, 1914, 1964; The Dalles, Wasco Co., July 1, 1914, 1334; Portland, Aug. 21, 1915, E. Bartholomew (Barth. Fungi Columb. 5053).

88. PUCCINIA COMANDRAE Pk. Bull. Torrey Club 11: 49. 1884.

ON SANTALACEAE:

Comandra umbellata (L.) Nutt.—Dufur, Wasco Co., July 30, 1914, 2504; Hood River, May 18, 1915, 2660, July 22, 1915, 3141.

This micro-form, found commonly in the Rocky Mt. and Pacific coast states, possesses teliospores having similar morphological characters to those of the heteroecious rust *P. pustulata* (Curt.) Arth., which has aecia on *Comandra* and uredinia and telia on *Andropogon*. A number of such correlations between micro-forms and the telia of heteroecious forms whose aecia occur on the same host have been pointed out by Travelbee (Proc. Ind. Acad. Sci. 1914: 233. 1915) among species occurring in North America. Dietel (in Engler & Prantl, Die Nat. Pflanzenf. 1¹** : 69. 1897) was apparently the first to point out this sort of correlation between *P. mesneriana* Thüm. and *P. coronata* (*P. Rhamni*).

89. PUCCINIA COMMUTATA Sydow, Monog. Ured. 1: 201. 1902.

Allodus commutata Arth. Résult. Sci. Congr. Bot. Vienne 345. 1906.

ON VALERIANACEAE:

Valeriana occidentalis Heller—Hilgard, Union Co., July 10, 1914, 1541.

90. PUCCINIA CONFERTA Diet. & Holw. Erythea 1: 250. 1893.

Puccinia recondita Diet. & Holw. Erythea 2: 128. 1894.

ON CARDUACEAE:

Artemisia ludoviciana Nutt.—Corvallis, Sept. 2, 1914, F. D. Bailey, 2532, Sept. 4, 1914, 2509.

A micro-form in which the teliospores resemble quite closely those of *P. Absinthii* (cf. 58), a brachy-form also common in the west. It is probable that this should be considered a correlated form.

91. PUCCINIA CONVULVULI (Pers.) Cast. Obs. 1: 16. 1842.

Uredo Betae Convolvuli Pers. Syn. Fung. 221. 1801.

ON CONVULVULACEAE:

Convolvulus atriplicifolius (Hallier f.) House—Central Point, Jackson Co., Oct. 6, 1914, M. P. Henderson, 1949; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 221.

92. PUCCINIA CREPIDIS-ACUMINATAE Sydow, Oestr. Zeitschr. 51: 27. 1901.

ON CICHORIACEAE:

Crepis gracilis (D. C. Eaton) Rydberg—Baker City, Baker Co., July, 1913, J. R. Weir, 154.

93. PUCCINIA CYANI (Schleich.) Pass. Rabh. Fungi Eur. No. 1767. 1874.

Uredo Cyani Schleich. Pl. Helv. 95.

ON CARDUACEAE:

Centaurea Cyanus L.—Corvallis, June, 1913, 1145, April 8, 1914, 2551, July 29, 1914, 2552, July 4, 1914, G. B. Posey, 3106; Orenco, Washington Co., April 2, 1915, 3069.

94. PUCCINIA DEBARYANA Thüm. Flora 58: 364. 1875.

Puccinia compacta DeBary, Bot. Zeit. 16: 83. 1858. (Not *P. compacta* Berk. 1855.)

ON RANUNCULACEAE:

Anemone Drummondii Wats.—Mt. Hood, 7,000 ft., foot of Elliott Glacier, Sept. 1, 1901, E. W. D. Holway.

95. PUCCINIA DENTARIAE (Alb. & Schw.) Fuckel, Symb. Mycol. Nachtr. 1: 7. 1871.

Uredo Dentariae Alb. & Schw. Consp. Fung. 129. 1805.

ON CRUCIFERAE:

Dentaria tenella Pursh—Corvallis, April 5, 1914, 1288.

A micro-form occurring on the petioles and blades of the basal leaves causing considerable distortion. So far as the writer is aware this species is known from North America only from the above collection.

96. PUCCINIA DICHELOSTEMMAE D. & H. *Erythea* 3: 78. 1895.
Allodus Dichelostemmae Orton, Mem. N. Y. Bot. Gard. 6: 183.
 1916.

ON ALLIACEAE:

Hookera pulchella Salisb. (*Brodiaea congesta* Smith)—Dallas, Polk Co., March 20, 1900, W. N. Suksdorf (Barth. N. Am. Ured. 1541); Corvallis, April 28, 1915, 2611, May 1, 1915, 2669; E. of Wren Station, Benton Co., April 17, 1915, 2618.

The first-mentioned collection bears aecia and a few telia. It is probable that they belong together. The last specimen mentioned consists of aecia only. The others bear telia only. The two stages rarely occur together. This species may be separated from all other species of *Puccinia* occurring on Alliaceae by the very large, broad teliospores (38–45 by 43–58 μ) having smooth walls 5–7 μ thick.

97. PUCCINIA DOUGLASII Ell. & Ev. Proc. Phil. Acad. 1893: 152.
 1893.

Puccinia Richardsonii Sydow, Monog. Ured. 1: 317. 1902.

Allodus Douglasii Orton, Mem. N. Y. Bot. Gard. 6: 198. 1916.

ON POLEMONIACEAE:

Phlox condensata (A. Gray) E. Nels.—N. slope Mt. Hood, 7,000 ft., Aug. 7, 1914, III, 1494, I, 2624.

Phlox diffusa Hook.—N. slope Mt. Hood, 7,000 ft., Aug. 7, 1914, 1602, 1603; Sept. 1, 1901, E. W. D. Holway.

98. PUCCINIA ELLISI DeToni, in Sacc. Syll. Fung. 7: 651. 1888.

Puccinia Angelicae E. & E. Bull. Wash. Lab. 1: 3. 1884. (Not *P. Angelicae* Fckl. 1869.)

Puccinia Bakeriana Arth. Bull. Torrey Club 31: 3. 1904.

ON UMBELLIFERAE:

Angelica genuflexa Nutt.—Corvallis, Sept. 7, 1901, E. R. Lake, 1496.

Otherwise known only from Idaho and Washington on the above host, and from California on *A. tomentosa*. It is doubtless a brachyform, though no pycnia have been found. The teliospores are closely and finely verrucose, a character which enables one to distinguish this species easily from *P. Angelicae* (cf. 62).

99. PUCCINIA EPILOBII-TETRAGONI (DC.) Wint. in Rabenh. Krypt. Fl. 1: 214. 1881.

Uredo vagans α *Epilobii-tetragoni* DC. Fl. Fr. 2: 238. 1805.

Puccinia Gayophyti Billings, in King, Geol. Expl. 40th Par. 5: 414.
 1871.

Puccinia Oenotherae Vize, Grevillea 5: 109. 1877.

Puccinia Boisduvaliae Pk. Bot. Gaz. 7: 45. 1882.

Puccinia Clarkiae Pk. Bull. Torrey Club 11: 49. 1884.

Puccinia glabella Holw. N. Am. Ured. 1: 76. 1907.

ON ONAGRACEAE:

Boisduvalia densifolia (Lindl.) Wats.—Minam River, Wallowa Co., Oct. 2, 1897, E. P. Sheldon, 9049; Corvallis, July, 1910, 1116, Aug. 10, 1911, 1123, Sept. 20, 1914, 1546; Calapooya Valley, Douglas Co., July 24, 1899, M. A. Barber (Rocky Mt. Herb. 40989); Grant's Pass, Josephine Co., Sept. 2, 3, 1916, J. R. Weir, 222, 251.

Boisduvalia glabella (Nutt.) Walp.—Burns, Harney Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 385).

Boisduvalia stricta (A. Gray) Greene—Corvallis, Aug. 13, 1914, 1492; Medford, Jackson Co., June 26, 1915, G. B. Posey, 3275; Wimer, Jackson Co., July 22, 1892, E. W. Hammond, 149 (Rocky Mt. Herb. 48696).

Clarkia pulchella Pursh—Hilgard, Union Co., July 10, 1914, 1529.

Epilobium minutum Lindl.—Corvallis, Aug. 15, 1909, 1170.

Epilobium paniculatum Nutt.—Cole's Creek, Wallowa Co., June 10, 1897, E. P. Sheldon, 8263 (Rocky Mt. Herb. 70411); Hood River, May 14, 1914, 1510, May 16, 1915, 3271; Hilgard, Union Co., July 10, 1914, 1530, 1544; Ontario, Mahheur Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 383); Corvallis, Aug. 1910, 3065, Aug. 10, 1911, F. D. Bailey, 1174; The Dalles, Wasco Co., June 19, 1914, 3107; N. slope Mt. Hood, Aug. 7, 1914, 1491; Near Cascade Locks, Hood River Co., Aug. 11, 1910, 1073; Philomath, May 26, 1914, 3351, April 21, 1899, Moses Craig; Klamath Falls, Klamath Co., Sept. 8, 1916, J. R. Weir, 225.

Gayophytum ramossissimum T. & G.—Redmond, Crook Co., July 1, 1914, 2536; Hood River, July 23, 1915, 3272; Farewell Bend, Crook Co., July 15, 1894, J. B. Lieberg, 435 (Rocky Mt. Herb. 66228).

Godetia amoena (Lihm.) Lilja.—Corvallis, July, 1910, 1115, Wren, Benton Co., June 26, 1914, 1327.

Sphaerostigma Boothii (Dougl.) Walp.—Muddy Station, John Day Valley, May 12, 1885, Thomas Howell.

Sphaerostigma dentatum (Cav.) Walp.—Pleasant Creek, near Wimer, Jackson Co., April 23, 1889, E. W. Hammond, 143.

As here considered, this species includes all the long-cycled autoecious forms occurring on Onagraceae. The treatment follows the disposition made of them by Bisby in his recent admirable discussion of the Onagraceous rusts (Amer. Jour. Bot. 3: 538. 1916).

100. PUCCINIA EPIPHYLLA (L.) Wettst. Verh. Zool.-Bot. Ges. Wein. 35: 541. 1885.

Lycoperdon epiphyllum L. Sp. Pl. 1653. 1753.

Aecidium Tussilaginis Pers. in Gmel. Syst. Nat. 2: 1473. 1791.

Puccinia Poarum Niels. Bot. Tidsskr. II. 3: 26. 1877.

ON POACEAE:

Poa ampla Merrill—Hood River, May 14, 1914, 1591.

Poa annua L.—Hood River, July 22, 1915, 3196.

Poa macrantha Vasey—Newport, Lincoln Co., June 20, 1915, 3123.

Poa pratensis L.—Corvallis, May 19, 1913, F. D. Bailey, 1194, March 29, 1914, G. B. Posey, 3126, April 29, 1914, F. D. Bailey, 3125, June 29, 1914, G. B. Posey, 1311; Philomath, May 10, 1914, 3124; Hood River, May 14, 1914, 1586, 1592; The Dalles, Wasco Co., July 1, 1914, 1302; N. slope Mt. Hood, Aug. 7, 1914, 1557; Ashland, Jackson Co., Sept. 10, 1914, 1565; Kamela, Union Co., July 22, 1915, M. E. Peck; Klamath Falls, Klamath Co., Sept. 8, 1916, J. R. Weir, 224, 239.

Poa triflora Gilib.—Klamath Falls, Klamath Co., Sept. 8, 1916, J. R. Weir, 239a.

Poa sp.—Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 228, 229; Klamath Falls, Klamath Co., Sept. 8, 1916, J. R. Weir, 218; Austin, Grant Co., Aug. 1915, J. R. Weir, 194.

This rust is especially common in western Oregon particularly on blue grass. Only uredinia are known in the above collections as is the common condition except in those made in the far north or at high elevations.

Nielsen (Bot. Tidsskr. 2: 26. 1877) was the first to show the relation between this rust and *Aecidium Tussilaginis* Gmel. He succeeded in infecting *P. annua*, *P. trivialis*, *P. nemoralis*, *P. fertilis* and *P. pratensis* by sowing aeciospores from *Tussilago farfara*. He infected the aecial host by sowing with teliospores from *P. annua*.

Additional observations and culture work have been recorded by various European authors, which have been summarized by Klebahn (Die Wirtsw. Rostp. 290. 1904).

101. PUCCINIA ERIOPHORI Thüm. Bull. Soc. Imp. Nat. Moscow 55: 208. 1880.

Aecidium Ligulariae Thüm. Nov. Giorn. Bot. Ital. 12: 196. 1880.

Aecidium Cinerariae Rostr. Overs. Kong. Dansk. Vid. Selsk. Forh. Koph. 1884-5: 17. 1884.

ON CARDUACEAE: I.

Senecio ductaris Piper—Alpine meadow, E. Mt. Hood, 5,000 ft., July 23, 1915, 3326.

ON CYPERACEAE: III.

Eriophorum polystachyon L.—Alpine meadow, E. Mt. Hood, 5,000 ft., July 23, 1915, 3331.

In the alpine meadow where the above collections were made the *Aecidium* was very abundant and in fine condition. A search was

made for overwintered telia on Cyperaceous hosts associated with the *Senecio* and the only rust found was on very much weathered leaves which have been determined by comparison of the microscopic structure as above indicated.

Tranzschel (Beitr. Biol. Ured. III: 4. 1907), working in Russia, was the first to culture this species. He used telial material on *Eriophorum angustifolium* to successfully infect *Ligularia sibirica* and *Senecio paluster*.

In America, Arthur (Mycol. 8: 131. 1916), using aecial material from New York on *Senecio aureus*, obtained successful infection resulting in uredinia and telia on *E. viridi-carinatum*.

102. *Puccinia Eriophyllii* sp. nov.

O. and I. Pycnia and aecia unknown.

II. Uredinia amphigenous and caulicolous, scattered, small, roundish, 0.3–0.6 mm. across, early naked, pulverulent, pulvinate, chestnut brown, surrounding epidermis not conspicuous; urediniospores globoid, obovoid or oblong, 21–27 by 26–29 μ , wall chestnut brown, 2–3 μ thick, moderately and finely echinulate, pores 2, approximately equatorial.

III. Telia amphigenous, scattered, small, round, 0.3–0.6 mm. across, early naked, compact, pulvinate, blackish brown, ruptured epidermis not conspicuous; teliospores ellipsoid to oblong, 18–21 by 26–30 μ , apex and base rounded, not constricted, wall chestnut brown, 2–2.5 μ thick, uniform, minutely and obscurely verrucose; pedicel colorless, deciduous.

ON CARDUACEAE:

Eriophyllum lanatum (Pursh) Forbes—Wren, Benton Co., June 26, 1914, 1319 (type).

Eriophyllum leucophyllum (DC.) Rydberg—Redmond, Crook Co., July 1, 1914, 3083.

Distinguished from other species of *Puccinia* on related hosts by the very small teliospores.

103. *Puccinia Fendleri* (Tracy & Earle) comb. nov.

Aecidium Fendleri Tracy & Earle, in Green, Pl. Baker 1: 17. 1901.

Puccinia Koeleriae Arth. Mycologia 1: 247. 1909.

ON BERBERIDACEAE: I.

Berberis aquifolium Pursh—Corvallis, May 12, 1914, 1276, June 7, 1908, J. C. Bridwell, 3389.

Berberis nervosa Pursh—Hilgard, Union Co., July 10, 1914, 2568.

ON POACEAE:

Koeleria cristata (L.) Pers.—Hilgard, Union Co., July 10, 1914, 1363.

The aecia of this species have often been confused with those of *P. graminis* (cf. 151). Arthur in 1908 (Mycol. 1: 246. 1907), using telial material from *Koeleria cristata* from Colorado, obtained, as a result of infection experiments, the development of aecia on *Berberis aquifolium*.

104. PUCCINIA GEMELLA Diet. & Holway, in Sydow's Monog. Ured. 1: 541. 1903.

ON RANUNCULACEAE:

Caltha biflora DC.—N. slope Mt. Jefferson, 6,000 ft., Aug. 13, 1914, H. P. Barss & G. B. Posey, 1624; foot of Mt. Jefferson, 5,000 ft., Aug. 28, 1916, H. P. Barss, 3401.

A micro-form, differing from *P. Treleasiana* Pázsch., which occurs in the Rocky Mt. region on *Caltha* sp., in the smooth spores.

105. PUCCINIA GENTIANAE (Strauss) Link, in Willd. Sp. Pl. 6^o: 73. 1825.

Uredo Gentianae Strauss, Ann. Wett. Ges. 2: 102. 1810.

ON GENTIANACEAE:

Gentiana oregana Engelm.—Sumpter, Baker Co., July 16, 1913, J. R. Weir, 191.

106. PUCCINIA GILIAE Hark. Bull. Cal. Acad. 1: 34. 1884.

ON POLEMONIACEAE:

Navarettia intertexta (Benth.) Hook.—Corvallis, Aug. 1898, Moses Craig, July, 1910, 1121; Umpqua Valley, Douglass Co., June, 1887, Thomas Howell, 1835; Hood River, Aug. 17, 1888, L. F. Henderson (673), 1120.

This is a hemi-form distinct from *P. plumbaria* (cf. 150) which is an opsis-form. In *P. Giliae* the telia are early naked and the spores smooth. In *P. plumbaria* the telia are long covered by the cinereous epidermis and the spores are finely and closely verrucose.

107. PUCCINIA GLUMARUM (Schmidt.) Erikss. & Henn. Zeits. Pflanzenkr. 4: 197. 1894.

Uredo glumarum Schmidt. Allg. Oekon. Fl. 1: 27. 1827.

Puccinia neglecta West. Bull. Soc. Bot. Belg. 2: 248. 1863.

Trichobasis glumarum Lev.; Cooke, Myc. Fung. 208. 1865.

ON POACEAE:

Elymus glaucus Buckl.—Hood River Co., May 14, 1914, 1590, 1596, 1597, July 23, 1915, 3199.

Hordeum Gussoneanum Parl.—Corvallis, June 4, 1914, F. D. Bailey, 1385.

Hordeum vulgare L.—Moro, Sherman Co., June 11, 1915, F. K. Ravn and A. G. Johnson.

Sitanion hystrix (Nutt.) J. S. Smith—Redmond, Crook Co., July 1, 1914, 1423, 1429.

Sitanion jubatum J. G. Smith—Ashland, Jackson Co., June 7, 1916, H. B. Humphrey; Klamath Falls, Klamath Co., Sept. 11, 1916, J. R. Weir, 232.

Triticum aestivum L.—Moro, Sherman Co., June 25, 1915, D. E. Stephens, 3371, 3379; Medford, Jackson Co., June 8, 1915, F. K. Ravn, A. G. Johnson, 3370.

Triticum compactum Host.—Moro, Sherman Co., June 11, 1915, F. K. Ravn & A. G. Johnson (Barth. Fungi Columb. 4756); June 25, 1915, D. E. Stephens, 3373, 3378, 3380, 3385.

Triticum diococcum L.—Moro, Sherman Co., June 11, 1915, F. K. Ravn & A. G. Johnson.

Triticum vulgare L. (Collective)—Corvallis, June 10, 1915, 2676, 2679, 2680, June 12, 1915, 3134; Hood River, July 22, 1915, 3142; Moro, Sherman Co., June 11, 1915, F. K. Ravn, A. G. Johnson, M. A. Carleton.

This very important wheat rust was first found in the United States, May 21, 1915, at Sacaton, Arizona, by Dr. F. K. Ravn, the eminent Danish cereal pathologist, who at that time was making a tour of investigation of cereal diseases in company with pathologists of the Department of Agriculture (Carleton, Science N. S. 42: 58. 1916). A few weeks later the rust was found by Dr. Ravn and party at Medford and Corvallis and later was detected at Moro, Oregon. There is every evidence that this rust has been present in the western states for some years. Several collections reported above were made in 1914 but were confused with *P. Clematidis*. The writer is indebted to Dr. H. B. Humphrey for examining most of the collections and for the detection of several specimens belonging here, previously referred to other species.

108. PUCCINIA GRANULISPORA Ell. & Gall.; Ellis & Ever. Bull. Torrey Club 22: 61. 1895.

ON ALLIACEAE:

Allium nevii Wats.?—Austin, Grant Co., Aug. 1915, J. R. Weir, 204.

109. PUCCINIA GROSSULARIAE (Schum.) Lagerh. Tromsø. Mus. Aarsh. 17: 60. 1895.

Aecidium Grossulariae Schum. Pl. Enum. Saell. 2: 223. 1803.

Puccinia Pringsheimiana Kleb. Zeits. für Pflanzenkr. 4: 194. 1894.

Puccinia Magnusii Kleb. Zeits. für Pflanzenkr. 5: 79. 1895.

Puccinia albiperidium Arth. Jour. Myc. 8: 53. 1902.

Puccinia uniporula Orton, Mycol. 4: 201. 1912.

ON GROSSULARIACEAE: I.

Ribes divaricatum Dougl.—Bridal Veil, Multnomah Co., May 18, 1915, 3252; Hilgard, Union Co., July 10, 1914, 3001.

Ribes lacustre (Pers.) Poir.—N. slope Mt. Hood, Aug. 7, 1914, 2561.

Ribes sanguineum Pursh—Bridal Veil, Multnomah Co., May 18, 1915, 3253.

Ribes sp.—Philomath, April 26, 1914, 2571; Corvallis, April 11, 1915, 3045.

ON CYPERACEAE: II, III.

Carex festiva Dewey—Hilgard, Union Co., July 10, 1914, 1360.

Carex Goodenowii J. Gay—Hilgard, Union Co., July 10, 1914, 1359.

Carex Kelloggii W. Boot—Portland, Aug. 21, 1915, E. Bartholomew 5941 (Barth. Fungi Columb. 4962).

Carex magnifica Dewey—Clatsop Co., Nov. 7, 1913, 1195.

Carex mertensii Prescott—Mt. Hood, Aug. 7, 1914, 3004.

Carex monile Tuckerm.—Clatskanie, Columbia Co., May 20, 1914, F. D. Bailey, 3013.

Carex nebraskensis Dewey—Hilgard, Union Co., July 10, 1914, 1361.

Carex phyllomanica W. Boot?—Klamath Falls, Klamath Co., Sept. 8, 1916, J. R. Weir, 254.

Carex spectabilis Dewey—W. slope Mt. Jefferson, July 3, 1914, F. D. Bailey, 1417; Vicinity Mt. Jefferson, Aug. 12, 1914, H. P. Barss & G. B. Posey, 3007.

Carex sp.—In open meadow along Minum River, Wallowa Co., Aug. 20, 1897, E. P. Sheldon, 8751.

This common form having aecia on *Ribes* sp. was first cultured by Klebahn in 1892. The species has since been extensively studied by the culture method in both Europe and America (Klebahn, Die Wirtsw. Rostp. 295-302. 1904) under various names.

In America, Arthur began culture work in 1901 and has reported the results of numerous cultures (Jour. Myc. 8: 53. 1902; 10: 11. 1904; 11: 59. 1905; 12: 65. 1906; 13: 196. 1907; 14: 13. 1908; Mycol. 4: 13. 1912; 7: 67. 1915; 7: 78. 1915). The species is doubtless represented by several biological strains and further culture work will need to be conducted in order to determine their limits. Considerable confusion has resulted on account of the variable number and position of the germ pores in the urediniospores.

110. PUCCINIA GRUMOSA Syd. & Holw. in Sydow, Monog. Ured. 1: 641. 1903.

ON LILIACEAE:

Stenanthium occidentale A. Gray—Bridal Veil, Multnomah Co., May 18, 1915, 2670; Hood River, July 24, 1915, 3082.

This species, described from a collection on *Zygadenus elegans* made by Professor Holway at Banff, Alberta, has been previously known only from the original collection. The above collections clearly belong here and add a new host. The only other collection of *Puccinia* on *Stenanthium* known to the writer is one obtained by him in January, 1917, on a phanerogamic specimen of *S. gramineum* collected in Georgia by A. W. Curtis, now in the herbarium of the New York Botanical Garden. This has been referred to *P. atropuncta*, a species known only from east of the Rocky mountains on related hosts.

111. PUCCINIA HARKNESSI Vize, Grevillea 7: 11. 1878.

Puccinia cladophila Pk. Bot. Gaz. 4: 127. 1879.

ON CICHORIACEAE:

Lygodesmia juncea (Pursh) D. Don—Denio, Harney Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 396c).

Ptiloria paniculata (Nutt.) Green—Sherman, Sherman Co., July 1, 1914, 2535.

112. *Puccinia Helianthi-mollis* (Schw.) comb. nov.

Aecidium Helianthi-mollis Schw. Schrift. d. Nat. Ges. Leipzig 1: 68. 1822.

Puccinia Helianthi Schw. Schrift. d. Nat. Ges. Leipzig 1: 73. 1822.

ON CARDUACEAE:

Helianthus annuus L.—Sherman, Sherman Co., July 1, 1914, 2525; Corvallis, Aug. 1910, F. D. Bailey, 1129; Umatilla, Umatilla Co., July 11, 1914, 1468.

113. PUCCINIA HEMIZONIAE Ell. & Tracy, Jour. Myc. 7: 43. 1891.

ON CARDUACEAE:

Hemizonia truncata (DC.) Gray—Grant's Pass, Josephine Co., July 12, 1887, Thos. Howell.

Lagophylla ramossissima Nutt.—Grant's Pass, Josephine Co., Sept. 2, 1916, J. R. Weir, 220.

114. PUCCINIA HEUCHERAE (Schw.) Diet. Ber. der Deutsch. Bot. Ges. 9: 42. 1891.

Uredo Heucherae Schw. Schrift. Nat. Ges. Leipzig 1: 71. 1822.

Puccinia Tiarella B. & C. Grevillea 3: 53. 1874.

Puccinia spreta Pk. Rep. N. Y. State Mus. 29: 67. 1878.

Puccinia congregata E. & H. Bull. Calif. Acad. Sci. 1: 26. 1884.

ON SAXIFRAGACEAE:

Heuchera micrantha Dougl.—Hood River, Feb. 1, 1915, 3266; Mary's River, Corvallis, June 5, 1915, 2674; Ashland, Jackson Co., Sept. 10, 1914, 2533.

Leptaxis Menziesii (Pursh) Raf.—Hood River, July 24, 1915, 3318, 3359.

Mitella Breweri Gray?—N. slope Mt. Jefferson, Aug. 27, 1916, H. P. Barss, 3397.

Mitella ovalis Greene—Mary's Peak, Benton Co., May 23, 1915, 3037.

Mitella sp.—N. slope Mt. Jefferson, 8,000 ft., Aug. 8, 1914, H. P. Barss & G. B. Posey, 2529.

Tellima grandiflora (Pursh) Dougl.—Corvallis, July 15, 1910, 1122, Apr. 8, 1914, 3075; Austin, Grant Co., Aug. 1915, J. R. Weir, 214.

Tiarella unifoliata Hook.—Bridal Veil, Multnomah Co., Aug. 11, 1910, 1070; Ashland, Jackson Co., Sept. 10, 1914, 3028.

115. *Puccinia hieraciata* (Schw.) comb. nov.

Caecoma (*Aecidium*) *hieraciatum* Schw. Trans. Am. Phil. Soc. II. 4: 292. 1832.

Puccinia patruelis Arth. Mycol. 1: 245. 1909.

ON CYPERACEAE: II, III.

Carex praegracilis Boott (*C. marcida* Boott)—Ontario, Malheur Co., Aug. 1901, Griffiths & Morris; Andrews, Harney Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 339a).

This species shows a distribution from coast to coast and has aecia on Cichoriaceous hosts. Arthur (l. c.) has conducted one successful culture and obtained the development of pycnia and aecia on *Agoseris glauca* following sowings of teliosporic material on *Carex pratensis* from Colorado. Other aecia having a similar morphology, including a rare form on *Hieracium* collected by Schweinitz, on which the present name is based, are properly referred here. No aecial collections have been made in Oregon.

116. *PUCCINIA HIERACII* (Schum.) Mart. Fl. Mosq. 226. 1812.

Uredo Hieracii Schum. Enum. Pl. Saell. 2: 232. 1803.

Puccinia sejuncta Syd. Ann. Myc. 1: 236. 1903.

ON CICHORIACEAE:

Hieracium albiflorum Hook.—Hood River, May 16, 1915, 3312, July 23, 1915, 3311.

Hieracium cinereum Howell—Hood River, July 22, 1915, 3324.

Hieracium gracile Hook.—N. slope Mt. Jefferson, Aug. 6, 1914, H. P. Barss, 2541.

Hieracium scouleri Hook.—Austin, Grant Co., Aug. 1915, J. R. Weir, 156.

Hieracium sp.—Hilgard, Union Co., July 9, 1914, 3319; Austin, Grant Co., Aug. 1915, J. R. Weir, 213; Klamath Falls, Klamath Co., Sept. 3, 1906, J. R. Weir, 240.

This species may occur on the same plants with *Aecidium columbiense* (cf. 215) which is doubtless the aecial stage of some heteroecious rust not yet determined. Sydow (l. c.) has described *P. sejuncta* based on such a mixture.

117. PUCCINIA HOLBOELLII (Hornem.) Rostr. Middelser om Groenland 3: 534. 1888.

Aecidium Holboellii Hornem. Fl. Dan. 37: 11. 1840.

Puccinia Barbareae Cooke, Grevillea 8: 34. 1879.

The type of *P. Barbareae* was described as on a "Cruciferous plant" from Oregon, Dr. Lyall 61. The data on the type collection at the Kew Herbarium reads "Oregon Boundary Commission, Ft. Coville to Rocky Mts. 1861, Dr. Lyall 61." Since Ft. Coville is in northeastern Washington there would seem to be little chance of this collection having been made within the state of Oregon. However, since it has been recorded from our limits both in the original description and by Holway (N. Am. Ured. 1: 45. 1906) it is included here with the above explanation. The species undoubtedly does occur in eastern Oregon as the range includes all the surrounding states.

118. PUCCINIA HOLCINA Erikss. Ann. Sci. Nat. 9: 274. 1899.

ON POACEAE:

Holcus lanatus L.—Corvallis, June 10, 1915, 2678, June 12, 1915, 3113; Toledo, Lincoln Co., July 19, 1915, 3116; Yaquina, Lincoln Co., July 17, 1915, 3117; Salem, Marion Co., May 1, 1914, G. H. Godfrey, 3118; Portland, Aug. 19, 1915, E. Bartholomew (Barth. Fungi Columb. 4852).

Evidently a common rust in western Oregon, otherwise known from North America from a few other collections made on the Pacific coast from California to Vancouver Island, B. C., and from a single locality along the eastern coast in Massachusetts. This species may be easily separated from *P. Rhamni* (cf. 159) in the telial stage by the evenly thickened apices of the teliospores. The urediniospores of the two rusts are similar. Those of the present species are somewhat larger and globoid, 19–24 by 23–27 μ , while in *P. Rhamni* they are globoid or broadly ellipsoid, 16–20 by 18–24 μ .

The aecial connection is unknown. The rust has evidently been introduced from Europe and is able to maintain itself by over-wintering urediniospores.

119. PUCCINIA HYPOCHOERIDIS Oud. Nederl. Kruidk. Arch. II, 1: 175. 1872.

ON CARDUACEAE:

Hypochaeris radicata L.—Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 2543.

120. *Puccinia insperata* sp. nov.

O. Pycnia not seen.

I. Aecia chiefly hypophyllous and petiolicolous; in crowded groups on yellowish spots 2–3 mm. across; cupulate, 0.2–.25 mm. broad; peridium whitish, margin recurved, lacerate; peridial cells rhombic, 19–27 by 35–45 μ , overlapping, outer wall 1–1.5 μ thick, inner wall 3–4 μ thick, verrucose; aeciospores globoid or broadly ellipsoid, 15–19 by 19–23 μ , wall colorless, 1–1.5 μ thick, finely and closely verrucose.

II. Uredinia amphigenous, scattered, round, 0.2–0.5 mm. across, tardily naked, pulverulent, pulvinate, cinnamon brown, ruptured epidermis conspicuous; urediniospores subglobose or broadly ellipsoid, occasionally obovate, 19–21 by 23–29 μ ; wall cinnamon brown, 1.5–2 μ thick, minutely and closely echinulate, pores 2–3, scattered.

III. Telia amphigenous and petiolicolous, scattered, round, 0.2–0.8 mm. across, tardily naked, pulvinate, becoming pulverulent, blackish brown, ruptured epidermis conspicuous; teliospores ellipsoid or broadly obovoid, occasionally somewhat irregular, 16–20 by 23–32 μ , rounded at both ends, scarcely or not at all constricted, wall chestnut brown, 1.5–2 μ thick, uniform, smooth; pedicel colorless, deciduous.

ON CICHORIACEAE:

Nabalus hastatus (Less) Heller—Hood River, May 16, 1915, 2662, July 24, 1915, 3265, type.

A very distinct species separable from the eastern *P. orbicula* Pk. by the smooth teliospores and the presence of a definite peridium in the aecidium. The two collections were made at the same spot. The first shows aecia unaccompanied by pycnia, associated with telia chiefly on the petioles, suggesting strongly an opsis-form. The second collection, however, shows scattered uredinia and telia with a few old aecia.

121. PUCCINIA IRIDIS (DC.) Wallr. in Rabenh. Krypt. Fl. 1: 23. 1844.

Uredo Iridis DC. Encycl. 8: 224. 1808.

ON IRIDACEAE:

Iris tenax Dougl.—Corvallis, June 24, 1914, F. D. Bailey, 1343; Wren, Benton Co., July 22, 1914, 1413, Ashland, Jackson Co., Sept. 10, 1914, 1994.

122. PUCCINIA JONESII Pk. Bot. Gaz. 6: 226. 1881.

Allodus Jonesii Arth. Résult Sci. Congr. Bot. Vienne 345. 1906.

ON UMBELLIFERAE:

Peucedanum triternata (Pursh) Nutt.—Austin, Grant Co., Aug. 1915, J. R. Weir, 149, 151.

123. PUCCINIA LIGUSTICI Ell. & Ev. Bull. Torrey Club 22: 263. 1895.
Puccinia luteobasis Ell. & Ev. Bull. Torrey Club 24: 457. 1897.

ON UMBELLIFERAE:

Ligusticum apiifolium (Nutt.) Gray—Corvallis, 1911, 1166, April 15, 1913, F. D. Bailey, 3080, March 23, 1914, G. B. Posey, 3328, March 22, 1914, G. H. Godfrey, 2549; Orenco, Washington Co., June 23, 1913, 3079.

124. PUCCINIA LUXURIOSA Sydow, Monog. Ured. 1: 812. 1904.

Puccinia tosta luxurians Arth. Bull. Torrey Club 29: 229. 1902.

ON POACEAE:

Sporobolus airoides Torr.—Andrews, Harney Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 304).

Bethel (Phytopath. 7: 93. 1917) has reported successful cultures of this rust on *Sarcobatus vermiculatus*, amply supported by field observations. Arthur (Mycol. 1: 234. 1909) has infected that host with teliospores of *P. subnitens* (cf. 167) from Nevada. Bethel, however, failed to obtain infection on any of the aecial hosts for that species with teliospores from *Sporobolus airoides* in Colorado. It is possible that the two forms represent biological races of the same species and should be united.

125. PUCCINIA MAJANTHAE (Schum.) Arth. & Holw. Bull. Lab. Nat. Hist. Univ. Iowa 5: 188. 1901.

Aecidium Majanthae Schum. Enum. Pl. Saell. 2: 224. 1803.

Puccinia sessilis Schneider, in Schröter Abh. Schles. Ges. 49: 19. 1870.

ON POACEAE:

Phalaris arundinacea L.—Beulah, Malheur Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 26a).

No culture work has been reported in America. In Europe the aecia have been found on *Allium*, *Arum*, *Convallaria* and various other related hosts. Various names have been given to the different biological forms (Klebahn, Die Wirtsw. Rostp. 263-272. 1904; Sydow, Monog. Ured. 1: 776-784. 1904). Aecia on *Smilacina*, *Polygonatum*, *Maianthemum* and *Uvularia* from the central and eastern United States doubtless belong here in whole or in part.

126. PUCCINIA MALVACEARUM Bert. Gay's Hist. de Chile 8: 43. 1852.

ON MALVACEAE:

Abutilon ? sp. (cultivated shrub)—Corvallis, May, 1914, W. E. Lawrence, 3364, Nov. 17, 1914, W. E. Lawrence, 3363, Jan. 12, 1915, 2627.

Althaea ficifolia Cav.—The Dalles, Wasco Co., Aug. 25, 1915, E. Bartholomew (Barth. Fungi Columb. 4758, N. Am. Ured. 1559).

Althaea rosea Cav.—Corvallis, April 27, 1907, E. R. Lake, 1299, Aug. 1909, 1068, Sept. 1910, 1014, Jan. 12, 1915, W. E. Lawrence, 2627; Gibbon, Umatilla Co., June 5, 1911, comm. 1850; Klamath Falls, Klamath Co., Sept. 19, 1911, 1031; Salem, Marion Co., May 2, 1913, comm. 1866; Svenson, Clatsop Co., June 5, 1913, comm. 1895; Grant's Pass, Josephine Co., July, 1913, 1926; Dayton, Yamhill Co., April 6, 1914, comm. 1479; Lents, Clackamas Co., April 27, 1914, comm. 1936; Ione, Morrow Co., June 26, 1914, comm. 1937; The Dalles, Wasco Co., July 1, 1914, 1342; Hillsboro, Washington Co., July 26, 1914, 1738; Medford, Jackson Co., March 31, 1915, 2556.

Malva rotundifolia L.—Corvallis, Apr. 12, 1909, J. C. Bridwell, 3388, Aug. 30, 1913, 1141, Feb. 14, 1914, 1181; The Dalles, Wasco Co., July 1, 1914, 1303.

Malva ? sp.—New Pine Creek, Lake Co., July, 1910, comm. 3376.

127. PUCCINIA MCCLATCHIEANA Diet. & Holw. Erythea 2: 127. 1894.

ON CYPERACEAE:

Scirpus microcarpus Presl.—Elgin, Union Co., Aug. 19, 1897, E. P. Sheldon, 8735; Beulah, Malheur Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 348); Glenbrook, Benton Co., Aug. 1909, 1190; Hubbard, Marion Co., May 27, 1914, 2518; Gresham, Multnomah Co., June 6, 1914, F. D. Bailey, 2516; Tualatin, Washington Co., July 10, 1914, F. D. Bailey, 1356; Hood River, Aug. 5, 1914, 2520; Mary's Peak, Benton Co., Aug. 15, 1914, 2517; Orenco, Washington Co., April 2, 1915, 3386; Yaquina, Lincoln Co., July 20, 1915, 3317; Toledo, Lincoln Co., July 19, 1914, 3012.

128. PUCCINIA MELANCONOIDES Ell. & Hark. Bull. Calif. Acad. Sci. 1: 27. 1884.

Allodus melanconioides Arth. Result Sci. Congr. Bot. Vienne 345. 1906.

ON PRIMULACEAE:

Dodecatheon latifolium (Hook.) Piper—Hills, N. W. Corvallis, April 5, 1914, 1290, May 1, 1915, 3049, April 13, 1912, F. D. Bailey, 1001; Moist Woods (Corvallis?), April, 1897, Moses Craig.

129. PUCCINIA MENTHAE Pers. Syn. Fungi 227. 1801.

ON LABIATAE:

Mentha canadensis L.—Corvallis, Aug. 10, 1910, 1167, Nov. 4, 1911, 1172; Clatskanie, Columbia Co., Oct. 6, 1914, F. D. Bailey, 3099; Portland, Aug. 21, 1915, E. Bartholomew (Barth. Fungi Columb. 4968).

Mentha canadensis lanata Piper—Toledo, Lincoln Co., Sept 25, 1911, F. D. Bailey, 1162.

Mentha piperata L.—Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 255.

Mentha spicata L.—Hood River, Aug. 6, 1914, 1482; Elk City, Lincoln Co., Aug. 20, 1914, 3217; Portland, April, 1914, comm. 3208; The Dalles, Wasco Co., July 1, 1914, 1340.

130. PUCCINIA MESOMEGALA B. & C. in Peck, Rep. N. Y. State Mus. 25: III. 1873.

Dicaeoma mesomegalum Kuntze, Rev. Gen. Pl. 3: 469. 1898.

ON CONVALLARIACEAE:

Clintonia uniflora Kunth.—Mt. Hood, Sept. 1, 1901, E. W. D. Holway, 1016, Road to Mt. Hood, Aug. 7, 1914, 1601; Klamath Co., Oct. 7, 1903, E. B. Copeland (Sydow, Ured. 1776); Bridal Veil, Multnomah Co., Aug. 11, 1910, 1079; Parkdale, Hood River Co., March 20, 1915, L. Childs, 3188; Sumpter, Baker Co., July 16, 1913, J. R. Weir, 216.

This very distinct micro-form is very common in the mountains of the northwestern states on the above host, and on *C. borealis* in the northern tier of states from New Hampshire to Minnesota and in Canada.

131. PUCCINIA MICROMERIAE Dudley & Thomp. Jour. Myc. 10: 54. 1904.

ON LABIATAE:

Micromeria chamissonis (Benth.) Greene (*M. Douglasii* Benth.)—Mary's Peak, Benton Co., June 20, 1910, 3163; Corvallis, June, 1910, 1157, May 4, 1912, F. D. Bailey, 1134; Philomath, April 20, 1912, F. D. Bailey, 1136, Jan. 6, 1914, 1154; Eugene, Lane Co., July 11, 1914, G. B. Posey, 1292; N. slope Mt. Hood, Aug. 7, 1914, 2560; Washington Co., July-Aug. 1897, Moses Craig; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 252.

132. PUCCINIA MICROSORA Körn.; Fuckel, Fungi Rhenani 2637. 1874.

ON CYPERACEAE:

Carex mirata Dem.—Clatsop, Clatsop Co., Nov. 7, 1913, 1196.

Otherwise known only locally from the eastern United States. The aecial stage is unknown.

133. PUCCINIA MILLEFOLII Fckl. Sym. Myc. 55. 1869.

ON CARDUACEAE:

Achillea millefolium L.—Philomath, May 10, 1914, 1834; Yaquina River, Elk City, Lincoln Co., Aug. 20, 1914, 1625; Hood River, July 22, 1915, 3139.

This micro-form, evidently introduced from Europe, is otherwise

known only from a few collections made in California and single collections from Montana and New Mexico.

134. PUCCINIA MONARDELLAE Dudley & Thomp., Jour. Myc. 10: 53. 1904.

ON LABIATAE:

Monardella odoratissima (Benth.) Greene—Hilgard, Union Co., July 10, 1914, 1531.

Monardella villosa Benth.—Ashland, Jackson Co., Sept. 10, 1914, 2542; Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 2534.

135. PUCCINIA MONOICA (Pk.) Arth. Mycologia 4: 61. 1912.

Aecidium monoicum Peck, Bot. Gaz. 4: 230. 1879.

ON POACEAE: III.

Koeleria cristata (L.) Pers.—Austin, Grant Co., Aug. 1915, J. R. Weir, 237.

This species has aecia on *Arabis* as has been shown by Arthur (Mycol. 4: 59. 1912; 7: 75. 1915). No aecial collections have been seen from Oregon but this stage undoubtedly occurs in the eastern part of the state. The collection cited under *P. Holboellii* (cf. 117) was said to have aecia on a part of the original specimen which undoubtedly are to be referred here rather than to *A. Barbareae* DC. as was done by Vize in the original notice of *P. Barbareae*.

136. PUCCINIA MONTANENSIS Ellis, Jour. Myc. 7: 274. 1883.

Aecidium Hydrophylli Pk. Bull. Buff. Soc. 1: 68. 1873.

Aecidium Phaceliae Pk. Bull. Torrey Club 11: 50. 1884.

Aecidium Mertensiae Arth. Bull. Torrey Club 31: 6. 1904.

ON HYDROPHYLLACEAE: I.

Hydrophyllum albifrons Heller—Corvallis, April 5, 1914, 1289; Mary's Peak, Benton Co., May 21, 1915, 3029.

Hydrophyllum capitatum Dougl.—Near Crystal Lake, Corvallis, May 20, 1899, E. R. Lake, 1600.

Hydrophyllum tenuipes Heller—Corvallis, April, 1910, 1111, 3105; April 15, 1912, F. D. Bailey, 1124.

Hydrophyllum sp.—Horse Creek Cañon, Wallowa Co., May 14, 1897, E. P. Sheldon, 8040.

Mertensia laevigata Piper—Jefferson Lake, Marion Co., Aug. 1892, Moses Craig; Parmelia Lake, Cascade Mts., July 2, 1914, J. H. Corsaut, 2554.

ON BORAGINACEAE: I.

Phacelia heterophylla Pursh—Philomath, April 20, 1912, 1168.

Phacelia leucophylla Torr.—Austin, Grant Co., Aug. 1915, J. R. Weir, 155.

ON POACEAE: II, III.

Elymus glaucus Buckl.—Glendale, Douglass Co., July 17, 1914, 1347.

The aecial stage of this rust is very common in western Oregon particularly on *Hydrophyllum*. The uredinial and telial stages are doubtless much more common than the single record above would indicate. The species is very difficult to separate in the uredinial stage from *P. Clematidis* (cf. 85) and it is probable that some of the collections referred to that species belong here.

Arthur (Mycol. 8: 139. 1916) sowed aecia from *Hydrophyllum capitatum* on *Agropyron tenerum* and *Elymus virginicus*. On the former uredinia and telia developed, and on the latter a few uredinia only. This is the only successful culture with this species, though aecia on other Hydrophyllaceae and on Boraginaceae are referred here on morphological grounds.

137. PUCCINIA MUTABILIS Ellis & Gal. Jour. Myc. 5: 67. 1889.

ON ALLIACEAE:

Allium Geyeri Wats.—Blue Mts., July 5, 1897, W. C. Cusick, 1827.

The writer is indebted to Professor Holway for the specimen on which this record is based.

138. PUCCINIA MADIAE Syd. Monog. Ured. 1: 121. 1902.

ON CARDUACEAE:

Madia elegans Don.—Corvallis, June, 1910, 2619.

Madia glomerata Hook.—Corvallis, Aug. 1899, E. R. Lake.

Madia sp.—Hood River, June 20, 1914, 3349.

This species is very close to, and possibly identical with, *P. Hemizoniae* (cf. 113).

139. PUCCINIA OBSCURA Schroet., Pass. Nuov. Giorn. Bot. Ital. I, 9: 256. 1877.

Aecidium Bellidis Thüm. Fungi Austr. 635. hyponym. 1873.

Puccinia Bellidis Lagerh. Bol. Soc. Broter. 8: 134. 1890.

ON JUNCACEAE:

Juncoides parviflorum (Ehrh.) Coville—Ashland, Jackson Co., Sept. 10, 1914, 2519; Bend, Crook Co., Sept. 11, 1916, J. R. Weir, 200; Ukiah, Umatilla Co., Aug. 21, 1903, M. A. Crosby.

No culture work has been conducted in America. Plowright (Jour. Linn. Soc. Lond. 20: 511. 1884) has shown the aecia to be *A. Bellidis*, having cultured the species in both directions. Other European workers have confirmed Plowright's results (Klebahn, Die Wirtsw. Rostp. 317. 1904).

140. PUCCINIA OBTECTA Pk. Bull. Buff. Soc. Nat. Hist. 1: 66. 1873.
Aecidium compositarum Bidentis Burrill; DeToni in Sacc. Syll.
Fung. 7: 799. 1888.

ON CYPERACEAE:

Scirpus americanus Pers. (*S. pungens* Vahl.)—Westfall, Malheur Co., Aug. 1901, Griffiths & Carter (Griffiths, W. Am. Fungi 353).

Arthur (Jour. Myc. 14: 20. 1908) has cultured this species on *Bidens*. Using telia on *S. americanus* from Indiana successful infection resulting in pycnia and aecia was obtained on *B. frondosa* and *B. connata*. Aecia have not been collected west of the Rocky Mt. region. The above collection was issued as *P. canaliculata*, which is now interpreted as occurring only on *Cyperus* having aecia on *Xanthium* and is unknown in Oregon.

141. *Puccinia Ortonii* sp. nov.

O. Pycnia few, imperfectly known.

I. Aecia chiefly hypophyllous, gregarious, in roundish or elongated groups 6–8 mm. across, short cupulate, 0.2–0.3 mm. in diameter; peridium yellowish, the margin erose; peridial cells oblong or rhombic, 20–26 by 29–35 μ , slightly overlapping, the outer wall finely striate, 8–10 μ thick, the inner verrucose or slightly tuberculate, 4–6 μ thick; aeciospores globoid or broadly ellipsoid, 18–19 by 19–24 μ , wall colorless, 1–1.5 μ thick, very closely and finely verrucose.

II. Uredinia amphigenous, scattered, round, 0.5–1 mm. across, tardily naked, cinnamon brown, cinereous when covered, ruptured epidermis conspicuous, pulverulent; urediniospores broadly ellipsoid (or when young obovoid), 19–26 by 23–32 μ , wall cinnamon brown, 2–3 μ thick, moderately and very minutely and obscurely echinulate; pores 3–5, scattered.

III. Telia amphigenous, scattered, round, 0.2–1 mm. across, tardily naked, ruptured epidermis conspicuous, chestnut brown, cinereous when covered, pulvinate, somewhat pulverulent; teliospores broadly and somewhat angularly ellipsoid, 18–26 by 30–42 μ , rounded at both ends, slightly or not constricted at the septum, wall chestnut brown, 1.5–2.5 μ thick, uniform, smooth, with hyaline papilla over pore of apical cell which is usually at the apex but occasionally placed laterally, pore of lower cell varying in position from near the pedicel to the septum; pedicel deciduous, colorless.

ON PRIMULACEAE:

Dodecatheon Hendersonii leptophylla Suks.—Lake of the Woods, Cascade Range, Aug. 1892, Moses Craig.

The above collection bears aecia and uredinia only. This species differs from *P. melanoides* (cf. 128) in the presence of uredinia in the life cycle. It is to be regarded as a correlated form with that species.

The species is dedicated to Prof. C. R. Orton who was the first to separate the material from the opsis-form. The following is a list of the specimens from other localities in the Arthur herbarium.

Dodecatheon alpinum Greene—Susanville, California, 5,000 ft., June 30, 1897, II, iii, M. E. Jones; Bluff Lake, San Bernardino Mts., California, 7,400 ft., Sept. 1895, III, Miss Nora Pettibone, 2853; Mt. Eddy, Siskiyou Co., California, Sept. 7, 1903, i, ii, III, E. B. Copeland, (Sydow, Ured. 1774, type).

Dodecatheon Jeffreyi Van Houtte—South of Sitka, Alaska, ii, III, Aug. 29, 1916, J. P. Anderson, 337; Vancouver Island, British Columbia, Aug. 26, 1908, ii, III, E. W. D. Holway.

Dodecatheon (tetrandrum Suks.?)—Mt. Adams, Washington, 6,000–7,000 ft., Aug. 31, 1886, W. N. Suksdorf (Barth. N. Am. Ured. 554, 1457).

142. PUCCINIA OXYRIÆ Fckl. Symb. Nachtr. 3: 14. 1875.

ON POLYGONACEÆ:

Oxyria digyna (L.) Hill—Strawberry Mt., 8,000 ft., Grant Co., Sept. 2, 1913, W. E. Lawrence, 1112.

Evidently a rather rare species represented in the Arthur herbarium otherwise only by single collections from Colorado, Utah, Idaho, Alberta and British Columbia on the above host.

143. PUCCINIA PALMERI D. & H. Erythea 7: 98. 1899. (Not *Aecidium Palmeri* And. 1891.)

Allodus Palmeri Orton, Mem. N. Y. Bot. Gard. 6: 202. 1916.
(Not *A. Palmeri* Arth. 1906.)

ON SCROPHULARIACEÆ:

Pentstemon Menziesii Hook.—Near Mt. Jefferson, Linn Co., July 3, 1914, F. D. Bailey, 3046; Mt. Hood, 6,000 ft., Sept. 1, 1901, E. W. D. Holway; Horse Creek, Wallowa Co., June 24, 1897, E. P. Sheldon, 8368.

This is an opsis-form common in the Rocky Mt. and north Pacific states. Dietel & Holway (l. c.) based their combination on *Aecidium Palmeri* Anderson. This *Aecidium*, as has been recently determined by Orton, working in this laboratory, is the aecial stage of the heteroecious rust *P. Andropogonis* Schw. and not the aecia of this species. While the name *P. Palmeri* D. & H. has been misapplied in this way it seems best to retain it for this species, particularly since the telia described apply to this fungus.

144. PUCCINIA PARKERÆ Diet. & Holw. Erythea 3: 78. 1895.

ON SAXIFRAGACEÆ:

Ribes lacustre (Pers.) Poir.—Whitewater Ranger Station, near Mt. Jefferson, Aug. 28, 1916, H. P. Barss, 3398; Hood River, July 23, 1915, 3016.

This short-cycled form possesses teliospores which closely resemble the telia of the *Carex* rusts having aecia on *Ribes* (cf. *P. Grossulariae*, 109) as has been pointed out by Holway (N. Am. Ured. 1: 53. 1906). It is not to be confused with the rust having a similar life history in the eastern United States, *P. Ribis* DC. The latter has verrucose spores, while in the one under discussion the spores are smooth.

145. PUCCINIA PATTERSONIANA Arth. Bull. Torrey Club 33: 29. 1906.
ON POACEAE:

Agropyron spicatum (Pursh) Rydb.—Dufur, Wasco Co., June 19, 1914, 1398; Hilgard, Union Co., July 10, 1914, 1364; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 208.

The aecial form of this distinct heteroecious rust is unknown.

146. PUCCINIA PECKII (DeToni) Kellerm. Jour. Myc. 8: 20. 1902.
Aecidium Oenotherae Pk. Ann. Rep. N. Y. State Mus. 23: 60.
1873. (Not *P. Oenotherae* Vize, 1877.)

Aecidium Peckii DeToni, in Saccardo Syll. Fung. 7: 790. 1888.
? *Puccinia ludibunda* E. & E. Proc. Phil. Acad. 1893: 153. 1893.

ON CYPERACEAE:

Carex Hookeriana Dewey—Springbrook, Yamhill Co., May 14, 1914, F. D. Bailey, 3015; Whitewater Station near Mt. Jefferson, Aug. 12, 1914, H. P. Barss & G. B. Posey, 3006.

The above collections are referred somewhat doubtfully to this species as no aecia have been collected in the Pacific northwest.

The aecia occur on Onagraceae as was first shown by Kellerman (l. c.) and later by Arthur (Bot. Gaz. 33: 13. 1903; Jour. Myc. 8: 52. 1902; 11: 58. 1905; 12: 15. 1906; 13: 195. 1907; Mycol. 1: 233. 1909; 2: 222. 1910; 4: 15. 1912).

147. PUCCINIA PENTASTEMONIS Pk. Bull. Torrey Club 12: 35. 1885.
ON SCROPHULARIACEAE:

Pentstemon diffusus Dougl.—Bridal Veil, Multnomah Co., May 18, 1915, 3267.

148. PUCCINIA PIMPINELLAE (Str.) Mart. Fl. Mosq. Ed. II: 226.
1817.

Uredo Pimpinellae Strauss, Wett. Ann. 2: 102. 1810.

Puccinia Osmorrhizae Cke. & Peck, in Peck, Rep. N. Y. State Mus. 29: 73. 1878.

Puccinia trifoliata E. & E. Bull. Torrey Club 22: 58. 1895.

ON UMBELLIFERAE:

Osmorrhiza brevipes (Coulter & Rose) Suks.—Corvallis, May 4, 1912, F. D. Bailey, 2550, July 3, 1914, G. B. Posey, 1998, Apr. 28, 1915, 3313; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 196; Austin, Grant Co., Aug. 1915, J. R. Weir, 189.

Osmorrhiza divaricata Nutt.—Jackson Co., Sept. 7, 1903, E. B. Copeland (Sydow, Ured. 1778); Mt. Hood, Hood River Co., Aug. 7, 1914, 3081.

Osmorrhiza Liebergii (Coulter & Rose) Suks.—North of Mt. Jefferson, Aug. 28, 1916, H. P. Barss, 3400.

Osmorrhiza occidentalis Nutt.—Paisley, Lake Co., Aug. 1914, J. C. Elder, 3183.

149. PUCCINIA PIPERI Ricker, Jour. Myc. 11: 114. 1905.

ON POACEAE: II and III.

Festuca pacifica Piper—Eight Dollar Mt., Oregon, June 12, 1904, C. V. Piper, 6502, type.

This species is evidently rare, since it is known only from the type locality listed above and from two localities in California. The life history is unknown.

150. PUCCINIA PLUMBARIA Pk. Bot. Gaz. 6: 238. 1881.

Aecidium Giliae Pk. Bot. Gaz. 4: 230. 1879. (Not *P. Giliae* Hark. 1884.)

Allodus Giliae Orton, Mem. N. Y. Bot. Gard. 6: 199. 1916.

ON POLEMONIACEAE:

Gilia gracilis (Dougl.) Hook.—Mary's Peak, Benton Co., May 21, 1915, 3310; Hood River, May 14, 1914, 1526, 2514, June 9, 1915, 3274.

Phlox speciosa Pursh—Sherman, Sherman Co., July 1, 1914, 2515.

151. PUCCINIA POCULIFORMIS (Jacq.) Wettst. Verh. Zool. Bot. Ges. Wein 35: 544. 1885.

Lycoperdon poculiforme Jacq. Coll. Austr. 1: 122. 1786.

Aecidium Berberidis Pers. in Gmel. Syst. Nat. 2: 1473. 1791.

Puccinia graminis Pers. Neues Mag. Bot. 1: 119. 1794.

Puccinia Phlei-pratensis Erikss. & Henn. Zeit. f. Pflanzenkr. 4: 140. 1894.

Uredo quinqueporula Arth. & Fromme, Torreyia 15: 265. 1915.

ON POACEAE: II, III.

Agropyron dasystachyum (Hook.) Vasey—Sherman Sta. O. W. R. R. & Nav. Co., Sherman Co., July 1, 1914, 1420.

Agrostis exarata Trin.—Ashland, Jackson Co., Sept. 10, 1914, 1567.

Alopecurus californicus Vasey—Corvallis, Sept. 21, 1914, 1552.

Avena fatua glabrata Peterm.—Philomath, Jan. 16, 1914, 1138.

Avena sativa L.—Corvallis, Aug. 12, 1911, 3161, July 6, 1914, 1667, Aug. 13, 1914, 1661, Aug. 9, 1915, G. H. Godfrey & F. D. Bailey, 3135; Cottage Grove, Lane Co., July 14, 1914, 1674; Pleasant Hill, Lane Co., Aug. 7, 1913, F. D. Bailey, 1130.

Beckmannia erucaeformis (L.) Host.—Corvallis, Aug. 8, 1915, 3026a.

Dactylis glomerata L.—Cottage Grove, Lane Co., July 14, 1914, 1670; Corvallis, July 6, 1914, 1666; Clatsop, Clatsop Co., Nov. 3, 1913, 1155; Philomath, Jan. 6, 1914, 1084.

Deschampsia elongata (Hook.) Munro—Glendale, Douglass Co., July 17, 1914, 1410; Ashland, Jackson Co., Sept. 10, 1914, 1566, 1568; Wren, Benton Co., June 26, 1914, 1329; Garden Home, Multnomah Co., July 20, 1915, 3157, 3158.

Elymus glaucus Buckl.—Philomath, Jan. 1, 1914, 1152; Bend, Crook Co., Sept. 11, 1916, J. R. Weir, 211.

Festuca elatior L.—Wren, Benton Co., June 26, 1914, 1324; Cottage Grove, Lane Co., July 14, 1914, 1348; Corvallis, July 29, 1915, 3190.

Festuca megalura Nutt.—Corvallis, June 24, 1914, 1390, Aug. 13, 1914, 3191.

Festuca myuras L.—Cottage Grove, Lane Co., July 14, 1914, 1351.

Festuca pacifica Piper—Corvallis, July 6, 1914, 1434, July 29, 1914, 1416.

Hierochloe macrophylla Thurb.—Glendale, Douglass Co., July 17, 1914, 1411 (type of *Uredo quinqueporula*).

Hordeum distichon L.—Corvallis, Aug. 20, 1915, H. P. Barss, 3184.

Hordeum vulgare L.—Corvallis, Oct. 5, 1914, 3165.

Lolium multiflorum Lam.—Cottage Grove, Lane Co., July 14, 1914, 1349; Corvallis, Sept. 20, 1914, 1551; Tualatin, Washington Co., July 10, 1914, F. D. Bailey, 1357.

Lolium subulatum Vis.—Corvallis, March 22, 1915, 3277.

Phleum pratense L.—Cottage Grove, Lane Co., July 14, 1914, 1668; Hood River, June 19, 1914, 1665; Springbrook, Yamhill Co., June 22, 1914, F. D. Bailey, 3136; Briton, Lincoln Co., July 17, 1915, VanGundia, 3086, 3087; Corvallis, Aug. 13, 1914, 1662; Philomath, Jan. 1, 1914, 1151; Gresham, Multnomah Co., Aug. 7, 1913, F. D. Bailey, 1140; Sumpter, Baker Co., June, 1913, J. R. Weir, 97; Grant's Pass, Josephine Co., Sept. 2, 1916, J. R. Weir, 246.

Triticum compactum Host.—Moro, Sherman Co., June 11, 1915, F. K. Ravn & A. G. Johnson.

Triticum vulgare L.—Corvallis, July 29, 1914, 1684; Hood River, Aug. 5, 1914, 1669; Ashland, Jackson Co., Aug. 28, 1913, 1125; Union, Union Co., Aug. 13, 1915, F. D. Bailey, 3133; Albany, Linn Co., Aug. 22, 1900, E. B. Townsend, 3384.

Since the classic researches of DeBary, who first demonstrated heteroecism in rusts by showing that this species has aecia on *Berberis*, this rust has received more attention on the part of investigators than any other species. (Klebahn, Die Wirtsw. Rostp. 205-235. 1904.)

In America the most important work has been conducted by Carleton (Div. Veg. Phys. & Path. U. S. D. A. Bull. 16. 1899; Bur. Pl. Industry, U. S. D. A. Bull. 63. 1904); Arthur (Jour. Myc. 8: 53. 1902; 11: 57. 1905; 12: 17. 1906; 13: 198. 1907; 14: 16. 1908; Mycol. 2: 227. 1910; 4: 18. 1912); Freeman & Johnson (Bur. Pl. Ind. U. S. D. A. Bull. 216. 1911); Stakman (Minn. Exp. Sta. Bull. 138. 1914; Jour. Agr. Research 4: 193-199. 1915) and Stakman and Piemeisel (Jour. Agr. Research 6: 813-816. 1916; 10: 429-495. 1917).

In Oregon the rust is apparently not as important on wheat and other grains as it is in the spring wheat districts east of the Rocky mountains. No aecial collections have been made.

A number of unrecorded hosts appear in the above list. Since the publication of *Uredo quinqueporula* by Arthur and Fromme (l. c.), telia have been found on a duplicate specimen which determines that that species is properly referred here. The number of pores in the uredospores of that collection is unusual for this rust, the usual number being 4, and in the absence of telia was considered of sufficient importance to separate it as a distinct species.

152. PUCCINIA POLYGONI-ALPINI Cruchet & Mayor, Bull. Herb. Bois 8: 245. 1908.

ON POLYGONACEAE:

Rumex paucifolius Nutt.—Crater Lake, Klamath Co., Sept. 9, 1916, J. R. Weir, 253.

This specimen is referred to the above species on account of the hyaline umbo covering the pore of the apical cell in the teliospore. The species is described from material on *Polygonum alpinum* from Europe with which our material closely agrees. A collection on that host from Idaho is also to be referred here. The rust is unlike any other recorded on *Rumex*. The only other collection recorded on this host from North America is the one on which *P. uniformis* Pammel & Hume from Wyoming was based, which Holway (N. Am. Ured. 1: 36. 1906) considers to be on *Polygonum* sp. and refers to *P. Bistortae*.

153. PUCCINIA POLYGONI-AMPHIBII Pers. Syn. Fung. 227. 1801.

Aecidium Geranii maculati Schw. Schr. Nat. Ges. Leipzig 1: 67. 1822.

ON POLYGONACEAE:

Polygonum amphibium L.—Brandt's Ranch, Wallowa Valley, Aug. 26, 1897, E. P. Sheldon, 8972; The Dalles, Wasco Co., Aug. 25, 1915, E. Bartholomew (Barth. N. Am. Ured. 1566).

Polygonum Muhlenbergii S. Wats. (*P. emersum* Britt.)—The Dalles, Wasco Co., Aug. 26, 1915, E. Bartholomew (Barth. Fungi Columb.

4762); Portland, Aug. 21, 1915, E. Bartholomew (Barth. Fungi Columb. 4861).

Polygonum pennsylvanicum L.—Corvallis, Sept. 20, 1914, 1547; Clatskanie, Columbia Co., Oct. 10, 1914, F. D. Bailey, 1944.

No collections of aecia referable to this species have been made west of the Rocky mountains. Tranzschel (Centr. f. Bakt. II, 11: 106. 1903) was the first to show that this species has aecia on *Geranium*. Arthur working with American material has confirmed Tranzschel's results (Jour. Myc. 11: 59. 1905; 12: 18. 1906).

154. PUCCINIA PORPHYROGENITA Curt.; DeToni in Sacc. Syll. 7: 703. 1888.

Puccinia porphyrogenita Curt. in Thüm. Myc. Univ. 545 (hyponym). 1876.

Puccinia acuminata Pk. Rep. N. Y. State Mus. 23: 57. 1872. (Not *P. acuminata* Fckl. 1869.)

ON CORNACEAE:

Cornus canadensis L.—Near Mt. Jefferson, Aug. 1892, Moses Craig; Larch Mt., Multnomah Co., Aug. 11, 1910, 1078; South Mt. Jefferson, Linn Co., July 3, 1914, F. D. Bailey, 1840; Mt. Hood, Aug. 7, 1914, 1604; Trail to Hanging Valley, Mt. Jefferson, Aug. 11, 1914, H. P. Barss & G. B. Posey, 1622.

155. PUCCINIA PROCERA Diet. & Holw. Erythea 1: 249. 1893.

ON POACEAE:

Elymus arenicola Schrib. & Smith—Umatilla, Umatilla Co., May 11, 1915, 3200, 3201, July 11, 1914, 1374, 1375; Sherman Sta. O. W. R. R. & Nav. Co., Sherman Co., July 1, 1914, 1421.

This species is distinguishable from other forms on *Elymus* by the large urediniospores, 26–32 by 32–48 μ . The aecial connection is unknown.

156. PUCCINIA PUNCTATA Link, Ges. Nat. Freunde Berlin Mag. 7: 30. 1816.

ON RUBIACEAE:

Galium aparine L.—Hood River, July 24, 1915, 3225; Ashland, Jackson Co., Sept. 10, 1914, 3239; Corvallis, May 1, 1915, 3148.

Galium asperrimum A. Gray—Big Cañon, Wallowa Co., Aug. 24, 1897, E. P. Sheldon, 8774.

Galium triflorum Michx.—Mary's Peak, Benton Co., Aug. 15, 1914, 1513, 1515; Elk City, Lincoln Co., Aug. 20, 1914, 2528; Hood River, July 24, 1915, 3224.

Galium sp.—Philomath, April 20, 1914, F. D. Bailey, 2570; Corvallis, April 8, 1914, 1524; Dufur, Wasco Co., June 30, 1914, 1335.

157. PUCCINIA PYGMAEA Erikss. Fungi Par. Scand. 9: 449. 1895.

ON POACEAE:

Calamagrostis aleutica Bong.—Newport, Lincoln Co., July 18, 1915, 3204, Aug. 30, 1914, 1579.

The above collections show uredinia only. The aecial connection is unknown.

158. PUCCINIA RECEDENS Syd. Monog. Ured. 1: 146. 1902

ON CARDUACEAE:

Senecio harfordii Greenman—Bridal Veil, Multnomah Co., May 18, 1915, 3273.

Senecio sp.—Hilgard, Union Co., July 10, 1914, 1542.

159. PUCCINIA RHAMNI (Pers.) Wettst. Verh. Zool.-Bot. Ges. Wein 35: 545. 1885.

Aecidium Rhamni Pers. in Gmel. Syst. Nat. 2: 1472. 1791.

Puccinia coronata Corda, Icones 1: 6. 1837.

ON RHAMNACEAE: I.

Rhamnus purshiana DC.—Corvallis, July 5, 1911, F. D. Bailey, 1135, May 9, 1914, 1827, May 12, 1914, 1277, July 5, 1914, H. P. Barss, 1940; Hood River, May 14, 1914, 1278; Clatskanie, Columbia Co., May 20, 1914, F. D. Bailey, 1281; Cottage Grove, Lane Co., May 1, 1915, C. E. Stewart, 3058.

ON POACEAE: II, III.

Agrostis alba L.—Toledo, Lincoln Co., July 19, 1915, 3119.

Agrostis alba maritima Meyer—Philomath, Jan. 6, 1914, 1149, 1150.

Agrostis exarata Trin.—Corvallis, Feb. 14, 1914, 3098, June 29, 1914, G. B. Posey, 1306, 1308, Sept. 20, 1914, 1553, Sept. 5, 1914, 1578, Dec., 1915, G. B. Posey; Hood River, June 19, 1914, 1401; Philomath, June 26, 1914, 1344; Eugene, Lane Co., July 11, 1914, G. B. Posey, 1377; Newport, Lincoln Co., July 18, 1915, 3120; Garden Home, Multnomah Co., July 20, 1915, 3121; Portland, Aug. 21, 1915, E. Bartholomew, 5943.

Agrostis foliosa Vasey—Yaquina, Lincoln Co., July 17, 1915, 3122.

Agrostis longiligula Hitchc.—Jetty, Lincoln Co., July 19, 1915, VanGundia, 3256.

Agrostis microphylla Steud.—Wren, Benton Co., June 26, 1914, 1314; Cottage Grove, Lane Co., July 14, 1914, 1353; Corvallis, July 6, 1914, F. D. Bailey, 1436.

Avena sativa L.—Newport, Lincoln Co., July 18, 1915, 3132; Briton, Lincoln Co., July 19, 1915, G. VanGundia, 3088; Marshfield, Coos Co., July, 1916, C. E. Owens; Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 3162.

Calamagrostis canadensis (Michx.) Beauv.—Clatskanie, Columbia Co., May 20, 1914, F. D. Bailey, 1580.

Calamagrostis hyperborea Lange—Clatsop, Clatsop Co., Nov. 7, 1911, 1109.

Festuca elatior L.—Elk City, Lincoln Co., Aug. 20, 1914, 1380.

Festuca subulata Trin.—Ashland, Jackson Co., Sept. 10, 1914, 1561; Mary's Peak, Benton Co., Aug. 15, 1914, 1572; Elk City, Lincoln Co., Aug. 20, 1914, 1382.

Holcus lanatus L.—Canby, Clackamas Co., July 21, 1911, 1182; Philomath, Jan. 6, 1914, 3115, 1133; Cottage Grove, Lane Co., July 14, 1914, 3114; Mouth of Salmonsberry River, Tillamook Co., July 17, 1915, G. VanGundia, 3085, 3129; Yaquina, Lincoln Co., July 17, 1915, 3112; Jetty, Lincoln Co., July 19, 1915, G. VanGundia, 3130; Eddyville, Lincoln Co., Aug. 10, 1915, Hoerner, 3090; Grant's Pass, Josephine Co., Sept. 2, 1916, J. R. Weir, 227; Portland, Jan. 9, 1914, 1139; Elk City, Lincoln Co., Aug. 20, 1914, 1379.

Lolium multiflorum Lam.—Near Gray Station, Linn Co., July 4, 1914, 1419; Corvallis, July 6, 1914, 1435, Sept. 20, 1914, 1554; Newport, Lincoln Co., July 21, 1915, 3128.

Lolium perenne L.—Corvallis, Aug. 3, 1914, 1412, Sept. 1, 1914, 3127.

Panicularia elata Nash—Clatskanie, Columbia Co., Aug. 11, 1913, F. D. Bailey, 1105.

Panicularia pauciflora (Presl.) Kuntze—Orenco, Washington Co., June 13, 1914, 1388; Neah-Kah-Nie Mt., Tillamook Co., Sept. 17, 1915, F. D. Bailey, 3258; Portland, Aug. 21, 1915, E. Bartholomew, 5942 (Barth. Fungi Columb. 4973).

This coronate-spored grass rust is evidently very common throughout western Oregon on native grasses. It is, however, not common in the Willamette valley on oats. All of the collections on that host are from near the sea coast.

DeBary (Monat. Akad. Wiss. 211. 1866) was the first to conduct cultures indicating the genetic connection with aecia on *Frangula* and *Rhamnus* in Europe. Since that time many European investigators have conducted culture experiments (Klebahn, Die Wirtsw. Rostp. 254-262. 1904).

In America this species has been cultured by Arthur (Bull. Lab. Nat. Hist. State Univ. Iowa 4: 398. 1898; Jour. Myc. 11: 58. 1905; Mycol. 4: 18. 1912) and Carleton (Div. Veg. Phys. & Path. U. S. Dept. Agr. 16: 48. 1899; Bur. Pl. Industry, U. S. Dept. Agr. Bull. 63: 15. 1904).

The only culture made with Pacific coast material was made in 1916 in this laboratory under the writer's direction, using telial material on *Agrostis exarata* sent to the writer from Corvallis by G. B. Posey. This was used to inoculate *Rhamnus Purshiana*, with

the development of pycnia and aecia. This host is the only one on which aecia have been collected in Oregon, and they are very abundant, as the number of collections indicates.

160. *Puccinia Romanzoffiae* sp. nov.

O. Pycnia not seen.

III. Telia chiefly hypophyllous and petiolicolous, crowded on confluent groups, 0.5-1 mm. across or covering extensive areas on the petioles, early naked, pulverulent, chestnut brown, ruptured epidermis noticeable; teliospores somewhat irregularly ellipsoid or oblong, 19-24 by 34-42 μ , rounded above and below, not or scarcely constricted; wall chestnut brown, 2-3 μ thick, marked by large sparsely distributed irregular tubercles, thickened at apex by a low sub-hyaline umbo to 4-5 μ , pore of lower cell at septum similarly thickened; pedicel colorless, short deciduous.

ON HYDROPHYLLACEAE:

Romanzoffia sitchensis Bong.—Mt. Jefferson, 8,000 ft., Aug. 14, 1914, H. P. Barss, 2539, type.

This species is distinguished from other species on this family of hosts by the character of the markings of the teliospore. In *P. Hydrophylli* Pk. the teliospores are closely and finely verrucose while in *P. Phaceliae* Syd. & Holw. they are smooth. The character of the teliospores in the latter species suggests a correlation with *P. montanensis* (cf. 136) which has aecia on *Phacelia* and other members of the family Hydrophyllaceae.

161. PUCCINIA RUBEFACIENS Johans. Bot. Centr. 28: 394. 1886.

ON RUBIACEAE:

Galium boreale L.—Hilgard, Union Co., July 10, 1914, 1540; Austin, Grant Co., Aug. 1916, J. R. Weir, 241.

The teliospores of this micro-form are very similar in shape and size to those of the opsis-form *P. ambigua* (cf. 61) and the eu-form *P. punctata* (cf. 156). These three species on *Galium* doubtless represent a series of correlated forms.

162. PUCCINIA RUGOSA Billings, King's Rep. 40th Par. 914. 1871.

(Not *P. rugosa* Speg. 1886.)

Puccinia Troximontis Pk. Bot. Gaz. 6: 227. 1881.

Puccinia Columbiensis E. & E. Proc. Phil. Acad. 1893: 153. 1893.

ON CICHORIACEAE:

Agoseris laciniata (Nutt.) Green—Corvallis, July 10, 1915, 3215.

163. PUCCINIA SAXIFRAGAE Schlecht. Fl. Berol. 2: 134. 1824.

Puccinia curtipes Howe, Bull. Torrey Club 5: 3. 1874.

ON SAXIFRAGACEAE:

Saxifraga Marshallii Greene—Hood River, May 16, 1915, 3268; Mary's River, E. of Wren, Benton Co., April 17, 1915, 2617.

Saxifraga odontoloma Piper—Corvallis, May 1, 1915, 3269.

164. PUCCINIA SHERARDIANA Koern. Hedw. 16: 19. 1877.

Puccinia Malvastris Peck, Bull. Torrey Club 12: 35. 1885.

ON MALVACEAE:

Sidalcea virgata Howell—Corvallis, May 31, 1892, A. T. Mulford, 5, Apr. 13, 1912, F. D. Bailey, 3354, June 23, 1913, F. D. Bailey, 1128, Apr. 8, 1914, 3352, Apr. 29, 1914, G. B. Posey, 3353, Apr. 30, 1915, 3071; Newburg, Yamhill Co., Apr. 9, 1915, F. D. Bailey, 3072.

165. PUCCINIA SIDALCEAE Holw. N. Am. Ured. 1: 67. 1907.

ON MALVACEAE:

Sidalcea oregana Gray—Klamath Co., July 10, 1903, E. B. Copeland, type.

This collection was distributed as *P. Sphaeralceae* E. & E. in Sydow's Uredineen 1782.

166. PUCCINIA STIPAE Arth. Bull. Iowa Agr. College Dept. Bot. 1884: 160. 1884.

ON POACEAE: II and III.

Stipa comata Trin. & Rupr.—Umatilla, Umatilla Co., July 11, 1914, 1369, May 11, 1915, 3205; Hermiston, Umatilla Co., May 12, 1915, 3206.

This species has aecia on various genera of Carduaceae including *Aster*, *Solidago*, *Grindelia* and *Senecio*, as has been shown by Arthur (Jour. Myc. 11: 63. 1905; Mycol. 4: 19. 1912, 7: 72. 1915). No aecial collections have been made in Oregon, though that stage is doubtless not uncommon in the eastern part of the state (cf. 69).

167. PUCCINIA SUBNITENS Dietel, Erythea 3: 81. 1895.

? *Aecidium Sarcobati* Pk. Bot. Gaz. 6: 240. 1881.

ON CHENOPODIACEAE: I.

Sarcobatus vermiculatus (Hook.) Torr.—Eastern Oregon, Aug. 1902, D. Griffiths (Vestergren, Micro. Rar. Sel. 852).

ON POACEAE: III.

Distichlis spicata (L.) Greene—LaGrand, Union Co., March, 1915, C. C. Cate, 3278; Umatilla, Umatilla Co., July 11, 1914, 1367, 1373; Moro, Sherman Co., Aug. 4, 1914, C. R. Ball, 1856.

This remarkable species has aecia on a large number of hosts in the Polygonaceae, Chenopodiaceae, Amaranthaceae, Cruciferae, etc. as was first shown by Arthur (Bot. Gaz. 35: 19. 1903; Jour. Myc. 11: 54. 1905, 12: 16. 1906, 13: 197. 1907, 14: 15. 1908; Mycol.

1: 234. 1909, 2: 225. 1910, 4: 18. 1912). Bethel (Phytopath. 7: 92-94. 1917) has also conducted very extensive cultures and proven the genetic connection with aecia on many hosts.

In 1915, Arthur (Mycol. 8: 135. 1916), using telial material sent by the writer collected by Mr. C. C. Cate at LaGrand, Ore., obtained the development of aecia on *Chenopodium album*. This is the only culture made with material from the Pacific coast.

The aecia on *Sarcobatus* are included here on the strength of culture work conducted by Arthur, in which he obtained aecia on that host using telial material on *Distichlis* from Nevada. The matter is complicated by the fact that Bethel (l. c.) finds that the aecia on this host in Colorado go to *P. luxuriosa* (cf. 124) and *P. subnitens* can not be made to infect *Sarcobatus*. It is possible that the two species represent closely related biological forms.

168. PUCCINIA SYMPHORICARPI Hark. Bull. Calif. Acad. Sci. 1: 35. 1884.

ON CAPRIFOLIACEAE:

Symphoricarpos albus (L.) Blake—Corvallis, Oct. 17, 1909, F. L. Griffin, 1047, July, 1910, 1086, Aug. 1910, 1050, May 4, 1912, 1087, May 19, 1913, F. D. Bailey, 1158; Sheridan, Yamhill Co., July 7, 1914, H. P. Barss, 1291, July 8, 1916, H. P. Barss, 3396; North slope Mt. Hood, Aug. 7, 1914, 1611; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 234; Hood River, July 24, 1915, 3064.

This micro-form is exceedingly abundant in western Oregon. This species is morphologically correlated with the telial stage of *P. abundans* (cf. 59), which has aecia on the same host, as has been pointed out by Travelbee (Proc. Ind. Acad. Sci. 1914: 233. 1915).

169. PUCCINIA TARAXACI (Reb.) Plowr. British Ured. & Ustil. 186. 1889.

Puccinia Phaseoli var. *Taraxaci* Reb. Fl. Noem. 356. 1804.

ON CICHORIACEAE:

Taraxacum Taraxacum (L.) Karst.—Corvallis, June, 1910, 1117; Bonneville, Multnomah Co., Aug. 10, 1910, 3078; Ashland, Jackson Co., Sept. 10, 1914, 3074; The Dalles, Wasco Co., July 1, 1914, 3073; Talent, Jackson Co., June 22, 1915, G. B. Posey, 3077; Newburg, Yamhill Co., Apr. 13, 1914, F. D. Bailey, 3076.

170. PUCCINIA TOUMEYI Syd. in Sacc. Syll. Fung. 16: 299. Feb. 1902.

Puccinia circinans Ell. & Ev. Bull. Torrey Club 27: 61. 1900.
(Not *P. circinans* Fckl. 1869 or Dietel 1897.)

Puccinia chasmatis Ell. & Ev. Jour. Myc. 8: 15. May, 1902.

ON SCROPHULARIACEAE:

Pentstemon sp.—Canyon City, Grant Co., Aug. 26, 1914, W. E. Lawrence, 3185.

171. PUCCINIA TRAUTVETTERIAE Syd. & Holw. in Sydow, Monogr. Ured., 1: 552. 1903.

ON RANUNCULACEAE:

Trautvetteria grandis Nutt.—S. W. slope Mt. Hood, July 23, 1915, 3251.

This interesting micro-form, known only from a few collections from the mountains of the northwestern states, has also been reported from Japan.

172. PUCCINIA TRITICINA Erikss. Ann. Sci. Nat. VIII. 9: 270. 1899.

ON POACEAE:

Triticum aestivum L.—Hood River, June 20, 1914, 1399.

Triticum ovatum Rasp.—Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 1407.

Triticum vulgare L.—Lebanon, Linn Co., Aug. 2, 1913, F. D. Bailey, 1126; Myrtle Creek, Douglass Co., June 9, 1914, F. D. Bailey, 1941; Cottage Grove, Lane Co., July 14, 1914, 1676; Corvallis, July 6, 1914, 3159, 3160, July 10, 1914, F. D. Bailey, 1677, July 29, 1914, 1685; Bend, Crook Co., Sept. 11, 1916, J. R. Weir, 201.

This, the common leaf rust of wheat, is very abundant in western Oregon. The life history is unknown. In morphological characters, it resembles closely the forms on native grasses commonly referred to *P. rubigo-vera*, most of which are now included in *P. Clematidis* (cf. 85).

173. PUCCINIA UNIVERSALIS Arth. Jour. Myc. 11: 21. 1908.

Aecidium Dracunculi Thüm. Bull. Soc. Nat. Moscow. 58: 212.

1878. (Not *P. Dracunculi* Auers. 1850.)

ON CARDUACEAE: I.

Artemisia sp.—White Pine, Baker Co., June, 1913, J. R. Weir, 120.

ON CYPERACEAE: II, III.

Carex multicaulis Bailey—Grant's Pass, Josephine Co., May 5, 1887, Thomas Howell.

Carex praegracilis W. Boott. (*C. marcida* Boott.)—Redmond, Crook Co., July 2, 1914, 1425.

Carex Rossii Boott.—Hood River, July 23, 1915, 3289.

Carex umbellata Schk.—Hood River, July 23, 1915, 3282.

This species has aecia on *Artemisia* as has been shown by Arthur (Jour. Myc. 14: 21. 1908; Mycol. 2: 224. 1910, 4: 16. 1912).

174. PUCCINIA URTICATA (Lk.) Kern, Mycol. 9: 214. 1917.

Aecidium Urticae Schum. Enum. Pl. Saell. 2: 222. 1803.

Caecoma urticatum Link, in Willd. Sp. Pl. 6²: 62. 1825.

Puccinia Urticae Lagerh. Mitt. Bad. Ver. 2: 72. 1889. (Not *P. Urticae* Barcl. 1887.)

Puccinia Garrettii Arth. Bull. Torrey Club 32: 41. 1905.

ON URTICACEAE: I.

Urtica Lyallii S. Wats.—Philomath, April 26, 1914, 1829, May 10, 1914, 2569; Corvallis, May 1, 1915, 3052.

ON CYPERACEAE: II, III.

Carex Barbarae Dewey (*C. laciniata* Boott.)—Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 250.

Carex magnifica Dewey—Newberg, Yamhill Co., April 13, 1914, F. D. Bailey, 3009; Clatskanie, Columbia Co., May 20, 1914, F. D. Bailey, 3002; Neah-Kah-Nie Mt., Tillamook Co., Sept. 17, 1915, F. D. Bailey, 3357.

Carex nebraskensis Dewey—Andrews, Harney Co., Aug. 1901, Griffiths & Morris (Griffiths, W. Am. Fungi 339).

Carex rostrata Stokes (*C. utriculata* Boott.)—Clatskanie, Columbia Co., May 20, 1914, F. D. Bailey, 3010; Redmond, Crook Co., July 1, 1914, 1433.

Carex sp.—Hood River, May 14, 1914, 3021.

The connection of this *Carex* rust with aecia on *Urtica* was first shown by Magnus in 1872 (Vehr. Bot. var. Prov. Brandb. 14: 11. 1872). Many other European investigators have confirmed Magnus results (Klebahn, Die Wirtsw. Rostp. 293. 1904).

In America Arthur has conducted numerous successful culture experiments with this species (Bot. Gaz. 29: 270. 1900; 35: 16. 1903; Jour. Myc. 8: 52. 1902; 12: 15. 1906; 14: 14. 1908; Mycol. 2: 223. 1910; 4: 17. 1912). Kellerman has also conducted successful culture experiments (Jour. Myc. 9: 9. 1903). None of the culture work, however, has been conducted with Pacific coast material.

175. PUCCINIA VERATRI Duby, Bot. Gall. 2: 890. 1830.

Puccinia Veratri Clinton, in Peck, Rep. N. Y. State Mus. 27: 103. 1875.

ON ONAGRACEAE: I.

Epilobium sp.—Parkdale, Hood River Co., May 14, 1914, 1511.

ON LILIACEAE: II, III.

Veratrum californicum Durand—The Meadows, Wallowa Co., Aug. 18, 1897, E. P. Sheldon, 8714.

Veratrum viride Ait.—Calloway Station, Benton Co., June 28, 1901, E. R. Lake, 1131; Parkdale, Hood River Co., May 14, 1914, 1279; Hilgard, Union Co., July 10, 1914, 1934.

The aecial collection is referred here with some confidence. It was made in the immediate vicinity of *Veratrum* plants showing fresh

uredinia. The aecia were somewhat old and no uredinia were found on other *Epilobium* plants in the vicinity. Tranzschel (Ann. Myc. 7: 182. 1909) established the connection of aecia on *Epilobium* with *P. Veratri*, obtaining his clue from the close morphological resemblance of the teliospores of this species to those of *P. Epilobii* DC. Bisby (Am. Jour. Bot. 3: 527-561. 1916) has pointed out the morphological similarity of this species with *Uromyces plumbarius* (cf. 201), *P. Epilobii*, *P. Epilobii-tetragoni* (cf. 99) and *P. Epilobii-Fleischeri*.

176. PUCCINIA VIOLAE (Schum.) DC. Fl. Fr. 6: 62. 1815.

Aecidium Violae Schum. Enum. Pl. Saell. 2: 224. 1803.

ON VIOLACEAE:

Viola adunca J. F. Smith—Mary's Peak, Benton Co., May 21, 1915, 3223.

Viola glabella Nutt.—Corvallis, Linn Co., April 16, 1912, 1081; Corvallis, May 19, 1912, F. D. Bailey, 3198, April 29, 1914, F. D. Bailey, 3164, July 14, 1914, H. P. Barss, 2548; Hood River, May 14, 1914, 3197; Portland, Aug. 30, 1915, E. Bartholomew, 5978 (Barth. N. Am. Ured. 1677); Sumpter, Baker Co., July 16, 1913, J. R. Weir, 186; Mary's Peak, Benton Co., Aug. 15, 1914, 2547.

Viola nephrophylla Greene—Hilgard, Union Co., July 10, 1914, 2557.

Viola rugulosa Greene—Horse Creek Canyon, Wallowa Co., June 4, 1897, E. P. Sheldon, 8258.

Viola sp.—N. slope Mt. Hood, Aug. 7, 1914, 2553.

177. PUCCINIA WULFENIAE Diet. & Holw. Erythea 3: 79. 1895.

Puccinia Syntheridis Ell. & Ev. Bull. Torrey Club 27: 61. 1900.

ON SCROPHULARIACEAE:

Synthyris rotundifolia Gray—Philomath, April 20, 1912, 1146; Corvallis, April 8, 1914, 1286.

178. TRANZSCHELIA PUNCTATA (Pers.) Arth. Résult Sci. Congr. Bot. Vienne 340. 1906.

Aecidium punctatum Pers. Ann. Bot. Usteri 20: 135. 1796.

Puccinia Pruni-spinosae Pers. Syn. Fung. 226. 1801.

ON ROSACEAE:

Amygdalus Persica L.—Kiger's Island, Benton Co., Oct. 5, 1913, C. M. Scherer, 1825.

Prunus domestica L. (Italian Prune)—Salem, Marion Co., Aug. 1909, 1062; Yamhill Co., Sept. 9, 1911, 1040; Corvallis, Oct. 29, 1914, G. B. Posey, 3110.

This is not an uncommon disease of the prune, though apparently doing little damage. It is less common on the peach. No aecial collections have been made in the northwest.

Tranzschel (Trans. Bot. Acad. St. Petersb. 11: 67-69. 1905) was the first to culture this species showing that aecia occur on *Anemone*.

In America Arthur (Jour. Myc. 12: 19. 1906; 13: 199. 1907) has shown that the aecia on *Hepatica* common in the eastern United States are genetically connected.

179. *UROMYCES AEMULUS* Arth. Bull. Torrey Club 38: 373. 1911.

Nigredo aemula Arth. N. Amer. Flora 7: 241. 1912.

ON ALLIACEAE:

Allium validum S. Wats.—Paisley, Lake Co., Aug. 1914, J. S. Elder, 1987.

180. *UROMYCES AMOENUS* Syd. Ann. Myc. 4: 28. 1906.

ON CARDUACEAE:

Anaphalis margaritacea occidentalis Greene—Hood River, July 23, 1915, 3243; Crater Lake, Klamath Co., Sept. 9, 1916, J. R. Weir, 235.

Anaphalis margaritacea subalpina Gray?—N. slope Mt. Hood, Aug. 7, 1914, 1613.

181. *UROMYCES ARMERIAE* (Schlechtld.) Lev. Ann. Sci. Nat. III, 8: 375. 1847.

Caeoma Armeriae Schlechtld. Fl. Berol. 2: 126. 1824.

ON PLUMBAGINACEAE:

Statice armeria L.—Newport, Lincoln Co., May 16, 1914, C. E. Owens, 1999, July 18, 1915, 3018.

This species differs from *U. Limonii* in the shorter, broader teliospores and the short mostly deciduous pedicel. The first collection mentioned bears aecia accompanied by uredinia, the second, uredinia and telia only. The rust is abundant on a cliff near the seashore. So far as we are aware this is the first record of this species in America.

182. *Uromyces Beckmanniae* sp. nov.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, elliptical, 0.5-0.8 mm. long, soon naked, pulverulent, cinnamon brown, ruptured epidermis noticeable; paraphyses none; urediniospores globoid or broadly ellipsoid, 19-24 by 23-30 μ , wall colorless or pale yellow, 2-2.5 μ thick, finely verrucose-echinulate, pores 8-10, scattered.

III. Telia amphigenous and culmicolous, scattered or crowded, oblong, 0.4-0.7 mm. across, often confluent to form crusts or lines, tardily naked, blackish brown; teliospores obovoid or ellipsoid, angular, 20-26 by 29-40 μ , apex rounded or angular, narrowed below; wall chestnut brown, 1-2 μ thick, smooth, but showing distinct longitudinal ridges, apex thickened, 3-6 μ , pedicel colorless or slightly tinted next to the spore, equalling the spore or usually deciduous.

ON POACEAE:

Beckmannia erucaeformis (L.) Host.—Corvallis, Sept. 21, 1911, 1183; south Mary's River, Sept. 30, 1914, 3144, Oak Creek, July 29, 1915, 3145 type, Aug. 14, 1915, 3026, May, 1916, G. B. Posey.

Evidently the most common rust in Oregon on this host. It differs from *U. Hordei*, which is in general a southern form not known on the Pacific coast, in the larger teliospores which show distinct longitudinal ridges. From *U. Jacksonii* (cf. 192) this species differs in the thickened apices of the teliospores. No clue is available as to the aecial host. The rust is difficult to separate from *Puccinia Rhamni* (cf. 159) in the uredinial stage.

183. UROMYCES BRODIEAE Ell. & Hark., Harkness, Bull. Cal. Acad. Sci. 1: 28. 1884.

Uromyopsis Brodieae Arth. Result Sci. Congr. Bot. Vienne 345. 1906.

ON ALLIACEAE:

Brodiaea sp.—Corvallis, May 4, 1912, F. D. Bailey, 3304, April 25, 1915, 2625.

This opsis-form is evidently common in western Oregon. The rust is usually found attacking the tips of the leaves early in the spring. Aecia usually predominate, the telia being inconspicuous and easily overlooked.

184. UROMYCES CARNEUS (Nees) Hariot, Jour. de Bot. 7: 376. 1893.
Aecidium carneum Nees; Funk. Krypt. Gew. Ficktelgeb. 25: 4. 1818.

Uromyces lapponica Lagerh. Bot. Nat. 1890: 274. 1890.

Uromyopsis lapponica Arth. Result Sci. Congr. Bot. Vienne 345. 1906.

ON LEGUMINOSAE:

Astragalus sp.—Austin, Grant Co., Aug. 1915, J. R. Weir, 168.

185. UROMYCES CARYOPHYLLINA (Schrank.) Wint. in Rab. Krypt. Fl. 1¹: 149. 1881.

Lycoperdon caryophyllum Schrank. Baier. Fl. 2: 668. 1789.

Nigredo caryophyllina Arth. N. Am. Flora 7: 246. 1912.

ON CARYOPHYLLACEAE:

Dianthus Caryophyllus L.—Portland, Sept. 30, 1912, F. D. Bailey, 1089, Dec. 19, 1912, F. D. Bailey, 1744; Corvallis, Dec. 1910, 3181.

186. UROMYCES FABAE (Pers.) DeBary, Ann. Sci. Nat. IV, 20: 80. 1863.

Uredo Fabae Pers. Neues Mag. Bot. 1: 93. 1794.

Nigredo Fabae Arth. N. Am. Flora 7: 251. 1912.

ON LEGUMINOSAE:

Lathyrus obovatus (Torr.) White?—Sumpter, Baker Co., July 16, 1916, J. R. Weir, 192; Austin, Grant Co., Aug. 1915, J. R. Weir, 197.

Lathyrus oregonensis White—Andrews, Harney Co., Aug. 1901, Griffiths & Morris (Griffiths, West. Am. Fungi 349a); Spencer Creek, Klamath Co., July 10, 1903, E. B. Copeland (Syd. Ured. 1764).

Lathyrus pauciflorus Fern.?—Klamath Falls, Klamath Co., Sept. 8, 1916, J. R. Weir, 203.

Lathyrus polyphyllous Nutt.—Mt. Hood, Aug. 31, 1901, E. W. D. Holway.

Lathyrus sulphureus Brewer—Corvallis, May 9, 1914, 3226; Ashland, Jackson Co., Sept. 10, 1914, 3320.

Lathyrus sp.—Scotts, 7 mi. N. of Fort Klamath, Klamath Co., Sept. 20, 1913, E. P. Meinecke, Cr D 10; Glendale, Douglass Co., July 17, 1914, 1506; N. Mt. Hood, Aug. 7, 1914, 1490, Aug. 9, 1914, 1486; Whitewater Forest Station, Aug. 12, 1914, H. P. Barss, 3248; Garden Home, Multnomah Co., July 20, 1915, 3249.

Vicia americana Muhl.—N. slope Mt. Hood, Aug. 7, 1914, 1489, Aug. 9, 1914, 1485; Corvallis, Sept. 21, 1914, 1545.

Vicia linearis (Nutt.) Greene—Mary's Peak, Benton Co., June 20, 1910, 1501; Philomath, June 20, 1910, 1502; Newberg, Yamhill Co., April 13, 1914, 1525; Springbrook, Yamhill Co., June 25, 1914, F. D. Bailey, 3238.

Vicia truncata Nutt.—Bonneville, Multnomah Co., Aug. 10, 1910, 1179; Hood River, May 14, 1914, 1527.

Vicia sp.—Dothan, Douglass Co., Sept. 8, 1914, G. B. Posey, 1550.

187. UROMYCES FALLENS (Desmaz.) Kern, Phytopath. 1: 6. 1911.

Uredo fallens Desmaz. Pl. Crypt. 1325. 1843.

Nigredo fallens Arth. N. Am. Flora 7: 254. 1912.

ON LEGUMINOSAE:

Trifolium pratense L.—Mary's Peak, Benton Co., June, 1910, 3094; Springbrook, Yamhill Co., June 22, 1914, G. B. Posey, 3234; Corvallis, July 15, 1914, G. B. Posey, 3093, Oct. 26, 1914, G. B. Posey, 1983; Parkdale, Hood River Co., Aug. 5, 1914, 3101; Portland, Aug. 23, 1915, E. Bartholomew (Barth. Fungi Columb. 4788).

188. UROMYCES HETERODERMUS Syd. Ann. Mycol. 4: 29. 1906.

ON LILIACEAE:

Erythronium parviflorum (Wats.) Goodding—Corvallis, April 13, 1912, F. D. Bailey, 1114.

A short-cycle form not uncommon in the Rocky Mt. and Pacific coast regions.

189. *UROMYCES HOLWAYI* Lagerh. *Hedwigia* 28: 108. 1899.
Uromyces Lili G. W. Clinton; Peck, Ann. Rep. N. Y. State Mus.
 27: 103. 1875. (Not *U. Lili* Kunze. 1873.)
Nigredo Lili Arth. Résult Sci. Congr. Bot. Vienne 344. 1906.

ON LILIACEAE:

Lilium parviflorum (Hook.) Holzinger—Wren, Benton Co., July, 1911, W. E. Lawrence, 1144; Hood River, May 9, 1915, 3044; May 16, 1915, 2661; Bridal Veil, Multnomah Co., May 18, 1915, 2659; Portland, June 21, 1915, 3060.

190. *UROMYCES HYPERICI-FRONDOSI* (Schw.) Arth. Bull. Minn. Acad. Nat. Sci. 2²: 15. 1883.
Aecidium Hyperici-frondosi Schw. Schr. Nat. Ges. Leipzig 1: 68. 1822.
Nigredo Hyperici-frondosi Arth. Résult Sci. Bot. Vienne 344. 1906.

ON HYPERICACEAE:

Hypericum Scouleri Hook.—Corvallis, June 24, 1914, F. D. Bailey, 1628, July 29, 1914, 1476; Hood River, June 20, 1914, 3372.

This species has not been previously reported west of the Mississippi valley.

191. *UROMYCES INTRICATUS* Cooke, *Grevillea* 7: 3. 1878.
Uromyces Eriogoni Ell. & Hark.; Harkness, Bull. Cal. Acad. Sci. 1: 29. 1884.
Nigredo intricata Arth. N. Am. Flora 7: 244. 1912.

ON POLYGONACEAE:

Eriogonum compositum Dougl.—The Dalles, Wasco Co., July 3, 1914, 1300; Hood River, July 22, 1915, 3140.

Eriogonum microthecum Nutt.—Redmond, Crook Co., July 2, 1914, 2537.

Eriogonum stellatum Benth.—Wren, Benton Co., June 26, 1914, 1326; Hilgard, Union Co., July 10, 1914, 1439.

Eriogonum umbellatum Torr.—Mt. Hood, 7,000 ft. elev., Sept. 1, 1901, E. W. D. Holway, 6,500 ft., Aug. 9, 1914, 1481, 1493.

Eriogonum vimineum Dougl.—Elgin, Union Co., Aug. 15, 1899, C. L. Shear (Ell. & Ev. Fungi Columb. 1470).

Eriogonum virgatum Benth.—Grant's Pass, Josephine Co., July 13, 1887, Thomas Howell, from Phanerogamic specimen in the herbarium Missouri Bot. Gard.

Eriogonum sp.—Waloupi Canyon, Wallow Co., Aug. 18, 1897, E. P. Sheldon, 8727; Hermiston, Umatilla Co., May 12, 1915, 3039, 3250; Hood River Co., July 22, 1915, 3140.

192. UROMYCES JACKSONII Arth. & Fromme, Torreyia 15: 260. 1915.
ON POACEAE:

Agrostis Hallii Vasey—Corvallis, Sept. 4, 1914, 1576.

Agrostis maritima Lam.—Hood River Co., Aug. 26, 1915, E. Bartholomew, 5971 (Barth. Fungi Columb. 4992).

Deschampsia caespitosa (L.) Beauv.—Toledo, Lincoln Co., July 19, 1915, 3194.

Deschampsia elongata (Hook.) Munro—Orengo, Washington Co., June 13, 1914, 1396; Corvallis, July 6, 1914, 2658, type, July 29, 1914, 1438; Glendale, Douglass Co., Aug. 17, 1914, 1408.

Hordeum jubatum L.—Umatilla, Umatilla Co., July 11, 1914, 1376.

Hordeum nodosum L.—Portland, May 21, 1914, F. D. Bailey, 1583.

In addition to the above collections this species is now recognized on *Agrostis pallens* from California and *Muhlenbergia Lemmoni* from Arizona and New Mexico. Collections have also been made on *Deschampsia elongata* in Washington and on *Hordeum nodosum* in Washington and California.

193. UROMYCES JUNCI (Desmaz.) L. Tul. Ann. Sci. Nat. IV, 2: 146.
1854.

Puccinia Junci Desmaz. Pl. Crypt. 81. 1825.

Nigredo Junci Arth. N. Am. Flora 7: 238. 1912.

ON CARDUACEAE: I.

Arnica cordifolia Hook.—Austin, Grant Co., Aug. 1915, J. R. Weir, 190.

ON JUNCACEAE: II, III.

Juncus balticus Willd.—Redmond, Crook Co., July 2, 1914, 1426; Umatilla, Umatilla Co., July 11, 1914, 1372; Toledo, Lincoln Co., July 19, 1915, 3391.

This species develops its aecia on various Carduaceae. In Europe cultures have been conducted by various authors, according to Klebahn (Die Wirtsw. Rostp. 329. 1904), showing that the aecia occur on *Pulicaria dysenterica* (*Inula dysenterica*).

In America Arthur (Mycol. 4: 22. 1912, 7: 77. 1915) has shown by culture experiments that aecia occur on *Carduus* and *Ambrosia*. The aecia on *Arnica* are referred here on morphological grounds.

194. UROMYCES JUNCI-EFFUSI Sydow, Monog. Ured. 2: 290. 1910.

Puccinia Junci Schw. Trans. Am. Phil. Soc. II. 4: 295. 1832.
(Not *P. Junci* Desmaz. 1825.)

Uromyces effusus Arth. Jour. Myc. 13: 193. 1907. (Not *U. effusus* DeToni. 1888.)

Nigredo Junci-effusi Arth. N. Am. Flora 7: 239. 1912.

ON JUNCACEAE:

Juncus Bolanderi Engelm.—Ashland, Jackson Co., Sept. 10, 1914, 2523.

Juncus ensifolius Wikstr.—Minum River, Wallowa Co., Aug. 11, 1897, E. P. Sheldon, Aug. 20, 1897, 8751a; Corvallis, Aug. 10, 1911, 1188, July 29, 1914, 2522; Philomath, Oct. 28, 1911, 1184, 1185, 1186, Jan. 6, 1914, 1106; Clatsop, Clatsop Co., Nov. 7, 1913, 1199; Hood River Co., Aug. 5, 1914, 2521; Ashland, Jackson Co., Sept. 10, 1914, 2524; Newport, Lincoln Co., July 17, 1915, 3394.

Juncus Mertensianus Bong.—Big Creek, Waldport, Lincoln Co., Aug. 23, 1915, F. D. Bailey, 3381.

Juncus orthophyllus Cov.—Silver Lake, Lake Co., (?) Aug. 20, 1891, J. B. Lieburg, from Phan. spec. in N. Y. Bot. Gard. 765.

Juncus oxymetris Engelm.—St. Johns, Multnomah Co., July 28, 1902, E. P. Sheldon, from Phanerogamic specimen in National Museum 11019.

This species has not been connected with any aecial form. From field observations made by the writer in Oregon it seems probable that the aecia are to be looked for on *Aster*.

195. UROMYCES LUPINI Berk. & Curt. Proc. Am. Acad. 4: 126. 1858.

Nigredo Lupini Arth. Résult Sci. Congr. Bot. Vienne 344. 1906.

ON LEGUMINOSAE:

Lupinus laxiflorus Dougl.—Garden Home, Multnomah Co., Aug. 1909, 1828, July 20, 1915, 3240.

Lupinus rivularis Dougl.—Springbrook, Yamhill Co., May 14, 1914, F. D. Bailey, 1528.

Lupinus sp.—Mt. Hood, Aug. 31, 1901, E. W. D. Holway, Aug. 9, 1914, 3227; Bonneville, Multnomah Co., Aug. 11, 1910, 1074, 1088; Philomath, May 10, 1914, 3108; Springbrook, Yamhill Co., June 22, 1914, F. D. Bailey, 3111; Jetty, Lincoln Co., July 19, 1915, VanGundia, 3131; Newport, Lincoln Co., July 20, 1915, 3264; Hood River, July 23, 1915, 3020; Eddyville, Lincoln Co., Aug. 9, 1915, Hoerner, 3180.

196. UROMYCES MEDICAGINIS Pass. in Thüm. Herb. Myc. Oecon. 156. 1874.

Nigredo Medicaginis Arth. N. Am. Flora 7: 256. 1912.

ON LEGUMINOSAE:

Medicago lupulina L.—Albany, Linn Co., Aug. 1907, David Griffiths; Medford, Jackson Co., June 26, 1915, G. B. Posey, 3057.

The aecia of this species in Europe have been shown by Schroeter (Krypt. Fl. Schl. 3¹: 306. 1887) and by Treboux (Ann. Myc. 10: 74. 1912) to occur on various species of *Euphorbia*.

No aecia in America have been found which can be referred to this species. There is, however, no evidence at present available for believing the American species different from the European.

197. UROMYCES MINIMUS Davis, Bot. Gaz. 19: 415. 1894.

Nigredo minima Arth. Résult Sci. Congr. Bot. Vienne 344. 1906.

ON POACEAE:

Muhlenbergia comata (Thurnb.) Benth.—Wallowa Valley, Wallowa Co., July 28, 1900, Wm. C. Cusick.

Muhlenbergia racemosa (Michx.) B.S.P.—Wallowa Valley, Wallowa Co., July 28, 1900, Wm. C. Cusick.

198. UROMYCES OBLONGA Vize, Grev. 5: 110. 1877.

Uromyces minor Schröt. Krypt. F. Schles. 3¹: 310. 1887.

Uromycopsis minor Arth. Résult Sci. Congr. Bot. Vienne 345. 1906.

ON LEGUMINOSAE:

Trifolium albopurpureum T. & G.—Corvallis, E. R. Lake, 3229.

Trifolium dubium Sibth.—Corvallis, Apr. 10, 1914, F. D. Bailey, 1522; Orenco, Washington Co., June 13, 1914, 3228; Yaquina, Lincoln Co., July 17, 20, 1915, 3100; Gerlinger, June 22, 1914, G. B. Posey, 3231.

Trifolium eriocephalum Nutt.—Corvallis, July, 1910, 1989.

Trifolium Hallii Howell—Corvallis, June 6, 1899, E. R. Lake, 3232, May 12, 1903, A. H. Post, 3230.

Trifolium microdon H. & A.—Corvallis, May 11, 1907, E. R. Lake, 1498.

Trifolium oliganthum Steud.—Corvallis, May 11, 1914, F. D. Bailey, 2513.

Trifolium procumbens L.—Corvallis, June 22, 1901, L. C. M., 1833, July, 1910, 1176.

Trifolium tridentatum Lindl.—Philomath, June 24, 1914, 1345; Corvallis, May 28, 1903, E. R. Lake, 3236, May 11, 1914, F. D. Bailey, 3235.

This ophis-form is very common on native *Trifolium* sp. The original collection by Harkness was reported as occurring on "Bur cloves" now considered an error for *Trifolium*.

199. UROMYCES OCCIDENTALIS Diet. Hedwigia Beibl. 42: 98. 1903.

Nigredo occidentalis Arth. N. Am. Flora 7: 252. 1912.

ON LEGUMINOSAE:

Lupinus sp.—Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 248.

200. UROMYCES PERIGYNIUS Halsted, Jour. Myc. 5: 11. 1889.

Nigredo perigynia Arth. Résult Sci. Congr. Bot. Vienne 344. 1906.

ON CYPERACEAE:

Carex arthrostachya Olney—Corvallis, July, 1910, 1191, 1192.

This species is morphologically indistinguishable from *P. Asterum* (cf. 69) in all spore stages except in the possession of one-celled teliospores. Like that species the aecia occur on *Aster* and *Solidago*. The genetic connection was established by Arthur in repeated experiments (Jour. Myc. 10: 16. 1904; Mycol. 4: 21. 1912, 7: 75. 1915, 7: 83. 1915). Fraser (Mycol. 4: 181. 1912) has confirmed Arthur's results in part.

The above collection is the only one so far known from the Pacific coast.

201. UROMYCES PLUMBARIUS Peck, Bot. Gaz. 4: 127. 1906.

Nigredo plumbaria Arth. Résult Sci. Congr. Bot. Vienne 344. 1906.

ON ONAGRACEAE:

Pachylophus marginatus (Nutt.) Rydb.—Snake River, E. Oregon, June 3, 1901, W. C. Cusick (Phan. spec. 2542).

Pachylophus montanus (Nutt.) A. Nels.—Crooked River, Crook Co., July 3, 1901, W. C. Cusick (Phan. spec. 2633).

This species is correlated in morphological characters with *P. Epilobii-tetragoni* (cf. 99).

202. UROMYCES POLYGONI (Pers.) Fuckel, Symb. Myc. 64. 1869.

Puccinia Polygoni Pers. Neues Mag. Bot. 1: 119. 1794.

Nigredo Polygoni Arth. Résult Sci. Congr. Bot. Vienne 344. 1906.

ON POLYGONACEAE:

Polygonum aviculare L.—Corvallis, Sept. 4, 1914, 1929; Clatskanie, Columbia Co., Oct. 6, 1914, F. D. Bailey, 1945; Medford, Jackson Co., June 20, 1915, G. B. Posey, 3055.

203. UROMYCES POROSUS (Peck) comb. nov.

Aecidium porosum Peck, Bot. Gaz. 3: 37. 1878.

Uromyces coloradensis Ellis & Ev. Erythea 1: 204. 1893.

Uromycopsis porosa Arth. Résult Sci. Congr. Bot. Vienne 345. 1906.

ON LEGUMINOSAE:

Vicia americana Muhl.—Orenco, Washington Co., April 23, 1915, I, 1161, June 13, 1914, III, 3237.

The two collections were made at the same spot on different dates. The first consists of aecia only and the second of telia only.

204. UROMYCES PROEMINENS (DC.) Pass.; Rabh. Fungi Eur. 1795. 1873.

Uredo proeminens DC. Fl. Fr. 2: 235. 1805.

Nigredo proeminens Arth. N. Am. Flora 7: 259. 1912.

ON EUPHORBIACEAE:

Euphorbia glyptosperma Engelm.—Wasco Co., July 23, 1885, W. N. Suksdorf (from Phan. spec. in N. Y. Bot. Gard.).

Euphorbia oregonensis Millsp.—Horse Creek Canyon, Wallowa Co., May 20, 1897, E. P. Sheldon, 8115.

205. UROMYCES PUNCTATUS Schröt. Abh. Schles. Ges. 48: 10. 1870.

Nigredo punctata Arth. N. Am. Flora 7: 253. 1912.

ON LEGUMINOSAE:

Astragalus Purshii Dougl.—Austin, Grant Co., Aug. 1915, J. R. Weir, 236.

The aecia of this species have been shown by European authors to occur on *Euphorbia cyparissias*. No aecial collections have been made in America.

206. UROMYCES SCIRPI (Cast.) Burrill, Bot. Gaz. 9: 188. 1884.

Uredo Scirpi Cast. Cat. Pl. Mars. 214. 1845.

Nigredo Scirpi Arth. Résult Sci. Congr. Bot. Vienne 344. 1906.

ON CYPERACEAE:

Scirpus paludosus A. Nels.—Waldport, Lincoln Co., Aug. 23, 1915, F. D. Bailey, 3323.

This species was first shown by Dietel (*Hedwigia* 29: 149. 1890) to have its aecia on *Sium latifolium* and *Hippurus vulgaris*. Other investigators have added other Umbelliferous hosts to the list.

In America Arthur (*Jour. Myc.* 13: 199. 1907; 14: 17. 1908; *Mycol.* 1: 237. 1909) has shown that *Cicuta maculata* is an aecial host. Fraser (*Mycol.* 4: 178. 1912) has confirmed Arthur's work. Aecia on other hosts are properly referred here on morphological grounds. The species can doubtless be separated into a number of biological forms when more extensive culture work has been conducted.

207. UROMYCES SILPHII (Burrill) Arth. *Jour. Myc.* 13: 202. 1907.

Aecidium compositarum Silphii Burrill; DeToni in Sacc. *Syll. Fung.* 7: 798. 1888.

Uromyces Junci-tenuis Sydow, *Monog. Ured.* 2: 289. 1910.

Nigredo Silphii Arth. N. Am. Flora 7: 239. 1912.

ON JUNCACEAE:

Juncus occidentalis (Cov.) Wieg.—Corvallis, Aug. 10, 1911, 1187, June 24, 1914, F. D. Bailey, 1387, July 29, 1914, 1445; Philomath, Jan. 6, 1914, 1108, May 10, 1914, 3393; Hood River, July 24, 1915, 3392.

Arthur (*Jour. Myc.* 13: 202. 1907; 14: 17. 1908) has shown that this common species has its aecia on *Silphium*. Using telial material on *J. tenuis* from Indiana, West Virginia and Nebraska, five successful

infections of *Silphium perfoliatum* were obtained, all of which resulted in the development of pycnia and aecia. The aecia on *Silphium* have been collected, so far as known to the writer, only in the Mississippi Valley from Ohio to Wisconsin, Kansas and Missouri, on three species of *Silphium*. The range of the telial collections referred here, however, is much greater including nearly the entire United States and Canada except the south Pacific slope. It seems probable that some plants other than *Silphium*, at present unrecognized, also serve as aecial hosts for this species.

208. UROMYCES SOLIDAGINIS (Sommerf.) Niessl, Verh. Natur.-Ver. Brüm. 10: 163. 1872.

Caeoma Solidaginis Sommerf. Suppl. Fl. Lapp. 234. 1826.

Telospora Solidaginis Arth. Résult Sci. Congr. Bot. Vienne 346. 1906.

ON CARDUACEAE:

Solidago sp.—Dufur, Wasco Co., June 30, 1914, 1336.

This is the only micro-Uromyces occurring in both Europe and America. This species shows a morphological correlation with *P. Asteris* (cf. 70).

209. UROMYCES SPRAGUEAE Hark. Bull. Calif. Acad. Sci. 1: 36. 1884.

Uromycopsis Spragueae Arth. Résult Sci. Congr. Bot. Vienne 345. 1906.

ON PORTULACAEAE:

Calyptridium roseum Wats.?—Crater Lake, Klamath Co., 7,000 ft., Sept. 22, 1913, E. P. Meinecke, CrPkD (2) 11.

Spraguea multiceps Howell—Strawberry Mt., Grant Co., Sept. 2, 1913, W. E. Lawrence, 1177.

210. UROMYCES SUBSTRIATUS Sydow, Ann. Myc. 4: 30. 1906.

Nigredo substriata Arth. N. Am. Flora 7: 253. 1912.

ON LEGUMINOSAE:

Lupinus sp.—Austin, Grant Co., Aug. 1915, J. R. Weir, 150.

211. UROMYCES TRIFOLII (Hedw. f.) Lev. Ann. Sci. Nat. III, 8: 371. 1847.

Puccinia Trifolii Hedw. f.; DC. Fl. Fr. 2: 225. 1805.

Nigredo Trifolii Arth. Result Sci. Congr. Bot. Vienne 344. 1906.

ON LEGUMINOSAE:

Trifolium hybridum L.—Corvallis, Aug. 1909, 3092; Hood River Co., May 14, 1914, 3091, Aug. 5, 1914, 3095; Portland, June 11, 1914, 3233; Springbrook, Yamhill Co., June 22, 1914, G. B. Posey, 3103; Garden Home, Multnomah Co., July 15, 1914, F. D. Bailey, 1508; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 217.

212. UROPYXIS SANGUINEA (Peck) Arth. N. Am. Flora 7: 155. 1907.
Uromyces sanguineus Peck, Bot. Gaz. 4: 128. 1879.
Puccinia mirabilissima Peck, Bot. Gaz. 6: 226. 1881.

ON BERBERIDACEAE:

Berberis aquifolium Pursh—Sauvies Island, Multnomah Co., Apr., 1882, Joseph Howell; Siskiyou, Jackson Co., May 31, 1894, E. W. D. Holway (Barth. N. Am. Ured. 1400); Corvallis, March 26, 1908, C. C. Cate, 3382, April 13, 1908, F. L. Griffin, 3383, March 14, 1913, 1137; Philomath, Jan. 1, 1914, 1153; Tualatin, Washington Co., March 25, 1915, F. D. Bailey, 2616; Grant's Pass, Josephine Co., Sept. 3, 1916, J. R. Weir, 182a.

Berberis pumila Greene, Pokegama, Klamath Co., July 9, 1903, E. B. Copeland (Sydow, Ured. 1777; Baker, Pacific Coast Fungi 3708).

FORM GENERA

213. AECIDIUM ALLENII Clinton in Peck, Rep. N. Y. State Mus. 24: 93. 1872.

ON ELAEAGNACEAE:

Lepargyrea canadensis (L.) Greene—Strawberry Mt., Grant Co., Sept. 2, 1913, W. E. Lawrence, 1113; Sumpter, Baker Co., June, 1913, J. R. Weir, 6; Gold Center, July, 1914, H. F. Wilson, 1842.

214. AECIDIUM COLLINSIAE Ell. & Ev. Bull. Washb. Lab. 1: 4. 1884.
Aecidium Tonellae D. & H. Erythea 3: 77. 1895.

ON SCROPHULARIACEAE:

Collinsia parviflora Lindl.—Philomath, April 20, 1912, 1169.

This species is evidently an heteroecious form known otherwise only from Washington on the above host and on *C. Rattoni* and *C. tenella*.

It is apparently distinct from *P. Collinsiae* P. Henn. (Hedwigia 37: 269. 1898) as stated by Hennings. The aecia of the latter, judging from the description, arise from a limited mycelium. There is no evidence of telia in any of the collections of *A. Collinsiae* examined. *P. Collinsiae* has evidently been collected but once and material is not available for examination.

215. AECIDIUM COLUMBIENSE Ell. & Ev. Erythea 1: 206. 1893.

ON CICHORIACEAE:

Hieracium albiflorum Hook.—Hood River, road to Lost Lake, May 16, 1915, 3245.

Hieracium sp.—Bridal Veil, Multnomah Co., May 18, 1915, 3291.

The aecia arise from a distributed mycelium and are not followed by any other stage. *Puccinia Hieracii* may however occur on the

same plants and even on the same leaves. Sydow (Ann. Myc. 1: 326. 1903) described *P. sejuncta* on such a mixture.

216. *AECIDIUM DELPHINII* Barth. Jour. Myc. 8: 173. 1902.

Aecidium Batesianum Barth. in E. & E. Fungi Col. 1901. 1904.

ON RANUNCULACEAE:

Delphinium depauperatum Nutt.—Mary's Peak, Benton Co., May 21, 1915, 3216.

Delphinium sp.—Corvallis, April 11, 1915, 2615; Redmond, Crook Co., May 15, 1915, 3327.

This species is possibly identical with aecia on other Ranunculaceous hosts referred to *P. Clematidis* (cf. 85). For purposes of this list it is retained as a separate form as no cultures have been conducted.

217. *AECIDIUM GRAEBNERIANUM* Henn. Hedwigia 37: 273. 1898.

Aecidium Alaskanum Trelease, Harr. Alaska Exp. 5: 37. 1904.

ON ORCHIDACEAE:

Limnorchis dilatata (Pursh) Rydb.—Horse Lake, Cascade Mts., Aug., 1909, J. C. Bridwell, 3322.

This unconnected *Aecidium* is doubtless heteroecious since no other stages have been found following the aecia on any of the collections examined. The species is known otherwise only from Alaska and in the mountains of British Columbia, Montana and California.

218. *PERIDERMIMUM COLORADENSE* (Diet.) Arth. & Kern, Bull. Torrey Club 33: 426. 1906.

ON PINACEAE:

Picea Engelmannii Parry—Whitman National Forest, Wallowa Co., July, 1913, J. R. Weir, 277.

This species forms large witches' brooms.

219. *PERIDERMIMUM ORNAMENTALE* Arth. Bull. Torrey Club 28: 665. 1901.

ON PINACEAE:

Abies concolor (Gord.) Parry—White Pine, Baker Co., June, 1913, J. R. Weir, 145.

Abies nobilis Lindl.—Larch Mt., Multnomah Co., Aug., 1910, 3293.

220. *Uredo Phoradendri* sp. nov.

O. Pycnia not seen.

II. Uredinia amphigenous, gregarious, not crowded, spots not conspicuous, punctate; rounded or slightly elongated, 0.4–0.8 mm. across, tardily naked, somewhat pulverulent, bright orange, dehiscent by an elongate or irregular fissure of the epidermis, ruptured epidermis conspicuous and persistent; peridium membranous, at first hemispherical, remaining closely adherent to the ruptured epidermis,

made up of colorless isodiametric cells, 14–19 μ across, sometimes somewhat rhomboidal, smooth, wall 1–1.5 μ thick; urediniospores ellipsoid or obovoid, 17–33 by 26–32 μ , wall colorless, 1.5–2.5 μ thick, very closely and minutely echinulate, pores very indistinct, 10–12, scattered.

III. Telia unknown.

ON LORANTHACEAE:

Phoradendron villosum Nutt.—Corvallis, Sept. 21, 1915, C. E. Owens, 3377 type.

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