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CONTRIBUTIONS FROM THE CRYPTOGAMIC LABORATORY
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LXXI. — *PRELIMINARY DESCRIPTIONS OF NEW SPECIES
OF RICKIA AND TRENOMYCES.*

BY ROLAND THAXTER.

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LXXI.—PRELIMINARY DESCRIPTIONS OF NEW SPECIES
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RICKIA.

THE genus *Rickia* has proved to be a large and varied one, and although I have enumerated below only those forms parasitic on Acari which have come under my notice, many others are known to me on a variety of hosts, an account of which I have reserved for a future paper. The general habit appears to be very variable, including in addition to the condition seen in the type form, others in which the median cell-series is undeveloped, as well as various species with a more or less complicated system of branches. The antheridial characters, moreover, appear to be equally variable. Not only do the antheridia which are extraordinarily abundant in some species seem wholly lacking in others, but their character may vary in different cases. In some there may be a single antheridium, only, similar to that of *Peyritschiella*, definitely placed at the base of the perithegium; or an antheridium of this type may be associated with others of the normal habit variously disposed. Again even in forms having the three characteristic cell series, antheridia may be present like those of the genus formerly separated as *Distichomyces*, each antheridial cell becoming more or less free in a compact group. Since both the antheridial characters and those of the receptacle thus appear to be so variable, it has not seemed desirable to limit the genus to the type form as illustrated by *Rickia Wasmanni*, and I have therefore given it a more liberal interpretation; including under it forms with two or with three cell-series, whether they be simple or branched, and whether their antheridia be of the *Rickia* or the *Distichomyces* type. The latter genus is, therefore, abandoned, one species only, ***Rickia Leptochiri***, being involved in this change.

The only American form, *R. minuta*, thus far recorded on Acari, has been described by Paoli ("Redia," Vol. VII, fasc. 2, 1911, republished in Malpighia, Vol. XXIV, 1912) from immature specimens with undeveloped perithecia, a practice which it is surely most desirable to avoid in the systematic study of a group which presents such great difficulties as do the Laboulbeniales. I have been fortunate, however, in obtaining abundant material of this species, fully matured, from the Amazon region, for which as well as for other hosts, I am indebted to the kindness of Mr. W. H. Mann who has allowed me to look over his collections made on the Leland Stanford Expedition in 1911. I am further greatly indebted to the kindness of Messrs. T. Petch, Geo. Schwab and J. B. Rorer who have most generously collected or caused to be collected for me numerous insects, in Ceylon, Kamerun and Trinidad respectively, from among which a majority of the following hosts were obtained. I am also indebted for two species of Acari collected in Grenada to Mr. C. T. Brues and kindly placed at my disposal; while lastly I am much indebted to Mr. Nathan Banks for his determinations of the host-genera.

In the following diagnoses I have assumed that the side bearing the perithecium is "anterior." The spore measurements are for the most part made within the perithecium.

***Rickia furcata* nov. sp.**

Furcate, sometimes irregularly branched. Basal cell short and rather stout, the receptacle above it dividing in two straight divergent branches; an anterior, bearing a perithecium, and a posterior. Anterior branch consisting of a series of usually eleven cells, the lower superposed horizontally, the upper obliquely; all cutting off appendiculate cells externally; the series extending nearly to the apex of the perithecium, to which it is united throughout its length; the second cell of the series extending inward below the base of the latter, the outline of which is symmetrically subfusiform, the inner lip-cell protruding as a finger-like process. Posterior branch indeterminate, formed by a double series of cells which are more or less regularly paired above the second cell of the outer row, the third cell bearing the primary appendage on its narrow subtending and long cylindrical basal cell; many, but not all of the cells above in both rows cutting off distally and externally small cells which bear well-developed appressed appendages or antheridia (?). Appendages subcylindrical, $8-16 \times 2.5 \mu$. Perithecium $30-40 \times 8-10 \mu$, including terminal projection

(2.5–3 μ). Spores about $25 \times 2.5 \mu$. Total length to tip of perithecium 40–70 μ , to tip of posterior branch 50–175 μ .

On *Euzercon* spp. No. 2431, Trinidad; No. 2236, Manaos, Amazon; No. 2058, Grenada, W. I.

This species, and to a more marked degree the following, depart greatly from the normal type, and would be placed in a new genus with little hesitation were it not for the structure which characterizes various others of the many undescribed species known to me. It is evident that the "posterior branch" is an indeterminate proliferation beyond the primary appendage, which appears to involve both the "median" and the "posterior" marginal series of the more normal forms. The receptacle, especially when a primary perithecium fails to develop, may become variously branched and more than one secondary perithecium may be produced. Antheridia of a type like that of *Distichomyces* appear to be developed externally on the posterior branch nearer the base. The specimens from Brazil and Trinidad seem to be identical, although those from Grenada, though otherwise similar, are constantly somewhat smaller.

***Rickia arachnoidea* nov. sp.**

Basal cell rather short and stout, the receptacle above it dividing into two usually furcate arachnoid branches; an anterior on which a perithecium is produced, and a posterior. Anterior branch indeterminate, consisting of two parallel series of cells usually not opposite, irregularly appendiculate, furcate at a variable distance from its base; one of the branchlets sterile, often greatly elongated; the other short but variable, bearing a perithecium which on one side is usually united to the upper six cells, some of them appendiculate, which continue one of the two series forming the perithecial branchlet which thus extends to the apex of the perithecium, beside which it terminates in a short brown appendage: the perithecium long, slightly and nearly symmetrically inflated, the tip bent distally abruptly sidewise; the other row of the perithecial branchlet ending horizontally or obliquely below the base of the perithecium and consisting of from three to eight cells, some of which are appendiculate. Posterior branch indeterminate, furcate, usually, just above its first to fifth pair of cells, the cells of the two indeterminate branchlets not paired, irregularly appendiculate, indeterminate, usually greatly elongated: the second cell of the main receptacle below its furcation bearing the large long nearly cylindrical basal and subtending cells

of the primary appendage, which may be on either side. Appendages suffused with brownish, mostly rather short and stout, $7-18 \times 4 \mu$. Spores $30 \times 3 \mu$. Perithecia $70 \times 18-20 \mu$. Diameter of branches $8-10 \mu$, greatest length $460-520 \mu$, in largest specimens. Basal and subtending cell of primary appendage $18-20 \times 4 \mu$, the former rarely divided.

On *Discopoma* sp. Trinidad, No. 2433; on *Trachyuropoda* sp. Trinidad, No. 2429; also an immature specimen from the Amazon on same host; on *Euzercon* sp., Trinidad, No. 2432.

When normally developed this curious form appears to be more or less regular in its structure, as above described, but especially when injured or when the first perithecium aborts, secondary branching takes place, and more than one perithecium may be formed. That there is no significance in "anterior" and "posterior" as applied to the main branches of this form, is indicated by the variable position of the primary appendage beyond which they proliferate. The plant has a characteristic sprawling habit, its branches resting on the upper surface of its host, which is its usual position of growth. Unless it is viewed sidewise, the cell-series bordering the perithecium is not visible, and may thus be wholly overlooked. The appendages, as in all the species, are borne from small subtending cells. Among described species it is most nearly allied to *R. furcata*.

***Rickia anomala* nov. sp.**

Hyaline, rather strongly curved throughout above the basal cell. Median cell-series wanting. Basal cell wholly free, longer than broad, of nearly the same diameter throughout. Anterior series consisting of three or rarely four cells, subisodiametric, externally convex, subequal, without appendages. Posterior series of usually nine cells, the two or three lower larger, rounded; the rest smaller, subequal, irregularly rounded; the first, third, fifth, and seventh cells separating distally small cells which subtend appendages, the second cell subtending the basal cell of the primary appendage, which is relatively very large, wholly free, constricted at the base, terminated by a small cell which subtends the appendage proper; the latter somewhat smaller than the others, but otherwise similar, faintly brownish, bladder-like, roundish, or somewhat longer than broad. Perithecium directly continuous with the anterior series, externally wholly free, rather long and narrow, the tip well distinguished, narrowed, its lower half united on the inner side to the distal cell of

the posterior series, which ends in a minute suffused roundish hardly distinguishable cell; the inner lip-cell forming a finger-like straight free process. Spores about $25 \times 3 \mu$ (in perithecium). Perithecia $30-35 \times 8-10.5 \mu$. Basal cell $14-18 \times 5-6.5 \mu$. Basal and subtending cell of primary appendage $16-17 \times 7 \mu$. Appendages $9 \times 4.5-7 \times 6 \mu$. Total length $48-56 \times 14-16 \mu$.

On a minute mite belonging to a new genus, near *Iphiopsis*. Trinidad, No. 2440.

Although there are fourteen specimens of this peculiar species in various stages of development, none of them show any indication of the presence of an antheridium.

***Rickia Discopomae* nov. sp.**

Hyaline, becoming slightly soiled with dirty brownish throughout. Basal cell large, twice as long as broad. Main body of the receptacle of about the same diameter throughout, broadening slightly below the perithecium, usually rather strongly curved. Cells of the three cell-series small, subequal, squarish or subisodiametric, arranged in tiers of three cells each with some regularity; the middle series extending half way along the tip of the perithecium, its two or three terminal cells free beyond the base of the primary appendage, which terminates the posterior marginal row. Cells of the median row fifty to sixty in number, sometimes less; those of the anterior marginal row thirty to fifty; of the posterior marginal row fifty to sixty, the cells of both marginal rows cutting off appendiculate cells irregularly, except those of the posterior row opposite the perithecium which produce them uninterruptedly; the appendages and antheridia thus irregularly and rather sparingly distributed along the margins. Appendages short and usually inflated. Perithecium rather short and stout, the tip often somewhat bent outward, the apex blunt. Spores $30 \times 5 \mu$. Perithecium $48-52 \times 18-25 \mu$. Total length $250-350 \times 18-32 \mu$, measured below the perithecium. Appendages $7-10 \times 3-4 \mu$.

On superior surface of *Discopoma* sp. Peradenya, Ceylon, No. 2111.

The antheridia of this species are not certainly recognized, but appear to be of the type seen in "*Distichomyces*." The appendages appear to branch occasionally, becoming furcate, a condition possibly resulting from the proliferation of old antheridia.

***Rickia elegans* nov. sp.**

Basal cell hyaline; cells of median row small, rounded; those of marginal rows horizontally elongated or their axes directed upward somewhat obliquely, more than fifty cells in the posterior row, about twenty-five in the anterior; the cells at maturity in all the rows becoming deeply suffused with rich blackish brown and quite indistinguishable; all the cells of the marginal rows cutting off small cells which remain almost wholly hyaline and bear short appendages, their cup like bases rich brown, the distal portion hyaline. Perithecium wholly united on its inner side to the median row, the last two or three free cells of which reach to the middle of the short stout deeply suffused rather broad tip, which is bent rather abruptly outward; the apex hyaline, or translucent; the body nearly straight, about the same diameter throughout, rather narrow, rich brown, not as deep as the tip, the outer margin somewhat irregular, continuous with that of the receptacle below. The whole plant straight or curved, tapering gradually from apex to base. Perithecium $65-85 \times 20 \mu$. Appendages about $15 \times 4 \mu$. Total length $200-220 \times 35-40 \mu$.

On legs and margin of body of *Discopoma* sp. Peradeniya, Ceylon, No. 2110.

This species is very closely allied to *R. Berlesiana* Paoli (Bac.), differing chiefly in its much more numerous cells, which are smaller and differently arranged and the total suffusion of the receptacle. In fully mature specimens, the perithecium is concolorous with the receptacle, and not distinguishable from it.

***Rickia cristata* nov. sp.**

Basal cell three times as long as broad, its upper half or less included between the lower cells of the marginal rows. Posterior row crest-like, the cells radially elongated, each separating several appendiculate cells, the pointed bases of which are intruded between them nearly to their bases, the appendiculate cells becoming so multiplied, where the series curves over against the tip of the perithecium, that the primary cells are obliterated; the primary cells of this series about eighteen, the appendiculate cells thirty-six to forty: the anterior series extending slightly beyond the middle of the perithecium, the base of which it incloses, consisting of three or four cells from which a number of appendiculate cells are cut off, as in the posterior series,

one or two of the uppermost bearing pointed antheridia: the appendages six to eight: the middle series of six flattened cells lying along the inner margin of the perithecium for a little more than two thirds of its length. Perithecium rather short and stout, slightly curved, the apex blunt and opposite the bases of the distal appendages of the posterior series, the tip well distinguished externally. Spores $30 \times 4 \mu$. Perithecium $45 \times 18 \mu$. Free portion of the basal cell about 18μ ; the rest of the plant $60-75 \times 48-52 \mu$. Appendages $16-25 \times 4 \mu$, becoming brownish and subtended by the usual dark cup-like base.

On the inferior surface of a mite parasitic on *Prioscelis* sp. (?) and belonging to a new genus near *Cilliba*. Kamerun, No. 2438.

A species closely allied to *R. Coleopterophagi* Paoli and *R. minuta* Paoli, differing in the form of its appendages and the arrangement of its cell-series. The single type of *R. Coleopterophagi* as well as those of *R. minuta*, are immature, so that it is not possible to judge of the perithecial characters in these species. The latter, however, has been received from Brazil (Mann) on various mites parasitic on Scarabaeidae, and an abundance of well matured individuals are available for comparison. The species though very variable is quite well distinguished from the one above described. The tip of its perithecium is wholly free; the cells of the middle series vary considerably in number and extend as far as those of the posterior series, which is more nearly vertical, the general habit of the plant being more slender; the basal cell is not intruded between the lower cells of the anterior and posterior series and there are other differences.

***Rickia pulchra* nov. sp.**

Basal cell variably developed, more often short, the upper half enclosed by the lower cells of the marginal series; or long and very stout distally. Posterior marginal series consisting usually of four cells, the lower opaque blackish brown bearing distally a very minute rounded appendage, the next above somewhat rounded and cutting off a small cell which subtends an antheridium, the third large triangular, its pointed end directed upward, and cutting off three to five appendiculate cells which lie external to it; the uppermost small, flattened, distally pointed, separating a single minute cell which lies external to it and subtends a small short brownish spine-like appendage: the anterior series consisting of three cells, similar to and symmetrical with the corresponding cells of the posterior series, and

bearing an antheridium and appendages in a similar fashion so that the individual is bilaterally subsymmetrical: the middle series consisting of but two flattened cells, the upper, its broader extremity free beyond the distal cell of the posterior series, nearly twice as long as the lower, which is opaque below and forms with the two lower cells of the two other series a suffused area in which cell-divisions are not visible and which extends upward so as to involve the lower half of the perithecium; the tip of which is nearly free, usually bent slightly toward the anterior series, and subtended anteriorly by a straight appendage about $15 \times 3 \mu$, suffused towards the base, and apparently the indurated base of the trichogyne. Appendages nearly symmetrical on either side, long and slender, hyaline, becoming deeply suffused at and towards the base, cylindrical, tapering slightly at base and apex. Antheridia normally solitary, borne distally from the subbasal cells of the two marginal series, hyaline, the necks purplish, curved outward. Spores, in perithecium about $22 \times 3.5 \mu$. Perithecia $35-40 \times 15 \mu$. Basal cell $18-50 \times 6-15 \mu$. Appendages $35-60 \times 4-6 \mu$. Total length exclusive of stalk $48-56 \times 35-38 \mu$.

On the inferior surface and legs of *Macrocheles* sp. and *Celaenopsis* sp. Kamerun, Nos. 2438, 2439.

A very beautiful species, quite unlike any other known form. The specimens on *Celaenopsis* are somewhat smaller.

***Rickia obcordata* nov. sp.**

Hyaline. Basal cell bent, its pointed upper half filling the sinus of the slightly asymmetrical obcordate body. The marginal series consisting of typically six cells each and subsymmetrical with one another, the posterior shorter, terminated by the slender basal cell of the primary appendage which, like all the appendages and the antheridia, projects radially in a more or less regular fashion: basal cells of the marginal series radially extended, broad and rounded externally, separating a small triangular cell above, which subtends an appendage symmetrically placed on either side of the body, the second and third cells of both series separating externally three to four small cells which subtend each an antheridium, the necks quite hyaline projecting more or less radially, usually straight, the third cell on the posterior side usually bearing an appendage distally: the fourth and fifth an antheridium and an appendage, or an appendage only in both series, except in cases where there are but five cells in the posterior series, the uppermost of which always subtends the

primary appendage; the sixth cell of the anterior series producing neither appendage nor antheridium. Appendages subcylindrical, several times as long as broad, faintly suffused above the conspicuous blackened slightly constricted base. Median series consisting of five cells successively smaller from below upward, the three lower rounded, the uppermost triangular, its upper face free below the slightly projecting truncate or bluntly rounded free tip of the perithecium. The latter otherwise completely enclosed, vertical or slightly oblique, and lying almost wholly anterior to the median axis. Perithecium $60 \times 25 \mu$. Body $90-100 \times 78-85 \mu$. Basal cell including foot $28-35 \times 15-18 \mu$. Appendages $24-35 \times 5 \mu$. Projecting antheridia 12μ .

On a minute mite. Kamerun, No. 2441.

A very minute form characteristic from its obcordate almost symmetrical form and radiating antheridia and appendages.

***Rickia elliptica* nov. sp.**

Hyaline, elliptical to nearly circular in outline. Basal cell very short, sometimes entirely included in the angle between the inner surfaces of the basal cells of the marginal rows, the foot, only, projecting beyond the general outline of the main body. Anterior marginal row consisting of from five to eight cells subradially elongated, the two uppermost extending downward to sharp points, all or nearly all cutting off distally a small triangular appendiculate cell; the appendage which terminates the distal cell appressed against the free anterior face of the tip of the perithecium: posterior marginal row consisting of from seven to nine cells, similar to the anterior series except that the upper cells are smaller, the uppermost much smaller, bearing distally the basal cell of the primary appendage which is small, narrow, free, not greatly longer than the subtending cell of the very small appendage; other appendages stouter, short, irregular with slightly suffused bases. Median series of six to eight cells, one to three of the terminal ones externally free above the basal cell of the primary appendage, the successive cells subisodiametric, somewhat irregular in outline, and not greatly differing in size. Perithecium almost wholly inclosed, the tip free externally, slightly bent outward below the apex which is subtended on its inner side by an erect finger-like upgrowth, geniculate at its base; body of the perithecium rather long and narrow, subsymmetrical. Spores (in perithecium) $22 \times 2.5 \mu$. Perithecium $30-40 \times 10-12 \mu$, not includ-

ing the projection which is $7 \times 2 \mu$. Basal cell, including foot, $8-16 \mu$. Total length of body $50-66 \times 35-40 \mu$.

On legs of *Discopoma* sp. Trinidad, No. 2433.

Although seven specimens in perfect condition and of various ages have been examined, I have seen no indication of an antheridium. The base of the trichogyne persists as a minute dark rounded body below the base of the upgrowth from the inner terminal wall-cell.

***Rickia inclinata* nov. sp.**

Minute, hyaline, of irregularly rounded form. Basal cell forming a well defined slender stalk, the upper third or half inserted in the angle between the two basal cells of the marginal rows. Anterior marginal row not extending above the base of the perithecium, consisting of two radially elongated cells which are subequal and cut off distally and externally two to three appendiculate cells: posterior marginal row consisting of seven cells like those of the anterior, externally convex, the second to the fourth more radially elongate than those above, which are successively smaller; the basal usually separating one, the rest two appendiculate cells distally and externally; the terminal cell much flattened followed by the broad basal cell of the primary appendage, which appears to be a member of the series, its inner margin in contact with the fourth cell of the median series: median series of four subequal irregularly rounded cells. Perithecium stout, its axis straight and characteristically tilted inward at a slight angle to that of the receptacle, its base in contact with the distal cell of the anterior series, externally wholly free; the tip quite free, bent very slightly outward, the apex broad, flat, each lip-cell projecting very slightly and somewhat irregularly. Spores $25 \times 3 \mu$ (in perithecium). Perithecium $38-40 \times 11 \mu$. Basal cell, including foot, $25 \times 8 \mu$. Total length of body to tip of perithecium $50 \times 41-44 \mu$. Appendages hyaline, tapering very slightly, $16 \times 3 \mu$, with clearly defined dark basal septa.

On a minute mite, as yet undetermined. Trinidad, No. 2307.

A characteristic and minute species, distinguished by its tilted perithecium, which is externally free. It is closely allied to *R. Celae-nopsis*, from which it differs in the number and arrangement of its cells, etc. I have been unable to determine the presence of an antheridium in either of the two adult types.

Rickia Celaenopsis nov. sp.

Hyaline, minute, somewhat angular in outline. Basal cell forming a well developed stalk, the upper third or less inserted in the angle between the two basal cells of the marginal rows. Anterior series consisting of two cells, the lower characteristically triangular in form, its outer margin straight and evenly continuous with that of the upper cell, which is radially elongated and cuts off distally an appendiculate cell which is relatively very long, its distal half or two thirds projecting free beyond the margin and subtending a relatively very large and long antheridium which projects above it just at the base of the perithecium: posterior series consisting of typically six cells, the basal like that of the anterior series, triangular, but cutting off distally a slightly prominent appendiculate cell; the four cells above obliquely elongated, lying subparallel, and separating distally a conspicuously protruding upturned appendiculate cell; the terminal cell triangular, subtending the wholly enclosed sublenticular basal cell of the primary appendage, the subtending cell of which is free, bell- or dome-shaped, bearing a rather stout appendage. The appendages subcylindrical, several times longer than broad, rarely furcate, with the usual dark subtending base: median series consisting of usually six cells, the basal and distal somewhat larger, the rest squarish or slightly compressed, subequal, the upper margin of the distal cell free, its oblique wall very thick and directly continuous with the margin of the tip and the distal portion of the venter of the perithecium which rise erect beyond it. Perithecium thick walled, somewhat inflated, quite free and convex externally, erect or nearly so, the tip symmetrical, truncate conical, the apex flattened or slightly rounded. Spores $20 \times 3 \mu$ (in perithecium). Perithecium $40 \times 20 \mu$. Basal cell including foot $25 \times 8 \mu$. Total length of body to tip of perithecium, $50 \times 38 \mu$, largest. Antheridium about 12μ long.

On legs of *Celaenopsis* sp. Trinidad, No. 2426.

Closely allied to *R. inclinata*, but differing in many details of structure, the triangular form of the two basal cells of the lateral series giving it a characteristic appearance.

Rickia discreta nov. sp.

Hyaline, rather elongate. Basal cell relatively large and long, distally symmetrical, but slightly intruded between the lower cells of the marginal series. Anterior marginal series consisting of three

to four subequal obliquely separated cells, the lowest cutting off an appendiculate cell distally and externally, the upper an antheridium of the Peyritschiella-type, which subtends the base of the perithecium from which its hyaline sharply pointed stout extremity projects obliquely upward: posterior marginal series consisting of usually seven obliquely separated cells, usually the first, third and fifth, only, separating a rather large appendiculate cell; the uppermost cell triangular, its upper margin continuous with that of the distal cell of the median series, subtending the basal and large subtending cell of the primary appendage, the two latter subequal, the basal somewhat broader: median series consisting of normally six successively smaller, vertically slightly elongated cells. Perithecium erect, slightly curved outward distally, the tip free, the apex symmetrical, truncate, slightly papillate. Appendages relatively long and stout, yellowish, subcylindrical, the basal ring black and conspicuous; $15-25 \times 3.5 \mu$, the primary one $30-45 \mu$, its basal and subtending cells $10 \times 4 \mu$. Perithecium $25 \times 9 \mu$. Basal cell including foot $20 \times 7 \mu$. Total length to tip of perithecium $55-65 \times 18-22 \mu$.

On an undetermined gamasid mite. Trinidad, No. 2308.

This species is well distinguished by its large discrete yellowish appendages, somewhat elongate form, and large single antheridium. In one of the nine specimens examined a second antheridium is developed just below the first.

***Rickia spathulata* nov. sp.**

General form spathulate except for the projecting tip of the perithecium. Basal cell rather stout, its upper half or less inserted in the sharp angle between the lower cells of the marginal series. Anterior series consisting of six to eight cells, the lowest irregularly triangular, externally slightly concave, and without appendage, the rest usually but not always appendiculate, radially elongated, and slightly oblique upward; the subterminal cell bearing also an antheridium, the basal cell of which penetrates three fourths of its length; the terminal cell sometimes separating a second antheridium, its inner margin in contact with the lower two thirds of the perithecium, narrow, its extremity broader and convex: posterior series consisting of ten to thirteen cells, usually eleven, the lowest externally convex like the rest, the other members of the series each usually cutting off an appendiculate cell about half their length and lying between them; the upper ones successively narrower and more elongated radially;

the cells above the second or third curved inward in a somewhat crest-like series which lies parallel to the median series and the inner margin of the perithecium, the terminal cell of the series small, triangular, bearing the large basal cell of the primary appendage which, with the small subtending cell, forms a free straight projection, its axis bent inward at an angle of about 45° to that of the receptacle: median series consisting of eight to ten cells, the two or three lowest enclosed by the marginal series, the rest lying against the strongly convex inner margin of the perithecium, the free slightly convex margin of the uppermost reaching almost to the base of the free tip. Perithecium rather stout, its outer margin nearly straight, its inner convex, the outcurved tip, and externally a small portion of the body, free; the apex flat, protruding slightly externally. Spores $28 \times 3 \mu$, in perithecium. Perithecium $40-46 \times 16-20 \mu$. Basal cell, including foot, $28-33 \times 9-11 \mu$. Total length, not including primary appendage base, $12-16 \times 6-8 \mu$. Appendages $6 \times 2 \mu$ or smaller, wholly smoky brown, usually broken off, the dark base not conspicuous.

On legs of *Celaenopsis* sp. No. 2229, Amazon, "M. & M." (Mann No. 41).

A very well marked species peculiar for its more or less regularly spathulate outline, which is broken only by the projecting tip of the perithecium and the primary appendage. It is not nearly allied to other known acarine species, but is perhaps most nearly related to *R. minuta*.

***Rickia excavata* nov. sp.**

General form roughly triangular, distally concave. Basal cell three or four times as long as broad, its distal fourth included in the angle between the two lower cells of the marginal series. Anterior series consisting of four cells, the lower three subequal, usually all appendiculate, the uppermost vertically elongated, externally convex, extending to the middle of the venter of the perithecium: posterior series consisting of usually seven cells, the four lower similar to those of the anterior series, usually all appendiculate, the subtending cells hardly intruded between adjacent members of the series, the three terminal cells successively smaller, flattened, their septa at right angles to the axis of the series which they form, and which is continuous with that of the primary appendage and its basal and subtending cells, which, together with the two terminal cells of the posterior series form a free subtriangular projection directed at an angle of

somewhat over 45° to the axis of the body of the perithecium: the median series consisting of usually five cells, the lowest larger, longer than broad and lying mostly below the base of the perithecium; the three upper successively narrower, extending to the base of the tip of the perithecium, forming a series almost symmetrical with that of the three terminal cells of the posterior series and the primary appendage, the axes of the two series nearly at right angles. Tip of the perithecium wholly free, bent strongly inward, the apex abruptly distinguished, the lip-cells rather prominent, the inner more so, rounded; the body nearly vertical or inclined very slightly outward, rather long and narrow and symmetrically rounded basally and distally. Spores $18 \times 3 \mu$. Perithecium $30 \times 10 \mu$. Appendages subcylindrical, small, about $6 \times 2.5 \mu$. Basal cell $20 \times 6 \mu$. Total length to tip of perithecium $75 \times 34 \mu$, not including basal cell of primary appendage.

On *Celaenopsis* sp. Trinidad, No. 2427.

Clearly distinguished from other known species by its general form and excavated superior margin.

Rickia Euzerconalis nov. sp.

General form short-spathulate, hyaline. Basal cell very small and short, separating an appendiculate cell distally on the anterior side. Posterior marginal row consisting of usually eight, often nine cells, radially and obliquely but slightly elongated; all usually cutting off an appendiculate cell, except the distal one, which is small, triangular and subtends the large usually outcurved basal cell of the primary appendage which is free above it, two to three times as long as broad, and about the same diameter throughout: anterior marginal series consisting of usually five cells, more rarely four or six, the lowest separating an appendiculate cell below, which lies between it and the basal cell of the receptacle; the remaining cells large, each, except sometimes the lowest, separating an appendiculate cell distally; the uppermost extending to or beyond the middle of the perithecium with which its appendiculate cell with the appendage is in contact: median series consisting of almost invariably six, rarely five or seven, cells, not differing greatly in size, extending from just below the base of the perithecium nearly to its apex. Perithecium narrow, erect, its tip externally free, the inner lip-cell projecting as a short finger-like process. Appendages stout, yellowish-brown, $7 \times 3.5 \mu$. Spores $25 \times 2.5 \mu$. Perithecia $22-24 \times 8 \mu$. Basal cell including foot,

14-16 \times 6-8 μ . Total length to tip perithecium 50-70 \times 24-32 μ . Basal and subtending cell of primary appendage 12-15 \times 5 μ .

On *Euzercon* spp. Trinidad, Nos. 2432 and 2430; Kamerun, No. 2443.

This species is most nearly related to *R. Megisthani* from which it differs in its more complicated receptacle, larger size and more or less evenly spatulate outline. In this, as well as in the following species (*R. Megisthani*) the lowest appendage on the anterior side is subtended by a cell which lies external and inferior in relation to the lowest cell of this series, instead of distal, and has the appearance often of having been separated, not from this cell, but from the basal cell of the receptacle below and it is possible that this is its actual relation.

***Rickia Megisthani* nov. sp.**

Hyaline. Basal cell rather short and stout, obliquely separated from the basal cell of the anterior series, which is angular, subisodiametric and lies immediately below the base of the perithecium, cutting off an appendiculate cell which sometimes covers its whole outer margin, or more often lies external and inferior in relation to it; the series consisting of two other cells which are subequal, elongate; the base of the upper lying obliquely over the distal end of the lower, which may or may not cut off an appendiculate cell distally; the cell above it, sometimes lacking, with or without an appendiculate cell which lies in contact with the outer margin of the perithecium reaching to its upper third or half: the posterior series consisting of normally four cells, the lowest more often not appendiculate; the second and third equal and appendiculate; the fourth vertically elongated, its upper third or half quite free, straight or distally slightly geniculate and continued by the long free finger-like slightly curved basal cell of the primary appendage. Median series of three subequal cells, vertically placed and extending almost to the apex of the perithecium. Perithecium rather stout, its inner margin straight, its outer convex and one half to one third free; the tip very slightly bent inward; the outer lip-cell forming a small, short, finger-like projection. Appendages very short and small, 5 \times 2.5 μ . Spores 20 \times 2 μ . Perithecia 30-32 \times 8-117 μ . Basal cell, including foot, 16 \times 7 μ . Total length to tip of perithecium 50-60 \times 20-30 μ . The free termination of the posterior series, including basal and subtending cell of primary appendage 25-40 \times 5 μ .

On *Megisthanus* sp. Trinidad, No. 2435.

No antheridia have been seen in the numerous specimens examined. The species is very closely allied to *R. Euzerconalis* from which it differs in its smaller size, simpler structure and more irregular outline.

Var. **Trachyuropodae** nov. var. Similar in general to the type. Somewhat smaller, the distal cell of the anterior series extending cushion-like usually to the tip of the perithecium; the posterior series consisting of five cells, the distal one wholly enclosed or hardly protruding, directed slightly inward, bearing the more slender base of the primary appendage which is erect or curved very slightly outward. Appendages stouter.

On the thin anterior and lateral margins of *Trachyuropoda* spp. Ita-coatiara, Amazon, No. 2206, and Trinidad, No. 2429.

Abundant material of both type and variety have been examined and the differences noted seem constant, though not sufficient for specific separation.

Rickia Kameruna nov. sp.

Hyaline asymmetrical. Basal cell small and short, abruptly distinguished from the receptacle and from its broad pointed end, which is but slightly intruded between the two basal cells of the lateral series. Anterior series consisting of two cells without appendages, the upper partly overlapping the base of the perithecium which it subtends, and which is otherwise wholly free externally, rather long, its upper half bent slightly inward, the apex, only, free on the inner side, the outer and especially the inner lip-cell slightly prominent: the median series erect, consisting of five cells, the lowest not extending to the base of the perithecium: posterior series consisting of seven to eight cells, all except the upper one or two cutting off a relatively large appendiculate cell, the two lower slightly elongated radially, the rest very similar to those of the median series beside which they lie; the terminal one bearing terminally and externally the basal cell of the primary appendage which projects outward obliquely, its axis parallel to that of the free upper oblique margin of the terminal cell of the median series. Appendages rather stout, $10 \times 3 \mu$. Spores $18-20 \times 2 \mu$. Perithecium $30-34 \times 6-8 \mu$. Basal cell exclusive of foot 8μ . Total length to tip of perithecium $40 \times 20 \mu$. Basal cell of primary appendage, with subtending cell, 8μ .

On *Euzercon* sp. Kamerun, No. 2437.

Although the posterior series in this species is not extended to form an appendage, it seems as nearly related to *R. filifera* as to any of the other species, owing to the small development of its posterior series,

which leaves the external margin of the perithecium wholly free as in *R. Celaenopsis*. There appear to be two cells in the anterior series, the upper of which is almost concealed by the base of the perithecium. I have seen no indication of an antheridium in either of the three specimens from which the description has been drawn.

***Rickia filifera* nov. sp.**

Small and slender. Basal cell obliquely separated from the lower cell of the anterior marginal series which consists of two subequal cells; the upper extending a short distance upward external to the base of the perithecium: posterior series consisting of a variable number of cells (eight to fifteen) the basal extending above the base of the perithecium, the subbasal lying opposite to it; the third extending beyond its tip; the rest superposed to form a long, slender, erect, or slightly outcurved appendage, terminated by the undifferentiated basal cell of the primary appendage: the basal cell of the series, and many of the others, cutting off a small appendiculate cell distally and externally: median series consisting of two cells, the lower lying opposite the upper half or less of the perithecium, the upper in contact with the third and fourth cells of the posterior marginal series, its inner margin wholly free. Perithecium slender, the tip well distinguished externally and bent slightly outward, the inner lip-cell forming a short projection. Appendages slender, cylindrical, hyaline, $10 \times 2 \mu$. Spores $24 \times 2.5 \mu$. Perithecia $35-45 \times 8-12 \mu$. Basal cell including foot $12 \times 4-5 \mu$. Total length to tip of perithecium $35-45 \times 8-12 \mu$. Longest free flagellum, including primary appendage, 175μ .

On a very large mite allied to *Megisthanus*, on *Passali*. Kamerun, No. 2442.

This species varies considerably in size and in the length of the extension of its posterior marginal row. No antheridia have been recognized, although material of various ages is available. It is perhaps most nearly related to *R. Megisthani* but resembles it only remotely, and cannot be confused with it on account of its free "flagellum."

TRENOMYCES.

This very curious genus was first discovered by Chatton in France on Mallophaga infesting domestic fowls, and had been received by me from Dr. Müller who collected it at Elbing, Prussia, and from Dr.

Trinchieri who found it at Naples, before the appearance of the preliminary paper by Chatton & Picard in *Comptes Rendus* (CXLVI, p. 208, 1908) was published. It was thus discovered almost simultaneously in Italy, Germany and France, and has since been found in New England and received from various other parts of North America.

Having been interested to learn something further as to the distribution and characteristics of the species in this genus, I have made a special effort to accumulate material, and am especially indebted for an opportunity to do so to the kindness of Prof. V. L. Kellogg, who has allowed me to go over his very large accumulations of duplicates in alcohol, and of Mr. M. A. Carriker who put his valuable collection at my service. Mr. Kirkpatrick has also sent me Mallophaga from turkeys and pigeons collected for me at the Rhode Island Experiment Station, for which I am greatly indebted to him, and I have also obtained material from Guatemala collected by the late Professor W. A. Kellerman; from the Bahamas, (W. W. Worthington), as well as from other sources.

The results of my examination of some thousands of Mallophaga have been somewhat disappointing, since their parasites are generally rare, and, if the data obtained may be assumed to indicate the actual conditions, have not found this aberrant group of insects a very favorable substratum for the development of numerous or characteristic species. As will be seen the following enumeration includes only six additional forms, none of them, with the possible exception of *T. gibbus*, departing very far from the characters of the type-species. In all a more or less complicated rhizoidal apparatus is developed, simple in one species, which penetrates the host. The receptacle consists of two cells terminated by a bicellular apiculate appendage resembling a spore of *Puccinia*, the upper giving rise to fertile branches which grow downward and corticate the lower, the corticating cells producing perithecia or antheridia according to the sex of the individual; although in some instances the corticating cells of the male are hardly developed, the antheridia arising directly from single cells obliquely separated from the lower margin of the subbasal cell of the receptacle. As in *Dimeromyces* and *Dimorphomyces*, to which the genus is most nearly related, the basal cells of the perithecium break down, and the cavity of the latter and that of the stalk-cell become continuous.

TRENOMYCES HISTOPHORUS Chat. & Picard.

This species, which appears to vary greatly in size, has been received from Dr. Müller, from Elbing, Prussia; from Prof. Trinchieri from Naples, Italy, and I have examined type material kindly sent me by Professor Chatton. In this country it has been obtained on species of *Menopon* and *Goniocotes* from Kittery Point, Maine, and from Newton, Mass. (on hosts kindly sent me by Mr. Walter Deane), on *Menopon* sp. from Gundlach's mockingbird, Bahamas; on *Menopon* from hen, Jamaica, W. I., and Guatemala: in the Kellogg collection on *M. mesoleucum* (crow), Palo Alto, California; *M. tridens*, Iowa; *Menopon* sp., No. 256b; on *Goniocotes*, Guatemala.

A species has been examined from various species of *Nirmus*, *N. punctatus* (Calif.), *N. maritimus* (N. E. and Cal.), *N. olivaceus* (Elbing, Prussia, Dr. Müller), which seems hardly separable from the many variations of *T. histophorus*. A variety, which may possibly prove a distinct species has also been found on *Menopon numerosum* (Kellogg, No. 24b), *Menopon* spp. (Kellogg, Nos. 80b, 256b, 74b), *Docophorus* sp. (Kellogg, No. 997). In this form the basal cell and the upper enlarged portion of the rhizoid are more or less conspicuously suffused with smoky brown in all cases. The ascogenic cell is usually near the base of the short stalk, and the distal cell of the appendage is somewhat more compressed than in the type but there are otherwise no distinctive characters.

Trenomyces Lipeuri nov. sp.

Male individual. Rhizoid more or less abruptly enlarged immediately below the integument, the swollen portion variably elongated and passing below into a rather stout simple, cylindrical prolongation of variable length. Basal cell of the receptacle bent at right angles to the rhizoid, horizontally elongated and corticated on the upper surface by an irregularly double series of small cells, which give rise to a corresponding series of erect or slightly divergent antheridia. Stalk-cell of the antheridium very slender, broadened below the basal cells; the body rather short and stout, subfusiform, the efferent tube short and slender. Appendage lying horizontally; the distal cell twice as long as the basal. Length from tip of appendage to last corticating cell, largest specimen, $42\ \mu$. Appendage $15 \times 9\ \mu$. Total length of antheridium including stalk $35\ \mu$; efferent tube $4\ \mu$ long; rest of body about $18 \times 10\ \mu$.

Female individual. General structure like that of the male; the base of the rhizoid shorter and relatively broader with very thick walls, the rhizoid proper, simple. Corticating cells of the basal cell vertically elongated, closely associated in a double crest-like series, bearing two or three to fifteen perithecia. The latter yellowish more or less distinctly tinged with brown, the stalk rather slender and clearly distinguished, about one third as long as the body of the perithecium which is rather short and stout, subfusiform; the apex blunt and relatively broad, crowned by four more or less clearly defined prominences which surround the short rounded or slightly sulcate apex. Perithecium, including stalk, $90-110\ \mu$. The main body $60-80 \times 20-28\ \mu$. Total length of rhizoid about $90-100\ \mu$ the slender portion about $7\ \mu$ in diameter.

On various parts of *Lipeurus* sp. on Buzzard, Los Amates, Guatemala, No. 1547. On *L. celer*, Nos. 1564-67, California (Kellogg, Nos. 20a, 684c, 39a).

This species is clearly distinguished by the horizontal arrangement of its peritheciogenous cells and by its simple rhizoid. It is somewhat variable in size, the specimens from Guatemala producing a greater number of smaller perithecia than those from California. The appendage which also lies horizontally is usually quite hidden or broken off, and appears to be rather narrow, the distal cell larger.

***Trenomyces Laemobothrii* nov. sp.**

Male individual. Corticating cells extending but slightly below the subbasal cell, the lower two thirds of the basal cell quite free, the latter thick-walled, somewhat broader distally, about as long as broad. Antheridia of the usual form suberect in a compact group, six or more in number, the stalk-cells rather long, broader distally and not abruptly distinguished from the body. Appendage relatively very large, the cells subequal, broadly rounded, the apiculus hardly distinguishable. Basal cell $18 \times 18\ \mu$. Appendage $28 \times 18\ \mu$. Antheridia including stalk $45-50 \times$, the body $12 \times 25\ \mu$, including efferent tube.

Female individual. Basal cell rather large and rounded, more or less completely corticated, except at the base where the ends of the corticating branches may be clearly visible. Perithecia about six in number, rather slender, subfusiform, the stalk relatively short, not distinguished from the body, the tip large, its margins slightly convex, but otherwise not distinguished from the main body; the

rather prominent sulcate apex subtended by four somewhat spreading bisulcate prominences. Appendage relatively very large, the subequal cells rounded as in the male. Perithecium, including stalk $140-160 \times 20-25 \mu$. Appendage $30 \times 20 \mu$.

On *Laemobothrium atrum* from Coot, New England. M. C. Z., No. 1537.

This species is most easily distinguished by its unusually large appendage, which resembles a stout spore of *Puccinia*. It seems most nearly related to *T. Lipeuri*, the perithecia being very similar. The mode of growth is however, quite different. The rhizoids are entirely broken off in all the specimens.

Trenomyces circinans nov. sp.

Male individual. Corticating cells few and irregular, producing usually not more than two to four antheridia. Antheridia of the usual form, the body bent often at a right angle to the slender stalk-cell or sometimes recurved, the stalk $18 \times 4 \mu$, the body $18 \times 14 \mu$. Appendage relatively small, the cells about equal, $18 \times 11 \mu$, the distal cell blunt pointed.

Female individual. Swollen portion of the rhizoid bearing several horizontal or upcurved lobes from which arise usually furcate smaller lobes running to slender threads of no great length. Perithecia two to four, usually strongly circinate when young, at maturity typically bent or even recurved, rarely straight, the stalk relatively slender, the body often rather abruptly distinguished, broader distally below the tip, which may be subtended by a distinct elevation on one side and is well distinguished, its margin usually slightly convex, separated by a slight constriction from the crown formed by four symmetrically placed somewhat spreading lobes which surround the hardly prominent apex, the whole surface of the stalk and body more or less distinctly roughened or granular, the walls much thickened. Appendage relatively small like that of the male. Perithecium including stalk $225-280 \times 28-35 \mu$; the stalk $70-125 \times 10 \mu$ or broader. Appendage $20 \times 10-14 \mu$.

On various parts, especially the head of *Lipeurus* sp., on pigeons, Kingston, R. I., No. 1549; on *L. baculus*, Elbing, Prussia (Dr. Müller); on *Docophorus Californicus*, California, No. 1555 (Kellogg No. 666); on *D. Montereyi*, No. 1554 (Kellogg No. 264c).

The Californian forms on *Docophorus* are not quite so well marked as those from Prussia and Rhode Island which, by their abruptly



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