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New York State Museum Bulletin

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ALBANY, N. Y.

March-April 1920

The University of the State of New York New York State Museum

JOHN M. CLARKE, Director

EPHRAIM PORTER FELT, State Entomologist

34th REPORT OF THE STATE ENTOMOLOGIST

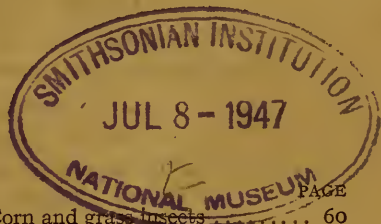
ON

INJURIOUS AND OTHER INSECTS

OF THE

STATE OF NEW YORK

1918



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THE UNIVERSITY OF THE STATE OF NEW YORK

1921

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Errata

Page 29, line 14 for figure 5 read plate 6.

Page 99, third line of legend for figure 9, for Caryæ read *C. caryæ*.

Page 237, figure 54 b, the figure is reversed.

Plate 17, the upper and lower figures should be transposed.



*The University of the State of New York
State Museum, September 3, 1920*

*Dr John H. Finley
President of the University*

SIR:

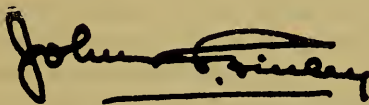
I have the honor to communicate herewith and to recommend for publication as a bulletin of the State Museum, the annual report of the State Entomologist for the year 1918.

Very respectfully yours

JOHN M. CLARKE

Director

Approved for publication,

A handwritten signature in black ink, appearing to read "John H. Finley". The signature is written in a cursive style with a horizontal line underneath.

President of the University

New York State Museum Bulletin

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ALBANY, N. Y.

MARCH-APRIL 1920

The University of the State of New York New York State Museum

JOHN M. CLARKE, Director

EPHRAIM PORTER FELT, State Entomologist

THIRTY-FOURTH REPORT OF THE STATE ENTOMOLOGIST

1918

Dr John M. Clarke, Director of the State Museum

I have the honor to present herewith my report on the injurious and other insects of the State of New York for the year ending September 30, 1918.

The season of 1918 has presented many features in common with the abnormal spring and summer of 1917. The rainfall in the western part of the State was not so great as last year and the injury then so generally attributed to the seed corn maggot was much less prevalent, and limited very largely to the wetter ground. The developments of both last year and this have shown that the seed corn maggot problem is largely a question of methods, the depth of planting and drainage being the more important factors and the insect injury largely a consequence of unfavorable conditions.

The apple tent caterpillar was notable for its absence in most sections of the State, particularly in portions of Dutchess county. The late leaf feeders, such as the red-humped apple worm and the yellow-necked apple worm were, as last year, exceptionally abundant, and there has been even more severe damage in Rensselaer and Columbia counties in particular. The fall webworm, the hickory tussock moth caterpillar and some related species were also uncommonly numerous and destructive.

Fruit tree insects. Reports from areas infested by the recently established apple and thorn skeletonizer indicate a moderate abun-

dance of the insect with some extension of the infested territory. It is now known to occur from Yonkers north to Yorktown Heights and it appears to be somewhat generally distributed in Nyack.

Codling moth. Field studies of the codling moth were continued in cooperation with the bureau of horticulture of the State Department of Farms and Markets. Evening temperature records were kept by George W. Mead, living 3 miles west of Barker and about 2 miles from Lake Ontario, and E. E. Crosby, residing 4 miles southeast of Lockport and located on the Erie plain about 14 miles from the lake. Interesting variations between these two localities were found to exist and as evening temperatures greatly influence the deposition of codling moth eggs, these data have a practical bearing and serve to explain some apparent inconsistencies in the abundance of the pest in various orchards. The observations on deposition of eggs in different parts of Erie county by L. F. Strickland, inspector of the Department of Farms and Markets, show an interesting correlation between high evening temperatures and oviposition by this very injurious insect.

Field tests were also conducted to determine the possibility of destroying the moths before they laid their eggs by spraying the trees thoroughly with a nicotine preparation, other insecticides being simply incidental to the main purpose. Work of this kind was conducted on the farm of L. L. Morrell, Kinderhook, and that of R. E. Heard, Lockport. The spraying on the latter farm was under the supervision of Mr Strickland and a canvass of the results shows a decided improvement following the application. The data amply warrant the continuation of work along this line.

The series of experiments to determine the relative efficiency of the several sprays for control of codling moth have been continued in the western part of the State and the data in relation thereto are given in a general discussion of the codling moth work.

Apple maggot. It was not possible to continue the field work with this insect, though it happens that the orchard sprayed with poison late last year was gratifyingly free from injury last summer. There was no spraying the past season and the fruit was very severely damaged. This alone suggests that a late application of poison at the time the flies are issuing is the most promising method of controlling the pest, particularly since similar results have been obtained by other workers.

White-marked tussock moth. The past season has been noteworthy because of the unusual abundance of the caterpillars in orchards and the consequent general and rather serious damage to

the fruit. It was this insect rather than the leaf roller which injured most of the apples in many localities.

Red bugs. Injuries by red bugs are becoming increasingly abundant here and there in the State. Fruit growers suffer considerable losses from these pests and frequently secure only indifferent results in control work due to variations in the time of hatching of the bugs and the further fact that spraying, in order to give the best results, must be done while the bugs are small and their work relatively inconspicuous.

San José scale. This serious pest of earlier years has attracted comparatively little attention the past two seasons. Spraying with lime sulphur wash at winter strength has uniformly resulted in satisfactory control and in not a few localities there has been but little breeding even in unsprayed orchards. The wet, cold weather of early summer has probably had an important influence on the development of this insect, and largely checked its breeding, though parasites doubtless have rendered material assistance in controlling the scale.

Pear thrips. This minute and destructive pest is sporadically abundant here and there in the pear-growing sections, specially in the Hudson valley, and despite the watchfulness of fruit growers there is likely to be considerable loss before the seriousness of the infestation is appreciated or the need of immediate action realized.

Pear psylla. There have been some reports of injury by pear psylla though in many localities the insect has been only moderately abundant and in not a few almost absent. The cool weather and heavy rains have had a marked influence in preventing the pest from multiplying greatly.

Grass and grain pests. The cool weather and abundant rains of last spring, as in 1917, were unfavorable to the development of sufficient grasshoppers to cause serious damage and in most sections these insects were not unusually abundant though toward the end of the season they were somewhat numerous in restricted localities.

The white grub injury rendered probable by the abundance of May and June beetles in 1917 failed to develop in most localities. There was material injury in restricted areas though this was hardly comparable to that of 1915. Warning notices outlining probabilities were issued in early spring and it is very probable that in many localities the comparative freedom from damage was due to farmers taking precautions and not planting crops liable to injury, such as corn and potatoes, on land where conditions favored an abundance of white grubs.

Wheat midge was prevalent in the rye fields of the eastern part of the State and caused somewhat more damage than in 1917. The wheat fields of the western section were also generally infested by this insect. A survey of the situation in Erie, Genesee, Niagara and Orleans counties disclosed a general prevalence of the insect practically without reference to time of sowing, depth of plowing or previous treatment, though it was noteworthy that, generally speaking, the more vigorous fields showed less of the pest. The bearded wheats are usually less infested. The results of these studies are summarized in the body of the report.

Grass lands, specially pastures and corn fields, were seriously injured in Broome county localities by grass webworms, the associated bronze-colored cutworm and also the greasy cutworm. There were complaints of serious injury to corn by webworms and damage by the lined corn borer was also reported.

Investigation by the Entomologist of the European corn borer shows it to be very destructive in eastern Massachusetts. The occurrence of the pest in this state means possibly great losses unless there is early and effective control. Potentially it is a serious enemy of corn and other important crops. It is extremely desirable to prevent its spread. The history of other pests in this country suggests that actual extermination, though costly, would be true economy. There should be at least a determined effort to accomplish this through federal and state agencies.

Field crops. There was some injury to beans by the seed corn maggot. This was much less than in 1917 in spite of the fact that there was considerable wet weather. The comparative immunity was due largely to modifications in methods, care being taken not to put beans on wet land, and if this was necessary, shallow rather than deep planting seemed to be the rule.

Potato aphid appeared toward the end of June on Long Island and later developed in the Hudson valley and was reported from the central part of the State. The history of the attack was very similar to that of 1917. The damage was markedly less, because the farmers more generally appreciated the status of the pest and were ready to adopt control measures whenever conditions justified them.

Black flea-beetles were unusually abundant and injurious on Long Island, in the Hudson valley and in some other sections of the State, the damage being limited mostly to potato and tomato plants recently transplanted. The probabilities are that poor culture the preceding year, due presumably to scarcity of labor, was a factor in producing conditions favorable to injury by this pest.

Similar conditions, possibly more accentuated, may be expected another season.

Forest tree pests. There has been comparatively little damage by insects to forest trees though there was some stripping of woodlands in the Catskills by caterpillars of the snow-white linden moth. The antlered maple caterpillar defoliated extensive areas in the nearby Berkshires and was reported from one New York locality. The fall, as in 1917, was characterized by an unusual abundance of hickory tussock moth caterpillars and associated species, though the damage does not appear to have been so extensive.

Insects and health. The necessity of controlling flies and other insects frequenting human habitations has been greatly emphasized by the extensive mobilization of troops. This was anticipated by the Entomologist in the preparation of *Household and Camp Insects* (Museum Bulletin 194), which appeared in February 1917. The publication was widely distributed among military officers as well as to those specially interested in work of this kind throughout the country. There has been a constant demand for the bulletin throughout the season.

The importance of insect control in camp and field is apparent when it is recalled that diseases have been responsible for more deaths in armies during war times than are caused by wounds and that such infections as typhus, cholera, malaria of various types, trench fever and typhoid fever may be carried by insects and some of the more important of these infections are disseminated only by such agents. It therefore follows that the application of precise knowledge regarding the habits of insects to the extremely varied conditions encountered by an army in the field and particularly an appreciation of the benefits resulting from the avoidance or amelioration of conditions favorable to the reproduction of dangerous insects, means an enormous advantage to the units in a position to utilize such knowledge.

The broader phases of insect control and sanitation were discussed by the entomologists at the Pittsburgh meeting of the American Association of Economic Entomologists and as an outcome a special committee, of which the State Entomologist was a member, was appointed for the purpose of promoting the better utilization of the entomological talent of the country in army sanitation. There have been several conferences with representatives of the surgeon general and a number of entomologists are now demonstrating the utility of their calling as active members of sanitary corps. Furthermore, the Entomologist, upon the invitation of the camp surgeon,

made an examination of conditions at Camp Upton with special reference to the complex mosquito problem of that section.

Another very important phase deserves consideration at this time, namely, the desirability of adopting every reasonable precaution to prevent epidemics after the establishment of peace. Various infections have been widely distributed as a result of the wholesale movement and dissemination of troops and with entire nations suffering from malnutrition, conditions will be almost ideal for extensive epidemics when warm weather permits insects to become active carriers of disease. The peril is greatest in portions of Europe though sections to which troops return will by no means be free from danger. Doctor Prinzing, in his monograph on "Epidemics Resulting from Wars," states that, "Until comparatively recent times the most serious human cost of war has not been losses in the field, nor even the losses from disease in the armies, but the losses from epidemics disseminated among the civil populations. It was the war epidemics and their sequelae, rather than direct military losses that accounted for the deep prostration of Germany after the Thirty Years' War. Such epidemics were also the gravest consequence of the Napoleonic Wars." Wasted resources and reduced man power in certain European countries mean a relaxation of sanitary precautions and with the renewed activities of insects another season, there will be almost unexampled opportunities for the spread of disease unless precautions are adopted and rigidly enforced at the very outset.

Special entomological service. The plan was to promote the production of larger and better crops and was a development from and continuation of the insect pest survey and information service conducted during the summer of 1917. It is emergency war work. A series of weekly reports or digests were issued throughout the active part of the season, the first appearing May 23d and the last August 1st. These were distributed to farm bureau agents throughout the State and to a number of specially interested persons, particularly those in position to influence the adoption of better measures for the control of insect pests. This was supplemented by correspondence directing the attention of observers to features of special importance. The service was possible only through the cooperation of the farm bureau agents and a number of observers in various parts of the State, the latter mostly earlier correspondents of the office. In addition to the weekly reports mentioned above, special circulars were issued warning of probable injury by grass webworm, potato

aphis, summer leaf feeders and the wheat midge and recording the most recent developments.

The main purpose of the undertaking was to secure early and accurate reports of insect activities from all over the State, to summarize the information thus obtained, distribute it promptly, and thus effect material reduction in the serious losses annually inflicted by these pests. Particular emphasis was laid upon the initial signs of injury in order to promote control before much damage had been caused. The more important crops received first attention, specially the insect enemies of potatoes, such fruits as apples, pears, peaches and cherries, cereal and forage crops and truck and garden crops.

It is impossible, from the nature of the case, to give exact figures as to the value of the service. The mere fact that a close watch was kept for such injury is worth much in times when every effort should be made to increase production. An estimate made in 1913 placed the approximate damage in this State to all farm crops at \$20,000,000 annually. The figures should be considerably higher now. Furthermore there is need of discouraging unwise or misdirected efforts against insects of little importance or the use of materials or methods of doubtful efficiency. The Entomologist has constantly kept these problems in mind and in working through farm bureau agents has been able to do much in standardizing practices and increasing production.

The Entomologist has also served as collaborator with the Emergency Entomological Service of the United States Bureau of Entomology, thus assisting in improving conditions in the country as a whole and at the same time bringing the state work into closer touch with that of the Nation, to the mutual advantage of both.

Gall insects. The "Key to American Insect Galls" has been carried through the press. It is the only comprehensive tabulation of these interesting deformities and since it deals primarily with the more obvious swellings or plant malformations rather than with the minute and highly complex gall makers themselves, it will greatly facilitate the study of the interrelations between plants and insects. There is also brought together and tabulated in this bulletin data which are of great value in interpreting biological processes and are not without their economic or practical bearing, since a number of species comprised in this large group are pests of prime importance, notably the Hessian fly and the wheat midge, the latter being much more destructive in earlier years than at the present time.

Some attention has been given to gall midges and a number of interesting forms, including several new genera, have been described.

Lectures. The Entomologist has delivered a number of lectures on insects, mostly economic species, before various agricultural and horticultural gatherings, some of these being in cooperation with farmers institutes or county farm bureau agents. Several lectures have also been given under the auspices of local welfare associations.

Publications. Brief popular accounts of the more destructive insects have been prepared as heretofore and widely circulated through the county farm bureaus and the local papers.

Owing to delay in printing, the report for 1916 did not appear until the current year and is the only Museum bulletin on entomology issued in the period covered by this report. A paper of more than usual interest, "Insects and Camp Sanitation," was prepared for the *Journal of Economic Entomology*. A general popular discussion entitled "Gall Insects and Their Relations to Plants" appeared in the June issue of the *Scientific Monthly*. A popular summary of losses caused by insects and the possibilities in control measures was published in State Service under the title "Insects Destroy Millions in Property." The need of continuing entomological investigations even under war conditions was presented under the title "Entomological Research and Utility" in the *Scientific Monthly*. There were also several technical papers describing gall midges.

Collections. Very desirable additions to the state collections have been made through the year, some of the best material being reared in connection with studies of insect outbreaks or as a result of requests for information concerning previously unknown forms. Special attention has been paid to the acquisition and preservation of immature stages, since these are very difficult to secure. A noteworthy donation of this character was that from Instructor C. P. Alexander of the University of Kansas, widely known because of his work on the Tipulidae. It comprises a series of larvae and pupae of representative crane flies belonging to eleven genera and sixteen species. A list of these is given under accessions to the collections. A recent communication from Mr Alexander states that we have one of the foremost collections of crane flies in America — largely due to the efforts of Mr Young.

Unusual demands for the identification of insects and information in regard to methods of control, partly a result of war conditions, has restricted the amount of time which could be given to the identification and arrangement of the collections. This latter is necessary, otherwise collections may be simply miscellaneous aggregations of unknown material of comparatively little service to anyone.

Mr Young, in addition to numerous identifications for correspondents, and other routine work, has made material progress in arranging and classifying the important parasitic flies belonging to the Tachinidae and is now devoting much time to the difficult Anthomyiidae, among which latter are found such pests as the onion maggot and the cabbage maggot. He was also exceptionally fortunate in collecting at Wells a large series of *Amplicoma vulpina* Hentz, an extremely rare Scarabaeid hitherto represented in the state collections by only one or two specimens without a recorded locality.

Miss Hartman's time has been fully occupied, in addition to numerous routine duties, by the many translations of technical literature needed in systematic work, the making of numerous excellent microscopic preparations of smaller insects, the arrangement and care of the pressed specimens of insect work and the extensive accumulations of alcoholic material.

The maintenance and development of an adequate representation of the insect life of the State means an enormous amount of work and with the passing of the present war stringency more adequate provision should be made for this line of activity. There are more than twenty thousand species of insects in the State, each represented by at least four stages and not a few presenting marked differences between the various molts or instars of the larva. This gives an idea of the enormous number of forms falling within the province of the entomologist. A thoroughly representative state collection should contain specimens of all and in the case of the many variable species, specimens of both typical and aberrant forms. Such a collection possesses not only scientific value because of the immense amount of material assembled and the lines of development illustrated, but is of great practical service in the speedy identification of any one of the thousand of insects of the State which without warning may become suddenly abundant and destructive. It is well known that satisfactory control measures can not be advised without at least some knowledge of the habits of the insect, and the more complete this is the more reliable the recommendations.

The development of collections requires adequate space. The constant increments of recent years have filled the boxes or trays to such an extent that there is urgent need of more space for this material. The wooden cases containing the insect collections should be replaced by steel cabinets and more provided to accommodate the additional boxes and trays required. Biological material, specimens difficult to secure and not easily preserved in a satisfactory manner

should receive special attention. There are now in the entomological collections a long series of types of species and genera. The possession of these uniques involves a responsibility to future generations and every precaution should be adopted to maintain the integrity of the collections if the entomological branch of the Museum is to discharge its full duty to both State and Nation.

Nursery inspection. The nursery inspection work of the State Department of Farms and Markets has resulted, as in former years, in a number of specimens representing various stages of insect development, some in very poor condition, being submitted to this office for identification. As such material may originate in a foreign country, determinations of this character are difficult and require for their successful prosecution a large collection and an excellent library of both domestic and foreign works. The correct identification of such material is important since the disposal of an entire shipment of nursery stock may be affected by the character of the infestation.

General. The work of the office has been materially aided as in past years, by the identification of a number of species, through the courtesy of Dr L. O. Howard, chief of the bureau of entomology, United States Department of Agriculture, and his associates. There has been very effective cooperation with the State Department of Farms and Markets and its agents, the county farm bureaus, the state experiment stations and other public welfare organizations. A number of correspondents have donated valuable specimens and many have aided materially by transmitting local data respecting various insects or assisting in other ways. It is a pleasure to note that there has been, as in the past, a most helpful cooperation on the part of all interested in the work of the office.

Respectfully submitted

EPHRAIM PORTER FELT

State Entomologist

INJURIOUS INSECTS

CODLING MOTH

Carpocapsa pomonella Linn.

Experimental work to test the relative efficiency of one, two and three applications was continued in the orchard of G. W. Mead, Barker. A general description of the orchard and the location of the plots has been given in the Report for 1917 (see pages 18 and 19) and need not be repeated here.

The first application was made May 27th and 28th. Two and one-half pounds of paste arsenate of lead were used to 150 gallons of water and a gallon of standard lime sulphur added to each 40 of the spray. This, the regular calyx application, was made to three plots, 300 gallons being used and some burning of the foliage resulted. The application was supervised by J. B. Achilles.

The second treatment was given to plots 1 and 2 July 9th, 170 gallons of spray being used. This was followed by a serious yellowing and dropping of the foliage. The work was supervised by L. F. Strickland.

The third spraying was given July 26th, to plot 3, 60 gallons of spray were used. The proportions were the same as in the earlier treatment. Throughout the work a Gifford spray gun was employed and the pressure was maintained at 225 pounds.

The apples were picked in early October and classified by L. F. Strickland, agent, Department of Farms and Markets. He was assisted in this work by J. B. Achilles and T. T. Neill of the same department. The fruit on the six trees of each of the three plots and that on the two check trees was carefully classified, and an examination of the complete data shows in the case of plot 1, sprayed once, a codling moth infestation ranging for individual trees from 6.18 to 18.28 per cent or for the plot 10.17 per cent wormy fruit. In plot 2, the ranges were from 3.7 to 19.45 per cent of wormy apples, the plot per cent being 10.66. Similar figures for plot 3 showed a variation from 5.34 to 15.95 per cent, the per cent for the plot being 9.10. These wide differences are due in part to great variation in the yield and probably also to the difficulty in doing equally thorough work with a nozzle which demands very rapid operation, if one would avoid overloading the trees with spray. With these facts in mind it was deemed best to make selections from each plot, taking trees which bore at least a moderate crop and those which did not deviate widely from what we judged to be the normal. This latter consideration resulted in the elimination of tree F on plot 3 because

the percentage of wormy apples was excessive. The selected data, which are believed to be more nearly representative, are given below.

Codling moth, Mead orchard, 1918

NO. OF SPRAYS	TREE	TOTAL FRUIT	PER- FECT	SCAB	LEAF ROLLER	TOTAL	CODLING MOTH			
							End	Side	Aug.	Shal- low
One.....	D.....	1 665	1 402	1	109	115	0	28	0	127
	Per cent..	84.20	.06	6.54	9.30	1.68	...	7.62	...	7.62
One.....	E.....	3 446	2 896	161	180	213	0	52	7	154
	Per cent..	84.03	4.67	5.22	6.18	1.50	.20	4.46	...	4.46
Total.....		5 111	4 298	162	289	368	...	80	7	281
Per cent....		84.09	3.11	5.65	7.20	1.56	.13	5.49	...	5.49
Two.....	A.....	2 091	1 798	2	139	162	0	6	1	155
	Per cent..	85.98	.09	6.64	7.74	1.28	.04	7.41	...	7.41
Two.....	C.....	1 470	1 147	8	123	130	0	8	0	122
	Per cent..	78.02	.54	8.36	8.84	1.54	...	8.29	...	8.29
Two.....	D.....	2 858	2 541	21	192	304	1	28	2	273
	Per cent..	88.90	.73	6.71	10.63	.03	.97	.06	9.55	9.55
Total.....		6 419	5 486	31	454	596	1	42	3	550
Per cent....		85.46	.48	7.07	9.30	...	.65	...	8.56	8.56
Three.....	A.....	3 179	2 726	88	146	236	0	25	0	211
	Per cent..	85.75	2.76	4.59	7.42	...	.78	...	6.63	6.63
Three.....	C.....	1 687	1 482	7	79	124	0	11	0	113
	Per cent..	87.84	.41	4.68	7.35	...	.65	...	6.69	6.69
Three.....	D.....	1 930	1 638	6	98	195	0	11	1	183
	Per cent..	84.87	.31	5.07	10.10	...	.56	.05	9.48	9.48
Three.....	E.....	2 452	2 172	13	138	131	0	7	0	124
	Per cent..	88.58	.53	5.62	5.34	...	.28	...	5.05	5.05
Total.....		9 248	8 018	114	461	656	...	54	1	631
Per cent....		86.83	1.23	4.98	7.09	...	.58	...	6.84	6.84
None.....	X.....	4 783	3 967	104	294	438	5	49	3	381
	Per cent..	82.93	2.17	4.14	9.15	.10	1.02	.06	7.96	7.96
None.....	Y.....	4 582	1 940	2 096	245	484	58	68	0	358
	Per cent..	42.33	45.74	5.34	10.56	1.26	1.48	...	7.81	7.81
Total.....		9 365	5 907	2 200	539	922	63	117	3	739
Per cent....		63.07	23.49	5.75	9.84	.67	1.24	.03	7.89	7.89

Examination of the above table shows first of all the progressive increase in the percentage of perfect apples in plots sprayed once, twice and three times and a markedly smaller per cent on the check trees. There is a marked difference between the amount of scab on the check trees and those which were sprayed and a considerable variation between the plot sprayed once and the two receiving more than one treatment, though for some cause or other plot 3 had a higher percentage of scabby fruit than the one sprayed twice. It is one of the anomalies which can not be readily explained. It will be noted that leaf roller or white-marked tussock moth injury to fruit, probably both, was not materially affected by any of these treatments. Codling moth infestation was much less in this orchard than last year, the percentage for the two check trees, 9.84, falling far below the 41.69 per cent of wormy fruit found in 1917 on the unsprayed trees in this orchard. The relatively light infestation

makes impossible any marked variations as a result of the treatment though the per cent of wormy fruit for the unsprayed plots is somewhat less than for the check trees.

Attention is also called to the fairly uniform percentage of apples in the various plots showing the peculiar blemish designated as "shallow," the check trees showing about 2 per cent higher than that for the plot sprayed but once and nearly three-fourths of a per cent lower than for the plot sprayed twice. These variations are really quite small. The figures given above show that in plot 1, 76 per cent of the wormy apples were injured by "shallow," 92 per cent of plot 2, 95 per cent of plot 3 and 80 per cent of the yield from the check trees. In other words the second and third treatments with a poison spray apparently increase the percentage of "shallow-affected" apples among the wormy by reducing the number injured in some other manner and apparently this gain is mostly in the elimination of side injury, though the figures do not contrast as strongly as one might wish.

Poison and Tobacco for Codling Moth

There has been considerable injury to apples in western New York during the last few years owing to young caterpillars hatching from late deposited eggs of the codling moth working just under the skin of the fruit and producing that characteristic and sometimes very general type of injury known as "shallow" and by some growers confused with the work of second brood codling moth larvae. Investigations of earlier years have absolutely connected this type of injury with young caterpillars hatching from eggs deposited the last of June or early in July upon the smooth surface of the growing apples. The young larvae enter the fruit at almost any convenient point and excavate just under the skin a small gallery with a radius of approximately one-sixteenth of an inch and when this is completed, many at least, instead of going deeper into the apple, forsake the injury and migrate to the blossom end. One of the problems is to prevent this type of mischief. The apple is growing rapidly at the time the codling moth eggs are hatching and consequently it is nearly impossible to keep the fruit well covered with poison during this period. The spraying experiments of earlier years have shown comparatively little influence upon the reduction of the "shallow" type of injury except as the infestation in the orchard as a whole was reduced by the successful control of the codling moth in preceding seasons.

Knowing that the period of oviposition for this pest was an extended one, lasting a month or more, and that presumably indi-

vidual moths would live a considerable portion of this time, we deemed it worth while to test the effect of a combined spray applied the latter part of June at a time when presumably most of the moths had emerged from their cocoons and before there had been any extensive deposition of eggs and injuring of the fruit by the young larvae. L. F. Strickland, agent of the Department of Farms and Markets, at our suggestion, selected an orchard belonging to R. E. Heard, of Lockport, and sprayed a group of six greening trees June 28th with 1 pint of black leaf forty to 100 gallons of water, to which were added 1 gallon of a standard lime-sulphur preparation and $1\frac{1}{4}$ pounds of powdered arsenate of lead. It was hoped that the black leaf forty would destroy some of the moths sheltering in the trees and the spray was therefore directed so as to drench the limbs and trunk as well as to cover the foliage. The poison would also be fatal to any caterpillars feeding upon the foliage. The application was made from the ground with a spray gun and 325 gallons were used on 200 trees. These latter were greenings about 100 years old, with a spread of 40 to 45 feet, a height of 30 feet and over and they were well laden. The top of the tree was first covered with a spray; this was then followed by an underspray designed in particular to saturate the limbs and the rough bark of the larger branches and the trunk. A pressure of 225 pounds was maintained and the experimental trees were protected by a barrier row of similarly treated trees on all sides. The greenings, owing particularly to a scarcity of labor, were rather too thick in the center and as a consequence it was not possible to do entirely satisfactory work from the ground. This was especially the case on branches near the top of the tree and when picking the men occasionally brought in lots showing an unusually high percentage of infestation. The natural difficulties presented by these trees made it difficult to obtain sharply marked results.

The earlier treatment of the orchard had been as follows. Just after the petals fell there was the usual application of a poison lime-sulphur wash, summer strength, all the trees being treated alike. Examinations by Mr Strickland in various orchards July 1st resulted in the conclusion that the maximum oviposition by the codling moth probably had not been reached. No unusual developments were noted in the orchard during the summer and at picking time, September 10th and 11th, the fruit on four of the experimental trees was carefully canvassed and in addition that on one entire tree (tree X) which received the general treatment described above for the orchard and the apples on one side of another (tree Y). These

two trees, X and Y, were three trees west of the six included in the experimental plot and were in the same row, tree Y being north of tree X. The lettering of the trees in the experimental plot was the same as in earlier years, it running from east to west. Tree B bore over 5 barrels, tree C $7\frac{1}{2}$ barrels, tree D approximately 10 barrels, tree F $7\frac{1}{2}$ barrels, tree X $6\frac{1}{2}$ barrels and the half of tree Y 4 barrels.

The results of this work are given in the tabulation below.

Heard orchard, 1918

TREES	TOTAL FRUIT	PER-FECT	SCAB	LEAF ROLLER	CODLING MOTH, WORMY				
					Total	End	Side	Side Aug.	Shallow
B									
Total.....	3 718	2 840	94	808	128	3	14	8	112
Per cent.....		76.38	2.52	21.73	3.44	.08	.37	.21	3.01
C									
Total.....	4 979	3 125	399	1 154	287	20	36	14	231
Per cent.....		62.75	8.01	23.17	5.77	.40	.72	.28	4.63
D									
Total.....	5 777	3 700	392	1 320	328	4	51	39	274
Per cent.....		64.04	6.78	22.84	5.67	.06	.88	.67	4.74
F									
Total.....	5 280	4 050	275	759	188	4	30	8	154
Per cent.....		76.70	5.21	14.37	3.56	.07	.57	.15	2.92
X									
Total.....	4 455	2 704	612	676	436	33	64	28	340
Per cent.....		60.69	13.73	15.17	9.78	.74	1.43	.62	7.63
Y									
Total.....	2 925	1 675	190	829	222	7	22	9	193
Per cent.....		57.26	6.49	28.34	7.58	.23	.75	.30	6.59

It will be seen from the above tabulation that the trees receiving a special tobacco-arsenate spray bore a smaller percentage of wormy fruit than those which were untreated. This is specially marked in the case of trees B and F, each with a total wormy fruit of about $3\frac{1}{2}$ per cent while the check trees yielded over $9\frac{1}{2}$ and $7\frac{1}{2}$ per cent of wormy apples. The somewhat high percentage of wormy fruit on trees C and D is probably to be accounted for in part at least by the large size of the trees and the crowded condition in the orchard rendering it difficult to secure the uniform and thorough treatment so desirable in experimental work. It can at least be said that this application appears to have reduced materially the number of wormy apples. The data here, as in earlier experimental work, indicate a considerable uniformity in the proportion of "shallow-affected" fruit to the total wormy. For example, the

trees receiving the special treatment have 83 per cent of the wormy fruit showing the "shallow" blemish, on the check trees it was 82 per cent and on trees B and F, those producing the smallest percentage of wormy fruit, it was 84 per cent. These ranges are very small and suggest that reduction in the infestation of the orchard is the surest method of eliminating the "shallow" type of injury. On the other hand, it should be stated that there was no such late oviposition as had obtained in earlier years when this trouble was more evident and were such conditions to prevail results might be very different. The information secured amply justifies further tests along these lines.

The time for this special treatment was fixed by examinations for eggs upon both leaves and young apples, specially the latter, and an attempt was made to have the spraying come just before many eggs were likely to be deposited. This varies from season to season and appears to be intimately connected with evening temperatures. It is possible that a comparatively simple rule for establishing the most effective time for this treatment can be worked out in connection with observations upon temperatures and oviposition now in progress.

A modification of this treatment was tried July 2d on the farm of L. L. Morrell, Kinderhook. Four rows of moderate sized apple trees, mostly greenings and some Baldwins, were dusted with 10 pounds of arsenate of lead, 40 pounds of tobacco and 50 pounds of sulphur. There was a light breeze and the dust drifted through the trees and covered the foliage thoroughly though there was more on the windward side. No codling moth work was visible at the time and later developments prevented a careful classification of the fruit. Mr Morrell expressed himself as very well pleased with the treatment and stated that the fruit was exceptionally free from codling moth injury.

Oviposition and Evening Temperatures

Unquestionably there is an intimate relation between evening temperatures and the deposition of eggs by the codling moth. In the first place very few eggs are deposited when the early evening temperatures, 8 p. m. and 9 p. m. sun time, are below 60 degrees and if there is a marked rise above this following a period of relatively cool weather, conditions are favorable for the deposition of large numbers of eggs. The low evening temperatures of June and early July in the vicinity of the Great Lakes appear to have a marked effect upon the codling moth and in certain seasons there may be a very general prevalence of the "shallow" type of injury following a delayed oviposition.

Through the kindly cooperation of George W. Mead of Barker and E. E. Crosby of Lockport, temperature records were kept through most of June and July. The two localities were selected for the purpose of ascertaining what differences might exist between the Barker orchard located about 2 miles from Lake Ontario and at an elevation 200 feet high, and the Lockport orchard some 14 miles from the lake and with an elevation of approximately 600 feet, this latter being on the Erie plain. The cool breezes of midsummer are very evident near the lake and less apparent in the vicinity of Lockport. The temperature records were made at 8 and 9 p. m. (daylight saving time) or 7 and 8 p. m., sun time. The latter record is the most significant so far as codling moth activities are concerned. It will be noted on referring to these records that the thermometer at 9 p. m. did not reach 60 degrees F. or higher until the 24th, rising the last of the month to 70 degrees. It is interesting to note in this connection that field observations resulted in finding eggs in orchards June 27th for the first time and a markedly greater abundance of eggs July 1st, the latter almost exactly coinciding with the decidedly higher evening temperatures. Again there was an increased oviposition July 12th which, on referring to the temperature records, will be found to follow a series of decidedly higher evening temperatures, and this was even more marked on July 16th and 18th.

The temperature and oviposition records given below justify the statement that codling moths will not lay many eggs when the early evening temperatures, namely 8 p. m. sun time, are below 60 degrees and a rise to this point or above is very apt to be followed by the deposition of large numbers of eggs, specially in orchards badly infested by this pest. It is not difficult to corroborate this general statement by finding the tiny, glistening, semitransparent or whitish specklike eggs with a diameter a little less than the head of an average pin upon the leaves, and particularly the smooth surface of the fruit. The period of most active egg laying in the western part of the State comes in early July, very likely the first week, though sometimes it may be delayed until the second or even the beginning of the third week.

Weather records, June 1918

DATE — JUNE	LOCKPORT, 4 MILES SOUTHEAST Observer, E. E. Crosby			BARKER, 3 MILES WEST Observer, George W. Mead		
	Temperature		Rain	Temperature		Rain
	8 p. m.	9 p. m.	Amount	8 p. m.	9 p. m.	Amount
9.....	.....	.....	.....	57	52	.....
10.....	.....	.....	.....	72 ^a	75 ^a	.....
11.....	70	72	1.20	54	54 ^b	1.27
12.....	53	54	.....	60	55	.....
13.....	59	52 ^c	.....	60	58.5	.....
14.....	56	53	.21	64	62	.....
15.....	64	59	.....	70	64	.....
16.....	69	66	.11	70	62	.....
17.....	74	60	.....	72	.....	.....
18.....	58	56	.....	72 ^d	50 ^d	.....
19.....	59	52	.....	72	54	.....
20.....	59	54	.8	57	53	.....
21.....	59	60	.....	62	60	.85
22.....	48	48	.....	48	47	.06
23.....	59	55	.....	50 ^e	.....	.05
24.....	66	62	.3	66	64	.....
25.....	63	60	.....	56	62	.....
26.....	70	70	.....	70	68	.....
27.....	68	70	.1	76	71-70	.....
28.....	.....	66	.....	79	64	.....
29.....	73	68	.....	.....	.....	.....
30.....	70	70	.77	67	70	.....

^a 8.30 and 10.30 p. m. respectively.

^b 9.30 p. m.

^c 11 p. m.

^d 7.45 p. m. and 11 p. m. respectively.

^e 7.30 p. m.

Weather record, July 1918

DATE — JULY	LOCKPORT, 4 MILES SOUTHEAST Observer, E. E. Crosby			BARKER, 3 MILES WEST Observer, George W. Mead		
	Temperature		Rain	Temperature		Rain
	8 p. m.	9 p. m.	Amount	8 p. m.	9 p. m.	Amount
1.....	56	56	.9	58	54	.90
2.....	64	58	.....	64	61	.....
3.....	.....	.....	.....	60	64	.....
4.....	72	62	.....	67	61	.....
5.....	74	68	.....	76	66	.....
6.....	68	62	.....	66	62	.....
7.....	60	59	.....	60	58	.....
8.....	59	56	.....	58	57.5	.....
9.....	60	60	.8	60	60	.....
10.....	62	60	.....	66	64	.....
11.....	68	64	.....	67	64	.....
12.....	66	65	.....	68	62	.....
13.....	.....	.....	.....	76	66	.....
14.....	76	66	.....	79	71	.....
15.....	70	66	.....	76	69	.....
16.....	69	67	.....	68	68	.....
17.....	64	.....	.....	72	67	.13
18.....	66	60	.....	74	66	.....
19.....	70	66	.....	77	67	.....
20.....	76	68	.....	78	74	.....
21.....	85	77	.....	85	81	.....
22.....	78	74	.....	85	78	.....
23.....	79	74	.9	76	72.5	.....
24.....	78	76	.35	81.5	76	.....
25.....	80	70	.....	80	79	.....
26.....	79	76	.....	84	80	.....
27.....	78	74	.....	74.5	74.5	.....
28.....	80	76	.....	76	72	.....
29.....	69	68	.58	72	76	.....
30.....	65	60	.....	66	63	.35
31.....	66	55	.....	62	56	.....

Codling moth oviposition in 1918

L. F. Strickland, Observer

PLACE	TOTAL NO. APPLES	TOTAL NO. EGGS	PER CENT OF EGG INFESTED APPLES	TOTAL NO. EN-TRANCES	PER CENT OF APPLES INJURED	TOTAL NO. EGG SHELLS	1918 DATE
G. W. Mead							
Barker, N. Y.	500	5	1.0	0	0	1	Je. 27
R. E. Heard							
Lockport, N. Y.	500	4	.8	0	0	0	Je. 28
R. E. Heard							
Lockport, N. Y.	500	5	1.0	0	0	0	Jl. 1
G. W. Mead							
Barker, N. Y.	600	8	1.3	1	.1	1	Jl. 1
G. W. Mead							
Barker, N. Y.	500	2	.4	13	2.2	8	Jl. 8
R. E. Heard							
Lockport, N. Y.	250	8	3.2	2	.8	2	Jl. 12
R. E. Heard							
Lockport, N. Y.	109	2	1.8	1	.9	3	Jl. 13
John Nelson							
Lockport, N. Y.	169	6	3.5	2	1.1	7	Jl. 15
Frank Dietrick							
Wilson, N. Y.	173	9	4.6	4	2.3	7	Jl. 15
W. W. Dutton							
Youngstown, N. Y.	100	2	2.0	3	3.0	2	Jl. 16
R. E. Heard							
Lockport, N. Y.	213	10	4.6	5	2.8	8	Jl. 16
R. E. Heard							
Lockport, N. Y.	300	17	4.6	1	.3	10	Jl. 18
Frank Dietrick							
Wilson, N. Y.	560	9	1.6	32	5.3	30	Jl. 23
R. E. Heard							
Lockport, N. Y.	649	5	.....	37	4.9	19	Jl. 23
G. W. Mead							
Barker, N. Y.	508	0	0	25	3.7	11	Jl. 24
R. E. Heard							
Lockport, N. Y.	226	3	1.2	7	2.6	13	Jl. 26
Frank Dietrick							
Wilson, N. Y.	600	2	.3	55	7.6	62	Jl. 26
R. E. Heard							
Lockport, N. Y.	500	0	0	4	.8	6	Jl. 29
Davis Farm							
Burt, N. Y.	500	0	0	45	8.1	26	Jl. 29

EUROPEAN CORN BORER

Pyrausta nubilalis Hubn.

The European corn borer easily ranks as the most important pest which has become established in the United States during the last 25 years, since the probabilities favor serious and widespread losses to our principal grain crop. The yield of corn is approximately twice that of oats and three times that of wheat. This new pest not only attacks corn, both sweet and field, but it may prove a serious enemy of Kafir corn and possibly greatly injure Johnson and Bermuda grass. The annual loss in this country might exceed a billion dollars, which would mean considerably less than 50 per cent damage to our 1918 corn crop of 2,582,814,000 bushels, which sold at a little over \$1.36 a bushel.

History in America. This pest was discovered in Massachusetts in 1917, and in 1918 caused very serious injury in badly infested

fields. The total infested area at the close of that season was approximately 400 square miles while data now at hand indicate some 1800 square miles infested in the eastern part of Massachusetts, extending from the Cape north to New Hampshire and including three of the southeastern towns in that state.

An infestation was discovered at Scotia, Schenectady county, January 29, 1919,¹ and subsequent investigations showed the borer to be somewhat generally established over an area of possibly 500 square miles, including portions of Albany, Schenectady, Schoharie, Herkimer, Fulton, Saratoga and Rensselaer counties and extending from a little east of Troy westward to Fort Hunter, north nearly to Saratoga and south to Esperance. The presence of the insect on the Mohawk flats is a serious phase of the problem since these areas are annually flooded and as a consequence infested stalks may be swept down the river and deposited along the extensive shore line of this water way.

An infestation in Erie county was located in September 1919, and subsequent examinations have shown this borer to occupy an area of possibly some 400 square miles in portions of Cattaraugus, Chautauqua and Erie counties, the insect having been found from a little east of Buffalo south and southwest to Gowanda and Fredonia.

There was also an infestation reported in September of the same year in Erie county, Pennsylvania. This latter appears to be confined to a very small area.

European history. This pest has an unsavory record in Europe, being reported as frequently causing a loss of 50 per cent to corn and hemp in central Europe. It is recorded as being widely distributed in central and southern Europe, west central and northern Asia, China and Japan. This latter leads us to expect that this pest can flourish throughout our extensive corn belt.

Work in corn. The caterpillars of this pest feed upon corn leaves to a slight extent, injure the tassels, tunnel the stalks and cobs (plate 1) and feed upon the corn itself (plate 2). Their work, followed by the invasion of moisture, bacteria and fungi may easily result in the nearly complete destruction of the entire crop. Field counts last season in Massachusetts by federal and state agents resulted in finding 100 per cent of the ears infested in a quarter of an acre of sweet corn and an examination of badly infested areas showed an average of 46 caterpillars to a plant, or approximately 1,050,000 to an

¹Owing to the delay in printing this report, it was considered advisable to bring this record of distribution down to the end of 1919.

acre. Conditions were so serious that 311 caterpillars were found in one hill of corn, 117 in one stalk and 15 in one ear, one caterpillar being sufficient to damage an ear seriously. The injury to nearby field corn was nearly as great, though sweet corn is much more generally grown in the infested area.

Food plants. There exists no undoubted evidence to show that the European corn borer breeds in New York State in any plant except corn, though all varieties are subject to attack. The work of the insect is most likely to be serious in small to medium varieties of corn because the larger ones can maintain a greater number of borers with less likelihood of severe injury. It should be noted that earlier fields of corn are much more likely to be infested than those planted later. The principal food plants in Massachusetts, as shown by investigations, are sweet corn, field corn, fodder corn, celery, beans, potatoes, Swiss chard, beets, spinach, dahlias, gladiolus, chrysanthemums, and several of the larger stemmed weeds and grasses, notably barnyard grass (plate 7) and the common ragweed, or Roman wormwood. Some of these plants become infested simply because they are growing in or near infested corn fields, though the pest seems to be able to maintain itself upon barnyard grass, dock and lady's thumb. The insect limits itself very closely to corn in sparsely infested areas.



Fig. 1 Characteristic holes in corn-stalks as they occur in late summer, early fall and winter

also works in the stubble and may be found in corn fields during the winter.

Signs of infestation. The European corn borer can be easily detected in corn stalks during the winter by the characteristic holes about one-eighth of an inch in diameter, frequently with discolored margins and usually plugged with borings. These entrance holes (figure 1) are most easily seen on corn stalks which have been stripped of leaves by cattle. The holes lead into irregular burrows or galleries (plate 4, figure 2) 1 inch to several inches in length, each of which is usually inhabited by a yellowish gray, indistinctly lined caterpillar about three-fourths of an inch in length. The head is brown, and the body minutely spotted with brown. The galleries that reach to the nodes are frequently irregularly enlarged at this point. The borer

Broken tassels with extruded borings at the point of injury are conspicuous and easily recognized signs of infestation. It is important to know that most of the tassel is affected and also to keep in mind the fact that tassels may be broken from other causes. The occasional hanging of one branchlet of the tassel is very rarely caused by the corn borer. Injury to the tassels is sometimes so severe as materially to affect the fertilization of the ears.

The small, oval, whitish feeding spots of the young borers or larvae on the leaves aid in the detection of the pest, though this type of injury is by no means conspicuous.

Compared with native corn insects. The European corn borer is the only corn pest in America which habitually bores in the stalks, in cobs and at the same time injures the kernels (figure 5). It is easily distinguished from the earlier appearing lined corn borer and the frequently associated stalk borer by the absence of well-marked reddish lines. Furthermore, the lined corn borer works almost entirely in corn 4 to 6 inches high while the European corn borer is rarely seen until the corn is 12 to 15 inches high. The stalk borer caterpillar, with its peculiar purplish blotch near the middle of the body breaking the well-defined white and purplish brown lines, can hardly be confused with the dull-colored European corn borer, although its work in the corn is somewhat similar. Furthermore, the stalk borer, when full grown may measure $1\frac{1}{4}$ inches in length, whereas the European corn borer is never more than 1 inch long. The corn ear worm, a native southern insect which can not winter in this latitude, attacks the tips of ripening ears, the greenish or brownish strongly marked caterpillars are over an inch long when full grown and very different from the European corn borer. Samples of corn stalks suspected of being infested by this pest should be sent to the farm bureau agent or the nearest entomologist.

Life history and habits. It is necessary to distinguish sharply between the habits of this insect in New York State and in Massachusetts. A study of the insect in the vicinity of Schenectady shows that it passes the winter as a nearly full-grown borer which begins to change to the pupa in June. The first moths emerge in June or early July, continue on the wing about a month; there being one brood. There are two broods or generations of this insect in eastern Massachusetts. The nearly full-grown caterpillars in either locality winter in the stems or stalks of corn and various other plants. The moths appear on the wing in Massachusetts from the middle of May to the latter part of June and in New York State during June and into July. They are nocturnal in habit and at

about 9 o'clock in the evening often make flights of 20 or 30 feet at a height of 6 feet or more above the ground and have been observed to make single flights of about one-seventh of a mile.

The moths lay their eggs in the spring on the under surface of the early leaves in shinglelike oval patches, the average number for the first brood as determined by studies in Massachusetts in 1919 being 386 and for the second brood in 1918, 727. Egg laying begins about $3\frac{1}{2}$ days after the moths emerge and continues for about $12\frac{1}{2}$ days, though adults may live as long as 30 days. The borer in New York State, at least, displays a marked preference for early planted corn and that planted 2 or 3 weeks later than the earliest may escape infestation altogether.

The young larvae or caterpillars eat out small areas on the leaves and as they increase in size descend and attack the developing tassel, working in the buds and later entering the stem and causing the characteristic breaking or bending at the base. The larger caterpillars enter the stalk and tunnel through all parts of the plant except the fibrous roots, retarding development and in many cases causing defective fertilization as a result of injury to the tassel. Infested stalks, when the caterpillars are active, are easily recognized by the dry or moist borings near or hanging from circular holes.

The larvae of the first brood confine their operations largely to tassels and stalks, frequently not injuring the ear. This greatly reduces the possible injury, though corn is planted so early in New York State and the moths appear so late, that it is possible for eggs to be laid directly upon the developing ears. Later developments in the infested areas have shown that there may be serious loss in sections where there is one brood, not only on account of the insect working in the stalks but because of general and somewhat severe damage to the ears.

The moths of the second brood fly mostly during August and deposit many of their eggs upon the silk of the developing ears, the young borers entering the tip and feeding frequently for some time without marked external evidence of their presence. Later the husks are penetrated, and we have the characteristic signs of borings so frequently noted in the corn stalks. Feeding may continue until checked by cold weather. The damage is frequently increased by the invasion of various rots and the breaking and decay of the affected parts. The average length of the larval period for the first brood, as established by the Massachusetts investigations, is 44 days, the maximum being 57 and the minimum 37 days. The first pupae of the second brood in Massachusetts were found in 1918 on July 11th, and were most abundant July 19th to 23d. The pupal

stage lasts about 8 days. About 59 days are required for the life cycle of the second generation. The biological data given above is based largely upon the work of Mr Caffrey and his associates at the Arlington (Mass.) Laboratory.

Available data indicate a connection between the percentage of stubble infested and the stalk infestation and, generally speaking, if the stalk infestation is below 10 per cent or thereabouts, the stubble infestation may be less than 1 per cent; while over 30 per cent stalk infestation may result in nearly 14 per cent of the stubble being infested, especially if the latter is long, while badly infested fields having a stalk infestation of 70 per cent or more may have nearly 60 per cent of the stubble inhabited by borers.

Description. The female moth is pale yellow with a robust body and a wing expanse of a little over an inch. The outer third of the fore wing is marked by two darker serrate lines. The hind wings are a plain yellow. The male is reddish brown and has a long, slender body. It is slightly smaller and much darker than the female. There is in this sex a pale yellow streak between the two serrate lines on the fore wings and two small yellowish spots near the middle. The hind wings are grayish with a broad band of pale yellow.

The nearly full-grown, overwintering caterpillars are about three-fourths of an inch in length, yellowish gray, brown headed, the body minutely brown spotted and with indistinct longitudinal reddish or dusky stripes. They may be distinguished from most other corn borers by the series of well-developed, horny, light brown tubercles, each with one or more short, stout hairs. The arrangement of the tubercles on the posterior extremity is shown in figure 2. These are the only caterpillars which feed upon the developing tassels, bore in all portions of the stem and cob and devour the corn

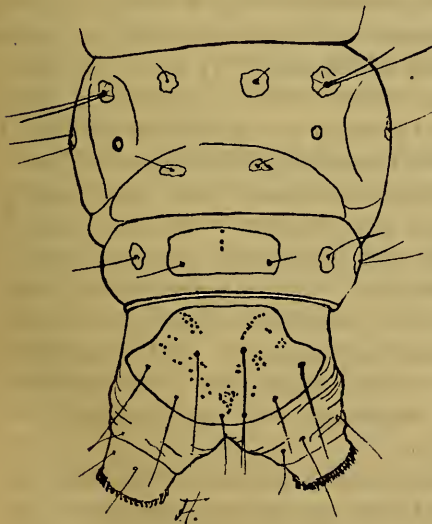


Fig. 2. Posterior extremity of a corn borer from above, showing tubercles, or warts, and hairs

upon the cob. (See page 61 for characteristics of other corn insects.)

Larvae of the genus *Pyrausta* resemble one another so closely that it is not easy to distinguish between related forms. This is particularly true of the smartweed borer, *Pyrausta ainsliei* Hein., a species occurring rather commonly in smartweed and frequently when nearly full-grown forsaking its food plant and entering nearby herbaceous plants, among others, corn. It is consequently very desirable to be able to distinguish between this casual invader of corn and the very similar and much more injurious European corn borer.

The full-grown European corn borer is moderately stout, the middle of the body being distinctly thicker than the extremities and the head brown or reddish brown, rarely black. The submedian tubercles on the anterior portion of each yellowish gray abdominal segment, specially the first to the sixth, are almost invariably rather widely separated, the distance being usually decidedly greater than the diameter of the tubercle. The anal plate is rather distinctly angulate laterally and has the anterior border somewhat emarginate mesially and laterally. An apparently invariable characteristic is found in the location of anterior setae 2 on the head, in that it is located on or close to a straight line drawn from anterior setae 1 to the anterior puncture.

The full-grown larvae of the smartweed borer is distinctly more slender than that of the European corn borer and with very little if any thickening near the middle of the body. It has a very dark-brown or black head and the whitish body is apparently more spotted, due to the submedian tubercles on the anterior portion of the abdominal segments, specially 1 to 6 being rather larger and therefore closer to each other, the distance between them being usually distinctly less than the diameter of a tubercle. The anal plate is not distinctly angulate laterally and the anterior margin is nearly truncate and slightly convex laterally. In this borer anterior setae 2 of the head is distinctly outside or lateral of a straight line drawn from anterior setae 1 to the anterior puncture. This smartweed borer is an accidental invader of corn stalks, and is not known to cause the injury so generally associated with the European corn borer larvae.

Manner of spread. Fortunately the moths do not fly great distances or the infested area would have been considerably larger after several seasons of nearly unchecked breeding. The pest can be widely disseminated by the shipment of infested plants or parts of plants, notably corn cobs, corn stalks, and in summer green corn as well as in a number of garden products, specially celery, Swiss

chard, beans, beets, spinach and ornamentals such as dahlias and chrysanthemums. In most cases, however, infestation would lead to rejection of the plants as being unfit for sale. The occurrence of the borer on the Mohawk flats, areas usually submerged each spring, makes its very probable that corn stalks or other plant stems containing living borers may be swept down stream and the insect become established in new territory. A corn stalk containing a living pupae was found in June 1919, on Dover Plot island near Cossackie.

It was at first thought that the insect was brought into this country with hemp imported for the rope walks near Boston, though later investigations have developed evidence in support of the insect having been introduced with broom corn. It is noteworthy that there is a broom factory near the original infestation in Massachusetts, that Amsterdam, N. Y., is an important center for this industry and even Irving, in the western part of the State, has a small factory.

The great danger of this insect being shipped in plants or parts of plants has resulted in the federal government and the states of Massachusetts and New York establishing quarantines designed to prevent the dissemination of the borer through commercial agencies. Regulations in New York State prohibit the movement to any points outside of the infested area of "any corn fodder or corn stalks whether used for packing or otherwise, or any sweet corn or roasting ears, corn on the cob or corn cobs; or any herbaceous plants such as cultivated garden or flowering plants, as celery, chard, green or string beans in the pod, beet tops, spinach, turnip tops; dahlia, gladiolus and chrysanthemum."

Control. Experience in Massachusetts and New York has shown that the most effective method of control is by burning all infested stalks and weeds, though there is a probability that a modified system of agriculture, directed toward the plowing under or the destruction of such materials, may result in a considerable reduction in injury, particularly in areas where there is but one brood.

Corn and corn land in the New York infested areas should be handled in such a way as to reduce to a minimum the possibility of borers surviving, and this will be accomplished in considerable measure by adopting the following precautions:

Cut corn close to the ground since many borers may winter in the stubble.

Plow thoroughly, preferably in the fall, and endeavor to cover the stubble deeply, since such measures destroy many borers.

Handle corn fodder in such a way as to reduce to a minimum the possibility of borers surviving. Putting the corn in a silo is the

best, cutting and shredding the corn stalks and even salting them promote their consumption by cattle. Where other treatment is impossible, the stalks should be composted or burned provided the expense is not out of proportion to the benefits secured. If possible do not allow pieces of corn stalk to become mixed with manure unless the latter is composted or handled so it will heat.

Corn fields and adjacent areas should be kept free from weeds and if there be nearby weedy areas they should be burned over if possible during the fall or early spring. Crops particularly likely to carry the borer, such as celery, beets, dahlias etc., should not be grown near corn because considerable infestation is due to the borers deserting the corn for one reason or another and crawling, in some cases 20 or 30 feet, before entering another plant. The danger of spread through commercial agencies can be materially lessened by observing a few precautions.

Plant small areas of very early sweet corn for the purpose of attracting the moths and in case a serious infestation results, destroy the insects by feeding the corn or in some other manner. The main crop should be planted a little later so as to escape the borers in large measure.

It is advisable to keep posted regarding both federal and state quarantines, otherwise there may be unexpected difficulties in disposing of crops grown in the infested areas.

Prevention of spread. Persons living in infested areas should be very careful not to send out any materials that might possibly contain living caterpillars of this pest. Attention is called in this connection to the quarantine previously cited. Residents of uninfested regions should be equally careful not to accept infested material from sections where this pest occurs. It is much easier to exclude the insect than to control it after it has become established.

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WHEAT MIDGE

Thecodiplosis mosellana Gehin

Wheat midge, "red maggot" or "red weevil" is somewhat familiar to most wheat growers, though in recent years it has not been associated with material losses of grain. The past two seasons this insect has been unusually abundant and in some fields excessively numerous. The urgent need of maximum production increased the importance of all insect pests and the status of the wheat midge was therefore studied in both the eastern and western grain-producing areas of New York. There have been, during recent years, some reports of the wheat midge being locally abundant, though there does not seem to have been any approach in recent years to the general prevalence of the insect such as obtained in 1917 and 1918. Investigations demonstrated the general occurrence of the insect in both rye and wheat, the former being the main small grain crop in some of the eastern counties of the State and the latter the important small grain in the western counties. Investigations were begun in 1917 and continued in 1918 and as a result we have considerable new information detailed below in regard to this insect and its present status as a grain pest.

A not unimportant outcome of these studies has been the establishment with a marked degree of certainty of the identity of the

wheat midge of America. It has been tacitly assumed that the species destructive here was the one responsible for the general and extended damage of earlier years in certain European countries, particularly England and France. It happens that there are two small midges very similar in appearance and with nearly identical habits which infest the developing heads of wheat and some other small grains. Rearings from wheat midge maggots in New York State and Ontario, Canada, produced a small fly identified with very little question as the species bearing the technical name given above. It is easily distinguished from the one (*Contarinia tritici* Kirby) commonly supposed to be prevalent in this country since the species in America has a short, stout ovipositor less than one-half the length of the body when extended, while the same organ in the other species has a length approximately twice that of the body. Both are so similar in general appearance that it is not surprising they were confused and this misunderstanding, which has prevailed for more than half a century, illustrates the practical difficulties in studying the flies belonging to this very interesting and not unimportant group. Furthermore, it should be noted that although there has been a change in the scientific name, the American records of earlier years appearing under the name of *Cecidomyia*, *Diplosis* or *Contarinia tritici* Kirby, refer with very little question to this comparatively unknown species.

The situation is not so simple as appears from the above account, since there are specimens in American collections recorded as having been reared from wheat heads which closely resemble the species under discussion. One of these was labeled as wheat midge by the late Doctor Fitch, a man who had unexampled opportunities of studying the insect during the serious outbreaks about 1850, and another was found in the collections of the United States National Museum at Washington and was labeled *Cecidomyia tritici* Kirby. Neither the one nor the other was our wheat midge, and they have been described by the writer as *Prodiplosis fitchii*¹ and *Itonida tritici*². Both of these species are entirely different from either of the wheat midges known to cause serious injury and it is presumable that they occurred in relatively small numbers and that their earlier identification as the species so destructive to wheat was a mischance which might easily occur when it is remembered that a considerable series of these midges, although very distinct when closely studied, present very striking general resemblances.

¹ 1912, Econ. Ent. Jour., 5:288.

² 1912, Econ. Ent. Jour., 5:289.

Signs of infestation. White heads or "false heads" in rye fields are very suggestive of wheat midge, though they may be produced by other causes. The white heads are generally empty, usually because the maggots have deserted them before the abnormal coloration attracted notice. A yellowish cast showing through the bracts covering the grain indicates the probable presence of small yellowish or orange-colored maggots and occasionally such heads may contain unexpected numbers of the pest. This yellowish color is seen only upon a moderately close examination.

There are no equally marked signs of infestation in wheat heads owing to the fact that the more yellowish glumes protecting the wheat grains tend to conceal the yellowish maggots sheltering beneath. It is comparatively easy to tear open a few heads and the presence of maggots is indubitable evidence of infestation. One of the easiest ways of making an examination of ripening grain is to rub heads to pieces in the hollow of the hand and in most instances, if the pest is present, the minute yellowish maggots will drop out of the bracts. This method gives an approximate indication of the extent of injury and if from five to ten maggots are commonly found in a head the infestation may be considered moderately serious.

Description. The small yellowish midges are delicate flies about one-sixteenth of an inch in length and with wings showing beautiful violet reflections. The male is easily recognized by its rather long, thickly haired antennae, apparently with nearly twice as many segments as are found in the much shorter, more sparsely haired antennae of the female. These midges do not present characters apparent to the unaided eye which can be depended upon for their recognition in the field, though the chances are that small flies presenting the above characteristics and numerous in the wheat fields at the time the heads are beginning to develop would belong to this species.

The maggots or larvae are pale yellowish when young and yellowish orange when full grown, moderately stout and at maturity about one-tenth of an inch long. They, like many gall midge larvae, have a distinct brown breastbone on the under side of the anterior extremity, and are able to snap or throw themselves an inch or so. Maggots presenting these general characters and occurring in the heads of wheat and rye are in all probability those of this species.

Recognition of these small insects is difficult and to aid those who wish to make a more serious study of the insect, the following technical descriptions have been drafted.

Larva. Length 2.5 mm, yellowish orange, stout. Head small, rather long; antennae stout, biarticulate; breastbone bidentate, the teeth diverging, obliquely truncate, the shaft long, slender and

tapering posteriorly. Skin coarsely shagreened. Posterior extremity roundly truncate and with two submedian pairs of rather obtuse tubercles, the outer pair distinctly smaller.

Male. Length 1.5 mm. Antennae a little longer than the body, thickly haired, reddish brown, yellowish basally; fourteen segments, the fifth with stems three and four and one-half times their diameters respectively. Palpi; first segment short, stout, second with a length fully three times its diameter, third a little shorter than the second, fourth one-half longer than the third. Face yellowish. Mesonotum dull reddish, the submedian lines yellowish, sparsely haired. Scutellum deep red, postscutellum whitish transparent. Abdomen with the basal half deep salmon, the distal segments yellowish transparent. Genitalia a variable yellowish and yellowish red. Wings hyaline, with a violet iridescence. Halteres yellowish transparent, the knob reddish. Coxae and femora basally, yellowish, the remainder of the legs a variable light straw; claws long, slender, evenly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, moderately stout; terminal clasp segment short, stout; dorsal plate short, deeply and triangularly emarginate, the lobes truncate or very broadly emarginate and sparsely setose; ventral plate long, broad, broadly and roundly emarginate, the lobes short, narrowly rounded; style long, slender.

Female. Length 2.5 mm. Antennae extending to the fifth abdominal segment, sparsely haired, fuscous yellowish, yellowish basally; fourteen segments, the fifth with a stem three-fourths the length of the cylindric basal enlargement, which latter has a length three times its diameter and slightly constricted near the basal third; terminal segment, basal enlargement with a length three times its diameter, the appendage stout, fingerlike. Palpi; first segment irregular, short, the second with a length nearly three times its diameter, the third as long as the second and the fourth about one-third longer than the third. Face yellowish. Mesonotum reddish brown, the submedian lines fuscous yellowish, sparsely haired. Scutellum and postscutellum mostly deep red. Abdomen pale yellowish orange. Halteres pale yellowish, the knob reddish. Coxae yellowish; femora and tibiae fuscous straw, the tarsi darker, the pulvilli nearly as long as the moderately stout claws. Ovipositor yellowish, stout, about one-half as long as the abdomen; terminal lobes lanceolate and sparsely setose. Cecid. a2252.

Name, common and scientific. This wheat midge, like a number of injurious insects, has been known by a variety of names. It has been shown above that there are at least two wheat midges in Europe and since it may be convenient to distinguish this species from the one it has hitherto been supposed to be, it is suggested that this insect be given the common name of the Moselle wheat midge, since it was in this region that it first attracted notice as a pest.

This species was originally described as *Cecidomyia mosellana* in 1857. It was discussed later by Fitch under the name *Cecidomyia tritici* in the belief that the insect he

was dealing with was identical with *Cecidomyia tritici* of Europe, a species regarded as being more abundant than *C. mosellana*. Later this Moselle midge was described by Wagner as *Diplosis aurantiaca* and was briefly noticed by Kaltenbach as *Cecidomyia aurantiaca*. It has been referred by Kieffer and Kertesz to the genus *Clinodiplosis* and was briefly noticed by Noble as *Itonida tritici*, this last in the belief that he was discussing the European *Contarinia tritici* Kirby. Kieffer in 1913, designated the Moselle midge as the type of a new genus, *Sitodiplosis*, separating it from *Thecodiplosis* on characters which in our estimation hardly justify the erection of a new genus and for the present at least we prefer to leave this wheat midge in the genus *Thecodiplosis*.

Life history and habits. The yellowish maggots of the wheat midge pass the winter in the soil or in the chaff, transforming to pupae in the spring, the delicate yellowish flies appearing early in June, particularly during a hot, sultry period. Doctor Fitch states that the appearance of the flies coincides with the first hoeing of Indian corn and the fading of the white flowers of honey locust. He estimates the duration of adult existence at about 3 weeks and states that they usually disappear toward the middle or last of July. This protracted flight explains in part the very uniform infestation of large fields. The presence of the maggot in almost equal abundance in early and late sown wheat is also made clear by this extended period of adult life.

The eggs, according to observations by Doctor Fitch, are deposited in winter wheat when it is a little more than knee high and as the heads are just protruding from their sheaths. Two to four or more maggots may be found around each developing grain. We obtained 73 from one head. This latter is exceptional under present conditions though nearly a handful was the record for earlier days. Doctor Fitch states that the fly is active and perfectly at home in a humid atmosphere and that as a consequence the midge is unable to remain about wheat heads during the day time in ordinary weather. Furthermore, wheat upon lowlands and along river flats is always more injured than that upon dry uplands. In addition the delicate maggots, like the flies themselves, must have a certain amount of moisture or they will not thrive; consequently a severe infestation, even if there be an abundance of midges, is impossible if the weather is dry at the time the heads begin to appear and if a change from a period of considerable moisture to one of relatively low humidity occurs shortly after the eggs are laid, the chances are decidedly against

many of the maggots developing successfully. They presumably succumb to the lack of moisture in much the same way as the parent flies.

The small maggots are at first whitish transparent with a greenish tinge, becoming yellowish orange when nearly full grown. They obtain their nourishment by absorbing plant fluids from the adjacent grains and husks. This drain upon the vitality of the plant reduces the size of the kernels of wheat and if the infestation is severe may blast a considerable proportion or in extreme cases all the grain. The maggots become full grown shortly before the wheat hardens and then desert the heads in large numbers. They wriggle out during a rain or when there is a heavy dew, descend the stalks or drop to the ground and establish themselves in the upper layers of the soil, probably rarely penetrating to more than an inch below the surface. Under some conditions considerable numbers of the maggots remain in the wheat heads, are carried with the grain to the thrashing machine and are thrown out with the chaff. Occasionally these yellowish maggots form a considerable proportion of the screenings.

It will be seen from the above that the number of maggots in a wheat head is variable, much depending upon weather conditions immediately preceding. The presence of a large number indicates a serious infestation while the absence of maggots is simply of negative value. They may have been in the head earlier and deserted it or there may have been no infestation. Many shrunken grains or empty husks under such conditions is evidence that something has prevented the normal development and in not a few cases most of the injury may be due to an infestation by the maggots of this midge.

Wagner, who studied the European wheat midge (*tritici*) and the Moselle midge (*mosellana*) about 1865, states that flies may be abroad for 6 or 7 weeks, that they are active all night and that quack grass is a host plant as well as rye and wheat, the Moselle midge apparently showing a greater preference for rye than wheat. This last observation is hardly confirmed by conditions found in western New York. In this connection it should be remembered that infestation is very probably proportional in large measure at least to the condition of the grain at the time the flies are most abundant. He states that these midges begin to oviposit as soon as the heads appear and continue until blossoming of the grain, and adds that the two species have such similar habits that what is true of one applies largely to the other. It follows from the last that American records in regard to life history are of most value for our purposes since they relate

entirely to our destructive wheat midge, which in some localities at least is the Moselle midge.

Early American history. The data brought together by Doctor Fitch indicate the probable establishment of this insect upon the St Lawrence river some 40 miles above Quebec in 1828 or earlier and its gradual spread southward through the Champlain and Hudson valleys and westward along the Mohawk valley and beyond until it had established itself in the entire wheat-growing areas of this and adjacent states. The appearance of this insect in the wheat fields was accompanied by losses far in excess of those characteristic of later outbreaks. It was so extremely destructive that wheat growing was abandoned for a time in portions of the upper Hudson valley. The devastation was so complete in some fields that the crop was not worth harvesting. Doctor Fitch and well-informed contemporaries state that the yield from large sections of the State was not one-third or one-fourth of an ordinary crop. One of the most interesting features in connection with this outbreak was the markedly greater losses during the first few years of the midges' presence, followed later by much less damage. The loss in New York State in 1854 was estimated at \$15,000,000 and correspondingly severe damage occurred in the state of Ohio. Yields of but one bushel an acre were not uncommon and there is at least one record of nearly a handful of maggots being rubbed out from a head of wheat. This latter was not very much more than our last summer's record of 73 maggots from one head. In 1856 the pest is credited with having destroyed from one-half to two-thirds of the crop in Livingston county on the uplands and nearly all on the flats. At least 2000 acres on flats which would have yielded 30 bushels an acre were not harvested and conditions were even worse in 1857.

There have been minor outbreaks since these early days and in some instances a considerable infestation in individual fields and perhaps over areas of large extent. Apparently most of these have been much more restricted than was true of 1917 and 1918 though it should not for a moment be supposed that the general occurrence of this pest during the past two years is likely to result in any such widespread damage as occurred in 1854 or thereabouts. The wheat midge was then a comparatively recent introduction and presumably exempt in large measure from attack by natural enemies. All the evidence points to the general prevalence of this insect year after year in the wheat-growing areas. The reason for the great discrepancy between the losses of earlier years and those occurring or likely to occur at the present time, is that natural enemies of this pest have

become so numerous and widely distributed as, in a large measure, to prevent the undue multiplication of this insect. Furthermore, many introduced insects appear to multiply more rapidly for a few years after they have become established in a new environment, and this seems to have been the history of the wheat midge and is something which many of us have watched during the past 25 years in the case of the once dreaded but now scarcely feared San José scale.

Wheat Midge in Western New York

A survey in mid-July of conditions in Erie, Genesee, Niagara and Orleans counties showed the maggot to be generally present, mostly in small numbers, throughout the greater part of the wheat-growing area. Many of the fields had 80 to 99 per cent of the heads infested and the shrunken grain varied from an average of about 4 per cent to as high as nearly 33 per cent, the latter being unusual.

Wheat midge did not appear to be nearly so abundant in Ontario county and other sections more removed from the four counties mentioned above. For example, very moderate infestations were found in samples received from both Ontario and Oswego counties and Professor Parrott has subsequently informed us that farmers in the immediate vicinity of Geneva have been gratified by the yields of the past two seasons, they having obtained as high as 42 to 47 bushels an acre. It is certain that wheat midge has not greatly reduced the crop in fields producing such quantities of grain.

The first object of this survey was to determine the prevalence of the insect and the second to ascertain whether any varieties, system of cultivation, time of sowing, location of field, or other factor which could be readily modified, had an important influence in either encouraging or preventing infestation. Many wheat fields were examined throughout the area and a number of representative samples taken and carefully examined in the laboratory to ascertain the total number of grains, the number and percentage shrunken and the number of maggots in the head. This latter varies considerably and while the presence of many maggots indicates serious infestation, their absence by no means proves the contrary since they frequently leave the heads during rains or when there is a considerable amount of moisture upon the grain.

A tabulation of these laboratory results is given below, the varieties being arranged in approximately the order of their importance in the region covered by the survey.

No. 6 — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
E. J. Yocum	Erie	Akron	411	10.6	34	4	(Wheat 3 years in succession)
Andrew Hughs	Genesee	Le Roy	278	13	36	9	
W. J. Jones	Genesee	Oakfield	386	8	31	8	
R. P. McPherson	Genesee	Le Roy	252	11.5	29	2.5	
R. P. McPherson	Genesee	Le Roy	292	2.4	7	...	Sept. 22 Oct. 15 Sept. 19 or 20 Sept. 20-25 Oct. 1 Oct. 20-25
Chas. Roth	Genesee	South Byron	252	7.5	19	6	
R. J. White	Genesee	Oakfield	230	11	26	12	
E. S. Gifford	Niagara	Gasport	290	27	78	15.4	
B. Martin	Niagara	Lockport	355	10	36	5.4	
A. J. Smith	Niagara	Lockport	209	6.22	13	2	
Lynn Burrows	Orleans	Albion	133	8.2	11	1.2	
Carl Hakes	Orleans	Albion	463	12.1	56	4	
Carl Hakes (Small heads)	Orleans	Albion	258	64	165	2	
Carl Parker (1st field)	Orleans	Albion	351	25.7	90	2.6	
Carl Parker (2d field)	Orleans	Albion	232	5.2-	12	3	
Carl Parker (3d field)	Orleans	Albion	164	20.1	33	1	
A. A. Sadler	Orleans	Albion	198	5	10	2	

White chaff — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
Hermann Gombert	Erie	Clarence Center	284	9.5	27	4	Sept. 15
H. H. Kelkenberg	Erie	Clarence	259	10.4	27	3.3	
R. P. McPherson	Genesee	Le Roy	139	6.3	9	...	
R. J. White	Genesee	Oakfield	218	10.5	23	6	
M. F. Capen	Niagara	Lockport	273	8.4	23	1.9	
Ezra Gunby	Niagara	Lockport	378	2.9	11	.8	
Edward Rankie	Niagara	Lockport	406	1-	6	.5	

Jones red wave — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
G. Danser	Erie	Clarence	414	14.2	58	9	Sept. 25
E. J. Snell	Erie	Akron	455	19-	86	19	Sept. 22
E. J. Yocum	Erie	Akron	276	16	46	10	.....

Klondike — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
G. Danser.....	Erie.....	Clarence.....	395	18.7	74	16	Sept. 25
Edward Sparling..	Erie.....	Akron.....	277	11.2	32	1.3	Sept. 12
W. Barrs.....	Niagara....	Lockport.....	354	15	53	5.3	.....
R. D. Bowmiller..	Niagara....	Lockport.....	381	6.8	26	2.9	Sept. 17
A. F. Dale.....	Niagara....	Lockport.....	476	27.3	130	13	.....
Geo. W. Mead.....	Niagara....	Barker.....	316	3.4	11	2	Sept. 17
R. D. Bowmiller (2d field).....	Niagara....	Lockport.....	486	15	73	4.7	Sept. 17
R. D. Bowmiller (2d sample).....	Niagara....	Lockport.....	160	16	26	7	.....

Iron clad wheat — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
J. F. Reed.....	Niagara....	Newfane.....	294	2.4	7	*1	.....
J. F. Reed.....	Niagara....	Newfane.....	244	8.59	21	3	.....
A. J. Smith.....	Niagara....	Newfane.....	306	2.6	8	*1	.....
A. J. Smith.....	Niagara....	Newfane.....	292	4-	11	1+	.....

* Minimum none, maximum 2.

Dawson's golden chaff — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
Richard Bates.....	Genesee....	Le Roy.....	236	5.5	13	2.5	.....
F. W. Mathews.....	Genesee....	Le Roy.....	240	5.8	14	2-	.....

Hundred mark — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
Robert Eichender..	Niagara....	Lockport.....	292	29	85	7	Sept. 25

Leap's prolific — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
Milford Hakes.....	Orleans.....	Albion.....	179	4-	7	1-	Oct. 1

St Louis prize — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
William Sack.....	Niagara....	Ransomville....	352	10.5	37	2.5	.....

No. 8 — Wheat midge, 1918

OWNER	COUNTY	ADDRESS	GRAINS			MAGGOTS AVERAGE PER HEAD	DATE SOWN
			No.	SHRUNKEN			
				Per cent	No.		
E. F. Strickland....	Erie.....	Akron.....	264	28	74	18	Sept. 15

It will be seen by the above data that no. 6 wheat had an average of a little less than 12 per cent shrunken grain for 16 samples, the average number of maggots to a head for the different samples ranging from 1 to over 15. This average does not include one sample of small heads taken from the field of Carl Hakes and showing over 50 per cent of shrunken grain. Subsequently Mr Hakes reported that the field showing 12.1 per cent of shrunken grain in the samples secured, yielded 22 bushels an acre, thrasher's measure. He estimated that there were 2 bushels of screenings an acre and considered there was some, though not serious, injury by the midge. He adds that the above figures are only approximate and that his early wheat yielded about 35 bushels an acre. It was from this latter that the sample of small heads showing 64 per cent shrunken grain was secured.

Carl Parker reported yields of 12, 32 and 22 bushels an acre from three fields showing in samples 25.7, 5.2 and 20.1 per cent of shrunken grain. He considered that the wheat was seriously injured by the midge and estimated the loss at 20 per cent.

E. J. Yocum reported an average yield of 20 bushels to the acre from a field showing 10.6 per cent shrunken grain and an average of four maggots to a head in a sample taken before harvesting.

One field of Mr McPherson's, Le Roy, which showed 11.5 per cent shrunken grain, produced 30 bushels an acre, with a shrinkage of 5 to 6 bushels for each 100 bushels.

The field of E. S. Gifford, Gasport, showing 27 per cent shrunken grain in the sample, produced 30 bushels an acre. Mr Gifford could give no information as to the screenings though he stated they were mostly chaff.

Seven samples of white chaff had an average of 6.4 per cent of shrunken grain, the number of maggots for the various samples averaging from a little less than 1 to 6 a head. This variety appeared to be somewhat more immune from maggot injury than the more popular no. 6 and in one section the more generally grown Jones red wave. The yield from a 6-acre field of Mr Kelkenberg was reported as 160 bushels, a little over 26 bushels an acre. There was 2 to 2½ per cent of shrunken grain. Mr Kelkenberg states that the yield was reduced somewhat by a low sag extending nearly across the field.

The field of Mr Capen, Lockport, showing 8.4 per cent shrunken grain in the sample, produced 20½ bushels an acre, there being practically no screenings.

Jones red wave had an average of 16.6 per cent of shrunken grain for three fields and an average of nearly four maggots a head. The midge, for some unexplained reason, appeared to be unusually abundant in the vicinity of Clarence and Akron, where this variety is grown quite extensively. Other wheats, however, seem to be nearly as badly infested. E. J. Snell reported that 16 acres produced 420 bushels, or 26 bushels an acre. The total waste was about 25 bushels, consisting of chaff, cockle, straw, quack, seed weevil and shrunken wheat. E. J. Yocum reported an average of about 18 bushels to the acre and stated that it was of poorer quality than his no. 6. A sample taken from the field before harvesting showed 16 per cent of shrunken grain and an average of 10 maggots to a head. This infestation was considerably greater than that of nearby no. 6.

Klondike had an average of 14.9 per cent of shrunken grain for a series of eight samples, the average number of maggots a head ranging from 1.3 to 16 for the different samples. Attention is called in particular to the field of Mr Dale of Lockport, with its 27.3 per cent of shrunken grain out of a total of 476, the average maggots to a head being 13. Mr Dale reported subsequently that this field yielded 500

bushels and 37 pounds of good wheat and 20 bushels and 5 pounds of screenings from 18 acres, an average of approximately 28 bushels an acre. He adds that the millers did not screen the wheat very closely since they needed all they could get and many half kernels went in. In the opinion of L. F. Strickland, agent, Department of Farms and Markets, who investigated wheat midge conditions in company with the Entomologist, these fields under conditions such as obtained last year should have yielded nearer 36 bushels to the acre which would mean a decrease in the crop of about 20 per cent due largely, if not entirely, to wheat midge.

The field of George W. Mead, Barker, showing in the sample 3.4 per cent shrunken grain, yielded $26\frac{5}{7}$ bushels an acre, there being approximately $4\frac{1}{2}$ bushels of shrunken wheat to each 50 or 60 bushels.

R. D. Bowmiller, Lockport, obtained a yield of $22\frac{2}{3}$ bushels an acre, there being approximately 35 pounds of shrunken wheat to each 60 bushels. This yield is probably the average for the two fields, samples from which gave an average of 15 and 16 per cent of shrunken grain.

Iron clad, a bearded wheat, had an average of a little over 4 per cent of shrunken grain for a series of four samples, the average number of maggots to a head varying from 1 to 3. It is interesting to note that samples of no. 6, growing as a mixture with iron clad, in the field of A. J. Smith, showed 6.2 per cent shrunken grains and 19 maggots in a sample of ten heads.

J. F. Reed, Gasport, obtained a yield of 26 bushels an acre from one field. He thinks he seeded too lightly as only about $1\frac{1}{4}$ bushels were sown to an acre. This is probably the average yield for his two fields which showed 2.4 and 8.59 per cent of shrunken grain respectively in the two samples taken.

A. J. Smith, Newfane, obtained $28\frac{1}{4}$ bushels an acre. There was mostly chaff in the screenings.

Two samples of Dawson's golden chaff had an average of 5.66 per cent of shrunken grain, the number of maggots to a head averaging about 2.

The field of Richard Bater, Le Roy, produced but 17 bushels an acre, the low yield being attributed in part at least to the hard winter. This appears probable since the field of Mr Mathews, with an almost identical percentage of shrunken grain in samples taken last summer, produced 33 bushels an acre and an estimated 3 pounds of shrunken grain to a bushel.

Hundred mark, one sample, showed 29 per cent of shrunken

grain and an average of 7 maggots to a head. The owner reported a yield of $26\frac{1}{2}$ bushels an acre and $1\frac{1}{2}$ bushels of screenings. He estimated the loss due to midge at 5 per cent.

Leap's prolific showed a little less than 4 per cent shrunken grain in one field and the number of maggots to a head was less than one.

A sample of St Louis prize had 10.5 per cent shrunken grain and an average of 2.5 maggots to a head.

One field of no. 8 wheat had 28 per cent shrunken grain and an average of 18 maggots to a head. The yield was $18\frac{3}{8}$ bushels an acre, from the machine by weight. There is very little question but that the large shrinkage was due to the exceptionally heavy midge infestation. The insect was unusually prevalent in that section and there were probably heavy losses as a consequence.

The above figures give some idea regarding liability of different varieties to injury by the maggot, though more conclusive evidence may be secured when two varieties are grown under practically identical conditions or even intermixed, for example, Klondike and Dawson's golden chaff, grown in the town of Le Roy, had 13.8 per cent and 5.8 per cent respectively in adjacent fields separated only by a lane, while the average number of maggots to a head were 3 and 2 respectively. Again, iron clad and no. 6, grown in Newfane, the latter intermixed, had a little less than 4 and 5.1 per cent respectively of shrunken grain, the former with an average of a little more than 1 maggot to a head and the latter with an average of less than 2 maggots to a head. Finally, no. 6 and white chaff intermixed in a Le Roy field had 2.4 and 6.3 per cent respectively of shrunken grain and an average of less than 1 and 9 maggots to a head for the two varieties. This latter was exceptional and may have been due to the white chaff in this particular instance being in a more attractive condition at the time the midges deposited their eggs, since for the region as a whole, the white chaff was certainly less affected by the midge than no. 6.

Wheat Midge in Rye

There was a very general and in some cases excessive infestation of rye by wheat midge. Conditions in Albany county were brought to our attention June 11th by H. E. Crouch, manager of the local county farm bureau. He stated that there was a somewhat general infestation, some 25 per cent of the heads being affected in portions of fields and that the infestation for the county might possibly be 1 or 2 per cent. It was by no means difficult to find ten maggots in one head and the presence of four or five was very common.

An examination of conditions near Niverville and Muitzeskill June 13th disclosed a rather general prevalence of the insect and resulted in locating two fields near Niverville where nearly 30 per cent of the heads were infested, a considerable proportion of these being white heads and empty or nearly so. In addition, there were numerous other heads apparently normal which showed a yellowish cast through the glumes and on examination several to a number of the grains were dwarfed or blasted by one to three or four maggots. One head from Niverville with 28 spikelets contained 9 larvae, a second with 22 spikelets 35 larvae, and a third with 23 spikelets 21 larvae.

An examination of conditions in and about Nassau showed a somewhat general prevalence of wheat midge, certain fields probably having 10 to 12 per cent of the heads infested while a number of others were almost free from the insect. A closer examination of one field showed the maggots to be uniformly present throughout, indicating in this instance at least very little or no connection between infestation and the proximity of strips of grass or grassy areas. One of the most serious infestations came to notice through N. G. Farber, Rensselaer county farm bureau agent, who sent in one head, superficially not badly affected, that contained 62 maggots.

Representative lots from three fields, two in East Schodack and one in North Chatham, were carefully examined and the results are tabulated below.

Wheat midge in rye fields

Analysis of samples June 18, 1918

	EAST SCHODACK NO. 1			EAST SCHODACK NO. 2			NORTH CHATHAM		
	No. and per cent	Per cent crop		No. and per cent	Per cent crop		No. and per cent	Per cent crop	
		Loss	Class		Loss	Class		Loss	Class
Large heads....	23	....	12	18	....	21	14	....	14
Spikelets....	81	....	....	51	....	....	46	....	....
Grains....	112	....	....	81	....	....	65	....	....
Grains, max....	162	....	....	102	....	....	92	....	....
Maggots....	29	....	....	1	....	....	10	....	....
Below max....	31%	4	....	20%	4.2	....	29%	4	....
Medium heads....	38	....	20	21	....	25	42	....	42
Spikelets....	68	....	....	75	....	....	66	....	....
Grains....	71	....	....	70	....	....	74	....	....
Grains, max....	136	....	....	150	....	....	132	....	....
Maggots....	45	....	....	41	....	....	23	....	....
Below max....	48%	9.6	....	53%	12.2	....	44%	18.5	....
Small heads....	46	....	24	44	....	52	41	....	41
Spikelets....	66	....	....	80	....	....	66	....	....
Grains....	43	....	....	76	....	....	39	....	....
Grains, max....	132	....	....	160	....	....	132	....	....
Maggots....	55	....	....	20	....	....	22	....	....
Below max....	67%	31	....	52%	27	....	70%	10	....
White heads....	82	43	43	2	2	2	2	2	2
Spikelets....	52	....	....	....	....	....	....	....	....
Grains....	....	....	....	....	....	....	....	....	....
immature....	61	....	....	....	....	....	....	....	....
Maggots....	12	....	....	....	....	....	....	....	....
Total and percent	189	87.6	....	85	45.4	....	99	34.5	....

East Schodack field no. 1 was very badly infested, no. 2 showed only a moderate infestation and the North Chatham field still less. The last was considered one of the best looking pieces of rye in that section.

Attention is called first of all to the varying percentage of large, medium, small and white heads in these three fields. The percentage of the last was low except in the Schodack field no. 1, while the marked difference between the Schodack field no. 2 and the North Chatham field is in the percentage of small heads.

The maximum grains possible are double the number of spikelets and the reduction from the maximum in each case is calculated by taking the difference between the maximum grains and the actual number and figuring out the percentage for the group and then the percentage reduction for the entire crop, this latter appearing by itself in the column marked Crop percentage, loss. It should be remembered that a maximum yield is very rarely obtained and that

not all the losses can be fairly attributed to wheat midge. It is evident from the above figures that a serious infestation, 30 to 50 per cent white heads, must mean a considerable reduction in the crop. For example, a white head $1\frac{3}{4}$ inches long contained 1 rudimentary kernel of rye and 8 maggots, another $3\frac{3}{4}$ inches long bore no grain and contained 12 maggots and a third, $3\frac{1}{2}$ inches long produced 14 badly shrunken grains of rye and contained 19 maggots. In other words, the white heads are practically a total loss and when their number reaches 40 per cent or more it must mean a large shrinkage in the crop. Furthermore, this is by no means the total reduction since there may be a considerable shrinkage from the possible maximum in the other heads which, for the large ones as shown by the above tabulation, may approximate 4 per cent, in the medium ones this may range from 9.6 to 18 per cent and in the small ones from 10 to 31 per cent.

The rye crop as a whole was probably not seriously reduced by wheat midge, though there is no doubt but that the yield of individual fields was considerably lower than it should have been and perhaps reduced to a much greater extent than the farmer realized. Unfortunately it has been impossible to get accurate information as to yields from these fields and thus demonstrate the relation existing between examinations of small quantities and the returns from relatively large areas.

Factors affecting infestation. One of the important objects of the survey referred to above, was to ascertain the conditions favorable to the wheat midge and if possible point out a practical method of reducing the probabilities of injury in subsequent years.

It was thought by some that early wheat was less injured than later fields though this does not appear to be borne out either by variation in infestation in fields sown early or late or a difference in injury among the varieties grown, at least so far as the period of maturity is concerned. The time of sowing of winter wheat can have comparatively little influence upon its ripening the following season because the latter is dependent more upon the weather following the starting of growth in the spring than upon the development of the plant before winter weather stops growth. There was practically no difference in the degree of infestation discoverable between early and late sown fields and, as will be shown later, the varietal infestation appears to depend upon other factors than that of earliness or lateness.

Deep plowing has been advocated as a method of controlling this pest and yet observations showed the insect to be as abundant in

grain fields which had been plowed year after year and produced wheat three or four seasons as in other areas where seeding is commonly put in with the grain and therefore plowing is impossible after harvest. Furthermore, even if deep plowing did materially influence the abundance of the midge, there is a question as to whether farmers could be induced to modify their practices in order to obtain a slight benefit in reducing the probability of infestation by midge.

The amount of infestation in fields remote from other wheat was carefully examined and here again little encouraging was found. The wheat midge, in areas where it is prevalent, appears to be fairly uniformly distributed throughout the entire section, occurring in almost equal abundance in wheat fields comparatively remote from land where grain had been grown the preceding year. There was also very little difference in the infestation between the margins of fields where the insects would presumably have better shelter through the winter and the middle of large fields in wheat.

There is some difference in the susceptibility of varieties, the bearded wheats with coarse hulls and considerable mineral matter in the chaff appear to be somewhat more free from the pest than the softer strawed, beardless varieties. White chaff, for example, was very frequently less infested, sometimes markedly so, than no. 6. There is a question as to whether this immunity is sufficiently great to warrant changing from one variety to another and as a rule that would not be advised.

The survey brought out rather distinctly the fact that the more vigorous fields of wheat were as a rule less affected by the midge. This may possibly have been due to the fact that there was just as much midge in these fields as in the others and that the apparent difference was due to more numerous and larger heads; in other words, to a larger proportion of grain rather than a reduction in the number of maggots. It is quite possible that the truth is midway between these extremes and that the unusually good fields of wheat, because of their vigor, developed more grain and at the same time presented conditions less favorable to the midge so that somewhat more of the pests succumbed than if the growth of the grain had been less rapid. It is certainly true that no harm can come from giving the best possible fitting to wheat ground and thus putting the crop in the very best condition to outgrow its various enemies.

It is very probable that weather conditions at the time the wheat is heading has a material influence upon the midge. Unusually cool, moist weather keeps the developing grain in a more succulent and therefore presumably more favorable condition for the growth of

the maggots and such atmospheric conditions are also favorable to activity by the midges. On the other hand, dry, warm weather would tend to restrict the time when the midges can deposit eggs successfully by hastening the development of the grain and particularly its hardening, the latter probably vitally affecting the successful development of the maggots. There is a very close relation between the development of the related Hessian fly and the condition of the grain. Soft-stemmed varieties are frequently very seriously injured while nearby stiffer-stemmed varieties are almost immune from attack. Striking variations may also be seen in different parts of a field, the more succulent-stemmed grain growing on moist land suffering more than the harder stalks of the same variety on gravelly knolls. The spring and early summer of both 1917 and 1918 were unusually cool and moist and the midge appears to have been exceptionally numerous. This at least suggests an intimate connection between the welfare of the insect and climatic conditions at the time the grain is developing. Weather conditions can not be changed. If the above is true, however, the probabilities favor decidedly less injury than during the last two seasons.

Control measures. The prolonged period during which wheat midges may be in flight and the general distribution of the insect throughout the grain-producing areas renders it extremely improbable that practical modifications in time of sowing, in rotation of crops or method of preparation, would have any very material influence upon this pest. We are strongly of the opinion, however, that the best possible preparation of the soil so as to promote a vigorous growth is of importance in the production of a medium to fair crop in spite of midge infestation.

We therefore advise following previous methods and using the same varieties, varying only in giving if possible better preparation. Otherwise changes may result in even more serious losses, specially if this be in the date of sowing, since an earlier seeding, as many growers have learned to their cost, may result in great injury by Hessian fly.

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NOTES FOR THE YEAR

The season has been remarkable for the scarcity of the apple tent caterpillar and the same has been true to a large extent of shade tree insects. The elm leaf beetle, presumably on account of the relatively cool spring and summer, caused very little injury.

The marked scarcity of early leaf feeders observed both this season and last was offset to some extent by the abundance of late leaf feeders which was particularly marked in the case of the red-humped and yellow-necked apple worms noticed below, and to a less extent than last year, in the case of hairy caterpillars, such as those of the hickory tussock moth and its associates.

A number of the more important or unusual insects attracting attention during the year are briefly noticed below.

FRUIT INSECTS

Yellow-necked and red-humped apple caterpillars. (*Datana ministra* Drury and *Schizura concinna* Sm. and Abb.). The yellow-necked and red-humped caterpillars, specially the former, have been exceptionally abundant and injurious, particularly in the upper Hudson valley. These insects were unusually numerous in 1917, and appear to have been much more abundant the past season. The first reports of injury were received toward the last of June and related to small, red-humped caterpillars feeding upon young trees in Greene county. Injury continued so that

it was a matter of record in early and mid-July. This insect and the yellow-necked caterpillars became so abundant that a special circular was issued the first of August. Subsequent evidence fully demonstrated the value of the warning since there was almost unprecedented stripping of young and even moderately small trees. The yellow-necked caterpillars continued numerous until the middle of September. The damage to many young trees is so great that extensive winter killing may occur, specially if the cold is unusual.

The moths of both species fly in midsummer and later deposit their whitish eggs in clusters on the underside of the leaves. The caterpillars are gregarious and when young skeletonize the foliage, though they soon commence to devour the entire leaf and their presence is easily recognized by the stripped or partly defoliated branches or even entire trees. The caterpillars of both species are easily distinguished from other common apple insects by the peculiar habit of elevating both extremities when alarmed and, as the pests are usually in clusters, the effect is grotesque and somewhat suggestive of a cluster of strange flowers. Young yellow-necked apple caterpillars are chestnut brown with obscure darker stripes and as they increase in size the body is distinctly striped with black and yellow and sparsely clothed with rather long, whitish hairs. The red-humped apple caterpillars are likewise striped and are easily distinguished by the coral red head, the similar colored swelling on the third thoracic segment and the red posterior extremity. This caterpillar has a series of short, black tubercles and is not hairy. Both of these caterpillars are about $1\frac{1}{2}$ inches long when full grown. The yellow-necked caterpillars winter in the soil and the red-humped ones in cocoons under trash on the ground, the moths of each not issuing until the following season.

These pests are easily controlled by spraying with a poison and under present conditions it is advisable to protect young trees from these and associated depredators by spraying about the first of August with arsenate of lead, using 2 pounds of the paste to 50 gallons of water.

Apple and thorn skeletonizer. (*Hemerophila pariana* Clerck). The establishment of this insect in Westchester and Rockland counties was recorded in Cornell Extension Bulletin 27 and in the report of this office for last year. Both these publications contain extended accounts to which the reader is referred for additional details. Reports received the past season indicate the occurrence of the insect north from Yonkers to Yorktown Heights. It is probable that there has been some extension of territory during the season

though it has not been possible to determine the limits closely. Specimens of partly grown and full-grown larvae and a number of cocoons were received from Nyack, July 18th. The material clearly indicated that feeding had been in progress for some weeks and established the fact that there are two if not three broods of this insect in New York State. A common parasite of some of the smaller leaf feeders, namely, *Exorista pyste* Walk., was reared from the material. This encourages the hope that eventually native enemies of allied or associated leaf feeders will prove of considerable service in preventing the undue multiplication of this recently introduced insect.

Quince curculio (*Conotrachelus crataegi* Walsh). The erratic appearance of this curculio has long been a matter of record, though so far as the writer recalls, nothing has appeared showing a great variation in emergence the same season. Several quince curculios were received May 31st from A. B. Clarke and Son, Milton, Ulster county, accompanied by the statement that they were very injurious to pears. The curculios were feeding actively upon the young fruit transmitted with the communication, eating deep holes into the sides of the pears. These holes were characteristic feeding punctures, each being circular, with a diameter a little less than one-sixteenth of an inch and opening into an irregular cavity with a diameter of about one-eighth of an inch. Subsequent correspondence developed the fact that quince bushes were in the near vicinity and the attack upon pears was probably accidental and due either to the lack of quinces or to the fact that the fruit had not sufficiently developed. A similar change of food habit in the plum curculio to adjacent crab apples, serious injury resulting to the latter, has been observed in earlier years.

The above was followed by a report from L. F. Strickland, inspector of the State Department of Agriculture, announcing the first appearance of quince curculios in the vicinity of Lockport, Niagara county, July 9th. This latter is about the time curculios usually appear in the western part of the State, though as evidenced by earlier records, occasionally there are wide departures from this presumably somewhat normal date of emergence. The climatic and other conditions in the Hudson valley and the western part of the State do not vary sufficiently to explain this difference of 5 weeks in the appearance of the adults, though they might easily account for a range of a week or 10 days. Evidently the quince curculio is likely to issue from the soil during a considerable period and since the most effective method of controlling the pest is by spraying just after the

insects begin feeding, it is evident that quince growers should watch closely for the first feeding punctures and be governed accordingly unless they prefer to make three applications, one just after blooming, a second about 2 weeks later and the third the latter part of July, or in other words, give practically the same treatment as the usual three sprays advised for the control of the codling moth. Usually the first would be too early to secure the best results and the second might well be delayed a little longer; otherwise it may be washed off before the insects feed to any extent. The ideal is to give the first treatment just after the curculios issue, making a second application a week later.

Magdalis barbicornis Latr. A few specimens of this insect were received July 9, 1917, together with samples of their work on quince from L. F. Strickland, Lockport, N. Y. The first sending was supplemented by a considerable series of beetles and samples of their work, July 12, 1918. This small, black weevil is a European species which has been recorded from Staten Island, N. Y., and Dorchester, Mass., feeding on elm in the latter locality.

The weevil gnaws irregular skeletonized areas on quince, the eating being on the underside of the leaf and consisting of excavations of the more tender tissues between the veinlets. The affected areas soon turn brown, are irregular and may vary from small spots with a diameter of approximately a twenty-fifth of an inch to diverse shaped areas, with a major diameter of one-half of an inch to an inch. Mr Strickland states that out of a total of 464 leaves examined, 156 exhibited injury of this character. The writer has noted similar work in earlier years upon quince trees in different parts of the State and there is a fair probability at least of the damage being caused largely if not entirely by this introduced insect.

Thorough spraying the last of June or early July with arsenate of lead would very probably protect the foliage if it did not destroy the weevils.

Raspberry Byturus (*Byturus unicolor* Say). Injuries by this pest in Milton and Marlboro continued the present season and in the judgment of one grower some 25 per cent of the crop is frequently lost through the work of this insect, although many growers attribute the shrinkage to something else or accept it as one of the inevitable developments.

The most satisfactory method of controlling this species is by early and heavy applications of arsenate of lead, using 8 pounds of paste to 100 gallons of water and spraying before the beetles have inflicted material injury. The beetles feed upon the unfolding leaves or

unopened buds, and consequently spraying to be effective must be early enough to catch the insects before there has been much damage to either buds or leaves.

Pear psylla (*Psylla pyricola* Forst.). There have been comparatively few reports of serious injury by pear psylla during the past summer. The extremely severe weather of last winter following injury by this insect and in some cases reduced vitality due to other causes, has resulted in a great deal of winter injury. This has been particularly marked in a number of pear orchards which have been making an unsatisfactory growth for several years past and have undoubtedly suffered to a greater or less extent from pear psylla. Trees in these orchards went into the winter in poor condition and were unable to survive the extreme conditions. Small limbs and in exceptional cases large limbs and in a few instances even most of the trunk was practically killed or so badly injured that the trees were unable to recover and slowly died back during the spring and early summer. Kieffer, Bartlett and Seckle trees fared the worst, while Clapps favorite largely escaped damage.

The pear psylla, it should be understood, is only one of a number of contributing causes which weakened the trees in earlier seasons so that they were unable to winter successfully. The severe weather has emphasized this injury and fruit growers are coming to realize as never before the need of keeping the trees vigorous if they are to avoid serious damage.

GARDEN INSECTS

White grubs (*Phyllophaga fusca* Frohl.). The year for serious white grub injury in Albany, Columbia and Rensselaer counties, as well as some other portions of the State, passed with little damage compared to the losses inflicted in 1915 and 1912. There were some reports of local injury here and there but the affected areas were by no means large and the injury could not be classed as severe.

It was hardly to be expected that these pests would be able to continue in large numbers through a long series of years, though it was not anticipated that there would be such a material diminution of the insects. This favorable outcome is very probably due in large measure to the activities of natural agents, such for example as the predacious maggots of the robber fly, *Promachus fitchi* O. S., a species comparatively abundant in infested fields in 1913 and 1916. Other natural enemies rendered material service in destroying the grubs and even the adult beetles, though the proba-

bilities are that many of the insects succumbed in the larval state since there was a considerable flight and much local injury to foliage in 1917.

A judicious rotation of crops and the exercise of moderate care in planting corn, potatoes and other susceptible crops upon land badly infested by young grubs will assist greatly in avoiding injury in subsequent years. The marked three-year periodicity of attacks should be kept in mind since it is a valuable guide in anticipating and safeguarding against losses by these pests.

Black flea-beetle (*Epitrix cucumeris* Harr.). There was unusual trouble from this insect, specially in the vicinity of Poughkeepsie, where potatoes and particularly recently transplanted tomatoes suffered severely. There were also reports of considerable damage in other parts of the State, notably in Broome, Monroe and Suffolk counties. This insect is one of the common garden pests ordinarily appearing in early spring and feeding upon a variety of young plants, though it displays a marked preference for potato, tomato and tobacco. The small beetles eat out characteristic oval skeletonized areas which soon turn brown and in the case of badly affected leaves the appearance suggests riddling with fine birdshot. This insect not only damages the plants but the numerous feeding places promote infection by blight or fungus. This latter may be more serious than the work of the beetle. The pest usually disappears before serious damage has been caused. The small black beetles, only about one-sixteenth of an inch long, winter in various shelters, feed for a time as indicated above and lay their eggs upon the roots of some of the common weeds. The young or grubs mine the roots and have been associated with "pimply" potatoes.

The general habits of this insect emphasize the value of clean cultivation since such procedure reduces the food supply of the grubs and there are consequently fewer beetles another season. The outbreak described above appeared to be rather closely related to weedy fields or weeds in the vicinity of the affected plants. The appearance of the small beetles should be a sign for thorough spraying with a poison such as arsenate of lead, using 2 or 3 pounds to 50 gallons of water and if necessary making a second application a few days to a week later. Paris green added to the bordeaux mixture is also an excellent preventive. Young tomato plants should not be set on ground where there are numerous flea-beetles without first protecting them by spraying or dipping in one of the poisons mentioned above. Dusting the plants with air slaked lime, plaster of paris, soot, coal ashes or even road dust affords considerable protection.

Potato aphid (*Macrosiphum solanifolii* Ashm.). The spring and early summer of 1918 was very similar to that of 1917. These conditions favor the multiplication of the potato aphid and, as last year, the insect began to attract notice toward the end of June in the southern part of the State, particularly on Long Island and in Orange and Rockland counties. The infestation was somewhat general though at that date did not appear to be serious. Early in July considerable damage was reported from Rockland county and entire fields were killed in Nassau county. The tomato crop was also threatened. About the middle of July the aphids became abundant in Dutchess county and were also reported from Madison county. About July 20th it caused somewhat serious injury in the Hudson valley, north of Greene county, and a week later was present though not generally serious in Columbia county.

The breeding of this insect is so closely related to weather conditions that one might almost forecast injury during a period when unusually low temperatures and moist conditions prevail. Potato aphids thrive at such times and their natural enemies can not develop with equal rapidity, consequently an important check is, for the time at least, held in abeyance.

Plant lice attack may be recognized by the edges of young leaves turning downward and after a short time the foliage shrivels and we have the characteristic dying condition. This progresses from the top downward and in very seriously infested fields all the foliage may rapidly succumb, part of this being very likely due to plant diseases as well as to insect injuries.

The potato aphid is very injurious to tomatoes since a serious infestation results in the bloom dropping without the setting of fruit, and as this occurs with the earlier blossoms, the loss is frequently considerable. Egg plants and peppers are also severely damaged, the plant lice working, as in the case of the tomato, on the underside of the leaves and the greatest injury likewise resulting from the attack upon the blossoms and the blossom stem.

Early and thorough spraying with a nicotine soap preparation is the best control measure. Use three-fourths of a pint (40 per cent nicotine) to 100 gallons of water to which are added 6 to 8 pounds of any cheap soap. The one essential is to spray thoroughly from the underside so as to drench all the insects. Several sprayings are sometimes necessary.

CORN AND GRASS INSECTS

Corn is one of our most important farm crops. It has been

seriously injured during the past year here and there by different insect pests and within recent years the European corn borer, a much more destructive pest, has become established in eastern Massachusetts, New Hampshire, portions of New York State and apparently in one small area in Pennsylvania. The possible occurrence of the European corn borer renders it more desirable than ever that we have at hand information regarding the more common at least of our corn insects, particularly those likely to be confused with this recent introduction, since it is very desirable that the new comer be quickly recognized so that necessary steps may be promptly taken for its control.

Corn is a grass, and insects feeding upon grass are very likely to injure corn; in fact, some of our most serious pests are normally grass-feeding insects which find it more convenient to subsist upon corn. There is also, as will be seen below, an intimate relation between the preceding crop and certain species injurious to corn. With these considerations in mind, we have brought together under one title brief discussions of a number of species which have attracted attention in this State during recent years because of their depredations upon various grasses and specially corn. To facilitate their recognition, the following summary tabulation of characters and habits has been prepared.

Insects Affecting Corn 1 to 6 inches High (Injury Mostly on Recently Turned Sod)

Backward, shriveling corn with small grayish caterpillars at the roots. Practically restricted to recently turned sod, June.

Grass webworms

Borers in the heart of young corn.

Borers are slender, yellowish, brown striped, length when full grown seven-eighths of an inch. Mostly on recently turned sod, June.

Lined corn borer

Borers, purplish brown and white striped with purplish brown blotch near the middle, over an inch long when full grown, mostly on or near weedy areas, occurs in various plants, June and later.

Stalk borer

Insects Affecting Corn Over 6 Inches High (Infestation Has No Relation to Sod)

Borers in the heart of corn; see stalk borer just above.

Borers in the tassel, stalk and all parts of ear, late July to fall, never more than three-fourths of an inch long, yellowish white, minutely brown spotted. European corn borer ¹

Borers in the tip of ears in late summer and fall, 1½ inches long when full grown, strongly marked, green, brown or nearly black.

Corn ear worm

Grass webworms (*Crambus luteolellus* Clem. and other species). These occasional pests of young corn are dirty yellowish, brown spotted caterpillars about three-fourths of an inch long when full grown. They live in webby shelters about the base of the young plants, feeding upon the lower portion of the leaves and the stalk but do not bore into the center like the lined corn borer, the stalk borer or the European corn borer. Ordinarily the depredations of these pests in cultivated fields are limited to portions adjacent to mowings or pastures or to crops planted upon badly infested and recently turned sod. The latter is due to the fact that the grass webworms pass the winter as partly grown caterpillars and when the sod is destroyed they must feed upon whatever else remains upon the soil or perish. There are several species of *Crambus* having these general habits, the three in New York State most commonly associated with injury to corn being *Crambus luteolellus* Clem., *C. vulgivagellus* Clem. and *C. trisectus* Walk. The adults or moths are known popularly as close-wings and are easily recognized by the somewhat peculiar habit of flying a short distance and alighting on a stem or blade of grass with the wings rather tightly wrapped about the body, hence the common name. These moths are yellowish gray and have a wing spread of approximately one-half of an inch. They are frequently extremely abundant in grass fields and when they are specially numerous one season there is considerable danger of injury to corn if it be planted upon sod the following year. There are some sections of the State where webworm injury appears, for some reason or other, to be more common than in other parts.

These grass webworms not only injure corn but occasionally become so extremely abundant as to cause serious damage to grass lands. This was the case in the St Lawrence valley in 1881. At that time extended areas were practically devastated by caterpillars of these inoffensive moths. The same thing occurred, though on a smaller scale, in portions of Albany, Columbia and Rensselaer counties in 1905, and in Broome county and probably adjacent areas

¹ See also page 32 for differences between this pest and a comparatively harmless smartweed borer occasionally found in nearby growing corn.

in 1918, according to reports and specimens received May 14th from J. F. Eastman, county agricultural agent. He states that the caterpillars were "found in large numbers in old pastures feeding at the roots of grasses. The areas of the pastures were to a large extent devastated owing to the ravages of these insects." The caterpillars concerned in this last injury were determined by G. G. Ainslie as *Crambus vulgivagellus* Clem. With these species there were also several specimens of the bronze-colored cut worm, *Nephelodes violans* Guen., and also of the greasy cut worm, *Agrotis ypsilon* Rott. These latter two were comparatively few, however. It is interesting to note that Mr Eastman reported crows, blackbirds, sparrows and other birds having fed so effectively upon the pest that none could be found some 3 weeks later, namely, June 11th.

A frequent crop rotation is presumably of considerable value in preventing injury by grass webworms. In localities where webworms are frequently numerous, it is advisable to keep corn and other susceptible crops some distance from grass lands and to avoid planting upon recently turned sod. Early fall plowing for badly infested land, mid-August or early September, would very likely result in the destruction of many of the young caterpillars and do much to prevent the possibility of injury if corn were planted the next season. If this be impractical, spring plowing should be delayed as late as possible so as to give the caterpillars a chance nearly to complete feeding before the sod is turned under. Replanted corn or late planted corn is very likely to escape serious damage.

Lined corn borer (*Hadena fractilinea* Grote). Yellowish, dull-brown striped, rather slender caterpillars, nearly an inch long, may work in early June in the heart of young corn, tunneling the stalks and giving evidence of their presence by the irregular holes near the base of the leaves and wilting of the earlier injured plants. The work of this pest is very similar to that of the stalk borer though the striking blotchy markings of the latter make it very easy to distinguish between the two. The caterpillar of the lined stalk borer presents a superficial resemblance, size and all, to the recently introduced European corn borer though it can be easily distinguished therefrom by the practical absence of chitinized or horny tubercles and the fact that usually it works only in young corn, generally in early June.

The lined corn borer appears to be a comparatively rare pest in New York State or else its work is overlooked or commonly attributed to some other insect. It was first recognized in the State in 1913

because of injury caused at Stone Ridge, Ulster county, and last summer it was brought to notice on account of damage in a corn field near Chenango Bridge, Broome county. In this latter instance, more than one-half of the corn appeared to be infested with the pest. There is also a possibility, however, that in some fields the work of grass webworms may have been confused with that of this insect.

Comparatively little is known regarding the life history and habits of the lined corn borer. The moths appear the latter half of July or in early August. It is probable that the partly grown caterpillars winter in the sod much as do those of a number of other noctuids, as well as the frequently associated grass webworms. When the presumably natural food, grass, is destroyed, these caterpillars, like the grass webworms, turn to whatever may be at hand and may therefore seriously injure corn. There is a fuller account of this insect in New York State Museum Bulletin 175.

Measures of value against grass webworms should be equally effective in checking this less known pest.

Stalk borer (*Papaipema nitela* Guen.). The stalk borer works in young corn very much as the lined corn borer. It is easily distinguished from all other corn-boring insects by the characteristic caterpillar about an inch long and strongly marked with purplish brown and five white stripes, one down the middle of the back and two on each side, the latter wanting near the middle of the body, due to a blotchlike extension of the purplish brown. This gives the active moving caterpillar the appearance of having been injured.

The moths emerge in late summer, leaving a pupal case in the burrow, a condition not true from fall to spring of corn infested by the European corn borer. The burrows of the stalk borer are larger than those of the European corn borer.

This native pest not only injures corn but is frequently found in a number of thick-stalked plants, specially potatoes, tomatoes and dahlias. The borer is a local pest and its operations are mostly confined to the outer rows in cultivated fields or to those weedy the preceding season. Clean and thorough cultivation is a most effective control measure. Cutting and crushing or burning wilting tips is also of service.

Corn ear worm (*Chloridea obsoleta* Fabr.). This pest is the cotton boll worm and the tobacco bud worm of the south. It is also known as the tomato fruit worm. It is a southern species which ranges north and feeds upon a considerable variety of garden crops and is best known in the north because of the caterpillars' work in green corn. They enter the tips of the ears, specially those

with loose husks, devour the kernels and in case of a serious infestation may destroy from one-fourth to nearly one-half of the kernels of the ears, rendering them unmarketable and usually totally unfit for human food. The full-grown caterpillars are about $1\frac{1}{2}$ inches long, vary greatly in color from a light green through a rose color and brown to almost black. They may be either striped, spotted or perfectly plain. They and their work are easily distinguished from the European corn borer by the small black not brown tubercles or warts on the body of the caterpillar and the limiting of feeding to the surface of the ear. It is not a borer.

Dusting the developing silk with powdered arsenate of lead has given excellent results in controlling this pest, though the deadly nature of the poison should be recognized and due precautions taken. Ordinarily such measures are not necessary in New York State. Frequent examinations should be made to detect the early work of the pest and care taken not to loosen the husks at the tip of the ear and thus facilitate the entry of this caterpillar. Partial stripping of the ear is also favorable to attack by the bumble flower beetle, *Euphoria inda* Fabr., an insect occasionally somewhat troublesome.

MISCELLANEOUS

European calosoma (*Calosoma sycophanta* Linn.). Two specimens of this beneficial and recently introduced insect were taken in Capitol Park, Albany, one July 12th and the other July 19th. Both the large, black, ungainly grubs of this insect and the brilliant greenish beetles are noted for searching out and devouring caterpillars of many kinds. Unlike a number of related ground beetles, both grubs and adults ascend trees and are therefore valuable aids in destroying leaf-eating caterpillars. It was this habit which led authorities of the United States and Massachusetts to spend considerable sums to secure the introduction of this species in an attempt to utilize insects for the control of the very destructive gypsy moth. This introduced beetle has proved itself one of the important checks upon the notorious pest just mentioned.

The finding of two beetles in Albany indicates the local establishment of the insect and under favorable conditions it may increase and be of material service in destroying shade tree pests. This new-comer is an active, moderately stout, brilliant greenish beetle, about an inch long. A closer examination shows that the head and thorax are a dark purplish blue, the latter bordered with greenish blue while the brilliant green wing covers show gorgeous purplish

reflections. Our native searcher, *Calosoma scrutator* Fabr., is larger and has the bright green wing covers bordered with purplish while the thorax has a copper-colored margin. The fiery ground beetle, *Calosoma calidum* Fabr., is considerably smaller than the other two mentioned, relatively common and is easily recognized by the rows of coppery-colored spots on the wing covers. All these ground beetles run rapidly, are predacious and if handled incautiously they inflict a rather severe bite. This European species is particularly valuable because both the beetle and the grubs climb trees and are therefore specially serviceable in destroying tree-feeding pests. They are very apt to be found on or near trees. They should be recognized at the outset and protected or at least not destroyed.

Maple and oak twig pruner (*Elaphidion villosum* Fabr.). The work of this common insect attracted more than usual attention in the vicinity of New York City, judging from the number of inquiries received. The presence of this borer is indicated by the dropping of cleanly cut twigs and small branches of oak, maple and other trees in the fall, spring and early summer and by lopping tips and wilting foliage in late summer and early fall. The borer is a legless grub about an inch long when full grown. It tunnels the twigs and smaller branches, usually eating away the interior so completely that the portion containing the pest drops as indicated above. The slender, grayish brown beetles about one-half of an inch long appear in midsummer and deposit eggs during July in the smaller twigs.

This insect is not usually very injurious though occasionally trees may be severely pruned and in some instances disfigured if not damaged by the borer. The most practical control method is the collection and burning of infested twigs in the fall, spring and early summer. This will be more effective if operations extend over a considerable area. There is a chance that spraying with arsenate of lead the latter part of July would be of some value in destroying the parent beetles before they have had an opportunity to lay eggs.

Liophloeus nubilus Fabr. (*tessellatus* Bondsd.). A specimen of this insect was received from J. H. Troy, New Rochelle, N. Y., December 31, 1917, through Dr G. G. Atwood of the Department of Farms and Markets and identified by Doctor Schwarz through the courtesy of Dr L. O. Howard as the above-mentioned species. Mr Troy states that, "In the winter it eats the roots (greenhouses) and in summer the leaves of rhododendron and taxus." The reported food habits lead us to suspect that most of the damage in this green-

house had been caused by the similar appearing black vine weevil *Otiorhynchus sulcatus* Fabr., since the recorded food habits are those of this earlier introduction rather than of the species under consideration. Doctor Howard states that this *Liophloeus* is quite abundant in Europe though it has never been reported as an injurious species. The larval habits are quite unknown. Fowler¹ states that the weevils occur on hedges, young trees, nettles etc. and may be obtained by beating ivy which seems to be the special food plant. It is recorded as generally distributed and common throughout the greater part of England and Wales.

Pyrausta theseusalis Walk. The larvae and pupae described in Museum Bulletin 180, 30th report, page 90-91, as those of *Phlyctaenia terrealis* Treits are those of this species according to a determination made by Dr H. G. Dyar of the U. S. National Museum through the courtesy of Dr L. O. Howard.

Gnorimoschema banksiella Busck. Mummied peaches, bored by the caterpillars of this species, were received June 20, 1918, from J. A. Thomson, Rochester, through the State Department of Farms and Markets. The species was kindly identified by August Busck of the United States National Museum, through the courtesy of Dr L. O. Howard. The peaches had been bored and the pits were eaten out of a number by brownish caterpillars which were crawling over the dried fruit and though there was an opportunity during the two days following for the caterpillars to escape, they seemed perfectly satisfied to remain on or near the mummied fruits. We were advised that there was nothing in the immediate surroundings which would suggest the migration of the larvae from the stems of some herbaceous plant in which they might have bored and perhaps produced galls under normal conditions.

This species has been recorded from Sea Cliff, N. Y., and also from Essex county, N. Y. The previously unknown larva is described below.

Larva. Length 7 mm. Head a deep amber, sparsely haired, the mouth parts a variable dark brown, thoracic shield yellowish brown, the body a dark reddish brown, the segmentation unusually strongly marked and the dorsal surface with very evident, somewhat irregular rugose transverse lines. Spiracles yellowish brown, darker in the center. Anal shield dark yellowish brown, a very fine almost invisible hair with a length about equal to the diameter of the body arises from each of the inconspicuous tubercles, there being two sublateral ones on each segment, one to each subsegment, a compound tubercle just above the lateral line and on the posterior

¹ Coleoptera of the British Islands, 5:198

subsegment a smaller tubercle slightly more dorsal. Below the lateral line there is a tubercle on each subsegment. The submedian tubercles are in a nearly straight line, while in the sublateral ones, the larger compound one on the anterior subsegment is somewhat more ventral. The smaller tubercles below the lateral line are in a nearly straight line. Legs whitish transparent, variably spotted with dark brown. Prolegs whitish transparent.

Norway maple leaf hopper (*Alebra albostriella* Fall.). A Norway maple twig was received March 27, 1918, from E. H. Moore, arboriculturist, department of parks, Brooklyn, showing on the two year old wood a badly swollen apparently cankerous condition suggestive of fungus or bacterial infection. The surface was slightly ridged and with numerous small openings suggesting possible fungus infection and a consequent rupturing of the overlying tissues, though examination by State Botanist House showed no injurious fungus present. On cutting, numerous oval, dead areas were found under the unhealthy bark and an examination of last year's wood disclosed under comparatively normal tissues, small oval cells about 1 mm long, some of which contained living eggs, presumably of this leaf hopper. It was stated that a great many trees in a large nursery on Long Island were affected in this manner.

White peach scale (*Aulacaspis pentagona* Targ.). Cherry twigs rather badly infested with this insect were received under date of March 15, 1918, from T. F. Niles, accompanied by the statement that the specimens were collected at Rye and furthermore that he had found the insect in other places. This southern form is rarely brought to notice in this State and an examination of the material disclosed nothing alive, indicating that the severe weather of the past winter had presumably killed a very large proportion of the insects.

Lecanium parasites. An unusual case of parasitism was brought to attention through the reception from Prof. Elsworth Bethel of the State Museum, Colorado, of a soft scale insect, possibly *Toumeyella pini* King on *Pinus edulis*. The scale itself was almost riddled with twenty-seven small, circular exit holes of an unknown parasite.

Bladder maple gall (*Phyllocoptes quadripes* Shim.). Soft maple leaves showing a very general infestation by this plant mite were received under date of May 27, 1918, from Robert S. Waterman, Ogdensburg, N. Y., accompanied by the statement that a large maple tree some 55 or 60 feet high was infested throughout in this manner. The galls are in an incipient stage, being marked on the underside of the leaf by a small, white tuft of longer hairs,

surrounded by a clear area of nearly naked green tissues and on the upper surface by small, broadly oval swellings 1 to 1.5 mm in diameter, mostly dark green in color, though a number are beginning to show the characteristic reddish or purplish red tint of the fully developed gall. Assuming the above statement to be correct, this is the most serious and general infestation by this plant mite hitherto brought to our notice.

PUBLICATIONS OF THE ENTOMOLOGIST

The following is a list of the principal publications of the Entomologist during the year 1918. The titles,¹ places of publication, and a summary of the contents of each are given. Volume and page numbers are separated by a colon.

Apple and Thorn Skeletonizer (*Hemerophila pariana* Clerck). Economic Entomology, Journal, 10:502, 1917

Records the establishment of this European insect in Westchester county, gives a summary of its habits and advises spraying with a poison.

Protect the Trees. Catskill Recorder, Nov. 9, 1917, p. 7

A brief note urging the collection and destruction of the egg masses of the white-marked tussock moth, *Hemerocampa leucostigma* Sm. & Abb.

New Gall Midges. New York Entomological Society, Journal, 25:193-96, 1917

The following are described as new: *Lasioptera piriqueta* from *Piriqueta ovata*, *Janctiella siskiyou* from seed of *Chamaecyparis lawsoniana* and *Feltiella venatoria* from larvae preying on red spiders.

The Mosquitoes of North and Central America and the West Indies, by L. O. Howard, H. G. Dyar and Frederick Knab. Carnegie Institution, v. 1, 2, 1912, v. 3, 1915, v. 4, 1917. Psyche, 24: 161-64, 1917

A review of the entire work.

Insects Destroy Millions in Property. State Service, 1:34-37, 1917.

A general discussion of losses caused by insects and the possibilities in control measures.

Entomological Research and Utility. The Scientific Monthly, Dec. 1917, 5:551-53

A brief summary of present conditions advocating continued investigation even under war conditions.

Asphondylia websteri n. sp. Economic Entomology, Journal, 10:562, 1917

Description of the alfalfa gall midge.

Insects and Camp Sanitation. Economic Entomology, Journal, 11:93-99, 1918

A general discussion of the importance of insects as disease carriers and advocating the use of entomologists in certain phases of camp sanitation.

¹ Titles are given as published. In some instances articles appearing in a number of papers have been given different titles by the various editors.

Notes and Descriptions of Itonididae in the Collections of the American Museum of Natural History. *Am. Mus. Nat. Hist. Bul.*, v. 38, art. 6, p. 179-82, 1918

Synonymical notes with technical descriptions of some earlier characterized species.

Apple and Thorn Skeletonizer. *Cornell Extension Bul.* 27, p. 143-147, 1918. See also *Ent. Soc. Ont.*, 48th Rep't, p. 44-47

A detailed account of a recently established pest (*Hemerophila pariana* Clerck)

Notes on Spring Spraying. *Rural New Yorker*, April 6, 1918. 77: 516

General recommendations in relation to dormant and delayed dormant spraying with lime-sulphur, nicotine and arsenate of lead.

Gall Insects and Their Relations to Plants. *Scientific Monthly*, 6:509-525, 1918

A popular account of American gall insects.

32d Report of the State Entomologist on Injurious and Other Insects of the State of New York, 1916; *New York State Museum Bul.* 198, p. 1-276, figs. 54, pls. 8, 1918 (issued July 1, 1918)

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Flies and Heat. *Health News*, June 1918. *Monthly Bulletin of New York State Department of Health*, p. 160-162.

A general summary with special reference to control measures.

Report on Tussock Moth Contest. *New York Forestry*, July 1918, p. 26-27

Summary of activities with a list of the prize winners.

New Gall Midges. *Economic Entomology, Journal*, 11:380-84, 1918

The genus *Allomyia* is erected, and *A. juniperina*, *Asphondylia dondiae*, *Thecodiplosis cockerelli*, *Mycodiplosis*

packardi and *Retinodiplosis albitarsis* are described as new and the male of *Onodiplosis sarcobati* Felt characterized.

Summer Leaf Feeders. Catskill Recorder, Aug. 9, 1918.

A general warning notice in relation to the unusually abundant yellow-necked and red-humped apple tree caterpillars, the fall webworm and the recently introduced apple and thorn skeletonizer, *Hemerophila pariana* Clerck.

Two Injurious Leaf Maggots. International Garden Club, Journal, 2:425-26, 1918

Popular accounts of the box midge, and the chrysanthemum midge [*Monarthropalpus buxi* and *Diarthronomyia hypogea*] with a discussion of control measures.

ADDITIONS TO COLLECTIONS, OCTOBER 16, 1917-
OCTOBER 15, 1918

The following is a list of the more important additions to the state collection of insects:

DONATION

Hymenoptera

- Cimbex americana* Leach, elm saw fly, larvae on elm, September 19, Mrs M. W. Carragan, Saratoga Springs
- Abia inflata* Nort., honeysuckle saw fly, larvae on honeysuckle, June 9, Mrs A. M. A. Jackson, Warner
- Diprion simile* Hartig, adults, cocoons and larvae, December 14, Dr W. E. Britton, New Haven, Conn. Same, cocoons, March 5, 14, W. L. G. Edson, Rochester. Same, European pine saw fly, larva on pine, June 20, Dummett Nurseries, Mount Vernon, State Department of Agriculture
- Neodiprion pinetum* Norton (*Diprion abbotii* Leach), white pine saw fly, larvae, August 13, W. H. Snell, Lewis. Same, larvae, on pine, August 27, H. J. Carbury, Gale. Through Conservation Commission
- Pontania monile* Marl., galls on salix, September 1, 1918, James R. Weir, Missoula, Mont.
- Rhodites radicum* O. S., rose root gall on rose, December 18, Dr G. G. Atwood, chief, bureau of plant industry, Department of Farms and Markets, Albany
- Rhodites tuberculator* Ckll., galls, August 12, T. D. A. Cockerell, Crescent, Col.
- Diastrophus radicum* Bass., blackberry root gall, gall on dewberry root, June 17, A. W. Morrill, Phoenix, Ariz.
- Diastrophus fusiformis* O. S., gall on *Potentilla monspeliensis*, July 25, S. H. Burnham, Hudson Falls
- Acraspis erinacei* Walsh, oak hedgehog gall on oak, August 15, Francis A. Bartlett, Stamford, Conn.
- Andricus cornigera* O. S., horned oak gall on oak, November 26, Ed. L. Ayers, chief inspector, Department of Agriculture, Houston, Texas
- Andricus punctatus* Bass., gouty oak gall on oak, November 26, Ed. L. Ayers, chief inspector, Department of Agriculture, Houston, Texas.
- Same, on pin oak, March 13, A. L. Alston, Rye
- Andricus batatoides* Ashm., live oak potato gall on oak twigs, November 26, Ed. L. Ayers, chief inspector, Department of Agriculture, Houston, Texas.
- Same, gall on oak, May 8, E. Bethel, Monterey, Cal.
- Philonix pezomachoides* O. S., oak pea gall on white oak, July 17, A. G. Ruggles, Robbinsdale, Minn.
- Philonix hirta* Bass., gall on burr oak, July 23, A. G. Ruggles, Hastings Road, Minn.
- Biorhiza forticornis* Walsh, oak fig gall on burr oak, July 23, A. G. Ruggles, Hastings Road, Minn.
- Neuroterus floccosus* Bass., oak flake gall on burr oak, July 17, A. G. Ruggles, Robbinsdale, Minn. Same, July 23, Hastings Road, Minn.
- Neuroterus umbilicatus* Bass., oak button gall on oak, August 1, Mrs Seth Bliss Hunt, Mount Kisco. Same, September 4. Same, September 5, J. J. Levison, Sea Cliff
- Metopius pollinctorius* Say, adult reared from cocoon of *A. luna*, March 29, Frederika Atwood, Rochester

- Dianthidium parvum* Cress., adult and nest, April, E. Bethel, Denver, Col., through T. D. A. Cockerell
Mellisodes ? *bimaculata* St Farg, adults working in lawn, July 29, O. S. Hunt, Cobleskill

Coleoptera

- Carabidae, new or interesting species contributed by D. B. Young: *Agonum sexpunctatum* Linn., *Pterostichus metallicus* Fabr. (both species foreign), *Opisthius richardsoni* Kirb., *Nebria eschscholtzii* Men., *N. obliqua* Lec., *Promecognathus laevissimus* Dej., *Scarites subterraneus* Fabr. (a deformed specimen with a double thorax), *Dyschirius analis* Lec., *D. marinus* Lec., *Clivina impressifrons* Lec., *C. americana* Dej., *Aspidoglossa subangulata* Chd., *Myas cyanescens* Dej., *Pericompso ephippiatus* Say, *Pterostichus longulus* Lec., *P. californicus* Dej., *P. isabellae* Lec., *P. substriatus* Lec., *P. relictus* Newm., *P. moestus* Say, *P. permundus* Say, *P. occidentalis* Dej., *P. scrutator* Lec., *P. erythropus* Dej., *P. orinomum* Leach, *P. mandibularis* Kirb., *Amara avida* Say, *A. interstitialis* Dej., *A. latior* Kirb., *A. fallax* Lec., *Diplochila major* Lec., *Calathus quadricollis* Lec., *Platynus anchomenoides* Rand., *P. crenistriatus* Lec., *P. octopunctatus* Fabr., *P. sinuatus* Dej., *P. atratus* Lec., *P. reflexus* Lec., *P. decens* Say, *Lebia furcata* Dej., *L. scapularis* Dej., *Apristus laticollis* Lec., *Cymindis laticollis* Say, *Brachynus cordicollis* Dej., *Nothopus zabroides* Lec., and *Cratacanthus dubius* Beauv.
- Scarites subterraneus* Fabr., adult, May 21, Steward J. Owens, Albany
Lebia grandis Hentz., from potato fields, October 11, F. P. Foster, Troy
Dermestes vulpinus Fabr., leather beetle, grubs on hoofs, October 15, T. M. Duche & Sons, 376-78 Greenwich st., New York
Alaus oculatus Linn., eyed elater, adult on decaying wood, June 11, H. C. Crouch, Albany
Melanotus communis Gyll., wire worm, larva on corn, July 16, E. V. Underwood, Oswego
Hydnocera subfasciata Lec., adult on *Tetradymia spinosa*, H. R. Hagan, La Point, Utah
Ptinus fur Linn., spider beetle, adults, September 23, Eliza S. Blunt, New Russia
Euphoria inda Linn., bumble flower beetle, grubs in manure, June 24, George A. Lintner, Summit, N. J. Same, adult, August 24, A. B. Clarke & Son, Milton-on-Hudson
Elaphidion villosum Fabr., oak and maple twig pruner, larvae in oak, June 24, Walter E. Maynard, Jericho. Same, July 6, Mrs M. Newborg, White Plains. Same, August 1, Charles C. Marshall, Millbrook
Galerucella luteola Müll., elm leaf beetle, adult, May 6, George C. Hodges, Utica
Coptocycla bicolor Fabr., golden tortoise beetle, adult, July 1, Mrs Charles C. Thorpe, Saugerties. Same, August 22, T. A. Gordon, Rensselaer
Tenebrio molitor Linn., meal worm, adults, September 23, Eliza S. Blunt, New Russia
Macrobasis unicolor Kirby, ash gray blister beetle on potato, July 9, N. G. Farber, Troy
Meloe angusticollis Say, oil beetle, adults, September 23, Eliza S. Blunt, New Russia
Eupagoderes decipiens Lec., adult impaled on thorn by shrike, May 20, Harold R. Hagan, Logan, Utah
Liphloeus nubilus Fabr., adult, December 31, J. H. Troy, New Rochelle

- Magdalis armicollis* Say, adult on cherry leaves, June 10, L. F. Strickland, Lockport
- Conotrachelus juglandis* Lec., twig injured on English walnut, June 11, Louis Arnold, Altamont, through Department of Agriculture
- Conotrachelus crataegi* Walsh, quince curculio, adults and work on small pears, May 31, A. B. Clarke & Son, Milton

Diptera

- Aplonyx sarcobati* Felt, galls on greasewood, August 1918, James R. Weir, Saratoga, Wyo.
- Lasioptera clavula* Beutm., dogwood club gall on flowering cornus, February 4, J. J. Levison, Sea Cliff
- Lasioptera vitis* O. S., grape tomato gall on grape, June 13, Arnold L. Schwoerbel, New York. Same, June 15, Charles H. Thomas, Rensselaer
- Lasioptera excavata* Felt, leaf-mining gall on *Crataegus*, July 17, 18, A. G. Ruggles, Robbinsdale, Minn.
- Rhabdophaga strobiloides* Walsh, pine cone gall on willow, June 11, Mrs W. H. Harmon, Chicago, Ill. Same, July 18, A. G. Ruggles, St River-Owatonna, Minn.
- Dasyneura lysimachiae* Beutm., loosestrife bud gall, adults on loosestrife, June 24, H. B. Scammell, Toms River, N. J.
- Allomyia juniperi* Felt, galls on juniperus, June 5, Ivan M. Way, Oxford, Col.
- Diarthronomyia artemisiae* Felt, gall on artemisia, July 15, James R. Weir, Missoula, Mont. Same, May 8, E. Bethel, Monterey, Cal.
- Diarthronomyia* ? *occidentalis* Felt, gall on artemisia, July 15, James R. Weir, Missoula, Mont.
- Oligotrophus betheli* Felt, juniper cone gall on juniperus, April 16, E. Bethel, Julian, Cal.
- Rhopalomyia ampullaria* Felt, galls on *Artemisia cana*, July 28, 1918, James R. Weir, Moorecroft, Wyo.
- Rhopalomyia salviae* Felt, salvia leaf gall on salvia, May 8, E. Bethel, Monterey, Cal.
- Rhopalomyia californica* Felt, gall on *Baccharis*, May 8, E. Bethel, Monterey, Cal.
- Rhopalomyia* ? *tridentatae* Rubs., gall on *Artemisia dracunculoides*, September, E. G. Titus, Idaho Falls, Idaho
- Asteromyia agrostis* O. S., adults on *Muhlenbergia*, May 20, C. N. Ainslie, Sioux City, Iowa
- Asphondylia arizonensis* Felt, adults on opuntia fruits, May 20, George G. Ainslie, Caney Springs, Tenn.
- Asphondylia atriplicis* Ckll., gall on *Atriplex confertifolia*, April 3, E. Bethel, Victorville, Cal.
- Asphondylia neomexicana* Ckll., galls on *Atriplex canescens*, August 1, T. D. A. Cockerell, Boulder, Col.
- Asphondylia dondiae* Felt., *Dondia multiflora*, April, E. Bethel, Point Ferme, Cal.
- Asphondylia* ? *ervi* Rubs., adults, pupal cases and infested pods of soy bean, *Glycine hispida*, November 14, S. I. Kuwana, Yamanshi, Japan
- Schizomyia petiolicola* Felt, grape petiole gall, February 27, W. W. Burch, Watervliet

- Cincticornia pilulae* O. S., oak pill gall on oak, September 4, Mrs Seth Bliss Hunt, Mount Kisco. Same on red oak, July 23, A. G. Ruggles, Hastings Road, Minn.
- Contarinia canadensis* Felt, ash midrib gall on ash, April 17, Robert S. Walker, Chattanooga, Tenn. Same, June 7, Munson Whitaker Co., New York
- Thecodiplosis mosellana* Gehin., wheat midge, infested rye heads, June 28, N. G. Farber, Troy. Note. Infested rye and wheat was received from many localities in the eastern and western parts of the State respectively. Same, midges on wheat, June 28, William A. Ross, Vineland Station, Ont.
- Thecodiplosis cockerelli* Felt, galls on *Pinus edulis*, Ivan M. Way, Oxford, Col.
- Mycodiplosis cerasifolia* Felt, adult reared from cedar rust aecia on *Crataegus* fruit, August 14, W. H. Wellhouse, Ithaca
- Mycodiplosis packardi* Felt, larvae with *Parharmonia* on pine, May 24, James L. Kolbe, Round Lake
- Retinodiplosis albirtarsis* Felt, larvae with *Parharmonia* on pine, May 24, James L. Kolbe, Round Lake
- Onodiplosis sarcobati* Felt, adult and galls on *Sarcobatus vermiculatus*, May 20, Harold R. Hagan, Logan, Utah
- Monarthropalpus buxi* Lab., box leaf midge, larvae on box leaves, January 9, Westchester county, Dr G. G. Atwood, chief, bureau of plant industry, Department of Farms and Markets, Albany
- Cecidomyia peritomatis* Ckll., gall and larvae on *Peritomatis serrulata*, April, T. D. A. Cockerell
- Cecidomyia semenrumicis* Patt., gall on hackberry, August 8, A. H. Hollinger, College Station, Texas
- Cecidomyia viticola* O. S., grape tube gall on grape, September 12, T. J. Headlee, New Brunswick, N. J.
- Phorbia ceparum* Meig., onion maggot, maggots on onion, June 19, W. I. Roe, Watertown
- Oedaspis atra* Loew., larvae on *Chrysothamnus*, June 8, H. R. Hagan, Manti, Utah
- Eurosta solidaginis* Fitch, gall on solidago, July 15, James R. Weir, Missoula, Mont.
- Euaresta pacifica* Doane, galls on *Artemisia aromatica*, September 9, E. Bethel, Durango, Col. Same, on *Artemisia dracunculoides*, September, E. G. Titus, Idaho Falls, Idaho

Lepidoptera

- Hemerophila pariana* Clerck, thorn and apple skeletonizer, pupa, October 16, Briarcliff Manor, through T. F. Niles, Chatham. Same, work on leaves, October 18, T. F. Niles, Pocantico Hills. Same, caterpillars and work, July 18, S. R. Bradley, Nyack
- Metzneria Lappella* Linn., caterpillar on burdock, February 5, 1918, E. G. Edson, Highland Park, Rochester
- Sitotroga cerealella* Olive, Angoumois corn moth, infested ear, October 1, F. H. Lacy, Poughkeepsie
- Gnorimoschema gallaeasteriella* Kell., gall on *Aster puniceus*, August, S. H. Burnham, Sandy Hill
- Gnorimoschema tetradyimiella* Busck., gall on *Tetradymia spinosa*, July, H. R. Hagan, La Point, Utah

- Gracilaria azaleella* Brants, Azalea leaf skeletonizer, caterpillars and work, May 31, J. B. Achilles, Lockport
- Paraclemensia acerifoliella* Fitch, maple leaf cutter, work and caterpillars on sugar maple, September 3, Nelson R. Gilbert, Bonaparte
- Archips rosaceana* Harr., green house leaf roller, caterpillars, March 15, P. M. Eastman, Albany
- Oxyptilus periscelidactylus* Fitch, grape vine plume moth, work on grape, June 13, Arnold L. Schwoerbel, New York. Same, caterpillar on grape, June 1, George T. Powell, Ghent
- Acrobasis caryae* Grote, caterpillar on walnut, May 17, Mary Faber, Pawling, through Department of Agriculture
- Crambus vulgivagellus* Clem., vagabond grass webworm, caterpillars on pastures, May 14, J. F. Eastman, Binghamton
- Parharmonia pini* Kell., pine sesian, caterpillars on pine, May 24, James L. Kolbe, Round Lake
- Melittia satyriniformis* Hubn., squash vine borer moth, July 2, E. A. Baldwin, Schenectady
- Phobetreron pithecium* S. & A., hag moth caterpillar, caterpillar on pear, August 2, L. F. Strickland, Lockport
- Sibine stimulea* Clem., saddle back caterpillar, October 15, Mrs Britton, through Dr Fred J. Seaver, New York Botanical Garden, Bronx Park, New York
- Thyridopteryx ephemeraeformis* Haw., bag worm, eggs, March 19, W. B. Hambright, Bronxville
- Cymatophora ribearia* Fitch, currant worm, pupa on currant, June 15, P. M. Eastman, Gloversville. Adult issued June 29
- Malacosoma neustria* Linn., lackey moth, egg on imported stock, March 15, P. M. Eastman, Albany
- Tolype vellea* Stoll., lappet moth, cocoon on hawthorn, June 1, W. L. G. Edson, Rochester
- Schizura concinna* S. & A., red-humped apple caterpillar on apple, August 21, F. D. Palmer, Norwich. Same, August 21, Mrs John Boyd Thacher, Altamont
- Heterocampa guttivitta* Walk., antlered maple caterpillar, August 13, Henry W. Thorne, Johnstown
- Datana integerrima* Grt. & Rob., black walnut caterpillar on walnut, August 8, William I. Roe, Watertown
- Datana ministra* Dru., yellow-necked apple tree worm, caterpillar, September 19, Mrs M. W. Carragan, Saratoga Springs. Same, August 27, Clarence T. Wood, Palmyra. Same, August 22, Chilmark Farm, Ossining. Same, on apple, August 21, Mrs John Boyd Thacher, Altamont. Same, August 21, F. D. Palmer, Norwich. Same on cherry, July 30, F. M. Brooks, Athens
- Euparthenos nubilis* Hübn., Catocala, adult, June 10, Cuyler Reynolds, Albany
- Nephelodes minians* Guen., bronze cut worm, caterpillar on pastures, May 14, J. F. Eastman, Binghamton
- Agrotis ypsilon* Rott., greasy cut worm, caterpillars on pastures, May 14, J. F. Eastman, Binghamton
- Hadena fractilinea* Grote, lined corn borer, caterpillar on corn, June 14, J. F. Eastman, Binghamton
- Halisdota caryae* Harr., hickory tussock moth, caterpillar and cocoons, September 28, George Ruppel, Bridgehampton. Same, July 13, Chilmark farm, Ossining. Same, July 10, George A. Lintner, Summit, N. J. Same, adult on egg mass, May 25, Department of Agriculture, Westchester county, through F. T. Niles

- Halisdota tessellaris* S. & A., hickory tussock moth, caterpillar, September 19, Mrs M. W. Carragan, Saratoga Springs. Same, pale tussock, caterpillar on maple, September 7, Mary B. Sherman, Ogdensburg
- Hyphantria cunea* Dru., fall webworm, caterpillar, September 7, Mary B. Sherman, Ogdensburg
- Basilona imperialis* Dru., pupa, October 11, Miss M. E. Hale, Elizabethtown
- Tropaea luna* Linn., luna moth, adult, May 27, Mrs Thurza Kusth, Albany
- Samia cecropia* Linn., cecropia moth, adult, June 1, Mrs Layman, Albany. Same, adult and cocoon, May 29, Mrs A. M. A. Jackson, Warner. Same, adult, May 23, Alice Furrer, Albany. Same, April 29, Elmer Wirsing, Albany, just emerged from cocoon and perfect
- Paonias excaecatus* S. & A., blinded sphinx, adult, July 22, May Seymour, Lake Placid
- Phlegethontius quinquemaculata* Haw., tomato worm, adult, September 14, Douglas Bradley, Albany
- Deilephila lineata* Fabr., lined sphinx, caterpillar, August 12, W. M. Keneston, Albany
- Basilarchia archippus* Cram., viceroy, caterpillar on hawthorn, June 1, W. L. G. Edson, Rochester
- Basilarchia astyanax* Fabr., red-spotted purple, chrysalids, June 4, David V. Haggerty, Poughkeepsie
- Papilio glaucus* Linn., var. *turnus* Linn., tiger swallow tail, caterpillar, August 28, Dr M. Bruce, Charlottesville. Same, chrysalis, August 26, Jonas A. Brooks, Berne

Hemiptera

- Enchenopa binotata* Say, two-marked tree hopper, eggs and adults on *Celastrus*, September 12, Dr F. J. Seaver, Bronx Park
- Phylloxera caryaecaulis* Fitch, hickory gall aphid, galls on hickory, June 6, Robert E. Farley, White Plains. Same, June 4, Munson-Whitaker Company, New York
- Physokermes piceae* Schr., spruce bud scale, adults on Koster blue spruce, July 26, Charles A. Slater, Mount Vernon
- Chermes cooleyi* Gill., Aphid spruce gall, July 15, Hicks Nursery, Westbury, Department of Farms and Markets
- Macrosiphum solanifolii* Ashm., potato aphid on potato, August 1, F. B. Hanford, New Baltimore
- Macrosiphum rudbeckiae* Fitch, aphid on golden glow, July 5, H. W. Dye, Williamson
- Chaitophorus lyropicta* Kess., Norway maple aphid, affected leaves, July 24, Mrs L. M. Jones, Port Jervis. Same, July 27, W. H. Dunn, Troy
- Tetraneura graminis* Mon., young and adults, September 25, H. D. House, Albany
- Phenacoccus acericola* King, false maple scale, cocoons on hard maple, June 1, Harry C. Morse, Gloversville
- Aulacaspis pentagona* Targ.-Toz., West Indian peach scale eggs on cherry, March 13, T. F. Niles, Rye. Same, adults on Japanese cherry, June 21, Fred J. Seaver, New York City
- Aspidiotus hederæ* Vall., white scale of ivy, December 18, Dr G. G. Atwood, chief, bureau of plant industry, Department of Farms and Markets, Albany

- Lepidosaphes ulmi* Linn., oyster shell scale, eggs on currant, April 27, A. B. Brooks, Keeseville
- Alebra albostriella* Fall., Norway maple leaf hopper, eggs on Norway maple twigs, March 27, E. H. Moore, Brooklyn
- Chlorochroa uhleri* Stal., Juniper plant bug, eggs and nymphs on Cornus, July 24, W. L. G. Edson, Rochester
- Lygus pratensis* Linn., tarnished plant bug, adult injuring peaches, July 2, L. D. Rhind, Dansville
- Poecilocapsus lineatus* Fabr., four-lined leaf bug, adults injuring dahlias, July 3, Ewell D. Baker, Forest Lawn. Same, adults on currant, June 25, Edgar Empie, Sharon Springs, through P. M. Eastman, Albany

Orthoptera

- Panchlora hyalina* Stoll., adult, November 23, H. W. Wardell, Albany

Odonata

- Epicordulia princeps* Hag., dragon fly, adult, May 29, Rosalie Ehrlich, Albany

Neuroptera

- Chrysopa* sp., cocoons on pine needles, August 21, William L. G. Edson, Rochester.
One was bred from the cocoons sent August 25

Isoptera

- Termes flavipes* Koll., white ant, adult, April 15, Mrs W. S. Elmendorf, Albany

Acarina

- Tetranychus telarius* Linn., red spider, eggs on Koster blue spruce, July 26
Charles A. Slater, Mount Vernon
- Tetranychus bimaculatus* Harv., on raspberry, August 12, W. M. Keneston, Albany
- Eriophyes rhoinus* Ckll., deformed head of *Rhus glabra cismontana*, October, T. D. A. Cockerell, Boulder, Col.
- Eriophyes* ? *aenigma* Walsh, galls on salix, July 3, 1918, James R. Weir, Buffalo, Wyo.
- Eriophyes fraxinifolia* Felt, galls on *Fraxinus*, July 28, 1918, James R. Weir, Moorecroft, Crook county, Wyo.
- Phyllocoptes minutissimus* Hodgk., galls on *Acer glabra*, June 28, 1917, James R. Weir, Oripino, Idaho
- Phyllocoptes quadripes* Shim., bladder maple gall, young galls, May 27, Robert S. Waterman, Ogdensburg. Same, galls on soft maple, July 4, Miss Katharine Pedersen, Lake George

S. C. Bishop Student collection, consisting of 100 species represented by 600 specimens in good condition, some of which are new to the collection, have been kindly donated to the State Museum by S. C. Bishop, State Zoologist.

*Representative Collection of Larvae and Pupae of Crane Flies,
Tipulidae, 11 Genera and 16 Species, presented by C. P. Alexander,
August 5, 1918, to the New York State Museum*

- Antocha saxicola* O. S., paratype, Ithaca, April 20, 1917, 1 larva
Bittacomorphella jonesi (Johns.) Ithaca, May 30, 1917, 2 larvae
Dicranomyia simulans (Walk.) Rosslyn, Va., July 7, 1912, 1 larva and portion
of a pupa skin
Eriocera cinerea Alex., Ithaca, May 24, 1917, 2 larvae
Eriocera longicornis (Walk.) Ithaca, April 30, 1917, a number of larvae, and pupae
Eriocera spinosa (O. S.) Ithaca, May 6, 1916, 4 larvae and 1 pupa
Hexatoma megacera (O. S.) Ithaca, May 6, 1914, several larvae and pupae
Holorusia rubiginosa Lw. Leland Stanford University, Cal., Feb. 22, 1915,
1 larva
Molophilus hirtipennis O. S., Ithaca, April 30, 1917, 1 larva and 1 pupal
exuvium
Pentoptera albitarsis O. S., Ithaca, March 30, 1917, 1 larva
Ptychoptera rufocincta O. S., Orono, Me., July 7, 1913, 1 larva
Tipula abdominalis (Say), Ithaca, April 18, 1914, several larvae
Tipula ignobilis Lw., Ithaca, June 1, 1917, 1 larva
Tipula oropezoides John., Ithaca, April 18, 1917, 1 larva
Tipula trivittata Say, Ithaca, April 22, 1913, 1 larva
Ula elegans O. S., paratype, Ithaca, October 16, 1912, several larvae and pupae

APPENDIX

A STUDY OF GALL MIDGES, VII

FAMILY ITONIDIDAE

Tribe Itonididinae (*Continued*)

The first part of the discussion of this large and extremely variable tribe appears in State Museum Bulletin 202, pages 76 to 205. There will be found on page 76 a discussion of the tribal characteristics and on pages 76 to 81 there is a key for the separation of all genera of the tribe, including those discussed below.

ARTHROCNODAX Rubs.

- 1895 Rubsaamen, E. H. Wien. Ent. Zeit., 14:189
 1896 Kieffer, J. J. Wien. Ent. Zeit., 15:92
 1897 ——— Synopse d. Cecidomyies d'Europe et d. Algerie, p. 29
 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 403
 1910 Rubsaamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:285
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:57
 1913 Kieffer, J. J. Gen. Insect., fasc., 152, p. 155

This genus may be recognized by the third vein uniting with costa well before the apex of the wing (pl. 16, fig. 7).

The antennae are composed of fourteen segments, binodose in the male (fig. 3), the palpi quadriarticulate and the claws simple. The basal clasp segment of the male has a more or less developed tooth at the internal basal angle. The ovipositor is short and apically with two large lamellae. Type *A. vitis* Rubs.

We have in this group a number of small, yellowish forms. It is probable that most of the species are zoophagous, though *A. apiphila*, believed at first to subsist upon organic débris in beehives, may in reality have been preying upon mites. The head and the anterior body segments are usually greatly produced in the larva.



Fig. 3 Arthrocnodax species, fifth antennal segment of male (enlarged, original)

Key to Species

- a* The two parts of the stems of the fifth antennal segment of the male plainly unequal
b Basal portion of the stem with a length less than its diameter
c Circumfila heavy, thick, the dorsal plate deeply and triangularly incised, the ventral plate short, narrowly rounded

- d* Stems one-half and as long as their diameters, respectively. Abdomen reddish brown. Length 1 mm, the third palpal segment broadly oval. *macrofila* Felt, C. 1023
- dd* Stems one-half and one and one-fourth times their diameters, respectively. Abdomen yellowish or dark carmine. Length 1 mm, the third palpal segment slender.
apiphila Felt, C. a1775
- ddd* Stems one-half and one and one-half times their diameters, respectively. Abdomen yellowish, the third and fourth segments black. Length 1 mm, fourth palpal segment narrowly oval. *cincta* Felt, C. 285
- cc* Circumfila long, not unusually heavy or thick; dorsal plate deeply and triangularly incised, the ventral plate narrowly rounded
- d* Stems three-fourths and one and three-fourths times their diameters, respectively. Abdomen yellowish brown. Length .75 mm, the fourth palpal segment slender. Reared from red spider on cotton. *carolina* Felt, C. a2461
- bb* Basal portion of the stem with a length about one-half greater than its diameter
- c* Distal portion of the stem of the fifth antennal segment with a length twice its diameter; abdomen pale yellowish, length 5 mm; dorsal plate deeply and triangularly incised; ventral plate truncate; reared from curled sumac leaves. *rhoina* Felt, C. a1720b
- cc* Distal portion of the stem of the fifth antennal segment with a length two and one-half times its diameter; abdomen yellowish brown; length 1 mm, dorsal plate short, broadly and triangularly emarginate; ventral plate long, broadly rounded; reared from mites on garden beans. *constricta* Felt¹, C. a2572
- bbb* Basal part of the stem of the fifth antennal segment in the male with a length two and one-half times its diameter
- c* Distal portion of the stem with a length three times its diameter. Abdomen dark red. Dorsal plate broadly and triangularly emarginate, ventral plate long, narrow, rounded. *ruffa* Felt, C. 678.
- cc* Distal portion of the stem with a length three and one-half times its diameter
- d* Abdomen pale yellowish. Length 1 mm. Dorsal and ventral plates triangularly emarginate, the latter sparsely setose apically. Reared from red spider on orange.
occidentalis Felt, C. a2328.
- dd* Abdomen yellowish brown. Length 1 mm. Ventral plate long, broad, rounded. *filicis* Felt, C. 139, 358.
- ccc* Distal portion of the stem with a length four times its diameter. Abdomen dark red. Length 1 mm. Ventral plate long, narrow, rounded. *sylvestris* Felt, C. a1630
- bbbb* Stems with a length three and three and one-half times their diameters, respectively. Abdomen light yellowish brown. Length 1 mm. Ventral plate short, broad, rounded. *fenestra* Felt, C. 641

¹ A Porto Rican species reared from red spider on garden beans (Jour. Econ. Ent. 7:481, 1914).

- aa* Basal and distal portions of the stems of the fifth antennal segments of the male equal or nearly so
- b* Basal portion of the stem with a length one-half greater than its diameter, the distal part with a length one-fourth greater. Abdomen yellowish. Length .6 mm. Ventral plate long, broad, rounded. Reared from Eriophyes galls. *meridionalis* Felt, C. 22335
- bb* Basal portion of the stem with a length two or two and one-half times its diameter
- c* Abdomen orange yellow. Length .75 mm. Dorsal plate short, incised. Ventral plate long, narrowly rounded.
incisa Felt, C. 67
- cc* Abdomen yellowish. Length .25 to .75 mm. Dorsal plate broadly and triangularly emarginate. Ventral plate long, broad, rounded.
abdominalis Felt
- ccc* Abdomen yellowish brown. Length 1 mm. Basal clasp segment with a rounded lobe basally. Ventral plate short, broad, rounded.
acerina Felt, C. 149
- cccc* Abdomen pale yellowish. Length 1 mm. Dorsal plate short, deeply and narrowly emarginate. Ventral plate long, broad, slightly emarginate. Reared from rolled elder leaves.
sambucifolia Felt, C. 21723
- ccccc* Abdomen dark red. Length 1 mm. Dorsal plate deeply and triangularly emarginate. Ventral plate long, broad, rounded.
fraxini Felt, C. 179
- ccccc* Abdomen fuscous. Length .75 mm. Dorsal plate long, narrowly incised. Ventral plate short, broad, rounded.
obscura Felt, C. 399

Arthrocnodax incisa Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 140; separate, p. 43-44 (Cecidomyia)

1908 ———— N. Y. State Mus. Bul. 124, p. 403

This orange-brown male was taken May 21, 1906, on soft maple, *Acer rubrum*, at Albany, N. Y.

Male. Length .75 mm. Antennae half as long as the body, rather thickly haired, light brown; fourteen segments, the fifth with stems each thrice their diameters. Palpi; the first and second segments short, irregularly subquadrate, the third and fourth, each about as long as the two preceding combined, the third a little stouter than the following. Mesonotum dark brown. Scutellum orange brown, postscutellum darker. Abdomen orange brown, somewhat darker dorsally on the second, third and fourth abdominal segments. Wings hyaline, costa light brown; halteres yellowish transparent. Legs a variable yellowish brown; posterior coxae reddish, femora and tibiae light brown, slightly darker distally, tarsi rather dark brown; claws slender, uniformly curved. Genitalia; basal clasp segment long, slender; terminal clasp segment swollen at the base; dorsal plate broad, deeply and narrowly incised, the lobes narrowing, broadly rounded apically; ventral plate narrow, long, subtruncate. Type Cecid. 67.

Arthrocnodax sylvestris Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 143; separate, p. 47 (Cecidomyia)

1908 ————— N. Y. State Mus. Bul. 124, p. 403

The dark carmine male was taken September 26, 1906, at Davidson's River, N. C.

Male. Length 1.25 mm. Antennae one-fourth longer than the body, thickly haired, brown; fourteen segments, the fifth with stems two and one-half and four times their diameters, respectively. Palpi; the first segment short, swollen distally, the second, third and fourth subequal, the latter more slender than the preceding. Mesonotum a variable yellowish and brown, submedian lines indistinct. Scutellum and postscutellum yellowish. Abdomen dark carmine, a fuscous spot near the middle. Wings hyaline, costa brown; halteres a semitransparent salmon; femora and tibiae pale fuscous distally, tarsi fuscous; claws rather slender, strongly curved. Genitalia; basal clasp segment stout, swollen; terminal clasp segment enlarged basally; dorsal plate short, broad, lobes broadly rounded; ventral plate long, slender, broadly rounded. Type Cecid. a1630.

Arthrocnodax rufa Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 403

This dark reddish male was taken July 24, 1906, on hickory, *Carya*, at Albany, N. Y.

Male. Length 2 mm. Antennae one-fourth longer than the body, thickly haired, fuscous yellowish; fourteen segments, the fifth with stems two and one-half and three times their diameters, respectively. Palpi; first segment subquadrate, the second narrowly oval, with a length three times its diameter, the third as long as the second, more slender, the fourth a little longer than the third. Mesonotum dark brown. Scutellum dark reddish brown, postscutellum reddish yellow. Abdomen dark reddish, the second and third abdominal segments darker; genitalia fuscous yellowish. Wings hyaline, costa light brown; halteres semitransparent. Anterior legs nearly uniform dark brown, the mid and posterior legs mostly pale straw, claws slender, evenly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment long; dorsal plate long, deeply and triangularly emarginate, the lobes narrowly rounded; ventral plate long, broad, broadly rounded. Harpes indistinct. Type Cecid. 678.

Arthrocnodax filicis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 136; separate, p. 35 (Cecidomyia)

1908 ————— N. Y. State Mus. Bul. 124, p. 404

This yellowish brown male was taken June 4, 1906, on fern at Karner, N. Y. It was also taken in a trap lantern at Nassau, N. Y. July 9th.

Male. Length 1 mm. Antennae longer than the body, sparsely haired, dark brown; fourteen segments, the fifth with stems two and one-half and three and one-half times their diameters, respectively. Palpi; the first segment subquadrate, slightly curved, the second rather stout, suboval, the third a little more slender, the fourth a little longer than the third; head black. Mesonotum dark brown. Scutellum and postscutellum lighter. Abdomen yellowish brown, vestiture scarcely perceptible. Wings hyaline, costa light brown; halteres yellowish white. Legs light brown, paler at the articulations; claws slender, uniformly curved. Genitalia; basal clasp segment long, stout; terminal clasp segment slightly swollen at the base; dorsal plate broad, deeply and widely emarginate, the lobes broadly rounded; ventral plate broad, broadly rounded. Type Cecid. 139.

Arthrocnodax abdominalis Felt

1911 Felt, E. P. Ent. News, 22:128-29 (Endaphis)

1914 ————— Econ. Ent. Jour., 7:458

This small, yellowish midge was reared by Prof. C. H. T. Townsend, Piura, Peru, from cotton leaves infested by a mite, Eriophyes.

Arthrocnodax meridionalis Felt

1912 Felt, E. P. Ent. News, 23:176-77

This species was reared from Eriophyes galls on *Ruellia tuberosa* collected at St Vincent, W. I.

Arthrocnodax fraxini Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 138; separate, p. 42 (Cecidomyia)

1908 ————— N. Y. State Mus. Bul. 124, p. 404

The dark reddish male described below was taken June 10, 1906, on ash, *Fraxinus*, at Albany, N. Y.

Male. Length 1 mm. Antennae nearly twice the length of the body, sparsely haired, light brown; fourteen segments, the fifth with stems each with a length two and one-half times its diameter. Palpi; the first segment subquadrate, the second one-half longer than the first, the third a little shorter, the fourth one-half longer than the third. Mesonotum nearly uniform dark brown, submedian lines yellowish. Scutellum yellowish laterally, dark orange apically, postscutellum a little darker. Abdomen dark reddish, slightly lighter dorsally on the second and third abdominal segments. Wings hyaline (pl. 12, fig. 11), costa dark brown; halteres yellowish transparent. Legs nearly uniform dark brown, lighter ventrally; claws rather slender, evenly curved. Genitalia; basal clasp segment long, stout, at the basal angle a thickly haired lobe; terminal clasp segment slightly swollen at base, long; dorsal plate broad, broadly and

triangularly incised, the lobes narrowly rounded; ventral plate stout, broad, broadly rounded. Type Cecid. 179.

Arthrocnodax acerina Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 136; separate, p. 40 (Cecidomyia)

1908 ————— N. Y. State Mus. Bul. 124, p. 404

This yellowish brown male was taken June 7, 1906 on maple; probably *Acer rubrum*, at Lake Clear, N. Y.

Male. Length 1 mm. Antennae twice the length of the body, thickly clothed with long hairs, dark brown; fourteen segments, the fifth with stems each with a length two and one-half times its diameter; terminal segment with the distal enlargement prolonged, the apical portion subconic. Palpi; the first segment irregular, subquadrate, the second twice the length of the preceding, oval, the third about as long, narrowly oval, the fourth subequal, a little stouter; face yellowish brown. Mesonotum reddish brown, probably with lighter submedian lines. Scutellum reddish. Abdomen yellowish brown with a distinct fuscous spot dorsally on the second and third abdominal segments. Wings hyaline, costa light brown; halteres whitish transparent. Legs pale straw color basally, tarsi darker; claws slender, uniformly curved. Genitalia; basal clasp segment long, stout, a stout, rounded lobe at the basal fourth, truncate; terminal clasp segment long, swollen at the base; dorsal plate broad, deeply and narrowly incised, the lobes narrowly rounded; ventral plate broad, broadly rounded. Type Cecid. 149.

Arthrocnodax fenestra Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 404

This light yellowish brown male was taken July 22, 1906 on a window at Nassau, N. Y.

Male. Length 2 mm. Antennae longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems three and three and one-half times their diameters respectively; terminal segment, the distal enlargement cylindrical, having a length about twice its diameter and a short apical process. Palpi; first segment subquadrate, the second with a length three times its diameter, the third a little shorter, narrowly oval, the fourth longer, dilated. Mesonotum dark brown, the submedian lines indistinct. Scutellum yellowish brown, postscutellum dark brown. Abdomen a light yellowish brown with the basal segment dark brown. Genitalia slightly fuscous. Wings hyaline, costa light brown; halteres yellowish white. Legs a nearly uniform straw brown; claws slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, tapering; terminal clasp segment long,

slender; dorsal plate long, deeply and triangularly incised, the lobes tapering, narrowly rounded; ventral plate long, broadly rounded. Type Cecid. 641, N. Y. State Museum.

Arthrocnodax obscura Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 404

This dark male was taken June 26, 1906 on blueberry, *Vaccinium*, at Karner, N. Y.

Male. Length .75 mm. Antennae longer than the body, thickly clothed with fine hairs, brown; fourteen segments, the fifth with stems each with a length two and one-half times its diameter; terminal segment with the distal enlargement somewhat produced, elongate-oval. Palpi; the first and second segments subequal, with a length about two and one-half times the diameter, the second and third each probably a little longer and more slender; head black. Mesonotum, scutellum and postscutellum dark fuscous, abdomen fuscous. Wings hyaline, costa probably light brown; halteres fuscous. Femora pale, tibiae fuscous, tarsi darker; claws slender, strongly curved. Genitalia; basal clasp segment long, truncate; terminal clasp segment slightly swollen at the base; dorsal plate broad, deeply and narrowly incised, the lobes obliquely truncate; ventral plate broad, truncate. Type Cecid. 399.

Arthrocnodax apiphila Felt

1907 Felt, E. P. New Species of Cecidomyiidae II, p. 20

1908 ————— N. Y. State Mus. Bul. 124, p. 301, 404

1914 ————— Econ. Ent. Jour., 7:458

1915 ————— N. Y. State Mus. Bul. 175, pl. 2, fig. 12

1918 ————— N. Y. State Mus. Bul. 200, p. 150

Both sexes were received October 10, 1907 from Dr Burton N. Gates, then expert in apiculture, United States Bureau of Entomology, with the statement that the larvae appeared to subsist on the chaff material and excrement in the bottom of the breeding box. It is possible they were preying upon mites. Midges were reared from brood comb affected by American foul brood and originating in Tulare county, California, August 2d. The comb contained much sealed brood when delivered and was found to have decayed. In addition to the midge larvae there were

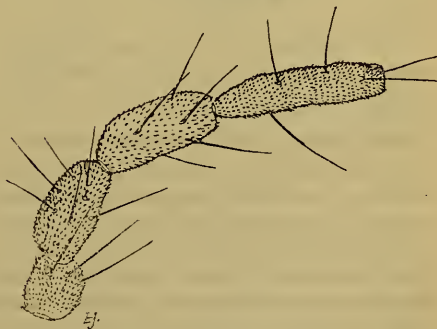


Fig. 4 *Arthrocnodax apiphila*, palpus of male (enlarged, original)

innumerable small mites, subsequently identified by Nathan Banks as a species of *Tyroglyphus* and a red mite belonging to the family Gamasidae, the latter being less abundant. The comb may have been infested by *Arthrocnodax* prior to its shipment from California though the probabilities indicate, in view of subsequently developed facts, that the Dipterous larvae were preying on the *Tyroglyphus*. This species was reared from a twig badly infested by *Pulvinaria vitis* Linn. and from a breeding jar containing forest tent caterpillar, *Malacosoma disstria* Hubn. cocoons and débris received from Tacoma, Wash. It was also obtained from a jar containing *Viburnum* leaves bearing numerous blister galls. The midge larvae were doubtless zoophagous in each instance. It is possible that *Aphanogamus floridanus* Ashm. (*Insect Life*, 4:123) may be a parasite of this species.

Male. Length 1 mm. Antennae one-fourth longer than the body, thickly haired, fuscous straw, the basal segment yellowish; fourteen segments, the fifth with stems one-half and one and one-fourth times their diameters respectively; terminal segment with the distal enlargement somewhat produced, subcylindric and distally tapering to an obtuse apex. Palpi (fig. 4); the first segment short, stout,

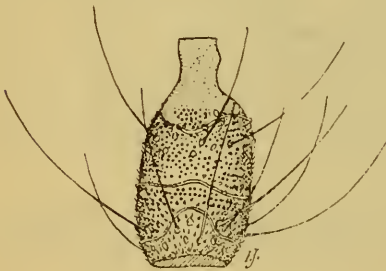


Fig. 7. *Arthrocnodax apiphila*, fifth antennal segment of female (enlarged, original)

subquadrate, the second nearly twice as long as the first, stout, narrowly oval, the third a little longer and more slender than the second, the fourth one-half longer than the third, more slender. Mesonotum yellowish or reddish brown, the submedian lines indistinct. Scutellum and postscutellum yellowish or orange yellow. Abdomen yellowish or deep orange carmine, genitalia fuscous yellow. Wings hyaline, costa fuscous straw; halteres pale orange. Coxae and femora basally pale yellow, the femora distally and tibiae light straw, tarsi light brown, the distal segments darker; claws long, slender, strongly curved, the pulvilli distinctly shorter than the claws. Genitalia; basal clasp segment long, stout, a rounded lobe basally; terminal clasp segment stout, swollen basally; dorsal plate short, broad, deeply and triangularly incised, the lobes narrowly rounded laterally; ventral plate long, broad, narrowly rounded.

Female. Length 1.25-1.5 mm. Antennae extending to the fourth abdominal segment, the fifth (fig. 5) with a stem one-fourth the

length of the cylindric basal enlargement. Terminal segment somewhat produced. Palpus nearly as in male, face fuscous yellowish, other color characters as in the male. Ovipositor (fig. 6) short, the lobes ovate and sparsely setose. Type Cecid. a1775.



Fig. 6 *Arthrocnodax apiphila*, tip of abdomen of female showing ovipositor (enlarged, original)

Arthrocnodax macrofila Felt

1907 Felt, E. P. New Species of Cecidomyiidae II, p. 21-22

1908 ———— N. Y. State Mus. Bul. 124, p. 302-3, 404

This reddish brown male was reared in the bureau of entomology, United State Department of Agriculture, August 3, 1902 from a fungus collected at Las Vegas, N. M.

Male. Length 1 mm. Antennae a little longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems very short, each with a length one and one-fourth times its diameter; terminal segment, the distal enlargement slightly produced, tapering, obtuse. Palpi; the first segment short, stout, subglobose, the second rather stout, with a length fully three times its diameter, the third a little longer and more slender. Mesonotum reddish brown. Scutellum light reddish yellow, postscutellum darker. Abdomen reddish brown. Wings hyaline, costa light straw, halteres yellowish transparent. Coxae, femora and tibiae pale yellowish, tarsi reddish brown; claws long, slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment short, broad, terminal clasp segment short, stout, swollen basally; dorsal plate short, broad, deeply and roundly emarginate, the lobes narrowly rounded; ventral plate long, tapering, narrowly rounded. Type Cecid. 1023.

Arthrocnodax cincta Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 143; separate, p. 47 (Cecidomyia)

This yellowish brown male was taken June 13, 1906 at Albany, N. Y.

Male. Length 1 mm. Antennae a little longer than the body, rather thickly clothed with fine hairs, dark brown; fourteen segments, the fifth with stems very short, each one and one-fourth times its diameter; terminal segment, the distal enlargement greatly produced, subcylindric, narrowly rounded. Palpi; the first segment presumably short, subquadrate, the second, third and fourth, each narrowly oval, subcylindric. Mesonotum nearly uniform dark brown. Scutellum dark reddish, postscutellum yellowish brown. Abdomen with the basal segments yellowish brown, the third and fourth black, fifth and sixth pale orange, terminal segments black. Wings (pl. 16, fig. 9) hyaline, costa dark brown; halteres yellowish transparent. Legs nearly uniform pale straw; claws long, slender, rather strongly curved basally. Genitalia; basal clasp segment long, a broadly rounded lobe at the basal third; terminal clasp segment greatly swollen at the base; dorsal plate broad, deeply and narrowly incised, the lobes broadly and narrowly rounded; ventral plate long, narrow, narrowly rounded. Type Cecid. 285.

Arthrocnodax carolina Felt

1913 Felt, E. P. Econ. Ent. Jour., 6:488-89

1914 ————— Econ. Ent. Jour., 7:458

1914 McGregor, E. A. Econ. Ent. Jour., 7:330

1918 Felt, E. P. N. Y. State Mus. Bul. 200, p. 17

The midges were reared from red spider on cotton by E. A. McGregor and are easily separated from the western *A. occidentalis* Felt by the shorter stems of the flagellate antennal segments and the rounded ventral plate. The larvae feed upon the eggs of the red spider and the species is ranked as one of the important natural enemies of red spider on cotton. *Aphanogamus floridanus* Ashm. is a very effective parasite of this midge.

Arthrocnodax rhoina Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 404

1918 ————— N. Y. State Mus. Bul. 200, p. 159

The pale yellowish male was reared August 27, 1907 from heads of curled sumac, *Rhus*, leaves taken at Albany, N. Y.

Gall. Reared from heads of stunted, irregularly curled leaves of sumac.

Male. Length .5 mm. Antennae a little longer than the body, sparsely haired, pale yellowish; fourteen segments, the fifth with

stems one and one-half and two times their diameters, respectively; terminal segment with the distal enlargement produced, having a length nearly twice its diameter and a short, stout process apically. Palpi; first segment subquadrate, the second narrowly oval, with a length three times its diameter, the third as long as the second, slender, the fourth one-fourth longer than the third, more slender. Face yellowish. Mesonotum fuscous yellowish. Scutellum, post-scutellum and abdomen pale yellow. Wings rather broad, costa light brown. Halteres and legs yellowish; claws very long, slender, evenly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment short; terminal clasp segment slightly swollen basally; dorsal plate short, deeply and triangularly incised, the lobes narrowly rounded; ventral plate short, truncate. Type Cecid. a1720b.

Arthrocnodax sambucifolia Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 404

1918 ————— N. Y. State Mus. Bul. 207, p. 188

This presumably pale yellowish male was reared at Albany, N. Y., September 13, 1907 from rolled elder leaves, *Sambucus canadensis*.

Gall. Reared from rolled elder leaves.

Larva. Length 1.5 mm, pale yellowish, slender. Head long, tapering, with a length over twice its diameter; antennae slender, with a length one-half greater than the diameter of the anterior fourth of the head. The chitinous rods supporting the head one-half longer than the head, converging posteriorly, the second segment with a diameter twice that of the basal portion of the head, the third with a diameter twice the posterior width of the second segment; the second, third and fourth segments at least, with long, well developed, submedian, sublateral and lateral setae, those of the fifth visible only on the lateral margins and on the following segments apparently rudimentary. Skin coarsely shagreened; posterior extremity roundly emarginate, with obscure submedian tubercles.

Male. Length 1 mm. Antennae one-fourth longer than the body, rather sparsely haired, pale yellowish; fourteen segments, the fifth with stems two and one-half times the diameter; terminal segment produced, the distal enlargement cylindrical, with a length two and one-fourth times its diameter; apical process rather short, stout. Palpi; first segment subquadrate, the second with a length three times its diameter, the third as long as the second, slender, the fourth one-fourth longer than the third, slender. Thorax and abdomen probably pale yellowish. Wings hyaline, costa light straw. Halteres and legs probably pale yellowish; claws very long, slender, evenly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment swollen basally; dorsal plate very short, deeply and narrowly emarginate, the lobes truncate; ventral plate long, broad, broadly and slightly emarginate. Type Cecid. a1723.

Arthrocnodax occidentalis Felt

- 1912 Felt, E. P. Econ. Ent. Jour., 5:402
 1912 Quayle, H. J. Cal. Agr. Expt. Sta. Bul. 234, p. 514-15
 1913 ——— Econ. Ent. Jour., 6:87
 1914 Ewing, H. E. Ore. Agr. Expt. Sta. Bul. 121, p. 58
 1914 Felt, E. P. Econ. Ent. Jour., 7:458

This midge was reared by Prof. H. J. Quayle from larvae preying on red spider, *Tetranychus*, Berkeley, Cal. It is considered one of the most important natural enemies of *T. telarius* on the Pacific coast.

PRODIPLOSIS Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 403
 1910 Rubsaamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:289
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:56
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 249

This genus was erected for certain small forms which show an interesting transition between the typical binodose antennae of the male Itonid and the cylindrical stemmed antennae of *Rhopalomyia*. The circumfila are rudimentary or wanting. The third to ninth segments are distinctly binodose, the eighth and ninth only slightly so, while the tenth to the fourteenth are cylindrical. The claws are simple. The third vein unites with the wing margin well beyond the apex. The genitalia are peculiar on account of the somewhat inflated harpes. Type *Cecidomyia floricola* Felt, C. 21681.

Prodiplosis floricola Felt

- 1907 Felt, E. P. New Species of Cecidomyiidae II, p. 21 (*Cecidomyia*)
 1908 ——— N. Y. State Mus. Bul. 124, p. 302, 403
 1918 ——— N. Y. State Mus. Bul. 200, p. 129, 133

The pale yellowish male described below was reared August 15, 1907 from somewhat enlarged, reddened flowers of the meadow sweet, *Spiraea salicifolia*, taken at Albany, N. Y. Apparently the same form was obtained from enlarged blossoms of Virgins bower, *Clematis virginiana*, taken at Karner, N. Y., August 15, 1907.

Gall. The enlarged flower buds in spiraea are reddish. As the season advances, infested blossoms become conspicuous because of their failing to open.

Male. Length 1 mm. Antennae one-fourth longer than the body, sparsely haired, pale straw; fourteen segments, the fifth (fig. 7a) with stems one and two times their diameters respectively; basal enlargement subglobose, a subbasal whorl of rather long, curved setae, the distal enlargement broadly oval, a few scattering whorls

of long, curved setae; circumfila apparently absent, the 10th (fig. 7b) to the 14th segments cylindric, the tenth with smooth stem two-thirds the length of the cylindric basal enlargement, which latter has a length three times its diameter and sparse whorls of hair sub-basally and near the distal third; terminal segment stout, tapering, a short, stout appendage distally. Palpi; the first segment short, stout, slightly swollen distally, the second one-half longer, a little stouter, the third longer and more slender than the second, the fourth one-fourth longer and more slender than the third; face pale yellowish. Mesonotum brown, the submedian lines indistinct. Scutellum yellowish with a few long setae, postscutellum yellowish. Abdomen pale yellowish, the segments margined posteriorly with

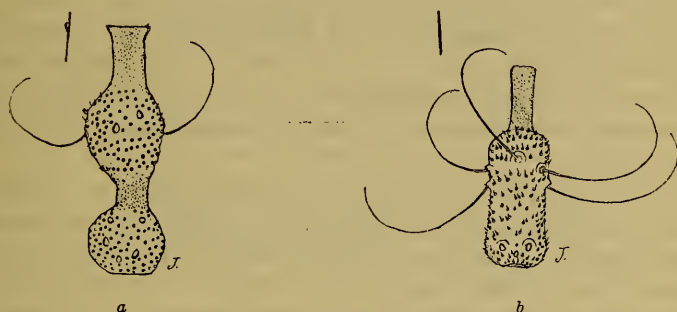


Fig. 7 *Prodiplosis floricola*: *a*, fifth and *b*, tenth antennal segments of male, only a few setae sketched in (enlarged, original)

long hairs. Wings hyaline, costa light straw, subcosta uniting with the margin near the basal third, the third vein well beyond the apex, the fifth at the distal third, its branch near the basal third; halteres pale yellowish. Coxae, femora and tibiae pale yellowish, tarsi brownish gray, the segments paler basally; claws long, slender, slightly curved, simple, the pulvilli shorter than the claws. Genitalia; basal clasp segment short, stout, roundly truncate; terminal clasp segment stout, swollen at the base, tapering, an apical spur; dorsal plate short, stout, deeply and narrowly incised, the lobes long, slender, tapering, irregularly angulate; ventral plate long, broad, the sides parallel, broadly and roundly emarginate, the lobes irregularly rounded. Harpes apparently very long, slender, irregularly curved, greatly dilated at the base, strongly curved, near the middle, tapering, obtuse; style long, slender, strongly curved. Type Cecid. ar681.

Prodiplosis fitchii Felt

1912 Felt, E. P. Econ. Ent. Jour., 5:288-89

This midge was labeled by Dr Asa Fitch as having been reared from shrunken grains of wheat.

CARYOMYIA Felt

- 1909 Felt, E. P. Econ. Ent. Jour., 2:292
1911 ——— N. Y. Ent. Soc. Jour., 19:56
1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 144

The males may have the flagellate antennal segments binodose or cylindric and subsessile. There are invariably three low, stout circumfila. The antennal segments of the female are cylindric, and with two circumfila. The palpi are tri- or quadriarticulate. The wings are relatively broad (pl. 15, fig. 4), the third vein uniting with the margin at or near the apex. The claws are simple and the pulvilli well developed. Type *Cecidomyia tubicola* O. S.

This genus has somewhat the appearance of a small *Hormomyia* or *Trishormomyia* except that the mesonotum is not greatly produced over the head and there are but fourteen antennal segments in both sexes. The male genitalia are much as in *Hormomyia* while the ovipositor of the female is short, triangular and with minute lobes apically.

Caryomyia may be an aberrant *Asphondylid* somewhat allied to *Cincticornia*, since the circumfila in the two genera are not markedly different and they occur upon the somewhat related *Carya* and *Quercus*. The constrictions in the antennal segments (fig. 9a) in some species of *Caryomyia* are such that too much importance should not be attached to them, specially as there are species where the constrictions are slight or wanting. It is possibly a connecting form and one might consider that in *Caryomyia* we had the process of constriction and extension of the antennal segments, so characteristic of the *Itonididinarieae* as a whole, in an incipient stage.

The larvae are usually stout, whitish and in the majority of the species the breastbone is slender and unidentate (fig. 14), a few have it narrowly bidentate (fig. 12), while in *C. caryae* O. S. this organ (fig. 8) is dilated apically and has the two teeth widely separated.

The genus *Caryomyia* produces most of the peculiar and variable leaf galls on hickory (see plate 10). Several of these, as observed by the late Doctor Thompson, begin as a brownish blistered area with a slight central point and as the galls develop the overlying epidermis is torn apart. A fuller description of this is given in the account of *C. inanis* Felt. The winter is passed by the larvae within the galls, the flies issuing about the time the young leaves appear. Two females were found at Nassau May 11, 1911, hopelessly stuck in the exudations from hickory buds. It not infrequently happens that several species of *Caryomyia* galls occur upon the same leaf.

Key to Species

- a Antennae of the male distinctly binodose
- b Nodes separated by distinct stems, the circumfila moderately long
- c Basal stem of fifth antennal segment long, with a length considerably more than its diameter
- d Male; length 3 mm, abdomen deep reddish orange; dorsal plate broad, narrowly emarginate, the lobes rounded; ventral plate broad, roundly emarginate, the lobes broadly rounded; terminal clasp segment long, hardly tapering. Female; length 4 mm, abdomen dark reddish orange; fifth antennal segment with a length three and one-half times its diameter; ovipositor with the lobes protuberant; wings long; larval breastbone unidentate. Reared from a yellowish green or brown, subglobular, thick-walled, hickory leaf gall 4 to 5 mm in diameter.
a n t e n n a t a Felt, C. a1944
- dd Male; length 2.25 mm, abdomen deep reddish orange, the ventral plate broadly subtruncate, the terminal clasp segment long, tapering. Female; length 3 mm, the fifth antennal segment with a length three times its diameter, the ovipositor with the lobes protuberant, the wings long. Larval breastbone bidentate, the teeth distant. Reared from a globose, thin-walled, yellowish green or brown hickory leaf gall about 2 mm in diameter
c a r y a e O. S., C. 1104, a1321, a1906
- cc Basal stem of fifth antennal segment short, with a length only about one-half its diameter
- d Male; length 2.5 mm. Abdomen fuscous yellowish, the ventral plate broad, broadly and triangularly emarginate. Female; length 3.5 mm; abdomen dark red, the fifth antennal segment with a length three and one-half times its diameter; ovipositor with the lobes indistinct, the wings relatively long; larval breastbone unidentate. Reared from a rust-red, hairy, thin-walled, hickory leaf gall 3 to 4 mm in diameter.
h o l o t r i c h a O. S., C. a1909
- dd Male; length 2 mm; abdomen fuscous yellowish, the ventral plate broadly and roundly emarginate. Female; length 3 mm; abdomen a brownish orange, the fifth antennal segment with a length three and one-half times its diameter; larval breastbone unidentate. Reared from a small, depressed, globular, yellowish green or brownish, thin-walled hickory leaf gall, some 2 mm in diameter.
c o n s o b r i n a Felt, C. a1948
- bb Nodes of the basal antennal segments separated only by a deep constriction, the circumfila short and stout
- c Male; length 3 mm; abdomen fuscous orange, the dorsal plate broadly and triangularly emarginate, the ventral plate broadly truncate; terminal clasp segment short, hardly tapering distally. Presumably reared from a green, thin-walled, globose, hickory leaf gall.
a r c u a r i a Felt, C. 1104x

- aa* Male; antennal segments cylindric, sessile, the circumfila short and stout
- b* Wings short or rather short
- c* Male; length 2 mm; abdomen dark red, the fifth antennal segment with a length three and one-half times its diameter, the dorsal plate broadly and narrowly emarginate, the lobes irregularly and broadly rounded, the ventral plate long, broad and broadly rounded. Female; length 1.75 mm; abdomen yellowish orange, the fifth antennal segment with a length two and one-half times its diameter, the lobes slightly produced, acute; larval breastbone unidentate. Reared from a small, green or red-tinted, conic, hickory leaf gall some 2 mm long.....
sanguinolenta O. S., C. a1945
- bb* Wings short, broad
- c* Ventral plate broadly rounded
- d* Male; length 1.75 mm; abdomen dark red, the dorsal plate triangularly emarginate, the lobes angular. Female; length 2 to 3 mm; abdomen dark red, the fifth antennal segment with a length two and one-half times its diameter, the lobes protuberant; larval breastbone slender, bidentate. Reared from a rust-red, long-haired, globular, hickory leaf gall 2 to 3 mm in diameter... t h o m p s o n i Felt, C. 1116a, C. a1908
- cc* Ventral plate emarginate
- d* Male; length 1.75 mm; abdomen dark red, the fifth antennal segment with a length three and one-half times its diameter. Female; length 1.5 mm; abdomen reddish orange, the fifth antennal segment with a length two and one-half to three times its diameter; ovipositor with the lobes short, slightly protuberant; larval breastbone unidentate. Reared from a greenish or black tubular, hickory leaf gall 2 to 3 mm long...
t u b i c o l a O. S., C. a1450, C. 1106, a1320
- dd* Male; length 1.75 mm; abdomen reddish orange, the fifth antennal segment with a length twice its diameter. Female; length 2.75 mm; abdomen dark reddish orange, the fifth antennal segment with a length three and one-half times its diameter; ovipositor with the lobes protuberant; larval breastbone unidentate. Reared from a thin-walled, subglobular, slightly nipped, hickory leaf gall 2 to 3 mm in diameter..... s i m i l i s Felt, C. a1946

Table of Larvae and Galls

This table is designed to assist in the identification of the species by characters found in the galls and larvae. It should be considered as tentative and suggestive rather than as final, owing to the variations in the galls and the difficulty of finding satisfactory specific characters in the larvae. It is probable that other species of *Caryomyia*, aside from those tabulated below, will be found to inhabit the hickory. Certain species are tentatively assigned to this genus

- a* Breastbone unidentate, slender
- b* Gall distinctly hairy
- c* Gall globose, small, thin-walled, long-haired, reddish (pl. 10, fig. 4)..
holotricha O. S., C. 1112a, 11137, 11333
- cc* Gall subglobose, large, thick-walled, short-haired, reddish.....
persicoides Beutm., C. 11941a
- bb* Galls smooth or at most sparsely pubescent
- c* Gall tubular, greenish or blackish (fig. 13, and pl. 8).....
tubicola O. S., C. 11106, 11320, 11450
- cc* Galls globose
- d* Gall thin-walled, purplish or red.....
sanguinolenta O. S., C. 11945
- dd* Gall small, thin-walled, depressed, yellowish green or brown....
similis Felt, C. 11946
- ddd* Gall small, thin-walled, with empty cavity above, green or brownish.....
inanis Felt, C. 11950
- dddd* Gall small, thick-walled, depressed, yellowish brown or green (pl. 10, fig. 9).....
consobrina Felt, C. 11948....
- ddddd* Gall large, thick-walled, yellowish or brown (pl. 10, fig. 1).....
antennata Felt, C. 11944
- ccc* Gall conical, the apex long (pl. 10, fig. 2, 3).....
caryaecolana sp., C. 11786
- cccc* Gall an irregular midrib swelling.....
cynipsea O. S.
- bbb* Gall not produced, the larva exposed on leaf and causing a yellowish spot.....
glutinosa O. S.
- aa* Breastbone bidentate
- b* Breastbone slender, the teeth approximate basally
- c* Gall small, globose, with long, erect, reddish or fuscous hairs (pl. 10, fig. 8).....
thompsoni Felt, C. 1116a, 11325, 11908
- cc* Gall an irregular swelling on the husk.....
nucicola O. S.
- bb* Breastbone broad, the teeth widely separated
- c* Gall globose, thin-walled, yellowish green or brown (pl. 10, fig. 7)..
caryae O. S., C. 11104, 11321, 11906
- aaa* Larval characters unknown, generic reference provisional
- b* Greenish or blackish blister leaf gall, diameter about 3 mm (plate 9)..
Caryomyia sp.

Caryomyia caryae O. S.

- 1862 Osten Sacken, C. R. Mon. Dipt. N. A., 1:191 (*Cecidomyia*)
- 1870 ——— Trans. Amer. Ent. Soc., 3:59 (*Callimome dura*)
 O. S. a parasite, Diploisis)
- 1906 Felt, E. P. Ins. Affec. Pk. & Wldd. Trees, N. Y. State Mus. Mem. 8, 2:745 (*Cecidomyia*)
- 1907 Jarvis, T. D. Ent. Soc. Ont., 37th Rep't, p. 67 (*Cecidomyia*)
- 1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 143; separate, p. 47 (*Dirhiza*)
- 1907 Cook, M. T. Acad. Sci. Proc., separate, p. 7 (*Cecidomyia*)
- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 388 (*Cecidomyia*)
- 1909 ——— Ent. Soc. Ont., 39th Rep't, p. 45 (*Hormomyia*)
- 1909 ——— Econ. Ent. Jour., 2:293
- 1909 Jarvis, T. D. Ent. Soc. Ont., 39th Rep't, p. 84 (*Cecidomyia*)
- 1910 Stebbins, F. A. Springfield Mus. Nat. Hist. Bul. 2, p. 14 (*Hormomyia*)
- 1918 Felt, E. P. N. Y. State Mus. Bul. 200, p. 46

The small, yellowish green or brown galls (pl. 10, fig. 7) of this species are rather abundant on hickory leaves though rarely so

numerous as those of some other species. They occur commonly in the vicinity of New York City, and about Albany, N. Y. They have been recorded from Ontario by Jarvis.

The galls begin to appear in June and by October contain a full-grown larva. The latter remains in its retreat till the following spring, then transforms to a pupa and normally produces an adult probably early in June. The midge described by Osten Sacken under the name of *Diplosis caryae* as the maker of this gall is probably an inquiline. In any event it can hardly be a *Caryomyia*. Adopting recognized principles of nomenclature, we have restricted the name *caryae* to the characteristic larva found by Osten Sacken within the gall and described by him prior to the description of the adult. The type specimens of the gall in the Museum of Comparative Zoology confirm our identification of this interesting species. *Platygaster caryae* Ashm. and *Ceroplastymerus caryae* Ashm. (*Insect Life*, 4:125) may have been reared from this gall.

Gall. Gall (pl. 10, fig. 7) about 2 mm in diameter, irregularly subglobular, usually with a slight nipple, sometimes distorted by pressure of adjacent galls, yellowish green or brown, very sparsely clothed with short, whitish hairs, thin-walled, monothalamous.

Larva. Length 2.5 mm, stout, white and easily distinguished by

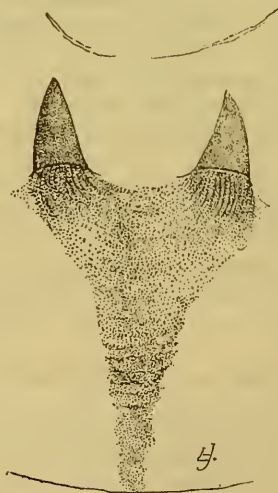


Fig. 8 *Caryomyia caryae*,
breastbone of larva (en-
larged, original)

the rather] conspicuous breastbone (fig. 8) with its two slender, widely separated toothlike projections. Head small; antennae

short, bidentate. Skin finely shagreened. The body tapers posteriorly to a narrowly rounded, nearly unarmed posterior extremity.

Male. Length 2.25 mm. Antennae about three-fourths the length of the body, sparsely haired, yellowish; fourteen binodose segments, the fifth with stems one and one-half times their diameters respectively; distal enlargement subcylindric, with a length about one-fourth greater than its diameter, terminal segment reduced, narrowly oval. Palpi; first segment short, stout, subquadrate, the second slender, with a length at least four times its diameter, the third as long as the second, the fourth longer than the



Fig. 9 *Caryomyia arcuaria*: *a*, third antennal segment of male, only two setae sketched in; *b*, a portion of the distal part in section showing the invaginated or concealed stem; *c*, Caryae: fifth antennal segment of female (enlarged, original)

third, dilated. Mesonotum fuscous yellowish, the submedian lines sparsely haired. Scutellum reddish orange, postscutellum fuscous yellowish. Abdomen deep reddish orange, the segments sparsely setose posteriorly. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae and legs a variable fuscous yellowish, the tarsi somewhat darker; claws long, slender, evenly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment long, stout; dorsal plate short, broadly and roundly emarginate, the lobes truncate; ventral plate long, broad, subtruncate.

Female. Length 3 mm. Antennae extending to the second abdominal segment, sparsely haired, pale yellowish; fourteen sessile, cylindrical segments, the fifth (fig. 9c) with a length three times its diameter; subbasal whorl thick, double, subapical whorl sparse, single; low circumfila at the basal half and apically, anastomosing irregularly; terminal segment slightly reduced, narrowly rounded. Face fuscous yellowish. Palpi; first segment short, stout, the second with a length five times its diameter, rather narrow, the third stout, with a length two and one-half times its diameter, the fourth one-half longer, somewhat dilated. Mesonotum dark brown, the submedian lines thickly haired. Scutellum yellowish, pale reddish and

thickly haired apically, postscutellum yellowish. Abdomen pale yellowish orange, the distal segments fuscous yellowish, all sparsely margined posteriorly with fuscous hairs; ovipositor pale yellowish. Claws stout, strongly curved, the pulvilli longer than the claws. Ovipositor short, stout, terminal lobes broadly triangular, narrowly rounded. Cecid. 1104, a1906.

Caryomyia antennata Felt

1909 Felt, E. P. Econ. Ent. Jour., 2:292

The midge produces one of the common hickory leaf galls about Albany, N. Y.

Gall. Yellowish green or brown, subglobular (pl. 10, fig. 1), thick-walled, the shape frequently modified by the pressure of contiguous galls, 4 to 5 mm in diameter, the surface sparsely clothed with a minute pubescence; walls very thick, with a diameter of 1 mm or more.

Larva. Length 2.25 mm, white, rather stout, the head small, antennae short, stout. Breastbone rather stout, unidentate, the tooth long, rather stout, the shaft somewhat enlarged at each extremity. Posteriorly the body tapers to the broadly rounded extremity.

Exuviae. Length 3 mm, whitish, stout. Antennal cases short, stout, with a rounded, chitinous thickening at the base. Thoracic horns rather long, slender, slightly curved. Wing cases extending to the fourth abdominal segment, the leg cases to the fifth, dorsum of the latter thickly margined posteriorly with six or seven transverse rows of stout, chitinous spines, posterior extremity nearly unarmed, broadly rounded.

Male. Length 3 mm. Antennae extending to the fourth abdominal segment, sparsely haired, fuscous yellowish; fourteen binodose segments, the fifth with stems two and one-half times their diameters respectively, the distal enlargement narrowly oval; terminal segment reduced, narrowly oval. Palpi probably quadriarticulate, the distal segment produced, with a length four times its diameter. Mesonotum fuscous yellowish, the submedian lines sparsely haired. Scutellum reddish, postscutellum, fuscous yellowish. Abdomen deep reddish orange, the segments sparsely margined posteriorly with fuscous setae; genitalia fuscous yellowish. Wings hyaline, costa pale straw. Halteres pale yellowish. Coxae and legs mostly fuscous yellowish; claws slender, evenly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment stout, terminal clasp segment stout, long, hardly tapering; dorsal plate long, broad, rather deeply and roundly emarginate, the lobes broadly rounded; ventral plate long, broad, broadly and roundly emarginate.

Female. Length 4 mm. Antennae extending to the second abdominal segment, sparsely haired, whitish transparent; fourteen cylindrical sessile segments, the fifth with a length three and one-half times its diameter; subbasal whorl rather thick, irregular; subapical whorl broad, irregular; circumfila at the basal third and apically, anastomosing somewhat irregularly; terminal segment narrowly oval.

Palpi; first segment with a length three times its diameter, incrassate, the second narrowly oval, the third and fourth as long as the first, the fourth somewhat dilated. Mesonotum yellowish brown, the submedian lines sparsely haired. Scutellum fuscous yellowish, post-scutellum reddish. Abdomen dark reddish orange, the terminal segment and ovipositor fuscous yellowish, the lobes slightly protuberant, narrowly rounded. Type Cecid. a1944.

Caryomyia holotricha O. S.

- 1862 **Osten Sacken, C. R.** Mon. Dipt. N. A., 1:193 (Cecidomyia)
 1874 **Glover, Townend.** Ms. Notes My Jour. Dipt., pl. 11, fig. 23 (Cecidomyia)
 1892 **Beutenmueller, William.** Am. Mus. Nat. Hist. Bul., 4:266 (Cecidomyia)
 1904 ———— Am. Mus. Nat. Hist. Guide Leaflet 16, p. 26-27 (Cecidomyia)
 1904 **Cook, M. T.** Ohio State Univ. Bul., ser. 8, 13:140-41 (Cecidomyia)
 1905 ———— Dep't Zool. & Nat. Res. Ind. 29th Rep't, p. 840 (Cecidomyia)
 1906 **Felt, E. P.** Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:619, 628, pl. 1, fig. 4 (Cecidomyia)
 1907 ———— N. Y. State Mus. Bul. 110, p. 143, separate, p. 47 (Dirhiza caryae)
 1908 ———— N. Y. State Mus. Bul. 124, p. 389 (Hormomyia)
 1909 ———— Ent. Soc. Ont., 39th Rep't, p. 45 (Hormomyia)
 1909 ———— Econ. Ent. Jour., 2:293
 1909 **Jarvis, T. D.** Ent. Soc. Ont., 39th Rep't, p. 84 (Cecidomyia)
 1910 **Stebbins, F. A.** Springfield Mus. Nat. Hist. Bul. 2, p. 13 (Hormomyia)
 1918 **Felt, E. P.** N. Y. State Mus. Bul. 200, p. 47

This small, globular, fuzzy, rust-red, hickory leaf gall is one of the most common occurring in New York State, sometimes being so abundant as to cover nearly the entire under surface of the leaf. This species is evidently widely distributed, since it was observed by the writer at Asheville, N. C., has been taken in numbers about New York City, listed from Ontario, Canada, by Jarvis and is recorded as being very abundant in Indiana by Cook. The galls, are usually on the under surface of the leaf. They are first yellowish, becoming reddish brown in autumn. The insects winter in the gall, the flies appearing in early spring. *Leptacis floridanus* Ashm. was reared from this gall.

Gall. Diameter 2 to 4 mm, globular or subglobular (pl. 6, fig. 4), thickly clothed with rather long yellowish or rust-red hairs, monothalamous, the walls rather thin.

Larva. Length 3 mm, stout, whitish, the head small; antennae long, bidentate; breastbone narrow, unidentate, the tooth long

roundly triangular. Segmentation rather distinct, the skin smooth. Posterior extremity broadly rounded, unarmed.

Exuvium. Length 3 mm, whitish; antennal sheaths short, annulate distally, the internal basal angles somewhat chitinized; dorsal horns long, slender. Abdominal segments with the dorsum thickly clothed with chitinous points and margined posteriorly with several rows of long, stout, chitinous spines.

Male. Length 2.5 mm. Antennae nearly as long as the body sparsely haired, whitish transparent; fourteen segments, the fifth with stems one-half and one and one-fourth times their diameters respectively, distal enlargement cylindric, with a length twice its diameter. Palpi fuscous yellowish, the first segment stout, incrassate, the second broadly oval, the third one-half longer, rectangular, the fourth one-half longer than the third. Mesonotum fuscous yellowish, the submedian lines sparsely haired. Scutellum yellowish



Fig. 10 *Caryomyia holotricha*: *a*, sixth antennal segment of female; *b*, palpus of female (enlarged, original)

red, postscutellum yellowish. Abdomen fuscous yellowish, darker basally; genitalia fuscous yellowish. Wings hyaline, costa pale straw. Halteres mostly pale yellowish. Coxae and legs fuscous yellowish, the tarsi variably tinged with carmine; claws slender, evenly curved, the pulvilli hardly as long as the claws. Genitalia; basal clasp segment stout, terminal clasp segment short, narrowly oval; dorsal plate long, broad, triangularly emarginate; the lobes narrowly rounded; ventral plate broad, broadly emarginate, the lobes broadly rounded.

Female. Length 3.5 mm. Antennae extending to the second abdominal segment, whitish transparent, sparsely haired; fourteen segments, the fifth (fig. 10*a*) with a length three and one-half times its diameter, subbasal and apical whorls sparse, circumfila at the basal half and apically; terminal segment slightly reduced, narrowly oval. Palpi (fig. 10*b*); first segment stout, incrassate, the second rectangular, with a length three times its diameter, the third as long as the second, slender, the fourth a little longer than the third.

Mesonotum dark brown, the submedian lines sparsely haired. Scutellum reddish orange, postscutellum pale orange. Abdomen deep red, the segments sparsely margined with short, fuscous hairs;



Fig. 11 *Caryomyia holotricha*, side view of terminal abdominal segments and ovipositor (enlarged, original)

ovipositor pale yellowish. Halteres pale orange, fuscous subapically. Ovipositor short (fig. 11), the lobes indistinct, tapering, narrowly rounded. Cecid. 1909

Caryomyia consobrina Felt

1909 Felt, E. P. Econ. Ent. Jour., 2:292

1918 ——— N. Y. State Mus. Bul. 200, p. 46

This species was reared in April and May 1909, from a small, depressed, globular, yellowish green or brownish, thin-walled, hickory leaf gall taken at Nassau, N. Y., September 16, 1908, a deformity quite distinct from that produced by *C. holotricha* O. S.

Gall. An irregular, small, depressed, globular, yellowish green or brownish, thin-walled gall (pl. 10, fig. 9), some 2 to 2½ mm in diameter with the surface very sparsely clothed with fine hairs. This gall has a somewhat general resemblance to that of *C. antennata*, from which it is easily separated by the much thinner walls.

Larva. Length 2.25 mm, whitish, stout, the head small; antennae short, stout. Breastbone rather stout, unidentate, the tooth long, slender, acute, the shaft somewhat expanded anteriorly, subobsolete posteriorly, the body hardly tapering, the posterior extremity broadly rounded.

Exuvium. Length 2.5 mm, whitish. Antennal cases short, distinctly segmented distally, the internal basal angles slightly chitinized, dorsal horns rather stout, slightly curved. Wing and leg pads

extending to the fourth abdominal segment, the dorsum of the latter with the segments margined with three or four rather sparse rows of stout, chitinous spines.

Male. Length, 2 mm. Antennae as long as the body, thickly haired, whitish transparent; fourteen segments, the fifth with stems one-half and one and one-fourth times their diameters respectively; the distal enlargement cylindric, with a length about twice its diameter, a broad, scattering whorl of stout setae, the circumfila with short loops; terminal segment produced, the distal enlargement with a length three times its diameter, tapering. Palpi; the first segment short, stout, the second with a length about four times its diameter, the third a little shorter, stouter, the fourth twice the length of the third, dilated. Mesonotum yellowish brown. Scutellum and post-scutellum orange. Abdomen rather thickly haired, fuscous yellowish, genitalia yellowish. Wings hyaline, costa pale straw. Halteres yellowish basally, fuscous apically. Coxae and legs fuscous yellowish, the tarsi tinged with pale orange; claws slender, evenly curved, the pulvilli a little shorter than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment short, tapering; dorsal plate long, deeply and triangularly emarginate, the lobes narrowly rounded; ventral plate long, slightly expanded, broadly and roundly emarginate, the lobes slightly rounded.

Female. Length 3 mm. Antennae extending to the second abdominal segment, sparsely haired, pale yellowish and variably tinged with carmine; fourteen sessile segments, the fifth with a length three and one-half times its diameter; subbasal whorl scattering, broad, subapical whorl scattering; circumfila near the basal half and apically; terminal segment slightly reduced, narrowly oval. Palpi; first segment stout, with a length three times its diameter, the second as long, more slender, the third a little longer, somewhat dilated, the fourth as long as the third, more dilated. Mesonotum yellowish brown, the submedian lines rather thickly haired. Scutellum and postscutellum pale orange. Abdomen sparsely haired, brownish orange; ovipositor pale yellowish. Halteres yellowish orange, fuscous subapically. Coxae and femora fuscous straw, tibiae and tarsi somewhat darker; claws rather stout, strongly curved, the pulvilli longer than the claws. Ovipositor short, the lobes tapering, narrowly rounded. Type *Cecid. a*1948.

Caryomyia arcuaria Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 338 (*Hormomyia*)

1918 ——— N. Y. State Mus. Bul. 200, p. 46

This peculiar male was separated from a series of specimens reared by the late Dr M. T. Thompson of Clark University, Worcester, Mass., from what appear to be a typical lot of *Caryomyia caryae* galls. This insect may have come from one of these galls.

Male. Length 3 mm. Antennae extending to the fourth abdominal segment, sparsely haired, light yellowish; fourteen segments,

the fifth with a length about four times its diameter, with a deep, short constriction near the basal third, the basal portion subglobose, the distal part cylindrical, with a length nearly twice its diameter; circumfila stout, the loops moderately short, rather sparse (figs. 9a, 9b); terminal segment somewhat produced, strongly constricted near the middle, tapering apically, narrowly rounded. Palpi; first segment long, slender, the second twice the length of the first, slender, the third three-fourths the length of the second, broader, the fourth one-half longer than the third, dilated. Mesonotum light brown, the broad submedian lines and posterior median area yellowish. Scutellum and postscutellum pale yellow. Abdomen a fuscous orange; basal segment dark brown, the distal segments lighter. Wings hyaline, costa light brown. Halteres and legs yellowish transparent; claws long, slender, slightly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment very short, greatly swollen, hardly tapering; dorsal plate short, broadly and triangularly emarginate, the lobes narrowly rounded; ventral plate broad, truncate. Type Cecid. 1104x.

Caryomyia sanguinolenta O. S.

- 1862 **Osten Sacken, C. R.** Mon. Dipt. N. A., 1:192 (Cecidomyia)
 1892 **Beutenmueller, William.** Am. Mus. Nat. Hist. Bul., 4:267
 (Cecidomyia)
 1904 ————— Am. Mus. Nat. Hist. Guide Leaflet 16, p. 28 (Cecidomyia)
 1906 **Felt, E. P.** Insects Affecting Park & Woodland Trees, N. Y. State
 Mus. Mem. 8, 2:718 (Cecidomyia)
 1908 **Jarvis, T. D.** Ent. Soc. Ont., 28th Rep't, p. 87 (Cecidomyia)
 1909 ————— Ent. Soc. Ont., 39th Rep't, p. 84 (Cecidomyia)
 1909 **Felt, E. P.** Econ. Ent. Jour., 2:293
 1910 **Stebbins, F. A.** Springfield Mus. Nat. Hist. Bul. 2, p. 13
 (Cecidomyia)
 1918 **Felt, E. P.** N. Y. State Mus. Bul. 200, p. 43

This species is widely distributed though not, as a rule, very abundant. It has been recorded from the vicinity of New York City, occurs here and there and is occasionally numerous in the neighborhood of Albany, N. Y., and has been recorded from Ontario by Mr Jarvis. The gall is a small, greenish, conical deformity frequently with a blood-red or purplish red coloring. Galls bearing this name in the Museum of Comparative Zoology are nearer the midvein than the margin of the leaf, conical and with a very slender tip.

Gall. Two to 3 mm in diameter, conical with a distinct nipple, greenish and variably tinged with purplish or blood red.

Larva. The larva has been described by Osten Sacken as yellowish with a distinctly pointed, spear-shaped breastbone.

Male. Length 2 mm. Antennae nearly as long as the body, sparsely haired, fuscous yellowish; fourteen sessile segments, the fifth with a length two and one-half times its diameter; circumfila

stout, the loops short, broad; terminal segment produced, tapering, narrowly rounded. Palpi; first segment short, stout, second one-half longer, slender, the third broadly oval, the fourth a little longer, tapering distally. Mesonotum shining yellowish brown, the submedian lines thickly haired. Scutellum dark reddish brown, post-scutellum reddish orange. Abdomen dark red, somewhat fuscous basally and laterally, the segments sparsely margined with fuscous hairs. Genitalia fuscous yellowish. Wings hyaline, costa yellowish brown. Halteres yellowish, fuscous subapically. Coxae, femora and tibiae fuscous yellowish, the tarsi a little darker; claws stout, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment stout; terminal clasp segment moderately slender; dorsal plate short, deeply and triangularly emarginate, the lobes broadly rounded; ventral plate broad, very broadly emarginate, the lobes broadly rounded.

Female. Length 1.75 mm. Antennae extending to the second abdominal segment, sparsely haired, pale yellowish carmine apically; fourteen segments, the fifth with a length two and one-half times its diameter; rather high circumfila at the basal third and apically; terminal segment slightly reduced, tapering, narrowly rounded. Palpi; first segment short, stout, the second broadly oval, the third a little longer, more slender, the fourth twice the length of the third. Mesonotum shining dark brown, the submedian lines thickly haired. Scutellum fuscous yellowish, postscutellum yellowish. Abdomen yellowish orange, the basal segments reddish; ovipositor yellowish transparent. Halteres pale yellowish. Coxae, femora and tibiae mostly pale straw, the tarsi a variable fuscous yellowish; claws rather slender, evenly curved, pulvilli as long as the claws. Ovipositor short, terminal lobes protuberant, triangular. Cecid. a1945.

Caryomyia thompsoni Felt

- 1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 388 (*Hormomyia*)
 1918 ——— N. Y. State Mus. Bul. 200, p. 7

This species was first reared by the late Dr M. T. Thompson, who apparently obtained it from a gall which he described as yellow, green or brown, melon-shaped, with a depressed center and either smooth with sparse, short, whitish hairs or quite pubescent. Subsequent rearings in the spring of 1908 enabled us to obtain in some numbers apparently the same insect from a peculiar small, globular, long-haired, thin-walled gall taken the preceding fall in the vicinity of New York City and which is probably the same as Thompson's very pubescent gall. Apparently the same gall was taken by L. H. Weld at Ithaca, N. Y., and at Evanston, Ill., judging from the photograph received. The original characterization of this species was drafted from an alcoholic specimen. The later descriptions are from recently reared material. The insects winter in the gall and

in nature undoubtedly appear in early June. Several specimens of *Paralellocladiposis caryae* Felt were also reared from this gall.

Gall (pl. 10, fig. 8, and pl. 8). Subglobular, about 2 to 3 mm in diameter, thin-walled, monothalamous and thickly clothed with rather long, erect, reddish brown or sometimes fuscous hairs. The clothing of the galls sometimes presents a somewhat whitish appearance. They much resemble very small closed chestnut burrs.

Larva. Length 2.5 mm, stout, whitish, the head small. Antennae biarticulate; breastbone (fig. 12) long, slender, minutely bidentate, the excavation broadly rounded, the shaft reduced. The body tapers slightly to a broadly rounded, unarmed extremity.

Exuvium. Length 2 mm. Antennal cases short, hardly extending to the base of the abdomen, the internal basal angles weakly chitinized. Cephalic horns rather long, stout at the base, slightly irregular. Wing and leg cases extending to the third abdominal segment, the dorsum of the segments margined with a rather thick band of four irregular rows of stout, chitinous spines, the remainder of the dorsal surface finely dotted with chitinous points.

Male. Length 1.75 mm. Antennae nearly as long as the body thickly clothed with short hairs, pale orange yellowish; fourteen sessile segments, the fifth with a length about three times its diameter, the circumfila stout, the loops short, broad; terminal segment constricted near the basal third, with a length nearly four times its diameter, broadly rounded. Palpi; the first segment presumably rectangular, with a length more than twice its diameter, the second short, greatly reduced, the third expanded and more than twice the length of the second. Mesonotum fuscous yellowish, the submedian lines sparsely haired. Scutellum dark reddish, postscutellum fuscous yellowish. Abdomen dark reddish, somewhat fuscous laterally; genitalia fuscous yellowish, fuscous apically. Wings hyaline, short, very broad, costa pale yellowish. Halteres and coxae pale orange; femora and tibiae pale yellowish, the tarsi pale yellowish, somewhat fuscous apically; claws long, slender, evenly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment somewhat reduced; dorsal plate long, broad, triangularly emarginate, the lobes broadly rounded; ventral plate long, broad, broadly and lightly emarginate.

Female. Length 2 to 3 mm. Antennae extending to the third abdominal segment, sparsely haired, pale yellowish, reddish apically;

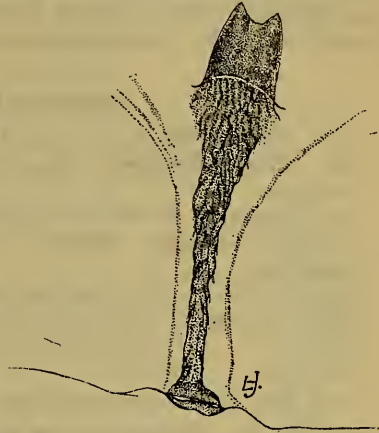


Fig. 12 *Caryomyia thompsoni*, breastbone of larva (enlarged, original)

fourteen sessile segments, the fifth with a length three and one-half times its diameter; circumfila near the basal third and apically; terminal segment slightly produced, tapering, narrowly rounded. Palpi; first segment rectangular, with a length twice its diameter, the second a little shorter, stouter, the third twice the length of the second, slightly expanded. Ovipositor pale yellowish, the lobes protuberant, with a length three times their width, tapering, narrowly rounded. Type Cecid. 1116a, 1908.

Caryomyia tubicola O. S.

- 1862 **Osten Sacken, C. R.** Mon. Dipt. N. A., 1:192 (Cecidomyia)
 1874 **Glover, Townend.** Ms. Notes My Jour. Dipt., pl. 11, fig. 25 (Cecidomyia)
 1886 **Hagen, H. A.** Ent. Am., 1:229 (Cecidomyia)
 1892 **Beutenmueller, William.** Am. Mus. Nat. Hist. Bul., 4:267 (Cecidomyia)
 1904 ———— Am. Mus. Nat. Hist. Guide Leaflet 16, p. 27 (Cecidomyia)
 1904 **Cook, M. T.** Ohio State Univ. Bul. 8, 13:141 (Cecidomyia)
 1905 ———— Dep't Geol. Nat. Res. Ind., 29th Rep't, p. 840 (Cecidomyia)
 1906 **Felt, E. P.** Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:619, 628; pl. 1, fig. 10 (Cecidomyia)
 1908 ———— N. Y. State Mus. Bul. 124, p. 388 (Hormomyia)
 1909 **Jarvis, T. D.** Ent. Soc. Ont., 39th Rep't, p. 84 (Cecidomyia)
 1909 **Felt, E. P.** Econ. Ent. Jour., 2:293
 1910 **Stebbins, F. A.** Springfield Mus. Nat. Hist. Bul. 2, p. 14 (Hormomyia)
 1918 **Felt, E. P.** N. Y. State Mus. Bul. 200, p. 43, 47

This rather common, characteristic gall is rarely so abundant as some of the other deformities occurring on hickory leaves. The



Fig. 13 *Caryomyia tubicola*, group of galls on underside of leaf and several stages shown below in profile (author's illustration)

young galls of this species, according to the observations of the late Dr M. T. Thompson, appear in late June or early July as nearly circular, yellowish or yellowish green blisters on the upper surface of the leaf. The presence of the developing gall is marked on the under surface by a pale yellowish color surrounded by a reddish, spongy growth adorned with numerous rather long plant hairs. The characteristic, partly grown galls of this species may be observed in early August as minute, yellowish green or even blackish nipples

protruding from the developing socket. The galls become full grown the latter part of August or early in September and drop to the ground, the larvae remaining therein till the following spring. Galls of this species, taken at East Schodack May 14, 1907, produced adults May 20th. This peculiar gall is common about New York City, the vicinity of Albany, has been received from Michigan and recorded from Ontario and also from Indiana. *Polygnotus* and *Torymus* species were reared from this insect.

Gall. The full-grown gall is a hollow tube 4 to 5 mm long and 1 mm in diameter (fig. 13, and pl. 8). The apex tapers rather suddenly and varies in color from greenish when young to brownish or even black when fully developed. These galls arise in characteristic sockets or pits. The partly developed galls differ from the full-grown ones mainly in length and are easily recognized on account of their resemblance to the more commonly observed form. These galls are occasionally abundant enough to produce a curling of the leaf, though as a rule they are somewhat scattering.

Professor Cook, writing of this gall, states that it is very similar to that of *C. holotricha* except that the amount of tannin is not so great. The upper portion of the wall is much thicker than either side of the lower wall, the point of attachment is not so large, and the gall is protected by a growth, producing a cup-shaped cavity in which it develops. The inner layers of cells are very rich in protoplasm. The cells are elongated with the long axis of the gall and fibrovascular bundles are more numerous than in *C. holotricha* though very small.

A more slender, similar appearing, though presumably different gall occurs occasionally on hickory leaves and has been described and figured by B. W. Wells in the *Ohio Journal of Science*, 16: 53 (fig. 27), 1915. This gall is almost invariably slightly curved, tapers to a nearly acute point and the entire interior is hollow.

Larva. Length 2 mm, stout, white, the head small; antennae small, biarticulate; breastbone (fig. 14) slender, unidentate, the tooth long, triangular, acute. Segmentation rather distinct, the skin nearly smooth, the posterior extremity broadly rounded.

Male. Length 1.75 mm. Antennae nearly as long as the body, sparsely haired, pale yellowish; fourteen cylindric, subsessile segments, the fifth (fig. 15) with a length about two and one-half times its diameter, a slight constriction at the basal third, the circum-



Fig. 14 *Caryomyia tubicola*, breastbone of larva (enlarged, original)

fila stout, the loops short, broad; terminal segment slightly produced, with a length three times its diameter, tapering. Palpi; first segment with a length twice its diameter, the second a little stouter

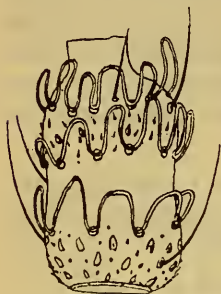


Fig. 15 *Caryomyia tubicola*, fifth antennal segment (enlarged, original)

and shorter, the third more than twice the length of the second. Face fuscous yellowish. Mesonotum dark brown, the submedian lines rather thickly clothed with fuscous hairs, the posterior median area yellowish. Scutellum light yellowish red, postscutellum yellowish. Abdomen deep red, the basal segments and lateral margins fuscous; genitalia fuscous yellowish. Wings hyaline (pl. 15, fig. 4), costa pale yellowish, subcosta uniting therewith before the basal half. Halteres semi-transparent basally, pale yellowish apically. Legs a nearly uniform pale yellowish transparent; claws long, slender, strongly curved, the pulvilli longer than the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment short, stout; dorsal plate short, broad, triangularly emarginate, the lobes roundly truncate; ventral plate long, broad, broadly and roundly emarginate, the lobes broadly rounded.

Female. Length 1.5 mm. Antennae extending to the third abdominal segment, sparsely haired, pale yellowish orange, red-tinted apically; fourteen sessile segments, the fifth with a length two and one-half times its diameter, circumfila near the basal half and apically; terminal segment reduced, broadly conical. Palpi; first segment stout, subquadrate, the second more than twice the length of the third, narrowly oval, the third swollen distally, shorter and more slender, the fourth more than twice the length of the third, strongly constricted basally. Face pale yellowish orange. Mesonotum yellowish brown, the submedian lines sparsely haired. Scutellum fuscous yellowish, fuscous laterally, postscutellum yellowish. Abdomen reddish orange; ovipositor pale yellowish. Halteres pale orange. Legs mostly a pale straw, the tarsi slightly darker; claws slender, strongly curved, longer than the pulvilli. Ovipositor short, the lobes protuberant, tapering, narrowly rounded. Cecid. 21450.

Caryomyia similis Felt

1909 Felt, E. P. Econ. Ent. Jour., 2:292

1918 ——— N. Y. State Mus. Bul. 200, p. 46

This species was reared the latter part of April and early in May from supposedly typical galls of *Caryomyia caryae* O. S. taken at Nassau, N. Y., September 16, 1908. The gall has been received from Michigan. An examination of the larva shows that it possesses a unidentate breastbone, while the male at least, differs markedly from that of typical *caryae* by the sessile, nearly cylindrical antennal segments. We are therefore constrained to erect a

new species. It is probable that this form is widely distributed and has heretofore been confused with *C. carya*, a name which has apparently been very loosely applied in the past.

Gall. Irregularly subglobular, 2 to 4 mm in diameter, depressed and without the small nipple so frequently seen in *C. carya* galls. The gall is sparsely clothed with a short, yellowish pubescence and has thin walls.

Larva. Length 3 mm, stout, whitish, the head small; antennae short, stout; breastbone unidentate, the shaft somewhat thickened anteriorly and tapering posteriorly. Skin coarsely shagreened, posterior extremity broadly rounded.

Male. Length 1.75 mm. Antennae nearly as long as the body, sparsely haired, reddish yellow, a variable carmine apically; fourteen subsessile, cylindrical segments, the fifth with a length two and one-half times its diameter, the circumfila stout, the loops short, rather thick; terminal segment reduced, tapering, narrowly rounded. Palpi; first segment short, incrassate, the second rectangular, with a length four times its diameter, the third short, narrowly oval, the fourth one-half longer than the third. Mesonotum fuscous yellowish, the submedian lines sparsely haired. Scutellum reddish brown, postscutellum fuscous yellowish. Abdomen deep reddish orange, the segments sparsely margined posteriorly with fuscous setae; genitalia fuscous yellowish. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxae and legs a variable fuscous yellowish, the tarsi somewhat darker; claws rather stout, uniformly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment short, stout; terminal clasp segment rather short, slightly swollen; dorsal plate broad, narrowly emarginate, the lobes broadly rounded; ventral plate broad, broadly and roundly emarginate, the lobes broadly rounded.

Female. Length 2.75 mm. Antennae extending to the third abdominal segment, sparsely haired, whitish transparent, a variable carmine apically; fourteen sessile segments, the fifth with a length two and one-half times its diameter, circumfil near the basal half and apically; terminal segment somewhat reduced, tapering. Palpi; first segment stout, second narrowly oval, the third a little longer, more slender, the fourth one-half longer than the third. Mesonotum yellowish brown, the submedian lines sparsely haired. Scutellum fuscous yellowish, postscutellum lighter. Abdomen dark reddish orange; terminal segment and ovipositor fuscous yellowish. Halteres pale yellowish. Coxae and legs mostly fuscous yellowish; claws rather stout, strongly curved, the pulvilli as long as the claws. Ovipositor short, the terminal lobes protuberant, tapering, narrowly rounded. Cécid. a1946.

Caryomyia inanis Felt

1909 Felt, E. P. Econ. Ent. Jour., 2:292

1918 ——— N. Y. State Mus. Bul. 200, p. 46

The inhabitant of this peculiar subglobular gall, easily recognized by the more or less well-developed empty chamber above the

inhabited cavity, was reared April 29, 1909 from hickory leaf galls taken at Nassau, N. Y., September 16, 1908. This gall appears identical with what the late Dr M. T. Thompson of Clark University, Worcester, Mass., termed a "double decker." The gall, according to his notes, first appears as a brownish, blistered area on the leaf, with a slight central point. As the gall develops the epidermis over the blistered area is lifted and borne on the top of the deformity like a cap. The gall in this stage is hemispherical, with the flat top covered by an epithelial plate and is attached by a point on the convex under surface. The rim of the gall is then slightly raised, forming a low wall around the top area. This rim may continue to grow at several points and the developing tissues bend inward till they meet and inclose a sort of upper chamber above the real top of the gall. The larva lives in the large chamber beneath. The adult issues through an irregular hole near and a little to one side of the base. Doctor Thompson reared from this gall *Clinodiplosis caryae* Felt, presumably an inquiline, as well as a *Caryomyia*.

Gall. Irregularly subglobular, diameter 2 to 3 mm, monothalamous, easily recognized by the more or less complete false chamber at the tip of the gall. This sometimes is represented simply by a few irregular ridges and in other specimens appears much as though the rapidly developing tissues had collapsed owing to some accident. The gall is green or brownish and is attached by a slender, short stem.

Exuvium. Length 3 mm, whitish, the antennal sheaths short; terminal segment very strongly reduced, conical, the internal basal angles slightly chitinized. Cephalic horns rather short, stout. Wing and leg cases extending to the third abdominal segment, the dorsum of the latter broadly margined with three or four irregular rows of stout, chitinous spines and with the intervening space thickly covered with chitinous points.

Female. Length 3 mm. Antennae extending to the third abdominal segment, sparsely haired, pale yellowish orange, the terminal segments tinted with carmine; fourteen sessile segments, the fifth with a length two and one-half times its diameter; circumfila irregular, near the basal third and apically; terminal segment somewhat reduced, tapering, narrowly rounded. Palpi; first segment subquadrate, the second subglobose, the third rectangular, with a length more than twice its diameter, the fourth one-half longer, somewhat dilated. Mesonotum shining fuscous yellowish, the submedian lines sparsely haired. Scutellum reddish brown, post-scutellum deep orange. Abdomen deep red, the segments sparsely margined with fuscous hairs; ovipositor yellowish. Wings hyaline, rather long, costa light straw. Halteres pale orange. Coxae and femora mostly pale yellowish; tibiae slightly fuscous, the tarsi fuscous yellowish; claws slender, evenly curved, the pulvilli as long as the

claws. Ovipositor short, the terminal lobes somewhat protuberant, tapering, broadly rounded. Type Cecid. a1950.

Caryomyia persicoides Beutm.

- 1862 **Osten Sacken, C. R.** Mon. Dipt. N. A., 1:193 (Cecidomyia)
 1892 **Beutenmueller, William.** Am. Mus. Nat. Hist. Bul., 4:267 (Cecidomyia)
 1904 ————— Am. Mus. Nat. Hist. Guide Leaflet 16, p. 28 (Cecidomyia)
 1906 **Felt, E. P.** Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:619, 628, pl. 1, fig. 9 (Cecidomyia)
 1907 **Beutenmueller, William.** New Species of Gall Producing Cecidomyiidae, Amer. Mus. of Nat. Hist. Bul., 23:393 (Cecidomyia)
 1909 **Jarvis, T. D.** Ent. Soc. Ont., 39th Rep't, p. 84 (Cecidomyia)
 1910 **Cook, M. T.** Mich. Geol. & Biol. Surv., Pub. 1, Biol. Ser. 1, p. 31 (Cecidomyia)
 1910 **Stebbins, F. A.** Springfield Mus. Nat. Hist. Bul. 2, p. 13 (Cecidomyia)
 1918 **Felt, E. P.** N. Y. State Mus. Bul. 200, p. 46

The gall only of this insect was briefly characterized by Osten Sacken in 1862. Other writers have been content to rest their identifications upon this brief characterization till Professor Beutenmueller described the larva in 1907. This gall insect appears to be widely distributed. It occurs rather commonly in the vicinity of New York City, about Albany and has been recorded by Jarvis from Ontario.

Gall. This is a rather large, irregular, monothalamous, hairy gall frequently 6 or 7 mm in diameter and usually clustered along the midrib. It may be distinguished from *C. holotricha* by the larger size, the shorter, curly hairs and the thicker walls. It turns to a variable brown or reddish brown in the fall.

Larva. Length 2 to 3 mm, stout, whitish. Breastbone rather stout, unidentate, the tooth rather long, narrow, the shaft somewhat expanded anteriorly and posteriorly. This breastbone differs somewhat from that described by Beutenmueller though it is very probable that the two are specifically identical.

Exuvium. Length 2.75 mm, whitish transparent. Antennal cases short, extending to the second abdominal segment, slightly chitinized at the internal basal angles. Cephalic horns rather slender, short. Wing and leg cases extending to the third abdominal segment, the latter thickly margined with a band composed of four or five irregular rows of stout spines, the posterior spines markedly longer, the remainder of the dorsal surface rather thickly dotted with chitinous points.

Female. Length 3 mm. Antennae extending to the second abdominal segment, sparsely haired, reddish; fourteen sessile segments, the fifth with a length three and one-half times its diameter; circumfila near the basal third and apically. Palpi; first segment short, irregularly quadrate, the second short, very broadly oval, the third a little longer, rectangular, the fourth twice the length of

the third, dilated. Mesonotum dull black. Scutellum and post-scutellum deep orange. Abdomen deep red, the terminal segment fuscous yellowish; ovipositor yellowish. Wings hyaline, long, slender, costa reddish. Halteres fuscous yellowish. Legs yellowish and variably tinged with deep red; claws stout, strongly curved, the pulvilli nearly as long as the claws. Ovipositor short, the terminal lobes slightly protuberant, short, tapering, narrowly rounded. Cecid. a1941a.

Caryomyia caryaecola n. sp.

- 1862 **Osten Sacken**, C. R. Mon. Dipt. N. A., 1:192 (Cecidomyia)
 1892 **Beutenmueller**, William. Am. Mus. Nat. Hist. Bul., 4:266 (Cecidomyia)
 1904 ———— Am. Mus. Nat. Hist. Guide Leaflet 16, p. 27 (Cecidomyia)
 1906 **Felt**, E. P. Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:619, 628, pl. 1, fig. 28 (Cecidomyia)
 1907 **Cook**, M. T. Acad. Sci. Proc., separate, p. 7 (Cecidomyia)
 1908 **Jarvis**, T. D. Ent. Soc. Ont., 38th Rep't, p. 87 (Cecidomyia)
 1909 **Jarvis**, T. D. Ent. Soc. Ont., 39th Rep't, p. 84 (Cecidomyia)
 1910 **Stebbins**, F. A. Springfield Mus. Nat. Hist. Bul. 2, p. 13
 1915 **Felt**, E. P. N. Y. State Mus. Bul. 175, pl. 4, fig. 9
 1918 ———— N. Y. State Mus. Bul. 200, p. 43

Galls, made by the above-named species, were taken on bitternut hickory at Hamburg, N. Y., October 17, 1907. They were limited, so far as we observed, entirely to the bitternut hickory (*Carya cordifolia*). Apparently the same species has been recorded by Jarvis as being locally common in Ontario on sweet hickory (*Carya alba*). Specimens gathered in the fall would presumably produce adults the following June, there being apparently one generation annually. The earlier bibliographic references cited above presumably refer to this species. The gall described below agrees very closely with specimens collected by Osten Sacken, deposited in the Museum of Comparative Zoology at Cambridge, Mass., and bearing the label *Cecidomyia caryaecola*.

Gall. The galls (pl. 10, figs. 2, 3) were almost invariably clustered, usually thickly, along or close to the midrib; three to eight or ten in a group, and sometimes two or three clusters on the underside of one leaf. The gall is subglobular, about 3-4 mm in diameter and almost invariably with a long, slender apical process as long or a little longer than the basal enlargement. The color in late fall is a pale greenish, the elongate tip being a variable dark reddish brown. The gall matures in October and drops from the leaves readily.

This gall is presumably distinct from the one appearing under the name of *Caryomyia caryaecola* O. S. in "Key to American Insect Galls," N. Y. State Museum Bulletin 200, p. 43 and plate 6, figs. 2, 3, 1918.

Larva. Length 2.5 mm, rather stout, pale orange. Head small; antennae short, stout, probably biarticulate; breastbone rather slender, unidentate, the tooth being long and narrowly triangular; segmentation rather distinct, the skin very finely shagreened; posterior extremity broadly rounded, the dorsal surface rather coarsely papillate.

Caryomyia cynipsea O. S.

1862 **Osten Sacken, C. R.** Mon. Dipt. N. A., 1:193 (Cecidomyia)

1906 **Felt, E. P.** Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:718 (Cecidomyia)

1918 ———— N. Y. State Mus. Bul. 200, p. 47

This species, according to Osten Sacken, makes a rounded, irregular, pale yellowish, hard swelling about one-half of an inch long on the underside of the midrib of the hickory leaf. The larvae observed by him in July were in small cavities, minute, whitish with the breastbone narrowing anteriorly to a point.

Caryomyia glutinosa O. S.

1862 **Osten Sacken, C. R.** Mon. Dipt. N. A., 1:193-94 (Cecidomyia)

1906 **Felt, E. P.** Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:718 (Cecidomyia)

1918 ———— N. Y. State Mus. Bul. 200, p. 47

This small, yellowish orange larva is widely distributed though somewhat rare. It is provisionally referred to the above-named genus, since it appears to be a typical hickory insect and is presumably



Fig. 16 *Caryomyia glutinosa*; *a*, head of larva; *b*, breastbone of larva (enlarged, original)

more closely allied to the varied forms making the diverse gall than to other species. This unique larva is remarkable in that it forms no gall but lives on the underside of the leaf, attached thereto by a

viscid secretion. The presence of the larva is indicated on the upper surface by an irregular, yellowish, brown-margined elevation.

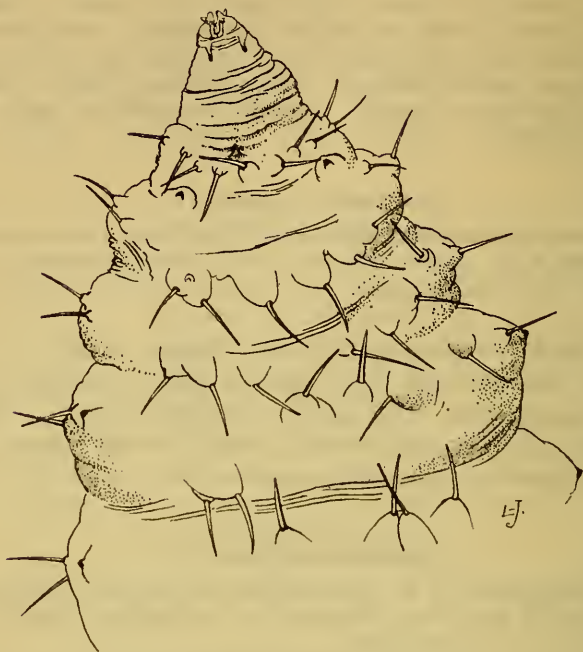


Fig. 17 *Caryomyia glutinosa*, anterior segments of larva (much enlarged, original)

There is a corresponding depression on the under surface, the latter having a diameter of about 3 mm.

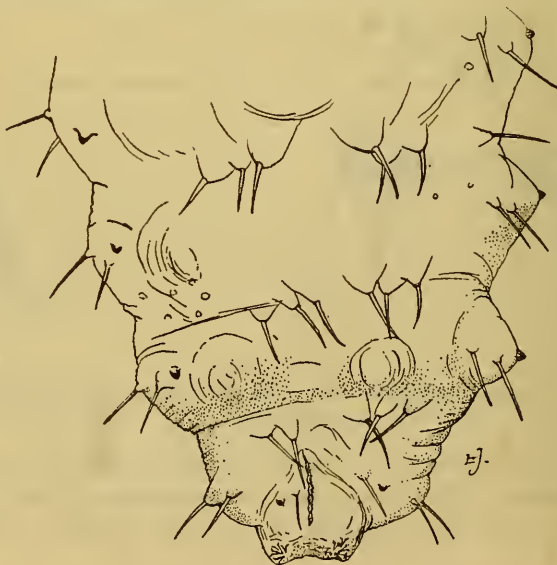


Fig. 18 *Caryomyia glutinosa*, posterior extremity of larva (much enlarged, original)

Larva. Length 3 mm, stout, yellowish. Head (figs. 16a, 17) moderate size, roundly triangular, the antennae rather stout, biarticulate. Breastbone (fig. 16b) greatly reduced, there being only a narrowly triangular, chitinous process apically. Body with the skin smooth, the segmentation rather distinct, each segment bearing an irregular, transverse row of rather stout, chitinous spines, the latter having a length nearly equal to that of the segment and laterally arranged in pairs. Posterior extremity (fig. 18) irregularly rounded, the posterior lateral angles each with groups of four short, stout, transparent spines. Cecid. a1547.

Caryomyia nucicola O. S.

1870 **Osten Sacken, C. R.** Am. Ent. Soc. Trans., 3:53 (*Cecidomyia caryae nucicola*)

1906 **Felt, E. P.** Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:718 (*Cecidomyia*)

1907 **Jarvis, T. D.** Ent. Soc. Ont., 37th Rep't, p. 68 (*Cecidomyia*)

1909 ————— Ent. Soc. Ont., 39th Rep't, p. 84 (*Cecidomyia*)

1918 **Felt, E. P.** N. Y. State Mus. Bul. 200, p. 49

This species infests the green husks of the nuts of shell-bark hickory, *Carya ovata*, producing swellings and giving them an irregular appearance. The husk is so badly deformed occasionally as to burst open, leaving the nut uncovered even when very immature, portions of the husk forming wartlike swellings on the basal portion of the nut. This gall was taken by Baron Osten Sacken August 9, 1860 near Rhinebeck, N. Y. On examination the husks were found to contain small, round cavities, often two or three together, each inhabited by pale reddish larva. The latter has a breastbone "distinctly elongated, narrow, its branches short and square, ending in sharp angles anteriorly, instead of being rounded; the emargination between them broad and deep." The posterior extremity of the body is smooth. This species has been recorded from Ontario, Canada, by Jarvis.

Caryomyia sp.

A number of irregular, dull greenish black margined or black blister galls (pl. 9) with a diameter about 3 mm, distinctly elevated on both the upper and under surface of the leaves and with a small nipple were variably scattered about the midrib and in some cases several were confluent. These specimens were taken at Nassau, N. Y., October 3, 1907. No adults were reared and the above generic reference is tentative.

Male. Length .75 mm. Antennae a little longer than the body, thickly haired, light straw, yellowish basally; fourteen segments, the fifth with stems two and one-half and three and one-half times their diameter respectively; terminal segment, distal enlargement produced, with a length over twice its diameter and tapering to a subacute apex. Palpi; first segment short, subquadrate, the second narrowly oval, with a length twice its diameter, the third longer, slender, the fourth one-fourth longer than the third, dilated. Face pale yellowish. Thorax a light salmon, the sides yellowish. Abdomen pale yellowish, the genitalia fuscous apically. Wings hyaline, costa pale yellowish; membrane tinged with yellowish; halteres yellowish transparent. Legs pale yellowish, the distal segments slightly fuscous; claws slender, strongly curved and slightly enlarged near the middle, the pulvilli shorter than the claws. Genitalia; basal clasp segment rather long; terminal clasp segment swollen basally, long; dorsal plate broad, narrowly and triangularly emarginate, the lobes irregularly rounded; ventral plate long, broad, narrowly and triangularly emarginate. Type Cecid. a1578b.

Giardomyia noveboracensis Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 405

This fuscous yellowish male was taken June 10, 1906, at Nassau N. Y.

Male. Length 1 mm. Antennae fully twice as long as the body, rather thickly clothed with fine hairs, light brown, the stems probably whitish; fourteen segments, the fifth with stems three and four and one-half times their diameters respectively; terminal segment, basal portion of the stem and the distal enlargement slightly prolonged, the latter subcylindric and with a long, spindle-shaped apex. Palpi; the first segment subquadrate, swollen distally, the second one-half longer than the preceding, narrowly oval, the third a little longer and the fourth still longer than the preceding; face pale yellowish. Mesonotum dark brown, the yellowish submedian lines sparsely clothed with light hairs. Scutellum pale orange, postscutellum fuscous orange. Abdomen fuscous yellow, rather thickly clothed with yellowish hairs, genitalia yellowish. Wings hyaline, costa reddish brown; halteres whitish transparent. Legs nearly uniform pale straw; claws rather stout, evenly curved, simple. Genitalia; basal clasp segment long, stout; terminal clasp segment greatly swollen at the base; dorsal plate broad, deeply and triangularly incised, the lobes obliquely truncate; ventral plate broad, long, tapering, broadly rounded. Type Cecid. 197x.

Giardomyia photophila Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 134; separate, p. 37-38 (phosphila)

1908 ————— N. Y. State Mus. Bul. 124, p. 405

This bright carmine male was taken June 16, 1906, in a trap lantern at Newport, N. Y.

Male. Length 1 mm. Antennae fully one-half longer than the body, thickly clothed with coarse setae, dark brown; fourteen segments, the fifth (fig. 19) with stems three and four and one-half times their diameters respectively; the terminal segment, basal enlargement somewhat flattened, the basal portion of the stem produced, the distal enlargement produced, subcylindric and bearing



Fig. 19 *Giardomyia photophila*, fifth antennal segment of male (enlarged, original)

a slender, spindle-shaped appendage about three-fourths its length. Palpi; probably consisting of four segments. Mesonotum yellowish brown, submedian lines indistinct, sparsely clothed with fine setae. Scutellum reddish brown with sparse apical setae, postscutellum dark brown. Abdomen bright carmine, rather thickly clothed with fine, yellowish setae. Wings (pl. 16, fig. 4) hyaline, costa pale straw, membrane sparsely clothed with fine setae; halteres yellowish transparent basally, reddish fuscous apically. Legs a nearly uniform reddish brown; claws long, slender, bent at nearly right angles, simple. Genitalia (pl. 19, fig. 7); basal clasp segment rather long, a subtriangular lobe basally; terminal clasp segment swollen at the base; dorsal plate broad, deeply and triangularly incised, the lobes broadly rounded distally; ventral plate stout, swollen at the basal third, tapering, broadly emarginate. Type Cecid. 323.

Giardomyia emarginata Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 405

The bright-red male has the terminal segments yellow. It was taken July 2, 1906 in a trap lantern at Newport, N. Y.

Male. Length 1 mm. Antennae longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems three and three and one-half times their diameters respectively; terminal segment, basal enlargement subglobose, the basal portion of the stem with a length four times its diameter, the distal enlargement subcylindric, with a length three and one-half times its diameter, apically a slender, tapering process. Palpi; the first segment irregularly cylindrical, with a length one-half greater than its diameter, the second segment with a length about four times its diameter, tapering, the third about as long as the second, more slender, the fourth a little longer than the third, somewhat dilated; face fuscous yellowish. Mesonotum dark brown, the narrow submedian lines yellowish, sparsely haired. Scutellum fuscous yellowish, post-scutellum a little darker. Abdomen rather bright red, the terminal segments yellow, each margined posteriorly with fuscous, rather coarse yellowish hairs. Wings hyaline, costa light brown. Halteres yellowish basally, fuscous apically. Legs a nearly uniform light straw; claws long, slender, evenly curved, the pulvilli about two-thirds the length of the claws. Genitalia; basal clasp segment long, slender, a subtriangular process at the internal basal third; terminal clasp segment long; dorsal plate long, broad, deeply and triangularly incised, the lobes obliquely truncate; ventral plate long, slender, broadly and triangularly incised, the lobes subtriangular. Type Cacid. 446.

Giardomyia hudsonica Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 406

This deep reddish male was taken June 9, 1906 in a trap lantern at Poughkeepsie, N. Y.

Male. Length 1 mm. Antennae about twice as long as the body, rather thickly haired, light brown; fourteen segments, the fifth with stems two and one-half and three and one-half times their diameters respectively; terminal segment, the distal enlargement cylindrical, with a length four times its diameter, apically with a long, slender, tapering process. Palpi; the first segment short, stout, with a length about twice its diameter, the second with a length nearly four times its diameter, the third a little shorter and more slender, and the fourth a little longer than the third and more dilated; face yellowish. Mesonotum dark reddish brown, the yellowish submedian lines sparsely haired. Scutellum dull orange, post-scutellum and abdomen dark reddish. Genitalia yellowish. Wings hyaline, venation probably as in allied forms. Halteres fuscous reddish, yellowish transparent basally. Legs a nearly uniform dark straw; claws stout, curved nearly at right angles, slightly swollen subapically, pulvilli about two-thirds the length of the claws. Genitalia; basal clasp segment long, slender, a lobe at the internal distal third; terminal clasp segment long; dorsal plate long, deeply and triangularly emarginate, the lobes broad, subrectangular; ventral plate long, slender, slightly expanded distally, broadly emarginate

and with inconspicuous submedian setose tubercles, the lateral angles slightly produced. Type Cecid. 200.

Giardomyia montana Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 406

This dark reddish male was taken June 16, 1906 in a trap lantern at Newport, N. Y., and similarly captured July 14th at Huguenot Park, Staten Island, N. Y.

Male. Length 1 mm. Antennae probably longer than the body, sparsely haired, dark brown; fourteen segments, the fifth with stems two and one-half and three and one-half times their diameters respectively. Palpi; the first segment subquadrate, swollen distally, the second, third and fourth, each subequal and successively more slender; face sooty yellow. Mesonotum dark brown, submedian lines yellow, each sparsely clothed with fine setae. Scutellum yellowish brown with sparse apical setae, postscutellum dark yellowish. Abdomen dark reddish brown with the basal and terminal segments yellowish, rather thickly yellow haired. Wings hyaline, costa reddish brown; halteres pale yellowish basally, fuscous apically. Legs a nearly uniform dark brown, lighter ventrally; claws rather long, bent at nearly right angles, simple. Genitalia (pl. 20, fig. 1); basal clasp segment stout, an angulate lobe at the distal third; terminal clasp segment swollen at the base, long; dorsal plate broad, deeply and narrowly incised, the lobes irregularly truncate; ventral plate swollen at the base, slender at the distal fourth, expanding apically, broadly emarginate, setose. Type Cecid. 325.

HYPERDIPLOSIS Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 405

1910 Rubsaamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:286

1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:59

1913 Kieffer, J. J. Gen. Inscct., fasc. 152, p. 211

This genus was erected for certain small, yellowish species with simple claws bent at nearly right angles and a very long, broad, very deeply and broadly emarginate ventral plate with long, slender, more or less divergent lobes. The dorsal plate is short, deeply and roundly emarginate, the lobes being broadly and roundly emarginate and with the lateral and internal angles produced and setose. The type is *Cecidomyia lobata* Felt.

The type species was captured on white clover and possibly lives upon fungus, since *H. fungicola* Felt was reared from a fungus on nectarine.

Key to Species

a Ventral plate with the long, slender lobes diverging

b Antennae light brown; legs pale brown

c Palpi rather stout; claws bent at right angles, hardly swollen; dorsal plate very short.....*lobata* Felt, C. 132

cc Palpi slender; claws bent at less than a right angle, distinctly swollen subapically; dorsal plate nearly as long as the ventral plate.....

coffea Felt, C. 2133

bb Antennae white; legs yellowish white. Reared from fungus on nectarine..

fungicola Felt, C. 977

aa Lobes of ventral plate parallel or nearly so, rather stout

b Antennae yellowish; legs fuscous yellowish, lobes of the ventral plate with a length equal to the width of the emargination; reared from a green, conical gall on Eupatorium.....

eupatorii Felt, C. a2116

bb Antennae light brown, legs pale yellowish, lobes of the ventral plate with a length equal to over twice the width of the emargination; reared from the partly decayed branch of wild fig.....

americana Felt, C. a2177a

bbb Antennae light brown, legs mostly straw color, lobes of the ventral plate with a length over twice the width of the emargination.....

bryanti Felt, C. 1428

Hyperdiplosis lobata Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 136; separate, p. 39

(Cecidomyia)

1908 ————— N. Y. State Mus. Bul. 124, p. 405

This yellowish brown male was taken June 4, 1906 on white clover, *Trifolium repens*, at Karner, N. Y.

Male. Length 1 mm. Antennae one-half longer than the body, sparsely haired, light brown; fourteen segments, the fifth (fig. 20a)

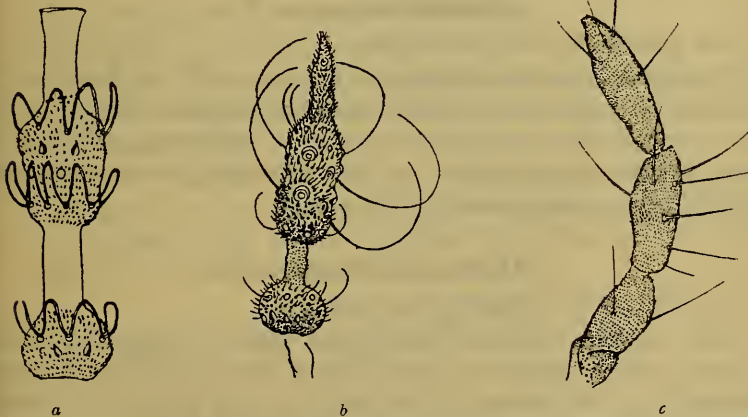


Fig. 20 *Hyperdiplosis lobata*: *a*, fifth antennal segment of male; *b*, terminal antennal segment of male, circumfila should be represented, though they are short and indistinct; *c*, palpus of male (enlarged, original)

with stems each with a length thrice their diameters; the distal enlargement is about one-half longer than the subglobose basal one, slightly constricted at the basal third, dilated at the distal third; subbasally and subapically short, indistinct circumfila; between a

sparse whorl of long, slender, curved setae, the loops of the basal circumfilum scarcely extending to the middle of this enlargement, those of the distal hardly beyond its apex; terminal segment (fig. 20b) with the basal enlargement subglobular, separated from the prolonged distal swelling by a short, slender stem, the latter with the basal two-thirds cylindrical, slightly constricted at the distal third, the terminal portion slender, subconical. Palpi (fig. 20c); the first segment broadly and irregularly oval, the second a little longer, stouter, the third a little longer and more slender than the second, and the fourth a little longer than the third; face yellowish brown, eyes large, black. Mesonotum a variable reddish brown, lighter posteriorly, submedian lines yellowish. Scutellum yellowish, post-scutellum and abdomen pale yellowish brown. Wings hyaline, costa light brown, the third vein joins the margin well beyond the apex; halteres yellowish transparent basally, fuscous apically. Legs pale brown, tarsi slightly darker; claws slender, very strongly bent, almost forming a right angle, simple. Genitalia; basal clasp segment stout, slightly produced at the internal basal third, excavated at the distal third; terminal clasp segment stout, tapering, a heavy apical spur; dorsal plate broad, deeply and roundly emarginate, the lobes with a greatly prolonged latero-posterior process, curving therefrom to a minor submedian process, the angles with long, stout setae; ventral plate slender, deeply and roundly emarginate, the lobes slender. Harpes long, slender, apparently consisting of two slender, chitinous processes extending along the slender lobes of the ventral plate. Type Cecid. 132.

Hyperdiplosis coffeae Felt

1911 Felt, E. P. Ent. News, 22:305

The midge was reared February 3, 1911 by W. H. Patterson, St Vincent, W. I., from the fruits of the Liberian coffee tree, *Coffea liberica*. It is tentatively referred to this genus, although the claws are less strongly bent, and the circumfila are more produced than in other species placed in this group.

Hyperdiplosis fungicola Felt

1911 Felt, E. P. Econ. Ent. Jour., 4:552-53

This delicate, yellowish species was reared in August 1897 from larvae on the outside of a nearly rotten, fungus affected nectarine received at the bureau of entomology from Mrs R. B. Tenney, Washington, D. C. It is closely allied to *H. lobata* Felt from which it is most easily separated by colorational characters.

Larva. Length 1.5 mm, moderately stout, tapering anteriorly, pale yellowish. Head moderate, tapering, broadly rounded distally. Antennae stout, with a length three times the diameter; breastbone wanting. Skin coarsely shagreened, each segment laterally with a stout seta near the middle; posterior extremity subtruncate, with

stout setae laterally near the posterior fourth. At the posterior lateral angles there is a stout, curved, conical process and just mesially a similar smaller process.

Hyperdiplosis meibomifoliae Beutm.

- 1907 **Beutenmueller, William.** Can. Ent., 39:306
 1918 **Felt, E. P.** Am. Mus. Nat. Hist. Bul., 38:181
 1918 ————— N. Y. State Mus. Bul. 200, p. 155

The small, pale orange midges were reared from a bud gall, presumably loose, on tick treefoil, *Desmodium* species. Owing to the condition of the type material it was possible to prepare a detailed description of the female only.

Hyperdiplosis eupatorii Felt

- 1911 **Felt, E. P.** Ent. News, 22:110-11

The species was reared by W. H. Patterson, St Vincent, W. I. from a green, conical gall with a length of about 4 mm, and a diameter of 1.5 mm, on the upper surface of the leaves of *Eupatorium*, the insects pupating within the deformity. It is provisionally referred to *Hyperdiplosis* because of the reduced circumfila and the deeply and roundly excavated ventral plate. The antennal stems of the typical *Hyperdiplosis* are more produced and the claws more strongly bent than in this West Indian form.

Hyperdiplosis americana Felt

- 1911 **Felt, E. P.** N. Y. Ent. Soc. Jour., 19:192

The small, pale midges were reared in numbers from a section of dead, partly decayed wild fig branch collected by E. A. Schwarz at Paraiso, Panama, and forwarded to this office by H. S. Barber under date of May 15, 1911. The adults appeared from the 31st of May until early in June. This species is allied to the somewhat aberrant *H. eupatorii* Felt and can not be considered typical of the genus. It is easily recognized by the very greatly produced, slender lobes of the ventral plate.

Hyperdiplosis producta Felt

- 1912 **Felt, E. P.** Ent. News, 23:177
 1918 ————— N. Y. State Mus. Bul. 200, p. 182

The midge was reared presumably from mite galls in the inflorescence of *Stachytarpha* collected by W. H. Patterson, St Vincent, W. I.

Hyperdiplosis bryanti Felt

- 1913 **Felt, E. P.** Psyche, 20:146

The small yellowish male was taken in August 1907 by Mr Owen Bryant at North Adams, Mass. It is allied to *H. americana*

from which it may be easily separated by differences in the color of the legs and in the emargination of the ventral plate.

METADIPOLOSIS Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 406
 1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:285
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:59
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 211

The genus is easily distinguished from the ordinary type of Itonid by the unique genitalia, the basal clasp segment being short, stout, broadly rounded and with conspicuous triangular, chitinous processes at the internal angles, while the terminal clasp segment is short, greatly constricted near the middle, enormously swollen and recurved apically. Type and sole species, *Metadiplosis spinosa* Felt.

Metadiplosis spinosa Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 406

The unique male characterized below was taken July 14, 1906 on quack grass, *Agropyron repens*, at Albany, N. Y.

Male. Length 1 mm. Antennae one-fourth longer than the body, thickly haired, dark brown, the basal segments reddish; fourteen

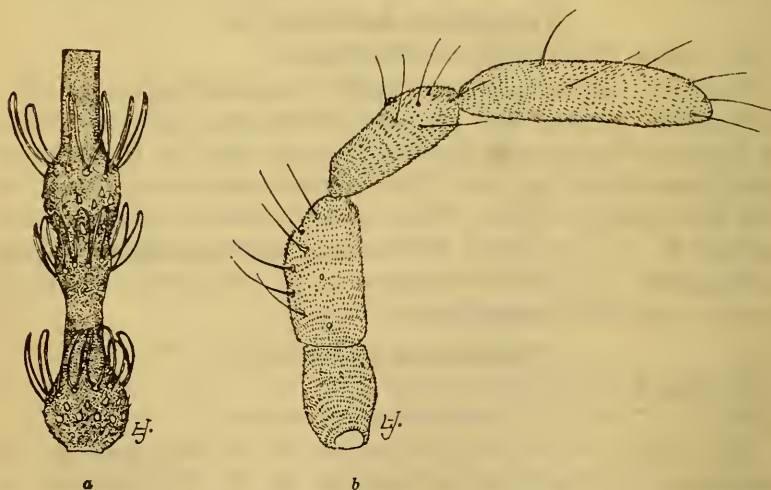


Fig. 21 *Metadiplosis spinosa*: *a*, fifth antennal segment of male, setae not sketched in; *b*, palpus of male (enlarged, original)

segments, the fifth (fig. 21a) with stems three and three and one-half times their diameters respectively. Palpi (fig. 21b); the first segment short, stout, subrectangular, the second twice the length of the first, stout, the third a little longer and more slender than the second

and the fourth one-half longer and more slender than the third; face reddish brown, eyes black. Mesonotum dark brown, the submedian lines indistinct. Scutellum reddish yellow, postscutellum reddish brown. Abdomen light reddish brown, rather thickly clothed with pale setae and slightly fuscous distally. Wings hyaline, costa yellowish brown, the third vein joining the margin well beyond the apex; halteres yellowish basally, semi-transparent apically. Legs a nearly uniform dark brown; claws (fig. 22) long, slender, evenly curved, simple, the pulvilli about one-third the length of the claws. Genitalia; basal clasp segment short, stout, truncate and at each internal distal angle a long, stout, chitinous spine; terminal clasp segment short, greatly constricted near the middle, enormously swollen and recurved apically; dorsal plate short, broad, deeply and rather narrowly incised, the lobes narrowly rounded; ventral plate slender, tapering, subacute. Type Cecid. 573.



Fig. 22 *Metadiplosis spinosa*, claw (enlarged, original)

EPIDIPOLOSIS Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 406

1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:285

1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:59

This genus is erected for a species remarkable because of the enormously produced, curved, setose-bearing spine on the basal clasp segment, this peculiar organ being nearly as long as the terminal clasp segment and strongly suggesting the genitalic modification we find in *Lobodiplosis*. It is, however, readily separable from this last named genus by the simple claws.

Type and sole species, *Epidiplosis sayi* Felt, C. 429

Epidiplosis sayi Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 406-7

This interesting form was taken July 1, 1906 on a window at Nassau, N. Y.

Male. Length .6 mm. Antennae twice as long as the body, sparsely haired, light brown, yellowish basally; fourteen segments, the fifth with stems two and two and one-half times the diameter respectively. Palpi; the first segment probably short, subquadrate, the second long, stout, tapering at each extremity, the third two-thirds the length of the preceding, narrowly oval, the fourth one-half longer than the third, slender; face fuscous yellowish. Mesonotum fuscous brown, submedian lines narrow. Scutellum reddish brown, postscutellum yellowish, basal and terminal abdominal segments yellowish orange, the third, fourth and fifth white, sparsely

haired. Wings (pl. 16, fig. 3) hyaline, costa light brown; halteres yellowish transparent. Legs nearly uniform dull brown; claws rather stout, strongly curved near the middle, the posterior at least, simple. Genitalia (pl. 19, fig. 6); basal clasp segment very short, broad, the ventral margin produced as a long, curved process bearing a long, stout seta apically; terminal clasp segment swollen at the base; dorsal plate broad, deeply and triangularly incised, the lobes roundly tapering, obtuse; ventral plate broad, broadly rounded. Type Cecid. 429.

LESTODIPLOSIS Kieff.

Leptodiplosis Kieff.

Coprodiplosis Kieff. sub. gen.

- 184 Kieffer, J. J. Soc. Ent. Fr. Bul., 63:280 (*Leptodiplosis*)
 1894 ——— Fuielle Jeun. Natural., 24:84
 (*Coprodiplosis*)
 1895 ——— Soc. Ent. Fr. Bul., p. 193
 1896 ——— Wien. Ent. Zeit., 15:93, 97
 1897 ——— Syn. Cecid. de Eur. & Alg., p. 38-39
 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 407
 1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:285
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:59-60
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 195

This genus, according to Kieffer, usually differs from *Clinodiplosis* by the spotted wings and the form of the male genitalia, the latter having the dorsal plate composed of two rounded lobes as long or



Fig. 23 *Lestodiplosis* species: *a*, dorsal view of head and anterior body segment of larva; *b*, breastbone (enlarged, original)

shorter than the rounded ventral plate. The females of some species have hyaline wings and Kieffer is unable to distinguish them from those of *Clinodiplosis*, except by the reddish color of the abdomen and the fuscous spot at its base. The subgenus *Coprodiplosis* Kieff. may be separated from the typical *Lestodiplosis* by the hyaline wings. The larvae, according to Kieffer, are zoophagous, subsisting upon the larvae of Cecidomyiids, Mycetophilids and Xylophagids. He has observed them living upon the larvae of *Rhopalomyia tanaceticola*. This record of zoophagous habits is confirmed by the rearings of American species, since members of this genus were obtained from a wide variety of galls and the larvae evidently subsisted upon Itonids, other small insects or acarids. See figures 23, 24 for the general characteristics of these larvae.

The genus, as recognized by us, is easily separated from all other Itonids by the very characteristic triangular lobe at the base of the slender basal clasp segment. The dorsal plate is usually short and rather deeply and triangularly emarginate, the lobes being narrow,

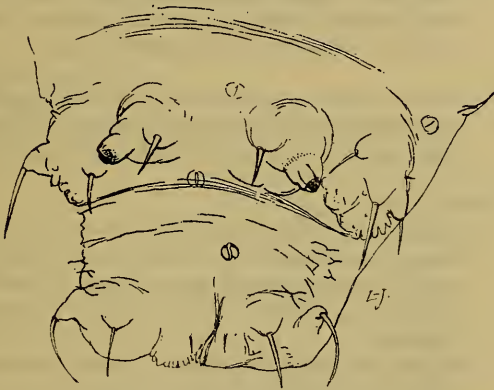


Fig. 24 *Lestodiplosis* species, dorsal view of posterior segments of larva (enlarged, original)

parallel and broadly rounded, while the ventral plate is long, rather broad and narrowly rounded apically. Species referable to this group are mostly small, ranging from .75 to about 2 mm in length, usually yellowish or reddish, though a few are brownish.

Species of this genus are very frequently reared from various galls and are probably zoophagous. This is undoubtedly true of *L. grassator* Fyles, *L. peruviana* Felt¹ and a number of other species, though it will be observed by referring to the records, that a considerable number of species have been reared from flowers

¹Ent. News, 22:10-11, 1911.

or rolled leaves. It is doubtful if species referable to this genus are responsible for the vegetable deformities or even partly so. We can not, in the present state of our knowledge, make definite statements respecting the habits of these forms. Certain species in the following table are given in two divisions as having the wings either hyaline or spotted. This is due to the fact that it is very difficult to draw a sharp line between spotted and unspotted wings in cases where there are intergradations. Furthermore, females which are not represented in the following table, frequently have spotted wings, while their consorts have the organs of flight hyaline. This character, though variable, is a very convenient one upon which to make primary divisions.

Key to Species

a Wings hyaline

b Wings narrow, the length three times the width

c Abdomen brownish

d Abdomen yellowish brown, the stems of the fifth antennal segment with a length three and one-half times the diameter, the distal node with a length one-fourth greater than its diameter; reared from fusiform galls on cherry twigs.....

cerasi Felt, C. a1593a

dd Abdomen reddish salmon, the fifth antennal segment having the stems with a length three and one-half times the diameter, the distal node with a length equal to its diameter, circumfila long

juniperina Felt, C. 746

cc Abdomen yellowish

d Abdomen pale yellowish, the fifth antennal segment having the stems with a length three times the diameter, the distal node with a length one-third greater than its diameter, circumfila rather long; reared from a cylindric fimbriate leaf gall on *Crataegus*.....

crataegifolia Felt, C. a1555

dd Abdomen yellowish, the second to fourth segments fuscous, the fifth antennal segment having the stems with a length two and one-half times the diameter, the distal node with a length one-half greater than its diameter, style short.....

cincta Felt, C. 465

ddd Abdomen fuscous yellowish

e Style short, the fifth antennal segment having the stems with a length two and one-half times the diameter, the distal node with a length one-half greater than its diameter, not constricted; reared from rolled edge of poplar leaf...

populifolia Felt, C. a1490

ee Style long, the fifth antennal segment having the stems with a length three and one-half times the diameter, the distal node with a length one-third greater than its diameter, constricted; reared from rolled ash leaves.....

fraxinifolia Felt, C. a1572

- dddd* Abdomen fuscous yellowish, fuscous basally, fifth antennal segment having the stems with a length two and one-half times the diameter, the distal node with a length one-half greater than its diameter, the style short; dorsal plate slightly emarginate, the lobes broadly emarginate. *basalis* Felt, C. 512
- ccc* Abdomen light carmine, the fifth antennal segment having the stems with a length two and one-half times the diameter, the distal node with a length one-half greater than its diameter; style long; reared from rolled *Verbena urticifolia* leaves.
verbenifolia Felt, C. a1577a
- bb* Wings moderate, with a length about two and one-half times the width
- c* Abdomen light brown
- d* Fifth antennal segment having the stems with a length three and one-half times the diameter, the distal node with a length equal to its diameter. *flavomarginata* Felt, C. 109
- dd* Fifth antennal segment having the stems with a length three times the diameter, the distal node with a length one-fourth greater than its diameter
- e* Wings medium, with a length two and one-half times the width, circumfila moderate; reared from *Phylloxera vastatrix* galls. *grassator* Fyles, C. 962, 963, 974
- ee* Wings broad, with a length only two and one-eighth times the width; circumfila heavy; reared from pods of *Yucca angustifolia*. *yuccae* Felt, C. 1017
- cc* Abdomen yellowish
- d* Abdomen pale yellowish
- e* Basal stem of the fifth antennal segment with a length three and one-half times its diameter
- f* Distal stem of fifth antennal segment with a length three times its diameter, the circumfila stout, rather long; reared from *Solidago* rosette gall.
solidaginis Felt, C. a1655b
- ff* Distal stem of fifth antennal segment with a length three and one-half times its diameter, circumfila rather long
hicoriae Felt, C. 261a
- ee* Basal stem of the fifth antennal segment with a length two and one-half times its diameter
- f* Distal stem of fifth antennal segment with a length three and one-half times its diameter, the circumfila short; reared from distorted flower buds of figwort, *Scrophularia marylandica*.
scrophulariae Felt, C. a1569
- dd* Abdomen fuscous yellowish, fifth antennal segment with the stems three and one-half times their diameters
- e* Abdomen fuscous yellowish
- f* Style long
- g* Distal node of fifth antennal segment with a length one-fourth greater than its diameter; reared from flowers of dogbane.
apocyniflorae Felt, C. a1684

- gg* Distal node of fifth antennal segment with a length one-half greater than its diameter; reared from subglobular leaf gall on poplar.
g l o b o s a Felt, C. a1656
- ff* Style short, the lobes of the basal clasp segment slightly rounded, the distal node of the fifth antennal segment with a length one-half greater than its diameter.
t s u g a e Felt, C. 168b
- ddd* Abdomen reddish
- e* Abdomen reddish fuscous, the fifth antennal segment with the stems three and one-half and three times their diameters respectively, the distal node with a length one-fourth greater than its diameter; reared from rolled milkweed (*Asclepias*) leaves.
a s c l e p i a e Felt, C. a1588
- ee* Abdomen reddish brown, the fifth antennal segment with stems three and one-half times their diameters, the distal node with a length one-fourth greater than its diameter
r u g o s a Felt, C. 650c
- eee* Abdomen reddish, fifth antennal segment with the stems three and three and one-half times their diameters, the distal node with a length one-fourth greater than its diameter; reared from *Clematis* flowers.
c l e m a t i f l o r a e Felt, C. a1694b
- aa* Wings spotted
- b* Legs broadly white-banded, the fifth antennal segment having the stems with a length two and one-half times their diameter, the ventral plate coarsely setose apically; reared from thorn leaf.
f l o r i d a Felt, C. 986
- bb* Legs not broadly white-banded
- c* Abdomen yellowish
- d* Basal segment dark brown or black.
c a r o l i n a e Felt, C. a1636
- dd* Abdomen orange tinted, the fifth antennal segment having the stems with a length three and one-half times their diameters, the distal node with a length one-fourth greater than its diameter
- e* Wings medium, with a length two and one-half times the width; reared from *Eupatorium ageratoides*.
e u p a t o r i i Felt, C. a1280
- ee* Wings broad, with a length two and one-half times the width; reared from plane (*Platanus*) leaf.
p l a t a n i f o l i a Felt, C. a1669a
- ddd* Abdomen reddish apically, the fifth antennal segment having the stems with a length three and one-half times their diameters, the distal node with a length one-fourth greater than its diameter.
a s t e r i s Felt, C. 615
- ddd* Abdomen red tinted, the fifth antennal segment having the stems with a length three and one-half times their diameters
- e* Wings moderate, with a length two and one-half times the width, reared from *Rumex*.
r u m i c i s Felt, C. a1595a

- cc* Wings rather narrow, with a length two and three-fourths times the width; reared from thickened leaf fold on *spiraea tomentosa*.....
spiraea folia Felt, C. 760 (a1174)
- dddd* Abdomen brown tinted, the fifth antennal segment having the stems with a length three times the diameters, the distal node with a length greater than its diameter; reared from *Solidago* leaf with elongate brown spots.....
triangularis Felt, C. 763 (a1170)
- cc* Abdomen dark red, the tarsi faintly banded
- d* Fifth antennal segment having the stems with a length two and one-half times the diameters; reared from rolled milkweed leaf
asclepias Felt, C. a1588a
- dd* Fifth antennal segment having the stems three and three and one-third times their length; reared from galls of *Phylloxera vastatrix*.....*grassator* Fyles, C. a1654

Lestodiplosis cerasi Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 407
 1918 ——— N. Y. State Mus. Bul. 200, p. 152

The reddish orange male was reared July 26, 1907 from variable, oval or fusiform twig swellings on wild cherry, *Prunus serotina*, taken at West Nyack, N. Y.

Male. Length 1 mm. Antennae nearly twice the length of the body, rather thickly haired, light brown; yellowish basally; fourteen segments, the fifth with the stems each three and one-half times their diameter; distal enlargement, with a length one-fourth greater than its diameter; terminal segment, distal enlargement with a length three times its diameter, obtusely rounded. Palpi; first segment subquadrate, the second narrowly oval, with a length two and one-half times its width, the third shorter than the second, more slender, the fourth one-third shorter than the third. Face yellowish. Mesonotum light brown, the submedian lines sparsely haired. Scutellum and postscutellum pale yellowish. Abdomen reddish orange with an indistinct fuscous spot on the second abdominal segment. Genitalia pale yellowish. Wings hyaline, costa brown. Halteres yellowish basally, fuscous apically. Coxae and base of femora pale yellowish, the distal portion of femora and tibiae fuscous yellowish, the tarsi darker; claws slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment stout; terminal clasp segment slightly swollen basally, long; dorsal plate deeply and narrowly incised, the lobes broadly rounded. Type Cecid. a1593a.

Lestodiplosis juniperina Felt

- 1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 141; separate, p. 44-45 (Cecidomyia)
 1908 ——— N. Y. State Mus. Bul. 124, p. 408

The reddish salmon male was taken August 7, 1906 at Nassau, N. Y.

Male. Length 1 mm. Antennae fully one-third longer than the body, thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems each three and one-half times their diameter; the distal node with a length equal to its diameter. Palpi; the first segment short, subquadrate, the others elongate, oval, successively a little shorter, the fourth a trifle longer than the others. Mesonotum dark brown, submedian lines sparsely haired. Scutellum yellowish orange, postscutellum fuscous reddish. Abdomen reddish salmon, the basal four segments dark red, genitalia yellowish. Wings hyaline, costa light brown; halteres yellowish basally, whitish apically. Coxae and femora fuscous transparent, tibiae and tarsi fuscous brown, distal segments darker; claws rather slender, strongly curved. Genitalia; basal clasp segment stout. Dorsal plate broad, deeply incised, the lobes acutely rounded; ventral plate narrow, broadly rounded. Harpes rather short, acute. Type Cecid. 746.

Lestodiplosis crataegifolia Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408

1918 ————— N. Y. State Mus. Bul. 200, p. 138

This yellowish male was reared July 17, 1907 from an irregular, rather spiny gall on the upper surface of a *Crataegus* leaf taken at Bath, N. Y.

Gall. Four to 5 mm high, 1.5 mm in diameter, the tip fimbriate. This is an irregular, rather spiny gall (pl. 12, fig. 2) on the upper surface of the leaf, each containing a yellowish larva, the posterior extremity being bright red. This species is probably an inquiline.

Larva. Length 2.5 mm, yellowish, the exposed posterior extremity bright red. Head short; antennae stout, with a length one-half greater than its diameter; breastbone bidentate, the teeth narrowly rounded. Shaft moderately chitinized. Skin nearly smooth; posterior extremity broadly rounded, deeply cleft. Provisionally referred to this species.

Male. Length 1.5 mm. Antennae one-half longer than the body, rather thickly haired, fuscous yellowish, yellowish basally; fourteen segments, the fifth with the stems three times their diameters; distal enlargement pyriform, with a length one-third greater than its diameter. Palpi; first segment probably quadrate, the second narrowly oval, with a length over twice its width, the third shorter, more slender, the fourth one-half longer than the third. Face yellowish. Mesonotum light brown, the submedian lines, scutellum and postscutellum yellowish. Abdomen yellowish transparent; genitalia slightly fuscous, the dorsum of the basal segment tinged with fuscous. Wings hyaline, costa pale straw. Halteres yellowish transparent. Legs a nearly uniform fuscous yellowish; claws slender, evenly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment slender; terminal clasp seg-

ment long, slender; dorsal plate long, deeply and narrowly emarginate, the lobes broadly rounded; ventral plate indistinct.

Female. Length 1.5 mm. Antennae nearly as long as the body, sparsely haired, pale straw, yellowish basally; fourteen segments, the fifth (fig. 25*b*) with a stem three-fourths the length of the cylindrical basal enlargement, which latter has a length two and one-half times its diameter, is slightly constricted near the basal third; terminal segment (fig. 25*a*) with a length three and one-half times its diameter, narrowly rounded. Palpi; first segment subquadrate, the second narrowly

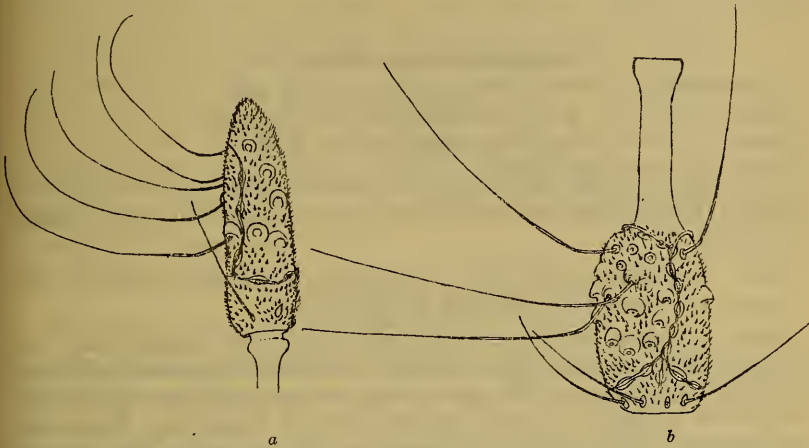


Fig. 25 *Lestodiplosis crataegifolia*: *a*, terminal and *b*, fifth antennal segment of female (enlarged, original)

oval, with a length three times its width, the third shorter, narrowly oval, the fourth nearly as long as the second. Face yellowish. Mesonotum dark brown, the narrow submedian lines yellowish, sparsely haired. Scutellum pale yellowish, sparsely setose, post-scutellum darker. Abdomen pale yellowish. Ovipositor short, terminal lobes narrowly oval, with a length three times the width. Otherwise nearly as in the male. Type Cecid. a1555.

Lestodiplosis cincta Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408

This yellowish male was taken July 3, 1906 on New Jersey tea, *Ceanothus americanus*, at Albany, N. Y.

Male. Length .75 mm. Antennae one-half longer than the body, thickly haired, pale brown, yellowish basally; fourteen segments, the fifth with stems twice the length of their diameters; the distal node with a length one-half greater than its diameter. Palpi; the first segment subquadrate, rounded distally, the second one-half longer, narrowly oval, the third a little shorter, the fourth a little longer and more slender than the third; face yellowish. Mesonotum dark brown, submedian lines narrow, yellowish. Scutellum and

postscutellum fuscous yellowish. Abdomen fuscous yellowish with the second, third and fourth abdominal segments fuscous, rather thickly clothed with fine hairs. Wings hyaline, costa pale brown; halteres pale yellowish basally, fuscous apically. Legs a nearly uniform dark brown, lighter ventrally; claws long, slender, strongly curved. Genitalia (pl. 20, fig. 4); basal clasp segment long, slender, obliquely truncate; terminal clasp segment long, swollen basally; dorsal plate broad, deeply and narrowly incised, the lobes narrowly rounded; ventral plate broad, narrowly rounded; style stout, short. Type Cecid. 465.

Lestodiplosis populifolia Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408
 1915 ————— N. Y. State Mus. Bul. 175, pl. 3, fig. 4
 1918 ————— N. Y. State Mus. Bul. 200, p. 38

This fuscous yellowish male was reared July 22, 1907 from a marginal leaf roll on poplar, *Populus tremuloides*, taken at Albany, N. Y.

Gall. A marginal leaf roll 10 mm long, 2 mm wide, slightly distorting and shortening that side of the leaf.

Male. Length 1.5 mm. Antennae one-fourth longer than the body, thickly haired, light brown, the basal segments yellowish; fourteen segments, the fifth with stems twice their diameters; distal node with a length one-half greater than its diameter. Palpi; the first segment short, stout, subquadrate, the second a little longer, narrowly oval, the third a little longer and more slender than the second and the fourth one-half longer and more slender than the third. Mesonotum dark brown, the submedian lines fuscous yellowish. Scutellum reddish orange, postscutellum a little darker. Abdomen fuscous yellowish, the distal segments yellowish. Genitalia fuscous. Wings hyaline, costa dark brown; halteres whitish transparent. Legs a nearly uniform dark brown; claws long, slender, evenly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment long, slender; dorsal plate short, stout, deeply and triangularly emarginate, the lobes narrowly rounded; ventral plate a little longer, slender, broadly rounded. Type Cecid. a1490.

Lestodiplosis fraxinifolia Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408
 1918 ————— N. Y. State Mus. Bul. 200, p. 179

The fuscous yellowish male was reared July 23, 1907 from badly rolled ash, *Fraxinus*, leaflets taken by L. H. Joutel at Newfoundland, N. J.

Gall. The whitish larvae occurred in badly rolled, young ash leaflets.

Male. Length 1.25 mm. Antennae one-half longer than the body, thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems three and one-half times their diameter, distal enlargement pyriform, with a length one-third greater than its diameter; terminal segment, distal enlargement with a length four times its diameter, apex obtuse. Palpi; first segment subquadrate, the second, third and fourth subequal, the third being slender. Face fuscous yellowish. Mesonotum light brown, the submedian lines and posterior median area fuscous yellowish. Scutellum light fuscous yellowish, postscutellum darker. Abdomen fuscous yellowish and pale orange, the segments thickly haired posteriorly, the basal ones somewhat fuscous; genitalia fuscous yellowish. Wings hyaline, costa light brown. Halteres semi-transparent basally, fuscous yellowish apically. Legs a nearly uniform fuscous yellowish; claws slender, strongly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment slender; terminal clasp segment long; dorsal plate broadly and roundly emarginate, the lobes narrowly rounded; ventral plate long, broadly rounded. Type Cecid. a1572.

Lestodiplosis basalis Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408

The dark yellowish male with the abdomen fuscous basally, was taken July 6, 1906 on New Jersey tea, *Ceanothus americanus*, at Albany, N. Y.

Male. Length .75 mm. Antennae one-half longer than the body; thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems, each two and one-half times their diameter, distal enlargement pyriform, with a length one-half greater than its diameter; terminal segment having the distal enlargement with a length two and one-half times its diameter, broadly rounded apically. Palpi; first segment subquadrate, the second with a length two and one-half times its diameter, the third a little shorter, narrowly oval, the fourth still shorter, more slender. Face yellowish. Mesonotum dark brown, the submedian lines yellowish. Scutellum dark orange. Abdomen fuscous basally, dark yellowish apically; genitalia tipped with fuscous. Wings hyaline, costa light brown; halteres pale yellowish. Legs a nearly uniform light brown, the tarsi slightly darker; claws slender, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment slender; terminal clasp segment stout at base, short; dorsal plate deeply and narrowly emarginate, the lobes broadly rounded; ventral plate long, broadly rounded; style long. Type Cecid. 512.

Lestodiplosis verbenifolia Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408

1918 ——— N. Y. State Mus. Bul. 200, p. 182

This light carmine male was reared July 20, 1907 from rolled leaves of *Verbena urticifolia* taken at Karner, N. Y.

Male. Length 1.25 mm. Antennae one-fourth longer than the body, thickly haired, light fuscous yellowish basally; fourteen segments, the fifth with stems each having a length two and one-half times their diameter; distal enlargement pyriform, with a length one-half greater than its diameter; terminal segment having the distal enlargement with a length three times its diameter, the apex obtusely rounded. Palpi; first segment quadrate, the second narrowly oval, with a length twice its diameter, the third a little longer, more slender, the fourth shorter, slightly dilated. Face yellowish. Mesonotum dark brown, the submedian lines yellowish. Scutellum and postscutellum fuscous yellowish. Abdomen light carmine, the dorsum of the second and third abdominal segments variably fuscous. Wings hyaline, costa light brown; halteres light fuscous. Legs light fuscous straw, the distal tarsal segments darker; claws slender, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment slender; terminal clasp segment slender; dorsal plate deeply and triangularly emarginate, the lobes narrowly and obliquely truncate; ventral plate short, broadly rounded, style short. Type Cecid. a1577a.

Lestodiplosis flavomarginata Felt

1907 Fe't, E. P. N. Y. State Mus. Bul. 110, p. 138; separate, p. 42 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 408

The light-brown male was taken June 1, 1906 on white clover, *Trifolium repens*, at Albany, N. Y.

Male. Length .75 mm. Antennae one-half longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems, each having a length three and one-half times their diameter; distal node with a length equal to its diameter. Palpi; the first segment suboval, the second twice the length of the first, elongate, oval, the third about the same length, more slender, the fourth a little shorter than the third, slightly expanded distally. Mesonotum yellowish brown, the broad median area thickly clothed with yellowish hairs. Scutellum reddish, the postscutellum probably concolorous. Abdomen light brown, anterior segments margined posteriorly with yellowish, posterior segments reddish. Wings hyaline, costa light brown; halteres reddish transparent basally, somewhat fuscous apically. Coxae yellowish transparent, tinged with reddish apically; femora yellowish transparent, tibiae slightly darker, tarsi light brown; claws slender, evenly curved. Genitalia; basal clasp segment very long, slender; terminal clasp segment slightly swollen basally; dorsal plate broad, deeply incised, the lobes broadly rounded; ventral plate narrow, broadly rounded; style very long. Type Cecid. 109.

Lestodiplosis grassator Fyles

1882 Fyles, T. W. Can. Ent. 14:237-39 (Diplosis)

1883 ——— Ent. Soc. Ont., 14th Rep't, p. 30-31 (Diplosis)

- 1889 Saunders, William Ins. Injur. to Fruits, p. 239 (Diplosis)
 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408
 1914 ——— Econ. Ent. Jour., 7:458
 1918 ——— N. Y. State Mus. Bul. 200, p. 168

This light-brown midge, reared from *Phylloxera vastatrix* galls, was recorded as very abundant in the vicinity of London, Ontario, in 1882. The larvae and pupae were found in *Phylloxera* galls, which latter were rather common on Clinton and other grape vines. The eggs are deposited at or near the entrance to the gall. The larva is said to be very active, groping about within the hollow of the gall and devouring the young lice. There were no evidences of the larvae attacking the parent insects, and there was usually an abundance of the young. One or two larvae occur in a gall and in no instance were living *Phylloxerae* found in association with the pupae — evidence that this Cecidomyiid is a voracious destroyer of this grape pest.

Male. Length 1.5 mm. Antennae nearly twice the length of the body, thickly haired, light brown; fourteen segments, the fifth with stems each three and one-half times their diameter; distal enlargement subglobose, with a length equal to its diameter; terminal segment, distal enlargement with a length nearly four times its diameter, the apex subacute. Palpi; first segment subquadrate, the second with a length three times its diameter, the third and fourth nearly equal to the second and more slender. Mesonotum yellowish brown. Scutellum and postscutellum lighter. Abdomen light brown. Wings with a length two and one-half times the width, hyaline, costa light brown. Halteres yellowish transparent. Legs pale brown; claws slender, strongly curved, the pulvilli a little shorter than the claws. Genitalia; basal clasp segment slender; terminal clasp segment long, slender; dorsal plate deeply and triangularly emarginate, the lobes broadly rounded; ventral plate long, broadly rounded; style long.

Female. Length 2 mm. Antennae nearly as long as the body, sparsely haired, pale yellowish; fourteen segments, the fifth with a stem one-fourth longer than the cylindric basal enlargement, which latter has a length two and one-half times its diameter and is slightly constricted near the middle; terminal segment with a length four times its diameter, narrowly rounded. Palpi; first segment quadrate, second rectangular, with a length two and one-half times its diameter, the third a little longer, more slender, the fourth a little longer and more dilated than the third. Mesonotum a variable yellowish dark brown. Scutellum yellowish, postscutellum dark brown. Abdomen yellowish brown. Ovipositor short, the terminal lobes with a length nearly twice the width, narrowly rounded. Type Cecid. 962.

Lestodiplosis yuccae Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 408
 1918 ——— N. Y. State Mus. Bul. 200, p. 27

This light-brown male was reared September 12, 1893 from pods of *Yucca angustifolia* received at the bureau of entomology, United States Department of Agriculture, Washington, D. C.

Gall. This species apparently produces no deformity, having been reared from *Yucca* pods.

Male. Length .75 mm. Antennae about twice the length of the body, thickly haired, light brown; fourteen segments, the fifth with stems each two and one-half times their diameter; distal enlargement pyriform, with a length one-fourth greater than its diameter; terminal segment, distal enlargement with a length three times its diameter, obtuse. Palpi; first segment quadrate, the second with a length three times the width, the third and fourth missing. Mesonotum reddish brown. Scutellum light yellowish. Abdomen light brown, rather thickly haired; genitalia fuscous. Wings with a length two and one-eighth times the width, hyaline, costa dark brown. Halteres yellowish transparent. Coxae and base of femora pale yellowish, distal portion of femora, tibiae and tarsi light brown; claws rather stout, strongly curved, the pulvilli about as long as the claws. Genitalia; basal clasp segment slender; terminal clasp segment long; dorsal plate probably triangularly emarginate; ventral plate long, broadly rounded; style long. Type Cecid. 1017.

Lestodiplosis solidaginis Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 409
 1909 ——— Ottawa Nat., 22:248
 1918 ——— N. Y. State Mus. Bul. 200, p. 192

This species was reared August 20, 1907 in association with *Rhopalomyia albipennis* Felt from a gall collected at Albany. It is presumably zoophagous.

Male. Length 1 mm. Antennae longer than the body, rather thickly haired, the basal segment yellowish; fourteen segments, the fifth with stems three and one-half and two times their diameters respectively; terminal segment, distal enlargement cylindrical, with a length about three times its diameter and tapering abruptly to a narrowly rounded apex. Palpi; first segment short, stout, broadly rounded, the second narrowly oval, the third a little longer, more slender, the fourth as long as the third; face yellowish. Mesonotum fuscous, the submedian lines darker. Scutellum fuscous, postscutellum a little lighter. Abdomen yellowish, the second and the base of the third segments reddish; membrane and pleura yellowish. Wings hyaline, costa dark brown, subcosta uniting therewith at the basal third; halteres yellowish. Coxae whitish transparent; femora yellowish basally, darker apically; tibiae a variable fuscous; tarsi with the first segment fuscous, the others lighter; claws slender, slightly curved, simple, the pulvilli shorter than the claws. Genitalia; basal clasp segment slender, terminal clasp segment slender, slightly swollen basally. Dorsal plate deeply and triangularly

emarginate, the lobes broadly rounded; ventral plate short, broad rounded; style slender. Type Cecid. a1655b.

Lestodiplosis hicoriae Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 137-38; separate, p. 41 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 409

This pale yellowish male was taken June 14, 1906 on hickory, *Carya*, at Nassau, N. Y.

Male. Length .75 mm. Antennae fully twice as long as the body, thickly clothed with fine hairs, light brown; fourteen segments, the fifth with stems, each having a length three and one-half times their diameter; distal node obpyriform. Palpi; the first segment short, subquadrate, second a little longer, broadly oval, the third a little longer, narrowly oval, the fourth more slender and longer than the third; face dark fuscous. Mesonotum dark brown. Scutellum reddish brown, postscutellum darker. Abdomen pale yellowish with dark brown mesially on the basal segment. Wings hyaline, costa pale brown; halteres whitish transparent. Legs a nearly uniform pale reddish straw color, tarsi slightly darker; claws slender, evenly curved. Genitalia; basal clasp segment long, slender; terminal clasp segment swollen basally, tapering; dorsal plate broad, deeply and narrowly incised, the lobes rather narrowly rounded; ventral plate broad, broadly rounded; style long. Type Cecid. 261a.

Lestodiplosis scrophulariae Felt

1907 Felt, E. P. New Species of Cecidomyiidae II, p. 22 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 303 (Cecidomyia) p. 409

1918 ——— N. Y. State Mus. Bul. 200, p. 185

This pale yellowish carmine male was reared August 8, 1907 from distorted flower buds of *Scrophularia marylandica* taken at West Nyack, N. Y.

Male. Length 1.5 mm. Antennae one-fourth longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems having a length one and one-half and three and one-half times their diameters respectively, the distal enlargement somewhat produced; terminal segment, distal enlargement prolonged, obtusely rounded. Palpi; the first segment short, stout, irregular, the second one-half longer, narrowly oval, the third about as long as the second, and the fourth a little longer than the third. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum yellowish brown, postscutellum fuscous. Abdomen pale yellowish carmine, the basal segments apparently with a variable fuscous spot, genitalia fuscous yellowish. Wings hyaline, costa light brown; halteres yellowish transparent. Legs a variable fuscous straw, the tarsi nearly black; claws rather long, slender, evenly curved, the pulvilli a little shorter than the claws. Genitalia; basal and terminal

clasp segments long, slender; dorsal plate short, broad, deeply and triangularly incised, the lobes broadly rounded; ventral plate short, broadly rounded; style short. Type Cecid. a1569.

Lestodiplosis apocyniflorae Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 409

1918 ——— N. Y. State Mus. Bul. 200, p. 180

This dull fuscous yellowish male was reared August 9, 1907 from unopened, apparently normal flower buds of dogbane, *A p o c y n u m a n d r o m a e s i f o l i u m*, collected at Nassau, N. Y.

Male. Length 1 mm. Antennae longer than the body, sparsely haired, yellowish brown; fourteen segments, the fifth with stems each having a length three and one-half times their diameter; distal enlargement subglobular, with a length one-fourth greater than its diameter. Palpi; first segment subquadrate, the second broadly oval, with a length twice its diameter, the third as long as the second, slender, the fourth a little longer and more slender. Mesonotum dull reddish, submedian lines indistinct. Scutellum and postscutellum dull reddish. Abdomen dull fuscous yellowish. Wings hyaline, costa dark brown; halteres white. Coxae dull reddish. Legs yellowish straw; claws long, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment stout; terminal clasp segment long, slender; dorsal plate deeply and triangularly emarginate, the lobes narrowly rounded; ventral plate long, broadly rounded. Type Cecid. a1684.

Lestodiplosis globosa Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 409

1918 ——— N. Y. State Mus. Bul. 200, p. 38

This fuscous yellowish male was reared July 24, 1907 from a variable subglobular leaf gall on poplar, *P o p u l u s t r e m u l o i d e s*, taken by L. H. Joutel at Newfoundland, N. J.

Male. Length .75 mm. Antennae nearly twice the length of the body, thickly haired, fuscous yellowish; fourteen segments, the fifth with stems having a length two and one-half and three and one-half times their diameters respectively; distal enlargement with a length one-half greater than its diameter. Palpi; first segment probably quadrate, the second narrowly oval, with a length about two and one-half times its diameter, the third as long as the second, more slender, the fourth a little longer than the third, slender. Mesonotum light brown, the submedian lines yellowish, indistinct. Scutellum reddish yellow. Abdomen fuscous yellowish. Wings hyaline, costa light brown; halteres pale yellowish. Legs a nearly uniform fuscous straw; claws slender, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment slender; terminal clasp segment slender, rather short; dorsal plate triangularly emarginate, the lobes narrowly rounded; ventral plate long, broadly rounded; style short. Type Cecid. a1656.

Lestodiplosis tsugae Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 139; separate, p. 43
(Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 409

This fuscous yellowish male was taken June 7, 1906 on hemlock, *Tsuga canadensis*, at Lake Clear, N. Y.

Male. Length 1 mm. Antennae twice as long as the body, thickly clothed with fine hairs, light brown, yellowish basally; fourteen segments, the fifth with stems each three and one-half times their diameter; distal node pyriform, with a length one-half greater than its diameter. Palpi; the first segment short, broadly oval, the second twice the length of the preceding, subrectangular, the third a little longer, more slender, the fourth about as long as the preceding, more strongly flattened; mouth parts prolonged in a short, triangular beak; face yellowish. Mesonotum dark brown, lighter posteriorly, submedian lines yellowish. Scutellum yellowish apically, rather thickly clothed with fine hairs. Abdomen fuscous yellowish. Wings hyaline, costa light brown; halteres yellowish transparent. Legs dark brown, ventral surface and base of femora paler; claws slender, uniformly curved, simple. Genitalia; basal clasp segment long, stout; terminal clasp segment swollen basally; dorsal plate short, broad, deeply and triangularly incised, narrowly rounded; ventral plate short, relatively broad, broadly rounded; style long. Type Cecid. 168b.

Lestodiplosis asclepieae Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 409, 410

1918 ——— N. Y. State Mus. Bul. 200, p. 180

This deep-red species was reared in early August 1907 from rolled leaves of milkweed, *Asclepias cornuta*, containing whitish larvae some 2 mm long and collected at Highland and also at Albany, N. Y.

Male. Length .75 mm. Antennae one-half longer than the body, thickly haired, fuscous yellowish; fourteen segments, the fifth with stems having a length three and one-half and three times their diameters respectively, the distal node with a length one-fourth greater than its diameter; terminal segment having the distal portion of the stem with a length about twice its diameter, obtuse. Palpi; first segment subquadrate, the second with a length three times its diameter, the third as long as the second, the fourth a little longer, all slender. Face light brown. Mesonotum reddish brown, the submedian lines thickly haired. Scutellum pale yellowish, post-scutellum fuscous. Abdomen deep red, the basal segments a variable fuscous; genitalia fuscous yellowish. Wings hyaline, costa reddish brown; halteres light straw. Coxae pale orange, the extremities of femora light fuscous. Legs a variable light brown, the anterior somewhat darker; claws slender, strongly curved, the pulvilli nearly

as long as the claws. Genitalia; basal and terminal clasp segments long; dorsal plate deeply and triangularly emarginate, the lobes narrowly rounded; ventral plate long, broadly rounded; style long. Type Cecid. a1588.

Lestodiplosis rugosa Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 141; separate, p. 45 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 409

1918 ——— N. Y. State Mus. Bul. 200, p. 194

This reddish brown male was reared July 15, 1906 from galls on *Solidago* collected at Albany, N. Y.

Male. Length .75 mm. Antennae twice the length of the body, thickly haired, light brown; fourteen segments, the fifth with stems each with a length three and one-half times their diameter; distal node with a length one-fourth greater than its diameter; terminal segment, the distal portion greatly produced, subcylindric, obtusely rounded. Palpi; the first segment subrectangular, rather slender, the second, third and fourth, each about as long as the first, rounded at each extremity. Mesonotum dark brown, submedian lines sparsely haired. Scutellum yellowish reddish apically, postscutellum dark brown. Abdomen reddish brown, thickly haired, basal segments darker, genitalia yellowish. Wings (pl. 16, fig. 8) hyaline, costa brown; halteres yellowish basally, fuscous apically. Legs nearly uniform light brown; claws slender, rather strongly curved distally. Genitalia; basal clasp segment long, slender; terminal clasp segment slightly swollen at the base, long; dorsal plate broad, deeply and narrowly incised, the lobes narrowly rounded; ventral plate narrow, broadly rounded; style long, slender. Type Cecid. 650c.

Lestodiplosis florida Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 409

1918 ——— N. Y. State Mus. Bul. 200, p. 138

This pale yellowish brown male was reared June 29, 1880 from a leaf roll on thorn, *Crataegus*, at Fort George, Fla., and sent to the bureau of entomology, United States Department of Agriculture. The larvae occur near the edge of the lower side of the younger leaves, causing the edge to bend down and roll up.

Male. Length 2 mm. Antennae one-half longer than the body, thickly haired, pale yellowish; fourteen segments, the fifth with stems with a length two and one-half and three and one-half times their diameters respectively; distal enlargement subglobose, with a length one-fourth greater than its diameter. Palpi; first segment subquadrate, the second dilated, with a length three times its width, the third as long as the second, slender, the fourth one-half longer than the third, slender. Mesonotum reddish brown. Scutellum

and abdomen reddish. Wings subhyaline, variably spotted. The whitish legs broadly banded with dark brown at the base and near the middle of the tibiae, on the first and the base of the second tarsal segments, on the apex of the second and the base of the third tarsal segments and apically on the fifth. Genitalia; basal clasp segment stout, long; terminal clasp segment slightly swollen basally, stout; dorsal plate deeply and triangularly incised, the lobes narrowly rounded; ventral plate broad, narrowly rounded; style stout.

Female. Antennae pale yellowish, the two basal segments blackish. Thorax dusky in the older specimens, reddish in the younger ones. Scutellum and abdomen reddish, the latter with pale, silky hair. Legs pale reddish yellow; femora clothed with blackish hair which gives them a dusky appearance; tibiae covered with silvery white hair, the base and a ring around the middle, black; tarsi silvery white, first joint black, also the base of the tip of the second and third. Wings pale buff with three more or less distinct dusky zigzag bands across (Pergande notes) Type Cecid. 986.

Lestodiplosis clematiflorae Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 409

1918 ——— N. Y. State Mus. Bul. 200, p. 129

This reddish male was reared August 28, 1907 from unopened flowers of Virgins bower, *Clematis virginiana*, collected at Karner, N. Y.

Male. Length 1 mm. Antennae one-fourth longer than the body, sparsely haired, light brown; fourteen segments, the fifth with stems three and one-half and three times their diameters, respectively; distal enlargement subglobose, with a length one-fourth greater than its diameter; terminal segment, distal enlargement with a length three times its diameter, obtuse. Palpi; first segment quadrate, the second with a length nearly three times its width, the third nearly as long as the second, more slender, the fourth longer than the third, more slender. Mesonotum slightly infuscated. Scutellum and post-scutellum a little darker than the reddish pleurae. Wings hyaline, costa reddish brown. Halteres, coxae and femora basally pale yellowish, the distal portion of femora and tibiae brownish; tarsi brown; claws long, slender, evenly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long; terminal clasp segment long, slender; dorsal plate deeply and triangularly incised, the lobes narrowly rounded; ventral plate long, narrowly rounded; style long. Type Cecid. a1694b.

Lestodiplosis carolinae Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 139; separate, p. 43 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 409

1918 ——— N. Y. State Mus. Bul. 200, p. 192

This pale yellowish male was reared October 5, 1906 from a large, loose, rosette gall on *Solidago canadensis* taken at Asheville, N. C.

Male. Length 1 mm. Antennae one-fourth longer than the body thickly haired, fuscous yellowish, lighter basally; fourteen segments, the fifth with stems thrice their diameters; distal node with a length equal to its diameter. Palpi; the first segment subquadrate, the other three twice as long, subequal; face fuscous yellowish. Mesonotum dark brown, submedian lines indistinct. Scutellum black or very dark brown, postscutellum dark brown. Abdomen pale yellowish, basal segments dark brown or black dorsally, the terminal segments shaded with orange; genitalia yellowish, tipped with dark brown and thickly setose. Wings subhyaline, spotted, costa pale yellowish and fuscous; there is a distinct marginal spot anteriorly near the middle and at the apical fourth; on the posterior border there is a marginal spot at the basal third and at the apex of the fork of the fifth vein, the halteres pale yellowish. Legs a variable light fuscous yellow basally, basal tarsal segments somewhat darker than the distal ones; claws slender, strongly curved. Genitalia; basal clasp segment long, slender; terminal clasp segment long; dorsal plate broadly and deeply incised, the lobes acutely rounded; ventral plate narrow, broadly rounded; style narrow, long. Type Cecid. a 1636.

Lestodiplosis eupatorii Felt

- 1907 Felt E. P. N. Y. State Mus. Bul. 110, p. 140; separate, p. 44
 1908 ————— N. Y. State Mus. Bul. 124, p. 410
 1915 ————— N. Y. State Mus. Bul. 175, pl. 4, fig. 19
 1918 ————— N. Y. State Mus. Bul. 200, p. 190

This pale yellowish species was reared September 12, 1906 from rounded galls (pl. 13, fig. 2) in flower heads of *Eupatorium ageratooides* collected at South Bay, Glen Lake, Lake Champlain, August 21, 1906.

Male. Length 1 mm. Antennae fully one-half longer than the body, thickly clothed with long hairs, light brown; fourteen segments, the fifth with stems three and one-half times their diameters, the distal node with a length one-fourth greater than its diameter. Palpi; the first segment rather elongate, subquadrate, second, third and fourth subequal, the last more slender; face yellowish. Mesonotum light olive brown, submedian lines sparsely clothed with pale yellowish setae. Scutellum pale yellowish, postscutellum dark brown. Abdomen yellowish orange, slightly darker posteriorly, basal segments irregularly fuscous. Wings subhyaline, very indistinctly spotted, costa light brown; halteres pale yellowish apically, slightly lighter basally. Legs mostly a variable fuscous yellow, the articulations and terminal tarsal segments lighter; claws rather light, strongly curved, simple. Genitalia; basal clasp segment long;

terminal clasp segment slender; dorsal plate broad, deeply and narrowly incised, the lobes acutely rounded; ventral plate rather narrow, broadly rounded. Type Cecid. a1280.

Lestodiplosis platanifolia Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 410

1918 ———— N. Y. State Mus. Bul. 200, p. 133

This pale yellowish male was reared August 1, 1907 from pale orange and whitish larvae occurring in rolls on the underside of leaves of the plane tree, *Platanus occidentalis*, collected in New York City.

Male. Length 1.1 mm. Antennae one-half longer than the body, thickly haired, light brown, the basal segments yellowish; fourteen segments, the fifth with stems two and one-half times their diameters; distal node slightly produced. Palpi; the first segment short, stout, irregularly subquadrate, the second one-half longer, rather stout, the third a little shorter and broader than the second, and the fourth shorter and more strongly flattened than the third; face light yellowish. Mesonotum light brown, the submedian lines sparsely haired. Scutellum pale yellowish, postscutellum fuscous. Abdomen mostly pale yellowish, the distal segments tinged with orange, the dorsum of the second and third segments with a fuscous spot, genitalia pale yellowish. Wings subhyaline, distinctly spotted with fuscous; halteres pale yellowish. Legs a light straw, the first and base of the second tarsal segments dark brown, the third and fourth tarsal segments basally and the fifth on the posterior legs also dark brown; claws long, slender, strongly curved subapically, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, slender; terminal clasp segment long; dorsal plate long, broad, deeply and roundly emarginate, the lobes narrowly rounded; ventral plate long, slender, tapering, narrowly rounded; style swollen at the base, long. Type Cecid. a1669a.

Lestodiplosis asteris Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 142; separate, p. 45-46 (Cecidomyia)

This dull yellowish male was captured June 17, 1906 on aster at Albany, N. Y.

Male. Length 1.25 mm. Antennae longer than the body, thickly haired, light brown, fuscous yellowish basally; fourteen segments, the fifth with stems three and one-half times their diameters; terminal segment, the distal node subcylindric, slightly dilated at the distal fourth, the apex broadly subconical. Palpi; first segment quadrate, the second narrowly oval, the third and fourth each as long as the second and successively more slender. Face fuscous yellowish. Mesonotum dark brown, the submedian lines distinct. Scutellum yellowish, reddish apically, postscutellum yellowish.

Abdomen dull yellowish, reddish apically and with a fuscous basal spot. Wings (pl. 16, fig. 6) subhyaline, costa dark brown. Halteres yellowish basally, slightly fuscous apically. Legs fuscous straw; claws slender, slightly curved. Genitalia (pl. 20, fig. 2); basal clasp segment long, slender; terminal clasp segment swollen at the base, long; dorsal plate broad, deeply and narrowly incised, the lobes narrowly rounded; ventral plate long, slender, narrowly rounded; style long, stout. Type Cecid. 615.

Lestodiplosis rumicis Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 410

1918 ——— N. Y. State Mus. Bul. 200, p. 126

This yellowish, red-tinted male was reared July 29, 1907 from curled dock, *Rumex crispus*, infested by *Contarinia rumicis* H. Lw. collected at Newport.

Male. Length 1.25 mm. Antennae nearly twice the length of the body, thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems three and one-half times their diameters; basal enlargement subglobose; subbasal whorl thick, distal enlargement with a length one-fourth greater than its diameter; terminal segment, distal enlargement with a length four times its diameter, obtuse. Palpi; first segment subquadrate, the second narrowly oval, with a length three times its width, the third as long as the second, more slender, the fourth shorter than the third, slightly dilated. Face yellowish. Mesonotum yellowish brown, the submedian lines sparsely haired. Scutellum yellowish with a few apical setae, postscutellum dark brown. Abdomen a variable yellowish, shaded with carmine basally, and apically slightly fuscous; genitalia yellowish. Wings subhyaline, spotted, costa yellowish and fuscous. Halteres yellowish transparent. Legs mostly fuscous yellowish, the tarsi slightly darker; claws long, slender, the pulvilli shorter than the claws. Genitalia; basal clasp segment slender; terminal clasp segment long, stout; dorsal plate deeply and triangularly incised, the lobes narrowly rounded; ventral plate broadly rounded; style long.

Female. Length 1.75 mm. Antennae as long as the body, rather thickly haired, light straw, yellowish basally; fourteen segments, the fifth with a stem one-fourth longer than the basal enlargement, which latter has a length three and one-half times its diameter and is distinctly constricted near the basal third; terminal segment produced, cylindrical, with a length five times its diameter, narrowly rounded. Palpi; first segment subquadrate, the second narrowly oval, the third one-half longer, more dilated, the fourth a little longer and more slender than the third. Mesonotum reddish brown, the submedian lines thickly haired. Scutellum light reddish orange, postscutellum yellowish and fuscous. Abdomen mostly pale salmon, the basal segments a variable fuscous. Ovipositor short, the terminal lobes narrowly oval, with a length two and one-half times the width. Type Cecid. a1595a.

Lestodiplosis spiraeafolia Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 410

1918 ——— N. Y. State Mus. Bul. 200, p. 133

The pale yellowish male was reared August 23, 1906 from a thickened leaf fold on meadow sweet, *Spiraea tomentosa*, collected at Albany.

Male. Length 1 mm. Antennae a little longer than the body, rather thickly haired, brown, yellowish basally; fourteen segments, the fifth with stems three and one-half and thrice their diameters, respectively; the distal enlargement pyriform, with a length one-third greater than its diameter; terminal segment, distal enlargement with a length two and one-half times its diameter, obtuse. Palpi; first segment subquadrate, the second with a length three times its width, the third as long as the second, more slender, the fourth slightly longer than the third, somewhat dilated. Face pale yellowish. Mesonotum pale yellowish. Scutellum and postscutellum a little lighter than the pale yellowish abdomen. Wings subhyaline, faintly spotted, costa pale straw. Coxae pale yellowish; femora and tibiae brown, the tarsi lighter. Genitalia; basal and terminal clasp segments long, slender; dorsal plate deeply and triangularly emarginate, the lobes narrowly rounded; ventral plate long, broadly rounded; style long, slender. Type Cecid. 760.

Lestodiplosis triangularis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 138; separate, p. 42 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 410

1909 ——— Ottawa Nat., 22:249

1918 ——— N. Y. State Mus. Bul. 200, p. 194

This species was reared August 26, 1906 presumably from an elongate, brown, blistered area on the leaves of *Solidago canadensis* taken at West Lebanon, N. Y., in August.

Male. Length 1 mm. Antennae longer than the body, sparsely haired, brown; fourteen segments, the fifth with stems three times their diameters, the distal node with a length greater than its diameter; terminal segment with the distal enlargement prolonged, subcylindric, the apical fourth subconical. Palpi; the first segment short, suboval, the second twice the length of the preceding, stout, the third a little longer and more slender than the second, the fourth a little longer and more slender than the third. Face yellowish. Mesonotum brownish yellow, submedian lines obscure. Scutellum reddish. Abdomen brownish yellow. Wings subhyaline, indistinctly spotted, costa brown. Halteres subhyaline. Coxae white; femora brown, paler beneath; tibiae lighter than the femora; tarsi brown; claws slender, strongly curved at the distal fourth. Genitalia; basal clasp segment long, slender; terminal clasp segment slightly swollen basally; dorsal plate broad, deeply and

narrowly incised, the lobes narrowly rounded; ventral plate narrow, long, narrowly rounded; style long, slender. Type Cecid. 763.

PARADIPLISIS Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 410
 1910 Rubsaamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:286
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:60
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 223

The genus is separated from *Itonida* principally by the peculiar structures of the male genitalia. The basal clasp segment is short, stout and broad, while the terminal clasp segment is short, stout and apically with a broad, chitinized serrate margin. The dorsal and ventral plates are short, broad, each rather deeply and narrowly emarginate; style short, stout. The third vein unites with the margin at the apex of the wing. The palpi are quadriarticulate and the claws simple. Type *Cecidomyia obesa* Felt, C 167.

Paradiplisis obesa Felt

- 1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 134-35; separate, p. 38 (*Cecidomyia*)
 1908 ——— N. Y. State Mus. Bul. 124, p. 410

This dark carmine male was taken June 7, 1906 on hemlock, *Tsuga canadensis*, at Lake Clear, N. Y. It is most easily recognized by the peculiar genitalic structures.

Male. Length 1.5 mm. Antennae as long as the body, rather thickly clothed with fine hairs, bright carmine; fourteen segments, the fifth with stems hardly as long and one-half greater than their diameters, respectively; distal enlargement subcylindric, with a length one-half greater than its diameter; circumfila distinct, the loops of the distal filum extending to the apex of the segment; terminal segment, distal node produced, constricted at the basal third, the appendage with a length twice the average diameter of the stem. Palpi; the first segment short, subquadrate, the second twice the length of the preceding, subrectangular, the third as long as the second, fusiform, the fourth one-third longer, more slender, all sparsely clothed with coarse setae; face pale yellowish, eyes large, black. Mesonotum and scutellum dark carmine, postscutellum fuscous. Abdomen dark carmine. Wings hyaline, costa pale brown, subcosta uniting with the margin at the basal third, the third vein curving slightly and joining the margin just beyond the apex, the fifth vein, almost obsolete distally, uniting with the posterior margin at the distal third, its branch at the basal third. Halteres whitish transparent. Legs nearly uniform pale straw, tarsi slightly darker; claws rather stout, slightly curved, simple. Genitalia (pl. 20, fig. 8); basal clasp segment very stout, broad, obliquely truncate; terminal clasp segment very stout, broadly rounded, the apex with a series of

heavy, chitinous teeth. Dorsal plate deeply incised, the lobes narrowly rounded; ventral plate broad, deeply and broadly emarginate, the lobes broadly rounded; style very stout, short. Type Cecid. 167.

Paradiplosis partheniicola Ckll.

1908 Cockerell, T. D. A. Entomologist, 1900, 33:201 (Diplosis)

1918 ——— N. Y. State Mus. Bul. 200, p. 202, 204

This reddish midge was reared March 26, 1900 by Prof. T. D. A. Cockerell from galls on *Parthenium incanum* collected at the foot of Picacho mountain, Mesilla valley, New Mexico. The type material, kindly placed at our disposal by the describer, has enabled us to refer the insect tentatively to the above-named genus and also to supplement, in considerable measure, the original description.

Gall (fig. 26). Diameter 5 mm, woolly, snow-white and appearing like little tufts of cotton wool at the base of the leaves.

Larva. It is described by Professor Cockerell as orange. The exuviae are colorless, except the dark sepia brown anterior extremity.

Male. Length 2.5 mm. Antennae probably nearly as long as the body, sparsely haired, pale yellowish; fourteen segments, the fifth with stems one and one-half and two times their diameters, respectively, distal enlargement with a length one-half greater than its diameter, slightly expanded at the distal fourth. Mesonotum reddish brown. Scutellum pale yellowish, postscutellum a little darker. Abdomen dark yellowish brown. Wings hyaline, costa pale straw, the third vein uniting with the margin well beyond the apex, the fifth, subobsolete distally, joining the posterior margin at the distal third, its branch at the basal third. Halteres pale yellowish. Coxae yellowish; femora, tibiae and tarsi mostly a pale straw. Genitalia; basal clasp segment short, stout; terminal clasp segment short, greatly swollen near the middle; dorsal plate moderately long, broad, deeply and triangularly emarginate, the divergent lobes broadly rounded; ventral plate moderately long, broad, broadly rounded; style short, tapering, acute.

Female. Length 2.5 mm. Antennae extending to the second abdominal segment, sparsely haired, very pale; fourteen segments, the fifth having a stem one-fifth the length of the basal enlargement, which latter has a length fully three times its diameter, is strongly constricted near the middle and has moderately thick subbasal and subapical whorls of setae; terminal segment reduced, subcylindric, with a length of about two and one-fourth times its diameter and



Fig. 26 *Paradiplosis partheniicola*, galls on *Parthenium* twigs (author's illustration)

with a short, stout knob apically. Palpi probably quadriarticulate. Dorsum of thorax shining black, slightly hairy, sides of prothorax brown. Scutellum prominent, sparsely setose. Abdomen raspberry color, blackish dorsally. Ovipositor blackish and when extended probably as long as the body, the terminal lobes with a length over twice the width, narrowly rounded apically and sparsely setose. Legs very pale, ochreous tinted. Other characters practically as in the male.

The male was described from specimens kindly donated by Professor Cockerell. The structural characteristics of the female were drafted from the types, the color characters being taken from the original description. Type *Cecid.* a1920.

OBOLODIPLOSIS Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 410-11
 1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:276
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:61
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 189

The genus was erected to include a remarkable form which diverges widely from the ordinary type of *Cecidomyia* in the male genitalia. The terminal clasp segments are greatly produced, being nearly one-half longer than the basal clasp segment. The dorsal plate is greatly expanded, nearly divided, the lobes being orbicular, while the ventral plate appears to be widely separated, the two lobes being short, stout and roundly triangular (pl. 17, fig. 2). The male has the flagellate antennal segments strongly trinodose, the claws are simple and the third vein unites with the margin well beyond the apex.

Type *Cecidomyia robiniae* Hald. (*C. orbiculata* Felt)

Obolodiplosis robiniae Hald.

- 1847 Haldeman, S. S. Am. Jour. Agric. & Sci., 6:193-4 (*Cecidomyia*)
 1859 Fitch, Asa Noxious & Other Insects, N. Y. 5th Rep't, p. 53-4 (*Cecidomyia*)
 1859 ——— N. Y. State Agric. Soc. Trans., 1858, 18:833-34 (*Cecidomyia*)
 1859 Haldeman, S. S. Boston Soc. Nat. Hist. Proc., 6:401-2 (*Cecidomyia*)
 1862 Harris, T. W. Insects Injurious to Vegetation, p. 567-68 (*Cecidomyia*)
 1872 Glover, Townend U. S. Com'r Agric. Rep't, p. 127 (*Cecidomyia*)
 1880 Chambers, V. T. Am. Ent., 3:60 (*Cecidomyia*)
 1891 Hopkins, A. D. W. Va. Agric. Expt. Sta. Bul. 16, p. 89-90 (*Cecidomyia*)
 1892 Riley, C. V. & Howard, L. O. Insect Life, 5:136 (*Cecidomyia*)
 1904 Washburn, F. L. Minn. Agric. Expt. Sta. Bul. 88, p. 188 (*Cecidomyia*)
 1905 ——— Minn. Agric. Expt. Sta. Bul. 93, p. 65 (*Cecidomyia*)
 1906 Felt, E. P. Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:730 (*Cecidomyia*)

1907 ——— N. Y. State Mus. Bul. 110, p. 133-34; separate, p. 37
(*Cecidomyia orbiculata*)

1908 ——— N. Y. State Mus. Bul. 124, p. 410-11 (*Obolodiplosis orbiculata*)

1918 ——— N. Y. State Mus. Bul. 200, p. 155

The remarkable male was taken June 10, 1906 on the common locust, *Robinia pseudo-acacia*, at Albany, N. Y. A number of adults were reared June 12 and 13, 1911 from irregular, marginal leaf folds on locust, *Robinia*, collected by Dr J. R. Gillett at Kingston, N. Y. Specimens in the United States National Museum labeled *Diplosis robiniae* belong here, having been reared at Washington June 25, 1903. The larvae are large, whitish, pupate for the most part within the galls, the pupa wriggling partly out before disclosing the imago. It is a common and occasionally an injurious species, many leaflets being destroyed.

Gall. Length about 1.5 cm, diameter 2 to 3 mm. This is an irregular, marginal leaf roll containing whitish larvae.

Larva. Length about 3 mm, whitish, tapering anteriorly.

Pupa. Length 2.5 mm, mostly dark reddish brown; thoracic horns short; eyes rather fuscous; wing pads extending to the fourth abdominal segment, the leg cases to the sixth or seventh.

Exuviae. Whitish transparent, the abdominal segments dorsally with a transverse row of stout, well separated spines on the posterior margin.

Male. Length 3 mm. Antennae about as long as the body, thickly haired, dark brown; fourteen segments, the fifth (fig. 27a)

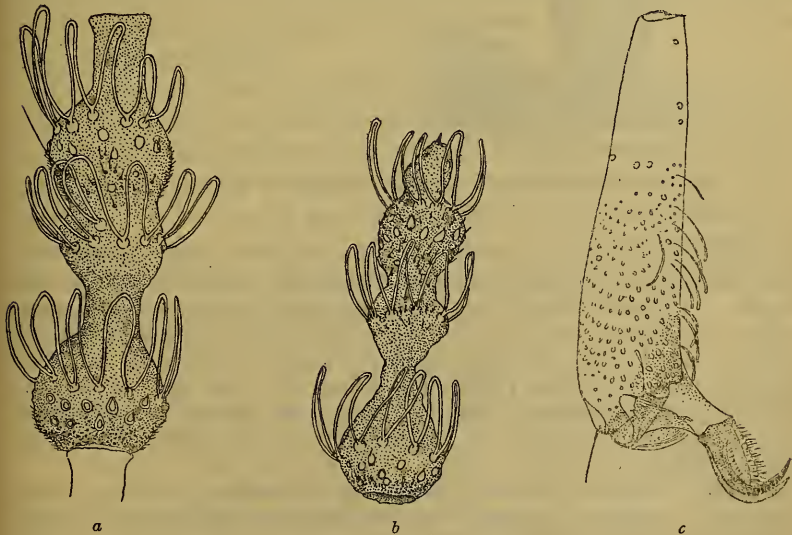


Fig. 27 *Obolodiplosis robiniae*: a, sixth antennal segment, only one seta sketched in; b, terminal antennal segment of male, setae not sketched in; c, side view of fifth tarsal segment and claws (enlarged, original)

with stems three-fourths and two times their diameters, respectively; terminal segment (fig. 27*b*), basal enlargement prolonged obpyriform the distal strongly divided, the two parts almost separated by a short stem, the terminal portion constricted at the base, short, subconic. Palpi (fig. 28); the first segment stout, subrectangular, the second twice the length of the preceding, the third one-half longer than the second, a little more slender, the fourth longer and more slender than the third; face dark yellowish brown, eyes large, black. Mesonotum dark brown, yellowish red laterally, submedian lines narrow, yellowish, sparsely ornamented with pale hairs. Scutellum rather dark red with fuscous apical hairs, postscutellum darker. Abdomen fuscous brown dorsally, the sclerites slightly darker than the pleurae and incisures, each segment posteriorly with a row of stout, light brown hairs, genitalia reddish brown. Wings (pl. 15, fig. 2) subhyaline, costa light brown; halteres yellow-

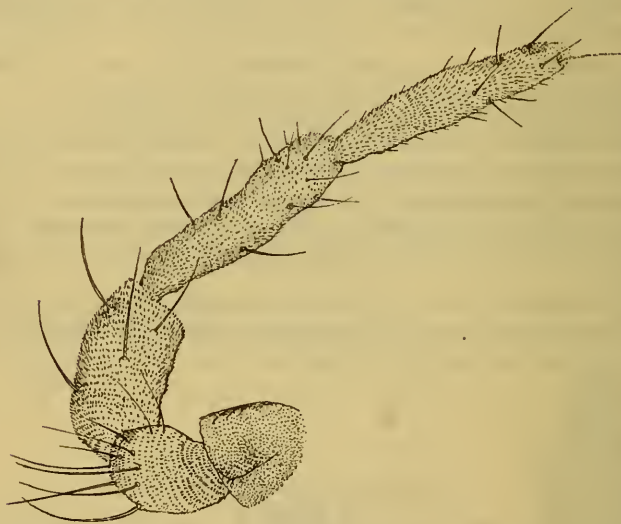


Fig. 28 *Obolodiplosis robiniae*: palpus of male (enlarged, original)

ish transparent basally, reddish fuscous apically. Legs nearly uniform dark straw, lighter ventrally; claws (fig. 27*c*) strongly curved, simple. Genitalia; basal clasp segment short, stout; terminal clasp segment swollen at the base and the apical fourth, greatly prolonged. Dorsal plate broad, the lobes deeply incised and broadly rounded laterally, and somewhat resembling a pair of wings (pl. 17, fig. 2); ventral plate apparently divided, the lobes short, subtriangular, widely separated; style stout, tapering from the distal third, narrowly rounded.

Female. Length 3 mm. Antennae extending to the third abdominal segment, sparsely haired, fuscous yellowish; fourteen segments, the fifth cylindrical, with a stem about one-fourth the length

of the cylindric basal enlargement, which latter has a length three and one-half times its diameter; terminal segment subcylindric, the basal portion with a length three times its diameter. Apically there is a stout, knoblike projection. Palpi; first segment subquadrate, the second narrowly oval, with a length about twice its diameter, the third a little longer, more slender, the fourth one-half longer than the third, somewhat dilated apically. Mesonotum dark brown, the submedian lines rather thickly haired. Scutellum reddish brown, postscutellum yellowish brown. Abdomen sparsely haired, reddish yellow distally. Ovipositor short, the terminal lobes narrowly oval, with a length a little over twice the diameter. Other characters nearly as in the male.

Several parasites have been reared from this insect, some of which are of considerable importance. Professor Washburn reared a Peteromaline which Washington authorities stated apparently represented an undescribed genus.

RETINODIPLOSIS Kieff.

- 1912 Kieffer, J. J. Neue Gallmucken-Gattungen, Bitsch, p. 1
 1913 ———— Genera Insectorum Fasc. 152, p. 220
 1915 Felt, E. P. Econ. Ent. Jour., 8:408

The species referred to this genus represent a homogeneous group of mostly closely allied species which are rather easily recognized by the dark-red or reddish brown color in connection with the short, almost transverse basal stems of the flagellate antennal segments, the rather long, broad distal enlargements, the fine, many-looped circumfila and the rather heavy genitalia, the two plates being usually deeply bilobed.

The larvae of the pitch-inhabiting forms are most easily recognized by the bilobed posterior extremity, the apex of each lobe being fuscous, heavily chitinized and strongly spined, an adaptation which permits the larva to extend its anal spiracles, located in these lobes, through the surface of the viscous resin it inhabits. The generic type is *Cecidomyia resinicola* O. S. A somewhat anomalous, though closely allied species, *R. taxodii* Felt, has been tentatively referred to this genus.

Key to Species

- a* Basal stem of the fifth antennal segment in the male with a length greater than its diameter
b Abdomen light yellowish brown, length 2 mm, the fifth antennal segment having the stems each with a length one-half greater than its diameter.
 Reared from pitch masses on hard pine.....
resinicola O. S., C. a185, a1930

- bb* Abdomen deep red, length 2 mm, the fifth antennal segment having the stems with a length one and one-half and two and one-fourth times their diameters, respectively. Reared from deformed Bald Cypress seeds.
taxodii Felt, C. a2722
- aa* Basal stem of the fifth antennal segment of the male with a length not greater than its diameter
- b* Abdomen dark reddish brown, length 2.25 mm, fifth antennal segment with the stems one-half and as long as their diameters, respectively. Reared from subcortical twig swellings on hard pine.....
inopis O. S., C. a2284
- bb* Abdomen dark reddish brown, length 3 mm, fifth antennal segment having the stems with a length three-fourths and one and one-half times their diameters, respectively. Reared from pitch masses on Monterey pine
resinicoides Wlms., C. a1930
- bbb* Abdomen dark reddish brown, length 3.5 mm, fifth antennal segment having the stems with a length as long and one-half longer than their diameters, respectively
- c* Legs a uniform brown. Reared from pitch masses on the long-leaved pine.....
palustris Felt, C. a2622
- cc* Legs narrowly annulate with white, the three distal tarsal segments of the posterior legs whitish. Reared from pitch masses on white pine.....
albitarsis Felt, a2917

Retinodiplosis resinicola O. S.

Pitch midge

- 1869 Sanborn, F. G. Boston Soc. Nat. Hist. Proc., 12:93 (Cecidomyia)
- 1870 Osten Sacken, R. Am. Ent. Soc. Trans., 3:345-45 (Diplosis)
- 1880 Comstock, J. H. U. S. Com'r Agric. Rep't, 1879, p. 256-57 (Diplosis)
- 1890 Packard, A. S. U. S. Ent. Com'r 5th Rep't, p. 797-98 (Diplosis)
- 1891 Townsend, C. H. T. Ent. Soc. Wash. Proc., 2:389-90 (Diplosis)
- 1892 Doran, E. W. Insect Life, 5:212 (Diplosis)
- 1893 Hopkins, A. D. W. Va. Agric. Expt. Sta. Bul., 32:238 (Diplosis)
- 1895 Comstock, J. A. Manual for the Study of Insects, p. 447-48 (Diplosis)
- 1897 Mik, Joseph Wien. Ent. Ziet., 16:290-92 (Cecidomyia)
- 1901 Howard, L. O. Insect Book, p. 114 (Diplosis)
- 1903 Eckel, L. S. Ent. News, 14:279-84 (Diplosis)
- 1903 Felt, E. P. Forest, Fish & Game Com. 7th Rep't, p. 505 (Diplosis)
- 1906 Felt, E. P. Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:340, 410-13, 424 (Cecidomyia)
- 1908 ——— N. Y. State Mus. Bul. 124, p. 414 (Cecidomyia)
- 1909 ——— Ent. Soc. Ont., 39th Rep't, p. 45 (Cecidomyia)
- 1911 ——— Econ. Ent. Jour., 4:465 (Itonida)
- 1912 ——— N. Y. Ent. Soc. Jour., 20:247-48 (Itonida)
- 1912 Kieffer, J. J. Neue Gallm.-Gatt., p. 1 (Retinodiplosis proposed)
- 1918 Felt, E. P., N. Y. State Mus. Bul. 200, p. 16

The peculiar, whitish masses of pitch (fig. 29) caused by this species are easily recognized. They may hang from the underside of the limbs and occasionally occur in considerable numbers on the trunk of pitch pine. There is frequently a dripping of the pitch in warm weather.

Observations by Miss Eckel show that the bright orange larvae are arranged radially about the equator of a spherical pitch drop. The eggs are deposited only on fresh pitch and never on twigs or leaves, the insect apparently taking advantage of fresh exudations and, as a rule, finding them in abundance. The young larvae grow rapidly and in the early stages have hooklike spines on the ventral surface of each segment. These disappear and the entire skin is covered with fine, backward curving spines. We reared adults the latter part of June and in early October from material which was supposed to represent only the work of the pine twig moth, *Evetria comstockiana* Fern. The normal pitch mass inhabited by this midge may contain from two to thirty larvae which, when full grown, are about 6 mm in length. The pupa works its way partly out of the pitch mass before the appearance of the midge.

Male. Length 2 mm. Antennae about as long as the body, thickly haired, dark brown; fourteen segments, the fifth with stems each one-half longer than the diameter; terminal segment, distal enlargement prolonged, apically a slender, fingerlike appendage. Palpi; the first segment short, stout, slightly swollen distally, the second nearly three times the length of the first, subrectangular, the third a little shorter and more slender than the second, the fourth a little longer and more slender than the third; face light brown. Mesonotum light brown, the submedian lines lighter and thickly clothed with yellowish setae; posterior median area yellowish; scutellum yellowish brown with sparse apical setae, postscutellum yellowish. Abdomen rather thickly clothed with fine setae, light yellowish brown, darker basally, genitalia yellowish. Wings hyaline, costa light brown; halteres yellowish basally, slightly fuscous apically. Legs a nearly uniform light brown, the pulvilli longer than the claws, the latter long, slender, strongly curved apically. Genitalia; dorsal plate short, broad, deeply and triangularly incised, the lobes



Fig. 29 *Retinodiplosis resinicola*, twig showing typical pitch exudations inhabited by larvae

internally with a notch at the basal third, narrowly rounded; ventral plate rather long, broad, deeply and broadly emarginate, the lobes widely separated, narrowly rounded; style short, stout, broadly rounded.

Female. Length 3 to 4 mm. Antennae nearly as long as the body, sparsely haired, fuscous yellowish; fourteen segments, the fifth with a stem about one-third the length of the subcylindric basal enlargement, which latter has a length twice its diameter; terminal segment produced, with a length three times its diameter and apically with a short, stout process swollen basally. Palpi; first segment subquadrate, the second a little longer, stouter, the third fully twice the length of the second, rather stout, the fourth as long as the third. Mesonotum dark brown, the submedian lines fuscous yellowish. Scutellum and postscutellum fuscous yellowish. Abdomen dark reddish. Halteres yellowish transparent. Legs fuscous yellowish. Ovipositor short, the terminal lobes narrowly oval, with a length twice the width. Otherwise nearly as in the male.

Described from females reared from resin masses on hard pine in association with a male, which latter compared very closely with Osten Sacken's type in the Museum of Comparative Zoology. This female is not readily separated from that of *Retinodiplosis inopis* O. S., though the latter, judging from specimens reared in the bureau of entomology at Washington, is a larger and darker form and differs from the species under consideration by deserting the pitch prior to pupation.

Parasites. This little insect in spite of its passing a large portion of its existence within pitch masses, is subject to parasitic attack. Miss Eckel, referred to above, has succeeded in rearing three species, as follows: *Syntasis diplosidis* Eckel, *Polygnotus pinicola* Ashm., and another belonging to the genus *Eupelmus*.

This midge can hardly be considered of much economic importance, yet we have observed trees which were seriously weakened by an excessive flow of pitch inhabited largely by the larvae of this species, and we are therefore inclined to believe that in such cases the flow caused by the larvae may seriously weaken a tree.

***Retinodiplosis taxodii* Felt**

1916 Felt, E. P. Ent. News, 27:415-17

1918 ——— N. Y. State Mus. Bul. 200, p. 19

A number of midges tentatively referred to this genus were reared April 27, 1916, by George W. Barber, Charleston, Mo., from cones of bald cypress, *Taxodium distichum*, the larvae occurring in thick-walled somewhat spongy monothalamous galls 5 to 7

mm in diameter and tightly packed in the cones. The galls are evidently modified or aborted seeds.

Retinodiplosis inopis O. S.

- 1862 **Osten Sacken, C. R.** Mon. Dipt. Am., 1:196-97 (*Cecidomyia*)
 1890 **Packard, A. S.** U. S. Ent. Comm., 5th Rep't, p. 800 (*Diplosis*)
 1891 **Riley, C. V. & Howard, L. O.** Insect Life, 4:126 (*Polygnotus pini-*
cola Ashm. reared)
 1906 **Felt, E. P.** N. Y. State Mus. Mem. 8, 2:752 (*Cecidomyia*)
 1910 **Smith, J. B.** Insects N. J. List, p. 732 (*Cecidomyia*)
 1911 **Felt, E. P.** Econ. Ent. Jour., 4:465 (*Cecidomyia*)
 1912 ——— Econ. Ent. Jour., 5:368-69 (*Itonida*)
 1913 ——— Econ. Ent. Jour., 6:331 (*Itonida*)
 1918 ——— N. Y. State Mus. Bul. 200, p. 15

This midge produces obscure subcortical swellings (fig. 30a) in the smaller branches of the scrub pine, *Pinus rigida* and *P. virginiana*, spins cocoons on branches and needles (figs. 30b, c) and occasionally becomes very abundant and somewhat injurious. The midges issue the latter part of May or early in June. This

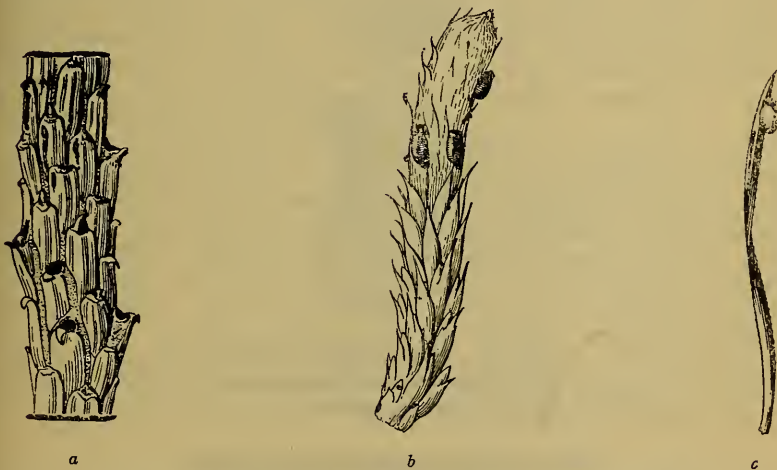


Fig. 30 *Retinodiplosis inopis*: a, swollen shoot showing two exit holes; b, young shoot bearing three cocoons; c, Pine needle bearing one cocoon

species approaches the pitch midge, *Retinodiplosis resinicola* O. S., from which it may be distinguished by its larger size, darker color and the shorter antennal stems of the male. The distal three antennal segments of the females are illustrated in figure 31. It is somewhat smaller than the western pitch midge, *R. resinicoloides* Wlms., a form easily separated by structural

characteristics. There is a difference in habit as well as color in the European *Itonida pini* DeG. All stages have been described by the writer (see the above citation).

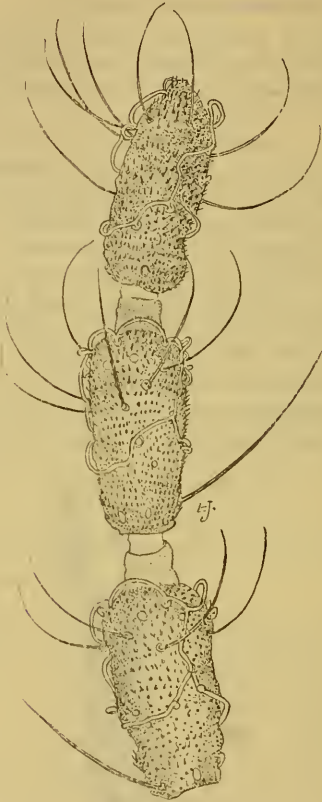


Fig. 31 *Retinodiplosis inopis*,
distal three antennal segments of
female (enlarged, original)

***Retinodiplosis resinicoloides* Wlms.**

- 1909 Williams, F. X. Ent. News, 20: 1-8 (*Cecidomyia*)
 1910 ——— Ent. Soc. Am., Ann., 3: 45-56 (*Cecidomyia*)
 1911 Felt, E. P. Econ. Ent. Jour., 4: 465 (*Itonida*)
 1918 ——— N. Y. State Mus. Bul. 200, p. 16

This species, evidently closely allied to *Retinodiplosis resinicola* O. S., occurs in California in the resinous exudations of the Monterey pine, *Pinus radiata*.

The midges, according to the observations of Mr Williams, were abroad in March, adults being plentiful in April. The soft, oblong

orange-colored eggs are deposited in fissures at the base of rather soft, whitish resin lumps. Late in May exuviae showed that many adults had escaped while a few eggs were to be found. Infestation is most likely to occur in places where limbs have been sawed off, or in crevices filled with pitch. The larvae, prior to transformation, make a thin, papery cocoon, probably spinning in the same way as has been observed in *Lasioptera*.

Male. Length 3 mm. Antennae about as long as the body, thickly haired, dark brown; fourteen segments, the fifth with stems three-fourths and one and one-half times their diameters; terminal segment, distal enlargement produced, with a length over twice its diameter, constricted near the basal third and with a long, tapering process apically, the latter with a length fully twice its diameter. Palpi; the first segment short, stout, subquadrate, the second rectangular, with a length more than three times its diameter, the third a little longer, more slender, the fourth as long as the third, more slender. Mesonotum dull dark brown, the submedian lines sparsely haired. Scutellum reddish brown, postscutellum yellowish brown. Abdomen a dark yellowish brown; genitalia fuscous. Wings hyaline, costa pale brown; halteres pale yellowish. Coxae reddish brown, femora and tibiae yellowish brown, the tarsi slightly darker; claws long, stout, evenly curved, the pulvilli longer than the claws. Genitalia; dorsal plate short, broad, broadly and roundly emarginate, the lobes widely separated, narrowly rounded; ventral plate short, broad, scarcely tapering, broadly and roundly emarginate; style short, stout, narrowly rounded.

Female. Length 3.5 mm. Antennae nearly as long as the body, thickly haired, dark brown; fourteen segments, the fifth with a stem one-fourth the length of the cylindrical basal enlargement, which latter has a length about three times its diameter; terminal segment hardly produced, with a length about three times its diameter and apically with a rather long, tapering process; halteres yellowish basally, fuscous apically. Coxae dark brown, the femora and tibiae yellowish brown, darker apically, tarsi mostly dark brown. Ovipositor about one-third the length of the abdomen, the terminal lobes slender, narrowly oval, with a length fully three times the diameter. Otherwise nearly as in the male. Described from cotypes. Cecid. a1930.

***Retinodiplosis palustris* Felt**

1915 Felt, E. P. Econ. Ent. Jour., 8:408-9

1918 ——— N. Y. State Mus. Bul. 200, p. 16

This species was reared May 20, 1915, from pitch on twigs of the long-leaved pine collected by Dr J. J. Davis at Talladega, Ala. It is closely related to *R. resinicoloides* Wlms., from which it may be separated by the longer basal portion of the stem of the fifth antennal segment and the distinctly greater emargination of the ventral plate.

Retinodiplosis albitarsis Felt

1918 Felt, E. P. Econ. Ent., Jour., 11:383-84

1918 ——— N. Y. State Mus. Bul. 200, p 16

Both sexes of this midge were reared in June 1918 from a white pine branch infested with *Parharmonia pini* Kell., the



Fig. 32 *Retinodiplosis albitarsis*. Posterior extremity of larva showing the chitinized, spined tubercles which protect the posterior spiracles.

exuded pitch masses being inhabited by larvae of this species apparently associated with those of *Mycodiplosis packardii*



Fig. 33 *Retinodiplosis albitarsis*. Lateral aspect of dorsum of first and second abdominal segments of larva, showing the median, partly divided tubercle of the first segment and the more deeply divided one of the second segment.

Felt. This species is easily recognized by the narrow white annulations on the legs and the three white distal segments of the posterior tarsi.

PARALLELODIPLOSIS Rubs.1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 411 (as *Clinodiplosis* Kieff.)

1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:287;

— 16:120

- aa* Ventral plate long, slender, tapering distally
- b* Dorsal plate rather long, triangularly emarginate, the lobes long and narrowly triangular
- c* Abdomen pale yellowish or carmine, length 1 mm; fifth antennal segment having the stems with a length two and one-half and four times the diameters, respectively. *triangularis* Felt, C. 428, 499
- aaa* Ventral plate long, rather stout, broadly rounded apically
- b* Dorsal plate short, the lobes truncate
- c* Abdomen dark red, the segments margined with fuscous, length 1 mm; fifth antennal segment having the stems with a length two and one-fourth and four times the diameters, respectively, trinodose. *subtruncata* Felt, C. 506
- cc* Abdomen fuscous brown, length 1 mm; fifth antennal segment having the stems with a length one and one-half and three times the diameters, respectively. *montana* Felt, C. 631
- ccc* Abdomen yellowish brown, length 1 mm; fifth antennal segment having the stems with a length twice and two and one-half times the diameters respectively *cinctipes* Felt, C. 1522
- aaaa* Ventral plate long, emarginate
- b* Ventral plate tapering distally, roundly emarginate
- c* Dorsal plate short, roundly emarginate, the fifth antennal segment having the stems with a length one and one-half and two and one-half times the diameters respectively; reared from roots of *Cattleya gigas*. *cattleyae* Moll., C. 979
- cc* Dorsal plate short, narrowly and triangularly emarginate, the lobes produced laterally; abdomen yellowish, length 1 mm; fifth antennal segment having the stems with a length two and one-half and three and one-half times the diameters respectively. *rubisolita* Felt, C. 656
- ccc* Abdomen pale yellowish, length 1 mm. Reared from oak bark. *corticis* Felt, C. 1075
- bb* Ventral plate long, slender, broadly emarginate
- c* Dorsal plate triangularly emarginate, the lobes truncate
- d* Abdomen reddish brown, length .75 mm; fifth antennal segment having the stems with a length three and four times the diameters respectively. *extensa* Felt, C. 228
- bbb* Ventral plate long, broad, scarcely tapering, very broadly emarginate
- c* Dorsal plate short, triangularly emarginate, the lobes truncate
- d* Abdomen a fuscous reddish brown, length 1.5 mm; fifth antennal segment having the stems equal, each with a length three and one-half times its diameter; the lobes of the dorsal plate roundly truncate. *pratensis* Felt, C. 741
- dd* Abdomen fuscous yellowish, fifth antennal segment having the stems with a length two and one-half and three and one-half times the diameters respectively; the lobes of the dorsal plate broadly emarginate; reared from bud gall on spirea. *clarkeae* Felt, C. a2074

ddd Abdomen reddish brown, length 1.25 mm; fifth antennal segment having the stems with a length one and one-half and two and one-half times the diameters respectively.....

carpini Felt, C. 347

Parallelodiplosis rubrascuta Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 142-43; separate, p. 46 (*Cecidomyia*)

1908 ——— N. Y. State Mus. Bul. 124, p. 411 (*Clinodiplosis*)

The dark-red male was taken June 1, 1906 on ash, *Fraxinus*, at Albany, N. Y.

Male. Length .75 mm. Antennae about twice the length of the body, thickly haired, yellowish brown; fourteen segments, the fifth with stems one and two times their diameters respectively; terminal segment, the distal enlargement thickened, slightly prolonged and a tapering, fingerlike apex. Palpi; the first segment short, irregularly subquadrate, the second twice the length of the first, rather stout, the third one-fourth longer than the second, slender, the fourth about as long as the third, more slender, face dark brown. Mesonotum with the anterior median and posterior sublateral lobes dark brown, the intermediate spaces lighter. Scutellum reddish brown, postscutellum dark brown. Abdomen dark brown, sparsely clothed with yellowish hairs. Wings (pl. 15, fig. 3) hyaline, costa light brown; halteres yellowish transparent. Legs slightly variable, pale straw color, femora somewhat darker apically; claws slender, strongly curved. Genitalia (pl. 20, fig. 3); dorsal plate broad, deeply and narrowly incised, the lobes moderately well separated, tapering, the external posterior angle slightly produced, the submedian posterior margin truncate, each lobe with several large, stout setae; ventral plate very long, slender, broadly rounded; style long, slender, acutely rounded. Type *Cecid.* 93.

Parallelodiplosis florida Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 411 (*Clinodiplosis*)

1918 ——— N. Y. State Mus. Bul. 200, p. 82

This yellowish brown male was reared January 24, 1883 from leaf galls on the round-leaved scrub oak, *Quercus*, at Georgiana, Fla. The living insect, according to Pergande, is orange-colored, the antennae dusky and the mesonotum with a broad, black stripe, the posterior margin of the abdomen somewhat brownish.

Gall. Pocketlike swellings along the midrib, grayish yellow in color and each containing one or two orange-colored larvae.

Male. Length 1 mm. Antennae nearly twice the length of the body, thickly haired, pale yellowish; fourteen segments, the fifth with stems one and one-half and two times their diameters, respectively; terminal segment, distal enlargement produced, subconical, with a length nearly three times its diameter, tapering to a short,

slender, narrowly rounded apex. Palpi missing. Mesonotum reddish brown, the yellowish submedian lines sparsely haired. Scutellum yellowish, postscutellum yellowish orange. Abdomen thickly haired, yellowish brown; genitalia yellowish. Wings hyaline, costa dark brown. Halteres pale yellowish. Coxae mostly a yellowish straw, the distal tarsal segments on the anterior and mid legs reddish brown; claws long, slender, evenly curved, the pulvilli about as long as the claws. Genitalia; dorsal plate short, stout, deeply and triangularly incised, the lobes somewhat divergent, roundly emarginate, the lateral angles somewhat produced, each posterior angle with a long, stout seta; ventral plate long, slender, narrowly rounded; style long, rather stout, narrowly rounded. Type, Cecid. 978.

Parallelodiplosis spirae Felt

1909 Felt, E. P. Econ. Ent. Jour., 2:293 (Clinodiplosis)

1918 ——— N. Y. State Mus. Bul. 200, p. 134

The pale yellowish midge with the extremity of the abdomen deep orange was reared the latter part of July and early in August from a variable yellowish or reddish, marginal roll occurring on the half-grown leaves of *Spiraea salicifolia* taken by Cora H. Clarke June 26, 1909 at Magnolia, Mass. This gall was observed in Albany June 5, 1908.



Fig. 34 *Parallelodiplosis spirae*, leaf rolls on *Spiraea* (original)

The galls (fig. 34) are very variable, yellowish or reddish, marginal leaf rolls some 3 mm long on the young leaves of *Spiraea salicifolia* and frequently assuming such fantastic shapes as to lead Miss Clarke to designate the deformity as a ram's horn or Vienna crescent gall.

Larva. Length 2.5 mm, yellowish. Head small, antennae rather long, tapering. Breastbone irregularly bidentate and consisting simply of a rather weakly chitinized, somewhat expanded anterior portion, the posterior part obsolete. Skin nearly smooth, the posterior extremity broadly rounded and finely shagreened.

Male. Length 1 mm. Antennae one-half longer than the body, thickly haired, reddish brown; fourteen segments, the fifth with stems two and two and one-half times their diameters respectively; terminal segment produced, the distal enlargement cylindrical, with a length nearly three times its diameter and an irregular, fingerlike process apically. Palpi; the first segment short, irregular, the second with a length three times its diameter, tapering slightly, the third as long as the second, more slender, the fourth a little longer and more slender than the third. Mesonotum reddish brown, the submedian lines sparsely haired. Scutellum yellowish red, postscutellum fuscous. Abdomen yellowish with deep orange extremities, the segments margined posteriorly with dark chitin and with rudi-

mentary lateral bands at the posterior third. Genitalia yellowish. Wings hyaline, costa fuscous yellowish. Halteres whitish basally, pale yellowish apically. Coxae and femora basally pale yellowish, remainder of the legs fuscous yellowish; claws long, slightly curved, the pulvilli rudimentary. Genitalia; dorsal plate short, broad, deeply and narrowly emarginate, the lobes broadly and roundly emarginate, the lateral angles slightly produced, setose; ventral plate long, slender, tapering slightly, narrowly rounded; style long, stout, narrowly rounded.

Female. Length 1.25 mm. Antennae nearly as long as the body, sparsely haired, dark brown, yellowish basally; fourteen segments, the fifth with a stem one-third the length of the cylindrical basal enlargement, which latter has a length three times its diameter, and is slightly constricted near the basal third; terminal segment produced, cylindrical, with a length four times its diameter and apically with a short, fingerlike projection. Palpi; long, yellowish, the first segment short, subquadrate, the second with a length three times its diameter, the third a little longer, more slender, the fourth one-fourth longer than the third, more slender. Mesonotum dark reddish brown, the submedian lines yellowish, sparsely haired. Scutellum yellowish brown, postscutellum yellowish. Abdomen sparsely haired, yellowish, the extremities reddish brown; the segments margined posteriorly with a narrow fuscous sclerite and with a rudimentary one near the middle laterally. Wings hyaline, costa dark brown. Halteres whitish basally, light fuscous apically. Coxae and femora basally yellowish, the distal portion of femora, tibiae and tarsi mostly dark brown; claws slender, slightly curved, the pulvilli rudimentary; ovipositor short, yellowish, the lobes extremely slender, with a length seven times their width. Type Cecid. a1838.

Parallelodiplosis acernea Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 143; separate, p. 46-47 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 411 (Clinodiplosis)

1915 ——— N. Y. State Mus. Bul. 175, pl. 2, fig. 12

1918 ——— N. Y. State Mus. Bul. 200, p. 150

This pale orange male was taken June 14, 1906 on red maple, *Acer rubrum*, at Nassau, N. Y.

Male. Length 1.5 mm. Antennae one-fourth longer than the body, rather thickly haired, light brown, yellowish basally; fourteen slightly trinodose segments, the fifth with stems two and two and one-half times their diameters, respectively; terminal segment, distal enlargement greatly produced, subcylindric and with an apical spindle-shaped appendage about three-fourths as long. Palpi; the first segment subrectangular, the second nearly twice the length of the first, rounded at the extremities, the third and fourth, each successively a little longer, more slender than the third; face pale yellowish, eyes large, black. Mesonotum dark brown, submedian lines pale yellowish, sparsely ornamented with fine setae. Scutellum

somewhat fuscous yellowish with sparse apical setae, postscutellum and abdomen pale orange, the latter slightly tinged dorsally with fuscous and rather sparsely clothed with fine, whitish hairs, genitalia pale orange. Wings (pl. 15, fig. 5) hyaline, costa light brown; halteres yellowish transparent. Legs nearly uniform pale straw tarsi somewhat darker; claws rather short, stout, gently curved. Genitalia; dorsal plate broad, short, deeply and narrowly incised, the lobes approximate, subtruncate, the latero-posterior angles produced, broadly rounded, the distal margin with several long, stout setae; ventral plate very long, slender, narrowly rounded; style stout, long, narrowly rounded.

Female. Length 1.5 mm. Antennae nearly as long as the body, sparsely haired, fuscous straw; fourteen segments, the fifth with a stem one-third the length of the cylindrical basal enlargement, which latter has a length about three times its diameter; terminal segment produced, with a length four times its diameter and apically with a long, fingerlike process. Palpi; first segment irregular, second narrowly oval, the third one-half longer, more slender, the fourth a little longer and more slender than the third; face fuscous yellowish. Mesonotum yellowish brown, the submedian lines sparsely haired. Scutellum and postscutellum pale yellowish. Abdomen reddish orange, sparsely setose. Costa dark brown. Halteres pale yellowish, slightly fuscous subapically. Coxae and femora basally yellowish transparent, the distal portion of femora, tibiae and tarsi mostly a light fuscous; claws stout, evenly curved, the pulvilli about half the length of the claws. Ovipositor about two-thirds the length of the abdomen, the terminal lobes narrowly elliptical, with a length fully four times the width. Type Cecid. 267.

Reared August 16, 1910 from a jar containing numerous chokecherries deformed by *Contarinia virginianiae* Felt.

Parallelodiplosis caryae Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 141-42; separate p. 45 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 411 (Clinodiplosis)

1909 ——— Econ. Ent. Jour., 2:293 (Clinodiplosis)

1918 ——— N. Y. State Mus. Bul. 200, p. 47

This insect was first taken on hickory at Albany, June 19, 1906, females being captured the 22d. The correctness of our associating this species with hickory is shown by its having been reared from a hickory leaf gall by the late Dr M. T. Thompson and subsequently in this office. The adults undoubtedly fly in early June and apparently they occur in at least two kinds of galls, possibly as inquilines.

Gall. The species was reared by Doctor Thompson from a deformity which he characterizes as the most curious gall he ever found. It appears first as a brownish blistered area on the leaf with

a slight central point and as it develops the circular cap is lifted up and borne on the top of the gall. At this stage the gall is hemispheric, attached to the leaf by a point on its convex under surface, while the flat top is covered with an epithelial plate. The rim of the gall is slightly raised, forming a low wall around the upper area. Many of the galls never develop further, while the rims on others continue to grow at several points until the upgrowths, bend inward, meet and inclose a sort of upper chamber above the real top of the gall. This latter is empty, as the larva lives in the large cavity beneath.

Three females of this species were reared by us May 15 and 17, 1909 from a globular, thin-walled, monothalamous, long-haired, hickory leaf gall much resembling the typical *C. persicoides* gall.

Exuvium. Length 2 mm, whitish, slender; antennal cases long, slender, acute apically, the internal basal angle somewhat slightly chitinized; cephalic horns long, slender. Wing cases extending to the fifth abdominal segment, the leg cases to the apex of the abdomen; dorsum of the abdomen with the segments margined posteriorly with an irregular row of stout, simple or compound spines, the remainder of the surface being mostly dotted with fine, chitinous points.

Male. Length 2.5 mm. Antennae one-fourth longer than the body, sparsely haired, light brown; fourteen segments, the third to the fourteenth trinodose, the fifth with stems one and one-fourth and three and one-half times their diameters respectively; terminal segment, distal enlargement with a length three times its diameter and a long, tapering, fingerlike appendage distally. Palpi; first segment short, subquadrate, the second one-half longer, stout, the third one-half longer than the second, more slender, the fourth a little longer than the third. Mesonotum brown, yellowish at the apex. Scutellum reddish. Abdomen yellow, the segments margined posteriorly with dark brown and with a short, transverse brown line near the middle. Wings (pl. 15, fig. 6) hyaline, costa dark brown; halteres yellowish. Legs yellowish basally, the tibiae and tarsi brown; claws long, strongly curved distally, the pulvilli rudimentary. Genitalia (pl. 17, fig. 1); dorsal plate short, broad, deeply and narrowly incised, the lobes obliquely truncate; ventral plate long, tapering slightly, a narrowly rounded apex; style long, slender, acute.

Female. Length 2.25 mm. Antennae as long as the body, rather thickly haired, dark brown; fourteen segments, the fifth binodose, the irregular stems two and two and one-half times their diameters, respectively; basal enlargement narrowly oval and with an irregular double whorl of long, stout setae; distal enlargement produced, expanded apically, with a length twice its diameter and low circumfila basally and apically. There is also a scattering whorl of slender setae. Distal segments cylindrical, with a short stem, the fourteenth

with a long, fingerlike appendage apically and a broad band of slender, strongly curved setae. Palpi yellowish, the first segment rather long, stout, the second one-half longer, stout, the third one-fourth longer than the second, slender, the fourth a little longer than the third, slender. Mesonotum shining dark brown, the broad, yellowish submedian lines and posterior median area yellowish, the former sparsely haired. Scutellum pale orange, postscutellum yellowish. Abdomen yellowish orange, the segments margined posteriorly with brown chitin and near the middle a rudimentary band of the same, the latter with submedian interruptions, the sixth segment mostly brown. Wings hyaline, costa dark brown. Halteres pale orange, slightly fuscous subapically. Coxae and femora mostly yellowish, tibiae and tarsi a variable dark brown, the latter somewhat lighter; claws long, slender, irregularly curved, the pulvilli rudimentary. Ovipositor one-half the length of the abdomen, stout, the terminal lobes slender, with a length six times their width. Type Cecid. 331.

Parallelodiplosis coryli Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 142; separate, p. 46 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 411 (Clinodiplosis)

This pale orange male was taken June 11, 1906 on hazel, *Corylus americanus*, at Albany, N. Y.

Male. Length 1.5 mm. Antennae a little longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems one and one-half and two times their diameters, respectively; terminal segment, distal enlargement greatly prolonged, subcylindric apically a spindle-shaped, thickly haired appendage. Palpi, the first segment irregularly subquadrate, the second twice the length of the first, slightly swollen at the basal third, the third about as long as the second, more slender, the fourth a little longer than the third and much more slender; face sooty yellow. Mesonotum dark brown, dark reddish laterally, submedian lines yellowish, ornamented with fine setae. Scutellum reddish basally, slightly fuscous apically, sparsely setose, postscutellum dark yellowish. Abdomen pale yellowish orange, sparsely clothed with fine, yellowish hairs, each segment narrowly margined with fuscous posteriorly and with short, dark, transverse lines on each side just behind the middle. Wings hyaline, costa dark brown; halteres whitish transparent basally, yellowish apically. Coxae and basal portion of femora pale straw yellow, the other parts of the legs nearly uniform sooty yellowish or brownish; claws slender, evenly curved. Genitalia; dorsal plate broad, deeply and narrowly incised, the lobes roundly truncate, the lateral angles prolonged, narrowly rounded; ventral plate long, slender, broadly rounded; style long, slender, narrowly rounded. Type Cecid. 216.

Parallelodiplosis triangularis Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 411 (Clinodiplosis)

The light-brown males of this species were taken July 2 and 6, 1906, at Nassau, N. Y.

Male. Length 1 mm. Antennae one-fourth longer than the body, thickly haired, light brown, fuscous basally; fourteen segments, the fifth with stems each two and one-half times their diameters; terminal segment, distal enlargement produced, subcylindric and with a spindle-shaped appendage. Palpi; the first segment subquadrate, the second long, rather broad, the third a little shorter, more slender, the fourth one-fourth longer than the second, more slender. Face fuscous. Mesonotum dark brown, submedian lines pale yellow. Scutellum fuscous yellowish, postscutellum light brown. Abdomen light brown; terminal segments yellowish, thickly haired. Wings hyaline, costa light brown. Genitalia; dorsal plate broad, deeply and triangularly incised, the lobes narrowly triangular; ventral plate long, slender, truncate; style stout at the base, long, tapering, constricted subapically. Type Cecid. 428.

Parallelodiplosis subtruncata Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 140; separate, p. 44 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 412 (Clinodiplosis)

This dark-red form was taken at Albany, N. Y., July 6, 1906 while collecting on goldenrod or *Solidago* and aster.

Male. Length 1 mm. Antennae one-half longer than the body, thickly haired, dark brown, fuscous yellowish basally; fourteen segments, the fifth with stems two and one-half and four times their diameters; terminal segment, distal enlargement prolonged, subcylindric, tapering to a spindle-shaped appendage. Palpi; the first segment rather short, irregularly rectangular, the second more than twice the length of the preceding, stout, tapering slightly distally, the third as long as the second, more slender, subfusiform, the fourth a little longer, more slender; face fuscous yellowish. Mesonotum dark brown, submedian lines yellow, uniting posteriorly in a median yellowish area. Scutellum dark red, postscutellum yellowish. Abdomen dark red, the segments margined posteriorly with fuscous, sparsely clothed with pale setae. Wings hyaline, costa light brown; halteres yellowish. Coxae and basal portion of femora pale yellowish, remainder of femora, tibiae and basal segment of tarsi fuscous brown, 3 distal segments yellowish, variably tinged with carmine; claws rather stout, strongly curved. Genitalia (pl. 20, fig. 7); dorsal plate short, broad, deeply, narrowly and roundly emarginate, the lobes well separated, the sublateral margin obliquely truncate, the submedian truncate; ventral plate narrow, long, tapering, irregularly truncate; style long, stout, narrowly rounded. Type Cecid. 506.

Parallelodiplosis montana Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 412 (Clinodiplosis)

This fuscous brown male was taken July 20, 1906 sweeping grasses and sedges at Newport, N. Y.

Male. Length 2 mm. Antennae probably longer than the body, thickly haired, dark brown; fourteen segments, the fifth with stems one and one-half and three times their diameters, respectively. Palpi; the first segment subquadrate, second with a length three times its width, tapering distally, the third a little longer than the second, more slender, the fourth longer and more slender than the third. Mesonotum dark brown, submedian lines indistinct, scutellum yellowish brown; postscutellum and abdomen fuscous brown, the latter thickly setose; genitalia yellowish. Wings hyaline, costa yellowish brown; halteres pale yellowish. Legs mostly dark brown; claws long, slender, evenly curved, the pulvilli about half the length of the claws. Genitalia; dorsal plate short, deeply and narrowly incised, the lobes obliquely truncate; ventral plate long, truncate; style long, tapering. Type Cecid. 631.

Parallelodiplosis cinctipes Felt

1914 Felt, E. P. Psyche 20:113

This midge was reared by Mr C. A. Frost, Framingham, Mass. in May 1908 from dead twigs of *Rhus vernix*.

Parallelodiplosis cattleyae Moll.

1891 Riley, C. V. & Howard, L. O. Insect Life 3:22 (Diplosis)

1902 Molliard, Marin. Marcellia, 1:165-71 (Cecidomyia)

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 412 (Clinodiplosis)

1911 Theobald, F. V. Rep't Econ. Zool., p. 105-7 (Cecidomyia)

1918 ——— N. Y. State Mus. Bul. 200, p. 29

These reddish midges were reared May 20, 1890 from roots of *Cattleya gigas* received from A. P. Morse, South Natick, Mass., by the bureau of entomology, Washington, D. C.

Gall. There is no description of the deformity. The larvae appear to simply occur in the roots.

Larva. Yellow or pale orange with a brown breastbone.

Exuviae. Length 2.5 mm, whitish transparent. Antennal cases extending to the second thoracic segment, wing cases to the second abdominal segment; thoracic horns long, tapering. Dorsum of abdominal segments 1 to 7 with a short, transverse, irregularly double row of rather stout, triangular spines.

Male. Length 2 mm. Antennae probably nearly as long as the body, sparsely haired, black; fourteen segments, the fifth with stems having a length one and one-half and two and one-half times their diameters respectively. Palpi; the first segment probably quadrate, the second broadly oval, with a length one-half greater than its

diameter, the third longer, the fourth probably as long as the third. Color red, with a faint, dusky shade (Pergande). Wings hyaline, costa yellowish brown. Genitalia; dorsal plate short, roundly emarginate; ventral plate long, deeply and roundly emarginate, the lobes narrowly rounded; style long, slender, narrowly rounded.

Female. Length 2.5 mm. Antennae nearly as long as the body, sparsely haired, black; fourteen segments, the fifth with a stem three-fourths the length of the cylindrical basal enlargement, which latter has a length two and one-half times its diameter; terminal segment produced, the basal enlargement with a length three and one-half times its diameter, apically a fingerlike process. Palpi; first segment subquadrate, the second narrowly oval, with a length over twice its width, the third a little longer than the second, more slender, the fourth one-half longer than the third, dilated. Color black. Ovipositor short, the terminal lobes narrowly oval (Pergande) subacute. Cecid. 979.

Parallelodiplosis rubisolita Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 412 (Clinodiplosis)

This yellowish transparent male was taken July 24, 1906 on low blackberry, *Rubus villosus*, at Albany, N. Y.

Male. Length 2 mm. Antennae a little longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems two and one-half and three and one-half times their diameters, respectively; terminal segment, distal enlargement with a length twice its diameter and apically bearing a slender, fingerlike process. Palpi; first segment narrowly oval, the second slender, with a length four times its width, the third a little longer, more slender, the fourth as long as the third. Body a nearly uniform yellowish transparent. The hyaline wings with a yellowish cast. Legs yellowish, the distal tarsal segments light brown; claws slender, very strongly curved, the pulvilli shorter than the claws. Genitalia; dorsal plate short, deeply and triangularly incised, the lobes angularly truncate; ventral plate long, broadly and roundly emarginate, the lobes narrowly rounded; style long, slender. Type Cecid. 656.

Parallelodiplosis corticis Felt

1915 Felt, E. P. Econ. Ent. Jour., 8:407

1918 ——— N. Y. State Mus. Bul. 200, p. 54

This pale yellowish form was reared by the late Dr C. V. Riley from larvae occurring in oak bark. Nothing further is known concerning the life history of this species.

Parallelodiplosis extensa Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 412 (Clinodiplosis)

This reddish brown male was taken June 11, 1906 on locust, *Robinia pseudo-acacia*, at Albany, N. Y.

Male. Length .75 mm. Antennae fully twice as long as the body, thickly haired, pale brown; fourteen segments, the fifth with stems two and two and one-half times their diameters, respectively. Palpi; the first segment subrectangular, swollen distally, the second twice the length of the preceding, fusiform, the third a little shorter, more slender, the fourth a little longer than the third, stouter. Mesonotum rather dark brown, submedian lines with sparse setae. Scutellum yellowish brown. Abdomen somewhat variable reddish brown with the terminal segment and pleurae yellowish, rather thickly clothed with yellowish white hairs, specially laterally. Wings hyaline, costa light brown; halteres yellowish transparent. Legs a nearly uniform pale straw color with the articulations tinged with carmine; claws slender, strongly curved at the distal fourth. Genitalia; dorsal plate broad, deeply and triangularly incised, the lobes well separated, obliquely and irregularly truncate, the lateral angles and a slightly produced middle angle, each with a stout apical seta; ventral plate long, slender, broadly and triangularly emarginate, the lobes short, stout, obtuse; style long, slender, swollen at the distal fourth, narrowly rounded. Type Cecid. 228.

Parallelodiplosis pratensis Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 412 (Clinodiplosis)

This dark reddish brown male was taken August 6, 1906 on Pine, *Pinus strobus*, at Albany, N. Y.

Male. Length 1.5 mm. Antennae fully one-fourth longer than the body, thickly haired, dark brown; fourteen segments, the fifth with stems each with a length three and one-half times its diameter. Palpi; first segment subquadrate, the second one-half longer than the first, the third a little longer than the second, more slender, the fourth more slender and one-half longer than the third. Face fuscous. Mesonotum light brown, submedian lines fuscous yellowish. Scutellum reddish brown, postscutellum fuscous yellowish. Abdomen fuscous reddish brown, the segments margined posteriorly with fuscous. Genitalia fuscous yellowish. Wings hyaline, costa light brown. Halteres pale yellowish. Legs fuscous straw the distal tarsal segments lighter; claws stout, strongly curved. Genitalia; dorsal plate short, deeply incised, the lobes widely separated, roundly truncate; ventral plate long, narrow, slightly emarginate, the lobes broadly rounded; style long, slender, swollen at the basal and apical fourths, acutely rounded. Type Cecid. 741.

Parallelodiplosis carpini Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 135; separate, p. 38-39 (Clinodiplosis)

1908 ——— N. Y. State Mus. Bul. 124, p. 412 (Clinodiplosis)

This reddish brown male was taken June 21, 1906 on ironwood, *Carpinus caroliniana*, at Albany, N. Y.

Male. Length 1.25 mm. Antennae one-fourth longer than the body, thickly haired, light brown, fuscous yellowish basally; fourteen segments, the fifth with stems one and one-half and two and one-half times their diameters, respectively; terminal segment, the distal portion produced, subcylindric and with a long, slender, fusiform appendage. Palpi; first segment short, the second one-half longer, stout, the third a little longer and more slender than the second and the fourth longer than the third. Face fuscous yellowish. Mesonotum dark brown or black, the submedian lines pale, sparsely haired. Scutellum dark orange, sparsely setose apically, postscutellum fuscous orange. Abdomen reddish brown with the pleurae and terminal segments dark yellowish, rather thickly clothed with yellowish setae. Wings (pl. 15, fig. 7) subhyaline, costa dark brown; halteres yellowish transparent basally, slightly fuscous apically. Legs brownish, yellowish red basally, lighter ventrally; claws strongly curved. Genitalia; dorsal plate broad, deeply incised, the lobes broadly rounded; ventral plate long, narrow, slightly emarginate, the lateral angles produced as setose tubercles; style extending to the tip of the terminal clasp segment. Type Cecid. 347.

Parallelodiplosis clarkeae Felt

1911 Felt, E. P. Econ. Ent. Jour., 4:553-54

1918 ——— N. Y. State Mus. Bul. 200, p. 133

A number of the yellowish males and females were reared September 19, 1910 from a narrow, clustered, apical, bud gall on *Spiraea salicifolia* collected in August 1910 by Cora H. Clarke at Magnolia, Mass. This species appears most closely allied to *C. pratensis* Felt, though it is easily separated by the broadly emarginate lobes of the dorsal plate. It is possibly an inquiline.

Gall. Length 7 mm, diameter 3 mm. This appears to be somewhat intermediate in character between the chestnut burr gall and the ordinary bud gall observed upon this shrub. The aborted leaves in this gall are slender, numerous, somewhat approximate and present a superficial resemblance to the fringed or chestnut burr gall.

ITONIDA Meign.

Cecidomyia Meign.

Diplosis H. Lw., *Cryptodiplosis* Kieff.

1800 Meigen, J. W. Nouv. Class. des Mouches á deux Ailes, p. 19

1803 ——— Illiger's Mag., 2:261 (*Cecidomyia*)

1804 ——— Klassifikation (*Cecidomyia*)

1818 ——— Besch. Eur. Zweifl. Ins., 1:73 (*Cecidomyia*)

1820 Billberg, G. H. Enumeratio Insectorum, p. 122 (*Cecidomyia*)

1834 Macquart, P. M. Hist. Ins., 1:159 (*Cecidomyia*)

1840 Westwood, J. O. Introduct. Class. of Ins. Syn., p. 126 (*Cecidomyia*)

1846 Rondani, Camillo. Nouv. Ann. Sci. Nat. Bologna, S. 2, 6:371 (*Cecidomyia*)

- 1847 Bremi, J. J. Beitr. Mon. Gallmücken, p. 5 (Cecidomyia)
 1850 Loew, H. Dipt. Beitr., 4:20 (Diplosis)
 1851 Meigen, J. W. Syst. Besch. Eur. Zweifl., 1:73 (Cecidomyia)
 1853 Winnertz, J. Linn. Ent. 8:137, 246 (Diplosis)
 1861 Rondani, Camillo. Atti Soc. Ital. Sci. Nat. Milano, v. 2, sep. p. 4
 (Diplosis)
 1862 Osten Sacken, C. R. Mon. Dipt. N. A., 1:76 (Diplosis)
 1863 Schiner, J. R. Fauna Austriaca Dipt., 2:382 (Diplosis)
 1876 Bergenstamm, J. E. & Low, Paul. Syn. Cecidomyidarum, p. 23
 (Cecidomyia)
 1877 Karsch, F. A. F. Revis. Gallmücken, p. 19 (Cecidomyia)
 1888 Skuse, F. A. A. Linn. Soc. N. S. Wales Proc., 3:36, 37, 38, 42, 43, 60,
 61 (Diplosis)
 1892 Kieffer, J. J. Wien. Ent. Zeit., 11:218 (Diplosis)
 1892 Rubsaamen, E. H. Berl. Ent. Zeit., 37:384 (Diplosis)
 1892 Theobald, F. V. Acct. Brit. Flies, p. 50, 75 (Diplosis)
 1895 Kieffer, J. J. Soc. Ent. Fr. Bul., 64:194 (Cryptodiplosis)
 1895 Rubsaamen, E. H. Ent. Nachr., 21:186 (Diplosis)
 1896 Kieffer, J. J. Wien. Ent. Zeit., 15:96 (Cryptodiplosis)
 1897 ——— Syn. Cecid. Eur. & Alg., p. 41 (Diplosis)
 1900 ——— Soc. Ent. Fr. Ann., 69:436, 446 (Diplosis)
 1901 Osten Sacken, C. R. Ent. Mon. Mag., ser. 2, 12:40-43 (Cecidomyia)
 1907 Bezzi, Mario. Wien. Ent. Zeit., 26:56
 1908 ——— Marcellia, 7:11
 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 412 (Cecidomyia)
 1908 Hendel, Fried. Verhandl. k. k. zool. bot. Ges. Wien., 58:49-50
 1910 Rubsaamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:286
 (Cecidomyia)
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:61
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 258

This, the oldest genus of the family, originally comprised all forms referred to the very generally known Cecidomyiidae, now Itonididae, and from about 1850 to 1890 or thereabouts there has been a lamentable disagreement as to the genus. Some dipterologists of note have held that Dasyneura or Perrisia and its allies were the true Cecidomyias, or Itonidas, while others have maintained with equal insistence that since *Cecidomyia* or *Itonida pini* DeG. was the type, this generic designation should be limited to forms having the Diplosid structure. The genus Diplosis, erected by Loew in 1850 for forms having binodose antennae in the male, has been made a synonym of Cecidomyia, later giving way to Itonida, and the genera formerly grouped under this latter designation, are now referred to Dasyneura or Perrisia and other genera. The necessity of this change is regrettable, since Diplosis has been invariably applied to certain insects having well defined general

characteristics, while as earlier stated, there has been a wide divergence of opinion as to species which should be grouped under *Cecidomyia*.

The generic characters of *Itonida* must be found in its type, *Tipula pini* DeG. The following are the essential characters which we have been able to glean here and there from keys and published descriptions of this insect.

Antennae with fourteen segments, the flagellate of the male binodose, the nodes distinctly unequal. Circumfila well developed. The palpi are quadriarticulate, the three distal segments subequal. The wing, as illustrated by Rubsaamen, has subcosta uniting with costa before the basal third, the third vein joining the margin well beyond the apex, the fifth uniting with the posterior margin at the distal third, its branch near the basal third. Kieffer states that costa is interrupted behind its union with the third vein. The pulvilli are longer than the claws and the dorsal and ventral plate of the male genitalia deeply bilobed. The ovipositor of the female, as illustrated by Rubsaamen, is rather long, stout, the terminal lobes long, narrowly oval, distinctly contracted basally, the minor lobes short and stout.

This genus, as at present restricted, comprises a large number of midges having simple claws, the third vein uniting with costa beyond the apex and not presenting characters peculiar to the preceding genera. The species placed here appear to live largely in leafy tissues.

Key to species

a Ventral plate long

b Ventral plate broadly and roundly emarginate, the lobes diverging strongly

c Fifth antennal segment having the basal portion of the stem with a length less than its diameter, the circumfila indistinct or wanting

d Abdomen fuscous yellowish, length .75 mm, fifth antennal segment with the stems one-half and two and one-half the length of their diameters. *infirma* Felt, C. 299

dd Abdomen yellowish brown, length .75 mm, fifth antennal segment with the stems three-fourths and one and one-fourth the length of their diameters. *paucifili* Felt, C. 297

cc Fifth antennal segment having the basal portion of the stem with a length greater than its diameter, the circumfila distinct

d Abdomen pale yellowish, fifth antennal segment with the stems nearly equal, each about three and one-half times the diameter

e Length 1.5 mm; dorsal plate triangularly emarginate, the lobes broadly truncate.

americana Felt, C. 420, a 694

- ee* Length 1.5 mm; dorsal plate deeply emarginate, the lobes produced laterally and roundly emarginate; reared from fleshy leaf gall on *Amelanchier*.
canadensis Felt, C. 21859
- eee* Length 1 mm; dorsal plate lobes diverging, rounded.
recurvata Felt, C. 361
- eeee* Length .75 mm; dorsal plate roundly emarginate, the lobes hardily diverging, obliquely truncate.
fragariae Felt, C. 328
- dd* Abdomen yellowish red, length .75 mm; dorsal plate short, triangularly emarginate, the lobes obliquely truncate; fifth antennal segment having the stems two and one-half and three times their diameters.
marginata Felt, C. 421, 34
- ddd* Abdomen dark brown, length 1 mm; dorsal fifth antennal segment having the stems three and four and one-half times their diameters.
ruricola Felt, C. 293
- bb* Ventral plate deeply and roundly emarginate, the lobes not diverging strongly
- c* Fifth antennal segment having the stems equal or nearly so
- d* Lobes of the ventral plate diverging apically
- e* Abdomen dark brown, length 1 mm; fifth antennal segment having the stems each with a length three and one-half times its diameter.
apicalis Felt, C. 409, 367
- dd* Lobes of the ventral plate nearly parallel, not diverging apically
- e* Lobes of the dorsal plate not strongly diverging
- f* Lobes of ventral plate slender
- g* Abdomen pale yellowish orange or yellowish brown, length 1 mm; fifth antennal segment having the stems each with a length three and one-half times its diameter.
agraria Felt, C. 247, 621, 626, 632
- gg* Abdomen dark yellowish brown, length .75 mm; fifth antennal segment having the stems with a length three and three and one-half times their diameters.
terrestris Felt, C. 371
- ggg* Abdomen dull red, length 1 mm; fifth antennal segment having the stems each with a length three and one-half times their diameter; fourth palpal segment as long as the third.
sanguinia Felt, C. 385
- gggg* Abdomen reddish orange, length 1 mm; fifth antennal segment having the stems each with a length two and one-half times their diameters; fourth palpal segment one-fourth longer than the third; reared from an apple aphid.
aphidivora Felt, 2316a
- ff* Lobes of ventral plate short, stout
- g* Abdomen dark brown, length 2 mm; fifth antennal segment, stems each with a length two and one-half times its diameter.
aprilis Felt, C. 1414

ee Lobes of the dorsal plate strongly divergent

f Abdomen pale yellowish, length 1.25 mm; fourth palpal segment three-fourths longer than the third, the fifth antennal segment having the two parts of the stem with a length three and three and one-half times their diameters; dorsal plate lobes very large, divergent, the distal third setose and as long as the ventral plate
explicata Felt, C. 515

ff Abdomen bright orange, length 1 mm; dorsal plate lobes divergent, distinctly constricted subapically and bearing a few stout setae apically; ventral plate twice the length of the dorsal plate; reared from wheat heads..
tritici Felt

cc Stems of the fifth antennal segment plainly unequal

d Stems each with a length about three and four and one-half times its diameter

e Abdomen reddish yellow, length 1.5 mm; reared from flowers of *Apocynum*.....*apocyni* Felt, C. 21684a

ee Abdomen fuscous yellowish, distally deep orange, length 1.5 mm; reared from apical bud galls on *spiraea*.....
spiraeina Felt, C. 21759x

eee Abdomen greenish bronze, length 1.5 mm; reared from flowers of *spiraea*.....*spiraeiflorae* Felt, 21681b

eeee Body yellowish or yellowish orange, length 1 mm.....
uliginosa Felt, C. 1486

dd Stems each with a length one and one-half and two and one-half times its diameter

e Abdomen dark or reddish brown, length 2 mm.....
hudsoni Felt, C. 1

ee Abdomen reddish yellow, length 1.5 mm.....
setariae Felt, 21721

ddd Stems with a length of one and one and three-fourths times their diameters respectively

e Abdomen dark brown; length 2 mm.....
reflexa Felt, C. 1422

dddd Stems each with a length of one and one and one-half times their diameters respectively

e Abdomen yellowish orange; length 1.5 mm; reared from decaying birch wood.....*putrida* Felt, 22264

bbb Ventral plate truncate or nearly so

c Abdomen pale yellowish orange, length 1.6 mm; fifth antennal segment having the basal part of the stem with a length twice its diameter.....*nixonii* Felt, C. 510

cc Abdomen dark fuscous yellowish, length 1.25 mm; fifth antennal segment having the basal part of the stem with a length one-half greater than its diameter.....*tolhurstae* Felt, C. 721

bbbb Ventral plate broadly rounded, dorsal plate long, the lobes rounded

c Abdomen pale orange, with a fuscous spot basally, length .5 mm; fifth antennal segment having the stems with a length two and one-fourth and three times their diameters.. *quercina* Felt, C. 342

- cc* Abdomen yellowish brown, length 1 mm; fifth antennal segment having the stems with a length two and three times their diameter; reared from squash. *cucurbitae* Felt, C. 966
- bbbb* Ventral plate narrowly rounded
- c* Wings yellowish, with a daggerlike fuscous spot on the branching of the fifth vein. *pugionis* Felt, a2150y
- aa* Ventral plate short
- b* Ventral plate broad, deeply and roundly emarginate
- c* Abdomen pale yellowish, length 1.25 mm; dorsal plate short; triangularly emarginate, the lobes produced laterally, the fifth antennal segment having the stems equal, each with a length three and one-half times its diameter; reared from rolled leaves of *Verbena urticifolia*.
verbena Beutm. C. a1577
- cc* Abdomen pale yellowish, length 1.5 mm; dorsal plate short, triangularly emarginate, the lobes angularly rounded, the fifth antennal segment having the stems each three and one-half times its diameter; reared from dwarfed catalpa shoots.
catalpae Comst., a1804
- ccc* Abdomen pale yellowish, length 2 mm; dorsal plate short, angularly and slightly emarginate; fifth antennal segment having the stems with a length one-half and two and one-half times their diameters; reared from crumpled leaves of *Tecoma*.
tecomae Felt, C. a1260
- cccc* Abdomen dark brown, length 2 mm; fifth antennal segment having the stems with a length one and one-half and two and one-half times their diameters. *reginae* n. sp., C. 1214
- bb* Ventral plate broadly and roundly emarginate
- c* Ventral plate tapering distally
- d* Fifth antennal segment having the basal portion of the stem with a length less than its diameter
- e* Abdomen reddish brown, length 1 mm; fifth antennal segment having the stems with a length one-half and one and one-half that of the diameter.
antennata Felt, C. 69
- ee* Abdomen dark brown, length .75 mm; fifth antennal segment having the stems with a length one-fourth and one and one-half that of the diameter.
flavoscuta Felt, C. 76
- eee* Abdomen dark reddish, length 1 mm; fifth antennal segment having the stems with a length three-fourths and twice that of the diameter.
foliora Rssl. & Hkr., C. 1339
- dd* Fifth antennal segment having the basal portion of the stem with a length greater than its diameter
- e* Abdomen reddish brown, length 1.6 mm; fifth antennal segment having the stems with a length one and one-half and two and one-half times that of the diameters.
claytoniae Felt, C. 46

- ee* Abdomen dark reddish brown, length 2 mm; fifth antennal segment having the stems with a length two and one-half and three and one-half times that of their diameter....
hartmaniae n. sp., C. 1389
- cc* Ventral plate hardly tapering distally, very short and broad
d Abdomen pale yellowish, length .75 mm; fifth antennal segment having the stems with a length two and two and one-half times that of the diameters...*excavationis* Felt, C. 65
- bbb* Ventral plate broad, triangularly emarginate
c Abdomen deep red, dark brown basally, length 1 mm; fifth antennal segment having the stems with a length of three-fourths and one and one-fourth that of their diameters; female abdomen dark brown, length 2 mm; fifth antennal segment with a stem one-fourth the length of the basal enlargement, which latter has a length four times its diameter. Reared from slight swellings, frequently followed by decay, at the base of cactus spines.....
opuntiae Felt, C. 21975
- cc* Abdomen dark brown, length 1.25 mm, fifth antennal segment with the stems each one-fourth longer than the diameter; basal clasp segment normal. Reared from flowerlike gall on *Taxodium*....
anthici Felt, C. 22120
- ccc* Abdomen reddish brown, length 1.25 mm; fifth antennal segment having the stems with a length one and three-fourths and one and one-fourth times that of their diameter; basal clasp segment greatly swollen.....*texanana* sp., C. 1265
- cccc* Abdomen yellowish, second segment of anterior tarsi white, length 2 mm; fifth antennal segment having the stems with a length one and one-half and two and one-half times their diameters respectively.....*albotarsa* Felt, C. 330

Itonida infirma Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This fuscous yellowish male was taken June 15, 1906 on syringa at Albany, N. Y.

Male. Length .75 mm. Antennae almost as long as the body, thickly haired, yellowish brown; fourteen segments, the fifth with stems one and one-half and two and one-half times their diameters. Palpi; first segment irregularly subquadrate, the second twice the length of the preceding, tapering, the third a little shorter, more slender than the second, the fourth one-half longer and much more slender than the third; face fuscous yellowish. Mesonotum pale fuscous yellowish. Scutellum fuscous yellowish, slightly darker apically. Abdomen fuscous yellowish with indistinct, fuscous median spots on the third and fourth abdominal segments. Wings hyaline, costa light brown; halteres yellowish transparent. Legs a nearly uniform fuscous yellowish, paler basally, darker distally; claws long, slender, strongly curved at the basal half. Genitalia (pl. 19, fig. 5); dorsal plate broad, triangularly emarginate, the lobes short, diverging, obliquely truncate; ventral plate long, slender, broadly and tri-

angularly emarginate, the lobes diverging, long, slender, broadly rounded; style long, slender. Type Cecid. 299.

Itonida paucifila Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This yellowish brown male was taken June 15, 1906 on deutzia at Albany, N. Y.

Male. Length .75 mm. Antennae a little longer than the body, thickly haired, dark brown; fourteen segments, the fifth with stems three-fourths and one and one-fourth times their diameters. Palpi; the first segment short, subquadrate, the second more than twice as long, more slender, the third one-half the length of the second, narrowly rounded, the fourth about twice the length of the third; face fuscous yellow. Mesonotum dark brown, yellowish laterally and posteriorly. Scutellum pale yellowish, postscutellum and abdomen yellowish brown. Wings hyaline, costa light brown; halteres yellowish transparent basally, slightly fuscous apically. Legs a nearly uniform pale brown; claws long, slender, evenly curved. Genitalia; dorsal plate broad, deeply and narrowly emarginate, subtruncate distally, the angles setose, ventral plate long, slender, broadly and roundly emarginate, the lobes long, diverging, broadly rounded; style long, slender, narrowly rounded. Type Cecid. 297.

Itonida americana Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

The pale yellow male was taken June 28, 1906 in a trap lantern at Poughkeepsie, N. Y.

Male. Length 1.5 mm. Antennae nearly as long as the body, thickly haired, a very pale brown, yellowish basally; fourteen segments, the fifth with stems each three and one-half times their diameter. Palpi probably quadriarticulate; face pale yellowish. Thorax and abdomen a nearly uniform pale yellowish, the terminal abdominal segments slightly more yellowish. Wings hyaline, the membrane yellowish, costa pale yellowish brown; halteres pale yellowish. Legs a nearly uniform pale yellowish straw color, the distal tarsal segments slightly darker; claws rather stout, short, strongly curved near the middle. Genitalia; dorsal plate broad, deeply, narrowly and triangularly emarginate, the lobes diverging, truncate, the lateral angles broadly rounded, the lateral margins narrowing anteriorly, the internal distal angles, each with a long, stout spine, the external with a group of long, coarse setae; ventral plate broad, long, deeply and roundly emarginate, the lobes narrow, diverging, narrowly rounded; style stout, long, curving, broadly rounded. Type Cecid. 420.

Itonida canadensis Felt

1911 Felt, E. P. Econ. Ent. Jour., 4:558

1915 ——— N. Y. State Mus. Bul. 175, pl. 2, fig. 12

1918 ——— N. Y. State Mus. Bul. 200, p. 135, 150

This pale yellowish species was reared August 5, 1908 from a woolly, oval leaf gall on the lateral veins of shadbush, *A melanchier canadensis*, taken by Cora H. Clarke at Coolidge Point, Magnolia, Mass., the last of the preceding June. Two Curculionids were also reared from these galls, namely, *Tachypterus quadrigibbus* Say and *Pseudanthonomus crataegi* Walsh. This gall midge is easily separable from allied forms by the long, broadly and roundly emarginate ventral plate, in connection with the produced stems of the fifth antennal segment and the form of the ventral plate.

Gall. Length 1 to 1.5 cm, an oval swelling on the lateral veins (fig. 35), with a yellowish discoloration and small slit on the upper surface and a broadly rounded, white, woolly, swelling beneath.



Fig. 35 *Itonida canadensis*, June berry leaves showing galls on both upper and under side of the leaf (author's illustration)

Larva. Length 3 mm, deep orange, moderately stout. Head small. Antennae rather short, stout, breastbone bidentate, the shaft rather slender, slightly expanded posteriorly. Skin finely shagreened; posterior extremity irregularly lobed and slightly tuberculate.

Itonida recurvata Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 134; separate, p. 38 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This yellowish male was taken June 21, 1906 in a trap lantern at Poughkeepsie, N. Y.

Male. Length 1 mm. Antennae probably one-fourth longer than the body, sparsely haired, pale yellowish; fourteen segments, the fifth

with stems each three times their diameters; terminal segment, distal node long, subcylindric, a spindle-shaped process apically. Palpi; the first segment subquadrate, the second with a length four times its diameter, the third slender, three-fourths the length of the second, the fourth a little longer and stouter than the third. Face yellowish. Thorax pale yellowish. Abdomen pale yellowish, reddish tinted basally and apically. Wings pale yellowish, costa brownish yellow. Legs pale yellowish white, the tips of the tarsi slightly dusky; claws stout, strongly curved near the middle, irregularly swollen at the distal third. Genitalia; dorsal plate broad, deeply and triangularly incised, the lobes diverging; ventral plate broad, tapering, broadly and roundly emarginate, the lobes narrow, slightly recurved; style long, stout, broadly rounded. Type Cecid. 361.

Itonida fragariae Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 133; separate, p. 37 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This pale yellowish male was taken June 18, 1906 on strawberry at Albany, N. Y.

Male. Length .75 mm. Antennae twice as long as the body, thickly haired, light yellowish brown; fourteen segments, the fifth with stems three times their diameters; terminal segment, distal enlargement produced, cylindric, with a spindle-shaped appendage. Palpi; the first segment rectangular, the second one-half longer, narrowly rounded, the third a little longer, more slender, the fourth longer and broader than the third. Mesonotum dark carmine, submedian lines yellowish. Scutellum tinged with carmine, post-scutellum yellowish. Abdomen pale yellowish with a median dorsal orange spot on the second and third segments. Wings hyaline, long, narrow, costa pale yellowish. Halteres yellowish transparent. Legs pale straw; distal tarsal segments light brown; claws slender, strongly curved. Genitalia; dorsal plate broad, deeply and broadly emarginate, the lobes obliquely truncate; ventral plate broad, long, broadly and roundly emarginate, the lobes diverging, slender; style long, slender, narrowly rounded. Type Cecid. 328.

Itonida emarginata Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 134; separate, p. 38 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This pale reddish male was taken May 17, 1906 at Albany, N. Y., and June 30th at Nassau, N. Y.

Male. Length .75 mm. Antennae longer than the body, thickly haired, dark brown; fourteen segments, the fifth with stems two and one-half and three times their diameters; terminal segment, distal enlargement prolonged, subcylindric, apically with a short, sub-

conical process. Palpi; the first segment short, suboval, the second a little longer, slender, the third suboval, broader than the second, the fourth one-fourth longer than the third, rather broad; face yellowish. Mesonotum pale reddish, the anterior, median and sublateral posterior areas slightly darker. Abdomen yellowish red with irregular, carmine markings. Wings hyaline, costa brown; halteres yellowish transparent basally, fuscous apically. Legs light brown, lighter ventrally, tarsi slightly darker; claws slender, strongly curved. Genitalia; terminal clasp segment swollen at the base, tapering; ventral plate swollen at base, tapering to a deeply and roundly emarginate apex, the lobes widely separated, acute; style long, slender, tapering, broadly rounded. Type Cecid. 34.

Itonida ruricola Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This dark-brown male was taken June 15, 1906 on sedge, *Carex*, at Nassau, N. Y.

Male. Length 1 mm. Antennae about twice the length of the body, thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems three and four and one-half times their diameters. Palpi; first segment subquadrate, the second with a length over three times its diameter, the third as long as the second, more slender, the fourth one-half longer than the third. Face fuscous yellowish. Mesonotum dark brown, the submedian lines yellowish. Scutellum fuscous orange, postscutellum a little darker. Abdomen dark brown, the terminal segments pale orange, sparsely yellow-haired. Wings; costa light brown; halteres yellowish transparent, fuscous apically. Legs pale straw; claws rather stout, strongly curved, the pulvilli shorter. Genitalia; dorsal plate short, deeply and triangularly incised, the lobes broadly rounded; ventral plate long, deeply and broadly emarginate, the slender lobes divergent; style long, narrowly rounded. Type Cecid. 293.

Itonida apicalis Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This dark-brown male was taken June 27, 1906 in a trap lantern at Newport, N. Y.

Male. Length 1 mm. Antennae twice as long as the body, sparsely haired, light brown, yellowish basally; fourteen segments, the fifth with stems each three and one-half times their diameter; terminal segment, distal enlargement produced and with a long, irregular, spindle-shaped appendage. Palpi; the first segment subrectangular, swollen basally, the second over twice the length of the first, stout, the third a little longer and more slender than the second, the fourth longer and a little broader than the third; face yellowish. Mesonotum dark brown, submedian lines yellowish, distinct. Scutellum fuscous, yellowish apically, postscutellum yellowish. Abdo-

men nearly uniform dark brown, the terminal segments light yellow; rather sparsely clothed with yellowish hairs. Wings subhyaline, costa dark brown; halteres yellowish transparent basally, slightly fuscous apically. Legs nearly uniform fuscous yellowish, tarsi lighter, terminal segments variably and slightly tinged with carmine claws long, slender, strongly curved near the middle. Genitalia (pl. 20, fig. 5); dorsal plate broad, deeply and narrowly incised, the lobes tapering; ventral plate broad, long, deeply and roundly emarginate, the lobes broad, diverging, obliquely truncate; style long, stout, swollen at the basal third, constricted at the distal fourth, more so at the distal eighth, slightly expanded and narrowly rounded. Type Cecid. 409.

Itonida agraria Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This pale yellowish male was captured at Newport and Nassau, N. Y., in June and July, 1906.

Male. Length .75 mm. Antennae fully twice as long as the body, thickly haired, pale straw; fourteen segments, the fifth with stems each three and one-half times their diameter; terminal segment, distal enlargement prolonged, subcylindric, apically a nearly equally long, spindle-shaped process. Palpi; the first segment irregularly subquadrate, the second, third and fourth each nearly subequal, with a length about four times the diameter; face yellowish. Mesonotum a variable orange, slightly darker anteriorly. Scutellum and post-scutellum a variable orange. Abdomen a pale yellowish orange. Wings hyaline, costa very pale straw; halteres whitish transparent. Legs almost whitish transparent, tarsal segments annulate with light brown; claws slender, uniformly curved. Genitalia; dorsal plate broad, deeply and narrowly incised, the lobes broadly rounded externally, irregularly and obliquely truncate, the internal and external angles slightly prolonged, each with a stout apical seta; ventral plate broad, long, deeply, broadly and roundly emarginate, the lobes well separated, narrow, narrowly rounded; style long, slender broadly rounded. Type Cecid. 247.

Itonida terrestris Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This dark yellowish male was taken June 21, 1906 in a trap lantern at Poughkeepsie, N. Y.

Male. Length .75 mm. Antennae one-fourth longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems three and three and one-half times their diameters. Palpi; the first segment irregular, subcylindric, with a length one-half greater than its diameter, the second with a length about four times its diameter, the third a little shorter and more slender and the fourth a little longer and more dilated than the third. Mesonotum

light yellowish brown. Abdomen dark yellowish brown, the terminal segment yellowish. Wings hyaline, costa light brown; halteres yellowish transparent. Legs a pale yellowish straw, lighter distally; claws long, slender, evenly curved, the pulvilli about two-thirds the length of the claws. Genitalia; dorsal plate short, deeply and triangularly emarginate, the lobes diverging, obliquely truncate, the lateral angles produced; ventral plate long, stout, deeply and roundly emarginate, the lobes slender, parallel, narrowly rounded; style long, slender, constricted near the distal sixth and seventh, narrowly rounded. Type Cecid. 371.

Itonida sanguinia Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

This dull-red male was taken June 24, 1906 on fern at Nassau, N. Y.

Male. Length 1 mm. Antennae twice as long as the body, thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems each three and one-half times their diameters; terminal segment, distal enlargement with a length one-half greater than its diameter and a long, fingerlike process apically. Palpi; first segment irregularly quadrate, the second with a length three times its diameter, slender, the third a little longer, more slender, the fourth a little shorter than the third, dilated. Face yellowish. Mesonotum fuscous yellowish, the submedian lines yellowish, sparsely haired. Scutellum fuscous yellow, sparsely setose apically, postscutellum dark brown. Abdomen dull reddish basally, slightly darker apically, sparsely clothed with fine, yellowish hairs. Wings hyaline, costa dark brown; halteres yellowish basally, slightly fuscous apically. Legs fuscous yellowish, the fore and mid tarsi darker, the hind tarsi pale yellowish; claws slender, strongly curved, the pulvilli about half the length of the claws. Genitalia; dorsal plate deeply and triangularly emarginate, the lobes broadly emarginate; ventral plate long, deeply and roundly emarginate, the lobes parallel, slender; style long, slender, narrowly rounded. Type Cecid. 385.

Itonida explicata Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 413 (Cecidomyia)

The pale yellowish midge was taken July 6, 1906 while collecting on golden rod or *Solidago* and aster at Albany, N. Y.

Male. Length 1.25 mm. Antennae one-fourth longer than the body, thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems two and three times their diameters; terminal segment, distal enlargement produced and with a subfusiform appendage constricted at the base and swollen at the basal fourth. Palpi; first segment subrectangular, the second twice the length of the first, stouter, the third longer and more slender than the second, the fourth nearly twice the length of the third, slender. Face and body pale yellowish. Genitalia slightly fuscous. Wings (pl. 16

fig. 10) hyaline, costa light brown. Halteres pale yellowish. Legs light fuscous yellowish, tarsi lighter; claws slender, uniformly curved. Genitalia (pl. 19, fig. 1); dorsal plate deeply and triangularly incised, the lobes divergent, tapering, broadly rounded; ventral plate broad at base, deeply and roundly emarginate, the lobes well separated, narrow, obtuse; style long, stout, broadly rounded. Type Cecid. 515.

Itonida aphidivora Felt

1912 Felt, E. P. N. Y. Ent. Soc. Jour., 20:245-46

1914 ————Econ. Ent. Jour., 7:458

This midge was reared in some numbers from apple leaves infested by the rosy aphid, *Aphis malifoliae* Fitch, at Nassau, N. Y.

Itonida aprilis Felt

1912 Felt, E. P. N. Y. Ent. Soc. Jour., 20:247

These midges are among the early appearing forms taken at Albany, N. Y.

Itonida tritici Felt

1912 Felt, E. P. Econ. Ent. Jour., 5:289

1918 ———— N. Y. State Mus. Bul. 200, p. 22

This is not the *Cecidomyia* or *Diplosis tritici* Kirby, a species described by several authors as having a long ovipositor and a midge associated with serious losses to grain in Europe. The type of Kirby's species has been destroyed (Trans. Linn. Soc. 4: 232, 1798). It is doubtful if the true *Cecidomyia*, presumably the *Contarinia tritici* Kirby, occurs in the United States. The specimens described under the above name are in the United States National Museum collection at Washington, were labeled *Cecidomyia tritici* Kirby and were presumed to be the midge which caused so much loss to American wheat growers in earlier years, since they were reared by Theodore Pergande from typical wheat midge material. The economic status of this species can not be determined at the present time, though data at hand indicate that most of the injury in American wheat fields is probably due to the work of the European *Thecodiplosis mosellana* Gehin, and if this be the case it follows that the extensive American wheat midge literature relates to this species and not to the insect formerly supposed to be the cause of the injury. It is to be expected that several midges would occur in wheat heads. The writer has already characterized three and others are known to occur in Europe. The difficulty is to determine between comparatively rare and relatively innocuous species and the one or more destructive forms.

Itonida apocyni Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 414 (Cecidomyia)

1918 ——— N. Y. State Mus. Bul. 200, p. 180

This reddish yellow male was reared August 21, 1906 from unopened, apparently normal blossoms of the spreading dogbane, *Apocynum androsaefolium*, taken at Nassau, N. Y.

Male. Length 1.5 mm. Antennae one-half longer than the body, thickly haired, pale yellowish; fourteen segments, the fifth with stems three and four times their diameters; terminal segment, distal node with a length three times its diameter, subcylindric, tapering, apically with a long, slender, tapering appendage. Palpi; the first segment short, subcylindric, with a length one-half greater than its diameter, the second segment with a length four times its diameter, the third a little longer and the fourth a little longer and more slender than the third. Mesonotum a light fuscous, the submedian lines sparsely haired. Scutellum yellowish; abdomen reddish yellow. Wings hyaline, costa yellowish; halteres pale yellowish. Coxae reddish yellow, femora and tibiae yellowish, the tarsi darker; claws long, slender, evenly curved, the pulvilli rudimentary, about one-third the length of the claws. Genitalia; dorsal plate short, broad, deeply and triangularly incised, the lobes well separated, broadly and roundly emarginate, the lateral angles produced, they and the internal angles each bearing stout setae; ventral plate long, broad, deeply and roundly emarginate, the lobes tapering slightly, narrowly rounded; style long, rather stout, constricted near the distal sixth and seventh, broadly rounded. Type Cecid. ar684a.

Itonida spiraeina Felt

1910 Stebbins, F. A. Springfield Mus. Nat. Hist. Bul. 2, p. 35 (Cecidomyia lappa)

1911 Felt, E. P. Econ. Ent. Jour., 4: 555-56

1918 ——— N. Y. State Mus. Bul. 200, p. 133

Both sexes of this species were reared April 16, 1910 from a jar containing bud galls on *Spiraea salicifolia* collected by Cora H. Clarke the preceding season at Magnolia, Mass. A male was also reared June 27, 1910. This species is closely related to *I. apocyni* Felt. The male may be distinguished by the fuscous yellowish abdomen with its distal segments deep orange, the distinctly broader wings, the more cylindrical distal enlargement of the fifth antennal segment, and the modification of the ventral plate.

Gall. The gall is simply an enlarged terminal bud about 3 mm in diameter. It was brown in color when collected and approached in general form, the fringed terminal bud gall taken on spiraea in that section and was somewhat intermediate in character between this

atter and a small bud gall 7 mm long and 2 mm wide, composed of brownish, rudimentary bracts and inhabited by pale orange larvae. The identity of the larva has not been established.

Itonida spiraeae Felt

- 1907 Felt, E. P. New Species of Cecidomyiidae II, p. 23 (Cecidomyia)
 1908 ——— N. Y. State Mus. Bul. 124, p. 304, 414 (Cecidomyia)
 1918 ——— N. Y. State Mus. Bul. 200, p. 133

This greenish bronze male was reared August 27, 1907 from slightly enlarged, reddened flowers of *Spiraea salicifolia* taken at Albany, N. Y.

Gall. The pale yellowish larvae of this species occur in the slightly enlarged, reddened flowers.

Male. Length 1.5 mm. Antennae one-half longer than the body, thickly haired, pale straw; fourteen segments, the fifth with stems having a length two and three times their diameters; terminal segment, distal enlargement produced and bearing a long, slender appendage. Palpi presumably composed of four segments; face pale fuscous. Mesonotum brown, the submedian lines whitish. Scutellum yellowish. Abdomen a greenish bronze, the first segment yellowish. Wings hyaline, costa light straw; halteres pale fuscous yellowish. Coxae pale yellowish, femora yellowish at the base, fuscous apically; tibiae and tarsi fuscous; claws long, slender, strongly curved, simple, the pulvilli distinctly shorter than the claws. Genitalia; dorsal plate short, stout, deeply and triangularly incised, the lobes narrowly separated, obliquely truncate; ventral plate long, broad, the sides nearly parallel, broadly and roundly emarginate, the lobes long, slender, subacute; style long, slender, broadly rounded. Type Cecid. a1681b.

Itonida uliginosa Felt

- 1914 Felt, E. P. N. Y. Ent. Soc. Jour., 22:133

This species was taken August 21, 1909, by C. P. Alexander in a bog swamp at Woodworth's lake in the Adirondacks, altitude 1570 feet. It may be distinguished from the related *I. apocyni* Felt by the yellowish orange body and the structure of the genitalia.

Itonida hudsoni Felt

- 1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 135; separate, p. 39 (Cecidomyia)
 1908 ——— N. Y. State Mus. Bul. 124, p. 414 (Cecidomyia)

This reddish brown male was taken April 19, 1906 on red cedar, *Juniperus virginiana*, at Poughkeepsie, N. Y.

Male. Length 2 mm. Antennae a little longer than the body, sparsely haired, dark brown; fourteen segments, the fifth with stems

one and one-half and two and one-half times their diameters; terminal segment, distal enlargement divided, a smaller proximal enlargement and a larger distal portion; the tip prolonged, the basal two-thirds stout, the distal third more slender. Palpi; first segment prolonged, slightly expanded at the distal third, the second a little stouter, one-fourth longer, the third a little more slender and one-half longer than the second, and the fourth about twice the length of the third and more slender. Head dark brown. Mesonotum light brown with an indistinct yellowish, median line and a similar color on the humeri, submedian lines sparsely ornamented with long, yellowish setae; posterior margin of mesonotum slaty brown. Scutellum bluish slate, the apex sparsely ornamented with long, yellowish setae. Abdomen dark or reddish brown, rather thickly clothed with yellowish hairs. Legs brownish yellow; claws stout, strongly curved. Wings (pl. 16, fig. 12) with costa and the apical half of the third vein reddish; halteres yellowish basally, irregularly brownish and yellowish apically. Genitalia (pl. 19, fig. 3); dorsal plate broad, deeply and triangularly emarginate, the lobes widely separated; ventral plate narrow, broadly and roundly excavated, the lobes narrow, widely separated, each with a long subapical seta. Harpes stout, apparently fused distally, swollen at the distal fourth, the margin finely and irregularly serrate; style long, stout. Type Cecid. 1.

Itonida setariae Felt

- 1907 Felt, E. P. New Species of Cecidomyiidae II, p. 22-23 (Cecidomyia)
 1908 ——— N. Y. State Mus. Bul. 124, p. 303-4, 414 (Cecidomyia)
 1918 ——— N. Y. State Mus. Bul. 200, p. 24

This reddish yellow male was reared August 25, 1907 from seeds of the common fox-tail grass, *Alopecurus pratensis*, at Albany, N. Y.

Male. Length 1.5 mm. Antennae longer than the body, thickly haired, light brown; the basal segment pale yellowish; fourteen segments, the fifth with stems one and one-half and two times their diameters; terminal segment, distal enlargement produced and with a long, slender, tapering appendage. Palpi; the first segment short, stout, irregularly subquadrate, the second stout, nearly twice the length of the first, the third a little longer, more slender, the fourth a little longer and more slender than the third; face light reddish. Mesonotum reddish, darker laterally, the submedian lines indistinct. Scutellum darker than the mesonotum, postscutellum reddish. Abdomen reddish yellow, sparsely clothed with long hairs; membrane and pleurae reddish yellow. Wings hyaline, costa light brown; halteres pale reddish or yellowish. Coxae pale yellowish, the anterior and mid femora and tibiae gray, the posterior femora and tibiae yellowish, the anterior and mid tarsi brownish, the posterior tarsi with the two basal segments yellowish, the others brown; claws long, slender, irregularly curved, the pulvilli distinctly shorter than the claws. Genitalia; dorsal plate short, broad, deeply and

triangularly incised, the lobes well separated, truncate, groups of long setae at the angles; ventral plate long, broad, the sides tapering slightly to a broadly and roundly emarginate apex, the lobes short, narrowly rounded. Harpes indistinct; style long, stout, tapering to an obtuse, slightly expanded apex. Type Cecid. a1721.

Itonida putrida Felt

1912 Felt, E. P. N. Y. Ent. Soc. Jour., 20:246-47

1918 ——— N. Y. State Mus. Bul. 200, p. 49

This species was reared from decaying birch wood inhabited by numerous larvae of *Bolitophila cinerea* Meign. collected at Albany.

Itonida reflexa Felt

1913 Felt, E. P. Psyche, 20:146-47

The male was received from C. W. Johnson of the Boston Society of Natural History. It was labeled "I. B. 16, 1906, Hampton, N. H., S. A. Shaw, 1143." It is easily separated from the related *I. putrida* Felt by the dark-brown abdomen and the somewhat longer antennal stems.

Itonida nixonii Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 414 (Cecidomyia)

This pale yellowish male was taken July 6, 1906 on New Jersey tea, *Ceanothus americanus*, at Albany, N. Y.

Male. Length 1.6 mm. Antennae one-half longer than the body, thickly haired, light brown, yellowish basally; fourteen segments, the fifth with stems two and two and one-half times their diameters, respectively; terminal segment, distal enlargement cylindrical, with a length three times its diameter, apically a slender, fingerlike process. Palpi; first segment quadrate, with a length one-half greater than its diameter, the second twice the length of the first, slender, the third a little longer than the second, slender, the fourth a little longer and more slender than the third. Face fuscous yellowish. Mesonotum dark brown, the submedian lines broad, yellow, posterior median area yellowish. Scutellum fuscous yellowish, post-scutellum yellowish. Abdomen pale yellowish orange, the distal segments narrowly and faintly margined posteriorly with fuscous, the latter continued slightly on the median line; genitalia slightly fuscous. Wings hyaline, costa light brown; halteres yellowish transparent. Legs a nearly uniform fuscous straw, tarsi slightly darker; claws long, slender, evenly curved, the pulvilli nearly as long as the claws. Genitalia; dorsal plate broad, deeply and roundly emarginate, the lobes broadly rounded, the angles slightly produced; ventral plate long, broad, nearly truncate apically; style long, stout, narrowly rounded. Type Cecid. 510.

Itonida tolhurstae Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 414 (Cecidomyia)

This dark fuscous yellowish male was taken July 30, 1906 on sumac, *Rhus*, at Albany, N. Y.

Male. Length 1.25 mm. Antennae a little longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems having a length one and one-half and two and one-half times their diameters, the terminal segment having the distal enlargement with a length four times its diameter and a stout, tapering, fingerlike process apically. Palpi; first segment subquadrate, the second with a length three times its diameter, the third longer, more slender, the fourth as long as the third, more dilated. Mesonotum dark brown, the submedian lines yellowish. Scutellum dark reddish, postscutellum dark brown. Abdomen dark fuscous yellow, the segments broadly margined posteriorly with dark brown and with short, transverse, dark lines laterally near the middle; venter mostly dark brown; pleurae fuscous yellowish. Wings hyaline, costa dark brown; halteres semitransparent. Coxae and femora basally pale yellowish, the distal portion of femora, tibiae and tarsi mostly light brown; claws stout, irregularly curved, the pulvilli about one-third the length of the claws. Genitalia; dorsal plate deeply and narrowly incised, the lobes broad, truncate; ventral plate long, broad, irregularly truncate; style long, slender. Type Cecid. 721.

Itonida quercina Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 137; separate, p. 41 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 414 (Cecidomyia)

This pale orange male was taken June 21, 1906 on swamp white oak, *Quercus bicolor*, at Albany, N. Y.

Male. Length .5 mm. Antennae nearly as long as the body, thickly haired, yellowish gray; fourteen segments, the fifth with stems having a length two and a quarter and three times their diameters. Palpi; first segment short, semiglobose, second rather long, curved, and the third a little longer, more slender; face pale yellowish. Mesonotum dark brown, submedian lines yellowish, sparsely ornamented with fine setae. Scutellum pale yellowish, postscutellum yellowish brown. Abdomen pale orange with a large fuscous median spot basally. Genitalia slightly fuscous. Wings hyaline, costa light brown; halteres pale yellowish basally and distally, pale orange in the middle. Legs pale straw color, the annulations variably marked with carmine, distal tarsal segments fuscous; claws stout, simple. Genitalia; dorsal plate broad, deeply incised, the lobes approximate, broadly rounded; ventral plate broad, expanding slightly to a broadly rounded setose apex; style long, stout, curved. Type Cecid. 342.

***Itonida cucurbitae* Felt**

1911 Felt, E. P. Econ. Ent. Jour., 4:555

The midge was reared July 10, 1876 from orange larvae on a squash, presumably by the late C. V. Riley. The vegetable had a curious, rough, fulvous appearance. The specimens were kindly placed at our disposal through the courtesy of Dr L. O. Howard. *Mycodiplosis cucurbitae* was also associated with this form, the two resembling each other so closely as to be inseparable with a hand lens.

***Itonida pugionis* Felt**

1911 Felt, E. P. Econ. Ent. Jour., 4:557-58

1918 ——— N. Y. State Mus. Bul. 200, p. 53

This striking form was first reared May 4, 1911 from a jar containing chestnut bark infested with numerous *Miastor americana* Felt larvae collected at Nassau. Subsequently it was obtained from maple bark containing many *Miastor* larvae. It is very probable that this form is predaceous. It is tentatively referred to this genus, though it appears to present no very close resemblance to known species. It is easily recognized by the striking coloration of the antennae and wings, especially the latter.

***Itonida catalpae* Comst.**

1881 Comstock, J. H. U. S. Comm. Agric. Rep't, 1880, p. 266-67 (Diplosis)

1890 Packard, A. S. U. S. Ent. Comm. 5th Rep't, p. 666-68 (Diplosis)

1906 Felt, E. P. Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:735 (Cecidomyia)

1908 Gossard, H. A. Econ. Ent. Jour., 1:181-82 (Cecidomyia)

1908 Houser, J. S. Ohio Agric. Expt. Sta. Bul. 194, p. 193 (Cecidomyia)

1908 Gossard, H. A. Ohio Agric. Expt. Sta. Bul. 197, p. 1-13 (Cecidomyia)

1909 Felt, E. P. Ent. Soc. Ont., 39th Rep't, p. 43 (Cecidomyia)

1910 Douglas, B. W. State Ent. Ind. 2d Rep't, p. 93-95 (Cecidomyia)

1918 Felt, E. P. N. Y. State Mus. Bul. 200, p. 186

The orange-colored larvae of this species occur, according to Professor Comstock, in the seed pods of *Catalpa bignonioides*, causing the seeds to rot and the pods to turn brown in midsummer. The attack may be observed in the early part of August and is indicated by the unripe and normally green pods turning brown. One-half of the pod may remain green while the remainder appears to be dry and apparently ripe. These abnormal pods have the mass of seeds fairly alive with active footless, yellow maggots, none over 3.25 mm long. They vary much in size, some being nearly full grown while others are quite young. The entire contents of the infested pods are in every case in a badly decayed condition.

Adults were reared in some 10 days. The larvae undergo their transformations in the soil, many of them apparently emerging through one hole. The insects seem to breed throughout the fall.

This species is best known on account of its injuring the pods and young twigs, though it appears capable of materially damaging the foliage. The following unpublished notes kindly placed at our disposal by Doctor Howard of the bureau of entomology, probably refer to this species. In June 1897 Mr Pergande found on the under side of catalpa leaves a number of pale greenish, whitish or yellowish Itonid larvae producing a slight abrasion on the surface. Most of the affected leaves showed peculiar, circular, brownish spots surrounded by yellowish green rings. These observations were repeated the following season and convinced Mr Pergande that the spots were caused by the larvae. He states that the very minute eggs are loosely laid upon the foliage and drop easily. They are elongate-oval, pale yellowish and highly polished. The final transformations, he states, must occur in the soil.

Male. Length 1.3 mm. Antennae about twice as long as the body, thickly haired, fuscous, basally fuscous yellowish; fourteen segments, the fifth with stems having a length two and one-half and three and one-half times their diameters; terminal segment, distal enlargement cylindrical, with a length five times its diameter, apically a long, slender, fingerlike appendage. Palpi; the first segment short, stout, irregular, subquadrate, the second about as long, more slender, the third one-half longer than the second, slender, the fourth a little shorter than the third. Mesonotum fuscous yellowish, the submedian lines yellowish; scutellum and postscutellum yellowish; abdomen light yellow; wings hyaline, costa pale yellowish; halteres yellowish. Legs a light fuscous yellowish; claws long, slender, evenly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment short, stout, roundly truncate distally; terminal clasp segment rather short, stout, tapering. Other structures indistinct in preparation.

Described from specimens received from Washington. Taken August 16, 1880 and probably types. Cecid. a1804.

Itonida tecomae Felt

- 1906 Felt, E. P. N. Y. State Mus. Bul. 104, p. 127-30 (*Bremia*)
 1908 ——— N. Y. State Mus. Bul. 124, p. 414 (*Cecidomyia*)
 1918 ——— N. Y. State Mus. Bul. 200, p. 185

The pale yellowish male was reared from yellowish larvae found upon the distorted, partially rolled leaves of trumpet vine, *Tecomaria radicans*, at Albany, N. Y., in August 1905. The wing is shown in plate 16, figure 5.

Gall. The pale yellowish larvae live freely upon the distorted, partially rolled leaves, producing pseudogall-like formations.

***Itonida myricae* Beutm.**

- 1907 **Beutenmueller, William** Can. Ent., 39:306
 1918 **Felt, E. P.** Am. Mus. Nat. Hist. Bul., 38:181-82
 1918 ——— N. Y. State Mus. Bul. 200, p. 40

This yellowish midge was reared from a bud gall on wax myrtle, *Myrica cerifera*. It is related to *I. tecomae* Felt, from which it is readily separated by a number of characters.

***Itonida verbenae* Beutm.**

- 1907 **Beutenmueller, William** Can. Ent., 39:306-7
 1908 **Felt, E. P.** N. Y. State Mus. Bul. 124, p. 414 (*Cecidomyia urtifolia*)
 1918 ——— N. Y. State Mus. Bul. 200, p. 182

This pale yellowish form was reared July 20, 1907 from the terminal rolled leaves of *Verbena urticaefolia* taken at Karner, N. Y.

Male. Length 1.25 mm. Antennae one-half longer than the body, thickly haired, light fuscous, the stems colorless, basally a nearly uniform pale yellowish; fourteen segments, the fifth with stems each three and one-half times their diameter. Palpi; the first segment rather long, irregularly subquadrate, the second slender, with a length fully three and one-half times its diameter, the third a little shorter and more slender and the fourth one-third longer and more dilated than the third. Thorax and abdomen a nearly uniform pale yellowish. Wings hyaline, costa light straw; halteres yellowish transparent. Legs light straw, the distal tarsal segments somewhat darker; claws long, stout, strongly curved basally, the pulvilli about half the length of the claws. Genitalia; dorsal plate short, broad, deeply and broadly emarginate, the lobes obliquely truncate, produced laterally; ventral plate long, slender, broadly and roundly emarginate, the lobes long, tapering, narrowly rounded; style long, slender, narrowly rounded. *Cecid. a1577.*

***Itonida reginae* n. sp.**

This dark brown male was taken May 28, 1907 at Regina, N. W. T. by T. N. Willing.

Male. Length 2 mm. Antennae one-fourth longer than the body, rather thickly haired, brown; fourteen segments, the fifth with stems one and one-half and two and one-half times their diameters; terminal segment, distal enlargement prolonged, tapering, obtuse. Palpi; the first segment stout, with a length about one-half greater than the diameter, the second about twice as long as the first and more slender, the third a little longer and more slender than the second and the fourth a little longer than the third. Mesonotum

dark brown, the submedian lines rather sparsely haired. Scutellum dark brown with a few apical setae, postscutellum and abdomen dark brown. Wings hyaline, costa pale reddish brown. Legs a nearly uniform dark fuscous straw; claws long, slender, strongly curved, the pulvilli as long as the claws. Genitalia; dorsal plate short, broad, deeply and triangularly emarginate, the lobes widely separated, broadly rounded, subacute; ventral plate short, stout, the basal half contracted, broadly and roundly emarginate, the lobes widely separated, slender, obtuse; style stout, tapering. Type Cecid. 1214.

Itonida antennata Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 414 (Cecidomyia)

This reddish brown male was taken May 21, 1906 at Albany, N. Y.

Male. Length 1.25 mm. Antennae one-half longer than the body, thickly haired, yellowish brown; fourteen segments, the fifth with stems one-half and one and one-half times their diameters; terminal segment, distal enlargement produced, the appendage subconical, obtuse. Palpi; first segment short, stout, swollen distally, the second narrowly oval, the third as long as the second, more slender, the fourth one-half longer than the second, slightly dilated. Face yellowish brown. Mesonotum dark brown, the yellowish submedian lines with pale setae, posterior median area yellowish. Scutellum yellowish apically, postscutellum yellowish. Abdomen reddish brown, darker basally. Wings hyaline, costa light brown. Halteres yellowish transparent. Coxae straw yellow, tinged with red. Legs mostly dark brown, lighter ventrally; claws stout, strongly curved. Genitalia; dorsal plate broad, deeply and roundly emarginate, the lobes widely separated, irregularly rounded; ventral plate broad, long, deeply and broadly emarginate, the lobes short, widely separated, broadly rounded; style broad at base, broadly rounded. Type Cecid. 69.

Itonida flavoscuta Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 137; separate, p. 41 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 415 (Cecidomyia)

This dark-brown male was taken May 21, 1906 at Albany, N. Y.

Male. Length .75 mm. Antennae longer than the body, thickly haired, dark brown; fourteen segments (fig. 36), the fifth with stems one-fourth and one and one-half times their diameters; terminal segment, distal enlargement produced, subconical. Palpi; first segment subquadrate, the second stout, the third one-fourth longer than the second and the fourth one-third longer than the third. Face reddish brown. Mesonotum dark brown, the submedian lines with pale setae. Scutellum yellowish, setose apically; postscutellum yellowish. Abdomen dark brown. Wings hyaline, costa light brown. Halteres yellowish transparent. Legs yellowish transparent, tinged with reddish at the extremities of femora, tibiae and

tarsi; claws stout, uniformly curved. Genitalia (pl. 20, fig. 6); dorsal plate narrowly and roundly emarginate, the lobes divergent

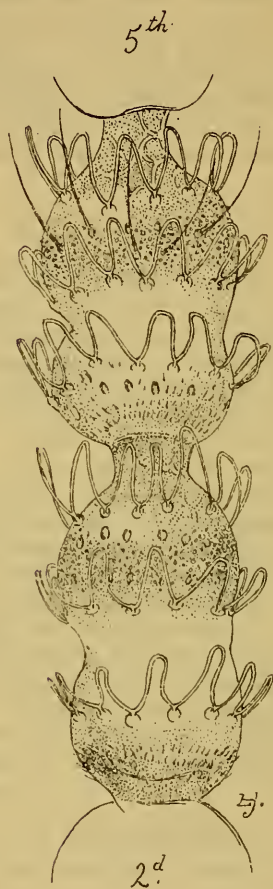


Fig. 36 *Itonida flavoscuta*, third and fourth antennal segments of male (enlarged, original)

and narrowly subtruncate; ventral plate broad, broadly and deeply emarginate, the lobes well separated; style stout, tapering, narrowly rounded. Type Cecid. 76.

Itonida foliora Rssl. & Hkr.

1908 Russell, H. M. & Hooker, C. W. Ent. News, 19:349-52 (Cecidomyia)

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 415 (Cecidomyia)

1910 Stebbins, F. A. Springfield Mus. Nat. Hist. Bul., 2:21, 22, 24 (Cecidomyia)

This insect is possibly *Cecidomyia erubescens* O. S. though as no stage of the insect was described, it is impossible to be certain without exhaustive rearings from a variety of marginal oak leaf rolls. The species was discovered by W. V. Tower in July 1905, working on the leaves of black oak. His observations on its life history were continued by H. M. Russell and subsequently C. W. Hooker completed the account. The marginal rolls (pl. 13, fig. 1) produced by this insect were very abundant on a black oak (*Quercus coccinae*, var. *tinctoria*) growing near the president's house on the grounds of the Massachusetts Agricultural College at Amherst, Mass. The infested tree was in a small clump of red oaks, none of which became infested, apparently indicating that this species occurs only on the black oak, particularly as the larvae were numerous upon the leaves and adults occurred in swarms under its branches. Every leaf was infested by from one to over one hundred larvae up to certainly within 10 feet of the top, though they were not so numerous on the upper branches as on the lower limbs. Our own observations show that certain Cecidomyiidae at least, display a marked preference for the foliage of the lower limbs.

Male. Length 1 mm. Antennae one-fourth longer than the body, thickly haired, dark brown; fourteen segments, the fifth with stems three-fourths and two times their diameters, respectively; terminal segment, distal enlargement slightly produced, apically an irregular conical projection. Palpi; the first segment rather long, stout, expanded distally, the second a little longer, more slender, the third one-half longer than the second, more slender, the fourth three-fourths longer than the third, somewhat dilated. Mesonotum dull black. Scutellum deep red, postscutellum yellowish. Abdomen deep red, the basal segments fuscous. Wings hyaline, costa reddish brown; halteres pale yellowish. Coxae, femora and tibiae mostly fuscous yellowish, the tarsi a little darker; claws long, slender, slightly curved, the pulvilli a little shorter than the claws. Genitalia; dorsal plate short, broad, deeply and triangularly incised, the lobes diverging, narrowly and irregularly rounded; ventral plate long, broad, the sides somewhat emarginate, broadly and roundly emarginate, the lobes short, obtuse; style stout, long and tapering, narrowly rounded.

Female. Length 1.5 mm. Antennae one-half the length of the body, sparsely haired, reddish brown; fourteen subsessile segments, the fifth with a length two and one-half times its diameter; terminal segment slightly produced, with a length four times its diameter and a short, stout process apically. Tarsi; first segment subquadrate, the second with a length twice its diameter, expanded distally, the third a little longer, narrowly oval, the fourth one-half longer than the third, slightly dilated. Ovipositor one-third the length of the abdomen, the terminal lobes with a length twice the width, narrowly oval. Otherwise nearly as in the male. Cecid. 1339.

Life history. Messrs Russell and Hooker state that the midges emerge from the ground from May 1st to the 20th, all disappearing by June 1st. May 4, 1908 five adults were captured and by the 11th the insects occurred in thousands, being so numerous that it was only necessary to sweep an open cyanid jar over the top of, and through the grass to obtain all the specimens desired. The flies appear just as the leaves begin to unfold and, for a time, after emerging, large numbers may be found in the early morning and on wet days, especially under the tree. As it becomes warmer and the dew dries they rise among the branches. The flight is feeble and the insects do not fly out beyond the borders of the tree. Oviposition begins when the leaves are 1 to 2 inches long, the eggs being deposited for the most part upon the under side and irregularly scattered between the veins. A few are laid, apparently by accident, upon the upper surface. An average of 70 eggs was obtained from each of 50 leaves, not over 6 being upon the upper surface, the total number varying from 40 to 120. One leaf $1\frac{3}{4}$ inches wide bore 281 eggs on its lower surface and 175 on the upper. The eggs hatch in from 4 to 6 days, the time varying with the weather. The young larvae migrate at once to the edge of the leaf or to any hole in it and begin to feed on the upper surface. After about 4 days of this feeding the edge begins to curl over on the upper surface, forming a roll, the upper face of which becomes more or less reddish. The larvae feed within this roll, extending it with the growth of the leaf. Occasionally a young larva feeds for a time in a circle on the exposed surface of the leaf, causing it to become reddish and wrinkled. May 22d nearly all the leaves near the ground bore rolls which, in some cases, nearly encircled the leaf, while in others they were about one-fourth of an inch long. One roll an inch long contained 25 larvae, while only a few were present in others. The longer rolls are said to contain relatively fewer larvae. The larval stage persists through the summer, full growth being attained by the last of September or the first of October, at which time all except those parasitized enter the ground and pupate prior to cold weather. Exceptionally full-grown larvae may be unable to escape and winter in the roll, the adults appearing at the usual time in the spring.

Natural enemies. This species is attacked by a chalcid egg parasite which appears at the same time in swarms almost as large as those of the host. The female chalcid walks around among the midge eggs, touching them rapidly with her antennae and stopping every now and then to insert her ovipositor and lay an egg in that of the host, neglecting others in the immediate vicinity. A mite

was also found abundant under and on the tree and it may prove to be a natural enemy of this species.

Itonida claytoniae Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 133; separate, p. 36-37 (Cecidomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 415 (Cecidomyia)

This reddish brown male was taken May 18, 1906 on *Claytonia virginica* at Albany, N. Y.

Male. Length 1.5 mm. Antennae longer than the body, thickly haired, light brown; fourteen segments, the fifth with stems one and one-half and two times their diameters; terminal segment, distal enlargement strongly constricted at the basal third and with a subglobular appendage. Palpi; the first and second segments suboval, nearly equal, the third one-half longer than the second, and the fourth one-half longer than the third. Face reddish. Mesonotum dark brown, the submedian lines paler. Scutellum reddish, postscutellum and probably abdomen reddish brown, the latter sparsely yellow haired. Wings hyaline, costa dark brown. Halteres reddish transparent. Legs dark brown, lighter ventrally; tarsi pale yellow; claws slender, strongly curved at the apical third. Genitalia; dorsal plate narrow, short, deeply and triangularly incised, the lobes well separated, narrowly rounded; ventral plate as broad as the dorsal plate, deeply and roundly emarginate, the lobes well separated, narrowly rounded; style stout, the edges irregularly convolute, broadly rounded. Type Cecid. 46.

Itonida hartmaniae n. sp.

The male described below was taken near a decaying hickory stump at Albany, N. Y., April 15, 1911.

Male. Length 2 mm. Antennae one-fourth longer than the body, thickly haired, dark brown; fourteen segments, the fifth with stems two and one-half and three and one-half times their diameters; terminal segment, distal enlargement with a length nearly four times its diameter, a constriction near the basal third and apically a long, stout, tapering process. Palpi; first segment subrectangular, with a length three times its diameter, the second about as long as the first, a little stouter, the third one-half longer than the second, more slender, the fourth one-half longer than the third, dilated. Mesonotum slaty brown, the submedian lines sparsely haired. Scutellum fuscous yellowish, postscutellum dark brown. Abdomen sparsely haired, dark reddish brown; genitalia dark brown. Wings hyaline, costa light brown; halteres yellowish basally, fuscous reddish and thickly setose apically. Coxae dark brown; femora mostly reddish brown; tibiae darker, the posterior with a broad subapical band of yellowish scales; tarsi mostly dark brown, the two distal segments on the anterior legs yellowish brown; claws stout, evenly curved, simple, the pulvilli about one-third the length of the claws. Geni-

talia; dorsal plate short, deeply and triangularly incised, the lobes diverging, obliquely truncate; ventral plate long, broad, tapering, broadly and roundly emarginate, the lobes short, broadly rounded; style long, stout, narrowly rounded. Type Cecid. 1389.

Itonida excavationis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 139 (*C. excavata*); separate, p. 42-43 (*Cecidomyia*)

1908 ——— N. Y. State Mus. Bul. 124, p. 415 (*Cecidomyia*)

The pale yellowish male was taken May 21, 1906 on soft maple, *Acer rubrum*, at Albany, N. Y.

Male. Length .75 mm. Antennae longer than the body, rather thickly clothed with short, dark brown setae, pale straw color; fourteen segments, the fifth with stems two and two and one-half times their diameters respectively. Palpi; the first segment short, subquadrate, slightly swollen at the distal third, the second twice the length of the first, slender, the third a little longer, more slender, the fourth one-half longer than the third; face yellowish white. Mesonotum reddish brown with distinct submedian yellowish lines sparsely clothed with setae. Scutellum yellow, tipped with carmine, postscutellum yellow. Abdomen pale reddish yellow with slightly fuscous areas dorsally on the second and third segments. Wings hyaline, costa pale brown; halteres yellowish transparent. Legs variably brown tinged with reddish, lighter ventrally, the anterior and mid tarsi distinctly darker than the posterior; claws slender, slightly curved. Genitalia (pl. 19, fig. 4); dorsal plate broad, deeply and roundly emarginate, the lobes widely separated, narrowly rounded; ventral plate narrow, narrowly rounded; style long, tapering, the margins slightly convolute, broadly rounded. Type Cecid. 65.

Itonida opuntiae Felt

1910 Felt, E. P. Ent. News, 21:10-12 (*Cecidomyia*)

1915 ——— N. Y. State Mus. Bul. 175, p. 39-41

1918 ——— N. Y. State Mus. Bul. 200, p. 172, 173

Midges were reared during June, July and August 1909, from discolored areas accompanied by more or less decay (fig. 37), at the base of spines on *Opuntia* leaves received from George V. Nash, head gardener of the New York Botanical Gardens at Bronx Park, N. Y. Apparently the eggs are deposited at the base of a spine, possibly near some recent wound and the larvae commence operations upon the tissues, their work being followed by decay and in some instances by the operations of a small Ptinid beetle belonging to the genus *Catorama*. In the latter case the dead tissues are traversed by irregular galleries, the *Cecidomyiid* larvae being in the near vicinity of living cells. This species occurred in New York in the leaves of *Opuntia banburyana* from Italy and an

Opuntia from British West Indies. It is probably American and presumable that the infestation originated in this country. The deep red male may be recognized by the short, broad, triangularly emarginate ventral plate.



Fig. 37 *Itonida opuntiae*, lobe of cactus showing characteristic signs of infestation (author's illustration)



Fig. 38 *Itonida anthici*, cluster of flowerlike galls and one gall enlarged (author's illustration)

Itonida anthici Felt

1913 Felt, E. P. Econ. Ent. Jour., 6:278

1918 ——— N. Y. State Mus. Bul. 200, p. 5, 19, 20

This interesting species produces pinkish white flowerlike galls on cypress, *Taxodium distichum*, the galls (fig. 38) sometimes being so numerous as to dominate the dark-green cypress foliage and give the appearance of an ordinary flowering plant thickly set with small blossoms. The gall was collected repeatedly by Dr

W. L. McAtee of the bureau of biological survey, Washington, and is apparently common and widely distributed, since we have records of its occurring in Arkansas, Mississippi and Alabama. The gall is probably a greatly hypertrophid leaflet.

Dr E. A. Burt of the Missouri Botanical Garden has recently called our attention to the fact that this gall was originally supposed to have been produced by a fungus, first designated as *Merulius cupressi* Schw. (Schrift d. Naturforsch. Gesell. Leipzig, 1:92, 1822) and subsequently referred to the genus *Cyphella* (Fries, Epicr. 567, 1836-1838). He states that it has been distributed in collections of fungi under one or the other of the above-mentioned botanical names. The above is paralleled by the earlier reference of the peculiar blister leaf galls produced by the genus *Asteromyia* to fungi belonging to the genus *Rhytisma*. The true nature of this cypress gall seems to have first been pointed out, according to Dr Burt (Mo. Bot. Gard. Ann. 1:380, 1914) by Berkley & Curtis (Acad. Nat. Sci. Phila. Jour. 3:207, 1856). See also Saccardo, Sylloge Fungorum 6:674, 1888.

Itonida manihot Felt

1910 Felt, E. P. Ent. News, 21:268-69 (Cecidomyia)

1918 ——— N. Y. State Mus. Bul. 200, p. 157

This yellowish brown West Indian species, only about 1 mm long, was reared from leaf galls on Cassava, *Manihot utilissima*, by William H. Patterson, of the agricultural school, St Vincent, W. I.

It was also received under date of March 16, 1915 from Prof. F. W. Urich, Trinidad, B. W. I. The male is most easily recognized by the long, deeply and roundly emarginate ventral plate and the short stems separating the antennal enlargements.

Itonida texana n. sp.

The reddish male described below was taken by E. S. Tucker in a trap lantern at Plano, Texas, during July. It is doubtfully referred to this genus and is remarkable because of the greatly swollen basal clasp segment.

Male. Length 1.25 mm. Antennae a little longer than the body, thickly haired, dark brown; fourteen segments, the fifth with stems one and three-fourths and one and one-fourth times their diameters, respectively; terminal segment produced, the distal enlargement subcylindric, with a length three times its diameter, and apically with a slender, fingerlike process. Palpi; first segment with a length over twice its diameter, the second a little longer, stouter, the third a little longer and more slender than the second, and the fourth a little longer than the third. Mesonotum reddish brown, the sub-

median lines indistinct. Scutellum and postscutellum reddish brown. Abdomen rather thickly clothed with yellowish hairs, a variable reddish brown. Wings hyaline, costa light straw; halteres yellowish transparent, slightly fuscous apically. Coxae, femora and tibiae a variable dark brown and yellowish, the segments slightly fuscous apically; claws slender, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment greatly swollen, ovate, with a length only one-fourth greater than the diameter; terminal clasp segment as long, stout, curved; dorsal plate short, broadly emarginate, the lobes broadly rounded; ventral plate deeply and triangularly emarginate, the lobes divergent, tapering; style short, tapering, narrowly rounded. Type Cecid. 1265.

Itonida albotarsa Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 132-33; separate, p. 36 (Cecidomyia)

The yellowish male was taken on hickory, *Carya*, at Albany, N. Y., June 19, 1906.

Male. Length 2 mm. Antennae longer than the body, sparsely haired, light brown; fourteen segments, the fifth with stems one and one-half and two times their diameters, respectively; terminal segment produced, the distal enlargement constricted at the basal third, with a length over twice its diameter and apically with a short, conical appendage. Palpi; first segment subquadrate, the second with a length three times its diameter, the third a little longer, more slender, the fourth one-third longer than the third. Mesonotum yellowish, sparsely clothed with black hairs. Abdomen yellowish, lighter distally, the segments margined posteriorly with long, black hairs. Wing (pl. 15, fig. 8) with costa dark brown; halteres yellowish, slightly fuscous apically. Legs thickly clothed with fuscous hairs, yellowish basally; tibiae black, the tarsi fuscous, except the white second of the anterior and the second to fifth of the posterior. Genitalia (pl. 19, fig. 2); dorsal plate short, deeply and triangularly emarginate, the lobes broadly rounded; ventral plate long, deeply and triangularly emarginate, the lobes triangular; style short, narrowly rounded. Type Cecid. 330.

Itonida taxodii Felt

1911 Felt, E. P. Econ. Ent. Jour., 4:556-57

1918 ——— N. Y. State Mus. Bul. 200, p. 19

This insect, characterized earlier, was reared in February and March 1883, by the late Theodore Pergande from a conical, globular or elongated deformation of the leaves of bald cypress, *Taxodium distichum*, collected by H. G. Hubbard in Florida. Specimens were kindly placed at our disposal for study through the courtesy of the United States National Museum.

Larva. Length about 2.5 mm, moderately stout, tapering at both extremities, apparently deep reddish; breastbone indistinct in the preparation.

Itonida ramuli Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 164 (Cecidomyia)

This reddish orange species was reared May 25, 1907 from a small, monothalamous, almost imperceptible enlargement on the smaller twigs of *Cornus paniculata* taken at Albany, N. Y. The female has fourteen antennal segments, the fifth with a stem about one-third the length of the basal enlargement, which latter has a length about three times its diameter. The ovipositor is short and the terminal lobes long, slender, narrowly rounded and thickly setose.

Gall. A small, monothalamous, almost imperceptible enlargement on the smaller twigs. Length 5 mm, diameter 2.5 mm. The branch has a diameter of only 1.5 mm. The larva occurs in a rather large, oval chamber.

Larva. Length 2 mm, whitish yellow, moderately stout. Head small, triangular; antennae short, stout, uniarticulate. Body with the segmentation moderately distinct; skin nearly smooth; breastbone roundly bilobed, the shaft obsolescent; posterior extremity broadly rounded, with conical, chitinous, sublateral pseudopods and just anteriorly a submedian pair of spined tubercles; sublaterally a pair of rather long, stout spines.

Female. Length 2.5 mm. Antennae extending to the fifth abdominal segment, sparsely haired, pale yellowish; fourteen segments, the fifth with a stem one-third the length of the cylindrical basal enlargement, which latter has a length three times its diameter; terminal segment somewhat reduced, subconical. Palpi; first segment stout, subquadrate, the second more than twice the length of the first, rather slender, the third about as long, a little stouter, the fourth one-half longer than the third. Face light fuscous yellowish. Mesonotum yellowish brown, the submedian lines lighter, thickly setose, the posterior median area light reddish yellow. Scutellum light reddish, sparsely setose apically; postscutellum reddish brown. Abdomen deep reddish orange, the segments posteriorly sparsely setose. Costa dark brown, subcosta uniting with the margin at the basal third, the third vein just beyond the apex. Halteres yellowish transparent, light fuscous subapically. Coxae and base of femora yellowish transparent, femora distally; tibiae and tarsi dark brown, the second and third tarsal segments on the posterior legs fuscous yellowish; claws long, slender, slightly curved, the pulvilli one-third the length of the claws. Ovipositor short, terminal lobes long, slender, narrowly rounded. Type Cecid. a1384.

Itonida cincta Felt

- 1911 Felt, E. P. Econ. Ent. Jour., 4:558
 1918 ——— N. Y. State Mus. Bul. 200, p. 54

This name is applied to a series of well-marked females reared by the late C. V. Riley from larvae taken under oak bark. Though the markings simulate closely those of *Lestodiplosis*, the long ovipositor and the relatively broad lobes prevent its reference thereto and we have therefore tentatively placed it in the above-named genus. It is such a well-marked form that there should be no difficulty in recognizing it subsequently. Specimens, evidently from the same lot, occur in the Museum of Comparative Zoology at Cambridge, Mass.

Itonida piperitae Felt

- 1907 Felt, E. P. New Species Cecidomyiidae II, p. 22 (*Cecidomyia*)
 1908 ——— N. Y. State Mus. Bul. 124, p. 303 (*Cecidomyia*)

This yellowish female was reared September 4, 1907 from small, enlarged terminal buds on peppermint, *Mentha piperita*, taken at Nassau, N. Y.

Gall. Green, hoary, pyriform, slightly enlarged buds, diameter 3 mm.

Female. Length 1.25 mm. Antennae as long as the body, sparsely haired, brown, yellowish basally; fourteen segments, the fifth with a stem three-fourths the length of the basal enlargement, which latter has a length about twice its diameter; terminal segment produced, the distal enlargement with a length three times its diameter, apically a long, slender appendage. Palpi; first segment short, stout, subquadrate, the second one-half longer, more slender, the third a little longer and more slender than the second, the fourth one-third longer and more slender than the third. Face yellowish. Mesonotum shaded orange red, the submedian lines indistinct. Scutellum reddish basally, light fuscous apically; postscutellum deep orange. Abdomen pale orange. Costa light reddish brown, subcosta uniting therewith near the basal third, the third vein just beyond the apex. Halteres pale yellowish, slightly fuscous subapically. Legs light yellowish orange, the articulations variably tinged with carmine; claws long, slender, strongly curved, simple, the pulvilli nearly as long as the claws. Ovipositor short, the terminal lobes narrowly oval, with a length three times the width. Type Cecid. a1663c.

Itonida abdominalis nov. nom.

- 1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 124-25; separate, p. 28
 (*Oligotrophus carya*e)

The reddish brown female was taken on hickory, *Carya*, at Albany, N. Y., June 1, 1906.

Female. Length .75 mm. Antennae extending to the middle of the abdomen, sparsely haired, light brown; fourteen segments, the fifth with a stem one-fifth the length of the cylindrical basal enlargement, which latter has a length about three times its diameter; terminal segment slightly reduced and apically with a rather short, stout appendage. Palpi; first segment with a length twice its diameter, the second one-half longer, the third as long as the second, the fourth a little longer than the third. Face yellowish. Mesonotum black. Scutellum and postscutellum reddish brown. Abdomen reddish brown, the distal segment and ovipositor light yellowish, the other segments margined posteriorly with dark brown. Costa reddish brown, subcosta uniting therewith at the basal fourth, the third vein joining the margin well beyond the apex. Halteres yellowish or reddish transparent. Coxae and basal portion of femora yellowish, distal portion of femora, tibiae and tarsi a variable straw brown; claws slender, slightly curved, simple. Ovipositor short, the lobes lanceolate, slender, coarsely setose. Type *Cecid.* 102.

DYODIPLOSIS Rubs.

- 1910 Rubsamen, E. H. Zeitschr. Wissenschaft. Insektenbiol., 6:287
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:62
 1912 Rubsamen, E. H. Zeitschr. Wissenschaft. Insektenbiol., 8:49
 1913 Kieffer, J. J. Gen. Insect., fasc. 152 p. 205

This genus, previously unrecognized in America, presents a general resemblance to a typical *Hormomyia*. It may be distinguished by the mesonotum not being produced over the head, the tri- or quadri-articulate palpi, the moderately long circumfila, the female being noteworthy because of the erect loops and the two connecting fili, the simple claws and rudimentary pulvilli, the short ovipositor, the heavy genitalia with a broadly lobed dorsal plate and the broad, truncate, ventral plate. Type *Hormomyia aranariae* Rubs.

Dyodiplosis davisii n. sp.

The male was taken in a trap lantern at Huguenot Park, Staten Island, June 22, 1906. It appears to be most closely allied to this genus though it differs somewhat from the typical form. Two Indian species are known and as the generic type is European, this would indicate a wide distribution for the genus or at least closely allied forms.

Male. Length 3.5 mm. Antennae probably longer than the body, pale straw yellow, and presumably with fourteen segments. The fifth with stems with a length one-half greater and a little greater than their diameters, respectively; distal enlargement subcylindrical, with a length about twice its diameter; circumfila with short, moderately thick loops. Palpi; first segment with a length over twice

its diameter, the second as long as the first, the third one-half longer than the second and the fourth one-half longer and more slender than the third. Face fuscous yellowish, mesonotum brown, with broad, fuscous yellowish, sparsely haired, submedian lines. Scutellum reddish brown, postscutellum light yellowish, abdomen dark reddish brown, thickly clothed with fine yellowish setae, the basal segment light yellowish. Wings hyaline (pl. 14, fig. 1). Halteres yellowish transparent, fuscous subapically, legs fuscous straw, claws long, slender, slightly curved. Pulvilli rudimentary. Genitalia (pl. 18, fig. 2); both clasp segments long, stout; dorsal plate broad, very broadly and triangularly emarginate; ventral plate longer, broad and broadly rounded; style a little longer, narrowly rounded apically. Type Cecid. 383.

HORMOMYIA Loew

Angelinia Rond.

- 1850 Loew, H. Dipt. Beitr., 4:20, 31
 1853 Winnertz, J. Linn. Ent., 8:188, 283
 1861 Rondani, C. Soc. Ital. Sci. Nat. Milano Atti, 2:5, 8 (*Angelinia*)
 1862 Osten Sacken, C. R. Dipt. N. A., 1:176
 1863 Shiner, J. R. Fauna Austriaca Dipt., 2:396
 1876 Bergenstamm, J. E. & Low, Paul Syn. Cecidomyidarum, p. 24
 1888 Skuse, F. A. A. Linn. Soc. N. S. Wales Proc., 3:37, 39, 43, 110
 1892 Rubsamen, E. H. Berl. Ent. Zeitschr., 37:329, 392
 1892 Theobald, F. V. Acct. Brit. Flies, 1:51
 1896 Kieffer, J. J. Wien. Ent. Zeit., 15:91
 1897 ——— Syn. Cecid. de Eur. & Alg., p. 25
 1900 ——— Soc. Ent. Fr. Ann., 69:445-46
 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 387
 1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:284
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:57
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 137

The genus *Hormomyia*, as originally proposed, was unfortunate in that its author attempted to include thereunder two very distinct forms, namely, a true *Hormomyia* represented by *H. fasciata* H. Loew not Meigen, now referred to *H. dubitata* Rubs., and a species closely allied to *Phytophaga*, namely, *Mikiola fagi* Hart. These very diverse forms were evidently associated because of apparent similarities, particularly as Kieffer has subsequently made *fagi* the type of a new genus. We are constrained, after an examination of the literature, to hold *Cecidomyia crassipes* H. Lw. to be the type of this genus.

Apparently ignoring characters given by Loew, Rondani attempted to limit the conception of *Hormomyia* to species having an equal number of antennal segments in both sexes and named as a type of this genus, *H. cucullata* Meig., a species apparently unknown

to Loew at the time the genus was erected. Furthermore, he proposed *Angelinia* for the species with males possessing twice as many antennal segments as the females. This latter is evidently true or nearly true of the type species of *Hormomyia*. It is to be noticed that Loew described the antennae of the female *H. dubitata* as having the flagellate segments plainly double, though Rubsaamen illustrates these segments as sessile, cylindrical, with a length about four times the diameter and with very little or no indication of a median constriction.

Typical species of *Hormomyia* are easily recognized by their large size, relatively heavy structure and in particular by the mesonotum

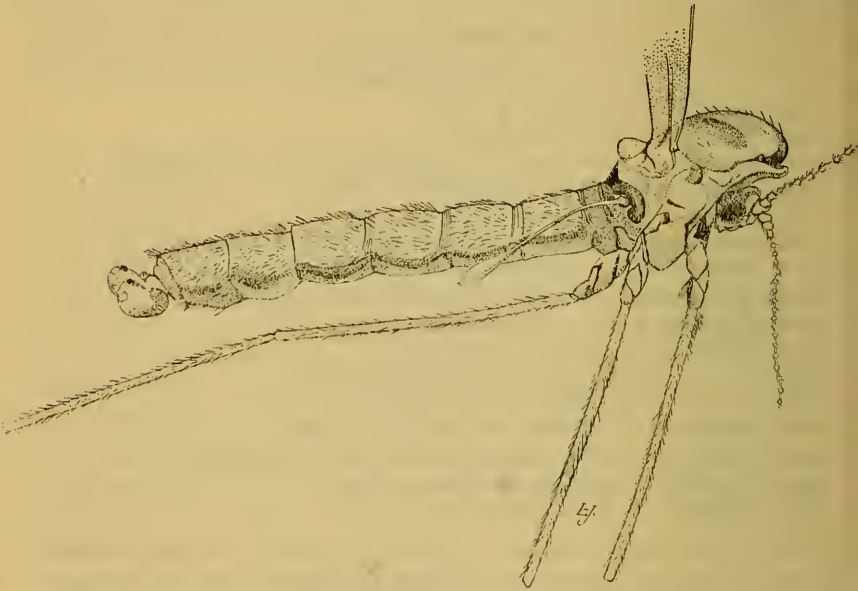


Fig. 39 *Hormomyia americana*, side view of body of male showing in particular the greatly produced mesonotum (enlarged, original)

being greatly produced over the head (fig. 39). The antennae of our American forms, some of which are provisionally placed here, have from fourteen to twenty-seven segments, those of the male binodose and provided with three low though distinctly looped, frequently somewhat irregular, yet very characteristic circumfila (fig. 40). The antennal segments of the female are equally variable in number, may be distinctly binodose or cylindrical and mostly with two rarely with three circumfila. These latter are in some forms at least very nearly as well developed as in the male. The species referable to this genus vary so greatly in structure and both sexes

of so few have been reared that we are unable to find the limits of variation and to definitely associate the sexes. It is quite possible that some of the females placed in this genus may have to be located elsewhere when the two sexes are known.

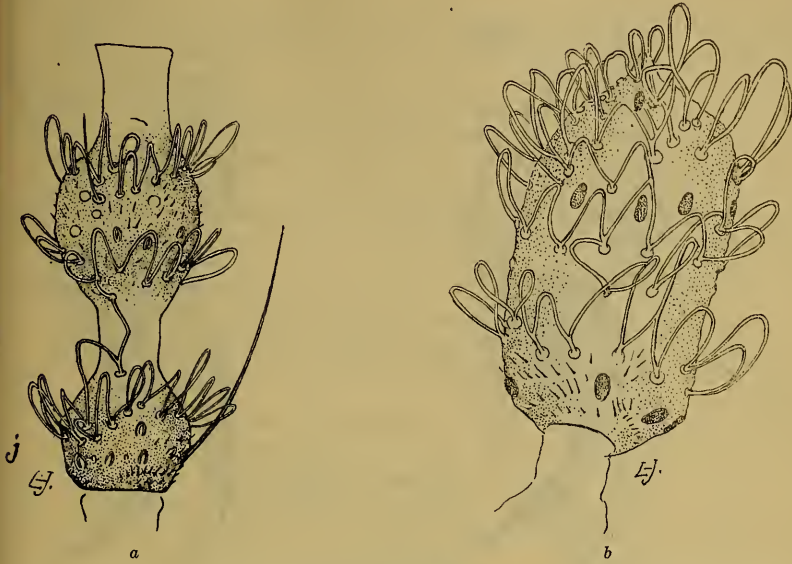


Fig. 40 *Hormomyia americana*: *a*, fifth antennal segment of male, only two setae represented; *b*, terminal antennal segment of male, setae not sketched in (enlarged, original)

The palpi are more or less reduced and in most species are unarticulate or biarticulate (fig. 44a). The wings are long and narrow, the third vein usually joining the margin at or beyond the apex (pl. 14, figs. 2-4). The claws (fig. 41) are long, stout, evenly curved, mostly simple and the pulvilli are greatly reduced in many species, specially in the males. The male genitalia are heavy, the basal clasp segment being stout while the terminal clasp segment is usually obtuse and with a more or less rudimentary spur. The dorsal plate is broadly emarginate while the ventral plate is usually short and relatively broad. The ovipositor of the female is short and with broad terminal lobes.

Several European species have been reared from *Carex*. This is likewise true of *H. caudata* Felt and it is probable that a number of other American species live in associated plants.



Fig. 41 *Hormomyia americana*: *a*, side view of apex of last tarsal segment and claws of the foreleg; *b*, same of last tarsal segment and claw of the hind leg (enlarged, riginal)

Key to Species

Males

- a* Antennae composed of more than 20 segments
 - b* Abdomen yellowish; length 5 mm. Antennae with 25 segments, the palpi uniaarticulate.....*americana* Felt, C. 91
 - bb* Abdomen yellowish with the fifth, sixth and seventh segments dull orange; length 7 mm. Antennae with 27 segments, the palpi biarticulate; ventral plate long, broad and broadly rounded..*palustris* Felt, C. 1205
 - bbb* Abdomen uniformly fuscous yellowish; length 6 mm. Antennae with 26 segments, the palpi biarticulate; ventral plate long, broad, deeply and triangularly emarginate.....*needhami* Felt, C. 788

Females

- a* Large, at least 4 mm long
 - b* 24 antennal segments, length 7 mm. Abdomen a variable yellowish; antennal segments with 2 circumfila, the fifth cylindric, with a length three times its diameter and with a distinct constriction at the basal third; lobes broadly oval.....*cincta* n. sp. C. 1345

- bb* 23 antennal segments, length 8 mm. Abdomen deep salmon; antennal segments with 2 circumfila, the fifth cylindric, with a length two and one-half times its diameter and with but a slight constriction at the basal third; lobes narrowly oval.
maxima n. sp. C. 1371
- bbb* 20 antennal segments or more. Abdomen yellowish brown; antennal segments with 2 circumfila, the fifth cylindric, with a length three times its diameter.
montana n. sp. C. 1071
- bbbb* 18 antennal segments. Abdomen reddish brown; 3 circumfila, fifth antennal segment with a stem one-fourth the length of the cylindric basal enlargement, which latter has a length twice its diameter.
pudica Felt, C. 1465
- bbbbb* 18 antennal segments. Abdomen dark brown; antennal segments with 3 circumfila, the fifth cylindric, with a length two and one-half times its diameter.
atlantica Felt, C. 815
- bbbbbb* 14 antennal segments
 - c* Length 4 mm. Flagellate antennal segments with 3 circumfila
 - d* Abdomen yellowish orange, the fifth antennal segment with a length four times its diameter. Reared from a bud gall on sedge.
caudata Felt, C. a2718
 - dd* Abdomen dark brown, the fifth antennal segment distinctly binodose.
coloradensis Kll., C. a1919
- aa* Small species, length 3.5 mm or less
 - b* Flagellate antennal segments, binodose, with 3 circumfila, abdomen golden yellow.
alexanderi n. sp., C. 1353

Hormomyia americana Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 125; separate, p. 28-29
 1908 ——— N. Y. State Mus. Bul. 124, p. 387

This striking form was first taken in a trap lantern at Nassau, N. Y., May 31, 1906 and again May 28, 1908.

Male. Length 5 mm. Antennae as long as the body, sparsely fine haired, fuscous yellowish, distal segments tinged with carmine; twenty-five segments, the fifth (fig. 40a) with stems one and one-half and one and one-fourth times their length, respectively; terminal segment (fig. 40b) reduced. Palpi one much produced segment, the basal fifth greatly enlarged and tapering suddenly to the

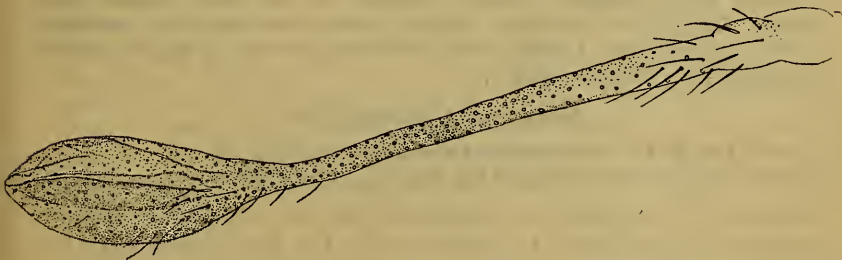


Fig. 42 *Hormomyia americana*, halter of male (enlarged original)

distal slender, slightly curved portion; face yellowish brown. Mesonotum with the anterior median triangular area and posterior sublateral irregular areas dark brown, the median posterior area and oblique sublateral anterior areas and the lateral area bordering the posterior submedian darker areas, fuscous yellowish. Scutellum yellowish, postscutellum yellowish anteriorly and laterally, black on the median posterior area. Abdomen semitransparent, yellowish, each segment tinged with orange basally, the sixth and seventh segments nearly suffused with orange, genitalia reddish brown with fuscous markings. Wings (pl. 14, fig. 4) hyaline, costa pale straw tinged with carmine, the third vein joining the margin well beyond the apex; halteres (fig. 42) very long, slender, yellowish transparent, distally fuscous yellowish. Coxae fuscous yellowish tinged with reddish, femora and tibiae fuscous yellowish, tarsi slightly darker, tinged with reddish; claws stout, strongly curved at the basal fourth (fig. 41). Genitalia (fig. 43); basal clasp segment short, stout;

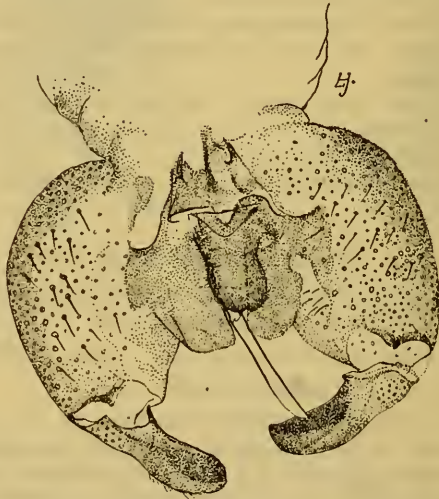


Fig. 43 *Hormomyia americana*, genitalia of male (enlarged, original)

terminal clasp segment slightly swollen at the base; dorsal plate broad, deeply and broadly incised, the lobes broadly rounded; ventral plate stout, broadly rounded though with a slight median emargination. Type Cecid. 91.

Hormomyia palustris Felt

- 1907 Felt, E. P. New Species of Cecidomyiidae II, p. 19
 1908 ——— N. Y. State Mus. Bul. 124, p. 300, 387

Males of this species were captured May 20, 1907, in considerable numbers by Dr James G. Needham on the lake marsh near the Limnological laboratory at Ithaca, N. Y. A close search failed to disclose any females.

Male. Length 7 mm. Antennae nearly as long as the body, thickly haired, pale yellowish; twenty-five to twenty-seven segments, the fifth with the basal stem very short, the distal as long as the diameter; terminal segment reduced, narrowly oval. Palpi; the first segment short, stout, irregular, with a length three times its diameter, the second one-half longer than the first, more slender. Face fuscous. Mesonotum brown with broad submedian lines, and a posterior yellowish median area. Scutellum pale yellowish, post-scutellum yellowish margined posteriorly with fuscous. Abdomen yellowish with the first four segments mostly pale yellowish transparent, the fifth, sixth and seventh dull orange. Genitalia fuscous yellowish. Wings hyaline, costa light brown, the third vein just beyond the apex. Halteres pale yellowish white. Legs long, slender, pale yellowish; claws long, stout, evenly curved, the pulvilli nearly one-half the length of the claws. Genitalia; basal and terminal clasp segments short, stout; dorsal plate short, broad, broadly and slightly emarginate, the lobes obliquely truncate; ventral plate long, stout, broadly rounded. Harpes stout, divergent, broadly rounded. Described from alcoholic specimens. Type Cecid. 1205.

Hormomyia needhami Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 160

1908 ——— N. Y. State Mus. Bul. 124, p. 387

This species was captured by Dr James G. Needham at Lake Forest, Ill., June 6, 1906.

Male. Length 6 mm. Antennae extending to the fourth abdominal segment, very long, finely haired, pale fuscous yellowish, the stems semitransparent; twenty-six segments, the fifth with stems one-half and one and one-half times their diameters respectively; terminal segment reduced, short, broadly rounded, thick and irregular circumfila. Palpi, the first segment short, stout, with a length about one-half greater than its diameter, the distal segment twice the length of the first; face fuscous. Mesonotum yellowish, the anterior and lateral margins bordered by fuscous, the latter slightly produced on the median line. Scutellum and postscutellum pale yellowish, the latter dark brown posteriorly. Abdomen fuscous yellowish, sparsely clothed with fine hairs. Wings hyaline, costa light brown, the third vein just before the apex; halteres fuscous yellowish. Legs a variable fuscous yellowish; claws rather long, stout, slightly curved, pulvilli short, about one-half the length of the claws. Genitalia (pl. 18, fig. 1); basal clasp segment short, stout a roundly triangular lobe at the basal third; terminal clasp segment long, stout; dorsal plate short, broadly and triangularly emarginate, the lobes broadly triangular; ventral plate long, broad, deeply and triangularly emarginate, the lobes subtriangular. Type Cecid. 788.

Hormomyia cincta n. sp.

This large species was captured May 21, 1906, by S. A. Shaw at Hampton, N. H., and transmitted to this office for study through the courtesy of Prof. C. W. Johnson of Boston, Mass.

Female. Length 7 mm. Antennae rather thickly haired, fuscous yellowish; twenty-four segments, the fifth with a stem about one-sixth the length of the subcylindric basal enlargement, which latter has a length three times its diameter, is slightly constricted near the basal third; low circumfila occur near the basal third and apically; terminal segment reduced, narrowly oval. Palpi probably biarticulate. Mesonotum a variable reddish brown, the submedian lines and posterior median area fuscous yellowish. Scutellum yellowish, postscutellum dark brown. Abdomen a variable yellowish, the segments margined posteriorly with dark brown and with a broad, indeterminate, dark brown band laterally; ovipositor pale orange; venter apparently concolorous with the dorsum. Wings hyaline, costa pale brown, the third vein joining the margin at the apex. Halteres fuscous yellowish. Coxae a variable fuscous yellowish; femora and tibiae mostly yellowish brown, the latter slightly fuscous apically; tarsi mostly fuscous yellowish; claws long, stout, slightly curved, the pulvilli about one-third the length of the claws. Ovipositor short, the lobes broadly oval. Type Cecid. 1345.

Hormomyia maxima n. sp.

This species was swept from palustral grasses at Johnstown, N. Y., June 8, 1909, by C. P. Alexander. This may prove to be the female of *H. americana* Felt.

Female. Length 8 mm. Antennae about three-fourths the length of the body, sparsely haired, pale yellowish; twenty-three segments, the fifth with a stem about one-fourth the length of the cylindric basal enlargement, which latter has a length two and one-half times its diameter, is slightly constricted near the basal third, low circumfila near the basal third and apically; terminal segment slightly produced, with a length three times its diameter or with a rudimentary additional segment. Palpi; uniarticulate, the basal third greatly thickened ventrally and broadly rounded, the distal portion slender, strongly curved at the basal third and tapering to an irregular, setose apex. Mesonotum reddish brown. Scutellum and postscutellum pale yellowish orange, the latter broadly fuscous posteriorly. Abdomen deep salmon, the dorsal sclerites sparsely fused with fuscous scales; ovipositor yellowish, light fuscous apically. Wings hyaline, costa pale straw, the third vein joining the margin beyond the apex. Halteres whitish basally, fuscous yellowish apically. Coxae and legs mostly pale straw, the tibiae and tarsi slightly darker; claws long, irregularly curved, simple, the pulvilli one-fourth the length of the claws. Ovipositor short, the terminal lobes narrowly rounded. Type Cecid. 1371.

Hormomyia montana n. sp.

This species, loaned for study through the courtesy of the United States National Museum, was taken in Colorado.

Female. Length 5 mm. Antennae extending to the base of the abdomen, rather thickly haired, light yellowish; twenty and possibly more segments, the fifth cylindrical, with a length fully three times its diameter; low circumfila occur at the basal third and subapically. Palpi; the first segment short, stout, subquadrate, the second stout, with a length about five times its diameter, thickly setose. Mesonotum reddish brown, the submedian lines rather thickly haired. Scutellum fuscous yellowish brown, postscutellum reddish and dark brown, fuscous yellowish anteriorly. Abdomen a variable yellowish brown, the fourth, fifth and sixth segments somewhat fuscous posteriorly. Wings hyaline, costa light brown, the third vein uniting with the margin well beyond the apex. Halteres yellowish brown. Legs a nearly uniform fuscous yellowish; claws stout, slightly curved, the pulvilli shorter than the claws. Ovipositor short, the lobes broadly oval. Type Cecid. 1071.

Hormomyia pudica Felt

1913 Felt, E. P. Psyche, 20:146

The species was received through Prof. C. W. Johnson of the Boston Society of Natural History and labeled: "June 13, 1907, Hampton, N. H., S. A. Shaw, 1124." It presumably has eighteen segments and is easily separated from *H. atlantica* by the three circumfila and the long uniarticulate palpi.

Hormomyia atlantica Felt

1908 Felt, E. P. N. Y. State Mus. Bul., 124, p. 387

This species was taken May 14, 1901 at Clementon, N. J., by Prof. C. W. Johnson.



Fig. 44 *Hormomyia atlantica*: *a*, palpus of female; *b*, fifth antennal segment of female (enlarged, original)

Female. Length 5 mm. Antennae hardly extending to the base of the abdomen, thickly haired, fuscous yellowish; eighteen sessile segments, the fifth (fig. 44b) cylindric, with a length two and one-half



Fig. 45 *Hormomyia atlantica*, side view of apex of distal tarsal segment and claws of female (enlarged, original)

times its diameter and three rather strongly elevated circumfila, the first near the basal third, the second near the distal third and the third subapical; terminal segment greatly reduced, broadly sub-oval. Palpi (fig. 44a); the first segment short, stout, subquadrate,



Fig. 46 *Hormomyia atlantica*, side view of apex of abdomen and ovipositor of female (enlarged, original)

the second a little longer, subconical; face fuscous yellowish. Thorax greatly produced over the small head. Mesonotum with the median subtriangular area dark brown, the irregular lateral areas light brown, somewhat diffuse, the broad submedian lines and the posterior median area fuscous yellowish. Scutellum pale yellow, post-scutellum reddish yellow. Abdomen sparsely clothed with fine setae, shining dark brown, the third and fourth segments narrowly margined posteriorly with yellowish, the seventh and eighth segments mostly yellowish, the latter and the base of the following tinged with bright red, terminal lobes dark fuscous, slightly yellowish basally. Wings (pl. 14, fig. 2) hyaline, costa light brown, the third vein just beyond the apex. Halteres pale yellowish transparent, slightly fuscous apically. Legs light fuscous yellowish, the distal tarsal segments somewhat darker; claws (fig. 45) long, stout, curved near the basal third, pulvilli about one-half the length of the claws. Ovipositor (fig. 46) short, the terminal lobes long, narrowly oval. Type Cecid. 815.

Hormomyia caudata Felt

1916 Felt, E. P. N. Y. Ent. Soc. Jour., 24:176

1918 ——— N. Y. State Mus. Bul. 200, p. 27

This species was reared April 29, 1915, by George G. Ainslie from what were evidently modified buds or shoots of a sedge, probably cyperus species collected at Clarksville, Tenn. The galls occurred at the very base of the plant. The midge is easily distinguished from other known females by the greatly produced fifth antennal segment in connection with its moderate size.

Hormomyia coloradensis Ckll.

1908 Cockerell, T. D. A. Can. Ent., 40:421-22

This species was taken by Professor Cockerell September 24, 1908 on a street pavement at Boulder, Col. The following description has been drafted from types he kindly placed at our disposal.

Female. Length 5.25 mm. Antennae extending to the fourth abdominal segment, thickly haired, fuscous yellowish; fourteen segments, the fifth greatly produced, binodose, with a length more than four times its diameter; basal portion of the stem irregular, with a length one-half greater than its diameter, the distal part with a length half its diameter; basal enlargement subglobose, with a sparse whorl of stout setae and a circumfilum; distal enlargement produced, with a length nearly twice its diameter and subbasal and subapical circumfila, the loops long; a scattering whorl of stout setae near the middle. Palpi; the first segment narrowly oval, the second subquadrate, with a length three times its diameter, the third one-half longer, slender, and the fourth a little longer and more slender than the third. Mesonotum greatly produced over the head, reddish brown, the broad submedian lines, the posterior median area and an irregular space at the base of the wings dark orange. Scutellum pale yellowish, sparsely haired, postscutellum yellowish.

Abdomen dark brown, basally dark orange, the segments sparsely haired; ovipositor pale yellowish. Wings hyaline, costa pale brown, the third vein uniting with the margin at the apex. Coxae and base of femora reddish orange, the most of femora, tibiae and tarsi dark brown; claws long, stout, evenly curved, the pulvilli rudimentary. Ovipositor short, the lobes lanceolate. Type *Cecid.* 1919.

***Hormomyia alexanderi* n. sp.**

This midge was swept from palustral grasses at Johnstown, N. Y., July 7, 1909 by C. P. Alexander.

Female. Length 3.5 mm. Antennae nearly as long as the body, thickly haired, pale fuscous yellowish; probably fourteen segments, the fifth binodose, with a total length about five times its diameter, the basal and distal portions of the stem, each a little longer than their diameters; the basal enlargement subglobose, a sparse whorl of stout setae and a circumfilum, the loops long; distal enlargement broadly oval, with a length nearly twice its diameter; subbasal and subapical circumfila, the loops long and a scattering whorl of stout setae. Palpi; basal segment rather stout, with a length five times its diameter, the distal segment greatly produced, with a length nearly three times that of the first. Mesonotum golden reddish. Scutellum and postscutellum yellowish. Abdomen a variable golden yellowish, sparsely haired. Wings subhyaline, thickly clothed with fuscous hairs, costa fuscous, the third vein uniting with the margin a little beyond the apex. Halteres yellowish orange. Coxae and femora mostly yellowish orange, the tibiae fuscous orange, tarsi a little darker; claws long, evenly curved, the pulvilli rudimentary. Ovipositor short, the lobes broadly and irregularly oval. Type *Cecid.* 1353.

TRISHORMOMYIA Kieff.

1912 Kieffer, J. J. *Neue Gallmucken-Gattugen*, Bitsch, p. 2

1913 ———— *Gen. Insect. fasc.* 152, p. 139-40

Certain species in this genus are separated with difficulty from *Hormomyia* Kieff., though the extreme forms cannot be confused with typical members of the older genus. The type is *T. strobli* Kieff.

A careful study of American material has resulted in separating species referable to this genus by the following characters. The insects are smaller and the mesonotum less distinctly produced over the head than in *Hormomyia*. There are fewer antennal segments, fifteen (the fifteenth being rudimentary) being the maximum and most species having but fourteen. The flagellate antennal segments of the male have the enlargements more produced than in *Hormomyia* H. Lw., and the circumfila are relatively longer and there are marked though not easily characterized differences in the genitalia. The flagellate antennal segments of the female are cylindrical, mostly

with three circumfila though two aberrant species, namely *T. clarkei* Felt and *T. verruca* Walsh have but two circumfila. There is a distinct tendency toward a prolongation of the ovipositor, this organ in *Trishormomyia* being rather to moderately long, *T. helianthi* Brodie showing the maximum development.

It is possible that further rearings, particularly of the larger forms placed in *Hormomyia* H. Lw., will result in a somewhat revised grouping of these species.

Key to Species

Males

- a* Antennae composed of 15 segments, the fifteenth rudimentary
- b* Palpi biarticulate
- c* Second palpal segment moderately long, stout
- d* Abdomen dark brown, the eighth segment mostly yellowish, the fifth antennal segment having stems with a length three-fourths and as long as their diameters respectively.....
consobrina Felt, C. 1204
- cc* Second palpal segment very long, slender, with a length about ten times its diameter
- d* Abdomen fuscous yellowish, the fifth antennal segment having stems one and one-half and two and one-half times their diameters respectively.....*saturni* Felt, C. 1493
- dd* Abdomen pale yellowish, the fifth antennal segment having stems with a length one and one-half and one and one-fourth times their diameters respectively.....*shawii* Felt, C. 1423
- ddd* Abdomen dark brown, the fifth antennal segment having stems nearly equal, each with a length one-half greater than the diameter.....*fenestra* Felt, C. 1596
- aa* Antennae composed of 14 segments
- b* Palpi triarticulate
- c* Abdomen shining black, length 5 mm; fifth antennal segment with stems one and one-half and equal their diameters respectively. Ventral plate spatulate and almost truncate.....
johnsoni Felt, C. 821
- cc* Abdomen dark red; length 4 mm; fifth antennal segment with stems one and one-half and one and one-fourth times their diameters respectively; ventral plate short, broad, roundly emarginate. Reared from cockscomb gall on *crataegus* leaves.....
crataegifolia Felt, C. 11362
- ccc* Abdomen dark brown; length 3 mm; fifth antennal segment stems each with a length one-half greater than the diameter; ventral plate broad, broadly emarginate.....*dilatata* n. sp. C. 407
- cccc* Abdomen dark reddish brown; length 1.5 mm; flagellate antennal segments with stems one and one-fourth and one and one-half times their diameters respectively; ventral plate short, broadly rounded.....*bullae* Felt, C. 1267

cccc Abdomen pale reddish; length 4 mm; fifth antennal segment with stems one and one-half and two and one-half times their diameters respectively; ventral plate narrow, narrowly incised.
incisa n. sp. C. 527

bb Palpi biarticulate

c Abdomen dark reddish brown; length 2 mm, the second palpal segment not three times the length of the first, the fifth antennal segment with stems two and one and one-half times their diameters respectively; ventral plate long, broad, roundly and slightly emarginate. Reared from truncate gall on Amelanchier.
canadensis Felt, C. a1758, a1558, a432

cc Abdomen dark yellowish brown; length 2.5 mm, flagellate antennal segments with stems one-half and three-fourths their diameters respectively; second palpal segment reduced; ventral plate short; reared from a tubular stem gall on Helianthus.
helianthi Brodie, C. a2453

ccc Abdomen dark reddish brown; length 1.5 mm. Flagellate antennal segments with stems with a length one and one-fourth and one and one-half times their diameters respectively, second palpal segment greatly produced; ventral plate short, broadly rounded.
bullae Felt, C. 1267

cccc Abdomen yellowish brown; length 5 mm. Ventral plate moderately long and broadly rounded.
proteana Felt, C. 1521

Females

a Large, at least 4 mm long. The flagellate antennal segments with 3 circumfila

b Abdomen dark brown, the fifth antennal segment with a length two and one-half times its diameter.
modesta Felt C. 1346

bb Abdomen dark reddish, the fifth antennal segment with a length three and one-half times its diameter, reared from a cockscomb gall on crataegus leaf.
crataegifolia Felt, C. a1362

aa Small species, length 3.5 mm or less

b Antennal segments with 3 circumfila

c Abdomen dark carmine; ovipositor short, reared from a truncate leaf gall on Amelanchier.
canadensis Felt, C. a1758

cc Abdomen dark brown, ovipositor as long as the abdomen, reared from a tubular stem gall on Helianthus.
helianthi Brodie, C. a2453

ccc Abdomen brownish yellow, ovipositor one-half the length of the abdomen, reared from a globose leaf gall on Helianthus.
bullae Felt, C. 1267

bb Antennal segments with 2 circumfila

c Abdomen dark reddish, the fifth antennal segment with a length two and one-half times its diameter, the second palpal segment three times as long as the first. Reared from a terminal bud gall on Spiraea.
clarkii Felt, C. a1759a

cc Abdomen dark red, the fifth antennal segment with a length twice its diameter, the second palpal segment with a length one-half greater than its diameter. Reared from a subconic willow leaf gall.
verruca Walsh, C. a1785

Trishormomyia consobrina Felt

1907 Felt, E. P. New Species of Cecidomyiidae II, p. 18 (Hormomyia)

1908 ——— N. Y. State Mus. Bul. 124, p. 299, 387 (Hormomyia)

This form was taken on Azalea at Albany, N. Y., June 6, 1907.

Male. Length 5.5 mm. Antennae extending to the fifth abdominal segment, sparsely haired, dark brown; fifteen segments, the fifth with stems three-fourths and as long as the diameter; terminal segment reduced, irregularly fusiform. Palpi; the first segment stout, tapering distally, with a length three times its diameter, the second one-half longer, slender, tapering to a subacute apex. Face dark brown and yellowish. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum pale orange yellow, postscutellum darker. Abdomen dark brown, the eighth segment mostly yellowish. Genitalia fuscous. Venter pale yellowish orange. Wings hyaline, costa light brown, the third vein joining the margin just beyond the apex. Halteres yellowish basally and apically, the stem semitransparent. Legs long, slender, light fuscous yellowish; claws long, stout, evenly curved, the pulvilli one-third the length of the claws. Genitalia; basal clasp segment long; terminal clasp segment long, stout; dorsal plate short, broad, broadly emarginate, the lobes obliquely truncate; ventral plate long, spatulate, strongly constricted near the middle, roundly truncate. Type Cecid. 1204.

Trishormomyia shawi Felt

1913 Felt, E. P. Psyche, 20:145 (Hormomyia)

This species is separated from the allied *T. consobrina* Felt by colorational characters and the extremely slender second palpal segment. It was received from C. W. Johnson of the Boston Society of Natural History and labeled: "VIII-20, 1909, Hampton, N. H., S. A. Shaw, 1187."

Trishormomyia saturni Felt

1914 Felt, E. P. N. Y. Ent. Soc. Jour., 22:133 (Hormomyia)

The midge was taken August 24, 1909, by C. P. Alexander in the Adirondacks, altitude 1540 feet. It may be separated from the related *T. shawi* Felt by the darker abdomen and the distinctly longer stems of the flagellate antennal segments.

Trishormomyia fenestra Felt

1915 Felt, E. P. Can. Ent., 47:231-32 (Hormomyia)

The midge is closely related to *T. shawi* Felt, from which it is easily distinguished by marked differences in color characters and in the structure of the basal clasp segment. Both sexes were taken by C. P. Alexander, August 22, 1910, at Woodworth's Lake, Fulton county, N. Y.

Trishormomyia johnsoni Felt1907 Felt, E. P. New Species of Cecidomyiidae II, p. 18-19 (*Hormomyia*)1908 ——— N. Y. State Mus. Bul. 124, p. 299-300, 388 (*Hormomyia*)

This species was taken at Auburndale, Mass., May 28, 1906 by Prof. C. W. Johnson.

Male. Length 5 mm. Antennae extending to the fourth abdominal segment, sparsely haired, dark brown; fourteen segments, the fifth (fig. 47) with stems one and one-fourth and three-fourths times their diameters; terminal segment produced, the distal portion of the stem with a small subglobular enlargement. Circumfila, especially on the distal enlargement, very irregular. Palpi; the first segment short, subrectangular, the second about as long as the third, the third more than twice the length of the second, more slender. Face, dark reddish brown. Mesonotum dark brown, the submedian lines narrow, fuscous yellowish. Scutellum brown, reddish apically and laterally, postscutellum dark brown, reddish apically. Abdomen sparsely haired, shining black. Genitalia reddish brown, the terminal clasp segment distally, black. Wings (pl. 14, fig. 3) hyaline, costa reddish brown, the third vein just beyond the apex. Halteres pale reddish yellow basally, slightly fuscous apically. Legs a variable fuscous yellowish, the distal tarsal segments darker. Genitalia; basal clasp segment long, slender, a quadrate lobe at the basal third; terminal clasp segment long, stout; dorsal plate short, broad, deeply and broadly incised, the lobes broadly rounded; ventral plate spatulate apically, broadly rounded laterally, truncate distally. Type Cecid. 821.



Fig. 47 *Trishormomyia johnsoni*, sixth antennal segment of male, only one seta sketched in (enlarged, original)

Trishormomyia crataegifolia Felt1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 160 (*Hormomyia*)1908 ——— N. Y. State Mus. Bul. 124, p. 388 (*Hormomyia*)1908 Jarvis, T. D. Ent. Soc. Ont., 38th Rep't, p. 86 (*Hormomyia*)1909 Felt, E. P. Ent. Soc. Ont., 39th Rep't, p. 45 (*Hormomyia*)1909 Jarvis, T. D. Ent. Soc. Ont., 39th Rep't, p. 83 (*Hormomyia*)1915 Felt, E. P. N. Y. State Mus. Bul. 175, pl. 3, fig. 8 (*Hormomyia*)1918 ——— N. Y. State Mus. Bul. 200, p. 136 (*Hormomyia*)

This species was reared in early April 1907 from deep-red larvae which deserted cockscomb galls on crataegus leaves the preceding

fall. The galls are very local in the vicinity of Nassau, we have received them from Michigan, and Jarvis records them as somewhat rare at Ontario, Canada. *Eupelmus dryorhizoxeni* Ashm. and *Torymus* species were reared from this gall.

Gall. Length 1 cm. Height 2 cm, strongly compressed, crinkled with an irregular, serrate edge. Color mostly green, irregularly marked with yellowish, especially in the older galls, portions of the tips frequently turning brown.

Cocoon. Length 4 mm, diameter 1.5 mm. This is composed of a few whitish threads to which numerous fine particles of sand adhere. The structure is so open that the deep red body of the larva can be easily seen.

Male. Length 4 mm. Antennae a little longer than the body, sparsely haired, reddish brown; fourteen segments, the fifth with stems each one-fourth longer than their diameters; terminal segment produced, the distal enlargement broad, subglobular and with a slightly prolonged subconic tip. Palpi; the first segment stout, subrectangular, the second shorter, broadly oval, the third one-half longer, narrowly oval. Mesonotum dark brown, the submedian lines sparsely clothed with whitish hairs and a few scattered hairs on the lateral borders. Scutellum dark brown, a few whitish hairs on each side, postscutellum slightly darker. Abdomen dark red, pleurae darker. Wings hyaline, costa reddish brown, the third vein uniting with the margin a little beyond the apex; halteres and coxae yellowish red, the remainder of the legs a little paler, with the tarsi somewhat whitish; claws stout, evenly curved, the pulvilli shorter than the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment stout, slightly swollen near the distal third and apically; dorsal plate short, broad, broadly rounded; ventral plate short, broad, broadly and roundly emarginate, the lobes irregularly rounded.

Female. Length 4 mm. Antennae extending to the fourth abdominal segment, yellowish red or reddish, sparsely haired; fourteen segments, stem of fifth (fig. 48) with a length about one-sixth of the subcylindric basal enlargement, which latter has a length fully three times its diameter, is slightly constricted near the basal third; heavy, though rather short, circumfila at the basal fourth, near the middle and subapically, the loops a little longer than the distance between the supporting stems; terminal segment produced, slender, with an irregular apical appendage. Palpi; the first segment long, irregularly rectangular, the second short, irregularly oval, the third

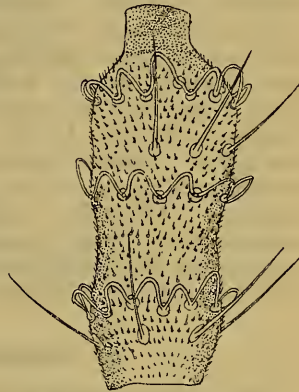


Fig. 48. *Trishormomyia crataegifolia*, fifth antennal segment of female (enlarged, original)

a little longer and broader. Ovipositor, terminal lobes short, broadly oval. Other characters about as in the male. Type Cecid. a1362.

***Trishormomyia incisa* n. sp.**

This form was taken in a trap lantern at Nassau, N. Y., July 8, 1906.

Male. Length 4 mm. Antennae nearly as long as the body, thickly haired, pale yellowish tinged with carmine apically, yellowish basally; fourteen segments, the fifth with stems one and one-half and two and one-half times their diameters; terminal segment somewhat produced, the distal enlargement broadly oval, irregular. Palpi; the first segment oval, the second moderately stout, with a length four times its diameter, the third as long as the second. Face fuscous yellowish. Mesonotum pale yellowish, irregularly tinged with carmine anteriorly and laterally. Scutellum fuscous yellowish with sparse apical setae, postscutellum a little darker. Abdomen pale reddish, darker basally, the segments dorsally tinged with fuscous; genitalia yellowish and dark carmine, thickly setose. Wings hyaline, costa light brown, the third vein uniting with costa beyond the apex. Halteres fuscous yellowish. Legs a pale straw, rather thickly haired; claws long, slender, evenly curved, the pulvilli rudimentary. Genitalia; basal clasp segment stout; terminal clasp segment long, stout; dorsal plate broad, broadly and triangularly emarginate, the lobes narrowly rounded; ventral plate long, narrow, narrowly incised. Type Cecid. 527.

***Trishormomyia dilatata* n. sp.**

This species was taken in a trap lantern at Newport, N. Y., June 27, 1906.

Male. Length 3 mm. Antennae as long as the body, sparsely haired, light brown; fourteen segments, the fifth with stems one and one-half times their diameters; terminal segment somewhat produced, the distal enlargement narrowly oval. Palpi; the first segment subquadrate, the second somewhat produced, the third longer and tapering to a slender, acute apex. Face yellowish brown. Mesonotum pale yellowish brown with an ill-defined sublateral carmine spot near the base of the wings. Scutellum dark carmine, yellowish basally, postscutellum yellowish. Abdomen dark brown, darker basally, the segments margined with brownish orange. Wings (pl. 15, fig. 1) subhyaline, costa dark brown, the third vein uniting with costa beyond the margin. Coxae yellowish orange with variable carmine markings. Legs fuscous yellowish, variably tinged with carmine at the articulations; claws long, slender, slightly curved, the pulvilli rudimentary. Genitalia (pl. 18, fig. 3); basal clasp segment stout; terminal clasp segment long, stout, and triangularly emarginate; dorsal plate broad, broadly emarginate; ventral plate broad, broadly emarginate. Type Cecid. 407.

Trishormomyia helianthi Brodie

- 1894 Brodie, William. Biol. Rev. of Ont., 1:44-46 (Cecidomyia)
 1909 Jarvis, T. D. Ent. Soc. Ont., 39th Rep't, p. 83 (Cecidomyia)
 1913 Felt, E. P. Can. Ent., 40:418 (Hormomyia)
 1918 ——— N. Y. State Mus. Bul. 200, p. 206, 207 (Hormomyia)

This species produces on *Helianthus* more or less cylindrical flask-shaped galls (fig. 49, pl. 11, fig. 2) having a length of 10 to 25 mm and a diameter of from 1.5 to 5 mm. There may be one to ten galls in an axile, firmly attached to the stem by an expanded base and projecting in various directions, usually upwards, often at right



Fig. 49 *Trishormomyia helianthi*,
 tubular galls on *Helianthus* (author's
 illustration)

angles to the stem, and occasionally downward. They occur on the upper third of the stems of *H. decapetalus* and *H. divaricatus*. They are also found on *H. annuus*. The gall has been collected about Toronto, Canada, Evanston, Ill., and Salt Lake City, Utah. It is local at Evanston, Ill., occurring in September (L. H. Weld).

Trishormomyia bulla Felt

- 1867 Walsh, B. D. Ent. Soc. Phila. Proc., 6:226 (Cecidomyia)
 1894 Brodie, William. Biol. Rev. of Ont., 1:74 (Cecidomyia)
 1909 Jarvis, T. D. Ent. Soc. Ont., 39th Rep't, p. 83 (Cecidomyia)
 1912 Cosens, A. Can. Inst. Trans., 9:317 (Cecidomyia)
 1914 Felt, E. P. Can. Ent., 46:286-87 (Hormomyia)
 1918 ——— N. Y. State Mus. Bul. 200, p. 206 (Hormomyia)

This species produces subglobular yellowish galls (pl. 11, fig. 1) about the size of large peas on *Helianthus* leaves, the deformities being about equally prominent on both surfaces and irregularly located, however, usually near the midrib. The gall has been recorded from Ontario, Canada, and Evanston, Ill. It occurs commonly in July on plants in a deep rich soil at North Evanston, Ill.

(L. H. Weld). The midge is closely related to *T. helianthi* Brodie from which it may be separated by its smaller size, longer stems of the antennal segments of the male and the distinctly longer palpi of the female.

Trishormomyia proteana Felt

1914 Felt, E. P. *Psyche*, 20:113 (Hormomyia)

The midge was collected by C. W. Johnson at Auburndale, Mass., May 28th, and is easily distinguished from other large Hormomyias by the antennal segments and specially the cylindrical basal flagellate antennal segments.

Trishormomyia canadensis Felt

1908 Felt, E. P. *N. Y. State Mus. Bul.* 124, p. 388 (Hormomyia)

1910 Stebbins, F. A. *Springfield Mus. Nat. Hist. Bul.* 2, p. 39 (Eriophyes, in error)

1915 Felt, E. P. *N. Y. State Mus. Bul.* 175, pl. 4, figs. 17, 17 (a) (Hormomyia)

1918 ——— *N. Y. State Mus. Bul.* 200, p. 134, 135 (Hormomyia)

This species was reared in early April from galls (fig. 50) on shad-bush, *Amelanchier canadensis*, taken in September 1907, by Cora H. Clarke at Magnolia, Mass., the deep orange larvae deserting the galls in the fall and hibernating in the soil. It has been recorded from Springfield, Mass., and occurs about Albany, N. Y. *Torymus ? ebria* O. S. has been reared from this gall.



Fig. 50 *Trishormomyia canadensis*, lipped galls on Juneberry leaf (author's illustration)

Gall. Length about 5 mm, projecting on the under side of the leaf, mostly greenish and tapering to a deep reddish lipped extremity. The upper surface of the leaf is marked by a slightly rounded elevation with a thick, whitish, woolly covering. The galls are monothalamous and may occur singly or in clusters.

Female. Length 3 mm. Antennae extending to the third abdominal segment, sparsely haired, yellowish brown, fuscous basally; fourteen subsessile cylindrical segments, the fifth with a length about twice its diameter; circumfila at the basal third, near the middle and subapically, the loops with a length about equal to one-half the distance between their bases; terminal segment reduced, narrowly rounded. Palpi; the first segment stout, irregularly oval, the second more than twice the length of the first, tapering apically. Face fuscous brown. Mesonotum dark reddish brown, the submedian lines sparsely haired. Scutellum dark reddish brown, postscutellum reddish; pleurae a variable fuscous orange and

fuscous brown. Abdomen nearly naked, dark carmine; terminal segment somewhat fuscous. Ovipositor dark yellowish. Wings hyaline, costa yellowish brown, the third vein just beyond the apex. Halteres dull orange basally, yellowish carmine apically. Coxae fuscous apically. Legs mostly light fuscous yellowish, the fifth tarsal segment and claws fuscous, the latter stout, evenly curved, the pulvilli as long as the claws. Ovipositor short, the terminal lobes stout and tapering to a narrowly rounded apex.

Male. Length 2 mm. Antennae as long as the body, sparsely haired, reddish brown, dark brown basally; fourteen segments, the fifth with stems twice and one and one-half times their diameters; terminal segment, distal enlargement reduced, broadly oval. Palpi; the first segment subquadrate, the second twice the length of the first, stout, narrowly rounded distally. Face dark brown. Mesonotum very dark brown, the submedian lines sparsely haired. Scutellum dark brown, postscutellum reddish brown. Abdomen dark reddish brown, the segments sparsely haired posteriorly. Pleurae and genitalia dark brown. Wings hyaline, costa dark red, the third vein at the apex. Halteres a variable reddish and reddish brown. Coxae dark brown; femora and tibiae light reddish brown, tarsi darker; claws long, slender, evenly curved, the pulvilli three-fourths the length of the claws. Genitalia; basal clasp segment long, stout; terminal clasp segment stout, swollen near the distal fourth; dorsal plate short, broad, broadly and triangularly emarginate; ventral plate long, broad, roundly and slightly emarginate, the lobes short, narrowly rounded. Type Cecid. a1758.

Trishormomyia modesta Felt

1913 Felt, E. P. Psyche, 20:145 (Hormomyia)

This species was taken at Auburndale, Mass., May 22d by Prof. C. W. Johnson of Boston, and at New Haven, Conn., June 30, 1905 by B. H. Walden.

Female. Length 4 mm. Antennae sparsely haired, fuscous yellowish; fourteen segments, the fifth cylindrical, with a length two and one-half times its diameter; there are low circumfila near the basal third, the middle and apically; terminal segment slightly produced, with a distinct knob. Palpi; first segment short, second with a length three times its diameter, the third a little longer, tapering. Mesonotum smooth, reddish brown, the yellowish, submedian lines narrow. Scutellum pale yellowish, postscutellum yellowish, dark brown basally. Abdomen a nearly uniform shining dark brown; venter concolorous; ovipositor pale orange. Wings hyaline; halteres yellowish basally, fuscous apically. Coxae, femora and tibiae mostly a light fuscous yellowish, tarsi fuscous yellowish or dark brown; claws stout, evenly curved, the pulvilli about one-third the length of the claws. Ovipositor short, the lobes broad, tapering, broadly rounded. Type Cecid. 1346.

Trishormomyia clarkei Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 388 (Hormomyia)
 1915 ——— N. Y. State Mus. Bul. 175, pl. 4, fig 7 (Hormomyia)
 1918 ——— N. Y. State Mus. Bul. 200, p. 133 (Hormomyia)

The female was reared April 7, 1908 from a terminal bud gall on *Spiraea salicifolia* collected by Cora H. Clarke, at Magnolia, Mass., October 14, 1907. The larvae at the latter time were in yellowish, oval cocoons about 2.5 by 1.5 mm in diameter. The deep orange, stout larvae, about 5 mm long desert the galls in the fall, hibernate in the soil, the adults appearing in the spring and presumably oviposit in the opening buds. Apparently the same gall was collected at Lake Placid, N. Y.

Gall. The larvae occur in nearly globular terminal bud galls about 4 mm in diameter and with a nearly normal green color, except that the tips of the rather closely adherent bud scales are tinged with dark red.

Female. Length 3.5 mm. Antennae extending to the third abdominal segment, sparsely haired, dark reddish brown, fuscous basally; fourteen subsessile, cylindrical segments, the fifth with a length about two and one-half times its diameter; the loops of the circumfila, anastomosing irregularly, have a length about equal to the distance separating their bases. Palpi; the first segment subquadrate, with a length twice its diameter, the second long, with a length three times its diameter. Face fuscous. Mesonotum shining dark brown, the submedian lines sparsely haired. Scutellum and postscutellum reddish brown. Abdomen dark reddish, nearly smooth, the pleurae a variable dark brown and reddish. Ovipositor reddish orange, the venter dark reddish, the basal segment a variable fuscous. Wings hyaline, costa yellowish brown, the third vein at the apex. Halteres yellowish basally, reddish apically. Coxae reddish brown; femora, tibiae and tarsi a variable fuscous yellowish; claws long, stout, strongly curved; pulvilli longer than the claws. Ovipositor short, the terminal lobes with a length three times their width, roundly truncate. Type Cecid. a1759a.

Trishormomyia verruca Walsh

- 1864 Walsh, B. D. Ent. Soc. Phil. Proc., 3:606 (Cecidomyia)
 1867 ——— Ent. Soc. Phil. Proc., 6:226 (Cecidomyia)
 1906 Felt, E. P. Insects Affecting Park & Woodland Trees, N. Y. State Mus. Mem. 8, 2:745 (Cecidomyia)
 1910 Stebbins, F. A. Springfield Mus. Nat. Hist. Bul. 2, p. 10 (Cecidomyia)
 1915 Felt, E. P. N. Y. State Mus. Bul. 175, pl. 4, fig. 14 (Hormomyia)
 1918 ——— N. Y. State Mus. Bul. 200, p. 33 (Hormomyia)

A single female was reared from this gall May 8, 1908 from material taken by Cora H. Clarke at Magnolia, Mass., the preceding fall.

- aa* Fifth antennal segment having the basal portion of the stem with a length two and one-half or three times that of the diameter
b Abdomen pale orange.....*a m e r i c a n a* Felt, C. 451, 660
bb Abdomen fuscous yellowish.....*m o n t a n a* Felt, C. 718

Odontodiplosis karnerensis Felt

1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 141; separate, p. 45 (*Cecidomyia*)

1908 ——— N. Y. State Mus. Bul. 124, p. 404

This dark-brown male was taken May 16, 1906 at Karner, N. Y.

Male. Length .75 mm. Antennae one-half longer than the body, thickly clothed with fine hairs, light brown; fourteen segments, the fifth (fig. 51*a*) with stems one and one-half and two and one-half times their diameters, respectively. Palpi (fig. 51*b*), the first segment short, the second narrowly oval, the third one-half longer than the second. Mesonotum dark brown with a silvery luster.

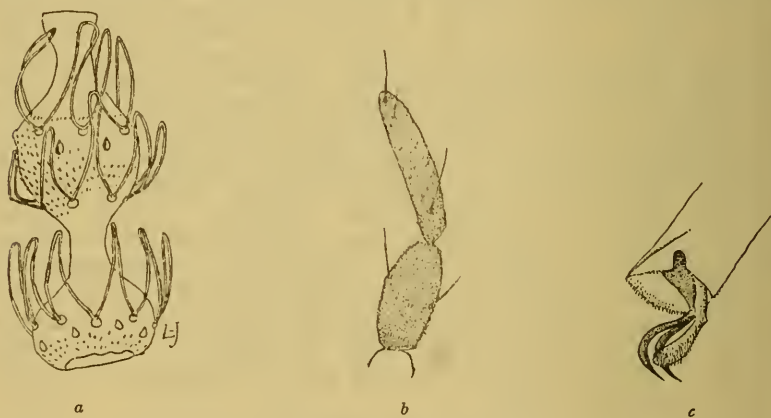


Fig. 51 *Odontodiplosis karnerensis*: *a*, fifth antennal segment of male the setae not sketched in; *b*, palpus of male; *c*, side view of apex of the distal tarsal segment and claws (enlarged, original)

Scutellum reddish, postscutellum dark brown. Abdomen reddish yellow, sparsely ornamented with rather coarse hairs. Wings (pl. 16, fig. 1) hyaline, costa reddish brown; halteres whitish transparent. Legs semitransparent, yellowish brown, tarsi variably reddish, light or dark brown; claws (fig. 51*c*) slender, strongly curved, simple. Genitalia; basal clasp segment long, slender, a basal lobe thickly clothed with stout, rather long setae; terminal clasp segment abruptly swollen at base, slender; dorsal plate broad, very deeply emarginate, the lobes well separated, broadly triangular, the apex broadly rounded; ventral plate narrow, tapering, broadly rounded. Harpes presumably broad, slightly excavated internally, the broadly rounded posterior margin with a series of large triangular chitinous teeth; style long, slightly curved at the distal fourth, broadly rounded. Type *Cecid.* 27.

Odontodiplosis americana Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 404

This pale yellowish male was taken July 3, 1906 on alder, *Alnus viridus*, and the 24th on low blackberry, *Rubus villosus*, at Albany, N. Y. The female, provisionally associated with this species, was taken on the same date.

Male. Length 1 mm. Antennae one-fourth longer than the body, thickly haired, pale straw; fourteen segments, the fifth with stems each three times their diameter; terminal segment, distal node stout, subcylindric, with a length about four times its diameter and at the distal fourth tapering to a narrowly rounded apex. Palpi; the first segment short, stout, irregularly ovoid, the second rather stout, with a length over three times its diameter, the third a little longer and more slender than the second; face yellowish, eyes dark reddish. Mesonotum fuscous yellowish. Scutellum pale yellowish, postscutellum dark brown. Abdomen pale yellowish, dark brown basally and apically. Wings hyaline, costa pale straw; halteres yellowish transparent. Legs a nearly uniform pale straw; tarsi slightly lighter, the terminal segments darker; claws long, slender, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, slender, a rudimentary lobe at the basal third; terminal clasp segment long, slender; dorsal plate short, broad, broadly and triangularly emarginate, the lobes diverging, broadly rounded; ventral plate short, broad, broadly rounded. Harpes convolute, rather short, approximate, the margin dentate; style long, slender, narrowly rounded. Type Cecid. 451.

Female. Length .75 mm. Antennae about as long as the body, sparsely haired, light brown; probably fourteen segments, the fifth with a stem fully as long as the cylindric basal enlargement, which latter has a length over twice its diameter, and is slightly constricted near the basal third; terminal segments cylindric, with a length four times their diameter, obtusely rounded apically; mouth parts slightly produced. Palpi; first segment irregularly subquadrate, the second narrowly oval, with a length three times its diameter, the third one-half longer than the second, more slender. Mesonotum dark brown, submedian lines sparsely setose; scutellum pale orange; postscutellum fuscous orange. Abdomen yellowish orange with indistinct fuscous markings laterally. Wing membrane rather thickly clothed with narrow, hairlike scales; costa dark brown; halteres pale yellowish basally, whitish transparent apically. Legs fuscous yellowish. Ovipositor short, the lobes with a length six times the width.

Odontodiplosis montana Felt

1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 404

This fuscous yellowish male was taken July 27, 1906 on hemlock, *Tsuga canadensis*, at Newport, N. Y.

Male. Length .65 mm. Antennae a little longer than the body, very thickly haired, light brown; fourteen segments, the fifth with stems each three times their diameter; terminal segment, distal enlargement subcylindric, with a length about three times its diameter and tapering strongly at the distal fourth to a narrowly rounded apex. Palpi; the first segment short, stout, irregularly subquadrate, the second narrowly oval, with a length nearly three times its diameter, the third one-half longer and more slender than the second. Mesonotum fuscous yellowish. Scutellum dull yellowish, postscutellum and abdomen fuscous yellowish, the latter sparsely haired. Wings hyaline, costa yellowish brown; halteres semitransparent basally, slightly fuscous apically. Legs mostly a pale straw yellow, the tarsi brown, the distal segments darker; claws long, slender, strongly curved, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, slender, an inconspicuous lobe at the basal third; terminal clasp segment long; dorsal plate short, broad, deeply and narrowly incised, the lobes narrowly rounded; ventral plate long, broad, broadly rounded. Harpes expanded, convolute and with long, closely-set teeth on the posterior margin; style indistinct.

This specimen appears abnormal in that one basal clasp segment apparently bears two terminal clasp segments, the apical portion of the second being closely fused with the proximal third of the basal clasp segment. Possibly it is a malformed style. Type Cecid. 718.

ADIPLOSIS Felt

- 1908 Felt, E. P. N. Y. State Mus. Bul. 124, p. 405
 1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:287
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:61-62
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 203

The genus is easily distinguished from *Odontodiplosis* Felt, to which it is closely related, by the stouter basal clasp segment without a basal lobe and the total absence of teeth on the ventral plates or harpes.

Type and sole species, *Cecidomyia toxicodendri* Felt, C. 263.

Adiplosis toxicodendri Felt

- 1907 Felt, E. P. N. Y. State Mus. Bul. 110, p. 137; separate, p. 40-41
 (Cecidomyia)
 1908 ——— N. Y. State Mus. Bul. 124, p. 405

The fuscous brown midge was taken June 14, 1906 on poison ivy, *Rhus toxicodendron*, at Nassau, N. Y.

Male. Length .75 mm. Antennae about one-half longer than the body, thickly haired, light brown; fourteen segments, the fifth (fig. 52a) with stems each three times their diameter; terminal segment, distal enlargement somewhat produced, subcylindric, slightly swollen distally and with a fusiform terminal appendage nearly as

long as the enlargement. Palpi (fig. 52*b*) consisting of but three segments, the first short, subquadrate, the second twice the length

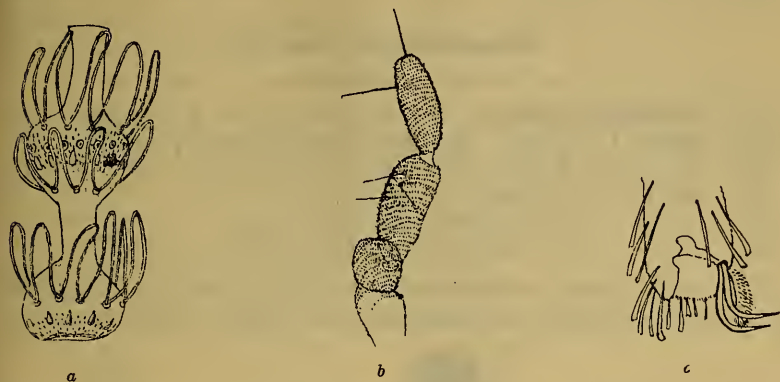


Fig. 52 *Adiplosis toxicodendri*: *a*, fifth antennal segment of male; *b*, palpus; *c*, distal tarsal segment (enlarged, original)

of the preceding, rounded at each extremity, the third a little shorter than the second, more slender; face fuscous yellowish, eyes large, black. Mesonotum reddish brown, submedian lines pale yellowish, sparsely ornamented with fine setae. Scutellum and pleurae fuscous yellow, postscutellum yellowish. Abdomen a nearly uniform fuscous brown, rather thickly clothed with fine setae. Wings (pl. 16, fig. 2) hyaline, costa reddish brown; halteres yellowish transparent. Coxae and femora pale yellowish, tibiae and tarsi pale brown, tarsi slightly darker; claws (fig. 52*c*) rather slender, strongly curved, simple. Genitalia; basal clasp segment stout, obliquely truncate; terminal clasp segment slender, swollen at the base; dorsal plate broad, deeply incised, the lobes well separated, narrowly rounded; ventral plate broad, broadly rounded; style stout, tapering, narrowly rounded. Type Cecid. 263.

MONARTHROPALPUS Rubs.

- 1892 Rubsamen, E. H. Berl. Ent. Zeitschr., 37:329, 381
 1896 Kieffer, J. J. Wien. Ent. Zeit., 15:92, 94
 1897 ——— Syn. Cecid. de Eur. & Alg., p. 30
 1910 Rubsamen, E. H. Zeitsch. Wissenschaft. Insektenbiol., 15:284
 1911 Felt, E. P. N. Y. Ent. Soc. Jour., 19:58
 1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 149

This peculiar Diplosid is easily distinguished by the unarticulate palpi and the normal mesonotum. The male binodose antennal segments have three circumfila, the claws are simple and the third vein unites with the margin near the apex of the wing. The female has the ovipositor terminating in a long, stout, chitinous spine with a length equal to about one-half the diameter of the abdomen. The reduction of the palpi, the approximation to equality in the develop-

ment of the circumfila in the sexes and the simple claws indicate an affinity with *Hormomyia*. Type and sole species, *M. buxi* Lab.

***Monarthropus buxi* Lab.**

Box Leaf Midge

- 1873 **Laboulbene, Alexandre.** Soc. Ent. Fr. Ann., ser. 5, 3:32 Tab. 9
 1913 **Chaine, J.** Sci. Nat., Zool., Ann. (Paris), IX ser., 17:269-359
 1913 ——— C. R. Hebdom. Soc. de Biol., 74:156-58
 1913 **Felt, E. P.** Tree Talk, v. 1, no. 2, p. 18
 1915 ——— N. Y. State Mus. Bul. 180, p. 42-46
 1918 ——— N. Y. State Mus. Bul. 200, p. 158

This rather large, yellowish orange midge was found by Prof. A. E. Stene in May 1910 infesting a box hedge, *Buxus sem-*



Fig. 53 *Monarthropus buxi*, box leaves showing galls (author's illustration)

pervirens, at Newport, R. I. Galls received May 25th produced an abundance of midges. It occurs in a number of localities

on Long Island and has been reported from the Pacific coast. The midges complete their transformations in the galls and at the time of emerging, leave the whitish exuviae protruding. They are therefore easily transported with infested plants.

Gall. A more or less irregular, oval swelling of the leaf (fig. 53) with an eccentric, oval, clear space excavated by the yellowish larva. There may be very slight elevation of the leaf with an irregular, yellowish or brownish discoloration, the margin of the enlargement being indicated by a darker green. The gall is most easily seen by transmitted light. An infested leaf may contain only one or two of the maggots or there may be half a dozen with a nearly complete destruction of the vital parts of the leaf.

Male. Length 2 mm. Antennae nearly as long as the body, sparsely haired, reddish; fourteen segments, the fifth (fig. 54a) with

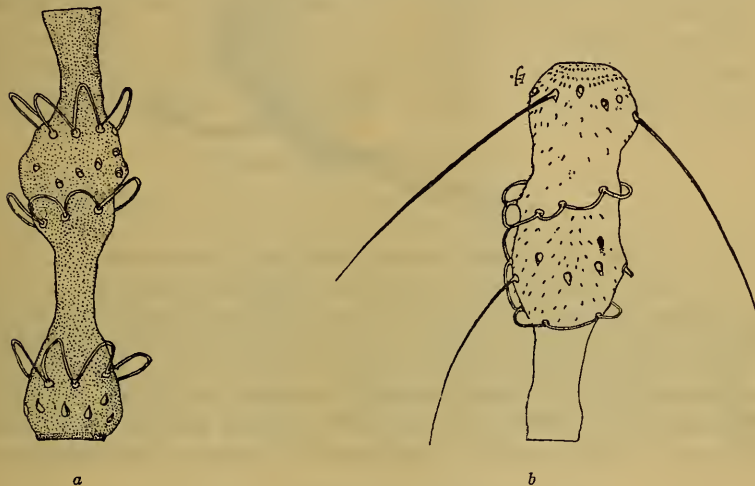


Fig. 54 *Monarthropalpus buxi*: *a*, fifth antennal segment of male, setae not sketched in; *b*, same of female (enlarged, original)

stems two and three times their diameters, respectively; three circumfila, the loops rather stout, short and approaching those of *Hormomyia*. Palpi (fig. 55); one long segment somewhat expanded distally, sparsely setose. Mesonotum, scutellum and postscutellum a variable yellowish orange, the submedian lines sparsely haired. Abdomen sparsely haired, a variable orange, the basal segments lighter, the distal bright orange; genitalia fuscous yellowish. Wings hyaline, costa dark brown, the third vein uniting therewith at the apex. Halteres orange basally, fuscous yellowish distally. Legs a nearly uniform yellowish orange; claws tapering, simple, the



Fig. 55 *Monarthropalpus buxi*, palpus of male (enlarged, original)

pulvilli rudimentary. Genitalia; basal clasp segment stout; terminal clasp segment short, stout; dorsal plate broad, broadly and triangularly emarginate, the lobes broadly rounded; ventral plate long, broadly and roundly emarginate, the lobes tapering.

Female. Length 2.5 mm. Antennae extending to the fourth abdominal segment, sparsely haired, reddish; fourteen segments, the fifth (fig. 54*b*) with a stem about one-half the length of the cylindrical basal enlargement, which latter has a length three times its diameter



Fig. 56 *Monarthropalpus buxi*, side view of apex of the abdomen and ovipositor (enlarged, original)

and rather high circumfila at the basal third and apically; terminal segment with a length about twice its diameter, irregularly obtuse. Body a nearly uniform reddish orange, the abdomen sparsely haired. Ovipositor (fig. 56) short, broadly rounded and with a curved chitinous spine having a length about one-half the diameter of the abdomen. Other characters about as in the male. Cecid. a2035.

ONODIPLOPSIS Felt

1916 Felt, E. P. N. Y. Ent. Soc. Jour., 24:175

This genus with its greatly reduced palpi, the somewhat produced mesonotum and the modified ovipositor is allied to the series referable to *Hormomyia* and its near associates and particularly to *Monarthropalpus* Rubs. The type is *O. sarcobati* Felt.

Onodiplosis sarcobati Felt

1916 Felt, E. P. N. Y. Ent. Soc. Jour., 24:176 (female)

1918 ——— Econ. Ent. Jour., 11:384 (male)

1918 ——— N. Y. State Mus. Bul. 200, p. 126

This remarkable female was reared from a bud gall on *Sarcobatus vermiculatus* collected on the shore of Utah lake.

It produces an irregular fleshy oval deformation apparently composed of appressed thickened bud scales, with a length of 10 mm and a diameter of 6 mm. The gall hardens with age. The female is noteworthy because of the thick tuft of long, silky, yellowish white hairs at the base of the ovipositor.

CYSTODIPLOSI Kieff. & Jörg.

1910 Kieffer, J. J. & Jørgensen, P. Centrbl. Bakt. Parsit. Insektk., 27: 395-396

1913 Kieffer, J. J. Gen. Insect., fasc. 152, p. 149

This Argentine genus is allied to *Monarthropalpus* Rubs. by the unarticulate palpi, though it is easily distinguished by there being but thirteen antennal segments in the female, the third and fourth being fused. The basal and distal nodes of the flagellate antennal segments of the male are globose and ovoid respectively, the dorsal and ventral plates are bilobed and the ovipositor is stout, chitinous and needlelike. Type *C. longipennis* Kieff. & Jörg.

Cystodiplosis eugeniae Felt

1913 Felt, E. P. Ent. News, 24:175-76

1918 ——— N. Y. State Mus. Bul. 200, p. 173

The midge provisionally referred to this genus was reared in April 1912, from hairy, irregularly clustered leaf galls on *Eugenia buxifolia* collected by Dr E. A. Schwarz at Key West. The galls are irregularly spherical or somewhat elongate, monothalamous, with a diameter of about 1.5 mm, moderately thick walls and are clothed externally with long, crinkly, yellowish or reddish brown hairs. The transformations occur within the galls.

ASTRODIPLOSI Felt

1913 Felt, E. P. N. Y. Ent. Soc. Jour., 21:218

This genus is easily separated from all other American trifili having unarticulate palpi by the distinctly black and yellow-marked wings. The circumfila are well developed, the mesonotum is normal, the pulvilli rudimentary and the genitalia peculiar. The type is *A. speciosa* Felt.

Astrodiplosis speciosa Felt

1913 Felt, E. P. N. Y. Ent. Soc. Jour., 21:218

1918 ——— N. Y. State Mus. Bul. 200, p. 169, 170

The strikingly colored midge was reared from an irregular stem gall on an unknown vine provisionally referred to the genus *Cissus*

by Doctor Britton of the New York Botanical Garden. The galls were collected at Puerto Barrios, Guatemala, March 20, 1913, and forwarded to us through the courtesy of Prof. E. Bethel of Denver, Col. The gall is an irregular, gouty stem swelling, composed of soft tissues with here and there irregularly oval cells with a diameter of approximately 2 mm. Entire swellings may have a length of 2 to 9 cm.

EXPLANATION OF PLATES

PLATE I

241

European Corn Borer ¹

Pyrausta nubilalis Hubn.

Ear of corn showing external injuries. Note the circular hole in the husks and near the base of the ear; the conspicuous moist borings indicate serious injury.

¹ Permission to make the first reproduction of the four admirable colored plates, 1-4, drawn from life by R. E. Snodgrass was very kindly given by Dr L. O. Howard, Chief of the Federal Bureau of Entomology.



Ear of corn showing external injuries

PLATE 2

243

European Corn Borer

Pyrausta nubilalis Hubn.

Borers at work in an ear. Note the small borers near the tip and partly concealed by the silk and the larger, more destructive one near the middle of the ear.



Borers at work in an ear

PLATE 3

245

European Corn Borer

Pyrausta nubilalis Hubn.

Broken tassel caused by the European corn borer. Note that the break is near the base of the tassel and occurs in the main part of the stalk.

The small figure to the right shows two tassel buds which have been invaded by very young borers just after they have deserted the leaves.



Broken tassel caused by European corn borer and portion of tassel showing work of young borers

PLATE 4

247

European Corn Borer

Pyrausta nubilalis Hubn.

- 1 Borings in stalk containing the brown pupae
- 2 Nearly full-grown borers working in the corn stalk; note the extruded borings.
- 3 Pupa in stem somewhat enlarged.
- 4 Egg mass on the leaf. The eggs are usually found on the underside of the lower leaves of young plants and frequently in areas where there is a second brood on the developing ear.
- 5 Female moth. (Note that the designation of the sexes on the plate has been inadvertently transposed.)
- 6 Male moth.



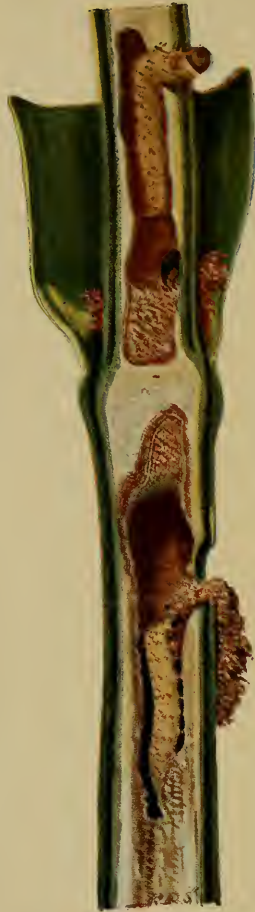
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3



4



2



5



6

Moths and work. 1. Borings in corn stalk showing pupa. 2. Caterpillars at work in corn stalk. 3. Pupa in stem. 4. Eggs on leaf. 5. Male and 6 Female moth,

PLATE 5

249

European Corn Borer

P y r a u s t a n u b i l a l i s Hubn.

Corn stalks badly infested by this borer. Note the riddled condition of the main stalk, the badly damaged, partly developed ear and the injury to husks and leaf sheaths. (Reproduced by courtesy of the Massachusetts Department of Agriculture)



Work of European corn borer in corn

PLATE 6

251

European Corn Borer

Pyrausta nubilalis Hubn.

1 One ear of corn badly damaged by caterpillars. Note the borings into the kernels and the damage to the stalk. There is also a portion of an ear from which a part of the corn has been removed showing injury to the cob itself.

2 Vial containing caterpillars taken from one hill of corn. As many as 311 have been found in one hill. (Reproduced by courtesy of the Massachusetts Department of Agriculture)



Work of European corn borer in corn

PLATE 7

253

European Corn Borer

Pyrausta nubilalis Hubn.

Clump of barnyard grass, *Echinochloa crus-galli*, infested by borers. Note the two caterpillars in the slit portions of the stem. The ability of this insect to maintain itself on various weeds, a habit now limited to eastern Massachusetts, greatly complicates the problem.



Work of European corn borer in barnyard grass

PLATE 8

255

Hickory Tube Gall

Hickory tube gall, *Caryomyia tubicola* O. S., and also a few of the woolly globular galls, probably those of *Caryomyia thompsoni* Felt.

Plate 8



Hickory tube gall

PLATE 9

257

Unknown Hickory Gall

A cluster of leaves showing oval dark greenish or blackish blisters sometimes very abundant and produced probably by a species of *Caryomyia*.

Plate 9



Unknown hickory gall

PLATE 10

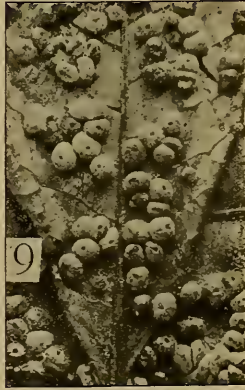
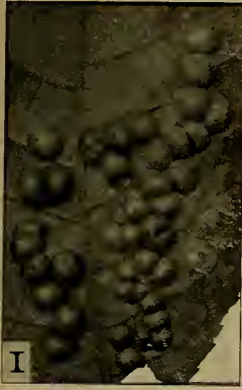
259

17

Hickory Leaf Galls

- 1 *Caryomyia antennata* Felt, numerous galls (after Thompson)
- 2 *Caryomyia caryaecola* O. S., a series of galls (author's illustration)
- 3 *Caryomyia* "caryaecola," another type (after Stebbins)
- 4 *Caryomyia holotricha* O. S., a series of galls (after Thompson)
- 5 *Caryomyia* species, possibly *C. caryae* O. S. (author's illustration)
- 6 *Caryomyia* species, adult unknown (author's illustration)
- 7 *Caryomyia caryae* O. S., a series of galls (author's illustration)
- 8 *Caryomyia thompsoni* Felt (after Thompson)
- 9 *Caryomyia consobrina* Felt (after Clarke)

Plate 10



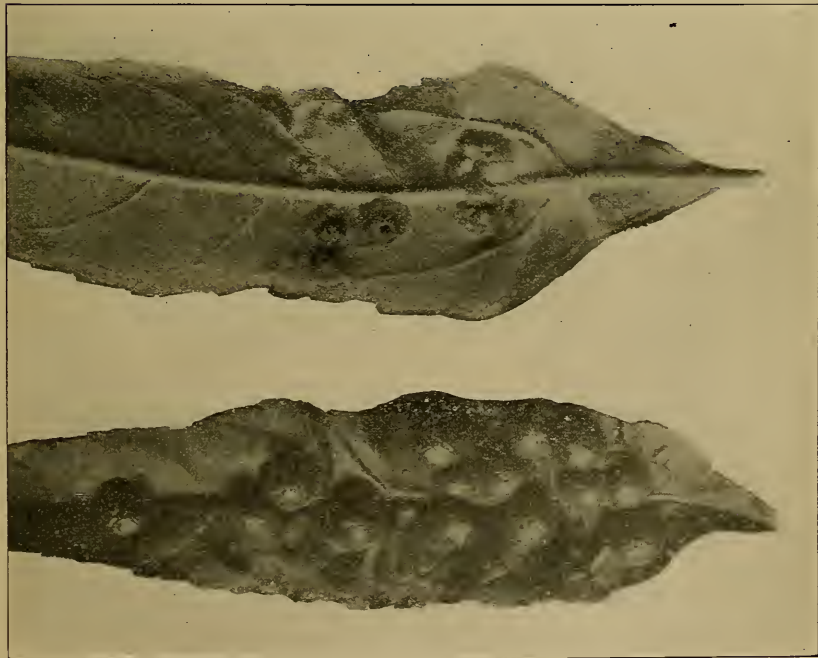
Hickory leaf galls

PLATE II

261

Midge Galls on Helianthus

- 1** *Trishormomyia bulla* Walsh, galls on *Helianthus*
- 2** *Trishormomyia helianthi* Brodie, galls on *Helianthus*



Midge galls on helianthus



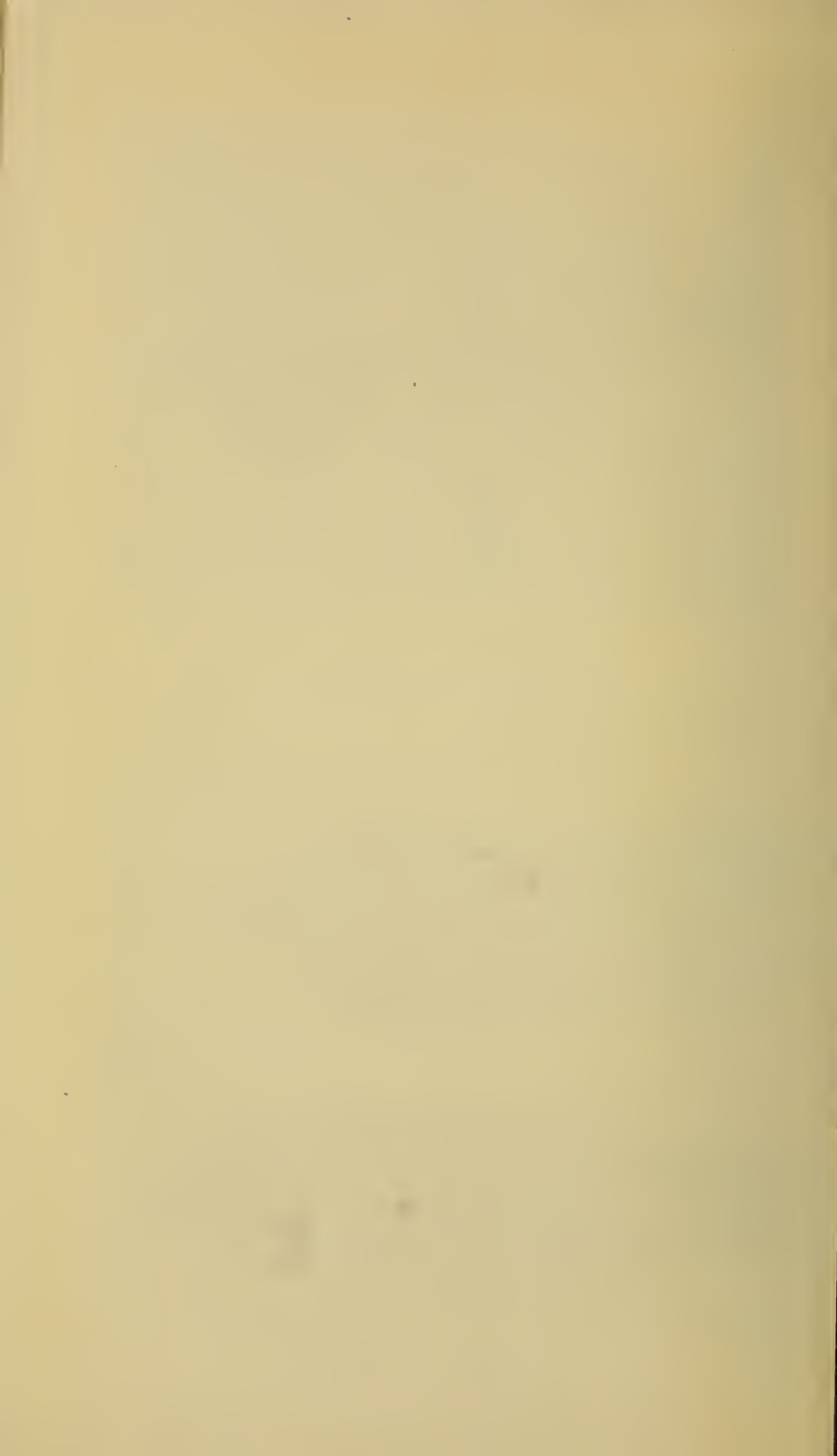


PLATE 12

263

Midge Galls on Willow and Thorn

- 1 *Trishormomyia verruca* O. S., galls on willow leaves
- 2 Gall on crataegus leaf, from which was reared *Lestodiplo-
loysis crataegifolia* Felt, probably a predator and not
the producer of the gall

Plate 12



Midge galls on willow and thorn

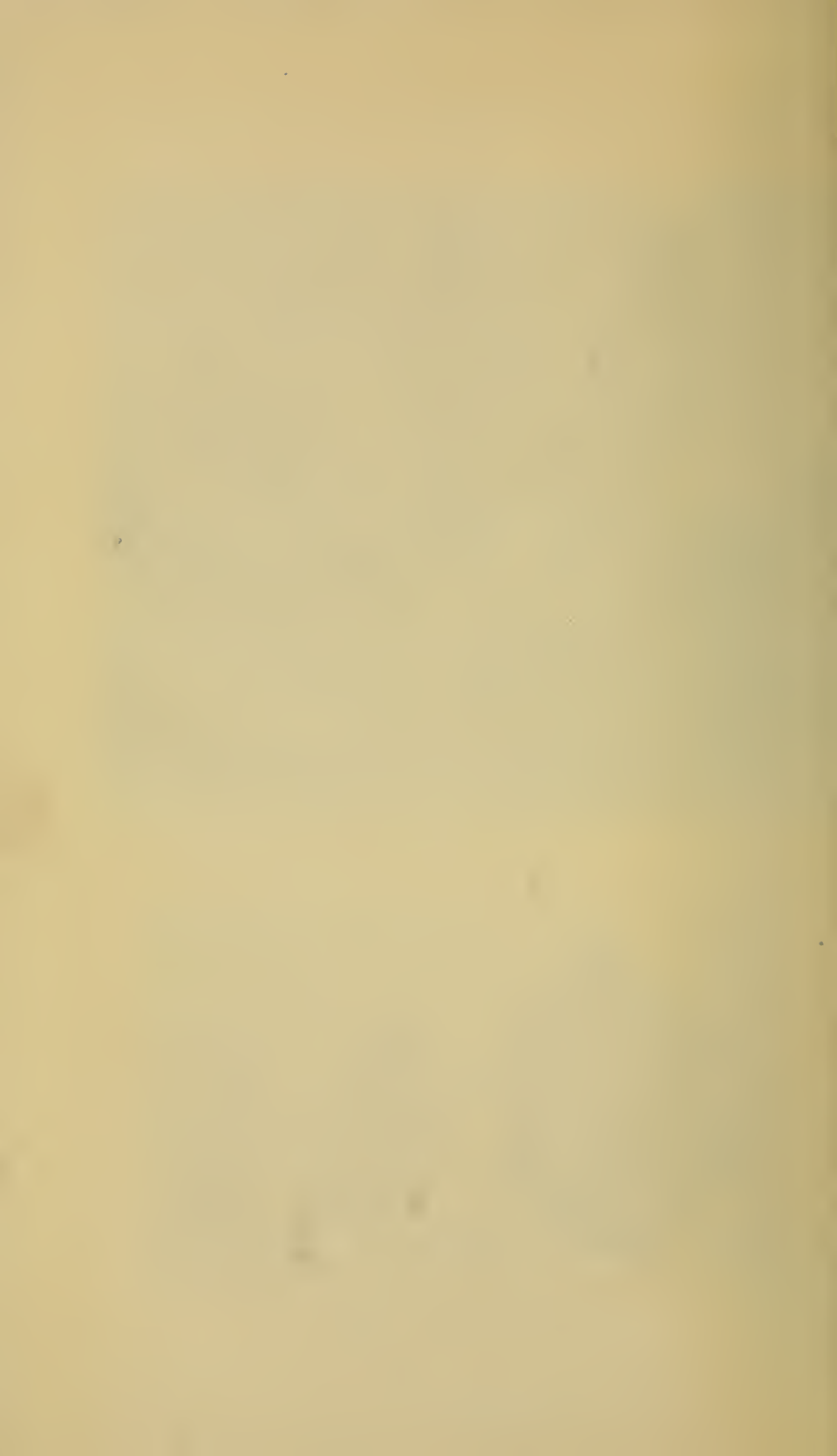
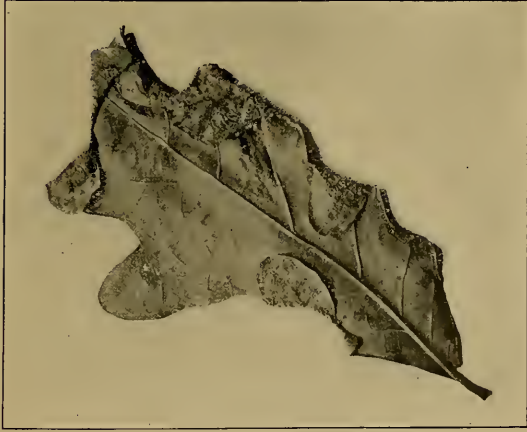


PLATE 13

265

Midge Galls on Oak and Eupatorium

- 1 *Itonida foliora* Rssl. and Hkr., marginal leaf rolls on oak leaf
- 2 Enlarged flower heads of *Eupatorium* from which was reared *Lestodiplosis eupatorii* Felt, probably a predator and not the producer of the gall



1



2

Midge galls on oak and eupatorium

PLATE 14

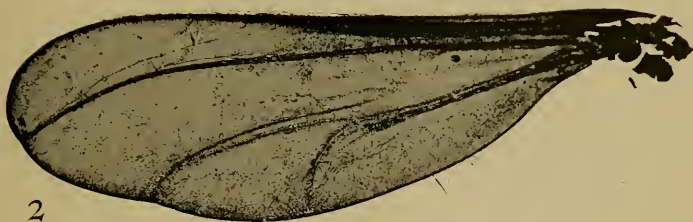
267

Gall Midge Wings

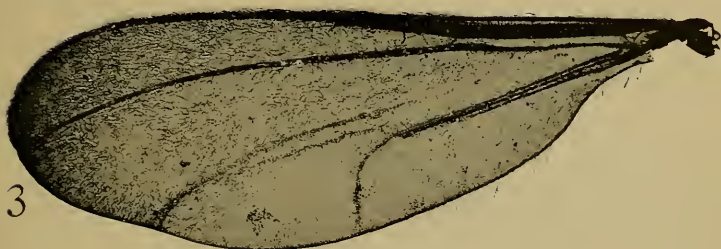
- 1 Wing of *Dyodiplosis davisi* Felt, male, C. 383, x 20
- 2 Wing of *Hormomyia atlantica* Felt, female, C. 815,
x 13
- 3 Wing of *Hormomyia johnsoni* Felt, male, C. 821, x 13
- 4 Wing of *Hormomyia americana* Felt, male, C. 91,
x 13



I



2



3



4

Gall midge wings

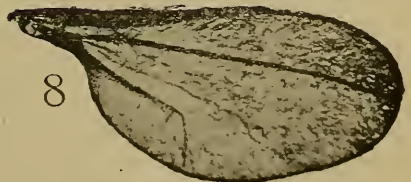
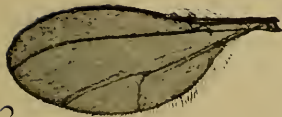
PLATE t

269

Gall Midge Wings

- 1 Wing of *Trishormomyia dilatata* Felt, male, C. 407,
x 20
- 2 Wing of *Obolodiplosis robiniae* Hald., male, C. 180,
x 20
- 3 Wing of *Parallelodiplosis rubrascuta* Felt, male,
C. 93, x 20
- 4 Wing of *Caryomyia tubicola* O. S., male, a1450, x 20
- 5 Wing of *Parallelodiplosis acernea* Felt, male, C.
267, x 20
- 6 Wing of *Parallelodiplosis caryae* Felt, male, C.
331, x 20
- 7 Wing of *Parallelodiplosis carpini* Felt, C. 216, x 20
- 8 Wing of *Itonida albotarsa* Felt, male, C. 330, x 20

Plate 15



Gall midge wings

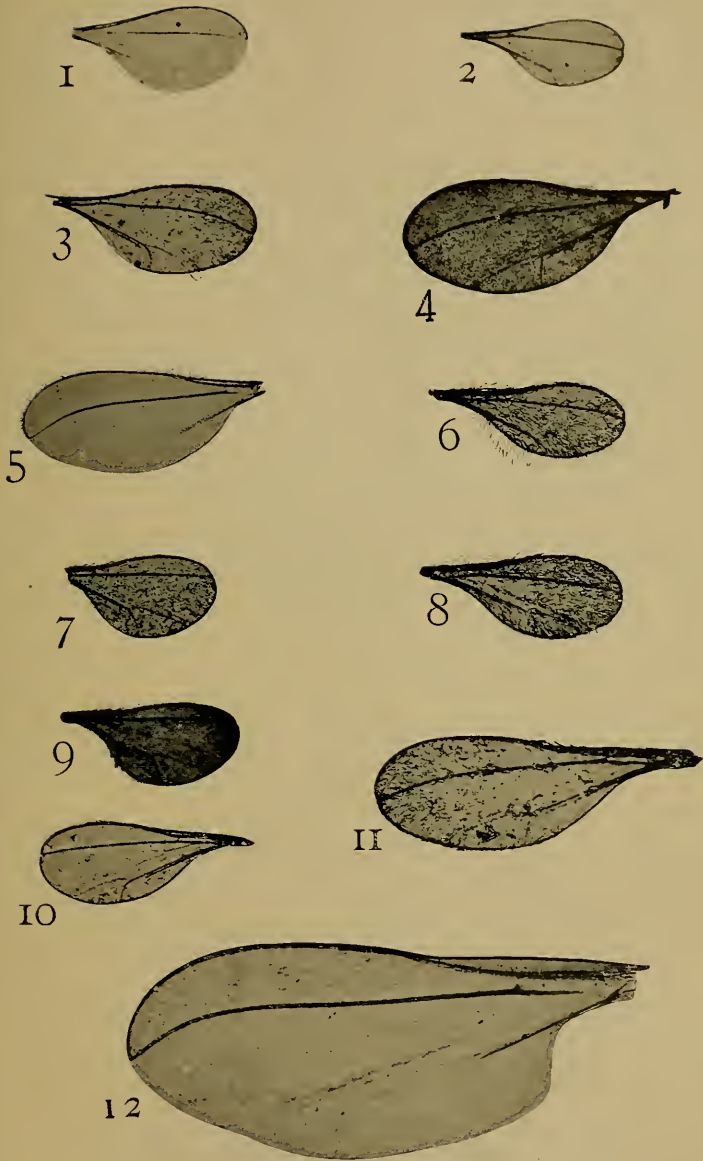
PLATE 16

271

Gall Midge Wings

- 1 Wing of *Odontodiplosis karnerensis* Felt, male, C. 27, x 20
- 2 Wing of *Adiplosis toxicodendri* Felt, male, C. 263, x 20
- 3 Wing of *Epidiplosis sayi* Felt, male, C. 429, x 20
- 4 Wing of *Giardomyia photophila* Felt, male, C. 313, x 20
- 5 Wing of *Itonida tecomae* Felt, male, a1260, x 20
- 6 Wing of *Lestodiplosis asteris* Felt, male, C. 615, x 20
- 7 Wing of *Arthrocnodax* sp., male, C. 473, x 20
- 8 Wing of *Lestodiplosis rugosa* Felt, male, C.650c, x 20
- 9 Wing of *Arthrocnodax cincta* Felt, male, C. 285, x 20
- 10 Wing of *Arthrocnodax fraxini* Felt, male, C. 179, x 20
- 11 Wing of *Itonida explicata* Felt, male, C. 515, x 20
- 12 Wing of *Itonida hudsoni* Felt, male, C. 1, x 20

Plate 16



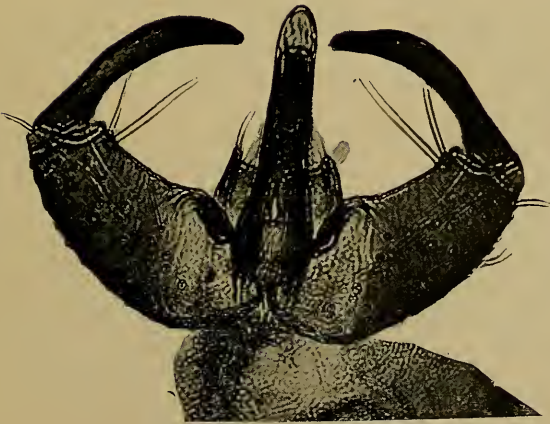
Gall midge wings

PLATE 17

273

Gall Midge Genitalia

- 1 Genitalia of *Parallelodiplosis caryae* Felt, C. 331,
x 260
- 2 Genitalia of *Obolodiplosis robiniae* Hald., C. 180,
x 260



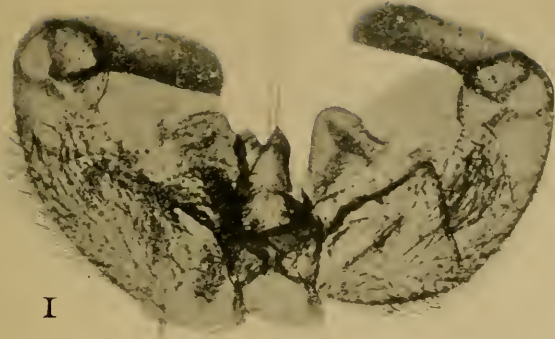
Gall midge genitalia

PLATE 18

275

Gall Midge Genitalia

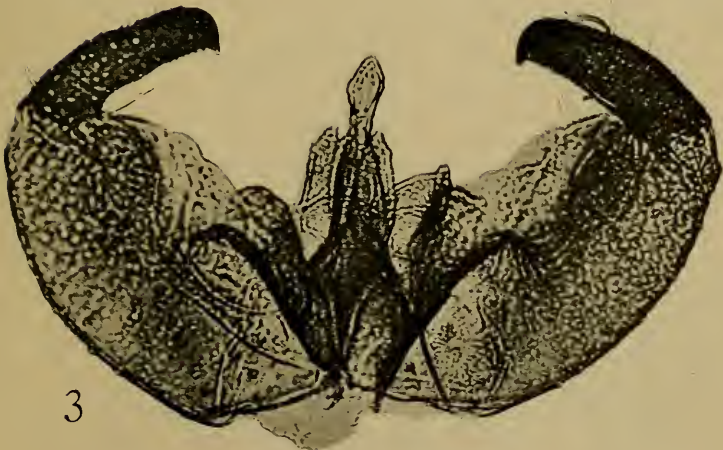
- 1 Genitalia of *Hormomyia needhami* Felt, C. 788, x 90
- 2 Genitalia of *Dyodiplosis davisii* Felt, C. 383, x 260
- 3 Genitalia of *Trishormomyia dilatata* Felt, C. 407,
x 260



I



2



3

Gall midge genitalia

PLATE 19

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Gall Midge Genitalia

- 1 Genitalia of *Itonida explicata* Felt, C. 515, x 260
- 2 Genitalia of *Itonida albotarsa* Felt, C. 330, x 260
- 3 Genitalia of *Itonida hudsoni* Felt, C. 1, x 260
- 4 Genitalia of *Itonida excavationis* Felt, C. 65, x 260
- 5 Genitalia of *Itonida infirma* Felt, C. 299, x 260
- 6 Genitalia of *Epidiplosis sayi* Felt, C. 429, x 260
- 7 Genitalia of *Giardomyia photophila* Felt, C. 323,
x 260

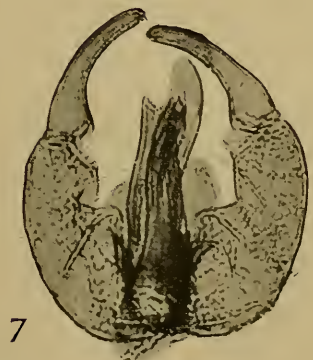
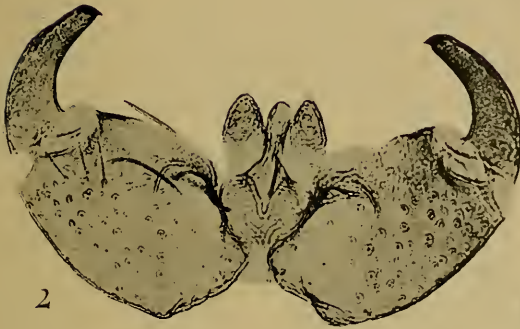
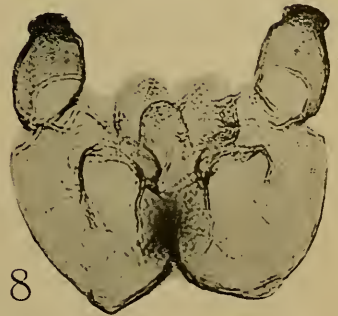
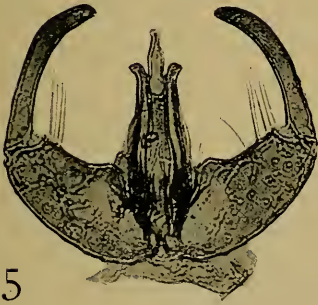
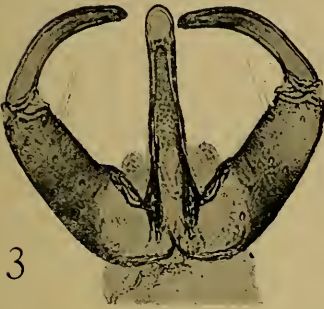


PLATE 20

279

Gall Midge Genitalia

- 1 Genitalia of *Giardomyia montana* Felt, C. 325, x 260
- 2 Genitalia of *Lestodiplosis asteris* Felt, C. 615, x 260
- 3 Genitalia of *Parallelodiplosis rubrascuta* Felt,
C. 93, x 260
- 4 Genitalia of *Lestodiplosis cincta* Felt, C. 465, x 260
- 5 Genitalia of *Itonida apicalis* Felt, C. 409, x 260
- 6 Genitalia of *Itonida flavoscuta* Felt, C. 76, x 260
- 7 Genitalia of *Parallelodiplosis subtruncata*
Felt, C. 506, x 260
- 8 Genitalia of *Paradiplosis obesa* Felt, C. 167, x 260



Gall midge genitalia

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