

the United States, Mexico and other tropical and subtropical countries could do an important service by the discovery of this plant. It will be interesting to know whether it is distributed through the intervening region between North Carolina and Ecuador, or whether it is more probable that it has been introduced through the agency of commerce from one country to another. My attention has recently been called to the fact that a form of this plant was distributed in Ellis & Everhart's "Fungi Columbiani" No. 2166 collected on *Asclepias pumila* at Stockton, Kansas, July 18, 1904, by E. Bartholomew and determined by Dr. Farlow as forma *asclepiadis* Farl. The rhizoid system does not seem to be nearly so well developed in this form as in that on the ragweed. This not only shows a greater geographic range, but also an extension to genera outside of the Compositæ. It ought to be found on other hosts. The writer will be pleased to receive specimens from other sections if they are found.

The plant was discovered in North Carolina by Dr. F. L. Stevens. Since the note was written for the *Gazette*, Dr. Stevens has given additional notes on the occurrence of the plant. The first collection was made in August, 1903, at West Raleigh. It occurs there every year in great abundance. In many cases the ragweed is so affected that the distortion can be recognized from the car windows. The stems and leaves affected are more or less stunted, twisted and curled. Rarely the affected areas on the stems may be slightly greater in diameter.

Other locations in North Carolina, with dates on which it has been collected by Professor Stevens, are given herewith.

1. Polkton	August 1, 1908.
2. Clayton	" 2, 1908.
3. Carey	" 5, 1908.
4. McLeansburg	" 7, 1908.
5. Davidson	" 13, 1908.
6. Mt. Ulla	" 15, 1908.
7. Hiddenite	" 17, 1908.
8. Taylorsville	" 18, 1908.
9. Connelly Springs	" 20, 1908.
10. Connelly Springs	" 21, 1908.
11. Marion	" 21, 1908.

12. Rutherfordton	August 22, 1908.
13. Hendersonville	" 25, 1908.
14. Auburn	" 27, 1908.

GEO. F. ATKINSON

THE PRESENT STATE OF OUR KNOWLEDGE OF THE ODONATA OF MEXICO AND CENTRAL AMERICA

THE completion of the account¹ of the Odonata in the *Biologia Centrali-Americana* and the rather restricted circulation which the book must enjoy, owing to the necessarily expensive character of this series,² will perhaps justify the publication in SCIENCE of a summary of the main results obtained, and of a comparison with previous work done in this field.

The preparation of this volume successively undertaken by McLachlan, of London; Hagen, of Cambridge, Mass., and Karsch, of Berlin, and successively relinquished by each of them under the pressure of ill-health or of other work, was entrusted to the present writer in the beginning of 1899.

The material on which it is based was primarily that acquired for the purpose by Dr. Godman, editor of the *Biologia*, and his associate, the late Osbert Salvin, F.R.S., but thanks to the directors, curators and owners of public and private museums, a still larger series of specimens has been available. It is, therefore, a great pleasure to acknowledge the aid thus rendered by the Academy of Natural Sciences of Philadelphia, the United States National Museum, the Museum of Comparative Zoology, the American Museum of Natural History, the Carnegie Museum of Pittsburgh, the California Academy of Sciences, the Field Columbian Museum, the late Robert McLachlan, F.R.S., and Messrs. E. B. Williamson, C. C. Adams, C. C. Deam, J. G. Needham, H. Kahl, O. S. Westcott and E. A. Smyth, Jr.

¹"Odonata," by Philip P. Calvert, forming pages 17-420, v-xxx, plates II.-X., 1 map, of volume Neuroptera, *Biologia Centrali-Americana*. Edited by F. Duane Godman, F.R.S., etc., London, 1901-8, 4to.

²A sketch of the *Biologia* was published in *Entomological News*, XVI., pp. 317-322, December, 1905.

These collections contain the fruits of the field labors in Mexico, Central America and adjacent territory, both north and south, of Messrs. A. Agassiz, A. Alfaro, C. F. Baker, H. S. Barber, O. W. Barrett, J. H. Batty, Dr. Berlandier, P. Biolley, F. Blancaneaux, A. Boucard, L. Bruner, Burgdorf, H. K. Burrisson, P. P. Calvert, Merritt Cary, G. C. Champion, Chaves, L. J. Cole, O. F. Cook, Collins, Lieutenant Couch, J. C. Crawford, Jr., G. R. Crotch, C. C. Deam, F. Deppe, C. H. Dolby-Tyler, Dubosc, A. Dugès, G. Eisen, H. J. Elwes, Festa, A. Forrer, H. Frühstorfer, G. F. Gaumer, F. D. Godman, P. H. Goldsmith, R. F. Griggs, the Hassler Expedition, R. H. Hay, B. Hepburn, Professor A. Heilprin (Expedition of the Academy of Natural Sciences, Philadelphia), Heyde, J. S. Hine, M. E. Hoag, C. F. Hoege, L. O. Howard, H. N. Howland, E. Janson, M. Kerr, C. H. Lankester, F. L. Lewton, F. E. Lutz, G. F. Mathew, W. M. Maxon, J. F. McClendon, R. E. B. McKenney, McNeill, N. Miller, A. B. Nichols, Palmer, H. Pittier, Ribbe, W. Richardson, C. W. Richmond, S. N. Rhoads, G. O. Rogers, H. Rogers, O. Salvin, H. de Saussure, W. Schaus, Schild, Schumann, S. C. Schumo, Shakspear, H. H. Smith, F. E. Sumichrast, O. Thieme, W. L. Tower, C. H. Townsend, J. F. Tristan, M. Trujillo, C. A. Uhde, C. F. Underwood, F. H. Vaslit, W. H. Vogel, C. Werckele, O. S. Westcott, C. H. White, E. B. and L. A. Williamson, H. Wilson and Mrs. E. B. Williamson.

In consonance with the general plan of the *Biologia* the work deals chiefly with the geographical distribution and taxonomy of these insects in Mexico and Central America, but includes their extra-limital occurrence also. The advance in knowledge which is here recorded can be seen from a comparison with the three older works which attempted completeness at their respective periods. (1) The "Synopsis of the Neuroptera of North America," by Hermann Hagen, published by the Smithsonian Institution in 1861; (2) the same author's "Synopsis of the Odonata of America" in the *Proceedings of the Boston Society*

of *Natural History*, volume XVIII., 1875, which, as it omits the Lestinae and Agrioninae, must be supplemented for these subfamilies by the synopses of Baron Edmond de Selys Longchamps in the *Bulletins de l'Academie Royale des Sciences de Belgique*, 1865-77; and (3) the "Catalogue of Neuroptera Odonata" [of the world], by Mr. W. F. Kirby, London, 1890. This comparison is set forth in the following tables:

TABLE I.

Showing the Increase in the Number of Species and of Localities

Author	Number of Species		No. of Localities quoted from						
	Mexico	Cen. Amer.	Mexico	B. Hon. & Yucatan	Guatemala	Honduras	Nicaragua	Costa Rica	Panama
Hagen, 1861	69	4	10	(1)	(1)	(1)	0	0	0
Hagen, 1875, and Selys, 1861-77	88	26	15	(1)	(1)	(1)	1	0	1
Kirby, 1890	89	38							
Calvert, 1901-8	219	208	144	10	55	5	7	31	13

TABLE II.

Showing the Increase in the Number of Records

Author	Number of Records ^a						
	Mexico	B. Hon. & Yucatan	Guatemala	Honduras	Nicaragua	Costa Rica	Panama
Hagen, 1861	77	1	2	4	0	0	0
Hagen, 1875, and Selys, 1862-77	120	1	10	4	1	0	15
Calvert, 1901-8	1215	27	508	66	25	237	125

After deducting the duplications, the total number of species now known for Mexico and Central America as a whole is 293, of genera 71.

Only five of the species recorded by previous authors have not been seen by the writer—*Paraphlebia hyalina*, *Argia orichalcea*, *Herpetogomphus boa*, *Herpet. menetriesii* and *Macromia* sp., the last known only in the

^a A "record" for any species is the noting of its occurrence in any one locality, and for each species there are as many records as there are separate localities at which it has been found.

nymphal stage. Two species, *Argia calida* Hagen and *A. funebris* Hagen, are known only from the type specimens.

Synoptic keys are given to the genera of the six sub-families comprising more than one genus each and to the species of forty-five of the genera. Two genera (*Hesperagrion* and *Metaleptobasis*—both Agrioninæ) and eighty-one species have been described as new.

Except in these eighty-one species and in the genus *Argia*, the specific descriptions and the figures on the plates are limited to features unnoticed, or insufficiently or incorrectly described or figured in the previous literature, which it is believed has been cited very fully. The distribution of each species is given in detail; the number and sex of the specimens examined and the collector's name are stated after each locality. To give the fullest information on such topics, the first of the two tables in the introduction comprises an alphabetically-arranged list, by countries, of all the localities from which Odonata are represented, the state, altitude and temperature-zone of each locality, the date of collection, the collector's name, and often remarks on the physical character of the environment or the precise spot where the insects were gathered.

The greater part of the nine years occupied in the preparation of this work has been consumed by the gathering and tabulating of various characters—especially those of the veining of the wings—which have been employed by previous writers to separate the genera, or which seemed to lend themselves to that purpose. These data (collected without the aid of clerks or assistants), numbering above one hundred and fifty thousand, were reduced to percentages for each of the species studied. Features which showed a variation of ten per cent. or less were thereby assumed to be of sufficient constancy to serve as generic characters, and among these importance was naturally assigned to those showing the least degree of variability. Many of the specific, as well as the generic, characters employed in the work rest on a similar basis. At the same time it must be remarked that the data are not sufficiently numerous for any one species

to furnish bases for mathematical formulæ. The limitations of time and strength and in many cases also the available material forbade the examination of more than twenty-five or thirty individuals of a species, but not infrequently these were tabulated for twenty-five different characters, which in the case of the wind-details were noted for both sides of the body in each specimen. Further statement of this part of the work is not made here nor is it more than hinted at in a large part of the *Biologia* volume itself, since it is hoped to publish in another place tables of the percentages obtained.

Under each species, where possible, special attention has been given to noting: (1) the color changes through which the imago passes from the time of transformation to the final tints of old age—which has been done for fifty-two species, the most extensive changes being perhaps those of *Hesperagrion heterodoxum* (pp. 103, 377 and Plate VI., Figs. 1-6); (2) the geographical variations; (3) the individual variations found in the same locality. Owing to the conservative attitude adopted towards species, many of these variations (2) and (3) will doubtless afford—indeed have already afforded in one case—additional “species” to later workers in this field, but in these days one may perhaps reply to criticism with *de speciebus dividendis non disputandum*. In the matter of nomenclature some use has been made of trinomials, in the sense of the American Ornithologists' Union.

The areas which have been most carefully examined are portions of the Mexican states or territories of Tepic, Jalisco, Guerrero, Morelos, Distrito Federal, Tamaulipas, Vera Cruz and Tabasco, the central belt of Guatemala from the Caribbean to the Pacific and a few localities in Costa Rica. The odonatologically unknown area in Mexico and Central America is, therefore much greater than that which has been investigated.

Of the physical data which have yet been brought together, only those on temperature are sufficiently complete to enable one to make a natural division of Mexico and Central America as a whole, with which the distribu-

tion of the Odonata can be compared. A new map showing the mean annual temperatures of these countries has been compiled on the basis of previous maps and more recent records of meteorological observatories, and is included in the volume. Classifying these temperatures into groups of 5° C. each, there are obtained five (or six?) zones whose mean annual temperatures range from 30° (or more?) C. to less than 10° C. The second table in the introduction, a systematic list of the species, gives their distribution, *inter alia*, by temperature-zones. Incidentally it may be mentioned that the zone of 25°–20° C. has yielded the greatest number of species of dragonflies and the greatest number of endemic species.

As may be gathered from the foregoing, the ecological relations of these insects have not been fully treated in the *Biologia*, but many data have been brought together in a separate paper⁴ dealing with the composition of this Odonate fauna and its relations to temperature, rainfall, forest areas and other environmental factors. Two ecological topics, however, are incidentally referred to in the *Biologia* volume but not in the ecological paper: Mimicry and the Proportions of the Sexes.

The examples of mimicry indicated are: *Paraphlebia* and *Palæmnema* (page 133, footnote ‡); *Libellula saturata croceipennis*, *Orthemis ferruginea*, *Libellula foliata* and *Palltothemis lineatipes* (pp. 212, 292); *Dythemis cannaerioides* and *Cannacria* species (p. 277); *Rhodopygia hollandi* and *Erythemis hæmatogastra* (pp. 319, 338); *Platyplax sanguiventris* and *Erythemis peruviana* (pp. 328, 334). In none of these cases, however, is there as yet any evidence for or against the protective value of these resemblances.

Proportions of the Sexes.—10,838 specimens have been cited in this work from Mexico and Central America and 2,746 of the same species from other countries. Of the 10,838, 7,165 are males, 3,673 are females. That these

⁴“The Composition and Ecological Relations of the Odonate Fauna of Mexico and Central America,” by Philip P. Calvert. To appear in the *Proc. Acad. Nat. Sci. Philadelphia* for 1908.

numbers can not be regarded as having any special significance may be seen from the following comparisons:

A. Forms with dissimilarly colored wings in the two sexes, males the more conspicuous: *Heterina cruentata* 265 ♂, 91 ♀; *H. vulnerata* 43 ♂, 44 ♀; *H. macropus* 239 ♂, 81 ♀; *H. infecta* 27 ♂, 27 ♀.

B. Forms with uncolored wings, bodies dissimilarly colored in the two sexes: *Argia extranea* 236 ♂, 160 ♀; *A. pulla* 414 ♂, 53 ♀; *A. lacrymans* 7 ♂, 7 ♀; *Ischnura ramburi* 18 ♂, 27 ♀; *I. denticollis* 140 ♂, 143 ♀; *I. demorsa* 44 ♂, 57 ♀; *Orthemis ferruginea* 196 ♂, 76 ♀; *O. levis* 28 ♂, 28 ♀.

C. Forms with similarly colored wings and bodies: *Megaloprepus cærulatus* 42 ♂, 32 ♀; *Mecistogaster ornatus* 49 ♂, 73 ♀.

It is more likely that these numbers are due to the accidents of collecting than that they represent the proportions of nature.

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SOME INVERSIONS OF TEMPERATURES IN COLORADO

As a part of some botanical work being done on the hills south of Boulder, Colo., two thermographs were kept running during the spring of 1908. One of these was located on the campus of the University of Colorado, at an altitude of 5,420 feet, the other on a mesa (flat-topped hill) about three quarters of a mile to the south, and at an altitude of 5,835 feet. The station on the mesa is about one mile east of the face of Green Mountain, which rises abruptly 3,000 feet.

As is well known, a mean difference of three degrees Fahrenheit usually occurs for each 1,000 feet in mountain districts, the higher points being the colder. Unless “inversion” occurs the records of the mesa would be expected to show about one or two degrees colder than the university campus. The observations show that inversion does occur and that the night temperatures on the mesa are distinctly higher than on the university campus. For the present note it will be sufficient to give certain data for the month of May.