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**Entomological news.**

[Philadelphia]American Entomological Society, 1925-  
<http://www.biodiversitylibrary.org/bibliography/2356>

**v. 50-51 1939:** <http://www.biodiversitylibrary.org/item/20181>

Article/Chapter Title: How many insects are there in the World?

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Subject(s): Hemiptera, Fulgoroidea, Auchenorrhyncha, Insecta

Page(s): Page 219, Page 220, Page 221, Page 222

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### **How Many Insects are there in the World?**

By Z. P. METCALF, North Carolina State College of Agriculture and Engineering of the University of North Carolina.

This being census year it is perhaps not amiss to take a census of our insect population. The possible number of insects in the World has always been a subject of great interest to me. I, of course, refer to the number of kinds of insects or species and not to the number of individuals. No one has been foolhardy enough to attempt to make a world census of insect individuals so far as I am aware. Wolcott (1937a) has recently given us a list of the number of invertebrates collected from one hundred square feet of grassland in New York State. If this figure were taken as the average for the land area of the world, it would be fairly easy to multiply the land surface of the earth by the number of animals per one hundred square feet and arrive at a figure that would be utterly meaningless to any one save an astronomer. Before we get into such figures, however, let us inquire as to the estimated number of kinds of animals in the World. Text-book statements range from 250,000 to 1,000,000 and some hardy soul has recently suggested that there must be at least 10,000,000 species of animals living in the World at the present time. This figure was based upon the maintenance of the present rate in description of new species for another 150 years. Before we condemn such figures as completely fantastic, let us look at the past record. In 1758 Linnaeus established binomial nomenclature and described 312 genera and 4,203 species of animals of all classes, or a ratio of 13 species to each genus. The insects comprised 74 genera and 2,102 species, or a ratio of 28 species to each genus. Of these 1 genus and 42 species were included in what we speak of today as the Homoptera-Cicidina and Fulgorina. This gives a ratio of species of Homoptera to all other animals of 1:100.

Sherborn (1902a) lists all the animals that were described between the years 1758 and 1800. This list includes 3,234 genera and 58,833 species, or a ratio of 18 species to each genus.



Fabricius (1803a) redescribes all the known species of Homoptera. He includes 14 genera and 452 species, a ratio of 13 species to each genus; and a ratio of known Homoptera to all animals of 1:130.

Sherborn (1922a-1933b) lists all the animals described from 1800 to 1850. This list includes 52,214 genera and 363,588 species or a ratio of 8 species to each genus, or a total population of the Animal Kingdom from 1758 to 1850 of 55,448 genera and 422,421 species.

Dohrn (1859a) catalogs the known Hemiptera of the World. He includes 222 genera and 3,259 species or a ratio of 13 species to each genus. If we compare the species of Homoptera listed in 1859 to the rest of the Animal Kingdom, we find a ratio of 1:130; and a ratio of genera to species of 1:8.

Since 1850 the only reliable source of information in regard to the number of new species is found in the Zoological Record. Counting the number of new species every 10 years as recorded in this publication gives us an average of 10,542 new species of insects described each year, 249 species of Homoptera, and 7,253 species of animals not insects.

If these averages are substantially correct they would give us a grand total of 948,780 species of insects since 1850 and a total of 652,770 species of animals not insects. A grand total of 1,601,550 species of animals described since 1850, or a total since 1758 of 2,023,951 species of animals.

There are two methods that we may use to check these figures. In the first place, a careful count shows that we now have in our card catalog of the Homoptera of the World 2,544 genera and 19,882 species. These figures do not include any synonyms. This catalog may be considered complete up to the end of 1937. Our calculations based on the above figures would give us 23,179 species of Homoptera, including synonyms; showing that our calculations are substantially correct. Now if the Homoptera represent 1/125 of the Animal Kingdom, as our figures would seem to indicate, then the total number of described species of animals in the World would be 2,898,625.



There is a second method that may be used. The new Nomenclator Zoologicus will list 225,000 genera. The ratio of species to genera was 8:1 in 1850. If this ratio is maintained today as would be indicated also by the ratio of species to genera in the Homoptera, we would have 1,822,500 described animals in the World.

Averaging the three sets of calculated figures we get an estimated number of 2,500,000 animals and 1,500,000 insects described from 1758 to 1940.

I recognize the limitations of these figures and the many inaccuracies in them, at the same time I believe that they are more accurate than the figures current in most text books. At least they have done this; they have occupied my thoughts on a hazy Indian summer day; their calculations have kept an otherwise idle adding machine busy; and last by no means least important, I hope they have stimulated your thoughts in this field. I trust also, that they will make those of us who profess to be systematists more systematic as we go about our daily business of describing new genera and species, so that those who come after us will not have to do too much counting and recounting, too much learning and unlearning.

And one final conclusion perhaps best expressed in the lines of the ancient limerick:

From figures astronomical  
And pains gastronomical  
May the good Lord deliver us,  
But there's no hope for any of us  
As long as so many of us  
Have thought quite hysterical.

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### The Cockroach *Supella supellectilium* in California (Orthoptera: Blattidae).

Information published in the last few years has shown that this circumtropical cockroach has been rapidly extending its distribution within the more austral parts of the United States. Bach (Proc. Entom. Soc. of Wash., XXXIX, pp. 205-213, text figs. 1 and 2, pls. 18 and 19, (1937)) has given a good summary of the subject. Hebard (Trans. Amer. Entom. Soc., LXI, p. 273, (1935)) further reported it from Tucson, Arizona, and Rehn (Entom. News, XLIX, p. 143, (1938)) added Pennsylvania to its distribution.

Recently three immature individuals of this species, representing several instars including that preceding maturity, have been sent to me for determination by Mr. V. E. Williams, Entomologist to the Agricultural Commissioner of Los Angeles County, California. These specimens were collected in a residence at San Bernardino, California, by Mr. John R. Coy, Agricultural Commissioner of San Bernardino County, April 8, 1940.

This record extends the range of the species within the United States to California, thus giving it a distribution extending from Pennsylvania to southern California, northward in the interior to Nebraska, Missouri, Illinois (Chicago and Urbana) and Indiana (Indianapolis). It was first recorded from the United States at Miami, Florida, by the present author in 1903 (Entom. News, XIV, p. 125) as the synonymic *Phyllodromia cubensis*.

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