

smaragdina, Walk.

1850. *Zammar*a, Walker, Cat. Brit. Mus. Homop. I., 33.
 1881. *Zammar*a, Distant, Biol. Cent. Amer. Homop. 3; pl. I., 1.
 1888. *Zammar*a, Woodworth, Psyche, V., 67.
 1892. *Zammar*a, Uhler, Trans. Md. Acad. Sci., 174.
 angulosa, Walk.
 1850. *Zammar*a, Walker, Cat. Brit. Mus. Homop. I., 34.
 1888. = *smaragdina* Walk., Woodworth, Psyche, V., 67.
 Habitat—California, Mexico.

PRACTICAL ENTOMOLOGY.

A CONTRIBUTION TO THE STUDY OF THE INSECT FAUNA OF HUMAN EXCREMENT (with especial reference to the Spread of Typhoid Fever by Flies). By L. O. Howard, Ph.D. Proc. Washington Acad. Sciences, December 28, 1900. Royal 8vo., pp. 60, fig. 22, plates 2.

This paper, just issued by Dr. L. O. Howard, the United States Entomologist, is of enormous and far-reaching importance. The subject is, undoubtedly, at first sight an unpleasant one; but it is of such intense interest to all, that it becomes the duty of anyone who appreciates the bearing of this paper to draw public attention to it, as a source of authoritative and definite information on a subject which may affect the health of every individual in every community, especially where many human beings are gathered together, as in military camps and large cities. Moreover, this paper indicates a ready means, always available, by which the spread of typhoid fever, cholera and other kindred diseases may be to a large extent prevented. It has for some time been recognized by advanced physicians and some few others, that "flies" are the direct agents in the distribution of some diseases; but Dr. Howard, by the investigations which are here summarized, proves what kinds of flies are responsible for this evil, shows the way in which they do it, and points out how it may be prevented. The present contribution is a record of actual observations by Dr. Howard and his assistants at Washington, aided by correspondents in many parts of the United States. Dr. George M. Sternberg, Surgeon-General of the U. S. Army, and other high medical authorities are cited, showing the importance of the careful and regular treatment of fæcal matters in large encampments, and instances are given of the fatal results of neglecting the precautions recommended.

Dr. H. A. Veeder, in a paper entitled "Flies as Spreaders of Disease in Camps," published in the New York Medical Record of September 17, 1898, brought together a series of instances and strong arguments in favour of his conclusion that flies are prolific conveyers of typhoid under improper camp conditions.

In Dr. G. M. Sternberg's circular No. 1, published April 25, 1898, explicit directions were given to army surgeons regarding sinks, which, if explicitly followed, would have prevented the spread of typhoid by flies. Two sentences may be quoted from this circular: "Sinks should be dug before a camp is occupied, or as soon after as practicable. The surface of fæcal matter should be covered with fresh earth or quicklime or ashes three times a day. No doubt typhoid fever, camp diarrhœa, and probably yellow fever, are frequently communicated to soldiers in camp through the agency of flies, which swarm about fæcal matter and filth of all kinds deposited upon the ground or in shallow pits, and directly convey infectious material, attached to their feet or contained in their excreta, to the food which is exposed while being prepared at the common kitchen or while being served in the mess tent." Thus the Surgeon-General not only gave sound instructions, but stated his reasons for these instructions:

"In 1898 an epidemic occurred in the camp of the Eighth Cavalry at Puerto Principe, Cuba, in which 250 cases of the fever occurred. The disease was imported by the regiment into its Cuban camp, and Dr. Walter Reed, U. S. A., upon investigation, reported to the Surgeon-General that the epidemic 'was clearly not due to water infection, but was transferred from the infected stools of the patients to the food by means of flies, the conditions being especially favorable for this manner of dissemination.'

"The agency of flies in the transmission of Asiatic cholera was convincingly shown at an early date by the observations of Tizzoni and Cattani, Sawtchanko, Simmonds, Uffelmann, Flugge and Macrae, while Celli had shown as early as 1888 that flies fed on the pure cultures of *Bacillus typhi abdominalis* were able to transmit virulent bacilli into their excrement."

Owing to the prevalence of typhoid in the United States Army during the summer of 1898, an Army Typhoid Commission was appointed in that year, at the request of the Surgeon-General. The report of this Commission has not yet been published, but one of the members, Dr. Victor M. Vaughan, U. S. V., read before the annual meeting of the

American Medical Association, at Atlantic City, New Jersey, June 6, 1900, a paper entitled "Conclusions Reached After a Study of Typhoid Fever Among American Soldiers in 1898." This paper, which is one of the most important contributions to the study of enteric fevers published, comprises 53 categorical conclusions. The one relating to flies is as follows:

"27. Flies undoubtedly served as carriers of the infection.

"My reasons for believing that flies were active in the dissemination of typhoid may be stated as follows:

"*a.* Flies swarmed over infected faecal matter in the pits and then visited and fed upon the food prepared for the soldiers at the mess tents. In some instances, where lime had recently been sprinkled over the contents of the pits, flies with their feet whitened with lime were seen walking over the food.

"*b.* Officers whose mess tents were protected by means of screens, suffered proportionately less from typhoid fever than did those whose tents were not so protected.

"*c.* Typhoid fever gradually disappeared in the fall of 1898, with the approach of cold weather and the consequent disabling of the fly.

"It is possible for the fly to carry the typhoid bacillus in two ways. In the first place, faecal matter containing the typhoid germ may adhere to the fly and be mechanically transported. In the second place, it is possible that the typhoid bacillus may be carried in the digestive organs of the fly and may be deposited with its excrement."

The miasmatic theory of the origin of typhoid fever was not supported by the investigations of the Commission, and it was found that infected water was not an important factor in the spread of typhoid in the national encampments of 1898. The conclusion was reached that the fever is disseminated by the transference of the excretions of an infected individual to the alimentary canals of others, and that a man infected with typhoid fever may scatter the infection in every latrine, or regiment, before the disease is recognized in himself, while germs may be found in the excrement for a long time after the apparent complete recovery of the patient. The remarkable statement is made that in the encampments of 1898 about one-fifth of the soldiers developed typhoid, and that more than 80 per cent. of the total deaths were caused by this fever.

In all medical and newspaper literature on this subject the expression used in connection with insects has been simply "flies." It occurred to

Dr. Howard, in 1898, that from the scientific and practical points of view there was a distinct necessity for careful investigation of the insects which breed in human fæces, or are attracted to them; such an investigation was consequently begun in 1898 and carried on through 1899 and part of 1900. It is the results of this investigation which Dr. Howard now presents.

In summing up, Dr. Howard states that the number of insects found breeding in or frequenting human excrement was very large. There were many coprophagous beetles—44 species in all—and many hymenopterous parasites of beetles and flies, but these were not thought to have any importance from the disease-transfer standpoint. Of flies there were studied in all 77 species, of which 36 were found to breed in human fæces, while 41 were captured upon them.

The practical bearing of the work is brought out when we consider which of the forms are likely from their habits to actually carry disease germs from excrement, in which they have bred or which they have frequented, to food substances upon which human beings feed. Therefore, extensive collections of flies were made in pantries, kitchens, etc., by means of sticky fly-papers. No less than 23,087 flies were examined, of which 22,808 were the ordinary house fly, *Musca domestica*. A complete list is given of all species bred on or taken during the investigation, including a full account of the common house fly and its habits. There are excellent figures of many species, together with a great deal of information which will be of interest to scientific readers.

Dr. Howard points out that, although the most abundant species found breeding in or attracted to human excrement do not occur in kitchens and dining-rooms, yet the common house fly, notwithstanding the fact that it prefers horse manure as a breeding place, does, under some circumstances, as in army camps, where human excrement is left exposed, breed in that substance in large numbers, and, as it also is much attracted to food supplies, it may transfer to these the germs of typhoid or other epidemic diseases from the places where it has bred or to which it has been attracted. On account of these facts, it is recommended that box privies should be abolished from every community, that the depositing of excrement in the open within town limits should be considered a punishable misdemeanour, and every breach of this law should be brought to the notice of the police, so that the nuisance may be removed. Boards of Health in all communities are urged to look after the proper

treatment of horse manure, so as to reduce to a minimum the number of house flies. Practical inferences to be drawn from this important investigation are that house flies, which occur everywhere and have a remarkable capacity for flying or being carried long distances in railway trains or other conveyances, are capable of carrying the germs of fatal diseases from place to place, and are therefore a source of great danger. In view of this, steps should be taken to restrict as much as possible their opportunities for breeding, by rendering their favourite habitats unsuitable for the purpose. To this end all such exposed matter in which they could breed should be removed or covered up as quickly as possible. Ashes, lime, or even dried earth, are usually easily obtainable, and will answer well for this last-mentioned purpose. Steps should be taken to prevent as much as possible the entry of flies into hospitals, houses, kitchens and pantries, by means of screens on doors and windows, and all flies found inside such protected buildings should be destroyed by a constant use of fly-papers or pyrethrum insect powder.

J. FLETCHER.

FOUR NEW SPECIES OF HIPPISCUS.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Since the publication, in *Psyche* for 1892, of my study of the Orthopteran genus *Hippiscus*, a few additional species have come to light, and they are herewith described. The first species belongs to the subgenus *Hippiscus*, the others to the subgenus *Xanthippus*.

Hippiscus citrinus, sp. nov.—A compact and stout though rather small form. Head rather stout and full, broad above, luteo-testaceous, more or less infuscated above, dark fuscous in a stripe behind the eyes; the carinæ more or less infuscated; summit of head obscurely punctate, the vertical scutellum obscure and, with the foveolæ, much as in *H. compactus*; frontal costa broad, flat, punctate, depressed at the ocellus, where it is slightly enlarged, but otherwise subequal; antennæ ferruginous in basal, blackish in apical half. Pronotum stout, somewhat constricted mesially and considerably expanded on the metazona, the disc nearly plane with rather heavy rugæ forming the scutellum of the prozona, the metazona nearly smooth, but with a few slight rugæ and granulations; median carina very uniform and not prominent, but on the metazona slightly arcuate as seen laterally; lateral canthi tolerably distinct on the metazona (but rounded posteriorly), considerably surpassing the median