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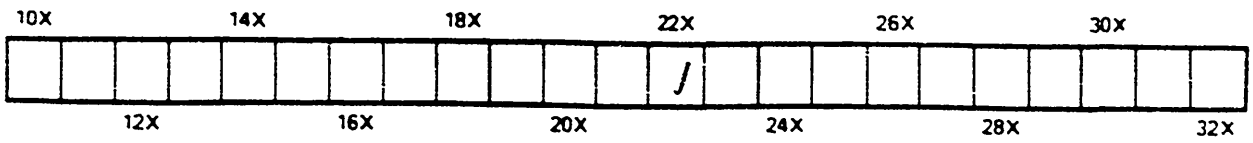

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TWELVE YEARS' EXPERIENCE WITH RUBBER STOPPERS. USED IN THE BIOLOGICAL COLLECTION OF THE MUSEUM IN CAMBRIDGE.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The late Professor L. Agassiz, in 1867, requested of me a detailed plan for the development of the entomological department of the Museum, Among the different collections proposed was a biological collection similar to my own for Neuroptera and Pseudo-neuroptera, but extended to include all Arthropoda. The Professor in a marginal note stated that this collection should be commenced immediately, and developed as rapidly as possible. In my collection the alcoholic objects were included in vials placed horizontally near the pinned dry objects, so that all belonging to one species were together and presented a clear view to the observer. I used vials closed with cork stoppers, which for a small collection and by a continual supervision, proved sufficiently safe. Nevertheless experiments were made with several substances, hoping to prevent the evaporation of the alcohol and the necessity of refilling a large number of vials every six months. This arrangement is, as stated, sufficient for a small collection, but when applied upon a comprehensive and extended scale, proves inadequate. The continual supervision and refilling of several thousand vials would have needed a considerably larger expense and a special assistant. The best velvety cork stoppers did not do as well here as in Europe, owing to the greater changes of temperature. Experiments were made during six years upon a large number of substances in the hope of increasing the efficiency of the cork stoppers. Fats, tallow, stearine to impregnate the cork, wax, sealing wax, different resins and varnish, shell-lac, iron-lac, guttapercha and India rubber in different solutions, thick oil paint, collodium, waterglass, very fine bladder around that part of the cork placed in the vial, and glue and paste to cover the external part of the cork with strong paper and bladder, were subjected to trial. Several of these substances were tried on an extensive scale and

for several years, all proving to be more or less unsatisfactory. Finally it was decided to use India rubber stoppers. Though these were decidedly more expensive, they have during twelve years given the most satisfactory results. A continual supervision and re-filling of carefully closed vials is unnecessary, and the greater outlay at first is after a few years more than repaid; time, alcohol and manual help are saved. At first the strong compression of the alcohol in placing the stoppers was the principal cause of insecurity of the filled vials, as the stoppers were very apt to slip out. In putting the stopper in the vial, I introduce now a fine insect pin (to be removed later), allowing the air to escape and thus preventing the strong compression of the alcohol (Ann. Rep. of the Museum for 1874, p. 13).

A small test vial, 70 m. m. long and 16 m. m. broad, filled in this way, October, 1873, was kept purposely for three years in the sunshine; the length of the air bubble retained in the vial was carefully measured, and found to be 14 m. m.; a year later the bubble had about the same length. In summer the bubble was smaller, owing to the greater expansion of the alcohol, proving at the same time the close fitting of the stopper. On November 14, 1882, the bubble was 20 m. m. long, and is now, October 6, 1885, 30 m. m. long. The vial was never opened during the twelve years, and is now in such a condition that it would not need re-filling if used in the collection. The collection contains many smaller vials and a number of larger ones (the largest for the larva of *Dynastes hercules*, 180 m. m. long and 50 m. m. broad), and with very rare exceptions, re-filling was not necessary. I would remark that all stoppers used are of vulcanized India rubber. The so-called pure rubber stoppers used for chemical purposes are probably better, but they were then not for sale in Boston, and are also 30 per cent. more expensive. During late years a number of them have been used to ascertain their reputed superiority. A disadvantage of the vulcanized stoppers is the formation of small crystals of sulphur in the alcohol, which attach themselves firmly to the insects, and are for delicate objects injurious. This disadvantage is, however, easily obviated, or at least very much diminished, when the stoppers are thoroughly washed before use, or better, are put half an hour in warm water.

The most important point was, how long these stoppers would do well, and when they would need to be replaced by new ones. To know exactly the average time of the efficiency of the rubber stoppers, it was necessary to know the number of vials in use. My assistant has counted them carefully. To Coleoptera belong 1,423; Lepidoptera, 1,547;

Pseudo-neuroptera, 979; Neuroptera, 454; Hymenoptera, 523; Galls, 171; Spiders, 644; Parasites, 208; Hemiptera, 57; Orthoptera, 14 (the last two orders are not arranged, and the rich biological material of the alcoholic collection of the Museum is not placed in vials); besides a large number not yet arranged in the boxes of the different orders. There are about 7,800 vials in use. The larger part of the collection presented by Mr. F. G. Schanpp, and the very large collection of the Peabody Academy, are not included in the above enumeration. For want of space, they have been stored provisionally in large glass jars filled with alcohol, in which the small vials with cork stoppers are placed.

Of the 7,800 vials with rubber stoppers, perhaps two-thirds were filled and labelled 10 and 12 years ago, the others in the successive years, half of them three years ago. More than half are of a size needing stoppers of 8 to 12 m. m. at the smaller end; two-thirds of the rest of 14 to 18 m. m.; the rest with larger ones 30 to 37 m. m. (milk stoppers), and a few as large as 42 m. m. Some vials, at times a large number, were opened for identification and study of the contents. A very small number had to be changed every year, and these were closed with pieces of rubber rope (of 6, 10, 12, 16, 25 m. m. diameter), which was used as an experiment, but proved to be unsuccessful. In addition to these, in each year during late years three or four of a certain size needed to be changed. These vials, 65 m. m. long by 8 m. m. broad, were closed by stoppers, which had to be forced 16 m. m. into the vials. The alcohol began to evaporate, the vials turned easily on the corks, which is never the case in well closing vials; the part of the stopper in the vial was somewhat smeared, and had lost its elasticity. Indeed these stoppers would have served probably longer by re-filling, but for greater safety they have been always changed. All these vials were closed twelve years ago, and they began to give out during the last few years. The part of the stopper outside of the vial always bulged out considerably, so that by this mark alone the vials to be changed were easily noticed. A part of these stoppers were not well made; when cut they are not solid throughout, but filled with numerous holes, representing a kind of fibrous tissue. The strong depression in the rubber trade during late years has caused the use of poorer material in vulcanizing; some numbers of the smaller sizes are now decidedly bad. Nevertheless, of all stoppers in use, less than one per mille gives out every year after twelve years' use, and in the first six years probably only one per two mille. Stoppers of the larger size keep

much better. After all, I think the result is a decided success. All the so-called pure rubber stoppers for chemical laboratories of American make are, as far as I am able to ascertain, manufactured of vulcanized rubber, which is not the case with those imported from Germany. The Professor of the chemical laboratory here has had the same experience. The 7,800 stoppers of different sizes have cost about $110; if they had been bought at once at wholesale figures, the price would have been 30 to 35 per cent. less.

As the stock in hand for the advancement of the collection has to be a large one, I may draw attention to a method recommended by Prof. W. Hempel, of Dresden, Saxony, to prevent the stoppers becoming too hard (Bericht d. Deutsch. Chem. Gesell., 1882, vol. xv., Heft. 6, No. 184). Rubber stoppers or tubes retaining their elasticity should be kept in large glass jars, in which an open vessel with petroleum has been placed. It is better to keep the light from the jar; wooden boxes should not be used. Stoppers which have become hard should be brought together in a jar with sulphuret of carbon until they are softened, and afterwards be kept in a jar with petroleum just as the others. Before knowing this I used to soften such stoppers by squeezing in different directions, or by rolling with a piece of board. Of course Prof. Hempel's method is better, as it prevents the gradual evaporation of the fluids used for the solution of the rubber in the process of vulcanization. It is remarkable that until now none of the stoppers in the vials arranged in wooden boxes have become hardened, though the same stoppers not fixed in vials with alcohol grew hard. Probably the strong pressure of the alcohol by fitting the stoppers has some influence in keeping them soft; besides, the part of the stopper outside of the vial is mostly small. I do not know whether rubber stoppers for similar purposes have been used here or in Europe earlier than in the Cambridge Museum; if so, I would be very glad to know the results obtained elsewhere.

PRELIMINARY LIST OF THE SPECIES OF ACARINA OF NORTH AMERICA.

BY HERBERT OSBORN, OF THE IOWA AGRICULTURAL COLLEGE, AND LUCIEN M. UNDERWOOD, OF SYRACUSE UNIVERSITY.

The Acarina, especially the more minute forms, have been but little studied in America, a fact which seems the more strange when we con-

sider what interesting objects they form for microscopic work. As in most groups of Arthropoda, the pioneer work in this country was done by Thomas Say, whose descriptions of a number of the larger species appeared as early as 1821. Later on Dana and Whelpley (1836), and Haldeman (1842), contributed descriptions of a few species. More recently Dr's. Fitch, Leidy, Packard, Riley, LeBaron and Shimer, and Mr. Ashmead, have published descriptions of species and notes on habits, while quite lately Mr. Harry Garman has published a valuable paper on the Phytoptidæ, which it is hoped he will follow up by still more extensive study of this family.

It is hoped that the following list of the Acarina of the United States and Canada—which we have made as complete as possible up to date—may encourage the further study of the group, and as an additional aid it may be in place to make a few statements concerning their habits and the methods of studying them.

The Trombididæ are found on plants or free as adults, frequently in the larval form, as parasites on insects. The Hydrachnidæ are aquatic, and probably many interesting parasitic forms will be found by careful examination of the gills of bivalve mollusks. Of the Gamasidæ occurring as parasites on insects but few of the probable number have yet been described. In the Acaridæ we have many parasitic forms on birds and mammals, and here especial care should be taken to identify with described European forms whenever possible, particularly in all cases where the bird or mammal host is identical in the two countries. Doubtless many described species occur commonly here which have never been recorded, e. g. *Myobia musculi* seems never to have been recorded in America, but has been taken at Ames, Iowa, and hence is included in our list. A few species common to domesticated animals that are being constantly imported from other countries have been included in this list, even when we have been unable to find a positive record of their occurrence here.

The Phytoptidæ are microscopic in size, and occur on buds, leaves and fruits, producing galls, deformations, blisters or rusts, and their study offers an almost unlimited field for careful investigation.

A large proportion of the mites are too small to be readily studied or preserved, except as microscopic objects, and the most desirable method is to mount them at once, or as soon after collecting as possible, in glycerine jelly or prepared balsam. It is frequently a great advantage to

examine them carefully with the microscope while still alive and moving.

The American literature on this subject, besides being quite scanty, is widely scattered, and some of the papers now quite difficult to procure.

Family TROMBIDIDÆ Leach.

I. *Tetranychus* Dufour.

1—T. TELARIUS Linn. Packard, Guide to Study of Insects, 660; Murray, Economic Entom., 97*; Saunders, Can. Ent. xii, 237* (1880); Insects Inj. to Fruit, 355* (1883); Ontario Entom. Rep., xi, 70* (1880); Forbes, Ill. Rep., xiii., 106 (1884); Standard Nat. Hist. ii., 103.

II. *Trombidium* Fab.

1—T. PARASITICUM Murray. Economic Entom., 129* (1877); Ont. Entom. Rep., xi., 71 (1880).

Atoma parasiticum, Latr. (1806). Riley, Mo. Rep., vii., 176* (1875). *Trombidium muscarum*, Riley. First Rep. U. S. Entom. Com. 306–311 (1878).

2—T. SERICEUM Say. Jour. Phila. Acad. ii., 70 (1821); Coll. Writings ii., 16; Riley, Mo. Rep. vii., 175* (1875), et. Supp., 63; Murray, Economic Entom. 138* (1877); Ont. Entom. Rep. xi., 72 (1880).

3—T. GRYLLARIUM Murray. Economic Entom. 136* (1877).

Atoma gryllaria, LeBaron. Ill. Rep. ii., 61* (1871).

4—T. SCABRUM Say. Jour. Phila. Acad. ii., 69 (1821); Coll. Writings ii., 16; Riley, Mo. Rep. vii, 175 (1875).

5—T. GIGANTEUM Riley. First Rep. U. S. Entom. Com., 312 (1878).

6—T. BULBIPES Packard. Mass. Rep. iii., 26* (1873); Murray, Economic Entom. 136*; Ont. Ent. Rep. xi., 71.

LARVAL FORMS INCERTIS SEDÆ.

1—LEPTUS (*Trombidium ?*) AMERICANUS Riley, Mo. Rep. vi, 122 (1874); Murray, Economic Entom., 116.*

2—LEPTUS (*Trombidium ?*) ARANEÆ Say, Jour. Phila. Acad. ii., 80 (1821); Coll. Writings ii., 23.

3—LEPTUS (*Trombidium ?*) HISPUS Say, Jour. Phila. Acad. ii., 81 (1821); Coll. Writings ii., 23.

4—LEPTUS (*Trombidium ?*) IRRITANS Riley, Mo. Rep. vi., 122 (1874); Murray, Economic Entom., 116*; Ontario Entom. Rep. xi., 71.

* A star indicates an illustration at the reference marked.

5—OCYPETE *(Trombidium ?)* COMATA Say, Jour. Phila. Acad. ii., 82 (1821); Coll. Writings, ii., 23.

III. *Erythræus* Latr.

1—E. MAMILLATUS Say, Jour. Phila. Acad. ii., 70 (1821); Coll. Writings ii., 16.

Family BDELLIDÆ Duges.

I. *Bdella* Latr.

1—B. MARINA Packard, 1st Rep. U. S. Fish Com., 544 (1874); Guide to Study of Insects, 660; Am. Nat. xviii., 827* (1884); Standard Nat. Hist., ii., 103.

2—B. OBLONGA Say, Jour. Phila. Acad. ii., 74 (1821); Coll. Writings, ii., 19.

Family HYDRACHNIDÆ Sundeval.

I. *Limnochares* Latr.

1—L. EXTENDENS Say, Jour. Phila. Acad. ii., 80 (1821); Coll. Writings ii., 22.

II. *Hydrachna* Müller.

1—H. COCCINNEA Haldeman, Proc. Phila. Acad. i., 196 (1842).

2—H. FORMOSA Dana & Whelpley, Am. Jour. Science, 1st ser., xxx., 357* (1836).

3—H. NEBULOSA Haldeman, Proc. Phila. Acad., i., 196 (1842).

4—H. PYRIFORMIS Dana & Whelpley, Am. Jour. Science, 1st ser., xxx., 358* (1836).

5—H. 5-UNDATA Haldeman, Proc. Phila. Acad., i., 184 (1842).

6—H. SCABRA Haldeman, Proc. Phila. Acad. i., 184 (1842).

7—H. TRIANGULARIS Say, Jour. Phila. Acad. ii., 79 (1821); Coll. Writings ii., 23.

8—H. TRICOLOR Packard, Am. Jour. Science, 3rd ser., i., 108 (1871).

9—H. BELOSTOMÆ Riley, 1st Rep. U. S. Entom. Com., 312* (1878).

III. *Atax* Fab.

1—A. HUMEROSA. Standard Nat. Hist. ii., 102. Where described?

2—A. YPSILOPHORUS. Standard Nat. Hist. ii., 102. Where described?

IV. *Thalassarachna* Packard.

1—T. VERRILLII Packard. Am. Jour. Science, 3rd ser., i., 107 (1871); Standard Nat. Hist. ii., 102. Referred by Murray to *Pontarachna*.

Family GAMASIDÆ Leach.

I. *Sejus* Koch.

1—S. AURIS Murray, Economic Entomology, 167 (1877). *Gamasus auris* Leidy, Proc. Phila. Acad., 1872, 138.

II. *Dermanyssus* Duges.

1—D. AVIUM Duges ——. Murray, Economic Entom., 169*; Ont. Entom Rep. xi., 73.

III. *Gamasus* Latr.

1—G. ANTENNÆPES Say, Jour. Phila. Acad. ii., 71 (1821); Coll. Writings ii., 17.

2—G. COLEOPTRATORUM Latr. ——; Packard, Guide to Study of Insects, 663; Murray, Economic Entom., 158*.

3—G. JULOIDES Say, Jour. Phila. Acad. ii., 72 (1821); Coll. Writings ii., 18.

4—G. MUSCULUS Say, Jour. Phila. Acad. ii., 72 (1821); Coll. Writings ii., 17.

5—G. NIDULARIUS Say, Jour. Phila. Acad. ii., 72 (1821); Coll. Writings ii., 17.

6—G. SPINIPES Say, Jour. Phila. Acad. ii., 71 (1821); Coll. Writings ii., 17.

IV. *Argas* Latr.

1—A. AMERICANA Packard, Rep. U. S. Geol. Survey of Montana, Idaho, Wyoming and Utah (Hayden) 740* (1872); Murray, Economic Entom., 182.

V. *Uropoda* Latr.

1—U. AMERICANA Riley, Proc. A. A. A. S. xxv., 273–275* (1877); Mo. Rep. ix., 41 (1877); Standard Nat. Hist. ii., 102.

2—U. VEGETANS DeGeer. ——; Packard, Guide to Study of Insects, 663; Murray, Economic Entom., 162*.

Family IXODIDÆ.

I. *Ixodes* Latr.

1—I. ALBIPICTUS Packard, Am. Nat. ii., 559* (1868); 1st Ann. Rep. Peabody Acad. Science, 65 (1869); Am. Nat. iii., 365 (1869); Guide to Study of Insects, 662*; Standard Nat. Hist. ii., 100*.

2—I. AMERICANUS Latr. ——. Fitch, N. Y. Rep. xiv., 363 (1871).

3—I. ANNULATUS Say, Jour. Phila. Acad. ii., 75 (1821); Coll. Writings ii., 19.

4—I. BOVIS Riley, Packard, 1st Ann. Rep. Peabody Acad. Science, 68 (1869); Rep. U. S. Geol. Survey of Montana, Wyoming and Idaho (Hayden) 740* (1872); Guide to Study of Insects, 663, 668*; Murray, Economic Entom, 193; Osborn, Bull. Iowa Agr. Coll., 75 (1884).
5—I. CHORDEILIS Packard, 1st Ann. Rep. Peabody Acad. Sci., 67 (1869).
6—I. COOKEI Packard, 1st Ann. Rep. Peabody Acad. Sci., 67 (1869).
7—I. CRENATUS Say, Jour. Phila. Acad. ii., 76 (1821); Coll. Writings ii., 20.
8—I. CRUCIARIUS Fitch, N. Y. Rep. xiv., 366 (1871).
9—I. ERRATICUS Say, Jour. Phila. Acad. ii., 77 (1821); Coll. Writings ii., 20.
10—I. FUSCUS Say, Jour. Phila. Acad. ii., 79 (1821); Coll. Writings ii., 22.
11—I. LEPORIS-PALUSTRIS Packard, 1st Annual Rep. Peabody Acad. Science, 67 (1869).
12—I. NIGROLINEATUS Packard, 1st Ann. Rep. Peabody Acad. Science, 66 (1869).
13—I. ODONTALGIÆ Fitch, N. Y. Rep. xiv., 371 (1871).
14—I. ORBICULATUS Say, Jour. Phila. Acad. ii., 76 (1821); Coll. Writings ii., 21.
15—I. PUNCTULATUS Say, Jour. Phila. Acad. ii., 78 (1821); Coll. Writings ii., 21.
16—I. 5-STRIATUS Fitch, N. Y. Rep. xiv., 366 (1871).
17—I. ROBERTSONII Fitch, N. Y. Rep. xiv., 366 (1871).
18—I. SCAPULARIS Say, Jour. Phila. Acad. ii., 78 (1821); Coll. Writings ii., 21.
19—I. UNIPUNCTATA Packard, 1st Ann. Rep. Peabody Acad. Science, 66 (1869); Guide to Study of Insects, 662, 668.*
20—I. VARIABILIS Say, Jour. Phila. Acad. ii., 77 (1821); Coll. Writings ii. 21.

Family ORIBATIDÆ Nicolet.

I. *Oribata* Latr.

1—O. ASPIDIOTI Ashmead, Can. Entom. xi., 93 (1879); Saunders, Insects Inj. to Fruit, 396 (1883).
2—O. CONCENTRICA Say, Jour. Phila. Acad. ii., 73 (1821); Coll. Writings ii. 18.
3—O. GLABRATA Say, Jour. Phila. Acad. ii., 73 (1821); Coll. Writings ii., 18.
4—O. QUADRIPILIS Fitch, N. Y. Rep. iii., 442 (1856).

II. *Nothrus* Koch.

1—N. OVIVORUS Packard, Guide to Study of Insects, 664,* Riley, Mo.

Rep. ii., 102 (1870); 3rd Rep. U. S. Entom. Com., 175* (1883); Standard Nat. History, ii., 102*.

III. *Hoplophora* Koch.

1—H. ARCTATA Riley, Mo. Rep. vi., 53, 81 (1874); Murray, Economic Entom., 225*; Saunders, Insects Injurious to Fruit, 239* (1883); Ontario Entom. Rep., xiii., 66; Standard Nat. Hist. ii., 102*.

Family ACARIDÆ.

I. *Tyroglyphus* Latr.

1—T. MYCOPHAGUS Megnin. Jour. Anat. Phys. (1874)*; Ontario Entom. Rep. xi., 73*.

Rhizoglyphus mycophagus Murray, Economic Entom., 262*.

2—T. PHYLLOXERÆ Riley, Mo. Rep. vi., 52, 53, 81 (1874); Saunders, Can. Ent. xiv., 127* (1882); Insects Inj. to Fruit, 239* (1883); Ontario Entom. Rep. v., 61; xiii., 66; Standard Nat. Hist. ii., 100.

Rhizoglyphus phylloxeræ Murray, Economic Entom., 258*.

3—T. ENTOMOPHAGUS Laboul., Ann. Soc. Ent. Fr. (1862); Murray, Economic Entom., 263; Ontario Entom. Rep., xi., 73.

4—T. SIRO Latr.——(*Acarus siro* L., *Tyroglyphus farinæ*, *T. sacchari* Auct.) Packard, Guide to Study of Insects, 665; Murray, Economic Entom., 267*; Saunders, Can. Ent., xii., 237* (1880); Ontario Entom. Rep., xi., 74.

5—T. GLOVERI Ashmead, Amer. Entomologist, new series, I., 106 (1880); Saunders, Insects Injurious to Fruit, 391 (1883).

Acarus? Gloveri Ashmead, Can. Ent., xi., 159 (1879).

6—T. LONGIOR Gervais (1844); Am. Nat. xvi., 599; Murray, Economic Entom., 267*; Ontario Entom. Rep., xi., 74.

7—T. MALUS Riley, Mo. Rep. v., 87* (1873); Murray, Economic Entom. 275*; Ontario Entom. Rep. xi., 74*; Osborn, Bull. Iowa Agric. Coll. 59 (1884).

Acarus? malus Shimer, Trans. Am. Entom. Soc., i., 368 (1868).

8—T. RIBIS Fitch, N. Y. Rep. iii., 424 (1856).

9—T. ACERIS.

Acarus aceris Shimer, Trans. Am. Entom. Soc., ii., 320 (1869).

II. *Cheyletus* Latr.

1—C. SEMINIVORUS Packard, Guide to Study of Insects, 665, 668*.

III. *Sarcoptes* Latr.

1—S. CATI Hering & Gerlach ——; Murray, Economic Entom., 302; Osborn, Bull. Iowa Agric. Coll. 76 (1884).

2—S. MUTANS Robin & Lang, Comptes-Rendus xlix. (1859); Murray, Economic Entom. 305*; Osborn, Bull. Iowa Agric. Coll., ii., 76.

3—S. SCABIEI Latr.——; Murray, Economic Entom., 292*; Packard, Guide to Study of Insects, 666; Ontario Entom. Rep. xi., 75*; Osborn, Bull Iowa Agric. Coll. 76 (1884); Standard Nat. Hist. ii., 100*.

IV. *Psoroptes* Gerv.

1—P. EQUI Gervais, Ann. Soc. Nat. (1841); Murray, Economic Entom., 308*; Packard, Guide to Study of Insects, 666; Osborn, Bull. Iowa Agric. Coll. 76 (1884).

Dermatodectes equi Gerl., *D. bovis* Gerl., *D. ovis* Gerl., *Dermatokoptes communis* Furst.

V. *Symbiotes* Gerl.

1—S. BOVIS Gerlach ——; Murray, Economic Entom. 313*; Osborn, Bull. Iowa Agric. Coll. 76 (1884).

Sarcoptes bovis Hering, *Chorioptes caprœ* Gerv., *Symbiotes equi* Gerl., *Sarcodermatodectes caprœ* Delaf. & Bour., *Dermatophagus bovis* Furst.

VII. *Myobia* Claparede.

1—M. MUSCULI Schrank ——; Murray, Economic Entom., 315*.

VIII. *Pterolichus* Robin.

1—P. FALCIGER Megnin.—— Garman, Am. Nat., xviii., 430* (1884).

IX. *Dermalcichus* Koch.

1—D. PICI-PUBESCENTIS Packard, Am. Nat. iii., 493, plate vi., figs. 1, 2, 3 (1869); Guide to Study of Insects, 666; Weed., Am. Nat. xviii., 633 (1884).

X. *Cytoleichus.*

1—C. SARCOPTOIDES Megnin, Am. Nat. xvii., 422 (1883).

XI. *Demodex* Simon.

1—D. FOLLICULORUM Simon ——; Murray, Economic Entom., 329*; Packard, Guide to Study of Insects, 667; *Faxon*, Bull. Museum Comp. Zool. v., No. 2*; Standard Nat. Hist., ii., 100*.

2—D. PHYLLOIDES Csokor. Verhandl. der K. K. Zool-bot. Gesell. in Wien., xxix., 419 (1879); Am. Nat. xvi., 1009 (1882); xvii., 1113 (1883).

XII. *Phytoptus* Dujardin.

1—P. ABNORMIS Garman. Appendix to Ill. Rep. xii., 134 (1883).

2—P. ACERICOLA Garman. Appendix to Ill. Rep. xii., 135 (1883).

3—P. FRAXINI Garman. Appendix to Ill. Rep. xii., 136 (1883).

4—P. OLEIVORUS (Ashmead).—Hubbard, Rep. U. S. Entom. 1884, 363–373*.

Typhlodromus oliivorus Ashmead, Can. Ent., 160 (1879).

5—P. QUADRIPES Garman. Appendix to Ill. Rep. xii., 132*, 135 (1883); Osborn, Bull. Iowa Agric. Coll., 57 (1884).

Vasates quadripes Shimer, Trans. Am. Entom. Soc. ii., 319 (1869).

6—P. QUERCI Garman. Appendix to Ill. Rep. xii., 138 (1883).

7—P. PYRI Murray, Economic Entom., 340*, 358 (1877); Garman, Appendix to Ill. Rep. xii., 140 (1883); Osborn, Bull. Iowa Agric. Coll. 56 (1884).

Typhlodromus pyri Scheuten, Wiegman's Archiv. (1857); Packard, Guide to Study of Insects, 666, 668*.

8—P. SALICOLA Garman, Appendix to Ill. Rep., xii., 138 (1883).

9—P. THUJÆ Garman, Appendix to Ill. Rep., xii., 138* (1883).

10—P. ULMI Garman, Appendix to Ill. Rep., xii., 136 (1883).

INCERTIS SEDÆ.

1—HYPOPUS CONCOLOR Hald., in Terrestrial Air Breathing Mollusks of the U. S. (Binney), ii., 107.

2—ACARUS? SEMEN Walsh, Proc. Am. Entom. Soc., iii., 606.

3—ACARUS? ÆNIGMA Walsh, Proc. Am. Entom. Soc., iii., 608.

ELAPHIDION PARALLELUM, NEWM., AND PHYMATODES VARIABILIS, FAB.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

In the Oct. number of this journal I noticed with interest the article by Mr. Clarkson on *Elaphidion villosum*, Fabr. I have reason to believe that the same is partly the case also with *E. parallelum*, Newm., which I find to be the common oak-pruner here. But I do not agree that it is always, or even in the majority of instances, the case with either species,

As bearing on this subject I give the following extract from my notes for 1885, which relates also to *Phymatodes variabilis*, Fab. :—

"Last fall (Sept.) I laid in a large supply of red, white and black oak and hickory twigs, containing larvæ of oak-pruners. The majority were red oak and hickory, but all were kept in separate boxes. Also a large box full of sawed hickory wood which contained wood-boring larvæ. These were all kept regularly moistened. During May and June, as I was absent from home at the time, another person, a lady, collected and saved for me a bottle full of beetles from the vicinity of these boxes (all taken from and around the large box of hickory wood, she says). These I afterward examined, and found the bottle to contain 145 *Phymatodes variabilis*, Fab., and 18 *Elaphidion paralleum*, Newm., besides two *Tenebrionidæ* of uncertain origin. As to which the two species proceeded from, the twigs or the hickory wood, the lady, who examined the twigs from time to time without being able to discover a single specimen among them, is almost certain that they all came from the large box of sawed hickory, on the underside of the papers covering which she was able to pick them off in large numbers, as well as all over and around the box and on the wood inside. Upon examining a good number of the twigs of each kind later in the season, I found not an insect in them (with the exception of one which contained a dried and shrivelled larva that had not transformed), but they showed every sign of the insects having emerged as perfect beetles. The *E. parallelum*, Newm., must have come from the twigs, while the *P. variabilis*, Fab., all proceeded from the sawed hickory wood. Packard gives the latter species as living only in white oak, but I am confident that these came from hickory, though I cannot conceive what became of the other numerous *Elaphidions* which must have emerged from the twigs."

In my notes for 1884, under date of 18th Sept., I extract also the following :—"Found an oak-pruner in the pupa state, inclosed in its silken white cocoon, inside a red oak twig. The end of the twig was not closed up, as is usually the case, but the passage was open, and a couple of inches up from the end the larva had changed to the pupal state, leaving its cast off skin below it in the passage."

Upon reading the account by Dr. Fitch, of *E. villosum*, Fabr., I find he says that "some of the worms enter their pupal state the last of autumn, and others not till the following spring. Hence, in examining the fallen limbs in the winter, a larva may be found in one, a pupa in an-

other." Now, though I have found the pupa of *E. parallelum*, Newm., very early in the fall (18th Sept., as stated above), and Mr. Clarkson has found the imago of *E. villosum*, Fabr., in November, I am inclined to think that these early metamorphoses were from eggs deposited earlier than others, or that by some favorable circumstances these individuals developed more rapidly and thus metamorphosed earlier. It is my opinion that both these species may assume the imago state either in the fall or the following spring, some, more forward than others, attaining this state in the fall. Perhaps favorable years, when some of the eggs may be deposited earlier in the summer than usual, produce the autumn imagos, which then remain within the twigs during the winter and emerge early in the spring. These in turn, if the season is at all favorable, will lay their eggs earlier than the others, and thus continue the early metamorphosis.

Toward the conclusion of his account Dr. Fitch says that "in at least three-fourths of the fallen limbs no worm is to be found," it having been devoured by birds either at the time the branch fell or afterward. The ground under oak and hickory trees here I have known some years (1884) to be covered with the twigs early in September, blown down by heavy winds, and at such times nearly all of the larvæ are destroyed by insectivorous birds, which extract them from their burrows, if they have not already been dislodged. This explains why so few of the beetles were obtained from the twigs I had saved—only 18 beetles from a large supply of the twigs, every one of which had certainly fallen that season, and been occupied at the time—the birds had destroyed all the others, and that very soon after their fall! But I cannot concur in the view taken by Dr. Fitch, that the larva severs the branch that it may fall to the ground, thus to aid its transformation. It is very probable that the larva cuts the twig to stop the flow of sap, the dead wood being necessary to mature its growth, and is conscious of none of that "consummate skill and seemingly super-terrestrial intelligence" which the worthy Doctor so enthusiastically attributed to it.

MISCELLANEOUS NOTES ON BUTTERFLIES, THEIR LARVÆ, ETC.

BY W. H. EDWARDS, COALBURGH, W. VA.

2. On the scarcity of certain Species in 1885.

The most notable instance was that of *C. Philodice*, which is usually

a very common species here. Throughout the year I saw but three or four examples.

In 1884, *V. Cardui* was remarkably abundant, as it seems to have been all over the Northern States. But in 1885 I scarcely saw one.

The Argynnids *Cybele* and *Aphrodite* were conspicuous for their absence in '85; so also *Phyc. Nycteis* and *Tharos*. For several years *P. Ajax* and *Turnus* have been far less common than formerly, though no change has taken place in the abundance of their food-plants. As to *Arg. Diana*, I have seen but two examples in as many years, and the species is practically extinct here.

2. As to Food Plants of *P. Ajax*.

The only plant known to me is the Pawpaw, Asimina. At the Philadelphia meeting of the A. A. A. S., 1884, Mr. E. M. Aaron stated that *Ajax* larvæ fed on spice-wood and upland huckleberry; and in a letter to me subsequently, that of his own knowledge, he knew *Ajax* would lay eggs on spice-wood, and that the larvæ fed both on that plant and sassafras.

I tried in vain, in 1885, to make these larvæ eat either spice-wood or sassafras, giving both to the young just out of egg, and before their taste could have been prejudiced against these plants by having eaten pawpaw. The larvæ starved to death, and I could not see that a leaf was even nibbled. I then tried larvæ immediately after successive moults to the last, with same result. So that I am satisfied *Ajax* larvæ in this region will not eat the plants spoken of. For Tennessee, where Mr. Aaron's observations were made, I do not undertake to speak. The only butterfly larvæ which will eat spice-wood and sassafras, so far as I know, are those of *P. Troilus* and *P. Palamedes*, and they are restricted to these and allied plants.

3. PAP. PALAMEDES. This species has been taken at Glencoe, Nebraska, as Mr. G. M. Dodge writes me, many degrees farther to the north than has before been observed.

4. CHIONOBAS BORE, Schn. and Hübner.

In the paper on "Insects in Arctic Regions," the translation of which is printed in CAN. ENT., xvii., p. 157, the author, Herr Aurivillius, says: "Let us take as an example Oeneis *Bore*, Schn., a true hyperborean butterfly, which has never been found outside the Arctic circle, and even there only occurs in places which bear a truly arctic stamp." In the note

appended, the editor of C. E. says that Mr. Edwards "informs us that Mr. David Bruce has taken *C. Taygete* Hüb., which is syn. of Oeneis *Bore* Sch., in Colorado," Not being satisfied that Mr. Bruce's examples were *Taygete* Hüb., I sent a male, one of them, to Dr. Staudinger, who replied, 16th Oct., 1885: "The Chionobas agrees perfectly with some *Bore* Hüb., from the highest northern region of Europe, the Varanger Fjord. *Bore* is a very variable species, and offers all passages to *Taygete* Hüb., so that I consider the latter as the Labrador form o. *Bore*. Now that the true *Bore* is also discovered in Colorado is a very interesting fact; it would be interesting to see a large series of this Colorado form, to know if there also will be passage to the Labrador *Taygete*." I saw six examples of this *Bore*, taken by Mr. Bruce, and they were all of one pattern, so that I do not believe any passage into *Taygete* will be found in Colorado. In the absence of such, I shall regard *Bore* as a species distinct from *Taygete*. It may be one species in Europe, but so far as appears is thoroughly distinct in America.

On the end of abdomen of one of the females sent me by Mr. Bruce was an egg shell adhering to the hairs. By softening the butterfly, I was able to get this off in fair condition, so that Mrs. Peart has found it possible to make an excellent drawing of it. I do not despair of yet obtaining eggs of this species and rearing the larvæ. Mr. Bruce found *Bore* on the highest summits visited by him.

5. CHIONOBAS NORNA, Thunb.

This species has hitherto been supposed to be limited to Europe and Asia. But I have received three females of it from northern Alaska. One I sent to Dr. Staudinger, who writes, 29th Nov., 1885: "As far as I can judge from this one bad specimen, it is a dark variety of *Norna*. This is a very variable species, which I receive also from North and Central Asia, and from whence I have some specimens like to this one sent, although *Norna* is generally lighter colored." The other two females were nearly perfect, and no doubt they are *Norna*. I hope to figure both *Bore* and *Norna* in vol. 3, But. N. A.

6. On feeding Larvæ after Frost has killed the Leaves.

Mr. A. H. Mundt, of Fairbury, Ills., has told in a former number of CAN. ENT. how he fed belated larvæ of *P. Cresphontes* on dried leaves of the prickly ash, which he softened in water, and that his larvæ went to pupation. He writes, 13th Nov., '85: "I have still five larvæ of *Cres-*

phontes. I forgot to get food for them before it froze, but found in a book a lot of leaves of Ptelea trifoliata (Hop-tree) gathered two years ago last spring. These I soaked over night, laid between blotting paper, and put in the glass. The larvæ eat them readily." This shows the way to carrying through belated larvæ in the fall, but also how larvæ from far off regions may be saved, if the dried leaves of their plants are sent with them.

7. Larvæ supposed to have been killed by Electricity.

Miss Annie M. Wittfeld wrote me 23rd Sept., 1884, from Georgiana, Fla.: "Yesterday about daybreak, the sky was completely clear. Some twenty minutes later a small black cloud rose in the southeast, and moved very fast, though there was a dead calm with us. All of a sudden came a stroke of lightning and at the same instant a fearful clap of thunder and a puff of wind that took all before it. It lasted but a second and then all was clear and calm again. After breakfast I went to my glass of Limenitis *Eros* larvæ, of which I had six fully grown, and found all to be dead and stiff, All my other larvæ were not affected; these last were in wooden boxes, while the *Eros* were between glass."

8. On pairing Butterflies in Captivity.

It is common enough for certain Sphinges and Bombycidæ to mate in boxes, and immediately after leaving pupae. This may happen when the eggs are mature at birth of insect. With many species of butterflies the eggs do not mature for several days after chrysalis, as is the case with the large Argynnids, but with others, as Phyciodes *Tharos* and *Nycteis* and *Myrina*, they are mature from the start. I have not experimented in this direction, but from what Miss E. L. Morton, of Newburgh, N. Y., tells me, it may be possible to induce butterflies of some species to mate and so to obtain eggs, for the eggs are laid very shortly after copulation, as I have several times observed. Miss Morton had by mistake placed a male Satyrus *Alope* under a bag of netting on grass. Three days later she introduced a female, which up to that time was supposed to be the second female. Almost immediately the pair mated, and a few hours later eggs were laid. In attempting to get eggs in this manner, it would be best that a male caught in the field should be introduced to a female just from chrysalis, for in the field it is these last which are sought by the males. Almost always when a pair of butterflies in copulation are taken

the male will be found worn or broken, while the female is uninjured in wing, and therefore must have lately left the chrysalis.

9. Effect of Cold applied to certain Larvæ.

I was feeding a brood of Coenonympha *Ampelos*, in June, from eggs sent from Vancouver Island, by Mr. Fletcher. After second month all the larvæ showed signs of lethargy except one, which went rapidly to pupa, having passed but three moults. (At same time I was feeding larvæ of *C. Galactinus* from eggs sent by Prof. Rivers, from California, and all these pupated after but three moults. From the pupæ came *Californius*, proving this species to be seasonally dimorphic, *Galactinus* being the winter, *Californius* the summer form.)

The remaining *Ampelos* larva spoken of at last rested asleep. Early in August, I placed them on ice, temp. about 32°, and there left them three months, till 7th Nov., having in mind to delude them into a belief that winter was over and gone when they should be brought into warm air again. The experiment succeeded perfectly as to part of the larvæ On 21st Nov., one passed 3rd moult, and 2nd Dec. a 4th moult, and 30th Dec. pupated. Another passed 3rd moult 23rd Nov., but has not yet reached the 4th (as I write 5th Jan. '86.) In fact, these larvae feed and move about only when placed in sunshine, and cloudy days and cold nights retard their growth. Two other larvae seem to have gone to sleep again, and have not moulted since they left the ice. It is usual for larvae to pass a moult soon after the end of hibernation, apparently to get rid of the shrunken skin, and this is an extra moult. At least, I have found this so, whenever the larvae hibernate half grown, so that *Ampelos* should pass four moults if hibernated, though three are the rule in summer.

ON TWO NEW HEMIPTERA-HETEROPTERA.

BY WM. H. ASHMEAD, JACKSONVILLE, FLORIDA.

Among a very interesting collection of Mexican and other Hemiptera sent to me by Mr. Samuel Henshaw, Curator of Boston Society of Natural History, for identification, I find two species new to science and peculiar to genera never before detected in North America, although both are well represented in the European fauna.

In the first genus, *Stenocephalus* A. & S., in Europe, four species are known, principally peculiar to the southern portions of that continent.

These are :—*S. agilis*, Scop.; *S. setulosus*, Ferrari; *S. medius*, Mls. Rey, and *S. neglectus*, H. S.

In the other genus, *Cantacader*, A. & S., two species only are known —*C. quadricornis*, and *C. Staudingeri*, Baer., also from south Europe.

Now, the detection of representatives of these genera in North America is especially gratifying to me, and below will be found full generic and specific descriptions.

FAMILY COREIDÆ.

Stenocephalus, A. & S.

Gen. char.—Head triangular, prolonged anteriorly between the antennæ with its extremity bifid; eyes large, globular, prominent; antennæ very long, hairy; first joint thickened, a little shorter than the head; second joint slender, much longer than the first; third shortest; fourth about as long as the second and slightly stouter; beak attaining to the base of the intermediate legs; first and second joints about equal in length; third and fourth shorter; prothorax trapezoidal, narrowed anteriorly, and with the posterior angles not very prominent: scutellum triangular, moderate sized; elytra with corium long and membrane with five or six longitudinal veins, sometimes forked; abdomen not quite as long or sometimes a very little longer than the elytra and rounded posteriorly; legs moderately long, hairy, without spines; femora but slightly curved, subequal in length.

Stenocephalus Mexicanus, n. sp.

Length, .43 inch. Brownish pubescent, form of *Stenocephalus neglectus*, H. S., but more robust, and thickly and finely punctate, punctures black; head blackish; antennæ: first joint stout, black, more densely pubescent than other joints; second joint but slightly longer than fourth, with two yellowish white annuli; third joint shortest, with a yellowish white annulus at base; fourth joint with a small yellowish white annulus at base and another in the middle; beak with first joint yellow; second joint yellow beneath, above and joints third and fourth piceous; the extreme tip of scutellum is yellow. The membrane of wing is brown with six longitudinal veins, the first and last being forked, and the stout vein at base, or where it joins the corium, yellow; legs: anterior femora black, excepting at base, which is yellow, tibiæ for a third of their tips and at base black, balance yellow, tarsi black; intermediate and posterior femora yellow for more than half their length, balance black; tibiæ and tarsi same as anterior pair.

Described from one specimen, Isthmus of Tehuantepec, Mexico, F. Sumichrist.

This is the first of the genus described from North America, and is very closely related to *S. neglectus*, H. S.

It is at once distinguished from that species, however, by a more robust form, a different antennal and abdominal coloration, and by the membrane not quite reaching the tip of the abdomen.

FAMILY TINGITIDÆ.

Cantacader, A. & S.

Gen. char.—Head elongated and projecting but little between the antennæ; front horned; eyes small, globular, not prominent; antennæ slender, very long; the first two joints short, second very long, fourth short, pointed fusiform; beak lying in a well pronounced groove, and reaching nearly to the base of the posterior legs; prothorax somewhat abruptly rounded at its posterior border and not prolonged to a point, although the scutellum is not uncovered. The other characters are those of *Monanthia*.

Cantacader Henshawi, n. sp.

Length, .23 inch. Yellowish brown, elongate, narrowed anteriorly, and gradually widened posteriorly, with the wings extending beyond the abdomen: head brownish on vertex with three pale horns, two just back of antennæ and the third in the centre just back of these, with their points converging forward towards each other, two pale but prominent lateral carina, one on each side, extending from base of antennæ back to prothorax, more prominent posteriorly; eyes brown; antennæ: first and second joints short, stout, brownish, the first twice the length of the second; third joint extremely long, slender, paler in color, and abruptly thickened and black at tip; fourth joint longer than first, fusiform, black; thorax with lateral margins reflexed, and with three prominent carina; wings long with the raised veins piceous and the reticulated cells small; abdomen and legs brownish yellow, with the extreme tips of tibiæ and tarsi and claws black.

Described from one specimen sent me by Mr. Samuel Henshaw, labelled Boston, July 7th, 1879, to whom I take pleasure in dedicating the species.

It is the only species of the genus described from North America, and is a very easily recognized species.