# SOME CONSIDERATIONS ABOUT AN ABDOMINAL ORGAN IN CERTAIN TORTRICIDÆ MOTHS

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In 1952, Dr. A. DIAKONOFF described a peculiar abdominal organ which he observed in a new genus of the Tortricidæ from New Guinea, and which he believed had not previously been discovered. In 1953, the above author named this new genus *Tremophora,* and considered it as allied to *Tæniarchis* Meyr. As one of the distinguishing features of *Tremophora,* the author mentioned: "Abdomen in both sexes with a pair of dorso-lateral moderate reniform openings on first segment, being terminations of a paired abdominal sense organ."

In a supplementary note, DIAKONOFF (1955) described the above organ in detail, and figured it. He wrote: "The genus *Tremophora* differs from all its allies, and, as far as I know, also from all other Lepidoptera, in possessing the above mentioned peculiar organ in the tergite of the second abdominal segment. It consists of a paired, rather deep excavation of the segment, externally having the appearance of two rather large, somewhat kidney-shaped holes with slightly elevated edges, situated towards the anterior edge of that segment, with their long axis directed longitudinally. The excavations penetrate downwards and slightly forwards, each forming a short blind tunnel with a thick, sclerotized, and apparently smooth wall. These organs, which I called the "dorsal organs," are present and are equally developed in both sexes; their superficial appearance is similar in the six known species of *Tremophora.*"

At first, DIAKONOFF supposed those organs as possibly "being a kind of tympanal organ of peculiar construction," but no indication of the presence of a membranous portion was found. An histological study of the organs was rather disappointing: "No traces of neural elements could be found in the sections; neither did the structure of the sclerotized walls of the cavities provide any indication as to the function of the dorsal organs." It was less probable to explain those organs as scent organs with a mysterious function, because prior to this the true scent organs in the Lepidoptera were usually found built differently in the male and the female.

"It was suggested to me," DIAKONOFF wrote further, "that the dorsal organs might be the equivalents of the so-called mite chambers of certain Hymenoptera (e.g. *Xylocopa, Mesotrichia*), cavities of the body of special structure, inhabited by peculiarly specialized Acari. However, I have never observed any trace of mites in these organs; moreover, mite chambers have never yet been recorded in Lepidoptera."

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*Done at the American Museum of Natural History, in connection with a research on the North American Tortricidæ genera, supported by a grant of the National Science Foundation.

In a conclusion to his note, DIAKONOFF expressed his regret that there was very little hope for *Tremophora* (or allied genera) that material suitably preserved for anatomical and histological purposes would become available soon. Without such material, the author did not see any possibility of solving the problem of the organs he discovered.

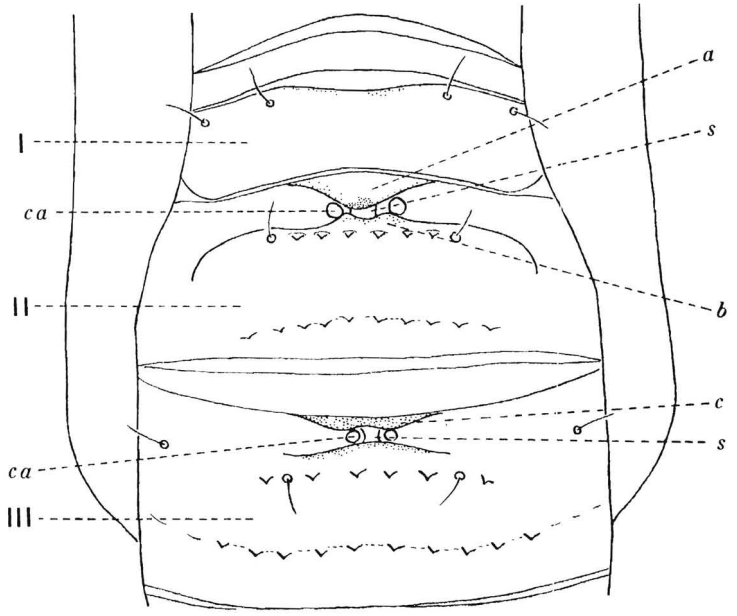
Unfortunately I have had no opportunity to see the *Tremophora* species described by DIAKONOFF, and they are known to me only from descriptions and figures. I believe nevertheless that the structures presented in some Holarctic Tortricidæ species are of the same nature as those in *Tremophora.* I observed similar cavities on the abdomen in many North American *Archips* Hb., e.g. in *argyrospila* Wkr., *georgiana* Wkr., *rosana* L., *negundana* Dyar, *striana* Fern., and *dissitana* Grote. In all these species the above cavities are present on the second abdominal tergite. There are among *Archips fervidana* (Clem.) and *A. semiferana* (Wkr.) specimens either with cavities or without. Most European *A. podana* (Sc.) have paired cavities not only on the second abdominal tergite but also on the third. In *A. cerasivorana* (Fitch), *A. infumatana* (Z.), and *A. purpurana* (Clem.) I could not discover any marks of such cavities at all. They are constantly absent also in *Pandemis* Hb., *Choristoneura* Ld., *Aphelia* Hb., *Clepsis* Gn., and many other Archipsini genera.

Very interesting is the presence of cavities on the third to eighth abdominal tergites in *Amorbia emigratella* Busck; in *A. cuneana* (Wlsm.) they are less developed. In *A. humerosana* Clem. the cavities have been observed usually on the third abdominal tergite, and in some specimens also on the fourth and fifth; in the latter case they are usually not so distinct. In other Sparganothinæ genera the cavities are found in *Cœlostathma* Clem. and *Platynota* Clem., but never in *Synnoma* Wlsm. or *Cenopis* Z.

Usually the cavities are reniform or round, situated at both sides of the middle line of the tergite. Occasionally they join together in some *Amorbia* specimens and form a common, much larger cavity. In most Archipsini and Sparganothinæ the entire cavity is smooth-chitinous, only rarely being completely covered with scales. The cavities are variously deep in some specimens of the same species, and give the impression of being caused by a pressure. A similar location of cavities in all the moths I studied suggested to me that these cavities might be explained as indentations caused by the texture of the inner surface of the pupal shell.

An examination of those exuviæ showed that in all species which possessed abdominal cavities in the moth stage, similar cavities were present also in the pupæ. The well-developed cavities of the pupæ corresponded exactly to those of the moths. On the other hand, the less developed cavities of the pupæ were never observed on the corresponding abdominal tergites of the imagines. The pupæ of certain Tortricidæ have the most well developed cavities usually on the second and the third abdominal tergites; likewise the moths. In *Archips fervidana* (Clem.) the cavities were not observed in all pupæ; they were also not found in all moths of this species. It is a very important observation that in *A. purpurana* (Clem.) the cavities are well developed in the pupa and absent in the imago.

The presence of those cavities in some Tortricidæ pupæ was already mentioned by MOSHER (1916) in a paper on the classification of the Lepidoptera, based on the pupæ. This author wrote about "prominent cavities" on the dorsum of the second and the third abdominal segments in the *Archips* pupa. There is no doubt that they were the cavities described below.




Dorsal view of basal part of pupal abdomen of *Archips argyrospila*
*I, II,* and *III* - first, second and third tergites; *a* - flanged plate of the first tergite; *b* - the same of the second tergite; *c* - the same of the third tergite; *ca* - cavities; *s* - screen between them.

The structure of the area bearing the cavities is, in the Tortricidæ pupa (see figure), more or less consistent in various species and genera which have such cavities. The postsegmental margin of the first tergite has a chitinous flanged plate (*a*) directed caudad. Near the presegmental margin of the second tergite there is another flanged plate (*b*), directed cephalad and usually less developed. Both plates are directed towards each other but do not touch each other. The area surrounded by those plates is deepened and raised gradually toward the sides of the tergite. In the middle of the whole excavation there is an elevated chitinous screen (*s*). It is situated lower than the flanged plates and is sometimes partly covered by them. At both sides of this screen there are two round cavities (*ca*) which correspond to those discussed above in some Tortricidæ moths. In case the screen is not developed, the cavities join together and form a common large cavity.

On the third tergite, the anterior flanged plate (*c*) is formed by a chitinous fold situated caudad from the presegmental margin of the tergite. In

other respects the whole area with cavities resembles that on the second tergite, but the flanged plates are less developed. If the flanged plates and cavities are present on the following tergites, they are usually like those on the third tergite. A degradation of the flanged plates or their complete absence on the fourth and subsequent tergites is of usual occurrence.

It is difficult as yet to say anything definite about the significance to the pupa of the above chitinous structures around the cavities, or about the meaning of the cavities as such. If the flanged plates between the first and second abdominal segments in the pupa might prevent its excessive reclining dorsalward, they are useless for this purpose on the remaining tergites, because both plates are located there on one and the same tergite. Very probably, the flanged plates and the chitinous screen between and under them may serve for the purpose of strengthening the dorsal side of the pupa and its defence against any external pressure or impact. In both cases, the cavities might be explained either as former reservoirs of chitin used for strengthening the adjacent parts of the tergites, or as attachment places of some chitinous processes which were possibly present in ancestors and are absent in the recent pupæ. Finally, the whole chitinous area around the cavities might facilitate the moving of the pupa, as do the transverse rows of spines on tergites. Only a comparative morphological study of the various Lepidoptera pupæ and observations on living Tortricidæ pupæ might answer the above questions.

## POSTSCRIPT

After the present note was sent to the publisher, a paper by G. C. VARLEY (*Ent. Mo. Mag.* 92: 107-108; 1956) on the same subject became available to me. The author describes and illustrates the structure of the same "abdominal organ" in the pupa of *Archips podana* (Sc.) which he calls *"Cacœcia oporana* L.", and mentions the presence of this "organ" in the pupæ of some other *Archips* species. The description given by VARLEY does not differ from mine except in terminology. Prof. VARLEY is inclined to see in the discussed "abdominal organ" a structure useful in pupal identification. The facts of individual variation of this "organ" in some Tortricidæ species, as I have mentioned in the present paper, diminish however the taxonomic value of this character.

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