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SAPROGLYPHID HYPOPI (ACARINA : SAPROGLYPHIDAE) 
ASSOCIATED WITH WASPS OF THE GENUS ZETHUS FABRICIUS 

BY 
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PART I

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INTRODUCTION

Insects are often infested with mites which do not assume a parasitic role. The mites which are the subject of this study represent that particular stage of the life cycle of members of the Acaroidae, known as the 'hypopus'. The hypopial stage is regarded as an adaptation to adverse conditions such

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as scarcity of food and dryness. Hypopii are also considered to represent a dispersal phase, because of their ability to attach to other invertebrates which carry them to favorable niches.

The family Saproglyphidae was created by Oudemans (1923) for the genus Saproglyphus Berlese 1890. Zakhvatkin (1942) enlarged the family to accommodate the following families: Winterschmidtiidae, Ensliniellidae, Czespinskiidae, Pontopiddaniidae, and Nanacaridae. Baker and Wharton (1952) assigned family status to each of Zakhvatkin’s groupings, including the Saproglyphidae. Türk and Türk (1957) shared Vitzthum’s opinion (1942) that the saproglyphids should be classified as a subfamily under the Acaridae (= Tyroglyphidae). However, Hughes (1961) followed Dubinin’s classification (1953), and placed the saproglyphid in the subfamily Tyroglyphinae.

In 1942, Oudemans placed the genera Calvolia and Vidia in the family Carpoglyphidae. In 1924, Vitzthum created a new family Ensliniellidae for the genera Ensliniella and Vidia. The genera Calvolia, Ensliniella and Vidia were transferred to the Saproglyphidae in 1947 by Zakhvatkin. Kennethiella was designated by Cooreman (1954) as a new genus for the species Ensliniella trisetosa Cooreman, 1942. Later this genus was transferred from the Ensliniellidae to the Saproglyphidae by Baker (1960). Türk and Türk (1957) assigned Vidia to Vitzthum’s subfamily Ensliniellidae, and they proposed a new subfamily Calvolinae for Calvolia. They, too, placed the subfamilies Ensliniellinae, Calvolinae and Winterschmidtinae in the family Acaridae (= Tyroglyphidae). In 1960, Baker agreed with Zakhvatkin’s classification and added two new genera, Monobiacarus and Vespacarus, to the Saproglyphidae; at the same time he gave a key to the genera of this family based on hypopi.

The mites assigned to the family Saproglyphidae according to Zakhvatkin’s classification possess in common certain features that differentiate them from related taxa and, additionally, they form a group related in mode of living and association with insects, particularly Hymenoptera. It seems, therefore, that Zakhvatkin’s definition of this family is satisfactory for the present purpose.

The family Saproglyphidae contains twelve genera, including Vidia and two new genera, Macropharpa and Zethacarus, all of which are known only from hypopial stadia. The genus Vidia was created by Oudemans in 1905, to accommodate the hypopi (deutonymphs) of Vidia undulata Oudemans. In 1909, Oudemans described another species V. squamata Ouds. from the nest of a megachilid bee. The same author (1917) added another new species, V. lineata, to this genus.

Zakhvatkin (1941) placed Vidia undulata and V. lineata in a new subgenus Vidia s. str. and, at the same time, created a second subgenus, Crabrovidia, for two new species V. (Crabrovidia) gussakovskii and V. (Crabrovidia) popovi which were found on wasps of the genus Crabro in the vicinity of Moscow and the Ukraine U.S.S.R. Cooreman (1948) named the species V. concellaria from a sphecid wasp, Cerceria arenaria, found in the environs of Brussels, Belgium. Baker (1964) described a new species, Vidia cooremani, based on a hypopus from the nest of a wasp, Ectemnius sp.

A third new subgenus, Vidia (Zethovidia), two new genera, Macropharpa and Zethacarus, and a new species of Calvolia are here proposed for twenty-eight new species of saproglyphid hypopi recovered from museum specimens of wasps belonging to the genus Zethus Fabricius.

This study presents the description and classification of all of the known hypopi of saproglyphid mites associated with the wasp genus Zethus. After Drs. R. Bohart and L. Stange had assembled a very extensive collection of Zethus spp. for a revisional study, the author initiated work on these acarines with the hope that, ultimately, the systematics of both wasps and mites may be shown to be closely correlated.

**Collections and methods.**

Approximately one hundred species of the solitary wasp genus Zethus were searched for mites. The mites which are herein described were taken from twenty-four species of these wasps, although numerous other species of mites belonging to at least three other families (Acaridae, Anoetidae and Chaetodactylidae) were taken from the other species of Zethus.

The hypopi of these particular mites were not confined to any special region on the bodies of their hosts. They were distributed on both sides of the metathorax near the propodeum, between veins on the wings, and near the caudal end of the abdomen. Although the association between the mites and their adult hosts is probably phoretic, the hosts exhibit no specia-
lized mite chambers or acarinaria to make the association more intimate. A mite-bearing wasp belonging to another genus, *Parancistrocerus fulvipes* Ss., is shown in plate 1. Its exposed acarinarium is packed with hypopi of *Vespacarus* sp. of the saproglyphid family. The abdomen of the wasp is sharply bent to expose the mite chamber on the dorsal side of the abdomen, between tergites I and II.

The dried hypopi were brushed from the bodies of pinned wasps, transferred with a needle to 10% KOH solution for clearing, and then mounted in Hoyer's medium. A projection microscope was used as an aid in drawing.

![Plate 1: A mite-bearing wasp, *Parancistrocerus fulvipes* Ss.](image)

The mite chamber (or acarinarium) is packed with hypopi of *Vespacarus* sp.

The leg segments bear setae of the common type and a number of setiform processes or more specialized sensilla, such as pegs, solenidia, etc. It is convenient to record the numbers of these on each of the segments by a notation; for example, trochanters r-r-r-o, femora r-r-o-r, etc. These counts are inclusive and no attempt is made to indicate the kinds of sensilla involved. The measurements given for various structures or distances are in microns, but, for simplicity, the unit designation (µ) is omitted. Body length is measured from the anteriormost extremity of the propodosoma to the hindermost limit of the opisthosoma; width is measured across the body at the humeral sulcus.
 Depositories for type specimens are abbreviated, as follows:
BMNH, British Museum of Natural History.
USNM, United States National Museum.
UCD, Department of Entomology, University of California, Davis.

Geographical distribution.

Judging from evidence presented by R. Bohart and Stange (1965), the Amazon Basin has
been a center of distribution for wasps of the genus Zethus from which there have been obvious
endemic developments in the Andes, southern Brazil, northern Argentina, Mexico and the
Caribbean area. Since the mites with which this study is concerned have been recovered only from
certain species belonging to this particular genus of wasps, it may be supposed that the above-
mentioned localities are also the homes of the associated mites.

Morphology and terminology.

The nomenclature used here in reference to the body chaetotaxy was proposed by Zakhvat-
kin (1941). Additional new terms applicable to body sclerites and dorsal pores are introduced.
Most of the taxonomic features are common to representatives of the subgenus Vidia (Zetho-
vidia) and the two genera Macroharpa and Zethacarus. An illustration of the species V. (Zetho-
vidia) diminuta (Plate 2) is used for labeling most of the body parts.

Dorsum: The names and corresponding letter labels for different pairs of dorsal setae include:
the internal vertical vi; the epipodial es; the scapulars, internal sci and external sce; the dorsal
centrals dx-d4 positioned on the middle part of the hysterosomal plate. The laterals are repre-
sented by an anterior pair al and a posterior pair pl; anterior sublateral asl is a new designation
for the internal humeral hi of Zakhvatkin (1941); a posterior sublateral psl is located between
d3 and the valvular pore va; the humeral he is external to asl. The sacrals, internal sai and
external sae, are the terminals of the dorsal series. Five pairs of pores have been found on hyste-
rosoma: humeral (hu-pore), valvular (va-pore), marginal (pl-pore), anterior median (am-pore)
and posterior median (pm-pore). The am-pore is feebly developed and close to d3; the pm-pore
is lateral to d4.

Venter: The nomenclature used for setae on the venter includes: the gnathosomal setae gns
(one or two pairs) on the anteriormost part of the incipient gnathosoma (fig. 3), and the ventral
humeral (hv) located between leg II and leg III. The setae carried on the central junction of
apodemata IV are referred to as metasternal setae (mts), the setae on both sides of the genital
slit are called paragenitals. Some structures of the body are renamed to simplify the descrip-
tions. The Y-shaped structure which connects coxa I of opposite sides is designated as the
presternum (Ps). The thickened fold between coxae I and II is called apodeme I (Ap I); the
midrib, between Ap III and Ap IV, when present, is called metasternum III (Ms III); metasterner-
um IV (Ms IV) is the backward extension of the basal junction of apodemata IV. Each coxal
shield I and III bears a very weak pore (cp). Each one of a pair of discs located anterior to the
genital slit is called a genital disc (gdi). The suctorial plate is fairly uniform in this group of
species.

Leg Chaetotaxy: Because the setal pattern on the leg segments of all of the species discussed
is fairly constant, no attempt is made to designate any individual seta or special sensilla, except
that setae $d$ and $d^2$ are referred to as duplex setae $dd^1$ trs; designate the seta on trochanter III; the dorsal seta on tibia III is called the macroseta $ms$; while the other seta of the same segment is called the tactile seta ($ts$). All the other leg setae and sensilla have been designated by earlier authors (TÜRK and TÜRK 1957, HUGHES 1961).

In developing the descriptions of genera and species, the author has relied on several characteristics that have received attention in the past. These are: the pattern of furrows on the propodosomal plates; the ratios of distances $sci-sci/sci-sce$; the relative distances between $d_3$ and the $pm$-pore and $d_4$ and the $pm$-pore; the length relationships of metasternal setae and metasternum III; the solenidia $wr$ and setae $sta$ present on tarsal podemes I and II (figs. 2 C, 2 D); the length ratio of tactile seta $ts$ and macroseta $ms$ on tibia III; the placement of particular setae on the dorsal shields; construction of coxal apodemes; leg setation and tarsal appendages.

ASSOCIATION BETWEEN MITES AND INSECTS.

Biological relationships of varying degrees of complexity are found between mites and other invertebrates. The most interesting and best known are the association of mites with insects. The co-existence of mites and other invertebrates in a variety of habitats not only provides the opportunity for predation between the groups but also furnishes ideal conditions for the development of more complex associations such as commensalism and parasitism (EVANS et al. 1961). VITZTHUM (1941) and TRAGARDH (1943) have discussed in detail the various types of associations. Five major groups have been proposed in Tragardh's work: parasitic, predaceous, exudate feeders, commensals, and phoretic. The parasitic and predatory mites form relatively well-defined groups, but in the case of many species participating in apparently harmless associations, data on the true relationships are lacking. In order to explore the nature of these relationships, it is necessary to present some of the previous information related to this subject.

In 1735 de Geer noticed on the house fly a tiny red mite, with an oval body enclosed in a chitinous carapace; and having, in lieu of any ordinary mouth, a minute membranous tube, apparently closed, but furnished with two setae. LINNAEUS (1758, in the Systema Naturae) adapted the description of DE GEER, and called the creature Acarus muscarum.

PERKINS (1899) was the first to discover a mite chamber (acarinarium), an adaptation for carrying phoretic mites, on the basal abdominal segment of bees (Xylocopinae) and of wasps of the genus Parancistrocerus (Plate 1). PROPOVICI-BAZNOSANU (1913) found that the mite Trichodactylus osmiae Dufour (Chaetodactylidae) sometimes acts as a commensal, developing simultaneously with the megachilid bee Osmia sp.; at other times it acts as a parasite and prevents the development of the bee. In 1957 VAN LITH reported that the mite Chaetodactylus kills the larva of the megachilid bee, Chelostoma florisoromne (L.), and then multiplies on the pollen-nectar mass stored as food for the bee larva.

KROMBEIN (1958, 1959) discovered that the adults of Chaetodactylus krombeini may attack either the egg or the young larva in the nest of the bee, Osmia lignaria Say.

COOREMAN and CREVECOEUR (1948) pointed out that the saproglphid mite, Vidia concellararia Cooreman, lives as a commensal in the nest of the sphexid wasp, Cerceris arenaria L. The feeding stages of the mite devour remnants of the prey (curculionid larva). Because the survival of this particular mite depends exclusively on provision of the food by the mother wasp, the mite synchronizes its development to parallel the developmental cycle of the wasp. In such cases the developmental stages of the mite are completed in a very brief period (15 days), early
in the life span of the wasp, and then the mite protonymphs transform into diapaused stages (hypopi) that remain in the nest waiting the emergence of the overwintering wasp pupa. When the adult wasp emerges from the cocoon in the following spring, the hypopi attach themselves to the wasp's body, and consequently gain access to a new nest. *Vidia conciliaria* Cooreman has only a single generation a year, a natural adaptation to suit its host, *Cerceris arenaria*, which is an univoltine species in Belgium, whereas an American species of *Vidia* must have two or three generations a year (Krombein 1964) in the nest of the hibiscus wasp *Ectemnius paucimaculatus* (Packard).

Symbionts found on various species of a group of animals may shed some light on problems of taxonomy and geographical distribution of the host. An example of the use of a mite symbiont by which it was possible to distinguish between slightly differing hosts has been cited by Le Veqe (1950). Two specimens of carpenter bees labeled *Mesotrichia confusa*, one from Singapore (Malaya) and one from Trang (Siam), yielded closely related but nevertheless distinctly different species of mites. Examination of the hosts showed that the one from Trang was *M. variadissima*, not *M. confusa*.

In discussing the relationship between the yellow-banded carpenter bee, *Mesotrichia caffra* L., and its symbiont mite, *Dinogamasus braunsi* Vitzthum, Skaife (1952) found that the adult mites live in the abdominal pouches of the females bees until nesting begins, and then they leave the pouches and enter the bee nest where they lay eggs upon the pupae. The hatched mite larvae feed on exudations from the skin of the bee pupae. The mites complete their developmental cycle very rapidly and when the adult bees emerge, the adult mites take up their abode in the abdominal pouches of the female bees. The mites apparently neither harm the bees nor render them any service.

Cooper (1954) discussed in detail what he calls "Venereal transmission of mites by wasps." He suggested that males of the wasp *Ancistrocerus antilope* must emerge from the nest bearing loads of hypopi of *Kennethiella trisetosa*. On the other hand, female wasps emerge devoid of hypopi, and then acquire them from the male at mating. Consequently the hypopi forsake the female body during construction of the new nest or provisioning.

Since adult male wasps must emerge from their cells with a full load of hypopi (deutonymphs), and females must emerge without hypopi, it would seem that whatever factors determine that a particular wasp's egg will be fertilized, hence diploid and giving rise to a daughter, must also determine that hypopi will not normally be released into a nest cell containing a diploid egg. Krombein (1961) proposed another explanation for this relationship. The female wasp larva eats the adult mites in the cell before spinning a cocoon, but the male wasp larva does not harm the mites in its cell. Consequently the emerged adult male wasps would be the only sex infested with hypopi.

The association may be of direct benefit to either partner. In the case of the saprogyphid mite *Vidia* sp. and the Douglas fir beetle, it is believed that the adults of this mite feed on nematodes occurring under elytra of the beetles (Atkin, 1959). Also, a similar relationship has been found between the mesostigmatic mite, *Dinogamasus* Kramer, and certain carpenter bees of the genus *Mesotrichia* Westwood. According to Le Veqe (1932), these mites clean away the excess pollen which otherwise adheres to the backs of the bees or litters their galleries and forms a fertile bed for pathogenic fungi. The author suspects that the relationship between the saprogyphid mites described in the text and their vespid hosts might be of a similar nature. Obviously the mites gain free transportation and access to favorable environments; and, in return, they may provide sanitation for the developing stages of the wasp by feeding on caterpillar remnants and excreta that may encourage the growth of injurious microorganisms in the wasp's cell.
Life history and behaviour of Saproglyphid mites.

The developmental stages of these mites consist of the egg, larval, nymphal and adult stages ordinarily found in other mite groups. The larva, protonymph, tritonymph, and adult have functional mouth parts. The hypopus (deutonymph) is a resting stage; it lacks mouth parts and has a suctorial plate ventrally on the end of the opisthosoma by which it attaches to the insect host.

Certain saproglyphid mites have adjusted their developmental cycles perfectly to those of their hosts. According to KROMBEIN (1961) the rhythmic pulsation of the female wasp's abdomen during oviposition may stimulate the hypopi of Vespacarus which then forsake the body of the wasp and drop into a new uninfested nest or cell. He found that transformation of the hypopi first to tritonymphs and then to adults takes place in the interval between oviposition by the female wasp and the completion of feeding by the wasp larva.

The adult mites are on the wasp larva when it begins to spin, and they are enclosed in the finished cocoon. The adult female mite begins to lay eggs as soon as the wasp transforms to the pupal stage. Since the period between voiding of the meconium and pupation may be several days in summer or a number of months in winter, KROMBEIN suggests that some factor in the wasp's development may initiate ovulation in the female mite. It seems probable that this factor may be diminution or cessation in production of a juvenile hormone at the time the wasp pupa begins to develop within the last larval skin. The growth and differentiation hormone present in the body fluid of the wasp during this developmental period may then stimulate ovulation in the female mite when she feeds on this fluid.

Species of Vespacarus deposit eggs around the mouth parts and legs of the newly transformed wasp pupa, whereas Monobiacarus lays its eggs on the cell walls and partitions (KROMBEIN, 1961). A gravid female mite may lay up to 20 eggs over a period of 10-15 days. The Vespacarus eggs are ovoid; the larvae hatch after 2-15 days, depending on the nest temperatures. The larvae are slightly larger than the eggs, ranging from 125-200 long and 55-155 wide, and are ovoid in shape. They transform to protonymphs in less than two days. The protonymphs are larger than the larvae, ovoid in shape, and range from 250-300 long and 150-165 wide.

The author (1967) has observed the larvae, as well as the protonymphs, of Vespacarus minimiferits actively creep about; both of these stages confine their exploratory or crawling activities principally to the bodies of wasp pupae. Possibly this restricted wandering of the immature mite indicates that the physical association of mites and wasps is more than casual during this period of their development.

Some of the mites are in the protonymphal stage when the wasp pupa is ready to shed its exuvia (KROMBEIN, 1961). As eclosion draws near, the mites cluster on the venter of the wasp, around the mouth parts and legs. The first appearance of the hypopi coincides with the emergence of the adult wasps. The synchronization of the two events suggests the possibility that the transformation of protonymph to hypopus in mite development is incited by the release of moulting fluid on the part of the insect (MOSTAFA, 1967). The synchronization of mite and wasp development in this manner appears to be a promising area for further investigation.

According to KROMBEIN (1961) and MOSTAFA (1967), the Vespacarus hypopi soon leave the pupal exuviae, climb onto the adult wasp, and crawl around until they reach the apical margin of the specialized mite chamber or acarinarium (Plate 1) at the base of the second abdominal
segment. Then the hypopi turn around and back into the acarinarium. As additional hypopi
perform the same maneuver, they come to lie in single rows with their anterior ends facing the
outside opening of the chamber. Not all wasps and bees are equipped with acarinaria. In
such cases the hypopi affix themselves to various parts of the host with the aid of their sectorial
plates. The hypopi are then ready to infest a new nest and resume their life cycle if they happen
to be on a female instead of a male wasp.

**EcoLOGY OF SAPROGLYPHIDAE.**

The saproglyphid mites are cosmopolitan, and are richly represented in temperate and tro­
pical zones of both hemispheres. Some saproglyphids are free-living on dead, decaying, organic
materials. The mites occupy all possible kinds of habitats created by the accumulation of such
substrates, either naturally or in human households. The general conditions necessary for their
survival are: high humidity, low oxygen content, and protection from the direct rays of the sun.

Agricultural products attract few species of Saproglyphidae — e. g., *Calvolia romanovae*
Zakhv. has been found on stored wheat and grains; *C. zacheri* Ouds. infests mouldy cheese;
and *Saproglyphus neglectus* has been reported on mushrooms and toadstools.

The majority of saproglyphids, as discussed previously, are insect associates. They live
in galleries of bark beetles and in nests of solitary and social bees and wasps. The following
table indicates the specificity of this group of mites to their hosts.

**Saproglyphid Mites, their Insect Hosts and Localities.**

<table>
<thead>
<tr>
<th>Mite Species</th>
<th>Insect Host</th>
<th>Locality</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Calvolia longipes</em> Türk</td>
<td>Orthoptera: <em>Chelidura acanthopygia</em></td>
<td>Germany</td>
</tr>
<tr>
<td>fraxini Türk</td>
<td>Beetles: <em>Leprismus orni</em></td>
<td></td>
</tr>
<tr>
<td>ruenhi Türk</td>
<td><em>Dryocoetes willows</em></td>
<td></td>
</tr>
<tr>
<td>tarsoriafracta Türk</td>
<td><em>Plenidium sp.</em></td>
<td></td>
</tr>
<tr>
<td>kueissli Krausse</td>
<td>(Tenebrionids, Chrysome­</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lids, Cerambycids)</td>
<td></td>
</tr>
<tr>
<td>striata Vitzthum</td>
<td><em>Taphrotrychus sp.</em></td>
<td>W. Africa; Italy</td>
</tr>
<tr>
<td>fusiformis Zakhv.</td>
<td><em>Blatophagus minor</em></td>
<td>USSR</td>
</tr>
<tr>
<td>elliptica Zakhv.</td>
<td><em>Ips acuminatus</em></td>
<td></td>
</tr>
<tr>
<td>nataliae Zakhv.</td>
<td><em>Hylesinus fraxini</em></td>
<td></td>
</tr>
<tr>
<td>circunspecta Vitz.</td>
<td><em>Ips stebbingi</em></td>
<td>Tibet</td>
</tr>
<tr>
<td>trypetidarum Cooreman</td>
<td>Diptera: <em>Celidodacus fenestratus</em></td>
<td>Congo</td>
</tr>
<tr>
<td>reticulata Zakhv.</td>
<td>Bees: <em>Osmia dalmatina</em></td>
<td>Switzerland</td>
</tr>
<tr>
<td>summerni n. sp.</td>
<td>Wasps: <em>Zethus (Zethoides) binodis</em></td>
<td>Brazil</td>
</tr>
<tr>
<td>thraca Vitz.</td>
<td>Diptera: <em>A green fly?</em></td>
<td></td>
</tr>
<tr>
<td>goetae Türk</td>
<td>Beetles: <em>Aphodius sp.</em></td>
<td>Germany</td>
</tr>
<tr>
<td>calliphorae Vitz.</td>
<td>Diptera: <em>Calliphera vomitoria</em></td>
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<td>bulgarica Storkan</td>
<td>Ants:</td>
<td>Bulgaria</td>
</tr>
<tr>
<td>astiona Türk</td>
<td><em>Lasius and Formica spp.</em></td>
<td>Germany</td>
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<tr>
<td>Ensliniella parasitica Vitz.</td>
<td>Wasps: <em>Alldynerus spp.</em></td>
<td>Italy; Germany; USSR</td>
</tr>
<tr>
<td>hotzylevi Zakhv.</td>
<td>rossi</td>
<td>USSR</td>
</tr>
<tr>
<td>aegyptiana Baker</td>
<td>vinciquerrae</td>
<td>Egypt</td>
</tr>
<tr>
<td>homigi Baker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kennethiella trisetosa (Cooreman)</td>
<td>Wasp: <em>Ancistrocerus antilope</em></td>
<td>USA; Finland; Europe</td>
</tr>
<tr>
<td>Macronarpa amazonica n. sp.</td>
<td>Wasps: <em>Zethus (Zethoides) ferrugineus</em></td>
<td>Brazil</td>
</tr>
<tr>
<td>pachynapoda n. sp.</td>
<td><em>Zethus (Zethoides) labulatus</em></td>
<td></td>
</tr>
<tr>
<td>palpognatha n. sp.</td>
<td><em>Zethus (Zethus) roridus</em></td>
<td></td>
</tr>
<tr>
<td>arora n. sp.</td>
<td><em>Zethus (Zethus) arotus</em></td>
<td></td>
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</tbody>
</table>
The present study shows that the great majority of the hypopi of the subgenus *Vidia* (*Zethoidia*) are confined to the two highly specialized subgenera, *Zethusculus* and *Zethoides* of the wasp genus *Zethus*. In fact, *Zethusculus* wasps carry only the hypopi of *Vidia* (*Zethoidia*). On the other hand, the hypopi of *Zethacarus* have been recovered from the wasps of the most primitive subgenus, *Zethus* s. str. The occurrence of the hypopi of *Macroharpa* on the wasps of the species
groups pallidus, clypearis and biglumis, supports the opinion (BOHART, personal communication) that the pallidus group is closely related to the wasp subgenus Zethoides. It is also important to point out that this genus of mites is known only from Brazil. Zethus fuscus and orizabae are wide-ranging wasps (BOHART, personal communication). This may explain why they carry mite species of two different genera (Vidia fusca and Zethacarits ellipsus respectively).

The relationship of the wasp group binodis to the rest of the subgenus Zethoides is not clear (BOHART & STANGE, 1965). Since binodis is the only wasp that is associated with hypopi of the genus Calvolia, this discovery may be of significance to wasp phylogeny involving the Zethus binodis group.

The restriction of hypopi belonging to the subgenus Vidia (Zethovidia) to the most specialized subgenera of Zethus suggests that these particular mites are more advanced in their phyletic relationships than the other saproglyphid mites herein described.

It should be noted that even though saproglyphid mites have been found on wasps of the three known subgenera of Zethus, there are whole species groups of Zethus from which no mites have been taken. In the subgenus Zethus these are: chalybeyus, infundibuliformis, magretti, heydeni, montezuma, cubensis, sicheliamus, sulcatus, strigosus, spinosus, spinipes and discoelioides groups; in the subgenus Zethoides: olmecits, aztecus, minimus and carinatus groups; in the subgenus Zethusculus: imperfectus group.

**Diagnosis of Saproglyphidae.**

*Adults.* Integument smooth or striate. Propodosoma and hysterosoma separated by a suture. Internal scapular setae sci shorter than external scapular see. Female genital opening between coxae III and IV, with welldeveloped genital discs. Male genital opening between coxae IV. Male has no anal or tarsal suckers on leg IV. All tarsi have caruncles and claws; no paired rods connect claw to apex of tarsus.

*Hypops.* Active or migratory. Gnathosomal rudimentary. Dorsal shields engraved with thin furrows which sometimes anastomose to form a reticulate pattern. Suctorial plate provided with a highly developed pair of discs at center, preceded by another small, granulated pair of discs; other discs small, arranged on periphery of plate. A set of duplex setae dd arises distally on tarsi I and II. Tarsi I to III have well-developed ambulacra, each consisting of a stalked membranous pretarsus that terminates in a claw; claw not connected by paired rods to apex of tarsus. Tarsus IV has neither pretarsus nor claw. Leaf-shaped setae present on tarsi I to III.

**Key to genera of Saproglyphidae.**

*Hypopi.*

1. Tarsus IV widens towards its tip; eyes present. ................. *Calvolia* Oudemans.

2. Tarsus IV narrows towards its tip; eyes present or absent. .......... 2.

3. Apex of tarsus IV rounded or blunt. .................................. 3.


3. Proximal leaf-shaped seta on tarsi I and II with pronounced, heavy, brownish stalk (Fig. 21 B); pore on coxal field I uniquely marked. .................. *Zethacarits* Mostafa.

   Proximal leaf-shaped seta on tarsi I and II with slender stalk; pore on coxal field I feebly outlined.  

   *Vidia* Oudemans.
   Claws of tarsi I to III small. .................................................. 5.
   Tarsi III and IV without digitiform process. ......................... 6.
   Internal gnathosomal setae long. ........................................... 7.
7. Coxal apodemes IV meet mesally forming a central junction that extends posteriorly into metasternum IV. .......... *Vespacarus* Baker
   Coxal apodemes IV do not meet mesally, metasternum IV absent. .......... *Monobiaacarus* Baker.

**Genus Vidia Oudemans.**


Type : *Vidia undulata* Ouds., 1905.

Eyes absent or represented by a pair of pigmented, feebly marked elevations at base of rostrum, dorsal in position. Gnathosoma completely reduced or represented only by a small protuberance having 1 or 2 pairs of setae. Dorsal shields clearly etched with furrows running transversely or obliquely on propodosoma, longitudinally on hysterosoma; these furrows sometimes anastomose, forming distinct narrow polygons which may resemble scales. All, or almost all, of dorsum covered by two shields.

Tarsi I and II have 2 to 3 leaf-like setae; *et al* somewhat thickened and may resemble a rod. Legs III and IV inserted on venter so that only their distal segments protrude beyond body margins.

The genus at present contains 3 subgenera associated with Hymenoptera living in wood. The generic description is based on the hypopial stage only.

**Key to the subgenera of *Vidia* Ouds.**

**Hypopi.**

1. Tarsi I and II each with 3 leaf-like setae (Figs. 2 C, 2 D); 1 sword-like or palmate seta present or absent on each of tarsi III and IV (Fig. 2 F), this is very transparent, difficult to see............. 2.
   Tarsi I and II each with 1 or 2 leaf-like setae; sword-like or palmate seta absent on tarsi III and IV; on wasps of subfamily *Crabroninae* ................. *Crabroniida* Zakhvatkin.
2. Tarsus III with a diminutive palmate or sword-like seta located ventrally close to distal end; tarsus IV bears ventrally a transparent sword-like or palmate seta (Fig. 2 F); eyes present or absent; on wasps of genus *Zethus* Fabr. ................ *Zethovidia* Mostafa.
   Tarsus III without a diminutive palmate or sword-like seta; without sword-like seta on tarsus IV; eyes absent; on bees belonging to genera *Megachile* and *Prosopis* .......... *Vidia* Zakhvatkin.

**Zethovidia** Mostafa, new subgenus.

**Hypopus.**

(Plate 2).

Type : *Vidia* (*Zethovidia*) diminuta Mostafa, sp. n.

Eyes present; apex of propodosoma with micropunctate sclerotization subdivided into 3 fairly distinct but possibly not discrete sclerites, a median and a pair of lateral elements; median
element appears to be a forward extension of main propodosomal plate, constricted between eyes, bears a pair of vertical setae on its apical margin. Dorsal plating with a basic pattern of closely spaced micro-punctations and a network of widely spaced, sometimes interconnecting, furrows. Pleural margins of propodosoma reinforced with a strand of 3 discrete epipodial sclerites; middle sclerite bears an epipodial setae (Fig. 2 A) directly above coxa I; posterior scler-

PLATE 2: *Vidia* (Zethovidia) *diminuta.*

A. — dorsal aspect of hypopii; B. — venter of hypopus; C. — leg I of hypopus; D. — leg II of hypopus; E. — leg III of hypopus; F. — leg IV of hypopus; G. — apodemes III and IV, with suctorial plate.
rite long and deflexed behind trochanter II (this sclerite may appear broken into two portions due to pressure applied in mounting procedure), continuing onto venter as apodeme of coxa II. Gnathosoma incipient, front convexity bears 1 or 2 pairs of setae. Median prestral apodeme Y-shaped. A small faintly outlined pore occurs on each coxae I and III.

Tarsi I and II carry a set of duplex setae dd (Figs. 2 C, 2 D) near their distal ends; setae eta, famulus β, and gamma γ occur on base of tarsus I, but neither one found on tarsus II; foliate or sword-like seta ss present on tarsus IV. Formulae for setae on leg segments: trochanter I-1-1-0, femora I-1-0-1, genua 3-3-1-0, tibiae 3-3-2-1, tarsi 10-7-7-5. Legs I and II long and slender; (only in V. (Zv.) fusca are they short and stout); legs III and IV short and stout.

KEY TO SPECIES GROUPS OF THE SUBGENUS Zethovidia.

Hypopi.

1. With two pair of gnathosomal setae, lateral pair very tiny, difficult to see... *diminuta* Group. With one pair of gnathosomal setae, lateral pair absent.......................... 2.

2. Small external sacral setae sae arise lateral to and/or in front of fairly long internal sacrals sai. Small external sacral setae sae arise between and slightly in front of fairly long internal sacrals (Fig. II B).......................................................... *reticulata* Group. Pretarsi I and II each shorter than their respective tarsi; macroseta ms on tibia III shorter than internal sacral seta sai.......................................................... *fusca* Group.

KEY TO SPECIES OF THE *Diminuta* GROUP.


2. Suctorial plate without projected apron; macroseta of tibia III 1.5 as long as tactile seta ts on same segment .......................................................... *diminuta* Mostafa. Suctorial plate with wide, truncate apron projecting beyond hind margin of opisthosoma (Fig. 3 C); macroseta of tibia III 2 times as long as tactile seta of same segment........ *paraguayensis* Mostafa.

3. Metasternal setae on central junction of apodema IV shorter than (or subequal to) length of metasternum III, and much shorter than setae on trochanter III.......................... 4. Metasternal setae longer than metasternum III and almost equal to setae on trochanter III.... 7.


5. Posterior edge of suctorial plate contiguous with hind margin of opisthosoma; metasternum IV short, does not reach genital slit; eyes present............................ *laevopodemis* Mostafa. Posterior edge of suctorial plate distant from hind margin of opisthosoma; metasternum IV long, reaches genital slit; eyes lacking (only marks of their sockets remain on anterior part of propodosomal shield) .................................................. *oculabsens* Mostafa.

6. Metasternum IV long, extends behind level of genital discs; posterior edge of suctorial plate apodeme adjacent to hind margin of opisthosoma; broad band of plain conjunctiva at humeral sulcus...... *mexicana* Mostafa. Metasternum IV short, does not extend behind level of genital discs; posterior edge of suctorial plate apodeme quite distant from hind margin of opisthosoma; no broad band of plain conjunctiva at humeral sulcus ........................................... *salvadorensis* Mostafa.

7. Internal and external scapular setae in straight line across propodosomal plate... *arizonensis* Mostafa. Internal scapular setae posterior to external scapulars................................. 8.
8. Eyes large, protuberant on anterior edge of propodosoma, close to each other; no additional apodeme between apodemata I and presternal midrib. *Vidia (Zethovidia) diminuta* Mostafa. Eyes very small, not protuberant on anterior edge of propodosoma, widely spaced; an additional apodeme lies between apodemata I and presternal midrib (Fig. 9 A).

*Vidia (Zethovidia) diminuta* Mostafa, n. sp.

_Hypopus._

(Plate 2).

*Dorsum.* Body ovoid, hysterosoma tapered rearward to blunt, thinned-walled, protuberance located between setae *sai.* Eyes comma-shaped, close together. Vertical setae very fine, tuberculate. Propodosomal plate triangular, transversely furrowed on its basal portion; furrowed sculpturing grades into a coarse, polygonal reticulum near its apex. Scapular setae *sei* shorter than *sce* and with smaller alveoli; internals and externals not quite aligned in a straight crossrow, internals situated barely anterior to externals; spacing *sei-sei* approx. two times distance *sei-sce* (36 : 19 respectively); *sce* on margins of propodosomal plate. Hysterosomal plate transversely rugose near humeral sulcus, longitudinally rugose over midportion of metapodosoma and hysterosoma, bears 11 pairs of fine setae and 5 pairs of pores. Humeral pore (*hh-pore*) between setae *hb* and *asl*; valvular pore (*vu-pore*) directly opposite seta *psh*; posteromarginal pore (*pl-pore*) and postero-median pore (*pm-pore*) of opposite sides nearly aligned in a crossrow. Intervals between setae of different pairs: *d1-d2* 24, *d2-d3* 27, *d3-d4* 41. Distance *d3* to *pm-pore* approx. three times distance *d4* to *pm-pore.* Total body length 231, width 150.

*Venter.* Gnathosoma incipient, front convexity bears 2 pairs of setae; median pair stout, peg-like, blunt-tipped, divergent, on pronounced cylindrical tubercles; lateral pair less than half as long as middle pair, very thin, without tubercles. Median bar of presternal apodeme of uniform width to half its length, then tapers to a faintly bifid tip between apodemata I (Fig. 2 B). Apodemata I arch towards midventral line, free ends terminate close to ventral fold of humeral sulcus. Tips of apodemata II end close to, or articulate with, deep-lying bosses on anteriormost arches of apodemata III.

Metasternum IV terminates close to genital slit, its posterior tip forms a thinly sclerotized, lanceolate blade. Metasternal setae *mts,* at central junction of apodemata IV, approx. as long as metasternum III. Suctorial plate as figured.

*Legs.* Solenidion *w1* of tarsus I two times as long as basal width of this segment, slightly longer than *mG* of genu I. Seta *trs* of trochanter III shorter than metasternal seta *mts* located at central junction of apodemata IV. Macroseta *ms* on tibia III 1.5 as long as tactile seta *ts* (11 : 7 respectively). Sword-like seta *ss* of tarsus IV as long as tibia plus tarsus together, pointed distally.

*Holotype.* Hypopus on _Zethus diminutus diminutus_ Fox; San Bernardino, Paraguay; deposited in UCD.

*Paratypes.* Three hypopi, same data as holotype; other four hypopi recovered from _Zethus diminutus santaremiae_ Bohart and Stange; Santarem, Brazil. Deposited in USNM, BMNH, and author's collection.
REMARKS. This species shares with *V. (Zv.) paraguayensis* the dagger-like form of metasternum IV, but it differs from the latter in that the suctorial plate of *diminuta* does not have such a well-developed apron. *Diminuta* has a reticular pattern on the propodosomal plate which is obviously distinguishable from that of *paraguayensis*.

**Vidia (Zethovidia) paraguayensis** Mostafa, n. sp.

_Hypopus._

(Plateus 3).

_Dorsum._ Body widest at anterior third, tapered towards both extremities, with transparent, spatulate or truncate apron-like flap projecting slightly beyond caudal end. Vertical setae close together, their sockets almost contiguous; vertical setae shorter, thinner than median gnathosomals. Propodosomal plate coarsely furrowed across its basal half, with furrows joining to form a polygonal reticular pattern on its anterior half. Scapular setae *sci* located slightly anterior to pair *sce*; spacing *sci-sci/sci-sce* = 39/22. Humeral sulcus deeply infolded. Hysterosomal plate furrowed transversely near humeral sulcus, longitudinally furrowed over midpoint of hysterosoma; short furrows join to form polygonal cells between setae of pairs *d2* and *d3*. Posterior marginal and posteromedian pores (*pl-pore, pm-pore*) positioned in a straight crossrow. Spacing between setae of different pairs: *d1-d2* 28, *d2-d3* 35, *d3-d4* 49. Distance *d3* to *pm-pore* 42, *d4* to *pm-pore* 14. Body length 303, width 213.
**Venter.** Median gnathosomal setae stout, blunt-tipped, on thick rimmed tubercles, longer than verticals. Lateral gnathosomals very fine, not more than one-third as long as medians, without tubercles. Presternal apodeme Y-shaped, its midpiece tapers posteriorly to a feebly splintered point; tip does not extend backward to level of free ends of apodemata I. Hindmost tips of apodemata II terminate just in front of small acuminate processes on the arches of apodemata III. Metasternum IV projects backward almost to genital slit, its posterior half lanceolate or dagger-like.

Metasternal setae *mis*, at central junction of apodemata IV, slightly longer than metasternum III; also longer than setae on trochanters III. Suctorial plate as illustrated, with wide, truncate apron projecting beyond hind margin of opisthosoma.

**Legs.** Tarsus I (30) twice as long as tarsus III (15). Solenidion *w1* of tarsus II slightly longer than *w1* of tarsus I; it is also twice as long as solenidion *σ* of genu II and equal to *mG* of genu II. Seta *mG* of genu I equals tactile seta *is* of tibia III. Macroseta *ms* of tibia III (17) twice as large as *is* (8) of this segment. Seta on femur I reaches distal end of tarsus I; seta on femur II reaches distal end of tarsus II.

**Holotype.** Hypopus on *Zethus diminutus diminutus* Fox; San Bernardino, Paraguay; deposited in UCD.

**Paratypes.** Nine hypopi, same data as holotype; distributed to BMNH, UCD, USNM and author’s collection.

**Remarks.** *V. (Zv.) paraguayensis* and *V. (Zv.) diminuta* comprise a group which is easily distinguished from other species within the subgenus by having the posterior half of metasternum IV dagger-like. The species *paraguayensis* can be separated from *diminuta* because its suctorial plate projects backward in a wide, truncate apron; also the pattern of furrows on the propodosomal plate of the former is quite different from that of *diminuta*.

**Vidia (Zethoidia) laevapodemis** Mostafa, n. sp.

**Hypopus.**

(Plate 4).

**Dorsum.** Body ovoid, gradually tapered to a rounded posterior end bordered by internal sacral setae. Propodosomal plate triangular, constricted anteriorly between a pair of bean-like eyes, decorated with sinuate furrows; furrows run transversely on its basal two-thirds, almost longitudinally on its apical part. Vertical setae thinner, shorter than median gnathosomals. Scapular setae arranged in a straight line across propodosomal plate; spacing between *sci-sci* (36) twice as long as distance *sci-sce* (17). Dorsal plates reflected onto venter just behind apodemata II. Hysterosomal shield longitudinally furrowed, with a few furrows joining together to form a polygonal ornamentation between setae *d2* and *d3*. Spacing between setae *d2-d2* less than *d3-d3*. Intervals between setae of dorsoventral pairs: *dx-d2* 20, *d2-d3* 31, *d3-d4* 40. Distance *d3* to *pm-pore* 26, *d4* to *pm-pore* 16. Body length 228, width 156.

**Venter.** Two pairs of gnathosomal setae; medians on rigid tubercles, well separated from each other; laterals very fine, less than half as long as medians. Apodemata II terminate not far from smooth arches of apodemata III. Metasternal setae much shorter than metasternum III, these also shorter than trochanteral setae III. Metasternum IV short, narrow, tapers to a sharply pointed tip anterior to genital suckers. Suctorial plate as illustrated.
**Legs.** Tarsus I (26) twice as long as tarsus III (13); proximal member of duplex setae (d) very tiny, shorter than ht of tibia I. Solenidion wr long, extends beyond base of duplex setae, length of wx on tarsus I equals wx on tarsus II; wx much longer than seta mG on legs I or II. Macroseta ms of tibia III (17) less than three times as long as tactile seta ts (7) of this segment.

**Holotype.** Hypopus on Zethus menkei Bohart and Stange, 23 mi. S. Matias Romero, Oaxaca, México. Deposited in UCD.

**Paratypes.** Six hypopi, same data as holotype. Other five hypopi carried by same wasp species, 12 mi. S. Chivela, Oaxaca, México. Paratypes in USNM, BMNH, others retained by author.

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**PLATE 4: Vidia (Zethovidia) laevapodemis.**
A. — venter of hypopus ; B. — dorsum of hypopus ; C. — apodemes III and IV, with suctorial plate.

**REMARKS.** *Vidia* (Zv.) *laevapodemis* as well as *oculabsensa* distinctive in having no bosses on the arches of apodemata III. The former has one pair of prominent eyes which are lacking in the latter. Also, the two species can be separated because metasternum IV is very short in *laevapodemis*, but in *oculabsensa* it is long and reaches genital slit. Although this species is related to *V. (Zv.) mexicana*, it can be distinguished from the latter in that the propodosomal and hysterosomal plates are overlapping or juxtaposed; in *mexicana* they are clearly separated by a wide, unfurrowed strip across the dorsum. Moreover, metasternum IV in *laevapodemis* is very short; in *mexicana* it is long, reaching almost to the genital slit.

**Vidia (Zethovidia) mexicana** Mostafa, n. sp.

**Hypopus.**

(Plate 5).

**Dorsum.** Body ovoid, hysterosoma gently narrowed rearward to an unsclerotized, rounded end. Eyes comma-shaped, close together. Proposomal plate triangular, transversely rugose on its basal portion; furrowed into a polygonal reticulum anterior to scapular setae sci (Fig. 5 B).
Internal and external scapulars arranged almost in a straight crossrow; spacing sci-sci approx. 1.8 times distance sci-sce (36 : 20 respectively). Hysterosomal plate not overlapping propodosomal plate; suture represented by a broad band of plain conjunctiva. Hysterosomal plate with polygonal cells transversely elongate anterior to 2nd pair of dorsocentral setae (d2), longitudinally oriented over rest of plate. Posteromedian pore (pm-pore) anterior to posteromarginal pore (pl-pore). Distances between dorsocentral setae: d1-d2 21, d2-d3 33, d3-d4 41. Distance between d3 and pm-pore approx. 1.7 times distance d4 to pm-pore. Total body length 243, width 157.

PLATE 5: Vidia (Zethoidea) mexicana.
A. — venter of hypopus; B. — dorsum of hypopus; C. — apodemes III and IV, with suctorial plate.

Venter. Gnathosoma with two pairs of setae on front convexity; median pair peg-like, on small tubercles; lateral pair very tiny, less than half as long as median pair. Median prester nal apodeme very thin at its distal tip. Anteriormost arches of apodemata III widely separated from free ends of apodemata II. Metasternum IV narrows to a very sharp tip, behind level of genital discs, close to genital slit (Fig. 5 C); metasternal setae very much shorter than metasternum III. Suctorial plate as illustrated. Opisthosoma terminates in a very faintly outlined pad having a rounded edge (Fig. 5 C).

Legs. Legs generally well developed, highly sclerotized. Solenidion w1 of tarsus I slightly swollen at its distal end, longer than mG, more than half as long as tarsus. Solenidion of genu I thinner and longer than that of genu II. Tarsus I two times as long as tarsus III (26 : 13 respectively). Trochanteral seta of leg III longer than metasternal setae. Tactile seta of tibia III slightly less than one-half as long as macroseta (7 : 17 respectively).

Holotype. Hypopus on Zethus parheri Bohart and Stange, 30 mi. W. Acayucan, Veracruz, Mexico; deposited in UCD.

Paratypes. Seven hypopi, same data as holotype; distributed to BMNH, USNM and author’s collection.

Remarks. This species is very similar to V. (Zv.) laevapodemis, but mexicana has a boss or knob on each arch of apodemata III, whereas laevapodemis has none. This characteristic
separates it as well from oculabsensa. Metasternum IV is much longer in mexicana than in laevaphodenis. Additionally, there are discernible differences in the patterns of reticulation on the propodosomal plates of these two species.

**Vidia (Zethovidia) salvadorensis** Mostafa, n. sp.

**Hypopus.**

(Plate 6).

*Dorsum.* Margins of propodosoma noticeably concave, apex bell-shaped, its margins converge behind eyes to form a tongue-like projection; vertical setae arise on this projection. Hysterosoma tapered to a rounded posterior extremity, with projecting lobe. Vertical setae shorter than median gnathosomals. Transverse rugosities on propodosomal plate form a cluster of 5-6 polygonal cells behind setae *sci* (Fig. 6 B). Four scapular setae aligned in a straight crossrow;

**Plate 6: Vidia (Zethovidia) salvadorensis.**

A. — venter of hypopus; B. — dorsum of hypopus; C. — apodemes III and IV, with suctorial plate.

shaft and socket of *sci* larger than corresponding parts of *sci*; distance *sci-sci* approx. 1.3 times as long as distance *sci-sci* (32 : 25 respectively). Distances between successive dorsal setae *d1-d2* 24, *d2-d3* 35, *d3-d4* 46; spacing *d3* to *pm-pore* 38, *d4* to *pm-pore* 41. Body length 254, width 149.

*Venter.* Anterior face of gnathosoma convex; median gnathosomal setae peg-like, tuberculate; lateral gnathosomals one-third as long as medians, very slender, without tubercles. Ventral apodemes as illustrated (Fig. 6 A). Metasternum IV slender, its posterior two-thirds tapers to a sharp point in front of or between genital discs *gdi*. Metasternal setae (6) shorter than parallel-sided section of metasternum III. Suctorial plate as illustrated (Fig. 6 C).

*Legs.* Tarsus I more than twice as long as tarsus III. Solenidion wr on tarsi I and II identical in form and size, each more than one-half length of its segment. Macroseta *ms* on tibia III
more than 3 times as long as tactile setae on opposite side of same segment (21:6). Solenidion σ on genu I sharply pointed, spinous; corresponding sensillum on genu II peg-like. Seta on trochanter III about two times as long as seta on femur IV.

_Holotype._ Hypopus on _Zethus irwini_ Bohart and Stange; 4 mi. N. Quezaltepeque, El Salvador; retained by author.

_Paratypes._ Nine hypopi, same data as holotype; distributed to BMNH, UCD and USNM.

_REMARKS._ This species and _V._ (Zv.) _paraguayensis_ have suctorial plates with well developed, truncate aprons; in _salvadorensis_ this apron does not project beyond the posterior margin of the opisthosoma. The two species can be separated according to the shape of the distal part of metasternum IV; it is narrow in _salvadorensis_ but in _paraguayensis_ it is flattened blade-like. Moreover, the seta on the trochanter of leg III is approximately three times as long as the metasternal setae.

**Vidia (Zethovidia) arizonensis** Mostafa, n. sp.

_Hypopus._

(Plate 7).

**Dorsum.** Body suboval but with a slight epivertical projection. Vertical and median gnathosomal setae equal in length. Propodosomal plate covers almost entire upper surface, margins convergent in front of eyes; furrows between rugae with frequent junctions so that ornamentation appears as a coarse reticulum; polygonal cells transversely elongate behind scapular setae, becoming longitudinally oriented towards vertex (Fig. 7 B). Scapular setae in a line across propodosoma, sce somewhat longer than sci; spacing sci-sci 32, sci-sce 20. Ornamen-

**PLATE 7 :** _Vidia (Zethovidia) arizonensis._

A. — venter of hypopus; B. — dorsum of hypopus; C. — apodemes III and IV, with suctorial plate.
tation of hysterosomal plating coarsely reticulate near sulcus, cells becoming so elongate and slender near margins and over opisthosoma that reticular appearance grades into a rugose pattern. Both dorsal plates overlap body margins, their ventralmost edges especially visible near humeral sulcus. Dorsal setae as illustrated. Posteromarginal pl-pore situated farther to rear than pm-pore. Distances between successive dorsomedian setae $d_1-d_2$ 19, $d_2-d_3$ 34, $d_3-d_4$ 43; interval $d_3$ to pm-pore 34; $d_4$ to pm-pore 19. Body length 239, width 162.

**Venter.** Gnathosoma diminutive, bordered by rami of presternal apodeme. Median gnathosomal stout, blunt-tipped, divergent; on prominent, cylindrical tubercles; lateral gnathosomals one-half as long as medians, very fine. Mid-rib of presternal apodeme of uniform width for two-thirds of its length, its posterior third tapers to a point between apodemata I. Posterior notched ends of apodemata II appear to articulate with projecting studs on arches of apodemata III; metasternum IV slender, tapered from base to tip, ends between genital discs gdi. Metasternal setae much longer than metasternum III. Suctorial plate as illustrated.

**Legs.** Solenidion $w_1$ on tarsus I clavate, slightly swollen at its distal end, more than one-half as long as tarsal segment; $w_1$ on tarsus II identical with this sensillum on first leg. Macroseta $ms$ (24) on tibia III approximately four times as long as ts (6). Seta $mG$ slender but as long as $w_1$ on legs I and II. Seta on trochanter III equals length of metasternal seta.

**Holotype.** Hypopus on Zetkus guerreroi arizonensis R. Bohart, San Simeon, Cochise Co., Arizona; retained by author.

**Paratypes.** One hypopus, same data as holotype. Five hypopi on Zethus guerreroi guerreroi Zav.; 35 mi. N. Juchitan, Oaxaca, México. Distributed to USNM, BMNH, UCD and author’s collection.

**Remarks.** *V. (Zv.) arizonensis* has a pattern of reticulation on the propodosomal plate which appears as a group of coarse polygonal cells; cells behind scapular setae are transversely elongate. This species can be distinguished from its relative, *V. (Zv.) compactilis*, because it has the scapular setae sce and sci placed on a straight line across the propodosomal plate; while in *compactilis* the internal scapulars sci are posterior to the external scapulars sce.

**Vidia (Zethovidia) compactilis** Mostafa, n. sp.

*Hypopus.*

(Plate 8).

**Dorsum.** Body widest at anterior third, diminishing in width towards caudal end. Pattern of ornamentation on propodosomal plate distinctive (Fig. 8 B). Internal scapular setae located slightly behind externals. Distance sci-sci/sci-sce = 29/27. Vertical setae thinner, but as long as median gnathosomals. Epipodial setae es thinner, but longer than median gnathosomal setae. Hysterosomal plate reticulate, cells transversely oriented near humeral sulcus, elongate over mid-part of hysterosoma. Posteromedian pore (pm-pore) anterior to posteromarginal pore (pl-pore). Intervals between dorsocentral setae: $d_1-d_2$ 22, $d_2-d_3$ 34, $d_3-d_4$ 41. Distance $d_3$ to pm-pore 31, $d_4$ to pm-pore 14. Body length 236, width 168.

**Venter.** Gnathosoma developed as a rounded, lobular projection; bears two pairs of setae, lateral pair diminutive. Presternal apodeme extends backward to level of humeral sulcus. Free ends of apodemata II seem to articulate with well-developed apophyses on arches of apodemata.
III. Metasternum III shorter than that of *V. (Zv.) rugocoxa*. Metasternum IV terminates behind genital discs (Fig. 8 A). Metasternal setae (17) much longer than metasternum III but equal to setae of trochanters III. Suctorial plate as illustrated (Fig. 8 C); its truncate apron does not project beyond hind margin of opisthosoma.

**Legs.** Tarsus I (23) less than twice as long as tarsus III (13). Solenidia \( w_1 \) of tarsus I and tarsus II equal in length (13), both much shorter than setae \( mG \) of genu I (20). Macroseta of tibia III (20) almost three times as long as tactile seta (7) of same segment, but equal to \( mG \) of genu I.

**PLATE 8 : Vidia (Zethovidia) compactilis.**

A. — venter of hypopus; B. — dorsum of hypopus; C. — apodemes III and IV, with suctorial plate.

**Holotype.** Hypopus on *Zethus guerreroi guerreroi* Zav. ; 3 mi. N. W. Petalcingo, Puebla, México. Deposited in UCD.

**Paratypes.** Four hypopi, same data as holotype. In USNM, BMNH, and author’s collection.

**Remarks.** This species can be distinguished from its closest relative, *V. (Zethovidia) rugocoxa*, by the well-developed eyes, the ornamentation of the propodosomal plate, the shortness of metasternum III, and a different ratio for *sci-sci/sci-scie*.

**Vidia (Zethovidia) rugocoxa** Mostafa, n. sp.

**Hypopus.**

(Plate 9).

**Dorsum.** Body orbicular, somewhat truncated anteriorly, hysterosoma slightly excavate behind posterolateral seta \( (ph) \). Propodosomal plate forms a cap over vertex and folds under apex; vertical setae displaced to venter, to a position ordinarily occupied by gnathosomals. Eyes
very small, rod-like, widely spaced. Dorsal plates cover entire dorsum of body and reflect onto venter. Propodosomal plate with pattern of reticulation as illustrated; a Y-shaped furrow occurs between eyes. Scapular setae sci shorter than sce; internals originate behind externals; distance sci-sci about 1.3 times distance sci-sce (35 : 28 respectively). Hysterosomal and propodosomal plates overlap. Hysterosomal plate transversely furrowed near humeral sulcus, furrows anastomose to form almost isodiametric polygons on a raised area bounded by dorsocentral setae d1 and d2; polygonal pattern persists behind d2 but the cells become narrow and elongate. Spacing between dorsocentral setae : d1-d2 24, d2-d3 32, d3-d4 45. Distance d3 to posteromedian pore (pm-pore) approx. 2.3 times distance d4 to pm-pore (37 : 16 respectively). Total body length 239, width 158; ratio of lengths of propodosoma/hysterosoma = 70/174.

**Plate 9 :** *Vidia* (Zethovidia) *rugocoxa.*
A. — venter of hypopus; B. — dorsum of hypopus; C. — apodemes III and IV, with suctorial plate.

**Venter.** At least one pair of gnathosomal setae, displaced posteriorly, tubercles of median gnathosomals almost between coxae I; presence of external gnathosomals uncertain. Prester nal apodeme Y-shaped, angle between arms slightly less than 45 degrees; ventral plate of coxa I provided with an additional, long apodeme which originates on anterior rim of coxa and lies between apodeme I and prester nal midrib (represented by broken lines in Figure 9 A). Hindermost tips of apodemata II appear to articulate with acuminate processes on arches of apodemata III. Metasternal setae slightly longer than metasternum III and equal to setae on trochanters III. Metasternum IV constricts near its base, projects backward beyond level of genital disc. Suctorial plate as illustrated, with wide, truncate apron not projecting beyond posterior margin of opisthosoma.

**Legs.** Tarsus I (22) approximately 1.5 times as long as tarsus III (14). Solenidia wi of tarsi I and II of equal length, shorter than mG of genu I. Seta mG of genu I (21) approximately
equal to sensory seta (macroseta) of tibia III (20). Macroseta of tibia III almost 3 times as long as tactile seta (7) of this segment.

**Holotype.** Hypopus on *Zethus guerreroi guerreroi* Zav. ; 3 mi. N. W. Petlalcingo, Puebla, México ; deposited in UCD.

**Paratype.** One hypopus, same data as the holotype ; retained by author.

**REMARKS.** This species is unique in having an additional long apodeme on coxal field I. It also has but one pair of gnathosomal setae. The eyes are unusually small and quite far apart.

**Vidia (Zethovidia) oculabsensa** Mostafa, n. sp.

**Hypopus.**

(Plate 10).

**Dorsum.** Body arcuate anteriorly, widest at sulcus where dorsal shields bend under to cover a good portion of ventrolateral surface ; width diminishes abruptly behind leg IV. Propodosomal plate with short vertical setae on its projecting apex ; propodosomal and hysterosomal shields overlap at sulcus. Eyes lacking or not pigmented, but both sides of anterior part of propodosomal plate have criscentic notches where eyes should be. Scapular setae *sce, sci* positioned in a straight line across propodosoma ; interval *sci-sci* approximately two times *sci-sce* (43 : 22 respectively). Propodosomal plate adorned with wavy furrows ; furrows principally transverse, but several curve forward and anastomose anterior to internal scapular setae. Hysterosomal shield decorated with longitudinal, sinuate furrows. Dorsum unshielded laterally, behind anterolateral seta al. *Pm-pore* situated very close to seta d4 ; spacing d3 to *pm-pore* (40) more than three times d4 to *pm-pore* (12). Body length 274, width 189.

**Venter.** Two pairs of gnathosomal setae ; medians on tubercles, longer, thicker than laterals. Each median gnathosomal as long as solenidion wr of tarsus I. Free end of presternum tapered to a point. Apodemata III lack projecting knobs on anterior arches. Metasternal
setae at junction of apodemata IV equal in length to metasternum III but shorter than seta on trochanter III. Metasternum IV long, reaches genital slit. Short paragenital setae arise midway along side of genital slit. Suctorial plate has a weak, apron-like flap which does not extend to posterior extremity of opisthosoma.

**Legs.** Setae $mG$, $ht$ on genua and tibiae of legs I, II equal in length. Slightly swollen solenidion $w1$ of tarsus I slightly shorter than its homologue on tarsus II. Seta $eta$ (34) on tarsus I twice as long as solenidion $w1$ (17) of same segment. Tactile seta $ts$ of tibia III approximately one-third as long as macroseta $ms$ on this segment (9 : 28).

**Holotype.** Hypopus on *Zethus inconstans* Fox; Chapada de Aunr Mato Grosso, Brazil. In UCD collection.

**Paratypes.** Two hypopi, same data as holotype. One in USNM, the other retained by the author.

**Remarks.** *Vidia (Zethovidia) oculabsensa* is unusual in having no eyes. It resembles *salvadorensis* and *laevapodemis*. The ventral aspect of the opisthosoma is similar in *oculabsensa* and *salvadorensis* (c.f., Figs. 10 B, 6 C), but the former differs from the later by having no bosses on arches of apodemata III. The species can be distinguished from *laevapodemis* according to the position of the suctorial plate; in *oculabsensa* the rim of this plate does not reach the extreme tip of the opisthosoma; in *laevapodemis* its rim is congruent with the body outline. Furthermore, the $pm$-pore in *oculabsensa* is closer to the dorsocentral seta $d4$ than in *laevapodemis*. The long metasternum IV reaches the genital slit of *oculabsensa*; it does not extend so far backward in *salvadorensis* and *laevapodemis*. 