

**THREE NEW SPECIES OF THE GENUS *HISTIOSTOMA*  
(ACARI, ASTIGMATA, HISTIOSTOMATIDAE)  
FROM DECOMPOSED ONION AND  
POTATO STORES IN EGYPT**

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**Abstract**

Three new species, *Histiostoma zaherii* n.sp., *Histiostoma metwllii* n.sp. and *Histiostoma rakha* n.sp. (Acari, Astigmata, Histiostomatidae) were described and illustrated on the basis of a survey of stored product mites associated with decaying onion and potato crops in Kafr El-Sheikh Governorate (Egypt). Adult female and male were described and illustrated.

**INTRODUCTION**

Family Histiostomatidae is considered to be one of the most important mite families, which affect stored products. It infests decomposed onion and potato tubers in stores (Mohanasundaram and Parameswaran 1991) resulting in unpleasant taste and smell. After infestation, these materials became not suitable for cultivation or human consumption. Histiostomatidae is one of many causal agents, which carry diseases of agricultural crops by means of their bodies, hairs and excreta such as *Botrytis allii* on onion, *Alternaria tenuis*, *Fusarium solani* and virus diseases of potato tubers (Sigrianskii 1940). Histiostomatid mites enter stores of onion and potato by cling its hypopus stage on bodies and legs of several species of beetles, flies and Myriapoda, which visit the stores (Fain and Miessen, 1997, and Hughes and Jackson, 1958). They are also found on decaying hyacinth bulbs and damp timber. They feed on sewage bacteria and the zoogloea film covering the clinker surface of onion and potato tubers (Hughes and Jackson, 1958). Many Histiostomatid mites are found on wet vegetable matters where decomposition takes place such as *Histiostoma feroniarum*, *H. adarosii*, *H. humidatus*, *H. ocellarum*, *H. unidentatum*, *H. coprae*, *h. musca*, *H. onthophagae*, *H. srphunculinae*, *H. sammari*, *H. egyptacum* and *H. bananai* for the authors, Clift (1983), Metwally and Ahmed (1987), Mohanasundaram and Parameswaran (1991), Tagami *et al.* (1992), Fain *et al.* (1993), Eraky and Shoker (1993), Tadars and Gabriel (1994), Chinniah and Mohanasundaram (1995), Eraky (1997), Fain and Erteld (1998).

Thus, the present work described the three new species, *Histiostoma zaheri* n.sp., *Histiostoma metwillii* n.sp. and *Histiostoma rakha* n.sp. (Acari, Astigmata, Histiostomatidae).

### MATERIALS AND METHODS

Samples from decaying onion and potato tubers were collected from stores in Kafr El-Sheikh Governorate. In the laboratory, the samples were investigated by stereomicroscope and different mite stages were separated by camel hair brush. Collected adult and different stages were cleared by in Nesbitt's fluid, mounted in Hoyer's medium on glass slides and examined microscopically. Mites were identified according to Hughes *et al.* (1958) and kept in the collection of Plant Protection Research Institute. The three new histiostomatid species were described and illustrated. All measurements are in microns

### RESULTS AND DISCUSSION

The new species *Histiostoma zaheri* n.sp., *Histiostoma metwillii* n.sp. and *Histiostoma rakha* n.sp. were classified according to Hughes *et al.* (1958) and described according to Fain *et al.* (1993).

#### A. Morphological studies:

Family Histiostomatidae Berlese 1897, Genus *Histiostoma* Kramer 1876.

#### Key to the species of the Genus *Histiostoma* based on females:

1. A terminal tarsal seta, legs I-IV, flagella-like.....2  
A terminal tarsal seta, legs I-II, flagella-like.....6
2. Hysterosoma dorsum heavily shagreened and with distinct bosses  
.....*H. protuberans* Hughes & Jackson  
*Hysterosoma* dorsum not shagreened and without distinct bosses.....3
3. Anterior and posterior ring like structure r1 and r2 circular, or almost  
circular.....4  
Posterior ring like structure oval or elongate .....5
4. A terminal tarsal seta, leg IV longer than tarsus  
IV.....*H. pyriforme* Michael, 1951  
Longest terminal tarsal seta, leg IV shorter than tarsus  
IV.....*H. berghi* Jensen, 1895.
5. Pedipalpal seta pp1 spine-like and anteriorly directed, seta vm3, posterior to  
posterior ring like structure r2 .....*H. sextoni* Hughes & Jackson  
Pedipalpal seta pp1 flagella-like and laterally directed, seta vm3, mesiad of

- posterior ring like structure r2. *H. cyrtandrae* Vitzthum, 1931
6. Setae on dorsum pilose.....7  
Setae on dorsum not pilose.....8
  7. Chelicera non serrated, setae pp2 on pedipalp short and fine ring-like structure r1 and r2 very small.....*H. piloseta* Hughes & Jackson.  
Chelicera serrated with 7 small teeth and one big tooth, setae pp2 on pedipalp nearly equal to setae pp1, ring-like structure r1 and r2 elongate and big.....*H. rakha* n.sp.
  8. Chelicera ending with minute setae with terminal knob, pedipalp with many bristle-like projections distally and laterally .....*H. bakeri* Hughes & Jackson  
Without knobbed seta, or without seta on end of chelicera, without bristle-like projections associated with the pedipalp .....9
  9. Posterior end of posterior disc r2 on level with anterior end of anus.....*H. himalaya* Vitzthum, 1923  
Posterior end of posterior disc r2 distinctly anterior to anus.....10
  10. Posterior disc r2 ovate or elongate.....11  
Posterior disc r2 circular, or almost circular .....14
  11. Setae vm3 laterad of and on a level with posterior disc r2 .....  
..... *H. fimetarium* Berlese & Canestrini 1881  
Setae vm3 not laterad of posterior ventral disc r2 .....12
  12. Tarsal setae ta5 legs III, IV ending hook or barb .....*H. phyllophorum*  
Oudemans, 1905.  
Tarsal setae ta5 legs III, IV without hook or barb .....13
  13. Chelicera flagella equal to serrated portion of chelicera, seta vm3 mesiad and opposite posterior disc r2, disc r2 elongate ..... *H. humiditatis* Vitzthum, 1927  
-Chelicera flagella longer than serrated portion of chelicera, seta vm3 posterior disc r2, disc r2 oval shape and anterior part of pedipalp with three spine projections.....*H. metwlyii* n.sp.  
Chelicera flagella shorter than serrated portion of chelicera, seta vm3 posterior or near end of disc r2.....*H. nigrelli* Hughes & Jackson
  14. Pedipalpal seta pp2 apparently missing, posterior disc r2 on a line between coxa II and III.....*H. murchiei* Hughes & Jackson  
Pedipalpal seta pp2 present, posterior disc r2 not on a line between coxa II and III .....15
  15. Pedipalpal seta pp1 spine-like and nearly equal to seta pp2 .....  
.....*H. feroniarum* Dufour, 1839  
Pedipalpal seta pp1 flagella-like and over twice as long as pp2 .....16

16. Chelicera not serrated, seta vm3 anterior and laterad of posterior ventral disc r2 .....*H. gordius* Vitzthum, 1923  
Chelicera serrated, seta vm3 below and laterad of posterior ventral disc r2.  
Dorsal setae not reach to base of the following seta. Seta sci in same level of  
sce setae .....*H. julorum* Koch  
Dorsal setae long and reach to base of the following seta chelicera serrated,  
seta vm3 below and inside disc r2. setae sci anterior in position of  
sce.....*H. zaheri* n.sp.

***Histiostoma zaheri* n.sp.**

**Diagnosis:** Chelicereal flagellum longer than in *Histiostoma feroniarum* and *Histiostoma julorum* 58.3  $\mu$  and increased than the top of the teeth. Body pyri shape, not rectangle as *H. feroniarum*, idiosoma longer than in *H. feroniarum*. Setae pp 1 on pedipalp longer than seta pp 2. This new species also differs from *H. julorum* in that the pairs of setae sci anterior of sce while in the same level in *H. julorum*. *H. zaheri* shorter than *H. julorum*, also the length of dorsal setae reach the base of the following setae not as in *H. julorum*, the distance between pair of setae d<sub>2</sub> shorter than in *H. julorum*. Pair of oil glands lay in position between d<sub>2</sub> and L<sub>3</sub> Terminal tarsal setae of Leg I, II only with flagellum shape, dorsum setae not pilose with out tristle-like projections associated with pedieale, posterior end of posterior disc r<sub>2</sub> distinctly anterior to anus, posterior r<sub>2</sub> circular or almost circular, pedipalpal setae pp<sub>2</sub> present, posterior disc r<sub>2</sub> between coxa IV, pedipalpal setae pp<sub>1</sub> flagella like and twice as long as pp<sub>2</sub> and chelicera serrated, setae vm<sub>3</sub> below r<sub>2</sub>.

**Female dorsum (Fig. 1):** Cuticle soft except a small punctuate and poorly sclerotized area in the anterior part of dorsum. Female 354  $\mu$  long, 231.4 wide chelicera serrated with seven large and five minute teeth. The scutum with 2 pairs of short setae vi and ve 26.6 & 25  $\mu$ , respectively. Setae sci and sce smooth, simple, its length 26.6 & 41.6  $\mu$ . Setae d<sub>1</sub> d<sub>5</sub> thin, 73.3 - 50  $\mu$  long. All the setae with inflated bases. Setae L<sub>1</sub> - L<sub>5</sub> 50 - 80  $\mu$  long. L<sub>3</sub> setae very close to the orifice of the oil glands. The orifice of the bursa copulatrix opens on the posterior margin between d<sub>5</sub> setae, very small round punctuate platelet, its diameter 20 $\mu$ . One pair of humeral setae 30 $\mu$  found laterally.

**Female ventrum (Fig. 1):** A very fine and small pair of sternal setae between apodeme 1 and 2, apodeme 1 attached to form a small sterna. A transverse genital opening 45 $\mu$ , a slit between the anterior pair of elongate ring like structure r<sub>1</sub> which its length 25 $\mu$ , while the posterior pair of this ring almost circle r<sub>2</sub>, its diameter 20 $\mu$



between cox IV, Anal opening longitudinal slit ,70 $\mu$  length and surrounded by two minute smooth pairs of setae an<sub>1</sub> and an<sub>2</sub>.

**Legs (Fig. 2):** The length of legs I, II, III, IV are 191.6, 175, 163.3 and 186.6  $\mu$ , respectively.

**Chetotaxy of legs:** Femer, genu, tibia, tarsus of leg I, [1,2+ (2), 2+ (1), 6+ (3)], leg II [1,2+ (1), 2+ (1), 5+ (2)], leg III [0,0, 2(1), 6+ (1)]and leg IV [1,0, 1+ (1), 6+ (1)]

**Male dorsum (Fig. 3):** 272  $\mu$  long, and 181  $\mu$  wide, conspicuously smaller than female but as in female except there is no copulatory pore. Dorsal setae as in female with length Vi, Ve (10, 15)  $\mu$ , setae sci and sce with length 18, 46  $\mu$ , h, is 58  $\mu$ , (L<sub>1</sub>-L<sub>5</sub>) are (40, 48, 45, 50 and 38  $\mu$ ) setae d<sub>1</sub>, d<sub>2</sub>, d<sub>4</sub>, d<sub>5</sub> (66.6, 56.6, 50, 45 $\mu$ , Dorsal setae reach to the base of the following setae.

**Male ventrum (Fig. 3):** Apodeme 1 joined with a small thick sternum while other apodemes free. A pair of very fine sternal setae s between apodeme 1 and 2. A small pair of setae vm<sub>2</sub>, on coxa three The first pair of ring likes structure r<sub>2</sub> smaller than female between cox 3 and associated with a pair of gentil setae vm<sub>1</sub>. Male genitalia is between coxa IV and surrounded by two small pairs of genital setae vm<sub>3</sub> and v<sub>01</sub>, second pair of ring like structure r<sub>2</sub> located beside setae v<sub>01</sub>.

**Legs (Fig. 4):**

The length of legs I, II, III, IV are 191.6, 175, 163.3 and 186.6  $\mu$ , respectively.

**Chetotaxy of legs:** Femer, genu, tibia, tarsus of Leg I [1,2+ (2), 2+ (1), 6+ (3)], Leg II [1,2+ (1), 2+ (1), 5+ (2)], III [0,0, 2(1), 6+ (1)], IV [1,0, 1+ (1), 6+ (1)]

**Type Material:** Holotype female and an allotype male were collected from decayed onion and potato crops in stores in Kafr El-Sheikh Governorate on 24 July 2004. and deposited in the collection of plant protection Institute, Ministry of Agriculture, Egypt. **Paratypes:**, (9) females and (3) males with the same date.

***Histiostoma metwallii* n.sp.**

**Diagnosis:** *Histiostoma metwallii* is similar to *Histiostoma humidatis* in setae Vm<sub>3</sub> not laterated of posterior disc r<sub>2</sub> and tarsal setae ta<sub>5</sub> legs III, IV without hook of barb but differs in chelicera flagella longer than serrated portion of chelicera, sexta Vm<sub>3</sub> posterior disc r<sub>2</sub>, disc r<sub>2</sub> oval shape and anterior part of pedipalp with three spine projections.



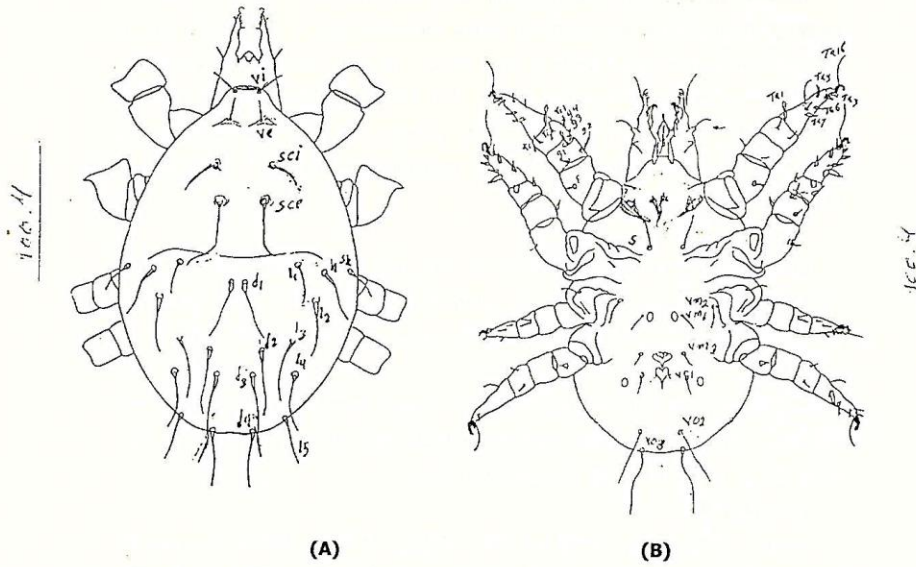


Fig. 3. Male of *Histiostoma zaheri* n.sp. (A) Dorsum and (B) Ventrum .

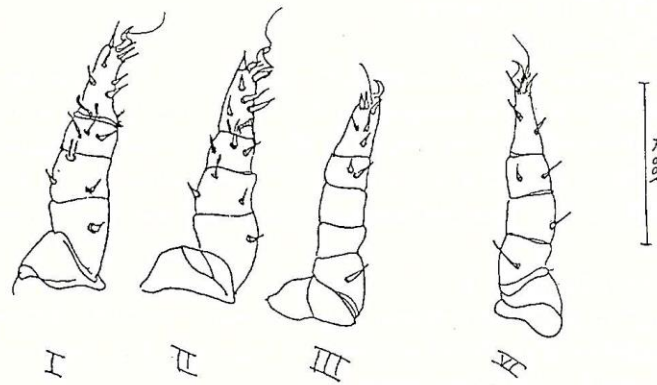


Fig. 4. Legs I-IV of male of *Histiostoma zaheri* n.sp.

**Female dorsum (Fig. 5):** Idiosoma 383  $\mu$  long and 216  $\mu$  wide. Cuticle soft except a small punctate and reticulate poorly sclerotized area in the anterior part of dorsum. This scutum bears 2 pairs of short setae (vi and ve) setae sci and sce 19 and 28  $\mu$  long, respectively. Setae  $d_1$  to  $d_5$  thin, 28 to 43  $\mu$  long. Some setae  $d_4$ ,  $d_5$  with inflated bases. Setae  $L_1$  to  $L_5$  14 to 43  $\mu$  long.  $L_3$  setae very close to the orifice of the oil glands. The bursa copulatrix opens as a longitudinal slit extended from level of  $d_2$  to  $d_4$ .

**Female ventrum (Fig. 5):**

Epimera 1 fused into a short sternum 13 $\mu$  Vulva of genitalia very wide 70 $\mu$ . Anterior rings oval, 19 $\mu$  elongated and situated in front of epimers -II 70 $\mu$ , while posterior ring  $r_2$  elongate 25 $\mu$ , situated in line between cox IV, Anus 80 $\mu$  long.

**Gnathosoma:**

Palps with large transparent membranes, anterior flagellum setae pp1 long 84 $\mu$  and three spines on the anterior lateral of pedipalp while the second setae pp2 28 $\mu$ . Fixed digit of chelicera bearing only one large tooth.

**Legs (Fig. 6):**

Average length of legs (I-IV) are 133.3, 116.6, 116.6 and 133.3 $\mu$ , respectively. Tarsi I and II with rather long tenent hairs.

Solenidia on leg 1 tarsus,  $\omega_3$ ,  $W_3$  apical and  $W_1$  and  $w_2$  at base.

**Chetotaxy of legs:** I [1,2 (2), 2 (1), 6 (3)], II [1,2 (1), 2 (1), 6 (3)], III [1,0, 2, 6 (1)], IV [1,0, 2, 6 (1)]

**Male dorsum (Fig.7):**

322 m  $\mu$  long, and 162 m  $\mu$ .wide Male conspicuously smaller than female because of the reduced size of the hysterosoma, body more rectangular than pear-shaped. Rostrum and all body of male granular and Gnathosoma of male not different from female. The vertical setae vi, ve 11.5 and 9.2m $\mu$ . The scapular setae sci & sce 11 and 20m $\mu$ . Lateral setae 11-15 (17-37m $\mu$ ). Dorsal setae d-d<sub>5</sub> 16.6-26.6 $\mu$ , humeral setae 20m $\mu$ .

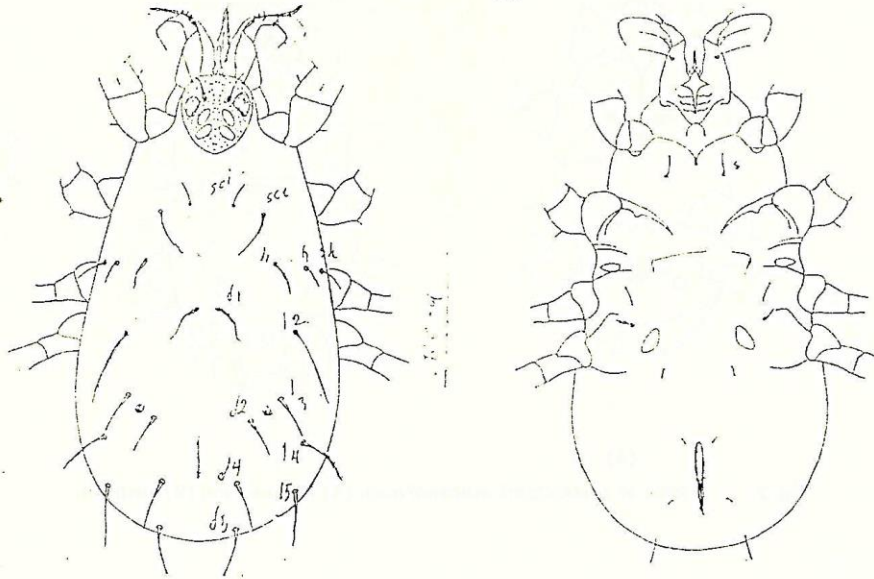
**Male ventrum (Fig. 7):**

Apodeme 1 joined in long sternum 45 m  $\mu$  but apodeme 2 joined to small sternum 20m $\mu$ . One pair of small sternal setae on coxa I region. On coxa III a small pair of setae  $vm_2$  10 m  $\mu$ . The first ring structure  $r_1$

elongate 12m $\mu$  long and associated with the pair  $vm_1$ , which is longer than  $vm_2$ , the anterior ring elongate and near together, while the posterior ring  $r_2$  semi circular and the genitalia located between them. Genitalia between coxae IV and associated with two small pair of setae the anterior pair  $VO_1$  and the second  $VO_2$ .



11



(A)

(B)

Fig. 5. Female of *Histiotoma metwali* n.sp. (A) Dorsum and (B) Ventrum .

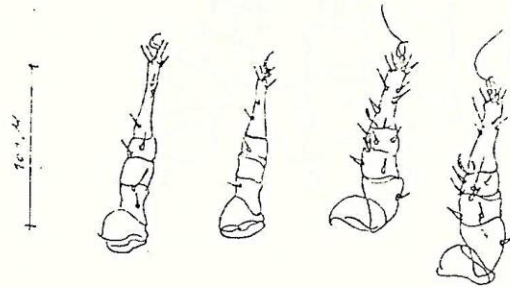


Fig. 6. Legs I-IV of female of *Histiotoma metwali* n.sp.

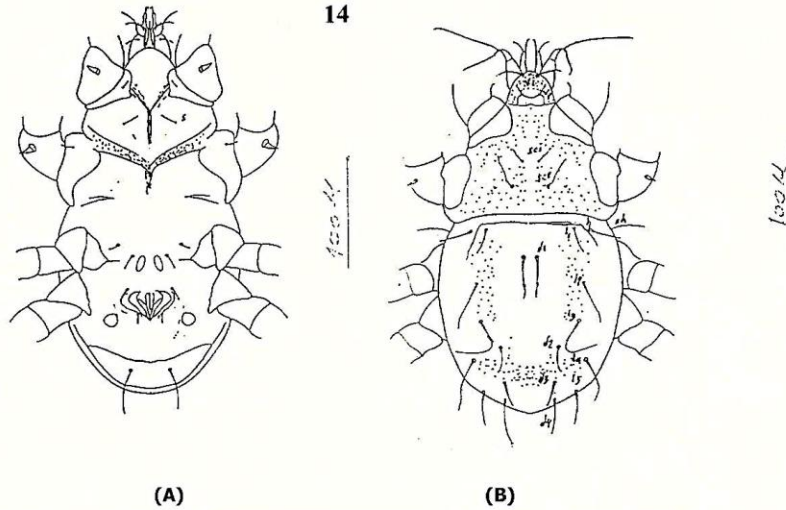


Fig. 7. Male of *Histiostoma metwalii* n.sp. (A) Dorsum and (B) Ventrum

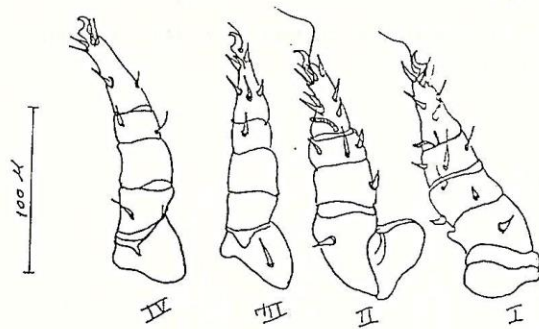


Fig. 8. Legs I-IV of male of *Histiostoma metwalii* n.sp.

Legs (Fig. 8):

**Legs (Fig. 8) :** I of male gives the appearance of being stout due to the thicker and shorter male tarsus, number of setae the same as in female, its length from leg I to IV is 175, 166.6, 133.3 and 163.3 $\mu$ , respectively.

**Chetotaxy of legs:** Length of legs [I-IV) are 166.8, 158, 150 and 166.6 $\mu$ . Leg I [1,2+ (2), 2+ (1), 6+ (3)], Leg II [1,1, (2+ 1)], Leg III [0,0, 1, 6+ (2)], Leg IV [1,0, 1, 5+ (1)].

**Type Material:** **Holotype** female and a male were collected from onion and potato stores in Kafr El-Sheikh Governortae on 10 June 2004.and deposited in the collection of plant protection Institute, Ministry of Agriculture, Egypt.

**Paratypes:** 10 females and 12 male with the same data.

***Histiostoma rakha n.sp.***

**Diagnosis:** This species is similar to *Histiostoma piloseta* in, dorsal setae are carried on big pappli and serrated but the chelicera differs from. *H. piloseta* because its chelicera has seven big teeth also pp<sub>1</sub> setae on pedipalp equal pp<sub>2</sub> not as in *H. piloseta* where setae pp<sub>1</sub> longer than pp<sub>2</sub>.

The two pairs of ring like structure elongate not round as in *H. piloseta* and they are bigger than in *H. piloseta*. Bursa copulatrix lies on line connected between setae d<sub>1</sub> as in *H. piloseta* but in this species bursa lies on line connected between d<sub>5</sub>.

**Female dorsum (Fig. 9):** Idiosoma 344 long and 175 $\mu$ wide,. Whitish and usually contains tiny points. The gnathosoma rather small in proportion to the rest of body. Each chelicera (Fig. 10) consists of elongate movable digit, serrated with seven small teeth 14 $\mu$  and one terminal large tooth chelicera. It can move freely backwards and forwards inside an extensive pre-oral trough. The terminal segment of the palp (Fig. 10) flattened bilobed. Palps with posterior flagellum little longer (15.3m $\mu$ ) than the anterior flagellum (12-14 m $\mu$ ). The palp freely moves and sweeps the suspended particles in the fluid medium towards the anterior end of mouth parts. The cuticle soft and covered with fine projections to which small particles of fungal hyphae and fine debris readily adhere.

A transverse punctuated striation separates the propodosoma from hysterosoma on the dorsal.

All dorsal setae small-serrated curved, with inflatted bases and carried on round tubricles, dp<sub>1</sub>, dp<sub>2</sub>, dp<sub>3</sub>, dp<sub>4</sub>, (dm<sub>1</sub>- dm<sub>2</sub>), (d<sub>01</sub>- d<sub>0</sub>) and its length (20.2-30.7m $\mu$ )

The orifice of the bursa copulatrix opens on the portion posterior between the setae d<sub>05</sub> as a small cup shaped.

**Female Ventrum (Fig. 9):**

Two pairs of chitinous rings, oblong, the anterior smaller than posterior 24, 30  $\mu$ . the anterior pair laying between coxae II and III on either side of the transversal genital opening 77  $\mu$ . while the posterior pair of ring like structure laying between coxae IV. Apodeme I fused while apodeme II free. One pair of simple smooth setae  $vp_1$  on the coxal region I. Apodeme of legs III and VI fused. Two pairs of small simple setae  $vm_1$  and  $vm_2$  on the coxal region of leg III. Another smooth pair of setae posterior of the second ring like structure  $vm_3$ . The anus opening 56.4  $\mu$  long not reaching the posterior margin of body and surrounded on each side with three fine smooth setae  $v_{01}$ ,  $vm_{02}$  and  $vm_{03}$ .

**Legs (Fig. 11):**

**Chetotaxy of legs (Fig. 11):** I [1,2 (2), 2+ (1), 9+ (3)], II [1,2 (1), 2+ (1), 9+ (3)], III [0,0, 2, 7], IV [1,0, 2, 5]

**Type Material:** Holotype female was collected from stores of onion and potato in Kafr El-Sheikh Governortae on 17 July 2004. and deposited in the collection of plant protection Institute, Ministry of Agriculture, Egypt.

**Paratypes:** seven females collected from the same previous places.

The male of this species is not found and the species may reproduce parthenogenitally (Thelytokous).





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ثلاثة أنواع أكاروسية جديدة تابعة لجنس *Histiostoma* من فصيلة  
**Histiostomatidae** المرتبطة بالبصل والبطاطس المتحللة في المخازن في مصر

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تم تسجيل ثلاثة أنواع أكاروسية جديدة تابعة لجنس *Histiostoma* من فصيلة  
*Histiostomatidae* وهي من الفصائل الأكاروسية التي تتواجد في المواد المخزونة وسجلت هذه  
الأنواع علي محصولي البصل ودرنات البطاطس المتحللة الموجودة في المخازن بمحافظة كفر  
الشيخ. وتم وصف هذه الأنواع وصفا مورفولوجيا دقيقا مع عمل رسومات توضيحية وبيان اختلافاتها  
مع الأنواع القريبة منها.