

MORPHOLOGICAL STUDY ON CHELOPISTES-MELEAGRIDIS LINNAEUS, 1758 AN ECTOPARASITE ON TURKEYS IN EGYPT, USING SEM.

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ABSTRACT

Chelopistes meleagridis is an ectoparasite on turkeys in Egypt. The investigation dealt with some parts of this species including, head (a striking feature in the temple was expanded and sexual dimorphism in the first segment of antennae), thorax (legs) and genitalia (female and male). The characters of these parts were described using SEM to give more details where little information is available from the literature.

INTRODUCTION

Lice are obligate ectoparasites lacking any free-living stage and occurring on all orders of birds and most orders of mammals. The degree of host specificity amongst lice is high and many monophyletic of lice occur on monophyletic groups of hosts.

Barker (1994) referred to many species of lice infesting only a single species of host. Moreover, genera of lice often are restricted to a single taxon of birds or mammals.

Chelopistes meleagridis (large size) is the most common as an ectoparasite on turkeys in Egypt. This louse was described firstly by **Madbouly (1961)** from body of turkeys in Cairo. He did not referre to enitalia.

According to **Aguirre et al., (1992)** the number of *C.meleagridis* was 27 out of 183 chewing lice, they were collected from domestic birds (turkeys) in Mexico. **George et al.,(1992)** recorded that 17.3% from a total of 794 suspected cases of domestic animals in northern Nigeria was positiveforlice, wherethe*C.meleagridis*is the most one of them on poultry.

The purpose of the present work is to demonstrate the exact morphology of various parts of the louse, including head (pulvinus, labrum and labium) antenna (sense organs) and genitalia (in both male and female) to reveal the characters of biting of avian louse *C. meleagridis*. Some figures and features using SEM in this species have not been studied in previous work.

MATERIAL AND METHODS

Chelopistes-meleagridis (*Virgula-meleagridis*, *Goniodes*) is found as an ectoparasite on the turkeys in Egypt. This species is common and of wide distribution on the body of the domestic turkey *Meleagris gallopavo* Linn on ventral and breast feathers.

This species was collected (by a very fine forceps) from different localities, Cairo, Giza, Faiyum, Minufiya, and Qalyubia.

The specimens were prepared in two ways:

- a- the insects were macerated in 10% KOH then dehydrated, cleared, and mounted in Canada balsam.
- b- the insects were put in neutral formaline, then washed in water and dehydrated, then put in acetone to examine by SEM.

RESULTS

CHELOPISTES MELEAGRIDIS

- **Head:** the head is flat, the anterior region is broad, approximately square-shaped and the temporal angle is directed postero-laterally in process which prolonged by a long seta on each side in the posterior region of the head (Fig.1).

The arrangement of the layers in the ventral region of the head are clear as follows:

- a) the first layer anterior of clypeus (represents the anterior margin of the head) is complete margin without any depression, it is dark coloured and very thick chitinized part. Its outer border is rounded anteriorly, and its inner border is dentated,

carries muscles which control the movement (Figs.1,5) around the whole surface of this margin.

- b) the second layer is the ventral of clypeus = clypeal plate, it is large, semi-circle, broad, and less chitinized than the anterior of the clypeus (Fig.5).
- c) behind the chitinized margin of pulvinus, a very thick mass of chitinized, ovoid shaped structure, its surface is smooth, well developed (Figs.1,3,6).
- d) the rest of pulvinus is an elongated band, lies posteriorly, a thick process which extends on either side of it, in a triangular shape which represents the condylar surface upon which the mandibles articulate, it is conspicuous as represented in (Figs 3,2).

The eye is large and flat with a long ocular seta behind it, as clear in (Fig.12).

The conus extends from the lateral side of the head directly above the scape. In the male (Fig.10) this part is very reduced, while in the female (Fig.12) conus is a triangular process, well developed. The form of the conus may often be correlated with the size of the antennae and the sexual dimorphism.

- **Mandible:** (Figs.1,2) it lies at the central part of the head, under the labrum. It is very powerful and densely chitinous. The mandible consists of two teeth; one is large while the other is long. The articulation is vertical, where the mandible is inserted at right angle with the head.
- **Labrum:** It is long, flat band, directly above the mandible. There are about 12 setae on its upper surface (Figs.2, 3, 6). **LABIUM:** there are two relatively long columnar lobes (Fig.4), these are labial palps on each side of mentum, they have six sensillae (Fig.2) on their terminal edge, between them, there are three fine setae on each side of the mentum.

- **Sitophore&Lingual Sclerites:** These components are easily observed in permanent specimens treated with (KOH) as clear in (Fig 7) using light microscope. They lie immediately above

- **Antenna:** the antenna is composed of five segments, it is filiform, easily visible at each side, the first segment (= scape) in male is enlarged and swollen, it is very clear in (Fig.10) by SEM. The sexual dimorphism is clear also in female (Fig.12), the first segment is of normal size, while the other four segments are approximately equal in length.

There are about ten sensillae of moderate size on the terminal segment of antenna (Fig.11). Sense organs are constricted on both the 4th. and 5th. segments of antennae. On segment five (Figs12, 13) there is one cavity (coeloconica sensillum) and two ovoid like structures (placodea sensilla) and on segment four (Fig.12), there is one cavity and one ovoid shaped structure, the whole are surrounded by a number of grooves or lines.

- **Thorax:** the sternal plate (Fig.14) is strange in shape and differs from other forms observed in previously reported publications. It extends medially between the three coxae, sclerotized, elongated anteriorly in the region of prothorax. From its anterior margin extends perpendicular part, on both lateral sides, there are two condylar masses. The latter may be responsible for the articulation with coxa on each side, and also for connecting head with thorax. On its posterior margin, it becomes very wide in metathorax, There is 4-5 long setae on each lateral side of the sternal plate.
- **Legs:** the three pair of legs are not equal in size, the third is the largest and the first pair of legs are the smallest (Fig.1). The tibia is very long, ends with tibial process which carries strong spine, in an opposite side to the claws. Tarsus is short, it ends dorsally with two claws (Fig.8) and ventrally with a pad (Figs.9,8). Claw is long and ends with smooth margin without any teeth. The pad is round, thick, large, protrudes outside at the base of tarsus, where its outer surface is smooth and inner part with many minute processes and two setae, one short and other long.

- **Genitalia:** abdomen broadly, oval, segments subequal, pleurites (Fig.17) heavily chitinized, postero lateral angles, with four long setae on each side. Female genitalia (Fig.16) on ventral surface; the sternum of segment 8 is well developed and represents the genital plate which protrudes into two lobes to segment 9. These two lobes bear very delicate short setae on outer margin. The ninth segment ends in two lobes. On its lateral side (=9th pleurite) there is a setae on its connection with sternum .

In male genitalia (Fig.15) on ventral surface; the sternum of segment nine is triangular shaped divided into two widely separated lobes. Each lobe ends in a round form. There is on its inner side one long very fine seta (at the beginning of the last quarter), and on the middle of its outer surface there is one long fine seta. In the middle of these two lobes, there is a very long, strong well developed penis. The penis (Fig.17) is round at its end with two longitudinal rows of sensillae (one row on each side).

DISCUSSION

The present research gives special attention to some parts not studied before using SEM.

- **Head:** Clay (1950) referred to complete marginal carina in ischnoceran head, so called circumfasciate type, as in *Goniodes*. She added that the head is basically similar throughout the *Ischnocera*, this part of the body apparently being the most closely adapted to the environment. Pulvinus seems to have an important function in grasping the feather and directing it towards the mandibles for attachment and feeding, she confirmed that the pulvinus which is a membranous lobe of characteristic structure, is present in all the *Ischnocera*.

According to Symmons (1952) in the *Goniodid* head the rim of the clypeus which is in contact with the pulvinus is more or less chitinized to form a continuous or broken semi-circle which supports the tissue of the pulvinus. She added that the ischnoceran head differs from the *Amblycera*

in extension of the anterior region of the head and enlargement of the clypeolabral suture to form a pad of tissue (= the pulvinus of Cope, 1940).

The present investigation adds more detailed information regarding the fine structure of the head of *C.meleagridis* using SEM.

- **Mandible:** According to *Clay (1950)*, the region of the head in front of the mandible is elongated, in *Ischnocera*, but the mandibles are near the anterior margin of the head in *Amblycera*. That is in agreement with the present work in *C.meleagridis*. where the elongate of the pre-antennal region the head.
- **Labium:** The present investigation on *C.meleagridis* clarifies the exact shape of labial palp, which is difficult to examine by the light microscope . It is different in shape and number of sensilla from *Bovicola* (*Tricho-dectidae: Ischnocera*) as reported by the author (1997 and 2001) using SEM.
- **Sitophore = Oesophageal Sclerite:** A true key character of all Psocodea is the sitophore (mortar or shavel) a unique derivation of the hypopharyngeal sclerite (Matsuda, 1965). In an early investigation, Cummings (1914) described the oesophageal sclerite, cushion, as usual in the *Goniodidae*, well developed. A round blob of dark chitin is situated in the middle of its anterior margin.

The present work clarifies that the exact shape of sitophore in *C.meleagridis*, is clear using KOH in whole mount preparations. It takes large size and distinct shape, and differs from those in the following species: *Columbicola columbae* (*Philopteridae: Ischnocera*), *Bovicola* spp. (*Trichodectidae: Ischnocera*) and *Heterodoxus spiniger* (*Boopiidae: Amblycera*) by author in 1998, 1999 & 2001 respectively. That may prove to be of taxonomical and morphological values.

- **Antenna (Sense Organs):** *Lyal (1985b)* noticed that the expansion of the scape in the male to house the enlarged musculature is found in many Ischnocera and Anoplura. That is clear in *Columbicola columbae* (Ischnocera) using SEM to show sexual dimorphism (*Kossa, 1998*).

In the Philopteridea- Ischnocera, there are five antennal segments, the organ on segment 5 comprises two of saucer-like sensilla and a third sensillum with a central cavity containing the sense peg; the whole sometimes surrounded by a number of grooves. The position of these three sensilla relative to one another may prove to be of taxonomic value as in *Goniodes lagopi* and *Naubates prioni*. On segment 4 there is a similar organ, but this has only one of the saucer like sensilla (*Clay, 1970*). The type and distribution of sense organs in the present work in *C.meleagridis* on the 4 and 5th antennal segments are previous examples and in agreement with Clay.

Clay added that in at least some of the Anoplura (eg. *Haematopinus tuberculatus*), the sense organ on segment 5 is similar to that found in the Ischnocera in having a cavity and two saucer-like areas with internal ridges, each area and the whole group being surrounded by a number of grooves. And the distribution of sensilla in Amblycera are similar to those in other Ischnocera.

In case of *Bovicola* the sense organs are constricted on segment three (last segment) that is in agreement with *Clay (1970); Prieto, et al., (1991)* and *Kossa (2001)*.

- **Legs:** According to Clay (*1970*) *all* Amblycera have two tarsal claws with the exception of the Gyropidae. That is in agreement with *Kossa (1999)* on *Heterodoxus spiniger* (Amblycera:Boopiidae). *Keler (1957)* figured and compared many kinds of legs, as *Stenocrotaphus pelatus* (Goniodidae-Ischnocera) which represent one of the most resemblance

example to Chelopistes in the present work as a general parasitic lice on birds (in having two claws).

Clay(1969) in her work on the key to the genera of the Menoponidae-Amblycera, explained that the pad - like structures along the inner side of the claw can be considered as pulvilli.

Examination of this pad with SEM in the present work on *C. meleagridis* suggests that the general form of this part with two claws, may prove to be a diagnostic character to the leg in avian lice. That also is similar to that in *Columbicola columbae* ectoparasites on pigeons, in having two long smooth claws but with two small pads.

- **Genitalia: Hopkins (1949)** indicated that the different morphological evidence, gonapophyses in the female lice are found in Rhyncophthirina, Anoplura and Trichodectidae, but are absent in all other Ischnocera (except *Osculotes*) and Amblycera.

Ferris (1951) considered that the tufts of setae or lobes each side of gonapophyses of that segment.

The various lobes and processes on the venter of the posterior segments in some genera in the Ischnocera may be vestiges of gonapophyses as described by Ferris for the Anoplura. Lice parasitic on mammals seem to retain or develop gonapophysis like structure (Clay, 1970).

According to Kossa (1998) female genitalia in *Columbicola columbae*, showed no indication for the presence of gonopods. That is similar to that in the present work on Chelopistes (*Goniodidae*-Ischnocera). This may be due to the observation that female lice parasitic on birds seems to reduce gonapophysis.

ABBREVIATIONS

A	articulation	Mu	Muscles
Ac	anterior of clypeus	P	Pulvinus

As	Antennal segment	P	Penis
C	Claw	Pa	Pad
Cmp	chitinized margin of pulvinus	Pl	pleura
Co	conus	Ps	Placodea sensillum
Cs	coeloconica sensillum	S	Sensilla
Cx	Coxa	Si	Sitophore
E	eye	Sp	sternal plate
Gp	genital plate in female	St	Sternum
L	labrum	T	Temporal angle
La	labium	Ta	Tarsus
Li	Lingual sclerite	Ti	Tibia
Lp	labial palp	Vc	ventral of clypeus
M	Mandible		

- *Chelopistes Meleagridis* Explanation Of Figures :-

- Fig.1 ventral view in female. x450.
- Fig.3 pulvinus & labrum. x466.
- Fig.5 marginal of clypeus.
- Fig.7 sitophore & lingual sclerites.
- Fig.9 pad, enlargement (fig.10) x4000.
- Fig.10 antenna-male x330.
- Fig.12 antenna-female x364.
- Fig.13 sense organs, enlargement of fig.13. x3600.
- Fig.16 female genitalia x147.
- Fig.17 lateral view in abdomen x346.
- Fig.15 male genitalia x404
- All figures SEM. Except, figs. 5,6,7. Light m. 40x12.5.
- Fig.4 labial palp x4200.
- Fig.2 mandible x605.
- Fig.6 ventral clypeus
- Fig.14 thc
- Fig.8 leg x900.
- Fig.11 end of antenna x4280.

REFERENCES

- *Aguirre, U.L., Iozoya, S.A., Quinones, L.S., & Guerrero, R.N., (1991):* Mal-lophaga of domestic birds in southeastern Coahuila, Mexico, *Folia, Entomo-logica-Mexicana* 82:93105; publ.1992.

- **Barker, S.C. (1994):** Phylogeny and Classification, origins, and Evolution of host associations of lice. International Journal for Parasitology, vol.24, no.8, pp. 1285 - 1291.
- **Clay,T. (1950):** An Introduction to a classification of the Avian Ischnocera (Mallophaga): part 1.Trans. R.Ent. Soc. Lond., 102:171 - 195.
- **Clay,T. (1969):**A key to the genera of the Menoponidae (Amblycera: Mallophaga: Insecta) Bull. Br. Mus. Nat. Hist.(Ent.) 24 : 1 - 26.
- **Clay,T. (1970):** The Amblycera (Phthiraptera, Insecta) Bull. Brit. Mus. Nat. Hist. Ent 25(3):75 - 98.
- **Cope,O.B.,(1940):** The morphology of Esthiopterum diomedae (Fabricius) (Mallophaga). Microentomology 5,117 - 142.
- **Cumming,B.F.,(1914):** Descriptions of five new species of Anoplura and Mallophaga. Bull.Ent.Res.,2,155 - 177.
- **Ferris, G.F.(1951):** The sucking lice. Memoirs of the Pacific Coast Entom-ological Society 1: 320 pp.
- **George,J.B.,Otoho,S., and Ogunleye,J.,(1992):** Louse and mite infestation in domestic animals in northern Nigeria. A dediminiyi B Trop Anim Health Prod.May;24(2):121 - 4.
- **Hocking, C.H.F. (1940):** The host associations of the lice of 4.
- **Keler, S.T.V. (1957):** Uber die deszendenz und die differenzierung der Mal-lophagen. Z. Parasitenk., Bd., 18: 55 - 160.
- **Kossa, F.I.,(1997):**Comparative morphological studieson Anoplura and Ma-llophaga using light and scanning electron microscopy (Head &Leg).J.Unio Arab Biol.,Cairo,8(A):333 - 353.
- **Kossa, F.I.,(1998):** Scanning electron microscopy of the pigeon louse Colu-mbicola Columbae (Linnaeus,1758). J. Unio Arab Biol., Cairo, Zoology., 5th International Conference ,vol.10(A), 537 - 551.

- **Kossa, F.I.,(1999):** Specific characters of *Heterodoxus spiniger* ectoparasite on dogs in Egypt(*Amblycera-Boopiiidae*)using electron microscopy. *J.Egypt. Ger.Soc.Zool.*,vol.30 (E) ,97 - 107.
- **Kossa, F.I.,(2001):**A comparative study on the species of the genus *Bovicola* (*Ischnocera:Trichodectidae*)ectoparasitic on farm animals in Egypt.Using SEM. *J. Unio Arab Biol., Cairo, Zoology.*, 8th International Conference ,vol.15(A) 107 - 122.
- **Lyal. C.H.C.(1985b):** A cladistic analysis and classification of *Trichodectidae* mammal lice (*Phthiraptera- Ischnocera*). *Bull. Brit. Mus. (Nat. Hist.) Ent.* 51 (3): 187 - 346.
- **Madbouly,M.H.,(1961):** Studies on morphology, taxonomy, and host distri-bution of *Mallophaga* (Bird-lice) in Egypt.B.SC Faculty of Science Cairo University Egypt. U.A.R.
- **Matsuda, R.,(1965):** Morphology and evolution of the insect head. *Mem. Am. Entomol. Inst.* 4:1-334.
- **Prieto, O.H.; Cicchino. A.C.; Abrahamovich, A.H. and Nunez, J.L. (1991):** Lice *Phthiraptera* parasites of cattle and pigs. Current status of knowledge and prospects for management and control, part 1:generalities,classification and specialized structures of the head. *Revista-de Medicina Veterinaria Buenos Aires* 72:4,154-174;156 ref.
- **Symmons,S.,(1952):** Comparative anatomy of the *Mallophga* head. *Trans. Zool. Soc.London.*,27: 349 - 436.







