Egyptian Journal of Biological Pest Control, 15(2), 2005, 67-69

Structure and Function of the Forewing Coaptations in the Predaceous Water Bug, *Lethocerus niloticus* (Stal) (Hemiptera; Belostomatidae)

Tawfik, M. F. S.
Center of Biological Control, Faculty of Agriculture, Cairo University
(Received, June 28, 2005; Accepted, July 30, 2005)

ABSTRACT

The giant water bug *Lethocerus niloticus* (Stal) is commonly found in Egypt inhabiting fresh or slightly brackish shallow water ponds and rice fields. In such habitats, the bug feeds on most of the aquatic animals that haunt the same places and remain most of its life in water depending in respiration on an air storage found dorsally between body terga and the closed hemelytra. These structures are firmly fitted to the body by some locking arrangements termed in this study as coaptations. One of these coaptations serves in the same time as wing- coupling apparatus during flight. The structures are described in details.

Key Words: *Lethocerus niloticus* (Stal), Wing coapitations, Structure, Function.

INTRODUCTION

The natural habitat of the predaceous water bug, *Lethocerus niloticus* (Stal) was described by Tawfik (1953) with a survey of aquatic insects that live there and the aquatic plants on which the bug haunts.

It is rather difficult to spread the closed hemelytra as it is felt that they are firmly fitted to the body by some locking arrangements. For such arrangements Leconte, as Hamilton cited (1931), use the term of "coaptations". The purpose of such coaptations is to build a subelytral cavity used to store air for breathing.

There are four different ways by which forewing coaptations are carried out in *Lethocerus* and are described bellow.

DESCRIPTION

The fore wings or hemelytra cover the dorsum of the abdomen (Fig. 1). Each hemelytron is somewhat triangular in shape, rather narrow, and more elongated (Fig. 2a). When the hemelytra are at rest, their clavus lie just behind the scutellum as a posterior border. The remaining part of the sclerotized basal portion is composed of two regions: the corium and the embolium. This latter is a narrow stripe occupying the costal region. The distal part of the hemelytron is quite membranous and is clearly veined. The venation is uniform and does not show any individual variation in contrast with the case of *Sphaerodema rusticum* Fabr. (Presswalla and Goerge, 1936). The membranous area has two different shades according to transparency. About two-thirds of the area is darker than the remaining narrow border which is thinner and more transparent.

Coaptation No.1

The lateral margins of the mesothoracic scutellum, as previously mentioned, form a groove into which the thick rim of the clavus is fitted (Fig. 2b).

This coaptation is found in most aquatic bugs. Hamilton (1931) found in one specimen of *Nepa cinerea* a case in which the inner margins of the clavus were nearly fused with the sctellum; to free the hemelytron, the clavus has to be torn from the corium. The basal angle of the clavus is round and it projects slightly forward to slip under the posterior border of the pronotum.

Coaptation No.2

Hamilton (1931) used the term "press fastener" coaptation for this type of locking arrangement. Taylor (1918) was the first who discovered this coaptation in *Belostoma smericana*. Presswalla and Goerge (1936) described same coaptation in *Sphaerodema rusticum*.

On the ventral surface of each hemelytron, in *Lethocerus*, a chitinized tube which ends with a socket-like cavity extends along the base of the narrow embolium. Presswalla and Goerge described a similar socket in *Sphaerodema* that lies between the embolium and the corium. Into this socket, the button or "the lmob-like projection" which arises near the end of the projecting epimeron of the mesothorax is pressed (Fig. 2a & b). The inner edge of the chitinized tube fits into the lateral depression of the mesothoracic postalare. The outer margin of the mesothoracic epimeron fits into a groove at the base of the hemelytron, between the outer margin of the chitinized wall tube and the costal margin.

Coaptation No.3

The hemelytra are also locked to each-other by another locking arrangement (Fig. 3).On the dorsal side of each hemelytron very near to the posterior angle of the clavus, there is a small elongated triangular chitinous projection, which forms a small longitudinal notch on the margin of the wing at this place. When the hemelytra are interlocked, the chitinous projection fits into the notch on the other side.

Presswalls and Goerge (1936) described an exact coaptation in *Sphaerodema*. They also found another coaptation in *Sphaerodema* which is completely absent in *Lethocerus* due, in agreement with their explanation, to the opening of its wings for flight very often.

Coaptation No.4

Lethocerus possesses a wing-coupling apparatus to make use of it in its flight and this apparatus represents a fourth form of coaptation (Fig. 4). Poisson (1932) was the first author to draw attention to the existence of wing-coupling apparatus in Heteroptera as cited by Presswalls

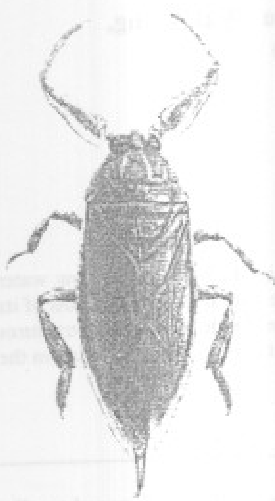

Figure (1): Adult of *L. niloticum*

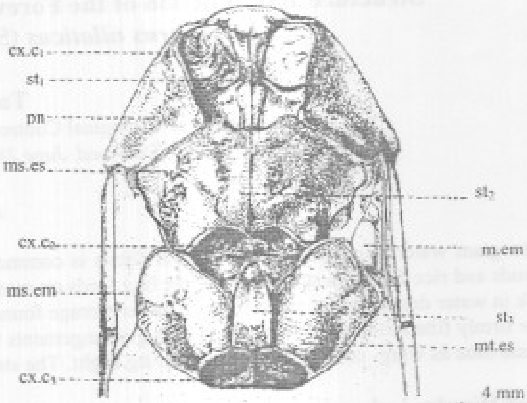

Figure (3a): Ventral aspect of thorax. cx.c1, cx.c2 and cx.c3, pro-, meso- and metathoracic coxal cavities; ms.em and mt.em, meso- and meta thoracic epimeron; ms.es amd mt.es, meso- and metathoracic episternum; pn, pronotum; st1, st2 and st3, pro-, meso- and metasternum.

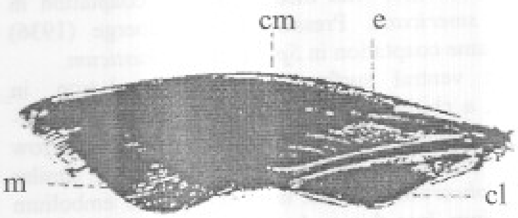

Figure (2a): Hemelytron of *L. niloticum*. cl, clavus; cm, corium; eb, embolium; m, membrane

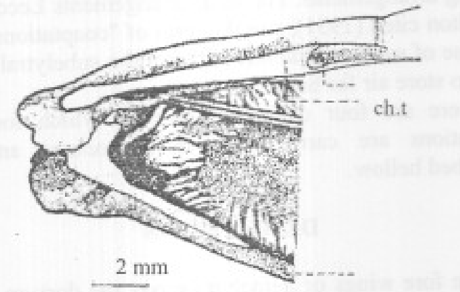

Figure (3b): Ventral aspect for base of hemelytron. c.1a, coaptation No.1- curved margin of the clavus; ch.t; chitinous tube; sk, c.2a, coaptation No.2- socket on the hemelytron.

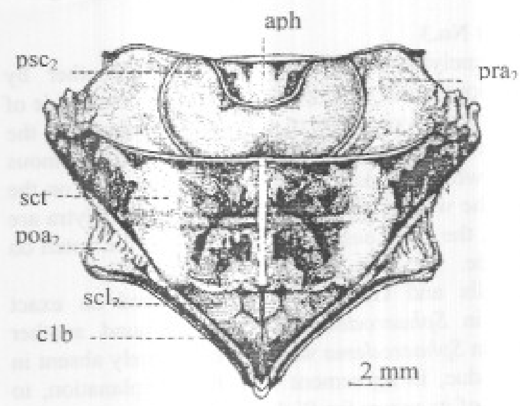

Figure (2b): Dorsal aspect of mesothorax. Aph, anterior phragma; c1b, coaptation No.1 groove on the scutellum; poa2, mesothoracic postalre; pra2, mesothoracic prealare; psc2, mesothoracic prescutum; sct2, mesothoracic scutum; scl2, mesothoracic scutellum.

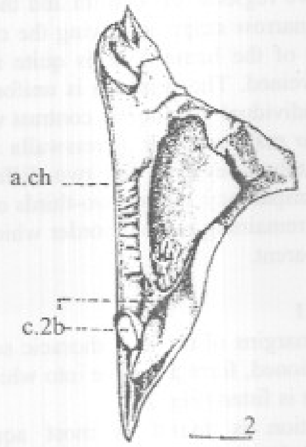

Figure (3c): Dorsal aspect for the mesothoracic epimeron. a.ch, air channel; e.2b, coaptation No.2-press-button; r, longtudinal ridge.

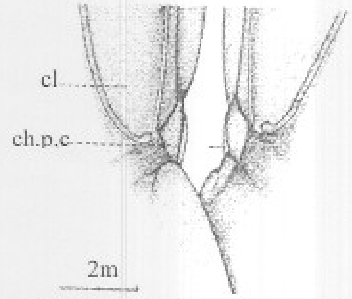

Figure (4): Coaptation No.3. ch. p, c3, Coaptation No.3- interlocking chitinous projection on posterior angle of the clavus; n, notch.

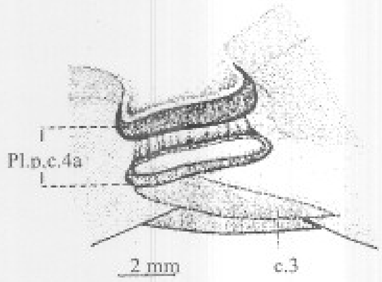

Figure (5a): Coaptation No.4;wing coupling apparatus.pl.p, c.4a, coaptation No.4-two parallel projections on the hemelytron; c.3, coaptation No.3.

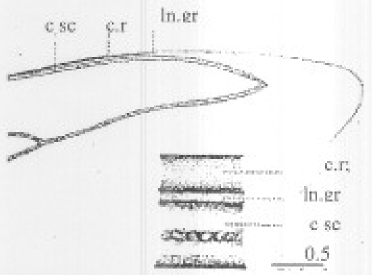

Figure (5b): Coaptation No.4; wing coupling apparatus. cr,c.4b, coaptation No.4- costal ridge, in. gr, inner groove; c. sc, costa + subcosta.

and Goerge (1936). The latter authors described similar coaptation in *Sphaerodema rusticum*. Hamilton (1931) stated that this coaptation, in *Nepa cinerea*, is week and it does not seem essential that this bug should have them fixed together for flight.

On the ventral surface of the posterior angle of the clavus and very close to the place of coaptation No. 3, there are two small parallel projections (Fig. 5a). The outer projection is round and faces the other projection. The costal margin of the hind wing, near the apical angle, is thick and slightly turned upward. Behind each costal ridge there is a longitudinal groove (Fig. 5b) interlocked with the projections of the clavus of its side causing the hind wing to be held in position for flight once the hemelytra are put to work. This mechanism enables the projections of the clavus to run cross way along the costal groove of the hind wing in response to flight movement. They reach the end of the groove at full stretch and return to the apical angle when the hind wing is folded and so causing the two wings to be separated. Same type of wing-coupling apparatus was previously reported for different Heteropteran bugs. By Tawfik (1962).

REFERENCES

Hamilton, Marion A. 1931. The Morphology of the water Scorpion, *Nepa cinerea* Linn. Proc. Zool. Scc. London pp. 1067-1136.

Poisson, 1932. Cited by Prsswalla and Goerge (1936).

Presswalla, M. J. & G. J. Goerge. 1936. The Morphology of *Sphaerodema rusticum* Fabr. J. Univ. Bom. Vol. IV, part V.

Taylor, L. H. 1918. Thoracic sclerites of Hemiptera. Ann. Ent. Scc. Amer. XI pp. 225-249.

Tawfik, M. F. S. 1953. The External Morphology and Life History of the Giant water Bug *lethocerus niloticus* Stal. M. Sc. Thesis, Faculty of Agriculture, Cairo University, 271pp.

Tawfik, M. F. S. 1962. The wing-coupling apparatus in Hemiptera- Heteroptera, Bull. Soc. Ent. Egypte. XLVI, pp. 505-510.