

THE ABDOMINAL NERVE GANGLIA OF SOME CARABIDAE (COLEOPTERA) OF IRAQ

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ABSTRACT

The abdominal nerve cord of some species of Iraq Carabids has been studied to evaluate the variation in the number of the abdominal ganglia among the species and to find out relation of these variations with the classical taxonomy of the family Carabidae into tribes.

INTRODUCTION

Brandt (1879) found that there are some differences in the number of the abdominal nerve ganglia in the different families of Coleoptera. All the species were found to have supra and infra Oesophageal centers, three thoracic separated ganglia and number of abdominal nerve ganglia in which the first one is fused or very close to the metathoracic ganglia. The last abdominal nerve centre is larger than the other ganglia, representing the fused hind ganglia.

It is usually elongated giving several nerves laterally and posteriorly as the number of the free abdominal ganglia decreases among the tribes the last nerve mass in the nerve cord increases in size.

Jeannel (1941) elevated the classical tribes of Carabidae into families based only on the number of the penultimate segment of the labial palp. While Lindroth (1960) believed that there is a close relation of the external characters of these tribes. Ali (1966) made keys for the tribes, genera and species of the Carabidae of Iraq comprising 229 species. The higher classification of this family still in some confusion. Many supertribal names have been proposed by different authors and all have been based merely on the external characters. Ali (1967) showed that no single character in the internal anatomy of adult Carabids have been found to support the classical sub-families Carabinae and Harpalinae or any of other proposed groups above the tribal level.

The present work has been conducted on 13 species of Iraq Carabid, collected from different localities to further knowledge in finding the correlation between the external features of this group of insects and their internal characters, in this case form of the abdominal nerve cord. (Fig. 1).

MATERIALS AND METHODS

Specimens were collected from the field mostly by pit fall. They were identified by the author. Some of the trapped were both of sexes while others were only of one sex. They were kept in 70% alcohol and many of them were dissected directly. After removal of wings and legs including the coxae, the metanotum was taken off. The abdominal terga and sterna were then removed to expose the internal system and to clear them from the fat body. After this prothoracic pleura were out and the pronotum was removed, then the thoracic sterna were separated from their respective ganglia, followed by dissection of the head. Diagrams were made with the aid of an ocular grid and squared paper Measurements were done with an ocular micrometer.

The abdominal nerve ganglia

Species studied:

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| | 1- Tribe Carabini |
| 1- <i>Calosoma auropunctatum</i> (Herbst) | |
| 2- <i>Carabus elivieri</i> Dej | |
| | 2-Tribe Notiophilini |
| 3- <i>Notiophilus aquaticus</i> (Fourc.) | |
| | 3-Tribe Bembidiini |
| 4- <i>Bembidion megalpilum</i> Walk. | |
| 5- <i>Bembidion niloticum</i> Dej. | |
| | 4-Tribe Harpalini |
| 6- <i>Acinopus khalisensis</i> Ali. | |
| 7- <i>Acinopus laevigatus</i> Hentr. | |
| 8- <i>Acupalpus mesopotamicus</i> Ali. | |
| 9- <i>Ophonus cribrellus</i> Reiche. | |
| 10- <i>Harpalus oaiphus</i> Reiche. | |
| | 5-Tribe Chlaeniini |
| 11- <i>Chalenius coeruleus</i> (Stev.) | |
| 12- <i>Chalenius flavipes</i> Menetr. | |
| 13- <i>Chalenius richardsi</i> Ali. | |

RESULTS

Carabus and *Calosoma* have four free ganglia between the first, which fused with the metathoracic ganglion and the posterior mass. This is found to be the most generalized case among all the genera studied in the present work. Both genera represent the tribe Carabini, which is considered by all worker of this group as the most primitive tribe in Carabidae.

Although the tribe Notiophilini is based on the unique type of striation of the elytra, it has a very peculiar type of reproductive system (Ali, 1967). The position of this tribe among the sub-family Carabinae is uncertain since the number of free abdominal ganglia is reduced to three and the reproductive organs are peculiar.

In the tribe Bembidiini it seems that there is a maximum case of specialization in the nervous system in which all the abdominal ganglia except the first, which is fused, with the last thoracic ganglion form one mass. This reduction in the number of the abdominal ganglia may be induced by the small size of the insect body.

The genera *Bembidion*, *Tachys* and *Asaphidion* which form the tribe Bembidiini have also a unique type of the female reproductive organs (Ali, 1967). This suggest that the tribes Bembidiini and Trechini should be put among the highly specialized Carabidae. *Chlaenius* was taken as a typical example for the tribe Chlaeniini in this work. This genus comprises a large number of species arranged in many subgenera. The present of only two free ganglia between the fused posterior ones and the first abdominal which is united with metathoracic ganglia suggests that this tribe is nearer to the Amarini and Pterostichini. From the point of the external morphology these tribes are very near to each other and they have been separated only on the basis of the number of setae in the penultimate segment of labial palp. There are some important variations in the abdominal ganglia of nervous system exhibited in the nerve cord of Carabidae. The most generalized type is found in the tribe Carabini where four free abdominal ganglia are present. In all the tribes studied in this work it seems that the first ganglion belonging to the first abdominal segment is fused with the metathoracic ganglion. (fig. 1).

It is found that the number of abdominal ganglia is reduced in some genera among this family and this reduction may be correlated with evolutionary status of these tribes. The following grouping of abdominal ganglia may help in the separation of some tribes of the

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family Carabidae:

- 1-Four free and well separated abdominal ganglia present between the first which is fused or close to the third thoracic ganglion and posterior fused ganglia..... Carabini
- 2-Three free abdominal ganglia present in the nerve cord Notiophlini
- 3-Two free abdominal ganglia present between the first and the fused posterior ones Chlaeniini + Amarini
- 4-The abdominal nerve cord with a single ganglion between the first and the fused posterior ones..... Harpalini
- 5-All the abdominal ganglia except the first, which fused to the third thoracic one fused together forming a single mass Bembidiini.

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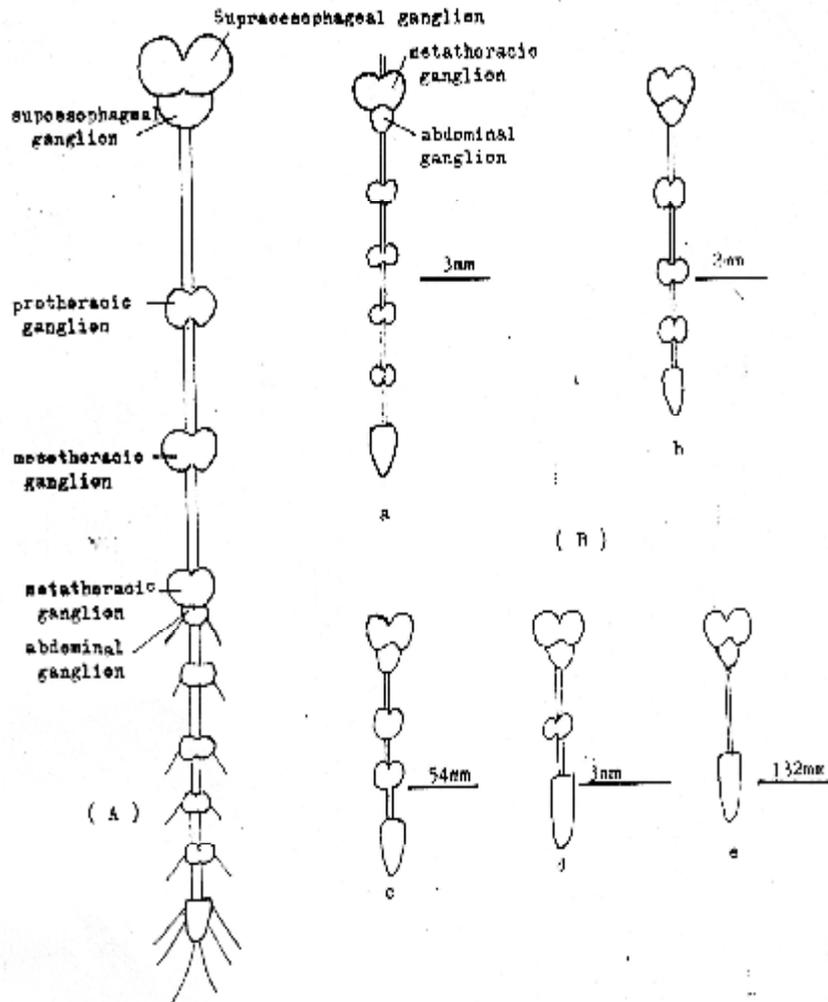


Fig. I : Central nervous system and abdominal nerve cord of certain tribes of family Carabidae
 A- The central nervous system of Carabini
 B- The abdominal nerve cords of :
 (a) Carabini (b)Notiochilini (c) Chlaeniini + Anarini
 (d) Harpalini (e) Bembidini