Beitr. Ent.	Berlin	ISSN 0005-805X
43(1993)1	S.119-122	19.04.1993

Karyotype and male internal Reproductive System of Aetalion Reticulatum L. (Aetalionidae, Cicadelloidea, Cicadina): Phylogenetic Aspects

With 6 Figures

VALENTINA G. KUZNETSOVA & VERA I. KIRILLOVA

Zoological Institute, Academy of Sciences, 199034 Leningrad

Abstract

The first information concerning karyotype characteristics and structure of male internal reproductive system for the most primitive cicadelloid family Aetalionidae has been obtained. The data are discussed from the phylogenetik point of view.

Zusammenfassung

Die ersten Angaben über Anatomie des männlichen Geschlechtssystems und Karyologie der Familie Aetalionidae, der primitivsten zwischen den Cicadelloidea, sind erhalten. Die Männchen von *Aetalion reticulatum* L. haben 9 Follikel in jedem paarigen Testis, Ahnansdrüsen kurz, offensichtlich von zusammengewickelten Tubuli geformt, 2n=21, XO. *Tolania opponens* WALK.? (*Tolania* ist eine primitive Gattung von unklarer systematischer Stellung) hat 8 Follikel, 2n=21, XO. Ein solcher Karyotyp ist auch bei anderen primitiven Vertretern der Cicadelloidea gefunden und als ein ursprüngliches für die Superfamilie angesehen (EMELJANOV, KIRILLOVA, 1989). Diese Ansicht ist durch unsere Angaben bestätigt.

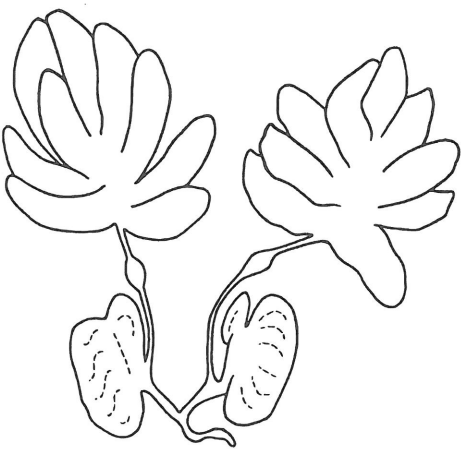
Summary

The first data on anatomy of male reproductive system and karyology of the family Aetalionidae, the most primitive one among the Cicadelloidea, have been obtained. Males of *Aetalion reticulatum* L. have 9 follicles in each of the paired testes, short accessory glands apparently fromed by twisted tubules, 2n=21, XO.
Tolania opponens WALK.? (a species of a primitive genus of an uncertain tyxonomical position) has been found to have 8 follicles and 2n=21, XO. Such a karyotype, earlier found in other primitive representatives of the Cicadelloidea is regarded as the initial one for the whole superfamily (EMELJANOV, KIRILLOVA, 1989). The last view is supperted by our data.

Karyotypes of more than 300 species belonging to four families of the superfamily Cicadelloidea are known. Based on analysis of the karyological data, an assumption was made, that 2n=22 is initial in the evolution of the superfamily, since this chromosome number is predominant in primitive families Membracidae, Ulopidae, Ledridae and in primitive members of the most advanced family Cicadellidae (EMELJANOV, KIRILLOVA, 1989).
No members of the Aetalionidae, the most primitive family among the Cicadelloidea (EVANS, 1946; EMELJANOV, 1987), has been karyotyped before our study.
The family Aetalionidae includes 8 genera and about 50 species, which are subdivided in two subfamilies: the most primitive Aetalioninae and the advanced Darthulinae. We have studied the karyotype of *Aetalion reticulatum* L. (Aetalioninae).
Also data on the structure of reproductive system in males for this species have been obtained. Such data having phylogenetic importance (EMELJANOV, KUZNETSOVA, 1979; KUZNETSOVA, KIRILLOVA, 1990) were lacking previously for Aetalionidae.

DOI: 10.21248/contrib.entomol.43.1.119-122

The insects were collected on our request by Dr. LUKO HILJE in Costa Rica directly from their host plants into mixture of three parts of ethanol to one part of glacial acetic acid and kindly sent to us. Nine specimens have been studied. The testes of adult males are located in 2-5 abdominal segments. Each testis consists of 9 whitish follicles (Fig. 1). The follicle is oval and is connected with the vas



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deferens through a narrow canaliculus (vas efferens). The vas deferens is in form of a narrow tubule. In some individuals spherical vesicles can be seen in the middle part of the vas deferens. Accessory glands paired, compact. Sometimes a loop-shaped tubular structure is observed in the accessory glands, apparently the glands are formed by twisted tubules. The ducts of accessory glands open into the lower part of the vas dererens. The ejaculatory duct is thin, bent, it opens into aedeagus.

Literature data on the structure of the reproductive system in primitive representatives of the Cicadelloidea are very scanty (IVANOV, 1926). Therefore it is not possible to trace any evolutionary tendency for this group as it has been done for the Fulgoroidea (EMELJANOV, KUZNETSOVA, 1979; KUZNETSOVA, KIRILLOVA, 1990). It may be supposed that, whereas in the evolution of the Auchenorrhyncha the initial number of seminal follicles was equal to 7 (EMELJANOV, KUZNETSOVA, 1979), their number was polymerized in *A. reticulatum*. The shape of accessory glands in *A. reticulatum* is apparently secondary. In the Gargara genistae, only representative of the closely related family Membracidae studied from this point of view, accessory glands are long, tubular (IVANOV, 1926). This particular shape of the accessory glands was in all probability initial in the Fulgoroidea. Tendency towards shortening of accessory glands and their differentiation into section is ovserved in the evolution of Fulgoroidea (KUZNETSOVA, KIRILLOVA, 1990).

Males of A. reticulatum have 2n=21,XO (6 specimens have been examined). Hence females should have 2n=22,XX. The male karyotype includes 10 pairs of autosomes and one univalent sex chromosome. All autosomes are gradually decreasing in size; sex chromosome is close to the shortest autosomes in its size (Fig. 2). In the metaphase of the first maturation division (MI) there are 10 bivalents and one univalent X-chromosome (Fig. 3). Therefore the above assumption (EMELJANOV, KIRILLOVA, 1989) that 2n=22 was initial in the evolution of the Cicadelloidea is confirmed.

Data on karyotypes of species of the genus *Tolania* STÅL also support this view. Position of this genus in the system of the Cicadelloidea is vague: it is placed either in Aetalionidae (METCALF, WADE, 1965) or in Nicomiidae (EVANS, 1946) or in Membracidae (STRUMPEL, 1983). EARLIER HALKKA

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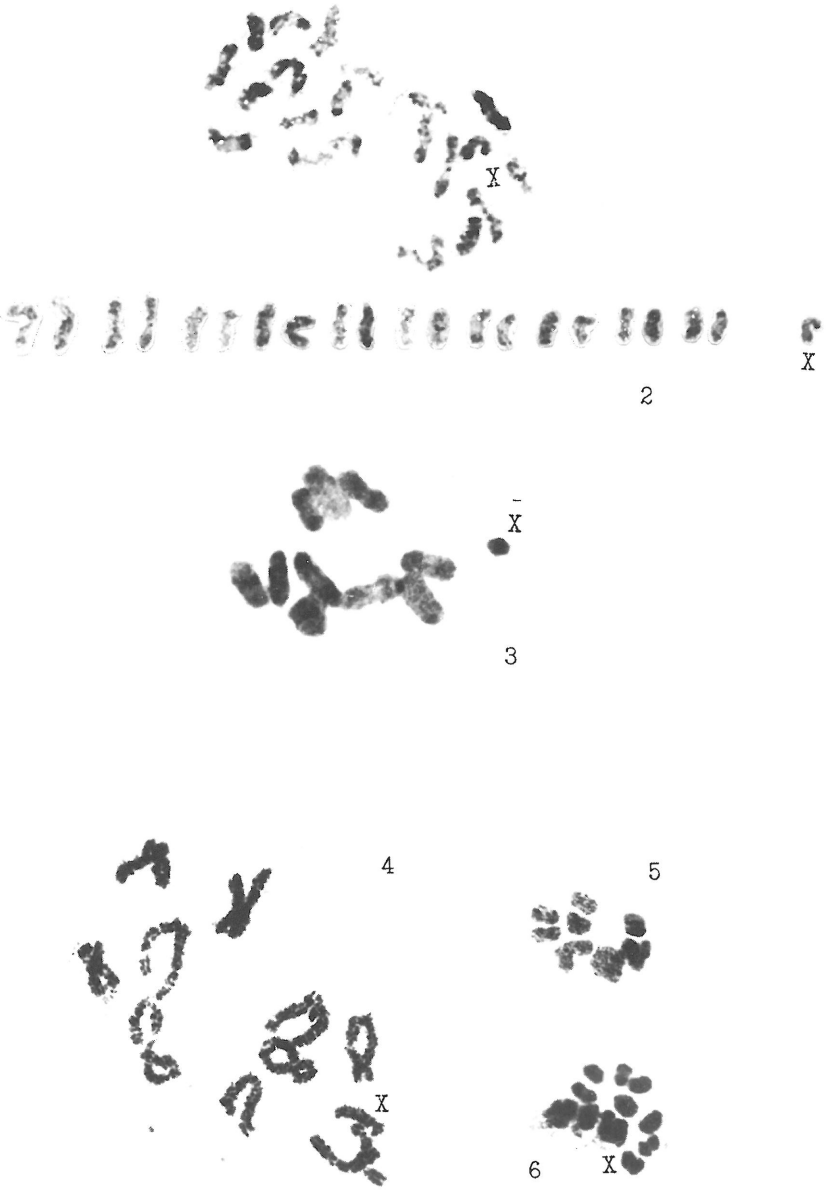

Fig. 1-3: *Aetalion reticulatum* L., ♂: internal reproductive system (**1**, see p. 120); mitotic metaphase and karyogram, 2n=21,XO (**2**); metaphase of the first maturation division (MI), n=11(10+X) (**3**).
Designations: f - seminal follicles, v.s. - seminal vesicle, g.a. - accessory gland, X - sex chromosome
Fig. 4-6: *Tolania opponens* WALK.?, ♂: prophase (diakinesis) of the first maturation division, n=11(10+X) (**4**); metaphases of the second maturation division (MII) with n=10 (**5**) and n=11 (10+X) (**6**) accordingly.

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(1963) reported on the chromosome number (but not karyotype structure) in *T. fraterna* STAL. (=*T. obtusa*) from Panama. The only male studied by him had 2n=21,XO. We have studied the karyotype of *Tolania opponens* WALK.? from Mexico. Material collected and fixed for us in Mexico by Dr. KERZHNER (Zoological Institute, Leningrad) contained one male of this species. Testes consist of 8 follicles. Follicles are small, sperical packed closely in 2 parallel rows, 4 in each.
In the karyotype of *T. opponens* WALK.? 2n=21,XO as in *T. fraterna*. The structure of karyotype is similar to that of *A. reticulatum*. Ten bivalents and one univalent X-chromosome are observed in diakinesis (prophase of the first maturation division) (Fig. 4). In bivalents one to three chiasmata are seen. The first maturation division is reductional for all chromosomes, therefore there are two types of metaphases II (the second maturation division): with n=10, i.e. only autosomes (Fig. 5) and with n=11, i.e. 10 autosomes and X-chromosome (Fig. 6), accordingly.

Acknowledgements

The authors would like to express their gratitude to Dr. HILJE and Dr. KERZHNER for the material lended, to Dr. EMELJANOV for his interest and valuable discussions.

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DOI: 10.21248/contrib.entomol.43.1.119-122