

A chromosomal analysis of eight Mediterranean species of *Philaenus*

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Abstract

The occurrence of chromosome variation among Mediterranean species of the genus *Philaenus* and the presence of four groups differing in karyotype was demonstrated. The observed chromosome groups in general agree with the division into the “*spumarius*” and “*signatus*” species groups proposed on the basis of morphological features.

Key words: Karyotype, type of sex determination, *Philaenus*.

Introduction

Among Hemiptera the suborder Auchenorrhyncha is a diversified group, rich in species. In the family Aphrophoridae (Cercopoidea), to which the genus *Philaenus* belongs, karyotypes of only 23 species from 10 genera have been described. In Auchenorrhyncha, the differences in numbers of chromosomes more often occur between genera only, while species belonging to the same genus are characterized by identical chromosomal sets (Kirillova, 1986; Emelyanov and Kirillova, 1991).

Until recently, the genus *Philaenus* was considered to include three species: the widely distributed *Philaenus spumarius* (L. 1758) and the Mediterranean species *Philaenus signatus* Melichar 1896 and *Philaenus tessellatus* Melichar 1889. The latter, with unclear taxonomic status, has been regarded also as synonym of *P. spumarius*. In the 1990s intensive studies of the genus *Philaenus* were undertaken and showed that in Mediterranean region there occur eight species (Drosopoulos and Asche, 1991; Loukas and Drosopoulos, 1992; Abdul-Nur and Lahoud, 1996; Drosopoulos and Remane, 2000; Remane and Drosopoulos, 2001; Drosopoulos and Quartau, 2002). Morphological studies on male genitalia indicated the presence of two taxonomic groups within the genus *Philaenus*: the “*spumarius*” group consisting of *P. spumarius*, *P. tessellatus*, *Philaenus loukasi* Drosopoulos et Asche 1991 and *Philaenus arslani* Abdul-Nour et Lahoud 1996, and the “*signatus*” group with *P. signatus*, *Philaenus italosignus* Drosopoulos et Remane 2000, *Philaenus maghresignus* Drosopoulos et Remane 2000 and *Philaenus tarifa* Remane et Drosopoulos 2001. At the same time, electrophoretic studies of enzyme loci undertaken for a few populations of *P. spumarius*, *P. signatus* and *P. loukasi* from Greece did not support the mentioned relationships, indicating that *P. spumarius* and *P. signatus* are more closely related while *P. loukasi* represents a separate group (Loukas and Drosopoulos, 1992).

These studies showed that, besides the very widely spread species *P. spumarius*, there is a group of seven other species, sympatric with *P. spumarius* though allo-

patric to each other: *P. signatus*, *P. loukasi*, *P. arslani*, *P. maghresignus*, *P. italosignus*, *P. tarifa* and *P. tessellatus*.

Recently, detailed chromosome analyses were undertaken for *P. spumarius* (Kuznetsova *et al.* 2003) and *P. arslani* (Maryańska-Nadachowska *et al.*, 2008). The aim of this paper is to compare karyotypes of eight species of *Philaenus* in the Mediterranean region.

Materials and methods

Insects were collected in Spain, Portugal, Italy (Sicily), and Greece. The gonads of males were dissected and fixed according to the standard method in the mixture of ethyl alcohol and acetic acid in proportions 3:1. The cytological slides were prepared from gonad tissues. The following methods of chromosome staining were used: standard Feulgen-Giemsa, C-banding, AgNOR-banding, DNA binding fluorochromes chromomycin A₃ (CMA₃) and 4'-6-diamidino-2-phenylindole (DAPI) (for details: Kuznetsova *et al.*, 2003). Analyses of chromosomes, processes of spermatogenesis and photographic documentation were made with a Nikon light microscope.

Results and discussion

The karyotype of *P. spumarius* was studied for the first time by Boring (1913). Successive studies of Kurokawa (1953) and Halkka (1959) confirmed $2n = 22 + XX/X0$. Studies undertaken by Kuznetsova *et al.* (2003), using various cytogenetic staining techniques of chromosomes (C-banding, AgNOR-banding, fluorescent staining: CMA₃ and DAPI), supplemented this basic information by distribution pattern and amount of heterochromatin, position of NORs and composition of nucleotides of C-heterochromatin. Our recent studies have shown a different number of chromosomes ($2n = 20$) and type of sex determination (neo-XY) in *P. arslani* (Maryańska-Nadachowska *et al.*, 2008) and the occurrence of karyotype variation among other Mediterranean species of the genus *Philaenus* (unpublished). These investigations are

being continued.

Karyological studies showed the presence of four species groups differing in karyotype. The first group comprises *P. spumarius* and *P. tessellatus*. The second group, represented by *P. loukasi* and *P. arslani*, is characterized by reduction of number of autosomes and the appearance of neo-XY type of sex chromosomes. The third group consists of *P. signatus*, *P. maghresignus* and *P. tarifa*, all possessing similar karyotypes. The last species, *P. italosignus* from Sicily, shows a peculiar type of sex determination system. The observed pattern follows a subdivision according to the host plant preferences. The observed chromosome groups in general agree with division into the “*spumarius*” and “*signatus*” species groups proposed on the basis of morphological studies (Drosopoulos, 2003) dividing each into two further chromosome subgroups.

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