

## Chromosomes of *Torymus bedeguaris* (Linnaeus, 1758) and *T. chloromerus* (Walker, 1833) (Hymenoptera: Torymidae)

## Хромосомы *Torymus bedeguaris* (Linnaeus, 1758) и *T. chloromerus* (Walker, 1833) (Hymenoptera: Torymidae)

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КЛЮЧЕВЫЕ СЛОВА: хромосомы, кариотип, Hymenoptera, Torymidae, *Torymus bedeguaris*, *Torymus chloromerus*.

ABSTRACT.  $2n = 12$  is found in *Torymus bedeguaris* and *T. chloromerus*. The karyotypes of both species contain five pairs of comparatively large meta/submetacentric chromosomes and a pair of small acrocentrics.

РЕЗЮМЕ. У *Torymus bedeguaris* и *T. chloromerus* обнаружено  $2n = 12$ . Кариотипы обоих видов содержат пять пар сравнительно крупных мета/субметацентрических хромосом и пару мелких акроцентриков.

The family Torymidae belongs to the superfamily Chalcidoidea and currently contains more than 70 genera and about 1000 species [Noyes, 2004]. Of these parasitic wasps, the genus *Torymus* Dalman, 1820 includes about 400 species and is therefore the largest in the family. Only a few North American members of the genus were karyotyped previously [Goodpasture & Grisell, 1975]. We have recently examined karyotypes of the two Palaearctic species, *Torymus bedeguaris* (Linnaeus, 1758) and *T. chloromerus* (Walker, 1833) (= *cyanimus* Boheman, 1834). The results of this study are given below.

### Materials and methods

Adult females of parasitic wasps were reared from galls of Cynipidae (Hymenoptera) and Tephritidae (Diptera) collected in the Moscow Area (Ozhigovo, 60 km SW Moscow) by the senior author, as well as in the Krasnodar Prov. (near Krasnodar) by V.V. Kostjukov and in the Stavropol Prov. (Prietokskiy, 150 km SE Stavropol) of Russia by E.N. Yegorenkova in 2006–2007. Chromosome preparations were obtained from ovaries according to the standard technique for studying chromosomes in adult parasitic Hymenoptera [Gokh-

man & Quicke, 1995]. Cell divisions were studied and photographed using the optic microscope Zeiss Axioskop 40 FL fitted with the digital camera AxioCam MRc. To obtain karyograms, the resulting images were processed with the image analysis program AxioVision version 3.1 and Adobe Photoshop version 6.0. Chromosomes were classified in four groups: metacentric (M), submetacentric (SM), subtelocentric (ST) and acrocentric (A) according to the works by Levan et al. [1964] and Imai et al. [1977]. Arm numbers (NF) were also calculated. Parasitic wasps were identified by the senior author, most of the identifications were confirmed by M.D. Zerova. Voucher specimens are deposited in the Zoological Museum, Moscow State University, Moscow, Russia.

### Results and discussion

*Torymus bedeguaris* (Fig. 1).  $2n = 12$  (8M + 2SM + 2A); NF = 22. The karyotype includes five pairs of comparatively large metacentrics and submetacentrics (the last pair of bi-armed chromosomes) as well as a pair of small acrocentrics. All chromosomes more or less gradually decrease in size except for the last pair.

*Torymus chloromerus* (Fig. 2).  $2n = 12$  (10M + 2A); NF = 22. The karyotype structure generally resembles that of *T. bedeguaris*, but all chromosomes are metacentric, except for the last pair of small acrocentrics.

Both studied species share similar karyotype structure, i.e. five pairs of comparatively large meta- and submetacentric chromosomes and a pair of small acrocentrics. Moreover, this pattern (sometimes with subtelocentric chromosomes in place of acrocentric ones) is the most widespread in the Nearctic members of the genus, although a few North American species differ in chromosome number and/or morphology from the most



Figs 1–2. Karyograms of *Torymus* spp: 1 — *T. bedeguaris*; 2 — *T. chloromerus*. Scale bar equals 10  $\mu$ m.

Рис. 1–2. Кариограммы видов рода *Torymus*: 1 — *T. bedeguaris*; 2 — *T. chloromerus*. Масштаб 10  $\mu$ m.

typical ones [Goodpasture & Grissell, 1975]. The data accumulated up to now therefore suggest that the karyotype structure found in *T. bedeguaris* and *T. chloromerus* is also likely to be a groundplan feature for the subfamily Toryminae and perhaps even for the whole family [Gokhman, 2005a; see also Goodpasture, 1975]. However, chromosome sets of all studied members of the subfamily Megastigminae contain only five pairs of bi-armed chromosomes [Gokhman, 2005b].

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