A chromosome study of *Charaxes jasius* L. (Lepidoptera, Nymphalidae)*

M. Trentini & M. Marini
Institute of Zoology, University of Bologna, via S. Giacomo 9, I-40126 Bologna, Italy

Abstract

The haploid chromosome complement of *Charaxes jasius* is n = 25 in both males and females. The chromosomes in the mitotic metaphase are rod⁻ and dot-shaped; the primary constriction, even after treatment with hypotonic solution, is lacking in them. Meiosis in females is achiasmatic.

Introduction

Nymphalidae are well known karyologically among Lepidopteran families: more than 150 species have been studied. The modal chromosome number is n = 31 (Robinson, 1971) corresponding to the mode in Lepidoptera (White, 1973 p. 412), but among Nymphalidae the 24 studied species of the Charaxinae have a great diversity of chromosome numbers (from n = 13 to n = 58) with modal number 25 – 26 (De Lesse, 1966, 1967, 1968; De Lesse & Condamin, 1965).

The present research is a report on the results obtained on the chromosome set of *Charaxes jasius* both males and females. This species is karyologically unknown and it is the only African species of the Charaxinae to reach the Mediterranean region.

Material and methods

Eggs, larvae, and adults of *C. jasius septentrionalis* Vrty were collected near Livorno (Tuscany) and raised on *Arbutus unedo* L. in the Institute of Zoology. Karyological observations were carried out on both male and female larvae, pupae, and newly emerged adults. Two techniques were employed in studying testis and ovarioles: a rapod squash method with Carnoy fixation, 45% acetic acid dissection, and aceto-orcein stain, and an air-drying technique (Crozier, 1968 with certain modifications). The detailed procedure is as follows. After 0.05% colchicine pretreatment for 2 h, testis and ovarioles were dissected out and kept under 1% sodium citrate for 20 min, fixed in 3:1 alcohol-acetic acid, dissociated in 60% acetic acid on a warmed slide, postfixed in Carnoy fluid, and stained with 2% Giemsa (pH 7) for 15 – 20 min at room temperature. Besides, dissected testes of newly emerged males were fixed in Serra's or Carnoy's fluids, embedded in paraffin, sectioned, and stained with haemalum-eosin or the Feulgen reaction.

Results and discussion

The spermatogenesis of *C. jasius* starts in the last larval instar and continues in the adults (Fig. 1). In the testis each cyst matures independently of the others, and it is possible to observe both larval testes with some cysts full of spermatozoa and adult testes with some meiotic cysts. The prolonged

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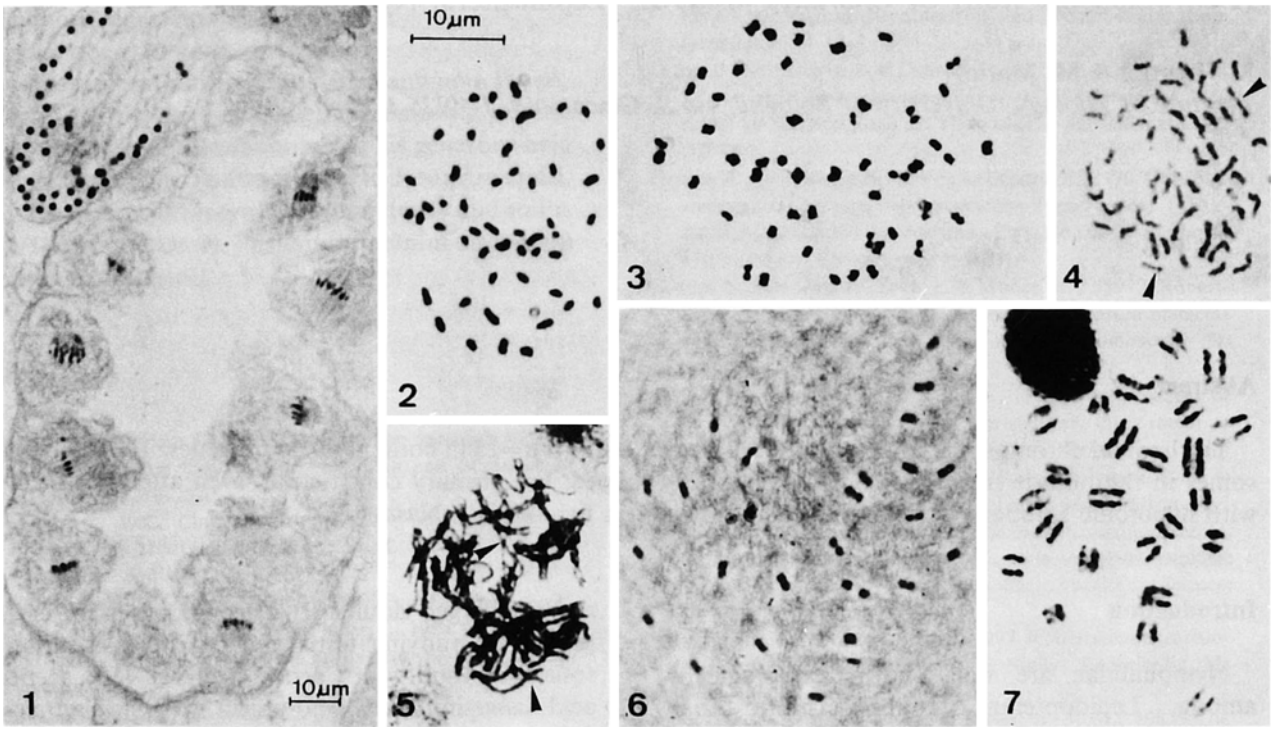

Figs. 1–7. Spermatogenesis (1–6) and oogenesis (7) of *Charaxes jasius*. Cell dissociation, air-drying, and Giemsa stain (2–5, 7) squash method with aceto-orcein stain (6): (1) Testis microtomic section of newly emerged male, Feulgen reaction; – (2–4) Pupal spermatogonial C-metaphase, 2n=50 (4, arrows indicate secondary constrictions); – (5) Pupal meiotic zygotene; – (6) Last larval metaphase I; – (7) 25 achiasmatic bivalents from newly emerged female.

spermatogenesis and the long reproductive life of the adult are probably related to each other. Spermatogonial mitoses are commonly found in the testes of the last two instar larvae and pupae. At mitotic C-metaphase the diploid chromosome number is always 2n=50 (Figs. 2, 3, 4). The chromosomes are rod- and dot-shaped; their length ranges from about 1 μm to about 3 μm (Fig. 2). In the metaphase cells that show a satisfactory colchicine action the two chromatids of each chromosome are clearly visible; they are separated in parallel along their entire length without any detectable primary constriction (Fig. 3). This fact and the anaphasic disjunction in parallel along the whole chromosome may be interpreted by assuming the holocentric nature of *C. jasius* chromosomes, as already observed in other Lepidoptera (see Murakami & Imai, 1974 for a review). Distinct secondary constrictions are present in some less contracted metaphasic chromosomes (Fig. 4).

During male meiosis prophase-I stages are observed (Fig. 5); 25 bivalents are clearly visible in metaphase I (Fig. 6). During female meiosis the ovarioles of newly emerged females still show oocytes and nurse cells in prophase I with 25 bivalents; the latter consist of parallelly aligned homologues showing their achiasmatic nature (Fig. 7). Absence of chiasmata in the female sex has also been reported in some other Lepidoptera (Suomalainen, 1965; White, 1973). With regard to the sex chromosome mechanism both males and females of *C. jasius* show 25 bivalents; this excludes an XO (♀) sex chromosome system and indicates an XY (♀) system, even if the sex chromosome pair is undetectable in our preparations.

The haploid chromosome number of the Charaxinae species ranges from 13 in *Charaxes zelica* Butl., *C. laodice* Drury, and *C. ethalion* Bsdv. to 58 in *C. acuminatus oreas* Talbot with 25 (7 species) or 26 (6 species) modal number (De Lesse, 1966, 1967, 1968; De Lesse & Condamin, 1965). The chromosome number of *C. jasius* strengthens the opinion that the modal number for this group is probably n=25.

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