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Genetic Blue-print of the Northern Green Barbet

KEYWORDS

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ABSTRACT *The present study pertains to the cytological analysis of the northern green barbet, Megalaima zeylanica caniceps. The cells were harvested, in vivo, from previously colchicinized mature individuals, following the conventional air-drying technique of Rothfels & Siminovitch (1958) with certain modifications. Chromosomes were categorized as per homologies based on arm ratio and were arranged, lengthwise, in a declining order.*

Chromosome count in 274 well spread metaphases revealed 96 + as modal diploid number. There were 16 pairs of macrochromosomes, including a pair of sex chromosomes. (Z- a sub-telocentric element, second in order of size and W - a sub-metacentric chromosome, third in order of size). The remaining thirty two pairs formed a continuous series whose morphology could not be ascertained and were clubbed together as microchromosomes.

Introduction
Although a staggering variety of birds are endemic to India, little is known about their cytogenetics. However, this dearth of cytogenetic information is common world-wide and to date, only 8% of the global avian fauna has been karyologically studied; these include 802 species out of a total of 8,948 extant forms (Garg & Shrivastava, 2013 a,b,c,d). The present communiqué deals with the karyological analysis of an Indian wild bird, the northern green barbet, *Megalaima zeylanica caniceps* of family Capitonideae.

Material & Method
Thirty six specimens of the barbet, *Megalaima zeylanica caniceps* were procured during suitable seasons. Harvesting of chromosomes was invariably done, *in vivo*, from bone-marrow cells of previously colchicinized adult individuals. The chromosomal plates were prepared after Rothfels & Siminovitch (1958) with certain modifications.

Cells were located and photographed at an initial magnification of 1500 x using an oil-immersion objective. A 35mm reflex camera, without lens, was adapted to take photo-micrographs using Kodak technical print film, Tri-X pan. A halonix tungsten lamp (12 V - 55 W) was used as the source of illumination.

The morphometric analysis, including percentage relative length (% L^R) and arm ratio (r), of the macro chromosomes was carried out from ten well spread metaphase plates of each sex. Computational program used after Elhance *et al.* (1997) provided mean and standard error. Classification of chromosomes, based on placement of centromere, was done according to Levan *et al.* (1964).

Results & Discussion
In all, two hundred and seventy four well spread metaphase complements were scored out of the bone-marrow extracts of thirty six individuals. The diploid number of chromosomes for the species was determined to be 96+ with variations between 88 and 98. This count was indicated by 45.25% of the total cells reckoned.

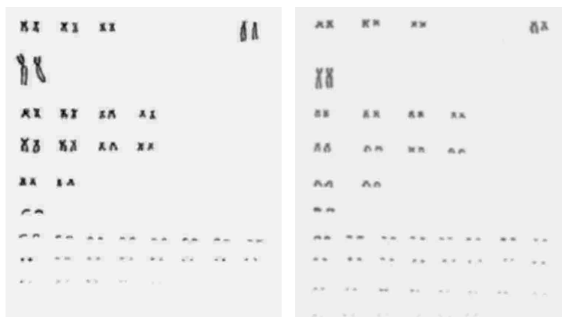

Fig-1 : Male & female karyotypes of green barbet

Unlike general condition in birds, this species has a very high diploid count. Even its congeneric forms, *Megalaima haemacephala* and its confamilial species, *Dinopium benghalense, Picoides mahrattensis* and *Picus virdis*, show 2n to be 90, 84 and 94 respectively (Kaul & Ansari, 1978 ; Hammar, 1970) indicating a general tendency of this avian order towards high chromosome number.

Macrochromosomes
There were 16 pairs of macro chromosomes. All, with a clearly defined size and centromeric position, could be easily recognized. In favorable cases, two arms could be distinguished in as much as 15 pairs. On the basis of arm ratios, macro chromosomes were arranged into five groups.

Group A was represented by three pairs of medium sized biarmed metacentric pairs (1, 2 and 3) with arm ratios of 1.08, 1.07 and 1.10 μ respectively. Specific individualization of each of these elements was not difficult, since there was a marked difference in size between successive pairs.

Group B comprised five pairs of chromosomes with their centromeres in median region. Chromosome 4, the largest element of the set, with a mean absolute length of 5.55 μ constituted 13.65 + 0.46% of the total macro chromosomal length (TML). Remaining elements, less than half the length of chromosome 4, exhibited little variations in size.

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Group C included four pairs of sub -metacentric chromosomes, fairly large to moderate in size and third, fifth, ninth & thirteenth in order. Chromosome 11 and 12 were not easily divisible due to their identical morphology and overlapping range of arm ratios but for their relative length.

Group D consisted of two pairs of small sized autosomes, chromosome 13 and 14, together with a sex element, alluded to as Z-chromosome. The small sized autosomes, sub -metacentric in nature, constituted 4.32 + 0.14 and 4.08 + 0.1% of TML respectively.

Group E had a single telomeric pair, chromosome-15, the smallest macro chromosome of the set constituting 3.71 + 0.19% of TML. This feature in *Megalaima zeylanica caniceps* literally attests the fact that, in birds, with large number of microchromosomes, the smallest macrochromosomes are preferentially telocentric (Tegelstrom & Ryttman, 1981).

Microchromosomes

A total number of 32 pairs, other than 16 described so far, formed a graded series of elements, whose morphology could not be resolved. Most of them appeared to be either telocentric or dot shaped and have been included in the category of micro chromosomes.

Sex-chromosomes

The mechanism of sex determination was found to be ZZ-ZW type. When karyotypes were arranged, it was found that in all female individuals, there was sub metacentric element (W-chromosome) without any homologue. It ranked between Z & chromosome - 9 and could be distinguished from latter in having a slightly higher relative length. On the other hand, homogametic males had sub-telocentric Z chromosome that could be paired rightly.

In majority of birds, Z chromosome has been reported to be fourth or fifth in size (Ray- Chaudhari, 1973 ; Au *et al.*, 1975 ; Hammar & Herlin, 1975). Often when Z is fifth in position, it is sub-metacentric, otherwise telocentric (Becak *et al.*, 1971). But, in the present species, the Z-chromosome ranked second in order of size with absolute length ranging between 3.70 and 4.23 microns.

Thus, in all, 15 pairs of macro autosomes, 32 pairs of micro chromosomes and a pair of sex-chromosomes (ZZ/ZW) constituted the genome of *Megalaima zeylanica caniceps*. Total chromosomal length of large autosomes, small autosomes and sex - chromosomes was computed to be 72.08; 39.21 and 7.90 microns respectively.

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