

## On the Chromosomic Polymorphism of *Rattus rattus* L. A Study on West-European Populations

During the last year the amount of information on chromosomic polymorphism of *Rattus rattus* L. has greatly increased. These contributions have proved that South-East-Asian populations of *Rattus rattus* are characterized by a genome with 42 chromosomes (YOSIDA et al.<sup>1,2</sup>, YONG<sup>3</sup>) whereas Australian, New Zealand (YOSIDA et al.<sup>2,4</sup>), Italian (CAPANNA et al.<sup>5,6</sup>) and South-American (BIANCHI et al.<sup>7</sup>) populations are characterized by a diploid number  $2n = 38$ . The decrement of the number of chromosomes is due to 2 centric fusions; other chromosomic changes (pericentric inversion) appear to complicate the phenomenon<sup>6</sup>.

Some very interesting data, which still need taxonomic clarification, are those obtained from the very recent observations of GROPP et al.<sup>8</sup> and of BADR and BADR<sup>9</sup>. These authors have observed a cohabitation of individuals with different genomes in the populations they studied in Northern Thailand and in Egypt. GROPP et al.<sup>8</sup> have observed diploid number  $2n = 42, 44, 46$  and  $48$  in Thailand, whereas BADR and BADR<sup>9</sup> found  $2n = 38$  and  $2n = 42$  in Egypt.

Recently YONG<sup>10</sup> has reported in this journal an individual with a 41 chromosomes complement with

only 1 Robertsonian fusion. This individual was found in a Malayan population which had been studied<sup>3</sup> for a long time and which had always been characterized by a diploid number  $2n = 42$ .

At this point it seems to us correct to report the data of our research concerning this interesting problem of chromosomic polymorphism.

We have studied the karyotype of different European populations of *Rattus rattus* by means of the bone marrow technique, considering besides the morphological characteristics of the different populations also their subspecific systematic positions. These results are given in the Table.

The first point that these data show is that there is no relation between subspecific division and the characteristics of the genome. As a matter of fact, the entire West-European population we studied has  $2n = 38$ , both for individuals referable to the subspecies *frugivorus* Rafinesque as for the *alexandrinus* Geoffroy and *rattus* L. Moreover our observations did not give evidence of any morphological differences in the karyotype. As a matter of fact, the 2 pairs of the small subtelocentric chromosomes (Nos. 12 and 17 of our karyogram<sup>6</sup>) which we described in our previous note<sup>5,6</sup>, and which characterize



Karyotypes of black rats from different populations: SS 1, Latium; CH 2, Switzerland; FR 5, France; SD 2, Sardinia; UK 1, England. Arrows indicate the characteristic chromosomes of the karyotype, i.e. the 2 large metacentrics and the small submetacentrics.

Country	Place	No. of specimens		Subspecies	Diploid number	
		♂	♀			
Italy	Toscana	Giglio	5	9	<i>frugivorus</i> Raf.	2n = 38
		Giannutri	11	9	<i>alexandrinus</i> Geoff.	2n = 38
		Maremma	9	7	<i>frugivorus</i> Raf.	2n = 38
	Lazio	Roma	1	3	<i>frugivorus</i> Raf.	2n = 38
		S. Severa	1	—	<i>frugivorus</i> Raf.	2n = 38
		Fiumicino	—	1	<i>alexandrinus</i> Geoff.	2n = 38
		Nemi	—	1	<i>alexandrinus</i> Geoff.	2n = 38
	Sardegna	Caprera	3	1	<i>alexandrinus</i> Geoff.	2n = 38
Switzerland	Genève	Air-le-Ville	2	1	<i>rattus</i> L.	2n = 38
	Valais	Sion	—	1	<i>rattus</i> L.	2n = 38
France	Provence		3	3	<i>frugivorus</i> Raf.	2n = 38
England	Surrey		2	4	<i>frugivorus</i> Raf.	2n = 38

the karyotype in the population of Tuscany, are found in any other population studied (Figure).

The fact that populations of *Rattus rattus* with a 38 chromosomes karyotype is not an isolated phenomenon of a restricted Italian area but apparently extended at least to all Western Europe induces us to interpret the Australian and South-American populations with a 38 chromosomes genome as a repopulating or invasion of black rats originating on the European continent via the intense sea traffic that exists between Western Europe and the areas mentioned.

At this point it is necessary to recall that YOSIDA et al.<sup>2,4</sup> ascribed the Australian population with a 38 chromosomes complement to the subspecies *rattus* L. which is lacking in South-East-Asia, whereas it is common in

central Europe where our observations have characterized it with the same diploid number<sup>11,12</sup>.

**Riassunto.** Nell'ambito del problema del polimorfismo cromosomico di *Rattus rattus* è stato studiato il cariotipo di varie popolazioni europee (Italia, Svizzera, Francia ed Inghilterra) riferibili alle sottospecie *frugivorus*, *rattus* ed *alexandrinus*. Il numero diploide osservato è sempre stato  $2n = 38$  e non è emersa nessuna differenza morfologica tra i cariogrammi delle varie popolazioni.

E. CAPANNA and MARIA VITTORIA CIVITELLI

*Istituto di Anatomia Comparata «B. Grassi»  
dell'Università di Roma, Via Borelli 50,  
I-00161 Roma (Italy), 12 November 1970.*

<sup>1</sup> T. H. YOSIDA, A. NAKAMURA and T. FUKAYA, *Chromosoma* 16, 70 (1965).

<sup>2</sup> T. H. YOSIDA, K. TSUCHIYA, H. T. IMAI, K. MORIWAKI and T. UDAGAWA, *Mammalian Chrom. Newsl.* 10, 217 (1969).

<sup>3</sup> H. S. YONG, *Chromosoma* 27, 245 (1969).

<sup>4</sup> T. H. YOSIDA, K. TSUCHIYA, H. IMAI and K. MORIWAKI, *Jap. J. Genet.* 44, 89 (1969).

<sup>5</sup> E. CAPANNA and M. V. CIVITELLI, *Mammalian Chrom. Newsl.* 10, 220 (1969).

<sup>6</sup> E. CAPANNA, M. V. CIVITELLI and R. NEZER, *Experientia* 26, 422 (1970).

<sup>7</sup> O. N. BIANCHI, J. PAULETE-VANRELL and V. RIOJA, *Experientia* 25, 1111 (1969).

<sup>8</sup> A. GROPP, M. OLBRICH, A. SANTADUSIT, K. MANYANONDDHA, G. FLATZ and J. MARSHALL, *Mammalian Chrom. Newsl.* 11, 111 (1970).

<sup>9</sup> F. M. BADR and R. S. BADR, *Chromosoma* 30, 465 (1970).

<sup>10</sup> H. S. YONG, *Experientia*, in press.

<sup>11</sup> This research was supported by the 'Gruppo di Studio per le popolazioni insulari del C.N.R.'.

<sup>12</sup> Acknowledgments. The authors thank the colleagues who provided part of the material: Dr. A. MEYLAN of the 'Station Fédérale d'Essais Agricoles', Nyon, Suisse, Prof. GIBAN and M. SPITZ of the 'Centre National de Recherches Zootechniques', Jouy-en-Josas, France, and Dr. R. REDFERN of the 'Pest Infestation Control Laboratory', Tolworth-Surbiton, England.

### Karyotype of the 'Carpincho' *Hydrochaeris hydrochaeris uruguayensis* (Rodentia Hydrochaeridae)

The rodent commonly called 'Carpincho' in Uruguay and Argentina is the largest which exists throughout the world at present. It usually lives at the riversides and also has aquatic habits. The adult animals may reach a weight of about 70 kg. Distribution: South America east of the Andes and south to Uruguay, west in Panama to the Canal<sup>1,2</sup>.

Peripheral blood was drawn from the ears of 4 young animals caught in different places of the Uruguayan territory. Slightly modified EDWARDS<sup>3</sup> method for blood cultures was followed. A diploid chromosome number of 66 was observed ( $2n = 64A + XY$ ) in cells harvested at 92 h of incubation at 37°C.

According to the length and the centromere position, the autosomes were classified in 6 main groups. Group A

contains 2 pairs of large submetacentrics; group B, 3 pairs of medium size submetacentrics; group C, 6 pairs of metacentrics and 5 pairs of submetacentrics; group D, 2 pairs of acrocentrics out of them (pair numbered 17) has small satellites; group E, 10 pairs of telocentrics; and group F, 4 pairs of small metacentrics.

The sex chromosomes constitute a well differentiated heteromorphic pair. The X chromosome is submeta-

<sup>1</sup> A. CABRERA and J. YEPES, *Mamíferos sudamericanos* (Co. Argentina Editores, Buenos Aires 1940).

<sup>2</sup> S. ANDERSON and J. KNOX JONES, *Recent Mammals of the World* (The Ronald Press Company, New York 1967).

<sup>3</sup> J. H. EDWARDS, *Cytogenetics* 1, 90 (1962).