

## THE KARYOTYPE OF THE BROWN MUSSEL *Perna perna* (L.) (BIVALVIA: MYTILIDAE)

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### ABSTRACT

The karyotype of the edible brown mussel *Perna perna* (L.) is described. Mitotic metaphases were obtained from 16 to 20-hour-old embryos. The diploid number was confirmed to be 28, with chromosomes varying from metacentric to acrocentric. Preliminary C-band studies revealed the presence of intercalary and terminal blocks besides centromeric heterochromatin.

### INTRODUCTION

Cytogenetic studies in the family Mytilidae have increased in the last decade. One of the reasons is that some cytogenetical techniques, currently used in the study of vertebrates, are being applied to solve controversial aspects about the systematics of this group of bivalves. Such studies are also justified by the commercial importance of some members of the Mytilidae and by their use in pollution control programs.

Within the family, the chromosomes of 11 genera have been studied. Of the two major morphological groups in the family, mytilid and modiolid, the former has received more attention, and the genus *Mytilus* has been by far the most widely investigated. Chromosome studies have been done in *M. edulis* (Ahmed and Sparks, 1970; Thiriot-Quévieux and Ayraud, 1982), *M. californianus* (Ahmed and Sparks, 1970), *M. coruscus* (Ieyama and Inaba, 1974), *M. galloprovincialis* (Thiriot-Quévieux and Ayraud, 1982) and *M. desolationis* (Thiriot-Quévieux, 1984b).

Cytogenetic studies of other genera are less frequent, and some are restricted to the report of chromosome numbers (Nakamura, 1985). The genus *Perna*, in spite of its wide distribution (tropical and subtropical Atlantic and Indian Oceans) has

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been studied previously only by Ahmed (1974), who made a tentative morphological description of the chromosomes of *P. perna* from Venezuela and *P. viridis* from Pakistan.

The present paper describes the karyotype of *Perna perna* (L.), an edible mussel of commercial value particularly in the S and SE coasts of Brazil.

## MATERIAL AND METHODS

Sexually mature specimens of *P. perna* were obtained from cultivated populations at the marine biological station CEBIMar, University of São Paulo, Brazil (23° 49' S, 45° 25' W). Mussels were made to spawn artificially through mechanical stimulation. Fertilization was carried out by diluting the eggs from a female and about 10% of the sperm of a male in 4 l of filtered seawater.

Embryos of 16 to 20 hours were immersed in a 0.01% solution of colchicine (Sigma) in seawater for 50 min., and then given hypotonic treatment consisting of 0.8% sodium citrate for 40 min. The material was fixed in a freshly prepared 3:1 mixture of ethanol and glacial acetic acid, and dissociated with 60% acetic acid. The cell suspension was gently dropped onto dry slides heated to 45°C. C-bands were obtained according to Sumner (1972). Preparations were stained with Giemsa (4%, pH 6.8).

## RESULTS

The chromosomes of 72 mitotic metaphase spreads were counted. Fifty-eight had 28 chromosomes, nine showed 27 chromosomes and the remaining five presented 25-26 chromosomes. Therefore, the diploid number of the species was confirmed to be 28. The karyotype consisted of four metacentric (pairs 1-4), five submetacentric (pairs 5-9), and five subtelocentric and acrocentric pairs (pairs 10-14) (Figure 1).

Only nine metaphases could be analyzed after C-banding, and none without superposition of chromosomes. However, we could observe that, besides centromeric heterochromatin, *P. perna* presented at least: a) one intercalary heterochromatic block on a metacentric chromosome (pair 3 or 4), and b) a terminal block on the long arm of an acrocentric (pair 13 or 14) (Figure 2).

## DISCUSSION

The chromosome number of *P. perna* ( $2n = 28$ ) was determined by Ahmed (1974) in specimens from Venezuela and confirmed by Shiotsuki and Lunetta (1978)

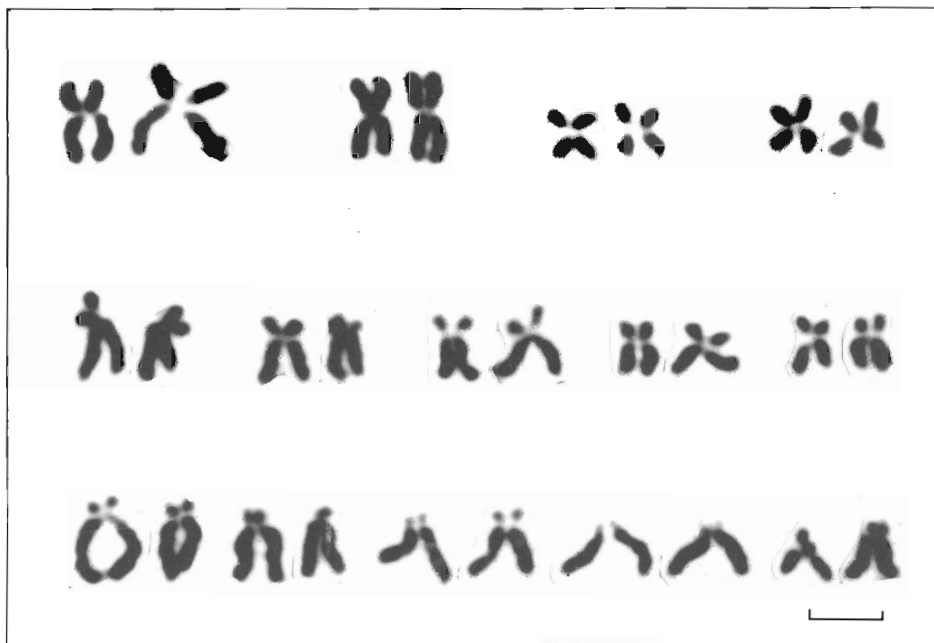


Figure 1 - Karyotype of *Perna perna*;  $2n = 28$ , including 4 metacentric (first row, pairs 1-4), 5 sub-metacentric (second row, pairs 5-9) and 5 subtelocentric and acrocentric pairs (third row, pairs 10-14). Scale bar, 5  $\mu$ .

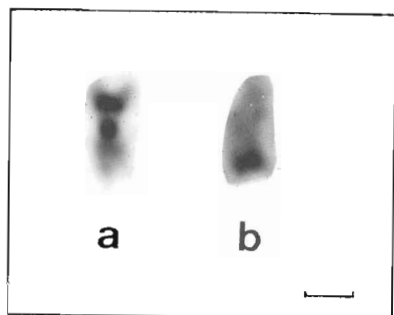


Figure 2 - C-banding: (a) small metacentric (chromosome 3 or 4) showing intercalary heterochromatin, (b) acrocentric (chromosome 13 or 14) with terminal heterochromatin on the long arm. Scale bar, 1  $\mu$ .

in Brazilian specimens. The diploid number is the same for all species of *Mytilus* whose karyotypes have been described. However, the diploid number in the family Mytilidae is highly variable, ranging from 22 to 32 (Nakamura, 1985).

The position of the centromeres on *P. perna* chromosomes varies from median to terminal, as in all other mytilids already described, with the exception of the antarctic species *Aulacomia ater regia*, which presents exclusively terminal or subterminal centromeres (Thiriou-Quévren, 1984a). At least numerically, *P. perna* shows greater similarity with *Mytilus* species than with *P. viridis* ( $2n = 30$ ), the only other species of the genus whose chromosomes have been described. However, the description of the karyotype of *P. perna* and *P. viridis* by Ahmed (1974) does not allow a detailed morphological comparison with our data. The author considered a tentative arrangement of *P. perna* chromosomes into 10 pairs of meta-submetacentrics and 4 pairs of acrocentrics, which differs from ours.

Dixon *et al.* (1986) performed the first successful C-banding study in the family. They used larval chromosomes to describe the heterochromatic regions of *M. edulis*. Four chromosome pairs presented noncentromeric heterochromatic segments either in homo or heterozygosis. It is interesting to note that the blocks were always terminal. We observed that in *P. perna* at least one of the heterochromatic blocks was, indeed, terminally located on the long arm of an acrocentric. But, in addition, we also observed an intercalary block on a metacentric chromosome. This block is not present in *M. edulis*. Considering the small number of C-band metaphases which we could effectively study, it is possible that noncentromeric heterochromatic blocks exist also in other chromosome pairs. After NOR-banding Dixon *et al.* (1986) found that the heterochromatic blocks in *M. edulis* corresponded to nucleolar organizers. Unfortunately, we failed to obtain NOR-bands in our material.

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## RESUMO

Descrevemos o cariótipo do mexilhão comestível *Perna perna* (L.). As metáfases mitóticas foram obtidas de embriões de 16 a 20 horas. O número diplóide foi de 28, incluindo quatro pares de cromossomos metacêntricos, cinco submetacêntricos, e cinco subteloacêntricos ou acrocêntricos. Estudos preliminares das bandas C revelaram a presença de blocos heterocromáticos intercalares e terminais, além dos pericentroméricos.

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