Parthenogenesis in ladybirds (Coccinellidae: Coleoptera): a new model for the study of asex?

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Abstract

Parthenogenesis, the development of eggs without fertilization resulting in the exclusive production of female offspring, is rare in animals and found predominantly in invertebrates. Polyploidy and hybridization of parents with different genomes as well as endosymbiont infections are often considered as its major causal events but the mechanisms triggering off asexual reproduction remain unclear.

Here we study the proximate causes at the origin of parthenogenesis in a first reported case of asexuality in the Coccinellidae (Coleoptera). The asexual populations were found in distant insular regions – the Macaronesia and the Mascarene – and were identified as *Nephus voeltzkowi* Weise, a bisexual species widespread in sub-Saharan Africa. Specimens from each population are diploid but present different karyotypes, composed respectively of 14 and 17 unmatchable chromosomes that evoke different hybrid origins. However, the great proximity of their genomes (99.8 % homology for the complete mitochondrial genome and 99.9 % for the complete nuclear ribosomal cluster), discards this interpretation. We propose that they belong to a single chromosomally polymorphic species undergoing Robertsonian fusions. It remains to be studied if these translocations are a pre- or post-parthenogentic event. Furthermore, specimens from both populations are infected with *Wolbachia*bacteria, contrary to bisexual species of the same genus. Although *Wolbachia*was shown to induce parthenogenesis in haplo-diploid organisms, it has been recently suggested it could induce parthenogenesis in hosts with other sex determination systems.

Parthenogenetic individuals from the South-Western Indian Ocean might have attained the Macaronesia by the hand of man: the two regions have been in contact since the 16thcentury, as they housed important ports of call of the Portuguese mythic round ward voyage " *Carreira da Índia*".

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