

Genetic comparison of two species of the genus *Gammarus* (*G. insensibilis* and *G. aequicauda*) from different geographic areas

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Electrophoretic analyses of several species of Amphipods have been carried out in recent years with the purpose of studying their genetic structure and to elucidate possible mechanisms of genetic adaptation to the environment.

Two species of the genus *Gammarus*, namely *G. insensibilis* Stock and *G. aequicauda* Martynov, proved very suitable for this kind of research (Bisol et al., 1987). These species seem to occupy different niches in the environments from which they were collected: *G. insensibilis* lives in more "marine" habitats, whereas *G. aequicauda* is more common in brackish water areas where it is subjected to more exacting conditions. Laboratory experiments have shown a higher resistance of the latter to wider ranges of temperature and salinities (Brun, 1971). However, occasionally, the two species can occur together.

The present study concerns the comparison of the genetic structure between and within populations of the two mentioned species sampled in the lagoon of Venice and in two lagoons of Southern France.

In the lagoon of Venice, *G. insensibilis* was collected near S. Felice Island, and *G. aequicauda* at Piovini. In Southern France, *G. insensibilis* was collected at Salses-Leucate and *G. aequicauda* at Canet Saint-Nazaire.

The electrophoretic analyses were carried out on 17 loci according to Selander et al. (1971). The loci considered for the calculation of the genetic distance were: AP, APK, EST-1, EST-2, FH, GAPDH, GOT-1, HK, LAP-1, MDH-1, MPI, PGI, PGM and XDH.

The results obtained indicate that the Italian and the French populations of *G. insensibilis* exhibit heterozygosity levels (0.029 and 0.038, respectively) which are not very dissimilar from one another. In both cases the observed values do not differ significantly from the expected ones. All the loci analysed in the two populations are in Hardy-Weinberg equilibrium.

As to the comparison between the two *G. aequicauda* populations, the mean observed heterozygosities appear quite different (Venice, Hobs=0.078; Canet Saint-Nazaire, Hobs=0.038). Previous studies conducted on a population of *G. aequicauda* from Sigean (not far from Canet Saint-Nazaire) indicate a similar heterozygosity value (Hobs=0.037) (Bisol et al., 1987). This confirms the lower polymorphism of the population from Canet compared with the one from Venice.

Considering the single loci analysed in the two *G. aequicauda* samples, PGI and MPI appear as the main responsible ones for the observed differences. In fact, MPI shows an observed heterozygosity of 0.535 in the Venetian population, whereas the French population is monomorphic. Similarly, the observed heterozygosity at PGI locus is 0.60 in the sample from Venice and 0.094 in that from Canet.

The evaluation of the genetic distance performed according to Nei (1972) shows, first of all, that the distance between *G. insensibilis* and *G. aequicauda* is the one expected between two good species ($D = 0.1402$). A high genetic similarity was found between the two geographic populations of *G. insensibilis* ($D = 0.0014$), whereas the genetic distance between the Venetian and the French populations of *G. aequicauda* is greater ($D = 0.0314$). In any case the latter value is within the range of those characterizing local populations of the same species, though it points out a higher rate of differentiation between the *G. aequicauda* populations in comparison with the *G. insensibilis* ones. It is difficult to establish the causal factors of such differentiation. However, considering that *G. aequicauda* lives in areas which are ecologically more marginal and exacting, it seems legitimate to hypothesize natural selection at work, although the concurrence of non selective forces cannot be discarded.

References

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Résumé

Dans ce travail on a comparé, par analyse électrophorétique, la structure génétique de quelques populations géographiques (Adriatique septentrionale et Méditerranée près de la cote Française) des deux espèces de *Gammarus*: *G. insensibilis* Stock et *G. aequicauda* Martynov. Les résultats montrent que les populations de *G. insensibilis* sont très semblables entre elles, tandis que les populations de *G. aequicauda* semblent différentes. On a aussi calculé la distance génétique, soit entre les deux espèces, soit entre les populations de chaque espèce. On discute brièvement des mécanismes qui peuvent être responsables des différences observées.