

SPATIAL DISTRIBUTION OF LEISHMANIA SANDFLY VECTORS IN PORTUGAL: RISK AREAS, CLIMATE CHANGES AND IMPACTS ON TOURISM

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INTRODUCTION

Portugal is an endemic region of Human and Canine Leishmaniosis, being the dog the main reservoir of *Leishmania infantum*, the protozoa transmitted by two confirmed vectors: *Phlebotomus perniciosus* and *Ph. ariasi*. Distribution of these two sandfly species is conditioned by climate and environmental conditions. *Ph. perniciosus* presents a larger climatic plasticity, being present from wet areas to more arid regions.

Growing awareness of global climate change has stimulated several assessments of its likely effects on vector-borne diseases (VBD). Countries with a temperate climate, such as Portugal, are at risk of future climate conditions that may be more favorable to VBD transmission.

SIAM II Project concluded that predicted future climate changes would enhance the number of days favorable to transmission of *Leishmania* strains, due to higher density and activity of *Ph. perniciosus* during a larger period (from April to November) (Figures 1, 2 and 3).

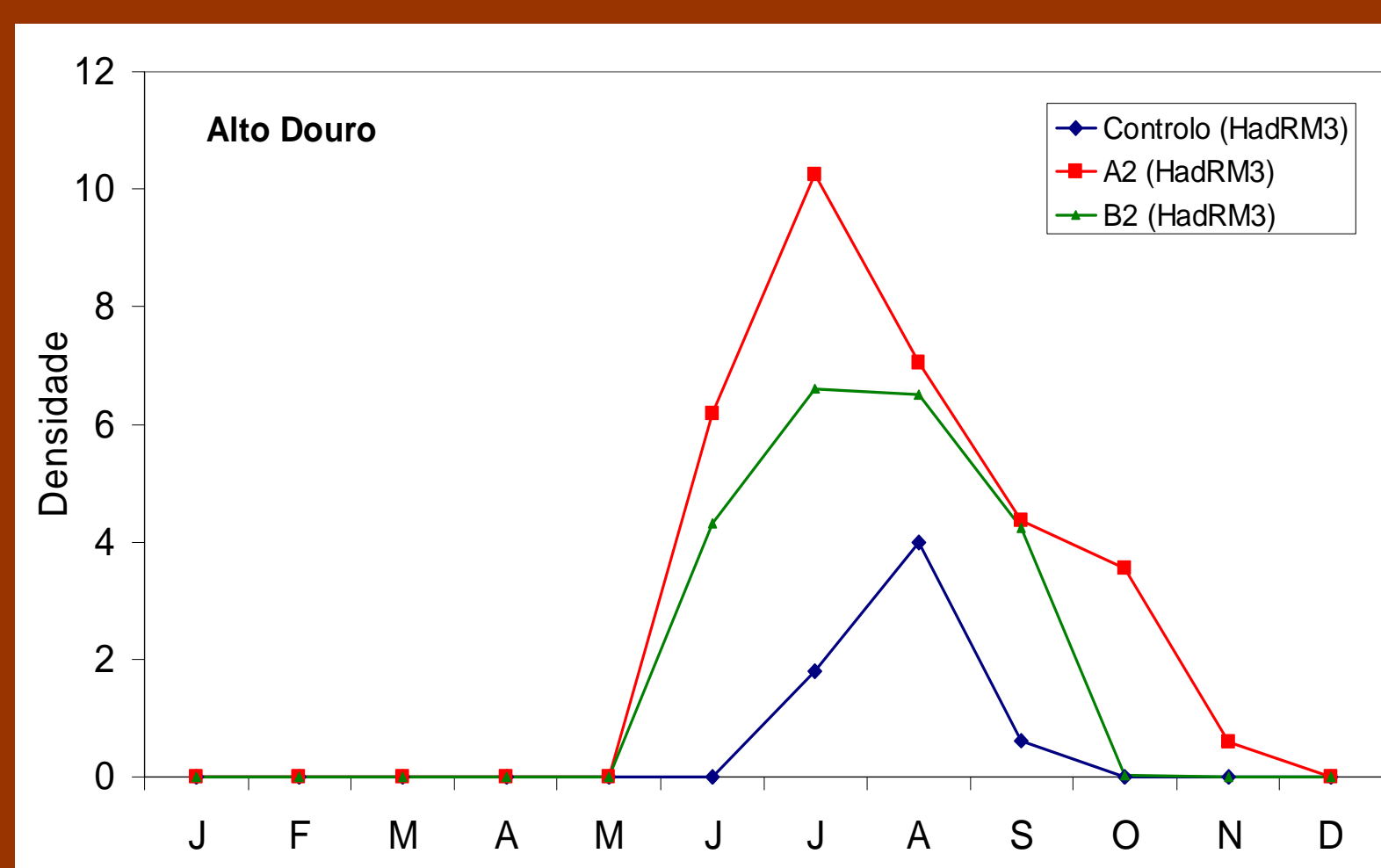


Figure 1 - Modeled densities of *Ph. perniciosus* for control and future climate scenarios for the Alto Douro Region

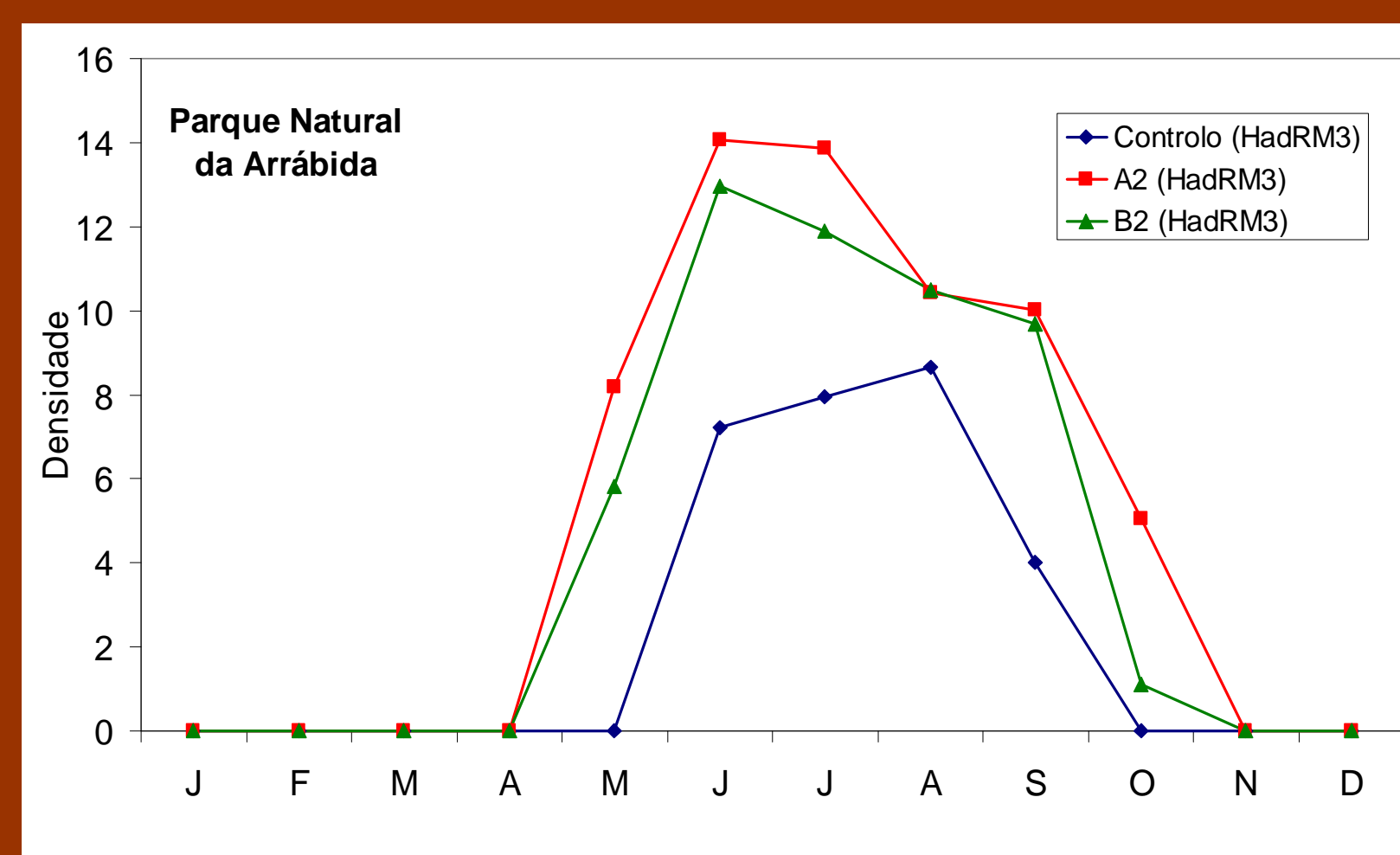


Figure 2 - Modeled densities of *Ph. perniciosus* for control and future climate scenarios for the Arrabida Natural Park Region

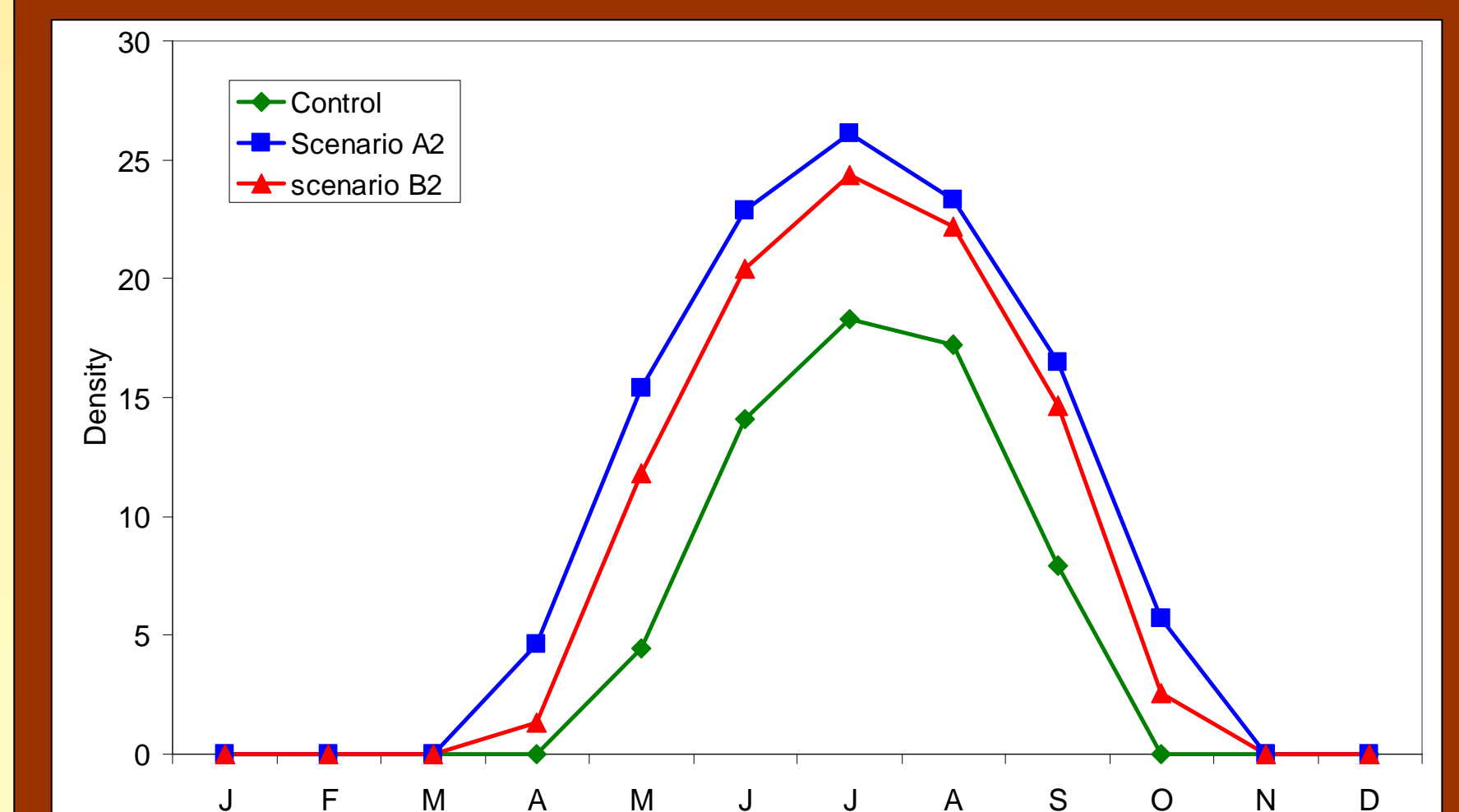


Figure 3 - Modeled densities of *Ph. perniciosus* for different climate scenarios for Algarve

Legend: Three climate scenarios were used: a control scenario representative of the period 1961-1990 when the global carbon dioxide (CO₂) concentration was about 354 ppm; a future scenario representative of the period 2070-2100 when the CO₂ concentration has risen to about 857 ppm (A2), and a second future scenario in which the CO₂ levels are about 615 ppm (B2)

Based on collections performed from 1978 to 2004, at 104 localities (Figures 4A and 5A), spatial distribution of both species in mainland Portugal was determined and, by geostatistical techniques (kriging), the most important risk areas were defined (Figures 4B and 5B). For *Ph. perniciosus*, risk areas were mainly at Northwest (NW) regions of Portugal and the Algarve region and for *Ph. ariasi*, risk areas were restricted to Northwest regions.

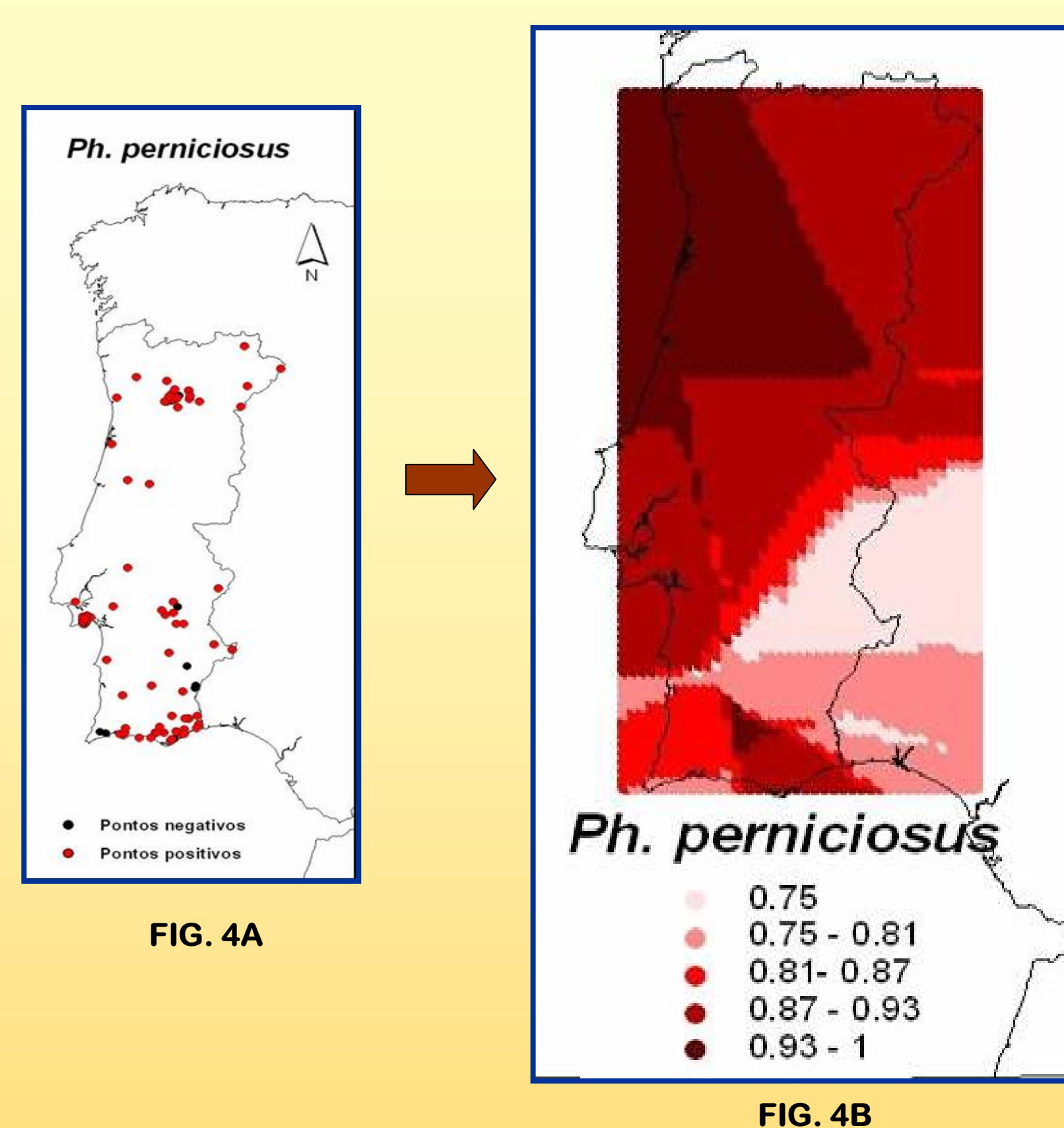


FIG. 4A

FIG. 4B

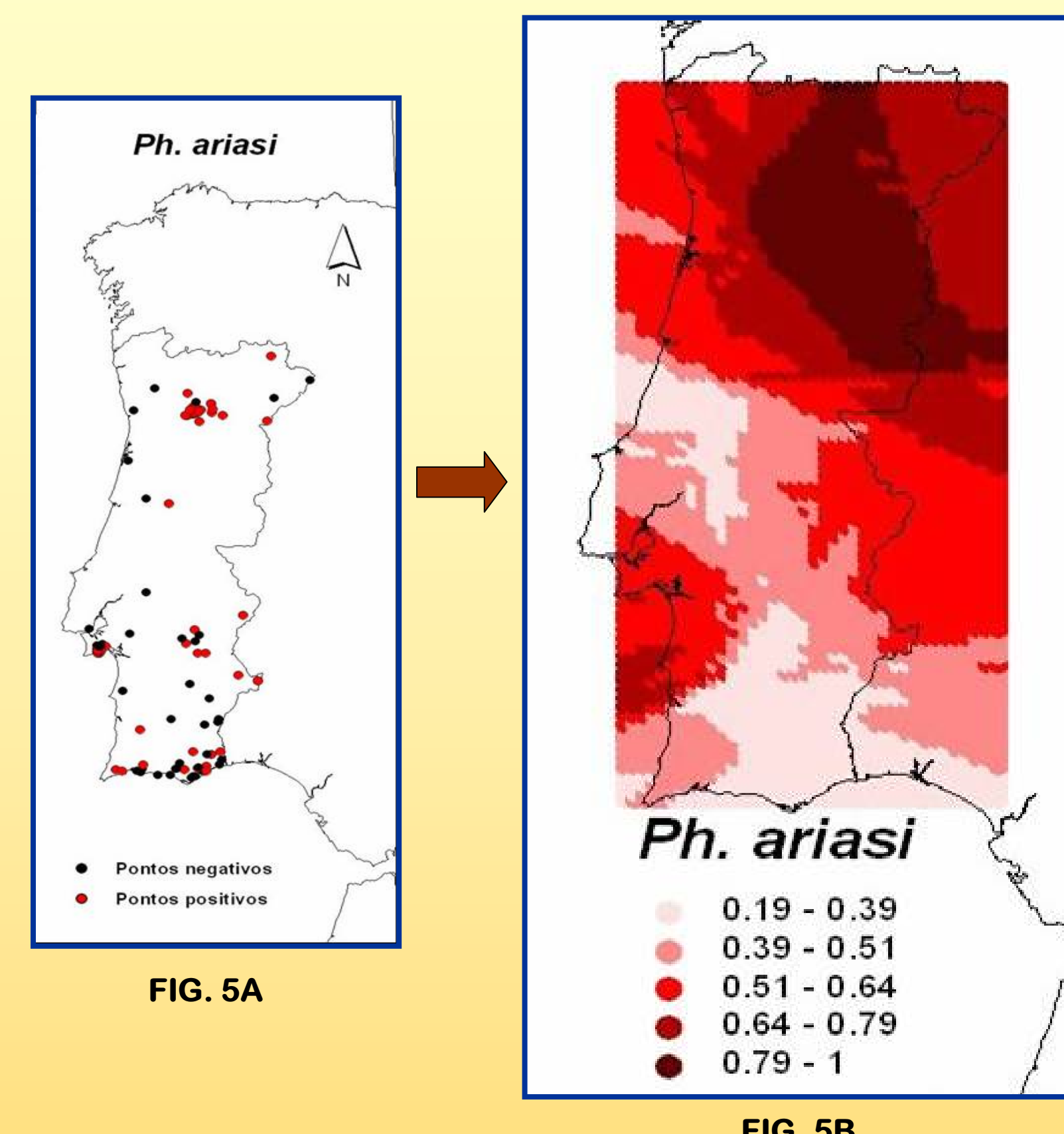


FIG. 5A

FIG. 5B

These new recent data, along with the previous information on impact of climate changes on developmental cycle of sandfly vectors, contributes for the application of several adaptation measures, as surveillance programs, to decrease the vulnerability to this disease.

This vulnerability is present, not only for local populations of these risk areas, but also for foreign tourists coming from non-endemic regions and from endemic regions, the latter potentially responsible for carrying other strains. With no less importance, the national tourists and their pets may also “transport” national strains between the different risk areas, contributing for the change of the known actual pattern.

Multidisciplinary measures, applied in a sustained way in Human and Canine Leishmaniosis and their vectors, should benefit these local populations, but also the tourists that visit Portugal every year.