Parasites & Vectors

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The dominant *Anopheles* vectors of human malaria in the Americas: occurrence data, distribution maps and bionomic précis

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Abstract

Background: An increasing knowledge of the global risk of malaria shows that the nations of the Americas have the lowest levels of *Plasmodium falciparum* and *P. vivax* endemicity worldwide, sustained, in part, by substantive integrated vector control. To help maintain and better target these efforts, knowledge of the contemporary distribution of each of the dominant vector species (DVS) of human malaria is needed, alongside a comprehensive understanding of the ecology and behaviour of each species.

Results: A database of contemporary occurrence data for 41 of the DVS of human malaria was compiled from intensive searches of the formal and informal literature. The results for the nine DVS of the Americas are described in detail here. Nearly 6000 occurrence records were gathered from 25 countries in the region and were complemented by a synthesis of published expert opinion range maps, refined further by a technical advisory group of medical entomologists. A suite of environmental and climate variables of suspected relevance to anopheline ecology were also compiled from open access sources. These three sets of data were then combined to produce predictive species range maps using the Boosted Regression Tree method. The predicted geographic extent for each of the following species (or species complex*) are provided: *Anopheles* (*Nyssorhynchus*) *albimanus* Wiedemann, 1820, *An.* (*Nys.*) *albitarsis**, *An.* (*Nys.*) *aquasalis* Curry, 1932, *An.* (*Nys.*) *darlingi* Root, 1926, *An.* (*Anopheles*) *freeborni* Aitken, 1939, *An.* (*Nys.*) *marajoara* Galvão & Damasceno, 1942, *An.* (*Nys.*) *nuneztovari**, *An.* (*Ano.*) *pseudopunctipennis** and *An.* (*Ano.*) *quadrimaculatus* Say, 1824. A bionomics review summarising ecology and behaviour relevant to the control of each of these species was also compiled.

Conclusions: The distribution maps and bionomics review should both be considered as a starting point in an ongoing process of (i) describing the distributions of these DVS (since the opportunistic sample of occurrence data assembled can be substantially improved) and (ii) documenting their contemporary bionomics (since intervention and control pressures can act to modify behavioural traits). This is the first in a series of three articles describing the distribution of the 41 global DVS worldwide. The remaining two publications will describe those vectors found in (i) Africa, Europe and the Middle East and (ii) in Asia. All geographic distribution maps are being made available in the public domain according to the open access principles of the Malaria Atlas Project.

Background

There is increasing knowledge of the global risk and distribution of *Plasmodium falciparum* malaria [1] and the intensity of its transmission [2], which reveals the nations of the Americas to have the lowest *P. falciparum* malaria endemicity worldwide [2] and hence the lowest *P. falciparum* morbidity [3,4]. Work is ongoing to develop the same cartographic suite for *P. vivax* [5]. Data from national health information system reporting support these findings and additionally shows a near cosmopolitan decrease in *P. falciparum* and *P. vivax* malaria morbidity and mortality across the continents between 2000 and 2007 [6].

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