Vector Hazard Report: Malaria in Haiti

Part 2: Vector Bionomics and Reference Material

Information gathered from products of The Walter Reed Biosystematics Unit (WRBU)

VectorMap
Systematic Catalogue of the Culicidae

All material in this brief is provided for your information only and may not be construed as medical advice or instruction. No action or inaction should be taken solely based on the contents of this information; instead, readers should consult appropriate health professionals on any matter relating to their health and well-being.
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Bionomics Dashboards:

*Anopheles albimanus Part 1*
*Anopheles albimanus Part 2*
*Anopheles crucians*
*Anopheles vestitipennis*
*Anopheles grabhamii*

Also:

*Keys to the Mosquitoes of Haiti*

*Introduction Literature: Malaria in Cambodia*

References
Anopheles (Nys.) albimanus Wiedemann, 1820

Bionomics:
Larvae of *An. albimanus* are found in a wide variety of permanent water habitats. They are salt tolerant. Habitats are usually in full sunlight or partial shade containing abundant floating, emergent vegetation and floating scum and algae. Habitats frequently have muddy bottoms and turbid or polluted water.

Medical Importance:
In 17 of 20 Caribbean region countries, *An. albimanus* is the primary malaria vector.

VectorMap Data Summary:
Number of Records: 1499
Number of Localities: 570

Maxent model of *An. albimanus* Nyari, A. 2011

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Bionomics: *Anopheles* (Nys.) *albimanus*

### Larval Habitat Type
- Animal foot-print
- Crab-hole
- Exposed pond/pool/pit
- Fallen fruit/husk
- Forest pond/pool
- Ground pool
- Lake/pond
- Marsh
- Ricefields, flooded field
- Salt-water marsh
- Water bank, oyster

### Month of Collection
- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

### Degrees of Shade
- 1-10m
- 10-100 m
- 100-1000 m

### Turbidity
- Clear
- Colored
- Polluted
- Turbid

### Water Source
- Permanent
- Semi-permanent
- Temporary

### Salinity
- Brackish
- Fresh

### Water Flow
- Moderate
- Slow
- Stagnant

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**Anopheles (Ano.) crucians** Wiedemann, 1828

**Bionomics:**
The larvae of *An. crucians* are found in semi-permanent and permanent pools, pond, lakes and swamps. Acidic water with emergent and floating vegetation is preferred. Females are outdoor night biters but will bite during the cloudy day and in the shade. Both sexes are attracted to lights.

**Medical Importance:**
*An. crucians* has been found to be naturally infected with malaria. Infection rates of 3.28% have been observed. This species may serve as an important malaria vector.

**WRBU Species Page**

**VectorMap Data Summary:**
Number of Records: 516  
Number of Localities: 86  
Bionomics:
Larvae have been found in rice fields, swamps, and ditches in clear, fresh and stagnant water usually with grass, rice, reeds or cattails (Belkin, Heinemann & Page, 1970).

Medical Importance:
*An. vestitipennis* is a suspected vector of malaria (Loyola E.G. et al. 1991).

VectorMap Data Summary:
Number of Records: 165
Number of Localities: 33
**Bionomics:**
*An. grabhamii* larvae have been found in slow moving stream margins, stream pools, flooded fields, ditches, and large man-made containers. The water is typically fresh and clear with or without vegetation. Larvae are known to tolerate brackish water (Simmons and Aitken (1942) and Belkin et al. (1970)).

**Medical Importance:**
This species is considered a malaria vector. Adult *An. grabhamii* mosquitoes have been found infected with *P. falciparum* Carley (1931) and Earle (1936).

**WRBU Species Page**

**VectorMap Data Summary:**
Number of Records: 136  
Number of Localities: 58  
Sources: Preserved Specimens from the Mosquito Information Management Project, Erwin, Terry, 1989
Haiti

Identification Keys

Species List for Medically Important Mosquitoes of Central and South America

Species List of Mosquitoes Reported from Zambia

WRBU Keys to the Medically Important Mosquitoes of Central and South America


<table>
<thead>
<tr>
<th>Topic</th>
<th>Author / Institution</th>
<th>Year</th>
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<th>Journal / Source</th>
<th>Summary</th>
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<tr>
<td><strong>Introduction Literature: Malaria in Haiti</strong></td>
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</tr>
<tr>
<td>Biosurveillance</td>
<td>Marquetti-Fernández, María del Carmen</td>
<td>2013</td>
<td>Contribution to knowledge of distribution of mosquitoes and some biological aspects of mosquitoes in Haiti</td>
<td>Anales de Biología 35: 55-63, 2013</td>
<td>Following the earthquake in 2010, rapid entomological assessment of 35 districts in Haiti were carried out, focusing on larval habitat. Results are described and include all mosquito species found.</td>
</tr>
<tr>
<td>Biosurveillance</td>
<td>Hobbs, Jesse</td>
<td>1986</td>
<td>The Biting And Resting Behavior Of Anopheles albimanus In Northern Haiti</td>
<td>J. Amr. Mosq. Control Assoc. Vor. 2, No. 2</td>
<td>A one year study of the biting and resting behavior of An. albimanus in 4 rural villages in Northern Haiti and discussion on how findings relate to malaria infection rates.</td>
</tr>
<tr>
<td>Biosurveillance</td>
<td>Eisele, Thomas P.</td>
<td>2006</td>
<td>Prevalence of Plasmodium falciparum infection in Rainy Season, Artibonite Valley, Haiti, 2006</td>
<td>Emerging Infectious Diseases 13(10)</td>
<td>A population-based survey to estimate the prevalence of Plasmodium falciparum infection among persons older than 1 month in the Artibonite Valley of Haiti during the high malaria transmission season in 2006.</td>
</tr>
<tr>
<td>Biosurveillance</td>
<td>Caillouet, Kevin A.</td>
<td>2008</td>
<td>Characterization of aquatic mosquito habitat, natural enemies, and immature mosquitoes in the Artibonite Valley, Haiti</td>
<td>Journal of Vector Ecology, 33(1):191-197</td>
<td>Descriptions of water body types that support mosquito breeding, of particular interest to the authors is the relationship between An. albimanus population levels and presence of aquatic predators.</td>
</tr>
<tr>
<td>Biosurveillance</td>
<td>Mason, John</td>
<td>1968</td>
<td>The Development of the Haiti Malaria Eradication Programme</td>
<td>The World Health Organization, WHO/MAL/68.665</td>
<td>A baseline survey of An. albimanus breeding sites, population density and biting behavior conducted in 1963-64.</td>
</tr>
<tr>
<td>Biosurveillance</td>
<td>Taylar, Robert</td>
<td>1966</td>
<td>The Ecology of Anopheles albimanus in Haiti</td>
<td>Mosquito News 26(3)</td>
<td>Knowledge, perceptions, and practices related to malaria were obtained from household representatives using a standardized questionnaire. Results suggest malaria control in Haiti should focus on enhanced surveillance and case management, with expanded information campaigns about malaria prevention and treatment options.</td>
</tr>
<tr>
<td>Evaluation of interventions</td>
<td>Clinton Health Access Initiative</td>
<td>2013</td>
<td>The feasibility of malaria elimination on the island of Hispaniola, with a focus on Haiti. An assessment conducted January–June 2013</td>
<td>N/A</td>
<td>A description of a historical malaria elimination plan that includes IRS, MDA and source reduction.</td>
</tr>
<tr>
<td>Evaluation of interventions</td>
<td>Schliessmann, D. J.</td>
<td>1973</td>
<td>Drainage and Larviciding for Control of a Malaria Focus in Haiti</td>
<td>Mosquito News 33(3)</td>
<td>A description of a historical malaria elimination plan that includes IRS, MDA and source reduction.</td>
</tr>
<tr>
<td>General Background</td>
<td>AFPMB</td>
<td>1994</td>
<td>Disease Vector Ecology Profile: Haiti</td>
<td>U.S. Army Center for Health Promotion and Preventive Medicine: SHG 015-0304</td>
<td>General background on VBD risk in Haiti including risk maps for malaria and other mosquito-borne diseases.</td>
</tr>
<tr>
<td>General Background</td>
<td>CHIPPM ?</td>
<td></td>
<td>A Soldier’s Guide to Staying Healthy in Hispaniola: Haiti and the Dominican Republic</td>
<td></td>
<td>This document is designed for distribution to deployed personnel to reduce the risk of disease and other non-combat related injuries.</td>
</tr>
</tbody>
</table>
References

Maxent model of *Cx. nigripalpis* Dornak, L. 2011
Maxent model of *Ae. scapularis* Dornak, L. 2011
Maxent model of *Ae. aegypti* Nyari, A. 2011
Maxent model of *An. vestitipennis* Nyari, A. 2011
Maxent model of *An. crucians* Nyari, A. 2011
Maxent model of *An. albimanus* Nyari, A. 2011

- People/1 Sq Km. This Product Was Made Utilizing The Landscan (2011)™ High Resolution Global Population Data Set Copyrighted By UT-Battelle, LLC, Operator Of Oak Ridge National Laboratory Under Contract No. DE-AC05-00OR22725 With The United States Department Of Energy. The United States Government Has Certain Rights In This Data Set. Neither UT-Battelle, Llc Nor The United States Department Of Energy, Nor Any Of Their Employees, Makes Any Warranty, Express Or Implied, Or Assumes Any Legal Liability Or Responsibility For The Accuracy, Completeness, Or Usefulness Of The Data Set. Available At Http://Www.Ornl.Gov/Sci/Landscan/
- Estimated Proportion of the General Population that are Infected with *P. vivax* at any one time, averaged over the 12 months of 2010. *Malaria Atlas Project*
The Walter Reed Biosystematics Unit is part of the Walter Reed Army Institute of Research and is based at the Smithsonian Institution Museum Support Center. To access taxonomic keys, the Systematic Catalog of Culicidae or to learn more about WRBU visit www.wrbu.org.

VectorMap is only as good as the data you provide. If you have collection records, models or pathogen testing results please contact the VectorMap team to learn how to contribute data at mosquitomap@si.edu.

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