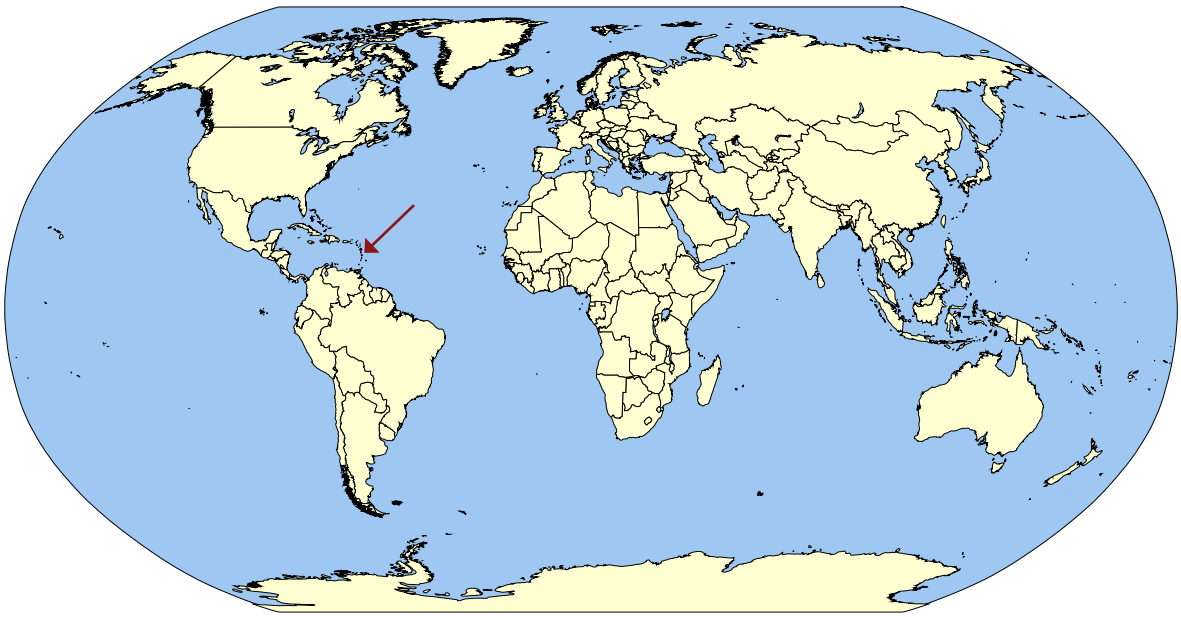
Martinique

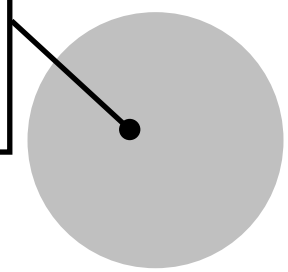


The History of Schistosomiasis in Martinique

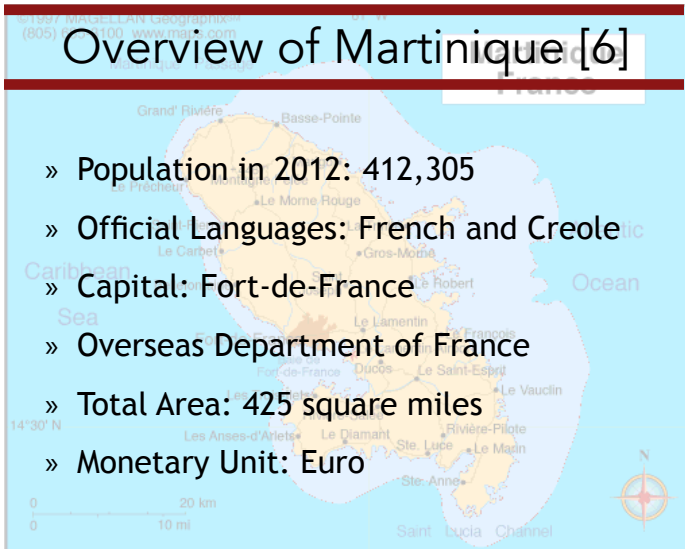
Schistosomiasis has been successfully eliminated in Martinique, a country whose story represents one of the most well documented cases of inadvertent schistosomiasis control resulting from successful, widespread invasion by non-competent competitor snail species. Beginning in the 1950s – prior to widespread advocacy of snail control – many countries used integrated control measures to respond to increasing schistosomiasis prevalence rates. On Martinique, *S. mansoni* had been prevalent in Biomphalaria glabrata snails since the 19th century [1]. The prevalence of *S. mansoni* was estimated at 6.4% in 1951 and 8.4% in 1961 [3]. By 1977, the prevalence of *S. mansoni* had reached 12% in the human population. In the years following, Martinique initiated integrated control efforts, including improved sanitation measures and sanitary education as well as detection and treatment of patients, but snail control provided the greatest prevalence reduction [1].

Schistosomiasis in Martinique

Schistosomiasis
eliminated
due to successful
snail control



Overview of Martinique [6]



- Population in 2012: 412,305
- Official Languages: French and Creole
- Capital: Fort-de-France
- Overseas Department of France
- Total Area: 425 square miles
- Monetary Unit: Euro

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Snail Invasions and Schistosomiasis

There were eight alien freshwater snail species invasions from 1950-2000 on Martinique [1]. Not all of them were beneficial in reducing schistosomiasis. Beginning in 1967, one invasive snail species had a particularly negative impact: *Biomphalaria kuhniana*, a member of the *Biomphalaria straminea-complex*, which was previously referred to solely as *B. straminea*. *B. kuhniana* was rapidly distributed across the whole hydrogeographic system of Martinique and proved to be a compatible host for *S. mansoni*, despite its lower susceptibility to infection. [1,2]

Later, in 1979, the exotic prosobranch snail, *Melanoides tuberculata* was accidentally introduced to the entire hydrogeographic system of Martinique, likely as spillover from the 1978-1980 biocontrol program employed by St. Lucia Island, which lies 34 km directly south of Martinique. The species rapidly colonized Martinique, displacing populations of *Biomphalaria glabrata* and *Biomphalaria kuhniana*, and becoming well established by the early 1980s [1]. The competitor snail, which proved non-competent for schistosome infection, became so common that by 1983 the leaders of the Ministry of Health in Martinique decided to capitalize on the accidental introduction to initiate a biological control program against schistosomiasis, using *M. tuberculata* [1]. At this point, Martinique had just began to use integrated control efforts, including sanitation and health education, but it quickly became apparent that the biological invasion of *M. tuberculata* would be the most successful form of control on the island. So, by 1989, after several more intentional introductions into water bodies, the prevalence of *S. mansoni* dropped to 1.33% and by 1990, malacological studies proved that both *B. glabrata* and *B. kuhniana* had totally disappeared from eight sites while very few individuals were recorded from the remaining sites [4].

The invasion of the snail *Melanoides tuberculata* was instrumental to the elimination of schistosomiasis from Martinique because it drove away the worm's intermediate host.

Successful Elimination

More recent surveys in 2003 have confirmed that schistosomiasis is eliminated on the island of Martinique [5]. Overall, the elimination is attributed to integrated control strategies with a focus on the control of *Biomphalaria* intermediate snail hosts and effective bio-control. However, it may be more appropriate to contribute more success to the unintentional biological control of snails that resulted from the accidental introduction and rapid colonization of *M. tuberculata* on Martinique, which drove successful elimination far faster than any field trials could [2].

A Note on Biological Control

Biological invasions are uniquely context-dependent and can present their own dilemmas. In the case of Martinique, these particular exotic competitor snails were well suited to the stable habitats and were able to replace the existing *B. glabrata* and *B. kuhniana* populations, leading to a positive outcome for schistosomiasis. However, in other environments, unintentional and intentional introduction of exotic species by similar mechanisms can have negative consequences as crop pests or as in displacers of important native species. Because of these possible environmental costs, most contemporary schistosomiasis control guidelines underestimate the importance of biological control, and tend to stress the need for full ecological consideration. A paradigm shift is needed to fully communicate the efficacious, positive outcomes achievable biological control.

References

1. Pointier, J. Invading Freshwater Snails and Biological Control in Martinique Island, French West Indies. *Mem. Inst. Oswaldo Cruz* **96**, 67-74 (2001).
2. Fried, B., Pointier, J., David, P. & Jarne, P. Biomphalaria Snails and Larval Trematodes. (2011). doi:10.1007/978-1-4419-7028-2
3. Atlas of the global distribution of schistosomiasis - Martinique. (1987).
4. Pointier, J. P. Biological control of the snail intermediate hosts of *Schistosoma mansoni* in Martinique, French West Indies. 1990–1993 (1992).
5. Rollinson, D. *et al.* Time to set the agenda for schistosomiasis elimination. *Acta Trop.* **128**, 423-440 (2013).
6. Infoplease. (2015). Martinique. At <http://www.infoplease.com/country/martinique.html>

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