

## SCHISTOSOMIASIS AND ITS INTERMEDIATE HOSTS IN THE LESSER ANTILLEAN ISLANDS OF THE CARIBBEAN

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*Schistosomiasis poses a significant health threat in the Caribbean area. This article reviews the status of the disease and various factors contributing to its transmission on the islands of the Lesser Antilles.*

### Introduction

The discontinuous distribution of *Schistosoma mansoni* in the Caribbean islands results from accidents of history, geography, and the migration of both infected people and intermediate host snails. The spread of infection requires the presence of infected people, a susceptible snail host, poor sanitation, and human dependence upon snail-infested water. The various Caribbean countries differ in these regards, and the relationships between the various critical factors determine whether and to what extent the disease exists.

Sturrock and Sturrock (1) cite reports of transmission in the following places: the Dominican Republic, Puerto Rico, Vieques, St. Maarten, St. Kitts, Montserrat, Antigua, Guadeloupe, Martinique, and Saint Lucia in the Caribbean and Venezuela and Suriname on the South American mainland. Ferguson et al. (2,3) report that the infection has been eliminated from St. Kitts and Vieques. Of the remaining places, Trinidad, Grenada, Barbados, and St. Vincent are apparently free of *Biomphalaria glabrata* (the most important snail host in the area), although *B. straminea* is present in Trinidad and Grenada.

Sturrock and Sturrock (1) showed that *B. glabrata* from Dominica, the Dominican Republic, Puerto Rico, and French Guiana were susceptible to St. Lucian *S. mansoni*, although the snails from French Guiana

showed signs of resistance to infection. Because the collections came from widely separated locations, the Sturrocks suggested that all Caribbean strains of *B. glabrata* and *S. mansoni* were likely to be mutually compatible, and they concluded that the only barriers to the spread of schistosomiasis were physical.

The author visited St. Kitts, Montserrat, Antigua, Dominica, and Grenada in late 1977 and early 1978, as well as St. Maarten in early 1979. This paper reviews the history and current status of schistosomiasis transmission in these and other islands of the Lesser Antilles (see Figure 1).

### Islands with a History of Schistosomiasis

#### *St. Maarten (120 Km<sup>2</sup>)*

This small island is well-drained and nowadays chronically short of water. There are no perennial streams, and domestic water comes from wells and a desalination plant.

Jones (4) reported seeing 24 cases of intestinal schistosomiasis from St. Maarten between 1920 and 1922, some of them serious. Nearly all came from Colombier, a village in the hills where there was a sugar mill. Hoffman (5) reported that standing water and schistosomiasis were still present there in 1929. However, no recent cases of the disease have been reported (6).

There are no longer any snail habitats at Colombier, the wettest valley in St. Maarten, and surface water remains only a few days following heavy rain. The local people

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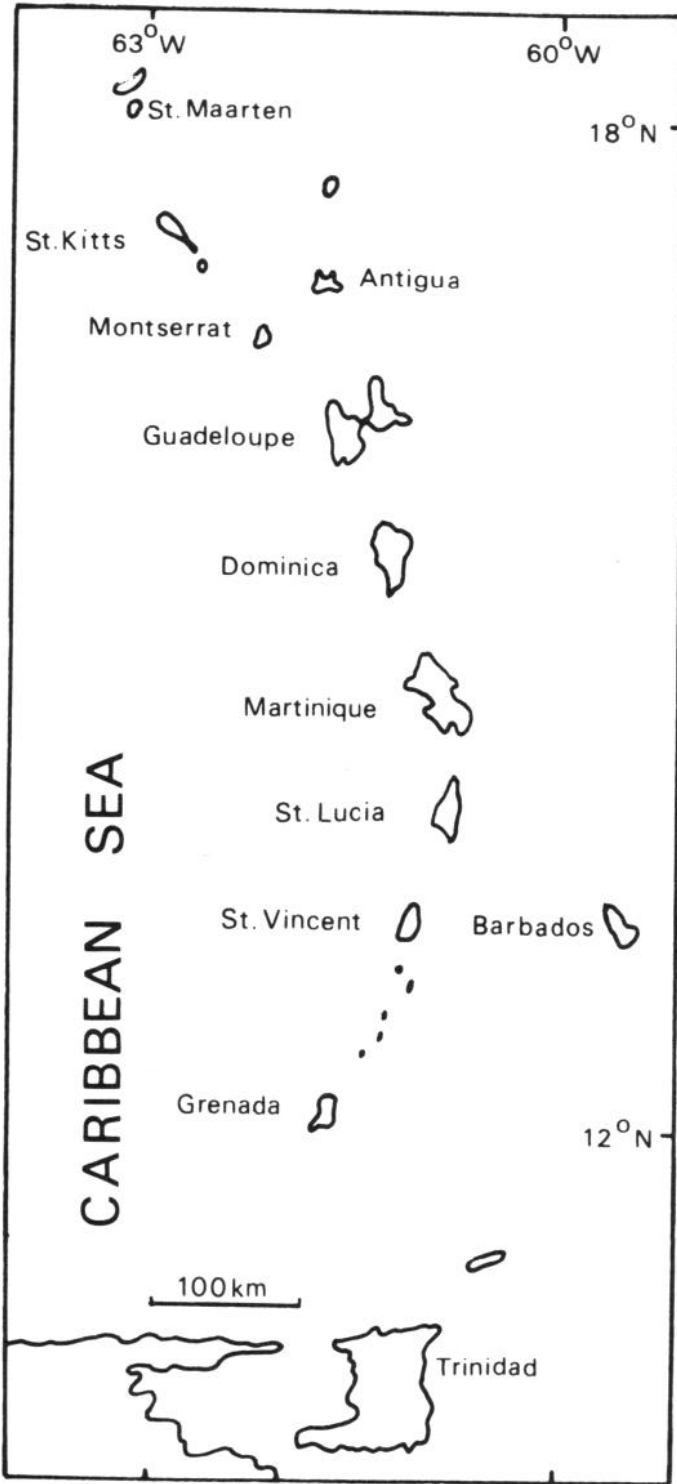
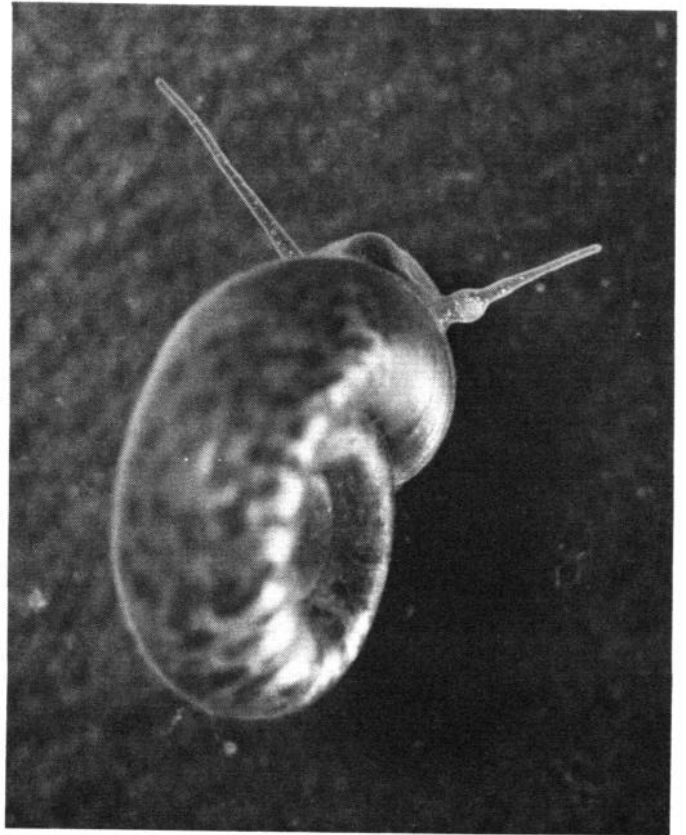


Figure 1. The Lesser Antilles.



*Biomphalaria glabrata*, intermediate host of schistosomiasis in the Caribbean. The swelling at the base of the right tentacle is a primary sporocyst of *S. mansoni*. Photo by the author.

associate this general change with the extensive deforestation that took place in the first half of the century; and Dr. Gibbs, who was born in the area, comments that the wet season is no longer as well-defined or as wet as it used to be.

*St. Christopher (St. Kitts; 186 Km<sup>2</sup>)*

St. Kitts is a small elongated island characterized by a forested central mountain

ridge with well-drained and fertile lower slopes supporting sugar-cane cultivation. Rainfall is moderate and surface water is severely limited below the forest line.

Schistosomiasis was previously hyperendemic in Boyd's Village and several other coastal villages bordering streams. In 1932 Jones (7) reported an island-wide schistosomiasis prevalence of nearly 25 per cent based on single saline fecal smears. The infection disappeared in the 1940s when streams running off the central mountain range were progressively tapped for water. Ferguson et al. (2) reported that by 1945 only one of the six "permanent" rivers on the island continuously reached the sea, the rest flowing only during the rains when snail populations were unable to establish themselves.

By 1959, *B. glabrata* was confined to an area called the West Farm Gut, and stools from 188 randomly selected schoolchildren and villagers were negative for *S. mansoni* (2). Since then, attempts have been made to eliminate *B. glabrata* from the island by using

molluscicides and the competitor snail *Marisa cornuarietis*. After Bayluscide treatments in 1965, *B. glabrata* appeared to be absent from the island until it was observed again in West Farm Gut in 1975. In 1976 Ferguson (8) reported finding the snail for the first time in Fountains River. Bayluscide was applied in 1976, but the application was restricted to the stretch of river below the last of several domestic water intakes and so was ineffective.

A September 1977 visit did not reveal any *B. glabrata* in West Farm Gut, and *Marisa* was abundant; however, this situation has been observed before and the *Biomphalaria* have recovered. The *B. glabrata* colony in Fountains River was thriving. Nevertheless, *B. glabrata* is now so restricted in its distribution that transmission of *S. mansoni* is unlikely to recur. Both the West Farm Gut and Fountains River habitats are relatively isolated, the former being protected as a water supply catchment area and the latter being mostly at an altitude of 450 meters in dense gallery forest. The infection (probably a zoonanthroponosis) once reported by Cameron (9) in resident West African green monkeys (*Cercopithecus sabaues*) is presumed to have died out, since no infections have been found in *Biomphalaria* for many years.

#### *Antigua (278 Km<sup>2</sup>)*

This comparatively flat island is generally well-drained; snail habitats have been restricted to the few permanently flowing streams and the many existing reservoirs and ponds. Cases of intestinal schistosomiasis were common early in the century, and in fact *S. mansoni* was first differentiated from *S. haematobium* in 1907 when Sir Patrick Manson described lateral-spined eggs found in the stool of a patient who had worked on Antigua and St. Kitts.

According to the 1923 Annual Report of the Medical Department, a hookworm survey detected *S. mansoni* in 18 per cent of those examined in St. John's parish, and Jones (7) tells of a reported 60 per cent prevalence in a

village adjoining the main water-collecting area. He also notes that planorbid snails were abundant in the pools and sluggish streams, and reports that a bifid-tailed cercaria from a planorbid snail was obtained from the filter bed of the St. John's city water supply.

Annual medical reports mention Bendal's Stream and the Body Pond complex, a series of dammed pools (originally the only reservoir for the St. John's water supply) as being areas of high transmission in the past.

Because of water impoundment projects, there are no longer permanently flowing streams on the island, and the disease has declined. The last reported cases occurred in the area of Sweets and Liberta villages about 13 years ago; these cases were asymptomatic and were discovered by routine parasitologic examinations (10).

A 1977 survey showed *B. glabrata* to be widespread and abundant in pools and dams throughout the island. Many of the new reservoirs are infested, but human contact with them is limited. It is possible that low-grade transmission continues in the Body Pond area among youths fishing the ponds, but increased transmission is unlikely unless the large reservoirs now under construction become important recreation sites.

A single empty shell of the melaniid snail *Thiara granifera* (also known as *Tarebia granifera*) was recently collected from the new Collins Dam. Wading birds are common in Antigua, and there is every likelihood that this snail will spread rapidly, as it has recently in Puerto Rico, Grenada, and Dominica. If it does spread, it may exert a further restraining influence on the population of *B. glabrata*.

#### *Montserrat (181 Km<sup>2</sup>)*

This small, hilly island has many habitats suitable for *B. glabrata*. Jones (7), writing in 1932, mentions the presence of planorbid snails and also refers to cases of schistosomiasis imported into St. Kitts from Montserrat. It is possible therefore that the infection has been present on Montserrat for many

years, although it has apparently not been sufficiently serious to draw attention. About 10 years ago the Hospital for Tropical Diseases in London diagnosed intestinal schistosomiasis in a Canadian youth who had bathed in Farms River but had reported no other contact with water in endemic areas. More recently, another case was diagnosed in a native of Montserrat living near Barzey's Stream, several miles away over a mountain ridge from Farms River (11).

In 1977 a brief survey of the island showed that *B. glabrata* was present in both Barzey's Stream and Farms River. The survey took place shortly after a period of heavy rain that could have been expected to flush many snails from these streams. The survey results thus suggest that large snail populations exist in these streams during the dry season. *B. glabrata* could not be found in the Belham River, although habitats were plentiful and associated snails (*Physa*, *Potamopyrgus*) were abundant.

Many youths from Harris' Village regularly swim in a pool below a derelict dam wall in the Farms River, and there is evidence that people wash and bathe in Barzey's Stream. It seems likely that a survey of local residents would reveal evidence of low-grade transmission associated with both rivers.

#### Guadeloupe (1,513 Km<sup>2</sup>)

Guadeloupe consists of two islands that are separated by a narrow strait and linked by a bridge. The western island, Basse-Terre, is mountainous, forested, and contains numerous permanent rivers, while the eastern island is low-lying, well-drained, and has only temporary streams. Schistosomiasis is most prevalent on Basse-Terre.

These islands have recently been studied extensively in preparation for introducing schistosomiasis control measures. Golvan et al. (12) report that the infection has become important relatively recently, owing to increased irrigation and the domestic use of previously neglected canals and flumes built

in the days when water power was important. Stool examinations have revealed a schistosomiasis prevalence of 24 per cent over a fourteen-year period at St. Claude on Basse-Terre, with a recent increase to 43 per cent among 15,407 people examined in 1972.

*B. glabrata* is widespread on both islands but is most numerous on Basse-Terre. *B. schrammi* also occurs but is refractory to infection with *S. mansoni*.

Combes et al. (13) have reported *Rattus rattus* and *Rattus norvegicus* naturally infected with *S. mansoni* in an uninhabited lake area, but Theron et al. (14) have concluded that rats are not an important factor in areas where human transmission occurs.

#### Martinique (1,000 Km<sup>2</sup>)

This volcanic island is topographically similar to Grenada, Saint Lucia, and Dominica—except in its southern portions, where it is less mountainous than the others. Rainfall is high, and snail habitats are widespread in natural streams and ditches constructed for irrigation and drainage.

Schistosomiasis was first reported in 1906. Grétilat (15) quotes a report by Leger, who found an 8.5 per cent prevalence among troops in 1908, and Noc (16) found 32 of 45 children in an orphanage infected. Guyard and Pointier (17) reported a prevalence of 6.4 per cent for Martinique as a whole, while Mathieu (18) reported a 70 per cent prevalence in the Commune of Lorrain. As yet no control measures have been undertaken.

The snail situation is somewhat confused. *B. glabrata* is apparently rare. The snail was first reported by Bordaz (19); its location (in a pond at the botanical gardens) suggests introduction by a human agency. Dreyfuss (20) and Grétilat (15) reported finding it at many sites around Fort-de-France, but Guyard and Pointier (17) believed that it may have been confused with *Helisoma* or with large specimens of *B. straminea*, since they were able to collect *glabrata* from only four sites in the six

years 1972–1978. In 1972 infected snails were obtained from one of four collecting sites—a reservoir whose snail population had been previously determined (probably erroneously) as *Australorbis peregrina* by Grétilat (15).

The most common planorbid is *B. straminea* (21). This snail is an important host in parts of Brazil, and Paraense (22) reports finding it naturally infected in Martinique. However, the relative importance of *B. glabrata* and *B. straminea* in transmission is far from clear.

In addition, Guyard and Pointier (17) have reported *B. schrammi* at Fort-de-France. This snail is not susceptible to infection with *S. mansoni*. Also, *B. havanensis* was reported by Grétilat (15), but this may have been due to misidentification of *B. straminea*, which Guyard and Pointier (17) have reported as being common in the area concerned.

#### *Saint Lucia (614 Km<sup>2</sup>)*

Saint Lucia is a rugged, forested island with heavy rainfall and many permanent

streams. Snail habitats are plentiful wherever the forest has been cleared for agriculture. Although schistosomiasis may have been present at a low level much earlier, it was first reported by Vinter (23) in the Soufriere Valley in 1925. It is possible that the infection's prevalence was then increasing, since there is no record of *S. mansoni* eggs having been found in 100,000 stool examinations done during a Rockefeller Foundation hookworm control campaign mounted between 1914 and 1924. By the 1970s, before control started, the schistosomiasis prevalence was above 70 per cent in the most involved communities.

*B. glabrata* is widespread and is the only *Biomphalaria* species recorded in Saint Lucia. Sturrock (24) discusses the transmission pattern in Cul-de-Sac Valley and shows that the most important sites are the streams where snails from high-level marshes can establish themselves during the dry season. This snail distribution pattern, which I have found in other valleys, is typical of mountainous areas with heavy rainfall. The ecology



An alluvial valley in Saint Lucia. Transmission of schistosomiasis may occur in the river and its tributaries during the dry season when conditions are suitable for a build-up of *B. glabrata* colonies. Photo by the author.

of fresh-water habitats in relation to their colonization by *B. glabrata* has been described by Sturrock (25), and the results of snail control in Cul-de-Sac Valley have been reported by Sturrock et al. (26). Jordan (27) has reviewed the progress of snail control, the provision of water supplies, and chemotherapy, the three basic schistosomiasis control methods employed in Saint Lucia.

As a result of the control program now in progress, the prevalence of schistosomiasis has been substantially reduced, and the threat of Saint Lucia residents carrying the infection to other areas has diminished. However, the possibility remains that snails from Saint Lucia could be transported to St. Vincent or Grenada, since extensive snail control is not part of the Saint Lucia program.

#### Islands without a History of Schistosomiasis

##### *Dominica (745 Km<sup>2</sup>)*

This extremely mountainous island supports dense forest, and heavy rainfall creates numerous torrential streams. It has apparently only recently been invaded by *B. glabrata*. In 1964 the Smithsonian Institute Biological Survey first reported the snail in artificial ponds in and around Roseau, the capital. Despite attempts to eradicate these populations, the snail spread via fish-culture ponds; by 1972 it had reached a natural pond situated high in the Roseau Valley and was common in ornamental ponds at a nearby hotel. Further attempts to eradicate the snail using Bayluscide succeeded only in destroying the hotel pool colony (28).

A 1974 survey showed that *B. glabrata* was still present in the natural pond and had spread into a large seepage area near a small community at Wotten Waven. It was also found in a stream and marsh system among houses at Trafalgar, over a mile away on the opposite side of the precipitous Roseau Valley.

A more recent 1978 survey showed that the snail was firmly established at Wotten Waven

and had spread into a second stream system near Trafalgar. However, the original Trafalgar habitat was heavily infested with *T. granifera*, and no *B. glabrata* were collected. *T. granifera* was not observed during the 1974 survey, and it seems to have been introduced into Dominica very recently. It is now ubiquitous in the Roseau Valley. Ferguson (8) has commented on the high densities achieved by this snail and has suggested that it must exert a "sustained restrictive pressure upon all other snails in a habitat."

There have been no reports of autochthonous schistosomiasis cases on Dominica, although the potential for transmission certainly exists at Wotten Waven and infected people live on the neighboring islands of Guadeloupe and Martinique. Although *B. glabrata* is spreading slowly throughout the Roseau Valley, it is currently absent from the most dangerous habitat at Trafalgar. While this may be only a temporary setback, it is possible that the faster-spreading *T. granifera* may slow down or even prevent *B. glabrata* from colonizing the island's rather limited number of suitable habitats.

##### *St. Vincent (387 Km<sup>2</sup>)*

This mountainous forested island, described by Harrison and Rankin (29), has a heavy rainfall and is similar to Saint Lucia—although the highest parts have been modified by more recent volcanism. Its fresh-water habitats, fauna, and water chemistry—which resemble those of Saint Lucia—have been described (29–31).

Schistosomiasis does not occur on St. Vincent because *Biomphalaria spp.* are absent, although suitable habitats abound and associated snails are present. If *B. glabrata* were introduced from nearby Saint Lucia, it might colonize the islands; and because St. Vincent is more densely populated, schistosomiasis might thrive. Although the transmission potential is high, however, the risk of introducing the infection is diminishing rapidly due to the control effort on Saint Lucia.

### Barbados (428 Km<sup>2</sup>)

This flat coral island is generally well-drained and has few snail habitats. Fresh water is stored naturally underground rather than in surface pools. There have been no reports of autochthonous cases of schistosomiasis.

*B. helophila* has been collected (32) by Paraense, but it is a poor host, and both the risk and the transmission potential involved are very low.

### Grenada (310 Km<sup>2</sup>)

Grenada is the most southerly of the Lesser Antilles. It is a small, mountainous, forested island with heavy rainfall and numerous permanent streams and rivers. Neither *B. glabrata* nor autochthonous cases of schistosomiasis have been reported, but *B. straminea* is apparently widespread. Malek (33) collected planorbids, which he referred to as *B. havanensis*, from three widely separated localities in 1965; adult snails from this collection proved unsusceptible to *S. mansoni* from both Puerto Rico and Saint Lucia. Richards (34) reported collecting a planorbid, described as *B. straminea*, from two sites in 1971. Again, adult snails proved unsusceptible; but a very few laboratory-reared juvenile snails yielded patent infections.

During a visit of mine in January 1978, planorbids were collected from a stream at Moya and a roadside ditch at Tivoli on the eastern side of the island. These snails were identified by Professor W. L. Paraense as *B. straminea*. However, in 1978 planorbid snails were absent from the sites of Malek's 1965 collection, and so it was not possible to determine whether both *B. havanensis* and *B. straminea* were still present or whether the specimens collected earlier were *B. straminea*.

*B. straminea* is an important intermediate host in parts of Brazil, where its extreme vigor and high density compensate for its low susceptibility to the Brazilian strain of *S. mansoni*.

Adults of the most recent collection from Grenada once again proved unsusceptible to St. Lucian *S. mansoni*, but one patent infection occurred among 107 survivors of 407 laboratory-reared juvenile snails exposed to approximately 1 miracidium each. This extremely low susceptibility is unlikely to support natural transmission under conditions prevailing on Grenada.

Although *B. straminea* is known to occur in several localities (and a prolonged search would doubtless reveal it in many more) it is absent or infrequent in many suitable habitats dominated by *T. granifera*. This latter snail was first reported on Grenada in 1970 by Ferguson (8). It is now widespread and in several places its numbers exceed 500 individuals per square meter.

### Discussion

*Biomphalaria* species are discontinuously distributed throughout the Caribbean region. Table 1 shows the members of the genus reported from each island in the Lesser Antilles and indicates whether the ranges of those species within each island are widespread or restricted.

There is ample evidence that gastropods or their egg clusters can be transported by animals and birds in mud and detritus and by man in shipments of aquatic vegetation (35, personal observations). The introduction of *T. granifera* into Puerto Rico (around 1953), Grenada (perhaps around 1970), Antigua (date unknown), and Dominica (between 1973 and 1977) from its original point of introduction to the Western Hemisphere in Florida (8, personal observations) demonstrates that the sea is no barrier, and the recent introduction of *B. glabrata* into Dominica (albeit probably by human agency) confirms this.

The distribution of *Biomphalaria* species in the Caribbean is therefore best explained by a combination of land movement and snail dispersion, the latter process being accelerated by human intervention. There is

Table 1. Reported distribution of *Biomphalaria* species and *Thiara granifera* in the Lesser Antilles.

Island	<i>Biomphalaria</i> species reported	Status as intermediate host	Distribution of reported <i>Biomphalaria</i> species	Presence of <i>Thiara granifera</i> reported
St. Kitts	<i>B. glabrata</i>	yes	restricted, declining	
Montserrat	<i>B. glabrata</i>	yes	widespread	
Antigua	<i>B. glabrata</i>	yes	widespread	yes (1977)
Guadeloupe	<i>B. glabrata</i>	yes	widespread	
	<i>B. schrammi</i>	no	restricted	
Dominica	<i>B. glabrata</i>	yes	restricted, spreading	yes (1977)
Martinique	<i>B. glabrata</i>	yes	very restricted	
	<i>B. straminea</i>	possibly	widespread	
	<i>B. schrammi</i>	no	very restricted	
	<i>B. helophila</i> *		?	
	<i>B. peregrina</i> *		?	
	<i>B. havanensis</i> *		?	
Saint Lucia	<i>B. glabrata</i>	yes	widespread	yes (1978)
Barbados	<i>B. helophila</i>	poor	restricted	yes (1969)
St. Vincent	none			
Grenada	<i>B. straminea</i>	possibly	restricted	yes (1970)
	<i>B. havanensis</i> *			

\*Identification suspected of possible inaccuracy.

thus every likelihood that *B. glabrata* will eventually be transported to both St. Vincent and Grenada. Whether it subsequently becomes established there will depend on local factors—including, on Grenada, the possibility of strong competition from already-established planorbid and other aquatic snails.

The recent introduction of the ovoviviparous and parthenogenetic snail *T. granifera* into the region will almost certainly have a restraining effect on planorbid snail populations in the future. Ferguson (8) reports instances of declining *B. glabrata* populations in areas invaded by *T. granifera* in Puerto Rico. In Grenada enormous numbers of *T. granifera* were present in torrential streams, demonstrating a clear ability to withstand heavy flushes. The snail may therefore prove a particularly effective tool for control efforts on mountainous islands such as Saint Lucia, Dominica, Martinique, and Guadeloupe.

*T. granifera* is the first intermediate host of

the lung flukes *Paragonimus westermani* and *P. kellicotti*. However, man only contracts paragonimiasis incidentally by eating the second intermediate host (various species of fresh-water crustaceans) in the raw state. This is unlikely to become a problem in the Caribbean, where river shrimps are always well-cooked before consumption.

Tables 2 and 3 provide an overview of the present situation on the Lesser Antilles; and Table 3 assesses the risk that schistosomiasis could be introduced and spread on islands with no past history of the disease. Of these latter islands, Dominica must be considered at greatest risk, since a good host snail is already established in areas where human contact occurs, and there is a nearby source of infected people. However, the transmission potential there is relatively low, due to the very high gradient of most streams.

On islands where *B. glabrata* is absent, every effort should be made to keep it so. A likely—and preventable—way of importing



Table 2. Overview of the present schistosomiasis situation on islands with a history of the infection.

Island	Status of the disease	Island's relative susceptibility to the indicated snail host(s) present	Relative extent of snail habitats	Relative degree of human contact with infected water	People per km <sup>2</sup>	Transmission potential	Risk of increasing disease
St. Maarten	Has died out (deforestation)	none	none	—	166	none	none
St. Kitts	Died out in 1946 (water management)	<i>B. glabrata</i> (+ + +)	+	+(?)	300	very low	very low
Antigua	May have died out (water management)	<i>B. glabrata</i> (+ + +)	+	+	170	low	low
Montserrat	+ (May be increasing)	<i>B. glabrata</i> (+ + +)	++	+++	140	moderate	moderate
Guadeloupe	+++	<i>B. glabrata</i> (+ + +)	+++	+++	225	high	high
Martinique	+++	<i>B. glabrata</i> (+ + +) <i>B. straminea</i> (+)	+++	+++	320	high	high
Saint Lucia	+ Declining (control)	<i>B. glabrata</i> (+ + +)	+++	+++	210	high	uncertain

Table 3. Overview of the schistosomiasis risk on islands with no history of the infection.

Island	Island's relative susceptibility to the indicated snail host	Existence of appropriate snail hosts	Potential degree of human contact with infected water	People per km <sup>2</sup>	Transmission potential	Risk of disease introduction
Dominica	<i>B. glabrata</i> (+ + +)	++	++	105	moderate	very high
St. Vincent	none	+++	+++	285	high if <i>B. glabrata</i> became established	high
Barbados	<i>B. helophila</i> (+)	+	+	615	low	low
Grenada	<i>B. straminea</i> (+)	+++	++	355	high if <i>B. glabrata</i> became established	low

juvenile snails and egg masses is upon aquatic plants imported for ornamental or piscicultural purposes. Some islands already ban the importation of such plants, but such laws are difficult to enforce because fishermen with small boats make many unregulated passages. Therefore, in all cases it would be desirable to have a qualified malacologist

periodically examine the snail fauna in public and private ponds.

It is more difficult to see what can usefully be done on islands like Dominica, where the intermediate host is already present. It is impractical to eradicate the snail or to screen visitors for schistosomiasis. So whether an infected visitor will contaminate the snail-

infested areas—before improvements in the general level of hygiene make that unlikely—remains a matter of chance.

On islands where the disease is hypoendemic or suspected, and where there is a danger of increased prevalence (e.g., on Montserrat), every effort should be made to detect cases and treat them.

Throughout the infected world, in the absence of controlling factors, schistosomiasis transmission has increased as population densities have increased. Since there is no reason to suppose that the Caribbean is immune from this trend, it is important that efforts be made now to stop the spread of the disease.

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### SUMMARY

This article reviews the history, present status, and potential for spread of intestinal schistosomiasis in the Lesser Antilles in the light of factors which contribute to its transmission.

Among the islands with a previous history of the disease, St. Maarten is no longer affected due to reduced rainfall. On St. Christopher and Antigua transmission became nonexistent or very slight after many snail habitats were destroyed by water management programs. On Saint Lucia the infection is under control. On Montserrat the prevalence of schistosomiasis is low but may increase. On Guadeloupe and Martinique the prevalence of endemic infection is increasing.

Of the islands with no history of the disease, Dominica is being invaded by *B. glabrata* and is at

serious risk because infected people live on nearby islands. The potential for transmission is high on both Grenada and St. Vincent, but Grenada lacks a good snail host and no *Biomphalaria* species at all have been found on St. Vincent. Barbados is too well-drained for snail hosts to thrive.

Overall, despite the recent rapid spread of the competing melaniid snail *Thiara granifera*, there is a very real danger of *B. glabrata* reaching uninfected islands. Also, around the world schistosomiasis transmission has tended to increase with rising population density, and there is no reason to think that the Caribbean area is immune to this trend. It is therefore important that steps be taken now to stop the spread of the disease.

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