

*The Rockefeller Foundation in Sardinia:  
Pesticide Politics in the Struggle Against Malaria*

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INTRODUCTION:

Indigenous peoples living in the arctic face greater risks from a host of toxic chemicals than those of us living in warmer climes. PCB levels in mother's milk of northeastern Canada's Inuit are 3 to 6 times higher on average than those measured in people from southern Canada. The Inuit's heavy diet of Arctic char, caribou meat, and especially walrus and narwhal blubber mean that they are top-order consumers, concentrating in their tissues long-lasting pollutants that have already been concentrated in the animals they consume. Concern over disproportionately high levels of toxic chemicals in Canada's arctic peoples was one of the original motivations behind the creation of the United Nations' POPs Treaty, which became legally binding in May, 2004. Chemicals manufactured and utilized in temperate and tropical latitudes are drifting or blowing toward the poles to present greater hazards than in their place of origin. In tracing these disproportionate effects of globalization, one study estimates that dioxin arriving in northern Canada originated in part from southern Canada, but much more from Mexico and especially the United States. Persistent Organic Pollutants in the arctic are one manifestation of the United States' global environmental footprint.<sup>1</sup>

This paper considers another kind of footprint, one that involves another POPs chemical, DDT, which was also exported from the U.S., but in this case it was sent abroad purposely for the goal of eliminating malaria on the island of Sardinia. Yet the Sardinian Project, lasting from 1946 to 1952--and funded mostly with U.S. money and staffed mostly with U.S. expertise from the Rockefeller Foundation--may be an environmental footprint that was more political and ideological than it was chemical. Any campaign to eliminate malaria was an environmental undertaking, but one that was directed from afar meant that it was an imperial undertaking. Because Italians and Americans did not always agree on the best methods for combating malaria, Sardinians and the Sardinian environment were often caught in the middle. The key to understanding the failures and successes of the Sardinian Project is to understand that there were two environmentalisms: one local and the other foreign, both of them having different concerns about health, beauty, and permanence.

## 1

Malaria had been a seasonal scourge across much of Europe until well into the twentieth century. As cheap quinine, sturdier housing, and land drainage became more widespread across Europe, malaria receded southward to the Mediterranean. Although the disease had been associated with its mosquito vector since at least the mid-nineteenth century, the difficulty of avoiding or killing this vector meant that until the 1920s, quinine pills were the treatment of choice, both for prevention and cure. It was also observed that malaria often diminished as agriculture intensified, giving rise to the adage that "malaria fled the plow," which helped spur still more agricultural development. In Italy, thousands of hectares of marshland were drained for the dual purpose of creating farmland and eradicating malaria.

Eradicating *mosquitoes* came into vogue as more powerful insecticides became available. But malariologists were generally skeptical about insecticides, at least initially. Even after the powerful insect-killing abilities of DDT were demonstrated first in the Pacific war, and then in the louse epidemic of Naples, zoologist Marston Bates considered mosquito eradication to be "a sledge-hammer approach to malaria control."<sup>2</sup>

Malaria is a complicated disease. It arises not from a virus or a bacteria that might be eliminated by a vaccine or antibiotic, but from a family of microscopic parasites that persist in human blood, being transferred between human hosts by certain kinds of mosquitoes. In theory, there would be a variety of ways to break the malaria cycle, as by treating the symptoms, killing the parasite, preventing human contact with mosquitoes, killing mosquitoes themselves, or by disrupting mosquito habitat. Variations in habitats or mosquito species also give rise to different virulences of the disease. Lewis Hackett, one of the preeminent malariologists during the interwar period, likened his work to a game of chess: malaria, he said, "is played with a few pieces, but [it] is capable of an infinite variety of situations."<sup>3</sup>

DDT hardly targeted the parasite, then, but instead served to kill mosquitoes--at least most of them--while smashing plenty of other things that got in its path. Within a few years of DDT's discovery, malaria disappeared across most Mediterranean lands as spray crews marched back and forth across its peninsulas and islands. Today, health experts note that DDT also served to eradicate malariology, a sophisticated science involving parasitology, entomology, epidemiology, ecology, and internal medicine. At least for a time, DDT was the magic sledge hammer that ridded malaria from those areas fortunate enough to receive it quickly and massively before insect resistance to DDT set in. Or at least this is the usual story of DDT and malaria. Two years ago, on the 50th anniversary of the Sardinian Project, elementary students in

the village of Birori, Sardinia, proclaimed in their school exhibit that, "Today, thanks to DDT, malaria has disappeared from Sardinia and from temperate regions."<sup>4</sup>

Sardinia was always Italy's most malarious region. Statistics show that 3800 Sardinians died of malaria in 1918, with around 100 times that number (or about one-third of the one million residents) acting as carriers, many of them suffering but not dying from the disease. Sardinia in turn became a preferred target of governmental malaria control programs, such as widespread quinine distribution. It was also a preferred target for experimental malariology. Lewis Hackett, a Rockefeller Foundation employee and co-director of Rome's Public Health Institute (also funded by the Rockefeller Foundation), carried out a number of malaria investigations in Sardinia. After reading about how the arsenic compound, Paris Green, was being used in the United States to kill mosquito larvae, Hackett and his colleagues tried it out in Sardinia in its first anti-malarial use in Europe, some two decades before DDT was itself being sprayed across the island in unprecedented quantities. Whether or not Sardinians knew it, Sardinia was an insecticide proving ground.<sup>5</sup>

Some 10,000 tons of DDT mixture were doused on Sardinia in the five years after 1946. The goal was to kill every last specimen of *Anopheles Labbranchiae* on an island the size of New Hampshire covering more than a million and a half separate swamps, springs, wells, and creeks--or wherever mosquitoes survived and bred--together with the inside walls of every human dwelling. At the height of the campaign, 32,000 DDT sprayers combed the island. The goal in Sardinia was not merely *malaria* eradication, but *mosquito* eradication. Official reports listed that the project came to within 99.936 % of achieving success: they missed a few mosquitoes. Although the Sardinian Project successfully rid the island of malaria, mosquitoes still persisted there. Some investigators deemed the project a failure.<sup>6</sup>

While many Sardinians interviewed in the course of this research wondered about the long-term effects of DDT in their blood streams, few of them realize that their grandparents took part in an experiment. They are quick to say that spraying DDT was the lesser evil of contracting malaria. But almost none of them know about the pre-DDT successes of controlling Sardinia's malaria with other remedies, be these other pesticides, medical treatments, or land management practices. Before World War II, Italy's own disease control programs had diminished malaria mortality in Sardinia by 90%, a statistic not often revealed in Rockefeller Foundation reports. With the disorganization brought on by the war, and a new malaria epidemic raging on the island by 1944, malaria needed to be controlled -- and certainly would have been in the absence of DDT and the Sardinian Project. Judging from malaria defeats in other parts of Italy and the Mediterranean over the next two years, it was also clear that *moderate* DDT spraying would also dramatically control malaria in Sardinia, without resorting to dousing. Just one year into the project, administrators were advising French malariologists on nearby Corsica -- also afflicted with the disease -- that they need use only one-third to one-fourth as much DDT as was being used in Sardinia if their goal was "merely" eradicating malaria instead of eradicating mosquitoes.<sup>7</sup>

Sardinia is now a favorite site for studying long-range toxicity of DDT. And to date, there is very little evidence to show that DDT caused any long- or short-term health problems in Sardinian DDT sprayers. A battery of tests carried out elsewhere on the physiologic effects of DDT suggest that humans are relatively resistant to its toxicity, and free from its adverse effects. A United Nations document claims that only lactating mothers and small children have suffered possible, discreet health problems from DDT. Birds and fish and insects are, however, highly susceptible to its toxicity. So with regards to humanity's ongoing struggle with malaria, DDT

may really be that wonder substance that its manufacturers promoted in the late 1940s.

Sacrificing a few winged or scaly creatures would seem a small price to pay for the worldwide eradication of malaria, a disease that inflicts billions and kills millions.

Such was the thinking of most Sardinian Project administrators when faced with local reports that fish, honey bees, sheep, and maybe worse had succumbed to the effects of DDT poisoning. There were even official cautions from the fledgling World Health Organization, which noted in a 1947 report that DDT, "[e]specially when used from aeroplanes ... may interfere with the normal biological cycles of the treated environment, [t]hat may upset the economy of the region, not only from the standpoint of animals but also of plants, both of crops and trees." Still, administrators felt that these problems would be far outweighed by enormous benefits. "The eyes of the world are on the Sardinian Project," urged the chief of the Rockefeller Foundation's International Health Division when faced with on-site technical problems and several frustrated personnel. Sardinia *was* the world's test site for the global eradication of malaria-carrying mosquitoes. If dangerous mosquitoes could just be eliminated from this island, they might be eliminated on a continental, even global scale. But the experimental nature of this project was not revealed in its full light until *after* project leaders went home, and only then, in English not Italian. Sardinians would have been the first to reap the expected benefits of prolonged DDT saturation, but they would also have been the first to deal with any ill side effects. Risk, real or unknown, is at the center of this transnational case of environmental justice.<sup>8</sup>

Uninformed or unacceptable risk imposed from afar is hardly new. Of many examples that might be named, the down-winders of nuclear tests carried out in Bikini atoll or Nevada deserts also confronted unjustifiable risk. Like malariologists who tried out DDT, those in

charge of nuclear testing justified their actions by pointing out that potential benefits of these new tools outweighed their hazardous side-effects. But it is the nature of malaria that makes the Sardinian Project a special case of environmental justice having a potentially deep environmental footprint.<sup>9</sup>

## 2

Malaria modifies not only human health, but also environmental health through the human techniques employed in combating the disease. DDT's tendency to kill not just mosquitoes, but also fish or birds or desirable insects is just one illustration of how malaria modifies the environment, with humans wielding spray guns as the agent of environmental change. Before DDT, the even cruder and probably more dangerous Paris Green also altered ecosystems in ways besides the mere killing of mosquito larvae that were its target.

In setting out to eradicate their malaria nemesis, then, humans did much more than introduce laboratory-synthesized toxins into the environment. Draining, damming, diking, and canalling were all carried out in the hopes that malaria would disappear--such engineering projects mean that Sardinia's current countryside can hardly be recognized in the black and white photographs taken of the same places a half-century ago. Eucalyptus was imported from Australia and planted by the linear kilometer in hopes of drying up marshland and sanitizing surroundings. Gambusia fish were brought in from Florida's Everglades to slurp up mosquito larvae, with concomitant effects on the aquatic food chain. In each case, it was malaria that induced humans to set environmental changes in motion.

Just as we can argue over precise distal and proximal causes of environmental change, by pointing to either humans or human disease as the ultimate source of Sardinia's modified environment, biologists can argue over whether such changes were good or bad. Diking riparian

areas and draining coastal estuaries certainly diminished biodiversity. Spreading invasive exotics like eucalyptus and gambusia likewise unbalanced an already transformed ecosystem. I would be very surprised if many biologists would celebrate these ecosystemic changes that arose from humans struggling to rid themselves of malaria.

But before condemning malaria as having ruined the nature of Sardinia, ecologists would be pleased to learn, for example, that Sardinia's highlands are no longer overgrazed. Because sheep herders traditionally migrated up and away from lowlands by summer--fleeing malaria-infested areas--the upper pastures and meadows saw intensive sheep use. Americans working on the Sardinian Project commented on the poor state of Sardinia's upland pastures. When malaria disappeared, herders could graze their animals more judiciously, balancing use between high and low pastures, thereby avoiding excessive grazing. The flora and fauna across Sardinia's Mount Gennargentu, now a national park, are probably richer and healthier because humans struggled against malaria and won the battle. Whether these physical and biological footprints represent harm or benefit, there is little question that malaria and humans working in tandem remodeled the face of Sardinia. When adding on the social and political changes stemming from malaria's demise, one would have to agree with historian Dennis Mack Smith who noted that malaria eradication may be “the most important single fact in the whole of modern Italian history.”

The POPs Treaty itself will produce environmental footprints, both desirable and otherwise according to interest group. Besides the kinds of ecosystem changes that occurred in Sardinia, induced by presence or absence of a powerful chemical, there is the other contentious issue of whether such chemicals may still be useful. DDT has gained notoriety in POPs negotiations precisely because of its ongoing ability to control malaria. While most mosquitoes today are quite resistant to DDT's killing power, they still *avoid* the chemical if possible, and will

fly out of a house treated with it when given the chance. There are many health experts who claim that DDT is still one of the cheapest and simplest malaria remedies, and is still of vital use in the tropics where there is a resurgence of the disease. POPs provisions now allow the use of DDT in disease vector control. But the mere act of monitoring and regulating this pesticide means that it may on occasion be unavailable when needed. POPs may really be a North-South issue. Canada was the first nation in the world to prohibit all production, exportation, and use of DDT. But might this fact be correlated with the other fact that malaria has almost never existed in this country except in a few individuals recently arriving from the tropics? 150,000 circumpolar Inuit should not be subjected to high levels of toxins in their tissues, but nor should 1 million tropical Asians, Africans, and Central & South Americans cease making *any* footprint if the free and easy use of DDT could have saved them from malaria.

The linked history of DDT and malaria presents us with a good opportunity to think about environmentalism. One of Sardinia's leading entomologists who was involved in the Sardinian Project, and who helped supervise subsequent insect-control operations there, declares that Sardinia's insect flora was forever transformed by the post-war DDT spraying. If periodic species inventories of Sardinia existed, they would undoubtedly show changes in floral and faunal composition over the last half century, and powerful insecticides may well have caused at least some of these changes. Even though Italy heavily restricted the use of DDT after 1970, it has been one of the last countries to agree to a complete ban on this chemical. The 1997 Italian POPs delegation explained that DDT was still being used in their country as an intermediary in the manufacture of other pesticides. Yet Italy's historic scrapes with malaria may also help explain some of the country's reluctance to implement complete DDT bans.<sup>10</sup>

Rachel Carson's *Silent Spring* was translated into Italian shortly after 1962, and saw a few reprintings. But except for scattered references to the book, and 25-year retrospective acknowledgements of its importance, Italians seem to have mostly passed over *Primavera Silenziosa*. This watershed of American environmentalism apparently had little effect in Italy. But it is wrong to say that Italians do not care about their environment. The World Wildlife Fund and various green groups and parties became more active in Italy in the late 70s and 80s, especially after the Seveso dioxin spill of 1976 and then Chernobyl. Human health was the issue, not concern for plants and animals. In Italy, people sought a healthy and beautiful countryside, but Species Red Books and extinction lists were slow to arrive there. Although Italians have little interest in biodiversity, they now have a greater percentage of their country protected in natural areas and national parks than either the United States or Canada. The fact that in densely populated Italy, villages and towns must be incorporated within protected areas, only reinforces the Italian view that humans are integral to their environment. Protecting it requires protecting them.

During the Sardinian Project, a number of local experts were very critical about DDT dousing: they called for the return to "Italian" methods of controlling malaria rather than relying on "American" methods of controlling mosquitoes. Their concern was their island and its inhabitants. Health, beauty, and permanence were very much on their minds even before Rachel Carson. Before nations impose powerful chemicals on others, and before they restrict others from using them, they must try harder to listen to what the locals say.

#### CONCLUSION:

Sardinia at the 50th anniversary of the Anopholes eradication campaign has become a favorite place for testing long-term DDT toxicity. Death rates and causes, cancer rates and types,

are carefully tabulated, both for former DDT sprayers and for the larger Sardinian population. To date, there is no study that concludes Sardinians suffered from DDT-caused health problems. A battery of other tests beyond Sardinia that investigate links between DDT and human health suggest that DDT really isn't very dangerous to humans -- with possible, discreet exceptions for small children and lactating mothers. However, other studies demonstrate that small creatures from birds to fish and other insects are acutely affected by DDT. And so DDT opponents may have more grounds to focus on disruptions to ecosystems than on disruptions to human health. If DDT was or is useful for controlling malaria -- today's most widespread disease that kills a person every 14 seconds -- then we must really analyze risk: Risk from DDT, risk from substitutes like pyrethrum (while organic is measurably more toxic), risk from habitat changes like draining. Even proponents of POPs now generally agree that limited DDT campaigns can lower the chances that humans contract insect-borne diseases. This recently ratified treaty will allow the limited use of DDT for health purposes.

DDT did help control malaria around the world, thereby saving millions of lives. But the Rockefeller Foundation did submit Sardinians to DDT levels that were much higher than was necessary for extinguishing malaria. Padded by technological hubris and post-war hegemony, the Rockefeller Foundation knowingly took a risk -- a small risk to humans as it turned out, given the characteristics of DDT's toxicity. The Foundation had eradicated mosquitoes elsewhere, and it might have eradicated them on this island. But one must consider whether that risk was worth it, or whether Sardinians were aware of these risks, or of the real goal of the project. And finally, one must wonder why other islands lying closer to home, like Long Island, were not chosen as the experimental site for eradicating a native mosquito.

## NOTES

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<sup>1</sup>Eric DeWailly and Christopher Frugal, "POPs, the Environment, and Public Health," p.13; Harriet Kuhnlein, Laurie Chan, Grace Egeland, Olivier Receveur, "Canadian Arctic Indigenous Peoples, Traditional Food Systems, and POPs," p.36; Barry Commoner, Paul Bartlett, Kimberly Couchot, and Holger Eisl, "The Deposition of Airborne Dioxin Emitted by North American Sources on Ecologically Vulnerable Receptors in Nunavut," p.96; all in David Downie and Terry Fenge, eds., *Northern Lights Against POPs: Combatting Toxic Threats in the Arctic* (Montreal: McGill-Queen's University Press, 2003).

<sup>2</sup>Marston Bates, "Preface," in John Logan, *The Sardinian Project: An Experiment in the Eradication of an Indigenous Malarious Vector* (Baltimore: The Johns Hopkins University Press, 1953), x.

<sup>3</sup>L. W. Hackett, *Malaria in Europe: An Ecological Study* (London: Oxford, 1937), 266.

<sup>4</sup><http://www.macommer.net/scuolaborori/presentazione.html> visited on 1 Sept 2003.

<sup>5</sup>Hackett, *Malaria in Europe*, 17.

<sup>6</sup>Logan, *The Sardinian Project*, 73, 104; *The Sardinian Project* (1948), Shell Film.

<sup>7</sup>John Logan to Leach, June 16, 1947, RAC 1.1 / 502 / 1 / 2 [RAC].

<sup>8</sup>WHO Expert Committee on Malaria: Report on the First Session, Geneva, 22-25 April, 1947, 15 [WHO Archives, Geneva, Switzerland]; D. B. Wilson to George Strode, Feb. 23, 1947, 1.2 / 700 / 12 / 106 [Rockefeller Archives Center, Pocantino Hills, NY].

<sup>9</sup>On calculated nuclear risk, see *Edmund Russell, War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* (Cambridge University Press, 2001).

<sup>10</sup>Interview with Carlo Contini on 20 October 2003, Cagliari. Gianmario Prospero, "Legislazione Fitosanitaria Italiana," Regione dell'Umbria, Giunta Regionale, I Dipartimento Agricoltura, 1981; Henrik Selin, "Regional POPs Policy: The UNECE CLRTAP POPs Protocol," in Downie and Fenge, *Northern Lights Against POPs*, 122.