

## REVIEWS

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KILLER ALGAE: THE TRUE TALE OF A BIOLOGICAL INVASION, by *Alexandre Meinesz*. 1999. 360p. ISBN 0-226-51922-8. The University of Chicago Press, Chicago.

Imagine for a minute you make a discovery, which has the potential for far-reaching changes, on a scale that few comprehend. What should you do to inform others of your discovery? How do you best convey the urgency of the situation to people who do not understand, or are unwilling to listen to you, even though you are an acknowledged expert on this topic? How would you deal not only with the frustration of being ignored, but further, actually being attacked in the media and having your credibility vilified for all to read? This is what the author, Dr. Alexandre Meinesz, has endured for the last 5 years.

The biological invasion of a seemingly benign little tropical alga, *Caulerpa taxifolia*, into the waters of Mediterranean Sea is portrayed in Meinesz's book, *Killer Algae*. In the authors own words: "This work is the expose of a double defeat—on the one hand the loss of control of the alga, which spreads each year and drastically modifies marine life, and on the other hand the debacle of scientific reasoning, which failed to carry the day in the face of flagrant deception by certain scientists and the laxity of the powers at all levels."

No one thought *Caulerpa taxifolia* could survive the cold waters of the Mediterranean after its purported accidental introduction at the Musée Océanographique de Monaco in the mid 1980s. Meinesz, a professor of biology at the University of Nice, first observed *Caulerpa taxifolia* in 1988, in the waters below the Museum. He recognized it for a tropical species and was interested in how it had gotten there. Upon observing this introduced species ability to survive the cold winter water temperatures, as well as its ability to aggressively out-compete native seagrass and algae, Meinesz was convinced of the potentially serious threat it posed to Mediterranean ecosystems.

Since 1992 he has been monitoring not only the rampant spread of this alga, but has also been desperately trying to convince the French authorities of the serious threat posed. However, in attempting to fulfill this obligation he came under personal attack from Prof. Francois Doumenge, director of the Musée Océanographique. At first the director disavowed the museums involvement in the plants introduction, and later when this fact could no longer be ignored, he attempted to confuse the issue by maintaining that the alga posed no risk and that it was actually beneficial by increasing primary production. The involvement of the media and the subsequent hype surrounding this debate captured the publics attention and caused *Caulerpa* to become a front page name. Killer algae it came to be dubbed after the discovery that this alga, like many other tropical Caulerpales, contained potent chemicals that deterred grazers from feeding on it.

Meanwhile the alga continued to spread and no agency was willing to take responsibility for its eradication. It now covers 10,000 acres off the coastlines of France, Spain, Italy and Croatia, and has devastated Mediterranean ecosystems. The plant is capable of increasing its coverage by a factor of 10 in a single summer growing season and can establish from just a single vegetative fragment. Its ability to invasively colonize all types of substrate, from mud to rock throughout the photic zone, has lead to vast monospecific meadows of *Caulerpa* that support virtually no native marine life. The loss of biodiversity is lamentable and the consequences for the Mediterranean cannot yet be fully appreciated.

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◀ 886 Meinesz, rather than being bitter about his ordeal, ties together some lessons learned from the *Caulerpa* story towards the end of the book. It is these points which disturbed me profoundly as a fellow scientist, and I urge all of you to take the time to read at least this section of his work.

1. Biodiversity and its protection is an all important issue at this time of human induced extinctions on a unprecedented scale. However, how do we protect biodiversity when taxonomists are no longer being trained, and ecology is a discipline relegated to the sidelines of mainstream biological science? The loss of knowledge about life units and systems is inevitable. For the first time since the expansion of the exact sciences two hundred years ago, a scientific discipline is in decline and the level of knowledge is decreasing. Botanists, zoologists and ecologists are, in many countries, also endangered species.

2. The trend for an increasing reductionist approach to biology compounds the lamentable decline in naturalists available to study and understand how whole systems function. Reductionism is not the key to dealing with the grave environmental issues that we are currently facing, due to the complexity of the real world. Emergent properties of systems are important phenomena derived from the interactions between individuals and species within a system. The whole is more than the sum of its parts. There is a clear and definite need for greater involvement in holistic, integrated approaches to science, especially where environmental issues are concerned.

3. Finally the communication of scientific results is an integral part of any researchers work. The system of peer-reviewed journal articles to disseminate knowledge is fundamental for the entire scientific establishment. However, much of the peer-reviewed literature is unavailable or incomprehensible to decision-makers. Moreover, there is an increasing tendency for scientific news to be disseminated by non peer-reviewed means, such as press releases or the Internet. Credence granted to the medias portrayal of an issue often equals or surpasses the attention paid to scientific publications on the same issue. It is every professionals responsibility to ensure that their work be portrayed as accurately as possible if they decide to use the media as a locus for dissemination of results. Scientists should know how to use the media advisedly, as the progression of scientific discourse in the media is nigh inescapable.

My one critique with the book is that Meinesz has the tendency to jump around in time, which sometimes detracts from the understanding of the sequence of events. I felt a little more effort could have polished this shortcoming and resulted in a more concise account of the whole affair. *Killer Algae*—part detective story and part object lesson in bureaucracy—is a classic case of an ecological invasion and how not to deal with it. As David Quammen sums it up in the foreword: "This is not a little book about some noxious alga. It is a little book ... about life on Earth."—Patrick Biber, *Division of Marine Biology and Fisheries, Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Causeway, Miami, Florida 33149-1098.*