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UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Southwest Region  
501 West Ocean Boulevard, Suite 4200  
Long Beach, California 90802-4213

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JUN 5 2002

F/SWR4:RSH

Mr. Stanley Martinson  
Chief, Division of Water Quality  
State Water Resources Control Board  
1001 I Street  
Sacramento, California 95814

DWQ Received  
Division Chief's Office

JUN 10 2002

Dear Mr. Martinson:

Section 303(d) of the Clean Water Act requires states to update the list of surface waterbodies for which water quality standards are not attained, or are not expected to be attained with the implementation of technology-based controls. It is our understanding that your agency is currently contemplating updating that list for California.

The National Marine Fisheries Service (NMFS) recommends that Agua Hedionda Lagoon, in the San Diego area, and Huntington Harbour, in the Santa Ana area, be added to the Clean Water Act section 303(d) list of water quality limited segments. We believe both of these water bodies are impaired due to infestations of *Caulerpa taxifolia*.

*Caulerpa taxifolia* is a highly invasive marine alga that was found in Agua Hedionda Lagoon in June 2000 and in Huntington Harbour in August 2000. These are the first known infestations along the Pacific Coast of North America. The introduction and spread of this seaweed throughout the Mediterranean has already resulted in devastating ecological and economic consequences. Similar dire consequences are likely to result in California if *Caulerpa taxifolia* is not eradicated. *Caulerpa taxifolia* may be the most threatening form of pollution of California's marine waters originating from nonpoint sources.

NMFS believes there is ample justification for listing Agua Hedionda Lagoon and Huntington Harbour as impaired for *Caulerpa taxifolia*. As a biological material released into Agua Hedionda Lagoon and Huntington Harbor through discharges of waste, *Caulerpa taxifolia* can be considered a pollutant, as defined in the Clean Water Act.



The presence of *Caulerpa taxifolia* impairs and threatens greater impairment of the beneficial uses of Agua Hedionda Lagoon and Huntington Harbour, including estuarine habitat, marine habitat, contact water recreation, and commercial and sport fishing. If *Caulerpa taxifolia* spreads to the ocean, the beneficial uses of the entire Pacific Coast also are at risk.

Thank you for the opportunity to identify water quality limited segments. We are hopeful that you will adopt our recommendation. Should you have any questions, please contact Mr. Robert Hoffman, of my staff, at 562-980-4043 or via email at: [bob.hoffman@noaa.gov](mailto:bob.hoffman@noaa.gov).

Sincerely,

  
for Rodney R. McInnis  
Acting Regional Administrator

Request for Fiscal Support to Combat Invasive Exotic Alga (*Caulerpa taxifolia*)  
Presently Threatening U.S. Pacific Coast

December 19, 2001

*Caulerpa taxifolia* (Mediterranean strain) is an exotic, invasive tropical alga that has either been accidentally selected from native strains or was inadvertently genetically engineered in Germany's Stuttgart Aquarium in the 1970s to be a hardy and cold tolerant strain. It was spread rapidly through the aquarium industry and now can be acquired world wide through the pet trade. In 1984, it was first noted in the wild as a 1 square yard patch below the Oceanographic Museum of Monaco in the northern Mediterranean. By 2001, *Caulerpa* had spread to over 30,000 acres at sites throughout the Mediterranean and Adriatic Seas in a near geometric expansion. It has also invaded waters of Australia. On June 12, 2000 it was found in U.S. waters of the California coast. Because Southern California provides the best opportunity for introduction of this species to the Pacific coast but it is anticipated that infestations could survive and grow as far north as Oregon and potentially some Washington bays and estuaries, this issue should be viewed as a coast-wide concern. Similar risks exist on the Atlantic and Gulf of Mexico coastlines.

After *Caulerpa* had demonstrated its ability to invade, persist and spread in Mediterranean marine waters having similar environmental conditions to much of Pacific coastal, lagoon and estuarine systems, it was placed on the U.S. Federal Noxious Weed List in 1999 following petition by over one hundred prominent scientists. This banned the importation of this species and interstate commerce, but did not address the flood of *Caulerpa* already available in the private aquarium markets throughout the country. On September 24, 2001, Gov. Gray Davis signed AB 1334 (Harman) to take greater actions to ban *Caulerpa* and look-alike sale or possession in the state of California.

Experience from the Mediterranean indicates that the alga spreads in carpets over the bottom on almost any substrate and reaches depths beyond those achieved by any other native seagrass or algae. Habitat values within infected areas are severely degraded and have destroyed local fishing and recreational uses of some waters. Vessel and fishing use quarantines are being used in some locations to prevent the spread of *Caulerpa* and some countries such as New Zealand are pursuing commerce bans with infested ports to prevent any risk of being infected by commercial vessel traffic.

In California, two infected systems were identified in 2000. These included Agua Hedionda Lagoon, an area supporting public recreational uses, electrical power generation facilities, aquaculture business, and rich natural resources. The second system is Huntington Harbour, a major private boating harbor that directly connects to the Seal Beach National Wildlife Refuge and the Seal Beach Naval Weapons Station. The alga has probably been present for as long as four years prior to discovery in 2000.

Given the history of spread in the Mediterranean, it is likely that other, as yet undiscovered infestations also occur.

To combat the occurrence of *Caulerpa* in California, a multi-agency headed public/private taskforce known as the Southern California Caulerpa Action Team (SCCAT) has been assembled. The SCCAT has taken a position that only full eradication and not control is acceptable in the fight against this invasive. This position has been taken based on well learned lessons from the Mediterranean invasion where full eradication is no longer possible and large-scale control seems unlikely. To date, nearly \$3 million has been spent by public and private parties on survey and treatment of known infestations, surveillance in high risk areas, research for treatment and detection, and public outreach to help locate infestations and prevent further discharges. Funds have come from an *ad hoc* assemblage of agency sources including emergency accounts and programs where funds have been earmarked for other uses. Other funds have been derived through donations made by private industry and environmental groups. However, it is clear that the demands for fiscal resources far outweigh the resources present within discretionary sources presently available. The lack of dedicated funds for exotic species response has been identified in a July GAO report to congress to be a critical shortcoming of present invasive species programs. This national review of federal response to invasive species did go on to identify the *Caulerpa taxifolia* eradication efforts in Southern California as an exemplary model of public-private partnership to respond to invasive species threats.

Based on identified needs, it is clear resources beyond those presently available will be required to complete the efforts of the SCCAT to eliminate *Caulerpa* from the California coast. These needs include funding to complete the 5-year eradication programs at Agua Hedionda Lagoon and Huntington Harbour as well as to respond to surveillance, outreach, and eradication research needs. In addition, it can be anticipated that additional infestations will be found and will require treating and immediate response funds will be required to act on any newly identified infestations. Five-year funding needs are estimated as follows:

<b>ALLOCATION</b>	<b>LOCATION</b>	<b>COST</b>
Treatment	Agua Hedionda	\$3.4 million
	Huntington Harbour	\$1.8 million
	Next Identified Site	\$5.5 million
Surveillance	High Risk Coastwide	\$1.8 million
Research		\$0.8 million
Outreach	Coastwide	\$0.5 million
<b>TOTAL 5-YEAR PROGRAM</b>		<b>\$13.8 million</b>

## NOXIOUS SEAWEED FOUND IN SOUTHERN CALIFORNIA COASTAL WATERS

Rachel Woodfield

Dubbed "killer algae," the alien seaweed *Caulerpa taxifolia* was discovered in June 2000 in a coastal lagoon in Carlsbad, California, within San Diego County. An aggressive clone of this species has already proven to be highly invasive in the Mediterranean Sea, where the governments of France, Spain, Monaco, and Italy have been unable to control its spread. The first confirmed American occurrence of this invasive species in California has caused considerable alarm. The resulting press coverage of the issue led to discovery of a second infestation of *Caulerpa taxifolia* in Huntington Harbour in Orange County (about 75 miles north of the Carlsbad occurrence). Genetic studies have determined these two infestations to be of the same clone threatening the Mediterranean Sea. Efforts are underway to eradicate *Caulerpa taxifolia* from California and control its spread before the infestation reaches the magnitude seen in the Mediterranean.

*Caulerpa taxifolia* is a green alga native to tropical waters that typically grows to small size and in limited patches. In the late 1970s this species attracted attention as a fast-growing and decorative aquarium species that became popular in the saltwater aquarium trade. A clone of the species was cultured for display at the Stuttgart Aquarium in Germany and provided to aquariums in France and Monaco. Around 1984 this species apparently escaped or was released from an aquarium into Mediterranean waters, and rapidly spread from an initial patch of about one square yard to over two acres by 1989. By 2000 it was reported to have blanketed more than 15,000 acres of the



photo: R. Woodfield

northern Mediterranean coastline and has recently been reported off northern Africa. Genetic analysis suggests that all *Caulerpa taxifolia* plants in the Mediterranean are clones of the original, inadvertently released saltwater aquarium plant.

In areas where the species has become well established, it has caused ecological and economic devastation by overgrowing and eliminating native seaweeds, seagrasses, reefs, and other communities. In the Mediterranean, it is reported to have harmed tourism and pleasure boating, devastated recreational diving, and had a costly impact on commercial fishing both by altering the distribution of fish as well as creating a considerable impediment to net fisheries. The dense carpet that this species can form on the bottom could inhibit the establishment of juveniles of many reef species, and its establishment offshore could seriously impact sport and

commercial fisheries and navigation through quarantine restrictions to prevent the spread of this species.

This alga poses a substantial threat to marine ecosystems Southern California, particularly to the extensive eelgrass meadows and other benthic environments that make coastal waters such a rich and productive environment for fish and birds. The eelgrass beds and other coastal resources that could be directly impacted by an invasion of *Caulerpa* are part of a food web that is critical to the survival of numerous native marine species including the commercially and recreationally important spiny lobster, California halibut, and sand basses. However, this threat is not exclusive to California. Aside from the likelihood that this invasive strain could thrive in other warm locales, such as the Gulf of California, the Gulf of Mexico, and the Pacific coast of Florida, cooler waters should not be ruled out as at risk also. This seaweed has been observed to survive many months in 50° F water. Given this tolerance to cold and the remarkable adaptability that this species has displayed, it would be wise for even more northern regions to be aware of the damage that introduction of this species could cause to their native ecosystems.

According to French biologist and *Caulerpa* expert Alexandre Meinesz, this clone can grow larger, at deeper depths (in excess of 300 feet), and in colder waters than the tropical populations of the species and therefore threatens not only tropical areas, but temperate regions as well. It grows on almost any substrate and in many different energy regimes, ranging from protected bays to exposed headlands. Great monotypic stands can develop, giving the appearance of a carpet of "astroturf." *Caulerpa* spreads readily via fragmentation, making prevention of

spread and mechanical removal nearly impossible. Fishing nets and boat anchors are believed to be primarily responsible for the dispersal of the species throughout the Mediterranean.



photo: A. Meinesz

This species has recently been reported near Sydney, Australia, smothering seagrass beds in a manner reminiscent of the invasion in the Mediterranean. Despite bans on its possession in France, Spain, and Australia, this organism continues to be transported and sold by the aquarium trade; fearing its eventual introduction into US waters, over 100 prominent scientists petitioned the federal government in 1998 to ban the use of *Caulerpa taxifolia* in American aquaria, leading to its designation in 1999 as a prohibited species under the Federal Noxious Weed Act. The discovery of this species in southern California, recently reported in the journal *Nature* to be genetically identical to the strain in the Mediterranean, confirms that it nevertheless continues to invade marine

ecosystems, such as the ecologically rich eelgrass beds that thrive in many of our coastal lagoons. It is likely that the alga was released from an aquarium at the locations in California where it has been discovered, a practice banned under California law. As of September 24, 2001 when Governor Gray Davis signed into law Assembly Bill 1334, it is now unlawful to sell, import, transport, transfer, or possess *C. taxifolia* and a number of look-alike species and other invasive *Caulerpa* species.

Although delays in recognizing the true threat of the invasion in the Mediterranean make the eradication of *Caulerpa taxifolia* there unlikely, distribution of the *Caulerpa* discovered in California is restricted enough that eradication efforts have been optimistically undertaken. After exploring techniques such as dredging, hand removal, draining of the lagoon, and application of various herbicides, Merkel & Associates, Inc., a biological consulting firm in San Diego, developed and implemented a plan to treat the seaweed *in situ* to avoid further fragmentation and spread. Each patch of *Caulerpa* was covered with a heavy vinyl tarp that was sealed to the bottom at the edges and fitted with a small "port" on top that allowed for the introduction of herbicide under the tarp. The tarp allowed for the direct treatment of the target patch, while preventing the loss of herbicide to the lagoon waters.

Although the algae appeared to have been effectively treated, the tarps have been left in place to prevent the regrowth of *Caulerpa* from portions lying deep in the bottom sediments that may not have been fully treated by the herbicide application. During 2000 and 2001 all known *Caulerpa* was treated in Carlsbad. The site is

surveyed regularly, with spot treatment and monitoring being expected to continue for at least five years in order to ensure full eradication. A very similar eradication effort is also underway in Huntington Harbour.



Both the Agua Hedionda Lagoon and Huntington Harbour infestations have responded well to the eradication efforts thus far and significant declines of the infestations have been noted in every measured metric. However, it is critical that the initial success of the eradication efforts undertaken not lull the public and regulators into a false sense of complacency. The probability that there are infestations that so far have avoided detection, as well as the common occurrence of *Caulerpa* residing in American aquariums, nearly ensures that this seaweed will continue to pose a threat to US coastlines.

The public can help prevent and detect infestations of *Caulerpa taxifolia*. The most important tasks in combating this invasive species are prevention of further introductions and identification of existing infestations. Extreme care must be taken when cleaning or dismantling fish tanks, because the tiniest fragment of *Caulerpa taxifolia* that is inadvertently washed into the gutter while rinsing a fish tank on the lawn could quite plausibly travel through the storm drain directly to a nearby estuary or beach and establish itself there. Aside

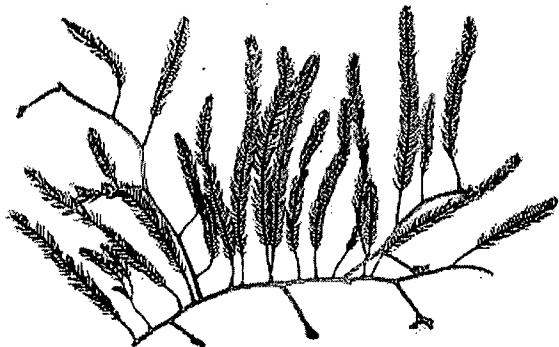
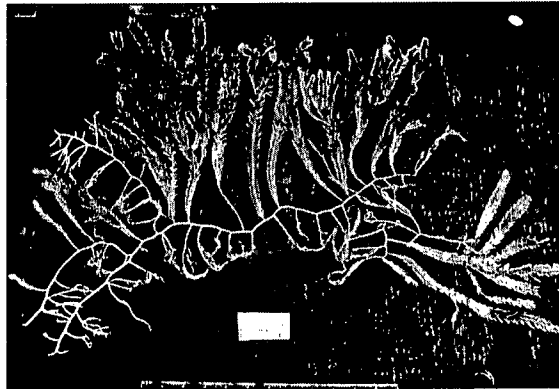
from all caution during tank maintenance, an even more responsible action would be to eliminate any risk of accidental introduction by discontinuing the use of *Caulerpa* in home aquaria. *Caulerpa* can be removed from the tank, with all the material it is attached to (rocks, gravel, etc), placed in a freezer for 24 hours, and then placed in the trash for disposal in a landfill. Under no circumstances should any unwanted aquarium plants or animals be released into the wild.

In addition to prevention of new introductions, detection of existing infestations is also critical. It is crucial that all people who spend time exploring the ocean bottom be educated and involved in detection and reporting. SCUBA and free divers as well as recreational and commercial fishermen can participate in the surveillance effort by familiarizing themselves with the appearance and habit of this seaweed. It is bright green with feathery fronds and grows in a low mat on the bottom. *Caulerpa* may be entangled in fishing tackle dragged over the bottom, but it does not float, so it is unlikely that it will be seen on the surface. However, large patches may be visible from above due to its distinct bright green color.

If *Caulerpa taxifolia* is observed in the wild, collect a sample for verification and note the location where it is found. Record as much information as possible about the location where it was found and report it immediately to the Southern California *Caulerpa* Action Team at (858) 467-2952, visit the website <http://caulerpa.cjb.net> or E-mail: [caulerpa@rb9.swrcb.ca.gov](mailto:caulerpa@rb9.swrcb.ca.gov).

#### Further Reading:

"Killer Algae", by Alexander Meinesz, translated by Daniel Simberloff. University of Chicago Press, 1999.



#### Websites:

- [http://www.swrcb.ca.gov/rwqcb9/News/Caulerpa\\_taxifolia/caulerpa\\_taxifolia.html](http://www.swrcb.ca.gov/rwqcb9/News/Caulerpa_taxifolia/caulerpa_taxifolia.html)
- [http://www.sciencenews.org/sn\\_arc98/7\\_4\\_98/bob1.html](http://www.sciencenews.org/sn_arc98/7_4_98/bob1.html)
- <http://www.mcbl.org/caulerpa/babbitt.html>
- <http://www.unice.fr/LEML/>

A websearch of *Caulerpa* returns many sites.

For further information contact:

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Merkel & Associates, Inc.  
858-560-5465  
Email: [rwoodfield@merkeline.com](mailto:rwoodfield@merkeline.com)





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

~~KAT~~  
CSW

AUG - 9 2002

OFFICE OF  
WATER

Dear Colleague,

This letter transmits the First Edition of the *Consolidated Assessment and Listing Methodology (CALM), Toward a Compendium of Best Practices*. CALM provides a framework for states and other jurisdictions to document how they collect and use water quality data and information for environmental decision making. The primary purposes of these data analyses are to determine the extent that all waters are attaining water quality standards, to identify waters that are impaired and need to be added to the 303(d) list, and to identify waters that can be removed from the list because they are attaining standards. This document is available on the web at [www.epa.gov/owow/monitoring/calm.html](http://www.epa.gov/owow/monitoring/calm.html)

EPA envisions states will use this document in a stepwise process. The first step involves documenting how attainment/impaired decisions are made in an assessment and listing methodology. The second step involves refining and expanding water quality monitoring to support assessments of all waters and waterbody types of the state.

The CALM guidance development process has been and will continue to be an iterative process. The development of CALM has occurred over the past two years with the involvement of many different workgroups consisting of federal and state staff. A series of public meetings to receive the input of a variety of stakeholders was an important part of the process. This First Edition has placeholders for parts of the document which are not yet complete. As additional chapters are completed and existing chapters updated, they will be posted on the website.

Please review CALM, provide comments, case studies and examples where methods are working and are not working in your state or jurisdiction. Future editions of CALM will include new approaches and more case studies based on experience using the document and will reflect comments received to date.

If you have any questions regarding this document, please contact Charles Sutfin, Director, Assessment and Watershed Protection Division at (202) 566-1159, or Margarete Heber, Chief, Monitoring Branch at (202) 566-1189.

Sincerely,

Robert H. Wapland, Director  
Office of Wetlands, Oceans and Watersheds

DWQ Received  
Division Chief's Office

AUG 16 2002