

CAN WE STOP “KILLER ALGAE” FROM INVADING FLORIDA?

by Charles Jacoby¹ and Linda Walters²

What is “killer algae”?

The Mediterranean strain of *Caulerpa taxifolia* earned the name “killer algae” because of its devastating effects on the Mediterranean coast. The story of this algae or seaweed represents one of the best-documented cases of accidental introduction, subsequent establishment and eventual invasion by a marine organism taken beyond its natural range (a non-native or nonindigenous marine organism).

The green algae, *Caulerpa taxifolia*, normally grows in warm tropical oceans. Aquarists often collect and breed this tropical strain for displays. In this case, *Caulerpa taxifolia* was bred at the Stuttgart Aquarium in Germany. Specimens were sent to the Monaco Oceanographic Museum, and as far as we can tell, some plants escaped or were released in 1984. When first discovered, *Caulerpa taxifolia* covered one square meter (10.8 square feet) of coastline. People ignored this accidental introduction and establishment because everyone felt confident this “tropical” algae would not survive winter temperatures. Big mistake!

Following successive breeding, *Caulerpa taxifolia* had gained a tolerance of colder temperatures. By the end of 2000, the algae covered over 131 square kilometers (50.6 square miles) of coastline in Croatia, France, Italy, Monaco, Spain and Tunisia. It continues to spread, and it has become invasive by causing ecological and economic harm. The Mediterranean strain of *Caulerpa taxifolia* overgrows native plants and animals. Loss of key species and blankets of algae have caused poor fishing and reduced tourism in many coastal communities.

In 2000, the Mediterranean strain of *Caulerpa taxifolia* appeared at two sites in southern California and three sites near Sydney, Australia. All introductions probably involved algae released by people. Rather than delay and risk an invasion, governments in California and New South Wales started eradicating “killer algae” before it spread. Millions of dollars have been spent on treating the algae with chemicals based on chlorine in California and copper sulfate in New South Wales. In addition, the New South Wales government sought to limit accidental spread of pieces of algae by banning swimming, boating and windsurfing in infested waterways and by asking people to keep their dogs out of these waters. Monitoring will continue for five years to determine if eradication is successful.

What does *Caulerpa taxifolia* look like?

All species of *Caulerpa* have upright fronds (blades) that are spaced out along a robust, creeping runner (rhizome). Fine, hair-like rhizoids branch off the rhizome. The rhizome and rhizoids grow underneath sand grains or adhere to rocks. The Mediterranean and tropical strains of *Caulerpa taxifolia* such as those founding Florida have featherlike, grass-green fronds with flattened branchlets that are 0.6–1.0 millimeters wide (0.02–0.04 inches). When mature, the branchlets are separated by about 1 millimeter (0.04 inches), and they are pinched at the tips and at the base where they attach to the midrib.



Above: *Caulerpa taxifolia* showing fronds, rhizome and rhizoids (Linda Walters)



At left: *Caulerpa taxifolia* showing branchlets (Linda Walters)

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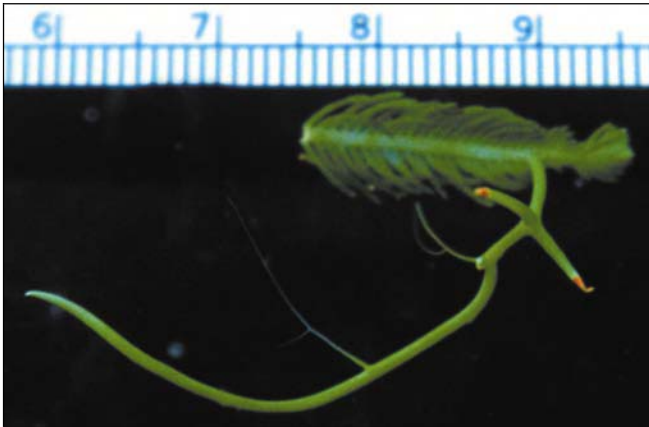
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Although similar in basic form, the two strains of *Caulerpa taxifolia* do differ. In south Florida, fronds of the native strain reach 3–15 centimeters in length (1.2–5.9 inches). Small clumps grow in sheltered or moderately wave-exposed areas down to 15 meters deep (45 feet). Fronds of the invasive strain reach 85 centimeters in length (nearly 3 feet). This strain can create huge meadows with over 8000 fronds per square meter (740 fronds per square foot) down to 100 meters (328 feet). Unlike the south Florida strain, “killer algae” can survive in water as cold as 11° Centigrade (52° Fahrenheit).

Several other species of *Caulerpa* with similar forms grow in Florida. *Caulerpa ashmeadii* has cylindrical rather than flattened branchlets. *Caulerpa sertularioides* has needle-shaped branchlets that are only 0.5 millimeter wide (0.02 inches) and do not taper at the midrib. The most similar species, *Caulerpa mexicana*, has flattened fronds that average 2–25 centimeters (0.08–0.16 inches) in height and tightly packed or overlapping branchlets that are 2–4 millimeters wide (0.08–0.16 inches) and pointed at the tips but not at the base.

Why is “killer algae” so invasive?

Rapid spread is one key trait of a successful invader. *Caulerpa taxifolia* spreads most easily by fragmentation. Fragments as small as 10 millimeters in length (0.4 inches) can rapidly produce a new rhizome, attach, and grow. The Mediterranean strain survives fragmentation better than the native strain in Florida.



A fragment (2 centimeters or .8 inches long) of *Caulerpa taxifolia* regenerating a rhizoid (Linda Walters)

Will “killer algae” invade Florida?

Florida has the right conditions for an introduction of the Mediterranean strain of *Caulerpa taxifolia*. It has an extensive coastline, a climate similar to previously invaded sites, and a large number of people with aquaria that could contain “killer algae.” Will an introduction turn into an invasion that causes ecological and economic harm? Hopefully not! Lessons from earlier invasions should help to significantly reduce the risk.

Knowing that the Mediterranean strain can survive and spread in a wide range of temperatures, eradication must begin quickly. A rapid response plan will need to be implemented if “killer algae” appear. Residents and visitors can help by being on the lookout for “killer algae” and reporting any sightings.

How can I help?

You can help prevent an invasion of “killer algae” just by following the law. In response to introductions in California and the potential for rapid expansion via fragmentation, the Mediterranean strain of *Caulerpa taxifolia* was added to the U.S. Federal List of Noxious Weeds in 1999 and to the Plant Protection Act in 2000. Thus, importing the Mediterranean strain of *Caulerpa taxifolia* or transporting it across state lines are federal offenses. Ordering *Caulerpa taxifolia* via the Internet would also be an offense if it turns out to be the Mediterranean strain.

You can also help by:

- 1) **Never dumping unwanted aquarium plants or animals into our coastal waters.** If you have unwanted algae, place it in a sealed freezer bag, freeze it for 24 hours, and dispose of it properly so that it will wind up in a landfill.
- 2) **Reporting sightings of either the native or Mediterranean strain of *Caulerpa taxifolia*.** If you see *Caulerpa taxifolia* in an aquarium, contact Linda Walters so she can test its DNA to see if it is the invasive strain. If you see the algae in the wild, please collect 3–5 fronds connected by a rhizome and photograph them or preserve them in rubbing alcohol. Send the photograph or preserved specimen, along with the date, time and exact location of the sighting to Linda Walters at the address given on the front of this sheet.
- 3) **Learning more about *Caulerpa taxifolia* and other invasive species.** The National Sea Grant College Program, Florida Sea Grant and other sources are developing additional fact sheets and complementary lesson plans on the Mediterranean strain of *Caulerpa taxifolia*, other invasive species and the impacts of marine invasive species in Florida. If you would like copies of these materials when they become available, contact Linda Walters or Chuck Jacoby at the address given on the front of this sheet.

