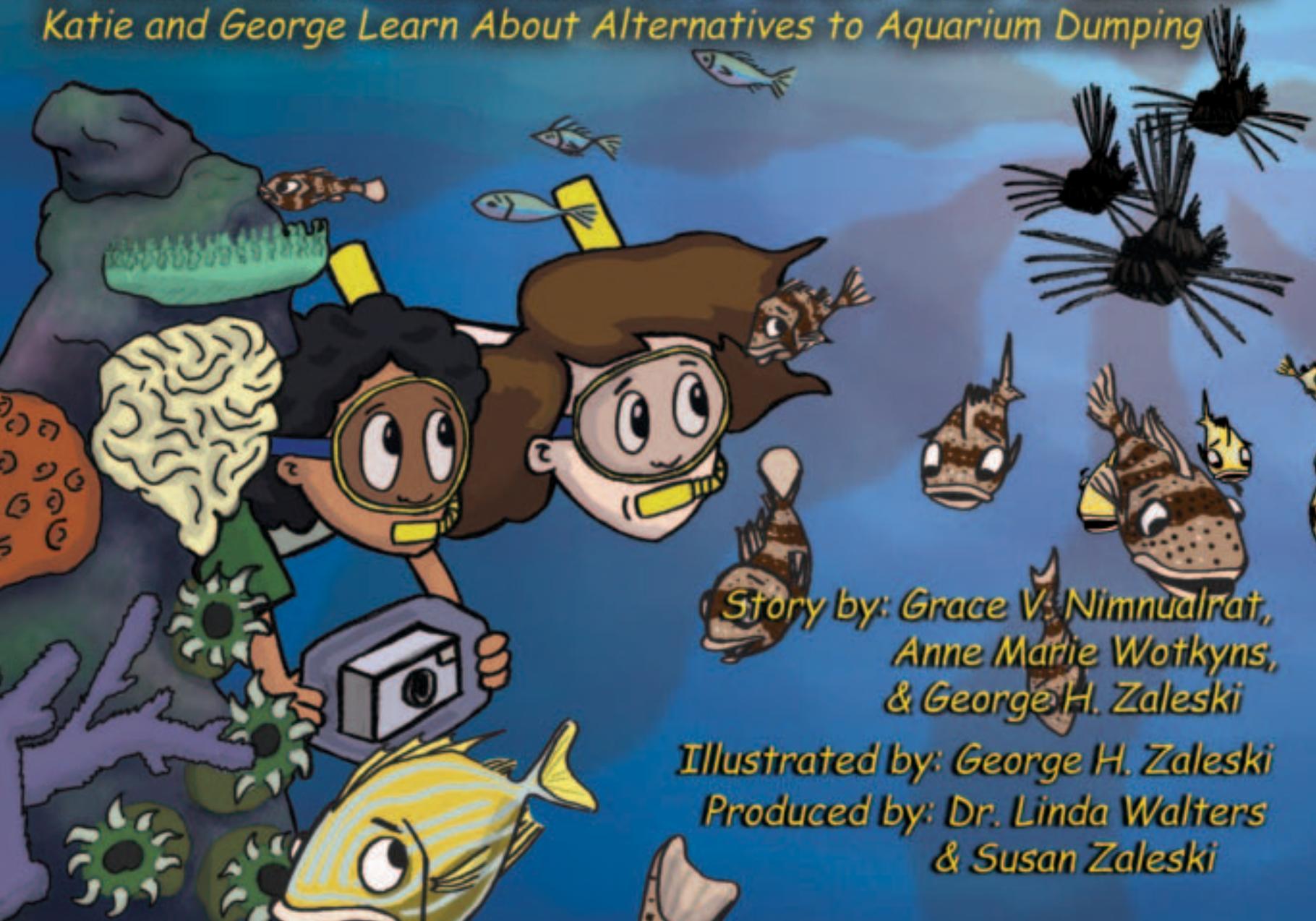


FISH INVADERS AT GYPSY POINT:

Katie and George Learn About Alternatives to Aquarium Dumping



*Story by: Grace V. Nimmualrat,
Anne Marie Wotkyns,
& George H. Zaleski*

*Illustrated by: George H. Zaleski
Produced by: Dr. Linda Walters
& Susan Zaleski*

This book was born out of a need to explain to our youngest home aquarium owners the importance of not releasing pets and plants from their fish tanks. As many of the home aquariums in the United States are “owned” by children 12 years old or younger, we consider it imperative to provide scientifically accurate, age-appropriate information that promotes environmental stewardship in the best way possible — by creating storybooks that are fun for families to read together!

Selected educators were brought together for a week-long workshop in the Florida Keys in 2008 to create two children’s books on “aquarium dumping”. During this workshop, educators were provided with information on two marine invasive species that scientists are convinced were the result of “aquarium dumping”: a feathery, green seaweed (*Caulerpa taxifolia*) and the red lionfish (*Pterois volitans*). Within the week, two amazing books began to take shape.

The book you hold in your hands “Fish Invaders at Gypsy Point: Katie and George Learn about Alternatives to Aquarium Dumping” was created for third through sixth grade children. A second book was developed for pre-school through second graders and is entitled, “A New Home for an Old Friend: Responsible Aquarium Stewardship”. We hope you enjoy both books!

To order copies of these books and to view our larger “Don’t Release” campaign with materials for all age aquarium hobbyists, please visit our website:

<http://www.usc.edu/org/seagrant/caulerpa/index.html>

This book has been produced with support from the University of Central Florida, National Sea Grant College Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under grant number NA 06OAR4170012, United States Fish and Wildlife Service, and Tampa Bay Estuary Program.



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On the end of a long dock at beautiful Gypsy Point that faces out to the Atlantic Ocean, Katie and George met to go snorkeling.

Hey George! I'm super excited to go snorkeling today!

Oh yeah, me too!
It will be so cool now since Dr. Linda taught us the scientific names for everything.
Let's get going!

Katie and George put on their masks and snorkels, so they could see and breathe underwater while watching all the colorful marine organisms.



Then they put on their fins, so they could swim fast like a fish.



Finally, they looked around to make sure the water was deep enough to jump in, there were no sharp rocks, or anything dangerous in the water, and off they went.

As Katie and George snorkeled, they saw the beauty of the underwater world with many of the native flora and fauna they had learned about in class.



They noticed some very small fishes that appeared to be eating plankton, microscopic organisms that live in the water.



Small fishes were nibbling on organisms in the seagrass.



Some larger fishes were camouflaged, hiding near a coral head, while others were exposed, hunting for invertebrates or smaller fishes to eat near the seagrass meadow.



Everything Katie and George saw was part of a well-balanced food web.

As they continued snorkeling toward the end of the Point, things began to change...



All around them, the water took on a spooky stillness. They didn't see any of the fishes they had admired moments earlier. Even the shrimp and crabs seemed to have disappeared!



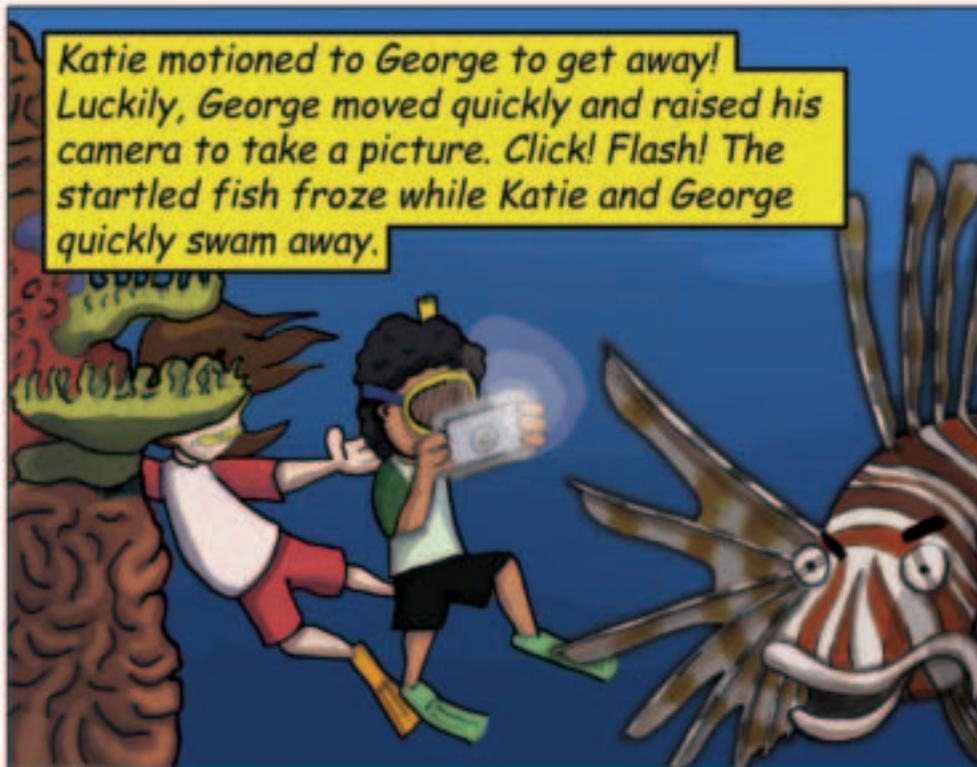
Soon they saw three large, ornate fish hanging around a massive coral head. The fish stood out with their reddish-brown and white vertical stripes and long spines on their dorsal fins.



As Katie and George got closer, one fish turned toward them, flared its fins, pointed its dorsal fin spines, and began to charge.



Katie motioned to George to get away! Luckily, George moved quickly and raised his camera to take a picture. Click! Flash! The startled fish froze while Katie and George quickly swam away.



Katie and George stopped to talk once they were safely back on the dock.

Where do you think those fish came from?

I don't know, but I want to find out.
Let's go talk to Dr. Linda at the University
Marine Lab!

Katie and George went to the University Marine Lab where Dr. Linda worked as a Research Scientist and Professor.



Hi guys! What can I do for you today?

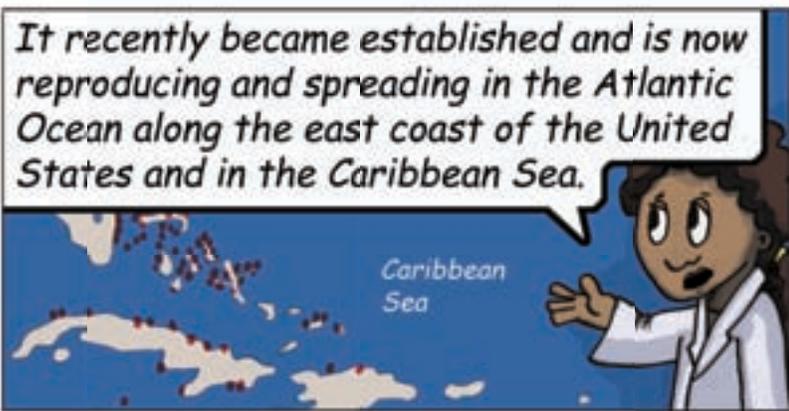


We went snorkeling at Gypsy Point and saw these beautiful, spiny fish that we've never seen before. Can you please tell us what they are?





Wow kids, I know exactly what this is... it is a red lionfish, which is native to the Pacific Ocean, in areas like Indonesia.



It recently became established and is now reproducing and spreading in the Atlantic Ocean along the east coast of the United States and in the Caribbean Sea.

As a new invasive species, lionfish are unbalancing the reef's food web by consuming large numbers of reef fishes.



These lionfish have long venomous spines that give you a very bad sting if you touch them, so be careful if you see them again.



We will have to post warning signs at the dock so no one gets stung. Yours is the first sighting at Gypsy Point! You both made an important discovery!



The red lionfish's scientific name is *Pterois volitans*. Scientists think this species was introduced by aquarium dumping, which means that people have intentionally or accidentally released their pets into coastal waters.



Do you mean people are doing this on purpose?

That's correct. People think they are doing their pet a favor, but this practice is harmful because it threatens the natural environment and all the other species that live there. Invasive species, like the lionfish, eat the food and take up the space that native species need. All organisms have their place in the environment and when an invasive species arrives, it often makes changes that are bad for the ecosystem.

Animals are not the only invasive species that cause problems for marine habitats. This is *Caulerpa taxifolia*. It is a marine seaweed that wreaks havoc in new environments when it overgrows native flora. It produces nasty chemicals that make it taste bad, so animals don't like to eat it. *Caulerpa taxifolia* invaded bays and estuaries in many locations in the world, including the Mediterranean Sea, parts of Australia, and even southern California". Researchers are convinced that all of these introductions started with aquarium dumping.



Well kids, there are some common reasons why this happens.



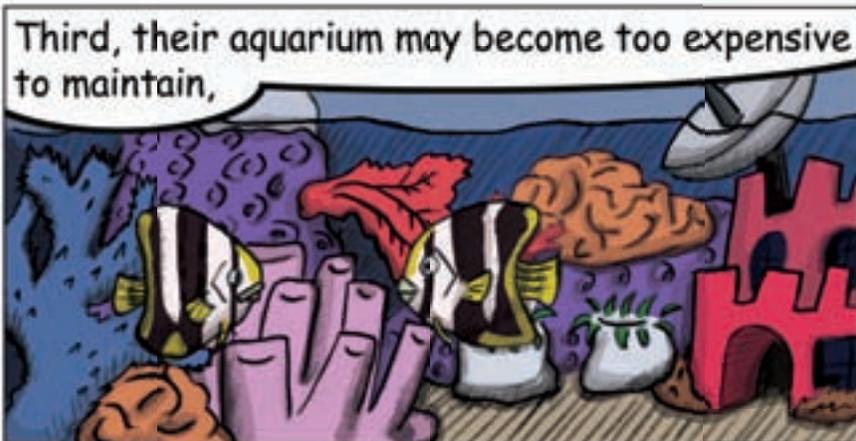
First, fishes or invertebrates may become too large for their tanks.



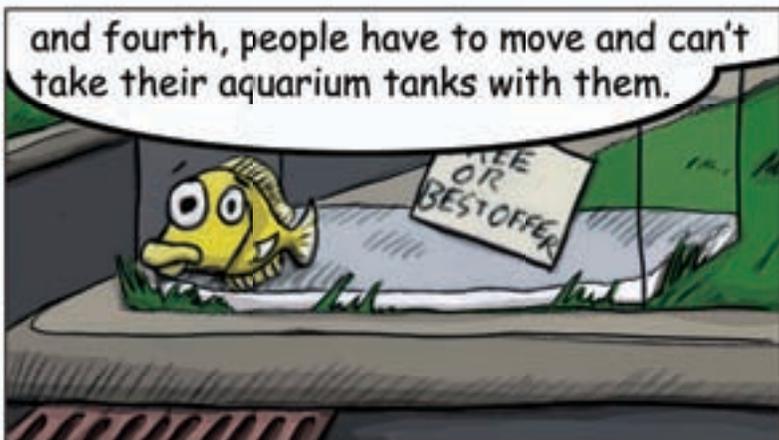
Second, their tanks may become overgrown with too much seaweed.



Third, their aquarium may become too expensive to maintain,



and fourth, people have to move and can't take their aquarium tanks with them.



These people don't know that there are four simple ways to deal with their aquarium tanks that are much better alternatives than dumping their tank contents in storm drains or local waterways.





What should people do instead?

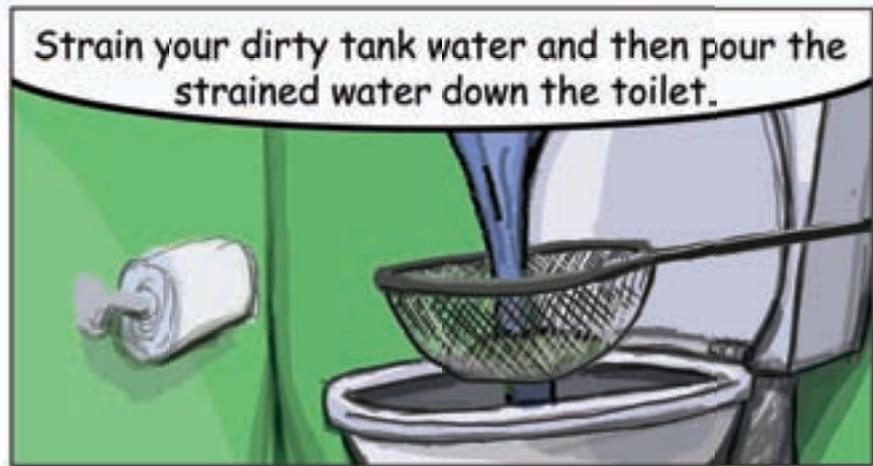
That's a good question. There are great alternatives to dumping non-native species into the wild. People can:



Give unwanted plants or pets to another aquarium hobbyist.



Give unwanted plants and pets to a responsible aquarium or pet store.



Strain your dirty tank water and then pour the strained water down the toilet.



Freeze *Caulerpa taxifolia*, anything caught in the strainer, and other unwanted plants for 5 days, and then throw them in the trash.



Or contact an aquarium or pet store for more help. They love to help protect our ocean.

Wow, those sound like much better and safer choices than dumping an aquarium tank down a storm drain or into the ocean.



Yeah, I sure hope we don't find any more invasive species at Gypsy Point! I can't wait to tell our friends about the red lionfish and what we just learned.



Thanks so much for your help, Dr. Linda!



Anytime, kids. You both are being excellent scientists by asking questions and making discoveries. Come back soon!



That night Katie and George called their friend Dave about their red lionfish discovery and asked if he wanted to go snorkeling with them tomorrow to see if they could find more lionfish at the Point.



That would be cool.



Awesome, we'll come by tomorrow to pick you up.



When they arrived at Dave's house, he answered the door with a clear plastic bag in each hand. Inside the bags were his aquarium fish and some seaweed.



What are you doing, Dave?



My mom says my aquarium tank is too expensive to maintain and I need to get rid of everything. So while we are snorkeling, I'm going to set everything free in the ocean.



You can't do that!



Why not?

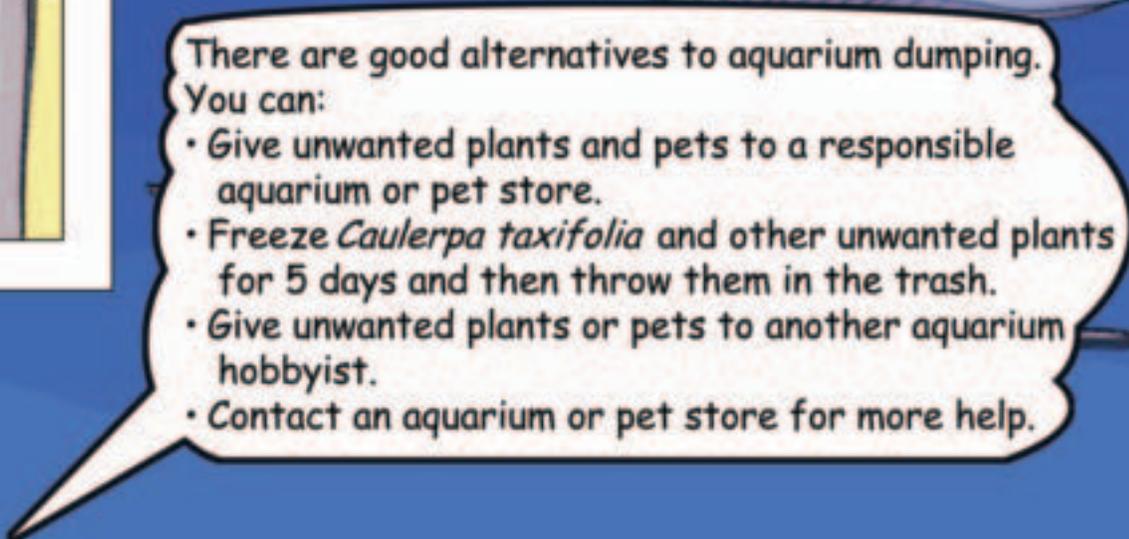


We just learned from Dr. Linda why people should not release aquarium organisms into the wild. Your fishes and seaweed could become established and threaten the natural environment of Gypsy Point and all of the organisms that live there.





But, my mom says that I need to get rid of them. What should I do?



There are good alternatives to aquarium dumping. You can:

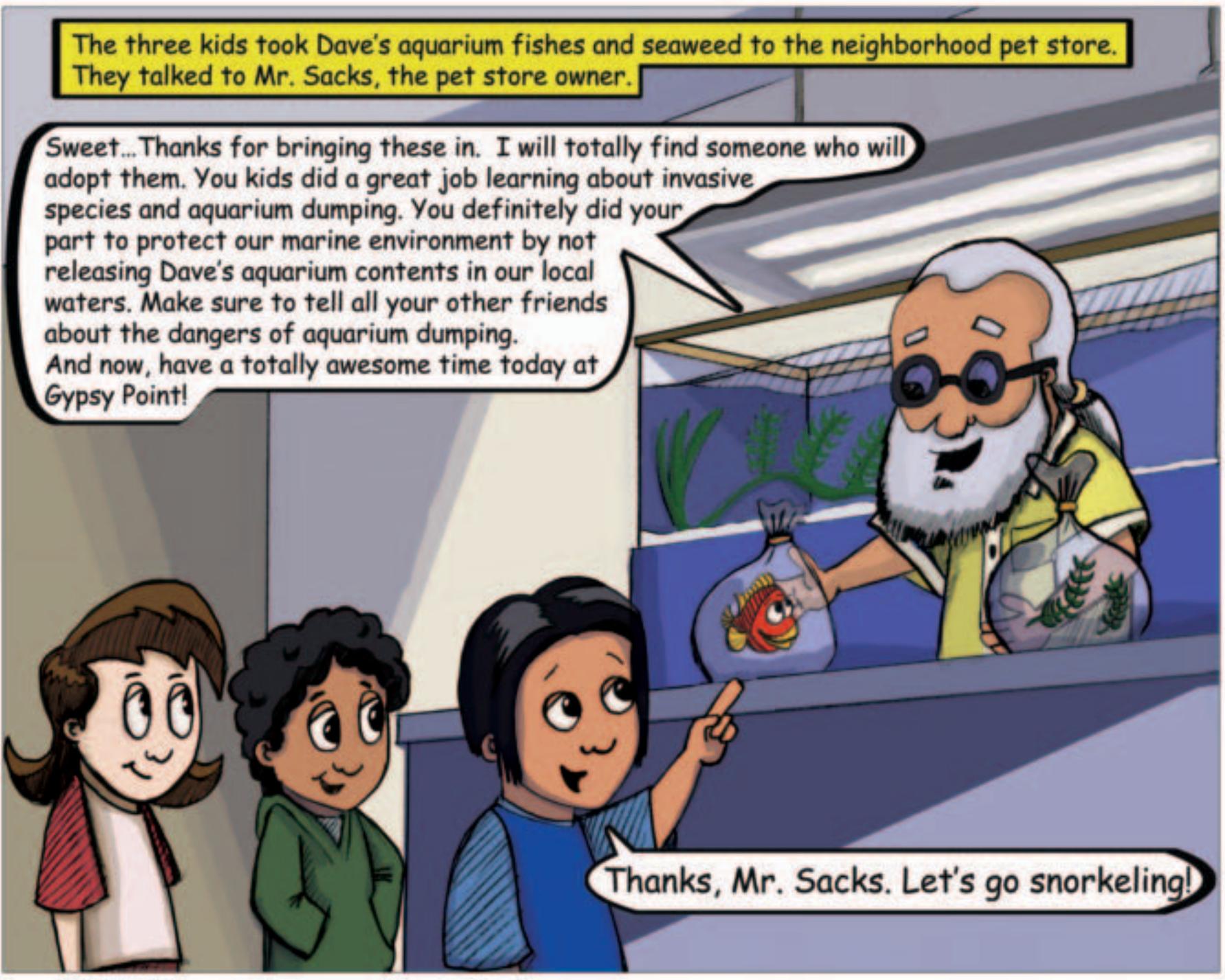
- Give unwanted plants and pets to a responsible aquarium or pet store.
- Freeze *Caulerpa taxifolia* and other unwanted plants for 5 days and then throw them in the trash.
- Give unwanted plants or pets to another aquarium hobbyist.
- Contact an aquarium or pet store for more help.



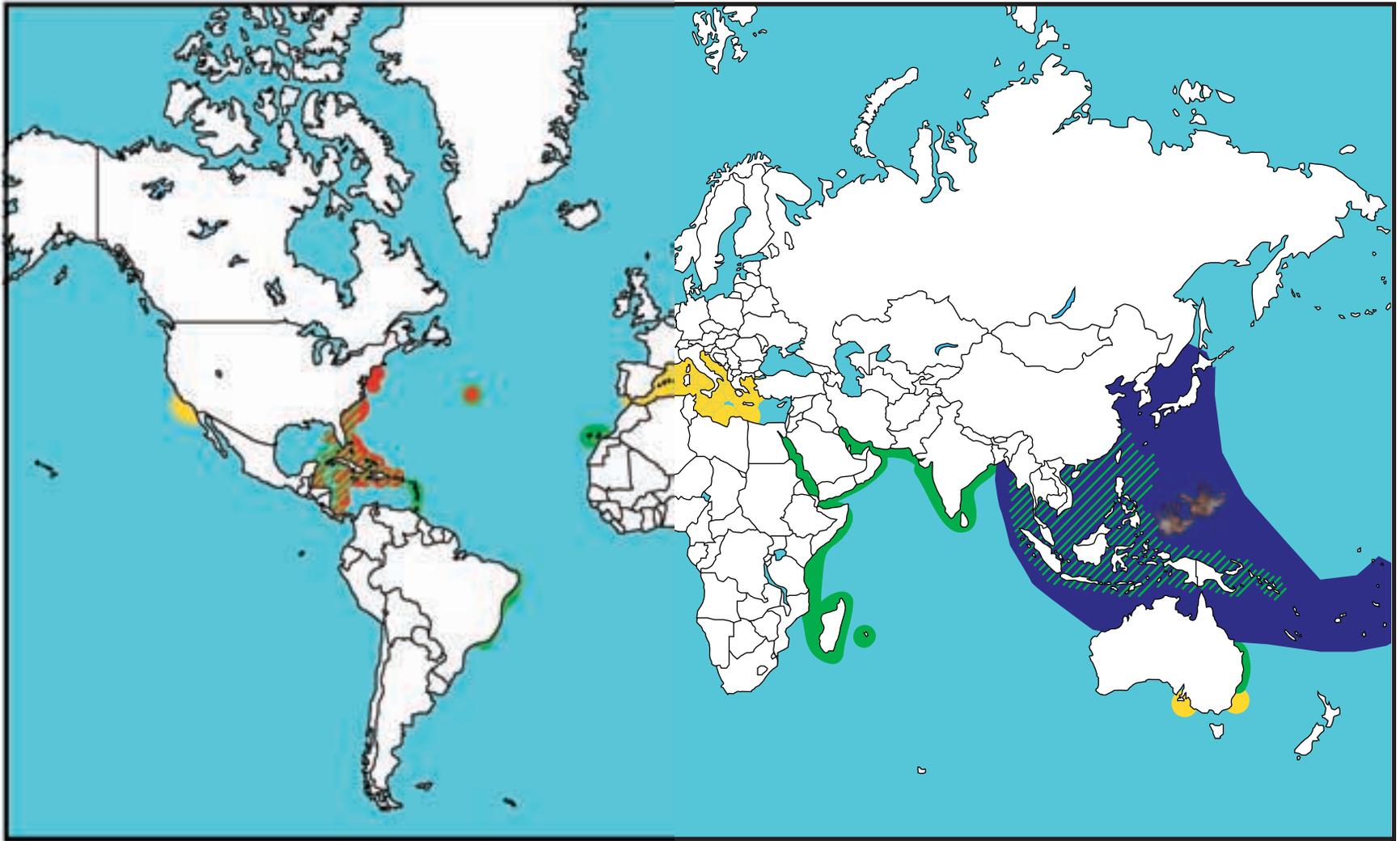
We should first stop at the Gypsy Point Pet Store, and Mr. Sacks can tell us what to do.

The three kids took Dave's aquarium fishes and seaweed to the neighborhood pet store. They talked to Mr. Sacks, the pet store owner.

Sweet... Thanks for bringing these in. I will totally find someone who will adopt them. You kids did a great job learning about invasive species and aquarium dumping. You definitely did your part to protect our marine environment by not releasing Dave's aquarium contents in our local waters. Make sure to tell all your other friends about the dangers of aquarium dumping. And now, have a totally awesome time today at Gypsy Point!



Thanks, Mr. Sacks. Let's go snorkeling!



 Native range of *Pterois volitans*

 Invasion of *Pterois volitans*

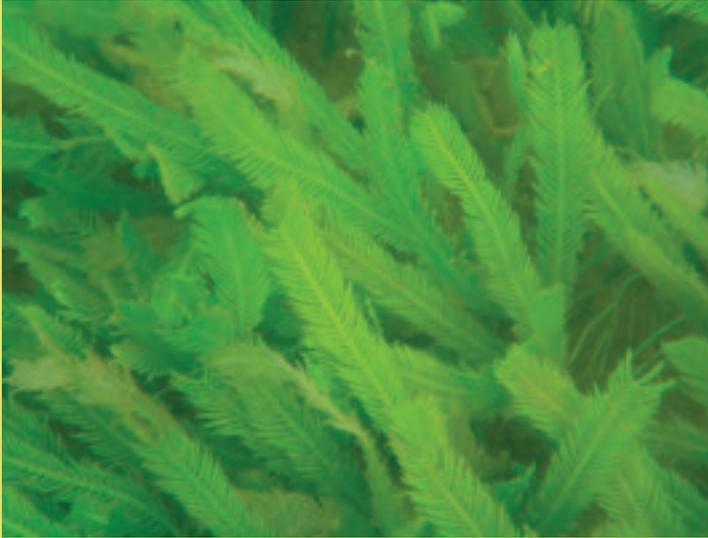
 Invasive *Pterois volitans* & Native *Caulerpa taxifolia*

 Native range of *Caulerpa taxifolia*

 Invasion of *Caulerpa taxifolia*

 Native *Caulerpa taxifolia* & *Pterois volitans*

Caulerpa taxifolia (Feather Algae)



- *Caulerpa taxifolia* (kă-lěr-pă tăx-î-fōl-ě-ă) is a bright green, marine (saltwater) seaweed with multiple feathery blades (fronds). Growth in this species is indeterminate, which means that it continues to increase in size until it dies.
- *Caulerpa taxifolia* spreads between locations primarily by fragments. Fragments as small as a few millimeters in length can move with water currents, and when they contact the bottom, they rapidly attach to it with using root-like structures called rhizoids. These fragments then rapidly increase in size. Fragments are produced by natural processes such as storms, humans anchoring their boats in infested locations and herbivores (e.g. fishes) that reject distasteful bites of this seaweed due to the chemicals it produces.
- *Caulerpa taxifolia* is native to subtidal waters (i.e. below the low tide line) in tropical and sub-tropical areas in the Caribbean, Indonesia, Southeast Asia, and northern Australia.
- Because of its beauty and ability to grow from fragments, *Caulerpa taxifolia* is very popular with the aquarium industry (public and hobbyist) and is lumped with other species of *Caulerpa* that are collectively called “feather *Caulerpa*” or “feather algae”.
- All infestations of *Caulerpa taxifolia* are suspected to be the result of accidental or purposeful “aquarium dumping” by either private individuals or public aquaria.
- *Caulerpa taxifolia* invaded the Mediterranean Sea, southern California, and parts of southern Australia. It entered the Sea of Japan but never became established. California spent over seven million dollars to successfully eradicate two infestations between 2000 and 2006.
- In invaded waters, you can find beds of *Caulerpa taxifolia* covering very large areas. *Caulerpa taxifolia* overgrows and smothers native marine species. This seaweed produces little food for invertebrates and fishes, so animals leave invaded areas.
- Because of its impact on marine ecosystems, tourism and local economies, *Caulerpa taxifolia* is classified as one of the 100 worst invasive species on our planet (Source: International Union for the Conservation of Nature).
- Please do not use *Caulerpa taxifolia* in your home aquaria. If you have *Caulerpa taxifolia*, please dispose of it by placing it in a plastic bag in the freezer for at least 5 days and then putting the closed bag in a trash can.

Pterois volitans (Red Lionfish)



Photo: N. Deloach

- *Pterois volitans* (těr-îs vôi-î-tăns) has distinctive stripes (bands) covering its body, alternating white and dark (dark red to brown or black). It has fleshy tentacles above its eyes and below its mouth.
- *Pterois volitans* has many sharp spines on its dorsal (back), anal, and pelvic (lower side) fins. Venom glands are located along grooves of each spine. If a spine punctures a victim, the venom enters the wound causing intense pain and swelling. In some cases, it may even cause temporary paralysis. Seek medical assistance if stung!
- With *Pterois volitans*, reproduction can occur year-round in the Atlantic Ocean. Each spawning event can produce tens of thousands of eggs.
- Lionfish are native to the tropical waters of the Western Pacific, Indian Ocean and Red Sea. *Lionfish* usually inhabit coral reefs.
- *Pterois volitans* is one of the most popular saltwater fish species imported into the United States for the saltwater aquarium hobby industry.
- The introduction of lionfish in US waters was likely caused by intentional or unintentional aquarium dumping. The only documented release of lionfish occurred in Florida during Hurricane Andrew (1992) when a home aquarium was flooded. However, the genetic diversity of collected individuals suggests that additional releases have occurred. Additionally, 7% of lionfish are actually a related species - *Pterois miles* (the devil firefish). *Pterois miles* is also native to the Indo-Pacific and also distributed in the aquarium hobby industry.
- *Pterois volitans* can now be found along the U.S. Atlantic coast from the Florida Keys to Rhode Island. Large numbers of individuals have also been observed in Bermuda, the Bahamas, the Caribbean, and Central America.
- *Pterois volitans* eats many species of fishes, shrimp, and crabs, including many that are economically important. *Pterois volitans* is capable of consuming prey up to half their body length by expanding their stomachs over 30 times its normal size!
- In their invaded range, *Pterois volitans* appears to have few predators.
- If you or someone you know has a lionfish, please make sure it is never released into coastal waters or down a storm drain. Please consult your local pet shop or Fish and Wildlife Service for advice if you cannot care for your lionfish any longer.
- If you catch a lionfish while fishing, do not release it back in the water! Without handling the fish, cut the line, and drop the fish into a bucket or cooler. Be careful not to let the spines poke you. Only researchers with permits should bring lionfish back to shore alive.
- If you catch a lionfish while fishing or see one while snorkeling/diving, please report it to the Reef Environmental Education Foundation (REEF) exotic species sighting program website at <http://www.reef.org/programs/exotic/report> or to the U.S. Geological Survey (<http://nas.er.usgs.gov/SightingReport.asp>).

Glossary

Aggressive – prone to attack or harm others.

Algae (Alga is singular) – this includes microscopic algae found in plankton and macroscopic seaweeds. Algae are different from plants because they do not have true leaves, roots, or stems.

Alternative - a different option that can serve the same purpose.

Aquarium dumping - accidental or intentional release of aquarium organisms (seaweeds, animals) environment.

Camouflage - the ways that animals blend into their environment, especially coloration, in order to avoid being seen by predators or prey.

Coral head - a large formation of stony, hard coral that provides the structure for a coral reef.

Displace – cause an organism to leave an area.

Dorsal - anything that is located on the back of an animal's body.

Economically important – Anything that affects the way humans make or obtain money. For example, organisms that humans use for food or other products.

Ecosystem – a particular type of habitat and all the living things in the habitat.

Eradicate – completely get rid of an organism in a specific area.

Established - when a new organism gets to an area and is able to survive and reproduce until there are enough of them to become a part of that habitat.

Equipment - the tools, clothing, or other items needed for a particular purpose or activity.

Fauna - animals in the environment.

Fish – used when discussing one fish or one species of fish.

Fishes – used when discussing more than one species of fish.

Flora - plants in the environment.

Food web - the way organisms in the environment are interconnected by their diets. For example, some seaweeds are eaten by invertebrates, some invertebrates are eaten by fish and birds, and some fish and birds are eaten by larger predators, such as sharks or humans.

Genetic diversity – variation of genes among individuals of the same species. Scientists measure this by looking at DNA.

Habitat - an organism's natural environment. Examples include forests, deserts, coral reefs, wetlands, and many others.

Hobbyist - person who does an activity for fun.

Infestation – when large numbers of an organism become established in a new place.

Invasive species - organism that establishes and spreads in a new area and threatens that ecosystem, habitat, and/or any native species.

Invertebrates - animals that have no backbones. Examples include oysters, mussels, and corals.

Marine - anything that lives in saltwater.

Microscopic - too small to see with only your eyes and must be viewed under a microscope.

Native - organisms that live in their natural or historical range of dispersal.

Non-native - organisms that are accidentally or deliberately introduced to an area that they could not get to on their own through natural dispersal (e.g. tides, currents, wind).

Organism - one individual of a particular species.

Ornate - very decorated or fancy.

Pectoral - anything that is located on the chest or sides of an animal's body.

Plankton - microscopic animals and plants floating in the sea or in lakes. They are usually near the water's surface and are eaten by fish and other aquatic animals.

Predators - an animal that eats other animals and plants in order to survive.

Research - a scientist's experiments that help us understand the world we live in.

Scientific name - the Latin name for an organism that is used by scientists in all countries throughout the world. The Latin name has two parts, a genus name, which it shares with other similar organisms, and a species name, which describes only it.

Seagrass - marine plants that live underwater and create meadows ("seagrass beds") that provide a habitat for hundreds of marine invertebrates and fish. Seagrasses are also food for some large marine animals, such as manatees.

Seaweeds (macroalgae) - marine plants that are different from seagrasses and land plants because they do not have true leaves, roots, or stems.

Snorkeling - swimming using a mask, snorkel, and fins.

Species - any one particular type of plant or animal.

Spine - a hard, pointy part that sticks out from an animal's body.

Territory - an area that an animal considers its own and defends that area against other animals.

Tentacles - movable parts that stick out from an organism's body.

Venomous - an animal that produces harmful chemicals and is able to deliver those chemicals with a bite or sting.

Vertical - running straight up or down, not side-to-side.

Waterways - natural and man-made bodies of water. These include rivers, streams, lakes, canals, wetlands and bays.

Anne Marie Wotkyns and Grace Nimnualrat, two of the authors of this book, both teach in the public school system in California. Anne Marie, who currently teaches 5th graders at J.B.Monlux M.S.T. Magnet Elementary School, has 17 years of teaching experience, is a National Board Certified Teacher, and was a Presidential Awardee for Excellence in Math and Science Teaching in 2006. Grace has 9 years of teaching experience and currently teaches 5th graders at the San Antonio ES Math, Science and Technology Magnet School and was 1 of 14 teachers in the Los Angeles Unified School District selected as Teacher of the Year in 2007-2008.

George Zaleski, the illustrator and author, was an easy choice for this project as he had previously collaborated on a “Don’t Release” animated video with the same friendly characters. George works in the animation and art industry in Los Angeles, California.

Dr. Linda Walters holds a B.S. in Biology from Bates College, and a M.S. and Ph.D. from the University of South Carolina. She is currently a Professor of Biology at the University of Central Florida. Her research centers on human impacts on marine systems, with a focus on tropical seaweeds, oyster reefs, coral reefs, and invasive species.

Susan Zaleski received her B.A. from Hamilton College and her M.S. from California State University at Fullerton. Susan’s M.S. research focused on dispersal of non-native seaweeds via the aquarium trade. Susan now works for University of Southern California Sea Grant Program where she provides outreach and advisory services in the areas of coastal ecosystem health, aquatic invasive species, marine protected areas, public recreation, and other emerging issues along the southern California coast.

We thank the following for contributions to our book, reviewing the book content, and assisting with our 2008 educator’s workshop:

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Alternatives to Release



Freeze *Caulerpa taxifolia*, anything caught in the strainer, and other unwanted plants for 5 days, and then throw them in the trash.



- Strain fish tank water to catch any fragments of aquarium plants, and then put all aquarium plants in a bag in the freezer for 24 hours. Next, throw the bag in regular trash.
- Only strained water goes down the toilet. CAUTION: It is unknown if microscopic organisms (plants, animals, bacteria, viruses) that are in the fish tank water can make it through the sanitation process intact if dumped down the toilet. Hence, the absolute safest thing to do with fish tank water is to pour it on your lawn, garden, or shrubs. Do not pour down a storm drain!
- Contact an aquarium store in your neighborhood to obtain advice on transporting plants and animals if you are giving your fish tank contents to a friend.
- Contact an aquarium store in advance to see if they are able and willing to take in your pets and plants.
- If you cannot find a home for your pets and plants, contact your local Fish and Wildlife Service for advice. They often hold “Amnesty Days” to promote responsible pet ownership.

While snorkeling, Katie and George come across a beautiful but unknown fish, so they snap a photo of it and take the photo to Dr. Linda at the University Marine Lab. She describes the unknown fish as a lionfish - a new, invasive species in western Atlantic waters that was most likely introduced by aquarium dumping (humans releasing unwanted plants and pets from aquarium tanks into local waterways). Dr. Linda discusses the serious problems this fish and another invasive species, the green seaweed *Caulerpa taxifolia*, are causing to coral reefs and other aquatic habitats. She also explains better alternatives to aquarium dumping that Katie and George then share with their friend Dave.

Although Gypsy Point is a hypothetical location along the Atlantic coast of Florida, the problems with aquarium dumping are very real! Please read this book with your family to learn about safe alternatives for pets and plants in your fish tank if you can no longer care for them. Thanks!

To order copies of these books and to view our larger “Don’t Release” campaign with materials for all age aquarium hobbyists, please visit our website:

<http://www.usc.edu/org/seagrant/caulerpa/index.html>

This book has been produced with support from the University of Central Florida, National Sea Grant College Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under grant number NA 06OAR4170012, United States Fish and Wildlife Service, and Tampa Bay Estuary Program.

