

The Ocean In Motion:  
Marine Science Education Program



Presented by:

**SAN DIEGO**  
**OCEANS**  
FOUNDATION

Promoting ocean stewardship since 1984!



# The Ocean In Motion

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# The Ocean In Motion

## The San Diego Oceans Foundation

The San Diego Oceans Foundation is a nonprofit organization dedicated to promoting ocean stewardship by leading community-supported projects which increase our understanding of marine animals, protect ecosystems and provide solutions to environmental challenges.

### Statement of Need

One of the many problems facing San Diego school districts is the current educational reform movement, emphasizing “tougher standards”. This competitive learning environment unfortunately forces educators to saturate their lesson plans with subjects like reading and math, leaving little space or time for science, especially marine science. This ultimately results in children that grow into adults who lack fundamental knowledge about the marine environment and how to protect it. With our qualified staff and enthusiastic volunteers, we bring marine science back into the classroom.



### Program Purpose

Educating students about the marine environment and encouraging them to take an active role its protection is of utmost importance (especially when the ocean is right in their backyard). With nearly 3 million people living in close proximity to our beaches and bays, the quality of life in San Diego is closely linked to the ocean. California, home to an abundance of ocean-related attractions, relies greatly on clean, safe and protected coastal waters. Without fundamental knowledge of how marine organisms and the quality of their aquatic world are interconnected, children may not recognize the need for their protection and conservation. Raising environmental awareness among young people is extremely vital to the survival of these systems (especially since these same minds will eventually be making the decisions which affect their health, both locally and worldwide).



Surprisingly, many of the youth we serve have never even been to the ocean!

With this program, we are able to bring the ocean to them  
- serving more than 975 local youth each year!



# The Ocean In Motion

## Program Details

The Ocean in Motion (OIM) is a mobile marine science program that has been developed in accordance with the California Science Content Standards and is available to all schools and youth organizations in San Diego County. OIM is designed to assist teachers in their endeavors to communicate the importance of science. The primary objective of OIM is to inspire San Diego youth to become environmental stewards through a science-based curriculum. By engaging and educating students about their local marine environment, we will be giving them the tools necessary to make informed decisions about how to protect San Diego's marine ecosystems in the future.

Qualified educators, experienced in the study of marine science, visit participating classrooms/programs (grades K-12) during/after school hours, providing interactive marine science lessons. Each class receives four, 90-minute presentations (one per week for four weeks) followed by a service learning project and optional topic-related field trip.



## Audience

The Ocean In Motion: Marine Science Education Program can be adapted to any grade level and audience. We understand that students need in-depth presentations and hands-on manipulatives to retain valuable information.

In order to meet these needs, each unit includes the following components, is age appropriate and child-centered:

- ◆ Interactive PowerPoint presentations
- ◆ Hands-on activities  
(i.e. group experimentations, fish dissections, live animal labs, etc.)
- ◆ Topic-related homework assignments
- ◆ Service Learning Opportunity
- ◆ Optional Field Trip





# The Ocean In Motion

## Ocean In Motion Topics

In order to better suit individual classroom curricula and student interests, we have developed three separate ocean-related topics for groups to choose from.

Each unit offers a general overview of the topic at hand, covers marine organisms native to San Diego and addresses environmental issues that pertain to us all. Presentations are informative, interactive and full of exciting facts that will keep all ages engaged. This program strives to stimulate scientific interest and curiosity about the waters that surround us. Throughout their series, students will be given baseline information that can be applied to other fields and constantly challenged to brainstorm ways to take personal responsibility for their local waters (giving them a sense of ownership and empowerment in relation to the field of science and conservation).

## Topic Choices

- 1) Marine Ecosystems
- 2) Sharks & Their Scaly Brethren
- 3) Marine Mammals, Sea Turtles & Ocean Birds





# The Ocean In Motion

## Marine Ecosystems

To the untrained eye, the ocean may seem like little more than a vast, blue desert. However, upon closer examination, a whole new world emerges, TEEMING with life.

“Marine Ecosystems” offers an introduction to a wide variety of ocean environments. In a month’s time, we will talk about the little laboratories that can be found in tidepool areas, the incredibly diverse kelp forests right off our coasts, and the astonishing world of the deep sea. Along with covering the animals that live in each environment and their specific adaptations, we will discuss the many ways in which people use marine resources, why they are important to conserve and what we can do in our everyday lives to ensure the prevalence of these valuable systems.

### Week 1: Marine Ecosystems Around the World

Introduction: Our connection to the world’s oceans

What is an “ecosystem”? (terrestrial examples)

Brief discussion about different marine ecosystems

(estuaries, sandy bottoms, mangroves, coral reefs, polar regions and the open ocean)

Food webs: The producers, consumers and decomposers of the sea (Microbes → Whales)

Activity: “The California Coast”

» how marine food webs are affected by change

Homework: *Seafood Watch* (your daily choices can support healthy oceans)

### Week 2: Tidepools: Our Rocky Shorelines

What are tidepools and how are they created?

Brief lecture on the movement of water (i.e. waves & tides)

Life on the edge (changes in light, temperature, salinity, amount of oxygen)

Tidepool life in southern California

» zonation patterns and the animals that live in each zone

Live Animal Lab: Touch tanks with living organisms from local tidepools

Handout: Tidepool Etiquette

Homework: *Algae House* (Is there kelp in your cupboard?)

### Week 3: Kelp Forests in San Diego

“Show and Tell” – Kelp products in the home

Characteristics of kelp forests and their role as an important habitat for others

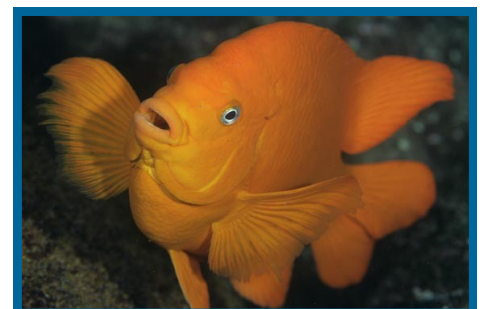
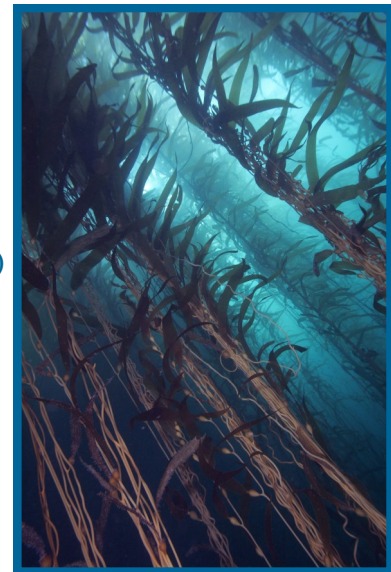
Giant kelp & understory algae

Kelp forest inhabitants (predators, prey and adaptations for each)

Activity: “Marine Debris...it’s Everywhere!” (grades K - 6)

Activity: “Stellar Sea Lion Population Analysis” (grades 7 - 12)

Homework: *Our friends, the fish...* (species ID)





# The Ocean In Motion

## Marine Ecosystems

### Week 4: Below the Photic Zone: Life in the Deep Sea

What it's like in the deep (light, pressure, temperature, etc.)

» What could ever survive in such conditions?

Bioluminescence -Bright light in an otherwise black space

Finding food and mates in a dark and “empty” world

Giant squid & Sperm whale confrontations

Hydrothermal vents

(harsh, extreme environments that support an array of newly-discovered, intriguing life)

Activity: “Finding your Friends in the Dark...Bioluminescence” (grades K - 3)

Activity: “Button-making Bonanza” (grades 4 - 6)

» show others how you support your marine environment

Activity: Ecosystem Jeopardy...Reinforcing learning objectives (grades 7 - 12)

Homework: Conservation pledge - You too can help protect valuable marine life!

### Week 5: Service Learning Opportunity (see page 12 for details)

- 1) Storm Drain Stenciling
- 2) Canyon Watch
- 3) White Seabass Restoration

### Recommended Field Trips (optional - dependent upon funding and transportation)

Choose one of the following options (see page 13 for details)

- 1) The Birch Aquarium @ Scripps
- 2) Cabrillo National Monument
- 3) SDOF Snorkeling & Science
- 4) Hornblower Harbor Cruise
- 5) SeaWorld San Diego





## Sharks & Their Scaly Brethren

Da, na, da na, da na, da na, da na...

This familiar sound often strikes fear in a lot of young hearts! Unfortunately, due to a popular Hollywood film and misleading media coverage, many people today are terrified at the sight of shark. These magnificent creatures just need a little PR help!

With this series, we will attempt to dispel some of the common misconceptions students may have about sharks. We will start by introducing some of the different fish species found around the world (from common to peculiar... and even the bizarre). A wide variety of fish species will be covered, with particular emphasis placed on those native to San Diego. The unit will conclude with a discussion about contemporary fisheries and our role in the overfishing crisis.

### Week 1: The Earth's Fishes...

Introduction: Our connection to the world's oceans

What makes a fish a fish???

Overview of the world's different fish classifications

» hagfishes, lampreys, chimaeras, sharks & rays and the bony fishes

The world's weirdest fish (images and adaptations)

Food webs: The producers, consumers and decomposers of the sea (Microbes → Whales)

Activity: "The California Coast"

» how marine food webs are affected by change

*Homework: Our friends, the fish... (species ID) - Part 1*

### Week 2: Shark!!!

Cartilagenous vs. Bony Fishes (compare & contrast)

Basic shark structures

The world's shark species (bottom feeders, ambush predators, schooling sharks, parasites, filter feeders and stereotypical representations)

Reproduction (egg layers, live bearers and those in between)

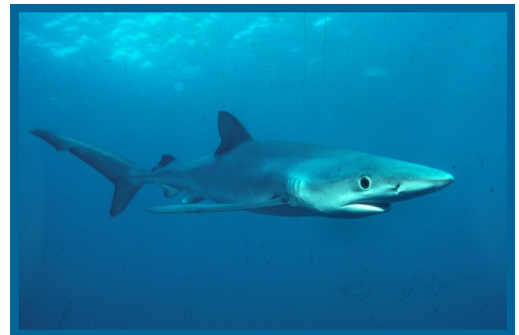
Friends & Enemies (remoras, pilot fish and humans)

Shark finning (the inhumane fishing practice common around the world!)

Tagging Experiment: "Becoming a Marine Biologist"

» the only way to learn about migratory populations in a marine environment

*Homework: Our friends, the fish... (species ID) - Part 2*





# The Ocean In Motion

## Sharks & Their Scaly Brethren

### Week 3: The Bony Fishes

Sharks vs. Bony Fishes (compare & contrast) - Review

Basic fish structures

Fish species native to San Diego

» Photo ID, ecological importance & fun facts

Activity: "Fishing for our Future" (grades K - 6)

Fish Dissection: Anatomy and Adaptations (grades 7 - 12)

Homework: *Seafood Watch* (your daily choices can support healthy oceans)

### Week 4: Fisheries Ecology

The increasing popularity of seafood across the globe

Current fishing practices

» gear used, effort vs. yield, bycatch, habitat destruction

Maintaining healthy oceans (how legislation is trying to help)

Marine Protected Areas

» Our guarantee of fish for future generations!

Activity: "Button-making Bonanza" (grades K - 6)

» show others how you support your marine environment

Activity: Fish Jeopardy...Reinforcing learning objectives (grades 7 - 12)

Homework: *Conservation pledge* - You too can help protect valuable marine life!

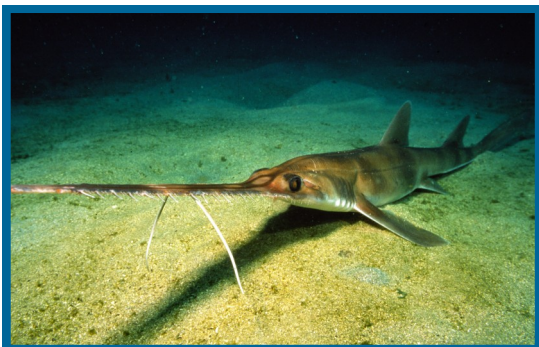
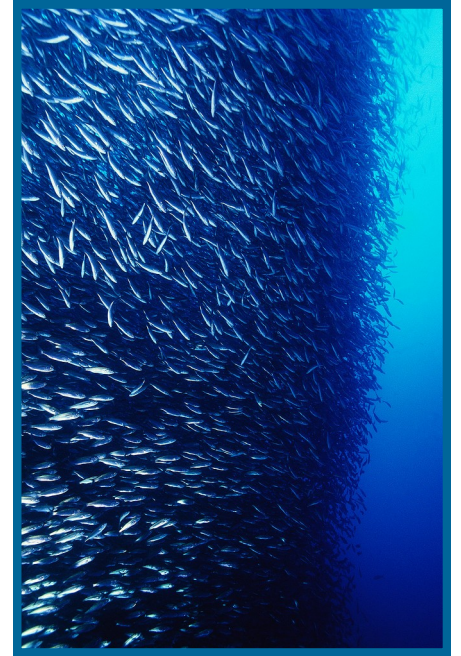
### Week 5: Service Learning Opportunity (see page 12 for details)

- 1) Storm Drain Stenciling
- 2) Canyon Watch
- 3) White Seabass Restoration

### Recommended Field Trips (optional - dependent upon funding and transportation)

Choose one of the following options (see page 13 for details)

- 1) SeaWorld San Diego (Aquarium Tours, Bat Ray Interaction, Shark Encounter)
- 2) The Birch Aquarium @ Scripps
- 3) SDOF Snorkeling & Science





# The Ocean In Motion

## Marine Mammals, Sea Turtles & Ocean Birds

With an ever-increasing human population and dwindling natural resources, the well-being of some marine animal populations is being overlooked. Constant coastal development, rising levels of pollution and irresponsible fishing methods are threatening many wild populations (and marine mammals, sea turtles and ocean birds are at the top of the list).

This module is designed to give students an overview of these threatened animals, their importance in maintaining healthy oceans and current conservation issues that pertain to them. Students will leave this series with a deepened appreciation for these animals and a heightened sense of responsibility in elevating their current status.

### Week 1: Seals, Sea Lions...And Don't Forget the Walrus!

Introduction: Our connection to the world's oceans

Class discussion: List as many marine mammals as possible

What are some characteristics that all mammals share?

How are marine mammals adapted to life in the sea?

The Marine Mammal Protection Act - one way of ensuring their survival

Seals vs. Sea Lions – How can you tell the difference?

Pinnipeds around the world (images and fun facts)

Activity: "The Blubber Experiment" (grades K - 6)

» How marine mammals survive in cold waters around the world!

Activity: "Stellar Sea Lion Population Analysis" (grades 7 - 12)

Handout: Wildlife Viewing Etiquette

Homework: *Our friends, the mammals... (species ID) - Part 1*



### Week 2: The World's Whales

Mysticeti vs. Odontoceti (compare/contrast baleen & toothed whales)

Songs, cries, whistles and clicks - Can you tell the difference?

Whales & Dolphins (images and fun facts)

Echolocation - "Seeing" without your eyes

Noise pollution & mass strandings

Commercial whaling and the decline of these majestic creatures (ITP)

Activity: "Echolocation in the Classroom" (grades K - 6)

Activity: "Finding Phoenix...Identifying N. Atlantic Right Whales" (grades 7 - 12)

Homework: *Our friends, the mammals... (species ID) - Part 2*





## The Ocean In Motion

### Marine Mammals, Sea Turtles & Ocean Birds

#### Week 3: The Other Marine Animals - Sea Cows, the Sea Otter, Polar Bear & Sea Turtles

The Florida Manatees: Manatees & Boats Don't Mix!

The Dugong and its long, lost relative, the Stellar's Sea Cow

Sea otters and their role in kelp forest ecosystems

Polar bears and climate change (Life in a Melting World)

The Ancient Sea Turtle (characteristics/adaptations)

» The survival of 7 species (poaching, tagging and conservation)

Activity: "Marine Debris...it's Everywhere!" (grades K - 6)

Tagging Experiment: "Becoming a Marine Biologist"(grades 7 - 12)

» the only way to learn about migratory, marine populations

*Homework: Seafood Watch (your daily choices can support healthy oceans)*

#### Week 4: Majestic Ocean Birds & Contemporary Fisheries

Quick review of weeks 1-3 (species ID & classifications)

Seabirds vs. Everybody Else (adaptations for life in/around water)

Calling the Estuary "Home" - California's shorebirds

Gulls, Pelicans & Cormorants (images and fun facts)

Penguins: Our cold (and warm) weathered friends...

Commercial Fishing

» The increasing popularity of seafood across the globe

» Concerns with regards to overfishing, bycatch & habitat destruction

Maintaining healthy oceans (how legislation is trying to help)

Eco-friendly fishing...

Activity: "Button-making Bonanza" (grades K - 6)

» show others how you support your marine environment

Activity: Marine Animal Jeopardy...Reinforcing learning objectives (grades 7 - 12)

*Homework: Conservation pledge - You too can help protect valuable marine life!*



#### Week 5: Service Learning Opportunity (see page 12 for details)

1) Storm Drain Stenciling

2) Canyon Watch

3) White Seabass Restoration

#### Recommended Field Trips (optional - dependent upon funding and transportation)

Choose one of the following options (see page 13 for details)

1) SeaWorld (Shamu Close-up, Rocky Point Reserve - Sea otters/Dolphins, Sea Turtles, Pacific Point - Seals/Sea lions, Manatee Rescue, Penguin Encounter, Wild Arctic - Polar Bear/Beluga/Walrus)

2) Children's Pool & Snorkeling with SDOF

3) Birch Aquarium @ Scripps

4) Hornblower's Whale Watching Adventure (December—April)



# The Ocean In Motion

## Service Learning Opportunities

Service-Learning is a teaching strategy that integrates meaningful community service with instruction and reflection. Service Learning projects enrich the learning experience, teach civic responsibility and strengthen communities. SDOF has many wonderful opportunities for students (and teachers) to learn about current marine conservation efforts in Southern California. By opting for one of the projects below, your student will discover real ways they can protect our environment and make a personal contribution to a better tomorrow.

Storm Drain Stenciling: Storm drains were designed to be the fastest and most efficient way of getting rainwater off of our streets. Unfortunately, the water that flows into these drainage systems carries trash, sediment, fertilizers, household cleaners, gasoline and motor oil with it, inevitably contaminating our oceans. Students who participate in our storm drain stenciling project will learn about the largest contributor to marine pollution worldwide (urban runoff)...and what they can do to safeguard our oceans! By stenciling the area around your school, students will be doing their part in raising awareness about our connection to the ocean and preventing the spread of pollution into our waterways. Oh...and they'll love walking by their artwork every day on their way to class!



Canyon Watch: San Diego, a city that borders the oldest, largest and deepest ocean in the world, has over 40 canyons that hold roughly 300 miles of public sewer lines. Most of these pipelines have unfortunately exceeded their life expectancy and are often inadequately maintained, making them susceptible to damage that can cause harmful spillover into our local waterways. To help keep our waters contaminant free and safe for all, students will learn how to hike and monitor one of our urban canyons. They will be responsible for locating manholes/sewer lines and checking for unusual smells or leaks. Students will undoubtedly realize the importance of volunteer work and learn to value their role in maintaining environmental health.

White Seabass Restoration: Once an important game fish and commercial food fish, white seabass have virtually disappeared from California's coast. This project offers students a wonderful opportunity to help replenish a local, marine fish population and be outdoors on the bay! Classes will be introduced to mariculture as a method of conservation. Students will learn how to care for our fish, be able to participate in a feeding and see what kind of data we need to track in order to maintain fish health. When else will they be able to interact with thousands of fish at one time?



**\* Participating schools/groups are responsible for any transportation associated with service learning opportunities.**



# The Ocean In Motion

## Field Trips

Upon completion of our four-part series, schools will be given the option of a topic-related field trip to put the students' newfound knowledge to the test. The objective of The Ocean In Motion Program is for students to leave with a better understanding of our vital marine ecosystems, a greater appreciation for all of the oceans' inhabitants and the enthusiasm and motivation to do their part to help conserve our natural environment. Ending the program with a field trip allows us to reinforce these lessons in a fun and exciting way. **These unique opportunities cannot be duplicated in a classroom setting!**



The Birch Aquarium: Through creative exhibits, programs and activities, the Birch Aquarium strives to increase the public's understanding of marine environments, their residents and the conservation efforts necessary for their survival. In addition their "Hall of Fishes", the aquarium offers an outdoor tidepool area and plenty of conservation-oriented exhibits for students to apply the information they've recently attained.

Cabrillo National Monument: Students jump right into diverse tidepool life with a trip to the rocky shores of Point Loma. Known as one of the prime tidepool viewing locations in Southern California, Cabrillo National Monument offers up a wide variety of marine algae, invertebrates and fish to view in their natural environment!

Hornblower Harbor Cruise & Sea Lion Adventure: Cruisers get a classic sightseeing tour with a green twist. Along with landmarks, natural wonders and military history, this outing also spotlights local environmental efforts through narration, video clips and on-board displays.

Hornblower Whale & Dolphin Watching Adventure: Cruisers get a chance to view the sea lions, dolphins, sea birds, harbor seals and even whales we discussed in class...in their natural environment!

SDOF Snorkeling & Science: Students take their first steps into the ocean with confidence! Our snorkeling site provides everything from kelp and seagrass beds to rocky shores and sandy bottoms. This area is teeming with life and a great place for further exploration.

Proper use of gear, snorkeling techniques, water-front hazards and safety precautions are emphasized. All necessary gear will be provided. (A trip to Children's Pool and snorkeling at La Jolla Cove will take place for the "Marine Mammals, Sea Turtles and Ocean Birds" unit - in order to observe local harbor seals in their natural state).

SeaWorld San Diego: OIM students who take the exciting trip to SeaWorld will be able to view a wide variety of animals in one location. On this trip, students will be able to see (first-hand) the wonderful animals we've been talking about for weeks. They will also get to expand upon some of the current conservation issues pertaining to them.

## Field Trip Volunteers

All SDOF volunteers must have passed a Live Scan criminal background check. They will have also been briefed about the day's events, necessary safety precautions and the educational material to be covered. Please contact [volunteer@sdoceans.org](mailto:volunteer@sdoceans.org) with any questions/concerns.

**\* Participating schools/groups are responsible for transportation and all fees associated with the field trip of their choice. Please inquire for prices regarding these low-cost opportunities.**



## Contact Information

# SAN DIEGO OCEANS FOUNDATION

www.sdoceans.org

The San Diego Oceans Foundation intends to raise awareness within San Diego communities concerning the health and vitality of our neighboring ocean systems, as they are affected by our everyday activities here on land.



If you believe that our programs are a worthy cause, you can support our endeavors by partnering with us, participating as a volunteer or our becoming a member today!



The San Diego Oceans Foundation is a volunteer, non-profit 501(c)(3) organization dedicated to promoting ocean stewardship and we'd love to welcome you aboard!

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Please feel free to contact us with any questions you may have about the information in this brochure. You can also visit our website at [www.sdoceans.org](http://www.sdoceans.org) to learn more about what we do!