

DRAFT

Sustainable Tourism for Marine Recreation Providers



Wolcott Henry photo



**The Coral Reef Alliance:
Coral Parks Program
Education Series**

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Introduction

In this era of the global economy, tourism has become a primary source of revenue for many regions of the world, generating nearly \$500 billion in worldwide revenues in 2001, and continuing to grow (WTO, 2001). The United Nations Environment Program (UNEP) facilitated a study that points out that the tourism industry now represents more than 10% of the world's gross domestic product (UNEP, 2002).

While tourism brings significant benefits for both local and global economies, its rapid growth and development in recent decades has caused widespread social and environmental change across the globe, particularly in popular coastal resort destinations. In contrast, the concept of sustainable tourism is now seen as a way to promote socio-economic development in a given region while simultaneously protecting local culture and the natural environment.

In order to address these issues and how they impact coral reefs, the Coral Reef Alliance (CORAL) has compiled this *Sustainable Tourism for Marine Recreation Providers* handbook. In an effort to promote sustainable tourism, the information contained in this handbook highlights some of the current environmental problems associated with tourism growth and development, and promotes practical solutions for marine recreation providers to adopt good environmental practices. We encourage readers to provide us with feedback as to how we can improve this publication. Comments, questions and general suggestions can be addressed to:

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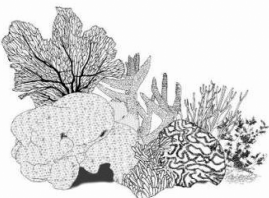


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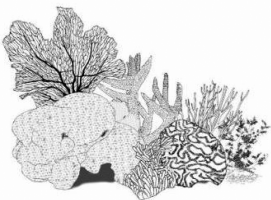
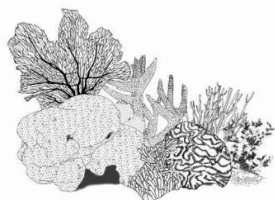
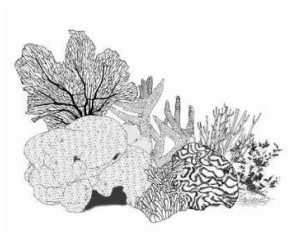


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Part I: Tourism and the Value of Coral Reefs



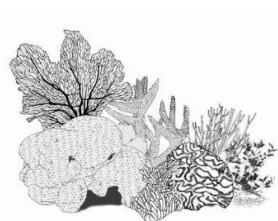
Tourism and the Value of Coral Reefs

Key facts about
tourism and reefs:

- Coral reefs are worth millions of dollars to numerous states and nations.
- Millions of divers visit reefs every year.

Every year millions of tourists travel to tropical resort destinations to experience the beauty and vibrancy of coral reef ecosystems. Snorkeling, scuba diving, recreational boating and a variety of other water sports activities make up a significant portion of the tourism market in several regions of the world. The economies of many island nations in particular are heavily dependent on this type of coastal tourism-generated revenue. As the following examples illustrate, the value of coral reefs for marine-related tourism is extremely high in areas that regularly receive high numbers of visitors:

- Coral reefs have been estimated to provide the world with US \$375 billion in goods and services (Status of Coral Reefs of the World, 2002).
- It is estimated that in Hawaii coral reefs generate US \$360 million annually in state revenues (NOAA, 2002).
- Tourism in the Caribbean generated approximately US \$34 billion in 2002 and is projected to increase to US \$74.1 in 2012 (WTTC, 2002).
- The World Resources Institute estimates that coral reefs in Southeast Asia are worth US \$700 to \$111,000 per square kilometer of reef for tourism. (Reefs at Risk in Southeast Asia, 2002).
- Worldwide there are more than 15 million certified recreational divers. Many of these divers regularly seek out coral reef ecosystems (World Atlas of Coral Reefs, 2001).
- It is projected that by 2005 the scuba diving industry alone will generate \$1.2 billion in worldwide revenues (The Ocean Conservancy, 2003).



Vibrant coral reef

Burt Jones and Maurine Shimlock photo

How Rapid Tourism Growth Affects Local Businesses and Communities

Socioeconomic
impacts of rapid
tourism growth:

- loss of traditional lifestyle.
- immigration.
- higher costs of living.
- limited local access to resources.
- resource conflicts.

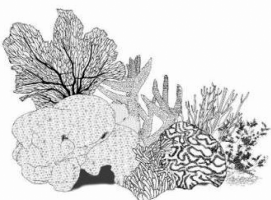
While growth and development can bring significant economic benefits and opportunities to a region, uncontrolled tourism can also have a problematic social and environmental impact on local communities. These include:

- **shifts to a service economy**, resulting in an abandonment or loss of traditional lifestyles, culture, and values.
- **an increase in immigration**, leading to greater competition for jobs and additional pressure on natural resources.
- **higher costs of housing and living**, which affect both local residents and visiting tourists.
- **economic development and activities** that limit local access to previously available natural areas and resources.
- **conflicts over resources**, particularly between local fishers and marine recreation providers.



Wolcott Henry photo

Construction of modern airstrips, such as this one in Roatan, Honduras, commonly opens up previously remote locations to rapid growth and development.



How Rapid Tourism Growth Affects Local Businesses and Communities (continued)

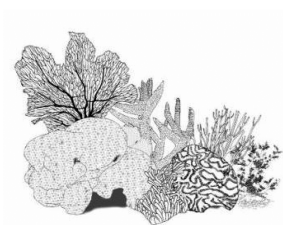
Combined effects of rapid tourism growth and irresponsible marine recreation:

- loss of tourism revenue.
- higher unemployment.
- fewer available food resources.
- less coastal protection.

Land-based pollution—especially sewage and solid waste—and intensive coastal development as a result of rapid economic growth cause the most significant impact to coral reefs in popular tourism destinations. Yet on a smaller but still significant scale—particularly in areas that are popular for marine-related tourism—irresponsible or uninformed marine recreation also undermines the health and attractiveness of nearshore coral reef ecosystems.

The combined effects of this growth and activity can have negative socio-economic and environmental impacts on both businesses and communities that depend on a healthy tourism industry. These include:

- **loss of tourism revenue:** revenues from marine-related tourism will fall as popular snorkeling, diving, and glass-bottom-viewing reefs decline as a result of poorly conducted marine tourism. Heavily damaged areas may see significant decreases in visitation from tourists.
- **higher unemployment:** reduced levels of tourism can lead to higher unemployment in industry-related jobs, such as those in hotels, restaurants, and boating.
- **fewer available food resources:** unmanaged marine recreation activities and the harvesting of species for souvenir and food consumption by tourists can directly deplete marine resources. This negative impact threatens the supply of locally caught seafood, and can be felt by the commercial and recreational fishing industries, as well as by fishers who depend on local resources as part of their food supply.
- **less coastal protection:** as reefs degrade and lose their physical structure, coastal areas will have increased exposure to damage from storms and waves.



Case Study: Creation of the Soufriere Marine Management Area

Soufriere is a small, rural town on the southwest coast of St. Lucia, in the Eastern Caribbean. The rapid growth of tourism in this area in recent years led to many changes and conflicts within the local population. Intensive shoreline development to support tourism created serious environmental problems, including: increased pollution and sedimentation in nearshore reef ecosystems, discharge of sewage, depletion of coastal fisheries, degradation of beaches, and poor resource management. All of these problems sparked conflicts between different user groups over management of these areas. In particular, local fishers and the dive industry challenged each other over who was damaging reefs. This conflict eventually led to the establishment of the Soufriere Marine Management Area (SOMMA; now known as the Soufriere Marine Management Association). Stakeholders worked together on conflict resolution and established the SMMA in 1994. The region has since been divided up into five management zones that attempt to address the interests of all stakeholders. These include: Marine Reserves, Fishing Priority Areas, Recreational Areas, Multiple Use Areas, and Mooring Areas. One already documented upshot of the establishment of a marine reserve within the boundaries of the management plan has been improved fish stocks in the areas surrounding the reserve.



Photos courtesy of Kai Wulf, SMMA

The creation of the Soufriere Marine Management Area has brought divergent user groups together in a common effort to protect the waters around the small town of Soufriere, St. Lucia. In the photo left, fishermen and tourists gather at a local beach.

Sustainable Tourism and Marine Recreation

This handbook will promote sustainable tourism by:

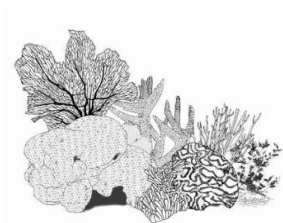
- highlighting the economic value of coral reefs.
- exploring relevant environmental threats.
- developing practical responses.
- providing examples of sustainable tourism.

This handbook, developed by the Coral Reef Alliance (CORAL), is designed to assist marine recreation providers and water sports enthusiasts in supporting behavioral and operational changes, and adopting good environmental practices that actively promote sustainable tourism. In part two the handbook will define the concept of sustainable tourism by:

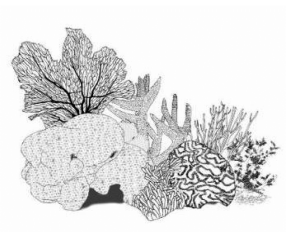
- providing an overview of sustainable tourism and related concepts.
- explaining the problems of rapid growth and development associated with unsustainable tourism and how they impact the natural environment.

As a well established and growing sector of the wider tourism industry, marine recreation is in a unique position to establish and promote sustainable practices. Part three of the handbook will develop practical solutions for marine recreation providers by:

- exploring relevant environmental issues and threats from different sectors of the marine recreation industry.
- developing practical responses that will promote good environmental practices and voluntary codes of conduct across a wide spectrum of marine recreation activities.
- providing examples of how sustainable practices can be leveraged to support and enhance marine protected areas.



Part II: Sustainable Tourism: Key Concepts



Sustainable Tourism: Key Concepts

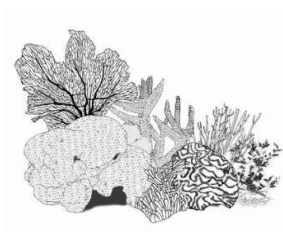
Key concepts:

- Sustainable Tourism.
- Unsustainable Tourism.
- Greenwashing.

Sustainable tourism often means different things to different people. In the context of this handbook, tourism—and its associated growth in development and activities—is considered sustainable when it simultaneously promotes economic development and protects the natural and cultural heritage of a region.

It is important, however, for tourists and bulk purchasers of marine recreation activities to be wary of a false sense of sustainable practices that is often promoted throughout the industry. For example, many resorts and marine recreation providers will offer trips and label them as sustainable tourism or “ecotourism” simply because they take place in an outdoor setting or superficially promote the protection of nature. Key concepts for understanding this issue include:

- **Sustainable tourism:** Tourism that provides economic benefits to local communities, respects cultural values, and minimizes environmental degradation for the long-term benefit of present and future generations.
- **Unsustainable tourism:** Tourism that provides limited economic benefits to communities, disrespects cultural values, and degrades and destroys the natural resources that support the economy of a region.
- **Greenwashing:** A false sense of companies’ or organizations’ promoting sustainable tourism or “ecotourism” when in reality little is being done to minimize operational impact to the natural environment.



The Problem of Unsustainable Tourism

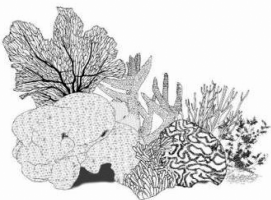
Poorly planned tourism growth negatively affects the environment through:

- tourism infrastructure and development.
- hotel, lodging, and restaurant operations.
- marine recreation.

When not planned properly, the rapid growth of tourism can create serious environmental problems for coastal communities. In many places, the explosion of visitors and development associated with tourism has led to the decline of natural ecosystems such as mangroves, wetlands, beaches, and coral reefs. The problem of unsustainable tourism in coastal areas is generally linked to the following:

- **tourism infrastructure and development.**
- **hotel, lodging and restaurant operations.**
- **marine recreation.**

In many locations the rapid growth and resulting negative impact of tourism have motivated communities to become more involved in the decision-making process of community development.



Examples of Sustainable Versus Unsustainable Tourism

| Tourism Activity | Sustainable Practice | Unsustainable Practice |
|-------------------------|--|--|
| Coastal development | Building away from the beach and coast, and properly disposing of waste. | Building on the beach—causing erosion and increasing sediments in the water column—and dumping waste in the water. |
| Hotels and lodging | Using phosphate-free detergents and treating sewage. | Dumping laundry waste and untreated sewage in near shore and coral reef environments. |
| Boating | Using moorings to avoid anchor damage, and properly disposing of oily waste. | Anchoring on the reef and dumping oily waste in water. |
| Restaurants | Selling abundant, non-threatened fish. | Selling rare, threatened, or endangered local fish. |
| Snorkeling and diving | Not touching the coral reef and related organisms. | Touching, feeding, and harrassing the coral reef and related organisms. |

Case Study: The Development of Cancun, Mexico

In the early 1970's the small town of Cancun, in the northeastern coastal area of the Mexican state of Quintana Roo, was rapidly developed and became a premiere Caribbean tourist destination. Just twenty-five years later the area is home to some 300,000 residents and supports more than two million visitors each year. However, this rapid growth in tourism development and infrastructure had a severe environmental impact, including mangrove loss, increased sedimentation and sewage effluent in coastal marine ecosystems, and pressure on coral reefs from consumer demands and marine recreation. In recent years environmental organizations and government agencies have sought to improve coastal development regulations and mitigate impact from future development that is likely to come in the Costa Maya region south of Cancun. In 1998 voluntary guidelines were published supporting low-impact tourism and environmentally conscious development practices throughout the state of Quintana Roo. Supporters of these guidelines are continuing to build relationships with government agencies and private developers to promote the Quintana Roo area as a leading example of sustainable development and tourism.



Coastal development in Cancun, Mexico

Wolcott Henry photo

Tourism Infrastructure Development

Tourism infrastructure development can affect coral reefs by causing:

- physical damage.
- sedimentation.

As larger numbers of tourists travel to a region, a common result is the rapid development of infrastructure to support these foreign visitors. In many respects, this brings clear benefits to a local community in the form of jobs and increased economic activity. However, if construction of supporting infrastructure in coastal regions is done in a poorly planned manner, there can be serious negative environmental consequences.

How does this affect coral reef ecosystems?

Coastal development projects—such as airport runways, resort hotels, restaurants, piers, and marinas—can kill coral directly by causing severe **physical damage** to the reef structure. Additionally, the long-term effects of increased levels of **sedimentation** generated by this type of coastal development negatively affect the health of coral reef ecosystems.

Specific consequences for coral reefs from tourism infrastructure development include:

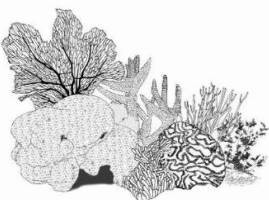
Physical damage to reefs:

- Blasting and dredging for projects destroy the foundation and structure of coral reefs, causing a reduction in biological diversity.
- Destruction of reef structure prohibits recruitment and settling of new corals and therefore inhibits recovery in areas that have been severely damaged.

Sedimentation:

- Coastal construction increases sedimentation. Many studies have shown that sediment suspended for extended lengths of time in a reef environment causes significant decline and death of living corals.
- The reduction of coral cover due to sedimentation contributes to overall ecosystem decline and a loss of diversity and stability.

Because corals and the symbiotic algae in their tissues need sunlight to produce food, sedimentation in the water column, which blocks out sunlight, kills corals.

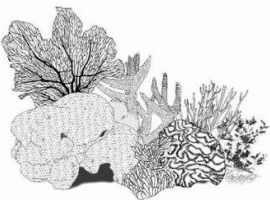


Hotel, Lodging, and Restaurant Operations

Hotel, lodging, and restaurant operations have direct impact on coral reefs through:

- pollution.
- over-consumption.

Hotels in coastal areas are able to significantly reduce their impact on the marine environment by implementing energy conservation and recycling programs.



In many ways, the environmental impact of coastal development is directly related to the consumption habits of tourists. In response to consumer demand, developers commonly build hotels, restaurants, golf courses, and other tourist accommodations directly on coastal waterfront property.

How does this affect coral reef ecosystems?

The operation of tourist facilities such as hotels and lodges creates solid and liquid waste from landscaping and golf courses, human waste, and laundry and other guest services. Additionally, restaurants that serve locally threatened or endangered fish contribute to the decline of local fisheries. This type of development generates increased levels of **pollution** and **over-consumption** of marine resources in nearshore environments.

Impacts on coral reefs from hotel, lodging, and restaurant operations include:

Pollution:

- Sewage, nutrient, or chemical run-off stimulates algae blooms that smother and inhibit coral growth and reduce species diversity on the reef.
- Pathogens, bacteria, and viruses associated with microorganisms contained in human waste can cause disease in several species of corals.
- The build-up in an ecosystem of chemical pollutants, such as herbicides and pesticides, can contribute to disease and poor health in fish and other species and make them unfit for human consumption.

Over-consumption:

- Excessive consumption of food resources—particularly threatened and endangered fish species that are served as seafood cuisine in restaurants—can lead to the collapse of local fisheries, as well as to the decline of diversity and stability in nearshore reef ecosystems.
- The sale of corals, shells, and other reef-dwelling species as ornamentals at hotel gift shops and local markets reduces diversity and stability in nearshore reefs. Many popular “curio” items are key components of reef ecosystems, and their removal leads to negative cascading effects in the environment.

Coastal tourism, particularly in tropical regions, has given rise to a booming

Marine Recreation

Marine recreation can directly affect coral reefs through:

- physical damage.
- harassment of marine life.
- pollution.

By operating with inefficient two-stroke engines, personal watercraft such as jet skis and wave runners dump nearly 30% of their fuel unburned into the marine environment.

marine recreation industry throughout the world. Snorkeling, diving, recreational fishing, and a variety of other water sports activities now represent a significant part of the economy in many regions that support coral reefs.

How does this affect coral reef ecosystems?

Poorly conducted boat operations, as well as irresponsible snorkeling and diving, can cause **physical damage** to reefs from improper anchoring, propeller wash and sedimentation, **harassment of marine life**, and unnecessary **pollution** of the environment.

Physical Damage:

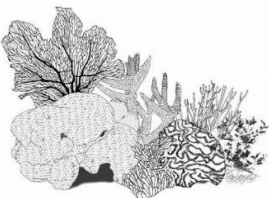
- Anchors and chains crush living corals and break up reef structure.
- Snorkelers and divers damage coral and other organisms in a reef by touching with hands, fins, or dangling equipment.
- Operating boats in shallow reef environments causes sedimentation, decreasing available sunlight for living corals.

Harassment of Marine Life:

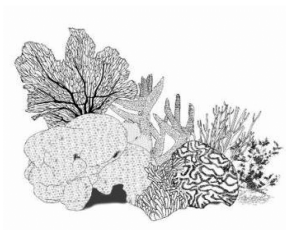
- Handling and feeding marine wildlife cause undue stress and behavioral changes to animals and can lead to abandonment of primary feeding and reproductive grounds.
- Chasing marine wildlife with boats—particularly turtles and marine mammals, such as whale and dolphins—causes stress and can separate cow/calf pairs.

Pollution:

- Fuels, oils, and other toxins released from inadequately maintained vessels can stress and kill corals and other organisms in the marine environment.
- Distribution of toxins in the food chain can impact fish populations and negatively affect available resources for consumers, including humans.
- Release of raw sewage from vessels can scar and cause disease in several species of corals.



**Part III: Establishing Good Environmental Practices and
Voluntary Codes of Conduct**



Establishing Good Environmental Practices and Voluntary Codes of Conduct

Key concepts for
marine recreation
providers:

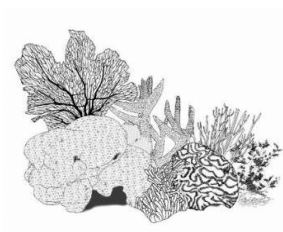
- establishing good environmental practices.
- voluntary codes of conduct.

The rapid growth of marine recreation in tropical areas around the world has contributed to the decline of coral reef ecosystems in many locations. Through simple behavioral and operational changes in business practices, however, marine recreation providers can simultaneously work to promote industry and protect the underwater environment.

This section of the training handbook will highlight the concept of good environmental practices and the establishment of voluntary codes of conduct for marine recreation providers. For each topic covered, the potential environmental problems will be addressed, followed by a list of recommended solutions.

The topics will include:

- **Anchoring**
- **Boat Operations and Maintenance**
- **Sewage and Garbage Disposal**
- **Snorkeler and Diver Impact**
- **Marine Wildlife Viewing**
- **Suncare Products**
- **Seafood Consumption**
- **Collection and Sale of Marine Ornamentals**
- **Recreational Fishing**



Anchoring

Anchoring damages corals in a number of ways:

- crushing and breaking corals.
- chafing coral tissue.
- breaking up reef structure.
- stirring up sediment.

Given the slow rate of growth for most coral species, it can take years for a reef to recover from damage caused by one improperly set anchor!

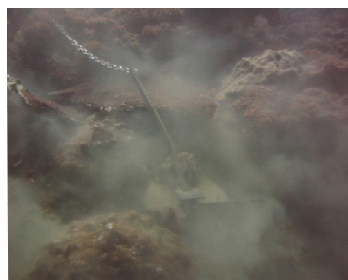
Every year the use of anchors for mooring commercial and recreational boats causes millions of dollars in damage to coral reefs around the world. Ironically, the effects of anchoring are slowly destroying the economic value that is inherent in healthy, undamaged reefs. Therefore, protecting against anchor damage not only preserves the biodiversity of an ecosystem, but also sustains the economic base of the marine recreation industry.

Anchors cause damage to reefs in a number of ways:

- Anchors, and the long chains associated with them, damage coral reefs by **crushing and killing corals** and other organisms on which they fall.
- Anchor chains **strip the live tissues off corals**, causing widespread scarring and leaving the injured corals open to infection and disease.
- Repeated anchor drops or large anchors will **break up the reef structure** and can prevent new corals from developing.
- Anchoring causes other harmful effects, such as **clouding the water with disturbed sediment**, which chokes corals and reduces the amount of sunlight that symbiotic algae require for photosynthesis.

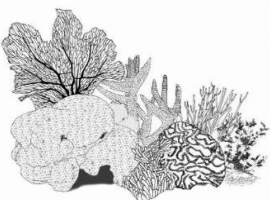


Mark Micklefield photo



John W. McManus photo

Even anchors from small boats can cause extensive damage to coral reefs!



Anchoring (continued)

Simple ways that boaters can reduce damage to coral reefs:

- Use mooring buoys.
- Change boating practices.

Minimizing anchor damage is crucial to protecting nearshore marine and coral reef ecosystems and the livelihoods that depend on them. Fortunately, anchor damage can be easily prevented through the installation of mooring buoys, simple changes in boating habits, and education.

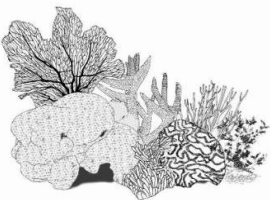
Use Mooring Buoys: Mooring systems provide permanent lines that allow boaters to fix their position without dropping anchor. An effective mooring program includes:

- the installation of moorings that are suitable for coral reef areas.
- use of moorings by all recreational and commercial boats.
- regular maintenance and correct use of moorings.
- outreach to and education of the boating community and the general public with respect to proper use and maintenance of moorings.

Change Boating Practices: By simply making small adjustments to their practices, boat operators can help protect and conserve coral reefs. Here are some examples:

- Correctly use mooring buoys whenever possible. Proper scope is a key element to reducing the load that boats place on moorings. Additionally, boaters should allow themselves room to maneuver by passing a mooring line at least half the length or more of the boat through the eye or "hook-up" point on the buoy, and then securing both ends to a cleat on the deck.
- When anchoring is absolutely necessary, boaters should make sure they are in designated areas away from important marine ecosystems and from where they will not be dragged near these areas and cause damage.
- If no moorings are present, dive boat operators may consider drift dives instead, or boat crews can manually swim anchors down and place them in locations where they will not damage or destroy reefs.
- Always avoid anchoring near coral reefs in heavy weather conditions such as high winds or swells, unless it is necessary for the safety of the crew, passengers, and vessel.

Remember that the attached anchor chain and line can cause as much damage to the reefs as the anchor itself does!



Anchoring (continued)

Simple ways that boaters can reduce damage to coral reefs:

- Educate boat users:
 - Explain mooring buoys and the threats of anchoring.
 - Provide information on anchoring practices.

Educate Customers and Tourists Who Rent Boats. Many tourists who rent boats, sailboats, kayaks, or canoes have little understanding of how harmful anchors can be to nearshore marine environments and reefs. Rental operators can help protect coral reefs by educating their customers. Here are some ideas of what rental operators should do for their customers:

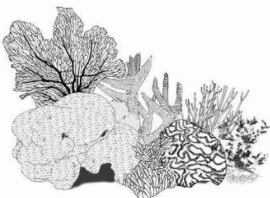
- Explain what mooring buoys are and encourage renters to use them whenever possible.
- Explain the proper way to anchor before guests set out.
- Provide waterproof information on proper anchoring practices on all rental vessels.
- Explain the potential negative impacts of poor anchor use.

See **CORAL's *Mooring Buoy Installation and Maintenance* handbook.**



Florida Keys National Marine Sanctuary photo

Many communities have realized that proper use and maintenance of moorings in popular areas plays a key role in protecting coral reefs from anchor damage.



Case Study: Day-Use Moorings in the Hawaiian Islands

The Day-Use Mooring Program in the Hawaiian Islands was initiated in the late 1980s in response to increasing anchor damage to coral reefs from commercial and recreational boaters across the state. Both Halas eyebolt pins and Manta Ray systems have significantly reduced anchor damage at several popular snorkel and dive sites.

Mooring projects are planned and completed largely by volunteers working in partnership with the Hawaii Department of Land and Natural Resources, the Malama Kai Foundation, environmental organizations, and members of the local dive industry. Partnerships, coalition-building, appropriate use of the media, outreach to the public, and development of consensus decisions have all proven valuable at integrating and involving many players.

Ultimately, the program still depends on the interest and energy of volunteers to make projects happen. In 2002, however, funding was secured from a grant through U.S. Fish and Wildlife Foundation, and a half-time Day-Use Mooring Program Coordinator was hired for the state.



FKNMS photo

Anchor chains often cause more damage to corals than anchors do!

Boat Operations

Boat operations can damage coral reefs through:

- Vessel groundings.
- Anchor damage.
- Pollution and increases in sedimentation.

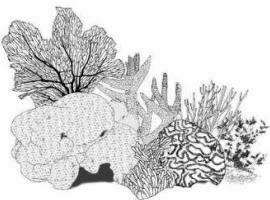
Many communities offer classes in basic boating, which teach skills that help prevent recreational boating accidents.

Recreational and commercial boating are immensely popular and are important economic activities that involve millions of people across the globe. In tropical areas, boaters often have relatively easy access to coastal or nearshore coral reef ecosystems, which serve as a source of food, resources, recreation, and tourism. As a result, it has become increasingly important for boaters of all backgrounds to engage in operations in an environmentally responsible manner.

While recreational boating experiences often lead to a conservation ethic among marine enthusiasts, there can be negative environmental impact associated with poorly conducted or irresponsible boat operations and accidents. Vessel groundings and anchor damage have the most immediate and destructive impact on coral reefs. However, an increase in pollution, sewage, solid waste, and sedimentation from shallow water operations can also negatively affect coral reefs and other nearshore marine ecosystems.

Poorly conducted boat operations can cause damage to coral reefs in a number of ways:

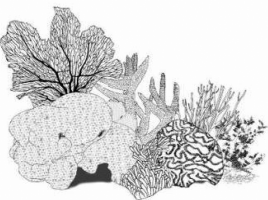
- When a boat collides with a reef, it **crushes and kills large areas of corals** and other reef-dwelling organisms. Additionally, a boat that sinks as a result of a collision can **introduce significant amounts of toxic fuel and oil into the marine environment**.
- Large commercial ships are known to cause **massive damage when running aground on reefs**. However, smaller private or commercial boats can also severely affect a reef ecosystem.
- Careless operation of small boats in shallow water can generate propeller wash; wave creation; and excess sedimentation, which can **smother reef-dwelling organisms** and inhibit the photosynthetic process of symbiotic algae that live within coral tissues.
- Operation of older boats and jet skis that have two-stroke engines—which are very inefficient on fuel consumption—contributes to **serious levels of pollution** in the environment.



Principles of boat operations that minimize negative environmental impact:

- Know the “rules of the road.”
- Keep boats in prime operating condition.

Simple behavioral and operational changes on the part of boat crews can significantly reduce damage to coral reefs.



Boat Operations (continued)

There are many established boating principles that conscientious operators can follow in order to avoid accidents and unintentional damage to coral reefs.

Follow Established Navigation Principles and Mooring Techniques.

- Stay within designated channel markers, and when in reef areas, stay beyond the furthest visible reef patch at unknown or unmarked sites.
- Obey all speed signs to avoid marine mammal strikes (propeller hits).
- Identify dark water areas as possible important underwater ecosystems, for example, shallow reefs.
- Know how to properly read and interpret a navigational chart.
- In coral reef areas, use mooring buoys where available. If anchoring, always drop anchors in sand or rubble channels well away from living reefs, and allow sufficient bowline scope to avoid dragging along the bottom.

Keep Boats in Prime Condition for Operations and Emergencies.

- Have boat engines regularly serviced by a certified mechanic to optimize performance and fuel efficiency. When possible, replace older two-stroke engines with more fuel-efficient, cleaner-burning four-stroke outboards. If you use a two-stroke outboard engine, opt for alkylate petrol. For larger vessels with in-board propulsion systems, consider converting to biodiesel.
- Carry a supply of basic tools that will assist engine repairs out at sea.
- Always carry both a primary and a secondary anchor line so vessels can be securely moored in emergency situations.
- Keep absorbent pads onboard to deal with hazardous chemical spills.
- Non-toxic oils are available and should be used whenever possible. Wait until you get to the marina to dispose of your waste oil, and recycle it if possible.
- Refuel only at a dock or in the marina. If you fill up at sea, you could spill fuel into the water. Have absorbent pads available when fueling in order to deal with any spills that occur.

Boat Operations (continued)

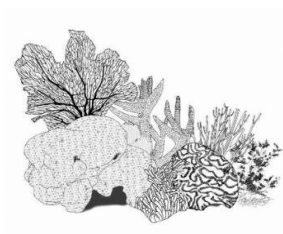
Principles of boat operations that minimize negative environmental impact:

- Educate customers and tourists who rent boats.

Educate Customers and Tourists Who Rent Boats.

- Instruct renters in basic navigation, boat handling, and safety principles.
- Explain the sensitive nature of coral reefs and the importance of avoiding shallow reef areas with motorized vessels (see Appendix — Environmental Briefings).
- Provide easy-to-use waterproof navigation and reef location charts.
- Explain the threat that anchors pose to nearshore ecosystems and reefs and the proper way to moor a boat without causing damage to the underwater environment.
- Provide on-board information about the location and proper use of reef mooring buoys at popular snorkel and dive locations.

For more extensive information on good environmental practices for boaters and marinas, check out, *Good Mate: Recreational Boating and Marina Manual*, published by the Ocean Conservancy.



Case Study: Development of the SmartVoyager Environmental Certification Program in the Galapagos Islands, Ecuador

Launched in May 2000, the SmartVoyager voluntary environmental quality standards certification program works to reduce negative environmental impacts on marine and terrestrial ecosystems connected to the unique Galapagos Islands. A broad set of stakeholders from the community—including government agencies, boat operators, tour associations, conservationists, and local citizens—participated in the development of the program.

Coordinators of this program developed a strategy that focused on tourists and the 60 tour boats that regularly shuttle them from island to island. They established voluntary standards which set specific and detailed conservation practices in place and further required vessels to educate their customers regarding the delicate and vulnerable nature of the islands' ecosystems.

Some examples of changes in boating operations include:

- replacement of on-board air conditioners and refrigerators that use chlorofluorocarbons (CFCs).
- replacement of old two-stroke outboards with cleaner-burning four-stroke models.
- installation of noise abatement systems on propulsion and generator engines.

Tour operators who met these standards were officially certified by the program. Stakeholders in this project included relevant government agencies, conservationists, tour operators, and members of the local community. While the initial focus targeted larger vessels, program coordinators soon realized that it was equally important to conduct outreach and provide resources that would integrate smaller-scale operations into the program, as well. To date, there has been widespread acceptance within industry that the SmartVoyager standards provide appropriate environmental guidelines and increase social responsibility in the Galapagos Islands.

Boat Maintenance

Repercussions from inadequate boat maintenance can include:

- leaks of toxic fuels and oils.
- heavy metals in the environment from anti-fouling bottom paint.
- discharge of raw or untreated sewage.
- toxic substances contaminating bottom sediments.

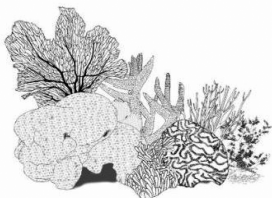
Chronic toxic waste leaks are a common source of pollution from small boat harbors and marinas.

While boaters can minimize their impact on the marine environment by conducting responsible operations, regular and proper maintenance is another key part of boating that can significantly reduce unintentional and unnecessary damage to nearshore coral reefs. A significant source of water pollution near harbors, marinas, and popular dive and snorkel sites commonly comes from fuel, oils, solvents, and cleaners used by recreational and commercial boaters.

One small fuel or sewage leak from a recreational or commercial vessel might not cause long-term damage to the marine environment. Over time, however, the combined effects of pollution from multiple boats in marinas or popular areas can lead to significant degradation of coral reefs and other marine habitats. These results have negative consequences for both the ecological health and economic value of an entire coastal community.

Inadequate boat maintenance can lead to damaging effects on coral reefs in the following ways:

- Environmental problems associated with boat maintenance are generated by **leaks of toxic substances**, such as oil or fuel, and the release of heavy metals from anti-fouling bottom paints.
- The cumulative effects of poor maintenance on boats **can be as negative and severe as other boating-related impacts** to coral reefs, such as anchor damage, groundings, and waste disposal.
- Accidental **discharge of raw or untreated sewage** can result from improper maintenance of vessel sewage-containment systems.
- Toxic substances, such as fuel, oil, and other chemicals, often **sink and contaminate bottom sediments**. Fish and other animals that feed on bottom-dwelling organisms can spread this contamination throughout the food chain and ecosystem.



Boat Maintenance (continued)

Boaters can reduce environmental impacts through:

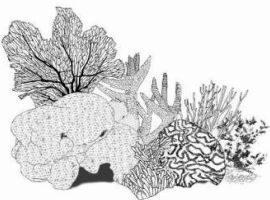
- performing regular boat maintenance.
- using absorbent bilge sponges.
- avoiding CFC refrigerants and fire extinguishers.
- avoiding pumping oily bilge water into the sea and minimizing use of toxic chemicals.

Regular, quality maintenance of small recreational or commercial boat is “win-win” for both the owner and the coral reef.

There are many practical solutions that can prevent or remedy problems associated with intentional or accidental dumping of toxic substances into sensitive marine habitats as a result of inadequate boat maintenance.

Maintenance for All Operations

- **Perform regular maintenance on engines, fuel tanks, and their associated components.** Have a mechanic perform regular servicing on an engine to maximize operating capacity and minimize fuel consumption. Use clean-burning four-stroke engines whenever possible, or convert engines on larger vessels to operate on biodiesel.
- **Regularly inspect areas that are susceptible to potential leaks of toxic substances.** This can include regularly checking fuel lines and tanks, filters, separators, vents, and bilge pumps.
- **Keep toxic absorbent sponges in bilges.** This can significantly reduce discharge of oils and fuels. You can easily find many types of sponges that absorb fuel and oil but not water. Additionally, absorbent pads or pillows should be kept on hand to clean any potential spills that might occur while a vessel is being fueled in a marina or harbor.
- **Avoid on-board refrigeration units and fire extinguishers that use chlorofluorocarbons (CFCs) or halons.** CFCs and halons have been shown to cause damage to the earth’s ozone layer. This natural layer in the atmosphere filters out harmful ultraviolet radiation (UV) from the sun. As light-sensitive animals, corals can be damaged by significant increases in UV exposure.
- **Avoid pumping oily bilge water into the sea,** particularly when you are near a coral reef. Unless the boat is in danger, wait until you can properly dispose of or recycle waste at a marine facility. Additionally, avoid using detergents or emulsifiers as bilge cleaners. These chemicals dissolve oils and fuel into water, thereby allowing both to be pumped overboard.
- **Avoid using toxic cleaners or other chemicals** while moored at coral reef sites. Cleaning can wait until vessels are back at the marina or a permanent, overnight mooring. Even then, boaters should minimize use of chemicals while seeking alternative biodegradable and non-toxic cleaners which are now available at many marine stores.



Boat Maintenance (continued)

In addition to maintenance for good operations, boaters can:

* In the marina:

- fuel carefully.
- avoid dispersing spills with liquid detergent.
- use non-toxic cleaners.

* In drydock:

- use catchment basins when removing bottom paints or when sanding.
- use non-toxic bottom paints.
- properly dispose of toxic paints and chemicals.

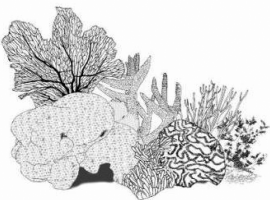
In addition to properly maintaining boats for regular operations on the water, it is important to engage in good practices while moored in a marina or engaged in vessel restoration or repairs during drydock.

In the marina:

- **Exercise care when fueling vessels on the water.** Have oil-absorbent pads ready for any potential leaks while fueling. Fill tanks only to 90% capacity in order to allow for expansion and to avoid spills due to overfilling.
- **Do not use dishwashing detergent to disperse small fuel or oil spills** in the water. This causes more harm than good, as it sends toxins below the surface and contaminates bottom sediments.
- **Use non-toxic and phosphate-free cleaners** on decks, bilges, and hulls. Many biodegradable cleaners are now commonly available at marine stores (see Appendix). Read labels and become familiar with “green” products.
- **When cleaning vessels, use the minimum amount of chemicals** necessary to do the job. Additionally, it is important to properly dispose of toxic materials, including rags, absorbent pads, paints, cleaners, and other items used during routine vessel maintenance.

In drydock:

- **Seek out facilities that have catchment basins** when pressure-washing and removing toxic bottom paints. If these facilities are not available, encourage your local marina to acquire them.
- **Use non-toxic, anti-fouling paints on boat hulls.** International laws are beginning to ban commonly used anti-fouling paints of the past. These paints are known to contain biocides and heavy metals that can cause cancer in both humans and marine animals. Less harmful anti-fouling paints are now available on the commercial market (see Appendix).
- **When sanding hulls or decks, use a vacuum sander** and place tarps or drop-cloths below the vessel in order to collect harmful bottom paint particles, fiberglass, varnish, or other toxic substances for proper disposal.
- **Properly dispose of all hazardous materials**, such as toxic paints and other chemicals, used during drydock, and reuse or recycle what you can.



Sewage and Garbage Disposal

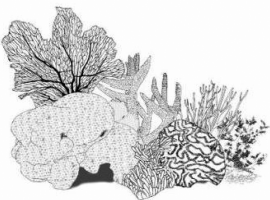
Improper sewage disposal:

- contributes to algae blooms.
- poses a health threat.

Improper garbage disposal:

- can be deadly to wildlife.
- can entangle and smother coral reefs.

Sewage effluent has been linked to black band disease in living corals in the Caribbean and a parasitic worm that destroys coral tissue throughout the Pacific.



A growing threat to both people and the environment comes from vessels discharging raw or partially treated sewage and dumping garbage in coastal waters. Human waste contains nutrients, pathogens, and viruses that can contribute to disease and detrimental algae blooms in coral reefs. It also poses a serious threat to human health. Garbage in the marine environment is unsightly and dangerous, and items such as plastics, styrofoam, and cigarette butts can prove fatal to many marine species.

Sewage and garbage disposal in the marine environment can damage coral reefs and wildlife in many ways:

- The build-up of sewage or other organic nutrients **contributes to massive algae blooms** in nearshore marine environments. This reduces available oxygen in the environment and smothers reef corals, thereby inhibiting growth and access to sunlight.
- Bacteria, viruses, and diseases associated with human waste can pose **serious risks for human health** and food resources in a local community. Additionally, bacteria associated with sewage can contaminate a variety of harvestable resources, such as fish and other species.
- Marine debris in the form of plastics, fishing line and nets, cigarette butts, and styrofoam is often consumed by or entangles turtles, seabirds, fish, and marine mammals and **causes the death of millions of animals** every year.
- When garbage becomes entangled on coral reefs, it **smothers and kills coral colonies** and can pose a **safety hazard** to snorkelers and divers.



Garbage in the marine environment, particularly discarded fishing gear, plastics, and styrofoam, can be deadly to wildlife. This green sea turtle in the Northwestern Hawaiian Islands was freed by NOAA divers, but suffered severe damage to both its front fins.

Jake Asher photo, NOAA

Sewage and Garbage Disposal (continued)

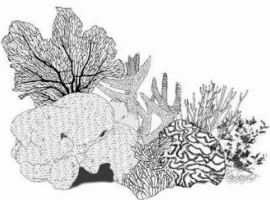
Steps to reduce sewage and garbage in the environment:

- pump-out facilities and land-based restrooms.
- sewage treatment and sanitation devices in prime working condition.
- “no-discharge zones.”
- keep garbage in contained places and minimize use of plastics and styrofoam.

In the marine environment plastic alone kills millions of marine animals every year!

There are simple steps that marine recreation providers and visitors can take to reduce the impact associated with sewage and garbage disposal from a boat.

- **Use pump-out facilities where available.** Disposal of sewage from small vessels on land is the best way to protect the marine environment, as this waste generally goes to some kind of treatment plant to minimize pathogens and levels of toxicity. If these facilities are not available, encourage your local marine to acquire them.
- **Use land-based restroom facilities prior to boat excursions.** Most land-based facilities are connected to some kind of municipal waste treatment facility. Using these facilities can significantly reduce discharge of untreated sewage at sea.
- **Keep vessel marine sanitation devices in good operating condition.** Regularly inspect and maintain all hoses, fittings, and mechanisms associated with waste storage in order to prevent accidental discharge of untreated sewage. Keep Y-valves closed while operating in coastal waters.
- **Treat sewage prior to release from vessel.** If pump-out facilities are not available, there are several non-toxic, biodegradable chemicals and mechanical methods that can be used to reduce solids and pathogens in waste prior to disposal in the environment (see Appendix). Small vessels should proceed as far offshore as possible prior to discharging treated sewage. Avoid discharging toilets or sewage holding tanks in confined or crowded places, environmentally sensitive areas, or marine protected areas.
- **Support the establishment of “No-Discharge Zones.”** The creation and enforcement of “No-Discharge Zones” help protect ecologically and economically important coastal areas in a community.
- **Keep garbage contained and minimize use of plastics/styrofoam.** Garbage bins on tour boats should be contained or kept inside to minimize the chance of debris blowing overboard. Additionally, vessels should use paper instead of plastic and styrofoam plates and cups and can provide information to tourists regarding the threat that improper garbage disposal poses to marine life.
- **Pick up damaged fishing nets or lines cut away from propellers.** Do not leave them in the sea, as they could injure or kill marine wildlife.



Snorkeler and Diver Impact

Snorkelers and divers degrade coral reefs by:

- touching and crushing organisms.
- stirring sediment.
- handling and harassing wildlife.
- providing artificial food to wildlife.

Snorkeler and diver-related impact is often simply the result of tourists being unaware and uneducated about the fragile nature of coral reefs.

Throughout the world, coral reefs are beginning to show signs of decline as a result of effects generated by the snorkeling and diving industry. These effects are relatively insignificant compared to larger environmental problems associated with coastal development, pollution, and over-fishing. Yet direct contact with corals, reef animals, and other wildlife by snorkelers and divers is leading to increased levels of degradation and disturbance in coral reefs.

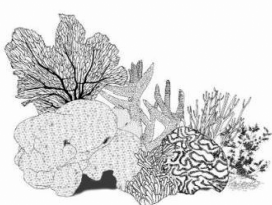
Irresponsible snorkeling and diving practices can cause physical damage to a coral reef:

- The consistent presence of small and large groups of people in a shallow coral reef habitat **can lead to significant degradation of an ecosystem over time.**
- Irresponsible or inexperienced snorkelers and divers regularly **crush and break corals and other reef-dwelling organisms** with fins, equipment, and body parts.
- Snorkeler and diver impact is **usually a result of individuals or groups** trying to gain control; get a closer look or photograph; stand or walk in a shallow area; fight a current; or handle, touch, and feed wildlife.
- The **cumulative effects of snorkeler and diver impact** can lead to a decline in living corals and other reef-dwelling organisms, increases in sedimentation, and disturbance to wildlife.
- Degradation of reefs from snorkelers and divers can **significantly reduce the beauty and aesthetic qualities** that attract visitors to a reef.



W. Harrigan photos, FKNMS

Snorkelers and divers can cause significant damage to coral reefs.

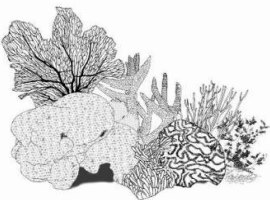


Snorkeler and Diver Impacts (continued)

Environmentally conscious snorkeling and diving includes:

- “no contact” policies.
- environmental briefings.
- discouraging fish-feeding or harassment of wildlife.
- support of mooring buoy projects.
- support of Marine Protected Areas.

Learning more about coral reef ecology generally makes snorkelers and divers more conscientious about impact to the marine environment.



If done in an environmentally conscious manner, snorkeling and diving can be an economically valuable and ecologically sustainable industry. Similarly, when conducted appropriately, these marine recreational activities are very important conservation mechanisms because of their high educational value. There are many simple ways that tour operators, marine recreation providers, and individual snorkelers and divers can reduce impact on coral reefs:

- **Establish a “no contact” policy.** Marine recreation providers and companies that rent and sell snorkel and dive gear can promote a voluntary “no contact” policy for recreational snorkelers and divers. Encouraging the use of flotation vests for inexperienced snorkelers and discouraging the use of gloves by divers can help support these policies.
- **Conduct environmental awareness briefings for tourists and other marine enthusiasts.** Studies have shown that damage to nearshore marine and reef environments can be minimized when tour operators educate tourists, photographers, videographers, and others about the sensitive nature of coral reef ecosystems and the potential consequences that can result from irresponsible snorkeling and diving.
- **Conduct buoyancy refreshers.** Dive operators in particular can conduct buoyancy refreshers and other basic dive skills training with inexperienced, out-of-practice, or non-regular divers.
- **Discourage the feeding of sharks and reef fish and the harassment of wildlife.** Wildlife disturbance caused by snorkelers and divers can be significantly reduced with a voluntary policy of “take only pictures, leave only memories”, which discourages fish-feeding and harassment of wildlife.
- **Support mooring buoy projects.** The establishment of permanent mooring buoys at popular snorkel and dive sites significantly reduces anchor damage to nearshore marine environments, particularly coral reefs, which are often associated with the marine recreation industry.
- **Support the establishment of Marine Protected Areas (MPAs).** Designation of MPAs often results in an increase of protective measures for an area. This can include reduction or elimination of anchoring, fishing, harvesting of corals and other species, and harassment of wildlife. These protections often enhance the economic and ecological value of an area and create market advantages for businesses operating in them.

Marine Wildlife Viewing

Irresponsible marine wildlife viewing can result in:

- disturbance of marine mammal cow/calf pairs.
- abandonment of primary feeding and reproductive grounds.
- injury or death.

In recent years wildlife viewing has grown into a significant sector of the marine recreation industry. Many stakeholders in the industry have realized that several species of animals previously considered “harvestable” now have much greater economic value for “wildlife viewing” by visiting tourists. Destruction of habitat, direct harvesting, pollution, and marine debris in the ocean remain the strongest threats to marine animals. In many cases, however, intrusive or irresponsible methods of marine wildlife viewing can potentially harm and even kill popular animals such as whales, dolphins, manatees and dugongs, and marine turtles, among others.

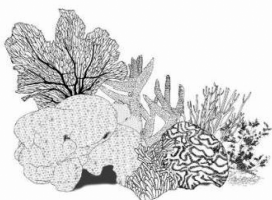
Irresponsible marine wildlife viewing can cause:

- **disturbance of cow/calf pairs.** Marine mammals such as whales and dolphins are commonly located in shallow, coastal tropical environments when nursing young. Intrusive viewing can create stress in mothers, separate cow/calf pairs, and decrease survival rates in new-born calves.
- **abandonment of primary feeding or reproductive grounds.** Excessive handling of or interaction with marine turtles can cause them to abandon primary feeding grounds in coastal environments. Marine mammals leave key breeding sites if stressed from human interaction.
- **injury or death.** Slow-moving marine animals, particularly whales, manatees, and marine turtles, can be injured and killed by propellers and fast-moving boats. Additionally, scarring caused by propellers can make marine animals more susceptible to infection and disease.



In recent years, whale-and dolphin-watching have become tremendously popular in many regions of the world, generating a significant source of revenue for coastal communities.

Lori Mazucca photos



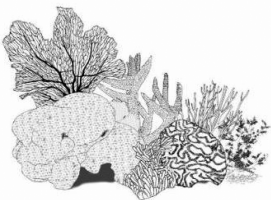
Marine Wildlife Viewing (continued)

In order to view marine life in a responsible way, operators should:

- Avoid chasing, feeding, and/or surrounding wild animals.
- Practice a policy of no contact.
- Observe the law.
- Be litter-conscious.

There are simple, yet important operating methods and practices by which boaters and other water sports enthusiasts can abide by in order to enjoy wildlife viewing without disturbing the animals involved. As a responsible boat operator or tourist, make sure to:

- **Avoid chasing marine animals.** Whether in the water or on a boat, water sports enthusiasts and tour operators should always operate at a slow speed and never chase marine animals. If whale-watching, it is best to approach animals very slowly from the side, versus head-on or from behind, and keep at a relative distance. Many environmental organizations and governments recommend staying at least one hundred yards from large whales. If animals approach the vessel, slow down or stop and put propellers in neutral. Always let the animals determine their own paths and behavior.
- **Practice a “no contact” policy.** As an individual water sports enthusiast or a small group, always avoid touching and handling marine animals such as turtles, whales and dolphins, and manatees.
- **Never feed wild animals.** Providing artificial food can alter an animal’s behavior and impair natural feeding abilities and survival mechanisms.
- **Avoid surrounding animals.** If several tour boats are engaged in whale-watching, for example, a concerted effort should be made to avoid surrounding the animals and causing unnecessary stress. This same concept applies to individuals or small groups that are in the water viewing wildlife.
- **Observe the law.** In recent years many places have passed laws banning or limiting the use of thrill craft or fast boat operations in sensitive marine habitat in order to protect slow-moving or endangered marine animals, such as manatees, turtles, and whales. Additionally, in many places it is illegal to touch or handle marine wildlife, particularly if the animals are threatened or endangered.
- **Be litter-conscious.** Marine debris is one of the greatest threats to wildlife in the oceans today. Be aware that debris as small as a cigarette butt can be very harmful to animals such as sea turtles. If engaged in boating or coastal activities, always dispose of trash properly so it does not end up in the marine environment.



Suncare Products

Suncare products are potentially a new threat to coral reefs:

- Petroleum-based products can be harmful to living corals.
- Suncare products may disrupt the natural hormone systems in animals.

Ironically, just as we are beginning to learn of the potential threat of sunscreens, scientists are now deriving compounds to make sunscreen from living corals.

Suncare products potentially pose a new and emerging threat to the health of coral reef ecosystems in tropical resort destinations. Many “sunscreens” are petroleum-based, and studies in recent years have shown that petroleum products can be detrimental to living corals and other organisms in a reef community. While scientists and others recognize the need to conduct more research into the direct impact of suncare products on coral reefs, excessive introduction of these chemicals into the environment is a growing concern of conservationists and many stakeholders within the marine recreation industry.

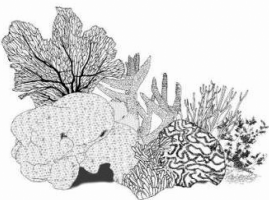
Excessive use of suncare products around coral reefs may have several negative effects on reef health:

- Several studies have shown that **petroleum products**, especially various types of oils, **can have severely damaging short-and long-term effects on living corals**. While sunscreens do not have the toxicity levels of heavy industrial oils, many are petroleum-based and could be potentially lethal to corals and other reef-dwelling organisms.
- The more **water-soluble a suncare product** is, the greater likelihood it will get into the water column and come into **direct contact with living organisms** in the reef community.
- Many suncare products are known to **contain chemicals that may actively disrupt natural hormone (endocrine) systems in animals**. Therefore, corals are potentially susceptible to damage from hormone disruption as a result of exposure to suncare products.



Leslie Richter photo

Coral reefs are a haven for biological diversity!



Suncare Products (continued)

Steps to reduce effects on coral reefs from suncare products:

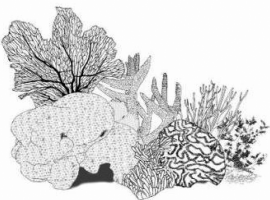
- Use UV-protective clothing as a substitute for sunscreen prior to entering the water.
- Educate tourists.
- Use organic suncare products.

More scientific studies need to be conducted to investigate the impact that petroleum-based suncare products have on coral reefs.

Marine recreation providers and tourists can take several simple steps to reduce the potential impact that suncare products have on coral reefs.

- **Use UV-protective clothing as an alternative to sunscreen prior to entering the water.** Wearing rash guards, skinsuits, wetsuits, and other aquatic gear can substitute for sun protection and can significantly reduce introduction of potentially lethal chemicals into the marine environment.
- **Educate tourists.** Marine recreation providers can use snorkel or dive briefings as an opportunity to educate tourists about the potential damage to coral reefs from the introduction of synthetic chemicals. Retail shops that sell suncare products or rent snorkel and dive gear also can provide information to tourists regarding repercussions for coral reefs.
- **Use organic suncare products.** Some manufacturers now make products that have less impact on the natural environment. For example, Caribbean Pacific produces a number of different biodegradable sunscreens that are organic and do not use petroleum-based ingredients. In some cases, resort destinations have adopted and actively promote these types of products in an effort to reduce human impact on popular reef locations.

The impact to coral reef ecosystems from chemicals associated with petroleum-based and other suncare products is not yet fully understood. However, environmental problems linked with similar chemicals, as well as extensive laboratory and field-testing on oils of various types, suggest caution in using these products in and around coral reefs. Rather than waiting to see the cumulative negative impact based on a lack of consideration of the issue, it is plausible and practical to recommend minimal exposure of shallow coral reef ecosystems to suncare products.



Seafood Consumption

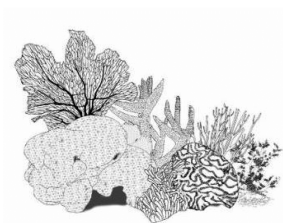
Over-harvesting of seafood poses a serious threat to coral reefs:

- unsustainable harvests.
- poorly informed and uneducated tourists.
- negative effects on the marketability of natural areas.

The over-harvesting of marine resources for seafood cuisine poses a serious threat to the health of coral reefs. In addition to buyers in existing international markets, vacationing visitors regularly consume many types of seafood harvested from the marine environment. As a result of the demand for seafood in popular tropical destinations, many reef fish, such as snappers, groupers, jewfish, jacks, conch, and lobster, have virtually disappeared in areas from the Caribbean to Hawaii to Asia.

As tourism has grown to become a major part of the socio-economic structure in these regions, it has become increasingly important for marine recreation providers — including sportfishers, dive and snorkel charters, and other boaters — to operate in ways that discourage excessive or uninformed consumption of marine resources, especially locally rare, threatened, and endangered species.

- Over-harvesting of key species in coral reefs can **disturb natural balances and lead to an overall loss of biodiversity** in the ecosystem.
- Tourists are often **unaware of the fact** that a seemingly harmless purchase of a seafood dish can have **serious negative consequences** for the environment.
- Compounded by other existing environmental problems, this type of consumption can **negatively impact the health and marketability of the same natural areas** that attract and support foreign tourists.
- Because of the potential for **short-term monetary gain** through the sale of popular seafood cuisine, many species are now **harvested from coral reefs and other marine habitats in an unsustainable manner**.



Seafood Consumption (continued)

Ways that environmentally conscious consumption can minimize impact to coral reefs:

- Educate.
- Avoid harvesting rare, threatened, or endangered species.
- Inquire about how seafood was caught.
- Observe the law.

There are a number of operational changes through which marine recreation providers can minimize the impact of both recreational and commercial fisheries to nearshore marine and coral reef ecosystems. In turn, travelers can become “responsible tourists” and contribute to both the economic and ecological sustainability of a particular region.

- **Educate clients and be informed consumers.** Marine recreation providers can supply information to clients about the sensitive nature of coral reef ecosystems. Operators have the opportunity to educate tourists regarding which species in a given region they should avoid as seafood because it is rare, threatened, or endangered.
- **Support ecologically sustainable fisheries practices.** Marine recreation providers that serve seafood cuisine can help protect stocks of threatened or endangered fish by not offering these items during their operations. Instead, they should support suppliers that harvest non-threatened and non-endangered fish and other species in an ecologically sustainable manner.
- **Inquire about how seafood has been harvested** when purchasing cuisine, and whether or not the species is locally threatened or endangered.
- **Observe the law.** Marine recreation providers and tourists should abide by all regional, national, and international laws regarding harvesting of marine species for seafood cuisine.

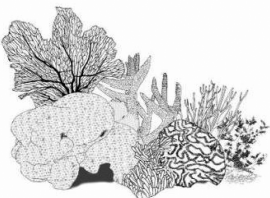


www.chartingnature.com



www.mbayaq.org

Many ocean conservation organizations now actively promote wise seafood choices for consumers through the use of educational “wallet-sized” seafood cards.



Collecting and Selling Marine Ornamentals

Souvenir collecting and sales harm coral reefs by:

- providing only short-term monetary gain.
- threatening sustainable fisheries and tour operations.
- reducing diversity and stability in coral reefs.

The Marine Aquarium Council provides certification of quality and sustainability for those involved with the collection of marine organisms.
www.aquariumcouncil.org

The collection and sale of marine organisms such as corals, shells, and aquarium fish pose an increasing threat to the health and diversity of coral reefs around the world. Not only do tourists commonly purchase marine ornamentals or “curious” while on vacation, but worldwide demand for such products has created a multi-billion-dollar industry that is having increasingly negative effects on coral reef ecosystems.

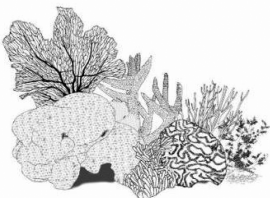
Marine recreation providers have the opportunity to inform and influence the behavior of consumers by pointing out the threats that this industry poses to coral reefs. Additionally, these same operators can minimize their own impact by discouraging the collection and sale of marine ornamentals, as this industry damages reefs in a number of ways.

- Because of the potential for **short-term monetary gain** through the sale of ornamental souvenirs such as fish, corals, shells, and other reef-dwelling organisms, many species are now **harvested from coral reefs and other marine habitats in an unsustainable manner.**
- Removal of living coral, “live rock,” and other marine organisms from coral reefs can **reduce the ability of these marine ecosystems to sustain local fisheries, tourism operations, and coastal protection.**
- Over-harvesting of key ecological components can have **unpredictable effects on the biodiversity and stability** of a coral reef. For example, excessive harvesting of urchins can lead to an overgrowth of algae, which can reduce live coral cover and overall species diversity on the reef.



Wolcott Henry photo

Corals for sale as ornamental souvenirs.



Collecting and Selling Marine Ornamentals (continued)

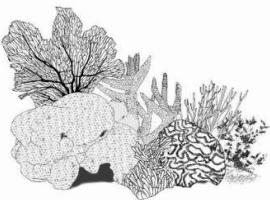
Limit the impact of the sale of marine ornamentals by:

- avoiding purchasing products.
- supporting “no take” zones and management plans.
- abiding by certification schemes.
- being informed and obeying the law.

Harvesting living coral from a reef environment removes habitat for countless other species of fish and invertebrates.

There are many practical ways—ranging from a complete avoidance of ornamental souvenir purchases to the support of a sustainable industry—that both marine recreation providers and tourists can minimize the impact associated with collection and sale of marine ornamentals.

- **Avoid selling or purchasing marine ornamentals.** Marine recreation providers should avoid selling marine ornamentals and souvenirs. Tourists, on the other hand, can help prevent the removal of key components of reef ecosystems for short-term gain by avoiding the purchase of marine ornamentals.
- **Support the establishment of “no-take” marine reserves,** in which it is illegal to collect marine organisms for sale or purchase as ornamentals and “curios.” Additionally, work with local communities and government officials to ensure that proper management and enforcement takes place in these protected areas.
- **Support the establishment of local and regional management plans** that limit the harvesting of marine organisms to levels that are sustainable for both industry and the ecological health of coral reefs. Remember that reefs have diverse economic values beyond the resources available for the marine ornamental industry.
- **Promote and support certification schemes** that give a market advantage to products harvested in a sustainable manner. If, as a consumer, you choose to buy marine ornamentals, make sure to purchase “certified” products in order to promote sustainable harvesting practices within the industry.
- **Be an informed business operator or consumer.** If you are a marine recreation provider, ensure that all your staff are informed about the potential negative consequences of harvesting marine ornamentals from coral reefs and that they share this information with clients. As a tourist or consumer, make the effort to be informed about why you should not purchase certain types of marine resources.
- **Observe the law.** Marine recreation providers and tourists should abide by all regional, national, and international laws regarding the harvesting of marine species as ornamental souvenirs.



Recreational Fishing

Concerns about the ecological impact of recreational fishing:

- declines in popular game fish.
- need for catch-and-release fishing programs.
- controversial nature of spear fishing.

Unsustainable fishing practices negatively affect the nutrition level in the diet of many local coastal communities.

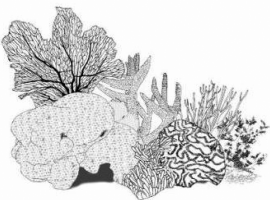
Throughout tropical resort destinations, visiting tourists regularly seek out sport fishing charters that target popular game fish, such as marlin, dorado, wahoo, and many others. Additionally, spear fishing and pole fishing amidst coral reefs has gained in popularity in recent years, among both tourists and locals in tropical communities. Though commercial fisheries likely have a bigger impact on open-ocean fisheries than do sport fishing charters, it has been shown that spear fishing can negatively impact populations of reef fish such as Nassau grouper, Jewfish, various types of parrotfish, and other marine species.

- Given the decline of many popular game fish throughout the world in recent years, **catch-and-release fishing is a growing practice** among sport fishing charters.
- In coastal environments the **decline in reef fish has been linked to spear fishing**, as well as to over-consumption of marine resources by local populations and visiting tourists.
- Critics point out that **spear fishing is too highly effective a method of harvesting reef fish**. For example, due to their method of resting within a reef at night, parrotfish are an easy target for spear fishers during this time.



Chuck Savall photo

Parrotfish are one of the most popular coral reef species targeted by recreational fishers throughout tropical regions of the world.



Recreational Fishing (continued)

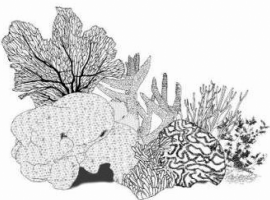
Ways that fishers can reduce impact to coral reefs and marine resources:

- Practice catch-and-release fishing.
- Avoid spear fishing.
- Prevent marine pollution from fishing gear.
- Observe the law.
- Support Marine Protected Areas.

De-hooking devices are available to increase the survival of game fish in catch-and-release fishing programs.

Fishers can adopt many simple practices that will protect marine ecosystems and enhance recreational fishing in local and regional communities.

- **Practice catch-and-release fishing.** Sport fishing charters can make significant contributions to conservation of fish species by practicing partial or total catch-and-release programs. These can be especially effective when dealing with threatened or endangered fish species.
- **Avoid spear fishing.** Many critics believe that spear fishing is too effective a method of harvesting marine resources. Additionally, the limited time available while on SCUBA contributes to excessive, rapid harvesting by many divers.
- **Prevent marine pollution from fishing gear.** Marine debris poses a serious threat to both coral reefs and open-ocean species. Monofilament line, lead weight, and associated fishing gear can tangle and kill corals and many other forms of marine life. Sport fishing charters and other recreational fishers can contribute to the protection of marine ecosystems by ensuring that no marine debris results from their fishing practices.
- **Observe the law.** Nearly all regions of the world have laws and regulations that govern fish-catch sizes and seasons. These laws are generally established to protect fisheries, and recreational fishers will benefit by following them.
- **Support the establishment of Marine Protected Areas (MPAs).** MPAs commonly strike a balance by leaving fishing open in some regions while establishing strict “no-take” zones in other areas. In several areas of the world, it has been shown that fish stocks rapidly improve in “no-take” zones, which leads to a spillover effect, including improved fishing in areas immediately adjacent to these zones.
- **Use “ecological common sense.”** In addition to observing laws and regulations, fishers should maintain an awareness to avoid spawning aggregations, reproductive seasons, and harvesting of juveniles. Additionally, when a large school of potential game fish is located, fishers can help protect the ecosystem and the fishing industry by not harvesting the entire school.



Case Study: Diver User Fees Support Bonaire National Marine Park, Netherlands Antilles.

First established in 1979, the Bonaire National Marine Park in the Netherlands Antilles is a leading example of how sustainable policies and practices can generate resources that protect coral reef ecosystems. Through a revitalization effort that began in 1991, the park has expanded its mooring system to reduce anchor damage; instituted a ban of spear fishing; engaged in the research and monitoring of coral reefs, both of which continue today; and introduced a user fee for divers, which generates funds for park protection.

The US \$10 annual diver fee was introduced in 1992 after a survey of visiting divers discovered overwhelming support for the concept. After paying the fee, divers are given a small colored tag to attach to their buoyancy control device while diving. Collection of these tags has now become a source of pride and commitment to conservation among many divers to the area. The funding generated from this program supports a small staff, operational costs of vehicles and boats, and maintenance of 75 public moorings, as well as research, monitoring, and education programs throughout the park. The adopted user fee has proven to be a key component that generates financial resources for the variety of conservation activities that take place in the park. Additionally, this user fee system has been adopted by other coral parks as a model for self-sufficiency in protecting coral reef ecosystems.



Divers explore a reef in Bonaire

Tegan Hoffmann photo

Case Study: North Sulawesi Watersports Association Working to Protect Bunaken National Park, Indonesia

To address the impact associated with the rapid growth of marine recreation in Bunaken National Park in recent years, the North Sulawesi Watersports Association (NSWA) has taken a lead role in promoting environmentally responsible policies and operations within the park. Following a rapid expansion of marine tourism in 1996, anchor damage quickly became identified as a serious threat to coral reef health in the area. Members of the NSWA established a no-anchoring policy in the park, and it has significantly reduced the problem today.

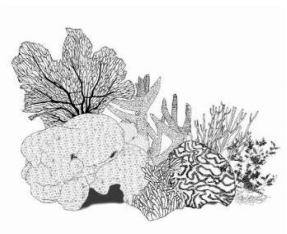
Additionally, NSWA promotes programs that create and distribute reef-friendly tourism informational brochures; develop working relationships with local restaurants to reduce the sale of threatened and endangered species such as lobster, shark, and grouper on menus; support the sale of locally handcrafted items; and provide scholarships to local residents in the field of marine science.

NSWA also partners with local officials to improve the enforcement of conservation laws in the park. The organization makes regular contributions that support police and ranger patrols, and in January 2000 it instituted a night patrol to reduce the problem of cyanide fishing. NSWA recently signed a memorandum of understanding with the Bunaken National Park rangers which will help formalize a regular patrol system to enforce conservation laws in the park.

In order to generate revenue to fund these and other protective measures for the park, NSWA instituted an annual US \$5 fee that provides visiting divers with a small colored tag to wear on their buoyancy control devices. The program is modeled on the one that was first established on the Caribbean island of Bonaire, 80 percent of the collected user fee goes straight into programs that support protection of the park.

To date, the generated revenue has helped support a variety of programs that have improved the management capacity of the park, including an increase in ranger patrols, conservation education in local villages, trash management, and rehabilitation of reefs and mangroves within the park. Overall, there is strong stakeholder support for the program from local villages and tourism industry representatives.

Part IV: Appendix



Environmental Briefings

The benefits of environmental briefing cards:

- Educate tourists on the diverse and fragile nature of coral reefs.
- Provide tour guides with an interpretive opportunity.
- Prepare guests for their excursion.
- Cultivate an environmental ethic and sense of responsibility for coral reefs.

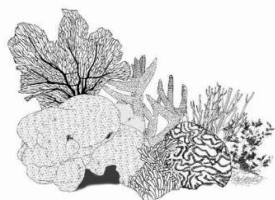
Environmental briefings are now commonly used throughout the dive industry. They allow dive masters or other tour guides to introduce visitors to a site, review the dive plan, and sensitize divers to the fragile nature of coral reef ecology and the importance of low-impact diving. This kind of briefing can be done in five minutes or less and serves to inform and educate visitors about the importance of sustainable practices moments before a dive takes place. Studies have shown that environmental briefings largely determine the degree of physical interaction that divers and snorkelers have with coral reefs.

Although the following **sample briefing card** relates most specifically to SCUBA diving, the included information can be adapted to environmental briefings for a range of on-water activities, from snorkeling to kayaking to glass-bottom reef viewing. Additionally, the specific content of briefings will always vary based on the region of the world in which the marine activities are taking place.

In all cases, tour guides can treat the briefing as an interpretive opportunity and can utilize local knowledge to enhance visitor experience and make a significant contribution to promoting low-impact, sustainable tour operations.



Fijian dive masters practice environmental briefings at a CORAL workshop.



Environmental Dive Brief

Coral reefs are very fragile ecosystems. Please help protect these special places by following some simple rules:

No Contact

- Use the "magic meter" by staying one meter off the reef.
- Even slightly touching coral can remove its protective layer of mucous, making it more susceptible to disease and other threats.

Buoyancy

- Maintain neutral buoyancy at all times.
- Do not hesitate to ask for our help or advice if you have too many or too few weights or would like tips on maintaining neutral buoyancy.

Good Finning

- Practice good finning technique, ensuring that your fins do not hit the coral at any time. One small kick could result in the loss of decades of growth.

Streamline Your Gear

- Make sure all hoses and equipment are secured so they do not drag or snag on the reef.

Let the Animals Come to You

- Never chase, harass, or try to ride marine life.
- Remember: The best encounters happen when the animals come to you!

Special Note to Photographers

- Remember to take special care to maintain neutral buoyancy, and avoid contacting the reef while taking photographs.

Take Only Pictures, Leave Only Bubbles!

- Take nothing living or dead out of the water, except garbage which has not become attached to the reef and does not contain living organisms.

Enjoy your dive!



Environmental Dive Brief

If you have time, select one or two interesting facts to help educate your clients.

EASY – Coral basics for the beginner.

What are corals?

- Although many people mistake corals for plants or rock, they are actually **spineless animals**. If you look closely, you will see that one coral mound or branch (known as a **coral colony**) is made up of hundreds of tiny animals called “coral polyps.”
- Each soft **coral polyp** lives inside its own hard, cup-shaped skeleton. The soft polyp is shaped like a sac or bag with an opening surrounded by long, stinging tentacles. During the day the tentacles hide inside the skeleton, but at night they come out to feed, capturing tiny microscopic animals (zooplankton) that float by.

What are coral reefs?

- Coral reefs are huge limestone structures that provide food and shelter for millions of sea creatures. Some reefs are so big that some can be seen from outer space!
- Hard corals are the main architects of the limestone structure of coral reefs. In and around the structure are millions of plants and animals carrying on with their business—similar to a busy city or apartment building.

INTERMEDIATE – Light facts for the more experienced diver.

How do corals grow?

- When corals die, their limestone skeletons are left behind, and new polyps settle on the hard surface. A coral colony is actually made up of many layers of dead skeletons covered by a thin layer of living polyps!
- Corals grow very slowly. Most existing coral reefs are between 5,000 and 10,000 years old.
- The **shape of coral** colonies can vary depending on the location. For example, where there are strong waves, corals tend to grow into robust mounds or flattened shapes. In more sheltered areas the same species might grow in more intricate shapes, such as delicate branching patterns.

ADVANCED – Impress your advanced divers!

Coral reefs and biodiversity

- Nearly 1/4 of all marine life is found in coral reefs.
- Scientists have identified more than 4,000 different species of fish and 700 species of coral.
- Coral reefs contain 32 of the 34 known animal phyla—four times the number found in tropical rainforests! (Phyla are the next highest ranking in taxonomy, after Kingdom).

What are zooxanthellae?

- “Zooxanthellae” (pronounced zo-zan-thel-ee) are tiny algae that live within the tissues of hard corals. The algae give coral its brownish-green color.
- The algae and coral have a **symbiotic relationship**, meaning that they are dependent on each other. The algae supply the coral with food, and the coral provides the algae with a safe and protected home.
- Like all plants, algae get their food from **photosynthesis**, a process that takes energy from sunlight to convert water, carbon dioxide, and minerals into organic material. This can supply corals with up to 98 percent of their nutritional needs. This explains why coral reefs are found in warm, sunny, tropical waters.
- When water temperatures increase, or when corals are stressed, they expel their symbiotic algae and become white or “bleached.” This is known as “coral bleaching” and can lead to coral death.

Environmentally Conscious Boating Products

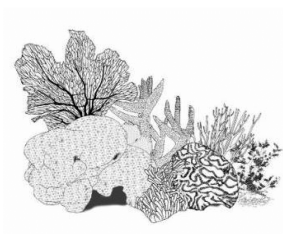
As environmental problems affecting the world's oceans have increased in recent years, many manufacturers of boating products have made a concerted effort to produce paints, chemicals, cleaners, and other products that are less toxic and harmful to the marine environment than products of the past. Check with your local marine supply store to see what environmentally safe products are available in your area. The following list highlights recommended products for marine recreation providers in the areas of:

- anti-fouling bottom paints
- fuel and bilge supplies
- boat cleaners
- sewage treatment



Dive boat on a coral reef in Palau

S. Flumerfelt photo



Environmentally Conscious Boating Products: Anti-Fouling Bottom Paints

Anti-fouling bottom paints

Many anti-fouling bottom paints of the past are slowly being phased out as a result of their toxic properties. Newer, less toxic paints use a variety of biocide alternatives to the copper or tributyltin-based (TBT) paints of the past. Boaters can use these alternatives to reduce pollution and the introduction of heavy metals into the marine environment.

What can your company use?

Recommended products:

Epaint

EP2000 - Water-based paint that is recommended for a smooth, hard finish; contains no organotin or copper compounds. 1 year to re-paint.

Cost - US\$68 per quart/\$228 per gallon

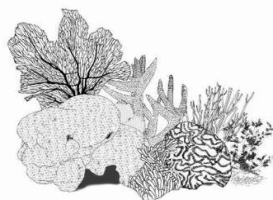
EP-ZO - High-performance anti-fouling bottom paint used on commercial and recreational vessels. Recommended by Epaint as the easiest to use and apply. 1 year to re-paint.

Cost - US\$47 per quart/\$177 per gallon

Product information

Epaint Company
25 Research road
East Falmouth, MA 02536
USA

(800) 258-5998 toll-free
(508) 540-4412 tel.
(508) 495-3210 fax
www.epaint.org
epaint@epaint.org



Environmentally Conscious Boating Products: Fuel and Bilge Supplies

Fuel and bilge supplies

Chronic leaks of toxic substances into the marine environment are a common problem near harbors, marinas, and popular boating sites. There are a number of inexpensive products that can reduce and/or eliminate pollution from small boats. Most of these products can be found at local marine hardware and supply stores.

What can my company use?

Bilge Absorbent Sock - Designed to be placed in the bilge to absorb oils and fuels while repelling water in order to prevent discharge into the marine environment. Cost - US\$12

Oil Absorbent Sheets - Material soaks up oil and gasoline but not water. Available for a variety of uses to minimize toxic oils and fuel discharge into the marine environment. Cost - US\$1.25

Engine Pan Pillow - Placed directly under the engine block to absorb leaks of oil and fuels. Does not absorb water. Cost - US\$12

Star Brite Sea Safe Bilge Cleaner - Dissolves oil, grease, gasoline, diesel, and fuel. (Emulsifies oils and fuels, does not necessarily prevent them from entering the marine environment like absorbers). Cost - US\$8.00 per quart

Fuel Overfill Catchment System - Designed to hook onto fuel vent while re-fueling in order to catch overflow spills. Cost - US\$70

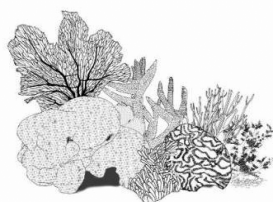
Fuel Vent Line Surge Protector - Helps minimize spills by shutting off pumps when vessel tank is full. Cost - US\$23

Fuel/Air Separators - Designed to prevent the discharge of fuel overboard while re-fueling or underway. Cost - US\$65

Vaccum Sander - For use in collecting hull and other debris during sanding operations. Cost - US\$80-\$300

Product information

West Marine
P.O. Box 50070
Watsonville, CA 95077-5050
USA
(800) 262-8464 toll-free
(831) 761-4421 fax
www.westmarine.com



Environmentally Conscious Boating Products: Sewage Treatment

Sewage treatment

The most environmentally conscious practice for sewage disposal is to use pump-out or other land-based facilities. Unfortunately, many harbors and marinas do not have pump-out stations or other disposal options. As a result, many boaters discharge sewage directly into the sea.

If you choose to discharge into the marine environment, it is important to stay as far offshore during the process as possible and to treat sewage prior to discharge. When treating your onboard sewage, avoid products with methyl alcohol, formaldehyde, glutaraldehyde, and quarternary salts, which are toxic to corals. Look for products that are biodegradable and non-toxic or have "eco-safe" labels.

What can my company use?

Recommended products:

Portable Marine Toilet - Comes in various models and allows small vessels to contain and dispose of human waste at land-based facilities versus at sea. Cost - US\$75-125

SeaLand Marine Toilet Tissue - Biodegradable tissue that breaks down quickly and does not contain dyes or perfumes. Cost - US\$3.00

SeaLand Ultra-Secure Holding Tank Treatment and Cleaner - Biodegradable chemical liquid that helps break down wastes. Cost - US\$8.00 per 8 oz.

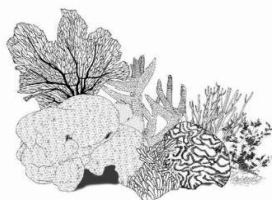
MDR Headzyme Tabs Toilet Treatment - Non-toxic, biodegradable chemical tablets that help break down waste. Cost - US\$6.00

Headzyme Holding Tank Treatment - Organic liquid formula that uses enzymes versus bacteria to assist in the break-down of tissue and waste. Cost - US\$12.50 per quart

Star Brite Sea Safe Toilet Treatment - Non-formaldehyde, biodegradable formula that helps break down tissue and waste. Cost - US\$7.00

Product information

West Marine
P.O. Box 50070
Watsonville, CA 95077-5050
USA
(800) 262-8464 toll-free
(831) 761-4421 fax
www.westmarine.com



Environmentally Conscious Boating Products: Boat Cleaners

Boat cleaners

Boaters can make a significant contribution to keeping toxic pollutants out of the marine environment by using only non-toxic and biodegradable boat-cleaning products. Avoid products with "toxic to humans" warnings on them (if it's toxic to humans, it will also be toxic to marine life). Become familiar with labels, and avoid products containing phosphates and ammonia, which cause algal blooms that overgrow corals and choke out other marine life. Also avoid hydrochloric acid, sodium, oxalic acid, petroleum distillates, kerosene, and chlorinated solvents, which are toxic and can cause coral death on contact or changes in behavior. Substitute chemical cleaners with natural ones, such as vinegar, citric juices, borax, and baking soda.

What can my company use?

Recommended products:

Simple Green - Multi-purpose cleaning agent that is non-toxic and biodegradable. Cost - US\$21.00 per gallon

Star Brite Sea Safe Boat Wash - Biodegradable formula that cleans away dirt, stains, grease, oil, and salt. Cost - US\$7.00 per quart

Star Brite Sea Safe Hull Cleaner - Removes stains from marine growth and rust; contains no solvents, strong acids, or harsh chemicals. Cost - US\$12.00 per quart

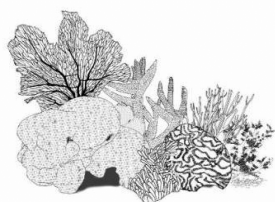
Star Brite Sea Safe Deck Cleaner - Biodegradable formula that cleans away dirt and stains. Cost - US\$8.00 per quart

Citrus Cleaner and Degreaser - Natural cleaning agent that is based on citris and is low in surfactants. Cost - US\$7.00 per pint

Citrus Boat Soap - Cleaning agent based on citrus and therefore low in surfactants. Does not produce high suds like detergents. Cost - US\$8.00 per quart

Product information

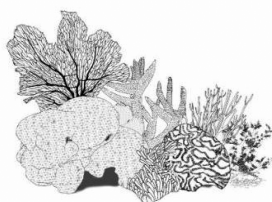
Star Brite
4041 S.W. 47th Avenue
Ft. Lauderdale,
FL 33314
USA
(800) 327-8583 toll-free
(954) 587-6280 tel.
(954) 587-2813 fax
www.starbrite.com



Environmentally Conscious Boating Products Four-stroke Outboard Engines

Technological advancements in recent years have allowed manufacturers to design marine outboard engines that are significantly cleaner than engines of the past. The classic example of this is the switch from older two-stroke models—which deposit as much as 30% of their fuel unburned into the marine environment and also generate significant amounts of air pollution—to cleaner, more fuel-efficient four-stroke models. Though the initial cost of four-stroke engines can be relatively high, in the long term they can save businesses money by requiring less fuel and reducing pollutants in the marine environment, thereby protecting the economic value of coral reefs.

| Model Description | Horse Power | 2004 Price |
|------------------------|-------------|-------------|
| <i>4-stroke models</i> | | |
| Yamaha F30TLRC | 30 | US \$4,750 |
| Yamaha F40TLRC | 40 | US \$5,144 |
| Yamaha F50TLRC | 50 | US \$5,827 |
| Yamaha F60TLRC | 60 | US \$6,338 |
| Yamaha F75TLRC | 75 | US \$7,200 |
| Yamaha F90TLRC | 90 | US \$7,688 |
| Yamaha F115TLRC | 115 | US \$8,594 |
| Yamaha F150TLRC | 150 | US \$11,383 |
| Yamaha F200TXRC | 200 | US \$15,387 |
| Yamaha F225TXRC | 225 | US \$16,894 |
| <i>4-stroke models</i> | | |
| Honda BF30D4LRGA | 30 | US \$4,095 |
| Honda BF40A4LRTA | 40 | US \$4,840 |
| Honda BF50A4LRTA | 50 | US \$5,380 |
| Honda BF75A4LRTA | 75 | US \$7,226 |
| Honda BF90A4LRTA | 90 | US \$7,822 |
| Honda BF115A4LA | 115 | US \$8,493 |
| Honda BF130A4LA | 130 | US \$9,375 |
| Honda BF150A4LA | 150 | US \$11,569 |
| Honda BF200A4LA | 200 | US \$13,994 |
| Honda BF225A4LA | 225 | US \$15,058 |



Environmentally Conscious Boating Products: Four-stroke Outboard Engines

| Model Description | Horse Power | 2004 Price |
|------------------------|-------------|-------------|
| <i>4-stroke models</i> | | |
| Mercury 30E EFI | 30 | US \$4,402 |
| Mercury 40E EFI | 40 | US \$4,823 |
| Mercury 50ELPT | 50 | US \$6,334 |
| Mercury 60ELPT | 60 | US \$6,732 |
| Mercury 75ELPT | 75 | US \$7,732 |
| Mercury 90ELPT | 90 | US \$8,380 |
| Mercury 115 ELPT | 115 | US \$8,594 |
| Mercury 225 XL | 225 | US \$16,686 |

Product information

Yamaha Motor Corporation
1270 Chastain Road NW
Kennesaw, GA 30144
USA
(806) 894-1626 tel.

Product information

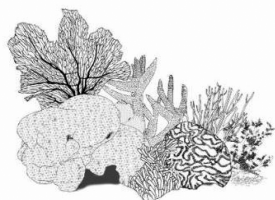
Honda Marine Group
4900 Marconi drive
Alpharetta, GA 30005
USA
(800) 426-7701 tel.
(678) 339-2670 fax

Product information

Mercury Marine
W6250 W. Pioneer road
P.O. Box 1939
Fond du Lac, WI 54936
(920) 929-5040 tel.



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CORAL's Educational and Outreach Materials

CORAL's educational and outreach materials:

- guidelines for good environmental practices.
- issue briefs for policy makers and community leaders.
- handbooks:

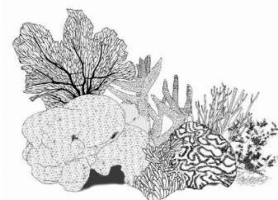
Coral Reef Ecology, Threats and Solutions.

Sustainable Tourism for Marine Recreation Providers.

Mooring Buoy Installation and Maintenance.

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."

-Maragaret Mead



The Coral Reef Alliance (CORAL) develops a broad selection of outreach and educational materials in order to promote the conservation and protection of coral reefs. Some of our materials include the following:

Guidelines for Good Environmental Practices - CORAL's guidelines reflect the most commonly accepted "best practices" around the world for marine recreation activities and give essential advice on how to protect coral reefs while enjoying activities in and around them. Guidelines are available in English, Spanish, Indonesian, and Japanese. They address the following topics:

- diving
- snorkeling
- whale and dolphin watching
- turtle watching
- underwater cleanup

Environmental Issue Briefs - CORAL's issue briefs discuss some of the most important issues being addressed by CORAL and the partners of the International Coral Reef Action Network (ICRAN) and are designed to assist policymakers, business leaders, and other influential community members to make informed decisions on issues that affect the health of coral reefs. Issue briefs are available in English and Spanish, with topics including:

- coral reefs and global climate change
- coral reefs and sustainable coastal development
- watersheds and healthy reefs
- exploitive fishing
- effective coral reef MPAs
- coral Reef mining, harvesting, and trade

Handbooks - CORAL's handbooks provide a comprehensive look at the nature of coral reefs, threats to these marine ecosystems, and practical solutions to promote and implement conservation and sustainable business practices. Our handbook series includes the following publications:

- *Introduction to Coral Reef Ecology, Threats and Solutions*
- *Mooring Buoy Installation and Maintenance.*
- *Sustainable Tourism for Marine Recreation Providers*

For more information on available materials and resources, visit our website at www.coral.org or email us at info@coral.org.