

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 recently facilitated a study which 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 is meant to highlight some of the current environmental problems associated with tourism growth and development, and to promote practical solutions for marine recreation providers to adopt good environmental practices. We encourage any 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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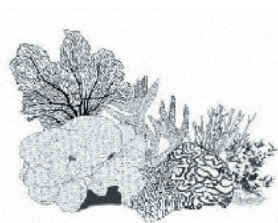
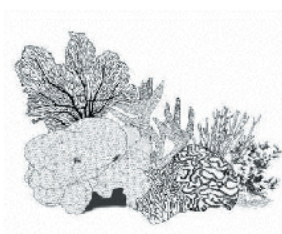
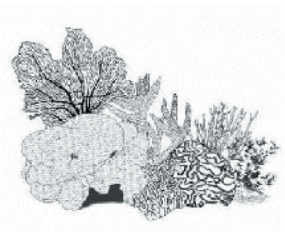


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Part I: Tourism and the Value of Coral Reefs



Tourism and the Value of Coral Reefs

Key facts about
tourism and reefs:

- 85% of tourism is in coastal regions.
- Millions of divers visit reefs every year.
- Coral reefs are worth millions of dollars to numerous states and nations.

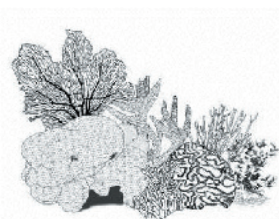
Every year, millions of tourists travel to tropical resort destinations to experience the beauty and vibrancy of coral reef ecosystems. Snorkeling, scuba diving, recreational boating and a variety of other water sports activities make up a significant portion of the tourism market in several regions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

- 85% of all tourism worldwide is in coastal areas, generating a US \$385 billion in annual revenues (Orams, 1999).
- According to a 2002 National Oceanic and Atmospheric Administration estimate, coral reefs generate US \$360 million annually for the state of Hawaii.
- Travel and tourism in the Caribbean is expected to generate US \$34.3 billion in 2002, increasing to US \$74.1 in 2012 (WTTC, 2002).
- An estimated 14 million + people engage in scuba diving every year. Many of these divers seek out coral reef ecosystems (Shackley, 1998).
- According to the 2002 "Reefs at Risk" report of the World Resources Institute, coral reefs in Southeast Asia are worth an estimated US \$700 to \$111,000 per square kilometer of reef for tourism.



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.
- Resource conflicts.

While growth and development can bring significant economic benefits to a region, uncontrolled tourism can also create problematic social and environmental impacts for 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** that affect both local residents and visiting tourists.
- **Conflicts over resources**, particularly between local fishers and marine recreation providers.

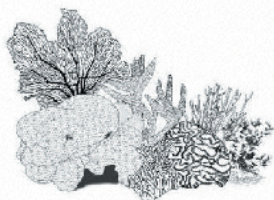
Case Study: Creation of the Soufriere Marine Management Area

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 near shore 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 (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.



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.

Photos courtesy of Kai Wulf, SMMA



How Rapid Tourism Growth Affects Local Businesses and Communities

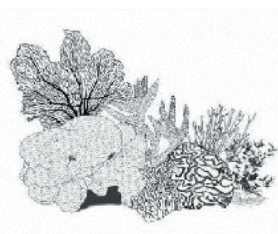
Combined effects of rapid tourism growth and irresponsible marine recreation:

- 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, causes the most significant impacts 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 near shore coral reef ecosystems.

The combined effects of this growth and activity can lead to 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 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. These negative impacts threaten the supply of locally caught seafood, and can be felt by the commercial and recreational fishing industries, as well as 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.



Sustainable Tourism and Marine Recreation

This handbook will promote sustainable tourism by:

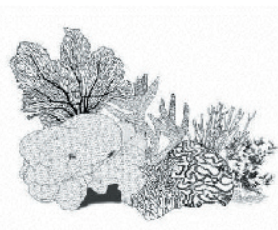
- Highlighting the economic value of coral reefs.
- Exploring relevant environmental threats.
- Developing practical responses.
- Providing examples of sustainable tourism.

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:

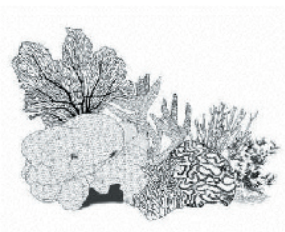
- Providing an overview of sustainable tourism and related concepts.
- Explaining the problems of rapid growth and development associated with unsustainable tourism and how it impacts the natural environment.

Marine recreation, as a well established and growing sector of the wider tourism industry, 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 voluntary codes of conduct and good environmental practices across a wide spectrum of marine recreation activities.
- Providing examples of how sustainable practices can be leveraged into support and enhancement of marine protected areas.



Part II: Sustainable Tourism: Key Concepts



Sustainable Tourism: Key Concepts

Key concepts:

- Sustainable tourism.
- Unsustainable tourism.
- Greenwashing.

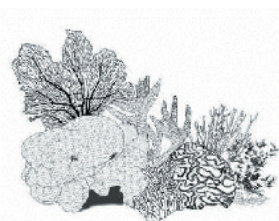
Sustainable tourism often means different things to different people. In the context of this handbook, tourism — and its associated growth in development and activities — is considered sustainable if it promotes economic development while simultaneously sustaining the natural areas that attract visitors to a particular destination.

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 simply because they take place in an outdoor location or superficially promote the protection of nature. Key concepts for understanding this issue include:

- **Sustainable Tourism:** Tourism that uses natural resources in such a way as to leave them healthy and undamaged for future generations.
- **Unsustainable Tourism:** Tourism that degrades and destroys the natural resources that support the economy of a region.
- **Greenwashing:** A false sense of companies or organizations promoting sustainable tourism when in reality little is being done to minimize operational impacts to the natural environment.

Examples of Sustainable Versus Unsustainable Tourism

Tourism Activity	Sustainable Practice	Unsustainable Practice
Coastal development	Building away from the beach and coast, and disposing of wastes properly.	Building on the beach causing erosion and increasing sediments in the water column and dumping wastes 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.	Anchoring on the reef; 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.



The Problem of Unsustainable Tourism

Poorly planned tourism growth negatively impacts the environment through:

- Tourism infrastructure and development.
- Hotel, lodging and restaurant operations.
- Marine recreation.

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

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

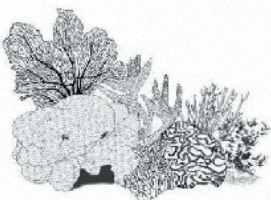
Case Study: The Development of Cancun, Mexico

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 over two million visitors each year. This rapid growth in tourism development and infrastructure, however, also led to severe environmental impacts, including deforestation, increased sedimentation and sewage effluent in coastal marine ecosystems, as well as 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 impacts 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 impact 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 impact 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 impact the health of coral reef ecosystems.

Specific impacts on coral reefs from tourism infrastructure development include:

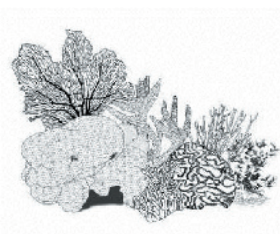
Physical Damage to Reefs:

- Blasting and dredging for projects destroys 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 blocks out sunlight, and kills corals.

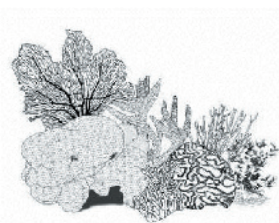


Hotel, Lodging and Restaurant Operations

Hotel, lodging and restaurant operations create direct impacts on coral reefs through:

- Pollution.
- Over-consumption.

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



In many ways, the environmental impacts of coastal development are 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 impact coral reef ecosystems?

The operation of tourist facilities such as hotels and lodges create solid and liquid wastes from landscaping and golf courses, human waste, 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 near shore environments.

Specific 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 of chemical pollutants in an ecosystem, such as herbicides and pesticides, can contribute to disease and poor health in fish and other species and make them unfit for human consumption.

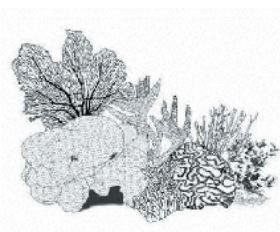
Over-consumption:

- 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 the decline of diversity and stability in near shore 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 near shore reefs. Many popular “curio” items are key components of reef ecosystems, and their removal leads to negative cascading effects in the environment.

Marine recreation can directly impact coral reefs through:

- Physical damage.
- Harassment of marine life.
- Pollution.

Because they operate using 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

Coastal tourism, particularly in tropical regions, has given rise to a booming 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 impact coral reef ecosystems?

Poorly conducted boat operations, as well as irresponsible snorkeling and diving, can cause **physical damage** to reefs through improper anchoring, propeller wash and sedimentation, touching of corals and **harassment of marine life**. Additionally, significant amounts of **pollution** in the marine environment is generated by inadequate maintenance of vessels and operation of older boats and jet skis that run on inefficient two-stroke engines.

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.

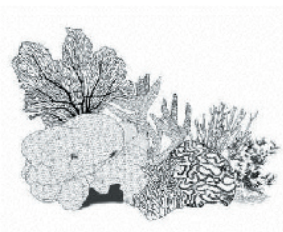
Harassment of Marine Life:

- Handling and feeding marine wildlife causes 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:

- Good environmental practices.
- Voluntary codes of conduct.

The rapid growth of marine recreation in tropical areas around the world has contributed to 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.

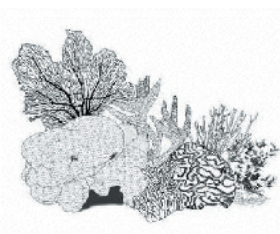
This section of the training handbook will highlight the concept of good environmental practices and establishment of voluntary codes of conduct for marine recreation providers. For each topic covered, the potential environmental problems will be addressed, followed by a list of recommended solutions.

The topics will include:

- Anchoring
- Boat Operations and Maintenance
- Sewage and Garbage Disposal
- Snorkeler and Diver Impacts
- Suncare Products
- Seafood and Souvenir Consumption
- Recreational Fishing

Case Study: The 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. Coordinators of this program developed a strategy that focused on tourists and the 60 tour boats that regularly shuttle them from island to island. Voluntary standards were established 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 (CFC's), replacement of two-stroke outboards with cleaner burning four-stroke models, and 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, it was quickly realized that it was of equal importance 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.

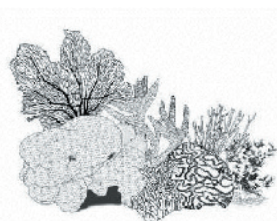


Anchoring

Anchoring can damage corals in a number of ways:

- Crushing and breaking corals.
- Chafing coral tissue.
- Stirring up sediment.

Given the slow rate 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 impacts caused by anchoring are slowly destroying the economic value that is inherent in healthy, undamaged reefs. Protecting against anchor damage, therefore, 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 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

Case Study: Moorings in the Hawaiian Islands

The Day-Use Mooring Program in the Hawaiian Islands was initiated in the late 1980's in response to increasing anchor damage to coral reefs from commercial and recreational boaters across the state. Both 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, Malama Kai Foundation, environmental organizations and members of the local dive industry. Partnerships, coalition building, appropriate use of the media, public outreach and the 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.



Mark Micklefield photo



John W. McManus photo

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

Good Environmental Practices: Anchoring

Simple ways that boaters can reduce impacts to coral reefs:

- Use mooring buoys.
- Hand set anchors far away from reefs.
- Educate boat users.

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

Minimizing anchor damage is crucial to protecting near shore 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 boats.
- Regular maintenance and correct use of moorings.

Change Boating Practices

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

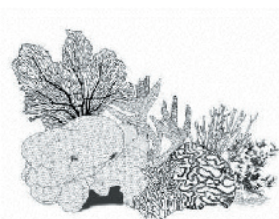
- Correctly use mooring buoys whenever possible. For reasons of safety, always run a check when you tie up to a mooring point (a buoy). Give yourself more room to maneuver by passing a mooring line about half the length of your boat through the eye of the buoy and secure both ends to a cleat on the deck.
- If anchoring is absolutely necessary, boaters should make sure they are in designated areas away from important ecosystems and where they will not be dragged near these areas or accidentally cause damage.
- Where no moorings are present, dive boat operators may consider drift dives instead of anchored dives.

Educate Customers

Many tourists who rent boats, sailboats, kayaks or canoes have little understanding of how harmful anchors can be to near shore 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 when possible.
- Explain the proper way to anchor before guests set out.
- Provide waterproof reminders of proper anchoring practices on all vessels.
- Explain potential impacts of poor anchor use.

Note: See CORAL'S Mooring Buoy Installation and Maintenance Handbook.



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.

Throughout the world, coral reefs are being damaged each year from poorly conducted or irresponsible boat operations and accidents. Vessel groundings and anchor damage have the most immediate and destructive impact on coral reefs. An increase in pollution and sedimentation from propeller wash and wave creation, however, can also negatively affect shallow coral reef ecosystems and seagrass beds.

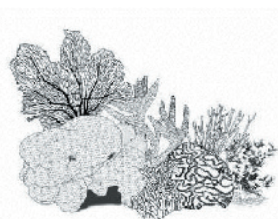
Poorly conducted boat operations can cause damage to coral reefs in a number of ways:

- When a boat collides with a reef, it **crushes and kills large areas of corals** and other reef dwelling organisms.
- Large commercial ships are known to cause **massive damage when running aground on reefs**, however, smaller private or commercial boats can also severely impact a reef ecosystem.
- Careless operation of small boats in shallow water, 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.



Florida Keys National Marine Sanctuary photo

Responsible boating is a key element to marine conservation.



Good Environmental Practices: Boat Operations

Principles of boat operation that minimize environmental impacts:

- Know the “rules of the road.”
- Keep boats in operating prime condition.
- Educate customers who rent boats.

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

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

Follow Proper Navigation and Mooring Principles

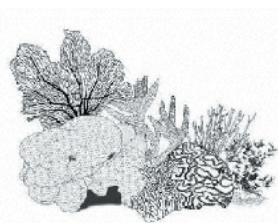
- Stay within designated channel markers, and when in reef areas, stay beyond the furthest visible reef patch in unknown or unmarked areas.
- Obey all speed signs to avoid marine mammal strikes (propeller hits).
- Identify dark water areas as a possible important shallow ecosystem, for example a shallow reef.
- Know how to properly read and interpret a navigational chart.
- In coral reefs, use reef mooring buoys where available. If anchoring, always drop anchors in sand or rubble channels well away from living reefs and allow sufficient 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 and, 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 a primary and secondary anchor line so vessels can be securely moored in emergency situations.
- Keep absorbent sponges on-board to deal with hazardous chemical spills.
- Non-toxic oils are available and should be used whenever possible. To dispose of your waste oil, wait until you get to the marina.
- Refuel only at a dock or in the marina. If you fill up at sea, you could spill fuel into the water.

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 Briefing Cards).
- Provide easy-to-use waterproof navigation and reef location charts.
- Explain the threat that anchors pose to near shore ecosystems and reefs and the proper way to secure boat without causing damage to the underwater environment.
- Provide on-board information about location and use of reef mooring buoys at popular snorkel and dive locations.



Boat Maintenance

Environment impacts from inadequate boat maintenance can include:

- Leaks of toxic fuels and oils.
- Heavy metals in the environment from anti-fouling bottom paint.
- Accidental discharge of raw or untreated sewage.

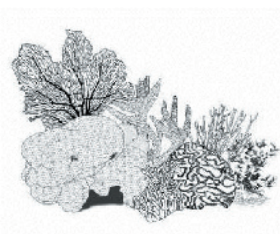
Chronic toxic waste leaks are a common source of pollution from small boat harbor and marinas.

Recreational and commercial boating is an immensely popular and important economic activity that involves millions of people across the globe. In tropical areas, boaters often have relatively easy access to coastal or near shore coral reef ecosystems that serve as a source of food, resources, recreation and enjoyment. While providing experiences that often lead to a conservation ethic among marine enthusiasts, there are many impacts associated with boating that can have a detrimental effect on the health of coral reef ecosystems. Proper maintenance is a key part of boating that can significantly reduce unintentional and necessary environmental impacts.

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

- 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, waste disposal, and groundings.
- Environmental problems associated with boat maintenance are generated by **leaks of toxic substances** such as oil or fuel, and release of heavy metals from anti-fouling bottom paints.
- Accidental **discharge of raw or untreated sewage** can result from improper maintenance of vessel sewage containment systems.

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



Good Environmental Practices: Boat Maintenance

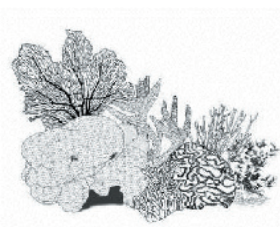
Boaters can reduce environmental impacts through:

- Regular maintenance.
- Using absorbent bilge sponges.
- Using non-toxic anti-fouling bottom paint.
- Avoiding CFC refrigerants.

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.

- **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. Many types of sponges are available that absorb fuel and oil but not water. Additionally, absorbent sponges should be kept on-hand while a vessel is being fueled in a marina or harbor.
- **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 negatively affect both human health and the marine environment. Less harmful anti-fouling paints are now available on the commercial market. For example, *Dolphinite Inc.* have developed and tested anti-fouling bottom paints that are made from biodegradable substances and are significantly less toxic than past products.
- **Avoid on-board refrigeration units that use chlorofluorocarbons (CFC's).** CFC's 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. Avoid using detergents or emulsifiers as bilge cleaners.



Sewage and Garbage Disposal

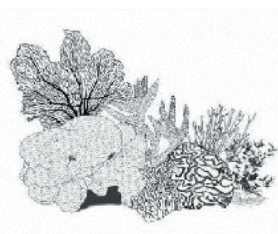
Improper sewage disposal:

- 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.



An increasing 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 and also pose 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 near shore 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, cigarette butts and styrofoam are often consumed by or entangle turtles, seabirds, fish and marine mammals and **cause the death of millions of these 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.



Jake Asher photo, NOAA.

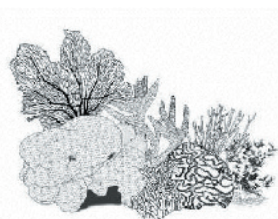
Garbage in the marine environment, particularly discarded fishing gear, plastics and styrofoam, can be deadly to wildlife. This green sea turtle in the Northwestern Hawaiian Islands was freed by NOAA divers, but suffered severe damage to both its front fins.

Good Environmental Practices: Sewage and Garbage Disposal

Steps to reduce the sewage and garbage in the environment:

- Pump-out facilities and land-based restrooms.
- Sewage treatment on vessels and sanitation devices in prime working condition.
- "No Discharge Zones."
- Garbage in contained places and minimal use of plastics and styrofoam.

Plastic alone in the marine environment kills millions of marine animals every year!



There are simple steps that marine recreation providers and visitors can take to reduce the impacts 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.
- **Use land-based restroom facilities prior to boat excursions.** Most land-based facilities are connected to some kind of municipal waste treatment facility. This can significantly reduce discharge of untreated sewage at sea.
- **Treat sewage prior to release from vessel.** If pump-out facilities are not available, there are several biodegradable chemicals and mechanical methods that can be used to reduce solids and pathogens in waste prior to disposal in the environment. Additionally, it is vital that small vessels proceed as far offshore as possible prior to discharging treated sewage. This prevents contamination of bottom sediments and coral reef habitat in shallow coastal regions. Avoid discharging toilets or sewage holding tanks in confined or crowded places, environmentally sensitive areas or marine protected areas.
- **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.
- **Support the establishment of "No Discharge Zones."** The creation and enforcement of "No Discharge Zones" helps 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. They could harm marine wildlife.

Snorkeler and Diver Impacts

Snorkelers and divers impact coral reefs by:

- Touching and crushing organisms.
- Stirring sediment.
- Handling and harassing wildlife.
- Providing artificial food to wildlife.

Many snorkeler and diver related impacts are simply the result of tourists being unaware and uneducated about the fragile nature of coral reefs.

Throughout the world, coral reef ecosystems are beginning to show signs of decline as a result of impacts generated by the snorkeling and diving industry. These impacts 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.

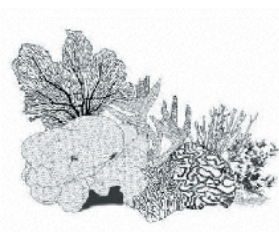
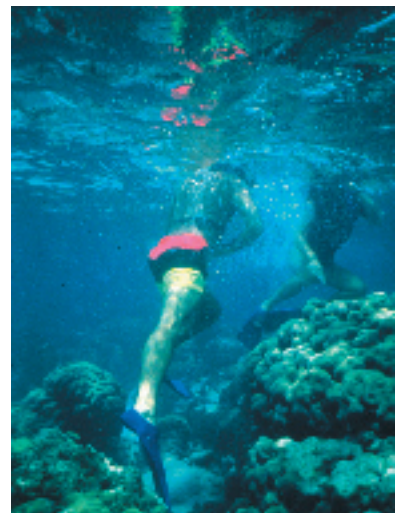
Irresponsible snorkeling and diving practices can cause physical damage to a coral reef:

- 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 impacts are **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 impacts** 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.



William Harrigan photos, Florida Keys National Marine Sanctuary

Direct contact by divers and snorkelers can cause significant damage to corals and other small reef dwelling organisms.

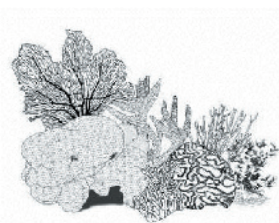


Good Environmental Practices: Snorkeler and Diver Impacts

Environmentally conscious snorkeling and diving includes:

- No-contact policies.
- Environmental briefings.
- Discourage fish feeding or harassment of wildlife.
- Support mooring buoy projects.
- Support of Marine Protected Areas.

Learning more about coral reef ecology generally makes snorkelers and divers more conscientious about impacts 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 individuals can reduce impacts to 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. These policies can be supported by encouraging the use of flotation vests for inexperienced snorkelers and discouraging the use of gloves by divers.
- **Conduct environmental awareness briefings for tourists and other marine enthusiasts.** Studies have shown that damage to near shore 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 impacts 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 feeding of sharks and reef fish and 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” that 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 near shore marine environments, particularly coral reefs, that 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

Poorly conducted 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. As tourism has come to be such a predominant part of the economy of many of the world's coastal communities, stakeholders in the industry have realized that several species of previously considered "harvestable" marine animals 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 most important 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.

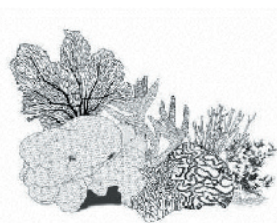
There are many potential negative impacts that poorly conducted or irresponsible viewing can have on marine wildlife. These include:

- **Disturbance of cow/calf pairs.** Marine mammals such as whales and dolphins can commonly be 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 or interaction can cause marine turtles to abandon primary feeding grounds in coastal environments. Marine mammals may 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 has become tremendously popular in many regions of the world, generating a significant source of revenue for coastal communities. Stakeholders in the tourist industry, fishermen and government officials have recognized that these animals have much greater economic value alive in their wild habitat than dead for commercial harvesting.

Lori Mazucca photos



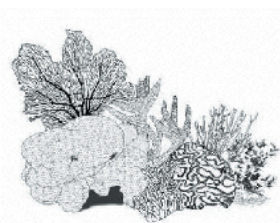
Good Environmental Practices: Marine Wildlife Viewing

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

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

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

- **Avoid chasing marine animals.** Whether in the water or on a boat, watersports 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 animal(s) determine its own path 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 for individual 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 make sure that trash goes in its proper place and does not end up in the marine environment.

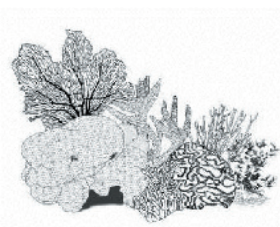


Suncare Products

Suncare products are potentially a new threat to coral reefs:

- Petroleum-based products can be harmful to living corals.
- Suncare products may disrupt 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 are potentially 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 impacts 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.

- 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 viewed as 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**. It is therefore possible that corals are 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!

Good Environmental Practices: Suncare Products

Steps to reduce impacts to coral reefs from suncare products:

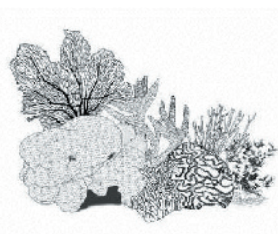
- Use UV protective clothing as a substitute for sunscreen prior to entering the water.
- Educate tourists.
- Use organic suncare products.

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

There are several simple steps that marine recreation providers and tourists can take to reduce the potential impact that sun care 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 act as a 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 can also provide information to tourists regarding impacts to 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 impacts at popular reef locations.

The impacts to coral reef ecosystems from chemicals associated with petroleum-based and other suncare products are not yet fully understood. Environmental problems linked with similar chemicals, however, 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 wait to see negative cumulative impacts 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.

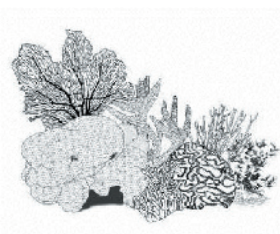


Seafood and Souvenir Consumption

Seafood and souvenir consumption poses a serious threat to coral reefs:

- Unsustainable harvests.
- Poorly informed and uneducated tourists.
- Negative effects on the marketability of natural areas.

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



The over-harvesting of marine resources for seafood cuisine or as ornamental souvenirs, or “curios,” poses a serious threat to the health of coral reefs. While vacationing, visitors regularly consume many types of seafood and other items harvested from the marine environment. As tourism has grown to become a major part of the socio-economic structure of many tropical countries, it has become increasingly important for marine recreation providers to operate in ways that discourage excessive or uninformed consumption of marine resources, especially threatened and endangered species.

- Given the potential for **short-term monetary gain** through the sale of popular seafood and 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.**
- Tourists are often **unaware of the fact** that a seemingly harmless purchase of a seafood dish or marine ornamental 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.
- Marine recreation providers have the **opportunity to influence the choices tourists make** by practicing and promoting low-impact, non-consumptive water sports activities.



Wolcott Henry photo

Corals for sale as ornamental souvenirs.

Good Environmental Practices: Seafood and Souvenir Consumption

Ways environmentally conscious consumption can minimize impacts to coral reefs:

- Education.
- No-contact or collection tour operations.
- Avoidance of marine ornamentals.
- Avoidance of rare, threatened or endangered species as cuisine.
- Observe the law.

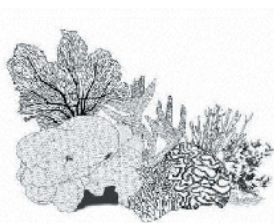
The Marine Aquarium Council <http://www.aquariumcouncil.org> is a non-profit organization that provides certification of quality and sustainability for those involved with the collection of marine organisms.

There are a number of ways that marine recreation providers can minimize impacts to near shore marine and coral reef ecosystems by the way they operate. 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 provide 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 should not be consumed as seafood or souvenirs because they are 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 serving these items during their operations. Instead, they should support suppliers that harvest non-threatened or endangered fish and other species in an ecologically sustainable manner. Additionally, operators can provide tourists with this information in order to promote sustainable fisheries.
- **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.
- **Observe the Law.** Marine recreation providers should abide by all regional, national and international laws regarding harvesting of marine species.



Many ocean conservation organizations now actively promote wise seafood choices for consumers. As part of this educational campaign, organizations such as Environmental Defense and the Monterey Bay Aquarium Foundation have produced wallet size guides to wise seafood choices. Photos courtesy of www.chartingnature.com and the Monterey Bay Aquarium Foundation www.mbayaq.org.



Recreational Fishing

Concerns about impacts 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.

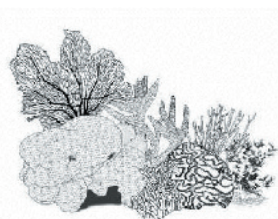
Throughout tropical resort destinations, visiting tourists regularly seek out sport fishing charters that target popular game fish such as marlin, dorado, wahoo and many others. Additionally, spear fishing and pole fishing among coral reefs has gained in popularity in recent years, both among tourists and locals in tropical communities. Though commercial fisheries likely have a bigger impact on open ocean fisheries than 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 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, parrotfish, due to their method of resting among a reef at night, 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.

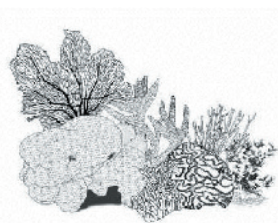


Good Environmental Practices: Recreational Fishing

Ways that fishers can reduce impacts 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 that increase the survival game fish in catch-and-release fishing programs.



There are many simple practices that fishers can adopt which 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. This 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 nature of 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 and 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.

Sustainable Tourism and Recreation Industry Support for Marine Protected Areas (MPAs)

In recent years, many popular coastal dive locations around the world have embraced environmentally sustainable practices as a method of increasing protection and support of Marine Protected Areas (MPAs) and enhancing the dive industry. Two successful examples of this move towards sustainable tourism include:

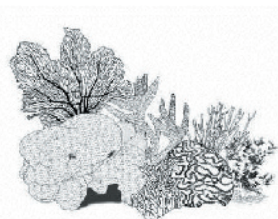
- Bonaire Marine Park, Netherlands Antilles
- Northwest Sulawesi Watersports Association in Bunaken National Park, Indonesia

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 research and monitoring of coral reefs that continues today; and introduced a user fee for divers that generates funds for park protection.

The US \$10 annual diver fee was introduced in 1992 after a survey determined overwhelming support for the concept from visiting divers. 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, 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.

Check out the site
for the Bonaire
Marine Park at:
<http://www.bmp.org>



Divers explore a reef in Bonaire

Tegan Hoffmann photo

Sustainable Tourism and Recreation Industry Support for Marine Protected Areas (MPAs)

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

To address the impacts associated with the rapid growth of marine recreation in Bunaken National Park in recent years, the North Sulawesi Watersports Association (NWSA) 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 NWSA established a no-anchoring policy in the park that has significantly reduced the problem today.

Additionally, NWSA 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 on menus such as lobster, shark and grouper; support the sale of locally handcrafted items; and provide scholarships to local residents in the field of marine science.

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

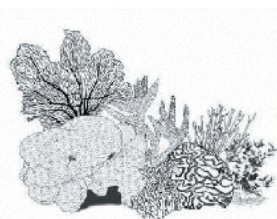
In order to generate revenue to fund these and other protective measures for the park, NWSA instituted an annual US \$10 fee that provides visiting divers with a small colored tag to wear on their BCD. Modeled on the program that was first established on the Caribbean island of Bonaire, 80% of the collected user fees go straight into programs that support protection of the park.

For more information about what is going on with the NWSA, check out the site at: <http://www.bunaken.info/>

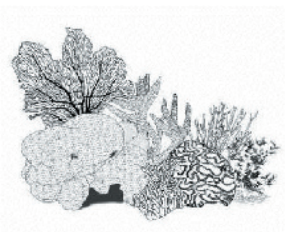


Steve Turek photo

Indonesia is home to some of the most species rich coral reefs in the world!



Part IV: Appendix – Environmental Briefing Cards



Environmental Briefing Cards

The benefits of environmental briefing cards:

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

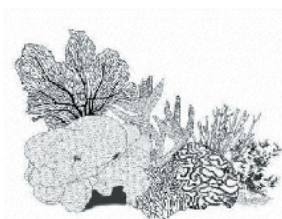
Environmental briefings are now commonly used throughout the dive industry. They allow dive masters or other tour guides to introduce visitors to a site, review the dive plan, and sensitize divers to the fragile nature of coral reef ecology and the importance of low-impact diving. This kind of briefing 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 is meant to take 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 substance of briefings will always vary based on what region of the world the marine activities are taking place.

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



Fijian divemasters practice environmental briefings at a CORAL workshop.



ENVIRONMENTAL DIVE BRIEF

Key Points

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

No Contact

- Try to use the “magic meter” and stay one meter off the reef.
- When you touch coral, you remove its protective layer of mucous, making it more susceptible to disease and other threats.

Buoyancy

- Keep neutrally buoyant at all times.
- If you have too many or too few weights, or would like tips on how to maintain neutral buoyancy, please let us know.

Good Finning

- Be aware of your fins and make sure they do not come in contact with the reef.

Streamline Your Gear

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

Let the Animals Come to You

- Never chase or harass marine life.
- Don't feed marine life unless under expert guidance.
- Remember, the best encounters are when the animals come to you!

Special Note to Photographers

- Remember to take special care not to touch the reef when taking photographs, and please be sure to watch your cameras and gear.

Take Only Pictures, Leave Only Bubbles!

- Take nothing living or dead out of the water, except recent garbage.

Enjoy your dive!



Environmental Dive Brief

Interesting facts about corals: 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 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. Coral reefs are so big that some can be seen from outer space!
- The actual limestone structure is made by hard corals, and in and around the structure are millions of other 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, they leave their limestone skeletons behind, and new polyps settle on the hard surface. A coral colony is actually layer upon layer of dead skeletons covered by a thin layer of living polyps!
- Corals grow very slowly. Most existing coral reefs are between 5000 and 10,000 years old.
- The **shape of coral** colonies can vary depending on the location of the coral. For example, where there are strong waves corals tend to grow into robust mounds or flattened shapes. In more sheltered areas the same species may 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 next to the Kingdom).

What is 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 supplies 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.”

About the Coral Parks Program

What is a coral park?

A coral park is a protected area that includes a coral reef in its boundaries and allows visitors. The coral parks program helps tourism and conservation to work in partnership for the benefit of coral reefs and the tourism industry.

The goal of the Coral Reef Alliance's (CORAL) Parks Program is to help coral park managers leverage sustainable tourism to build local investment in the conservation of coral reef parks. We work to achieve this goal by providing training, tools and resources to partners in local coral reef communities, including dive operators, conservation groups, and community leaders, and through our global partnership with the International Coral Reef Action Network (ICRAN). Our current geographic focus is on the Western Pacific, the Caribbean and the Mesoamerican Barrier Reef.

Training and technical assistance for coral parks: CORAL provides on-site training and technical assistance to communities and businesses that depend on coral reefs, helping to ensure the success of local coral parks. Topics include sustainable financing, preventing anchor damage, sustainable marine tourism, and coral reef ecology. CORAL works with marine recreation providers, bulk purchasers (such as cruise lines and tour operators), park managers, and other community members involved in the coral reef tourism industry. Through the development of partnerships between tourism and coral parks, CORAL builds cooperation that enhances both environmental and economic sustainability.

Financial support of park conservation programs: CORAL's microgrant program has provided much needed financial support to local conservation programs around the world. Since 1995, CORAL has provided over \$350,000 in microgrants to support grass-roots conservation. Currently, CORAL provides seed money to local partners participating in CORAL's training program. Through microgrants we help coral parks pay for mooring buoys to stop anchor damage, purchase functioning boats to patrol and enforce fishing rules, and publish brochures to educate visitors of park rules. Read more about past microgrant recipients on the CORAL website.

Information and Resources: The parks program provides tools and resources, as well as education and outreach materials (see page 41), to help park managers and communities to more effectively protect their coral reefs. Visit our website at www.coral.org/ to find information on:

- Coral Reef Fact Sheets for the general public
- International Directory of Coral Reef Organizations
- Online Coral Reef Education Materials Library
- Coral Reef Photobank

For more information:

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Web: www.coral.org



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 on:

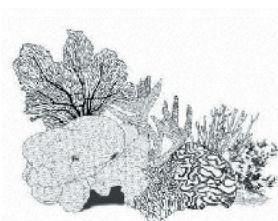
Coral Reef Ecology, Threats and Solutions.

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) has developed 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, and 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 Marine Protected Areas (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. 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/