

Pamlico Sea Base Sailing Guide



The following sections of this guide offer an in-depth instruction of the ins and outs of sailing; read and learn as much or as little as you choose. The more you learn before your arrival, the better **your** adventure will be.

Time to Hoist the Sails — Introduction to Sailing

A sailboat or sailing ship moves forward due to the action of the wind on its sails. Since the dawn of history, this vital technology has afforded mankind greater mobility and capacity for fishing, trade, and warfare. From moving the stones of the great pyramids from Aswan to Giza to allowing man to migrate throughout Polynesia to Nelson's defeat of the French Navy at Trafalgar, mankind's history has been intertwined with this seemingly simple technology (although it is not quite as simple as it seems).

The Physics of Sailing

The energy that drives a sailboat is obtained by manipulating the relative movement of wind and water speed; if there is no difference in movement, such as on a calm day or when the wind and water current are moving in the same direction, there is no energy to be extracted, and the sailboat will not be able to do anything but drift. Where there is a difference in motion, then there is energy to be extracted at the interface, and the sailboat does this by placing the sail(s) in the air and the hull(s) in the water. Sails are foils, and work just like airplane wings, generating lift using the fluid, in this case air, that flows around them. The curved surface of a sail generates high pressure on the windward side, and low pressure on the lee side, which serves to deflect the air off the trailing edge of the sail. Deflecting the air results in a reaction force on the sail and rigging that pushes the boat in a direction opposite that deflection. It is often said that lift is generated by the pressure differential on the sails, but this is not entirely true—the pressure differential deflects the air, but it is the deflection that generates the force. Since the air behind the sailboat has been deflected, it now has less energy, and is called dirty air, and racing sailors try to avoid sailing in dirty air, as it is slower. A common technique is trying to get upwind of an opponent, and make them sail in your dirty air, slowing them down.

The sail alone is not sufficient to drive the boat, as it would tend only to push the boat in the same direction as the wind. Sailboats do this by placing a second "sail" in the water, in the form of a **keel**. By doing this, it is possible to generate an additional source of lift from the water. By combining the lift from the underwater foil and the sail, the sailboat can sail in almost any direction, except straight into the wind.

When sailing downwind, a boat catches up to the wind, so the wind cannot push as hard on the sails; this limits the downwind speed of traditional sails to the wind speed. When sailing at an angle to the wind, however, the motion of the boat creates its own apparent wind, which combines the wind speed vector and the hull speed vector. Sailing into the wind can quickly add up to apparent winds of far greater than the true wind speed. However, it also changes the angle as the direction of the apparent wind moves toward the front. This is the wind that the boat is actually sailing by, and many modern boats are capable of exceeding the true wind speed by a significant factor.

Basic Sailing Techniques

Points of Sail

This section defines several terms that identify a sailboat's movement relative to the wind direction.

Steering and Turning

When steering a sailboat, the method for changing direction depends on the direction of the wind. Thus, all direction changes or turns are described by one of the following terms:

Heading up (or luffing up) means steering so the wind is closer to coming from directly in front (or "on the bow"). Heading closer to the wind requires trimming the sails, pulling them toward the vessel's center. Heading up so the wind is nearly or directly ahead causes sails to luff—to flutter without achieving lift. If the boat loses maneuverability because of this, it is said to be in irons.

Tacking (or coming about), one of the basic turning techniques, requires heading up and through the wind so it then comes across the opposite side of the boat, and the boat sails away on the opposite tack.

Heading down, bearing away, and falling off mean steering so the wind comes from closer to the vessel's aft. This requires easing sails, letting them out away from the vessel's center.

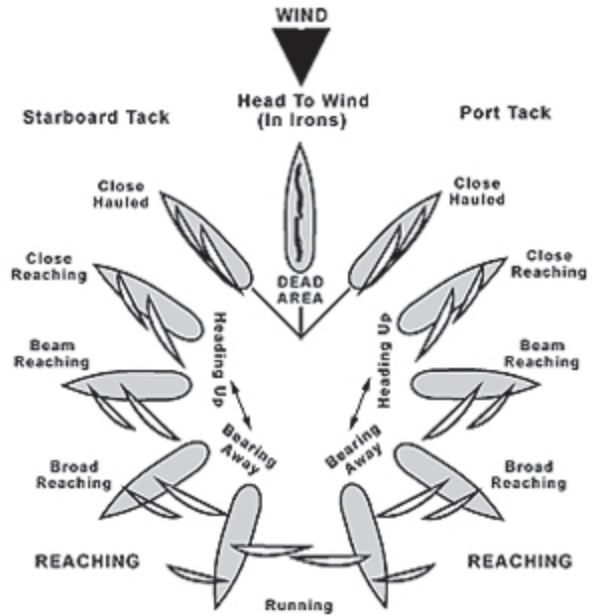
Jibing is the turning maneuver in which the boat heads down past the point where the wind crosses the vessel's stern, which causes the sails and boom to swing to the opposite side before the boat sails off on the opposite tack. The sail crosses with significant speed, and misjudged jibing can easily capsize a boat, especially in strong winds.

Trim is the fore and aft balance of the boat. The aim is to adjust the moveable ballast (the crew!) forward or backward to achieve an "even keel."

Balance is the port and starboard balance. The aim, once again, is to adjust weight inboard or outboard to prevent excessive heeling.

Sail: Trimming sails is a large topic. Simply put, however, a sail should be pulled in until it fills with wind, but no further than the point where the front edge of the sail (the luff) is exactly in line with the wind.

Running: Sailing the boat within roughly 30 degrees of either side of dead downwind is called a run. This is the easiest point of sail in terms of comfort, but it can also be the most dangerous. When sailing upwind, it's easy to stop the boat by heading into the wind; a sailor has no such easy out when running. Severe rolling is more likely as there is less rolling resistance provided by the sails, which are eased out. And loss of attention by the helmsman could lead the boat to jibe accidentally, causing injury to the boat or crew. (A preventer can be rigged to hold back damage from an accidental jibe.) Alternately, if there is a sudden increase in wind strength, the boat can



round up very suddenly and heel excessively, often leading a capsized smaller boat. This is called broaching.

Reaching: When the boat is traveling approximately perpendicular to the wind, this is called reaching. A “close” reach is somewhat toward the wind, and “broad” reach is a little bit away from the wind. A “beam” reach is with the wind precisely at right angles to the boat. For most modern sailboats, reaching is the fastest way to travel.

Sailing Upwind



Use a series of close-hauled legs to beat a course upwind. A basic rule of sailing is that it is not possible to sail directly into the wind. Generally speaking, a boat can sail 60 degrees off the wind. When a boat is sailing this close to the wind, it is **close-hauled** or **beating** (beating to weather). Since a boat cannot sail directly into the wind, but the destination is often upwind, one can only get there by sailing close-hauled with the wind coming from the port side (the boat is on port tack), then **tacking** (turning the boat through the eye of the wind), and sailing with the wind coming from the starboard side (the boat is on starboard tack). By this method, it is possible to reach that destination directly upwind. The heavier the wind, the rougher the seas, thus boat movement can be more uncomfortable. This can feel like the boat is beating its hull into the

waves, hence the term beating.

How close a boat can sail to the wind depends on the boat's design, sail trim, the sea state, and the wind speed since what the boat “sees” is the apparent wind, i.e., the vector sum of the actual wind and the boat's own velocity. The apparent wind speed is what the anemometer on top of the mast shows. A good analogy to this would be walking through an indoor room and feeling the “wind” on your face. The faster you walk, the more wind you feel. The apparent wind angle while sailing close-hauled will be less than the true wind angle. A good, modern sloop can sail within 25 degrees of the apparent wind. An America's Cup racing sloop can sail within 16 degrees under the right conditions. Those figures might translate into 45 degrees and 36 degrees relative to the actual wind, depending on boat speed.

Reducing sail: An important safety aspect of sailing is to adjust the amount of sail to suit the wind conditions. As the wind speed increases, the crew should progressively reduce the amount of sail. On a small boat with only a jib and mainsail, this is done by **furling** the jib and by partially lowering the mainsail, a process called “**reefing** the main.” Reefing means reducing the area of a sail without actually changing it for a smaller sail. Ideally, reefing does not only result in a reduced-sail area, but also in a lower center of effort from the sails, reducing the heeling moment and keeping the boat more upright.

Heeling: When a boat rolls over to one side under wind pressure, it's called “heeling.” As a sailing boat heels over beyond a certain angle, it begins to sail less efficiently. Several forces can counteract this movement.

The underwater shape of the hull relative to the sails can be designed to make the boat tend to turn upwind when it heels excessively; this reduces the force on the sails, and allows the boat to right itself. This is known as rounding up. The boat can be turned upwind to produce the same effect. Wind can be spilled from the sails by “sheeting out,” i.e. loosening the sail.

Lastly, as the boat rolls farther over, wind spills from the top of the sail. Most of the above effects can be used to right a heeling boat and to keep the boat sailing efficiently. However, if the boat



heels beyond a certain point of stability, it can capsize. A boat is said to have capsized when the tip of the mast is in the water.

A Boat's Position Relative to Wind



Rules of the Road

1. **Port tack** gives way to **Starboard tack** (when the paths of two boats on opposite tacks cross, the boat with its port side to windward must give way).

2. **Windward** gives way to the **leeward**, or downwind boat (if on the same tack). Overtaking boat gives way if above do not apply.

Note: It is everybody's responsibility to avoid a collision, and avoiding action must be taken if these rules are ignored.

Marine Heads

(Toilets for you landlubbers)

The toilet on a boat is called the head. Heads have some similarities to your toilet at home, and some very important differences. We receive negative comments regarding the heads on the boats, but most of these comments are based on misconceptions and abuse by our participants.

The head on the boat probably looks a lot like your toilet at home—round or oval and white or beige—but maybe a little smaller. If you are a big person, the smaller head can be a bit of a juggling act—like sitting on a child's stool.

It is best if the males sit on the head to urinate. (Actually, it's best if the males just pee over the side—“go where the fishes go.”) Urinating while standing can cause a huge, embarrassing mess if the boat hits a wave or heels from a strong gust of wind. If you find yourself in this situation, you have no one to blame but yourself! And you are expected to clean up your mess.

You flush the toilet at home, but on a boat you have to pump the head. This is a little unpleasant for some landlubbers because you have to get your face relatively close to the bowl in order to pump your waste away. Remember, the boat is not air-conditioned. You will be in a tiny closet-like room. It will be hot and maybe a little smelly—a lot like an old-fashioned outhouse.

Another important difference is the actual plumbing. Your toilet at home has big pipes to carry away the waste and uses a lot of water. Even the most environmentally friendly toilets use a gallon per flush. Unless you plan on doing a LOT of pumping while hunched over in a small closet with your face right at the toilet bowl, dripping wet with sweat, you are probably going to use a quart or so of water to pump the

waste away. And instead of having a 4-inch pipe to carry everything away, you will be pumping your waste through a 1½-inch hose.

Because you are using a small quantity of water and pumping through a small hose, **NOTHING** is allowed to be put in the head that you haven't eaten. This includes toilet paper. Toilet paper does **NOT** go into the head. The paper is put into a trash bag and secured. This may sound a little gross, but is actually a common practice throughout most of the world. Mexico, most of Central and South America and even many European countries do not have adequate sewer facilities for processing toilet paper—even the so-called fast-dissolving RV/Marine-type paper. So don't be disgusted. Remember, you are on a boat and not at your house. Things are different.

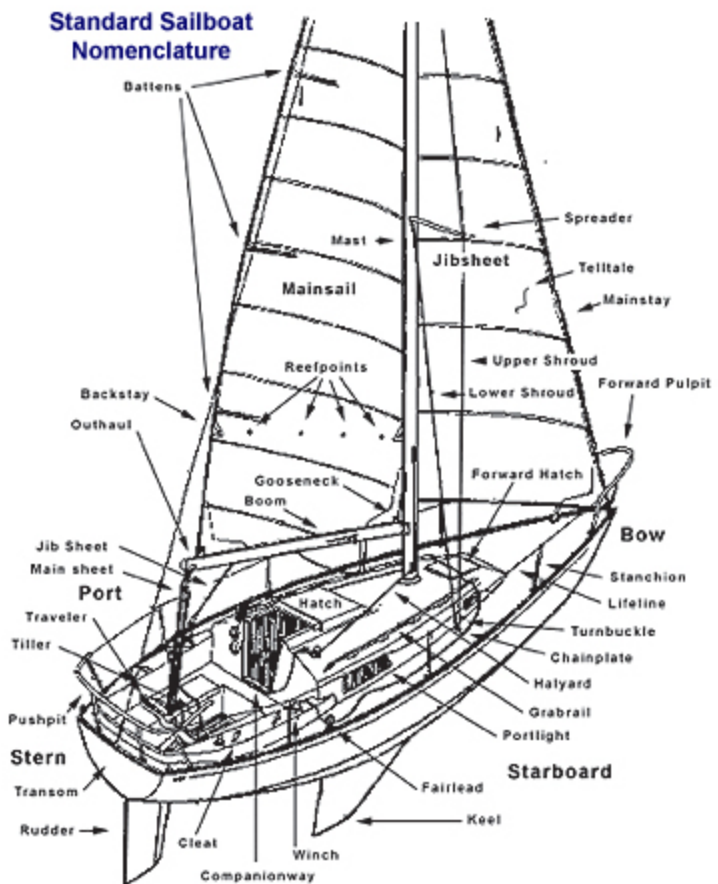
Many of us live on our boats year-round. We do not put toilet paper in the heads. If you do, it will clog the head. Then you and/or the captain will be in the tiny hot closet disassembling the head and cleaning out the hoses by hand. **DON'T PUT PAPER IN THE HEAD!!!** If you do, you have no one to blame for your misery but yourself.

Rope and lines

Rope is the term used only for raw material; once a section of rope is designated for a particular purpose on a vessel, it generally is called a line, as in outhaul line or dock line. A very thick line is considered a cable. Lines that are attached to sails to control their shapes are called sheets, as in mainsheet (line that controls the mainsail) or spinnaker sheets.

Lines (generally steel cables) that support masts are stationary and are collectively known as a vessel's standing rigging, and individually as shrouds or stays (the stay running forward from a mast to the bow is called the **forestay** or **headstay**).

Moveable lines that control sails or other equipment are known collectively as a vessel's **running rigging**. Lines that raise sails are called **halyards** while those that strike them are called **downhauls** or **cunningham**. Lines that adjust (trim) the sails are called **sheets**. These are often referred to using the name of the sail they control (such as main sheet, or jib sheet). Sail trim may also be controlled with smaller lines attached to the forward section of a boom; such a line is called a **vang**. Lines used to tie a boat up when alongside a dock are called **dock lines**. Some lines are referred to as ropes: A bell rope (to ring the bell), a **bolt rope** (attached to the edge of a sail for extra strength). A rode is what keeps an anchor attached to the boat when the anchor is in use. It may be chain, rope, or a combination of the two.



Standard Sailing Plans



Sloop: A Bermuda or gaff mainsail lifted by a single mast with a single jib bent onto the forestay. The mainsail is managed with a spar on the underside called a “boom.” One of the best-performing rigs, it is the fastest for upwind passages. It is by far the most popular for recreational boating because of its simplicity and potential for high performance. On small boats, it is a very simple rig. On larger sloops, the large sails have high loads, and one must manage them with winches or multiple purchase block-and-tackles.



Cutter: Like a sloop with two jibs in front. Better than a sloop for light winds. It's easier to manage, too. But, it has slightly less upwind ability than a sloop because it has more windage.

forward of
more
shorter
Generally,



Ketch: Like a yawl, but the mizzenmast is often much larger and is located the rudder post. The purpose of the mizzen is to make the sails smaller and manageable than they would be on a sloop with the same sail area. The masts also reduce the amount of ballast needed to keep the boat upright. The rig is safer and less prone to broaching or capsizing than a comparable sloop, and has more flexibility in sail plan when reducing sail under adverse conditions. The ketch is a classic small cargo boat.



Schooner: A two-masted gaff-rig. It mounts jibs and staysails, and often little triangular topsails. One of the easiest types to sail, but it goes poorly upwind without the topsails. The extra sails and ease of the gaff sails make it easier to operate, though not necessarily faster, than a sloop on all points of sail other than upwind. Schooners were more popular than sloops prior to the upsurge in recreational boating. The better performance of the sloop upwind was outweighed for most sailors by the better performance of the schooner at all other, more comfortable, points of sail. Advances in design and equipment over the last hundred years has diminished the advantages of the schooner rig. Most schooners sailing today are either reproductions or replicas of famous schooners of old.

Knots

Knots are one of the most important things a sailor needs to know, although only a few knots are required. One, in particular, is vital. The bowline is the absolute essential knot. You could get away with knowing only this knot. If you also know how to tie a clove hitch and a roundturn and two half hitches, you will easily be able to cope with all of the knot requirements on a boat.

Sailing terminology

Sailors use many traditional nautical terms for the parts of or directions on a vessel.

Starboard: right

Port: left

Forward or fore: front

Aft: rearward

Bow: forward part of the hull

Stern: aft part of the hull

Beam: the widest part

Masts: vertical spars

Booms: horizontal spars (if they can hit you)

Other important terms:

Walls are called **bulkheads**, while the surfaces referred to as ceilings on land are called **overheads**. Floors are called **soles** or **decks**. The toilet is traditionally called the **head**, and the kitchen is the **galley**. Lines are rarely tied off, they are almost always **made fast**.

Sailing Glossary

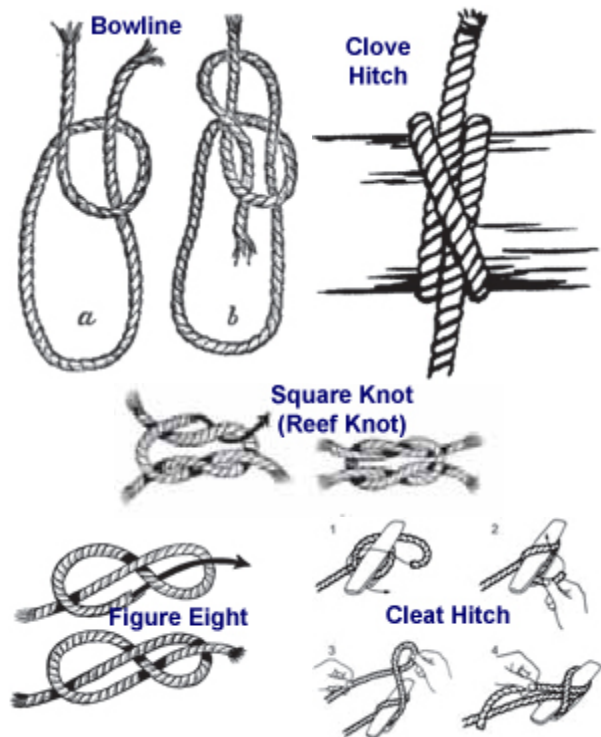
Abeam: At right angles to, or beside the boat

Aboard: On or in the boat

Aft: Toward the stern

Aground: When the hull or keel is against the ground

Anchor: An object designed to grip the ground, under a body of water, to hold the boat in a selected area



Apparent wind: The direction of the wind as is relative to the speed and direction of the boat **Astern:** Behind the boat

Backstay: A wire that runs from the top of the mast to the stern

Ballast: Weight in the lower portion of a boat, used to add stability

Beam: The width of the boat at its widest

Beam reach: A point of sail where the boat is sailing at a right angle to the wind

Bearing: A compass direction from one point to another

Bilge: The lowest part of a boat, designed to collect water that enters the boat

Block: A pulley

Boat hook: A device designed to catch a line when coming alongside a pier or mooring

Boom: The horizontal spar which the foot of a sail is attached to

Boom vang: A line that adjusts downward tension on the boom

Bow: The front of the boat

Bowsprit: A spar extending forward from the bow

Breast line: A docking line going at approximately a right angle from the boat to the dock

Broad reach: A point of sail where the boat is sailing away from the wind, but not directly downwind

Buoy: An anchored float marking a position or for use as a mooring

Can: A kind of navigation buoy

Cast off: To release lines holding a boat to shore or mooring, to release sheets

Chainplates: Metal plates bolted to the boat which standing rigging is attached to

Chock: A guide for an anchor, mooring, or docking line, attached to the deck

Cleat: A fitting used to secure a line to

Clew: The lower aft corner of a sail

Close hauled: A point of sail where the boat is sailing as close to the wind as possible

Close reach: A point of sail where the boat is sailing towards the wind but is not close hauled

Cockpit: The area, below deck level, that is somewhat more protected than the open deck, from which the tiller or wheel is handled

Downhaul: A line, attached to the tack, that adjusts tension in the sail

Draft: The depth of the boat at its lowest point, also the depth or fullness of the sail

Drift: The leeway, or movement of the boat, when not under power, or when being pushed sideways while under power

Ease: To loosen or let out

Fall off: To change direction so as to point farther away from where the wind is coming from

Foot: The bottom part of a sail

Foresail: The jib

Fouled: Entangled or clogged

Genoa : A large foresail that overlaps the mainsail

Ground tackle: The anchor, chain, and rode

Gunwale: The railing of the boat at deck level

Halyard: The line used to raise and lower the sail

Hard alee: The command given to inform the crew that the helm is being turned quickly to leeward, turning the boat windward

Head: Top of the sail

Headsail: A sail forward of the mast, a foresail

Headstay: A wire support line from the mast to the bow

Helm: The tiller or wheel, and surrounding area

Helmsman: The member of the crew responsible for steering

Heel: The leeward lean of the boat caused by the wind's action on the sails

In irons: Having turned onto the wind or lost the wind, stuck, and unable to make headway

Jib: A foresail, a triangle-shaped sail forward of the mast

Jibe: A change of tack while going downwind

Keel: A fin down the centerline of the bottom of the hull

Ketch: A two-masted ship with a small mast mounted forward of the rudder post

Knot: A unit of speed (one knot equals 6,076 feet per hour)

Lanyard: A line attached to any small object for the purpose of securing the object

Lazarette: Spaces below the deck that are designed for storage

Leech: The back edge of a sail

Leeward: Downwind

Lifeline: A cable fence that surrounds the deck to assist in the prevention of crew falling overboard

Line: Rope or cordage

List: The leaning of a boat to the side because of excess weight on that side

Luff: The front edge of a sail, and the flapping in the wind of the front of the sail (luffing)

Mainsheet: The line that controls the boom

Mizzen: The shorter mast behind the main mast on a ketch or yawl

Nun: A kind of navigational buoy

Pinch: To sail as close as possible toward the wind

Point: To turn closer toward the wind (point up)

Port: The left side of the boat

Port tack: Sailing with the wind coming from the port side, with the boom on the starboard side

Privileged vessel: The ship with the right of way

Reach: Sailing with a beam wind

Ready about: Prepare to come about

Rigging: The standing rigging is the mast and support lines; running rigging is the lines with which you adjust the sails

Rode: The line and chain that connect the anchor to the boat

Rudder: A fin under the stern of the boat used in steering

Running: A point of sail, going directly downwind

Sheave: The wheel of a block pulley

Sheet: A line used to control the sail

Shrouds: Support wires for the mast

Spreaders: Struts used to hold the shrouds away from the mast

Spring line: Docking lines that keep the boat from drifting forward and back

Starboard: The right side of the boat

Starboard tack: A course with the wind coming from starboard and the boom on the port side

Stern: The back of the boat

Tack: The front, lower corner of the sail; also course with the wind coming from the side of the boat; also to change course by turning into the wind so that the wind comes from the other side of the boat

Topping lift: A line that holds up the boom when it is not being used; also the line that controls the height of a spinnaker pole

Transom: The back, outer part of the stern

Trim: To adjust the sails, also the position of the sails

Wake: The swell caused by a boat passing through water

Winch: A metal drum-shaped device used to assist in trimming sails

Windward: Upwind

Please do not over-pack as space is limited on board

BRING

- 1 Set Field or Activity uniforms
- 2 T-shirts
- Lightweight rain gear (optional)
- Sunglasses with strap (Polarized are best)
- 1 pair walking shoes for Ocracoke
- 1 pair of inexpensive water shoes
- 16 oz of non-oily, non-aerosol, waterproof, SPF 50+ sunscreen lotion
- 1 pair of shorts
- Pants, long-sleeve shirt & light jacket (December & Spring)
- Toiletry kit
- Wide brimmed hat
- 1-2 pair of Socks
- Large-mouth water bottle with plastic clip, (If you like coffee, a mug in addition is good)
- One sheet or light blanket (summer) or warm blanket or a sleeping bag (winter and spring)
- Sleeping pad – Backpacking type
- 1 Swimsuit (modest style)
- 1 towel and a small pillow
- Insect repellent
- Prescription Medication
- Proof of age/photo ID
- Copy of Medical Insurance information

DO NOT BRING

- MP3/iPod/video game player
- Fireworks
- Skateboards

OPTIONAL ITEMS

- Hammock
- Fishing Equipment
- Camera (waterproof if possible)
- Personal snorkel gear
- Extra money (\$100-\$125)
- Bonine® (for seasickness)