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HEAVING TO AND FOREREACHING:

Mastering these key boathandling techniques makes sailing safer – and more fun

by

Beth A. Leonard

The 39-foot, Bob Perry-designed cutter, *Isalei-Rua*, bounded over the white-crested waves in King George Sound, the large outer harbor of the small city of Albany on the southwest corner of Australia. With a single reef in the main and the motor, she was making good between 4 and 5 knots close-hauled into 25 knots of breeze. I found the hum of the wind in the rigging and the occasional rush of water down the decks exhilarating, but I didn't think her owners felt the same. Bob's hands looked relaxed enough on the wheel, but he wasn't smiling. The muscles in Jacquie's jaw were tight, and her hand was white-knuckled on the binnacle.

After several years of preparation, Bob and Jacquie Donovan had just embarked on the cruising life. My partner, Evans Starzinger, and I had been talking with them about storm tactics a few days before, and they said they'd like to learn how to heave to on *Isalei-Rua*. Now we had enough wind to give it a try, so we were heading out into open water to see how the boat behaved. With her cutaway forefoot, modified fin keel and skeg hung rudder, we expected she would respond like Perry's Valiant design and heave to quite easily.

FOREREACHING VERSUS HEAVING TO

Five miles out from the harbor entrance, Evans leaned forward and said something to Bob. Bob throttled back and cut the engine. Under the reefed mainsail, the boat slowed gradually. Bob kept the helm centered, and after a few minutes *Isalei-Rua* ended up at a 45 degree angle to the wind, moving forward at between one and two knots. She would slowly come up to the wind until the mainsail stalled and started to luff, bringing her almost to a halt. She'd fall off ten or fifteen degrees and start sailing again, building up speed until she got to two knots. Then she would work back up into the wind until the mainsail stalled. And so she went at a slow jog across the water, weaving back and forth.

As she bled off speed, waves stopped washing down the decks, and spray stopped flying over the coachroof. Everything got quieter and calmer, and the motion became easy and slow, like a rocking horse. Jacquie's grip relaxed on the binnacle, and Bob smiled. "This is forereaching," Evans said. "You're jogging along to windward, not making much forward progress, but not going sideways either. You can see you still have a small wake behind the boat. Now let's try heaving to."

We raised their staysail, which completely filled the inner foretriangle. With the additional sail sheeted in, *Isalei-Rua* dropped her shoulder and took off like a freight train, driving through the waves and then crashing down with a shudder. "Okay," I said. "Turn her through the wind but don't release the staysail sheet." Bob spun the wheel and *Isalei-Rua* checked and started to come up into the wind. The tightly sheeted main luffed and then filled on the other side. The staysail tried to follow, but the sheet restrained it. The headsail shivered and then backed as Bob centered the wheel. *Isalei-Rua* coasted to a slow stop, her head about 45 degrees off the wind, her angle of heel reduced from more than 30 degrees to about 15. Evans played with the helm, eventually

locking it off about a quarter of a turn to windward. Though the boat still took the seas on her starboard bow, the GPS showed us slipping through the water at almost a ninety-degree angle to the wind.

All of the noises that accompany a boat making her way to windward in a stiff breeze died away, and *Isalei-Rua* sat like a contented seagull gently riding the waves. As when we were forereaching, the boat jogged up until the mainsail stalled and then fell off. But the backed jib prevented her from getting any forward momentum, and the motion was only noticeable when I concentrated on it. The wind carved spume-flecked furrows in the wave tops, but these ended along with the waves at a patch of smooth water extending about ten feet out from the windward side of the boat. I pointed this out to Bob and Jacquie. “That’s the slick. See, it’s sort of a wake, created by the drift of the boat to leeward. That’s how you know you’re really hove to.”

THE MECHANICS OF HEAVING TO AND FOREREACHING

An indispensable storm tactic, heaving to can be viewed as the equivalent of pulling on a handbrake in a car. It slows everything down and allows crews to enjoy a lovely picnic lunch on a summer afternoon a few miles from shore, make a repair to a sail while on passage, or take a time-out to look over an unfamiliar harbor entrance or talk over a boat handling decision. Forereaching can be considered a variation on the theme for boats with modern underbodies.

Most boats forereach quite comfortably under just a mainsail, so it’s easiest to start with this tactic when experimenting with your own boat. Generally speaking, you can forereach on one less reef than you would use for sailing in the given conditions. To forereach, the main should be sheeted to the centerline and the helm locked in position to hold the boat close-hauled. Start by locking the helm amidships and see what happens. If the boat falls off to a broad angle and just keeps sailing, you need to turn the helm more to windward. If it gets in irons or tacks through, you need to turn the helm a bit to leeward. You’re forereaching when the boat jogs up to windward, the sail starts to stall, and the boat falls off to leeward and starts sailing again. In addition to slowing things down, forereaching is a perfectly acceptable storm tactic so long as the waves are not breaking. We have forereached under a deeply reefed main on our 47-foot aluminum sloop, *Hawk*, into very large but well-spaced and not breaking seas for thirty-six hours in winds gusting over 50 knots in the Southern Ocean. But the few times we have been in breaking seas, we have always switched to another tactic (see sidebar, “Breaking waves”).

Heaving-to means setting up the sails and the rudder so that they oppose one another and the boat stops making headway. In the textbook case, the boat will ride with the wind and waves forty to sixty degrees off her bow and slide slowly to leeward creating a slick that causes waves to break before they reach the boat. As with forereaching, boats tend to jog up to windward, fall off, and then jog up again, making little headway and a fair amount of leeway. Exactly how much time the boat spends making headway versus leeway depends upon the hull configuration, the rig, the center of effort, and the size and shape of the waves, among other factors. A traditional full-keeled boat will normally make a knot of leeway and almost no headway; modified fin-keel boats with skeg hung rudders may make up to two knots of leeway. Most fin-keeled boats will continue to make headway, and are thus not technically hove to. Instead, they will forereach, making a knot or two of headway and less than a knot of leeway.

Different boats require different sail combinations and rudder angles to achieve a hove-to position, and the same boat will require different amounts of sail and rudder angle to heave to in different wind speeds and wave conditions. In gale force winds, many heavy displacement

cutters and sloops with traditional underbodies will heave to under a single- or double-reefed main sheeted in to the centerline, a backed headsail sized to between two-thirds and three-quarters of the foretriangle, and the helm lashed within a quarter turn of the centerline. In storm force winds, many traditional boats will heave to under just a storm trysail with no headsail at all.

Our first boat, the Shannon 37 ketch, *Silk*, had a centerboard in a modified fin keel and a skeg-hung rudder. Like most ketches with full-sized mizzens and traditional underbodies, she hove-to on the mizzen alone without a backed headsail. We used the full mizzen in gale force winds, and put in a reef at around 40 knots depending upon the wave state. With the helm locked on the centerline, we would adjust the mizzen sheet so the boat sat 45 to 50 degrees to the wind. We then fixed the mizzen boom in position with a vang from the end of the boom to a stanchion base. *Silk* would drift at about a knot and a half dead downwind. Yawls and ketches with small mizzen sails lack the sail area aft to keep them up into the wind in all but the most extreme conditions. They heave to best if treated like cutters or sloops.

To experiment with heaving to on your own boat, go out on a breezy day with at least 25 knots of wind. Reef the main so the boat is comfortable in the conditions, and then size the jib to between 80 and 100 percent of the foretriangle. Turn the boat through the wind, but do not release the jib sheet. Lock the rudder in a position that holds the boat's head 40-60 degrees off the apparent wind. Adjust the size of the sails if necessary: too little sail overall will prevent you from getting the boat's head up even with the helm hard to windward; too much headsail will cause the boat to fall off beam to the wind in any lulls; too much mainsail will bring the boat too close to the wind or even allow it to tack through in any gusts.

When the boat has bled off speed, use a GPS to determine the actual direction of drift, and check the boat's wake to see if you are making any headway or just leeway. Adjust the sails and rudder again, and see if you can stop all forward motion and make only leeway. If you can do that, you will be properly hove to, and if the wind is strong enough you should be able to see the slick to windward. Many experienced open-ocean sailors believe the slick protects the boat in extreme conditions with large breaking waves or cross-seas by forcing the seas to break before they reach the boat.

On a fin-keel racing boat with a spade rudder, you may only be able to slow the boat down so that you are forereaching at a couple of knots. Full-keeled, heavy displacement boats stall out forty degrees to the wind, giving them an 80-degree window within which they'll make no headway. But *Hawk*, with her fin-keel and spade rudder, will still have some forward momentum as close as 20 degrees to the apparent wind, so the window within which we can heave to is much smaller. A slight change in wind angle or a wave that knocks her bow off will have *Hawk* sailing again. Friends of ours on racier cruising boats have had the same experience. If they manage to get the boat to stop, the situation is not stable and has to be monitored constantly.

The leeway a boat makes while hove-to means that you do need sea room – a couple hundred feet if you're just stopping for a few minutes to take stock, a couple of miles if you're enjoying lunch with a few bottles of wine. Offshore in gale conditions you need a lot more room – most boats will drift between twenty and fifty miles to leeward every twenty-four hours.

If your headsail sheets outside of your stays, or if you have a staysail stay, the sheet or the sail will likely be chafing on something. While this is no problem for an hour or so, if you may heave to at sea for long periods of time you will need to experiment with ways to eliminate the chafe. The easiest solution is to use a staysail or storm jib sized to sheet inside the lifelines and shrouds.

Other solutions include rigging a short sheet that runs inboard from the clew to the sheet winches or using a snatch block to hold the sheet off the lifeline or shrouds.

Because most boats will forereach under just a reefed mainsail without a headsail, chafe is not normally a problem with this tactic. Also, when forereaching you don't need to worry nearly as much about leeway as when heaving to. Forereaching allows you to continue to make slow miles toward your destination without beating up the boat or yourself. But forereaching does not reduce the boat's motion as much as heaving to, and in extreme conditions the boat will not be protected by a slick as it will if the boat can be properly hove-to making only leeway. If you're in extreme conditions, trying to stop the boat completely, or need a stable platform to make a meal or fix something on deck, heaving to will be a better tactic. But if you're just trying to slow the boat down and can't afford to make any leeway, forereaching makes more sense.

FINE-TUNING

Isalei-Rua lay quietly in the wind, drifting slowly to leeward. But Evans wasn't satisfied. "That sheet lead's a problem," he said, pointing to the staysail sheet. The staysail was large enough that it could not be sheeted inboard of the stays and lifelines, so when the sail was backed the sheet ran across both. "It wouldn't matter for an hour or so, but it will chafe through it you heave to overnight. Let's try your storm jib."

Bob dropped down below and returned with a small sail bag. I turned to Jacquie and said, "Let's drop the staysail and put up the storm jib." She hesitated, afraid to leave the cockpit. Then she shrugged and joined me. Bob handed me the storm jib and we worked our way up to the sidedeck. Despite the wind whipping the four-foot waves into a froth, the motion was gentle, and the decks were dry. Moving around the boat took almost no effort.

Jacquie released the halyard at the mast while I crouched behind the staysail stay. The backed sail fell in a neat pile at the bottom of the stay, and I had no problem flaking it neatly despite the strong wind. "We often heave to just to do a headsail change," I told her. "It keeps the foredeck person dry and makes it much less likely someone will go overboard." She helped me roll the sail into a bundle and get it back in its bag, then I hanked on the storm jib. Evans and Bob had reefed the sheets inboard of the stays, and we tied them to the clew. Then we raised the sail, and once it was up Evans sheeted the windward sheet in until it was backed just as the staysail had been. The sheet led cleanly without chafing on anything. "This is the sail you'd really want to use if you were heaving to in a storm at sea," Evans said. "In stronger winds you'd probably need to take another reef in the main to balance out the sail plan."

As we turned back toward the harbor entrance, Jacquie and I dropped the storm jib and Evans eased the main. Soon we were flying from wave to wave, the bright sunshine finally warming us as the apparent wind speed dropped. It would take a lot more practice in a variety of conditions before Bob and Jacquie would know instinctively how to heave to on *Isalei-Rua*. But I could tell that they had gained a good deal of confidence in the boat and themselves in one short outing.

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Sidebar to "Heaving to and Forereaching":
BREAKING WAVES

Waves, not wind, do most of the damage to boats during storms at sea. But there is a big difference between normal ocean waves, even very large ones, and what are called “breaking waves.” Waves with whitecaps or with cresting foam and whitewater on top are not breaking waves and do not generally constitute a danger to a well-found boat. Breaking waves normally develop only when something opposes the movement of the wind driven waves. A strong ocean current like the Gulf Stream or the Agulhas current running counter to the prevailing waves or shoaling water along the edge of a continental shelf can cause storm-driven waves to rise up like combers running onto a beach. As they get higher and steeper, the crest of the wave becomes unstable and begins to collapse down its face, just as happens with a surfing wave. People who have experienced them have compared the wave faces to huge, moving waterfalls and described the breaking waves as rolling, tumbling avalanches of water.

To get some idea of the magnitude of the forces in a breaking wave, consider that every cubic yard of water weighs more than one ton. A breaking wave may contain several hundred tons of water moving at speeds of up to 30 knots. In the collapsing front of the wave, those forces will be twisting and turning. Most classic stories of boats being pitchpoled or rolled, like when the *Smeeton* got pitchpoled in *Tzu Hang* on their first attempt to round Cape Horn, are generally attributed to breaking waves.

Breaking waves are mercifully rare. They are unmistakable when experienced and cannot easily be confused with large, regular, cresting seas. We have been in breaking waves only twice in our 75,000 nautical miles and both were avoidable. Experts disagree on what tactics will best protect the boat in these conditions. In both cases, we ran off towing a drogue. Some very experienced sailors argue that the slick created by heaving to will cause the waves to break before they reach the boat. While we might consider heaving to in a boat that did so well, we would never choose to forereach into breaking waves.