Using Sonar for Navigation - Part Two

By Steve Dashew

In a previous article we wrote about using SONAR for navigation and discussed the learning curve during sea trials with our Furuno CH270 "search light" SONAR. Well, it is one thing to use this gear where there are accurate charts so you have a frame of reference, and quite another where the charts are non existent, or significantly inaccurate, as in much of Baja California and the Sea of Cortez.

Marina Coral

Our first serious use of our Furuno SONAR came as we entered Marina Coral, just north of Ensenada, Mexico. We were here to clear in with the various Mexican officials and to buy fuel.

There is no indication of this new harbor on the charts, but we picked up the image above at Google Earth so at least we had a feel for the harbor arrangement. The marina office had assured us the entrance was wide and deep, and at half tide we would have "no problem" with our five foot (1.5m) draft. As we rarely rely on local "knowledge" in the absence of SONAR we would have launched the dinghy to sound out the entrance.

Here is the view from the bridge of *Wind Horse*, our 83 foot (25.4m) motor yacht. The images from the Furuno CH270 SONAR and 2117 RADAR are at the bottom of the photo. This will begin to give you an idea of just how narrow an entrance this is.

The RADAR is set to minimum scale, 1/8th of a nautical mile, and each range ring represents 150 feet (45m). The SONAR is on a scale of 300 feet (90m) forward.

In this close up of the two screens you can get a real feel for how the SONAR (on the left) works. We easily confirm the breakwater edges and that there is plenty of water on each side and ahead directly ahead of us.

"Why not go with just the RADAR?" you might ask. If we trusted the entrance depths this would make sense. But if some of the breakwater rock had been rolled into the entrance by seas (which happens occasionally) or the entrance had shoaled, we'd end up with a visit to the ship yard.

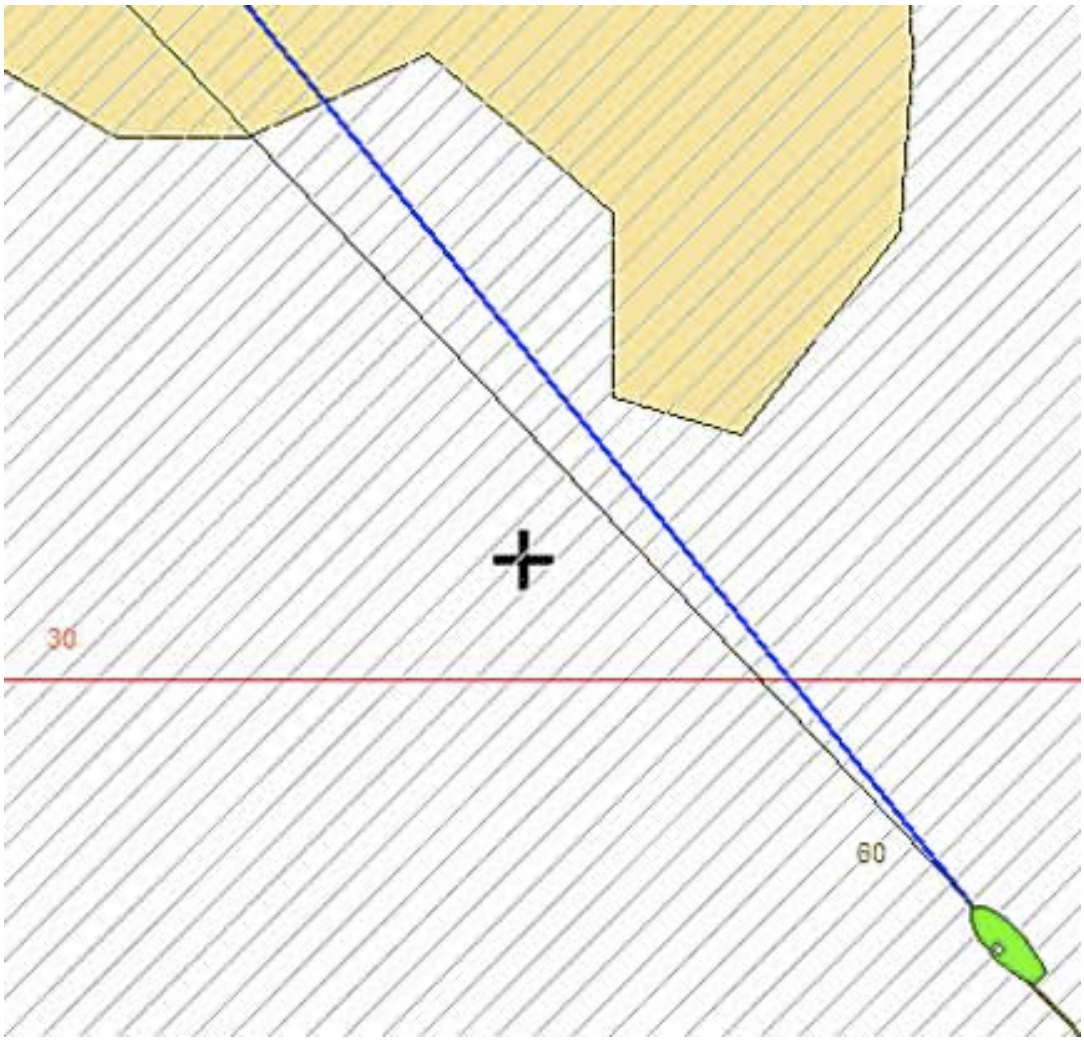
If you are heading south into Mexico Marina Coral makes a good first stop. They will walk you through the check in paperwork dance (now much easier with all the offices located in one building), and it is a good place to buy diesel. That is *Wind Horse* on the fuel dock.

We fueled up going south and returning. The diesel was clean, and the amount we were charged for filling our tanks tallied with what we thought we would need. The price at the end of February, 2007, was US$2.17 per US gallon. The next day in San Diego the price was seventy-five cents per gallon more.

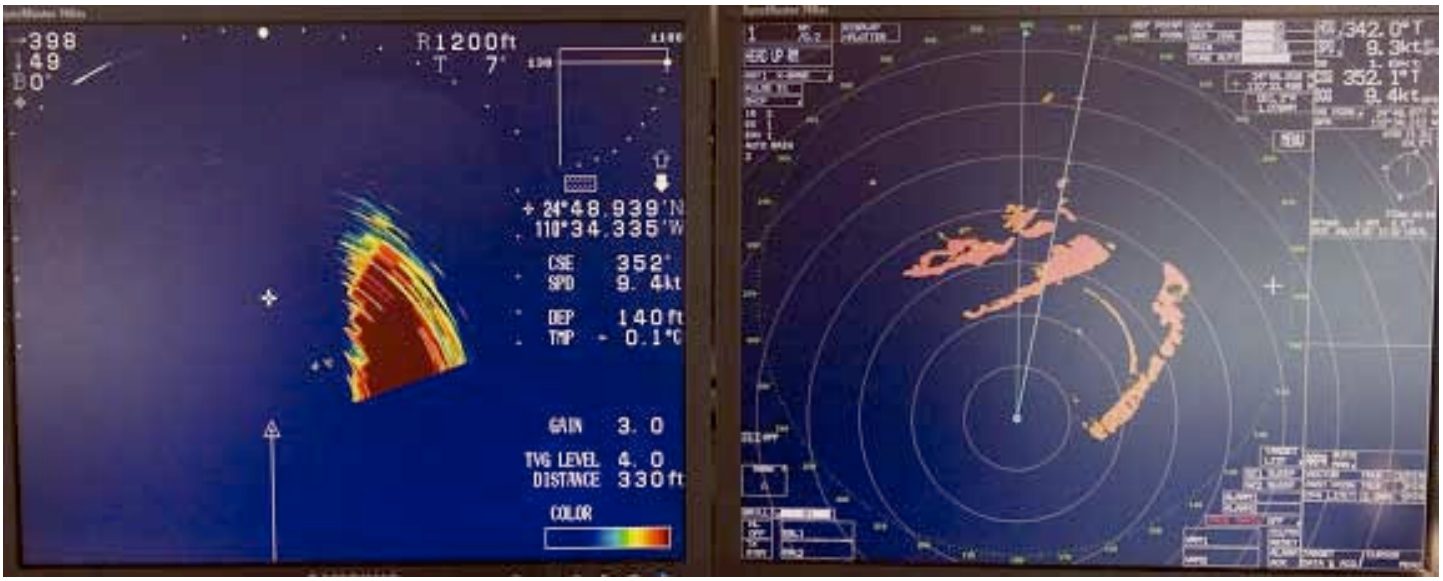
Isla San Francisco

Here is another example from this trip to Mexico. It has been fifteen years since we explored the Sea of Cortez and in that time frame we've come to appreciate GPS and electronic charting. The only problem is that for this area is that the actual position of what you are looking at tends to be off a quarter-to a-half-a mile from its charted position. And the soundings are suspect, with numerous rocks missing from the official charts.

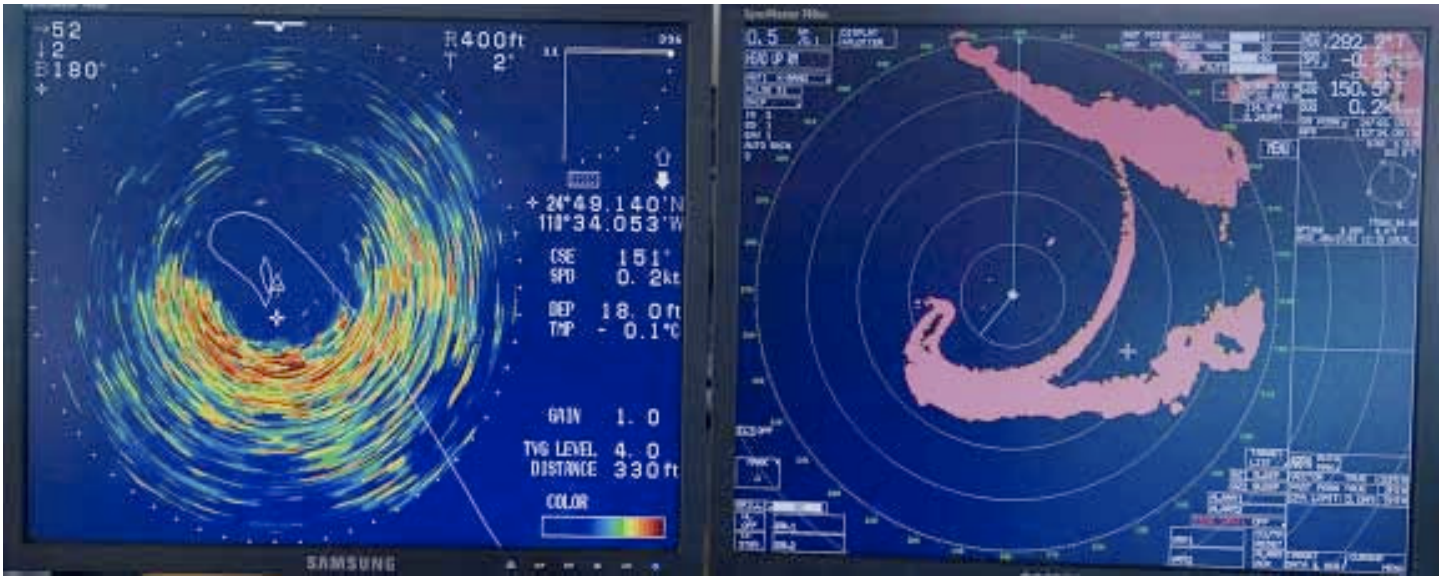
Isla San Francisco in the Sea of Cortez is a lovely spot to hang out when the weather is settled. The Google image (above) shows us a bit more than the paper and electronic charts. The overall shape is there, but of course without soundings.



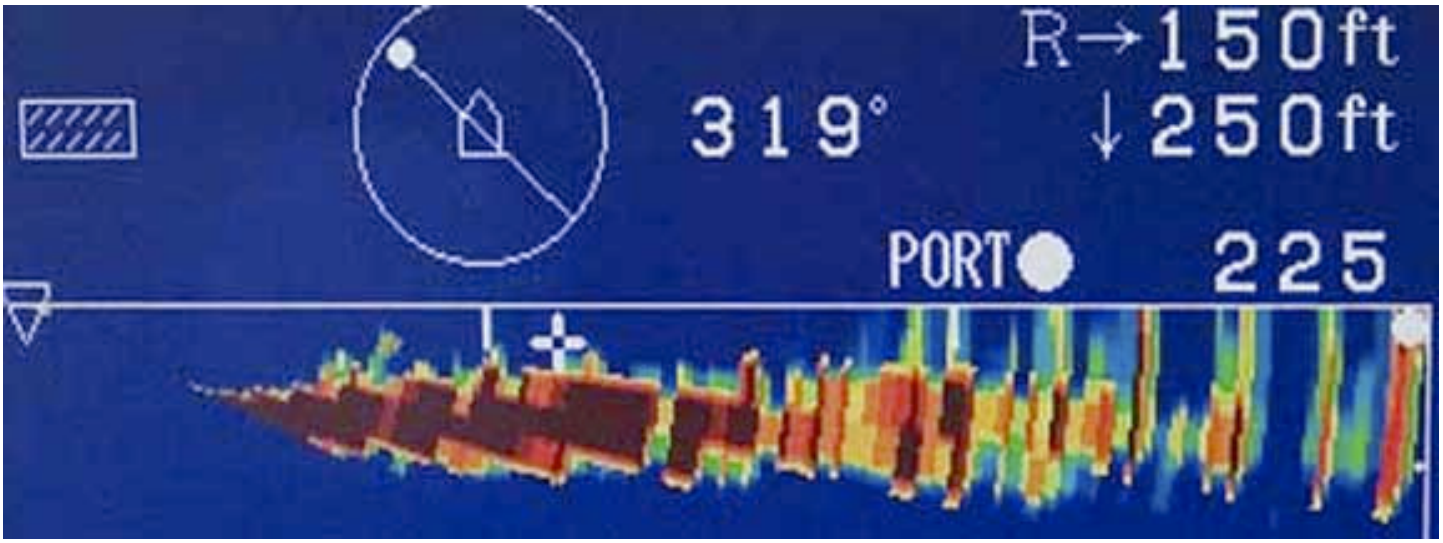
This is the vector chart detail of the approach (US DMA charts are no better).



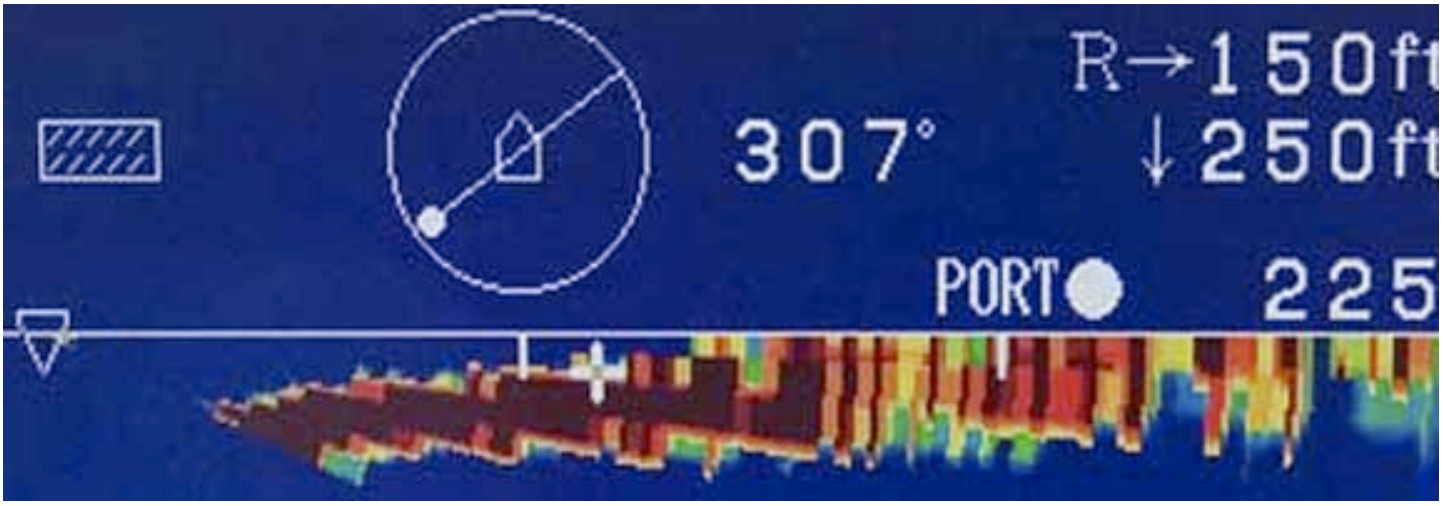
Putting the SONAR to work, here we are closing with the anchorage from the south. The SONAR (image above and left) is showing a clear path ahead, but there is something near the surface off our starboard bow (the dense red image). The RADAR screen on the right will put this into perspective. If you refer back to the Google image, you can see the hooked reef which is attached to the southern end of the island. That is giving us the SONAR return. Notice that this reef *does not show up* on radar as it is below the surface at high tide and it is also missing from the chart.



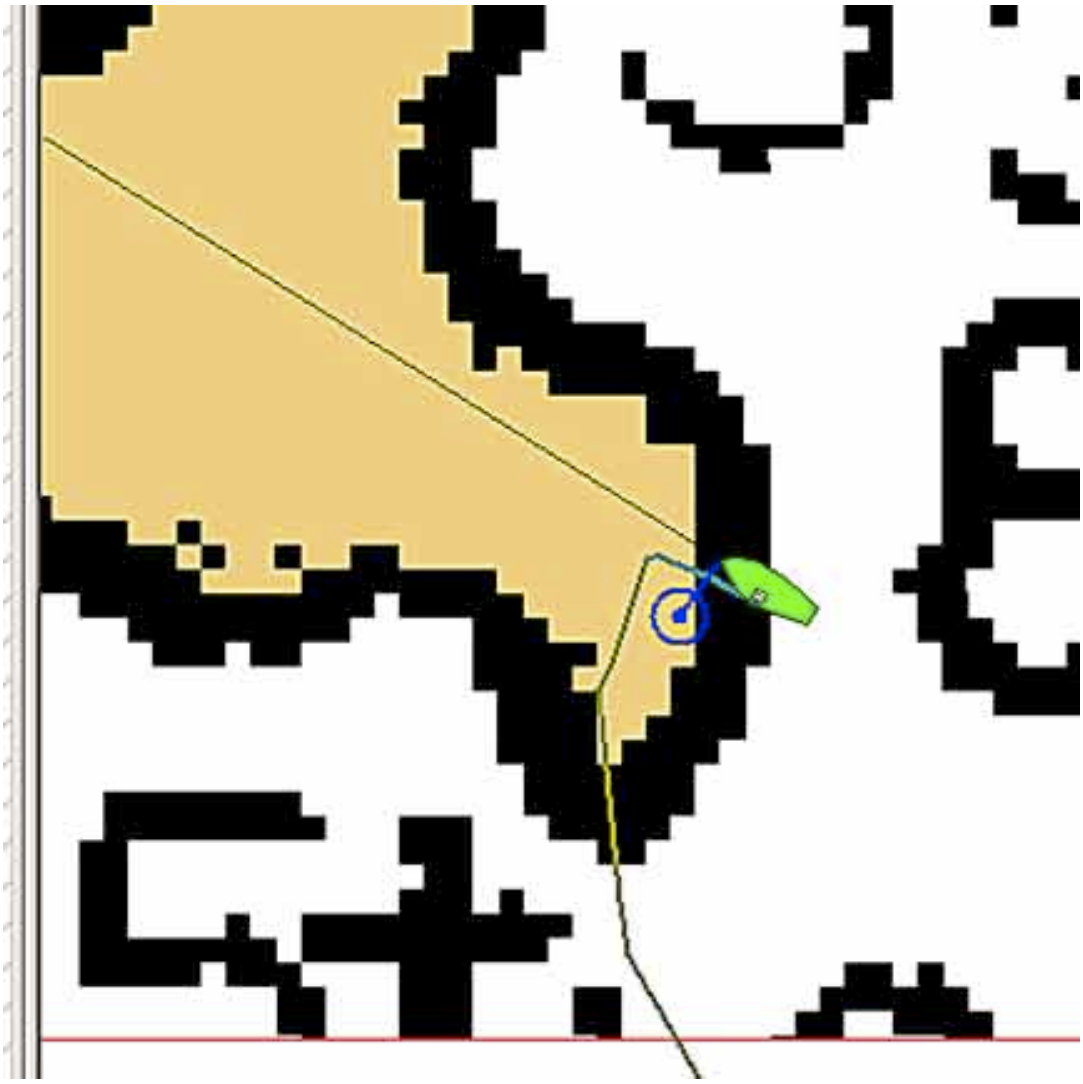
Now we have worked into the anchorage. The boat is facing north and you can see the reef to port and the beach behind us in both SONAR and RADAR (the reef shows up from this side). The SONAR is being operated in horizontal mode in this and the previous photos.



With the hook down we want to take a good check around us for bottom obstructions, so we switch to the vertical SONAR image. This vertical slice through the water is looking 30 degrees to port, towards open water. The image shows a slight increase in depth (the downward slope) and no obstructions. The boat is represented by the inverted triangle to the left.



Here we are looking through the aft port quarter at an angle of 120 degrees off the bow. About half way across from the right side of the image you see the bottom come up in a solid mass. That is the reef.



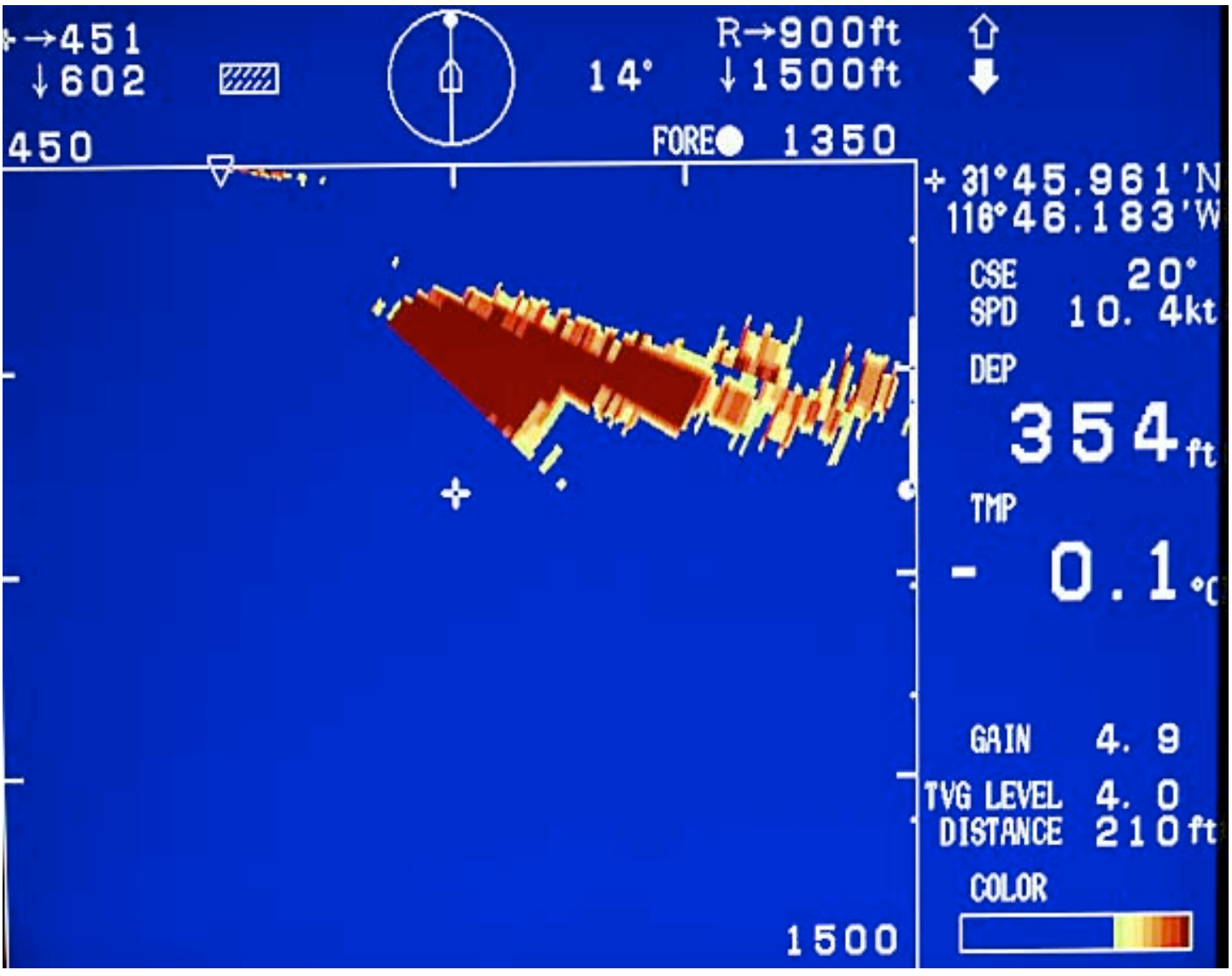
And the official US DMA chart of Isla San Francisco? Not a lot of detail as previously mentioned with the island off its charted position by a quarter of a mile.

Isla Carmen

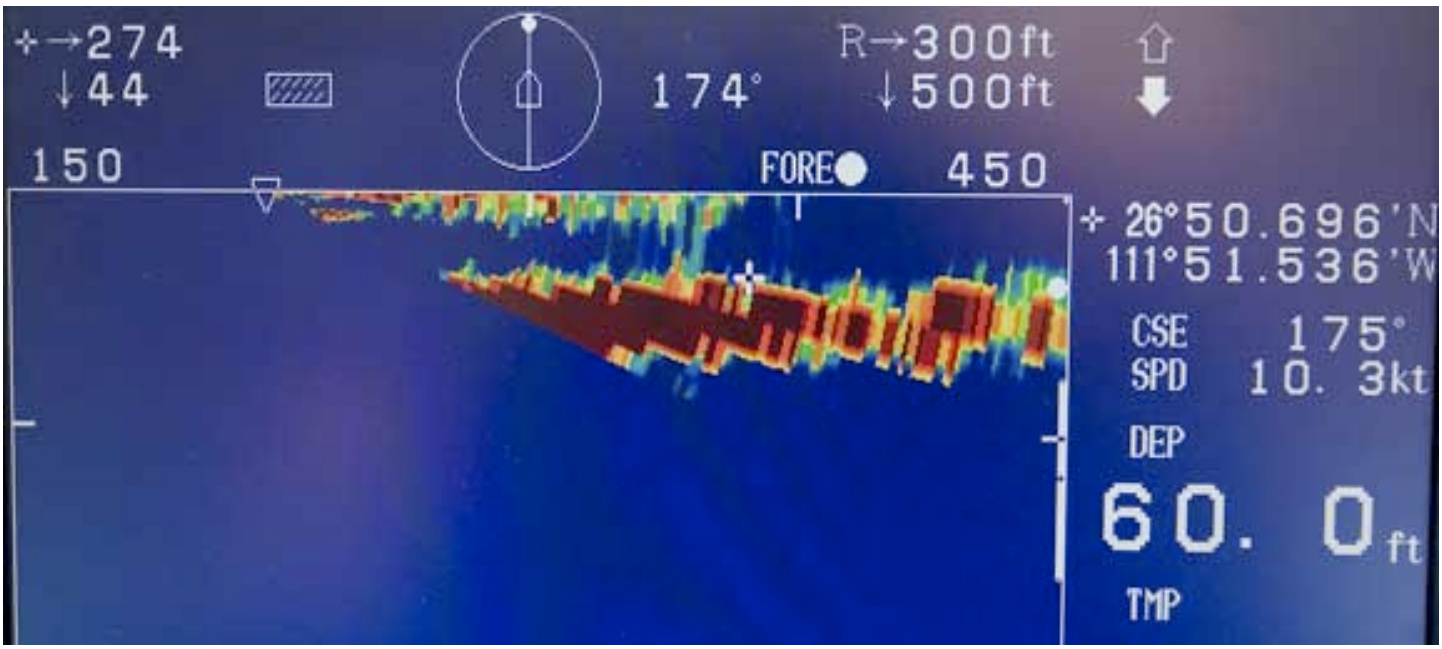
One more example from a little further north in the Sea of Cortez, this time Ballandra Bay on Isla Carmen, across from the town of Loreto. The photo above is looking right into the entrance to the anchorage. We know from previous visits that the entrance is deep in the center, but that there are reefs projecting out from the edges.

The SONAR here is on a 600 foot (180m) range while the RADAR is on half mile range, with each range ring equal to roughly 600 feet (180m). We are between the headlands which form the entrance to Ballandra Bay. You can see the reef on both sides of the SONAR image, much closer to us than the land mass indicated by RADAR.

The hook is down, set in the middle of the anchorage. SONAR range is at 500 feet (153m) and RADAR at a quarter of a mile (RADAR range rings are equal to roughly 300 feet -90m). Before SONAR we'd spend a while nosing back and forth with the depth finder, looking for obstructions on the bottom before dropping the anchor. SONAR is more thorough, faster, and easier.



We have been experimenting with using the SONAR when cruising coastwise, looking well ahead for changes in the bottom, which might signal a problem. The major concern here is update time as at our eleven knot cruising speed we are traveling at 19 feet per (5.8 meters) per second. The further out range is set, the slower the update period, but the more warning we get. The width of the SONAR beam also affects update time. What we like best so far is using vertical mode, with a relatively narrow angle of sweep. The photo above has bottom showing ahead 1350 feet (414 meters). You can see that the bottom is trending down. The water here is quite deep (354 feet/108 meters).



In this example water is just 60 feet (18 meters) deep and we've got range forward down at 450 feet (138 meters). The bottom depth is holding steady. The return at the surface is "sea clutter" from waves.

We're getting more comfortable with the SONAR and now feel that if we had to, we could navigate into situations like these using only SONAR - going very slowly of course. But our preference is to use SONAR as an *additional* navigational tool, practicing with it on an everyday basis so if an emergency does arise and we have to use SONAR as our *only* navigational system, we'll be prepared.

previous | highlights page