

HOLDING POWER

WE PUT THOUSANDS OF POUNDS OF FORCE ON 14 DIFFERENT ANCHORS TO SEE HOW WELL THEY WORK. SOME RESULTS MAY SURPRISE YOU

WHICH ANCHOR HOLDS BEST?

It should be a simple question. We've put a man on the moon and have decoded the human genome, so surely someone has designed the ideal anchor—one that sets quickly in all bottoms, steadfastly stays in place even in storm conditions, and reliably resets itself if the wind shifts dramatically. It should also be light enough for a couple to handle on a 35-to-40-foot boat and be easy to retrieve when the time comes. How hard could it be to design and build such a basic device? Harder than you think.

After three days of testing 14 different anchors in three different locations off Santa Cruz, California, Jeffery Moser from *Power & Motoryacht* magazine, Toby Hodges from *Yachting Monthly*, Chuck Hawley and several colleagues from West Marine, plus yours truly from SAIL confirmed what we all knew going in—that the effectiveness of any anchor is highly dependent on a long list of variables. Some variables (scope, anchor design, and weight) can be controlled; others (bottom surface, wind, and swell) can't. We also knew that the validity of our results depended on ensuring that all variables (apart from the design of the individual anchors) were kept as uniform as possible; all anchors were tested multiple times with identical scope in identical conditions. We tested in three different locations—on the west and east sides of Santa Cruz's wharf and off New Brighton Beach, near Capitola. The seas had just a hint of swell in all three locations, and the wind varied from flat calm to a maximum of 12 knots. We took bottom samples at each location with a weighted core sampler to determine the composition of the top 5 inches of the bottom surface. All three locations had a layer of fine dark sand on top of harder, finer, claylike sand. The New Brighton location appeared to have a thinner layer of sand and a harder layer of claylike sand than the two wharf locations.

BULWAGGA ::

THE OBJECTIVE ::

The goal of this test was to determine the performance characteristics of 14 anchors (on a hard sand bottom) deemed suitable by their manufacturers for a cruising sailboat in the 35-to-40-foot range. We judged performance on how quickly the anchor set, its holding power (as measured by a digital dynamometer attached to the rode and wired into a laptop computer, and whether it dragged (as determined by using visual ranges and precise GPS measurements). Our primary test scope was 5:1 in roughly 20 feet of water, but we also tested performance with scopes of 3:1 and 7:1.

Our primary goal was to learn the maximum holding power—and, more important, how each anchor acts before its maximum load is reached—in a specific test location and at a specific

scope that a cruiser on a 35-to-40-foot sailboat would actually use. Each anchor tested is available in a wide range of weights; we used the weight recommended for a 35-to-40 foot boat.

We were able to apply and accurately record how the anchors reacted to up to 5,000 pounds of load, thanks to the 52-foot, 92,000-pound research vessel *Shana Rae*, which we

chartered to do the pulling. Equipped with a 375-horsepower diesel engine and a 40-inch-diameter propeller, *Shana Rae* allowed us to apply more force on each anchor than it would ever experience in “normal conditions.” But we were looking for an anchor that could perform well beyond “normal conditions,” when anchor performance is most critical.

WHAT THE NUMBERS MEAN

We found that some of these anchors resisted pulls in excess of 5,000 pounds and that others broke out or dragged at considerably lower loads. Would such high loads actually be put on sailboat anchors in real life?

One indicator is the American Boat and Yacht Council (ABYC) table for different boat sizes and types that estimates the horizontal loads put on cleats in various wind strengths. Obviously an anchor should be able to cope with similar loads.

According to the ABYC the load on a 35-foot-LOA, 10-foot-beam boat is 255 pounds in 15 knots of wind; 900 pounds in 30 knots; 1,800 pounds in 42 knots; and 3,600 pounds in 60 knots. For a 40-footer, the figures are 300 pounds, 1,200 pounds, 2,400 pounds, 4,800 pounds; a 50-footer would require a storm anchor that could handle 6,400 pounds (go to sailmagazine.com for the complete table) of load.

The ABYC's figures are extremely conservative. Other authorities, including naval architect Robert Smith, who tested loadings on anchor rodes, suggest that the actual loads on an anchor could be as much as two-thirds less than the ABYC figures predict.

MAX
2,974 lbs
LOAD



WEIGHT: 28 LBS › PRICE: \$350
MELE COMPANIES › 888-674-4465
www.noteco.com/bulwagga

The concept behind the Bulwagga is fairly straightforward. Its three large flukes are designed to ensure that two flukes will always be properly aligned to dig into the bottom no matter how the anchor is oriented. The shank can pivot in the center of the anchor to help keep the load on the two working flukes equalized. In all of our test pulls the Bulwagga set quickly and held a maximum of 2,974 pounds of load before releasing abruptly (rather than dragging). We concluded that this anchor should be able to handle the load a 35-to-40-foot boat can exert on an anchor with a minimum of 5:1 scope; performance dropped off dramatically at 3:1. The overall results for the Bulwagga were good, but good luck trying to get it to sit neatly on your bow roller, and good luck trying to store it in a locker. Its unconventional shape makes it difficult to handle, and it can't be taken apart to be stored easily down below. That said, it comes as close to “throw it overboard, it's sure to catch something” as any of the anchors we tested. It would be a useful backup/kedge anchor, provided you have the necessary stowage space.

PHOTOS BY ABERN KINSMAN

CLAW ::

WEIGHT: 36 LBS › PRICE: \$99.99
LEWMAR INC. › 203-458-6200
www.lewmar.com

The Claw is Lewmar's version of the popular Bruce anchor that cruisers have been using for years. It stows easily in a bow roller, its one-piece construction is super-strong, and it is reportedly designed to be effective in a variety of seabeds. However, our test results came as a bit of a surprise: The maximum load we recorded for this anchor with 5:1 scope was 886 pounds. And that was only a short spike before the anchor released

completely. During most of the 5:1 pulls, it seemed to set and release rapidly without ever really catching. One pull showed it was slowly dragging under a load of about 300 pounds, but we were never able to say with certainty that the anchor had set. We recorded similar results with 7:1 scope. One idea we considered was that the Claw's flukes were simply not sharp enough to penetrate the harder claylike sand. The beach pull was also telling in that the Claw dug a much longer trench than other anchors that produced better results during the holding-power pulls.



MAX
886 lbs
LOAD

CQR ::

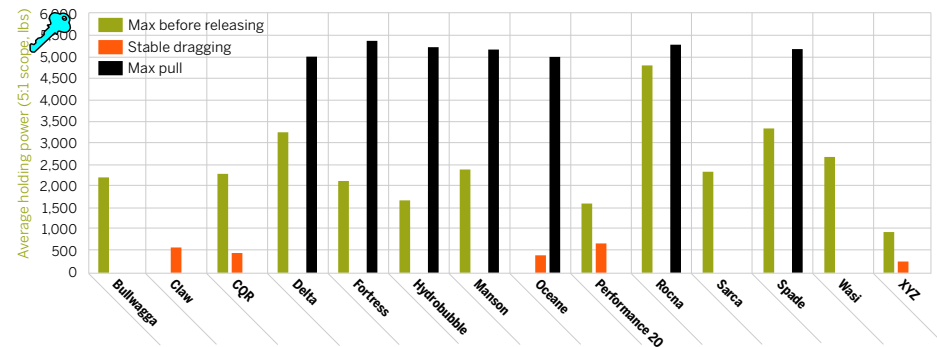
WEIGHT: 38 LBS › PRICE: \$582
LEWMAR INC. › 203-458-6200
www.lewmar.com

The CQR is another tried-and-true anchor that yielded surprising test results. The maximum load we recorded during our first three pulls on 5:1 scope was a very short spike up to 350 pounds, but most of the time we never felt the anchor set. No matter how slowly we went or how we tried to manually coax the anchor to set, it seemed to just skip along the surface of the bottom. The anchor did briefly hold over 2,000 pounds of load on pull four, west of the wharf, but those first three pulls did not inspire confidence and we were not able to replicate the results of pull four even when scope was increased to 7:1. The CQR's relatively sharp point looked capable of penetrating the layers of sand, but something appears to have kept the point from digging in, except when we got that 2,000-pound reading. Like the Claw, the CQR has been around for years. It also dug a considerable trench on the beach.



MA

ANCHOR TESTING ANALYSIS: AVERAGE OF PEAK STRAIN AT ALL LOCATIONS



We used a powerful test boat to determine max holding power



DELTA ::

WEIGHT: 36 LBS > PRICE: \$259.99
LEWMAR INC. > 203-458-6200
www.lewmar.com

The Delta is a one-piece plow-type anchor with large flukes. It was one of several anchors that held substantial loads on multiple pulls east of the wharf. On one pull at 5:1 scope, it set quickly and held firm up to 5,000 pounds. During two other 5:1 pulls, it held to a maximum of about 3,500 pounds, then slowly dragged (holding 3,500 pounds) for about 600 feet before releasing. Performance was considerably poorer at the other locations. It appears that the Delta's angled fixed shank, relatively sharp point, and large flukes helped it set quickly and hold (up to a point) as long as the scope was at least 5:1. Performance declined sharply at 3:1. The beach pull confirmed that the anchor set and dug in almost immediately, rather than plowing a long trench before setting.



TESTING PROCEDURE ::

As we gathered anchors for the test, we found that some manufacturers were a bit skeptical. They wanted assurances that the evaluation would be unbiased and that each anchor would be tested in similar conditions. This was our guiding principle, and we described our methodology to each manufacturer prior to the test. West Marine's VP of Product Development, Chuck Haw-

ley, and his colleagues from West Marine have conducted countless anchor tests over the years in our test location (they test any anchor West is considering carrying in its stores), but had never tested anchors weighing between 20 and 40 pounds off Santa Cruz. West Marine sells roughly half the anchors we tested.

Our procedure was as consistent as possible. Each anchor was pulled on the same rode (1-inch nylon rope with a 20-foot leader of 3/16-inch chain) at least three times with 5:1 scope. We moved the test boat (confirming our new location with the GPS) before each new pull to ensure the anchor had a chance to set in a fresh sea bed, and instead of testing each anchor three times in succession, we pulled the first anchor, weighed it, moved the boat, set the second anchor, weighed it, and so on, to make absolutely sure that no one anchor would be tested in a specific area of the bottom. We also tested the anchors with 3:1 and 7:1 scope and separately checked what hap-



FORTRESS ::

WEIGHT: 22 LBS > PRICE: \$420
FORTRESS MARINE ANCHORS
954-978-9988
www.fortressanchors.com

MAX
5,000 lbs
LOAD



The Fortress FX37 was one of several anchors we tested that consistently set quickly and held up to 5,000 pounds of load on multiple sets in multiple locations. Its sharp, large flukes dug in immediately. As we increased the loads and the rode became bow-string tight, the boat shuddered and kicked up some impressive turbulence at the stern but the anchor didn't budge. At only 22 pounds the Fortress was one of the lightest anchors we tested, and it was the easiest to stow (it can be broken down and will fit in a slim bag). It also held over 5,000 pounds on 3:1 scope. With its light weight, quick setting and retrieval, enormous holding power at a variety of scopes, and easy stowability, the Fortress ranked high among all the anchors we tested. However, we did bend

a fluke slightly during our veering test. This was while the anchor was under load, so it would be unfair to say anything other than it withstood a tremendous amount of abuse and still functioned properly. It would be difficult (but not impossible) to secure in a bow roller when not in use.

pened when we veered sharply on the rode. Scope was determined according to Shana Rae's depthfinder and confirmed via leadline. We also used a boat close to shore to pull each anchor in wet sand on the beach to make it easy to see how each anchor set.

Each test was conducted the same way. The anchor was attached to the rode and then dropped over the side. The rode was attached to the digital dynamometer, which was wired to a PC that recorded the strain on the gauge three times per second. The boat idled forward until the appropriate scope had paid out and the anchor had set. Once a set was confirmed, engine revs were slowly increased until the anchor dragged, released, or reached 5,000 pounds. Then the whole process was repeated with the next anchor.

HYDROBUBBLE ::

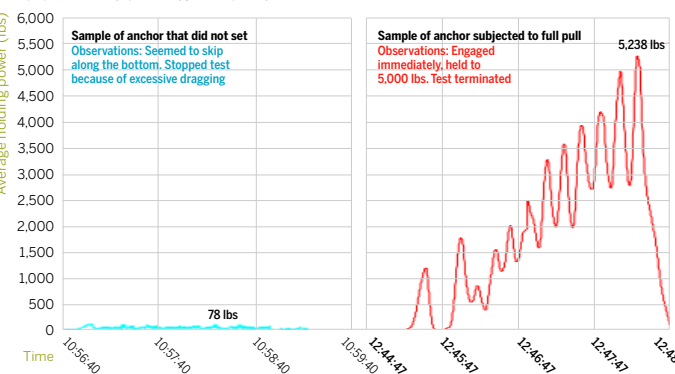


WEIGHT: 16 LBS
PRICE: \$249
ANCHOR CONCEPTS
888-282-2535
www.anchorconcepts.com

ing up to multiple 5,000-pound pulls. The minimal flotation provided by the eponymous bubble helps the anchor orient itself so that its heavy stainless-steel blade is always positioned to dig in at the optimal angle. Quick sets and multiple 5,000-pound pulls at 5:1 scope prove it worked beautifully every time.

What's most curious about the Hydrobubble is the shape of its blade. Instead of Delta or CQR-type flukes, the Hydrobubble's blade forms an upside-down V. It seems the pull of the shank drives the flat V-shaped blade deeper into the bottom. This could help explain how it penetrated the hard bottom even though the point wasn't particularly sharp. This anchor's performance exceeded our capacity to exert force on it, and I was able to take it apart and bring it back from California in my luggage. It may look unconventional, but the anchor with the effervescent name may represent a new and effective way to anchor a boat.

DATA GRAPHS: EACH PULL WAS GRAPHED USING THE COMPUTER

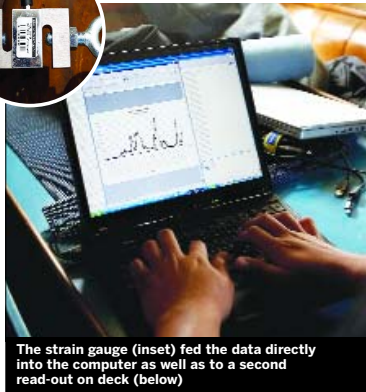


MANSON SUPREME ::



WEIGHT: 35 LBS > PRICE: \$450
 PLASTIMO USA >
 941-360-1888 > www.plastimo.com

The Manson Supreme is one of several newer anchors we tested that combine a rigid shank, a sharp point, a scooplike (rather than a plow-type) blade, and a roll bar that ensures the anchor is always properly oriented on the sea bed. It also set quickly and resisted multiple 5,000-pound pulls at 5:1 scope east of the wharf. Results at the other locations were also good, consistently topping out at 2,500 pounds before releasing. The Manson was also able to withstand 5,000 pounds at 3:1 scope. On the beach, it dug in without dragging. Its shape appears compatible with most bow rollers, but it would protrude more than a Claw or a CQR, and its roll bar could possibly interfere with some bow pulpits.



The strain gauge (inset) fed the data directly into the computer as well as to a second read-out on deck (below)



DATA AND ANALYSIS ::

With the digital dynamometer we were able to record the maximum load exerted on each anchor, to graph how increased load affected the anchor, and to incorporate accurate time and GPS data, along with visual range marking to show dragging. Thanks to Phil Cowley of West Marine, who provided the dynamometer as well as the software expertise to process the data. This procedure virtually eliminated any errors that could arise from physically jotting down readings of over 100 pulls at different scopes.

Over dinner on each test day we reviewed the day's results—everything from bottom sampling, hydraulic-crane operation, to each anchor's performance or lack of performance. Then, when we were all back in our respective offices, we again discussed each anchor's performance via a conference call to confirm our analyses.

OCEANE ::

WEIGHT: 38 LBS > PRICE: \$259
 WEST MARINE
 800-262-8464
 www.spade-anchors.com

The most obvious difference between the Oceane and the other one-piece plow/scoop-type anchors we tested is that its C-shaped shank is attached right at the front of the scoop, close to the point. In our on-the-beach tests the Oceane pivoted quickly on its sharp point, and its C-shaped shank did a good job of converting the lateral force on the rode into downward/digging force on the scoop. However, the Oceane did not produce consistent results. East of the wharf and at New Brighton, the Oceane failed to set after multiple attempts on scopes of 5:1 and 7:1. However, west of the wharf it set immediately, and we



recorded multiple maximum pulls. None of the other anchors we tested had such profoundly different results between venues, and the reason is not readily apparent. The Oceane's unique shape makes it difficult to stow on a bow roller.





ROCNA

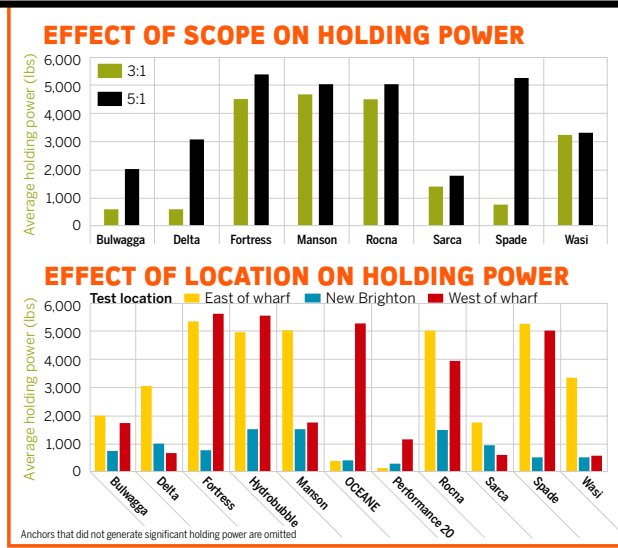
WEIGHT: 32 LBS › PRICE: ~~\$560~~
 SUNCOAST MARINE › 604-781-8347
www.rocna.com

The Rocna is very similar in design to the Manson, but the Rocna yielded slightly better results. Both withstood maximum pulls east of the wharf and had similar holding power on both 5:1 and 3:1 scope; the Rocna held slightly longer east of the wharf before releasing. Like the Manson, the Rocna, with its sharp point and roll bar, was one of the better-performing designs we tested; it has similar potential drawbacks, such as how much it would protrude on a bow roller and potential pulpit conflicts. However, the Rocna's blade was more angular and had slightly upturned flaps at the back, and its shank was slightly longer. These subtle differences might explain the Rocna's slightly better test results.

SARCA ANCHORLIGHT

WEIGHT: 33 LBS › PRICE: N/A
 ANCHOR RIGHT › 604-322-4008
www.anchorright.net

The Sarca was unlike any of the other anchors we tested. It consists of a large triangular blade, a pronounced roll bar, and a hollowed-out shank that allows the shackle to slide forward during retrieval. Its very sharp point (it could cut you if you weren't careful) was well



SPADE

WEIGHT: 35 LBS › PRICE: \$450
 SPADE ANCHORS › 800-262-8464
www.spade-anchor.com

The Spade turned out to be one of the better-performing anchors on 5:1 scope.

Multiple pulls at both wharf locations yielded 5,000-pound load readings. Its simple weighted point and mid-sized blade easily penetrated and held without dragging. Results fell off dramatically, however, at 3:1 scope and at the New Brighton location. Our beach pulls illustrate why the Spade was so successful. The heavily weighted point immediately dug in and nearly buried not only the blade, but the shank as well.



WEST MARINE PERFORMANCE 20

WEIGHT: 26 LBS › PRICE: \$200
 WEST MARINE › 800-262-8464
www.westmarine.com

The Performance 20 is a Danforth-style anchor marketed by West Marine, so when we were consistently unable to get the anchor to set at a variety of scopes and locations, there was considerable scratching of heads. For the majority of pulls on increasingly longer scope, the anchor seemed to set and release quickly. Several pulls

showed brief spikes, then a quick release. It also briefly held 1,500 pounds on 5:1 scope before slowly dragging and releasing off New Brighton. But that was only one pull of many—hardly enough to show the anchor is capable of holding anything close to that much load dependably. The Fortress showed how effective a Danforth-type anchor could be, so the only explanation the team could come up with was that the flukes of the particular anchor we tested weren't sharp enough to penetrate the hard, claylike sand.



WASI

WEIGHT: 32 LBS › PRICE: \$730
 SWISS TECH AMERICA ›
 408-505-7245
www.swisstech-america.com

The stainless-steel Wasi has a roll bar like some of the other anchors we tested, but its blade and shank design are unusual. The blade consists of a flat, heavy triangle, and the shank angle is very pronounced. This angle appears to provide the downward force required to propel the flat blade down into the bottom, and test results show it works. The Wasi set quickly on 5:1 scope, held to 3,000 pounds, and dragged before releasing when the load topped 4,000 pounds. Results were similar on 3:1 scope.

CONCLUSION

After three full days, over 100 test pulls, and countless hours crunching numbers and analyzing data, we learned a great deal about all the anchors we tested and about the challenges of anchor testing. Having several anchors with established reputations fail to set sparked many hours of debate. We questioned our methodology and tried to determine what could be done to insure that all anchors could at least return some results apart from "did not set." It's possible the size and power of the *Shana Rae* could have been too great to get accurate readings on some anchors. (Hawley and his team were able to get all the test anchors to set using a smaller, less powerful boat in a separate test.) The anchors that returned poor results in our test may produce better results in different conditions.

In the end, we were surprised that the CQR, Claw, XYZ, and Performance 20 performed poorly in our test and were impressed with the results of the new sharp-point/roll-bar designs, along with the Hydrobubble and the Fortress. Anchor design is evolving, but our results still confirm the rule of thumb that every boat should carry at least three different anchor designs and weights to deal with a wide variety of bottom types. ⚓