The Kadey-Krogen difference

What Is a Full Displacement Trawler Yacht?

"...an asymmetrical hull with an immersed transom and/or relatively flat aft sections will actually tend to roll more than a symmetrical hull in a following or beam sea."

Kadey-Krogen Yachts builds full displacement trawler yachts. This seems simple enough to understand but it has become evident there is confusion over what "full displacement trawler yacht" really means. To clarify, we will start by breaking that phrase down into its parts, beginning at the end and working backwards.

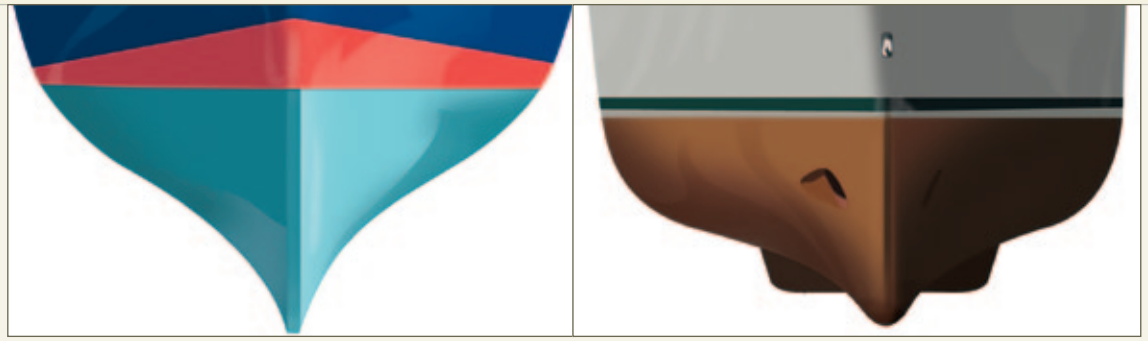
Yes, technically this is a trawler.

Start with the word "yacht." It is synonymous with good looks and quality. That one was easy.

Now take "trawler." Lest I open a can of worms I cannot close, let's just agree that a "trawler" is a vessel with which you can travel for an extended period of time and has the styling reminiscent of a commercial fishing vessel.

This leaves the words "full displacement." Unfortunately most people tend to think that all full displacement vessels are the same. Nothing could be further from the truth, and would be like saying all snow is the same. Yes, all snow is cold, falls from the sky and is whitish, but after those characteristics snow begins to be defined by measurable parameters that in layman terms are words like wet, dry, heavy and fluffy. Describing a full displacement hull is very similar. After we get past common characteristics such as "relatively slow" (as compared to an express cruiser), we can differentiate between full displacement hulls based upon two form fundamentals: longitudinal symmetry, and displacement-to-length ratio (D/L).

A yacht, whether classic or modern, exudes good looks and quality.



The Kadey-Krogen is on the left. Which entry form do you think moves easiest through the water? Which form do you think has a softer ride?

Longitudinal symmetry refers to the degree to which the stern shape matches the bow shape. The image of a barge quickly enters the mind. A barge is highly symmetrical and seaworthy, but does not have ideal longitudinal symmetry and therefore is not very seakindly. A simple way to describe what is desired is that a hull with good symmetry will have V-shaped sections and sharp waterlines at both ends.

So why do you want a vessel with a symmetrical hull form? There are four compelling reasons. First, the fine entry has superior wave cutting ability making it more efficient compared to blunt, stout-looking forms. The fine entry also yields a softer ride, which means less pounding in head seas.

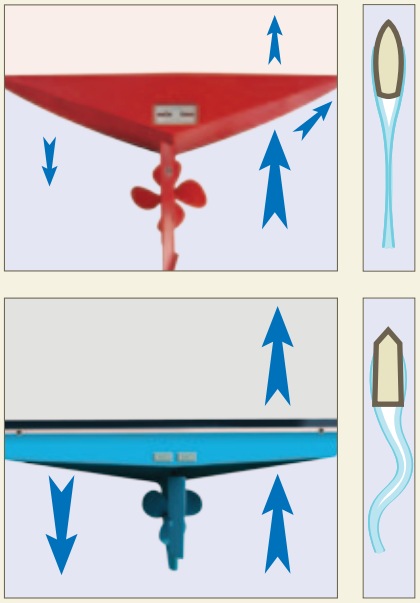
Second, symmetrical forms track better in a following sea. The V-shaped sections aft slice following seas rather than surfing them, making for a safer and more comfortable ride.

Third, the aft V-shaped sections also offer less resistance and drag than the broad waterlines of asymmetrical hulls. This results in better fuel economy.

And fourth, symmetrical forms roll less. Yes, contrary to popular belief, an asymmetrical hull with an immersed transom and/or relatively flat aft sections will actually tend to roll more than a symmetrical hull in a following or beam sea. Why? Simple physics. The leverage (upward force) that wave action has on those flatter sections is greater than on a hull that is more rounded and/or tapered. The upward force on one side creates a downward force on the other side and voila, you have roll. It is this roll (the downward pressure on the opposite side) that will then cause the vessel to veer off course (yaw). Those of you that snow ski or water ski will understand exactly what I mean.

The appropriately symmetrical hull form is much more seakindly than one that is not. Vessels roll and heave as though they are on springs, with less symmetrical forms having stiffer springs (lots of force per immersion) whereas the Kadey-Krogen transom effectively rides on softer springs. Comfort-wise, you can think of operating a wide-transom boat in rough seas as trying to drive a sports car through deep potholes.

The displacement-to-length ratio (D/L) indicates whether a given displacement is carried over a long waterline length or a short one. It reflects the load the vessel has to carry on a per-foot of waterline basis. Lower ratios tend towards lean and slippery forms with fine ends, and higher ratios tend towards full-bodied and less efficient



The laws of physics apply to hull shapes, too, and so for every wave action force on the hull there is an equal and opposite reaction of force on the water. A Kadey-Krogen hull (top) is designed to deflect a large portion of that wave energy and the result is truer tracking. Flatter hull shapes (bottom) direct nearly all of the wave force back vertically on the opposite side of the boat and thus the hull edges dig in, much like a slalom water ski or snow ski, causing the boat to corkscrew through the water.

forms with blunter ends. The lighter the load per foot of waterline length the better the economy and hence the better the range will be.

Low D/Ls result from either long waterlines or streamlined underbodies, or a mix of each. Both characteristics serve to improve hull efficiency and therefore fuel economy. Longer waterlines permit higher displacement speeds and streamlined sections result in a hull more easily driven through the speed range. For example, if a given displacement is stretched over a longer waterline, two things happen: The LWL increases (higher hull speed) and the ends get finer and sectional areas less full, i.e. streamlined (less hull drag). Of course, reducing a vessel's fully loaded weight (displacement) will lower D/L and improve economy but the fully loaded displacement requirement is usually already more or less locked in by the voyaging requirements (living quarters, fuel supply, provisions, etc.).

This long waterline low D/L approach (those in the 260-310 range) can be compared to a bank account earning compounded interest. Reducing D/L yields a more easily driven hull form thereby improving fuel economy and allowing for the use of smaller engines. The improved economy reduces the weight of fuel that must be carried for the desired range and the use of lower horsepower engines will reduce the weight of propulsion machinery. All this weight reduction now results in even greater fuel economy resulting in more weight savings resulting in even better economy, and so the benefits compound.

You may be asking, what about strength? Isn't strength compromised by this weight savings approach? Not in a Kadey-Krogen, which one could argue is actually stronger. Why? Because while the boat is solid fiberglass below the waterline, the coring material is vacuum bagged in place everywhere above the waterline. Utilizing core materials and the vacuum bagging process creates a stronger and lighter weight result. In addition, Kadey-Krogen hull laminations include an aramid fiber like those used in bulletproof vests.

So Kadey-Krogen yachts are strong, yet lighter in weight. This is accomplished by using proven structural design techniques and conventional lightweight materials.

Interestingly, D/L has had an opposite and incorrect application in the evaluation of long-range trawlers, and many inaccurate conclusions can be made using this ratio. It is important to understand that low D/L does not mean lightweight, or a less substantial structure, or a long and narrow form. How did these misconceptions come to be?

Back in the "early days" the market consisted predominantly of shallow flat-bottom coastal craft with insufficient internal volume for the fuel and supplies needed for long-range voyaging. These craft had very low D/Ls. To help separate the wheat from the chaff, Captain Robert Beebe published very useful minimum values of D/L below which the vessel was said to have insufficient "heft" or carrying capacity for long-range voyaging. Therefore, D/L was used to verify that a vessel had sufficient heft instead of being used to rate hull efficiency. Heft was rightfully considered to be a good thing in that context. And back then, since most boats' D/L ratios were way under the minimum for long range, the higher the D/L the better. Beebe and other experts agree that the minimum D/L should be around 260. With many modern passagemakers in the 350+ range, that makes those in the 260-310 range seem "light" and some builders' marketing guys have tried to capitalize on this incorrect assessment.

Naval architect James S. Krogen once said, "To produce a successful design, you must make an honest determination of how the vessel 'really' will be used and then prioritize every design decision to favor that outcome." In the case of a Kadey-Krogen full displacement trawler yacht, that outcome is a seakindly live-aboard ocean crossing yacht.

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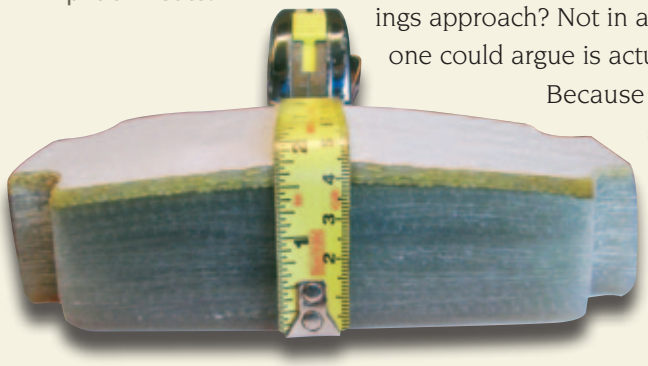

The yellow portion of this hull section is the aramid fiber reinforcement like that used in bulletproof vests.