Groundspeed versus Waterspeed when trolling lures - The Facts and the Myths.

A recent article I recommended to readers was written by a leading lure manufacturer, and discussed the numerous considerations and factors that come into play when setting a lure pattern for trolling behind a game boat. It was one of the better “how to and why” pieces I’ve seen.

The article contained a lot of good information for skippers and crews that covered almost every aspect of trolling skirted lures for large pelagics, most specifically marlin. However, when discussing the dynamics affecting a boat trolling lures in a current, the author discussed the pattern of pressure waves in a boat’s wake in a way that showed he misunderstood the relationship between speed through the water and speed over the Earth’s surface. He’s not alone in this misunderstanding of the effects of the interaction between the two on both lure and fish behaviour.

When asked for the optimum trolling speed range when using skirted lures on their boat, most skippers will generally talk about speeds between 6.5 and 8.5 knots, which is the range generally accepted as preferred for most pelagic hunters and the lures designed to attract them. However, the more interesting answer comes if you ask these same skippers if they vary that speed depending on whether they’re driving their boat into or with a current, and it’s then that many of them often say that they increase or reduce their boat’s power setting to maintain best boat speed when trolling into or with current respectively.

And that’s where they get it wrong…

Let’s consider the dynamics of what’s actually happening with a lure in the water. Both a lure - and for that matter the boat trolling that lure - perform in response to the water flowing over and around them. If you drop a lure behind a boat in a lake or a closed body of water, the lure performs as a function of the dynamic pressure and flow of the water over and around it created by the boat’s speed through the water. If you consider that body of water in isolation, and the lure performs exactly as you would like it to when trolled at say 7 knots, it doesn’t matter which direction you troll that lure around the lake, the boat will be doing 7 knots through the water, and the lure “feels” that 7 knots passing over it, and moves through the water exactly as it was designed and rigged to.

The “speed” I’m talking about here is the boat’s speed through that body of water, or waterspeed, not the boat’s speed across the face of the Earth, most commonly referred to as groundspeed. In the example of a boat moving on a lake, the boat’s speed through the water is the same as its groundspeed, because the water in the lake is not moving, but is static.

Now let’s take this same hypothetical boat and its hypothetical lure and put it in the open ocean. Assume the power is set at the same RPM used for 7 knots in the closed body of water, and what happens? Basically nothing different, because the boat still moves through the water around it at the same 7 knots waterspeed.

However, imagine this same open ocean body of water is now flowing southwards down the coast at 4 knots as a part of the East Australian Current… does the boat’s waterspeed change? No, it doesn’t… the boat is still moving through the water at 7 knots, oblivious to the fact that the body of water it’s operating in is coincidentally moving across the face of the earth at 4 knots. Therefore, still at the same power setting, and still at the same waterspeed of 7 knots, while steaming southwards the boat will actually be moving across the face of the Earth at 7 knots of waterspeed plus the 4 knots of current speed for a total groundspeed of 11 knots. Easy so far…

However - and this is the critical point - the performance of the lure behind the boat is only ever a function of how fast the boat is moving through the water and the water flow the lure feels (7 knots), not the groundspeed at which the boat and lure are moving across the face of the Earth (11 knots).

It's worth noting at this point that the ubiquitous GPS units found on all boats always calculate and display groundspeed (movement across the face of the Earth). Some of these units can also display waterspeed if they are receiving an input from a speed wheel or pitot type water pressure sensor. And the really sophisticated top-of-the-line plotting units can combine groundspeed with ground track, true heading, and waterspeed to calculate actual current direction and speed; but the basic speed readout on most GPS navigation units is just groundspeed.

And that's what a lot of skippers are looking at when they make the mistake of reducing the power setting to slow the boat back towards the 7 knots (groundspeed) displayed on their GPS plotters. In fact, neither the lure nor the marlin chasing it care in the slightest about groundspeed, they only bother with waterspeed, because that's the dynamic they use when swimming.

While marlin and many other sea creatures are certainly aware of their groundspeed as they navigate across the oceans, and can certainly sense currents, the speed they use swimming around in the water and chasing prey is only a function of waterspeed.

So if a boat and lure are heading north into the EAC and the skipper mistakenly increases power to boost the boat's GPS groundspeed readout to maintain 7 knots, he will actually be increasing the waterspeed to well above the correct 7 knots needed to make the lures swim correctly, and they will start flying out of the water and swimming in a way that doesn't give the best lure behaviour and reduces the angler's ability to attract fish.

So when driving into the current, a boat should only use the known power setting for the optimum waterspeed for the lures in the pattern, regardless of what the GPS groundspeed readout shows. The lures will then act as they should because the boat waterspeed will still be perfect for trolling, and the marlin will be happy because the lure will "look right", and they will be swimming at normal attack waterspeed to hit it.

Conversely, when driving downhill with the current there is no difference - a boat should once again be using the same still water power setting for the same optimum waterspeed despite the fact that the GPS groundspeed readout will be much higher.

A lure doesn't know or care about its groundspeed, and will always be swimming as it should if the boat trolling it maintains the correct RPM for the perfect trolling waterspeed. Ditto for the marlin… it probably knows its moving faster or slower across the face of the Earth if it's in a current, but the only speed it really cares about as it goes about its business and chases your lure will be the waterspeed.

Having belaboured that critical point, it's only fair to note that there are slight variations to this principle. Environmental factors that do affect waterspeed should always be taken into account when setting power for trolling. In other words, unlike the speed or direction of the current, wind acting on a boat may affect its waterspeed, so when trolling into a headwind, you'll need a very slight increase in power to maintain the same waterspeed, and conversely, if you're driving downwind with the boat's superstructure acting as a sail, you'll probably need to make a slight reduction in power to keep the boat at the optimum waterspeed that the lures need.

And of course, it goes without saying that if there are 10 people on your boat, the power setting needed to troll at the 7 knots or whatever it is that you've determined works best for your lures will be a little different to the RPM needed for that same trolling speed with only two of you on board.

But regardless, it's still only ever about the RPM for optimum trolling waterspeed.

The same article about lures and lure patterns I referred to at the start of this explanation of the difference between groundspeed and waterspeed noted that when setting a lure pattern and using the pressure waves in the wake to set lure positions, the distance between pressure waves would be greater when trolling into the current than it would be when trolling down current.

This is what was incorrect - it isn't. The distance between pressure waves behind your boat is strictly a function of waterspeed alone, and will always be exactly the same at a constant boat speed through the water. So if you're driving a boat at a constant 7 knots of waterspeed, the distance between pressure waves, and the distance behind the boat you run all the lures in your pattern should not change at all between heading into or heading with the current, *assuming you maintain the same waterspeed*, which as explained in detail above, you should.

If you're still having trouble getting your head around this, try thinking about this other example… totally different, but exactly the same principle. Check any airline schedule for the average flight times of a long haul trip heading from say Sydney to Los Angeles. Scheduled flight time from SYD to LAX will be about 13:00 hours. Yet the scheduled flight time for that same trip in the other direction will be about 14:00 hours. Why…? Global winds at high altitude (called jetstreams, but think of them as the atmospheric version of the ocean currents) blow almost constantly from West to East, never the other way around. However, as a general rule, modern airliners only ever cruise at a constant optimum design speed that gives them the most economical cruise conditions and fuel burn in still air, regardless of what direction they're flying.

This optimum cruise speed is a function of what the wing "feels" and at which it delivers the best performance. So the aircraft is always flying at the best "airspeed" (let's say about 500 knots) although at that speed, its "groundspeed" heading into the eastwards flowing jetstream may only average 400 knots, hence the longer flight time to get from LAX to SYD. But on the return journey, at the same optimum 500 knots airspeed, flying west to east with the jetstream will result in a higher groundspeed of 600 knots, and a shorter total flight time to LAX. The bottom line is that the aircraft only cares about the speed through the air that its wing feels and needs to fly most efficiently, regardless of what direction it's flying and what its resulting groundspeed is.

Apply this same aircraft operating logic to boats, lures, waterspeed, currents and groundspeed, and hopefully it will all make sense… because it does to marlin.

This has been a lot of words to explain a very simple principle. Best summarised as follows… Your boat, your lures, and the marlin chasing them only work as a function of speed through the water, not speed over the face of the Earth. Therefore, the power setting you use for trolling at your preferred speed for your lure pattern should never vary regardless of whether you're driving into the current, with the current, or across the current… except as noted for the very small changes that may sometimes be required to counter the effect of wind, swell and gross weight on the boat's speed through the water.

So if you're trolling down current, don't reduce the power setting, because you'll be changing the boat speed through the water, and will be slowing the lures down from their optimum performance waterspeed. Just accept the higher groundspeed and don't drive all the way to Southwest Rocks without keeping a mental calculation of how long it's going to take you to get home in the face of that current.

Similarly, if you're trolling into the current, once again use the same still water power setting you always use for your optimum waterspeed and accept that the scenery isn't going to change very fast at the resulting lower groundspeed. Regardless, the lures will still be performing properly, and that's all you and the marlin should care about.

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