3 TOP STEELHEAD FLIES

HOW TO GROOVE YOUR CASTING STROKE

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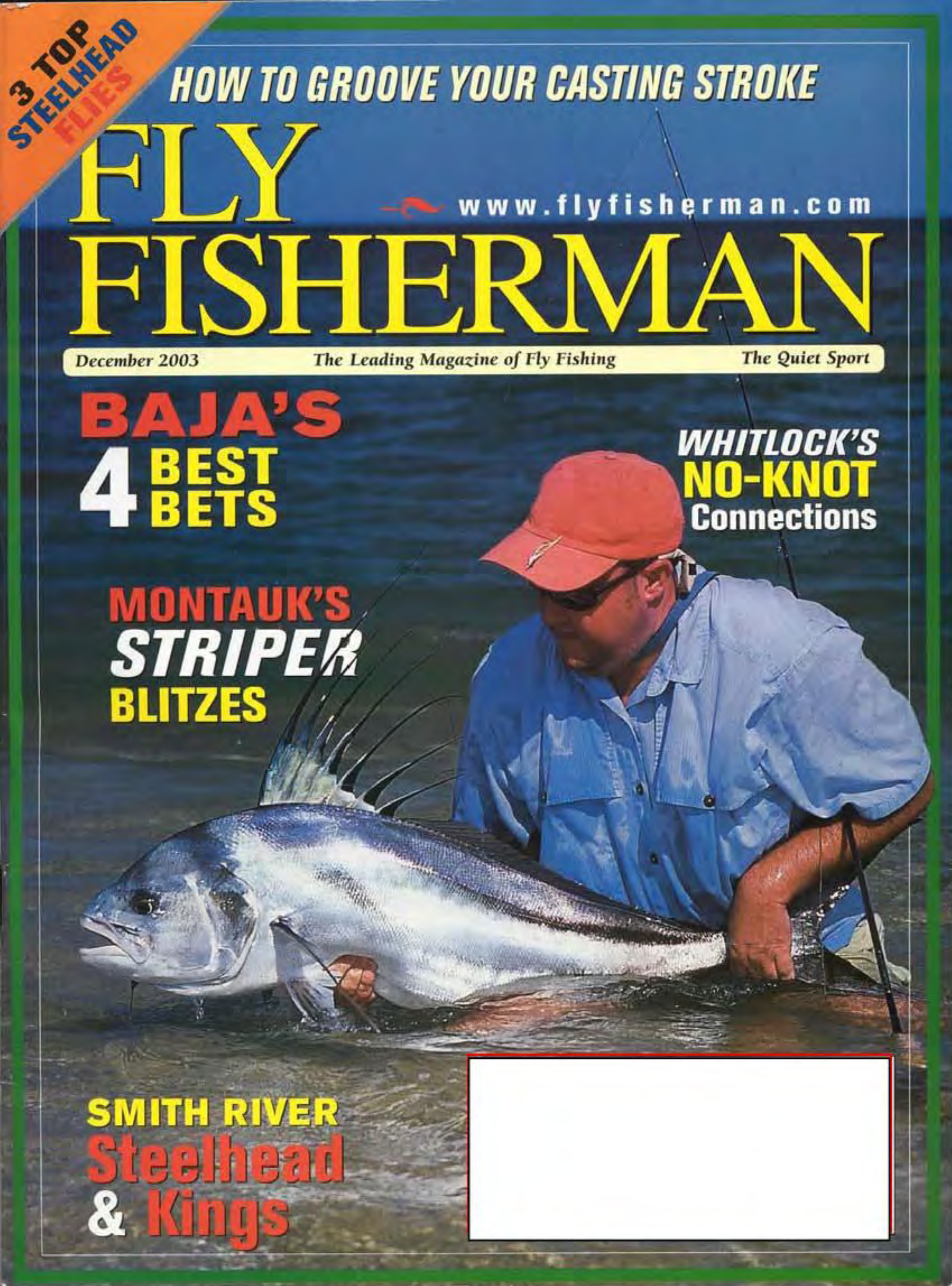

BAJA'S 4 BEST BETS

WHITLOCK'S NO-KNOT Connections

MONTAUK'S STRIPER BLITZES

SMITH RIVER Steelhead & Kings

Casting In the Groove

JOHN RANDOLPH

FOR MANY DECADES we have wondered what separates the experts from the good casters: What is it that casters such as Steve Rajeff, Lefty Kreh, and Bruce Richards do that makes their casts so fluid and perfect in their tight-loop deliveries? No one has scientifically analyzed the casting stroke—both perfect and imperfect—to answer our questions; until now, that is.

We recommend reading, and carefully studying, Noel Perkins's and Bruce Richards's feature "Understanding Your Casting Stroke" on page 34 of this issue for an understanding of how to improve your casting stroke. We also recommend this reading for casting instructors who want a clear explanation of the casting stroke for their students. Hopefully, someday soon there will be casting analyzers such as the one used by the authors (and used in a study by the University of Michigan) available to fly shops around the country to aid in teaching fly casting. As Lefty Kreh and Bruce Richards have pointed out, casting is the key to successful fly fishing.

Del Brown (above) was the dean of permit fishing with a fly. In his lifetime, he landed over 500 of them.

So what does the Perkins/U. of Michigan study show that is new? There is a "remarkable symmetry in the forward and back casts with rod speeds differing by a mere 5 percent." The authors point out that rod speed is the key in good casting and the Casting Analyzer is an "electronic speedometer" that shows a plotted line chart called your "casting signature." Good casting signatures have a few things in common: 1) The symmetry of both back and forward casts; 2) Smooth increase in rod speed followed by a quick rod stop; 3) Tight loops formed by rapid rod deceleration (rod stop). The signatures of poor casters reveal certain things in common: 1) A high degree of variability from cast to cast; 2) Asymmetric rod speeds; 3) Poorly defined rod stops; 4) Open loops; 5) Tailed loops.

Casting instructors have known these things for many decades, but no one has proved them in a graphically understandable way. The elements of good casting are important; they can be analyzed; and now they can be shown on graph paper. Expert fly fishers know how important this information is to their success, and they will address their casting practice to further improve their "casting signatures." Intermediate casters will study the signatures of expert casters and ask their instructors to help them "groove the right signature" in their stroke.

The professional level of casting instruction as the foundation of our sport is slowly improving, although standardization is still a few years away. The Casting Analyzer that Richards and Perkins have innovated and presented can go a long way in advancing that instruction to the next higher level, perhaps comparable to professional stroke instruction now available in the sport of golf. We hope this will happen, for newcomers to our sport find casting to be the very high threshold of entry that is most difficult to surmount. Anything that helps them understand casting can only aid us in instructing the eager learners of the next generation of fly fishers.

The Passing Generation

DAVE ENGERBRETSON, Del Brown, and Datus Proper were all giants of our sport, and all are quickly gone. Their passing marks the passing of a generation of American fly fishers who broke new paths in our sport and who, in their

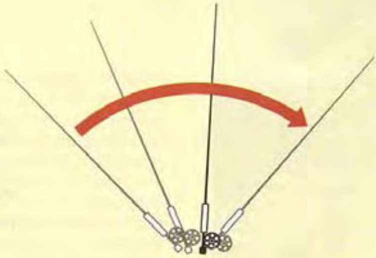

Figure 1.

UNDERSTANDING YOUR CASTING STROKE

NOEL PERKINS AND BRUCE RICHARDS

NEARLY ALL FLY-FISHING BEGINNERS stumble when learning how to cast. Proficient casting takes practice, yet practice does not necessarily make perfect when it only results in honing an ineffective stroke. To counter this, fly fishers can study a number of excellent books and videos on casting, or take classes at reputable fly-fishing schools, or take lessons from individual instructors or guides.

It is fair to say that most fly fishers, regardless of casting ability, aspire to improve their casting stroke. As Lefty Kreh notes, "Whenever I question my students about what aspects of fly fishing they want to learn, the majority always answers that more than anything else, they want to become good casters." Lefty further laments, "It is a shame that only a relatively small percentage of anglers will eventually become first-rate casters."

So what does it take to improve your casting stroke? For many of us, improvement follows from a good understanding of what we're trying to achieve during the stroke. Each part of the stroke serves a function, and understanding these functions prepares us for successful practice.

Fortunately, we now have a tool to help us better understand fly casting and accelerate our learning. The Casting Analyzer clips onto your rod and electronically measures your stroke. The Casting Analyzer records your "casting signature," which can then be dissected to reveal the critical parts of the stroke.

Since this device was constructed for a study by the University of Michigan and is not available to consumers, few anglers have access to the Casting Analyzer. However, by examining the signatures of expert through novice casters we can recognize common casting errors and illuminate the traits of a proficient casting stroke.

The Casting Analyzer measures the speed that you rotate a fly rod (see Figure 1 above). This rotational speed or rod speed is your major input to the fly rod during casting. The Casting Analyzer measures rod speed with a small electronic chip containing a miniature rate gyro to sense angular speed.

In lay terms, the Casting Analyzer is an electronic speedometer that measures and records rod speed while you cast. The result of this data comes in the form of a plotted line chart called a casting signature. The differences between casting skill levels are apparent when viewing these signatures.

MARK NYSTROM PHOTO

The Casting Analyzer was developed at the University of Michigan by co-author Noel Perkins. It detects rod speed and records the information on a hand-held computer.

MARK NYSTROM PHOTO

A high-tech casting analyzer records and illustrates casting performance.

Hallmarks of an Expert Caster

LET'S START WITH THE SIGNATURE of an expert casting a modest 35 feet of 5-weight line in a standard overhead cast. Figure 2 shows how the expert's rod speed varies with time over two consecutive casting strokes containing both backward and forward casts. Positive rod speed values (lines above the center line) designate the forward cast while negative values (lines below the center line) show the backcast.

This plot reveals several important conclusions. First, the forward casts and backcasts are almost symmetrical. Rod speeds differ by a mere 5 percent. This emphasizes the often-stated fact that the backcast is just the forward cast in reverse.

Second, both the forward cast and backcast begin with the same smooth increase in rod speed, followed by a quick stop where this speed suddenly decreases. The stops are followed by a "rebound" during which the fly rod flexes. This causes a secondary rotation of the caster's hand and a second smaller bump along the plot line. The amount of this rebound indicates how much the fly rod flexed as the expert loaded the rod during casting. The loop forms just after the butt of the rod stops, and the best loops are formed by rapid rod deceleration.

The most efficient loops have the smallest widths (or diameters). They travel faster and farther against the retarding effect of air drag. Small loops are a distinct advantage when casting into the wind and for distance. The ability to smoothly increase rod speed and then abruptly stop the rod, particularly in the backcast, are distinguishing characteristics of an expert fly caster.

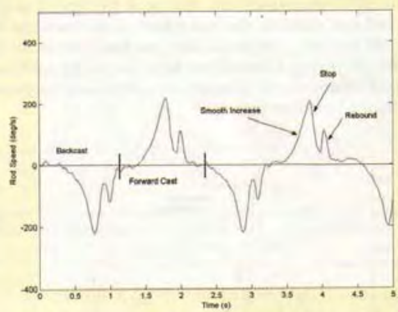

Figure 2. The signature of an expert fly caster (35-foot cast) shows a smooth increase in speed followed by a sudden stop, and remarkable symmetry between the forward cast and backcast. Positive values indicate rod speed on the forward cast, negative values show rod speed on the backcast.

Common Casting Mistakes

EXPERT FLY CASTERS ARE easily distinguished from intermediate and beginning fly casters by their signatures. The signature of the beginner shown in Figure 3a shows a high degree of variability from cast to cast, as might be expected from someone who is learning the motor control needed for fly casting. Beginners are simply searching for a casting stroke, and each stroke varies considerably from the next. Overall, the stops in the backcasts and forward casts are poorly defined, and the resulting loops are extremely large. In fact, the rate of deceleration of the beginner's stops is nearly ten times less than the expert's. Slow stops are a hallmark of inexperienced casters, and the analyzer graphically displays this important casting principle. Without a quick stop, loops are large and ill formed.

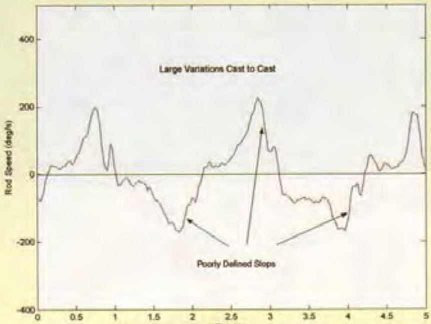

Figure 3a. Beginning casters display large variations in rod speed and poorly defined stops.

The signature of the intermediate fly caster shown in Figure 3b is unsymmetrical. The peak rod speed of the forward cast exceeds the rod speed of the backcast by over 40 percent. The stop after the backcast is weak, leading to poorly formed and large loops. In addition, the rod rotates slowly forward just after each backcast, producing "rod creep."

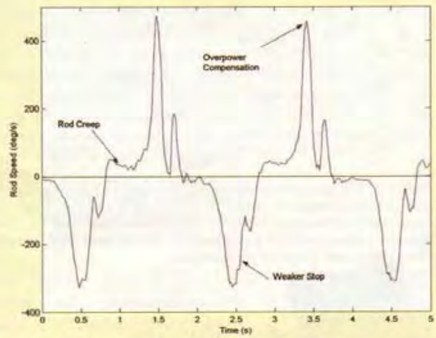

Figure 3b. The signature of this intermediate caster is unsymmetrical with the peak rod speed of the forward cast exceeding the rod speed of the backcast by over 40 percent.

Rod creep ultimately reduces the available space (casting arc) for applying power in the forward cast. To compensate, this caster overpowers the rod during the forward cast and achieves a peak rod speed nearly 100 percent greater than the expert at the same distance.

Two practical problems result from these casting mistakes. First, casters with similar signatures get tired far more quickly than experts who cast more efficiently. Second, because of this incorrect application of power, the resulting loops are likely to close upon themselves and form tailing loops. Tailing loops are identified when the tailing (top) portion of your loop falls below the leading (lower) portion of the fly line. This often creates knots and tangles in your leader.

Distance Casting

In Figure 4, an expert caster demonstrates how to cast for maximum distance and efficiency. The bottom half of Figure 4 shows the rod speed for a single backcast followed by a powerful forward cast. After the forward cast, the rod is stationary while line shoots through the guides. The maximum rod speed attained by this expert during the forward cast is more than three times greater than the modest cast by the same caster shown in Figure 2.

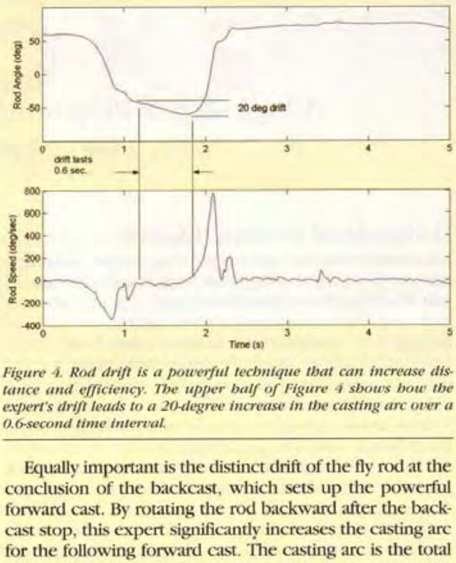

Figure 4. Rod drift is a powerful technique that can increase distance and efficiency. The upper half of Figure 4 shows how the expert's drift leads to a 20-degree increase in the casting arc over a 0.6-second time interval.

Equally important is the distinct drift of the fly rod at the conclusion of the backcast, which sets up the powerful forward cast. By rotating the rod backward after the backcast stop, this expert significantly increases the casting arc for the following forward cast. The casting arc is the total angle that the fly rod is rotated through from the start to the finish of the cast as illustrated in Figure 5. The upper half of Figure 4 shows how the rod angle varies within the casting arc as time progresses. From this you can see where the drift occurs. In this cast, the drift leads to a 20-degree increase in the casting arc over a 0.6-second time interval.

The Rod-Tip Path

The rotation of a caster's hand is the largest input to the fly rod. In turn, the motion of the tip of the fly rod is the largest input to the fly line and ultimately dictates the size, shape, and direction of the loop. However, the Casting Analyzer measures only the rotation rate of the fly rod at the reel seat while the motion of rod tip is affected by this rotation, plus additional motion due to the flexing of the fly rod.

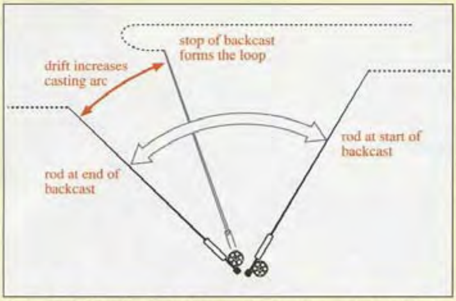

Figure 5. Drift at the end of the backcast increases the casting arc for greater distance casting.

Since the rod-tip path is critical to casting, it is important to understand its characteristics and also how to control it during casting. We were able to plot the position of the rod tip through the cast by first measuring the angular speed of the fly rod (using the Casting Analyzer) and calculating this position assuming that the rod remains straight or rigid. Then, by including a device called a strain gauge that measures rod flex, we added the rod's "flexible motion" to its "rigid motion" to determine the actual position of the rod tip through the cast.

When used in tandem, the Casting Analyzer and the strain gauge allow us to map the position of the rod tip as well as its speed during casting. Moreover, we can now also quantify the influence of rod flex in producing additional tip speed (higher loop speed), an effect of great interest to both rod designers and consumers.

The flexing of the fly rod during a forward cast is detailed in Figure 6 together with the rod speed for reference. The time axis is enlarged to view the details of just one forward cast. Values of speed or flex above the horizontal line indicate forward speed and forward flex (in the direction of the forward cast) while values below this horizontal line indicate backward speed and backward flex (in the direction of the backcast). The illustrations capture the rod during key phases of the forward cast including the loading, unloading, and the rebounding phases.

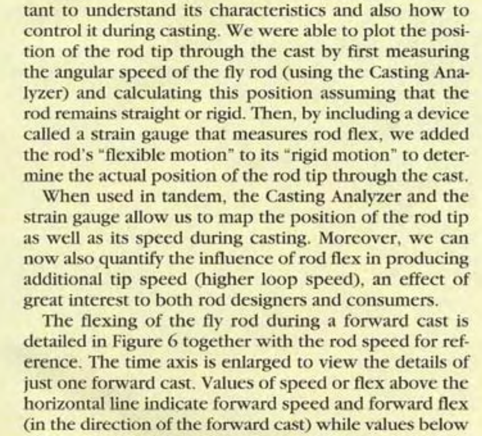

Figure 6. This comparison of rod speed and rod flex shows how the rod loads during an increase of speed during the forward cast and then rapidly flexes forward–or unloads–when the handle comes to a stop.

At the start of the forward cast shown in Figure 6, the rod is straight. The strain gauge signal indicates zero flex and the analyzer indicates zero rod speed. As the rod speed increases smoothly, the rod flexes backward as it loads. After the stop, the rod quickly unloads. Rod speed at the handle decreases, but the rod flexes rapidly forward. At the end of the unloading phase, the rod momentarily straightens and the strain gauge signal rapidly passes through zero flex. From this point on, the rod rebounds (flexes forward). The loop forms at the beginning of the rebound phase and is on its way.

The speed, shape, and direction of the loop are all determined by the path and speed of the tip of the rod during the loading and unloading phases and the small time interval from the stop to the rebound. In particular, the loop inherits the maximum speed of the rod tip during this time interval.

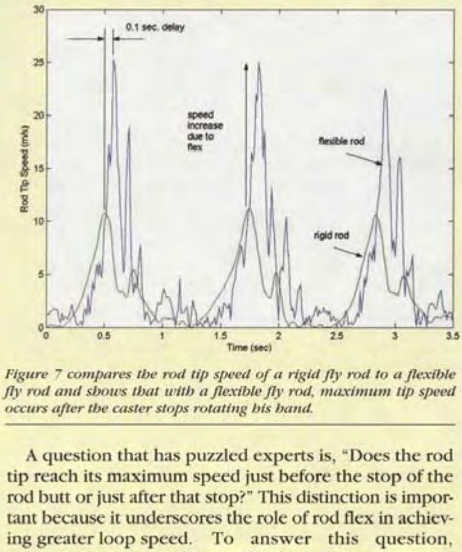

Figure 7 compares the rod tip speed of a rigid fly rod to a flexible fly rod and shows that with a flexible fly rod, maximum tip speed occurs after the caster stops rotating his hand.

A question that has puzzled experts is, "Does the rod tip reach its maximum speed just before the stop of the rod butt or just after that stop?" This distinction is important because it underscores the role of rod flex in achieving greater loop speed. To answer this question, examine the results of Figure 7, which shows the speed of the rod tip for two backcasts and one forward cast. This chart reveals the key influence of rod flex. The tip speed of the rigid rod (the green curve in Figure 7) reaches a maximum of 10 to 12 meters per second (m/s) just before the stop. This is the contribution of the rod-tip speed due to the rotation of the caster's hand alone. In contrast, the tip speed of the flexible rod (blue curve in Figure 7) reaches a maximum of 20 to 25 m/s about a tenth of a second later, just after the stop. More precisely, the cast reaches maximum tip speed at the end of the unloading phase, just as the rod momentarily snaps

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through its straight configuration. In this example cast with this fly rod, the flexing of the rod nearly doubles the rod-tip speed and leads to a small time delay (about 0.1 second) between the stop and the maximum tip speed. The additional tip speed gained by rod flex varies according to rod design or action and also by how much the rod is loaded during casting.

Casting experts agree that ideally the tip of the fly rod should travel along a straight path during the casting stroke to achieve the greatest horizontal acceleration of the fly line before the stop. A straight-line path also creates narrow loops.

CASTING PRINCIPLES VERIFIED BY SCIENTIFIC MEASUREMENT

1. Symmetry of motion—both in rod speed and angular distance—is one trademark of an expert caster. The backcast should mirror the forward cast.

2. High rod speed (on long casts) followed by rapid deceleration (on any cast) is clearly visible along the plot lines generated by an expert caster using the Casting Analyzer. This is the "speed-up-and-stop" advocated by Lefty Kreh and others.

3. The tip of the fly line should travel in a slightly convex (nearly straight) path for the most efficient transfer of energy to the fly line. If you don't "load" or bend the rod efficiently, the tip will move in a circular path, creating wide loops with slow line speed.

4. "Rod creep" is evident in the plot lines of an intermediate caster. "Rod drift" is apparent in the data generated by an expert caster. Rod creep occurs when a caster slowly advances the angle of the fly rod before starting the actual forward cast, thereby reducing the available casting arc. Expert casters do the opposite—they drift the rod backward just after the backcast to open the casting arc and increase the potential for maximum rod speed on the forward cast.

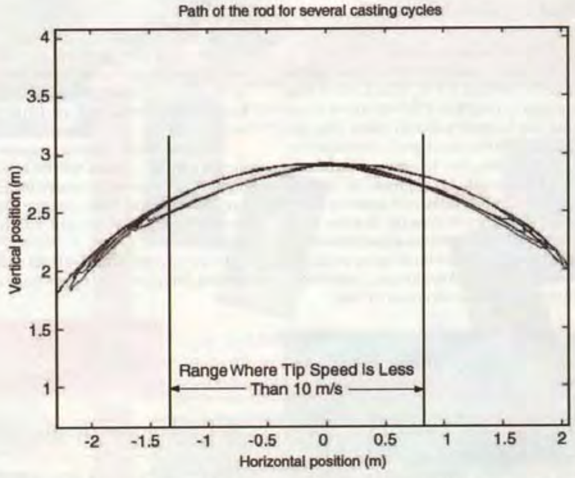

Figure 8. For tight loops, the tip of the fly rod should travel in a slightly convex (nearly straight) path through the middle of the stroke where rod speed is most significant.

The curves in Figure 8 correspond to the tip path as computed by the Casting Analyzer and strain gauge as compared with the position of the fly rod tip as measured by video. The overall agreement between these measurements confirms the accuracy of the electronic measurements.

The most important portion of the casting cycle lies in the middle of Figure 8, where the speed of the rod tip is significant. In this region the rod-tip path is slightly convex, which means the center of the path is only slightly higher than the ends.

If the rod tip follows a more exaggerated upward arcing path, the resulting loops will be larger and more wind resistant. If the tip path drops below horizontal or becomes concave at any time, the line will form a tailing loop.

At the beginning and end of these casting strokes shown in Figure 8, where the rod-tip speed is small the path is more convex. This is expected since the rod has very little flex during these portions of the stroke, and in the absence of rod flex, the rod-tip path should be perfectly circular and have a radius equal to the distance between the rod tip and the caster's elbow.

These measurements of the rod-tip path can be used to understand how changes to your casting stroke translate to changes in the rod-tip path. Doing so provides a powerful tool for fly-casting instruction that reveals why we sometimes throw wide-open loops, closed tailing loops, or good tight loops that have different shapes, sizes, speeds, and directions.

The measurements we discuss in this article are new to our sport and represent one step forward in providing quantitative data on how we cast. In particular, the Casting Analyzer can measure a unique casting signature that can help you identify and fix casting problems. We hope to learn a great deal more about this Casting Analyzer and its uses in understanding fly casting, fly-casting instruction, and tackle design for the future.

The Casting Analyzer helps show the importance of a smooth acceleration followed by a firm stop during the casting stroke.

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