

Frog Hair Fresh Water Tippet, Leader & Butt Materials

DESCRIPTION :

Frog Hair tippet material is an advanced, patent pending, tippet material made from a unique co-polymer that is subjected to a proprietary process that dramatically increases the suppleness and elasticity of the material, while achieving an incredibly high break strength and knot strength.

The combination of high break strength with high elasticity and suppleness creates a material having high "Shock Resistance", an elusive performance property that is provided by GAMMA's proprietary process. High "Shock Resistance" prevents untimely break-offs by limiting high forces applied to the line when the hook is set, or when there are sudden "jerks" against the line while fighting a fish. The result is more landed fish.

There are a number of other practical benefits that Frog Hair provides, and they can be appreciated right from the time it's taken off the new ergonomically designed spool. Its low coil memory makes it easy to handle and its suppleness makes knots draw down smooth and tight. While supple, Frog Hair is not limp, so it lays out beautifully during a cast. It also has less drag in the water providing for a more natural presentation of the fly to increase the number of takes and hook-ups. The result is a more enjoyable fishing experience that can be appreciated by experts and novices alike.

Another unique innovation is Frog Hair's new ergonomically and functionally engineered spool. Its contoured eight-sided shape fits comfortably and securely in the hand while dispensing material. Two retaining clips are provided to keep the loose ends of the material neatly secured on the spool. Sight windows are molded into the flange of the spool to easily see how much material remains on the spool. Printed elastic retaining bands indicate which size material is on each spool when the spools are stacked up. Last but not least, the spool material contains UV block to protect both the spool and tippet material from harmful UV rays.

TECHNICAL DATA :

Frog Hair tippet and leader materials are designed to provide the maximum possible strength for diameters that fall within traditional gauge classifications or "X" sizes. Technical data for diameter, average test strength, average knot strength, and elasticity for Frog Hair tippet, leader and butt materials can be found in Appendix I - Table 1.

Some notes on the measurement techniques used are listed below :

Diameter - The size of Frog Hair material follows the common standards established in the industry. The actual diameters listed in Table 1 are target values. Due to the manufacturing process, monofilaments are not always perfectly round. Therefore, taking diameter measurements using any type of micrometer will only provide the width of the monofilament across the two points at the position being measured.

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TECHNICAL DATA (cont'd) :

Strength & Elasticity - The strength and elasticity are measured using an Instron Tensile Testing Machine, which accurately monitors the amount of tension and corresponding stretch that is applied to the material up to, and including, its break point. A sample of material having a controlled length is held between two customized grips, which hold the material without allowing it to slip while force is applied to the material. The material is then stretched at a constant rate until the material breaks. Maintaining a constant rate of stretch is important since the rate at which the material is stretched can effect the force at which the material breaks (strength) and the amount of stretch the material can accommodate before it breaks (elasticity). The knot strength is measured in the same manner, except that an overhand knot is tied into the material about midway between the grips before testing.

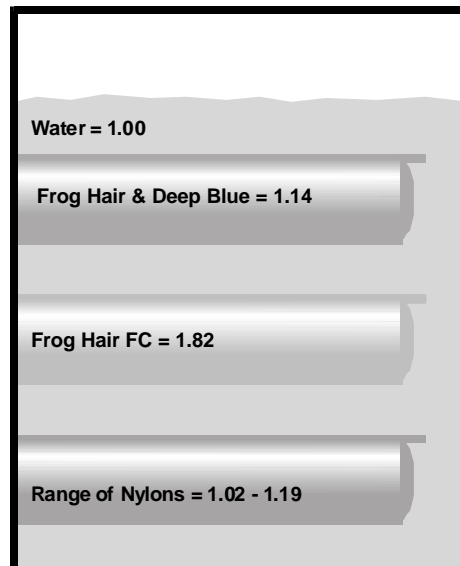
PROPERTIES :

Specific Gravity (Density)

The **Density** of a material is the weight of a material per unit of volume. Density is often expressed in terms of **Specific Gravity**, which is the density of a material relative to the density of water. Materials which have a specific gravity greater than 1.0 are more dense than water and will sink once the material breaks the surface tension of the water. For the same object made of different materials, the object made from a material having a higher specific gravity will sink faster. Conversely, materials which have a specific gravity less than 1.0, are less dense than water and will float on the surface of the water.

The **Specific Gravity** of Frog Hair is 1.14. In comparison, Fluorocarbons have a specific gravity around 1.80 and the range for most nylon based tippet materials is 1.02-1.19.

Specific Gravity Summary



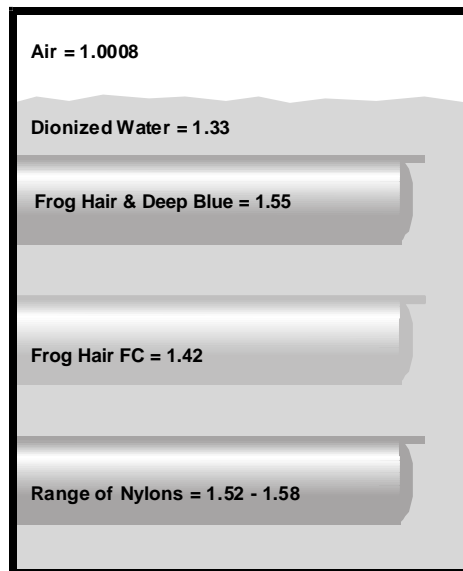
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Refractive Index

The **Refractive Index** is a measure of how fast light will travel through one material relative to another. When objects are observed at an angle through two different materials, each having a different refractive index, the object will have a distorted appearance at the interface where the two materials meet. The greater the difference in refractive index, the more distortion there will be. It is also theorized that materials having the same refractive index as water will be more or less invisible in water.

In the case of fishing line, materials which have a refractive index closer to that of water, (1.33 for deionized water) will not "spook" a fish to the same degree that fishing lines which have a refractive index further from that of water. The **Refractive Index** of Frog Hair is 1.55. In comparison, the typical range of **Refractive Index** for most nylon based tippet materials is 1.52 - 1.58.

Refractive Index Summary



Tenacity

The **Tenacity** of a material is its inherent strength per unit of cross section, or in the case of monofilaments, how strong the material is for its diameter. It is often expressed in units of pounds per square inch (psi) or kilograms per square millimeter based on the diameter measurement. By combining the high tenacity nylon co-polymer with GAMMA's exclusive material process, Frog Hair has one of the highest tenacity properties of any tippet material. The tenacity for the various Frog Hair sizes range from about 180,000 psi for the lighter gauges to 140,000 psi for heavier gauges.

Suppleness

The **Suppleness** of a material is a measure of how "pliable" a material is. The suppleness depends on the specific gravity of the material, its stiffness, and its geometry. Suppleness is a relative property and is generally measured by hanging a heart shaped loop and measuring how much the material sags. Due to the relatively thin sizes and lighter weight of tippet material, accurately measuring the suppleness of tippet materials is a difficult task to do reliably.

As general guide, materials having greater elasticity will generally have greater suppleness. Due to GAMMA's proprietary process, Frog Hair is the most supple fresh water material available.

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Effects of Moisture Content

When polymeric materials are exposed to moisture, either by humidity in the air or by immersion into water, the moisture will be absorbed by the material and in most cases, result in a reduction of strength and an increase in elasticity. Most nylons will absorb a maximum of about 8%-10% of moisture by weight. 100% PVDF fluorocarbon will absorb up to 3% by weight. The corresponding reduction in strength is about 5%-15% for nylons and about 3%-5% for 100% PVDF fluorocarbon.

Shock Resistance

The **Shock Resistance** is a measure of how much impact energy a material can withstand before breaking. Shock resistance is a combination of a material's strength and stiffness. A material that is extremely strong could have less shock resistance and under certain impact conditions, can actually break before a weaker material will.

Frog Hair is designed to optimize the strength and elasticity to provide maximum Shock Resistance. Some tippet materials may be as strong as Frog Hair, and some tippet materials may be as elastic as Frog Hair, but up to now, no other tippet material has the combination of strength and elasticity that Frog Hair provides. The chart in Appendix II provides a comparison of Frog Hair's shock resistance to that of 7 leading brands of tippet.

COMPARISON DATA :

Frog Hair has been extensively tested and compared to other leading tippet materials available in the market. The charts in Appendix III compare the test strength to diameter (tenacity), knot strength to diameter (knot tenacity), suppleness, and shock resistance Frog Hair to other leading copolymer tippet materials available in the market.

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APPENDIX I

Table 1 - Frog Hair Technical Data				
Size	Diameter	Test Strength	Overhand Knot Strength	Elasticity
8X	0.003" (0.076 mm)	1.8 lb (0.8 kg)	1.6 lb (0.7 kg)	30%
7X	0.004" (0.102 mm)	2.8 lb (1.3 kg)	2.4 lb (1.1 kg)	31%
6X	0.005" (0.127 mm)	3.7 lb (1.7 kg)	3.1 lb (1.4 kg)	31%
5X	0.006" (0.152 mm)	4.9 lb (2.2 kg)	4.2 lb (1.9 kg)	32%
4X	0.007" (0.178 mm)	6.2 lb (2.8 kg)	5.3 lb (2.4 kg)	32%
3X	0.008" (0.203 mm)	8.5 lb (3.9 kg)	7.2 lb (3.3 kg)	32%
2X	0.009" (0.254 mm)	11.1 lb (5.1 kg)	9.5 lb (4.3 kg)	35%
1X	0.010" (0.279 mm)	13.1 lb (5.9 kg)	11.2 lb (5.1 kg)	35%
0X	0.011" (0.279 mm)	15.0 lb (6.8 kg)	12.8 lb (5.8 kg)	35%
013	0.013" (0.330 mm)	20.0 lb (9.1 kg)	17.0 lb (7.7 kg)	32%
015	0.015" (0.381 mm)	26.0 lb (12.1 kg)	20.8 lb (9.5 kg)	32%
017	0.017" (0.432 mm)	35.0 lb (15.9 kg)	28.0 lb (12.7 kg)	30%
019	0.019" (0.483 mm)	42.0 lb (19.0 kg)	31.5 lb (14.3 kg)	28%
021	0.021" (0.533 mm)	52.9 lb (24.0 kg)	39.7 lb (18.0 kg)	28%
023	0.023" (0.584 mm)	62.0 lb (28.0 kg)	46.5 lb (21.1 kg)	28%
027	0.027" (0.686 mm)	85.0 lb (38.6 kg)	59.5 lb (27.0 kg)	28%

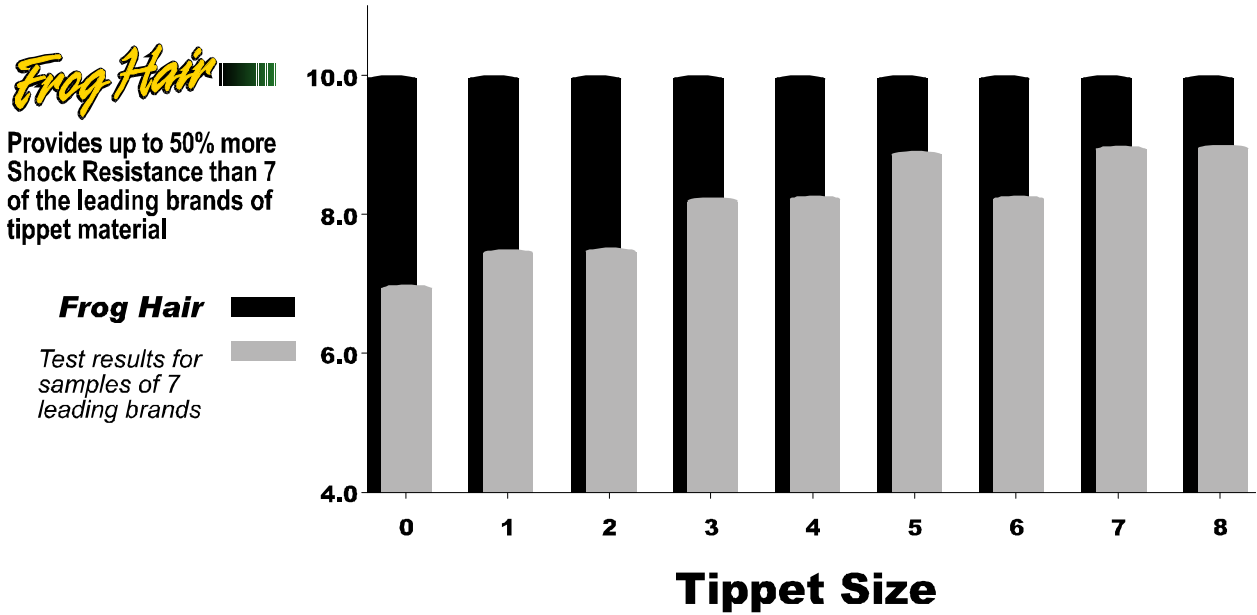
Notes :

- 1. Stated values are averages and actual results will vary within allowable manufacturing tolerances established by GAMMA Technologies.**

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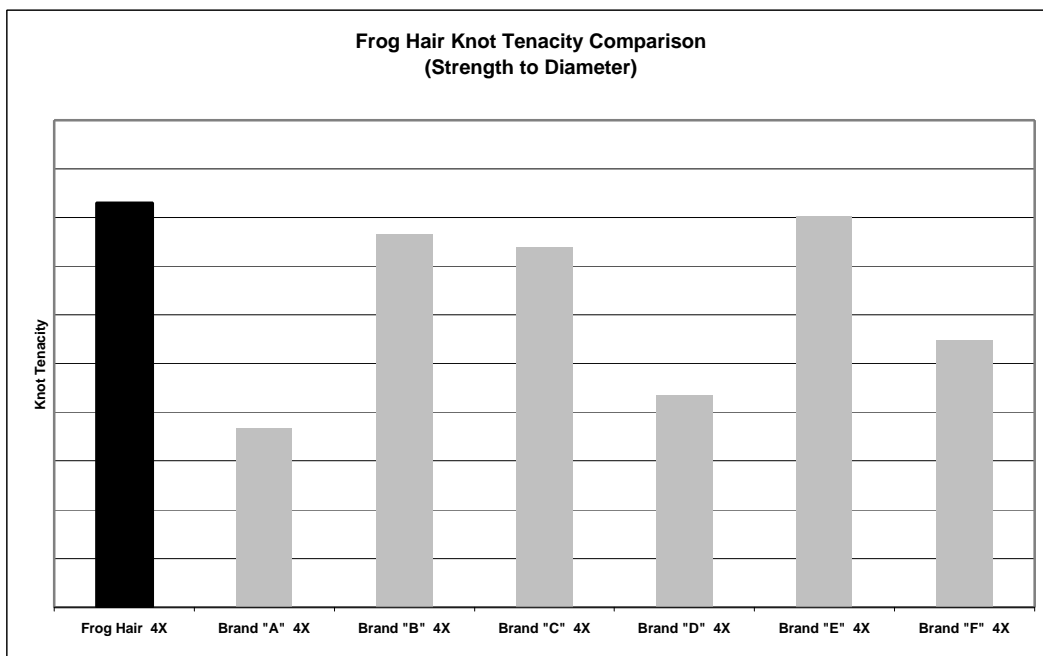
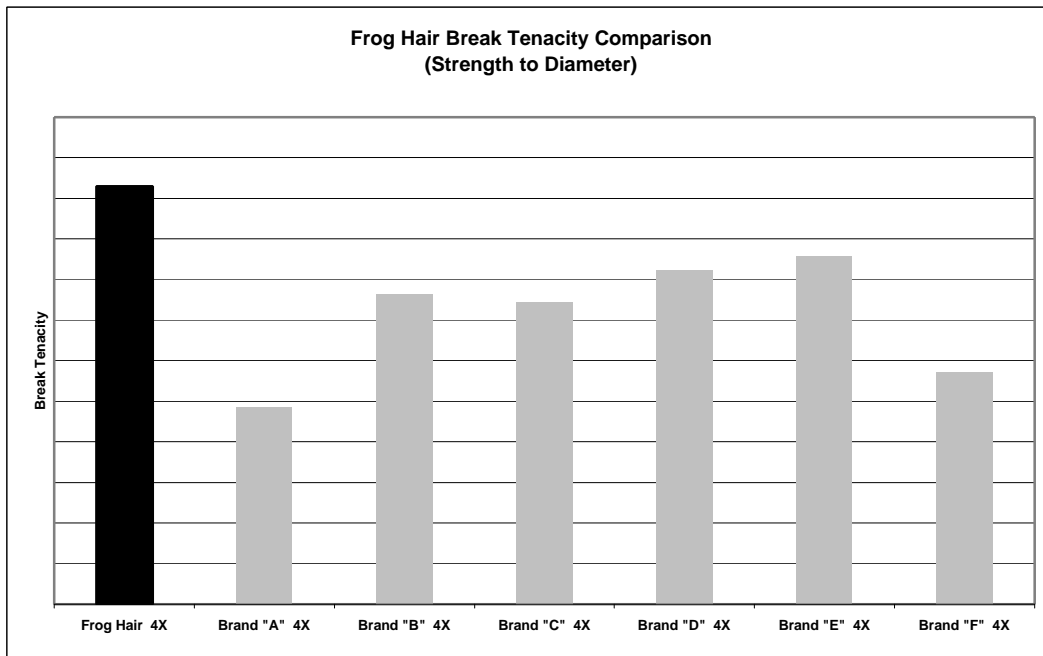
APPENDIX II

Tippet Shock Resistance Index



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APPENDIX III - Comparison Data Summaries



**Frog Hair
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APPENDIX III - Comparison Data Summaries (cont'd)

