

PROJECTILES

Units 9 & 4+5 Dr John P. Cise, Professor of Physics, Austin

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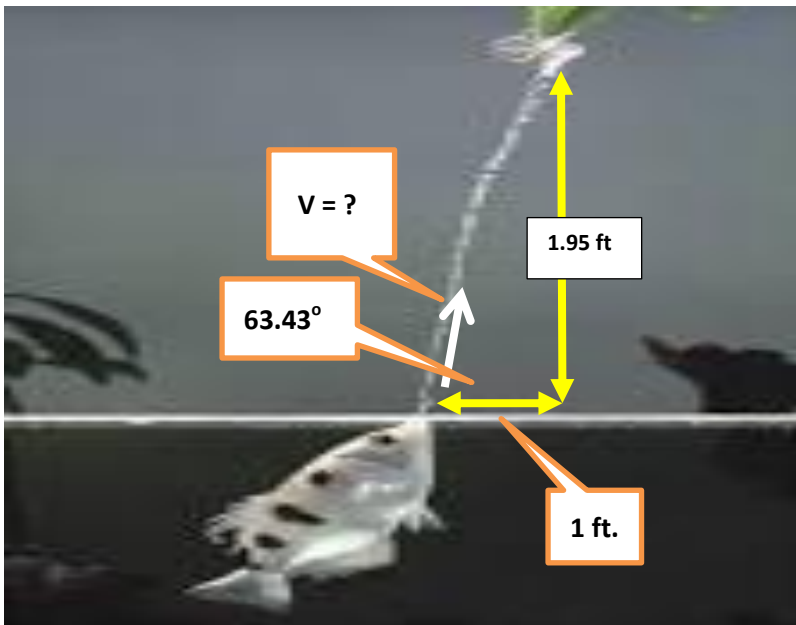
The Trick to the Archer Fish's Powerful Attack



INTRODUCTION: Archer fish spit out a powerful jet of water which knocks the prey off vegetation and the fish race to capture their dinner.

QUESTIONS: (a) Find cosine and sine of 63.43° ? (b) Find V (in ft/s and mph) of water spit and time of spit to get to prey?

HINT: Break solution into horizontal and vertical parts. 60 mph = 88 ft/s



ANSWERS: (a) $\cos. 63.43^\circ = 0.4473$, $\sin. 63.43^\circ = 0.8944$
(b) $V = \sim 40$ ft/s , or 27.27 mph

To capture their prey — a spider or insect, often sitting on branches above the water — (((archer fish spit out a powerful jet of water))). *The jet knocks the prey off and the fish race to capture their dinner.*

“When the jet hits a solid surface you can hear a loud knock that’s very impressive because the fish are very small,” said Alberto Vailati, a physicist at the University of Milan. Just how the fish generate a stream of water powerful enough to detach prey from vegetation has been a mystery. Now Dr. Vailati and his colleagues say the fish are able to modulate the velocity of the water coming out of their mouths. They increase the velocity over time and the water builds up as it is spit out in a continuous stream. “You have this drop of water that progressively increases in size over time, and gets inflated,” Dr. Vailati said. This large drop of water is then able to hit and knock down prey with incredible force. The technique used by the fish resembles something called water jet cutting, Dr. Vailati said, in which jets of water cut through metal. He and his colleagues [report their findings](#) in the current issue of the journal PLoS One.