



Activities How Archer Fish Spit at Insects

This activity is a fun way of demonstrating how archer fish spit water at insects. It supports the Eaten Alive exhibits *Dice with Death* and *Death at a Distance*.

What you need

Each group of students (4–5 per group) should have:

- One water pistol.
- One tape measure or ruler.
- One hanging rod (e.g., long piece of dowel, several coat hangers or dead tree branch).
- One dozen fly paper strips (photocopy, cut out and fold the accompanying sheet).
- One pair of 'nerd' glasses with stickers attached to the central flat area of the lens. This forces students to look through the thick section of the lens and have a distorted view—similar to an archer fish looking up through water and viewing refracted light. The sticker does not represent a blind spot that the fish may have. 'Nerd' glasses may be purchased for about AU\$5.00 each in shops that sell 'joke' gifts. NB – THESE GLASSES SHOULD NOT BE WORN FOR EXTENDED PERIODS OF TIME.



What to do

1. Hang the fly paper strips about one centimetre apart on the rod or coat hanger. The rod or coat hanger needs to be balanced more than one metre above ground between chairs, tables, a ladder—whatever you have available.



2. Student A should wear the 'nerd' glasses and shoot at the fly paper strips. They can shoot many times until the paper strip is knocked off the rod.
3. Student B should watch the paper strip closely and start timing as soon as the paper strip has been hit off the hanging rod, then stop timing when the paper strip hits the ground. This student should call out the time, so Student D can record the time for each strip of paper.
4. Student C should measure the distance between the strip's starting point (on the ground below where the strip was hanging) and the point where the strip eventually lands. This student should call out the distance, so Student D can record the distance for each strip of paper.
5. Student D should record the time and distance, then replace the paper strip on the branch, ready for Student A to shoot at the paper strip again.
6. Repeat this process about 20 times. Students can swap roles and repeat another 20 times, etc.,
7. Calculate how fast the archer fish would need to swim to gobble up the fly as it hits the water (ground). Using the following calculation:
$$\text{SPEED} = \text{DISTANCE (cm)} \div \text{TIME (seconds)}$$



What to notice

Experiment number	Time taken (seconds)	Distance strip landed away from starting point (centimetres)	Speed required to capture paper strip (divide distance by time to get cm/s)

Was it difficult to aim at the paper strips while looking through the thick lenses?

Is there much difference in the results when the 'shooter' changes?

How fast would you need to 'swim' to grab the fly paper strip?

Can you match the swimming speed of the archer fish and catch the fly paper strip in ONE TENTH of a second?!

What's happening

When they're looking for insects above the water, archer fish swim in an almost vertical position.

Once they have spotted an insect, the archer fish spits water at the insect to try and knock it into the water.

Water distorts an archer fish's view of insects, because water bends light and makes objects appear larger and in a different position. When you wore the thick lens glasses, this represented how an archer fish might see its environment.

So the archer fish allows for this distortion by shooting 'off-target'.

They also calculate where the insect will fall into the water and grab it in one tenth of a second. If the archer fish dawdles, other fish nearby will swoop in and gobble up the insect.

The archer fish has a groove along the roof of their mouth and a ridge-shaped tongue. When they press their gills shut, they push their tongue against the groove to shoot out jets of water.



Activities
How Archer Fish Spit at Insects



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