

ZENO'S PARADOX

By Tony Wu

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Zeno of Elea was a philosopher who lived in ancient Greece, somewhere around 500 BC. Among many things, he is perhaps most well remembered for a mental conundrum popularly known as Zeno's Paradox.

The paradox involves Achilles, the fabled Greek hero of the Trojan War, and goes something like this...

If Achilles were to try to run from point A to B, he would first have to travel half the distance between the two points. Having accomplished that, he would then need to travel half the remaining distance. Having done that, he would need to cut the distance in half again. And again, and again, and again...

Mathematically, if we assume that the distance between the two points is one (units don't matter), then the total distance that our hero travelled would be $1/2 + 1/4 + 1/8$ and so forth. Since you can keep dividing each successive distance in half, then logically, Achilles, the poor sap, would never reach his destination...not today, not tomorrow, not ever.

How's that for a brain twister?

What reminded me of this famous mind bender was a series of articles that appeared recently about the issue of overfishing.

The articles set out two differing points of view:

On the one hand were people arguing in favour of greater international cooperation and stronger protection measures to prevent overfishing. They submit that past experience with collapsed fisheries clearly demonstrates a clear and present danger for heavily targeted commercial species like orange roughy, Chilean seabass and bluefin tuna.

The other point of view argued that in most cases, there isn't enough data to arrive at a definite conclusion about whether commercial fishing is leading to long-term damage or not. The logic put forth by these people holds that data collected in recent years doesn't demonstrate conclusively whether fish stocks are declining or not, so we should continue fishing until we can gather more data.

I sense that Zeno would have viewed the second argument with great interest.

Let's say your family has been living in the same place for three generations. Your grandparents might remember the neighborhood as quiet, with little or no contact with outsiders. Life was slow, and everyone knew and trusted one another.

Your parents might say that no, in reality, your home town had actually always been a thriving port city. Sure people were friendly, but you had to pick your friends and be a bit careful about who you associated with.

And finally, you might characterise your neighborhood as a bustling urban center, with visitors from all over the world, where nobody stays put, and where you hardly know, much less trust, your neighbors.

The thing is, all of you would be correct. It's just that your reference points would be different, and that the major changes over three generations would not have been as noticeable during the span of only one lifetime.

So let's think about this in terms of fishing.

Fishermen several generations ago will have experienced and remembered one

thing, probably lots of big fish readily found and caught.

The next generation would remember a slightly different version of the seas. Fish would probably still have been plentiful, but not particularly easy to find, and the average size of the "big ones" would probably be smaller than the prize catches of the previous generation.

Keep this up over time, and what you get is a gradual change in the "baseline" of expectations. With each generation, long-term memories would fade, and the reference against which current fishermen and researchers base their opinions would also change.

As with the example of the family above, any short-term sample, say data collected for only a few years, probably would not conclusively demonstrate any big changes. But over greater periods of time, the story would most likely be much different.

This is exactly what's happening — there isn't enough good-quality, long-term data to have proper perspective in most cases, while data collected over too short a period doesn't show much. Based upon this less-than-ideal situation, some people are maintaining that we shouldn't do anything until we gather more data.

To me, that's sort of like saying it's perfectly ok to jump out of a plane without a parachute, as there hasn't been sufficient long-term data collected to determine conclusively whether doing so would be bad for your health. Yeah right, get a clue.

Were Zeno alive today, perhaps he would put it like this: "Forget the paradox. Use your head. If you throw a brick at a window, you know the glass will shatter. So if you keep cutting fisheries in half, what do you think will happen?"

