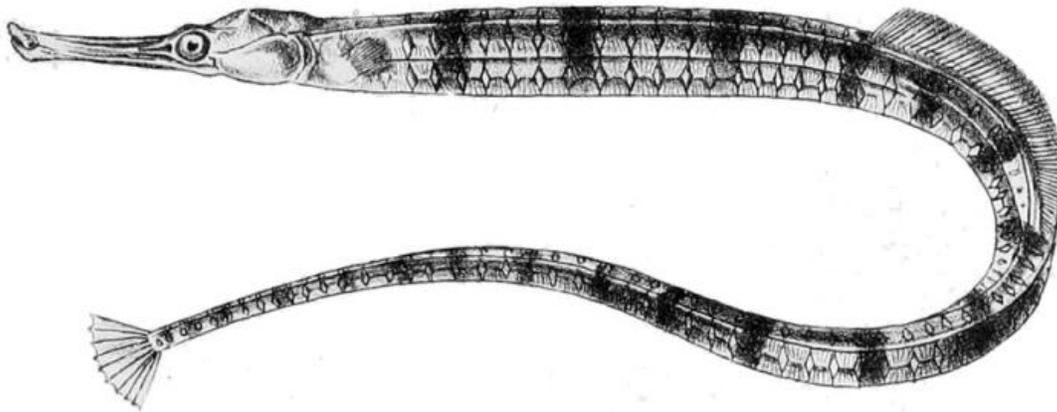


Pregnant pipefish fathers are not super dads

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Male pipefish (*Syngnathus acus*) with subcaudal pouch. Credit: Public Domain

Many aquatic species have a reputation for negligent parenting. Having cast their gametes to the currents, they abandon their offspring to their fate. However, hands-on parenting is taken to a whole new dimension in the Syngnathidae fish family. Instead of leaving the responsibility to the females, seahorse and pipefish males take the pledge to care for their young even before the eggs are fertilized. The females depart soon after placing their eggs directly into the male's brood pouch, leaving the soon-to-be fathers to incubate the developing embryos.

Ines Braga Goncalves from the University of Zurich, Switzerland, explains that the pregnant [males](#) support their offspring by removing the youngsters' waste and supplementing their nutrition, but it wasn't clear whether the males also provided the youngsters with an ample oxygen supply. Braga Goncalves explains that the lower availability of oxygen in water was believed to naturally limit the size of fish eggs and, as [pipefish](#) eggs are relatively large for the fish's size, it was assumed that the males somehow provided an abundant supply of oxygen, but no one had ever checked. Braga Goncalves and her colleagues Ingrid Ahnesjö from Uppsala University, Sweden, and Charlotta Kvarnemo from the University of Gothenburg, Sweden, have discovered that contrary to popular belief, pipefish dads supply much less oxygen than thought and they show that the fathers lose weight and body condition when oxygen is scarce.

They publish their results in *The Journal of Experimental Biology*.

To find the answer to the question of whether pipefish fathers provide abundant oxygen for their developing young, the trio went trawling for broadnosed pipefish in a Swedish fjord at the start of the mating season. Keeping the pipefish in large storage tanks with ribbons to simulate seaweed, Braga Goncalves recalls that the females were happy to mate with the males in captivity. Next she transferred half of the pregnant males to aquaria supplied with well-oxygenated water (100% O₂ saturation) and the other males to tanks that had low oxygen levels (40% O₂ saturation) before beginning the tricky process of measuring how much oxygen was available to the broods tucked away safely inside their fathers' pouches.

Gently securing the wriggling fish in a silicon sleeve and inserting a thin electrode, which precisely measured oxygen concentration, into the brood pouch of each male every 6 days during the first 24 days of the pregnancy, Braga Goncalves was surprised to see that even in the fully

saturated water, the [oxygen saturation](#) in the fluid bathing the incubating embryos was relatively low and only averaged 51%. And the situation was even worse for the youngsters whose fathers were in the poorly oxygenated water: the oxygen saturation only averaged 32%. Tracking brood pouch oxygenation over the first half of the pregnancy, Braga Goncalves was also concerned to see that the oxygen saturation fell by almost 50% in the well-oxygenated fish, reaching 40%; although it plummeted below 30% in the oxygen-deprived fish. The embryos didn't seem to be too badly affected by their breathless start - they were smaller and shorter, but survived as well as the better oxygenated embryos - however, the out-of-breath fathers suffered for their young, losing weight and body condition.

So, contrary to popular belief, male pipefish are unable to boost the oxygen supply that they provide to their precious cargo and the mystery of why pipefish eggs are so large remains. However, Braga Goncalves stresses that the fathers still give their young a fantastic start in life, protecting them from predators when they are at their most vulnerable and providing them with many of life's essentials.

More information: Braga Goncalves, I., Ahnesjö, I. and Kvarnemo, C. (2015). Embryo oxygenation in pipefish brood pouches: novel insights. *J. Exp. Biol.* 218, 1639-1646.

jeb.biologists.org/content/218/11/1639.abstract

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