

Home Table of Contents Feedback **Subscribe** Help/About Archives Search

SCIENCE NEWS Online

THE WEEKLY NEWSMAGAZINE OF SCIENCE

Subscriber Login

Access to full contents

[Sign In](#)

[Help](#)

What Else Is New?

[Home page.](#)

[Search](#)

[Archives](#)

Online Features

- **Math Trek**
[A Fair Deal for Housemates](#)
- **Food for Thought**
[Sickening Food](#)
- **Science Safari**
[Making Waves](#)
- **TimeLine**
[70 Years Ago in Science News](#)

[Print Article](#)

Week of March 11, 2000; Vol. 157, No. 11

[E-mail Article](#)

Pregnant—and Still Macho

Male seahorses allow scientists to test extreme notions of sex-role reversal

Susan Milius

One-half of the human race may find the idea more interesting than the other half does, but regardless, there's been plenty of speculation on what the world would be like if males were the ones who got pregnant.

The more elaborate hypotheses—about warp-speed progress in obstetrics or Tiger Woods endorsing maternity clothes—have yet to receive rigorous testing. However, some of the basic theories of sexual behavior and sexual selection are getting attention thanks to a burst of new studies in the topsy-turvy social world of the seahorse.



Appearing pregnant even though she's not, this female potbelly seahorse acquired her name for obvious reasons. This species grows to 8 inches in height in Pacific sea grass beds and rocky reefs near Australia and New Zealand. Males need about 20 days to complete a pregnancy. This seahorse is part of a popular exhibit at Chicago's Shedd Aquarium.

(Edward Lines/Shedd Aquarium)

In these unusual fish, the female still produces the eggs, but she deposits them into a pouch in her mate's body. Then she swims away, returning only for 5 to 10 minutes once a day during his several weeks of pregnancy. Finally, his distended body contracts and labors as he expels tiny seahorses one by one. Males of some species give birth to a few dozen, but others bear more than 100, and one Caribbean male astonished researchers as his half-tablespoon pouch held more than 1,500 babies.

They're real

"I spend a lot time saying, 'Yes, they're real,'" notes Heather Hall, a fish geneticist at the London Zoo and cofounder of Project Seahorse, an international project to study and conserve seahorses. Many of her visitors come to the zoo believing that seahorses are myths, and until the last decade, the paucity of scientific literature on the topic might have justified their beliefs.

"I find it incredible, still, that an animal that's so popular has been so little studied," says Hall. "I expected to be looking at research gaps and filling them in, not starting with a blank sheet of paper."

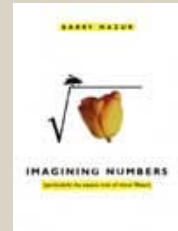
Seahorse study had been so neglected that until last year, taxonomy "was a complete mess, to put it politely," remarks Hall. About 150 Latin names appeared in print to describe roughly 35 species. One of the names mentioned most often in seahorse-trade records has been applied to a range of animals that Hall considers to include at least 10 distinct species. Finally, in 1999, creative fundraising from such sources as Guylian Chocolates of Belgium, which makes seahorse-shaped candy, allowed Project Seahorse to publish the first identification guide to the fish.

Subscribe

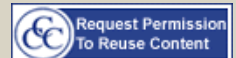
Subscribe to *Science News*.
Click OR call
1-800-552-4412.

NEW! Free E-mail Alerts

[Science News e-LETTER.](#)



Visit *Science News Books*, our online bookstore.



[Request Permission To Reuse Content](#)



Browse a *Science News* photo collection.



Subscribe to *Science News* in spoken-word format.



Buy a *Science News* Pangaea Mug.

It lists 52 species in one genus, *Hippocampus*, within the oddball syngnathid fish family. The syngnathids generally share a hunting style, snorting up small crustaceans and other prey through strawlike snouts. Body styles of the 35 syngnathid genera diverge from the few-frills swimming cylinders of pipefish to the abundantly adorned frames of sea dragons, which resemble a cross between a seahorse and a wilting begonia.

Hall often has to convince zoo visitors that seahorses are really fish. They breathe with gills, and they swim with fins. The biggest, the Pacific seahorse, reaches about 11 inches in height, whereas an Australian species stays under an inch.

Seahorses stick to narrow zones along tropical and temperate coasts, bobbing in sea grass meadows, mangrove stands, and coral reefs. All seahorses are marvels of camouflage, cloaked in murky brown-and-gray patterns that vanish into sea grass backgrounds.

Yet the animals assume startling colors during social moments or in unusual surroundings. Mates can blush a creamy yellow when meeting each other in the morning, reports Project Seahorse cofounder Amanda C.J. Vincent of McGill University in Montreal. She encountered one Australian male that took on the orange of the high-visibility tape that she used to mark a grid in the study area.

Vincent's studies of seahorse family life, starting in the mid-1980s, led the new wave of research. Lurking for hours underwater in sea grass beds in Australia, she detailed the doings of a typical species, *Hippocampus whitei*.

Males stick to about a square meter of their habitat though females range over perhaps a hundred times that area, she found. When two parties discover a mutual interest at the beginning of the breeding season, they court for several days. In lab tests, interlopers of either sex tried to interfere.

The courting pair might change color, sidle by each other, swim side-by-side holding tails, or grip the same strand of sea grass with their tails and wheel around it in unison. A male pumps water through the egg pouch on his trunk, which balloons and gapes open to display an alluring emptiness.

When a female's eggs reach maturity, she and her mate abandon grips on any anchors and, snout-to-snout, drift upward out of the sea grass, often spiraling as they rise. The female squirts perhaps 200 eggs from a chamber in her trunk into his pouch. Her body slims as his bulges. Both seahorses sink back to the bottom, and she swims off.

A male seahorse's body courses with prolactin, the same hormone that governs milk production in pregnant women. He doesn't supply milk, but his pouch provides oxygen as well as a controlled-environment incubator for about 21 days.

Throughout the male's pregnancy, his mate visits him daily for what Vincent calls morning greetings. The female seahorse swims over for about 6 minutes of interaction reminiscent of courtship. They change color, wheel around sea grass fronds, and finally promenade, holding each other's tails. Then, the female swims away until the next morning, and the male goes back to vacuuming up food through his snout.



A spiny seahorse wraps its tail around blades of sea grass.
(Edward Lines/Shedd Aquarium)

While monitoring the Australian seahorses, Vincent saw females refuse to mate with other males during her mate's pregnancy.

The pregnant male typically gives birth during the night, and a female returning for the morning greeting finds her mate ready for the next batch of eggs. That day or the next, she obliges as the greeting turns into courtship.

Mirror-image world

Such a lifestyle fulfills an ecologist's fantasy of finding a mirror-image world in which to test theories about reproduction. For example, Vincent wondered, would males that spend most of their adult lives pregnant still swat at each other competing for females? Or would they become the choosy sex, leaving females to battle it out to win male favors?

The latter sex-role reversal "had been tacitly and explicitly assumed" by researchers, she notes. Yet her lab tests in the late 1980s dashed that expectation.

When she watched various combinations of males and females sharing an aquarium tank, she found that only the males tail-wrestled. She has seen males snap their heads toward each other but hesitates to call this competition. Putting underwater microphones into tanks revealed that the fish make a noise like fingers snapping.

In competitive behaviors that males and females shared, Vincent rated the males as more intense. The male rival that triumphed in a contest for a mate typically turned out to be the heavier one. Contrary to old expectations, it looked to Vincent as if males were putting more effort into getting pregnant than females were exerting to impregnate them.

The intense male competition has raised questions about where to fit seahorses into the spectrum of animal mating systems. One way to look at the problem is to calculate which sex could produce more young if unlimited partners were ready and willing. In theory, the sex that competes the most forcefully ought to be the one that has the potential to have more offspring.



The leafy seadragon, about 14 inches in length, gives its young a no-frills version of the prenatal care common in the closely related seahorses. Females deposit up to 120 ruby-red eggs on the male's tail, and he carries them for 3 to 5 weeks.

(Edward Lines/Shedd Aquarium)

Vincent and Tim H. Clutton-Brock of the University of Cambridge in England have tested this prediction by comparing 29 fish, frog, or bird species in which dad tends the kids. In 27 species, the idea holds, they reported in 1991. For example, male three-spined sticklebacks and coqui frogs squabble over mates. In these species, males could produce more offspring than females could, and as predicted, the males get more competitive.

The reverse situation appears among 14 species, including two pipefish and such birds as phalaropes and jacanas. Males are the ones limiting the number of offspring, and female-female competition in romantic matters gets intense.

Recent work adds seahorses to the first group of species, says Heather D. Mason-Jones now at Amherst (Mass.) College. She explored the question for dwarf seahorses, *Hippocampus zosterae*, from the Florida Keys. Males of this species compete fiercely.

When mates meet for the first time, the male can be ready for action in about 4 hours. Although the female takes only a few hours to prepare a batch of eggs by pumping water into them, she demands several days of courtship. Because of this difference in readiness, males have the

potential to produce 17 percent more offspring than females could during a breeding season, Masonjones reports in the January *Animal Behaviour*.

Also, females have time-outs from the reproductive cycle that are 1.2 times longer than those of males. Hence, dwarf seahorses fit the model that competition goes with greater reproductive potential.

The female's longer courtship period doesn't seem to be based on physiology, Masonjones says. Once the female's eggs are ready, she has to lay them within a few hours. If the male flits off, she just ejects them onto the sea floor.

Masonjones speculates that some behavioral mechanism keeps females from hydrating eggs in the first hours of courtship to reduce the chances of wasting an egg clutch if the courtship goes awry. Losing a clutch represents a big loss; eggs represent about a third of the female's body weight.

Competition and choosiness

Masonjones has been exploring another aspect of competition and choosiness, the eternal question of who's investing more energy in the kids. For seahorses, the answer may look ridiculously obvious, but it's not, says Masonjones.

To estimate the female's direct contribution, Masonjones performed a chemical analysis of the energy stored in the eggs. "I did with fish eggs what any good nutritionist would do to find out how many calories are in French fries," she says.

To measure the toll that pregnancy takes on a male, Masonjones ventured into the frontier of seahorse obstetrics. She built a seahorse-size respirometer that records the oxygen concentrations in water flowing into and out of a chamber.

Before a male became pregnant, she checked his baseline need for oxygen. Then, she monitored the increase as pregnancy progressed. The male's body has to work hard by the end of pregnancy, consuming almost a third again as much oxygen as he did before mating, she concludes.



The multibanded pipefish, reaching 7 inches in length, has fused jaws and no teeth, just like its seahorse relatives. Males have a special patch of skin where a female can lay her eggs.
(Edward Lines/Shedd Aquarium)

To correct for oxygen used by his growing brood, Masonjones managed to keep 1/4-inch high preemie seahorses alive outside the pouch so she could measure their oxygen needs.

Despite the weeks of pregnancy, males directly contribute only half as much energy for offspring as females do, Masonjones found. Male seahorses then might fit the widespread pattern of the less-invested sex being the less-choosy, she told the 1998 meeting of the International Society for Behavioral Ecology in Asilomar, Calif.

Still, direct costs don't tell the whole story, she cautions. Now, she's working on ways to calculate indirect costs, such as increased predator risk.

Seahorse monogamy in the wild intrigues Vincent, so she brought some of the fish into her laboratory to test the speculation that the daily greeting helps cement the bond between the pair. She kept each female in a tank with two males. When the female filled one male's pouch with eggs, Vincent exiled him and left the female alone with the other male.

During the 2 weeks of her mate's pregnancy, the female seahorse and her tankmate greeted each other daily, clinging to the same bit of grass and changing color, but Vincent saw no serious courtship. When the original mate had given birth, Vincent returned him to the tank. The female then had a choice between him and the other tankmate.

Both males expressed eagerness for her attention, changing color and flaunting their pouches. They also tail-wrestled and whacked at each other with their snouts. In all six tests that Vincent performed, the female rejected her original mate and presented the next clutch of eggs to the tankmate that she had greeted each day. In seahorses, a daily greeting counts for a lot, Vincent concludes.

Clicking sounds

Not all the new seahorse science focuses on family life. Dwarf seahorses and a related species make clicking sounds when they feed, but just how they click has not been clear.

One theory held that rapid pressure changes create little cavities in the hollow behind the intake snout. However, that's not the case, argue D.J. Colson and a team based in Sara Lewis' lab at Tufts University in Medford, Mass. Probing the structure of the head, they found evidence that a bony file on one part scrapes against another segment.

Seahorse clicks could come from a stridulation, an underwater version of a cricket's sound, the researchers suggest. High-speed video with simultaneous sound revealed that the clicks start within 1 to 2 milliseconds of feeding.

The most important ability of a seahorse, however, may turn out to be its power to charm people, says Hall. With Vincent, she has been publicizing the threats to seahorse populations, and people are noticing. As coastal populations of people boom around the world, seahorse habitats are shrinking or choking with pollution.

An international trade that supplies wild-caught seahorses for sellers of traditional medicines, aquarium keepers, and curio collectors claims perhaps 20 million animals each year, Vincent concluded in a 1996 report distributed by TRAFFIC, a nonprofit watchdog for the international trade in wildlife. Commercial seahorse collectors in five countries have told Vincent that catches have declined by up to 50 percent since the early 1990s.

Drumming up support for aquatic conservation has never been easy, Hall laments. Many people cherish coral reefs, but the equally vital sea grass meadows seem to the untrained eye to be "just squidgy mud and grass," she says. Some of the rarest, most exciting marine species in these areas look like "boring little gray-brown fish," she admits.

Seahorses, thank heavens, are a very different matter. Hall hopes they'll become flagship species to inspire conservation of ecologically vital habitats.

"They're just one of those quirks of nature that people can't quite come to grips with," she says. "People are fascinated."

References and sources for this article

References:

Clutton-Brock, T.H., and A.C.J. Vincent. 1991. Sexual selection and the potential reproductive rates of males and females. *Nature* 351(May 2):58-60.

Colson, D.J. . . . and S.M. Lewis. 1998. Sound production during feeding in *Hippocampus* seahorses (*Syngnathidae*). *Environmental Biology of Fishes* 51:221-229.

Masonjones, H.D., and S.M. Lewis. 2000. Differences in potential reproductive rates of male and female seahorses related to courtship roles. *Animal Behaviour* 59(January):11-20. See <http://ase.tufts.edu/BIOLOGY/faculty/bios/lewis.html>.

Further Readings:

Vincent, A.C.J. 1996. *The International Trade in Seahorses*. Cambridge, Eng.: Traffic International. See <http://ww2.mcgill.ca/biology/labs/vincent/seahorse/index.htm>.

_____. 1995. A role for daily greetings in maintaining seahorse pair bonds. *Animal Behaviour* 49:258-260.

_____. 1994. The improbable seahorse. *National Geographic* 186 (October):126-140.

_____. 1994. Seahorses exhibit conventional sex roles in mating competition, despite male pregnancy. *Behaviour* 128:135-151.

Sources:

Tim H. Clutton-Brock
Large Animal Research Group
Department of Zoology
University of Cambridge
Cambridge CB3 0DT
United Kingdom

Heather Hall
Zoological Society of London
Regent's Park
London NW1 4RY
United Kingdom

Sara M. Lewis
Department of Biology
Tufts University
Medford, MA 02155

Heather D. Masonjones
Campus Box 2237
Department of Biological Sciences
Amherst College
Amherst, MA 01002-5000

Amanda C.J. Vincent
McGill University
Department of Biology
1205 Avenue Drive Penfield
Montreal, QC H3A 1B1
Canada

From *Science News*, Vol. 157, No. 11, March 11, 2000, p. 168.

[Home](#) | [Table of Contents](#) | [Feedback](#) | [Subscribe](#) | [Help/About](#) | [Archives](#) | [Search](#)

Copyright ©2000 [Science Service](#). All rights reserved.
1719 N St., NW, Washington, DC 20036 | 202-785-2255 | scinews@sciserv.org

.....