



## Ask the lobster doc

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*This column provides lobster health and handling information.*

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### Gynandromorph lobsters

I saw my first gynandromorph lobster over 20 years ago. A true bilateral gynandromorph – split down the middle with female characteristics (including ovaries) on the right side and male characteristics (including testes) on the left. It was also a bilateral colormorph – blue on the right and natural on the left (just a coincidence). Since then I've examined at least a dozen lobsters with myriad variations on the gynandromorphy theme.

Gynandromorph, which literally means part female (gyn-) and part male (andro-), should not be confused with hermaphrodite. Hermaphrodites are naturally and intentionally occurring complete individuals who *function* as both male and female either at the same time or as one and then the other.

Gynandromorphs are genetic abnormalities that occur in some animals whose natural state is to function as either

male or female for all their lives. A bilateral gynandromorph occurs when the split is down the middle.

The most interesting thing I learned from one of the gynandromorphs I've seen was that "she" could brood embryos. S/he was captured from the wild already bearing the brood so I can't be certain how the eggs were fertilized but I suspect a male lobster was involved. Although she dropped the eggs, a few hatched into gender differentiated lobsters.

The strangest gynandromorph I've seen had a combination of both male and female characteristics on both sides of the body – even on the very same appendages! Its gonopods (first pair of swimmerets) were calcified and hardened (like a male's) where they left the body, but they ended in soft feathery tips (like a female's).

The latest gynandromorph (see photo) is a mosaic of mostly female, but some male parts. Actually, the only male characteristic evident in the photo is the gonopod on the left side when viewed from the underside. This lobster doesn't even have a sperm duct (males have an opening on each side at the base of the 5th pair of male walking legs, from which spermatophore are ejaculated). One would have to look inside to see if this lobster has testes. In any case, it is certainly not capable of transferring sperm to a female because that requires at least sperm ducts and two male gonopods.

#### Genetics, environment

So, how do lobsters end up this way?

The short answer is no one knows for sure but it most definitely has something to do with genetics and most likely with the environment, too.

Gender differentiation in mammals is fairly well understood. Gender is genetically determined and males have an X and a Y chromosome while females have two Xs. Gender determination in other animals is more complicated and more

*This close-up shows a gynandromorph's first pair of modified swimmerets. The male gonopod is on the left in this view of the lobster's underside, and the female's soft, feathery version is on*



malleable. Hormone levels inside mother birds can influence gender. In fishes and reptiles, environmental conditions such as temperature can determine gender.

However, gender determination in crustaceans such as lobsters is poorly understood. There are numerous potential factors that may determine whether a lobster becomes male, female, or a mosaic including features of both. No one knows how many genes are involved or how the environmental influences the expression of lobster gender genes.

It would be interesting to study the DNA of gynandromorph lobsters to find clues including the exact genetic makeup of the cells within the male and female parts. Differences in the genetic makeup of the two sides of the same individual could point out which genes are involved in gender differentiation thereby making abnormalities such as this an opportunity to help us better understand lobster gender differentiation in general.

There is no way to instantly recognize a gynandromorph lobster when looking at it from above – and even flipping it over to check the obvious may not arouse suspicion. I suspect that many go unnoticed. Perhaps this article will raise awareness and lead to some interesting research. ■



Peter K. Pryor photo

*From left, the Morris lobster team of Bob III and his father, Bob Jr., show the gynandromorph lobster that they trapped south of Thatcher's Island off Rockport, MA on Jan. 13 aboard their lobster boat Spirit, based out of Pigeon Cove Harbor.*