

DNA and DEEPEND

An essential aspect of the DEEPEND research is research is identifying and tracking species and looking at genetic diversity through DNA studies. (Deoxyribonucleic Acid = DNA)

All living things are made up of cells. Each cell contains a nucleus. The DNA is found in the nucleus. The DNA in every cell of a specific living thing is the same. However, every individual has its own unique DNA sequence. Genes contain all the information to make that specific living thing. Your genes, for example, are the instructions to “build” you, from your height, eye, hair color, and so much more.

Genetic diversity is a measure of the differences between DNA sequences. By looking at sequence differences between individuals, scientists learn a lot about genetic diversity, both now and in the past. Understanding genetic diversity helps us understand the health of the Gulf of Mexico. DEEPEND research includes discovering genetic components of fish, crustaceans, cephalopod, and microbes.

A genome is a complete set of an organism’s DNA.

A DNA molecule is made up of a pair of twisting strands called a double helix. Within the strand, there are four chemical units: Adenine, Thymine, Guanine, and Cytosine. Scientists use the first letter to represent each: A, T, G, C.

The order of these chemicals determines the genetic makeup of a living thing. Think of them sort of like musical notes (A, B, C, D, E, F, G). The order of musical notes creates the tune or a specific song. If you play musical notes in this order, "EDCDEEEDDDEGG" you’ve played the tune for “Mary had a Little Lamb.” Play the same notes in a different order and you will create a different tune.

See *Deep-Sea Sequence* handouts to compare the DNA sequences of these animals.



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The DEEPEND Science Team is using DNA to:

- **IDENTIFY ANIMALS:** DNA helps identify organisms. Some species look so much like other species. Some go through big changes on the way from baby (called “larva”) to adult. Scientists might only know what the adult looks like, when the DEEPEND Science Team collects unidentified larva, without DNA information, could be misidentified as a completely different species. Scientists look to see if the pieces of DNA sequences are very similar or identical to known species or maybe they’re completely new. Looking at DNA has helped many scientists find out the identity of “mystery” crustaceans.

- **GENETIC DIVERSITY AND SPECIES/POPULATION HEALTH:** DNA can tell scientists a lot about an animal and the population it lives in. A lot of this information comes from comparing DNA sequences (or whole genomes) from different individuals of a species. When we look at the differences between sequences – even very small, single-letter differences – we can find out about the genetic diversity in the population. The more differences we see, the more diversity. Genetic diversity is a very good thing to have. If something changes in an environment, diversity can mean the species is better able to adapt to new conditions. The more diversity we see, the healthier the population is likely to be!

- **POPULATION CONNECTIVITY AND SPECIES/COMMUNITY RECOVERY ABILITY:** Many baby animals look very different than the adults of a species. In crustaceans, these babies not only look different, but they can move through the water differently. Most adults walk or burrow and, in general, they stay in the same area. Larval crustaceans, however, can swim. This means that they can travel far away from where they were hatched. This stage is called “dispersal” because the young disperse, or move away from where they hatched. Sometimes when they disperse, they travel to areas with different populations than their parents. The young then change into adults and become part of that population. Obviously, when individuals move to new populations, either as adults or as young, they bring their DNA with them. The number of individuals moving between populations helps us determine how connected the populations are to each other. Sometimes we find every group is so well connected to every other group that they are essentially one population. Other times, we find something stops individuals from moving between groups.

Connectivity helps us understand how diversity moves around within an area, like the Gulf of Mexico. Understanding how well DNA moves between populations helps us determine how likely groups are to recover from trouble. Remember, diversity helps us determine health, so maintaining diversity through dispersal or migration helps a population stay healthy, even when something happens to a population or an environment – like an oil spill.

Read more about DNA at the National Human Genome Research Institute:
www.genome.gov/25520880/deoxyribonucleic-acid-dna-fact-sheet/

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Taking Science Deeper!

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