# The Candidate Gene Approach

Background

From analyzing stickleback parents and offspring, scientists knew that lateral plate number was influenced mainly by just one gene. To find out which gene is at work, you will use the candidate gene approach.

The candidate genes in this case are genes that might influence lateral plate phenotype. Short sections of these gene are shown below. Each individual has two alleles, but for some of these genes the population has up to three alleles.
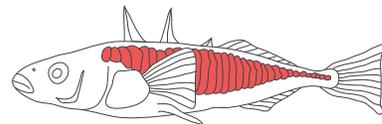
In this activity, you will compare the DNA sequences of the candidate genes in fish with different phenotypes. Then you will look for a connection between a fish's phenotype and its allele combination, also known as its genotype.
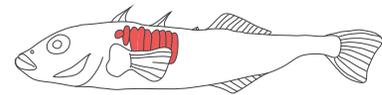
Low-plated
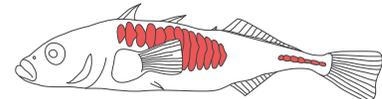
Partially plated

Completely plated
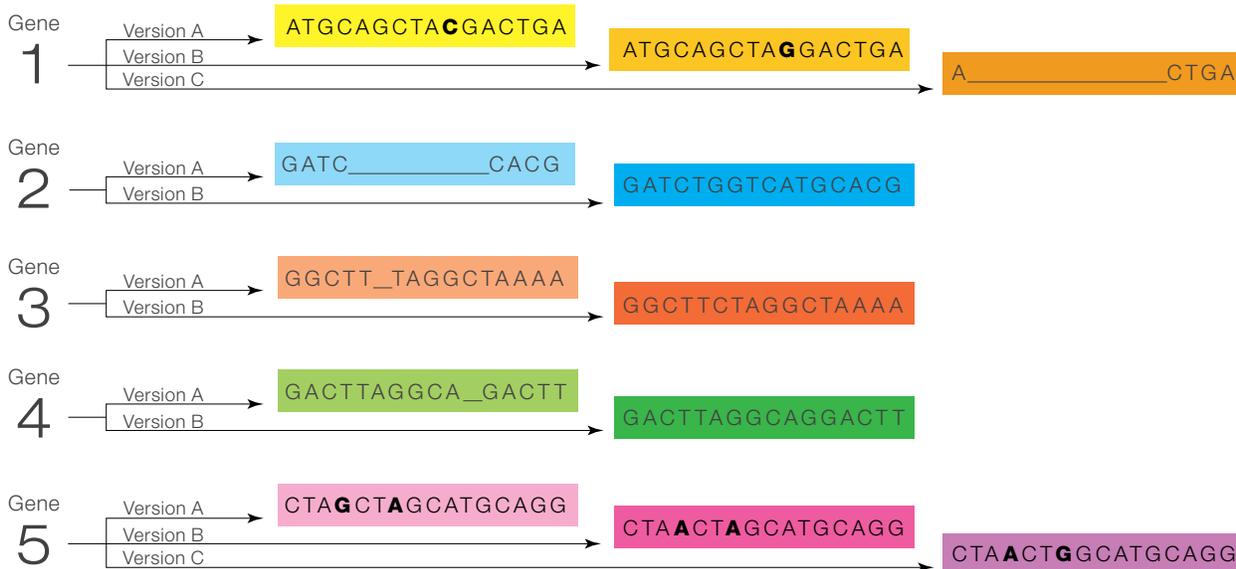
Lateral plate phenotypes

Instructions

1. Sort your cards (18 in all) by phenotype (low, partially, or completed plated). See the example card on page 2.

2. For each phenotype, look for similarities and differences in the allele combinations (genotype). Is there a gene for which the genotype always corresponds to a particular phenotype?

Candidate genes:
May influence phenotype

Alleles:
Sections of candidate genes, showing DNA differences

Gene **1**
Version A → ATGCAGCTA**C**GACTGA
Version B → ATGCAGCTA**G**GACTGA
Version C → A_____CTGA

Gene **2**
Version A → GATC_____CACG
Version B → GATCTGGTCATGCACG

Gene **3**
Version A → GGCTT_TAGGCTAAAA
Version B → GGCTTCTAGGCTAAAA

Gene **4**
Version A → GACTTAGGCA__GACTT
Version B → GACTTAGGCAGGACTT

Gene **5**
Version A → CTA**G**CT**A**GCATGCAGG
Version B → CTA**A**CT**A**GCATGCAGG
Version C → CTA**A**CT**G**GCATGCAGG

Phenotype

15 Partially plated

Fish identification number

Genotype for Gene 1: Different alleles are shown in different colors or shades.

Genotype for Gene 3: Identical alleles are shown in the same color or shade.

These alleles differ by one base (bold letters show where alleles differ).

These lines show where bases have been inserted or deleted. There is no physical break in the DNA strand.

Gene 1
ATGCAGCTA**C**GACTGA
ATGCAGCTA**G**GACTGA

Gene 2
GATC_____CACG
GATCTGGTCATGCACG

Gene 3
GGCTTCTAGGCTAAAA
GGCTTCTAGGCTAAAA

Gene 4
GACTTAGGCA_GACTT
GACTTAGGCAGGACTT

Gene 5
CTA**ACTA**GCATGCAGG
CTA**ACTA**GCATGCAGG

Questions

1. Which gene do you think influences lateral plate phenotype?

2. What is different about the allele combinations for this gene in low, partially, and completely plated fish?