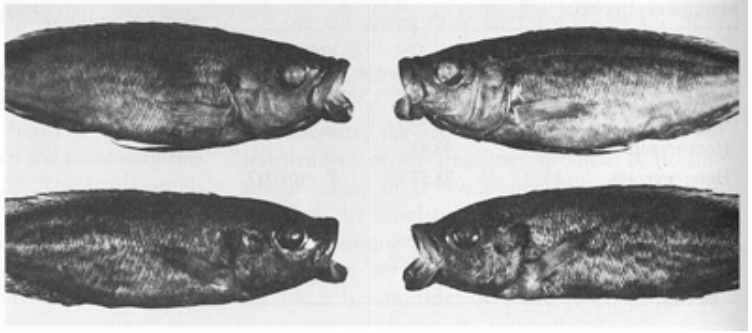
But first, a few things we didn't get to in previous lectures. . .

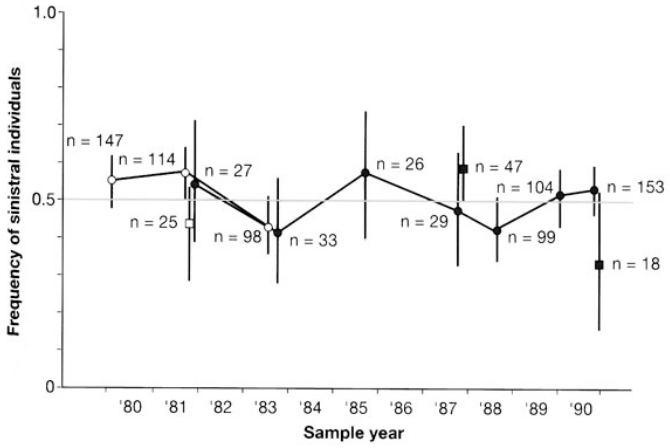
- Density-dependent selection
- Linkage disequilibrium

Density-dependent selection in *Perissodus eccentricus*



Perissodus eccentricus is a fish native to Lake Tanganyika, Africa. It's a *lepidophagous fish,* meaning that it feeds on the scales of other fish. In order to attack more efficiently, its mouth is twisted either to the left or to the right, so it can approach from behind and to the side, grabbing a mouthful quickly. . .

It turns out that the frequencies of left-handed and right-handed variants of *Perissodus eccentricus* fluctuate from season to season. (This graph shows the frequency of "lefties" over a decade.)



Another example

- *Drosophila* larvae come in two behavioral types, *rovers* which tend to crawl long distances when feeding, and *setters* which tend to stay in one place as they feed
- This is governed by one gene with two alleles: for^R and for^s
- Work by Sokolowski et al. (1997) suggests that density-dependent selection maintains these two alleles in the population—when one is most common, the other has the selective advantage.

Linkage disequilibrium

- If two alleles are tightly linked on the same chromosome, then selection that causes an allele at one locus to change frequency will cause an allele at the other locus to change frequency
- Sexual reproduction has the effect of breaking up linkage disequilibrium

Cowslips (*Primula veris*) come in two common varieties: "thrum" (long anthers, short style, shown on the left) and "pin" (long style, short anthers, shown on right).

(Visit Dr. A. J. Silverside's excellent page for the original image)

Anther height is governed by two alleles, *A* (long) and *a* (short). Style length is also governed by two alleles, *G* (short) and *g* (long). The loci are tightly linked.

Why's this matter?

- "Thrums" are GgAa
- "Pins" are ggaa
- Rarely, recombination will produce ggAa or Ggaa forms, with anthers and style both the same length.
- . . . but these plants don't self-fertilize (sex organs mature at different times), and insect pollination mechanics mean that "thrums" almost always outcross with "pins" and vice versa.
- This is linkage disequilibrium produced even in the presence of sexual reproduction