Biological Variation

Where does it come from and why is it important?

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Where does all this variation come from?

Why is it important?
Biological variation makes identification difficult in some species

Sierran Tree Frog (California)  different species  Pacific Tree Frog (Washington, Oregon)

these photos from Magnusson Park & Whidbey Island!
There are different levels of biological variation

variation across species = interspecific variation

variation within species = intraspecific variation

> variation within individuals = intraindividual variation

inter = across
intra = within
interspecific variation
variation across species
a major part of biodiversity

where does it come from? why is it important?
interspecific variation

where does it come from?
There are many explanations for the diversity among different species and why some places have higher interspecific diversity than others.
interspecific variation
where does it come from?

There are many explanations for the diversity among different species and why some places have higher interspecific diversity than others.

We do know that diversity causes more diversity: a field with more flower species, will usually have more pollinator species.
interspecific variation

why is it important?
**interspecific variation**

why is it important?

Ecosystems with multiple species are often more **productive, resilient** to disturbances, and have more diverse **functions**.
Interspecific variation
why is it important?

Ecosystems with multiple species are often more productive, resilient to disturbances, and have more diverse functions.

Interspecific diversity is important for nature and people. What are the many ways we rely on nature?
How many species did you rely on today?
intraspecific variation
variation within species
an often overlooked part of biodiversity
Intraspecific variation

Variation within species

An often overlooked part of biodiversity

Includes variation that is:

Genetic = DNA

Morphological = anatomy (shape/size of different body parts), color, pattern, etc.

That **may or may not** be genetic
intraspecific variation
variation within species
an often overlooked part of biodiversity

where does it come from? why is it important?
intraspecific variation

where does it come from?
intraspécific variation

where does it come from?

genetics

passed from parents to offspring
intraspécific variation
where does it come from?

- Genetics: passed from parents to offspring
- Plasticity: changes with age & the environment
intraspécifique variation
where does it come from?

**genetics**
passed from parents to offspring

**plasticity**
changes with age & the environment

*bonus*
sometimes, the *same* individual can change as it grows - this gives rise to *intrains**individual* variation
intraspecific variation

where does it come from?

**bonus!**
sometimes, the *same* individual can change as it grows - this gives rise to intra*individual* variation

plasticity changes with age & the environment

green iguanas often start out green & become orange with age
intraspecific variation
usually the result of both

- genetics: passed from parents to offspring
- plasticity: changes with age & the environment
intraspecific variation

why is it important?

for example

Genetic variation is important because it is better when a breeding pair is not closely related.

If a breeding pair is closely related, they are more likely to carry DNA for the same harmful traits.

Offspring will get a “double dose” of this DNA, which can be way worse than just one “dose”. 

some harmful traits are fine when there is only a single “dose”...

... but they can be fatal if you have two “doses”
**intraspecific variation**

why is it important?

*for example*

**Morphological variation** is important because it means members of the same species can divide up resources.

If all individuals were the same, they would have to compete for these resources.

With variation, individuals of different types can use different types of resources.
Intraspecific variation is important for humans because:

1. Genetic variation ensures that populations are healthy and individuals do not have harmful traits.

   e.g. The tiger, a charismatic species with high cultural value, is especially threatened because of its small population size and low genetic variation. Breeding individuals are often closely related.
Intraspecific variation is important for humans because:

2. Humans use the natural variation within species to create variants, cultivars, breeds, strains to suit our needs.

E.g. Human breeding of Koi fish and other species kept as pets has taken advantage of natural variation to produce fish with a range of colors and patterns.
Intraspecific variation is important for humans because:

3. Humans rely on variation within species to produce more reliable sources of food.

e.g. Different populations of the same species salmon “run” at different times of the year, meaning fisheries can have a consistent supply of new fish for many months.
So next time you’re trying to identify an individual, remember where variation comes from and why it is important - in nature, and for people!

Thank you!
Illustrating Interspecific and Intraspispecific Variation in Shorecrab Morphology

**Variation in Shore Crabs**

Purple Shore Crab
*Hemigrapsus nudus* “HENU”

Hairy Shore Crab
*Hemigrapsus oregonensis* “HEOR”

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**Step 1:** Interspecific differences in carapace shape

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by ______________ with help from Simone Des Roches

[Website: www.simonedr.com]
Illustrating Inter\textit{es}pecific and Intra\textit{sp}ecific Variation in Shorecrab Morphology

**Step 1:** Inter\textit{es}pecific differences in carapace shape connect-the-dots or for a challenge, draw the crab yourself on a separate page!
Illustrating Interespecific and Interaspecific Variation in Shorecrab Morphology

Don’t have the exact color? Try layering different colors!

**Step 2:** Interspecific and intraespecific differences in carapace color and pattern

color the crabs with the most common colors you see!

Variation WITHIN a species is called **INTRaespecific variation**.

Variation ACROSS different species is called **INTERespecific variation**.

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www.simonedr.com
“typical” coloration
Illustrating Inter\textit{erspecific} and Intra\textit{raspecific} Variation in Shorecrab Morphology

Variation in Shore Crabs

Purple Shore Crab
\textit{Hemigrapsus nudus} “HENU”

Hairy Shore Crab
\textit{Hemigrapsus oregonensis} “HEOR”

\textbf{Step 2:} Inter\textit{erspecific} and intra\textit{raspecific} differences in carapace color and pattern
color the crabs with with coloration that has confused you… e.g., \textit{reversed} coloration

Don’t have the exact color? Try layering different colors!

by \underline{______________} with help from: Simone Des Roches

www.simonedfrc.com
“reversed” coloration
Variation in Shore Crabs

Purple Shore Crab
*Hemigrapsus nudus* “HENU”

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Illustrating *Inter*specific and *Intra*specific Variation in Shorecrab Morphology

Don’t have the exact color? Try layering different colors!

Step 2: *Inter*specific and *intra*specific differences in carapace color and pattern
color the crabs with with the most unusual coloration you’ve seen!

Variation WITHIN a species is called *INTRA*specific variation

Variation ACROSS different species is called *INTER*specific variation

by ___________________ with help from: Simone Des Roches
www.simonedr.com
unusual coloration example of juvenile coloration!
Illustrating Inter-specific and Intra-specific Variation in Shorecrab Morphology

We would love to create a composite artwork with all of your creations stitched together!

If you would like for your work to be a part of this collaborative artwork, please send us a scan or photo of your completed worksheet!

Don’t forget to sign your name for credit!