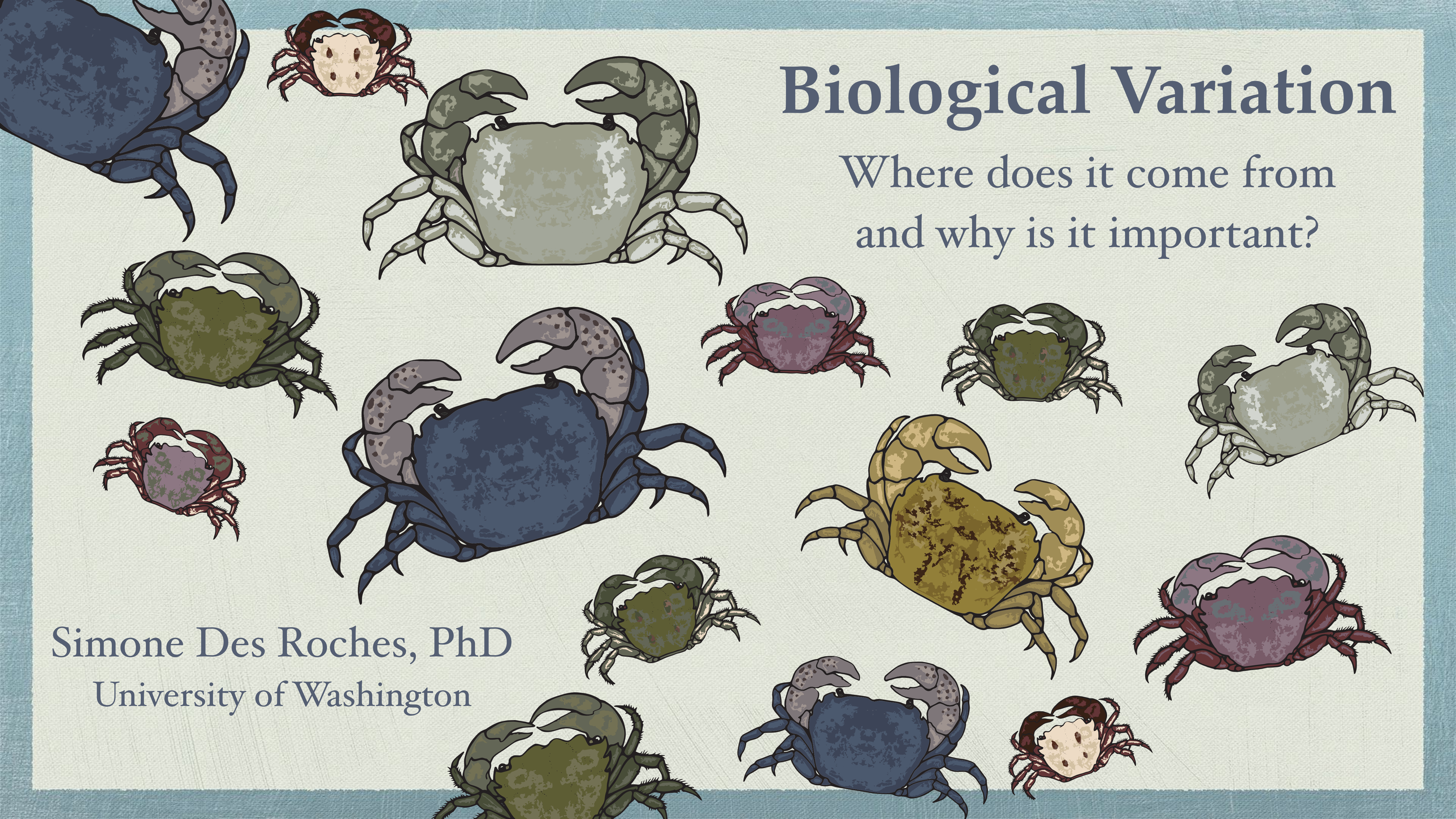
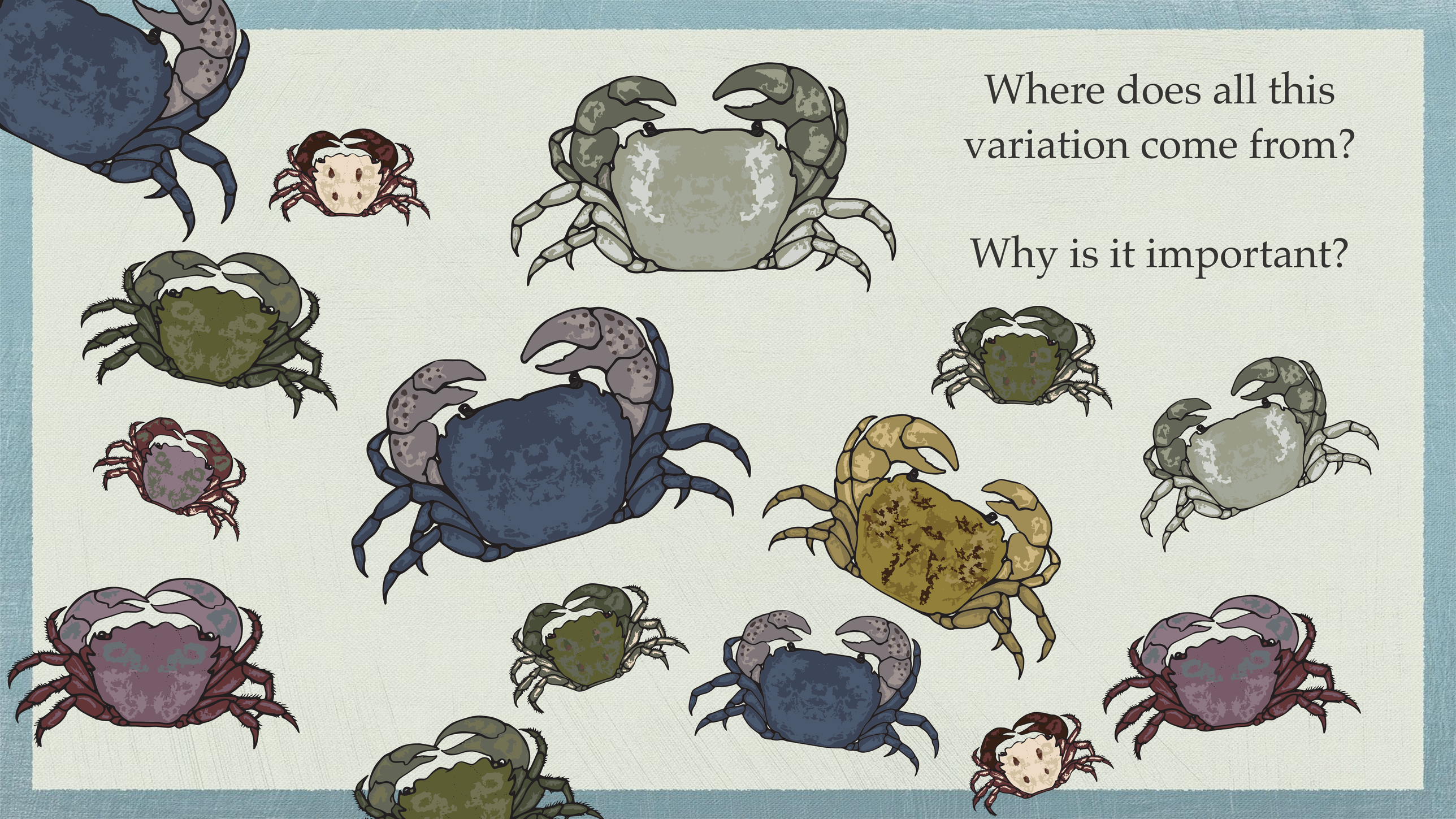
Biological Variation

Where does it come from and why is it important?



Simone Des Roches, PhD
University of Washington

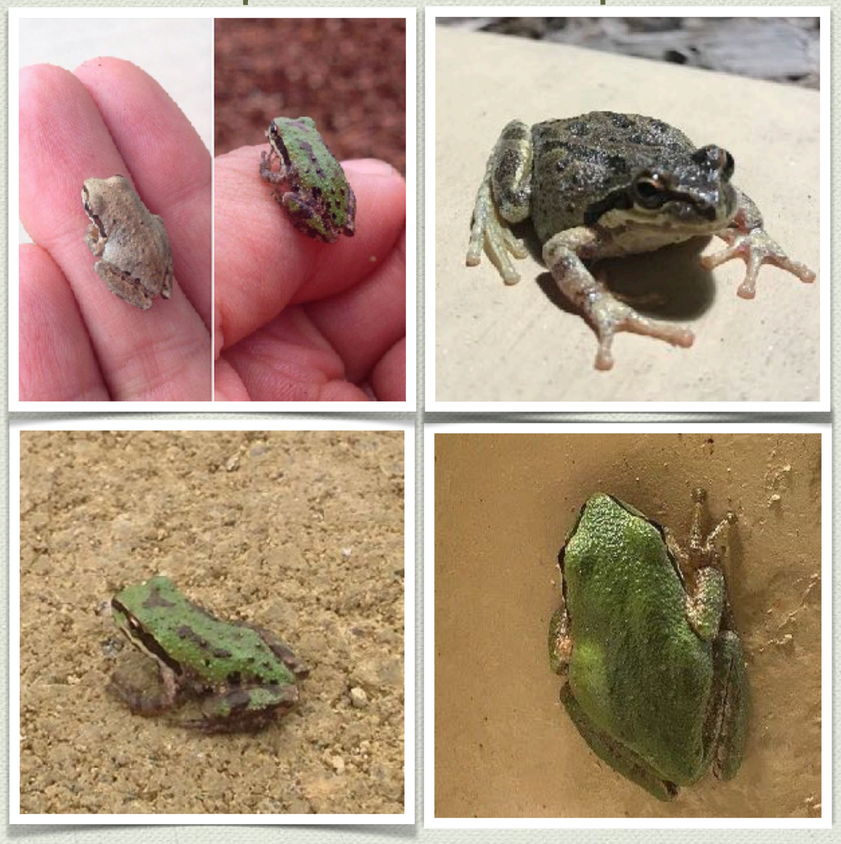


Where does all this variation come from?

Why is it important?

Biological variation makes identification difficult in some species

same species



Sierran Tree Frog
(California)

different species

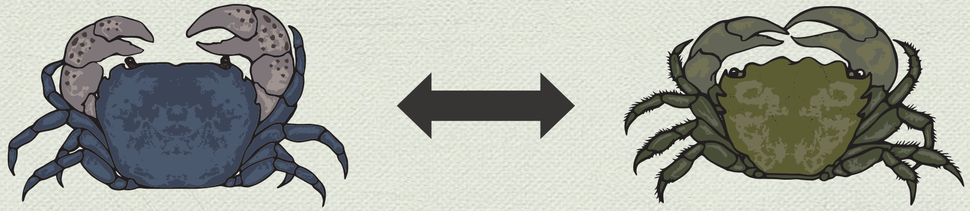
same species

Pacific Tree Frog
(Washington, Oregon)

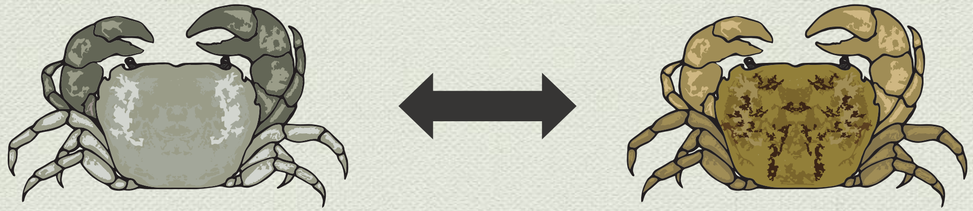
these photos from Magnusson Park & Whidbey Island!

There are different levels of biological variation

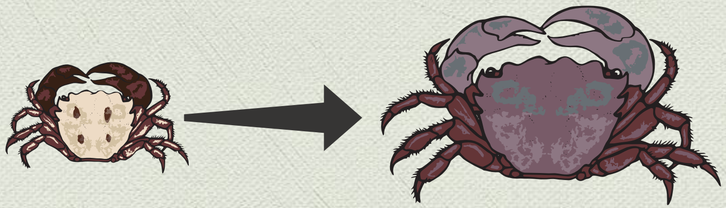
variation **across** species = **inter**specific variation



variation **within** species = **intra**specific variation



> variation **within** individuals = **intra**individual variation



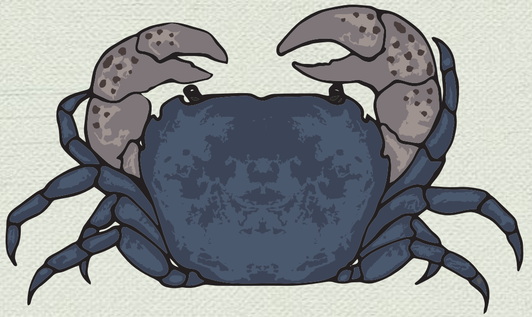
inter = across

intra = within

interspecific variation

variation **across** species

a major part of biodiversity

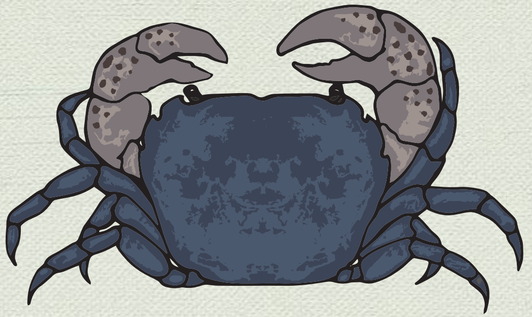


where does it come from?

why is it important?

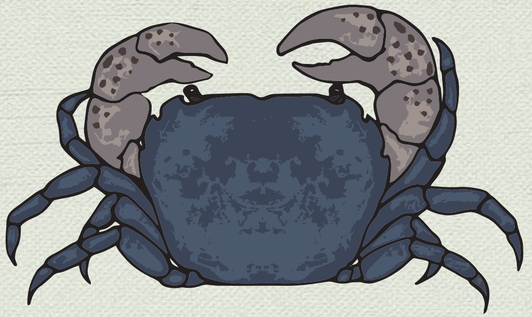
interspecific variation

where does it come from?

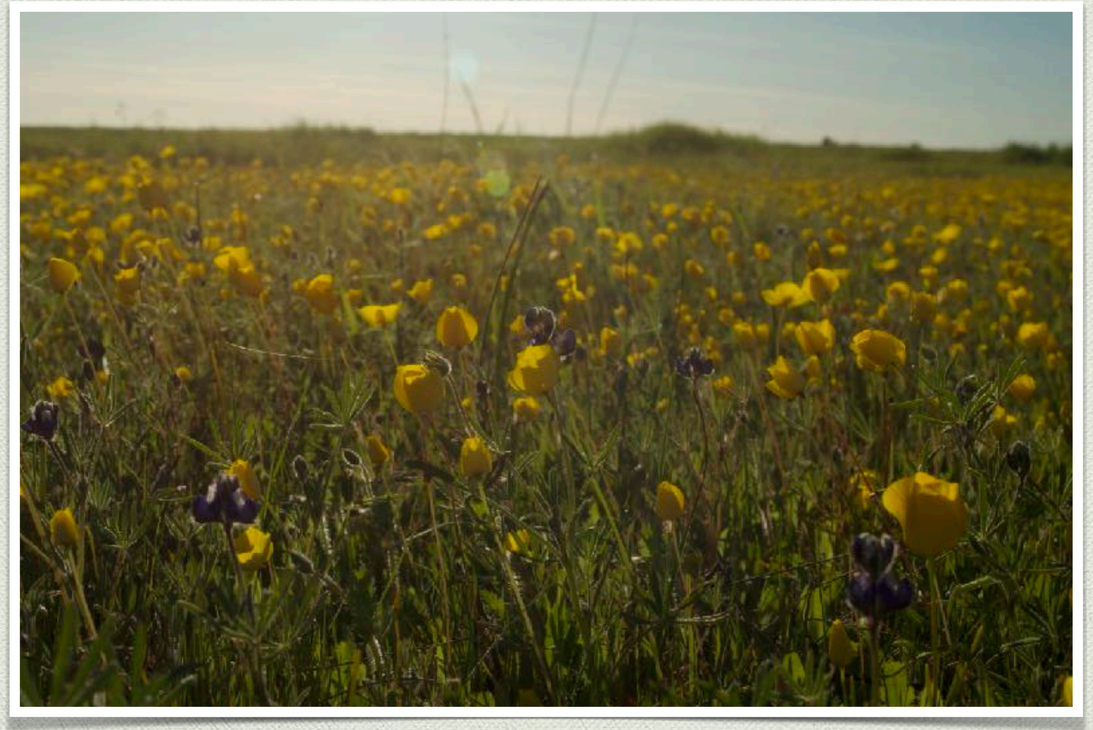


interspecific variation

where does it come from?

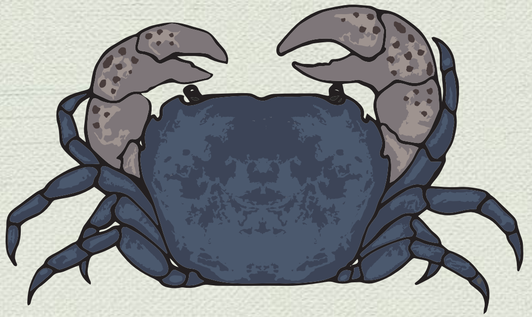


There are **many explanations** for the diversity among different species and why some places have higher interspecific diversity than others



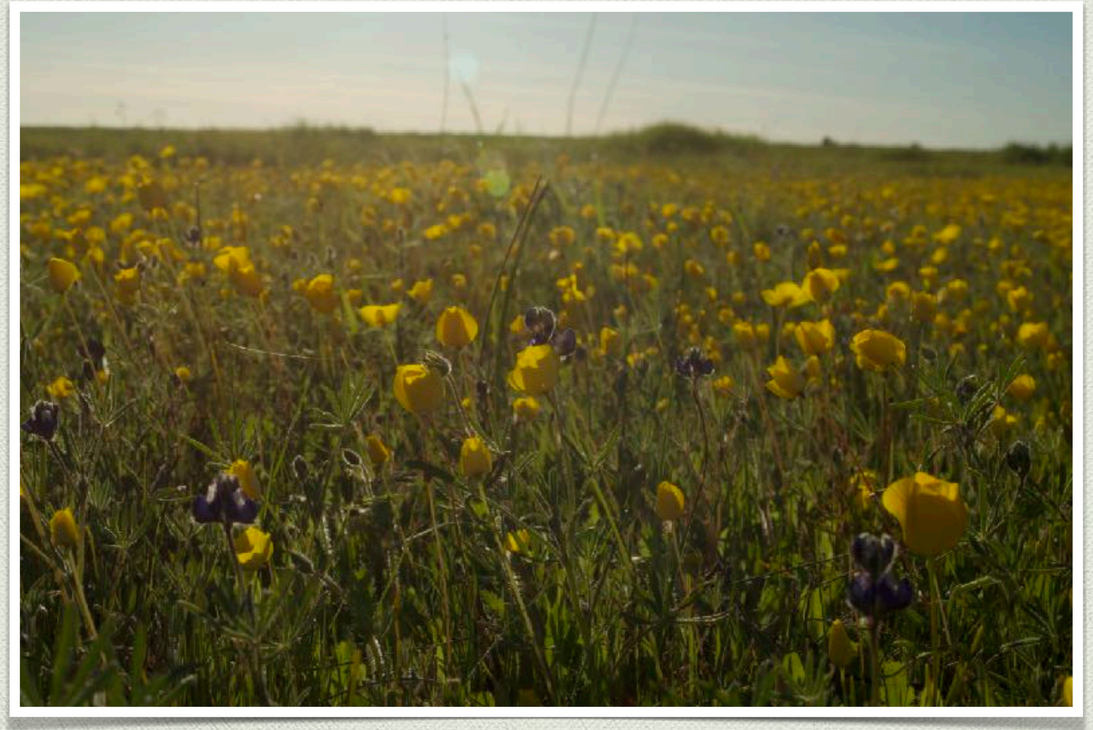
interspecific variation

where does it come from?



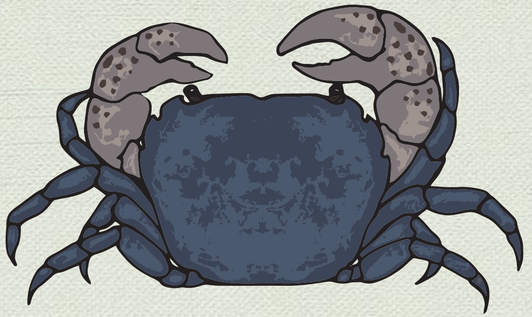
There are **many explanations** for the diversity among different species and why some places have higher interspecific diversity than others

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

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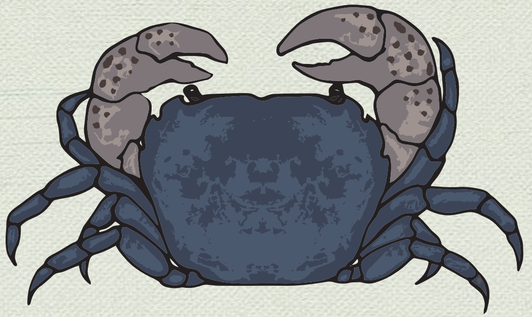
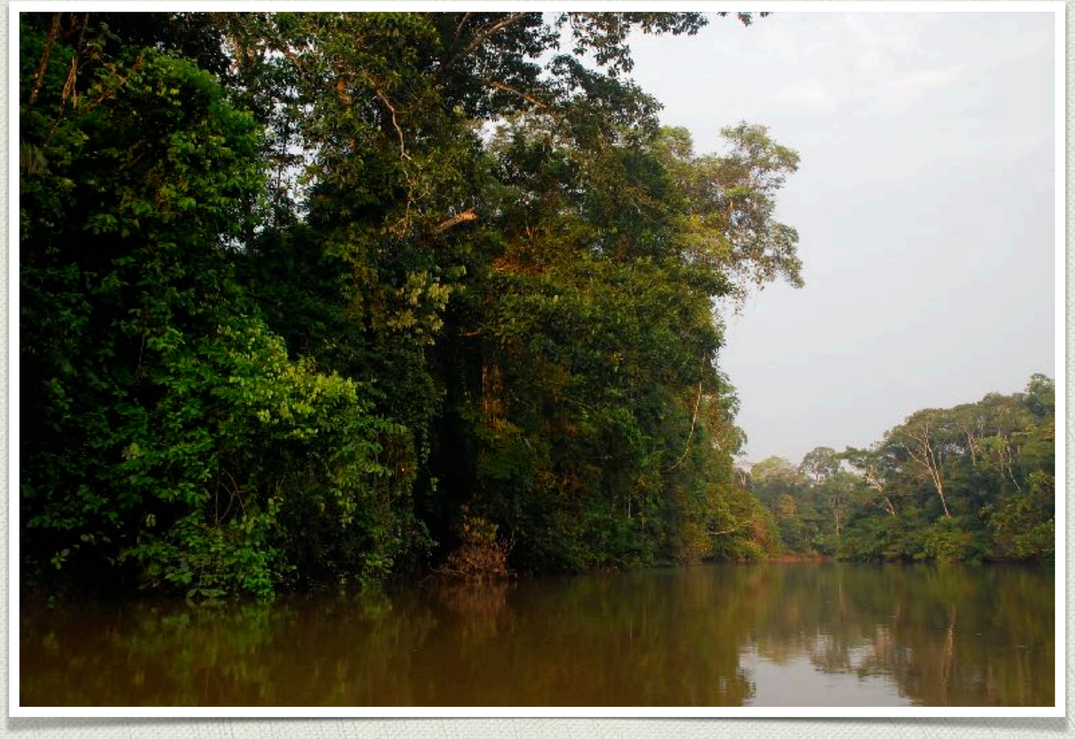
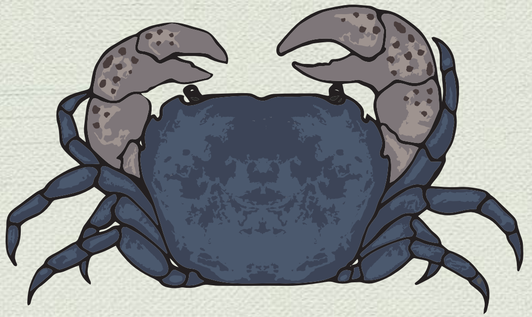


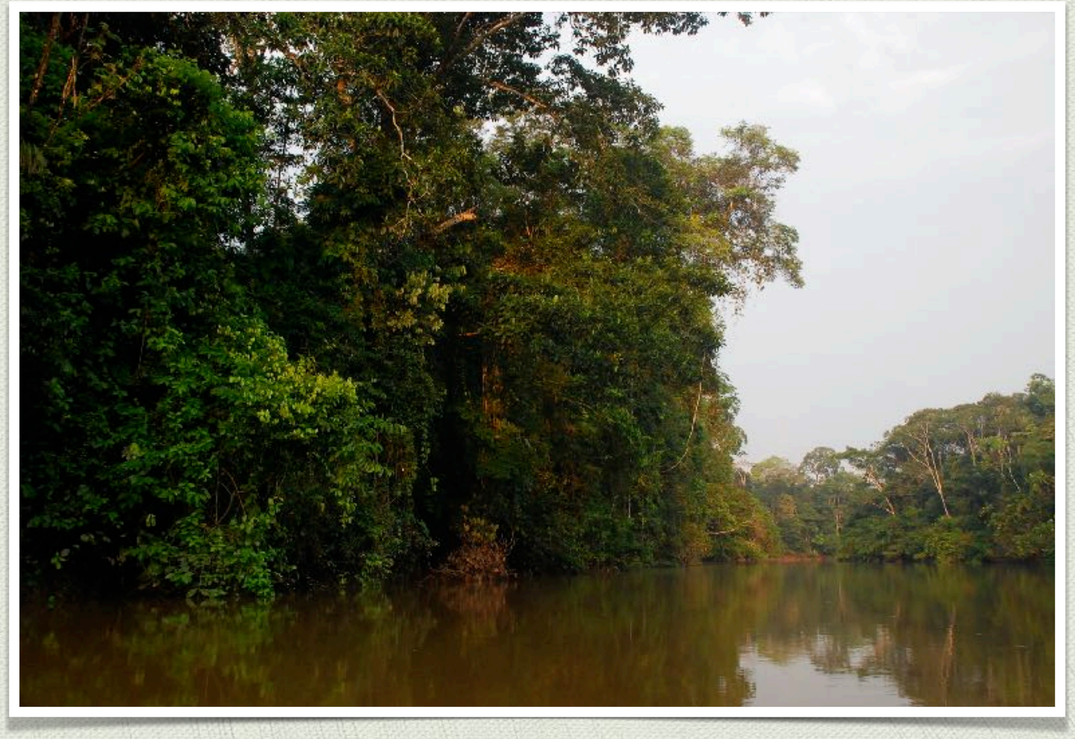


Ecosystems with multiple species are often more **productive**, **resilient** to disturbances, and have more diverse **functions**.

interspecific variation

why is it important?





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

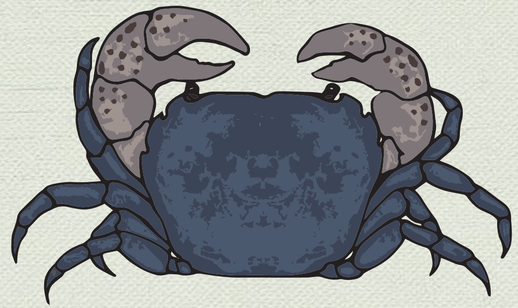
Interspecific diversity is important **for nature and people**. What are the many ways we rely on nature?

How many species did you rely on today?

intraspecific variation

variation **within** species

an often overlooked part of biodiversity



intraspecific variation

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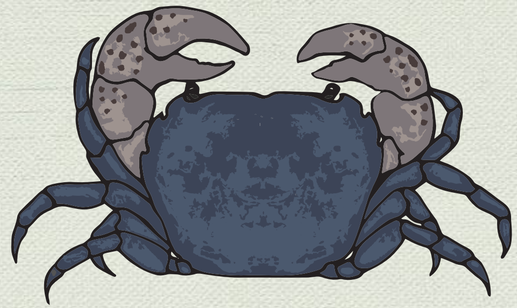


includes variation that is:

Genetic = DNA

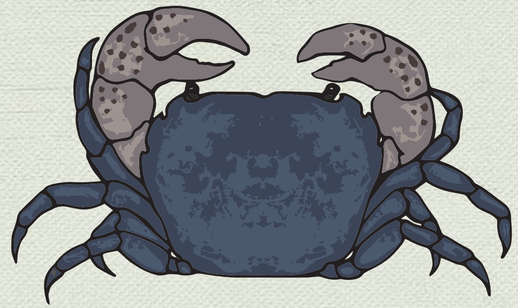
Morphological = anatomy (shape/size of different body parts), color, pattern, etc.

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

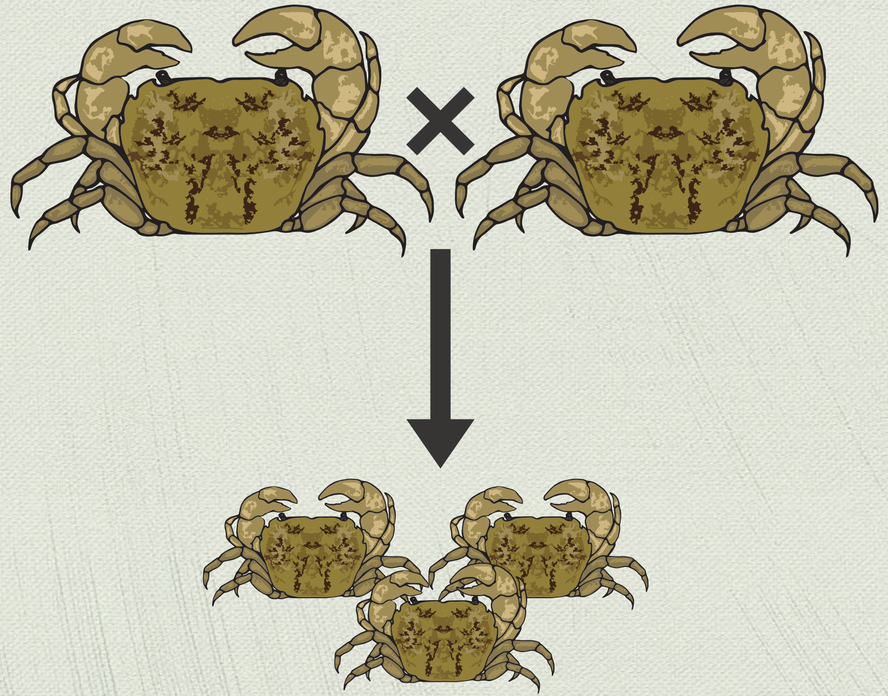
where does it come from?

intraspecific variation

where does it come from?

genetics

passed from parents to offspring

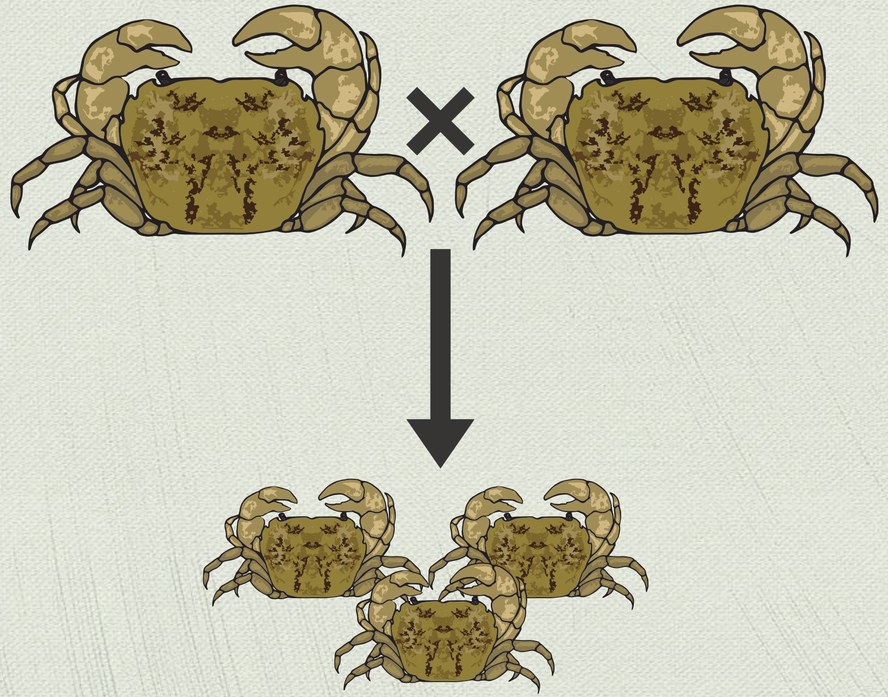


intraspecific variation

where does it come from?

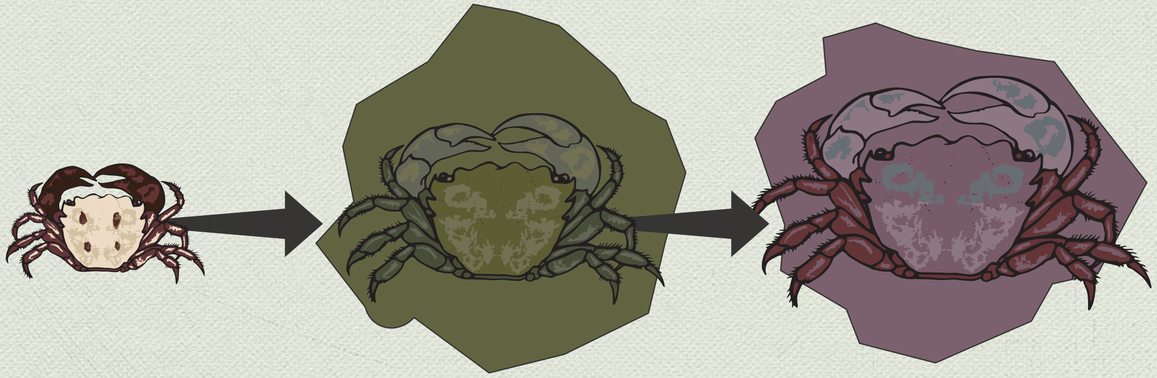
genetics

passed from parents to offspring



plasticity

changes with age & the environment

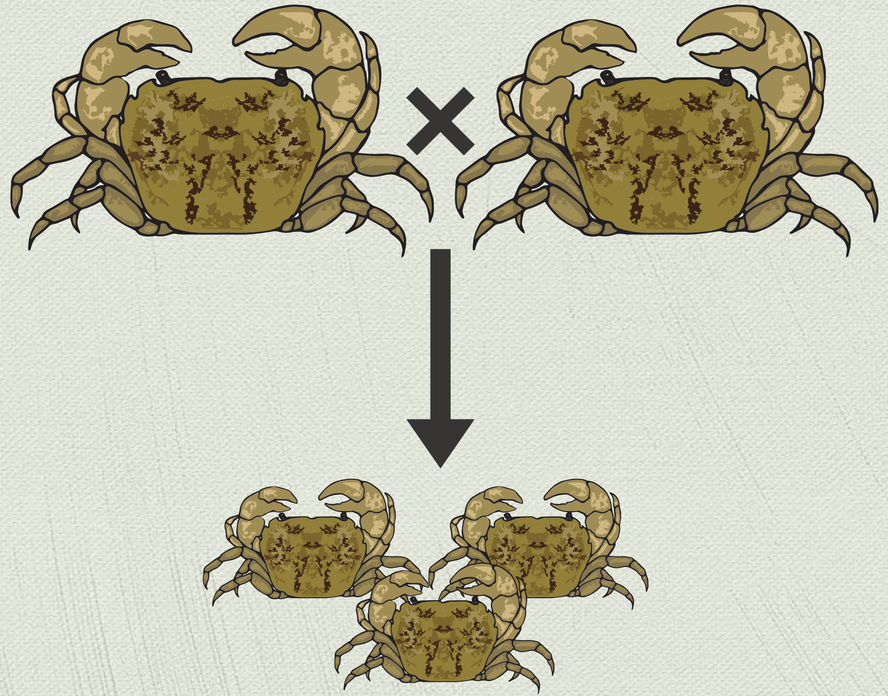


intraspecific variation

where does it come from?

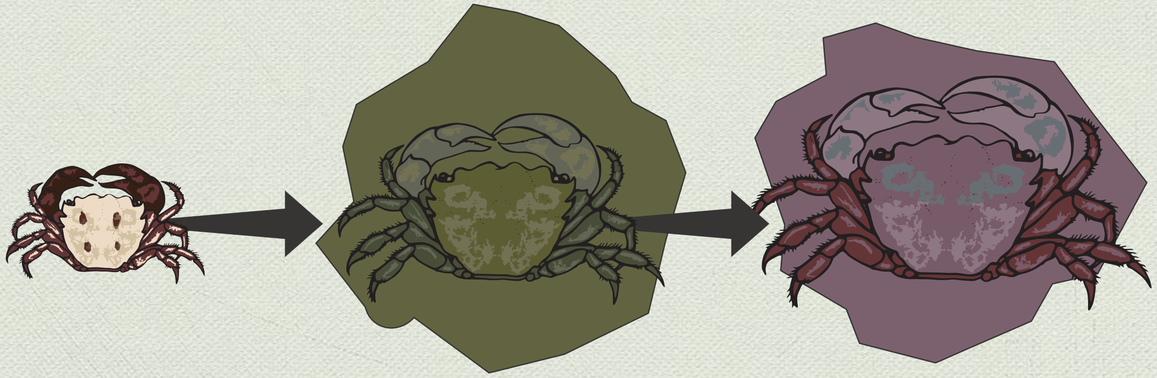
genetics

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 intraindividual* variation

intraspecific variation

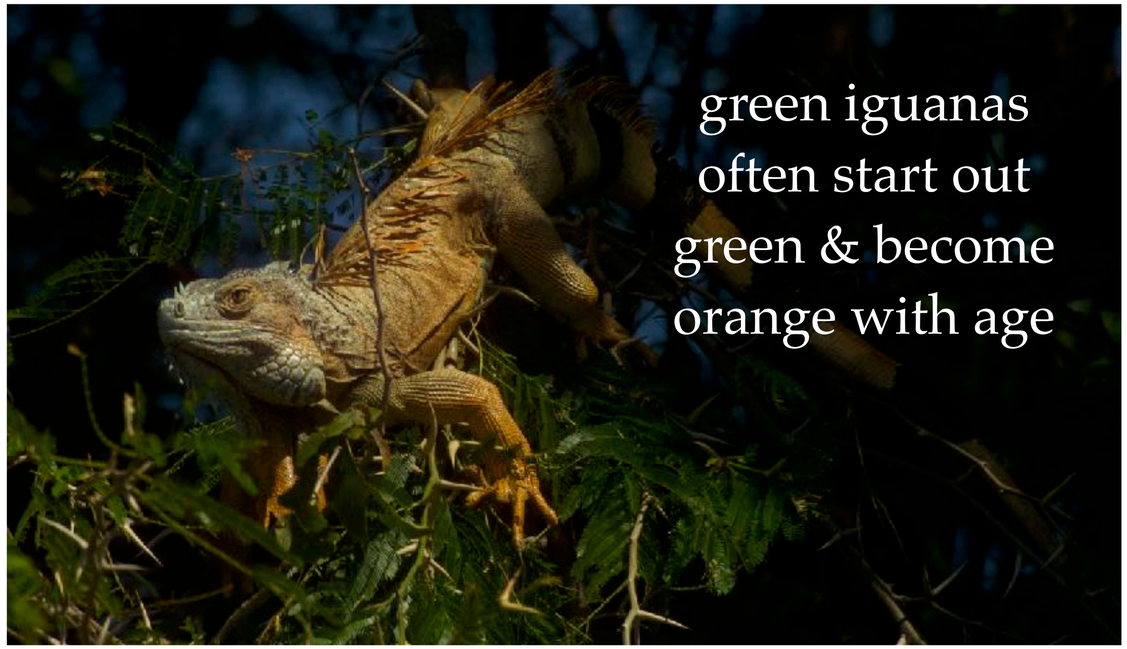
where does it come from?

bonus!

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

plasticity

changes with age & the environment



green iguanas often start out green & become orange with age

intraspecific variation

usually the result of both

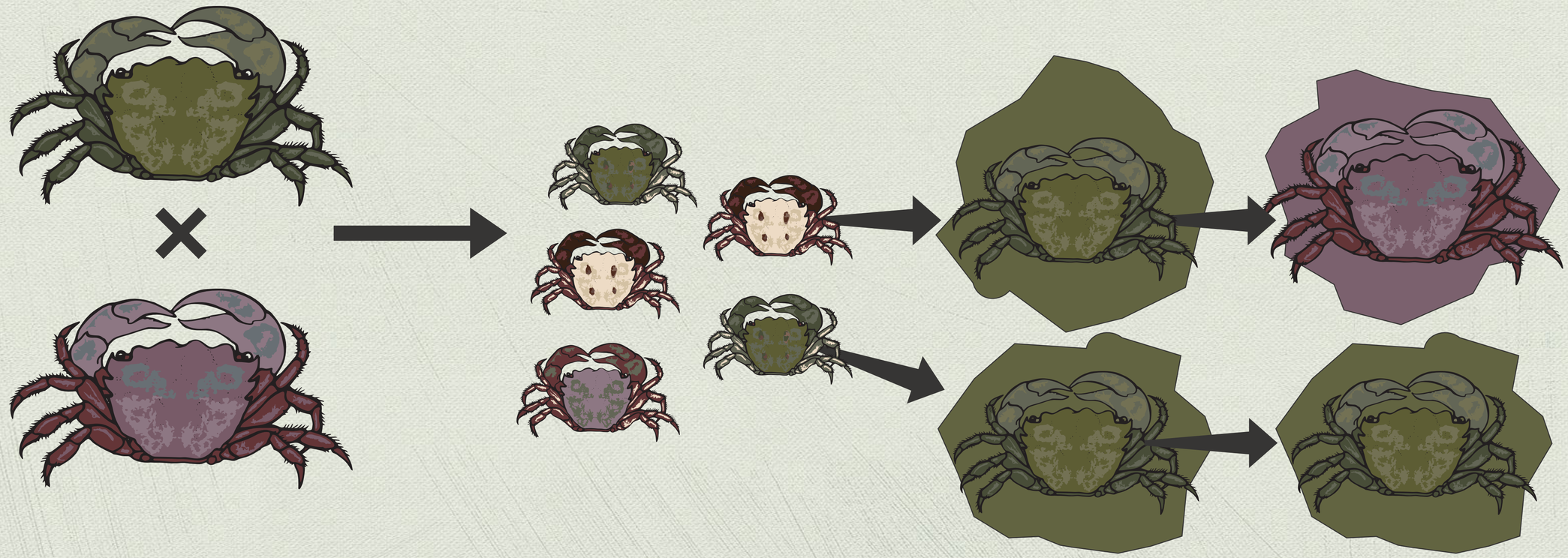
genetics

passed from parents to offspring

+

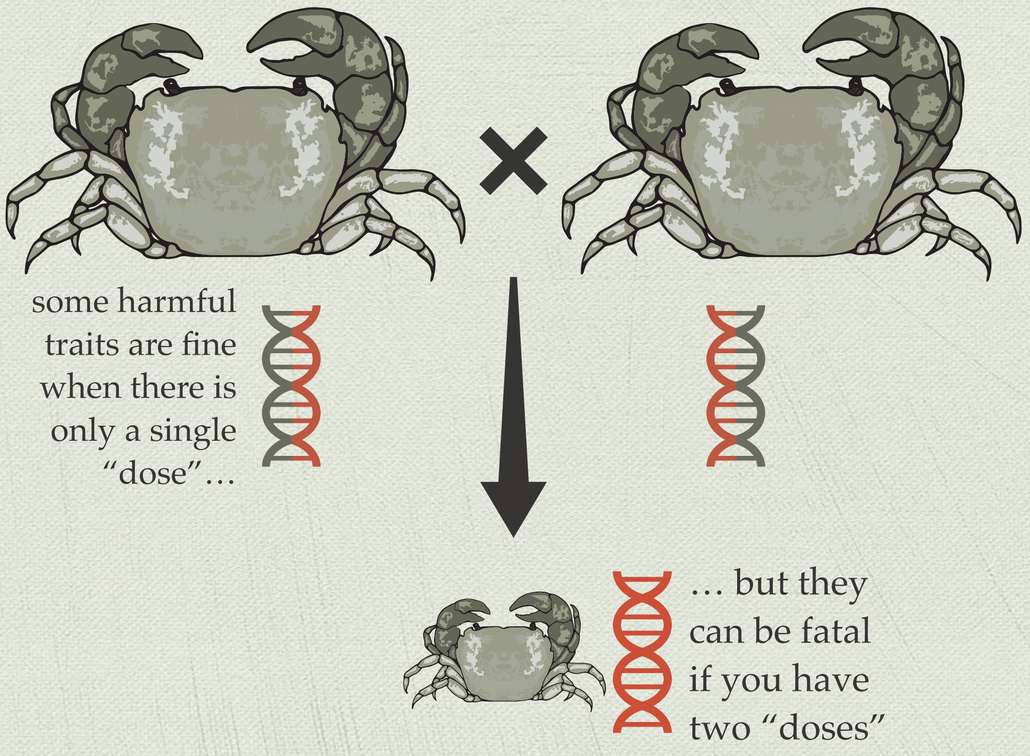
plasticity

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.

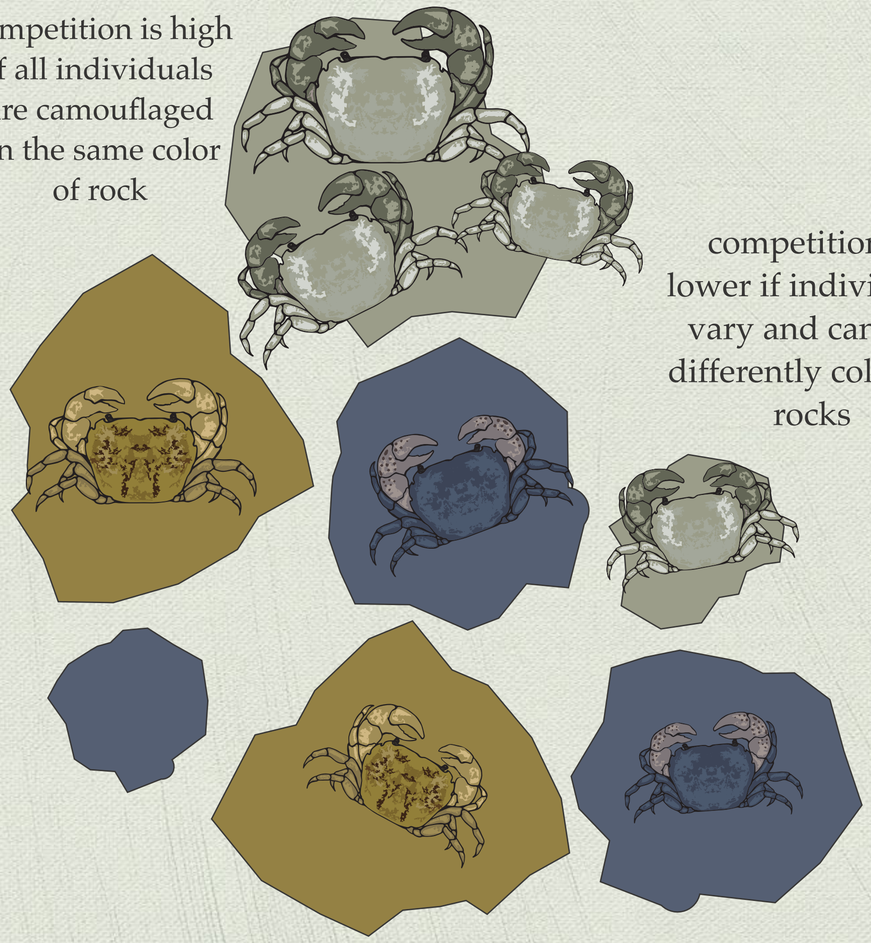
If a breeding pair is closely related, they are more likely to carry DNA for the same harmful traits.

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

intraspecific variation

why is it important?

competition is high if all individuals are camouflaged on the same color of rock



competition is lower if individuals vary and can use differently coloreed rocks

for example

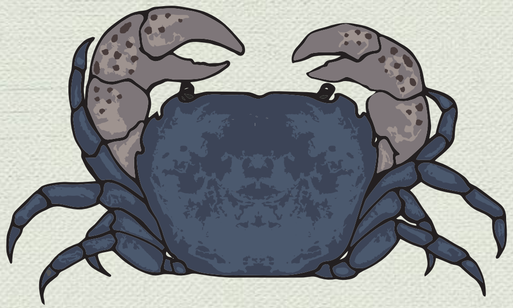
Morphological variation is important because it means members of the same species can divide up resources.

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

why is it important?



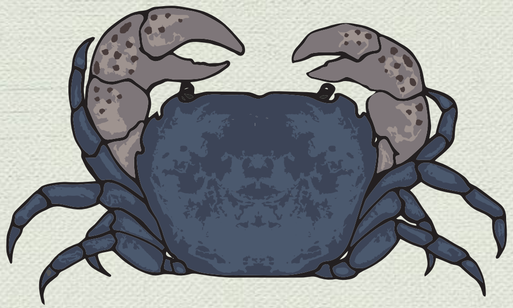
Intraspecific variation is important *for humans* because:

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

why is it important?



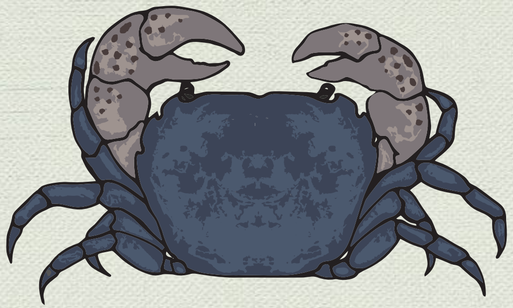
Intraspecific variation is important *for humans* because:

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

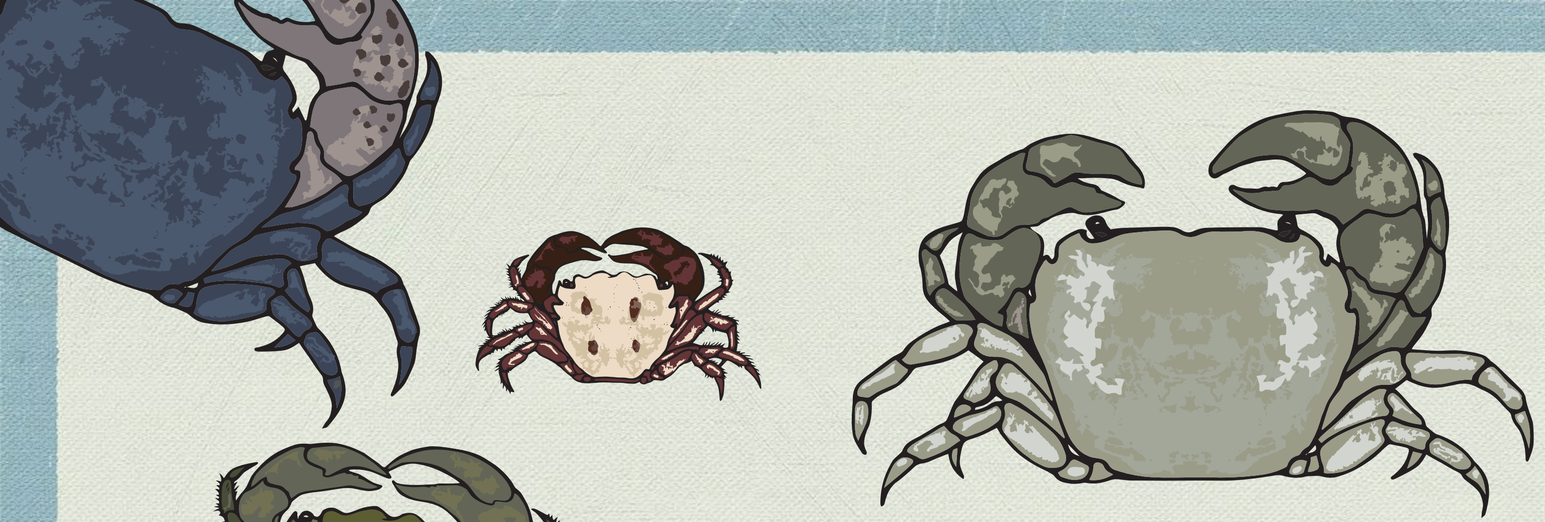
why is it important?



Intraspecific variation is important *for humans* because:

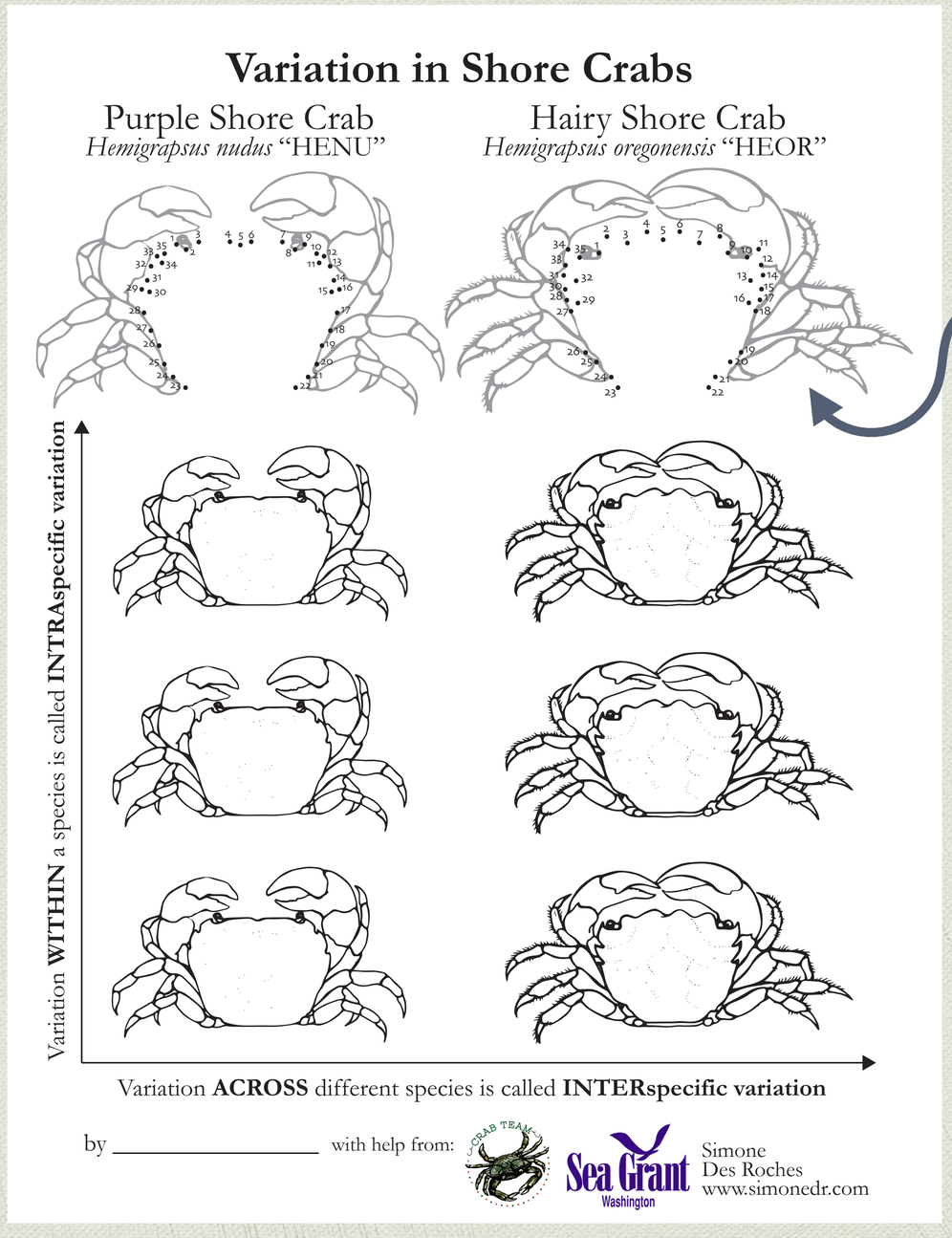
3. Humans rely on variation within species to produce more reliable sources of food.

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.



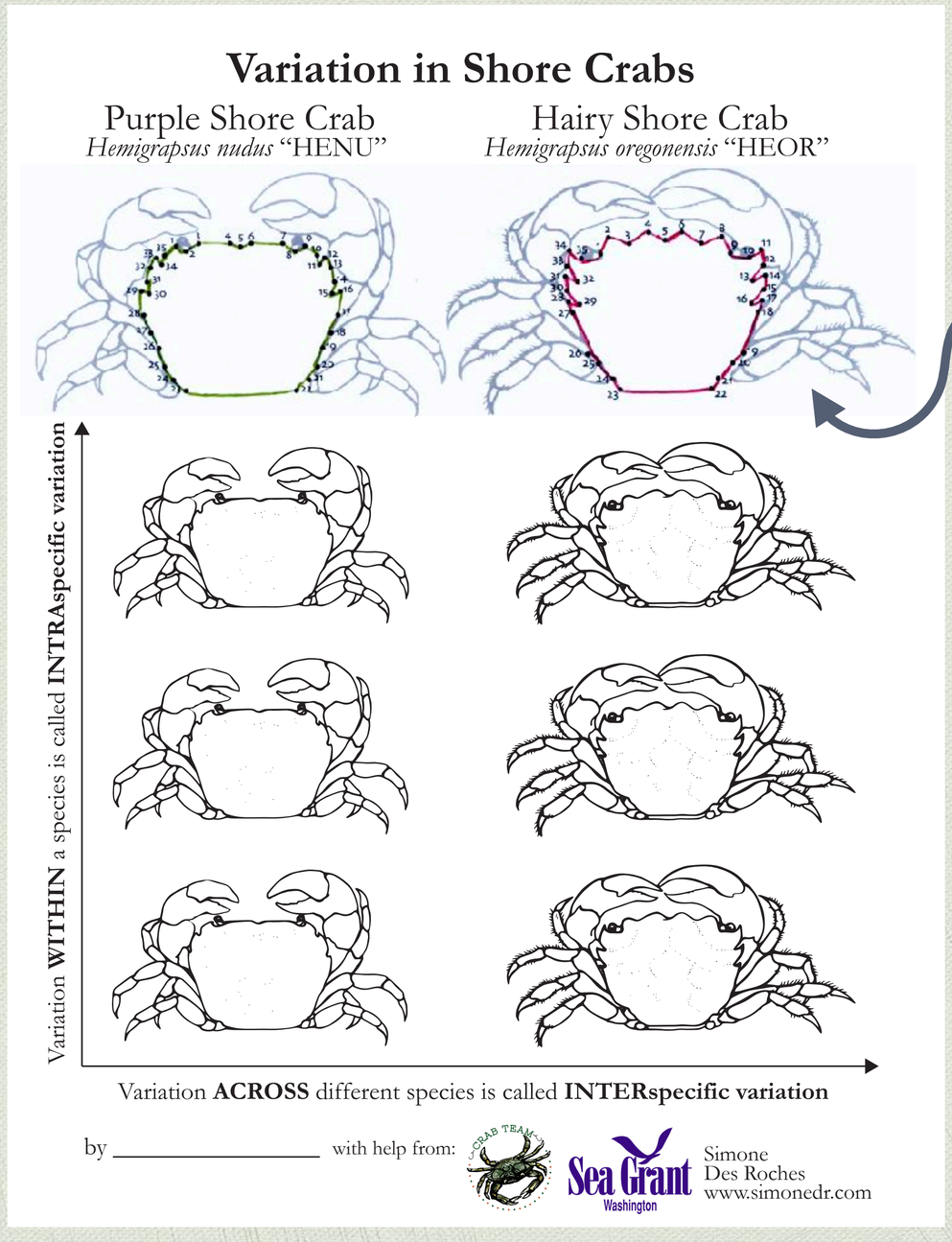
So next time you're trying to identify an individual, remember **where variation comes from** and **why it is important** - in nature, *and* for people!

Thank you!



Illustrating Interspecific and Intraspecific Variation in Shorecrab Morphology

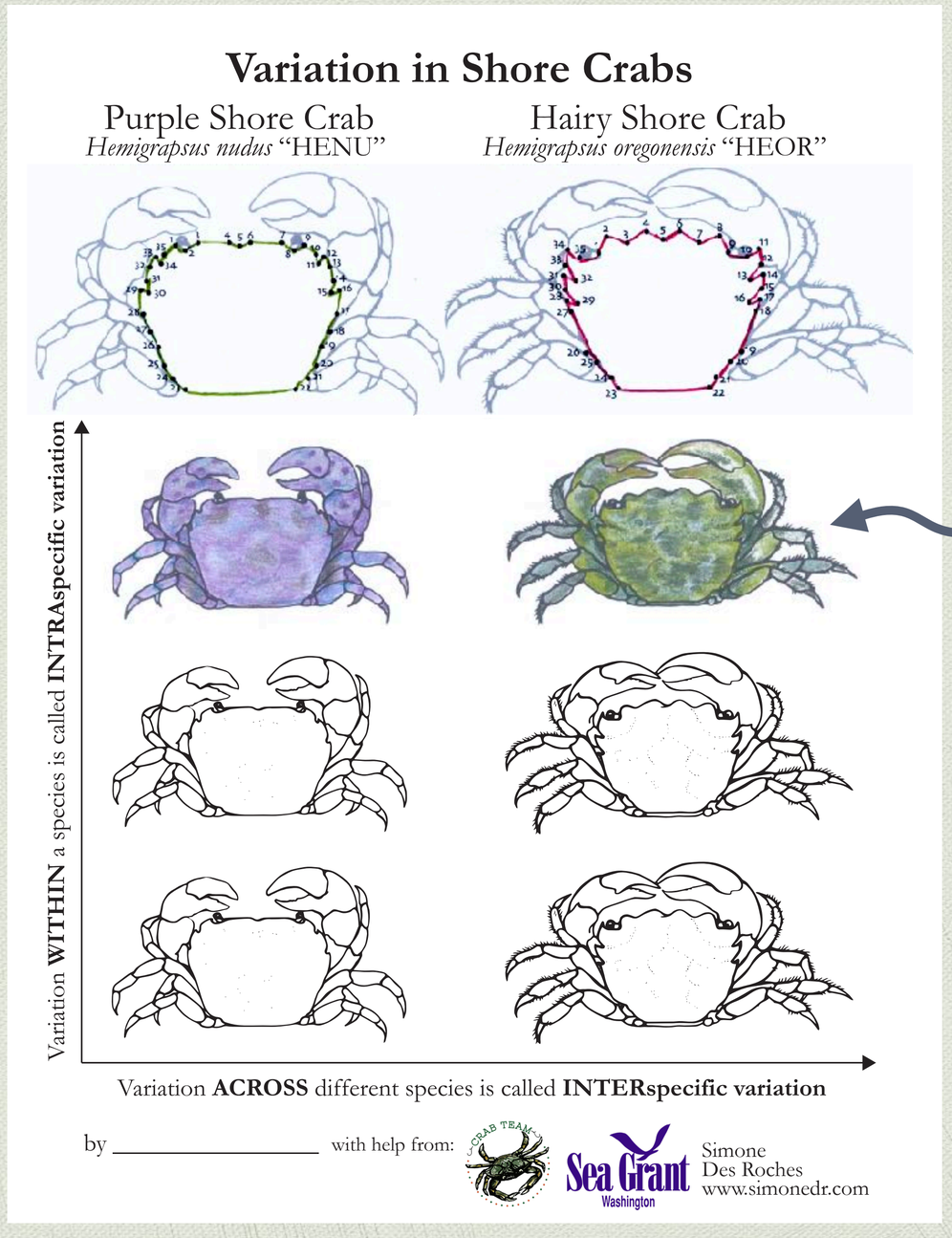
Step 1: Interspecific differences in carapace shape



Illustrating Interspecific and Intraspecific Variation in Shorecrab Morphology

Step 1: Interspecific differences in carapace shape

connect-the-dots *or* for a challenge, draw the crab yourself on a separate page!



Illustrating Interspecific and Intraspecific Variation in Shorecrab Morphology

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

Step 2: Interspecific and intraspecific differences in carapace color and pattern

color the crabs with the most common colors you see!

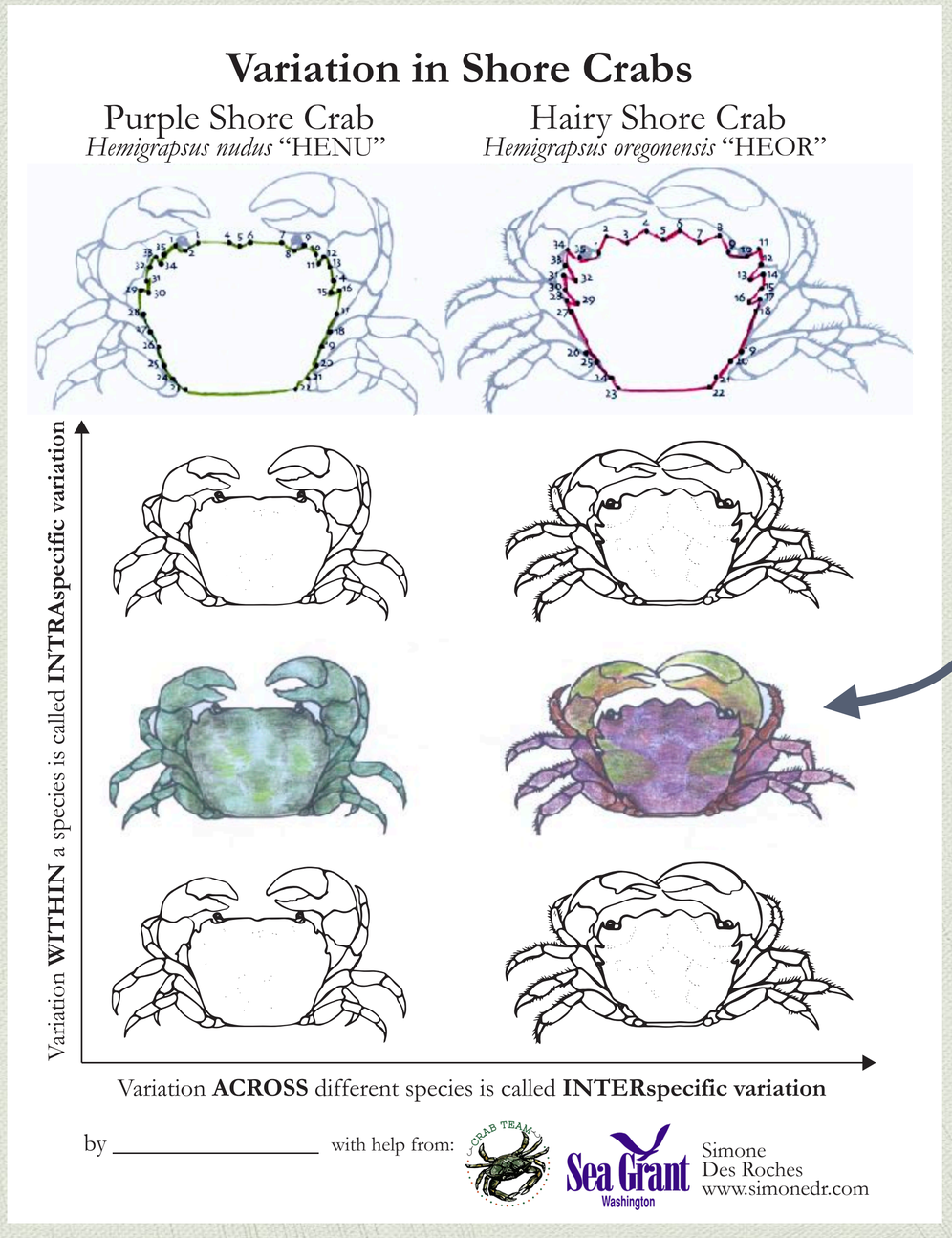
HENU

HEOR

HENU

"typical" coloration

HEOR



Illustrating Interspecific and Intraspecific Variation in Shorecrab Morphology

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

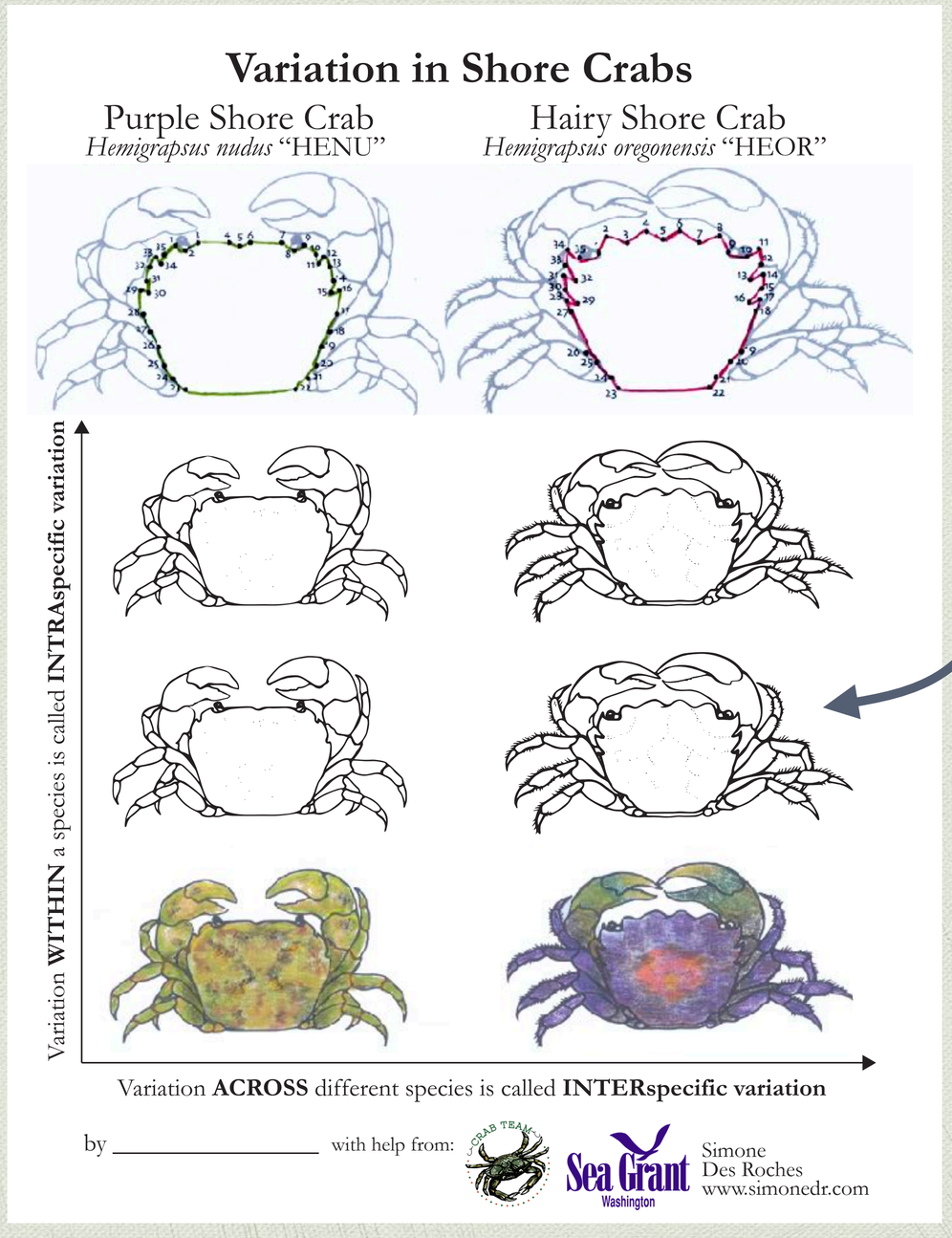
Step 2: Interspecific and intraspecific differences in carapace color and pattern

color the crabs with with coloration that has confused you… e.g., *reversed* coloration

HENU

“reversed” coloration

HEOR



Illustrating Interspecific and Intraspecific Variation in Shorecrab Morphology

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

Step 2: Interspecific and intraspecific differences in carapace color and pattern

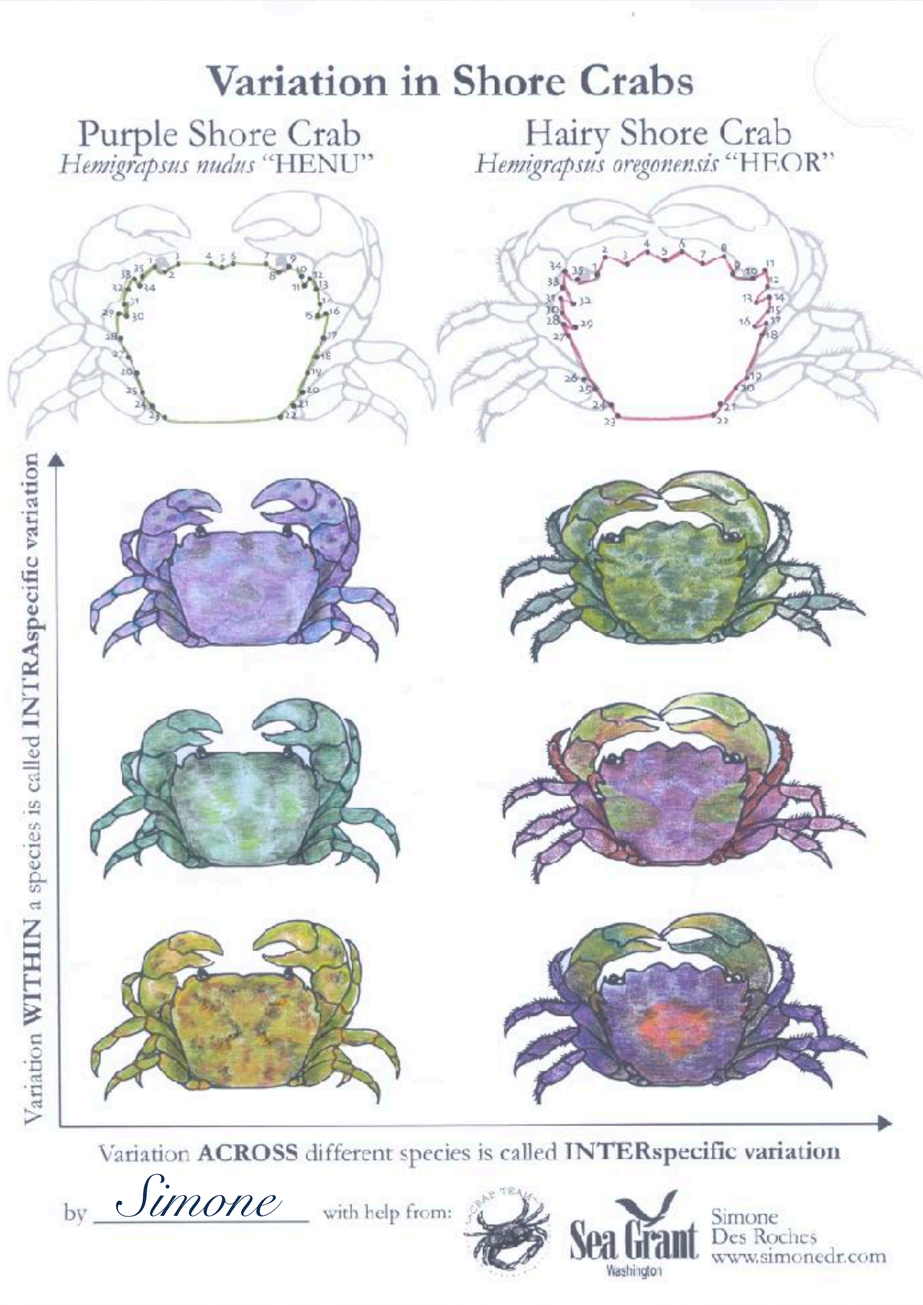
color the crabs with with the most unusual coloration you've seen!

HENU

“unusual” coloration

HEOR

example of juvenile coloration!



Illustrating Interspecific and Intraspecific 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!

HENU

HEOR