CSI: Wildlife DNA Barcoding Mystery

Learning Goals: - We are learning to analyze how human activities affect biodiversity by identifying species using DNA barcoding. - We are learning to carry out scientific investigations by applying bioinformatics tools to forensic evidence and drawing evidence-based conclusions.				
Success Criteria: student has demonstrated they can	C	AC	P	NY
I can follow easy step-by-step instructions to enter the DNA sequences into the NCBI BLAST and BOLD systems websites.				
I can understand the scores like percent identity and E-value to decide if the match is strong or if I need to check more.				
I can check if the results from both NCBI BLAST and BOLD Systems agree to be sure the identification is correct.				
I can look up each species and find out if it is endangered or protected by laws like CITES.				
I can explain why it's important to protect these species and what it means if someone has them illegally.				
I can keep all my information neat and clear on the worksheet, including species names, data, and conservation info.				
I can compare the DNA evidence with the suspects' stories and decide if their stories make sense or if they don't match.				
I can explain the strengths and limitations of the DNA barcoding method and how it helped identify species in the investigation.				
I can evaluate the investigation design and describe how evidence was collected, analyzed, and linked to suspects to support forensic conclusions.				
I can work with my classmates to discuss our findings and decide together who might be responsible using the evidence.				
Totals				

Part 1: DNA Analysis Using NCBI BLAST

Use NCBI BLAST to identify the species from each DNA sequence. Record the top match for each evidence sample.

Evidence Sample	Top Species Match	Percent Identity (%)	E-value	Query Coverage (%)
Evidence A (Vehicle Trunk)				
Evidence B (Blood Stain)				
Evidence C (Warehouse)				

Research Questions:

What does **percent identity** tell you about the match? _____

_____

What does a **small E-value** indicate? _____

_____

Part 2: Verification Using BOLD Systems

Use BOLD Systems to confirm your NCBI BLAST results. Record the species identification and BIN number.

Evidence Sample	BOLD Species ID	BIN Number
Evidence A		
Evidence B		
Evidence C		

Research Questions:

Do the **BOLD** results match your **NCBI BLAST** results? _____

_____

How does using **multiple databases** (NCBI BLAST and BOLD Systems) improve the reliability of your species identification?

_____

_____

Part 3: Conservation Status Research

For each identified species, research and record the conservation information.

Evidence A Species: _____

Conservation Status (Endangered/Threatened/Vulnerable/etc.):	
Protected under CITES? (Yes/No):	
Legal to trade? (Yes/No):	

Evidence B Species: _____

Conservation Status (Endangered/Threatened/Vulnerable/etc.):	
Protected under CITES? (Yes/No):	
Legal to trade? (Yes/No):	

Evidence C Species: _____

Conservation Status (Endangered/Threatened/Vulnerable/etc.):	
Protected under CITES? (Yes/No):	
Legal to trade? (Yes/No):	

Part 4: Suspect Analysis

Connect each piece of evidence to the correct suspect and evaluate their statements.

Evidence A (Vehicle Trunk)

Suspect: _____

Identified Species: _____

Does DNA evidence support or contradict their statement? _____

Evidence B (Blood Stain)

Suspect: _____

Identified Species: _____

Does DNA evidence support or contradict their statement? _____

Evidence C (Warehouse)

Suspect: _____

Identified Species: _____

Does DNA evidence support or contradict their statement? _____

Part 5: Case Conclusion

Based on your DNA analysis and evidence, make your recommendation:

Which suspect(s) should be charged with wildlife trafficking crimes?

☐ Suspect 1 (Alex Chen)
☐ Suspect 2 (Jordan Martinez)
☐ Suspect 3 (Morgan Li)
☐ Multiple suspects (specify): _____

Reasoning (provide evidence-based explanation):

_____

_____

_____

Most compelling piece of evidence:

_____

_____

Additional questions or investigations needed:

_____

_____

Discussion Questions:

What are three **strengths of the DNA barcoding** method used in this investigation? How did it help you identify the species accurately?

_____

_____

_____

What are **possible sources of error** or limitations in this investigation? How could these affect your results or conclusions?

_____

_____

_____

What considerations should be taken when **collecting evidence** to ensure it is not contaminated or degraded?

_____

_____

_____

If you were designing this investigation, **what additional data or evidence** would you collect to strengthen the case?

_____

_____

How might this forensic approach to wildlife trafficking be **improved with future technology or methods**?

_____

_____

_____

How does this investigation illustrate the **real-world importance** of biology and genetics in law enforcement?

_____

_____

_____

What did you find most **challenging about interpreting the BLAST results** and making connections to the suspects? How did you overcome this challenge?

_____

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