Horse Fossils: Evidence for Evolution -Academic

Fossils (preserved bones, footprints, etc.) tell us about extinct life forms. However, the fossil record may be incomplete as often organisms decompose or are eaten by scavengers before they can be buried by sediment to be preserved. The horse record is relatively complete back to 70 million years ago (mya). We can compare the older fossils found in lower rock layers to younger horse fossils found in layers above them to see how horses have changed over time. We can compare those changes to the plant fossils and rock types that tell us what the climate and ecosystem was like to infer how changes to the habitat may have resulted in some individuals being better fit to survive.

What is today the open grasslands of North America, seventy million years ago was a hot, humid and wet tropical forest. These dense forests were covered with vegetation which provided ample foliage for feed and cover from predators. Over time Earth's crustal plates shifted and the climate changed. With decreased rainfall, the forest changed into an open dry ground grassland habitat with very little tree cover.

Purpose:
How have habitat changes affected which horse traits are successful and passed down?

Write out a pre-lab to record the purpose question and identify the independent variable, dependent variable and your hypothesis.

Data
Organize the following information into a data table from which you can see how the horse ancestors have changed as their habitat changed.

- Time period
- Description of habitat
- Description of Horse species
    - Species Name
    - number of toes (toe bones-x)
    - description of foot (toe length, toe thickness, length of overall foot)
    - body size and description (height, proportions)
    - teeth shape & size (mm)

Follow Up Questions (Record in your notebook):
1. Describe changes to the environment. What might be some reasons for those changes?
2. How have their teeth shape changed?
    - How could the original teeth shape have been beneficial to eat the type of vegetation that was in the habitat for Hyracotherium?
    - How might the new body teeth shape have been beneficial in the new habitat 13 million years ago?
3. How has the body size changed over time?
    - How might the body size have been beneficial in the early environment?
    - How might the new body size have been beneficial in the new habitat 13 million years ago?
4. How did the Foot shape and toe number change?
    - How might the toe number/foot shape have been beneficial in the early habitat for Hyracotherium?
    - How might the new foot shape have been beneficial for the new habitat for Merychippus?
5. How might the advantages that Hyracotherium had in its original habitat become disadvantages as the habitat changed?
6. **Extension**: Suggest how the coloration of the horse hide (fur) would have also changed. What would be beneficial in the early habitat? What would be beneficial in the new habitat?

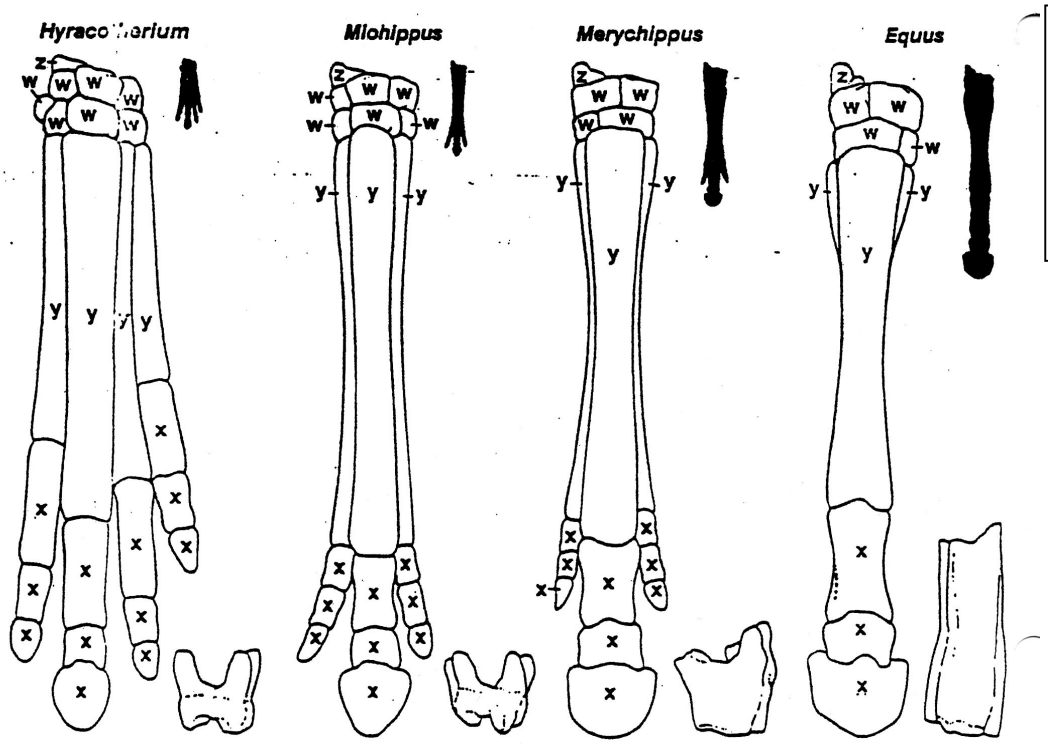
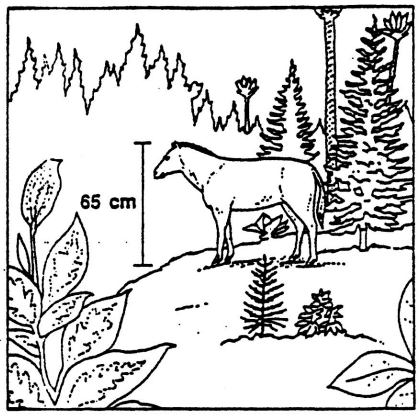


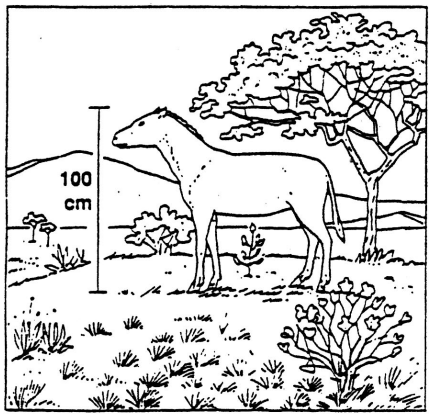
FIGURE 2. Forefoot bones and teeth of horses

Color the bones:
Toes (x) Red
Foot (y) Blue
Ankle (w) green
Heel (z) yellow

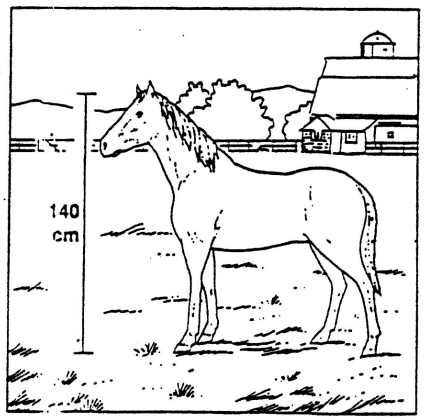
Hyracotherium
55 million years ago



Miohippus
30 million years ago



Merychippus
13 million years ago



Equus
Today

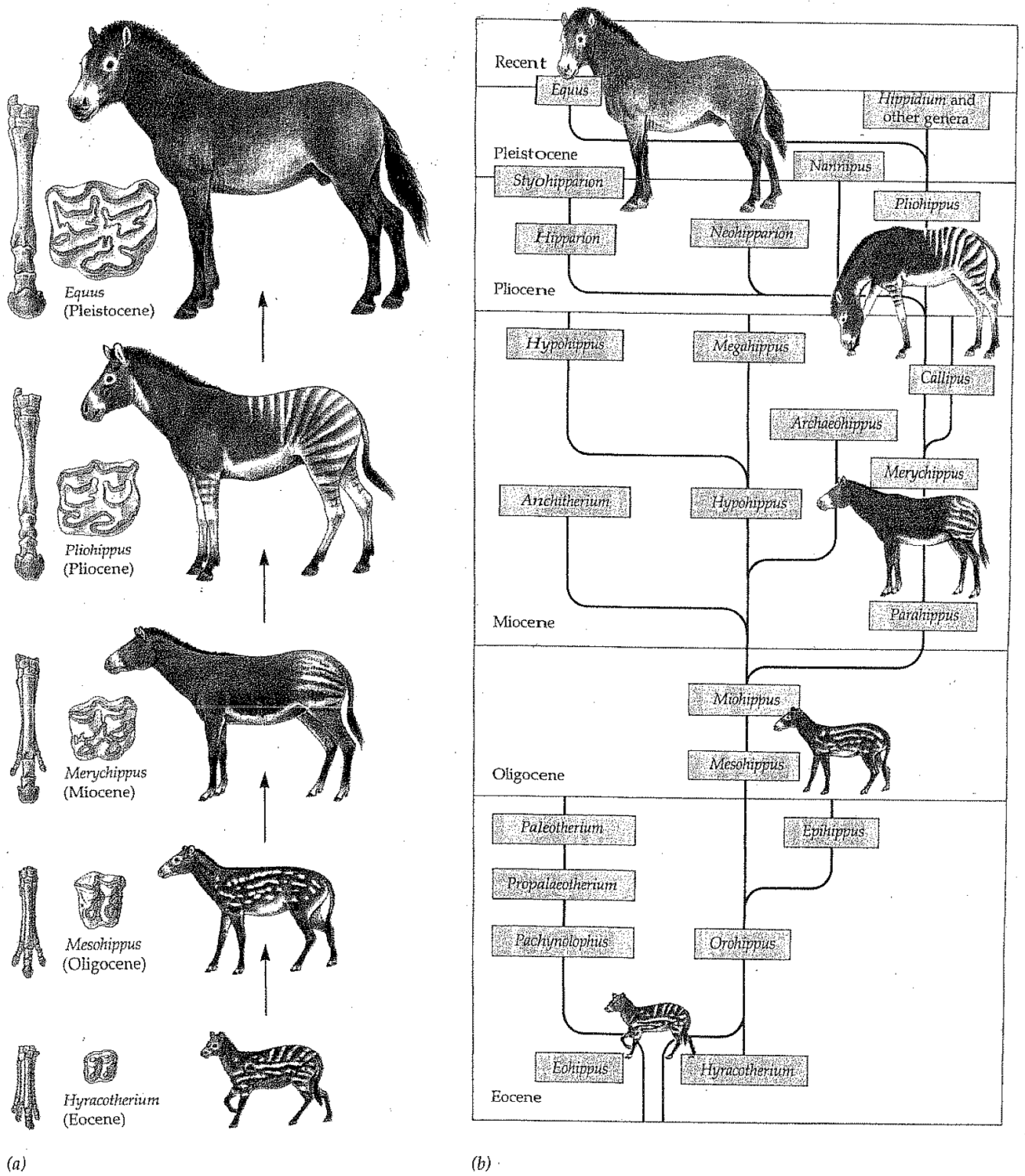


Figure 23.15
The phylogeny of horses. *(a)* One sequence of fossil horses that are intermediate in form between the modern horse and its Eocene ancestor, *Hyracotherium*, suggests phyletic progression with trends toward larger size, reduced number of toes, and teeth modified for grazing. *(b)* A more complete phylogeny reveals that the modern horse is the only surviving twig of an evolutionary "bush" with many divergent trends.