

Using Range and Habitat to Track Evidence

Background

Many organisms are found only in certain regions or habitats. Therefore, the presence of these organisms in smuggled or illegal goods can help reveal the source of the goods. If a forensic scientist found camel hairs on evidence, the scientist could suspect that the evidence had been in north Africa or southwest Asia, where camels are common. Likewise, the scientist could conclude that the evidence had been in one of the deserts of that region, a habitat where camels are well adapted to survive. This conclusion is based on the fact that the distribution of camels is limited in two ways: Their range consists largely of one geographic region (north Africa and southwest Asia), and they live largely in one kind of habitat (deserts).

The distribution of many species is limited in both these ways. One such species found only in a specific range and habitat is the caterpillar fungus. A fungus is a eukaryotic heterotroph with cell walls. Fungi survive as decomposers or, in some cases, as parasites. Most species of fungi require a moist environment and reproduce by releasing spores, or dormant reproductive cells.

The caterpillar fungus (*Cordyceps sinensis*), found mostly in south central China, is a parasite of the caterpillars of a certain species of moth. When a caterpillar inhales spores of this fungus through its breathing pores, the spores sprout inside the caterpillar, producing a mass of threadlike fungal cells called hyphae. Figure 1 shows the typical appearance of hyphae. As the fungus grows, it digests the caterpillar from the inside and produces a reproductive structure

called a fruiting body, shown in Figure 1. Wind spreads the spores that form inside the fruiting body to the next generation of caterpillars.

Like most fungi, the caterpillar fungus requires a moist environment. It is common in marshy grasslands and at high altitudes, where the climate conditions and presence of prey caterpillars permit it to live. Thus, like camels, the caterpillar fungus has both a limited geographic range (south central China) and a limited habitat (marshy grasslands and high altitudes). If the caterpillar fungus is found in evidence, its narrow range and habitat would make it useful to forensic scientists as an indicator of where the evidence has been.

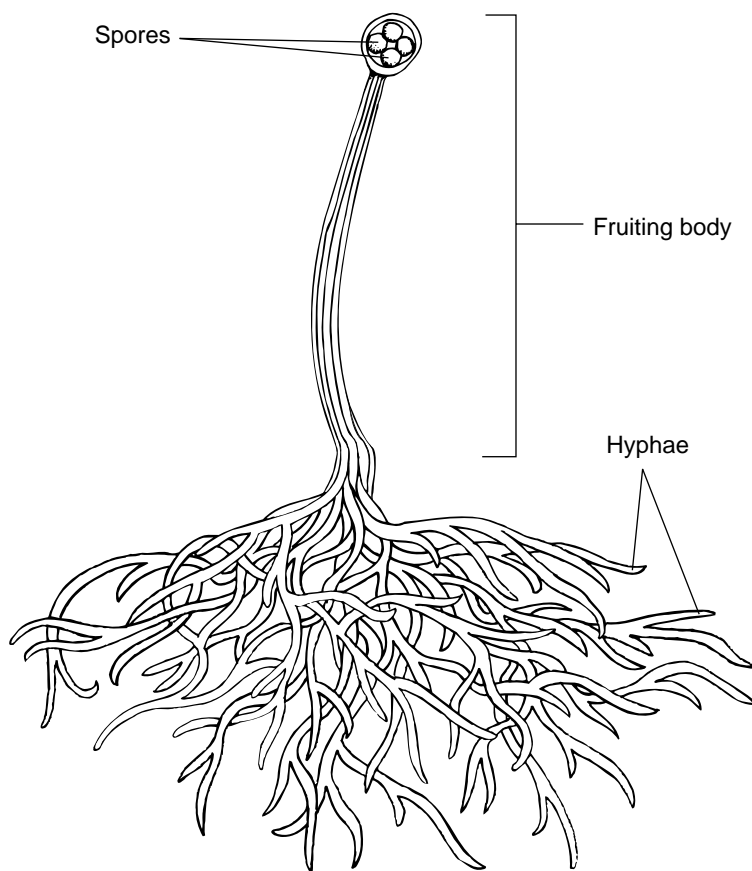


FIGURE 1

Using Range and Habitat to Track Evidence

Investigation

CASE SUMMARY

Customs inspectors opened a suspicious package of food products that was being imported from Australia. They found several stolen diamonds hidden in a box of cookies. The shipment had been stored in a warm, moist environment that enabled fungi to grow on some of the food products, including the cookies among which the diamonds were hidden. The police suspected that the shipment had been packed elsewhere before being sent through Australia to the United States in order to conceal its source. Australian customs officials opened some of the boxes in the shipment but did not find the diamonds. You are asked to use the information collected about the fungi found on the cookies to determine where the shipment was packed.

QUESTION FOR FORENSIC ANALYSIS

Where were the diamonds and food products packed?

MATERIALS (per group)

7 different colored pencils

PROCEDURE

1. The following species of fungi were found in the cookies that the United States customs inspectors confiscated:

Amanita muscara

Aseroe rubra

Nyctalis mirabilis

Tubaria rufofulva

Hygrophorus lewellinae

Microporus xanthopus

Hyphodontiella multiseptata

Use the information in Figure 2 on page 14 to draw the borders of the range of *Amanita muscara* on the map in Figure 3 on page 15 with a colored pencil. Label the range you have drawn with the name of the species.

2. Using a different colored pencil for each species, repeat step 1 with each of the species found in the evidence.









Species	Range	Habitat	Appearance	Additional Information
<i>Amanita muscaria</i> 	Southeast Australia	In forests under pine trees	Mushroom with red spotted cap and white stalk	Forms symbiotic associations (mycorrhizae) with many plants
<i>Aseroe rubra</i> 	Southeast Australia	In open forests and mountain grasslands	Mushroom with white stalk; cap has bright red arms	Has a strong odor of rotten meat
<i>Nyctalis mirabilis</i> 	Southeast Australia	In cool, temperate rainforests	Mushroom with silver-grey cap and white stalk	Grows on old mushrooms of other species
<i>Cordyceps sinensis</i> 	South-central China	In cold marshes and under trees above 4000 m.	Spikelike fruiting body on dead caterpillars	Is a parasite of caterpillars of the moth <i>Hepilus fabricius</i>
<i>Tubaria rufofulva</i> 	Throughout southeast Asia	In soil and decaying wood	Red mushroom	Grows on wood
<i>Hygrophorus lewellinae</i> 	Coastal areas of Indonesia	Grows among low plants along stream banks	White mushroom with waxy cap	Is common on ferns
<i>Microporus xanthopus</i> 	Laos, Sumatra, and Borneo	Grows symbiotically with algae as a lichen on termite nests	Forms a shelf with many small pores, attached to a yellow disk-shaped base	Grows attached to trees
<i>Hyphodontiella multiseptata</i> 	Sumatra and Borneo	On tree trunks and termite nests	Grows in a flat sheet	Grows symbiotically with algae as a lichen

FIGURE 2

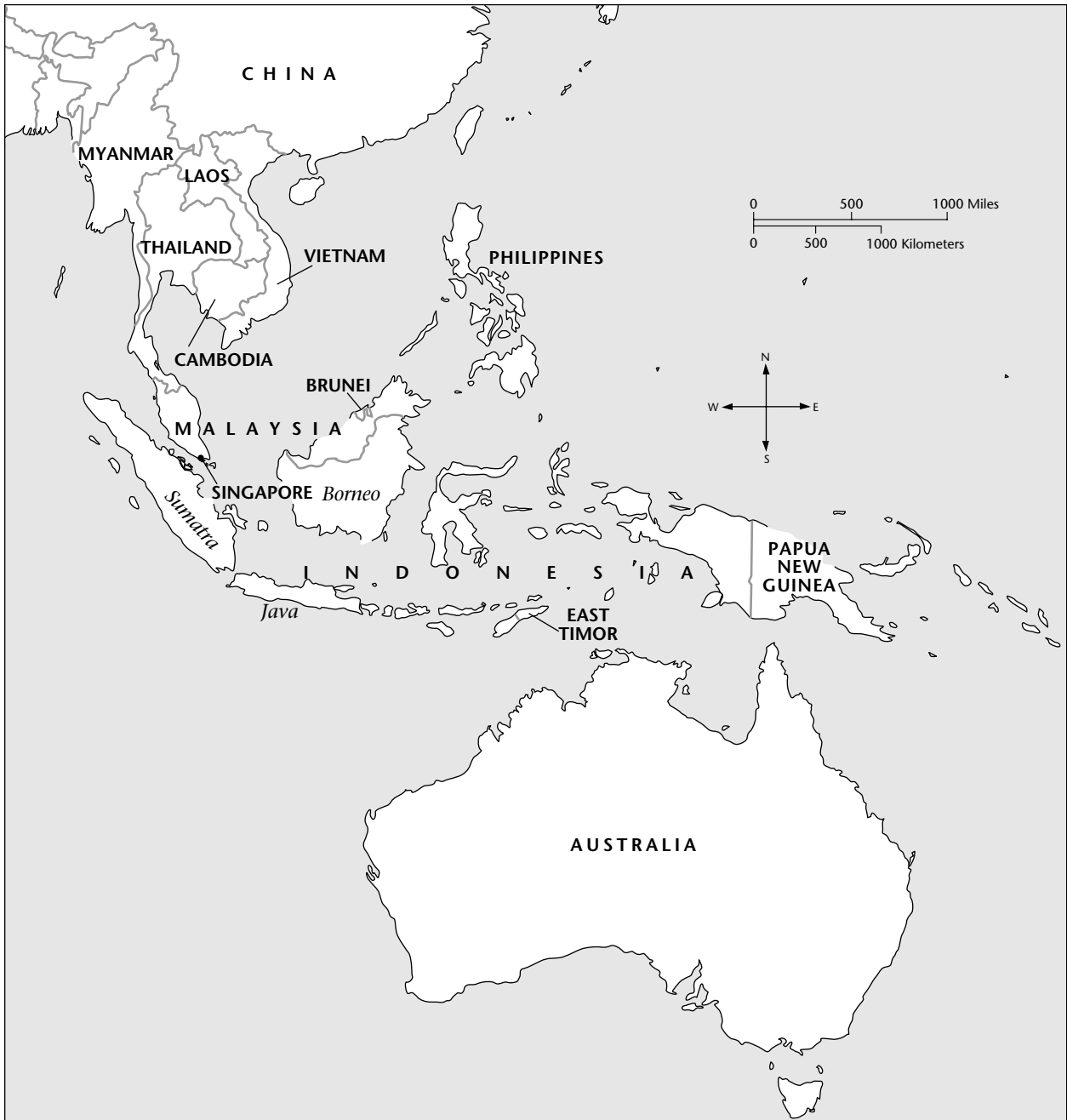


FIGURE 3

ANALYSIS AND CONCLUSIONS

1. **Analyzing Data** According to your map, where do all of the species of fungi found in the cookies occur?

2. **Drawing Conclusions** Where can you conclude that the shipment of diamonds was packed?

3. **Drawing Conclusions** Use the information in Figure 2 to describe the habitat in which the cookies were made or packed with the diamonds.

4. **Inferring** How can you explain the presence of the Australian fungi in the evidence?

5. **Predicting** Could fungi be used to identify the source of stolen artifacts smuggled from the Sahara? Explain your answer.
