Population biology in an endangered mushroom that lives on ancient oaks.

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Landscape changes have resulted in the decline of many species and habitats. Polypores, mushrooms with pores or tubes along their underside, are no exception. Sweden is home to 1/3 of Europe's population of the endangered orange polypore, *Hapalopilus croceus*. Little is known about this mushroom, it grows in living or dead ancient oak trees for maybe centuries; appearing in hollows and branch scars as a bright orange fruiting body. It is also a white-rot wood decomposer, meaning it can break down lignin (often the last remaining polymer in plant cells during decomposition). Species like these contribute to a healthy ecosystem and help prevent the accumulation of coarse woody material on the forest floor. In the last 100 years however, 80% of *H. croceus* has declined, largely due to habitat degradation.

This study aimed to examine *H. croceus*'s gene flow from surrounding populations as well as its reproduction and growth. Growth in mushrooms depends on how they digest substrate, environmental conditions, and resource availability. Because of this, polypores can exist for centuries in wood before reproducing. These factors influence how organisms cope with competition from others and thus can help us better understand the population biology of *H. croceus*. I compared growth in *H. croceus* to the more common red-banded polypore *Fomitopsis pinicola,* since both of these species have different decay strategies and thus could interact differently on a community level. During a lab study I found that *F. pinicola* grew much faster initially than *H. croceus.* This suggests *H. croceus* may establish later after the substrate is more decomposed, however a more detailed study is recommended to confirm this.

Examining reproduction can also be useful for expanding information on population biology. I found that this polypore can only mate with 25% of its sibling spores, but nearly 98% of spores from other fruiting bodies are potential partners. This is good news for a slow growing species whose habitat is disappearing; since mating between relatives is less common so future populations can maintain gene flow to defend against disease and changes in climate.

To better examine gene flow in *H. croceus*, we compared full genomes from Swedish, Latvian and Lithuanian individuals and found little to no variation between populations. This may be because the orange polypore possibly lives for centuries before it reproduces, so it is unlikely that enough generations have formed to show comparable mutations in its genome. 10,000 years ago Sweden was under an ice sheet that did not recede until roughly 8,500 years ago, after which oaks migrated across a previously existing land bridge from Denmark. Recent pollen data show that over the next 4,000 years, oaks flourished throughout Sweden. Thus perhaps *H. croceus* thrived as well, since it likely migrated along with the oaks. However, agriculture has proven devastating to countless habitats and peasant feuds between the royal navy in the 17th and 18th centuries saw oaks dwindle down 80% in many areas. These factors all potentially impact the genetic history in a species.

Since vast amounts of data have been collected, further analysis is likely to shed more light on the population biology of *H. croceus*. The results could help us understand how landscape alteration influences species; specifically highly fragmented and endangered ones affected by human activity. All of these efforts would aid in our understanding and conserving Europe's beloved ancient forests.

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