Fixing to collect? A validated brain tissue preservation method for mitigating the loss of neuroanatomical data in threatened biodiversity hotspots

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Introduction

Biodiversity hotspots, which harbor more endemic species than elsewhere on Earth, are increasingly threatened. There is a need to accelerate collection efforts in these regions before species become extinct. Vouchered specimens are fundamental to understanding biodiversity because they represent non-renewable records of a species existence. The diverse data sets (e.g., ecology, ethnology) generated from the collection of museum specimens afford investigators flexibility in how the data can later be used for a host of analytical approaches from molecular to macroevolutionary scales.

A useful data source for understanding aspects of biodiversity is neuroanatomical data in threatened biodiversity hotspots. Most biodiversity hotspots are in areas with significant biodiversity losses. Unfortunately, field methods used to preserve the brain, require few resources, and are extensible to researchers working in the world’s most fragile ecosystems.

Here, we have developed a protocol that overcomes these challenges. We field-adapted two fixation methods commonly used in the lab: immersion and transcardial perfusion. We evaluated fixed tissues with subresolution x-ray micro-computed tomography (µCT) and cytoarchitectonics. Our method is simple to implement in the field, requires few resources, and is extensible to researchers working in the world’s most fragile ecosystems.

Results

1) hotspots visited & animals collected

2) field method illustrated & supplies used

3) method validation

4) cytoarchitectonics

Conclusions

We successfully validated a protocol for fixation of brain tissue in a completely mobile and long-term field setting including sub-resolution imaging and cytoarchitectonics. Our approach can (1) free researchers from laboratory limitations and (2) rescue perishable neuroanatomical information from threatened biodiversity hotspots.

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