Predicting organismal jumping performance from morphology in frogs
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Ecological and evolutionary processes depend on individual fitness. Oftentimes, organismal performance is a more accurate predictor of individual fitness when compared to individual phenotypes. However, studies of organismal performance require the estimation of performance parameters using live animals. This prohibits the use of museum specimens and limits these studies to those species for which field collecting and manipulation is permitted. Recent work has shown that organismal performance, such as feeding performance in fishes, can sometimes be estimated from individual phenotypes. Here we explore an analogous approach by utilizing physical principles to mathematically derive three morphological proxies for three types of locomotory performance measures in frogs (jumping velocity, energy, and power). These morphological proxies require the collection of non-invasive anatomical measurements and allow us to estimate locomotory performance from phenotypes in frogs. Preliminary analyses of published measurements taken from live specimens suggest that we can reliably estimate locomotory performance from body mass and leg length without the necessity of obtaining live specimens and measuring movement in real time. Future work will seek to use data taken from live specimens to further validate our ability to estimate locomotory performance from morphological proxies in frogs, particularly among species occupying different microhabitats.