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Conference Details

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Conference Title: Genetics of Adaptation

Communication Title: Adaptation to feral environments is facilitated by ancestral and artificially-selected traits

ABSTRACT

Animals that escape captivity experience powerful changes in selection regimes, but their evolutionary responses have not been well studied. We used genomic and phenotypic data to assess how ancestral and/or artificially-selected (i.e. domestic) traits facilitated the recent, rapid evolution of Kauai's feral hybrid *Gallus gallus* (Red Junglefowl x domestic chickens). We found:

- 1) evidence of recent input to the Kauai gene pool from multiple domestic lineages, including "layer" breeds developed for enhanced, year-round egg production
- 2) an accompanying shift from ancestral (seasonal) breeding patterns to year-round reproduction, which likely abetted recent, exponential population growth
- 3) a selective sweep that favored the ancestral Red Junglefowl variant in a genome region controlling broodiness, a maternal care behavior that was attenuated by domestication.

Our characterization of phenotypic variation and breeding biology were greatly enhanced by data that we extracted from geospatially-indexed social media uploaded to the internet by Kauai tourists. Therefore, we also ground truth this novel method for remote eco-evolutionary sensing, and discuss its possibilities and pitfalls. Together, our findings from whole genome sequencing and social media analysis yielded new and important insights concerning feral population biology. Chiefly, we provide the first evidence that recombination of ancestral and artificially-selected reproductive traits (e.g. ancestral maternal care and enhanced fecundity) can be advantageous during feralization.

COMMUNICATION OUTCOMES

As an MSU postdoc, I am conducting pioneering studies of how feral populations evolve after escaping cultivation. Feral animals have received scant attention from evolutionary biologists, yet are poised to a) provide novel insights into basic evolutionary processes, and b) illuminate emerging features of human-impacted populations and ecosystems. My studies are chiefly independent from other projects in my home laboratory (the Getty lab), which is unified by interests in social behavior and evolution. I also collaborate with and co-mentor three senior graduate students.

In my first year at MSU, I published a pilot study revealing the hybrid origins of Kauai chickens in *Molecular Ecology*. This work was subsequently featured by *Nature*, *The New York Times*, and many other high profile science media outlets, and also a documentary broadcast throughout Europe (produced by St. Thomas Productions for French public tv). I am coauthor on a second manuscript, identifying evidence of adaptation in feral genomes, that is in press at *Nature Communications*, and co-author or senior author of three recent collaborations with Getty Lab graduate students (published and in press at *Behavioral Processes*).

My latest research reveals that feral chickens harbor a trait that humans artificially selected into layer breeds (prolific, year round egg production), which appears to abet feral population success. Through hybridization, this trait has invaded a population of Red Junglefowl on Kauai that were introduced by ancient Polynesians. The transition to prolific, year round reproduction likely facilitated the Kauai population's recent, exponential population growth. To my knowledge, this is the first indication that domestic life history traits, which are typically assumed to be maladaptive in the wild, can invade unmanaged animal populations. This is an exciting discovery for both "basic" evolutionary biology and applied population management.

The work I will present also introduces a novel method for remote population sensing. While fieldwork and genetic evidence corroborate the conclusions outlined above, my initial discovery was made through analyses of photos and videos uploaded to the internet by tourists. I analyzed these spatially- and temporally-indexed social media with help from MSU undergraduates. We are confident that our example will inspire others to explore how social media can be used to study non-human populations. Thus, both findings and methodology I will present at "Genetics of Adaptation" provide new and substantive scientific contributions.

The conference will be small, yet features several of the world's foremost investigators in this area of ecological genomics (Naomi Pierce, Jonathan Flint, Mark Kirkpatrick, and 13 other internationally renowned geneticists). It therefore offers outstanding opportunities to obtain advice, connections, and research input that will help me obtain a research intensive faculty position. This conference also presents unique opportunities to advance my research capabilities. The Red Junglefowl (*Gallus gallus*), which is the primary focus of my research, is native to the Indian subcontinent. Networking with local researchers at the conference will eventually help me overcome logistical and regulatory challenges associated with studying Red Junglefowl in their native range in India. My long term goal is to use these studies (of both feral and native Red Junglefowl) to advance evolutionary biology, while abetting the conservation and sustainability of our humanity's most agriculturally- and scientifically-important bird.