**­** XSEDE New Research Allocation Proposal:

Harnessing cloud computing and genomics to

facilitate adaptive species conservation of

non-model organisms

Progress Report

Principal Investigator: Marlis R. Douglas

Co-Investigators: Michael E. Douglas

Contributor: Tyler K. Chafin

*University of Arkansas*

*Fayetteville, Arkansas*

We here document products to date for Objectives listed in our Jan-Dec 2017 allocation (TG-BIO160065) in support of proposed renewal for the Jan-Dec 2018 period. We list in the Main Document for this renewal request several new objectives, to support efforts of other projects as some of the objectives from the 2017 request are stalled for sampling, or staged for manuscripts. To date we have used ~820,000 SUs of the 864,000 SUs allocated for the Jan-Dec 2017 period, and project that remaining SUs will be used with ongoing efforts before expiration on Dec 31, 2017. Below we summarize products of our work during the 2017 allocation period and Early Operations phase.

**Presentations at national scientific conferences**

Here we list presentations enabled by our work on Jetstream during the 2017 allocation period. Student authors are underlined.

*American Fisheries Society – Tampa, FL, 20-24 August 2017, invited symposium*

* Mussmann SM, **Douglas MR**, Douglas ME

Riverscape genetics of Speckled Dace: A contrasting study of the Colorado River and Great Basin Drainages (oral)

* Chafin TK, **Douglas MR**, Douglas ME

Differential introgression suggests a mosaic hybrid zone in *Gila* of the Colorado River Basin (oral)

* Bangs MR, **Douglas MR**, Douglas ME

Phylogenetic divergence and reproductive compatibility: An examination of hybridization and introgression in endemic and introduced suckers in the Colorado River ecosystem of western North America using ddRAD (oral)

* Douglas ME, Chafin TK, Mussmann SM, Bangs MR, **Douglas MR**

The “Gold Standard” and units of biodiversity in Southwestern Fishes: From population genetics to conservation genomics (oral)

* **Douglas MR,** Wangchuck K, Claussen J, Philipp DP, Bangs MR, Chafin TK, Douglas ME

Riverscape genomics of Golden Mahseer in Bhutan: A journey back to the headwaters? (oral)

*Jetstream NSF Site Review “Science Impacts” – Bloomington, IN, 19-20 July 2017*

* Chafin TK

Harnessing Jetstream cloud computing for conservation and evolutionary genomics (oral)

*Western Division American Fisheries Society – Missoula, MT, 22-25 May 2017*

* Mussmann SM, **Douglas MR**, Douglas ME

Riverscape genetics of Speckled Dace: A contrasting study of the Colorado River and Great Basin Drainages (oral)

*Wildlife Society – Little Rock, AR, 12 July, 2017*

* McDill PL

A molecular approach to dispersal and population structure in White-tailed deer from an Arkansas CWD hotspot (oral)

*Chronic Wasting Disease Research Symposium – Austin, TX, 12-16 July, 2017*

* Martin BT, **Douglas MR**, Holycross AT, Mackessy SP, Douglas ME

Population genomics of the Western and Desert Massassaugas (oral)

* Chafin TK, **Douglas MR**, Douglas ME

Differential introgression suggests a mosaic hybrid zone in *Gila* of the Colorado River Basin (oral)

We additionally presented 5 oral and poster presentations at the 2016 Joint Meeting of Ichthyologists and Herpetologists, 2 oral presentations at the 2016 Desert Fishes Council meeting, and 3 invited presentations to US Fish and Wildlife Service, Utah Department of Natural Resources, and Arizona Game and Fish Department on work utilizing Jetstream during the Early Operations phase (not listed).

**Publications in scientific journals**

Below we list publications resulting from our 2017 Jetstream allocation and usage during the early operations period. In-prep manuscripts are noted, and graduate student authors underlined.

* Bangs MR, **Douglas MR**, Thompson P, Douglas ME. 2017. Anthropogenic impacts facilitate native fish hybridization in the Bonneville Basin of western North America. *Transactions of the American Fisheries Society*. 146(1): 16-21.
* Bangs MR, **Douglas MR**, Mussmann SM, Douglas ME. 2017. The effects of introgression on phylogenetic discord: An empirical evaluation using Catostomus (Pisces: Catostomidae). *Molecular Phylogenetics and Evolution*. Submitted.
* Bangs MR, Chafin TK, **Douglas MR**, Douglas ME. 2018. Comparative species delimitations in the presence of gene flow for Flannelmouth (*Catostomus latipinnis*) and Bluehead Sucker (*C. Pantosteus discobolus*). In preparation.
* Chafin TK, Bangs MR, **Douglas MR**, Douglas ME. 2018. Untangling an ‘anomolous’ desert fish species complex reveals rapid radiation and reticulate evolution. In preparation.
* Chafin TK, Martin BT, Mussmann SM, **Douglas MR**, Douglas ME. 2017. FRAGMATIC: In silico locus prediction and its utility for ddRAD project design. *Conservation Genetics Resources.* https://doi.org/10.1007/s12686-017-0814-1
* Chafin TK, **Douglas MR**, Anthonysamy WJB, Harrel K, Walker JM, Cordes JE, Sullivan KO, Douglas ME. 2018. Species delimitation in a hypothesis-testing framework: A case study in Western Whiptail Lizards (*Aspidoscelis tigris*). *Copeia*. In preparation.
* **Douglas MR**, Chafin TK, Mussmann SM, Claussen JE, Philipp DP, Douglas ME. 2018 Are populations of economically important bonefish and queen conch ‘open’ or ‘closed’ in the northwen Caribbean Basin? *Marine Ecology Progress Series*. In preparation.
* Hancock DY, Stewart CA, Vaughn M, Fischer J, Lowe JM, Turner G, Swetnam T, Chafin TK, Afgan E, Pierce ME, Snapp-Childs W. 2017. Jetstream – Early Operations Performance, Adoption, and Impacts. *Concurrency and Computation: Practices and Experiences*. Submitted.

**Dissertations – In progress and complete**

Work on Jetstream in 2017 contributed to 3 in-progress and 1 completed dissertation, with the 2018 allocation renewal, if granted, expected to contribute to an additional 2 in-progress dissertations and 2 master’s theses. Dissertations enabled in part by the 2017 XRAC are listed below.

* Bangs, Max R.
  + Fishes as a template for reticulate evolution: A case study involving *Catostomus* in the Colorado River Basin of Western North America
  + Completed
* Chafin, Tyler K.
  + Semipermable species boundaries and the ‘speciation continuum’ in fishes: *Gila* of western North America
  + Expected completion: May 2019
* Mussmann, Steven M.
  + Fishes in the mist: Phylogeography of *Rhinichthys osculus*
  + Expected completion: May 2018
* Martin, Bradley T.
  + Hybrid zones in nature: Spatial, environmental, and temporal dynamics of hybridization in Box Turtles (*Terrapene* spp.) and Massasaugas (*Sistrurus* spp.) in North America
  + Expected completion: May 2019

**Education and Outreach**

We additionally have organized a joint workshop with the National Center for Genomics Analysis Support and Jetstream operations groups from Indiana University focusing on application of Jetstream and broad bioinformatics tools for graduate students and faculty at the University of Arkansas working with big data.

[[MRD insert sentences about work in Bhutan??]]

[[Maybe sentence about Newswire etc articles as ‘public-facing’ publications?]]