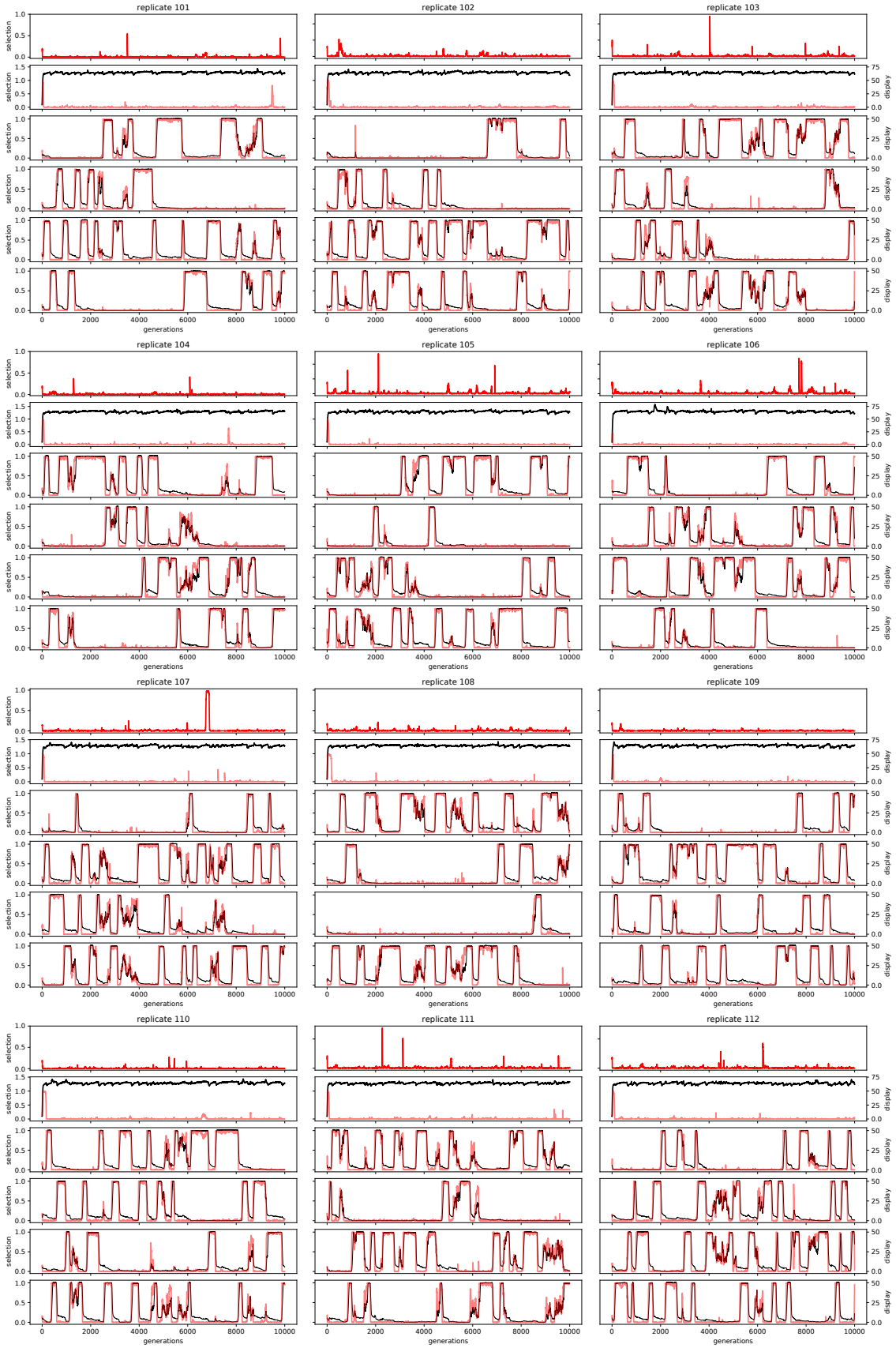
# On Sexual Selection in the Presence of Multiple Costly Displays : APPENDIX

This appendix contains plots for additional replicate results from conditions 4 and 5. In addition, this appendix includes instructions on replicating the results using files included with the supplemental data.

# Condition 4 replicates

Figures below show results for the first 12 replicates of condition 4. For plot description see figure 8. Replicate numbers indicate the value used to seed the random number generator for that replicate.



# Condition 5 replicates

Figures below show results for the first 12 replicates of condition 5. For plot description see figure 8. Replicate numbers indicate the value used to seed the random number generator for that replicate.

# Replication Instructions

If you are reading this, you likely are interested in replicating the data from ”On Sexual Selection in the Presence of Multiple Costly Displays”

## Getting MABE

The experiments in this paper were run using MABE. For a general introduction to MABE see: github.com/Hintzelab/MABE/wiki

The latest version of mabe can be found here, but the files in the project may not work with the latest version so all of the files needed to create a MABE executable are included here. The instructions below will allow you to run in windows, mac or linux environments.

If you have questions or need help, please contact Cliff Bohm at cliff@msu.edu

## generating an executable

. First, you should notice that there is a few directories.

`code/`
(contains the code needed to compile mabe)

`Cond_1/`
`Cond_2/`
`Cond_3/`
`Cond_4/`
`Cond_5/`
( Cond_1 though Cond_5 contain files needed to run condition 1 through 5 from the paper.)

To get started you will need to compile mabe for your system and for this you will need to have python and a c++ compiler installed on your computer. If you don’t have these or, if you have the wrong versions, you should reference the mabe quick start guide:

github.com/Hintzelab/MABE/wiki/Installation-and-getting-started-with-MABE

Once you have c++ and python installed correctly, then from a command line prompt, run the following commands (lines with # are comments, don’t try to run these):

```
cd code

python pythonTools/mbuild.py
# note, if your computer has multiple cores you can run mbuild.py with a -p option and a number of cores
# after a few moments there should be a file called mabe (or mabe.exe if you are on windows)
# test that this works


./mabe
# ./mabe.exe if on windows
# this should generate some output that looks reasonable and stop running at ”update: 110”
```

## running conditions

Once you have MABE compiled and have tested that it runs, copy the executable to each condition directory.
# copy mabe to the condition folders (if on windows, replace mabe with mabe.exe) # if you compiled with an ide, the executable may be in a diffrent location...

```
cp mabe ../Cond_1/.
cp mabe ../Cond_2/.
cp mabe ../Cond_3/.
cp mabe ../Cond_4/.
cp mabe ../Cond_5/.
cd ..
# pick the condition from the paper you want to run, for eaxample condition 1:
cd Cond_1
```

```
./mabe -f settings.cfg settings_world.cfg settings_organism.cfg -p GLOBAL-randomSeed 101
```
# this will run condition 1 with randomSeed 101. The output will be a pop.csv file
# which contains population averages for the population from every update. To run a different
# replicate, change the randomSeed. (e.g. change 101 to 102)

## What are the differences between conditions?

The only difference between the conditions are two parameters in the settings.cfg files. Using a text editor, you can view and alter these parameters.

**assignedRanges**
this will be two values, the first value (always 1) is the number of sexes (0 or 1) and the second value is the number of traits which can be selected (counting starts at 0).
when the second value is 1: females can mate randomly or choose a beneficial trait
when the second value is 2: females can mate randomly, choose a beneficial trait, or choose a costly trait
when the second value is 5: females can mate randomly, choose a beneficial trait, or any one of 4 costly traits

**optimizeValueDad**
this sets the cost on fathers, this parameter value is either (all that is changing is the cost multiplier which is either 1.0 or 0.1 and is boldface in the formula below):
MIN[DM_AVE[m1],60]-(**1.0***(MAX[DM_AVE[m2]-10,0]+MAX[DM_AVE[m3]-10,0]+MAX[DM_AVE[m4]-10,0]+MAX[DM_AVE[m5]-10,0]))
or
MIN[DM_AVE[m1],60]-(**0.1***(MAX[DM_AVE[m2]-10,0]+MAX[DM_AVE[m3]-10,0]+MAX[DM_AVE[m4]-10,0]+MAX[DM_AVE[m5]-10,0]))

## MGRAPH

MABE comes with a simple graphing tool, mgraph.py which can be found in code/pythonTools/mgraph.py

you can run mgraph.py from a condition directory to visualize your results with:
```
python ../code/pythonTools/mgraph.py -files pop.csv
```

To see details on usage you can either run:
```
python ../code/pythonTools/mgraph.py -h
```
or you can visit: github.com/Hintzelab/MABE/wiki/MGraph

## MQ

MABE also comes with a tool to submit multiple jobs called mq.py. You can find out more about mq.py at github.com/Hintzelab/MABE/wiki/MQ