Research Project Proposal Information:

Your proposal should have the following structure:

- Title, team member names
- Abstract (<250 words)
- Introduction
- Methods
- Potential Results
- Implications of Findings
- Literature Cited

You will need to conduct literature searches to find relevant previous studies to place your research in the appropriate context. The introduction should establish the background and importance of the research question(s), and clearly describe the hypotheses to be tested. The methods section should describe the means by which the project will be conducted in order to test the questions posed in the introduction. Information on your project provided below should greatly aid you in designing your study and writing this section. These methodological descriptions should generally be of sufficient detail that others could replicate your methods based solely on the text in your proposal—in the present case, you may not be familiar enough with logistics on the islands to accomplish this, but do your best to accurately describe your desired methods. In the potential results section, discuss the sorts of results you expect to be able to find at the conclusion of the study. In the implications of findings section, describe the interpretations of various possible results—what sorts of conclusions might you be able to draw at the end of this study?

Use the style for citation and bibliography for a journal that you believe would be appropriate for the publication of your eventual results.
**Brief Project Methods Outline:**

**Ecological divergence among blue holes:**

*Does predation risk modify population demographics, habitat use, and behavior in a radiation of Bahamas mosquitofish (Gambusia hubbsi) inhabiting blue holes?*

Comparative approach to understanding the effects of predators on multiple prey variables. Measure environmental variables, conduct underwater visual census surveys, conduct underwater visual time-budget surveys, and compare values between three blue holes with predatory fish (bigmouth sleeper, Gobiomorus dormitor) and three blue holes without predatory fish.

- Environmental variables: record time, water and air temperature, dissolved oxygen, pH, salinity, conductivity, turbidity, chlorophyll *a*, cyanobacteria, secchi disk depth, zooplankton
- Underwater quadrat surveys: conduct 20 1m³ quadrat surveys in each of 4 habitat types (shallow-near shore, deep-near shore, shallow off-shore, deep off-shore) around perimeter of each blue hole at two time periods (morning and afternoon), recording the number of juvenile, male, and female Gambusia hubbsi observed within each quadrat
- Time budget: follow single fish for 60-300 sec, measuring rates of key behaviors (# of feeding events, # of sexual behaviors, # aggressive intersexual behaviors, # aggressive intrasexual behaviors) for a total of approximately 15 males and 15 females per site

**Sexual isolation among blue holes:**

*Evolution of sexual isolation during a radiation of Bahamas mosquitofish in blue holes*

Experimental approach to understanding the role of ecological divergence (via variation in predation intensity) in driving speciation. By conducting behavioral trials within and among populations, this experiment will reveal insights into the strength of ongoing ecological speciation. Collect live fish, run behavioral experiments, film trials, measure multiple social behaviors, compare behaviors between trial pairings to evaluate the role of ecology in the speciation process.

- Fish collection: collect live fish from four blue holes (2 that have evolved without predatory fish, 2 that have evolved with predatory fish) and maintain at Forfar field station; separate sexes for ≥ 24 hours prior to experimentation
- Experiment: conduct sexual isolation experiment as follows: for each trial, place 2 males and 2 females from a given population into the behavioral arena (Plexiglass aquarium), record behaviors for 15 min, remove random male from arena, introduce foreign male (male from different population), record behaviors for 15 min; all trials will be recorded with a digital video camera; conduct 5 replicate trials for each population-pair comparison (12 comparisons exist for 4 populations, thus *n* = 60)
- Data collection: review videos to record behavioral data separately for each sex and each trial component (native only vs. foreign introduction): e.g., # of sexual behaviors, # aggressive intersexual behaviors, # aggressive intrasexual behaviors, time spent by females within 1 body length of male
Lionfish

Experimental approach to understanding the impact of invasive lionfish on marine blue hole ecosystems. This experiment will document the impact of lionfish on the abundance and diversity of other fish in the micro-environments they inhabit in a marine blue hole. Film trial, move fish, film trial, compare fish behavior and abundance before and after lionfish movement (i.e., before and after introduction, and before and after removal).

- Experiment: Choose a control location in the marine blue hole (no lionfish), and one location with a lionfish. Record each location for 30 minutes 3 times (suck, blow, and night) each day for 4 days. Then move the lionfish to the control site and repeat the data collection for 4 additional days. Lionfish will be enticed to stay in the new micro-environment with an artificial habitat (bucket).

- Data collection: review videos to record behavioral and abundance data separately for each targeted fish species (lionfish and other key species): e.g., for lionfish (# of attacks), for other species (# flights, # feeding behaviors, # intrasexual behaviors). The actual behaviors monitored will depend on your literature review.

Note: This will all happen at blue hole Key. The actual blue hole currently has 3 lionfish and ranges from 2-10 feet deep. These basic ideas are far from a proposal, but should give you ideas of the constraints (equipment, location, etc).

Ecotourism

Survey approach to determine how Androsians define ecotourism, their attitudes toward it, and what predicts how much they benefit from it. We will emphasize how social networks influence how much residents benefit from ecotourism.

- Data collection: Conduct a survey of residents with various levels of involvement in ecotourism, ranging from owning a business and 100% income to tangential benefits associated with use of tourism tax revenues (that would be anyone on the Island).
  - Dependent variables
    - Total income from ecotourism
    - % income from ecotourism
    - Participation levels
      - Heavily integrated (hotel, business, boarding, etc) (primary job or business)
      - Medium integrated (employee in season waiter, tour guide, etc) (side job or business food stand, opportunistic guide, etc)
      - Low (no direct income…maybe indirect (fixing roads and power…even though tourism gen taxes and pub benefits
        - Owner versus worker??? Owners elsewhere???
        - Perceptions (How imp is conservation (blue holes etc), is ecotourism good, what is ecotourism, aware Andros is ecotourism island, ??)
  - Independent Variables:
- Ethnicity
  1) Native (citizen)
  2) Income
  3) Years family on Andros
  4) Education (years/level)
  5) % amount tourism income prior to designation as ecotourism place. What year?
  6) Social network: (# govnt people, # foreigners, # local business owners, ???) local versus outside
     a) Frequency of communication, frequency work together, frequency exchange $, ?
  7) Geographic: dist from main road, beach, tourism center, ? (cost distances)
  8) Socio-econ impacts, info shared with outsiders, who they know?, social network

**Note:** Your literature review should assess how social network analysis is conducted and the questionnaire you develop should include questions designed for that purpose. I have provided you some example questionnaires but they do not include social network questions. We will target 200 respondents and use a convenience/snow ball sampling approach that stratifies by engagement in ecotourism (heavy medium and low).