**SP3: Future Species Distribution Models and Hypothesis Evaluation**

**- Rubric (20 pts) -**

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| **Criteria** | **Excellent** | **Average** | **Poor** |
| ***Points*** | **2** | **1** | **0** |
| Forecast maps of butterfly, host plant, and pairwise interactions for 2070 with figure legends | Forecast SDM map showing the overlap of the host plant and butterfly (with color legend) are present. Maps are cropped to maximize the distribution of the organism inside the frame, and SDMs are calculated correctly. Figure legends fully informs the reader so the figure can be interpreted. Legend includes the type of data used to generate the maps, sample size, the date the data were accessed from iNaturalist, and information on how the maps were generated. | Some mistakes detected in calculating the SDMs or legend for colors not provided. Figure legends do not fully describe figure (e.g., do not mention species name, or where data were obtained) making it difficult for the reader to ascertain the information provided in the figure. | Maps missing or SDM not calculated correctly resulting in an inaccurate forecast map. Figure legends missing or with very little information about the figure such that a reader cannot interpret the information provided by the figure itself. |
| ***Points*** | **3** | **2** | **1** |
| Evaluation of **butterfly** SDM for 2070 compared to present-day SDM | Written in paragraph form, the comparison goes beyond describing how the ranges shown by the present and forecast SDMs are similar or different to help understand why differences might have been observed. Where appropriate, descriptions move beyond political boundaries (e.g., countries, states, counties, etc) to consider distribution in light of geographical features (e.g., mountain ranges, rivers, etc).  | Comparison offers a verbal description of the similarities and differences between the current and future SDMs. However, the comparison does not move much beyond a description to incorporate factors that may play a role in the change in distributions observed. | Comparison missing or with very little information - not constructed in paragraph format. No critical analysis presented. |
| ***Points*** | **3** | **2** | **1** |
| Evaluation of **host plant** SDM for 2070 (compared to present) | Written in paragraph form, the comparison goes beyond describing how the ranges shown by the present and forecast SDMs are similar or different to help understand why differences might have been observed. Where appropriate, descriptions move beyond political boundaries (e.g., countries, states, counties, etc) to consider distribution in light of geographical features (e.g., mountain ranges, rivers, etc).  | Comparison offers a verbal description of the similarities and differences between the current and future SDMs. However, the comparison does not move much beyond a description to incorporate factors that may play a role in the change in distributions observed. | Comparison missing or with very little information - not constructed in paragraph format. No critical analysis presented. |
| ***Points*** | **3** | **2** | **1** |
| Evaluation of **pairwise** SDM for 2070 (compared to present) - but do not evaluate hypothesis | Written in paragraph form, the comparison goes beyond describing how the ranges shown by the present and forecast SDMs are similar or different to help understand why differences might have been observed. Where appropriate, descriptions move beyond political boundaries (e.g., countries, states, counties, etc) to consider distribution in light of geographical features (e.g., mountain ranges, rivers, etc).  | Comparison offers a verbal description of the similarities and differences between the current and future SDMs. However, the comparison does not move much beyond a description to incorporate factors that may play a role in the change in distributions observed. | Comparison missing or with very little information - not constructed in paragraph format. No critical analysis presented. |
| ***Points*** | **3** | **2** | **1** |
| Improvement in hypothesis | Clear consideration of feedback provided on the hypothesis from the last assignment. Where appropriate, improvement in hypothesis goes beyond grammatical changes, but rather reworks the entire statement to improve clarity and conciseness. Hypothesis is more aligned with the data to better communicate how the data can be used to test the hypothesis. | Grammatical changes accepted to improve clarity and/or conciseness of the hypothesis, but little else changed to improve the hypothesis. | Few to no changes made to the hypothesis since the first draft. |
| ***Points*** | **6** | **4** | **2** |
| Evaluation of the hypothesis followed by a discussion (include references where appropriate) | Evaluation clearly states whether the data support or refute the hypothesis. The discussion provides a clear explanation of how the data were used to support or refute the hypothesis. The evaluation also incorporates relevant information about the natural history and abiotic environment of the butterfly-host plant interaction. References used to support arguments made. | Evaluation is somewhat ambiguous about whether the data support or refute the hypothesis. Explanation of how the data were used to support or refute the hypothesis could be clearer, and the evaluation only superficially discusses relevant information about the natural history and abiotic environment of the butterfly-host plant interaction. Some references used, but some arguments not fully supported. | Evaluation does not state whether the data support or refute the hypothesis. The discussion does not clearly connect the data to the evaluation of the hypothesis nor postulate how the abiotic factors in the model might impact the butterfly-host plant interaction over the next 50 years as observed in the SDMs. Arguments are not supported by references where appropriate. |