**SP2: Species Distribution Maps (SDMs) and Hypothesis**

**- Rubric (25 pts) -**

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| **Criteria** | **Excellent** | **Average** | **Poor** |
| ***Points*** | **3** | **2** | **1** |
| Observation and SDM maps | Four individual maps showing the full range of the host plant or butterfly and one 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. | Some of the maps are missing or do not correctly display the full range of the butterfly or host plant. Some mistakes detected in calculating the SDMs or legend for colors not provided for the SDM overlap of butterfly and host plant map. | Most maps missing or do not adequately show the range of the butterfly or host plant. SDMs not calculated correctly resulting in an inaccurate predicted distribution. |
| ***Points*** | **4** | **2** | **0** |
| Figure legends for all maps and other required information | Figure legends accompany all maps and fully inform the reader so the figure can be interpreted. Legends describe the figure, nature of the data used to generate the maps, sample size, and the date the data were accessed from iNaturalist. Additionally for SDMs, figure legends include information on how the maps were generated. | 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. | 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** |
| Comparison of observation maps to SDM | Written in paragraph form, the comparison goes beyond describing how the ranges shown by the two maps are similar or different to help understand why differences might have been observed. | Comparison offers a verbal description of the similarities and differences but offers a limited explanation of the differences between the maps. | Comparison missing or with very little information - not constructed in paragraph format. |
| ***Points*** | **5** | **3** | **1** |
| Description of pairwise SDM (showing both butterfly and host-plant) | Written in paragraph form, the description verbally describes the distribution of overlap of the butterfly and host plant. Description does more than report the percent overlap, but provides a verbal description of the general area on the maps (e.g., referring to states or general regions with in the US). | Does not fully describe the intersection of the host plant and butterfly distribution or does not provide an accurate description of the distribution. | Description absent or provides little to no information to compare the distribution of host plant and butterfly. |
| ***Points*** | **5** | **3** | **1** |
| Hypothesis | Hypothesis is testable, falsifiable, and presented in a single sentence that is succinct and clearly written. The hypothesis clearly aligns with the data that are being collected (e.g., observation maps and SDMs). Excellent hypotheses also make use of the species names and distributions from the preliminary data collected. | Hypothesis is generally testable and falsifiable, but the hypothesis could be edited or rewritten to be more succinct and improve clarity. Hypothesis not as tightly aligned with the data to be collected and/or do not make use of species names or preliminary data. | Hypothesis is not testable and/or falsifiable. Hypothesis is very vague, does not align with the data that are to be collected nor refer to the species or preliminary data collected. |
| ***Points*** | **3** | **2** | **1** |
| Rationale | Makes use of natural history and life history traits of the butterfly and host plant to support testing the proposed hypothesis. Also, the rationale discusses the effects of changing abiotic components of the environment to make an argument regarding the stated hypothesis. | Rationale reiterates the life history traits of the butterfly and host plant but does not fully incorporate them into the argument being presented in the rationale. Additionally, abiotic components of the environment mentioned but not made a cohesive part of the rationale. | Does not incorporate the life history traits of the butterfly and/or host plant nor discusses the abiotic components of the environment. |
| ***Points*** | **2** | **1** | **0** |
| Discussion of impacts of abiotic versus biotic environment on butterfly-host plant interaction | Discussion goes beyond stating whether biotic or abiotic factors will have a greater impact on the butterfly-host plant interaction 50 years into the future. The argument provides specific examples of why this might be the case and connects their logic to the biology of the plant-insect interaction. | Discussion provides a reasoning for why biotic or abiotic components might be important to the butterfly-host plant interaction, but does not provide an argument as to why one might be more impactful than the other. | Only states whether biotic or abiotic components will have a greater effect on the butterfly-host plant interaction. Beyond listing what biotic or abiotic components might affect the interaction, no connection to the biology of the interaction is addressed. |