



# Evaluation Report

Population and Community Ecology  
Consequences of Intraspecific Niche  
Variation Working Group  
July 27-29, 2009

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## Executive Summary

### Brief Synopsis of Event

This report is an evaluation of a NIMBioS Working Group entitled “Population and Community Ecology Consequences of Intraspecific Niche Variation,” (Niche Variation) which held its first meeting at NIMBioS July 27-29, 2009. NIMBioS Working Groups are chosen to focus on major scientific questions at the interface between biology and mathematics. NIMBioS is particularly interested in questions that integrate diverse fields, require synthesis at multiple scales, and/or make use of or require development of new mathematical/computational approaches. NIMBioS Working Groups are relatively small (10-15 participants), focus on a well-defined topic, and have well-defined goals and metrics of success. Working Groups will typically meet 2-3 times over a two-year period, with each meeting lasting 3-5 days; however, the number of participants, number of meetings, and duration of each meeting is flexible, depending on the needs and goals of the group.

The Niche Variation group comprised 15 participants, including organizers Daniel Bolnick (University of Texas, Austin), Volker Rudolph (Rice University), and Kevin McCann (University of Guelph). Participants came from 13 universities in Austria, Canada, Sweden, and the United States (See Appendix A).

The Niche Variation Working Group brought together ecologists, evolutionary biologists, mathematicians, and a marine biologist to facilitate the development of mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interactions. During the first meeting, the Niche Variation working group settled on a focal question that would bind together our various sub-projects: how do the dynamics familiar ecological models change when one incorporates realistic patterns of intraspecific variation? The group assembled a list of relevant models that have been published previously and devised a strategy to split up the work of reviewing this prior literature. The group plans to write two review papers, one summarizing the relevant theoretical literature, and the second summarizing recent empirical progress in understanding the basis for why some populations exhibit more niche variation than others. Sub-groups then formulated specific models that incorporate niche variation into familiar ecological interactions, such as apparent competition, pollinator-plant dynamics, or tritrophic food chains. The group plans to analyze the dynamics of these models to determine how they behave with versus without intraspecific niche variation.

### Evaluation Design

An electronic survey aligned to the following evaluation questions was designed by NIMBioS’ Evaluation Coordinator with input from the NIMBioS Director and Deputy Director:

1. Were participants satisfied with the Working Group overall?
2. Did the meeting meet participant expectations?
3. Do participants feel the Working Group made adequate progress toward its stated goals?

4. Do participants feel they gained knowledge about the main issues related to the research problem?
5. Do participants feel they gained a better understanding of the research across disciplines related to the Working Group's research problem?
6. What impact do participants feel the Working Group will have on their future research?
7. Were participants satisfied with the accommodations offered by NIMBioS?
8. What changes in accommodations, group format, and/or content would participants like to see at future meetings?

The final instrument was hosted online via the University of Tennessee's secure online survey host mrInterview. Links to the survey were sent to the 15 Working Group participants on July 29, 2009. Reminder emails were sent to non-responding participants on August 5 and 10, 2009. By August 17, 2009, 12 participants had given their feedback, for a response rate of 80%.

## Highlights of Results

- Overall satisfaction with the Working Group was high among survey respondents, all of whom indicated they either agreed or strongly agreed that the Working Group was very productive and met their expectations.
- Ninety-two percent of respondents thought the presentations were useful and all thought that the presenters were very knowledgeable about their presentation topics.
- All respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Working Groups to their colleagues.
- Overall, respondents reported being satisfied with the travel, housing, and other amenities provided by NIMBioS.
- The majority of respondents agreed that they had a better understanding of the main issues related to Niche Variation as a result of participating in the Working Group.
- All respondents said the multidisciplinary composition of the Working Group was its most useful aspect.
- 100% of respondents agreed that the format of the Working Group was very effective for achieving its goals, and that the Working Group made adequate progress for the first meeting toward its goals.
- All respondents said they left this meeting with a good idea of what their contribution will be at the next meeting.
- All respondents said they planned to take the knowledge they gained during the Working Group and apply it to their own research.
- Seven respondents reported they developed solid plans for collaborative research with other Working Group participants, while three said collaborative research was a possibility.

## Conclusions and Recommendations

Overall, the Working Group was very successful in making progress toward its goals. Working Group respondents were satisfied with the meeting, indicating that it was a productive experience that met their expectations. Respondents were also satisfied with the travel, housing, and other amenities offered by NIMBioS.

Respondents overall reported high levels of learning, agreeing that they had a better understanding of the main research issues. All respondents agreed that the Working Group format allowed the group to make adequate progress toward using mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interaction. All respondents also said they left this meeting with a good idea of what their contribution will be at the next meeting.

All respondents indicated they planned to take the knowledge they gained during the Working Group and apply it to their own research, and several said they had developed solid plans for collaborative research with other Working Group participants.

Several suggestions were offered for improvement of future meetings, including using re-usable and recyclable serving materials, building some sort of free time for an activity into the schedule, inviting more females to the next meeting to increase diversity, arranging a lunch out with the group, and getting more whiteboard space.

Based on analysis of participant response data, the recommendations to NIMBioS and/or Working Group organizers are as follows:

- The Working Group had a multidisciplinary composition, but consider trying to recruit a broader diversity of participants regarding gender and race/ethnicity (if current participants are unable to attend subsequent meetings and must be replaced).
- Consider incorporating a half or full day field trip into the schedule for the next meeting. Several participants indicated they would be interested in a trip to the Great Smoky Mountains National Park.
- Consider arranging one lunch outside of the NIMBioS facility during the next meeting if feasible.
- Look into the possibility of creating more whiteboard space or purchasing an interactive whiteboard.
- Consider using more recyclable or reusable materials for food and beverage service

# Niche Variation Working Group Evaluation Report

## Background

### Introduction

This report is an evaluation of a NIMBioS Working Group entitled “Population and Community Ecology Consequences of Intraspecific Niche Variation,” (Niche Variation) which held its first meeting at NIMBioS July 27-29, 2009. The Niche Variation group comprised 15 participants, including organizers Daniel Bolnick (University of Texas, Austin), Volker Rudolph (Rice University), and Kevin McCann (University of Guelph). Participants came from 13 universities in Austria, Canada, Sweden, and the United States (See Appendix A).

The Niche Variation Working Group brought together ecologists, evolutionary biologists, mathematicians, and a marine biologist to facilitate the development of mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interactions. During the first meeting, the Niche Variation working group settled on a focal question that would bind together our various sub-projects: how do the dynamics familiar ecological models change when one incorporates realistic patterns of intraspecific variation? The group assembled a list of relevant models that have been published previously and devised a strategy to split up the work of reviewing this prior literature. The group plans to write two review papers, one summarizing the relevant theoretical literature, and the second summarizing recent empirical progress in understanding the basis for why some populations exhibit more niche variation than others. Sub-groups then formulated specific models that incorporate niche variation into familiar ecological interactions, such as apparent competition, pollinator-plant dynamics, or tritrophic food chains. The group plans to analyze the dynamics of these models to determine how they behave with versus without intraspecific niche variation.

### Working Group Background

Ecologists have long treated the trophic niche as a property of a species as a whole, implicitly assuming that individuals within a population are ecologically interchangeable. A growing body of data suggests that apparently generalist populations are, in fact, often composed of ecologically heterogeneous and relatively specialized individuals (*individual specialization*). The evolutionary consequences of niche variation are increasingly well understood, permitting frequency-dependent competition that can drive disruptive selection and evolutionary diversification. In contrast, very little is known about how niche variation affects the ecological dynamics of species or communities. Can ecologists safely ignore intraspecific variation?

The goal of this working group is to use mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interactions. The impact of niche variation will depend on its mechanistic basis, which can arise from quantitative genetic variation for trophic morphology, culturally transmitted foraging behaviors, search image formation, or social structure. We will bring together biologists and mathematicians familiar with

1) empirical patterns of niche variation; 2) theoretical quantitative genetics, population genetics, foraging theory, and neural networks, which can reflect the mechanisms of niche variation; and 3) mathematical models of population, predator-prey, and food web dynamics. By establishing connections between these usually separate fields, we hope to initiate a new field of mathematical ecological that melds genetics, evolution, and dynamic foraging behavior into ecological models, to determine how intraspecific variation affects ecological dynamics and community structure. Empiricists have yet to develop methods to experimentally manipulate niche variation, so at present mathematical theory is the only tool to determine the ecological effects of niche variation and make recommendations for empiricists.

### Participant Demographics

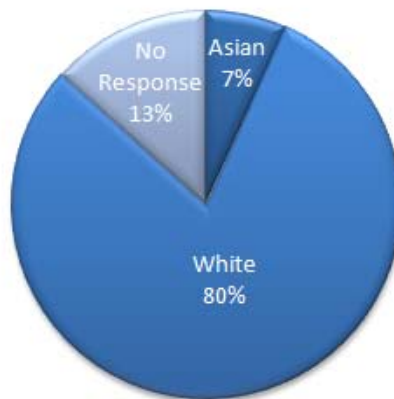
Niche Variation working group participants, who were college/university faculty (80%), postdoctoral researchers (13%), or graduate students (7%), came from 13 universities in Austria, Canada, Sweden, and the United States (See Appendix A). Primary fields of study for the 15 participants included biological/biomedical sciences, mathematics, and ocean/marine sciences (Table 1).

Table 1. *Participant fields of study and areas of concentration*

| Field of Study                 | Concentration        | # Participants |
|--------------------------------|----------------------|----------------|
| Biological/Biomedical Sciences | Ecology              | 10             |
|                                | Evolutionary Biology | 1              |
| Mathematics                    | Mathematical Biology | 2              |
|                                | Mathematical Ecology | 1              |
| Ocean/Marine Sciences          | Marine Sciences      | 1              |

The 3 females and 12 males (one of whom self-identified as being of Hispanic/Latino ethnicity) mostly self-identified racially as white (Figure 1).

Figure 1. Racial composition of program participants (n =15)





Two respondents indicated their work is currently supported by a National Science foundation grant. (Table 2).

Table 2. NSF grants supporting participant research

| Name of grant   | Institution(s) at which grant is held |
|---|---------------------------------------|
| Ecological Dynamics in Random Environments<br>Collaborative Research  | University of California Davis        |
| From Individuals to Communities: Consequences<br>of Ontogenetic Functional Diversity for Community<br>Structure and Functioning | Rice University                       |

## Evaluation Design

### Evaluation Questions

The evaluation of the Working Group was both formative and summative in nature, in that the data collected from participants was intended to both gain feedback from participants about the quality of the current Working Group and also to inform future meetings. The evaluation framework was guided by Kirkpatrick's Four Levels of Evaluation model for training and learning programs (Kirkpatrick, 1994<sup>1</sup>). The evaluation questions were developed according to level one of the model, participants' reactions, in order to gather information about how participants felt about the content and format of the Working Group, as well as the accommodations provided by NIMBioS. Several questions constituted the foundation for the evaluation:

1. Were participants satisfied with the Working Group overall?
2. Did the meeting meet participant expectations?
3. Do participants feel the Working Group made adequate progress toward its stated goals?
4. Do participants feel they gained knowledge about the main issues related to the research problem?
5. Do participants feel they gained a better understanding of the research across disciplines related to the Working Group's research problem?
6. What impact do participants feel the Working Group will have on their future research?
7. Were participants satisfied with the accommodations offered by NIMBioS?
8. What changes in accommodations, group format, and/or content would participants like to see at future meetings?

<sup>1</sup> From Kirkpatrick, D.L. (1994). *Evaluating Training Programs: The Four Levels*. San Francisco, CA: Berrett-Koehler.

## Evaluation Procedures

NIMBioS' Evaluation Coordinator designed an electronic survey aligned to the evaluation questions with input from NIMBioS' Director and Deputy Director. The final instrument was hosted online via the University of Tennessee's secure online survey host mrInterview. Links to the survey were sent to the 15 Working Group participants on July 29, 2009. Reminder emails were sent to non-responding participants on August 5 and 10, 2009. By August 17, 2009, 12 participants had given their feedback, for a response rate of 80%.

## Data Analysis

Data from the electronic survey included both forced-response and supply-item questions. All data were downloaded from the online survey host into the statistical software package SPSS for analysis. Quantitative data were analyzed using SPSS, while qualitative data were analyzed in SPSS Text Analysis for Surveys. Qualitative responses were categorized by question and analyzed for trends.

## Findings

### Participant Satisfaction

#### *Overall Satisfaction*

Overall satisfaction with the Working Group was high among respondents, 100% of whom indicated they either agreed or strongly agreed that the Working Group was very productive and met their expectations. Some general participant comments:

*"...NIMBioS has done great job..Thanks a lot!"*

*"The working group successfully integrated views from both theoreticians and empiricists, from both biologists and mathematicians, and successfully found a common ground that met the interest of all of the participants."*

Ninety-two percent of respondents thought the presentations were useful, and all thought that the presenters were very knowledgeable about their presentation topics. Additionally, 100% of respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Working Groups to their colleagues (Table 4).

Table 4. *Participant satisfaction with various aspects of the Working Group, by level of agreement*

|   | <i>n</i> | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------|----------------|-------|---------|----------|-------------------|
| I feel the Working Group was very productive.                               | 12       | 83%*           | 17%   | 0%      | 0%       | 0%                |
| The Working Group met my expectations.                                      | 12       | 83%            | 17%   | 0%      | 0%       | 0%                |
| The presenters were very knowledgeable about their topics.                  | 12       | 92%            | 8%    | 0%      | 0%       | 0%                |
| The presentations were useful.  | 11       | 92%            | 0%    | 9%      | 0%       | 0%                |
| The group discussions were useful.  | 12       | 92%            | 8%    | 0%      | 0%       | 0%                |
| I would recommend participating in NIMBioS Working Groups to my colleagues. | 12       | 92%            | 8%    | 0%      | 0%       | 0%                |

\* Note: Percentages in tables may not add to 100% due to rounding

### ***Satisfaction with Accommodations***

Overall, respondents reported being satisfied with the travel, housing, and facilities provided by NIMBioS during the Working Group. One participant’s comments about the overall accommodations:

*“I think NIMBioS did an excellent job [with the accommodations].”*

NIMBioS arranged housing for all 12 respondents, all of whom said they were satisfied with their accommodations. NIMBioS also arranged travel for 11 respondents, only one of whom was dissatisfied with his/her travel plans. The dissatisfied participant would have liked to have received his/her flight arrangements earlier. The majority of participants also reported being satisfied with the comfort and resources of the NIMBioS facility, as well as the quality of meals provided (Table 5).

Table 5. *Participant levels of satisfaction with Working Group accommodations*

| <b>Please indicate your level of satisfaction with the Working Group accommodations:</b> | <i>n</i> | Very satisfied | Satisfied | Neutral | Dissatisfied | Strongly dissatisfied |
|--|----------|----------------|-----------|---------|--------------|-----------------------|
| Comfort of the facility in which the Working Group took place                            | 12       | 58%            | 42%       | 0%      | 0%           | 0%                    |
| Resources of the facility in which the Working Group took place                          | 12       | 58%            | 33%       | 8%      | 0%           | 0%                    |
| Quality of meals   | 12       | 33%            | 58%       | 8%      | 0%           | 0%                    |
| Quality of drinks and snacks provided  | 12       | 42%            | 50%       | 8%      | 0%           | 0%                    |

## Working Group Format and Content

### *Most Useful Aspect*

Most respondents said the multidisciplinary composition of the Working Group was its most useful aspect, as they were able to learn from those in fields other than their own:

*“The mixture of biologists doing empirical work and mathematicians doing ecological theory.”*

*“Bringing people in with different backgrounds that are open minded. The different skills were very complementary and made this fun.”*

*“...the most useful outcome was the cross-talk between research areas. The food-web oriented people really seemed to enjoy talking with the population and quantitative genetics members, and vice versa. Both seemed to feel that they were learning new (or dusting off old) mathematical techniques. Equally, the empiricists such as myself really benefitted from learning new approaches to modeling, and the theoreticians were continually asking for information on the empirical patterns of niche variation.”*

Another respondent felt the leadership of the group was its most useful aspect:

*“..a group leader with a clear vision and the environment NIMBioS provided to make this working group possible.”*

### *Participant Learning*

Respondents were asked several questions to gauge their levels of learning about the main issues related to the research problem, including learning how intraspecific variation affects ecological dynamics and community structure, and about empirical patterns of niche variation. Respondents overall reported high levels of learning, agreeing that they had a better understanding of the main research issues (Table 6).

Table 6. *Participant self-reports of learning about issues related to the Working Group’s research problem*

| <b>As a result of participating in this Working Group, I have a better understanding of:</b> | <i>n</i> | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|--|----------|----------------|-------|---------|----------|-------------------|
| empirical patterns of niche variation.   | 12       | 50%            | 25%   | 8%      | 17%      | 0%                |
| how intraspecific variation affects ecological dynamics and community structure.             | 12       | 50%            | 42%   | 8%      | 0%       | 0%                |
| mathematical models of population, predator-prey, and food web dynamics.                     | 12       | 50%            | 50%   | 9%      | 0%       | 0%                |

### **Progress Toward Goals**

All respondents agreed that the Working Group format allowed the group to make adequate progress toward using mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interaction. Participant comments:

*“The group agreed to write a review on the existing literature linking individual variation and ecological dynamics and already laid out some models on which we will be working until the next meeting.”*

*“We started out by outlining three basic modeling frameworks we will pursue, and also made significant progress on a literature review that will become the basis for a synthetic review paper, and an empirical review paper. This almost exactly corresponds to what I had hoped the group might achieve.”*

*“I was impressed with how well the expertise and interests of each of the participants fit together in developing some basic mathematical models, which has enabled some quick progress. I am very optimistic that this working group will produce some nice results fairly quickly.”*

All respondents said they had a good idea of what their contribution will be at the next meeting. Some participant comments:

*“Yes I do, although our group's objectives are still somewhat vague, I think we have our “homework” assigned.”*

*“Yes for the most part. However, there is a lot of flexibility at this point, so I expect things to evolve.”*

*“Individuals have adopted specific modeling questions, and specific sets of papers in the existing literature which they are expected to review. Participants also seem keenly aware of the importance of making progress on these projects while at their home institution.”*

### **Impact on Future Research Plans**

All respondents said they felt that the exchange of ideas that took place during the Working Group would initiate and/or influence their future research. Some participant comments:

*“In addition to three collaborative projects arising for this working group, I intend to develop mathematical methods to analyze persistence of multispecies models with quantitative genetics and to apply this methods to a variety of ecological modules.”*

*“...the exchange of ideas during the working group helps a lot to organize various thoughts that I had before and brought me a lot of new inspirations. It was really helpful to bring together scientists from various research areas, which helps me to have a deeper and more complete understanding of the topic, especially from the perspectives that I seldom thought about before. I've learned a lot from the other group members. This experience, for sure will a strong impact on my future research. I really appreciate it.”*

*"I learned a lot about modeling in the meeting, and have thus begun to gain a skill set that will ultimately allow me to pursue some more extensive modeling research in the future. The models produced by the group will also motivate future experimental work by my lab, though it is hard to say how concrete these contributions will be until we have analyzed our models."*

In addition to new ideas for research, seven respondents said that they developed unanticipated plans for collaborative research with other Working Group participants, while two said the potential for collaboration was present:

*"Before the working group, I anticipated to do research collaboratively with the other group participants on a certain type of model, but now I've got the inspirations to work together with the other group participants on two different types of models, which helped me to develop a more complete perspective on individual specialization."*

*"Several categories of models were discussed that were not what I originally had in mind, but which contribute very nicely to the goals of the group. For instance, we have begun to evaluate the effect of niche variation by pollinators, on the dynamics of a pollinator-plant mutualist system."*

*"The group is exploring a number of interesting problems that I plan to become involved in."*

### **Suggestions for Future Working Group Meetings**

Respondents were asked several questions soliciting suggestions for future Working Group meetings. Overall, participants were highly satisfied with the content and format of the current meeting. Several participants, however, did offer suggestions for future meetings, including using reusable and recyclable cups, plates, and cutlery:

*"Provide mugs (let people put name tags on them), glass, and real silverware & plates. Given the quantity of people that will eventually be coming through the center, it seems like there'd be an awful lot of garbage to save by having a dishwasher in the center."*

Others suggested building some sort of free time for an activity into the schedule:

*"It would be useful to have a little bit more spare time. Maybe workshops should be 4-5 days."*

*"Maybe organize a trip for some more authentic taste of area (barbeque, blue grass, etc.)"*

*"Help set up possible day trips."*

*"A half day hike during the workshop would have been enjoyable."*

Other suggestions included inviting more females to the next meeting to increase diversity, arranging a lunch out with the group, better printing support, and getting more whiteboard space. One participant suggested that NIMBioS purchase an interactive whiteboard:

*"For a mathematical institute, the limited whiteboard space was a bit surprising. We quickly filled up our available whiteboards and had to erase things that might otherwise have been able*

*to stay up to help guide our discussions. Also, the camera for photographing writing on the boards was helpful, but could have been provided from the start. The camera also tends to catch glare from the lights, so is not a great format for recording writing on the board. Maybe look into getting one or more SMART Boards per room (or something equivalent). We use those at UTexas and they are excellent.”*

## Conclusions and Recommendations

Overall, the Working Group was very successful in making progress toward its goals. Working Group respondents were satisfied with the meeting, indicating that it was a productive experience that met their expectations. Respondents were also satisfied with the travel, housing, and other amenities offered by NIMBioS.

Respondents overall reported high levels of learning, agreeing that they had a better understanding of the main research issues. All respondents agreed that the Working Group format allowed the group to make adequate progress toward using mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interaction. All respondents also said they left this meeting with a good idea of what their contribution will be at the next meeting.

All respondents indicated they planned to take the knowledge they gained during the Working Group and apply it to their own research, and several said they had developed solid plans for collaborative research with other Working Group participants.

Several suggestions were offered for improvement of future meetings, including using re-usable and recyclable serving materials, building some sort of free time for an activity into the schedule, inviting more females to the next meeting to increase diversity, arranging a lunch out with the group, and getting more whiteboard space.

Based on analysis of participant response data, the recommendations to NIMBioS and/or Working Group organizers are as follows:

- The Working Group had a multidisciplinary composition, but consider trying to recruit a broader diversity of participants regarding gender and ethnicity (if current participants are unable to attend subsequent meetings and must be replaced).
- Consider incorporating a half or full day field trip into the schedule for the next meeting. Several participants indicated they would be interested in a trip to the Great Smoky Mountains National Park.
- Consider arranging one lunch outside of the NIMBioS facility during the next meeting if feasible.
- Look into the possibility of creating more whiteboard space or purchasing an interactive whiteboard.
- Consider using more recyclable or reusable materials for food and beverage service.

## **Appendix A**

### ***List of Participants***



## Participants

| Last name   | First name | Institution                          |
|-------------|------------|--------------------------------------|
| Amarasekare | Priyanga   | University of California Los Angeles |
| Araujo      | Marcio     | Florida International University     |
| *Bolnick    | Daniel     | University of Austin Texas           |
| Buerger     | Reinhard   | University of Vienna                 |
| DeAngelis   | Donald     | University of Miami                  |
| Jiang       | Yuexin     | University of Texas Austin           |
| Lou         | Yuan       | Ohio State University Columbus       |
| *McCann     | Kevin      | University of Guelph                 |
| Novak       | Mark       | University of California Santa Cruz  |
| *Rudolf     | Volker     | Rice University                      |
| Schreiber   | Sebastian  | University of California Davis       |
| Svanbäck    | Richard    | Uppsala University                   |
| Urban       | Mark       | University of Connecticut            |
| Van Allen   | Benjamin   | Rice University                      |
| Wolkowicz   | Gail       | McMaster University                  |

\* Organizer of Working Group

## **Appendix B**

### ***Niche Variation Working Group Survey***

## Niche Variation Working Group Survey

Thank you for taking a moment to complete this survey. Your responses will be used to improve the Working Groups hosted by the National Institute for Mathematical and Biological Synthesis. Information supplied on the survey will be confidential, and results will be reported only in the aggregate.

NIMBioS will send two reminder emails to Working Group participants who have not responded to this survey. If you would like to be excluded from these reminder emails, please enter your name below. Your survey results will still remain confidential and your name will not be associated with any of your responses in reporting of survey results.

Name:

Please check the appropriate box to indicate your level of agreement with the following statements about this Working Group: (Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied)

I feel the Working Group was very productive.

The Working Group met my expectations.

The presenters were very knowledgeable about their topics.

The presentations were useful.

The group discussions were useful

I would recommend participating in NIMBioS Working Groups to my colleagues.

Please check the appropriate box to indicate your level of agreement with the following statements.

As a result of participating in this Working Group, I have a better understanding of:

(Strongly agree, Agree, Neutral, Disagree, Strongly disagree)

empirical patterns of niche variation

how intraspecific variation affects ecological dynamics and community structure

mathematical models of population, predator-prey, and food web dynamics

Do you feel the working group made adequate progress toward using mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interaction?

Yes

No

Comments:

Do you feel the working group made adequate progress toward finding a common language for niche variation research across disciplines?

Yes

No

Comments:

Do you feel the expectations for the next Working Group are clear (in the sense that you are leaving this meeting with a good idea of what your contribution will be at the next meeting)?

Yes

No

Comments:

Do you feel that the exchange of ideas that took place during the Working Group will initiate or influence your future research? Please explain:

Did you develop unanticipated plans for collaborative research with other Working Group participants? Please explain:

What do you feel was the most useful aspect of the Working Group?

What would you have changed about the Working Group?

How do you feel about the format of the Working Group?

This was a very effective format for achieving our goals

This was not a very effective format for achieving our goals ->

The Working Group format would have been more effective if:

Is your work currently supported by an NSF grant?

Yes

No

Name of NSF grant:

Institution at which NSF grant is held:

Was your housing during the Working Group arranged by NIMBioS?

Yes ->

No

Overall, how satisfied were you with your housing arrangements?

Very satisfied

Satisfied

Neutral

Dissatisfied

Very dissatisfied

Comments about housing arrangements:

What could NIMBioS have done to make your stay in Knoxville more enjoyable (e.g. better information about nearby attractions, public transportation, etc.)?

Was your transportation to Knoxville arranged by NIMBioS?

Yes ->

No

Overall, how satisfied were you with your travel arrangements?

Very satisfied

Satisfied

Neutral

Dissatisfied

Very dissatisfied

Comments about travel arrangements:

Please indicate your level of satisfaction with the Working Group accommodations:

(Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied)

Comfort of the facility in which the Working Group took place

Resources of the facility in which the Working Group took place

Quality of meals

Quality of drinks and snacks provided

Please indicate any changes NIMBioS can make to improve the resources and/or accommodations available to Working Group participants:

Additional comments about Working Group accommodations:

Please provide any additional comments about your overall experience with the Working Group:

## Demographics

Your participation in answering the following questions is completely voluntary and will be used for aggregated reporting only. Answer only those questions with which you feel comfortable.

I am a(n):

Graduate student

Postdoctoral researcher

University faculty—teaching/research

University faculty—teaching only

University faculty—research only

University staff

Government

Business/industry employee

Non-profit organization employee

Other:

If you are affiliated with a college/university, please describe your institution: (check all that apply)

2-year institution

4-year institution

Minority serving institution

Women's only institution

Not applicable

What is your general area of expertise/research/study?

(Select from a list)

What is your area of concentration within this general area?

(Select from a list)

Gender:

Male

Female

Are you Hispanic or Latino?

Yes

No

What is your racial background? (check all that apply)

American Indian or Alaska Native

Native Hawaiian or other Pacific Islander

Asian

Black or African American

White

## **Appendix C**

### ***Open-ended Survey Responses***

## Open-ended responses, by question and response category

**Do you feel the working group made adequate progress, for its first meeting, toward using mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interaction? (n=5)**

The group agreed to write a review on the existing literature linking individual variation and ecological dynamics and already laid out some models on which we will be working until the next meeting.

Much better than expected!

We still have some distance to go on modeling, but I think we got a great start.

We started out by outlining three basic modeling frameworks we will pursue, and also made significant progress on a literature review that will become the basis for a synthetic review paper, and an empirical review paper. This almost exactly corresponds to what I had hoped the group might achieve.

I was impressed with how well the expertise and interests of each of the participants fit together in developing some basic mathematical models, which has enabled some quick progress. I am very optimistic that this working group will produce some nice results fairly quickly.

**Do you feel that the exchange of ideas that took place during the working group will influence your future research? Please explain: (n=12)**

Most definitely. In addition to three collaborative projects arising for this working group, I intend to develop mathematical methods to analyze persistence of multispecies models with quantitative genetics and to apply these methods to a variety of ecological modules.

As an empirical ecologist, the ideas that were discussed were really enlightening to me in terms of what insights can be gained from theory and how to actually do it. I expect our group will generate predictions that might be empirically tested and that I personally might follow up in my future research.

Yes, I believe it will. The diversity of approaches (mathematical and conceptual) definitely provided me with new tools and gave me new ideas for my own research.

Yes, made me interested in new types of models.

Yes, it's showed me how open and exciting a sub-field this avenue of research is

Yes, started working on a paper.

Yes, the exchange of ideas during the working group helps a lot to organize various thoughts that I had before and brought me a lot of new inspirations. It was really helpful to bring together scientists from various research areas, which helps me to have a deeper and more complete understanding of the topic, especially from the perspectives that I seldom thought about before. I've learned a lot from the other group members. This experience, for sure will have a strong impact on my future research. I really appreciate it.



I do, I may not study the exact field examined during this group, but I will continue to look for and pay attention to niche variation. I will also continue to develop skills and techniques I have been introduced to or improved on as a result of this meeting.

I realized that terms that are well defined mathematical terms are used quite differently by theoretical ecologists.

I learned a lot about modeling in the meeting, and have thus begun to gain a skill set that will ultimately allow me to pursue some more extensive modeling research in the future. The models produced by the group will also motivate future experimental work by my lab, though it is hard to say how concrete these contributions will be until we have analyzed our models.

absolutely, it aided me in an area that have yet to put much work into, although it bridges with past work, but as a result I am already doing work on a new, but related, area of theory

Yes. The meeting helped me to see where some of my own previous work can be applied to some new problems. I am enthusiastic about doing that.

**Did you develop unanticipated plans for collaborative research with other working group participants? Please explain: (n=11)**

I had no expectations about what collaborations would arise. Hence, the three collaborations that did arise were an unexpected and very pleasant surprise.

One of the group members and I actually discussed some potential future collaboration, which I had not anticipated before the meeting.

I did, and hopefully this will happen, those projects, however, are more empirical or based on meta-analysis so not directly the focus of the working group

No.

Not beyond those agreed upon within the context of the working group

Yes, started collaboration with colleagues with whom I had never collaborated before.

Yes. Before the working group, I anticipated to do research collaboratively with the other group participants on a certain type of model, but now I've got the inspirations to work together with the other group participants on two different types of models, which helped me to develop a more complete perspective on individual specialization.

Yes. The group is exploring a number of interesting problems that I plan to become involved in.

Yes. Several categories of models were discussed that were not what I originally had in mind, but which contribute very nicely to the goals of the group. For instance, we have begun to evaluate the effect of niche variation by pollinators, on the dynamics of a pollinator-plant mutualist system.

not yet but I imagine this will happen

Yes. I am involved in one or two collaborative efforts already from this meeting and anticipate that

there may be more developing.

**Do you feel the expectations for the next working group are clear (in the sense that you are leaving this meeting with a good idea of what your contribution will be at the next meeting)? (n=4)**

Yes I do, although our group's objectives are still somewhat vague, I think we have our "homework" assigned.

Yes for the most part. However, there is a lot of flexibility at this point, so I expect things to evolve.

Individuals have adopted specific modeling questions, and specific sets of papers in the existing literature which they are expected to review. Participants also seem keenly aware of the importance of making progress on these projects while at their home institution.

We will definitely have some interesting results by the next meeting.

**What do you feel was the most useful aspect of the working group? (n=11)**

a group leader with a clear vision and the environment NIMBioS provided to make this working group possible

The mixture of biologists doing empirical work and mathematicians doing ecological theory.

Bringing people in with different backgrounds that are open minded. The different skills were very complementary and made this fun.

Working with people with diverse skill sets

bringing together creative minds and different skills and perspectives

We came down to explicit models that need to be studied. We started to collect the relevant literature.

The working group successfully integrated views from both theoreticians and empiricists, from both biologists and mathematicians, and successfully found a common ground that met the interest of all of the participants.

Meeting the participants and determining a course of action for our next meeting and the time until then.

I enjoyed meeting and interacting with the other members of the workshop. I only new one or two of the members before this.

Personally, I am gratified that the group has made a number of theoreticians start to seriously evaluate the role of intraspecific variance in population and community dynamics. I believe this is an important direction for ecologists to tackle, and this group meeting has achieved the first step of getting a bunch of good modelers excited about these research directions., From the perspective of the group as a whole, the most useful outcome was the cross-talk between research areas. The food-web oriented people really seemed to enjoy talking with the population and quantitative genetics members, and vice versa.

Both seemed to feel that they were learning new (or dusting off old) mathematical techniques. Equally, the empiricists such as myself really benefitted from learning new approaches to modeling, and the theoreticians were continually asking for information on the empirical patterns of niche variation.

Meeting several people whose names I already knew, but had not met personally. Also meeting some of the younger members (grad students and post docs), who seem very good and enthusiastic.

**What would you change about the working group? (n=9)**

nothing :)

I wouldn't change anything.

Take a break for one day in between

nothing

nothing yet

Nothing.

Nothing. It's good enough.

Include more time for regional interests and group work.

I still wish we had been able to assemble a more diverse group, but we had 6 female invitees either decline or ignore our invitation (compared to two male invitees who declined).

**The working group format would have been more effective if: (n=0)**

**What could NIMBioS have done to make your stay in Knoxville more enjoyable (e.g. better information about nearby attractions, public transportation, etc.)? (n=10)**

Lou was fantastic in providing info about good places to eat, local music, and much much more :)

I think NIMBioS did an excellent job in that respect.

maybe organize a trip for some more authentic taste of area (barbeque, blue grass, etc.)

not much. it's only a little strange how "empty" the center and surrounding buildings were, but that's probably only a function of the center being new (and not having resident postdocs and researchers yet) and the fact that school was not in session

It would be useful to have a little bit more spare time. Maybe workshops should be 4-5 days.

The NIMBioS has done great job. It's good enough. Thanks a lot!

Things were good. Keep the coffee flowing. Help set up possible day trips. Control the weather better.

A half day hike during the workshop would have been enjoyable. Some time for a workout would have been helpful.

Until the group actually met, I did not realize we had funds available for a one-day field trip. We will avail ourselves of this opportunity next time., The hospitality suite at the hotel was a nice bonus - but we had no flip-charts for writing during group discussions!

i have no recommendations

**Please indicate any changes NIMBioS can make to improve the resources and/or accommodations available to working group participants: (n=4)**

earlier flight arrangements, would prefer to eat lunch out, could have used better support on printing

Healthier breakfast options. More cereals, for example, rather than pastries. Soy milk., Get rid of the wasteful use of plastic cups, plates, and cutlery. Provide mugs (let people put name tags on them), glass, and real silverware & plates. Given the quantity of people that will eventually be coming through the center, it seems like there'd be an awful lot of garbage to save by having a dishwasher in the center.

Coordination of travel plans would have been helpful. At least two of us traveled from the same airport on the same days, but on entirely different itineraries. If our flights were coordinated we could have discussed the research on the way to and from the meeting and we could have shared a taxi to the hotel.

Several members of the group commented on sore lower backs after sitting in the chairs all day. It is probably too late to fix this, but apparently the chairs don't give great lower back support., For a mathematical institute, the limited whiteboard space was a bit surprising. We quickly filled up our available whiteboards and had to erase things that might otherwise have been able to stay up to help guide our discussions. Also, the camera for photographing writing on the boards was helpful, but could have been provided from the start. The camera also tends to catch glare from the lights, so is not a great format for recording writing on the board. Maybe look into getting one or more SMART Boards per room (or something equivalent). We use those at UTexas and they are excellent.

**Please provide any additional comments about your overall experience with the working group: (n=2)**

thanks!

This is the second working group I have organized (the first was for NCEAS). It was many times more productive and pleasant than my previous working group. Thanks for the help organizing this!

**NIMBioS is creating a web page with links to blogs written by our participants about relevant research topics. If you maintain a blog and would like to be included in our list of links please provide your**

**URL, as well as a brief description of the topic (n=0)**

**Brief description of your blog: (n=0)**

**Do you feel the Working Group made adequate progress toward finding a common language for niche variation research across disciplines? (n=3)**

I think that a cross-discipline language will come naturally after we have some results and are actually able to make concrete recommendations to empiricists, which should happen in the future meetings. We already gave the first steps in this direction.

There were some definitely stumbling blocks here, but we did make progress by the end of the meeting.

This was not a major goal for the group, and was not discussed extensively, as this has been covered by prior review papers.