Causes and consequences of vector movement: implications for the spread of plant pathogens

NIMBioS Working Group, Meeting 1 , 30 March–2 April 2015

Broad objectives:

1. Develop a general understanding of how vector movement is driven by vector population dynamics, characteristics of the host plant and landscapes, and community dynamics.

2. Investigate the implications of vector movement for the dispersal of vector-borne plant pathogens.

Specific aims:

1. Review empirical evidence for
    a. vector behavior being influenced by local and landscape- level conditions
    b. the role of vector behavior in pathogen transmission.

2. Develop a series of mathematical models to look at the impact of host-dependent vector behavior on pathogen persistence and spread. Generally characterize how disease varies as a function of vector behavior. Potential approaches include non-spatial models (with disease prevalence as model output) or spatial models (with speed of disease spread as model output). Two potential directions of approach (currently there seems to be more data for the first one, so start with that one) are to
    a. use empirical data on vector behavior to set model parameter values or ranges of values; quantify how model output depends on vector behavior
    b. compare model output to data on broad-scale disease patterns to determine what types of behavior best generate these patterns.

3. Consider the relative roles of vector growth rates and movement behavior. Quantify which (if either) has a larger impact on pathogen prevalence and spread. Determine, from a vector perspective, when it is more evolutionarily favorable to invest in producing more offspring versus producing offspring with the ability to disperse (assuming there exists a tradeoff between growth and movement). Determine what implications evolved vector behavior has for pathogen persistence and spread. There is some empirical indication that movement matters more than growth (D. Crowder, unpublished data).

4. Consider the role of the virus transmission mechanism. How do previous results depend on virus transmission mechanism (persistent vs non-persistent)?

5. Determine potential control actions. Given what we have learned about vector behavior, what potential steps can we take to control diseases?

Dinner on Sunday, for those who are in town -- meet in hotel lobby at 6:30pm.

	Monday 30 March	**Tuesday 31 March**	**Wednesday 1 April**	**Thursday 2 April**
8:00	Breakfast at NIMBioS	Breakfast at NIMBioS	Breakfast at NIMBioS	Breakfast at NIMBioS
9:00	Welcome & Introductions	Group progress reports	Group progress reports	Group planning & Report on plans
10:00	Talk (Sharon)	Talk (Finke)	Discussion	
	Coffee break	Coffee break	Coffee break	Coffee break
11:00	Discussion of problems	Discussion (panel style?)	Working groups	Wrap up discussion
12:00	Lunch at NIMBioS	Lunch at NIMBioS	Lunch at NIMBioS	Lunch at NIMBioS
1:00	Talk (Legg)	Talk (?)	Working groups	Depart
	Discussion & Form working groups	Discussion		
2:00		Working groups		
3:00	Coffee break	Coffee break	Coffee break	
	Working groups	Working groups	Group reports	
4:00				
5:00	Group reports	Group reports		
	Reception at NIMBioS	Dinner	Dinner	

Day 1 (Mon) goals:

- Introductions: name, affiliation, expertise, goals, big ideas.
- Brainstorm what we want to accomplish longer term.
- Discuss how to tackle these ideas in paper-sized chunks. Identify 3-4 projects.
- Outline goals for the week – have outlines for 3-4 papers and preliminary analyses started.
- During data talks: think about questions this data could be used to address and/or what different modeling approaches could contribute.

Day 4 (Thu) goals:

- Are we satisfied with the sub-groups – i.e. are the projects exciting and manageable, while still tying into the broad goals?
- Are we missing anything?
- What are the overall goals for progress before the next meeting?
- What are the specific goals for each person before the next meeting?
- Who is designated as the point person for each sub-group?

Some thoughts:

- By having fixed times between days for food, coffee, etc, we are encouraging the groups to attend & mingle to cross-pollinate.
- The big balancing act is between developing & discussing big problems among all ~15 people and refining & making progress on specific problems in small groups. We should plan on feeling that out and shifting time around for these as we go.