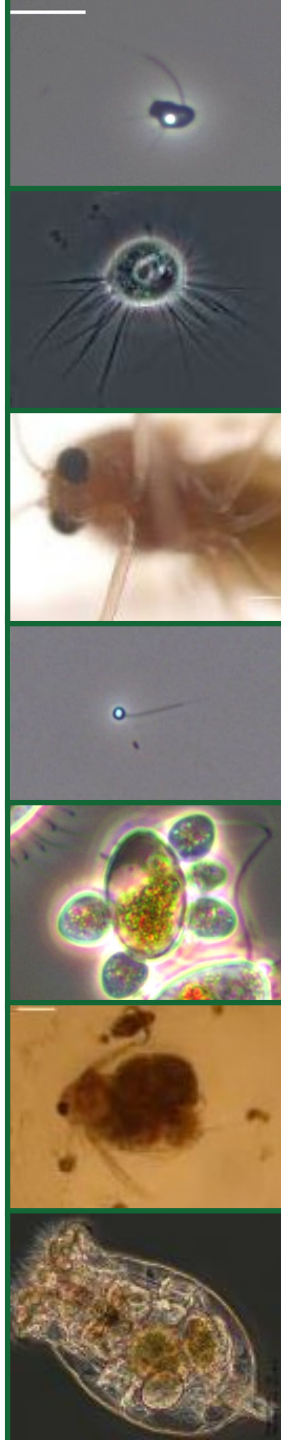
Barriers to Scale: Algae Crop Protection Workshop

Session 1 Summary: The Current State of Crop Protection

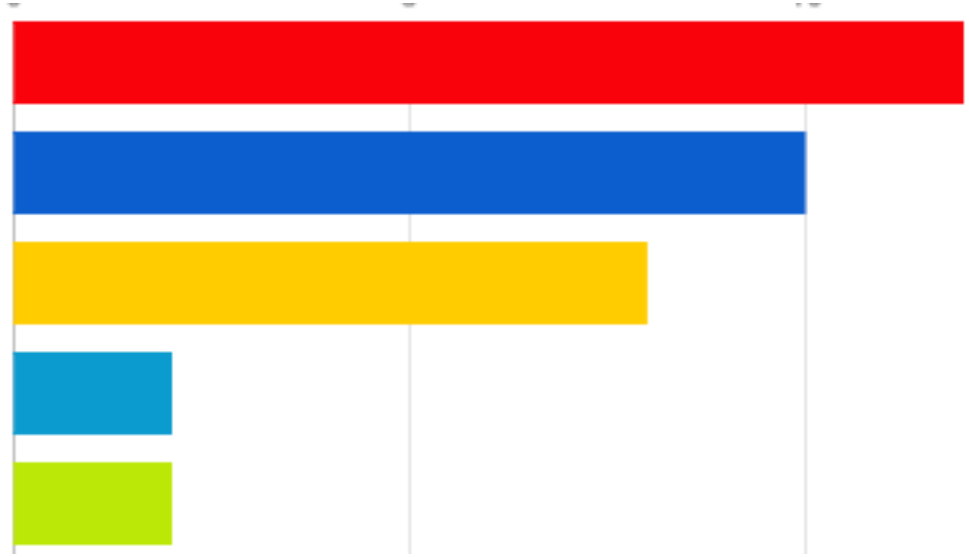
Moderator: Daniel Fishman
Panelists: Charley O'Kelly, John McGowen, Jason Quinn

Rapporteur: Zackary Johnson



Group Participants (Sector)

- Academia
- Industry / private sector
- National Laboratory
- Government (federal)
- Government (state, local, other)

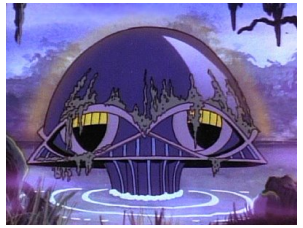


Panel Q&A discussion highlights

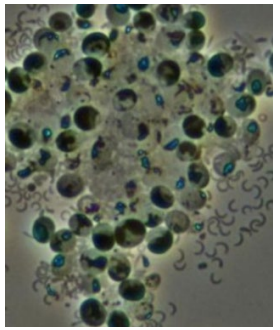



Crop Protection Themes

- **Identification** – Who?
- **Impact** – operation days, reduction in productivity, …
- **'Source' / Vector** – How/Where?
- **Removal / Remediation** – direct (additives), indirect (practices)
- **Context** – environment, microbiome, ecology, etc.

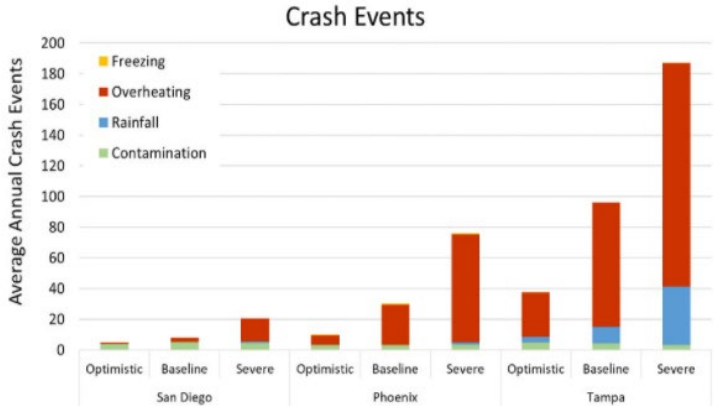


Rotifer with *Chlorella*



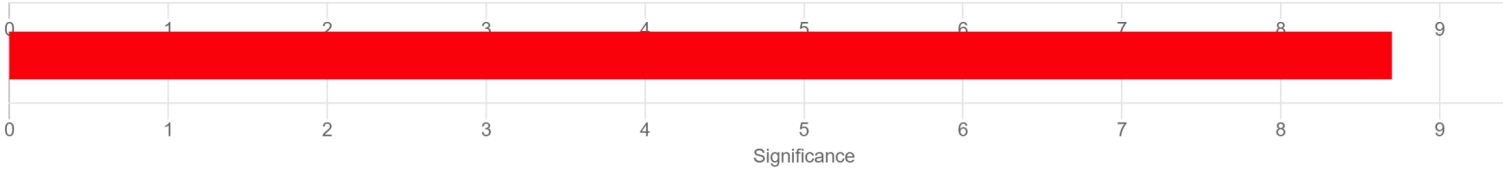
Current Challenges

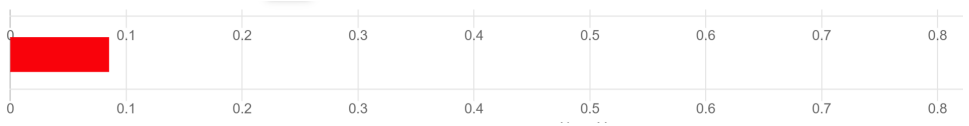
- Early stages of (basic/applied) understanding: cultivation, crops, pests
  - Different types of cultivation practices (e.g. alkaline, wastewater, PBR/tubes, conventional raceway)
  - No clear winners for algae strain for cultivation
  - Numerous pests per crop
  - Few outdoor growers – limited experience with strains
  - Basic biology / ecology in infancy
- Sharing of early knowledge
  - Few incentives for commercial operations to share
- Complexity



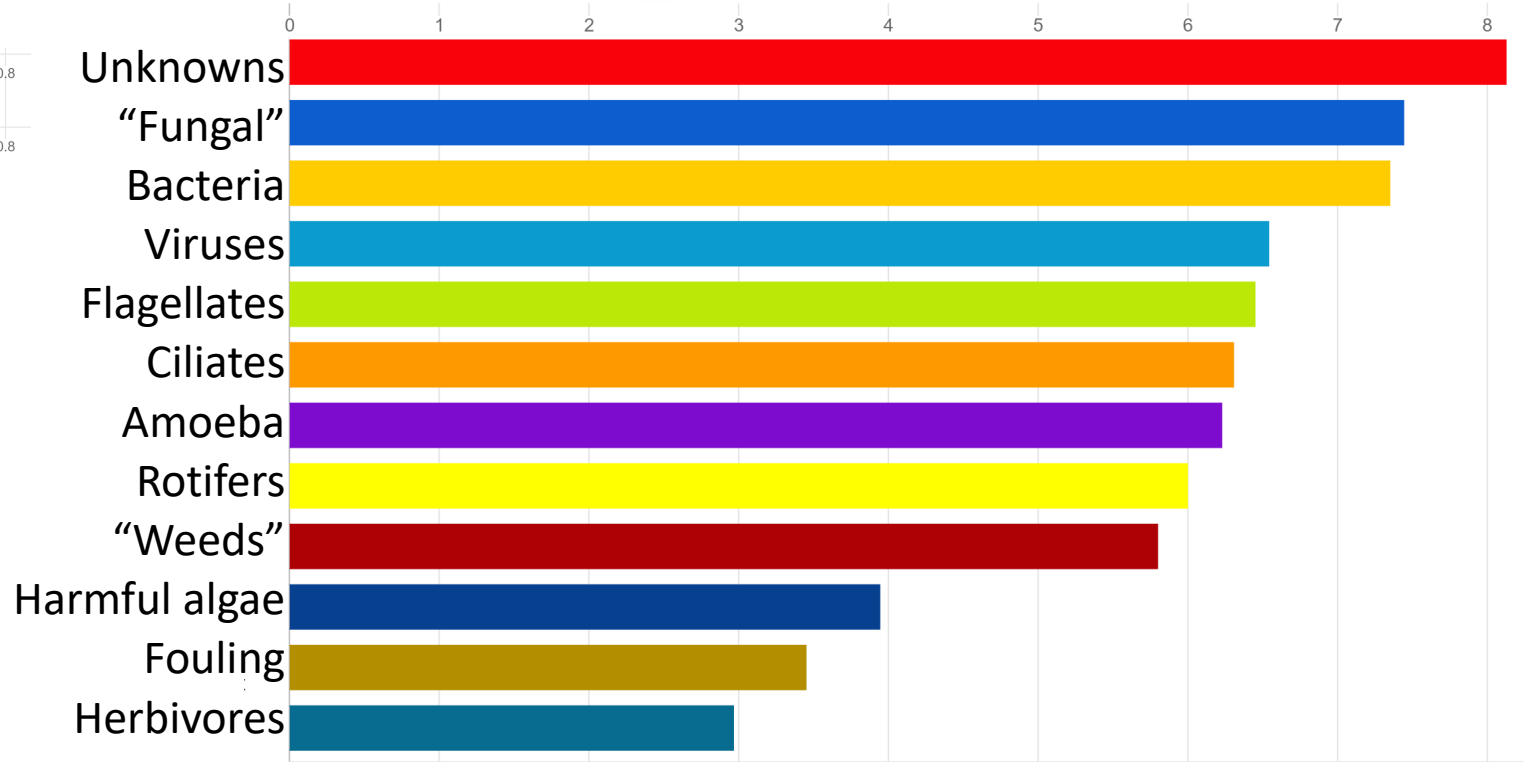
Current Pest Strategies

- Crop protection Significance
- Ranking of Challenging Pests
- Adequate Strategies to combat pests

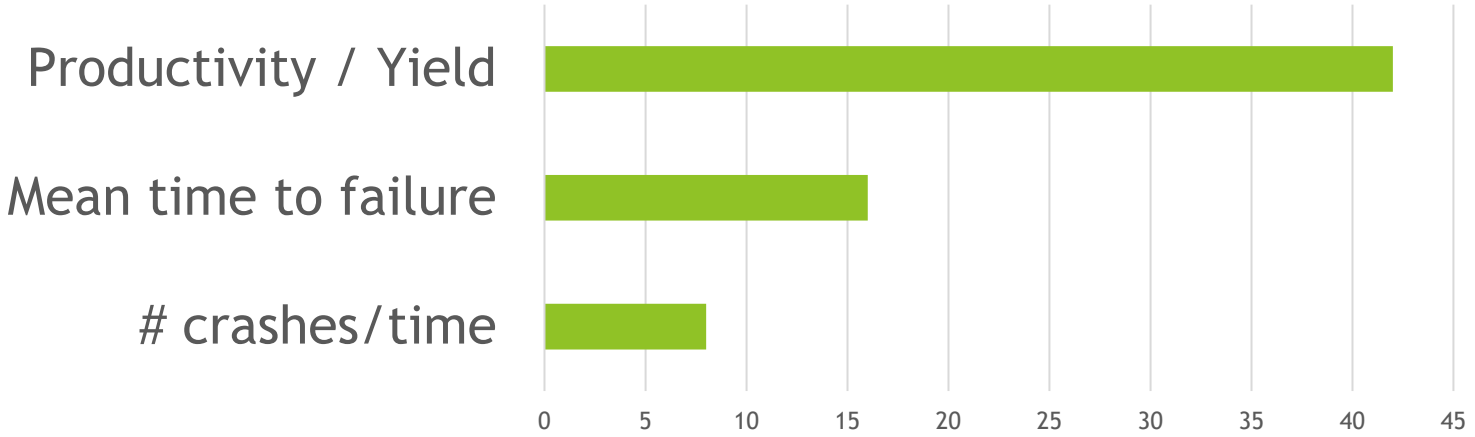




Summary: we think *it's important, lots of things to worry about, and we don't know what we're doing!*



Crop Protection Metrics

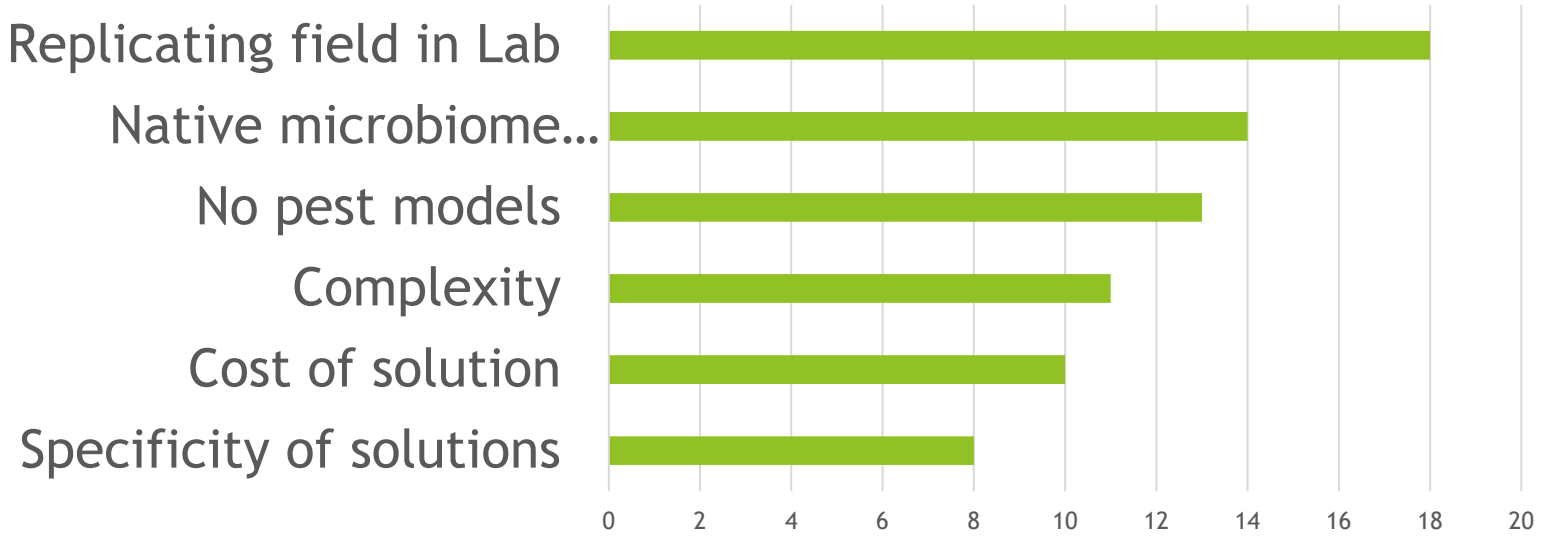


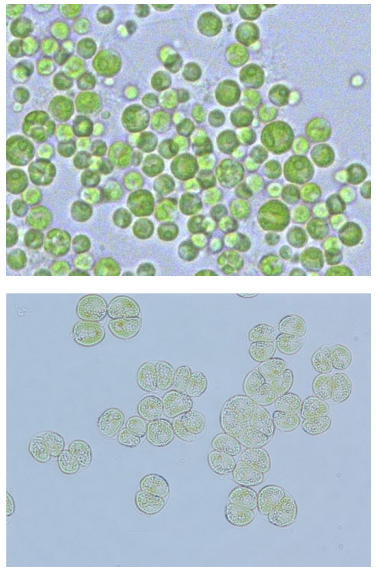
Other important metrics: Recovery, final product quality/purity, monitoring of pest, microbiome

Summary: *impact on productivity (rate, consistency) is the best metric of success; other aspects may be important for specific applications*

Crop Protection Barriers and Research Gaps

- **What are the key barriers to developing a crop protection strategy?**



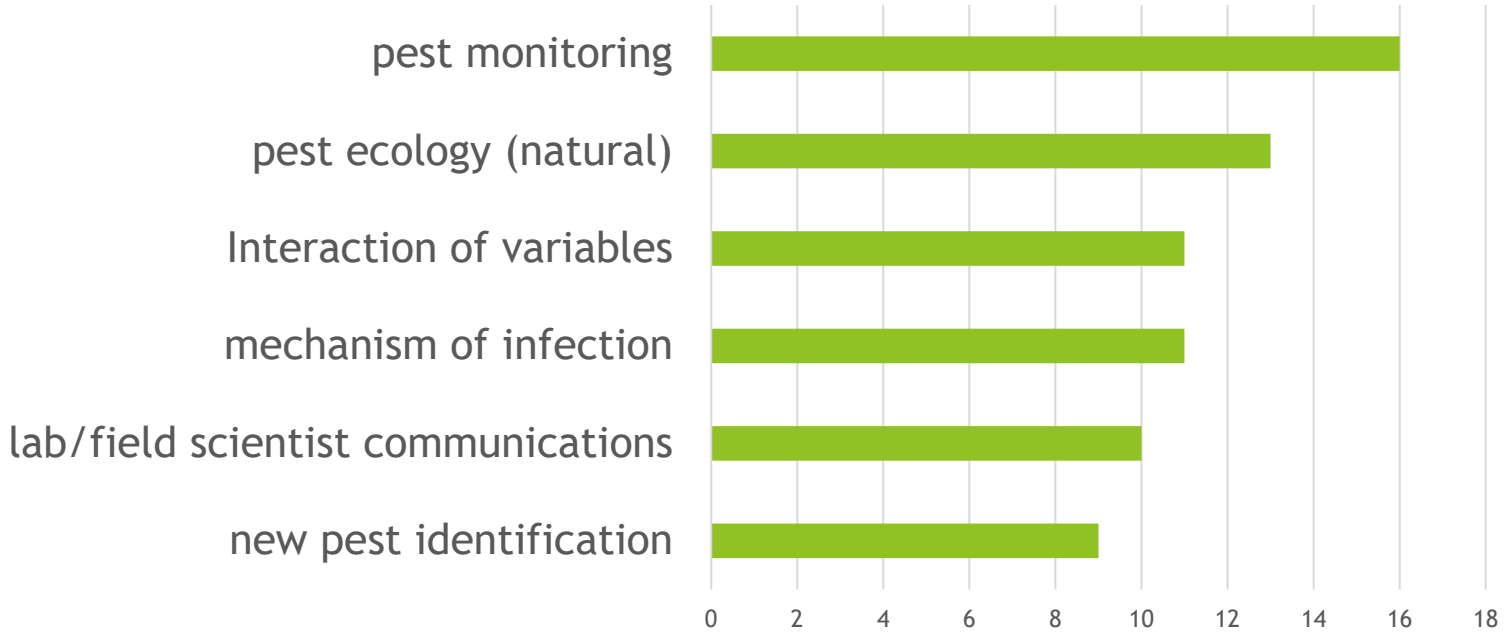


Other barriers: regulatory / product safety, difficulty working with pests, generalizing solutions

Summary: *multifaceted nature of system makes testing approaches/impacts complicated; additional implementation factors are also important*

Crop Protection Barriers and Research Gaps

- **What are the key gaps in research and technology?**



Other barriers: pest tool kits, classifying ‘pest’ among microbiome ‘noise’, …

Summary: *numerous gaps in research from basic to applied (and their linkages)*