

Water Quality Monitoring Council meeting
September 5, 2018

Molecular methods workgroup

Susie Theroux, SCCWRP



A need for the molecular methods workgroup

- Molecular methods are becoming **increasing popular** in environmental monitoring and bioassessment applications
- The rapid evolution of the DNA field has resulted in a **lack of clear guidance** on best practices for generating molecular data
- There is a need for **improved communication** among researchers to build consensus on methods and enhance collaboration
- California can be a leader in establishing **recommendations and guidelines** for using molecular methods in environmental monitoring



My charge:

1. Develop a charter for a new Molecular Methods workgroup
2. Determine key objectives and potential Workgroup products
3. Propose potential Workgroup structure and membership

Molecular Methods Workgroup charter

CALIFORNIA MOLECULAR METHODS WORKGROUP CHARTER

MISSION STATEMENT

The mission of the Molecular Methods Workgroup is to serve as a clearinghouse for key technical and programmatic guidance on the use of molecular methods for bioassessment and environmental monitoring programs in California. This workgroup will focus on improving coordination and collaboration among local, state, and federal agencies, tribes, non-governmental organizations, and other California Water Quality Monitoring Council workgroups. Additionally, the workgroup will focus on identifying the key technical challenges of emerging molecular methods and will help coordinate research efforts to address these challenges.

NEED FOR THE MOLECULAR METHODS WORKGROUP

Molecular methods are becoming increasingly popular in environmental monitoring and bioassessment applications. From quantitative PCR to metagenomics, these methods provide rapid, efficient, and affordable solutions to challenges facing monitoring programs. However, the rapid evolution of the DNA field has resulted in a lack of clear guidance on best practices for generating consistent and robust molecular data. Additionally, there is a need for improved communication among researchers to build consensus on analytical methods as well as to identify opportunities for collaboration. As these molecular methods become more widespread, the need for consistency and accuracy in molecular data becomes increasingly important.

OBJECTIVES

The Molecular Methods Workgroup will provide oversight and peer review of molecular methods to ensure that these efforts are technically sound and yield high-quality data for water quality managers. The Workgroup will focus on:

1. **Consensus-building:** Identify and provide recommendations on best practices for molecular methods including sample collection, sample processing, and analytical pipelines. Identify key technical challenges in generating DNA-based data to prioritize further research, as well as discuss emerging molecular methods and their potential utility in monitoring applications.
2. **Communication:** Provide online resources for communicating molecular results to management communities and water quality managers to enhance the interpretation and efficacy of molecular data.
3. **Coordination:** Improve coordination among research groups, sampling programs, and monitoring agencies to enhance collaborations and minimize redundancies in sample collection.

- In collaboration with Nick Martorano, Kris Jones, Nicole Hack
- “The mission of the Molecular Methods Workgroup is to serve as a clearinghouse for key technical and programmatic guidance on the use of molecular methods for bioassessment and environmental monitoring programs in California...”

Objectives

- **Consensus-building:** Identify and provide recommendations on best practices for molecular methods including sample collection, sample processing, and analytical pipelines. Identify key technical challenges in generating DNA-based data to prioritize further research, as well as discuss emerging molecular methods and their potential utility in monitoring applications.
- **Communication:** Provide online resources for communicating molecular results to management communities and water quality managers to enhance the interpretation and efficacy of molecular data.
- **Coordination:** Improve coordination among research groups, sampling programs, and monitoring agencies to enhance collaborations and minimize redundancies in sample collection.

Potential products from Workgroup

1. Primer on molecular methods
 - a. What is the difference between qPCR/eDNA/metabarcoding?
 - b. What tool is appropriate for my application?
2. Inventory of DNA sampling and research efforts across the state
 - a. Help to coordinate researchers
 - b. Reduce redundancies in sampling efforts
 - c. Better understand frequency and types of methods in use across State
3. Field sampling protocols
4. Data management
 - a. Workgroup website as digital resource for recommended protocols
 - b. Best practices for data management, templates for data archiving
5. Performance guidelines
 - a. Bioinformatic recommendations for reproducibility
 - b. Standards for the use of positive and negative controls



Charter : Structure

- Larger workgroup

- Comprised of key agency and user community members
- Discuss recommended protocols and sampling requirements with an eye towards implementation and regulatory workflows
- Provide recommendations to technical workgroup on key implementation challenges

Example members:

- SWAMP
- Cal EPA
- CADFW
- DNR

- Technical workgroup

- Comprised of technical experts, practitioners, academics
- Build consensus on sampling protocols and analytical methods
- Develop suite of guidelines for generating and analyzing DNA data and provide recommendations to larger workgroup
- Discuss emerging technologies and application to environmental monitoring

Example members:

- UCLA CALeDNA project lead
- Smithsonian DNA library project team
- US Bureau of Reclamation fish biologist

Feedback

1. Is this structure (larger workgroup and smaller technical workgroup) the best approach for the molecular methods workgroup?
2. How is membership determined?
 - Can anyone join, or invite-only?
3. What organizations and personnel should we be approaching to be involved? (email me your ideas!)

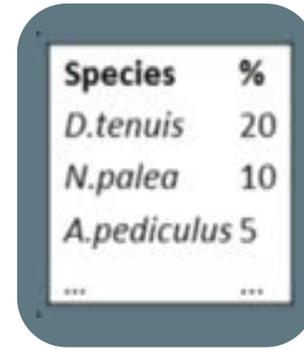
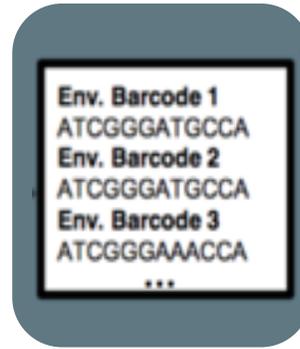
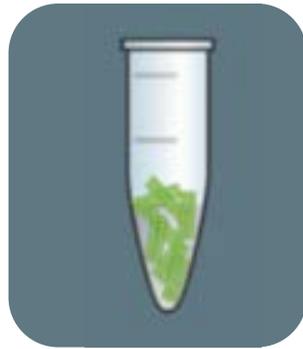
Bonus slides



Membership

Type	General / Technical	Contact	Organization	Contacted?
Academic	Technical	Rachel Meyer	UCLA (CALeDNA)	Yes
Academic	Technical	Holly Bik	UC Riverside	Yes
Federal	Technical	Josh Israel	US Bureau of Reclamation	Yes
Academic	Technical	Michael O'Mahoney	Smithsonian	Yes
Regulatory			California Dept Fish and Wildlife	
Regulatory			California DWR	
Federal			US EPA	
Regulatory			SWAMP	
Non-profit			SFEI	
Federal			NOAA	
Regulatory			Cal EPA	
Standards			ELAP	
Regulatory			DNR	

Generating DNA data



Sampling

DNA extraction

DNA analysis

Bioinformatics

Taxonomy ID

Biological data