Sea Change:

Using Citizen Science to Inform Fisheries Management

Rick Bonney and Jennifer Shirk
Cornell Lab of Ornithology
Citizen Science Association

Amber Von Harten
South Atlantic Fisheries Management Council

Laura Oremland
NOAA Fisheries

Leda Cunningham
The Pew Charitable Trusts

Ability to gather data hampered by:

- Vast EEZ
- The inky darkness
- Limited resources

Sea Change:

Using Citizen Science to Inform Fisheries Management?

Data can be gathered through citizen science:

- Many eyes on the water
- Fishermen knowledgeable observers
- Fishermen eager participants
- Building on cooperative research

But how useful can citizen science data be?

Stock assessment a-c-b's:

- **A**bundance data
- **C**atch data
- **B**iological (and environmental) data

Existing citizen science approaches in the marine world:

- Tagging
- Surveys
- Catch data
- Biological/environmental data
- Co-created projects

NOAA Fisheries Cooperative Shark Tagging Program

Engagement: Tag and recover tagged sharks

Data: 50+ years, 290,000 fish tagged, 17,000 recovered (33 of 52 species): Stock composition, movements, abundance, mortality, behavior …

Use: Best available information for some data-poor species

Reef Environmental Education Foundation (REEF) Fish Survey

Engagement: Recreational divers provide categorical abundance estimates of fish species

Data: Since 1993; reliable data for some population and growth rate estimates

Use: Multivariate auto-regressive state-space modeling; population assessment; habitat preferences

(Tolimieri et al. 2017)

Snook and Gamefish Foundation: iAngler

Engagement: Recreational anglers share fish length, weight, location caught, photos

Data: Discard data augmenting logbooks and interviews

Use: FL FWCC snook stock assessments

(Muller and Taylor, 2013; Jlorle et al. 2017)

Send us Your Skeletons

Engagement: West coast of Australia; Three species of declining fish, including snapper (*Chrysophrus auratus*)

Data: Fishermen donate skeletons to study age structure

Use: Social aspect to study: stewardship and setting example for children

(Fairclough 2014)

Environmental Monitors on Lobster Traps

Engagement: Volunteer lobstermen in New England

Data: Temperature data over 15 years; 6 million hourly observations

Use: 1 plus degree F of temperature rise

California Collaborative Fisheries Research Program

Engagement: 800 volunteers determine sites, survey nearshore fish on MPAs

Data: 10+ years of rockfish survey data

Use: enhance stock assessments; explore long-term effects of MPAs

Starr et al. 2015

SAFMC Citizen Science Program: *Pilot Project*

Engagement: Recruit and train fishermen volunteers as citizen scientists to provide supplementary data on scamp discards using a mobile app

Data: discard data (length, depth, images)

Use: consideration for use in 2019 stock assessment

PC: Greg McFall, GRNMS

Pilot Project:
Applicability for Citizen Science

Fishermen recognize the importance of understanding discards in stock assessments and have expressed interest in providing information that would reduce assessment uncertainty.

- Addresses a need identified by fishermen and scientists
- Fills a known data gap for difficult or expensive to access information
- Data desired are relatively simple to collect
- Data do not require costly equipment or specialized skills to collect
- Project is scalable -
  - Take place over a wide geographic area
  - Include fishermen from all sectors
  - Provide useful information within a short period of time with minimal start-up lag

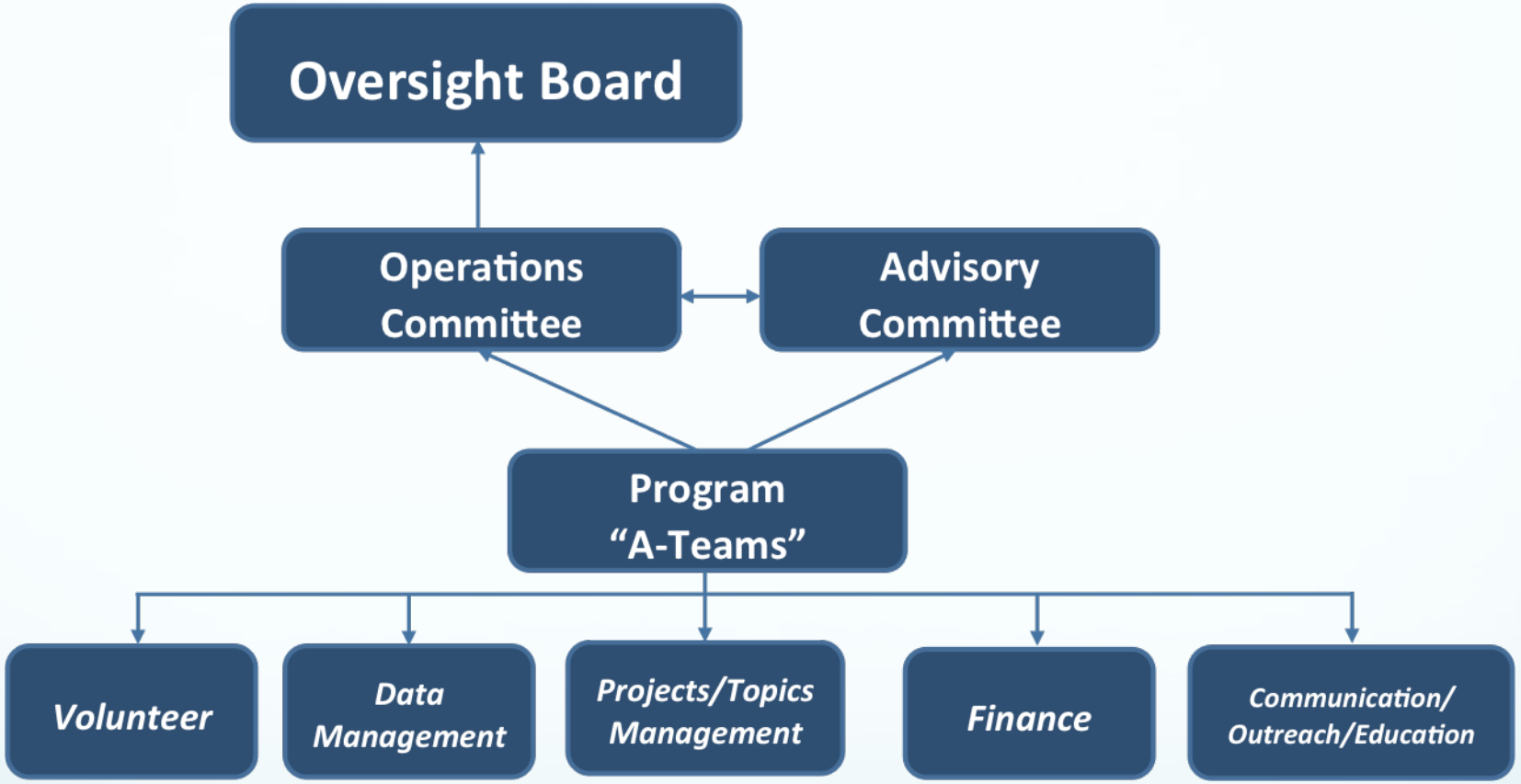
Pilot Project:
Characterizing Scamp Discards

Project Components

Volunteers	Project/Topics Management	Data Management	Finance/ Funding	Communication/ Outreach
• Fishermen to collect data • Assessment of skills - existing/ needed • Expectations for project • Motivations to participate	• Oversight of fishermen volunteers • Managing project planning • Working with partners • Data standards/ policies	• Database needs • QA.QC • Data sharing • Data access • Analysis	• Support for mobile app development • Support for fishermen training • Support for database development	• Training materials for fishermen • Sharing project updates/results • Evaluation • How data are used by Council

Researching the Role of Program Infrastructure in Guiding Effective Development of a Scamp Discard Citizen Science Project


Participant engagement
Identify goals
Science
Policy/action
Participants
Establish capacity
Staff
Volunteers
Partners
Design/ refine
Question/protocol
Training
Infrastructure
Manage
Participation
Data
Expectations
Apply & adapt
Research/action
Determine effectiveness
Transparency
Sustainability/accountability


Oversight Board
Operations Committee
Advisory Committee
Program "A-Teams"
Volunteer
Data Management
Projects/Topics Management
Finance
Communication/ Outreach/Education

Research Questions

- What happens when framework recommendations are enacted as a **program** for citizen science project development?
- How does the program-first approach lend itself to a successful **project**?
- What can we learn from the roll-out of the SAFMC Citizen Science Program that can **inform the development of citizen science across Councils** and management settings?

Goals

- “Ground reference” utility of framework components
- Support program refinement
- Support project evaluation
- Provide evidence to inform program development by other organizations
- Inform theory and practice of citizen science program development

Methods

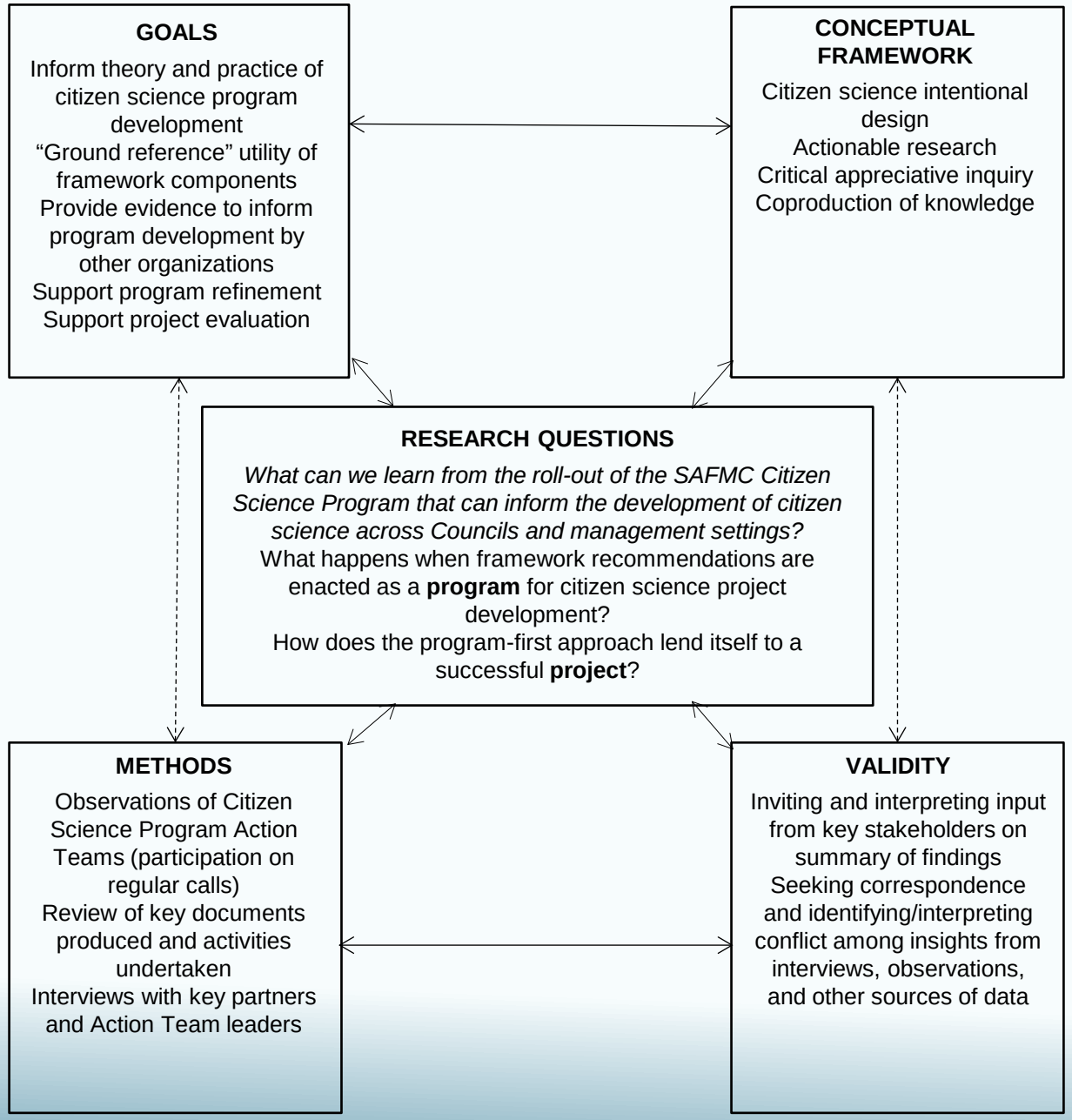
- Observations of Citizen Science Program Action Teams (participation on regular calls)
- Interviews with key partners and Action Team leaders
- Review of key documents produced and activities undertaken

Validity

- Inviting and interpreting input from key stakeholders on summary of findings
- Seeking correspondence and identifying/interpreting conflict among insights from interviews, observations, and other sources of data

Conceptual Framework

- Citizen science intentional design
- Actionable research
- Critical appreciative inquiry
- Coproduction of knowledge


GOALS
Inform theory and practice of citizen science program development
"Ground reference" utility of framework components
Provide evidence to inform program development by other organizations
Support program refinement
Support project evaluation
CONCEPTUAL FRAMEWORK
Citizen science intentional design
Actionable research
Critical appreciative inquiry
Coproduction of knowledge
RESEARCH QUESTIONS
What can we learn from the roll-out of the SAFMC Citizen Science Program that can inform the development of citizen science across Councils and management settings?
What happens when framework recommendations are enacted as a program for citizen science project development?
How does the program-first approach lend itself to a successful project?
METHODS
Observations of Citizen Science Program Action Teams (participation on regular calls)
Review of key documents produced and activities undertaken
Interviews with key partners and Action Team leaders
VALIDITY
Inviting and interpreting input from key stakeholders on summary of findings
Seeking correspondence and identifying/interpreting conflict among insights from interviews, observations, and other sources of data


Imagine what my eyes have seen...