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CRCP Managers Survey Ecosystem Research and Monitoring Information

Major findings

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Presentation Overview

- Survey Design and Implementation
- Outcomes and Findings
- Detailed information for each category of information
- Conclusions



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Survey design

(audience, categories of information, questions asked)

CRCP Managers Survey

Ecosystem Research and Monitoring Information

Final Report

I

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NOAA Coral Reef Conservation Program
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The target audience for the survey was composed of coral reef managers and others who have a need for and use CRCP's data products



Implementation of Survey and Responses

- Distributed to 203 people
- Response period was ~ four weeks
(March 28, 2016 – April 25, 2016)
- 142 people provided some data
 - **125 usable responses**
 - 65% response rate
- No response at all from 61 people
- 8 people opted out



The survey asked the coral reef managers about 12 categories of CRCP data and information:

- Mapping data and products;
- In-water physical or chemical environmental data;
- Remote sensing derived data, forecasts, and predictions;
- Transport and connectivity data and modelling;
- Water quality data;
- Information and organismal responses to stressors;



Data and information categories (cont.)

- Fishery species life history and ecology data;
- Fish and fishery species population demographics data;
- Socioeconomic and or fisheries dependent information;
- Coral physiology or genomics;
- Coral demographic data; and
- Information for assessment of recovery and restoration actions.

Survey Categories Mapped to Science Evaluation Presentations

<i>Data Category</i>	<i>Examples</i>	<i>Included in Session(s)</i>
Mapping data or products	raw sonar, satellite, or aerial data, groundtruthing data, or derived data products and maps	Foundational Efforts
In-water physical or chemical environmental data	pCO ₂ , pH, water temperature, flow, turbidity	Climate
Remote sensing derived data, forecasts, and predictions	SST, degree heating weeks	Climate
Transport and connectivity data and modeling	mark and recapture, passive acoustics, hydrodynamic modeling	Fishing Impacts
Water quality data	total suspended solids, nutrients, chemical contaminants, microbial communities	Land-based Sources of Pollution (LBSP)
Information on organismal responses to stressors	coral growth rates, toxicology, sublethal responses	Organism Responses and Biodiversity Metrics
Fishery species life history and ecology data	age, growth, reproduction, diet	Fishing Impacts
Fish/fishery species population demographics data	abundance, density, biomass	Fishing Impacts
Socioeconomic and/or fisheries dependent information	knowledge, attitudes and perceptions, economic valuation, fishing effort	Fishing Impacts
Coral physiology or genomics	reproductive histology, population genetics	Organism Responses and Biodiversity Metrics
Coral demographic data	percent cover, abundance, rugosity, recruitment rates	Foundational Efforts & Organism Responses and Biodiversity Metrics
Information for assessment of recovery/restoration actions	transplanting experiments, disease contamination	Organism Responses and Biodiversity Metrics



Respondents were asked to rate:

- The importance of each category to their work:
“Critical -I couldn’t do my work without it; Very Important; Moderately Important; Some-what un-important; Not at all Important; or Not Applicable, I have never heard of it.”
- They were then asked to list up to five categories of CRCP information that are most important for their work.



For each of the five categories, the respondents were asked the following:

- How often they use the information;
- How they use it;
- Extent to which the information meets their needs;
- How easy the information is to access;
- How satisfied they are with documentation for the information; and
- Their level of satisfaction with the product, in general.



These were followed by open-ended questions:

- What products and information in this category do you particularly like?
- What products and information in this category need improvement?
- Are any data or information in this category that are missing?
- What are examples of how you use information in your work?



Respondents were then asked about overall level of satisfaction with the CRCP and its products.

- Overall, how easy is it to access information from CRCP?
- Overall, how satisfied are you with CRCP products?



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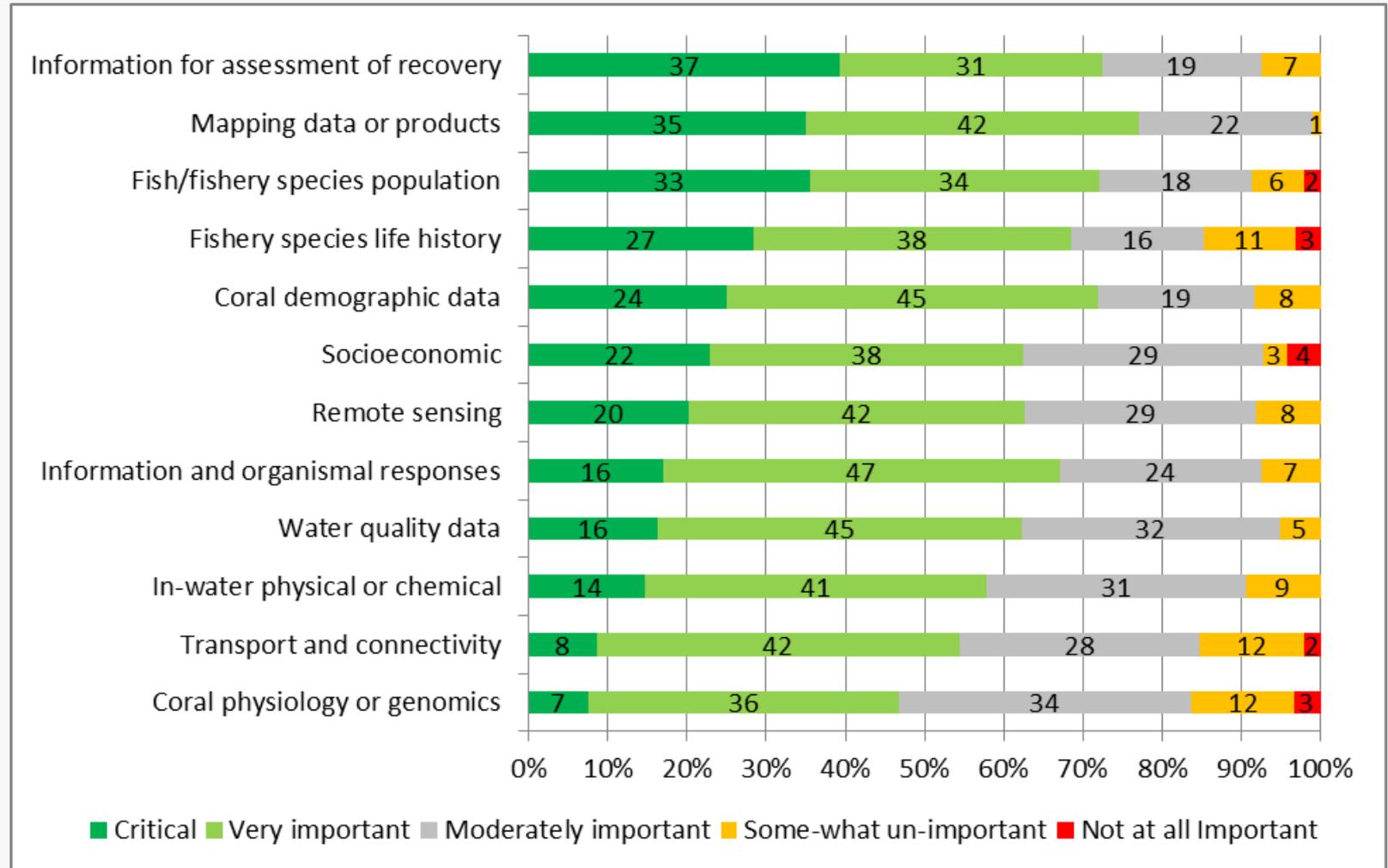
Outcomes and Findings

Who completed the survey?

Table 1 – Summary of responses for respondent’s sector, focus of work, occupation, and experience.

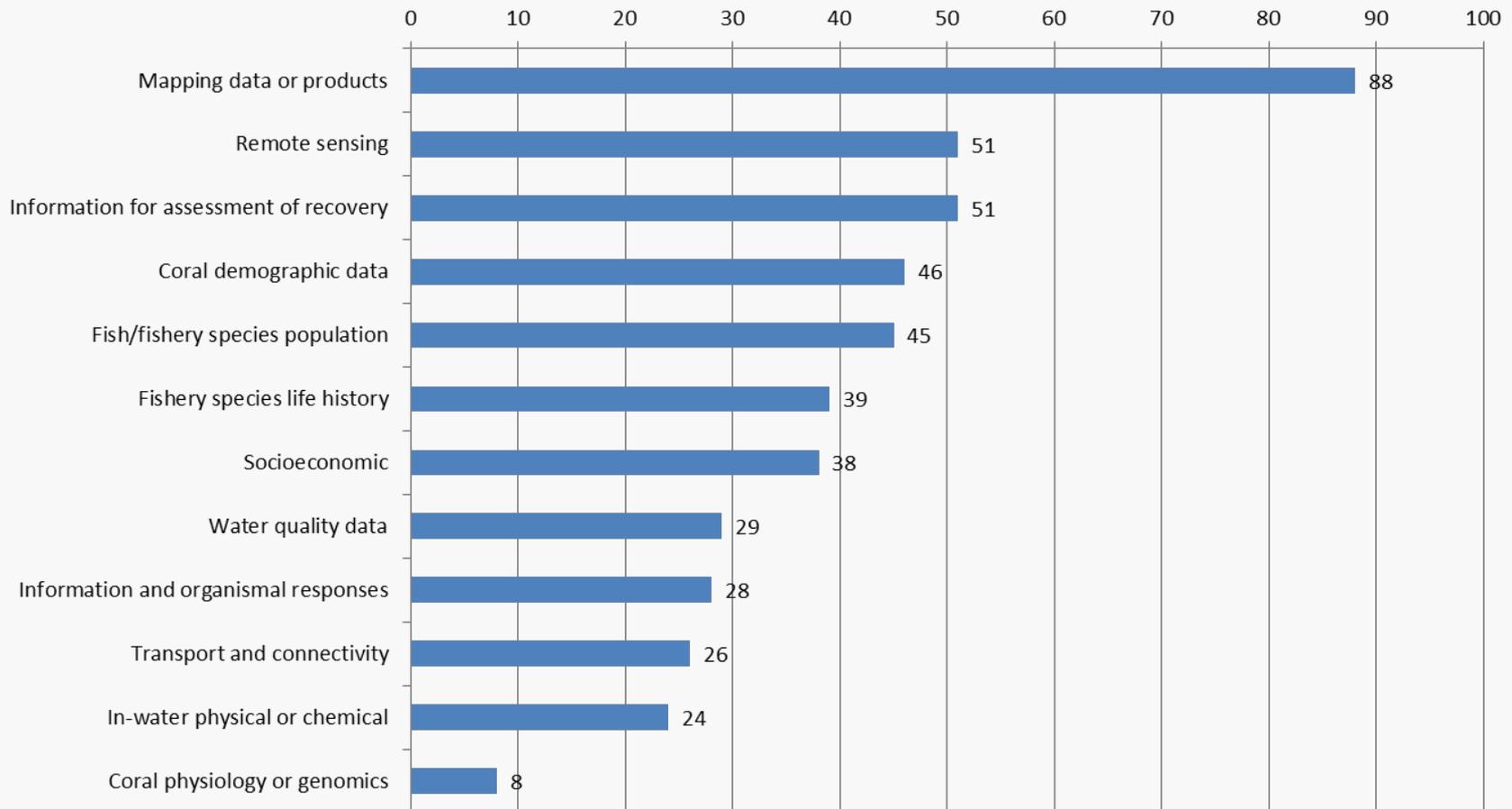
Characteristic	Percent	Count
Sector (n=124)		
Federal government	31%	38
State/territorial government	31%	38
Local government	2%	3
Academia	15%	18
Non-governmental organization	17%	21
Other	5%	6
Focus of Work (n=124)		
Fish and wildlife	27%	34
Coastal management or planning	27%	34
Parks and marine protected areas	15%	19
Other [b]	13%	16
Water quality	8%	10
Coral reef research	6%	8
Climate	2%	3
Occupation (n=125)		
Manager	47%	59
Scientist	38%	48
Outreach and education coordinator	4%	5
Other	10%	13
Experience (n=125)		
Less than 5 years	14%	18
5 to 10 years	30%	38
11 to 15 years	15%	19
More than 15 years	38%	48
Prefer not to answer	2%	2

“How important is each category to your work?”

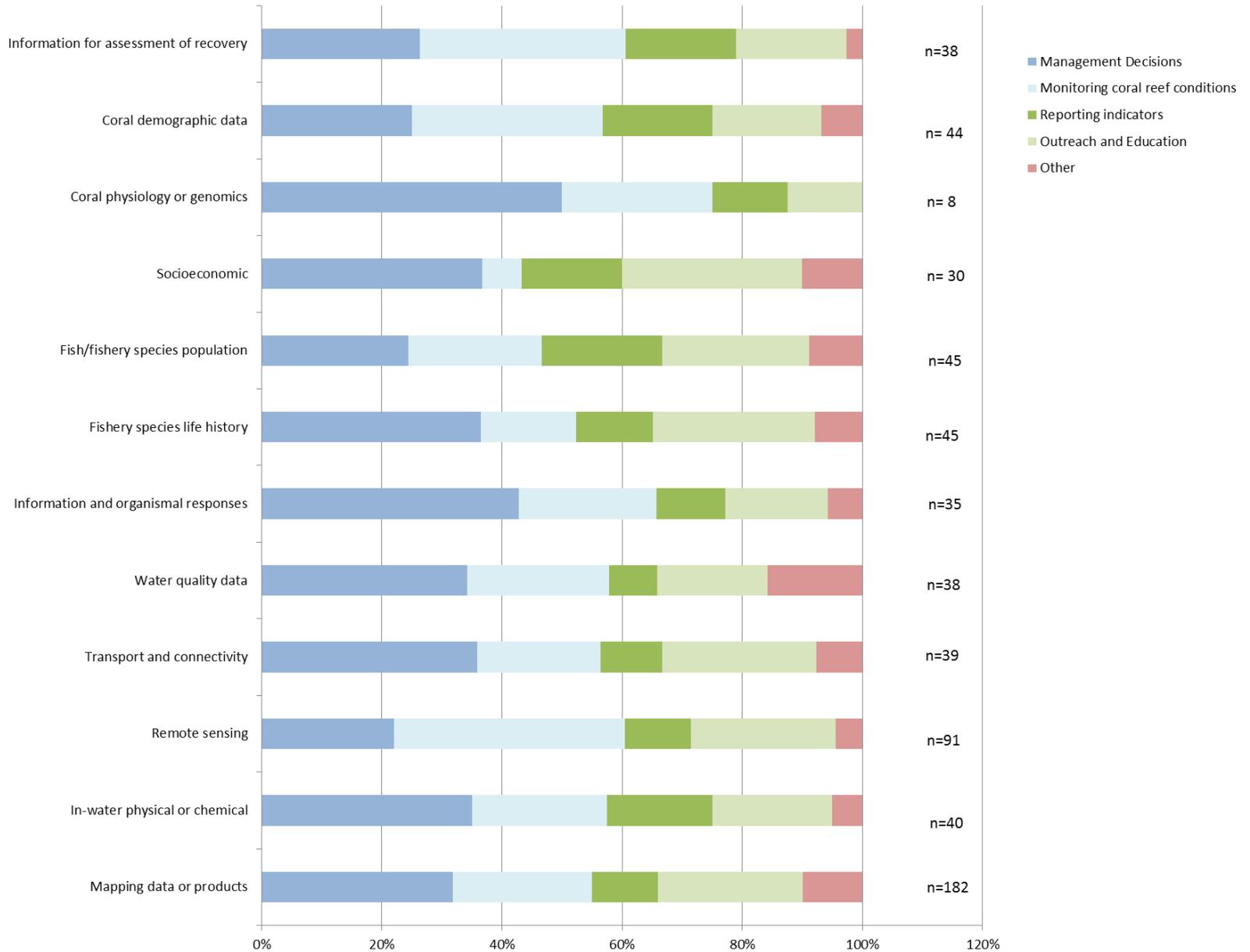


What categories are the most important for your work? (i.e., categories included in top five; n=119)

Number of Respondents Selecting Category in Top 5

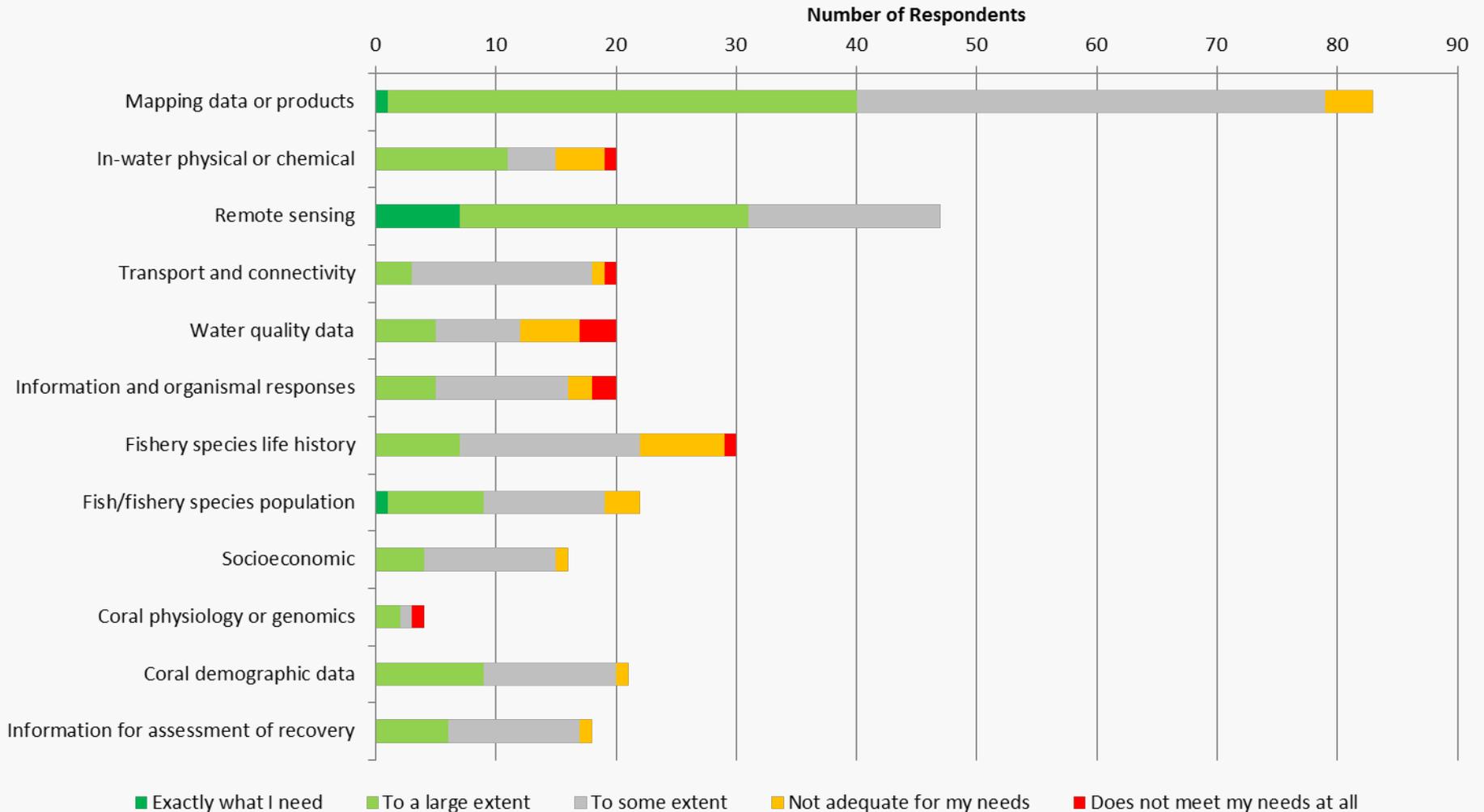


How is information being used?



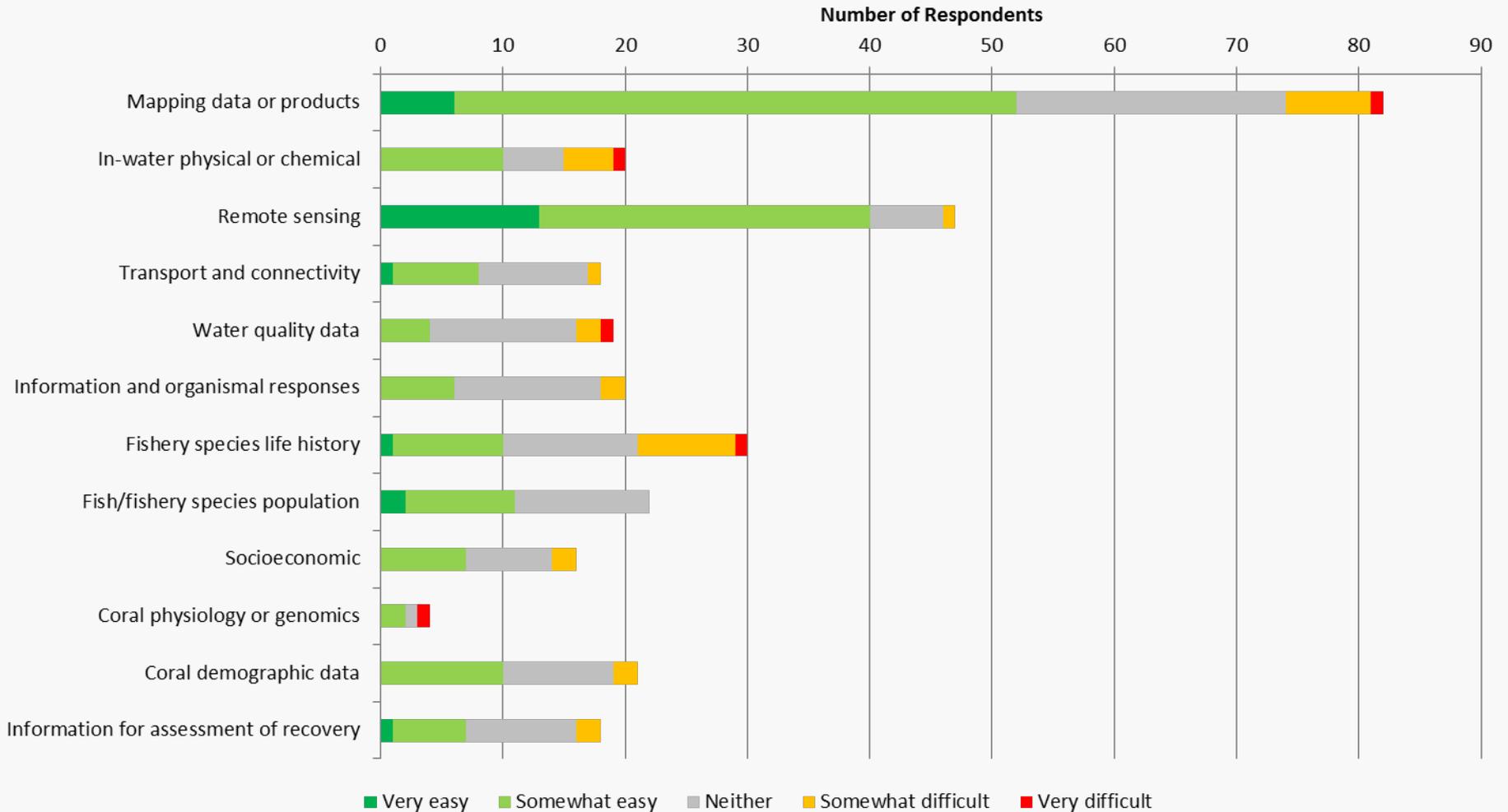
Is it meeting your needs?

(responses from those who selected category in top five)



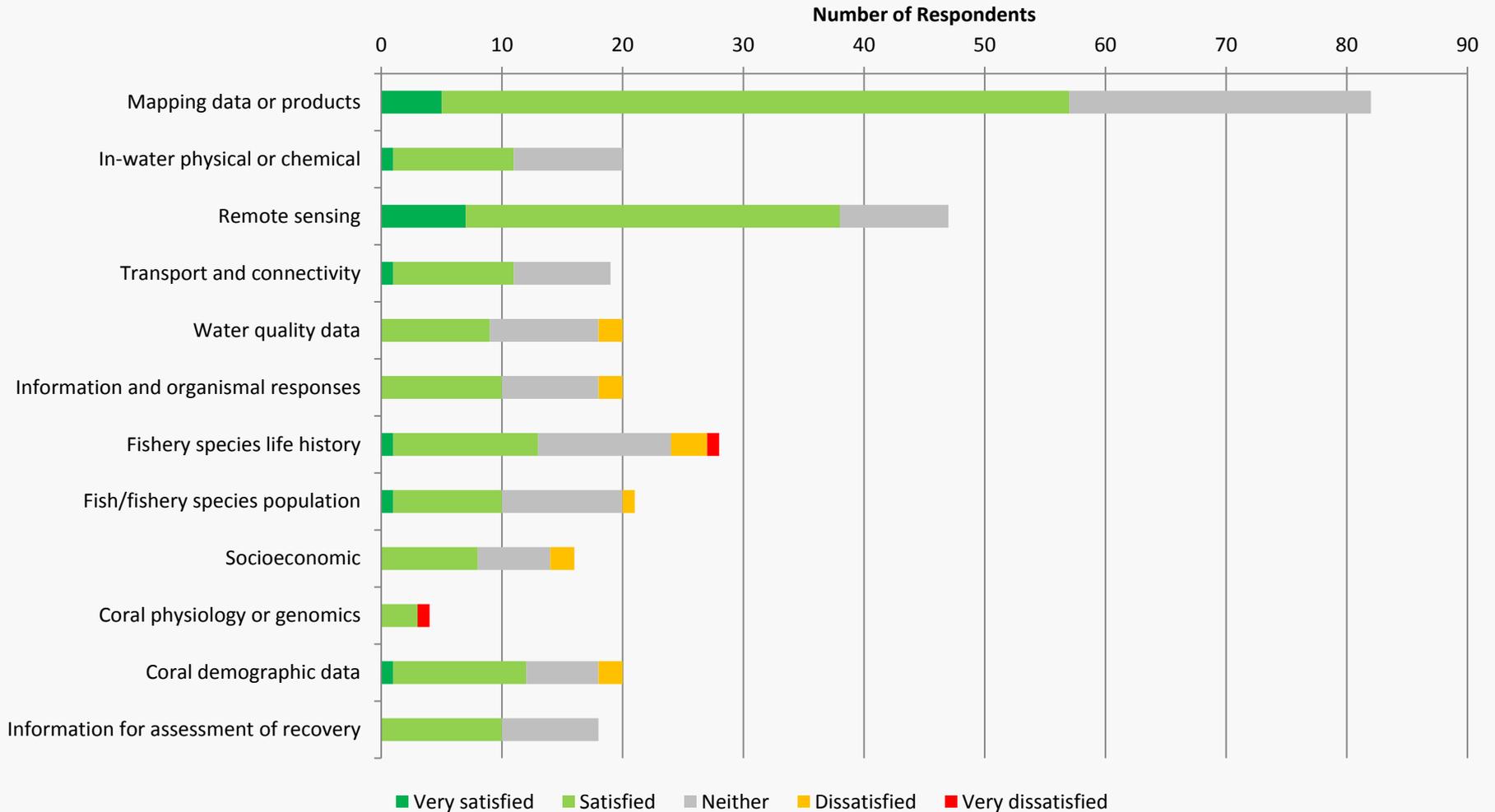
Can you access it?

(responses from those who selected category in top five)

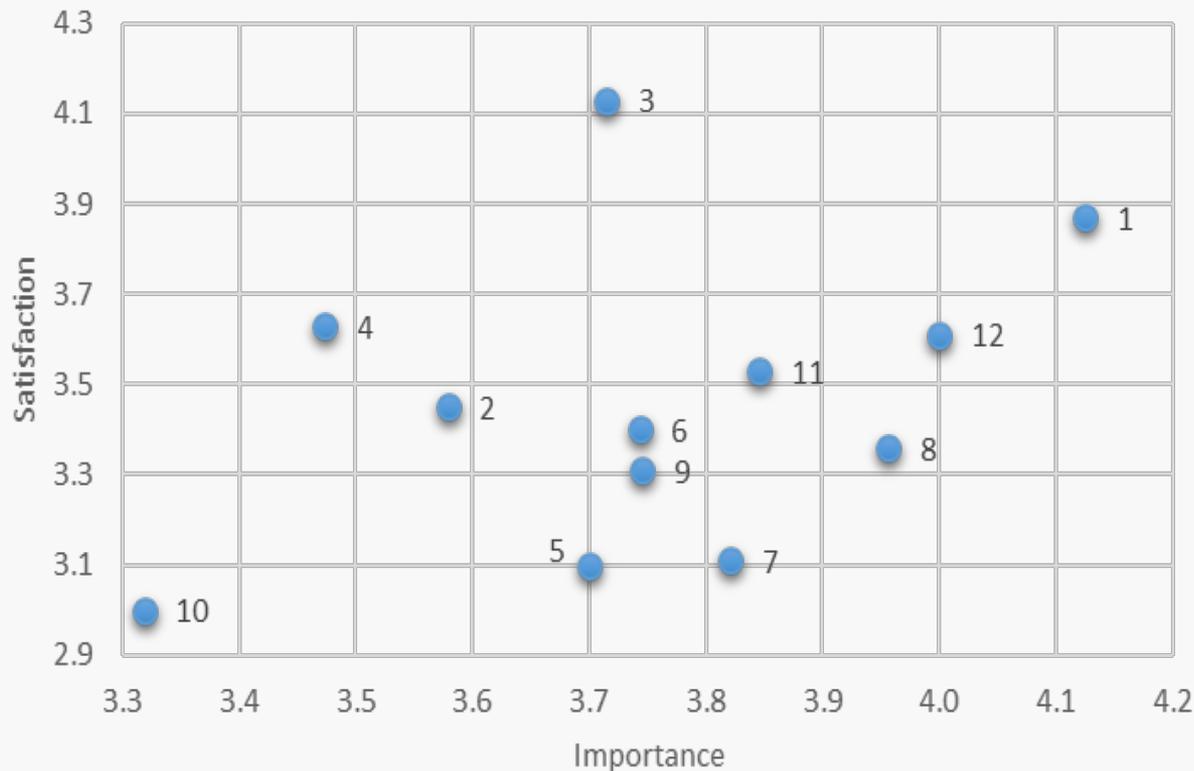


Is it well-documented?

(responses from those who selected category in top five)



If it is important to users, are they satisfied with it?



- 1 Mapping data or products
- 2 In-water physical or chemical environmental data
- 3 Remote sensing derived data, forecasts, and predictions
- 4 Transport and connectivity data and modeling
- 5 Water quality data
- 6 Information and organismal responses to stressors
- 7 Fishery species life history and ecology data
- 8 Fish/fishery species population demographics data
- 9 Socioeconomic and/or fisheries dependent information
- 10 Coral physiology or genomics
- 11 Coral demographic data
- 12 Information for assessment of recovery/restoration actions



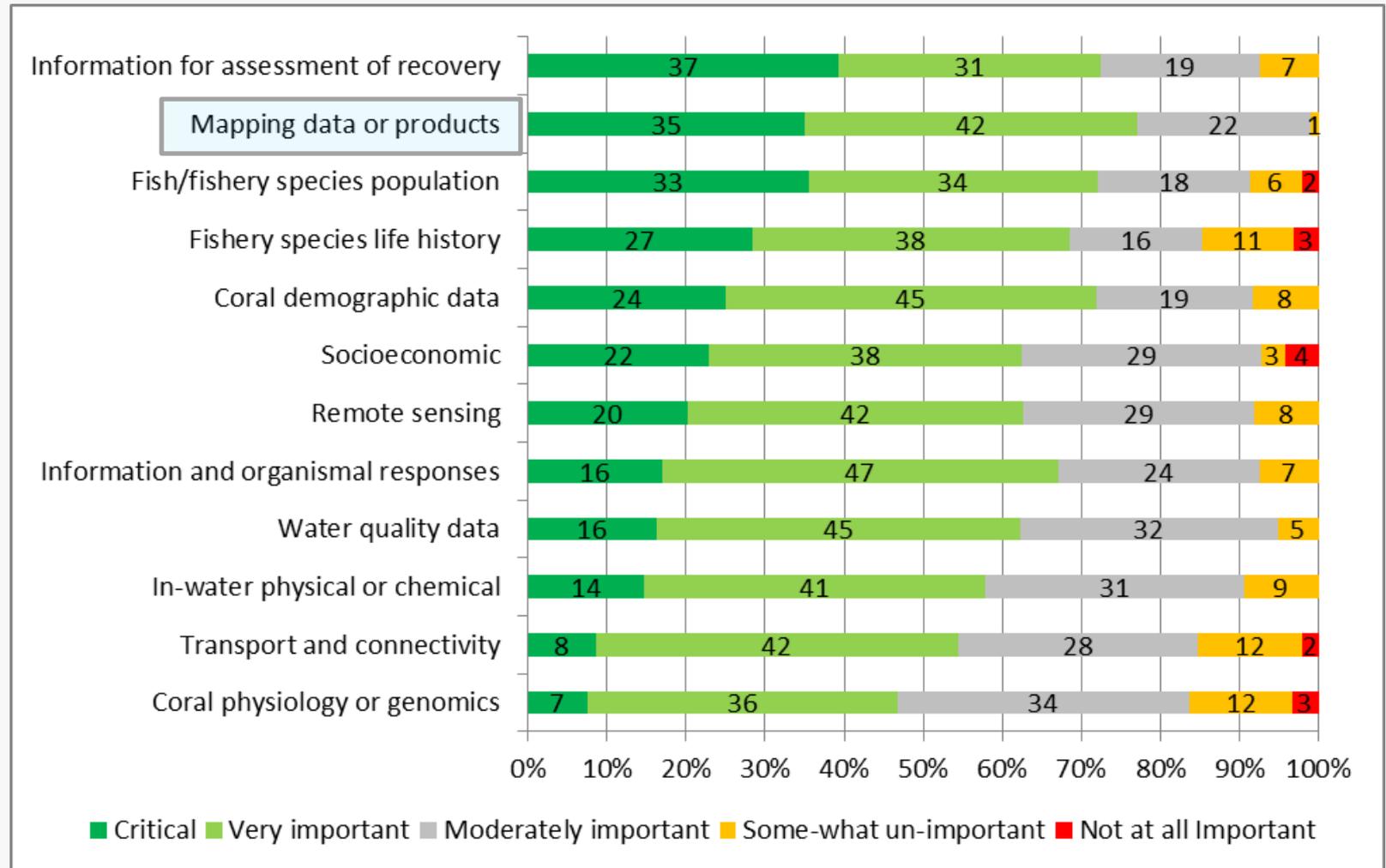
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Detailed information on responses
for individual categories

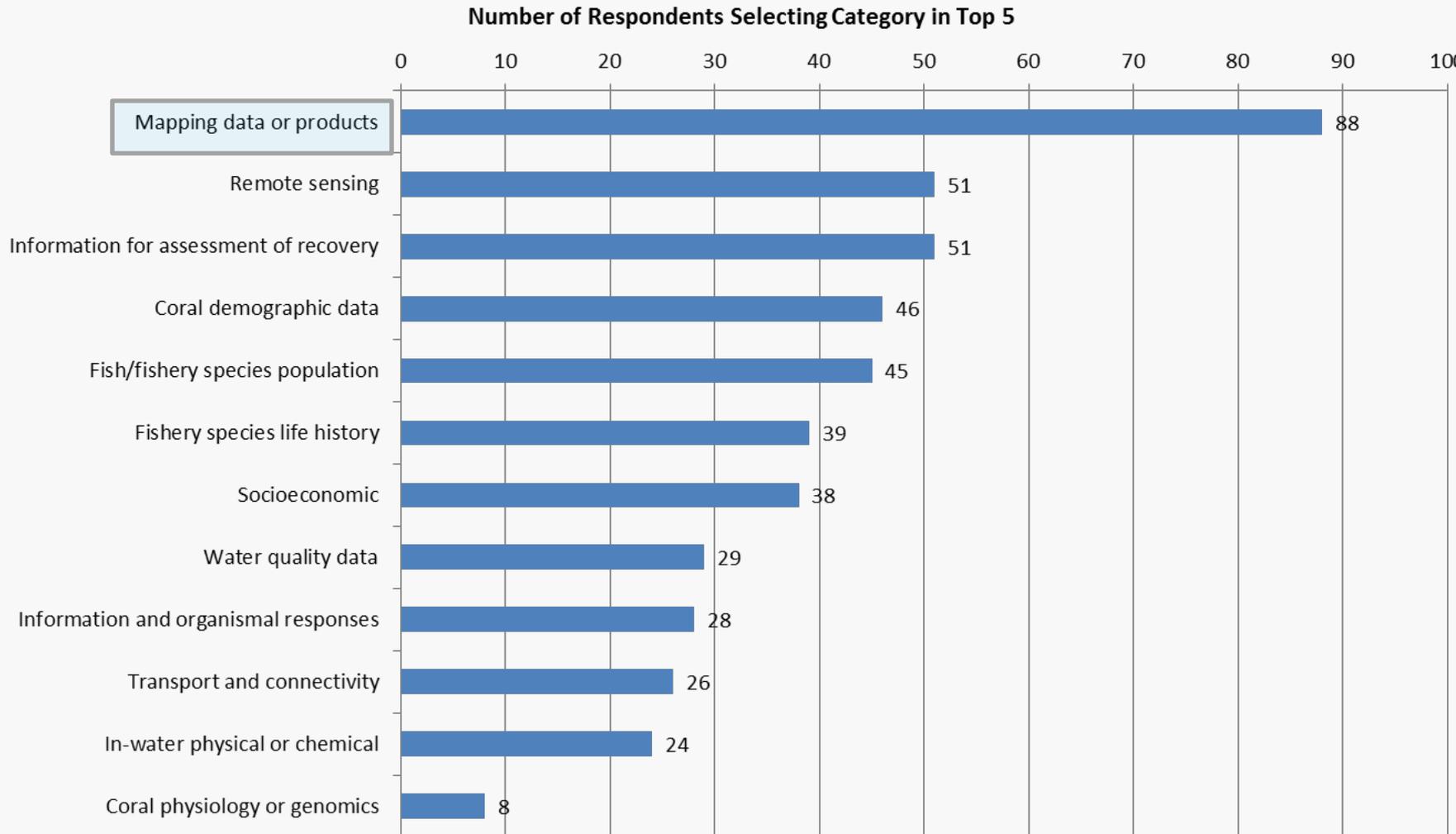
Mapping Data or Products

All respondents: “How important is each category to your work?”



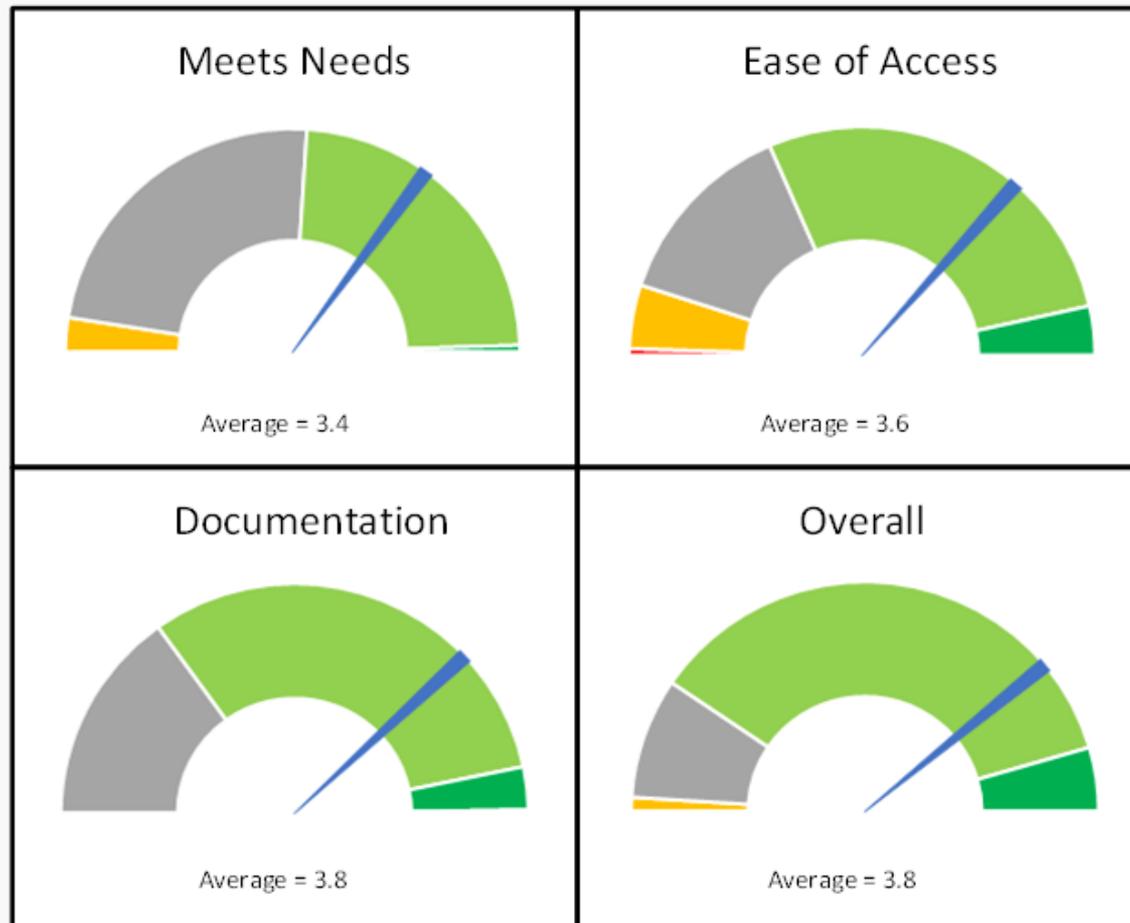
Mapping Data or Products

(All respondents: categories included in top five)



Mapping Data or Products

(top five for 88 /119; ~83 answered specific questions)



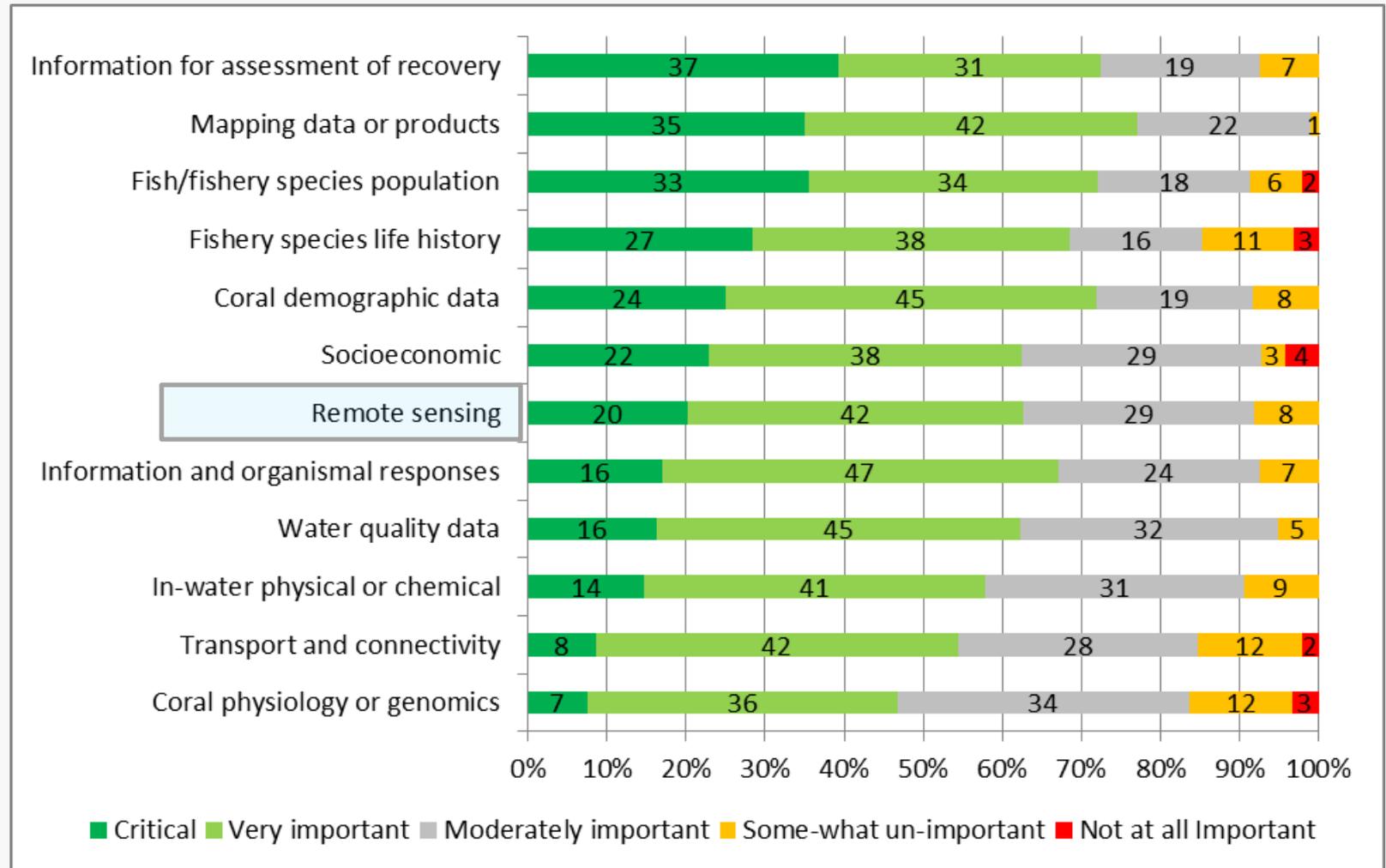
Mapping data or products:

Most Common Uses (n=85): Management decisions (68%), outreach and education (52%)

Items that Respondents Liked	<ul style="list-style-type: none">• Benthic habitat and bathymetry maps (mentioned by 15 respondents)• Maps and reports produced by the NOAA Biogeography Branch (led by Timothy Battista).• LIDAR.• Northeast BIOMapper.• Coral Reef Watch products.
Items needing improvement	<ul style="list-style-type: none">• Extend the accuracy, resolution, and coverage of habitat and bathymetric maps.• Update resolution and coverage of coral mapping products (e.g., coral species in American Samoa).• Greater spatial coverage and usability for LIDAR.• Complete Florida Reef Tract integrated map.• Updated information on Guam's watersheds.
Data that are missing	<ul style="list-style-type: none">• Habitat map for Hawk Channel, areas west of Marquesas, and the Gulf side in the Florida Keys.• Detailed bathymetry for mesophotic and deep water reefs• Coral recruitment polygons within MPAs.• Shelf-edge reef connecting Vieques with St. Thomas, USVI.
Examples of use	<ul style="list-style-type: none">• Management: describe essential fish habitat in fishery management plans, plan coral health monitoring, review a landing site for a telecommunications company, and prioritize watershed areas to address land-based pollution.• Plan research and generate sampling designs, for example: impact of invasive fish, distribution of mesophotic coral reefs in USVI, coral reef survey stations.• Identify locations for mitigation and restoration projects and assess potential impacts of vessel groundings.• Designation of MPAs and critical habitat.• Identify habitat boundaries and create higher resolution localized maps.• Grant-writing.

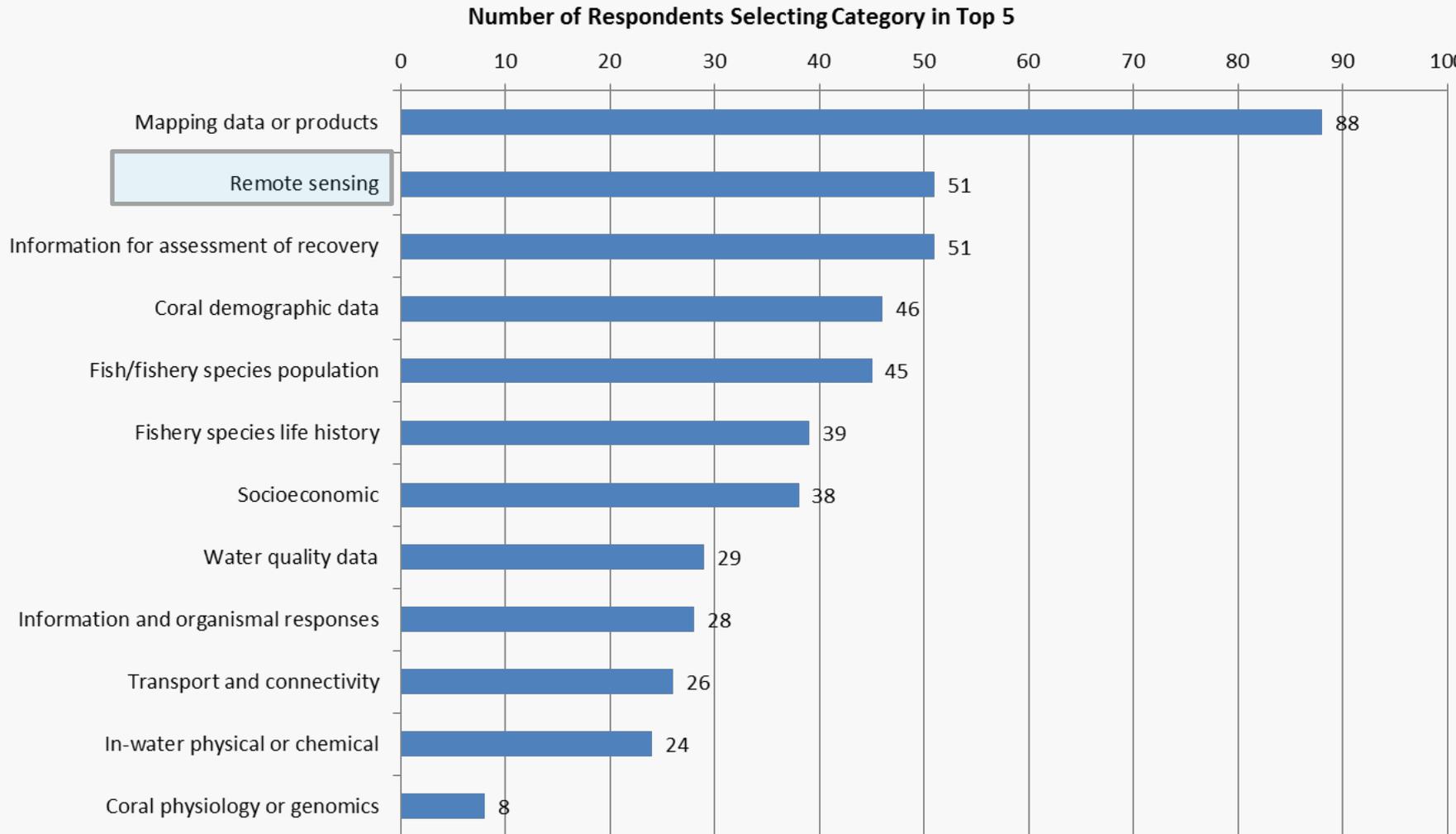
Remote Sensing Derived Data, Forecasts, and Predictions

All respondents: “How important is each category to your work?”



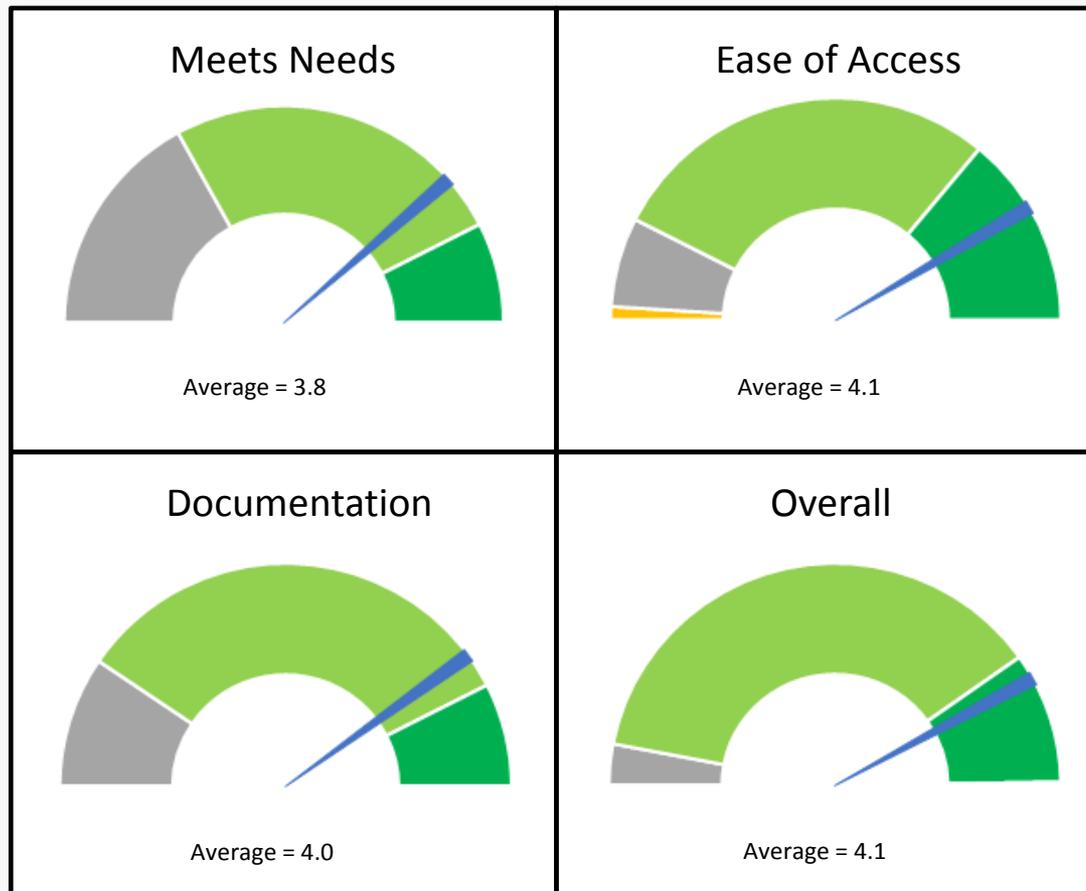
Remote Sensing Derived Data, Forecasts, and Predictions

(All respondents: categories included in top five)



Remote Sensing Derived Data, Forecasts, and Predictions

(top five for 51 /119; 47 answered specific questions)



Remote Sensing Derived Data, Forecasts, and Predictions: Most Common Uses (n=46): Monitoring coral reef conditions (76%)

Items that Respondents Liked

- NOAA Coral Reef Watch products, especially bleaching alerts and forecasts, the 5km product (mentioned by 13 respondents).
- SST and SST-derived products.
- Weather and sea conditions, e.g., Sea surface temperatures, ocean acidification, wind speed and direction, nutrients and harmful algal blooms.

Items needing improvement

- Continue increasing resolution on good products (SST and derived raw data products) rather than adding new products.
- Actual sea levels incorporating ENSO factors.
- Ability to detect a wide range of nutrients.
- Wave and surface current predictions.

Data that are missing

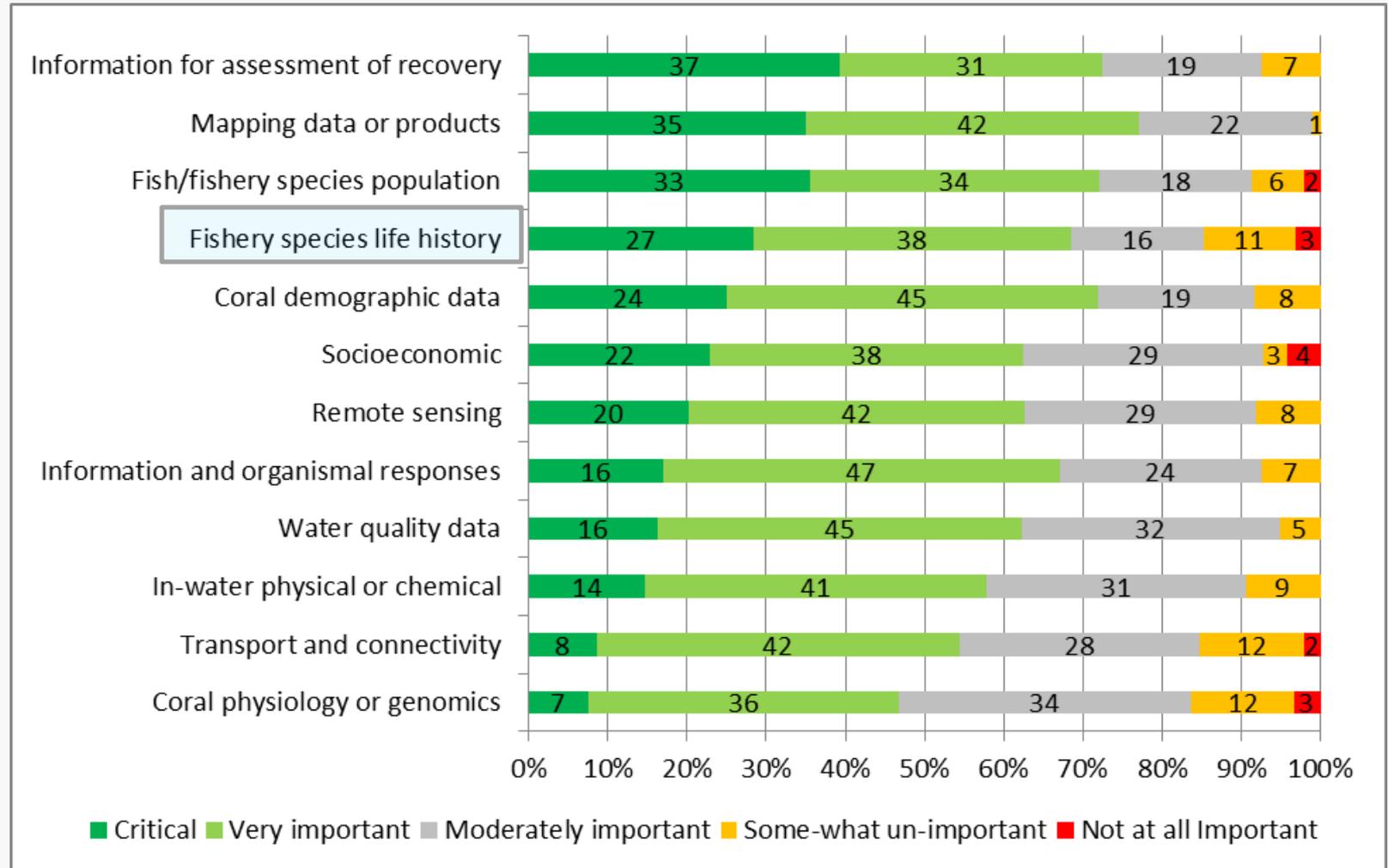
- Localized data in modeling.
- Turbidity plumes into the nearshore environment.
- Coastwatch data alongside the CRCP products (e.g., Chl_a, windspeed, wave heights, solar insolation).
- Coral disease forecasting.

Examples of use

- “We use the coral reef watch bleaching products as triggers for our bleaching response and BleachWatch community engagement programs.”
- “When bleaching is forecasted for our reefs, we focus monitoring on habitats that tend to bleach such as our staghorn-reefs within our lagoon.”
- “We monitor NOAA Coral Watch so we can share the warning, alert status for SST with our community program members and bring awareness.”

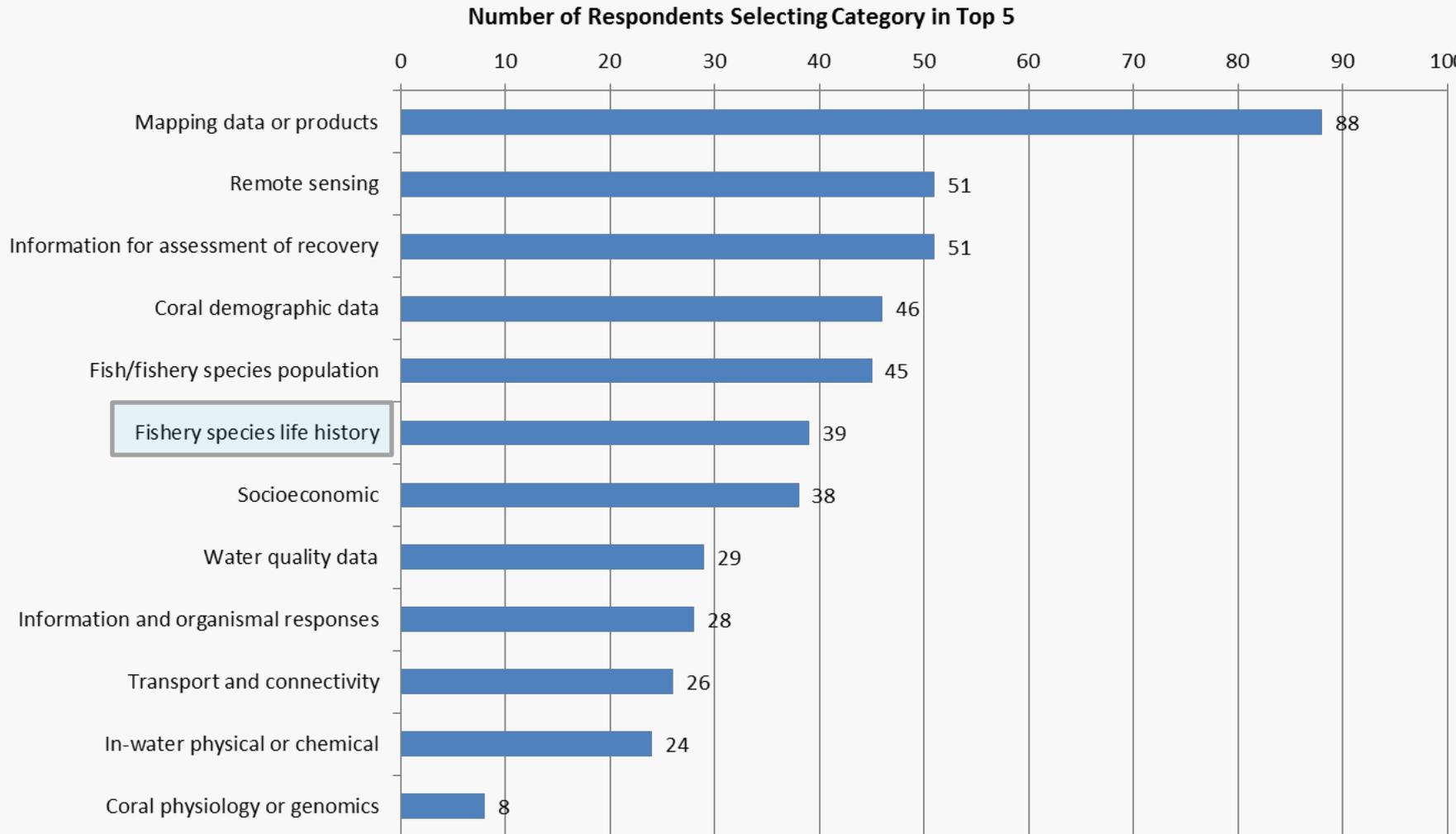
Fishery Species Life History and Ecology Data

All respondents: “How important is each category to your work?”



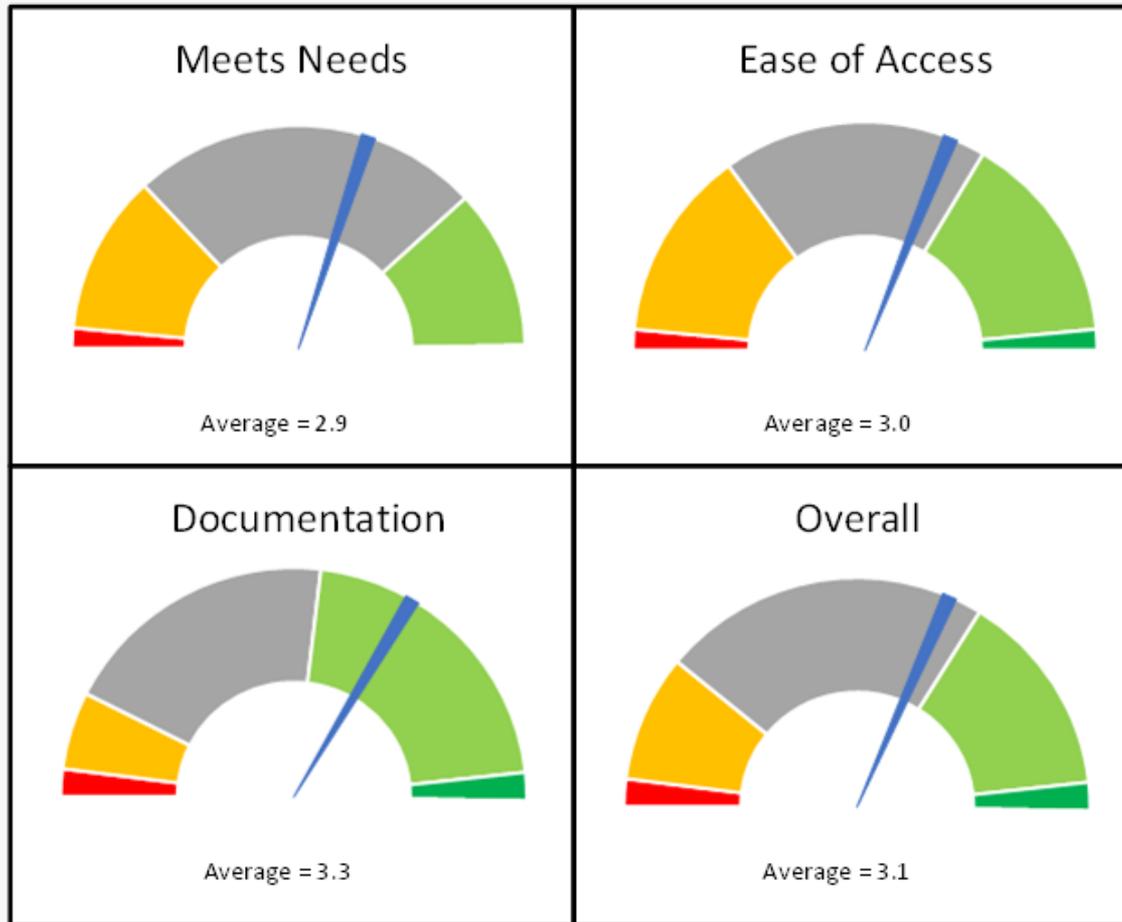
Fishery Species Life History and Ecology Data

(All respondents: categories included in top five)



Fishery Species Life History and Ecology Data

(top five for 39 /119; ~29 answered specific questions)



Fishery Species Life History and Ecology Data

Most Common Uses (n=30): Management decisions (77%)

Items that Respondents Liked

- “Reef Visual Census is critical to understanding long term trends in fish diversity, density and ecosystem health in Florida Keys.”
- Stock assessments of coral reef and bottomfish (e.g., studies done by Marc Nadon, Ben Richard, and Jake Asher).
- Caribbean Fishery Management Council studies funded by CRCP.
- CRCP cooperative work with State of Hawaii DLNR.
- Life history information (e.g. growth rate, longevity, age at first maturity), particularly for Caribbean reef fish.

Items needing improvement

- Life history information for numerous species; key information includes: growth rate, longevity, age at first maturity, fecundity, larval taxonomy and systematics, size frequency distribution, N mortality data.
- Information for specific regions: Caribbean, western Pacific, Hawaii.
- “The Florida Keys zone monitoring program was also critical to understanding management performance. It would be helpful to bring that program back.”

Data that are missing

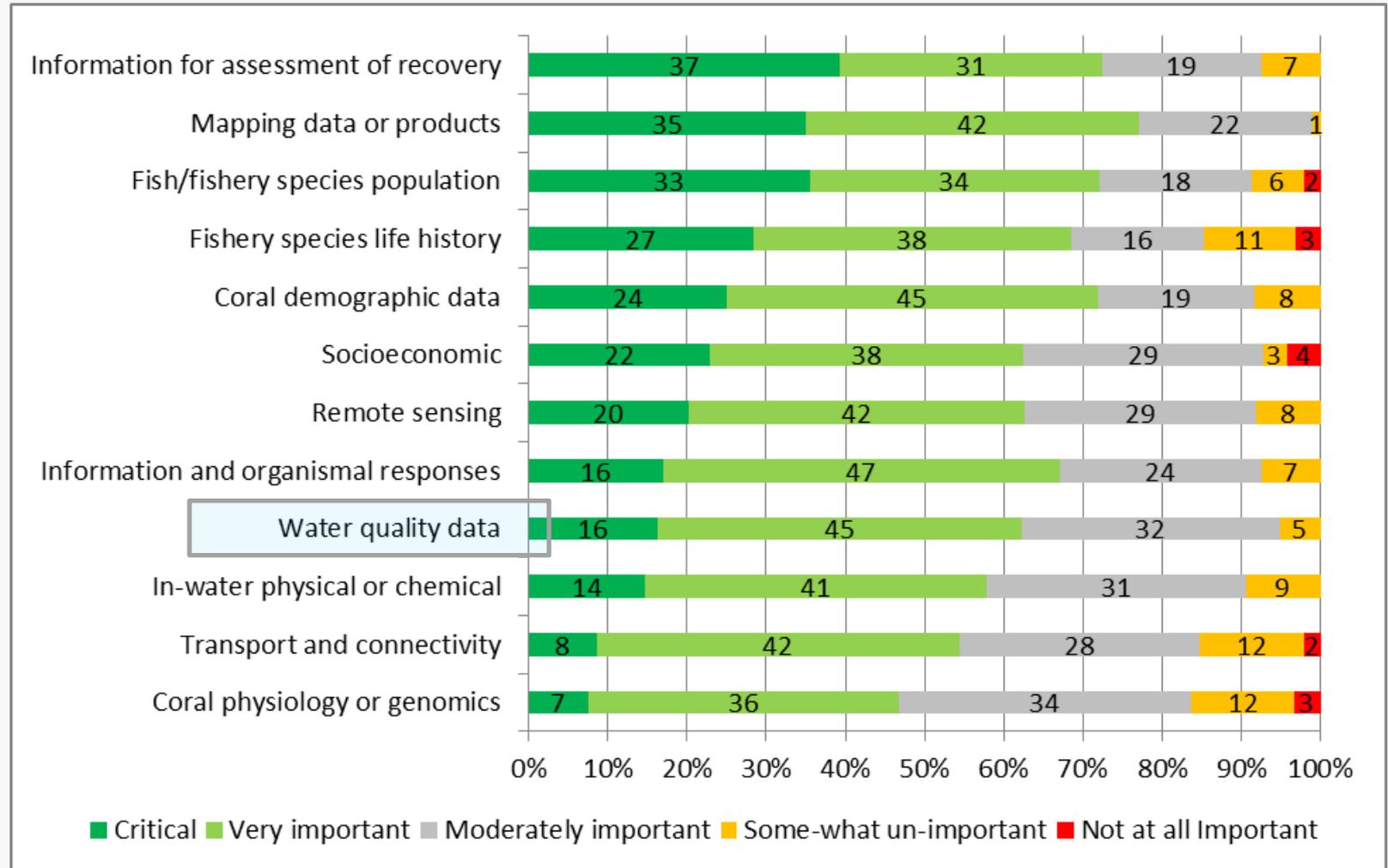
- Information to support assessment of whether existing fisheries rules work for local species.
- Life history data for local fish species, respondents specifically mentioned gaps for Hawaii, Pacific and western Pacific, American Samoa, Puerto Rico and Virgin Islands.

Examples of use

- RAMP data in particular are used for fisheries management, formal and informal education, and verification of local knowledge of species demographics.
- “We have used “Namdrik Atoll. Coral-Reef Resources Monitoring Assessment” to help develop our condition score for the Micronesia Challenge.”
- “We used life history data to build support for fishery management. Primary source was university and independent museum studies. Big gap exists with regard to most species maturity, fecundity, and the geographic variability thereof that makes management a challenge.”
- “The story of the W. Hawaii aquarium fishery and the performance of the MPAs in helping achieve an ecologically sustainable fishery is a really important story. It has allowed us to start conversations about other similar efforts in other geographies. We need more regional management initiatives, supported by this kind of science.”

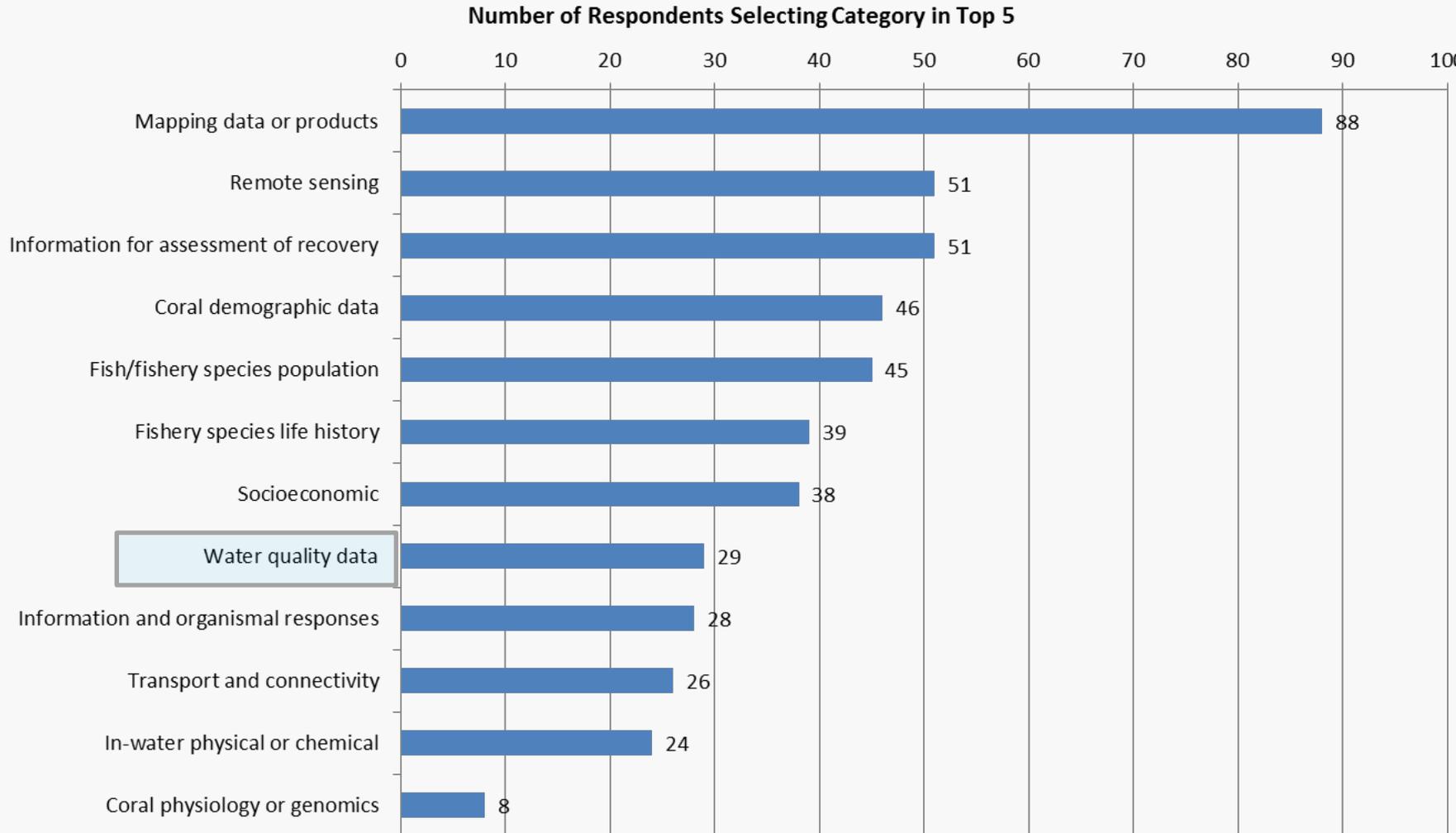
Water Quality Data

All respondents: “How important is each category to your work?”



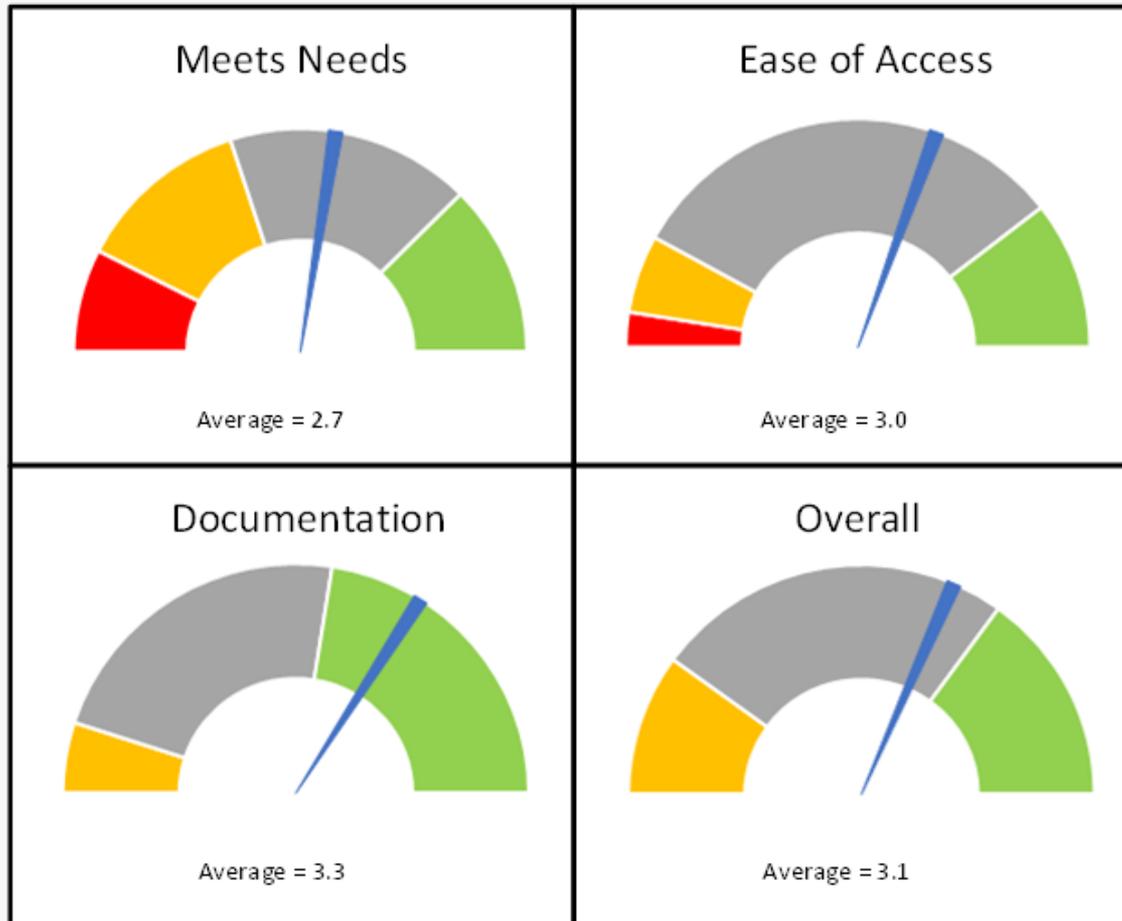
Water Quality Data

(All respondents: categories included in top five)



Water Quality Data

(top five for 29 /119; ~20 answered specific questions)



Water Quality Data

Most Common Uses (n=21): Management decisions (62%), monitoring coral reef conditions (43%)

Items that Respondents Liked

- Coral Reef Watch.
- Two respondents noted that the reports are easy to follow, one stated: “I started my career as a journalist and then became a policy person who also ran an NGO. I am not a scientist. I like examples such as: *if the soil erosion is reduced to the corals, normal tide flows and storm surges will clean off the corals and improve fish and coral habitats.*”

Items needing improvement

- Collect data at priority sites at watershed level, especially extreme highs and lows for: nitrate, nitrite, phosphate, salinity, suspended solids.
- Water quality data in CREP monitoring reports for Pacific Islands.
- Refine land mask for American Samoa because it currently covers nearshore fringing reefs.
- Link national status and trends to local water quality monitoring programs.

Data that are missing

- Size of soil plumes on inner reef for use with media for outreach.
- Accessible raw data sets online.
- In-situ data for American Samoa, needs include: temperature, turbidity, chlorophyll, and pH.
- “Link to local water quality monitoring programs, emerging pollutants of concern, more direct links to health of marine resources such as corals, fish, seagrass, mangrove root community.”

Examples of use

- “For my organization I have created the mantra, *Keep the soil off the coral.* Over the years, the information about clogging up the reefs has resonated with me and resulted in my steering my NGO into this kind of work.”
- “National status and trends information from sites sampled in PR and VI used to determine whether there are sediment contamination concerns in particular for proposed water resources development projects that have a dredging component.”



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Conclusions:

- Overall, there is high level of satisfaction with CRCP in general and with its product categories.
- The most important categories for respondents' work were "information for assessment of recovery" and "mapping data or products" ;
- "Remote sensing derived data" and "mapping data or products" had the highest level of satisfaction of all categories;
- "Remote sensing derived data" was also the second most frequently selected category in respondents' "top five" list.



Conclusions (cont.)

- “Fish/fisheries species life history” and “fish/fishery species population demographics” data were rated as important, but had a relatively high number of neutral and negative responses in terms of level of satisfaction.
- The lowest rated categories in terms in terms of “satisfaction”, “meeting needs”, and “ease of access” and “satisfaction with documentation” tended to be “fishery species life history” and “water quality data”.



Conclusions (cont.)

- There may have been some confusion on which products fit into which category; when some respondents provided open-ended responses about products in one category, they referenced products in other categories. This may indicate some confusion in how respondents rated the scaled factors in the report (e.g., overall satisfaction with the category, ease of access, etc.).
- The results provide insights about individual products and information that should be investigated further. However, comparisons between specific products and information streams should be interpreted cautiously. The input from the open-ended responses should prove quite valuable.



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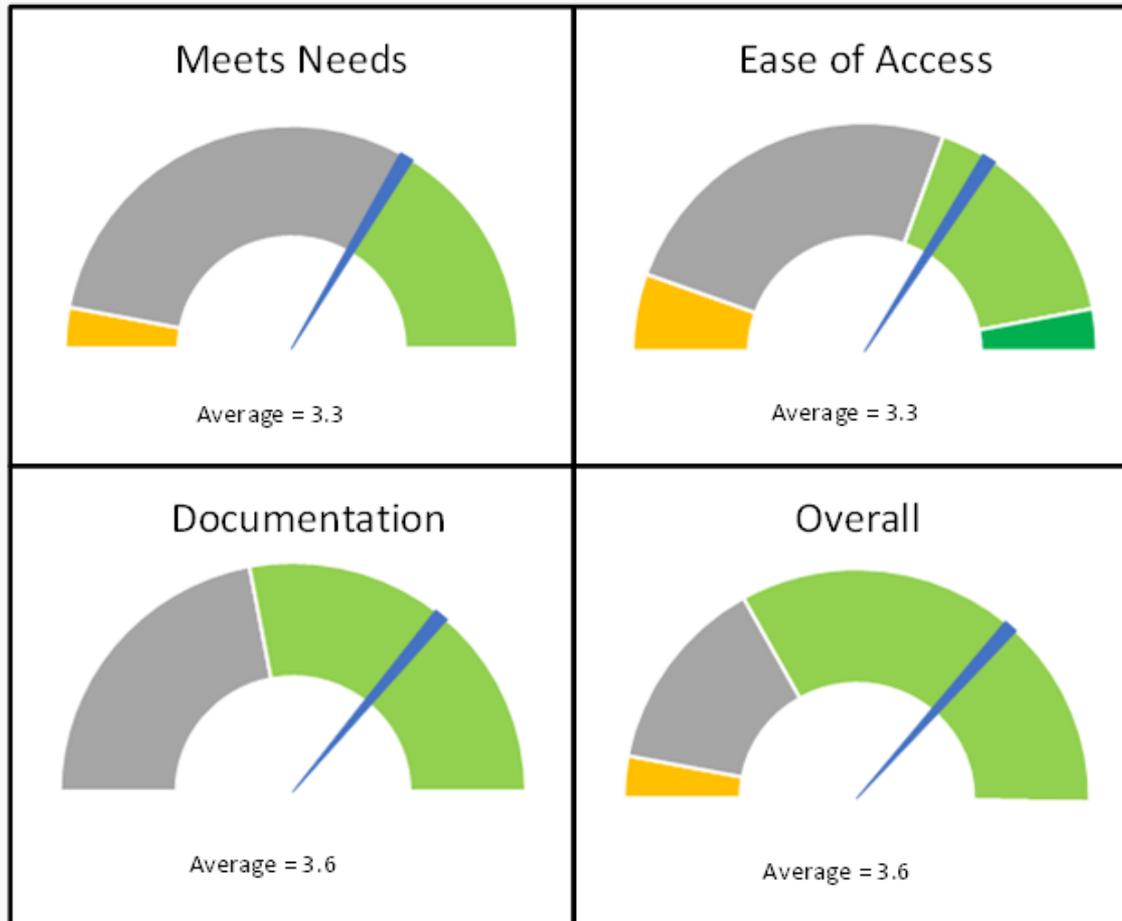
Questions?

Back-up Slides

- Additional slides if needed for questions/discussion

Information for Assessment of Recovery/Restoration Actions

(top five for 28 /119; 20 answered specific questions)



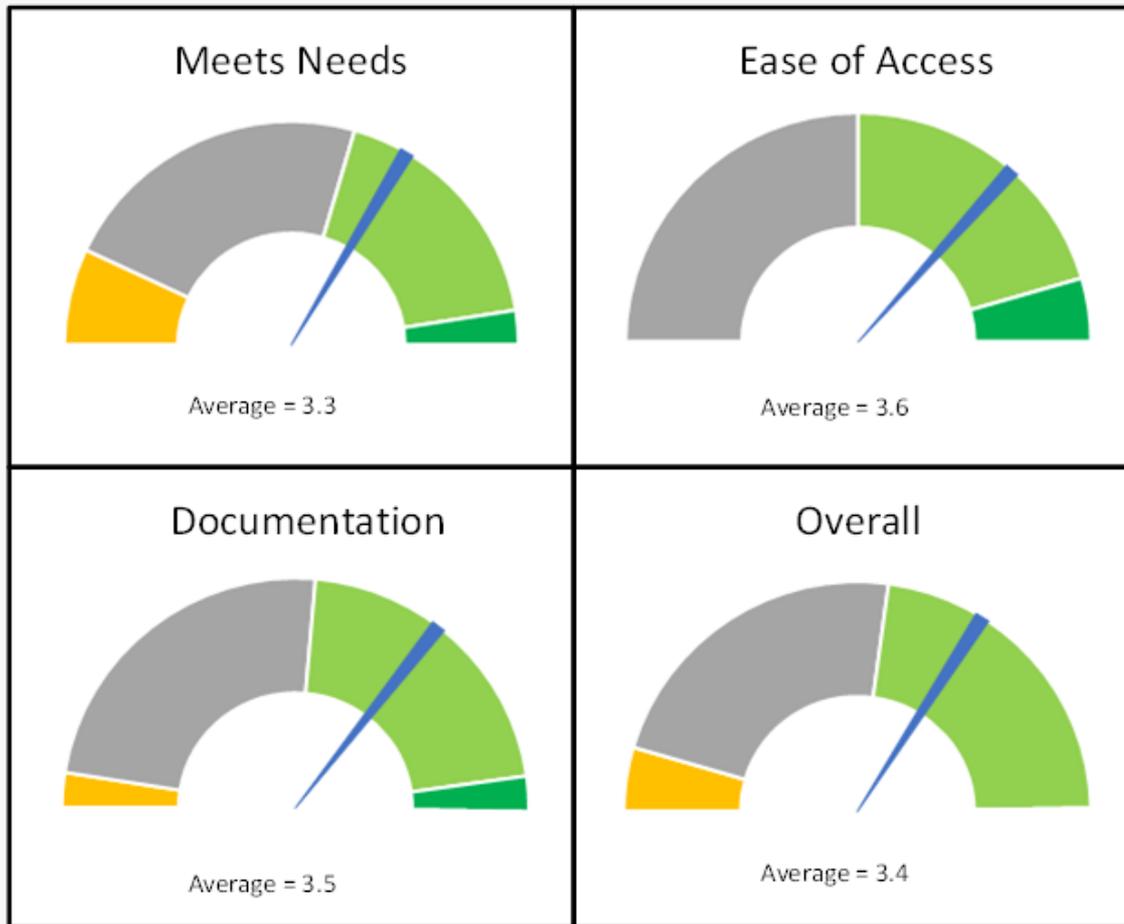
Information for Assessment of Recovery/Restoration Actions

Most Common Uses (n=18): Monitoring coral reef conditions (72%), management decisions (56%)

Items that Respondents Liked	<ul style="list-style-type: none">• “CRCP’s funding of the ocean tipping points project is exactly the kind of science that the domestic CRCP grants program should fund. This will give us tangible results and help us avoid the ‘cliff of collapse’ for reefs by telling us where the tipping points are and which geographies are approaching collapse.”
Items needing improvement	<ul style="list-style-type: none">• “Restoration work on coral reefs generally requires high specificity at the watershed level. This not normally the unit of measure nor the level of specificity of most of the available data.”• “Often the scale of the monitoring efforts in general are not on the same plane as monitoring efforts -- more coordination should happen directly between CRCP/NCCOS and folks directly involved with LBSP and coral implementation efforts in order to improve the effectiveness of monitoring efforts -- often our monitoring efforts are done on a shoestring budget -- with varying results.”• “We need a bigger focus on what actions will tangibly produce improvements for reefs. Reefs face 4 major threats in Hawaii - invasive species, land-based pollution, overexploitation, and climate change. It is often not clear which stressor is the major one in which geography. Understanding this is key - the ocean tipping points work will be a tremendous step forward.”
Data that are missing	<ul style="list-style-type: none">• “Determination of recovery threshold, recovery tools, water quality information and links to recovery, high priority high risk areas data collection.”
Examples of use	<ul style="list-style-type: none">• No examples provided.

Fish/fishery Species Population Demographics Data

(top five for 45 /119; ~22 answered specific questions)



Fish/fishery Species Population Demographics Data

Most Common Uses (n=23): Management decisions (48%), outreach and education (48%), monitoring conditions (43%)

Items that Respondents Liked

- Randomized surveys of community data (e.g., species, density, size classes).
- Estimates of population and health.

Items needing improvement

- Improved resolution for islands, specifically:
 - “Resolution of NCRMP fish data needs to be at finer than island-level”
 - CREP data are less useful for practical management applications at current resolution.
 - “For example the scale used by the Caribbean Fishery Council for determining “essential fish habitat” is a little bit ambitious, therefore details of areas that merit more weight are lost.”
- Improve output of technical reports, publications, and outreach by PIFSC fisheries program.

Data that are missing

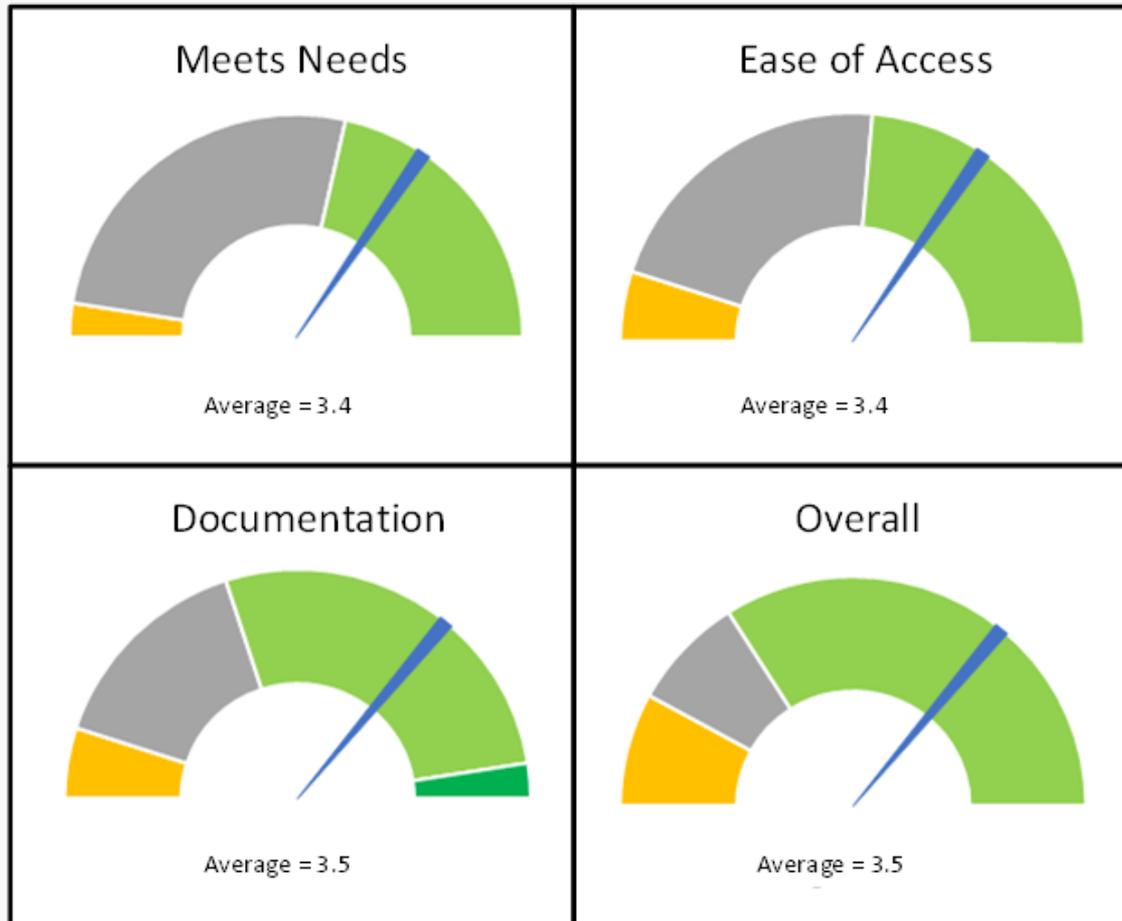
- Information on recreational fishing.
- Adequate sampling at local scale to detect temporal changes.
- Assessments at local scale of major threats and stressors.
- Fisheries independent data and spawning aggregation data, for southeast Florida for example.

Examples of use

- “We've developed a sustainable seafood campaign based on NOAA's and local government fish/fishery species population demographics data.”
- “The broad-scale CRED RAMP data sets are useful from a Central-Western Pacific perspective, and for spatial variation.”
- “Define biogeographic regions for reef fish. Understanding the impacts of fishing on local populations and how those change across the seascape.”

Coral Demographics Data

(top five for 46 /119; ~20 answered specific questions)



Coral Demographics Data

Most Common Uses (n=21): Monitoring coral reef conditions (67%), management decisions (52%)

Items that Respondents Liked

- Margaret Miller's research, specifically the northern FL Keys and Curacao Acropora palamata New NCRMP ESA coral demography (two respondents).
- "Faga'alu coral demographic data from Dr. Vargas Angel is a wonderful data set that we need more of in American Samoa."
- "I like very much both the published articles, and the existing monitoring reports for American Samoa and the Marianas Islands (CRED)... the 2005 and 2008 State of the Reefs reports, as well as local monitoring reports supported by CRCP grants. "
- CREMP and SECREMP monitoring data.

Items needing improvement

- Focus on targeted local data.
- Link work with ESA Section 6 efforts to take advantage of funding and collaboration opportunities.
- Ensure local monitoring efforts funded by CRCP product reports.

Data that are missing

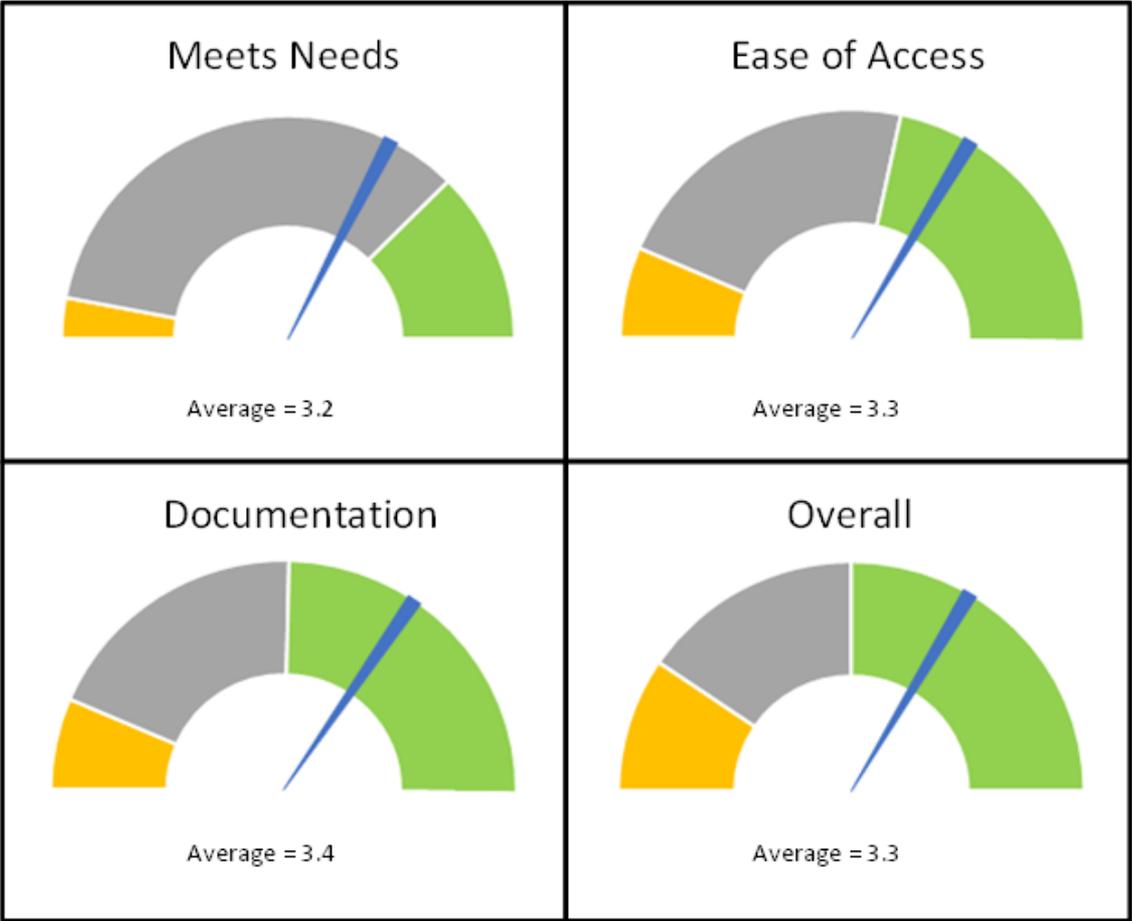
- Better geographic coverage of demographic information for key coral species.
- Additional data for American Samoa's coral reefs, especially back-reef areas.
- Information on targeted sites (e.g., dense patches or large colonies).
- Accurate species names in monitoring reports.

Examples of use

- "Defining coral reef biogeography, informing reef managers and the public on where unique, special areas are and why it's important to investigate them, Using the information in decision support tools to allow folks to make educated decisions using the best available information."
- "I use American Samoa coral demographics from CRCP projects in my research on corals in American Samoa, and in my work for various agencies and consulting companies in surveying in the Marianas for military permits and construction, also for consulting for in water construction projects in American Samoa."

Socioeconomic or Fisheries Dependent Information

(top five for 38 /119; ~16 answered specific questions)



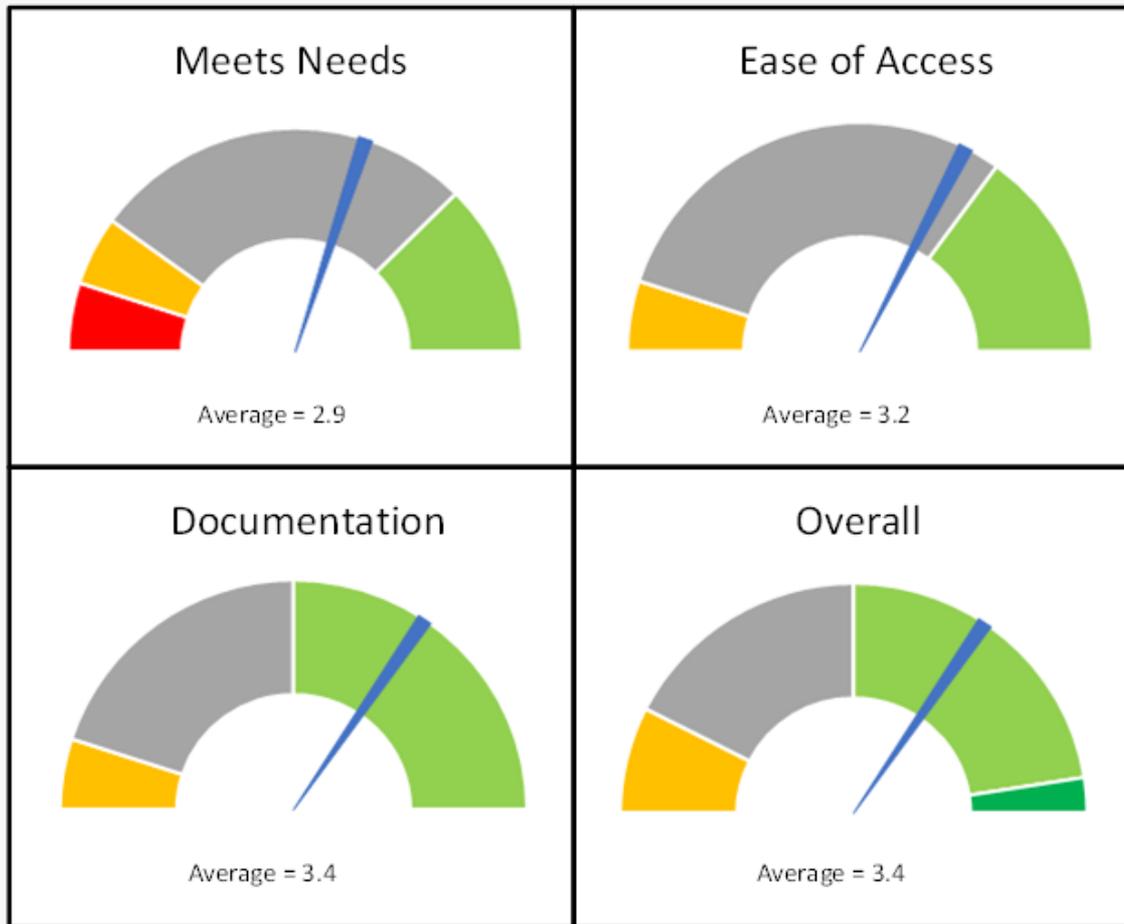
Socioeconomic or Fisheries Dependent Information

Most Common Uses (n=15): Management decisions (73%), outreach and education (60%)

Items that Respondents Liked	<ul style="list-style-type: none">• “Monitoring knowledge, attitudes and perceptions of both management and health of coral reef activities is very helpful.”• “Household interviews conducted by Dr. Levine have been enormously helpful in characterizing our communities attitude towards management actions such as implementing size regulations. Elder interviews have also helped document our shifting baseline issue in reef fisheries. We need more efforts like these.”• “The work that CRCP has funded for socioeconomic issues such as enforcement have been key to assess the efficacy of these efforts.”
Items needing improvement	<ul style="list-style-type: none">• Coral reef valuation should be more specific.• More focused attention on issues of human dependencies on reefs (e.g., fisheries, cultural practice, recreation).<ul style="list-style-type: none">○ “We need a targeted focused effort on how much fishing is occurring, by whom and where, and on the issues of enforcement which are critical”
Data that are missing	<ul style="list-style-type: none">• There were two responses to this question but they do not directly address the subject matter:<ul style="list-style-type: none">○ More data for American Samoa reef fish stocks.○ Support for formal education of islanders (Guam) in marine fields.
Examples of use	<ul style="list-style-type: none">• “We use the socioeconomic data in regular education and outreach as well as during NEPA review of management actions and regulatory development.”• “We wrote a grant to teach the Boy Scouts and Island Girl Power girls 7-14 how to fish responsibly. We also said that we would reach out to vulnerable populations like the elderly and veterans. We said we would teach everyone how to measure and record the fish data to help with the data.”• “I use interviews to show our community's support for stronger conservation measures such as size regs, and to show our shifting baseline issues.”

Information and Organismal Responses to Stressors

(top five for 28 /119; ~20 answered specific questions)



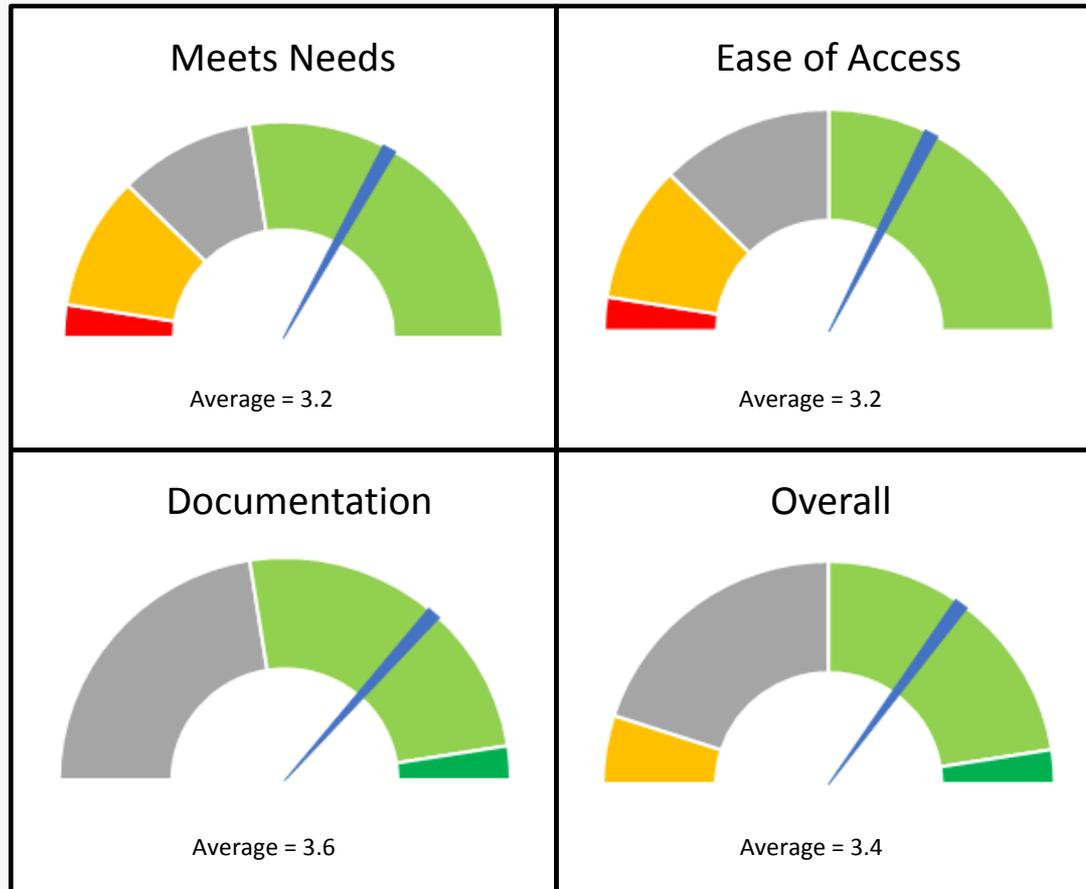
Information and Organismal Responses to Stressors

Most Common Uses (n=20): Management decisions (75%)

Items that Respondents Liked	<ul style="list-style-type: none">• “The types of research that Margaret Miller conducts on climate stressors on early life history and Cheryl Woodley conducts on causal factors of reproductive failure.”• “Response of mangroves, seagrasses and sponges to elevated temperatures. Changes in salinity. And O2”
Items needing improvement	<ul style="list-style-type: none">• “Specifically prioritized locality information should be a top priority for this program. We also do not have threshold for stressors to determine how much needs to be done to support recovery.”• Response of corals to specific threats, e.g., sedimentation impacts, literature review of coral stress response to LBSP.
Data that are missing	<ul style="list-style-type: none">• Lack of detail and inconsistency in parameters limit management at the local level.• Coral response to specific stressors and key coral species’ thresholds for nutrients, sediments, and contaminants.• Links between CRCP products and local projects.• CRCP coral monitoring support to MPAs under NOAA’s Trusteeship.
Examples of use	<ul style="list-style-type: none">• “Have used coral bleaching alert information in work related to ESA-listed corals in terms of analyzing potential impacts of water resources development on corals that have been stressed by bleaching. Have used results of LBSP studies in watersheds in St. John in particular showing levels of sediment based on different levels of development in order to assess potential impacts to our trust resources that could occur as a result of proposed water resources development projects.”• Use spatial information on stressors to select coral reef restoration sites.

In-Water Physical or Chemical Environmental Data

(top five for 24 /119; 21 answered specific questions)



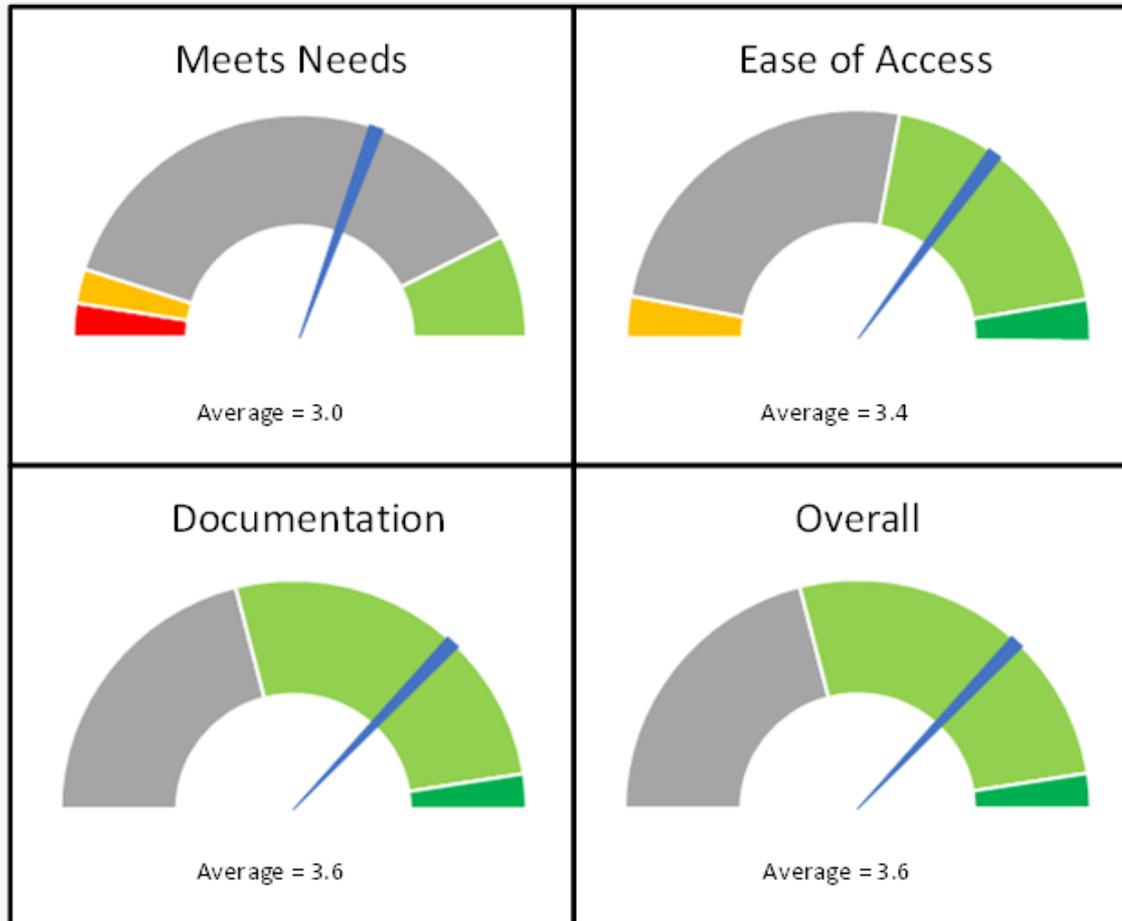
In-Water Physical or Chemical Environmental Data:

Most Common Uses (n=21): Management decisions (67%), monitoring coral reef conditions (43%)

Items that Respondents Liked	<ul style="list-style-type: none">• Swell forecast for coral reef disturbance.• Physical data in CREP monitoring reports for Pacific Islands.• AOML data related to CO₂ levels and temperature over time.• Data and reports from NCCOS, work in American Samoa by Dave Whitall.
Items needing improvement	<ul style="list-style-type: none">• Data on residence time, freshwater volume and velocity discharge, thresholds for health or recovery of coral reefs.• Linkage of chemical stressors to health of coral reefs.• Water quality data (e.g., suspended solids)• The 5km Coral Reef Watch Product over-predicts thermal stress.• A potential new product could combine existing swell products to predict damage from upcoming event to focus monitoring and research, predict areas favorable to different coral reef community types, and for conservation planning.
Data that are missing	<ul style="list-style-type: none">• Additional contaminant studies in West Maui to support decision making and identification of sources.• Improved CREP water quality data.• Watershed scale data, improved specificity across all strata, and inclusion of shallow areas.• Nutrients, turbidity, chlorophyll a and other water quality data for American Samoa.
Examples of use	<ul style="list-style-type: none">• “Project future management decisions, inform monitoring activities, and for outreach to the public.”• Provide updates on El Nino and coral bleaching.• Development of critical habitat.• Define LBSP problems in watershed to prioritize issues.

Transport and Connectivity Data and Modeling

(top five for 26 /119; ~19 answered specific questions)



Transport and Connectivity Data and Modeling

Most Common Uses (n=22): Management decisions (64%), outreach and education (45%)

Items that Respondents Liked

- Connectivity models created by Matt Kendall.
- Larval transport and distribution.

Items needing improvement

- Improve the Kendall connectivity models “to incorporate things like the 'island sticky effect'. This would require collaboration with others, but I think something useful for limited budgets because of its impact.”
- “More emphasis on this type of work to better understand the ecological dynamics in a system that then can be used to inform and adapt management decisions, particularly spatial management decisions.”

Data that are missing

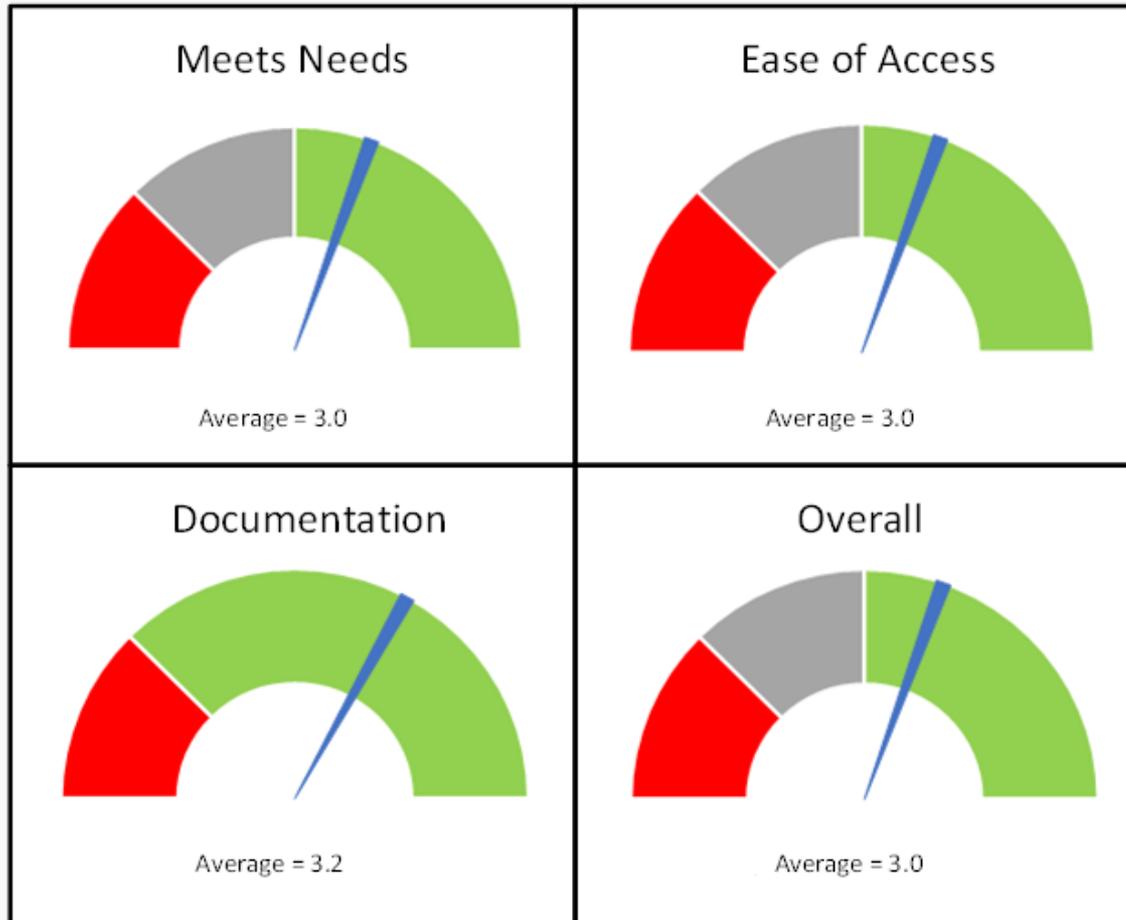
- More data and modeling for the Freely Associated States.
- Two other respondents indicated that gaps exist but did not provide additional details.

Examples of use

- “We have used "Assessing relative resilience potential of coral reefs to inform management in the Commonwealth of the Northern Mariana Islands" to help build support for implementing sustainable finance mechanisms for the Micronesia Challenge.”
- As a predictor variable in defining assemblage composition or fish stock status.
- Metapopulation structure
- Link between larval fish movement and connectivity.
- Management decisions, education and outreach

Coral Physiology or Genomics

(Top five for 8/119; 4 answered specific questions)



Coral Physiology or genomics:

Most Common Uses (n=4): Management decisions (100%)

Items that Respondents Liked

- Research on early life history by Miller and Woodley.

Items needing improvement

- Address topic of species identification uncertainty.
- Coordination between principal investigators and managers.

Data that are missing

- “PIRO has developed detailed descriptions of species ID uncertainty for ESA-listed Indo-Pacific corals, and will hold a workshop on this topic in June 2016 (funded by CRCP).”

Examples of use

- ESA decision-making.