

FishPath Tool User Guide

The Nature Conservancy

Last updated: February 07, 2020

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FISHERIES

Chapter 1

Introduction

1.1 Motivation for Developing the FishPath Tool and FishPath Process

Sustainable fisheries management tends to be underpinned by harvest strategies that specify a predefined relationship among data collection programs, assessment methods, and management measures. However, only a small fraction of the world’s fisheries has these management systems in place, with resource- and data-limited fisheries facing significant challenges in their development. Notable recent progress has been achieved in the development of stock assessments and other data-limited tools, but outstanding challenges for data-limited fisheries lie in developing fully articulated harvest strategies, which includes determining, linking, and implementing appropriate options. Understanding the full suite of available data collection, stock assessment, and management measure options and choosing the options most appropriate for each fishery is an often-daunting process, given the full landscape of options. Exacerbating the challenge of numerous options, data-limited fisheries are often simultaneously capacity-limited. In addition, small-scale fisheries have unique characteristics and challenges, requiring unique and tailored plans, and where “silver bullet” approaches that do not fully consider the entire fishery’s unique challenges must be avoided. An enormous challenge lies in making fisheries technical information, resources, and harvest strategy support tools accessible, simple, and structured, while not oversimplifying the innate complexity and nuanced aspects of each individual fishery setting as to the detriment of the fishery and fishery participants.

FishPath was developed as a collaboration between The Nature Conservancy (TNC), the U.S. National Oceanic and Atmospheric Administration (NOAA), and Australia’s Commonwealth Scientific and Industrial Research Organisation (CSIRO). FishPath is an approach for setting fisheries on the path to sustainability. The FishPath approach is something that everyone working in fisheries tries to do anyway — try and figure out what to do with what you have. It is simply a highly organized and inclusive way to do it and should be the entry point of any fisheries management development.

FishPath includes a stakeholder engagement process which is underpinned by the FishPath tool. The FishPath process aims to engage stakeholders and build capacity to develop predefined fisheries harvest strategies that are tailored to local conditions and challenges. The FishPath tool supports the process of narrowing down and identifying viable components of the management strategy. However, the FishPath tool, while providing advice on narrowing the viable list of harvest strategy options, does not make the final selection or articulate the details of, evaluate, and implement the harvest strategy. It is strongly encouraged that users work with trained facilitators from the FishPath Coaches Network to facilitate this process and use resources found within the FishPath tool that identify appropriate tools for carrying out the harvest strategy.

1.2 FishPath Tool Overview

The FishPath tool is an online decision-support tool that streamlines the process for identifying options for the 3 central components of a harvest strategy, specifically, the appropriate options for data collection programs, stock assessments, and management measures (or harvest control rules).

To do this, FishPath tool users answer a series of multiple-choice questions regarding social, economic, operational, biological, ecological and governance characteristics of the fishery, including available data. User responses then flag key assumptions, considerations, and cautions for each option contained in the FishPath tool, which provides customized advice on the appropriateness of any option for the fishery of interest. The results section provides a guided process for narrowing down available options to a short list to be more formally considered for inclusion in a harvest strategy (Figure 1.1). Users can also learn about each option through details, resources and links within the tool.

1.3. PURPOSE AND INTENDED AUDIENCE OF THE FISHPATH TOOL USER GUIDE

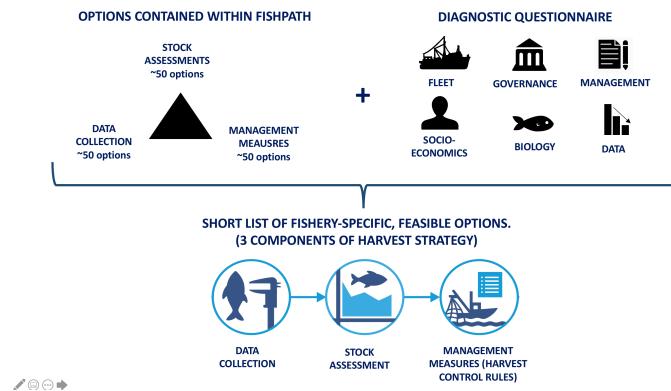


Figure 1.1: The FishPath tool at a glance.

It is important to understand what the FishPath tool does and does not do. First, the FishPath tool is not quantitative – it does not input, upload, or analyze data. The FishPath tool does not use an underlying model and is not a simulation or stock assessment tool. The FishPath tool does aid in the process of identifying a short list of viable options, but it does not prescribe a single, preferred option for each harvest strategy component. Rather, it encourages critical evaluation of an identified subset of options. The FishPath tool provides a standardized, transparent, and efficient platform for users to build the foundation of a harvest strategy for data-limited fisheries. The FishPath tool content undergoes continual updates to include the latest fisheries science and practitioner information. FishPath tool users may submit content suggestions at support@fishpath.org.

1.3 Purpose and Intended Audience of the Fish-Path Tool User Guide

The purpose of the FishPath Tool User Guide is to orient users to the FishPath tool, explain the functionality of tool features, and provide succinct guidance on applying the tool to different fishery contexts. The FishPath Tool User Guide is for fishery practitioners interested in using the FishPath tool to select and review appropriate harvest strategy options. The ultimate goal is to embed the fully articulated harvest strategy within a Fishery Management Plan (outside the scope of the FishPath Tool User Guide).

The FishPath tool is applicable in a variety of settings. Examples range from a large, inclusive FishPath stakeholder engagement where the tool is used in a multi-stakeholder setting, small expert groups, individual (“desktop”) use for harvest strategy development or review, and research related to individual components of a harvest strategy, such as selection of an assessment method or details about specific data collection or management measure options. The impact of the tool greatly depends on the context it is used, being most effective in a multi-stakeholder process and lead by experienced practitioners. The use of the tool can also be adapted to work with multi-species fisheries, multi-fleet fisheries, and in selecting current and future scenarios. Guidance on using the tool in these contexts will be incorporated into future versions of the user guide.

Chapter 2

Starting the FishPath Tool

Importantly, the FishPath tool requires a consistent internet connection to access the questionnaire, save answers, and interact with results.

2.1 Welcome Page

When a user navigates to <https://fishpath.org/>, a welcome page is displayed with two prompts: “Create an Account” or “Login” (Figure 2.1).

2.2 Creating a FishPath Account

Upon selecting “Create an Account”, a pop-up window appears with the following fill-in fields (Figure 2.2). An asterisk denotes mandatory information.

- Email*
- Password* (create a password)
- Organization Type*
- Organization
- Your Name*
- Country*

Note that the email and password fields are case sensitive.

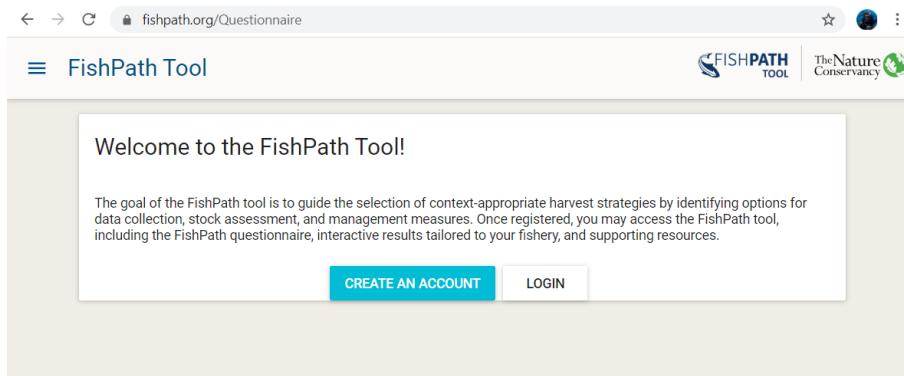


Figure 2.1: Welcome page of the FishPath tool.

This information is used to track user origin and the use of the FishPath tool. At this account creation stage, the user is also prompted to read and accept the Terms of Service of the FishPath tool, developed by The Nature Conservancy (Appendix B).

After reading and accepting the Terms of Service, the user will be directed to their FishPath Tool Dashboard page. The user will receive a confirmation email of account creation. After account creation, whenever the user returns to the Welcome Page of the FishPath tool, the user may simply “Login” with their email address and password (Figure 2.3).

2.3 FishPath Tool Dashboard

After creating an account (new user) or logging in (existing user), the user is directed to the FishPath Tool Dashboard (Figure 2.4), or the user’s “home-page” of the FishPath Tool. On the FishPath Tool Dashboard, users view 4 headings:

1. “**FishPath Tool User Guide**”, which contains detail on using the FishPath Tool and interpreting results.
2. “**My Fisheries**”, which provides a list of the user’s current list of fisheries they have started or completed in the tool. Users may access their fisheries at any time through this section, and return to in-progress FishPath questionnaires or results pages;

The screenshot shows a web browser window for the FishPath tool at fishpath.org/Questionnaire. The title bar says "FishPath Tool". The main content area is titled "Create an Account". It includes a "Please Note:" section with a note about private beta status and early access requests. Below this are fields for "Email *", "Organization Type *", "Password *", "Organization", "Your Name *", and "Country *". A large paragraph below the fields details the terms of use and data handling. At the bottom are "CANCEL" and "CREATE AN ACCOUNT" buttons.

Figure 2.2: “Create an Account” screen of the FishPath tool.

The screenshot shows a web browser window for the FishPath tool at fishpath.org/Questionnaire. The title bar says "FishPath Tool". The main content area is titled "Welcome to the FishPath Tool!". It includes a brief description of the tool's purpose. Below this is a "Login" form with fields for "Email" (containing "fisheriesscientist@university.org") and "Password" (a masked input). There is also a checkbox for agreeing to the "Terms of Service". At the bottom are "CANCEL" and "LOGIN" buttons.

Figure 2.3: Login Page of the FishPath tool.

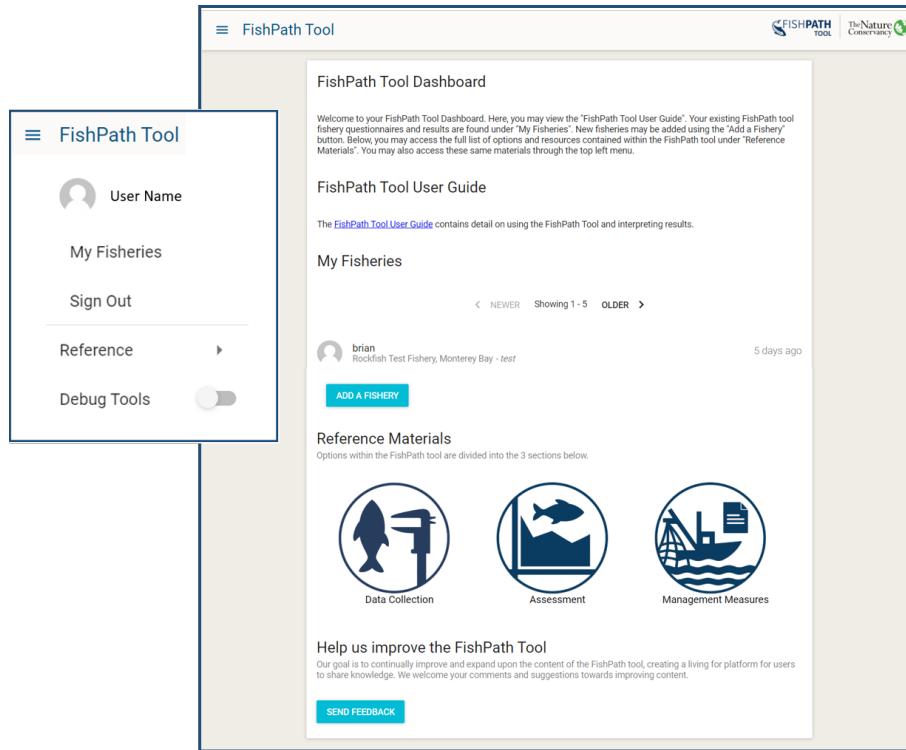


Figure 2.4: FishPath Tool Dashboard, or the homepage for FishPath tool users. The pop out shows the FishPath Tool Dashboard drop-down menu.

3. “**Reference Materials**”, which provides a list of all options contained in the FishPath tool with details and reference materials;
4. “**Help us improve the FishPath Tool**”, which allows the user to send feedback to the FishPath team.

When a user clicks the “FishPath Tool” menu in the top left corner, a drop-down display allows the user to navigate to various options (Figure 2.4). The “Reference Materials” tab displays all of the options contained in the FishPath Tool.

2.4 Adding a New Fishery

Selecting the blue button “Add a Fishery” allows users to start a new fishery in the FishPath tool that will be added to their account. First, a pop-up

“Fishery Information” screen appears to prompt users to define the fishery of focus (Figure 2.5), using the fields below. This information is used to better understand the use of the FishPath tool, provide high-level aggregate information about fishery characteristics, and to help users define the fishery to which they will be applying FishPath, so that answers will be directed at that fishery only. Multi-species, multi-fleet and other more complicated fisheries can require special consideration when approaching the questionnaire (guidance will be added to this document at a later date).

- Fishery Common Name(s):
- Genus / Species:
- Fleet and Gear Type(s):
- Geographic Area of the Fishery:
- Check all that apply: Multispecies fishery; Stock crosses management boundaries (transboundary); Multi-sector/fleet
- In what context is the FishPath Tool being used for this fishery?
 - Facilitated workshop with multiple stakeholder groups (e.g. scientists, fishers, managers)
 - Facilitated workshop with predominantly one stakeholder group (e.g. most participants are from the same fisheries agency)
 - Individual user with previous FishPath workshop experience
 - Individual user without previous FishPath workshop experience
 - Exploratory test run

Upon selecting “Submit”, the user is prompted to select one of the 3 harvest strategy components (sections) of the FishPath Tool (Data Collection, Assessment, Management Measures) and begin the FishPath tool questionnaire (Figure 2.6). Users can complete and review results from these sections independently. A pencil in the upper-right corner allows users to edit the fishery information (input in Figure 2.6) at any time.

Fishery Information

Please fill out the fields below to define the fishery under consideration. These characteristics are important to consider when filling out the FishPath questionnaire.

Fishery Common Name(s)	Geographic Area of the Fishery
Genus / Species	<input type="checkbox"/> Check all that apply
Fleet and Gear Type(s)	<input type="checkbox"/> Multispecies fishery <input type="checkbox"/> Stock crosses management boundaries (transboundary) <input type="checkbox"/> Multi-sector/fleet

In what context is the FishPath tool being used for this fishery?

Facilitated workshop with multiple stakeholder groups (e.g. scientists, fishers, managers)
 Facilitated workshop with predominantly one stakeholder group (e.g. most participants are from the same fisheries agency)
 Individual user with previous FishPath workshop experience
 Individual user without previous FishPath workshop experience
 Exploratory test run

[CANCEL](#) [SUBMIT](#)

Figure 2.5: The “Fishery Information” screen for adding a new fishery in the FishPath tool.

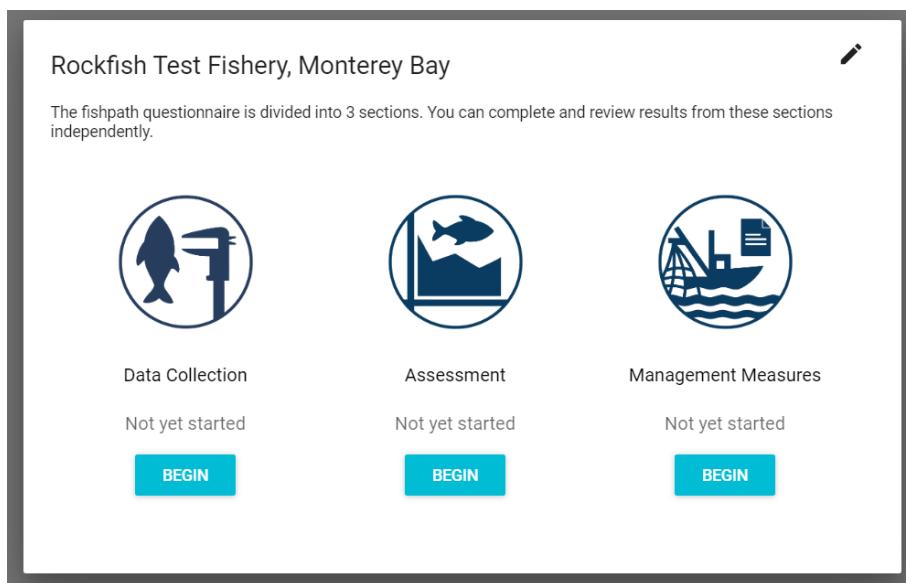


Figure 2.6: The “Fishery Information” screen for adding a new fishery in the FishPath tool.

Chapter 3

FishPath Tool Questionnaire

The goal of the FishPath tool questionnaire is to elicit information about all aspects of the fishery. This information leads to the activation of assumptions, cautions and considerations for each option. Across the three sections (Data Collection, Assessment, and Management Measures) the user answers a series of ~110 questions. Questions are categorized in 6 categories, which indicate the nature of the information in the question:

1. Biology/Life History
2. Data Availability
3. Governance
4. Management
5. Operational Characteristics
6. Socio-Economic

Some questions span multiple sections of the questionnaire (i.e. they are relevant in considering multiple components of a harvest strategy). To avoid duplication, such questions, once answered, will show as completed when beginning any subsequent section in which they occur.

At any time, the user may close and later return to their session via their “My Fisheries” dashboard. Any submitted answers will be saved with a consistent internet connection. Once the user has completed an individual section, which may only be achieved by providing responses to all questions in that section, the user may either complete a subsequent section or view results from the completed section. Results for any section become available

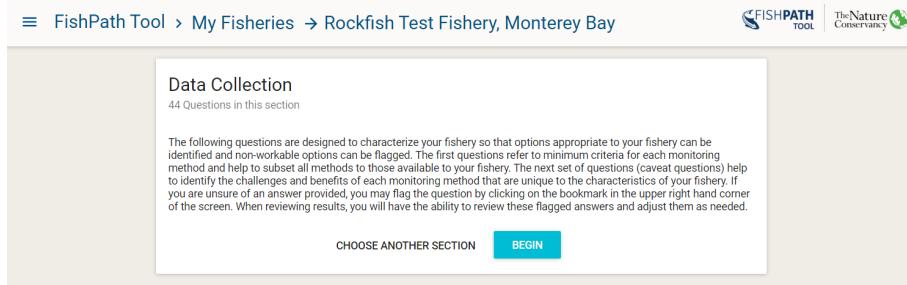


Figure 3.1: Data Collection section overview.

once the user has completed the respective questionnaire. The questionnaire is periodically updated by the FishPath team to reflect the latest fisheries science, so users may need to answer any new questions when returning to a fishery before reviewing results of associated sections.

After viewing the entry screen to the FishPath questionnaire (Figure 2.6), the user selects one of the 3 sections. An overview screen will appear with the name of the section, the number of questions associated with that section, and a short guidance on answering the questions (Figure 3.1). The user can then choose to “Begin” the section or “Choose Another Section”.

3.1 Criteria and Caveat Questions

In the FishPath tool, questions are designated as either “Criteria” or “Caveats” or both, which refers to how question responses are linked to options contained within FishPath.

A Criterion question is used to determine whether the fishery meets a minimum qualification required to apply an option. Whether the fishery meets the minimum (or often multiple) criteria for each option is indicated in the results window (see Results sections below). For example, in the “Assessment” section of the questionnaire, there are questions about data quality, quantity, and data type for the fishery, which correspond to the minimum levels required to enable each type of assessment method. Upon answering a “criteria question” about, for example, fishing effort data, within the Assessment section (Figure 3.2), the fishery will be scored in the results section according to whether it meets that particular minimum level of effort data required by particular assessment options. The Results section reports

Assessment > **Data Availability**

Question #8 (7 of 47 questions completed) - Criteria

ADD BOOKMARK  TAKE A NOTE 

What time series exists of length composition data?

The resolution of length categories or bins needs to be fine enough so that cohorts are discernible. Two or three size categories such as "big", "medium" and "small" is insufficient for the purposes of this question.

This question refers to data from either fishery-dependent or fishery-independent sampling.

0: Absent
 1: Snapshots/intermittent/inconsistent reporting
 2: Time series with flaws such as missing years of major or peak catch, missing major fleets/metiers or is generally poorly sampled (i.e., high uncertainty).
 3: Partial time series that includes major/peak years of catches from major fleets/metiers.
 4: Full time series since fishing began

[PREVIOUS](#) [NEXT QUESTION](#)

Figure 3.2: Example “criteria” question in the Assessment section of the FishPath Questionnaire.

not only whether or not each criterion is met, but also gives an indication, via subjectively assigned traffic light color scales, as to the degree the criteria is met, and provides guidance as to the level of uncertainty associated with that particular required input. Criteria questions are not included in the “Management Measures” section. While a management measure option may be ill-advised because it violates assumptions (i.e., “caveats”), there are no prohibiting factors that would prevent any single option being implemented, if so desired. Conversely, one cannot undertake certain assessments or forms of data collection without meeting minimum requirements.

Questions whose responses invoke “caveats” will not eliminate or retain options, but rather invoke subjectively assigned traffic light-colored warnings, or positive attributes, against specific options. These are intended to speak to issues that do not necessarily prohibit the option’s feasibility, but that should be given explicit consideration, and the ability to address each should be determined, before deeming the option is best suited to the fishery. As with the criteria questions, these are presented in the results section of the FishPath tool with explanatory text.

3.2 Anatomy of a FishPath Tool Question

(Figure 3.3) provides an example of a FishPath question screen:

1. At the top of the screen , the **section** is shown (either Data Collection, Assessments, or Management Measures).
2. The section is followed by the **question category** (i.e., Biology/Life History, Data Availability, Governance, Management, Operational Characteristics, or Socio-Economic).
3. A sub-heading identifies whether the question is a “**criteria**” or a “**caveat**” question.
4. The sub-heading also indicates the **number of questions answered** and remaining within that section.
5. For the Data Collection section only, it is also stated whether the question pertains to either issues of “**representation**” or “**implementation**”. This helps users to understand the intent of the question, by identifying whether the question has ramifications for the form of data collection in terms of its either ability to obtain representative data, or in its ability to be effectively implemented.
6. There is the ability to “**Bookmark**” the question. A bookmark flags questions for ease of later revisiting (Figure 3.4). A question may be bookmarked for reasons such as if the answer is unknown, it needs further consideration or input, is in dispute, or if the user feels the question is critical. As all questions must be answered in order to review results, adding a bookmark allows users to provide an interim response that may be revisited in the results section, once the user can evaluate the relative impact of their response.
7. Users can “**Take A Note**” on a question (Figure 3.4). Notes can be taken for a variety of reasons such as to clarify why a certain response was given, to capture important discussion had about a question, why the question was bookmarked or noting a response requiring further research. Notes can later form an important part of draft harvest strategy development, and, by providing justification for the response, can maintain traceability and replicability. When connected to the internet, all notes made will be saved into FishPath and available to the user for reference.
8. At the bottom of the screen, the user may advance to the **next question** or return to the **previous** question.

Data Collection > Operational Characteristics

Question #8 (7 of 43 questions completed) - Caveat

This question pertains to issues of representation.

No
 Yes

PREVIOUS **NEXT QUESTION**

Figure 3.3: Anatomy of a FishPath tool question.

Data Collection > Operational Characteristics

Question #8 (7 of 43 questions completed) - Caveat

This question pertains to issues of representation.

BOOKMARKED TAKE A NOTE

Do fishing activities (regardless of current management) correspond with the spatial extent of the fishable stock?

The purpose of this question is to ensure that data collection will be representative of the entire stock. An example of lack of representativeness would be if fishing activities take place only near the coast, but the stock extends far offshore.

No
 Yes

Notes

PREVIOUS **NEXT QUESTION**

Figure 3.4: Example FishPath tool question with “Bookmark” (green) and “Take a note” (text box) functionality selected.

3.3 Subjective Questions

While the majority of questions within FishPath are intended to be answered definitively (objective), certain questions are subjective in nature. The latter typically request a user response in the form of a perceived ranking (e.g. “low”, “moderate”, “high”). Most such questions invoke caveats and, when all caveats are considered together, the relative impact of those invoked by subjective questions can be evaluated. In this way, priority can be assigned to whether the response requires further consideration and debate, or whether it is of little relative significance in determining the most viable harvest strategy options. Further discussion can then be focused on the most appropriate issues.

Generally, the best approach to take when completing the questionnaire is to aim to do so relatively efficiently, without overtly laboring or debating over any one question. If in doubt, the question can be bookmarked, and notes can be taken, for easy revisiting later. The transparency of the FishPath tool is such that users will be able to see explicitly how their response to any one question influences the results (by invoking criteria or caveats), and to readily change their answer if so desired . Moreover, the aim of the questionnaire is to obtain an overall profile of the fishery’s characteristics, so as best to inform the choice of harvest strategy option. As such, questions may pertain to only a few options, or they may not invoke strong caveats. The goal is to appraise the fishery as a whole, as opposed to myopically focusing on any single question.

3.4 Completing the Questionnaire

Upon completing or exiting any of the three sections, a summary screen appears with the status of relative completion. Users review their result for completed sections, or otherwise continue the questionnaire (Figure 3.5).

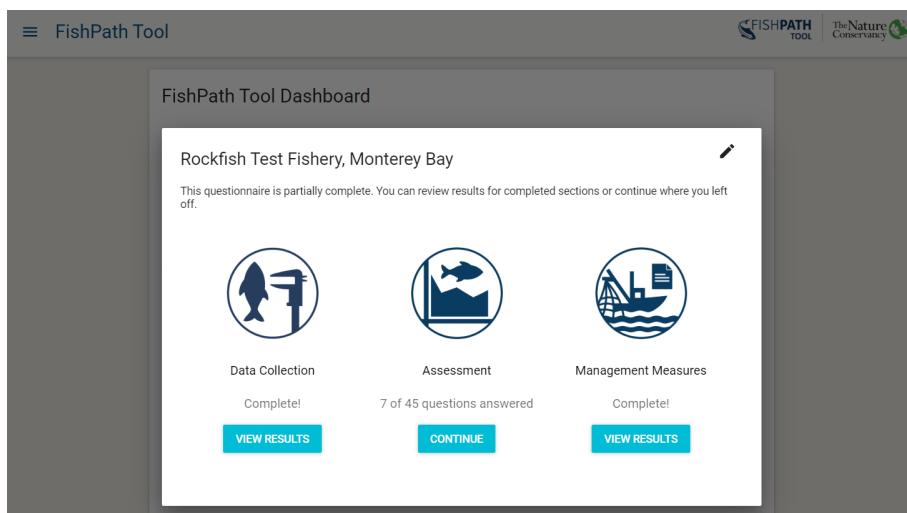


Figure 3.5: Summary window of the 3 FishPath questionnaire sections, showing questionnaire progress.

Chapter 4

FishPath Tool Results Overview

Each of the three sections of the results can be accessed individually without needing to complete all three sections. If a user has not completed the questionnaire in at least one of the sections, they will be prompted to return to finish the section questionnaire before accessing results (Figure 3.5).

4.1 Data Collection Section Results

The Data Collection section allows the user to understand viable alternate means of collecting information, and the broad type of data that may be collected. In a harvest strategy context, a data collection program defines the method and the type of data that will be collected on the species of interest. The collection of these data is critical for informing stock status. Fishery data are used to either glean empirical performance indicators or inform a quantitative assessment.

The FishPath tool covers a range of data collection mechanisms (from market surveys, to logbooks and observer programs). These data collection mechanisms are subdivided according to the broad category of data that may be collected, as these influence the viability of the data collection option. The four data categories in the FishPath tool are: 1) biological information; 2) data that yield a basic understanding of the fishery; 3) data that can inform temporal trend analyses (data time series), and 4) data that are of a sufficient quality to inform a model-based stock assessment.

4.2 Assessment Section Results

The Assessment section of the FishPath tool allows the user to understand which data-limited stock assessment methods are available and best suited to their fishery. In the FishPath tool, an assessment is defined as any analysis or performance indicator that gives useful information for management by direct or indirect measures of stock status. This could range from a “cause for concern” arising from expert judgement, qualitative risk assessments, values of empirical indicators relative to pre-defined trigger levels, multiple indicator frameworks, to life history analyses that provide estimates of fishing mortality, F , or fishing mortality at maximum sustainable yield FMSY, catch-only models, size or length based approaches, to population dynamics model-fitting approaches that estimate biomass.

4.3 Management Measure Section Results

A management measure is the form of control used to manage the fishing mortality. Once the desired management measures have been identified (for example, size limits, or catch adjustments in response to quantitative assessment outcomes), they are adjusted via “decision rules”, or “harvest control rules”. These specify the strength and nature of the pre-agreed management action to be taken given the status of the fishery, as determined by the assessment. Management measures can take many forms including spatial, temporal, effort, catch, and gear related restrictions. The FishPath tool does not have any minimum criteria listed for management measures, but instead uses cautionary caveats: while there may circumstances that point to an option being ill-advised, there are no hard-prohibiting factors, per se, that would prevent any single option being implemented. Multiple management measures can and should be used together. The FishPath tool results do not prescribe or give guidance on the specific form of the harvest rule, nor the strength of adjustment in response to assessment outcomes. However, FishPath does direct users to tools that can support in this process.

Chapter 5

FishPath Tool Interactive Results Page

Upon completion of the questionnaire for any section, the user is directed to the FishPath Tool Results Review page (Figure 13). The results are presented separately for each of the 3 sections, or harvest strategy component: 1) Data Collection; 2) Assessment; and 3) Management Measures (Figure 13, shown in dark blue bars near top of screen).

This interactive page has four main components:

1. **Results support tools** to share, export and copy results;
2. A **results table** of all the options contained in FishPath with their criteria and caveats;
3. **Questionnaire Summaries** (“Influential Answers” and “See All Answers”)
4. A step-wise **results narrowing process**.

While the general structure of the results pages is the same across all three sections, each has unique differences. Here, the results table and results narrowing process are described in general. This is followed by sections that describe the details unique to each of the three sections.

<TODO: UPDATE FIG 13 TO HAVE NUMBERS> (add link to this in 5.4)

5.1 Results Support Tools

At the top of the Results Page, the user may either “Share”, “Export”, or “Copy” the results for their fishery (Figure 13).

1. **Share:** This will generate a link that allows the user to share a fishery with someone. The user simply needs to send the link and the recipient will have view-only access to this fishery from their active account. A shared fishery can be saved under someone else’s FishPath account, and they can make a copy of it to separately edit, if needed. Tip: when creating a copy of a shared fishery in a user account, it is useful to rename the fishery so that edits are tracked under this new name.
2. **Export:** This allows users to export the question and answer list from the saved questionnaire, as well as a simple results file, as a .csv file.
3. **Copy:** This allows users to make a copy of a fishery’s results, be these their own, or from a shared link. To rename that fishery and edit it under a different name, the user should select the “Edit Name and Details” button.
4. **Edit Name and Details:** This allows users to edit the information entered on the Fishery Information form (name, species, geography, etc.)
5. **Generate Report:** Allows the user to create a .PDF of the FishPath results, with all notes captured. The report provides detailed information on each option and their associated caveats and criteria related to the fishery. Users can select to see a report for the “full list” of options, or for a specified list of “top options”. This process of identifying top options is detailed below.

<TODO: ADD FIG 13>

5.2 Results Table

The results table lists all the available options for the section of interest in rows. Each row summarizes the criteria met and failed, and the caveats invoked (see also “Criteria and Caveat Questions” section above). Each option can be selected and expanded to view its description and results in more detail. A guide to the content contained in each row is listed below.

Notes	Criteria	Caveats	Data Category	Option
hide		Biological information		Port/Landing-Site Monitoring

Figure 5.1: Headings of the FishPath tool results table.

5.2.1 Table Structure

Figure 5.1 displays a single row from an example results table. The single row represents one option in the FishPath tool, and the details of this single row are as follows:

- **Hide/Unhide:** Any option for which one or more of its minimum criteria have not been met by the fishery is automatically “hidden” (greyed-out) by the FishPath tool. For any option, including those not meeting minimum criteria, users may manually click this link to “hide” the option, or click “hidden” or reinstate it.



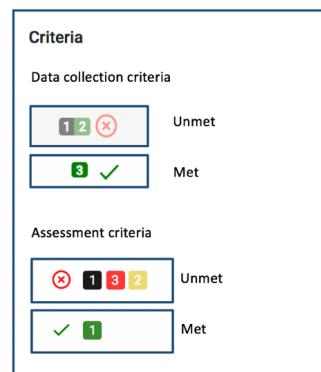
- **Notes:** As within the questionnaire, notes may be written and saved (with a secure internet connection) for each option. For example, notes may be taken on fishery-specific details (not covered within the questionnaire) on why that option may or may not be a good fit, or to record the user’s or user groups overall evaluation of the option, given its associated criteria and caveats. Alternatively, notes may be taken if options are hidden or reinstated, to justify that choice as documentation. Notes are included in the PDF report.

Notes



- **Criteria (Data Collection and Assessment sections):** The criteria column provides information on whether the fishery meets the minimum conditions required to undertake the option. As explained

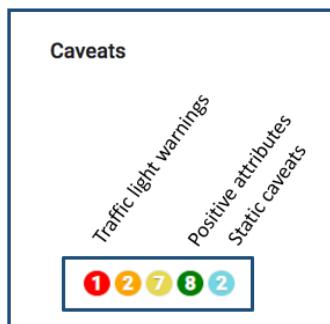
above, the Management Measures section does not include criteria. If the fishery has met all of the minimum criteria required for the option, a green check is displayed. On the other hand, if a fishery has not met one or more of the minimum criteria required for the option, a red X is displayed (and the option is automatically “hidden”). The numbered boxes next to the red “X” indicate the number of criteria met (green) and unmet (black). For the assessment section only, criteria also have associated “traffic light” colored (black, red, orange, yellow, green) guidance to encourage FishPath users to explicitly consider the possible uncertainty associated with the quality of their fishery’s information (with black equating to a minimum criterion not having been met). The numbers within in each symbol, are the subset of the total criteria for that option that were not met (black), and that invoked (red, orange, yellow) uncertainty warnings, and positive attributes (green) , as triggered by questionnaire responses.



- **Caveats:** The format of the caveats column is identical across all three sections. Caveats are shown as colored circles with numbers indicating the total number of questionnaire responses that invoked a caveat of that particular color. There are three types of caveats:
 1. **Cautionary, or warning caveats:** these are marked as red, orange, and yellow circles with the severity or strength of the caveat corresponding to the color (red being highest). These give cautionary guidance based on an attribute of a fishery. For example, if the user responded that the species of interest is susceptible to barotrauma, this would invoke a red caveat against size limits

as a management measure, since the fishing-induced mortality of the released (under- or over-sized) fish would render size limits ineffective.

2. **Positive attributes:** A green colored caveat provides reasoning for why the option might be well-suited for the fishery on the basis of a user response in the questionnaire.
3. **Static caveats:** Turquoise colored caveats are static caveats that need to be considered for an option, regardless of the fishery or the questionnaire responses. A static caveat is independent of specific fishery circumstances and as such are always present. These include key assessment assumptions, for example, that the assessment option assumes that fishery selectivity has not changed over time, or that the assessment method cannot explicitly address uncertainty.



- **(Data) Category:** The Category column allows the user to view the options by categories. This column is different for each section. In the Data Collection Section, this column is titled “Data Category”, showing the four categories of the type of data that may be collected (see also “Data Collection Section Results” above). In the Assessment Section, this column is titled either “Input-Based Category” or “Output-Based Category”, reflecting two sorting options available for organizing the assessment option results. In the Management Measures Section, this column is simply titled “Category” and displays the categories of management measures.
- **Option:** This is the name of the option being considered.

5.2.2 Full Option Details

Each row in the Results Table displays the option name with summarized results for each option. When users click on any option, a pop-up box appears, which provides full details of the option itself, together with the detail of the criteria and caveats invoked.

First, a description of the option is provided, together with relevant references, and contact information (if available or appropriate). For the Data Collection options, the types of data that may be collected using the option are summarized. For the Assessment section, where available, links to assessment packages are provided.

Next, the invoked criteria and caveats are summarized by (Figure 5.2)

- Criteria not met,
- Met criteria,
- Cautionary caveats,
- Positive attribute caveats, and
- Static caveats

Next to each, there are individual drop-down menus where the user can find the specific detail on each individual criterion and caveat, along with the question and response that invoked the criterion or caveat.

Criteria drop-down box (Figures 5.3-5.4): Each criterion drop-down shows the relevant question with the user's response shown (highlighted in black) relative to the minimum required level for that option (where green coloring starts on left) (Figure 5.3). The Assessment section assigns traffic light colors to levels above the minimum, indicating their relative uncertainty and thus the relative caution that should be taken (Figure 5.4).

Caveat Drop-Down Box (Figures 5.5-5.7): Each individual caveat box displays the FishPath question with the user's answer in grey text, followed by caveat text related to the use of the option in the fishery in the context of that particular question response. The color of each box reflects the caveat color (see caveat descriptions above): cautionary caveats shaded yellow, orange or red; positive attributes shaded green; and static caveats shaded in turquoise.

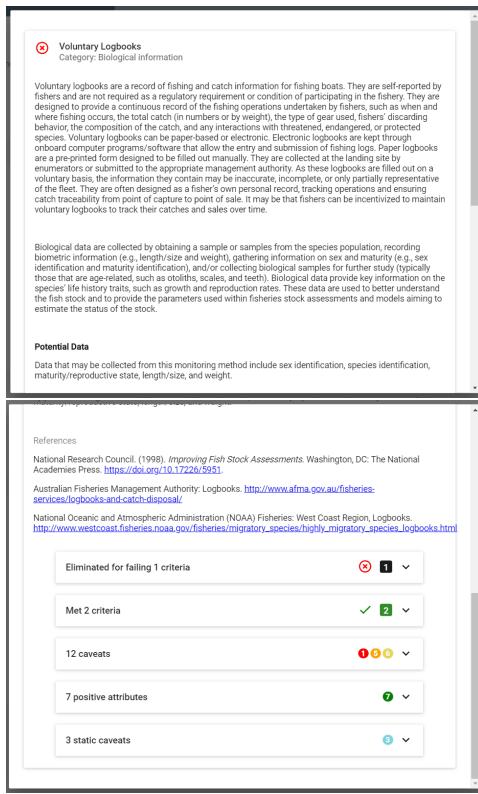


Figure 5.2: Example of pop-up box that appears when clicking on each option.

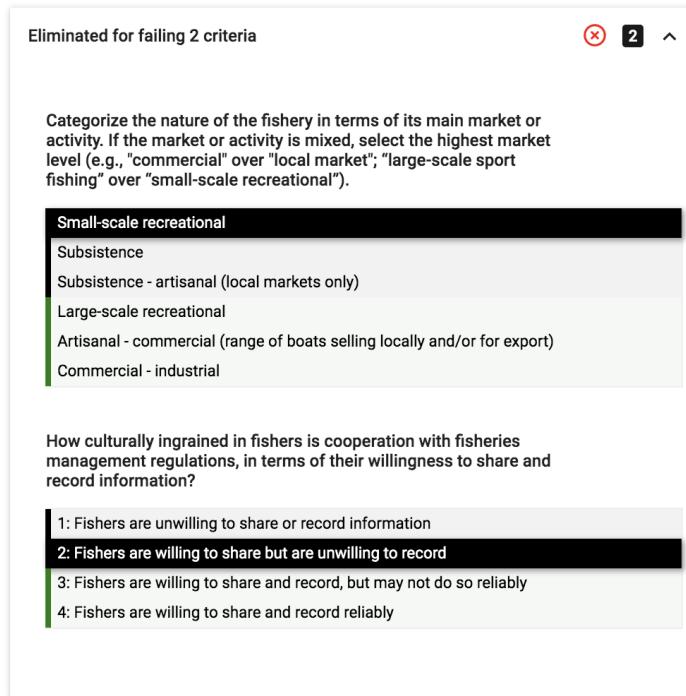


Figure 5.3: Example drop-down menu with details for an option in the Data Collection section that was eliminated for failing two criteria. The bold, black box and white text indicates the user answer to the question. The black answer options indicate those that result in elimination if selected. The green answer options indicate those that would have resulted in acceptance if selected.

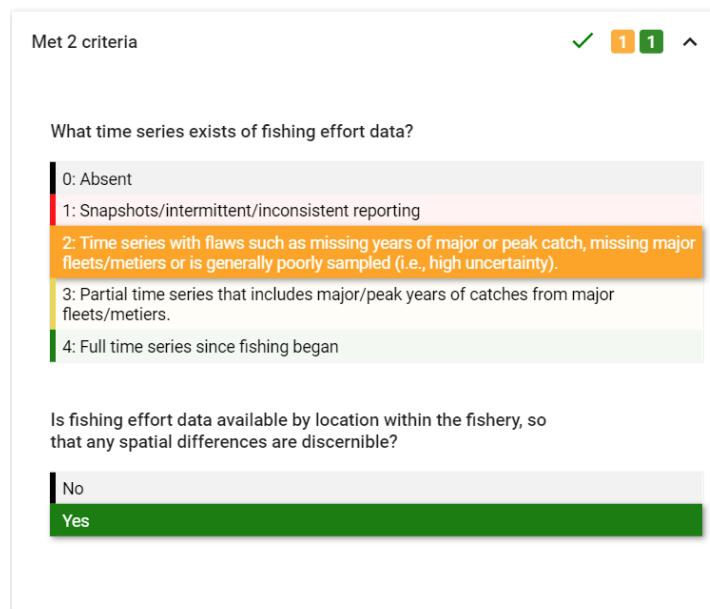


Figure 5.4: Example drop-down menu with details for an option in the Assessment section that has passed criteria, but indicating the user to take caution regarding the uncertainty in the fishing effort data. Red indicates high uncertainty in the data. Green indicates low uncertainty.

8 caveats 2 6 ^

Rank the current or potential research and/or institutional capacity to implement and maintain a formal harvest/management strategy (i.e., data collection, assessment, management measures).
Low-moderate

ⓘ This option may require moderate research or institutional capacity, but may be lower if low number of participants.

Are fishers, or can fishers be, incentivized/motivated to be involved in a data collection program?
No

ⓘ Will require strong community leadership (e.g. via cooperatives/associations) and/or strong governance

Is the fishery open access, as opposed to limited entry?
Intermediate

ⓘ May be difficult with open access component

Are there existing fishing cooperatives or associations (or clubs, organisations, or social media platforms) that could provide a starting point for building fisher cooperation?
No

ⓘ Will be difficult without strong governance

Are regulations enforced, and, if they are enforced, are the regulations respected and complied with?
Yes, but not respected

ⓘ If governance/enforcement is not trusted or respected, fisher information may be biased.

Figure 5.5: Example caveat drop-down menu with details for an option for which questionnaire responses invoked 8 cautionary caveats (2 orange, 6 yellow, as shown at the top right corner of the drop-down menu).

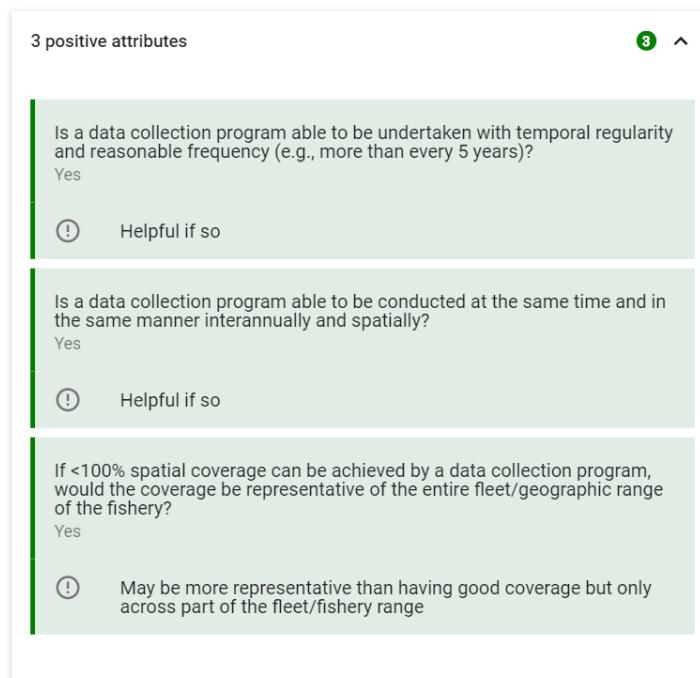


Figure 5.6: Example drop-down menu of positive attributes for an option for which questionnaire responses invoked 5 positive attributes (shown at the top right corner of the drop-down menu).

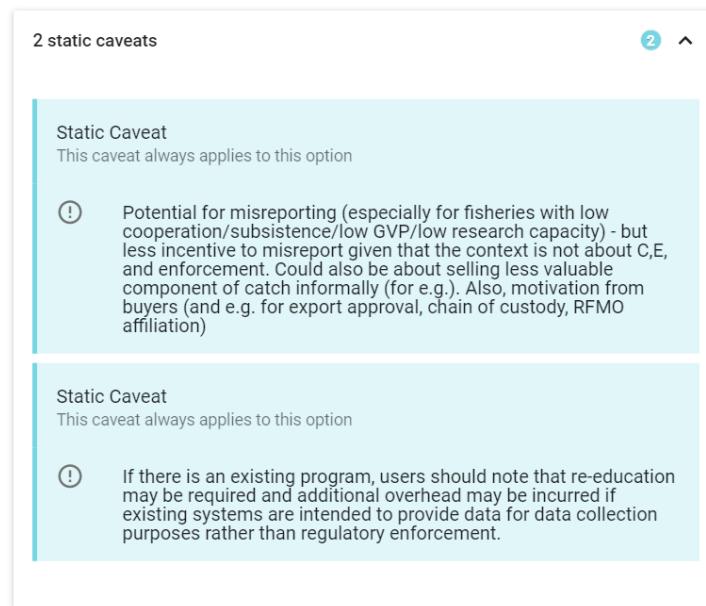


Figure 5.7: Example static caveat drop-down menu for an option with 3 static caveats (shown at the top right corner of the drop-down menu). Each individual static caveat box displays grey text to note “This caveat always applies to this option”, and a short explanation of the static caveat.

5.2.3 Filters and Sorting of Results Table

The “Filters and Sorting” functionality allows the user to arrange and view the options in different ways. This does not affect the results or shortlisting of options; it is merely a means to organize and display the results. All three sections have the same filter and sorting functions. The Assessment section has an additional option to select between two categories to sort and display: “Output-Based Category” (i.e., according to the general type of output generated by the assessment method or option); or “Input-Based Category” (i.e., according to the main form of input required by the assessment or option).

After clicking “Filters and Sorting”, a pop-up box (Figure 5.8) appears with the ability to sort the options by:

- **Default Order:** The default sort is to list all options that did not meet minimum criteria at the bottom (automatically greyed out as hidden options), with the options for which the highest number of cautionary caveats were invoked at the top for review.
- **Customized Sort Order:** This maintains the current sort order but allows users to return to the results table and “drag and drop” options into the preferred order.
- **Sort by option name:** Sorts options alphabetically by option name.
- **Sort by category:** Sorts options alphabetically by category name. For the Assessment section, users first select the Category Display that they want to display and sort by.

Clicking a Sort option automatically sorts the options on the screen. After making selections on the Filters and Sorting page, users can click outside of the pop-up onto the results table to return to the results. The “Show hidden options” functionality allows users to display or not display those options that have been “hidden” (greyed out) in the results table.

5.3 Summaries of Questionnaire Responses

If the user scrolls to the bottom of the results screen (below results table), they are provided with a summary list of the questions bookmarked by the user, together with a list of “Influential Answers”, and, finally, a “See All Answers” link.

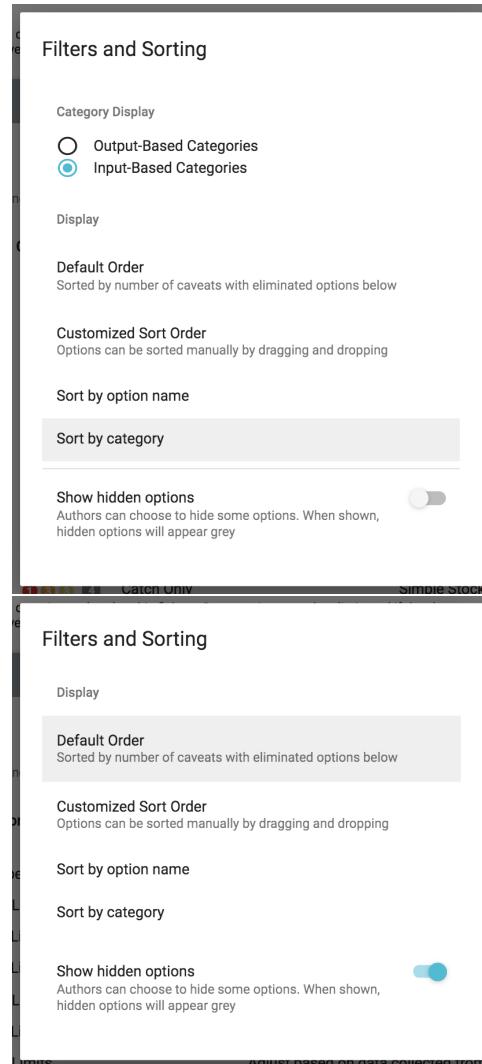


Figure 5.8: The “Filters and Sorting” pop-up boxes in the results pages from the A) Assessment section and B) Data Collection and Management Measure sections. The Assessment section includes the additional functionality select between two categories for display and sorting.

Flagged Questions

These answers were flagged for later review.

- Is the level of illegal, unregulated, or unreported fishing such that the stock or species of interest is affected to the extent that a data collection program would not be able to capture the extent of fishing mortality?
Yes
- If <100% spatial coverage can be achieved by a data collection program, would the coverage be representative of the entire fleet/geographic range of the fishery?
Yes

[SEE ALL ANSWERS](#)

Figure 5.9: List of flagged questions.

5.3.1 Flagged Questions

All questions that were “bookmarked” during the questionnaire will be listed here (Figure 5.9). Users can select each question to get a detailed list of all caveats invoked or criteria not met based on the response. Users can also select each question to change the answer, add notes, or remove bookmark. It is highly recommended to review these questions and invoked caveats so that users can update their response or provide more detailed notes on the response, based on seeing how the response impacts results.

5.3.2 Influential Answers

The “Influential Answers” list is a summary of the questions and user responses that invoked the most eliminating criteria (by number), together with the number of caveats and criteria invoked, by assigned traffic light color (Figure 5.10). The caveats invoked by the question are displayed (color strength and number) to its left.

It is recommended to review this list prior to entering the results narrowing process (described below), to better understand some of the key challenges facing the fishery. Users can select any question on this list to change an answer, add notes to the question, and see a list of all impacted options and their associated caveats (Figure 5.11).

At the bottom of these lists, there is a link to “See All Answers” (as well as at the top of the results screen under “Answers”). These links take users to a full list of answers from each section, showing all information, including the number of caveats invoked, and any flagged questions. This is a good resource for users wanting to review the questionnaire responses for a fishery.

Influential Answers

These answers eliminated many options and/or triggered caveats for other options.

- 14 15 Rank the current or potential research and/or institutional capacity to implement and maintain a formal harvest/management strategy (i.e., data collection, assessment, management measures).
Low-moderate

Do you have a basic understanding of the general life-history strategy of the species? (E.g., whether it is fast-growing, highly-productive, and short-lived, or if it is slow-growing, slow to mature, and long-lived?)
No

What time series exists of removal data for this fishery, and at what level of usability/completeness?
1: Snapshots/intermittent/inconsistent reporting

- 1 Does the species follow a boom-and-bust population cycle?
No

- 37 When data are collected (for intended use within an assessment), are they representative of the operational characteristics of the fleet(s) or fishers? If no data have been collected, could future data collection efforts for use within an assessment be representative of the fleet or fishers as a whole?
No

Figure 5.10: List of influential answers.

Can the sex of the species be determined (with or without causing the animal's death)?

If the sex ratio of the catch is unable to be determined, sex-based management regulations cannot be implemented.

Yes
 No

This answer impacts 8 options

! Basic understanding of the fishery - Electronic Monitoring: Shore-based cameras
Caveat - Cannot capture information that could be used to sex animals

! Basic understanding of the fishery - Electronic Monitoring: Vessel monitoring systems
Caveat - Cannot capture information that could be used to sex animals

ADD NOTE CANCEL **SAVE**

Figure 5.11: Impacted options for a question.

5.4 Results Narrowing Process

Typically, the FishPath questionnaire process results in a long list of potential options that are presented to the user. The challenge is to then refine this to a workable shortlist of options that can be reviewed in further detail, and around which a draft harvest strategy can be developed. This can be a daunting task, given the number of options, and the large amount of detail around the criteria and caveats invoked against each. As such, the Results Review provides guidance as to how to undertake the task of narrowing the list of viable harvest strategy components.

The Results Narrowing process prompts the user through a series of steps to further refine and narrow the options for their fishery, and to consider detail about the application of each option in the fishery. The goal is to finish with a short list of defensible, appropriate and documented options for the fishery.

First, the user accesses the Results Narrowing process by selecting the “Review Top Options” button located above the Results Table in the Results Screen.(See figure 13)

<TODO: Add link to fig 13>

After clicking on “Review Top Options”, the user is directed to a step-wise results review process (Figure 5.12). Each step of the results review process contains an “Instructions” box with clear steps, as well as the ability to access different steps of the results review process through “Back”, “Exit Review” and “Next Step” (Figure 5.12). Across the top of the page, the user views steps in the process:

The narrowing process (done as a group exercise or by independent users), consists of the following major steps:

1. **Option Retention (Figure 5.13):** The goal of the first step is to hide all options that are clearly not viable for the fishery due to failure to meet minimum criteria, logistical, political, or other major reasons. Users should carefully review the list to hide these options, as well as un-hide options that they want to reinstate. Specific instructions are included on the screen in this step of the process, including questions to consider as narrowing the list.

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The screenshot shows the FishPath Tool interface for 'Rockfish Test Fishery, Monterey Bay - Data Collection'. At the top, there are three tabs: 1. Option Retention (selected), 2. Identification of Top Options, and 3. Critical Evaluation of Top Options. Below the tabs is a section titled 'Instructions' with a list of 5 steps for narrowing down options. A 'FILTERS AND SORTING' button is located at the top right of the main table area. The main table has columns: Top Option, Notes, Criteria, Caveats, Data Category, and Option. The data in the table is as follows:

Top Option	Notes	Criteria	Caveats	Data Category	Option
hide	○	□ ✓	● ● ● ● ●	Biological information	Port/Landing-Site Monitoring
hide	○	□ ✓	● ○ ○	Basic understanding of the fishery	Market Surveys
hide	○	□ ✓	● ○ ○	Temporal trend analyses (data time s...)	Market Surveys
hide	○	□ ✓	● ○ ○	Basic understanding of the fishery	Port/Landing-Site Monitoring
hide	○	□ ✓	● ○ ○	Temporal trend analyses (data time s...)	Port/Landing-Site Monitoring

At the bottom of the screen are 'BACK', 'EXIT REVIEW', and 'NEXT STEP' buttons.

Figure 5.12: Overview of the FishPath Tool results screen and results review process.

This screenshot shows the 'Option Retention' step of the results review process. It features the same header and tabs as Figure 5.12. The 'Instructions' section contains the same 5-step guide. The main table is identical to the one in Figure 5.12, showing five rows of data. The 'FILTERS AND SORTING' button is also present. At the bottom are 'BACK', 'EXIT REVIEW', and 'NEXT STEP' buttons.

Figure 5.13: Step 1, Option Retention, in the results review process.

The screenshot shows a software interface for the 'Identification of Top Options' step. At the top, there are three tabs: 'Option Retention' (with a checkmark icon), 'Identification of Top Options' (highlighted with a yellow circle containing the number 4), and 'Critical Evaluation of Top Options'. Below the tabs, there's a section titled 'Instructions' with the following text:

Next, we want to work through the remaining options and prioritize (star) the "top" options. Starring an option will automatically move it to a short-list for detailed exploration. Star options that are:

1. Already being implemented that will continue to be considered or evaluated.
2. Being considered for future implementation or options that stakeholders would like to explore in detail. This includes options not currently available, but could become available under desired scenarios.
3. Listing a high proportion of positive (green) attributes relative to warning (yellow/orange/red) caveats.
4. Of interest in any other regard.

Below the instructions, there's a section titled 'Additional considerations:' with two bullet points:

- Considering key deficiencies or weaknesses in existing data collection protocols. Also consider how existing protocols could be expanded or improved.
- Avoiding unnecessary (and costly) overlaps (repeated sources of data), while acknowledging the value of corroboration across multiple sources of information.

At the bottom of the screen are three buttons: 'BACK', 'EXIT REVIEW', and 'NEXT STEP' (which is highlighted in blue). Below these buttons is a table with the following data:

Top Option	Notes	Criteria	Caveats	Data Category	Option	FILTERS AND SORTING
				Temporal trend analyses (data time s...)	Port/Landing-Site Monitoring	
				To inform model-based stock assess...	Independent Surveys: By researchers, performed regularly	
				Temporal trend analyses (data time s...)	Processor Monitoring	
				Basic understanding of the fishery	Market Surveys	
				Basic understanding of the fishery	Interviews	
				Basic understanding of the fishery	Port/Landing-Site Monitoring	

Figure 5.14: Step 2, Identification of Top Options, in the results review process.

2. Identification of Top Options (Figure 5.14): In this step, users review each remaining option to identify a short list of starred options that will be seriously considered and explored in more detail. Users should familiarize themselves with the sorting feature and the influential answer list (see above) to facilitate this process. When comparing options, users should compare the number of cautionary caveats and criteria, their relative strength, and the ratio of cautionary caveats to positive attribute caveats. Specific instructions are included on the screen in this step of the process.

3. Critical Evaluation of Top Options (Figure 5.15): In the final step, users can more critically evaluate the top options by considering each criterion and caveat in complete detail, and, potentially, ranking the options in order of potential. To facilitate this process, users can export a report that lists the top options and all of their details.

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The screenshot shows a software interface for the FishPath Tool. At the top, there is a navigation bar with three items: 'Option Retention' (with a checkmark), 'Identification of Top Options' (with a checkmark and the number '4' in a red circle), and 'Critical Evaluation of Top Options' (with a checkmark). Below the navigation bar, there is a section titled 'Instructions' containing the following text:

Next, we want to take a detailed review of the Top Options, and undertake thorough considerations of caveats.

1. For each of the Top Options, consider the caveats in detail: identify whether, and how, each caveat would be overcome.
2. If applicable and if desired, one can rank the options using the drag and drop function.

Below the instructions, there are three buttons: 'BACK', 'EXIT REVIEW', and 'FINISH'. A 'FILTERS AND SORTING' button is also present. The main area displays a table with the following data:

Notes	Criteria	Caveats	Data Category	Option
1	✓	1 2 3 4	Temporal trend analyses (data time s...	Port/Landing-Site Monitoring
2	✓	1 2 3 4	Basic understanding of the fishery	Interviews
3	✓	1 2 3 4	Temporal trend analyses (data time s...	Processor Monitoring
4	✓	1 2 3 4	To inform model-based stock assess...	Independent Surveys: By researchers, performed regularly

At the bottom of the main area, there are three buttons: 'BACK', 'EXIT REVIEW', and 'FINISH'.

Figure 5.15: Step 3, Critical Evaluation of Top Options, in the results review process.

Appendix A

FishPath Tool Frequently Asked Questions

How do I submit feedback about content or user experience?

FishPath benefits from the expertise and feedback of the global community of FishPath tool users. Users are encouraged to submit feedback about the FishPath tool, ultimately helping to improve the tool. There are three ways to submit feedback:

1. Submit issue on GitHub
2. The “Help us improve the FishPath tool” button on FishPath Tool Dashboard. The user is prompted to categorize their feedback as “Content Related” or “Software Issue”.
3. Email support@fishpath.org

How is my feedback addressed and incorporated?

The FishPath Tool undergoes periodic updates to ensure that the tool reflects the latest fisheries science and management information. User-submitted feedback and suggestions, as well as information from periodic reviews of the tool, are collated and synthesized by the FishPath Core Team and addressed and incorporated.

How often is the FishPath tool updated?

Every 6 months.

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How will I know about updates to the FishPath tool?

All FishPath users will receive an email every 6 months when updates are published. Common changes that users may expect are the addition of new options and questions. When they revisit the FishPath tool, they may need to answer new questions to see results and they may have new options in the results.

Are answers to new questions also updated in “copied fisheries”?

Once a fishery is copied, changes in the original or copied fishery will have no effect on the other.

Appendix B

Terms of Service

Last revised on October 23, 2018

The Nature Conservancy (“TNC,” “we,” “us,” or “our”) are pleased to provide FishPath and related software, data, websites, instructions, and services (“FishPath”) to you. If you are using FishPath on behalf of a business (such as your employer), that business accepts these terms of service (“Terms”) by your use. In that case, the words “You” and “Your” in these Terms refer to both you and that business.

The Terms govern Your access to and use of FishPath, so please carefully read them and Our Privacy Policy before using FishPath. By registering on the FishPath websites and using FishPath, You agree to be bound by these Terms and by our Privacy Policy. If You don’t agree with these Terms and our Privacy Policy, You cannot use FishPath or FishPath data in any way or at any time.

FishPath Data: Your Rights and Your Privacy

We developed FishPath as a user-friendly application to help users diagnose the challenges in their fishery and select appropriate options for data collection, stock assessment, and management measures. FishPath allows You to use Your fishery information (Your “Submission”). Your Submission to FishPath is voluntary. If You submit information to FishPath, these Terms do grant us the right to see and use Your Submission to improve the functionality of the tool as appropriate. We may copy and share an

anonymized aggregation of information from submissions, potentially including Your Submission, with the public. However, we will not share Your submission nor Your information in any non aggregated format.

Please refer to our Privacy Policy for a description of how we collect, use and disclose FishPath information, including Your Submission. We have the right to withdraw or change FishPath. As we describe below, we will not be liable to You if for any reason all or any part of FishPath is unavailable at any time or for any length of time.

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- probe, scan, tamper with, or test the vulnerability of FishPath or any of our systems or networks;
- avoid, breach, deactivate, impair, or circumvent any security or authentication measures, including those that protect FishPath and its data;

- attempt to decipher, decompile, disassemble or reverse engineer any of the software used to provide FishPath;
- interfere with, or attempt to interfere with, the access of any user, host or network, including, without limitation, by sending a virus, overloading, or flooding FishPath;
- encourage or enable anyone else to do any of the foregoing.

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THE ABOVE EXCLUSIONS AND LIMITATIONS OF DAMAGES ARE FUNDAMENTAL ELEMENTS OF THE BASIS OF THE BARGAIN BETWEEN YOU AND US.

Indemnity

You agree to release, indemnify, defend and hold harmless TNC, our subsidiaries and affiliates, and our and their respective officers, directors, agents, partners and employees, from and against any claims, disputes, demands, liabilities, damages, losses, and costs and expenses, including, without limitation, reasonable legal and accounting fees arising out of or in any way connected with (i) Your access to or use of FishPath, (ii) Your Submission, or (iii) Your violation of these Terms.

Termination

We may terminate Your access to and use of FishPath, at our sole discretion, at any time and without notice to You. Upon any termination, discontinuation or cancellation of FishPath, all provisions of these Terms that by their nature should survive will survive. This includes, for example ownership provisions, warranty disclaimers, and limitations of liability.

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These Terms are the entire and exclusive agreement between You and us regarding FishPath, and they supersede any prior agreements between You and us regarding FishPath.

These terms do not create any third party beneficiary rights. You may not assign or transfer these Terms, by operation of law or otherwise, without our prior written consent. Subject to the foregoing, these Terms will bind your successors and permitted assigns. We may freely assign or transfer these Terms without restriction.

If You do not comply with these Terms, and we do not take action right away, this does not mean that we are giving up any rights that we may have to take action in the future or seek all available remedies.

If it turns out that a particular provision of these Terms is not fully valid or enforceable, that provision will be enforced to the maximum extent permissible, and this will not affect any other Terms.

All claims arising out of this Agreement or relating to FishPath will be governed by the laws of the State of California, excluding the application of its conflicts of law rules. Any legal action or proceeding arising out of this Agreement or relating to these Services shall be brought exclusively in a state or federal court in or for San Francisco, California. You agree that any and all disputes, claims and causes of action arising out of, or connected with these Terms or Your Submission shall be resolved individually, without resort to any form of class action.