Limit Reference Points and the Fish Stocks Provisions

Joint TESA/NOG Workshop

Chairpersons: Julie Marentette & Tim Barrett

November 29, 2021

Overview

1	• Welcome & Housekeeping • Objectives & Agenda
2	• FSPs, LRPs & You • Pre-Requisite Survey
3	• Today's Activities

Welcome and Introductions

Your Co-Chairs:

Julie Marentette
Sr. Science Advisor (NCR)

Tim Barrett
Research Scientist (MAR)

Your Workshop
Coordinators:

Mary Thiess
Science Advisor (NCR)

Melissa Olmstead
A/Sr. Science Advisor (NCR)

A "*TESA/NOG Workshop*"?

TESA: Technical Expertise in Stock Assessment

- National DFO Science committee with the objective to promote stock assessment excellence through delivering national activities (including courses and workshops)
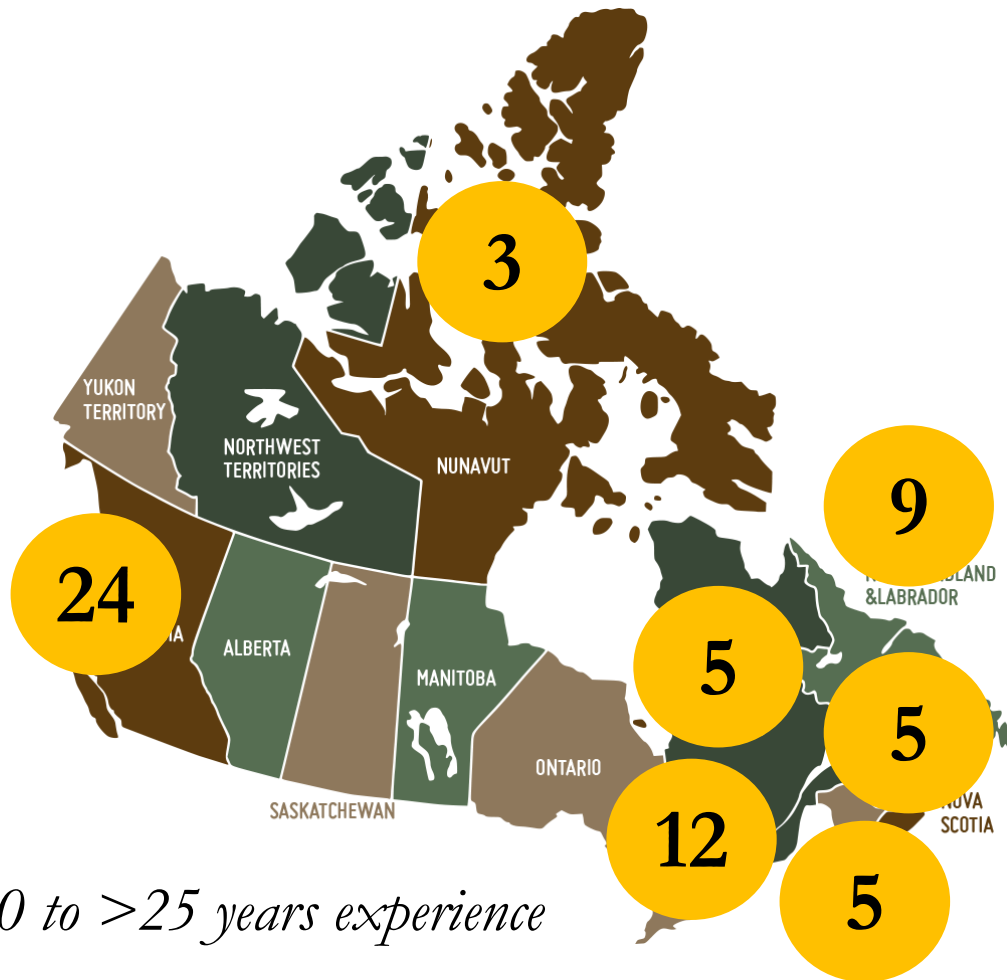
NOG: National Operational Guidelines Task Force

- National DFO Science group to develop Science sector guidelines in support of the Fish Stocks provisions
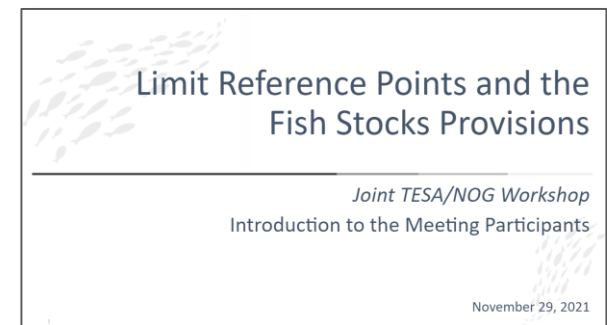
66 Participants

3

0 to >25 years experience

A. Robert Kronlund
(Interface Fisheries)

Sean Cox
(Landmark Fisheries)

Quang Huynh
(Blue Matter Science)

Limit Reference Points and the
Fish Stocks Provisions

Joint TESA/NOG Workshop
Introduction to the Meeting Participants

November 29, 2021
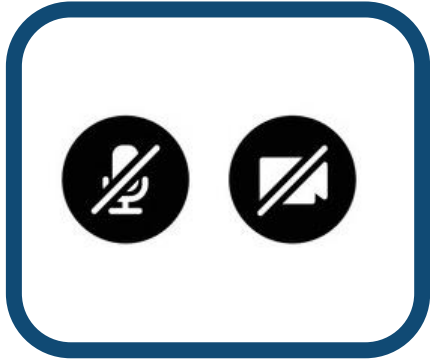
**Self-Introductions:
Thank you!**
(see Google Drive)

Housekeeping Notes

Please mute yourself and turn off camera when not speaking/asking questions (DFO staff may also wish to disconnect from VPN during workshop sessions)

This workshop will not be recorded (a TESA GitHub link will serve as a long-term repository for materials)

Housekeeping Notes

Break-out group data and exercise results do not apply to actual stocks; the principles and lessons learned may be common to many stocks.

Proceedings will capture workshop discussions and recommendations, but do not constitute peer-reviewed science advice

Housekeeping Notes

Questions will be addressed at the end of each presentation . To verbally ask a question or make a comment, please use the "Raise Hand" feature in MS Teams (& introduce yourself!), or add to the chat at any time

If you are having technical difficulties, please contact (via MS Teams or e-mail):
- **Mary Thiess** (Mary.Thiess@dfo-mpo.gc.ca)
- **Melissa Olmstead** (Melissa.Olmstead@dfo-mpo.gc.ca)

Workshop Objectives

1. To increase understanding and awareness of the requirements of the Fish Stocks provisions for Science, particularly with respect to LRPs and stock status;

2. To facilitate the sharing of knowledge and expertise on practical aspects of the process of (and some of the challenges associated with) selecting methods for defining LRPs and estimating stock status, and;

3. To explore and/or recommend possible considerations for national operational guidelines for stock assessment experts in setting LRPs and estimating stock status in a range of situations.

Workshop Agenda

Day 1: Monday, November 29, 2021		
10 min	Welcome, Introductions and Housekeeping	Chairs
30 min	*Talk:* The Fish Stocks Provisions, LRPs and You ● Review of pre-requisite survey feedback	Chairs
30 min	*Opening keynote talk:* Pushing the Limits: Part 1 - LRP Lessons from Three Pacific Stocks	Rob Kronlund
30 min	*Talk*: LRPs in American Lobster: Precaution under Uncertainty	Adam Cook
10 min	Break	--
1.5 hr	Breakout groups (Topic 1: Empirical/Data Limited Methods/Spatial Scale)	All

Day 2: Tuesday, November 30, 2021		
5 min	Welcome to Day 2	Chairs
35 min	Presentation from breakout groups ● 5 min per group, 6 groups	Breakout Group Leads
30 min	Discussion (group)	Chairs
30 min	*Talk:* The art and science of limit reference points with a few examples from Canadian fisheries	Sean Cox
10 min	Break	--
1.5 hr	Breakout groups (Topic 2: Data Rich Methods)	All

Workshop Agenda

Day 3: Wednesday, December 1, 2021		
5 min	Welcome to Day 3	Chairs
35 min	Presentation from breakout groups ● 5 min per group, 6 groups	Breakout Group Leads
30 min	Discussion (group)	Chairs
30 min	*Talk:* Time Varying Reference Points	Dan Duplisea
10 min	Break	--
1.5 hr	Breakout groups (Topic 3: Time Varying Productivity)	All

Day 4: Thursday, December 2, 2021		
5 min	Welcome to Day 4	Chairs
35 min	Presentation from breakout groups ● 5 min per group, 6 groups	Breakout Group Leads
30 min	Discussion (group)	Chairs
30 min	*Talk*: Accounting for parameter and structural uncertainty in stock assessment and MSE	Robyn Forrest and Sean Anderson
10 min	Break	--
1.5 hr	Breakout groups (Topic 4: Procedural Paradigms)	All

Workshop Agenda

Day 5: Friday, December 3, 2021		
5 min	Welcome to Day 5	Chairs
35 min	Presentation from breakout groups ● 5 min per group, 6 groups	Breakout Group Leads
30 min	Discussion (group)	Chairs
10 min	*Talk*: LRPs and Pacific Salmon	Carrie Holt
10 min	*Talk:* Visualizing reference points: Introduction to the Reference Point Calculator app	Quang Huynh
10 min	Break	--
30 min	*Closing keynote talk:* Pushing the Limits: Part 2 – Can LRPs Sustain Fisheries?	Rob Kronlund
2 hr	Summary and Synthesis	Chairs

Workshop materials can be found:

Google Drive (for this workshop): Link

TESA GitHub (long-term repository): Link

The Fish Stocks Provisions,

Limit Reference Points,
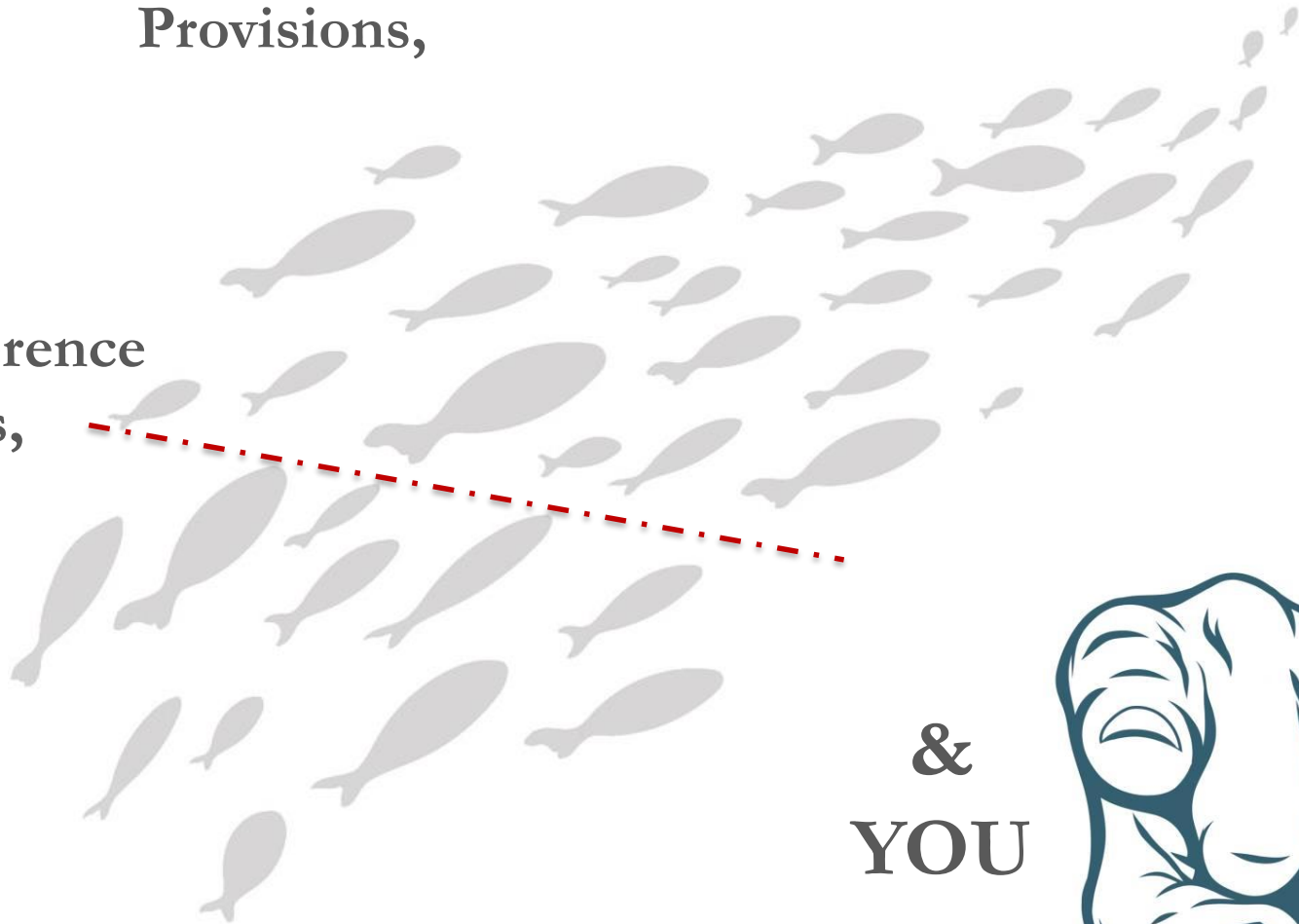
& YOU
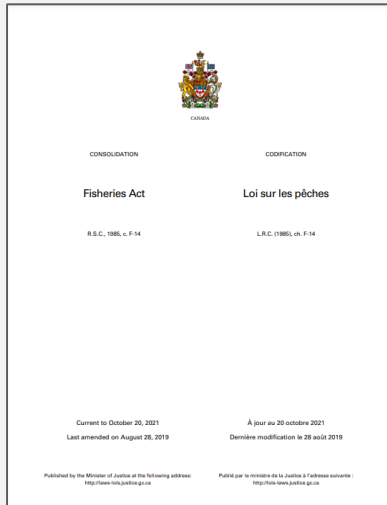
Changes to the *Fisheries Act* received Royal Assent on June 19, 2019

New! **Considerations (s. 2.5) and Fish Stocks Provisions (s. 6.1-6.3)**

FSPs interpreted in light of DFO Policies
Key Policy: "PA" Policy*

__A Fishery Decision-Making Framework Incorporating the Precautionary Approach__

The amendments introduce:

Fisheries management *objectives* for prescribed stocks	• At or above "level necessary to promote sustainability of the stock" • **Maintain/rebuild above the LRP** • Mitigating adverse socio-economic and cultural impacts
***Means* by which to achieve those objectives**	• Implement measures/a rebuilding plan • **Set a LRP**

The amendments introduce:

Information required to choose means/applicable provisions	• Socio-economic and Cultural Impacts • **Estimated Status relative to the LRP***
Considerations for decision-making	• Biology and environmental conditions (s 6) • A range of other considerations may also be taken into account (s 2.5)
New _Process Steps_ for management	• Major fish stocks subject to FSPs must be prescribed by regulation (s 6.3) • Include species and geographic coordinates

*_Triggers s 6.2 and requirement for a rebuilding plan_

To summarize the FSPs:

The way the FSPs are worded requires (only) one LRP and only one stock status determination (re: LRP) per stock **("one stock, one LRP")**

The **LRP** is also the only reference point mentioned in the *Act*, but it is not defined there.

Viewed through lens of PA Policy (2009)

Critical Zone | Cautious Zone | Healthy Zone

Removal Rate (y-axis)
Stock Status (x-axis)

❶ Limit Reference Point
❷ Upper Stock Reference
❸ Removal Reference
❹ Target Reference Point

In the PA Policy, a **"PA Framework"** is a decision-making system applicable to key harvested fish stocks, consisting of:

- **Objectives** (represented by various reference points and guidance for risk tolerance for preventable decline);

- **Associated monitoring labels** (status zones)*

- **Management measures** (including harvest strategies and harvest control rules where status can be an input)

The general aim is to avoid **serious harm to the stock** (conservation objective) while also achieving other fishery management objectives.

* Also used in the **Sustainable Survey for Fisheries:** strategic (institutional level) monitoring

The **Limit Reference Point** is part of:
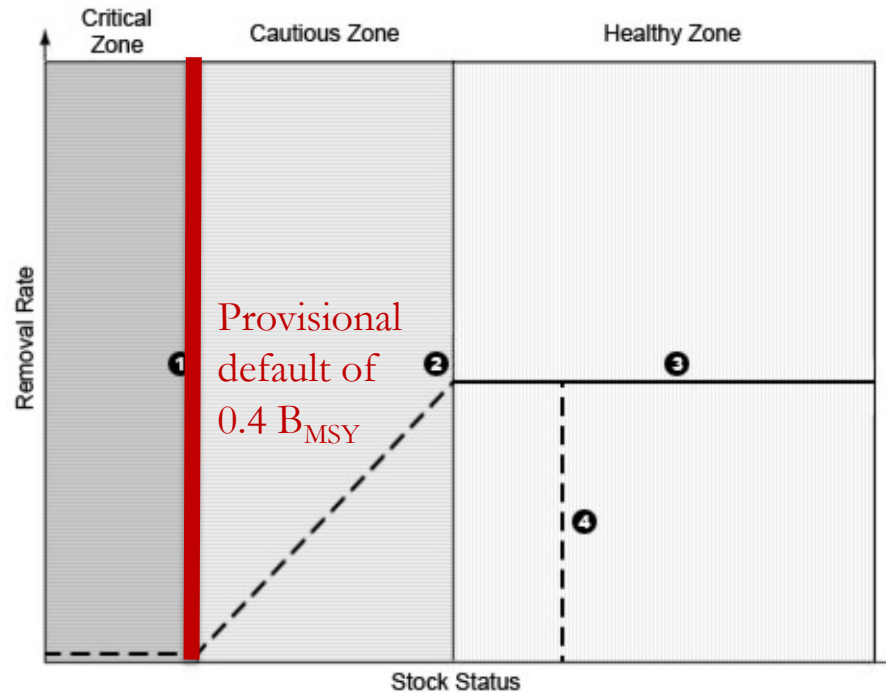
Critical Zone | Cautious Zone | Healthy Zone

Removal Rate (y-axis) / Stock Status (x-axis)

Provisional default of 0.4 B_{MSY}

❶ Limit Reference Point
❷ Upper Stock Reference
❸ Removal Reference
❹ Target Reference Point

Objectives
A threshold to (undesirable) states of serious harm

Status Metrics
Paired with stock status indicator to define "Critical Zone"

Management Measures
LRP often an operational control point for HCRs; Trigger for rebuilding plan (Policy **& FSPs**)

Implications of FSPs for Science

The LRP is the only PA element set by Science.

All other PA elements are set by fisheries managers informed by science advice and other considerations, including:

→ **Guidance tends to focus on threshold to serious harm and status metrics**

- other parts of 'serious harm' objectives such as **tolerable risks & timeframes**,

- **measures** to avoid /rebuild above the LRP, including its possible "other hat" as an OCP in an HCR

Implications of FSPs for Science

- **Renewed intensity of focus on LRPs (& estimated status re: LRP)**

  - ↑ number of stocks with LRPs to <u>enable</u> prescription, and;
  - Defensibility of choice of LRP after prescription

- **Meeting the "One stock, one LRP" Requirement to Prescribe Stocks**

  - Stocks are prescribed by species and geographical areas
  - One LRP and one estimated status per prescribed stock

Implications of FSPs for Science

For many stocks, **one LRP & status may not be a problem**, even if management unit (MU) does not align exactly with biological unit (BU) (and perfect alignment = rare)
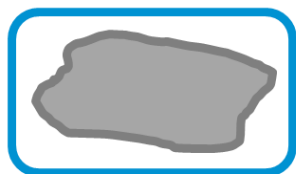
Biological Unit = Management Unit
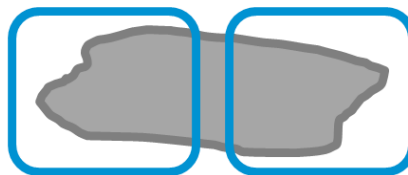
Biological Unit > Management Unit
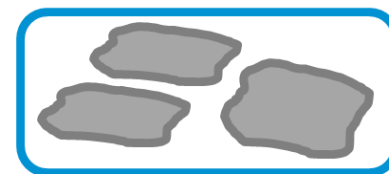
Biological Unit < Management Unit

The **more divergent MU versus BU**…

increased bias in reference points, misleading trends from indicators, risk of serial depletion, reduced ability to apply "traditional" view of LRPs as thresholds to serious harm …

even if overall harvest strategy aimed to achieve PA intent

Implications of FSPs for Science

Many assessments contain "**estimated status and trends**" as well as **forward-looking advice** to support choice of measures
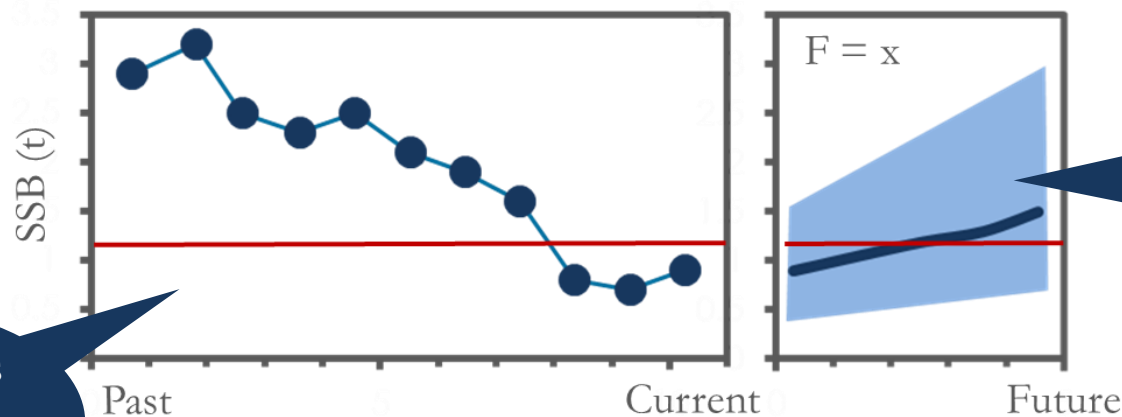
Determines if s 6.2 applies

Supports selection of management measures

These two pieces of advice:
- May not both be available for every stock
- May be emphasized differently across paradigms
- May or may not change with different ways to account for "biology and environmental conditions" in decision-making (ref pts vs measures)

Developing FSPs Guidance for Science

- New investments (2019-2024 and ongoing)

- Science Sector implementation includes

  - **Science National Operational Guidelines (NOG)**

  - Drafting via Task Force (experts from all regions)

  - Supported by a series of National Advisory Processes (2020-2024) and other events (workshops)

Fisheries and Oceans Canada
NATIONAL OPERATIONAL GUIDELINES
FISHERIES ACT: FISH STOCKS PROVISIONS

Ecosystems and Oceans Science Sector
DRAFT Version 0.2 – March 2021

Canada
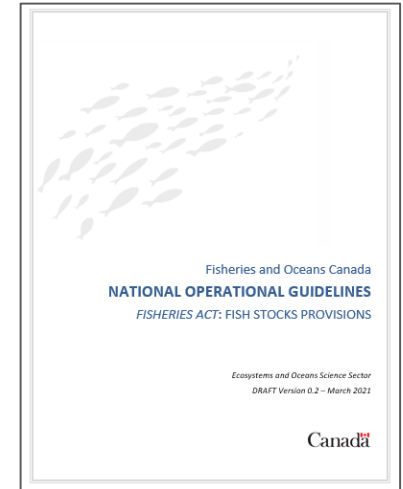
Rebuilding Plans	PA and FSPs	LRPs and FSPs
SAR 2021/006	SAR 2021/004	[2022]
RD 2021/051	RD 2021/057	

Important guidance also from **other initiatives** such as Ecosystem Approach to Fisheries Management (EAFM) Working Group

Technical guidance for Science will support the process of making choices, not prescribe them. It must be:

- **Flexible** enough to apply to diverse situations for Canada's major fish stocks

- **Consistent** with SFF/PA Policy (and any FSPs policies to come)

Basic Principles:
Minimum Criteria to Meet

Technical Cookbook:
Range of Options to meet them

Technical Considerations:
Pros, Cons, Caveats to Guide Choices

biology

data

paradigm

A whole "ocean" of inter-connecting circumstances to consider when operationalizing (and reporting on) an objective to avoid serious harm

management scale/regime

environmental conditions

biology

data

management
scale/regime

environmental
conditions
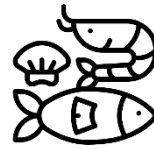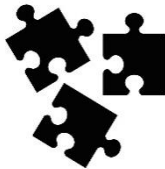
...ous harm

Not every topic can be covered in-depth in a single meeting

Workshop Technically Started Several Weeks Ago…

Pre-Requisite Activity
(now closed)

Pre-Workshop Exercise
(see GitHub / Google Drive)

Pre-requisite activity was designed to elicit input concerning:

1. What makes a **"good"** LRP/stock status indicator?)
    → *'Minimum criteria' aspect of guidance*
2. Inspire thinking about reasons why to pick a LRP/indicator.

1. Consistent with objective to avoid serious harm
2. Based on best available information
3. Operationally useful
4. Reliably estimated

Pre-Requisite Feedback: Summary Report
(see [GitHub](#)/[Google Drive](#))

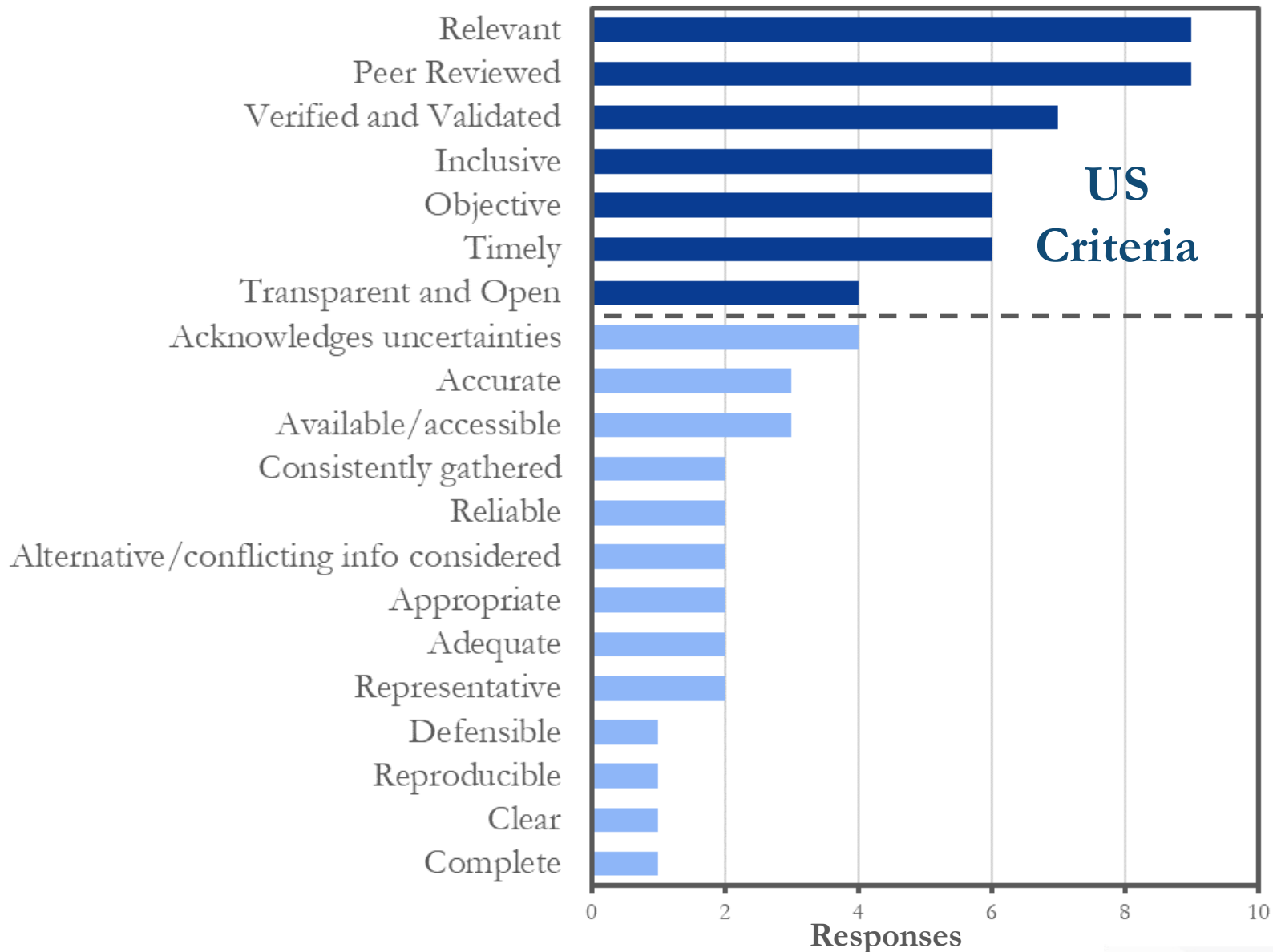# *Highlights:* **What is Serious Harm?**
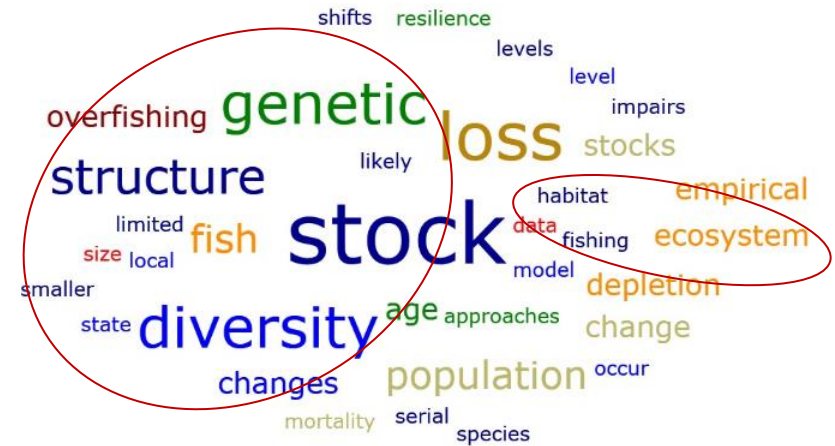
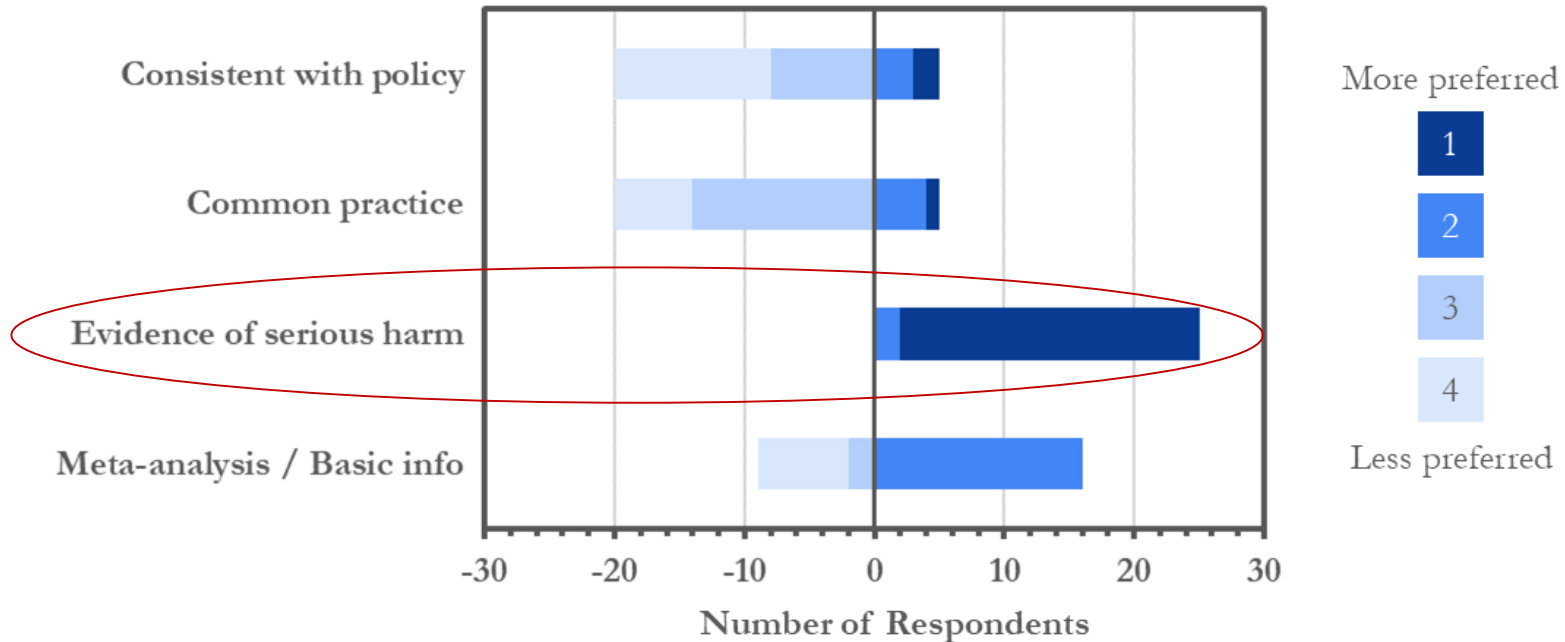

Traditional Definitions   *What Else?*

Biggest challenges for LRPs consistent with serious harm:
Data poverty, picking one LRP (or one indicator) from several
options, lack of stock-recruitment relationship, non-stationarity,
complex stock structure

Highlights: **"Best Available Information"**

US Criteria

Horizontal bar chart of Responses (x-axis 0 to 10):

- Relevant — 9
- Peer Reviewed — 9
- Verified and Validated — 7
- Inclusive — 6
- Objective — 6
- Timely — 6
- Transparent and Open — 4

(dashed line — US Criteria above)

- Acknowledges uncertainties — 4
- Accurate — 3
- Available/accessible — 3
- Consistently gathered — 2
- Reliable — 2
- Alternative/conflicting info considered — 2
- Appropriate — 2
- Adequate — 2
- Representative — 2
- Defensible — 1
- Reproducible — 1
- Clear — 1
- Complete — 1

x-axis label: **Responses**

Highlights: **Preferred Rationales**

Data that may be needed to diagnose serious harm:
Sufficient time series of catches and fishing mortality; declining or persistent low recruitment, surplus production or spawning biomass; contracting age/size structure; information on fecundity, growth, or natural mortality; a stock-recruitment relationship

Highlights: **Operationally Useful**
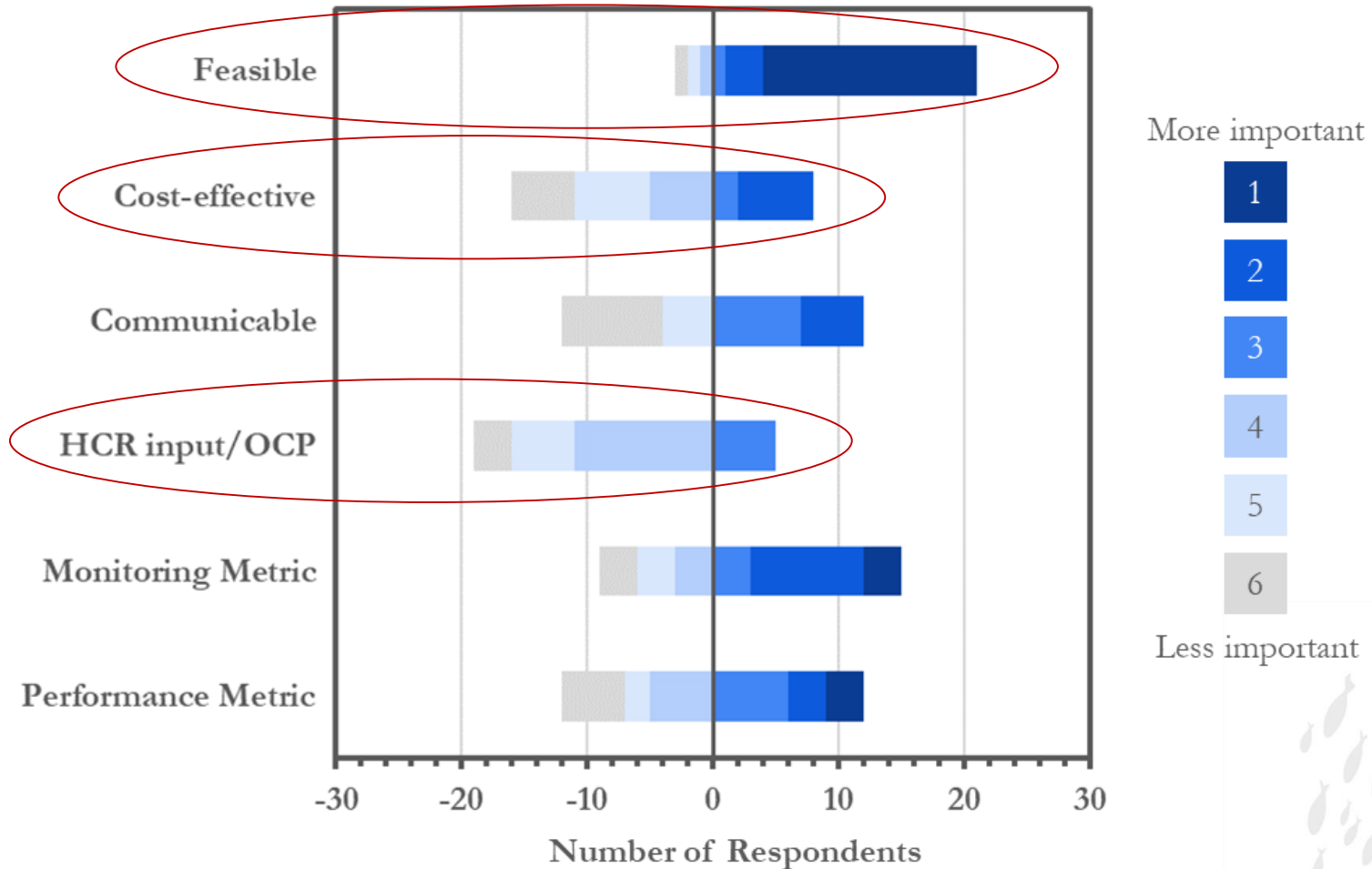
These considerations are inter-related (hard to rank), and operational considerations are expected to change across paradigms

Highlights: **Reliable Estimation**

What is it?

- Acceptable **accuracy & precision** (low variance & bias)

- Estimates **robust** to uncertainties (model or data points)

- Supported by reliable **data collection**

How do you know?

- Examining uncertainty of estimates

- Performing sensitivity tests

- Evaluating reasonableness of assumptions

- Simulation testing

- Comparison to other stocks

Highlights: **Ranking Candidate Best Practice Criteria**
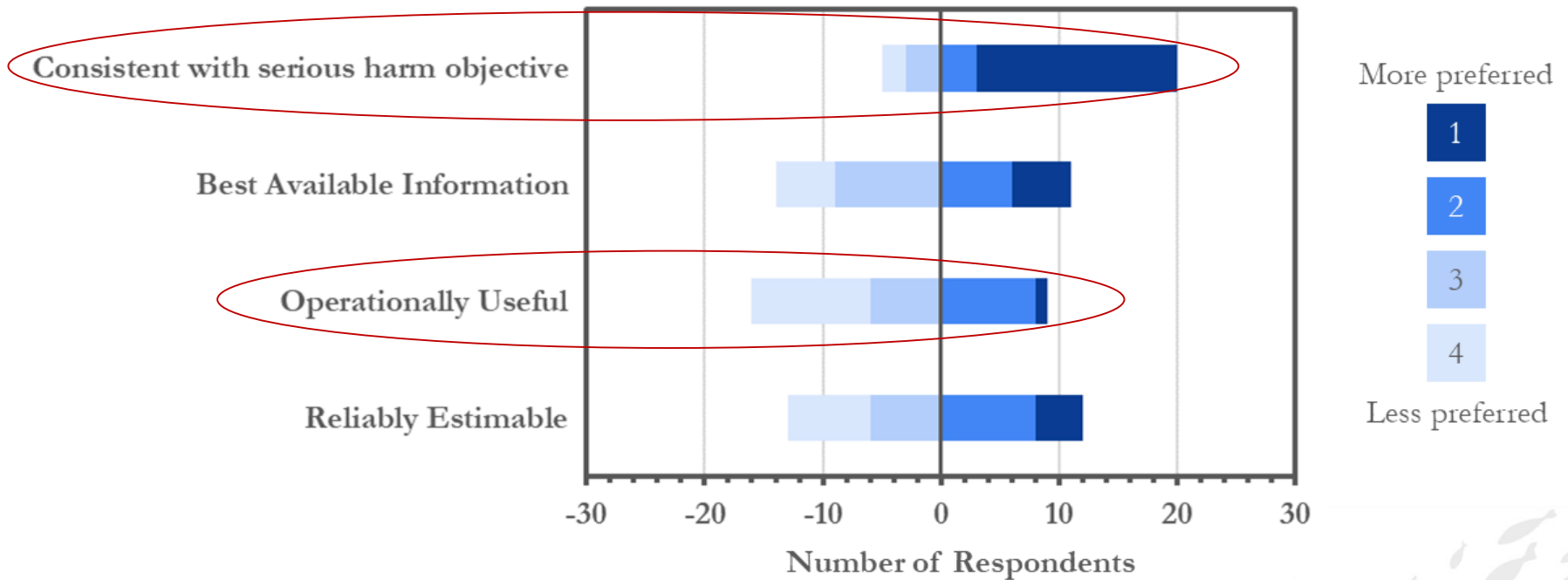
General response: majority felt all four were important (and some that it is hard to rank them); adjectives added

**Defensibility** comes (in part) from meeting these criteria

Breakout exercises are designed to elicit LRP decision(s) under different circumstances, and *how* and *why* those choices were made.

- What considerations or assumptions mattered?
- What was challenging and why?
- How do rationales change with new information or in different contexts?

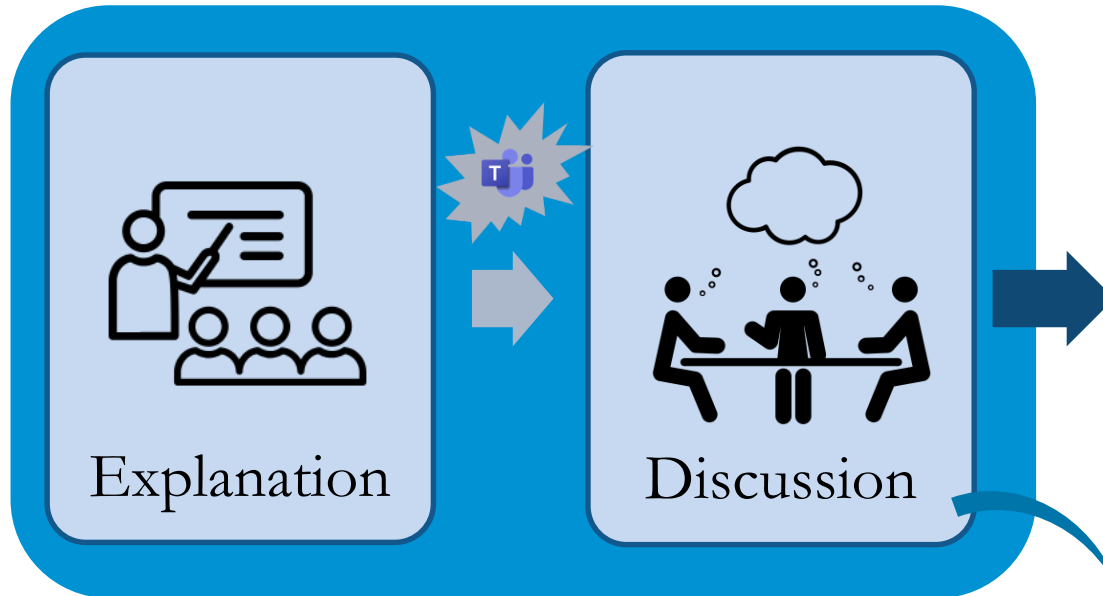- *How well do decisions and rationales plausibly reflect candidate best practice criteria?*

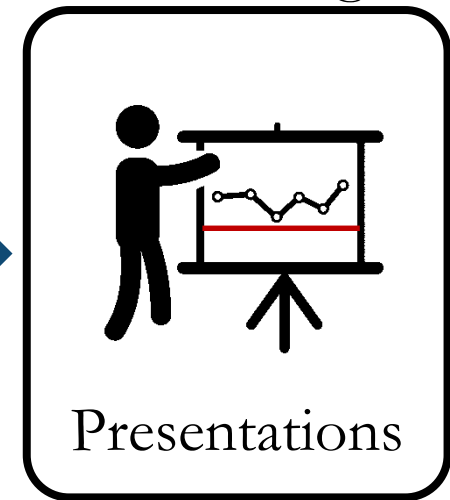# Six Breakout Groups

7-8 members each
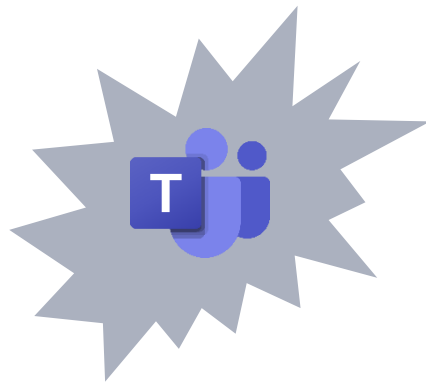
Six Breakout Groups

Each Day…   *Next morning…*

Explanation   Discussion   Presentations

1.5 hours   **5 min**

Send presentation to
Tim.Barrett@dfo-mpo.gc.ca
so we can collate them

Day 1: Today's Activities

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1.5 hr	Breakout groups (Topic 1: Empirical/Data Limited Methods/Spatial Scale)	All