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**Central and Arctic Region**

# Proceedings of the regional peer review for developing scientific advice on the design of a comprehensive long-term monitoring program for Redside Dace (*Clinostomus elongatus*) to inform recovery and management decisions

**Meeting date: February 4, 2020**
**Location: Burlington, ON**

**Chairperson: David Andrews**
**Editor: David Andrews**

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Canada

**Foreword**

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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***Aussi disponible en français :***

*MPO. 2023. Compte rendu de l'examen régional par les pairs pour l'élaboration d'un avis scientifique sur la conception d'un programme de surveillance complet du méné long (*Clinostomus elongatus*) pour informer les décisions de rétablissement et de gestion; le 4 février 2020. Secr. can. des avis sci. du MPO. Compte rendu 2023/023.*

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## SUMMARY

A regional science peer-review meeting was held on February 4, 2020 in Burlington, Ontario. The purpose of the meeting was to provide scientific advice on the design of a comprehensive long-term monitoring program for Redside Dace (*Clinostomus elongatus*) to inform recovery and management decisions. Participants included DFO Science, Species at Risk, and Fish and Fish Habitat Protection programs, the Ontario Ministry of Natural Resources and Forestry (OMNRF), conservation authorities, and experts from universities in Canada.

The federal recovery strategy for Redside Dace outlines the development of a monitoring program to quantify the population abundance and distribution of this endangered species in Canada. In order to help achieve this, the identification of potential monitoring objectives and related assessment variables such as the choice of appropriate sample units, suitable gears, and sampling effort required to attain a given level of statistical power were presented for discussion.

This proceedings report summarizes the relevant discussions from the meeting and presents recommended revisions to be made to the associated research document. The Proceedings, Science Advisory Report and Research Documents resulting from this science advisory meeting are published on the DFO Canadian Science Advisory Secretariat (CSAS) website.

## INTRODUCTION

Redside Dace (*Clinostomus elongatus*) is a small minnow found in headwater streams in southern and central Ontario and is listed as Endangered under the *Species at Risk Act.* The federal recovery strategy for Redside Dace outlines the development of a monitoring program to quantify the population abundance and distribution of the species in Canada. Currently, range-wide comprehensive and structured monitoring efforts have not occurred. The goal of the meeting, as described in the Terms of Reference (Appendix 1), was to develop advice that will guide the design of a long-term monitoring program for Redside Dace. The design advice was developed with consideration of the influence of imperfect detection on Redside Dace monitoring efforts, how sample unit boundaries are defined, the need for habitat and threat data collection, and the utility of stratifying effort in space and time.

## DETAILED DISCUSSION

The meeting chair provided the participants with an introduction to the Canadian Science Advisory Secretariat (CSAS) process and explained the purpose of the meeting. Context on the original request for science advice, and how the research advice may be used was presented. A summary of the terms of reference, as outlined by the steering committee, was also given. The draft research document was the basis for discussion, and participants were encouraged to add to or change the material, as needed, to ensure that the best and most up-to-date information was included.

### PAST, PRESENT, AND FUTURE MONITORING OF REDSIDE DACE IN ONTARIO

Presenter: Dr. Andrew Drake

The presenter summarized current, and past Redside Dace monitoring efforts in Ontario. While discussing what future monitoring might look like given current recovery goals. A participant asked how the authors arrived at this proposal, given there are many avenues that could have been explored. The presenter stated that for species undergoing drastic declines, such as Redside Dace, distribution as an assessment variable is valuable from a recovery standpoint. This meeting will explore the utility of using detection as a framework to speak to distribution endpoints. The presenter stated that if this review provides better alternatives then he looks forward to that.

Another participant asked if there is a mechanism to implement the advice from the outcome of this meeting. The presenter stated that managers aren't bound to this science but that the authors just tried to present what a program would look like based on potential objectives. There may or may not be an influx of funds to implement a program that monitors a large number of sampling sites. There are many considerations according to the presenter and the hope is that there could be more coordination between groups if there is buy-in for a large scale monitoring program. In response, another participant stated that if there is consensus that a Redside Dace monitoring program should be based on a repeat sampling, occupancy-based approach then the next step is to do a cost analysis. This analysis would act as a reality check to identify what is feasible within a season or years and what level of confidence we are comfortable with. The participant went on to explain that the sampling approach that will be presented could be used for multi-species groups in coastal wetlands and that it's up to the group if they are supportive of this sampling framework to monitoring other species at risk fishes. Another attendee stated that funding is always an issue and this challenge has dictated what types of sampling have occurred in the past, such as the implementation of the Ontario Stream Assessment Protocol (OSAP) sampling protocol.

## POTENTIAL OBJECTIVES OF A MONITORING PROGRAM

Presenter: Dr. Karl Lamothe

The presenter listed the types of objectives that one may consider when designing a Redside Dace monitoring protocol. This included a list of assessment variable options such as counts, presence/absence, and habitat variables. A discussion ensued about the relevance of monitoring threats to Redside Dace as part of any monitoring program. One participant noted that the presentation includes the monitoring of threats as an option but that this is missing from the research document. One could monitor changes in abundance in relation to environmental threats and how these have changed over time. The participant then noted that he appreciated how the authors stated the importance of being clear about objectives. Although there is a good rationale for monitoring occupancy, the authors jumped to this rather quickly. The participant felt that more context could be given to help explain to the reader why this variable is so important. This prompted another attendee to state that occupancy is actually a subset of abundance data and should be used as a fallback if the abundance model fails. If habitat variables are included in the model they will be useful in order to make predictions. When incorporating habitat variables, a co-author mentioned that on a fine-scale, we do not have a good understanding about what constitutes good habitat for Redside Dace. In response, an attendee noted that pool depth and woody cover appear to be important habitat variables. Another attendee pointed out that the research document should mention what aspect of these habitat variables the authors are measuring. For example, is mean used as a metric? Variance would be important for describing these habitat variables and for detecting change.

## OCCUPANCY AS A STATE VARIABLE

Presenter: Dr. Karl Lamothe

The presenter introduced the group to occupancy as a variable. This section focused on understanding the most simple forms of occupancy estimation and modelling. The first topic of discussion was how occupancy is related to abundance and if one Redside Dace is actually present in a pool, does this actually matter to managers. In response, a participant noted that only one individual needs to be detected for it to qualify as Redside Dace habitat. Technically, if only one fish is detected in a twenty year period then that habitat becomes protected. The discussion then moved on to detection rates. A participant noted that for two sites with equal abundance, detection rates can vary wildly due to factors that affect detection such as predation rates and sampling time. A coauthor pointed out that objectives of any monitoring study should really pertain to the questions that managers want answered. For that reason, it's important for managers to communicate what thresholds are important to them when it comes to occupancy and abundance of Redside Dace. One participant was concerned that if we sample randomly for Redside Dace, our ability to detect them in areas of the Greater Toronto Area (GTA) becomes smaller and smaller since their habitat is decreasing every year. This prompted the presenter to state that most of the Redside Dace data, to date, has been collected non-randomly and for that reason the published detection rates are almost surely inflated.

Closure, as it was defined in the document, was brought up by one participant. They suggested that the authors should do a better job of defining it in the document. An attendee suggested that having a short timeframe, without creating non-independent species detection sampling events, the better from a closure standpoint.

A participant began stating how Redside Dace range mapping was conducted by the Ontario Ministry of Natural Resources and Forestry (OMNRF) in the past. This included mapping presence/absence data over stream reaches and aquatic resources areas. He suggested this is one way to show Redside Dace distribution on a map. A co-author responded that the authors

wanted to be careful with the spatial units chosen, and decided that these units were chosen to maximize detection probability. The authors believe pool makes sense as a sampling unity for this reason.

The discussion then moved to the importance of the relationship between occupancy and abundance. One participant felt that the area of occupancy or MAPV is a function of density and abundance. He felt that the authors should include an additional piece that describes how occupancy and abundance are related to each other. A coauthor noted that many Redside Dace streams are idiosyncratic and wondered how occupancy and density may change from one area to the next. Another participant suggested that there are likely healthy populations of Redside Dace in certain headwaters, given that the species is short-lived and that declines have been occurring over 50 years. This prompted one participant to suggest that the occupancy-abundance relationship may differ between healthy populations and those that are in decline. The use of MAPV needs to be clarified in the document, according to one individual while one person asked if occupancy values include juveniles. The author clarified that occupancy is for fishes aged 1+.

## EFFORT AND POWER TO DETECTED CHANGES IN OCCUPANCY

Presenter: Dr. Karl Lamothe

The author presented information on how power was calculated as well as the trade-offs between effort and power to detect changes in occupancy in a sampling program. This started a debate amongst participants on appropriate values for alpha and beta in a Redside Dace monitoring program with most participants suggesting that the values chosen need to be better defended in the research document. One participant suggested that multi-season occupancy modelling could look at local extinction and colonization events and could be explored as this hasn't been done for fishes in Ontario.

A participant questioned the accuracy of the detection probabilities listed in the table given in the document. A coauthor stated that there is concern regarding these estimates given the different protocols used in each study. Another participant stated that occupancy estimates do not account for inter-annual variation and therefore declines aren't necessarily real. A coauthor responded that just because fishes aren't found at sampling sites doesn't mean these sites aren't used. They could be used during different times of the year and multiple visits within a year are required to understand seasonal variation. This led one participant to ask how to interpret changes in annual variability of occupancy over many years. A coauthor stated that the study design is meant to compare occupancy changes from time A to time B. To understand inter-annual variability since Redside Dace do move, multiple sampling events within a year would be required to control for randomness. A participant then stated that one should ponder whether putting all your effort into sampling period 1 and 2 or versus spreading out effort over those two years is the best way forward. This is an important distinction and gets at intensive vs extensive sampling when designing a sampling protocol.

From a policy perspective, a participant asked about the level of allowable harm that would be permissible in such a monitoring program. A coauthor stated that before allowable harm is evaluated, one needs to evaluate the value of each sampling event to the question we are addressing. In other words, we need to think about the sampling that is required before we address allowable harm.

Next, the participants engaged the authors with questions on sampling design and how this affects our ability to detect changes in occupancy and detection. One participant asked if detection probability changes depending on how well or poor a population is doing. A coauthor responded that he suspects that the response is not symmetrical. In other words, as abundance

declines detectability is expected to decline. Another participant asked how scale affects our ability to detect individuals. He stated that sampling a watershed or a catchment would be difficult since you wouldn't expect to find Redside Dace at most of the pools since their population and occupancy has drastically declined. A coauthor stated that effort becomes problematic depending on the scale you choose to sample and the amount of resources you have. The coauthor agreed that if we want to use an occupancy-based approach then targeting sites will violate many assumptions.

A participant noted that a variety of groups are applying the OSAP protocol to monitor the fish community and wondered if it's possible to use this established protocol to provide outputs for abundance. He did note that OSAP sites haven't been randomly selected but was interested to see if it could be used in some way. A coauthor responded that the lack of repeat surveys as well as the large scale at which this program is conducted may not be appropriate for Redside Dace monitoring.

## APPLICATION OF OCCUPANCY MODELS TO GULLY CREEK POPULATION

Presenter: Dr. Karl Lamothe

The lead author presented information on the application of occupancy models to real data collected at Gully Creek in the past. A participant suggested refitting the data so that bias can be accounted for. Because fish are removed during sampling, you don't get a chance to catch them again. Another participant stated that this is more of a problem where detection probabilities are high compared to when they are low. Sampling with and without replacement was debated as a group. A coauthor stated that sampling with replacement is preferred. This prompted one participant to ask if pool variables are correlated in any way. A coauthor said that they probably weren't. This led another participant to ask how habitat variables were chosen. The presenter stated that this was based on OSAP. This resulted in a discussion amongst participants about the importance of choosing appropriate covariates with respect to sampling design. Ultimately, this came back to the large number of sites needed to model occupancy and the feasibility of this given the large number of restraints encountered in the field. One participant noted that gear type is also important and should be discussed a little more in this section of the paper. This led a coauthor to state that scoring how well a gear type is deployed at a site could be modelled in the future.

The use of occupancy (presence/absence) and abundance (high/low) as categorical variables in models was debated amongst participants. The presenter stated that he thought about this but didn't carry it out. A participant noted that this was done for Eastern Sand Darter in the past using multi-state models. In order to carry this out, one has to define low abundance versus high abundance.

## HARM REDUCTION ASSOCIATED WITH PERMIT CONDITIONS

Presenter: Dr. Scott Reid

This presentation was given to provide some context to harm associated with permit conditions that would be relevant in this study. However, the research presented in this section was not under peer review for publication as part of this CSAS process.

This presentation allowed for much discussion by participants with respect to gear type and mortality. One participant asked how mesh size will affect Redside Dace monitoring from a harm perspective. A coauthor stated that a larger mesh size will be easier to deploy but will result in fewer small Cyprinids being captured. Alternatively, one reviewer stated that a small mesh size will result in higher mortality for young Cyprinids as these often get compacted by debris and

other fishes. These tiny fish are also much harder to identify from a logistical stand point. A participant asked if electrofishing settings change across rivers. A coauthor stated that voltage settings remain relatively constant across sites, but noted that in the Bay of Quinte drainage a higher voltage is needed which can increase fish mortality. In response to a question regarding mortality rates from a reviewer the presenter noted that good conditions occur in the fall for electrofishing and this causes less stress for fishes.

## CONCLUSIONS AND UNCERTAINTIES

Time was provided during the end of the day to address any outstanding issues, and to reach consensus on summary bullets that would be published in the upcoming Science Advisory Report. A coauthor started by asking for folks to speak to substantive issues that remain and reiterated that consensus is reached by lack of opposition to a particular issue.

A participant suggested that the report should discuss the many options that are available for monitoring of stream fishes and that occupancy was chosen in this report. The majority agreed that this should be included. Another person pointed out that the occupancy and n-mixture modelling were two great approaches used in the report but they should be flushed out a little more for people that don't have a background in this type of modelling. He stated that these two types of models are widely used in the scientific community but notes that most in the management community have yet to hear of it. He suggested that the finer details presented today, including the assumptions of the models will help make this report more digestible to managers that will be reading it.

Participants were happy with the wording of the first bullet. The wording of bullet two elicited some comments from participants. Most people wanted the bullet to reflect that indicators should be chosen to allow Redside Dace to be assessed relative to management objectives. Participants agreed to this change.

The third bullet was largely unchanged while the fourth bullet spoke to imperfect detection and participants felt that this bullet needed to be more explicit with respect to Redside Dace. Consensus was reached through wordsmithing. The fifth bullet dealt with sampling efficiency and the number of sampling sites required to detect changes in occupancy. Participants were mostly content with the wording of this bullet, however, some discussion occurred with respect to wording. Minor changes were made and the group moved on to the sixth and final bullet. One participant thought that a bullet should mention the issues with pre-existing guidance. Another participant interjected to say that we need substantially more sampling to be able to say something with confidence.

## CONCLUDING REMARKS AND NEXT STEPS

The Chair thanked all participants for their comments on the research document, and next steps were discussed. Participants stated that they wanted to review a draft of the Science Advisory Report as well as the finalized research document prior to publication. The meeting was then adjourned.

## APPENDIX 1. TERMS OF REFERENCE

# Scientific advice on the design of a comprehensive long-term monitoring program for Redside Dace (*Clinostomus elongatus*) to inform recovery and management decisions

## Regional Peer Review – Central and Arctic Region

**February 4, 2020**
**Burlington, ON**

Chairperson: David Andrews

### Context

The Ontario Recovery Strategy for Redside Dace (*Clinostomus elongatus*) identified monitoring actions that, if implemented, would help to ensure the persistence of Redside Dace and its habitat (Redside Dace Recovery Team 2010). Similarly, the federal Recovery Strategy and Recovery Potential Assessment for Redside Dace (DFO 2019) indicated that long-term monitoring to inform abundance and distribution, the status of habitat, and potential threats, would benefit species recovery. Species and habitat information obtained from monitoring could provide baseline information about the occurrence or abundance of Redside Dace at multiple spatial scales, including in areas subject to development impacts or recovery actions, thereby informing decision-making by DFO's Species at Risk and Fish and Fish Habitat Protection programs. Information obtained from monitoring could inform the conservation status of the species and the response to ongoing recovery actions. Although Redside Dace is detected by several agencies during the course of fish community monitoring and other targeted sampling, comprehensive efforts to conduct structured, range-wide monitoring efforts have not occurred. One factor that has prevented implementation of range-wide monitoring efforts is uncertainty about the most appropriate monitoring program objective(s) and related aspects of program design. Science advice about monitoring program design is needed to inform the implementation of Redside Dace monitoring efforts in Canada, thereby contributing necessary actions outlined in provincial and federal recovery strategies.

### Objectives

To develop advice that will guide the design of a long-term monitoring program for Redside Dace, including: the identification of potential monitoring objectives and related assessment variables; the choice of appropriate sample units; suitable gears; and, sampling effort required to attain a given level of statistical power.

### Expected Publications

- Research Document
- Science Advisory Report
- Proceedings

### Expected Participation

- Fisheries and Oceans Canada (DFO) – Science and Ecosystem Management
- Ontario Ministry of Natural Resources and Forestry
- Ontario Ministry of the Environment, Conservation and Parks

- Academics
- Conservation Authorities

**References**

DFO. 2019. Recovery Potential Assessment of Redside Dace (Clinostomus elongatus) in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2019/012.

Redside Dace Recovery Team. 2010. Recovery Strategy for Redside Dace (Clinostomus elongatus) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vi + 29 p.

## APPENDIX 2. LIST OF MEETING PARTICIPANTS

| Name | Organization/Affiliation |
|---|---|
| Adam van der Lee | DFO – Science, Ontario and Prairie Region |
| Andrew Drake | DFO – Science, Ontario and Prairie Region |
| Dave Andrews (Chair/Rapporteur) | DFO – Science, Ontario and Prairie Region |
| Karl Lamothe | DFO – Science, Ontario and Prairie Region |
| Marten Koops | DFO – Science, Ontario and Prairie Region |
| Rowshyra Castañeda | DFO – Science, Ontario and Prairie Region |
| Tessa Brinklow | DFO – Science, Ontario and Prairie Region |
| Rick Kiriluk | DFO - Fisheries Protection Program, Ontario and Prairie Region |
| Amy Boyko | DFO – Species at Risk Management, Ontario and Prairie Region |
| Andrea Dunn | Halton Conservation Authority |
| Chris Wilson | Ministry of Natural Resources and Forestry |
| Cindy Chu | Ministry of Natural Resources and Forestry |
| Nick Jones | Ministry of Natural Resources and Forestry |
| Scott Reid | Ministry of Natural Resources and Forestry |
| Alan Dextrase | No affiliation |
| Mark Heaton | No affiliation |
| Dave Lawrie | Toronto and Region Conservation Authority |
| Don Jackson | University of Toronto |

## APPENDIX 3. MEETING AGENDA

**Scientific advice on the design of a comprehensive long-term monitoring program for Redside Dace (*Clinostomus elongatus*) to inform recovery and management decisions**

Regional Peer Review – Central and Arctic Region

Date: February 4th, 2020

Location: Blue Water East Room, Waterfront Hotel Burlington, 2020 Lakeshore Road, Burlington, ON

Chairperson: Dave Andrews

| Time | Agenda Item | Presenter |
|---|---|---|
| 09:00 | Welcome and Introductions | Dave Andrews |
| 09:15 | Purpose of Meeting | Dave Andrews |
| 09:45 | Past, Present, and Future Monitoring of Redside Dace in Ontario | Andrew Drake |
| 10:30 | Potential Objectives of a Monitoring Program | Karl Lamothe |
| 11:00 | Occupancy as a State Variable | Karl Lamothe |
| 11:45 | Lunch | - |
| 12:45 | Effort and Power to Detected Changes in Occupancy | Karl Lamothe |
| 13:45 | Application of Occupancy Models to Gully Creek Population | Karl Lamothe |
| 14:45 | Harm Reduction Associated with Permit Conditions | Scott Reid |
| 15:45 | Conclusions and Uncertainties | All |
| 16:15 | Next Steps | Andrew Drake |
| 16:30 | End of Meeting | - |