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Proceedings of the Pacific regional peer review of the information for the identification of critical habitat for Cowichan (Vancouver) Lamprey

October 30, 2013
Nanaimo, British Columbia

Chairperson: Chrys Neville
Editor: Julia Bradshaw

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Road
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May 2022

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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SUMMARY

These proceedings summarize the relevant discussions and key conclusions that resulted from a Fisheries and Oceans Canada (DFO), Canadian Science Advisory Secretariat (CSAS) Regional Advisory Process on October 30, 2013 at the Pacific Biological Station in Nanaimo, British Columbia (BC). A working paper focusing on the Information to support the identification of critical habitat for the Cowichan (Vancouver) Lamprey (*Entosphenus macrostomus)* was presented for peer review.

In-person participation included DFO staff from Science branch and Species at Risk Program (SARP). Representatives from the province of BC, academia, and non-governmental organizations also participated.

The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report providing advice to the species at risk program to inform listing decisions under the *Species at Risk Act* (SARA), and subsequent recovery planning activities.

The Science Advisory Report and supporting Research Document will be made publicly available on the Canadian Science Advisory Secretariat (CSAS) website.

INTRODUCTION

A Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS), Regional Peer Review (RPR) meeting was held on October 30, 2013 at the Pacific Biological Station in Nanaimo to review the information needed to identify critical habitat for the Cowichan (Vancouver) Lamprey (*Entosphenus macrostomus*) as described under SARA. The Cowichan (Vancouver) Lamprey is listed as Threatened in Schedule 1 of the Species at Risk Act. As such, critical habitat for the species must be identified in the Recovery Strategy or Action Plan based on the best information possible.

The Terms of Reference (TOR) for the science review (Appendix A) were developed in response to a request for advice from the Species at Risk program. Notifications of the science review and conditions for participation were sent to representatives with relevant expertise from First Nations, the province of British Columbia and academia.

The following working paper was prepared and made available to meeting participants prior to the meeting (see Appendix B for the working paper abstract):

Information to support the identification of critical habitat for the Cowichan (Vancouver) Lamprey (*Entosphenus macrostomus*) by Sean MacConnachie (CSAP Working Paper 2013/nnn).

Entosphenus macrostomus was formerly commonly known as the Vancouver Lamprey and is recognized as such on the Species at Risk public registry. Recent efforts have been made to identify the species with its more appropriate common name of Cowichan Lamprey which will be used in this document. In addition, the species was originally named as *Lampetra macrostoma*. It was confirmed its species designation using microsatellite DNA analysis and was reclassified as *E. macrostomus* by the American Fisheries Society in 2013. In this document the new classification will be used although the old names may appear in the Appendix documents.

The meeting Chair, Chrys Neville, welcomed participants, reviewed the role of CSAS in the provision of peer-reviewed advice, and gave a general overview of the CSAS process. The Chair discussed the role of participants, the purpose of the various CSAS publications (Science Advisory Report, Proceedings, and Research Document), and the definition and process around achieving consensus based decisions and advice. Everyone was invited to participate fully in the discussion and to contribute knowledge to the process, with the goal of delivering scientifically defensible conclusions and advice. It was confirmed with participants that all had received copies of the Terms of Reference and working papers.

The Chair reviewed the Agenda (Appendix C) and the Terms of Reference for the meeting, highlighting the objectives and identifying the Rapporteur for the review. The Chair then reviewed the ground rules and process for exchange, reminding participants that the meeting was a science review and not a consultation.

Members were reminded that everyone at the meeting had equal standing as participants and that they were expected to contribute to the review process if they had information or questions relevant to the paper being discussed. In total, 12 people participated in the RPR (Appendix D). Julia Bradshaw was identified as the Rapporteur for the meeting.

Participants were informed that Tom Brown (DFO Science) had been asked before the meeting to provide detailed written reviews for the working paper to assist everyone attending the peer-review meeting. Participants were provided with copies of the written review. Jordan Rosenfeld (University of British Columbia/BC Ministry of Environment) also provided a written review and the agenda was modified to provide time for him to present his specific comments.

Nadinne Pinnell (DFO-SARP) gave short presentation to define critical habitat and what items must be considered. She indicated that the goal of defining critical habitat is to prevent wildlife from becoming extinct. Critical habitat is both the area and the biophysical features that are required and must be based on the best information available at the time. Geographic area includes key features including pools, ripples, riparian vegetation, water quality that are required to support the biological functions of the species. The features can have qualitative or quantitative attributes. Ms. Pinnell provided examples of approaches that could be taken to identify the geographic area including the area of occurrence, the bounding box approach and the critical habitat parcel approach. She indicated that for this paper the bounding box approach would be used. She explained that recommendations for additional studies for information that is unknown and that identification of activities that would likely destroy critical habitat were important components that should be included in the document. She indicated that these could be either specific (if known) or general. Ms. Pennell also indicated that it was important to determine if Residence applies to Morrison Creek lamprey as Section 22 of SARA prohibits the destruction of residence. Residence is a dwelling place, supports a life cycle function, requires a level of investment in the structure and must be occupied by one or more individuals. If residence applies to the Morrison Creek lamprey, the location, time of year, and period of occupation should be indicated using the best information available.

The Chair reminded the members that the conclusions and advice resulting from this review will be provided in the form of Science Advisory Report to the Species at Risk program to inform species at risk recovery planning. The Science Advisory Report and supporting Research Document will be made publicly available on the Canadian Science Advisory Secretariat website.

REVIEW

Working Paper: Information to support the identification of critical habitat for the Cowichan (Vancouver) Lamprey (*Entosphenus macrostomus*) by Sean MacConnachie (CSAP Working Paper 2013/nnn).

Rapporteur: Julia Bradshaw

Presenter: Sean MacConnachie

PRESENTATION OF WORKING PAPER

The presenter acknowledges that many of the issues that arose during the proceedings for the identification of critical habitat for Morrison Creek lamprey will also apply to the document for identification of critical habitat for Cowichan lamprey. This species of lamprey is freshwater parasitic and is found in Cowichan and Mesachie lakes. It has not been identified in the Cowichan River, below Cowichan Lake, despite not having any barriers to access. This limited distribution is a primary reason for it being listed as Threatened by SARA.

There was discussion regarding the correct name for this lamprey species. It was originally identified as the lake lamprey, but is also known under several pseudonyms including Vancouver lamprey and Cowichan lamprey. The presenter suggested that Cowichan lamprey is accepted as the common name for this species. There is also a question regarding the correct scientific name for the species, *Entosphenus macrostomus* or *Lampetra macrostoma.* It was confirmed the *E. macrostomus* should be used in reference to this species.

Population and distribution of this animal is not known and thus quantitative recovery targets have not been established. The adults build small nests for spawning by moving pebbles and

small stones. The adults die after spawning. Following hatching, the larval lamprey move to softer substrates where they burrow and feed on detritus. The largest numbers of juvenile lamprey have been observed in the fluvial fans and deltas of very small streams entering the lakes. The ammocoetes require appropriate sediment in which to burrow and a source of detritus for feeding. They remain as ammocoetes for several years although the exact duration is not known. Following metamorphosis into the adult form, the lamprey are found throughout the water column. They feed on trout, Coho salmon and other species in the lakes. Scarring events on prey species have been noted throughout the lake with upwards of 80% of the fish in the lake having scars.

The author described recent surveys conducted to look at distribution of ammocoetes in the lake. A number of areas where they had been located historically were no longer suitable due to logging activities. The areas were now very rocky with no soft substrate for the ammocoetes to burrow. The surveyors had covered the perimeter of the lake and documented areas that may be appropriate for lamprey based on substrate. However, the survey was conducted in two anomalous years, one of very high and one of very low water. There were concerns raised about the comprehensiveness of the survey and the extreme variability in the sampling conditions and that generalizations from these surveys should not be made. It was recommended that more work be done in future years. It was recommended that the map of the survey areas be included in the report.

Activities likely to threaten critical habitat are timber harvesting, urban development and recreational fishing/boating. Timber harvesting has been more recently in decline, more recent pressures are urban development and recreation (especially following the relatively recent closure of a pulp and paper mill. The author recommended that a riparian zone 50m upstream in streams entering the lakes be a buffer to protect the fluvial fan regions.

The author commented that Residence applies to the Cowichan lamprey due to the nest building activities undertaken.

REVIEWER'S COMMENTS

PRESENTER: TOM BROWN, DFO SCIENCE

Recommendations

The reviewer recommends changing the description of Cowichan as a "small lake" it is actually a rather large lake, or adding a relative measure of its size. Clarification on the population in decline is requested. The document is not clear which population of Cowichan Lamprey is declining, is it the whole system, or just Mesachie Lake?

The reviewer also suggests modifying the number of habitats identified from four separate habitats to two distinct habitats. One would include the fluvial fans for spawning and feeding juveniles. The other habitat would include the entire lake and house and feed the adult lamprey population. The reviewer was concerned about designating the entire lakeshore as ammocoete critical habitat when it is likely concentrated around the fluvial fans and that being more specific would be helpful. He also commented on the amount of unsuitable habitat on the lakeshore due to large boulder and cobble and suggested that listing unsuitable habitat would also be beneficial. However, a participant raises a concern that critical habitat will not be protected if unsuitable habitat separates areas of suitable habitat, if they are in a migration or movement area. Due to the several knowledge gaps about the biology, population and distribution of this species determining if and how the lamprey use these regions is not known.

The reviewer also suggests more information be added regarding potential predators (i.e. crayfish or other invasive species). More detail in general to the activities likely to destroy critical habitat is requested. A few examples are cited from the document, such as changing the sentence structure to reflect that acts of logging are likely to result in an increase in discharge from the watershed, but a decrease in water quality. It is recommended that hazardous waste removal be added as an activity that could impact the lamprey.

Riparian Habitat

The contribution of the riparian around the lake is questioned by the reviewer, who believes the fluvial contributions and macrophytes already in the lake are the main contributors of detritus for nourishment. It is generally agreed that not enough information on the contribution of the riparian surrounding the lake and the riparian upstream is known to allow for coherent science advice to be given. It is flagged as a knowledge gap. However, a distinction is made between Cowichan and Mesachie lakes. Mesachie, being a much smaller lake with only one tributary, is recognized as likely having a larger contribution from its riparian surround compared to Cowichan Lake with hundreds of small input streams.

The reviewer also points out that riparian removal does not alter the run-off rate. Approx. 20 – 30% of the surface area of the watershed needs to be removed in order to alter flow rates. Everyone agrees more information is required to understand how the riparian influences lamprey habitat.

A participant raises the topic of the Salmon weir that had been built in the 1980's that controls water flow from Cowichan Lake into Cowichan River. There is a concern that by artificially regulating the water levels are we messing up the natural flow in the river that could in turn affect other cues (that are not known, but most likely sensed by the lamprey). The weir used to be under control of the Crofton pulp mill and is now under the influence of the Town of Cowichan. Landowners are also influencing the regulation of the weir because of flooding concerns and a desire to maintain cottage beaches, etc. In the recovery document, it describes the water storage and diversion licenses for Cowichan watershed and describes the effect of the weir as slightly increasing water levels in the river compared to a pre-weir state and without consequence on water levels in the lake.

PRESENTER: JORDAN ROSENFELD, UNIVERSITY OF BRITISH COLUMBIA/BC MINISTRY OF ENVIRONMENT

Recommendations

The reviewer commented on the importance of the riparian area, both upstream and around the lake, in influencing critical habitat for Cowichan Lamprey. He was concerned that information on riparian area was lacking in the document. He commented on the lack of information on the source of detritus for the ammocoetes and the contribution from the riparian area.

The reviewer requests more clarity in the association of habitat with life stages. What are the conditions required by the ammocoetes. Where are the adults spawning and what types of substrate can they use? A participant added information that this species spawn later in the year than the Pacific lamprey and over a protracted period. It is noted by a participant that this may be extremely relevant to the coordination of changing water flows, which usually occurs in early fall and could make the deltas an important spawning area as well as a regulator of spawn timing.

It is noted that additional trapping is likely necessary to gain confirmations of spawn locations in both Mesachie and Cowichan lakes.

The reviewer suggests the removal of the restriction of substrate sizes for spawning and nest creation to no greater than 1 cm to reflect that a source of gravel smaller than 1 cm is required, but the mixed presence of various substrate sizes, including larger substrate, does not necessarily exclude it as being a spawning site. It is agreed that since we are lacking enough information to formulate definitive advice, it should be flagged as a knowledge gap and not be so specific about the requirements for substrate size in the document.

Riparian Habitat

The reviewer suggests a Riparian Area Regulation (RAR) approach be used in assigning riparian buffer widths to upstream tributaries (or some other objective, science-based, method of identifying appropriate buffer widths). He is concerned especially with how far upstream the protection is required to protect the downstream habitat.

Participants point out how difficult a RAR methodology will be in the case of Cowichan Lake with its numerous tributaries and inputs. The debate centers around whether to include the riparian as critical habitat itself or to identify the key features associated with the riparian and those features will be protected. The reviewer feels being inclusive is important to not rule out the potential for spawning sites and to recognize that the locations of suitable environment are subject to change.

There was a discussion about how far upstream of tributaries feeding into the lakes to consider as critical habitat (or not). There are two options. One is to identify features downstream that require protecting; if those features are altered by activities upstream, they would be able to prosecute offenders. The other option is to assign it as critical habitat and a distance upstream assigned to demarcate the critical habitat.

Because of the lack of information about this species, it is agreed upon by the group that a more conservative approach would be to designate 100 m upstream as critical habitat. There is a reference for the Cowichan lamprey not being found further upstream than 100 m and it is therefore not an arbitrary distance.

The point is raised that destruction must be shown at the population level. It may prove difficult to show that damage to one of many streams feeding Cowichan Lake has a population level impact.

GENERAL DISCUSSION

MESACHIE LAKE AS SOURCE HABITAT

A participant in the discussion called to attention a reference to a large movement of lamprey out of Mesachie Lake. It was estimated between 80 and 140 lamprey individuals were observed leaving Mesachie lake in a given month. There is also a possibility of a smaller number of adults moving into Mesachie Lake. This movement out of the lake may indicate that Mesachie is a rearing ground for Cowichan lamprey. Survival of recently metamorphosed lamprey is dependent on finding a source of prey fish to feed on (trout, Coho, other fish species) and therefore the adult lamprey move to Cowichan Lake where the prey species are more abundant.

The author raises the possibility that while Mesachie could be a rearing ground, it likely has a much smaller overall productivity when compared to the much larger Cowichan Lake. However,

from a population standpoint, Mesachie appears to be a source habitat and might justify higher priority protection. Mesachie also likely has stronger land use impact because of its small size and small number of input streams.

ACTIVITIES LIKELY TO DESTROY CRITICAL HABITAT

Participants agree that this section on the activities likely to destroy critical habitat requires more detail and more explanation of how the activity will affect the lamprey. Specific requests were made for both historic and current land use information including but not limited to:

- Forestry and logging (land tenures, how much is harvested, rotational rate, is it second growth, etc.)
- Pollutants (what kind of sewage systems are in use in the area, landfill information); hazardous waste removal.
- Impacts of agriculture in the area
- Land development (residential expansion information)
- History of recent changes to the area (Cowichan and Mesachie)
- Riparian removal (there is some disagreement within the group on significance of the impact of riparian removal)

Some recent developments in Mesachie Lake and their impact on the downstream environment were mentioned.

RESIDENCE

All agreed that residence also applies to Cowichan lamprey. The residence statement needs to be expanded to include the construction investment put into the residence by the lamprey as well as frequency and period of use, if the data is available. They form the nest by moving gravel substrate. Residence applies during the spawning and egg incubation periods. Cowichan lamprey are believed to spawn later in the calendar year compared to Pacific lamprey.

Not much is known about the spawning sites, however, we do know that they spawn in fluvial fans where a small substrate (approx 1 cm diameter) is required to build a nest. It is not known how broad the mixture of substrate sizes can be for the lamprey to still utilize the region for spawning.

KNOWLEDGE GAPS

Several knowledge gaps were flagged by the group of experts:

Abundance of current population. Recommend juvenile surveys. Potential to look at scarring rates on prey as an index of abundance.

Distribution and habitat associations of ammocoetes in the lakes. Recommend additional surveys during "normal" water level years. Most recent surveys have been conducted in years of extreme low and extreme high water levels. Survey should include areas outside of fluvial fan regions of stream to further define the features and attributes required for rearing and feeding ammocoetes. Presence and distribution of lamprey in streams flowing into Cowichan and Mesachie Lake

Food availability - what is the abundance of prey fish species in the lake?

Spawning areas. Only one location has captured spawning condition specimens. Require additional information on spawning locations. Recommend additional surveys during spawning period to identify spawning location in lakes and streams and provide additional detail to description of spawning area features and attributes.

Hazardous waste removal: may add contaminants to lakes.

Changes to water level from weir manipulation: Is this changing some of the natural seasonal changes in the lake? How often are changes made? If water levels are kept higher and then discharged, could it impact nesting areas? It is recommended that a history of change to the lake be added to the activities that could destroy habitat in the paper.

How are riparian areas for the streams and lakes linked to the ammocoete rearing and feeding spawning regions.

CONCLUSIONS

The paper was accepted with revisions and adding the additional information requested.

RECOMMENDATIONS & ADVICE

The recommendations suggested by the group are to:

- Recommendation to conduct further surveys on juveniles or adults (could electroshock ammocoetes to use as a proxy for adult population or a potential to use scarring marks on fish caught in the lake as a measure of population abundance).
    - Extend surveys to other areas that may possibly contain Cowichan lamprey (for example, West Lake on Nelson Island).
- Recommendation to increase the scope of trapping and surveillance into the spawning period.
- Recommendation to include as critical habitat the riparian widths 100 m upstream from the fluvial fans in Cowichan and Mesachie Lake. The RAR methodology (or other suitable, established, science-based objective measure to determine riparian widths) will be used on a case by case basis and not necessarily identified stream by stream.

Based on the best available information at the time, the group recommended that the Critical Habitat for Cowichan lamprey be considered Cowichan Lake, Mesachie Lake, Robertson River, Bear Creek as well as the unnamed watercourse connecting the two lakes and inflowing streams 100 m upstream of the lakes.

The vegetation around the stream is an attribute of the stream feature that supports ammocoete rearing and potential spawning. A science based tool (forest practices code, RAR) to identify appropriate riparian width should be applied as required. The vegetation around the stream supports the stream stability and prevents the input of sediments that may negatively affect the fluvial fan feature that supports ammocoete rearing and adult spawning.

An adequate food supply of detritus from sources such as macrophytes, riparian (near shore) vegetation or other sources is an important attribute of critical habitat features that support ammocoete rearing and feeding.

Residence for Cowichan Lamprey includes the nests that Cowichan lamprey construct within Cowichan and Mesachie lakes during the period they are being used for spawning or egg incubation.

ACKNOWLEDGEMENTS

The chair wishes to acknowledge and thank the authors for their hard work, Tom Brown for his review, and the active engagement of the participants to improve the quality of the scientific advice. Also, thanks to Lana Fitzpatrick of the CSAS office for coordinating and arranging meeting logistics. Thank you to Julia Bradshaw for being the Rapporteur.

APPENDIX A: TERMS OF REFERENCE

REVIEW OF THE INFORMATION FOR THE IDENTIFICATION OF CRITICAL HABITAT FOR COWICHAN (VANCOUVER) LAMPREY

Regional Peer Review – Pacific Region

October 30, 2013
Nanaimo, B.C.

Chairperson: Chrys Neville

Context

The Cowichan (Vancouver) lamprey (*Entosphenus macrostomus*) is a species derived from the Pacific lamprey (*L. tridentata*) and is reported only in Cowichan and Mesachie lakes on Vancouver Island, British Columbia. *L. macrostoma* was deemed a separate species based on its unique morphological and physiological traits, primarily its large oral disk and physiological adaptation to freshwater. There has been little or no research done on this species since the 1980s and no firm conclusions can be drawn with the current data regarding population status and trends. Its extreme endemic distribution is the principal factor in its designation as Threatened, and suggests that the species will always remain at some risk.

A variety of factors threaten the Vancouver lamprey and its associated habitat, though the extent and severity of threats are unknown. DFO SARA Management Program has requested science advice in support of the identification of critical habitat and residence and development of the Action Plan for the Cowichan Lamprey under SARA.

Objectives

The following working paper will be reviewed by meeting participants:

MacConnachie, S 2013. Recommendations for the identification of critical habitat for the Cowichan (Vancouver) Lamprey (*Entosphenus macrostomus*). CSAP Working Paper 2013/PXX

The working paper will be used to provide advice with respect to the following objectives:

- Provide the best available information regarding the geospatial extent and the biophysical attributes, features and functions of the habitat necessary for the survival or recovery of Cowichan lamprey in Canadian Pacific waters.
- Provide the best available information regarding residence for Cowichan Lamprey.

Expected publications

- CSAS Science Advisory Report (1)
- CSAS Research Document (1)
- CSAS Proceedings

Participation

- DFO Science, Ecosystem Management Branch, Species at Risk, Policy and Economics
- Province of BC

- Non-governmental organizations
- Regional district of North Cowichan
- Other Stakeholders

References Cited

Vancouver Lamprey Recovery Team. 2007. Recovery Strategy for the Vancouver Lamprey (*Lampetra macrostoma*) in Canada. *Species at Risk Act* Recovery Strategy Series, Fisheries and Oceans Canada, Ottawa, ix + 21 pp.

APPENDIX B: WORKING PAPER ABSTRACT

Critical habitat is proposed for the Cowichan (Vancouver) lamprey (*Lampetra macrostoma*) in Cowichan and Mesachie Lakes, on Vancouver Island, British Columbia. The Cowichan lamprey is currently listed as Threatened on Schedule 1 of the Species at Risk Act. The Cowichan lamprey is endemic to Cowichan and Mesachie lakes and any habitat that is critical for the survival and recovery for this species should be afforded protection. Given the relatively small size of the two lakes, the distribution of habitats for various life stages of the lamprey, and the extreme endemism of this species, the critical habitat for the Cowichan lamprey is recommended as Cowichan and Mesachie lakes in their entirety, the adjoining waterways, 50 meters upstream of tributaries into the lake.

APPENDIX C: AGENDA

Regional Peer Review Meeting (RPR)

Information for the identification of critical habitat for Cowichan (Vancouver) Lamprey

October 30, 2013

Pacific Biological Station
Nanaimo, BC

Chairperson: Chrys Neville

DAY 1 – Wednesday, October 30, 2013

Time	Subject	Presenter
0900	Welcome, Introductions, & Housekeeping	Chrys Neville
0915	CSAS Overview & Meeting Procedures	Chrys Neville
0930	SARA Critical Habitat (review for new RAP Participants)	Nadine Pinnell
1000	***Break***	
1015	Presentation of Working Paper (Cowichan Lamprey)	Sean MacConnachie
1045	Reviewer #1 comments & Author Response	Chrys Neville
1115	Group Discussion to review working paper	RAP Participants
1145	***Lunch Break***	
1245	Group Discussion to review working paper	RAP Participants
1400	***Break***	
1415	Review of Science Advice Report	RAP Participants
1600	***Adjournment***	

APPENDIX D: PARTICIPANTS

Last Name	First Name	Affiliation
Beamish	Dick	DFO Science, Retired
Bradshaw	Julia	DFO Science
Brown	Tom	DFO Science
Flostrand	Linnea	DFO Science
MacConnachie	Sean	DFO Science
MacDougall	Lesley	DFO Science
Neville	Chrys	DFO Science
Pinnell	Nadine	DFO Species at Risk Program
Pennell	Bill	Vancouver Island University
Rosenfeld	Jordan	UBC/BC Ministry of Environment
Wade	Joy	Fundy Aqua