



Participation in the Outplanting of Artificially Propagated Arctic Lamprey Larvae in Noto, Ishikawa, Japan



[Cover Photo: A local elementary school student releases artificially propagated Arctic Lamprey larvae in Machino River (Ishikawa, Japan) in front of news media reporters]

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Summary

I had the opportunity to participate in an outplanting of larval Arctic Lamprey in Noto, Ishikawa, Japan, in the summer of 2017. This event on June 19, 2017, was organized by Ishikawa Prefectural University and partnering local public agencies. Larval lamprey were artificially propagated by the university (led by Hiroaki Arakawa, a graduate student studying Arctic Lamprey, and his advisor/professor, Seiji Yanai). Hiroaki has worked for the Yakama Nation Fisheries Pacific Lamprey Project as an intern for five months (between November, 2016, and April, 2017) prior to this event as a result of attaining a highly competitive Japanese federal government grant through the Ministry of Education. This was an opportunity for me to return the favor for all his contribution to our project and to see his artificial propagation work and outreach in action (while I was in Japan on a personal trip visiting my in-laws).

The local 4th grade students arrived in their uniforms and were very attentive to hear the presenters. There were several local and regional newspaper and TV media (such as MRO, TV Kanazawa, Kokuriku Newspaper, and NHK, which is the Japanese “PBS”) there to report on the event as well. The local city staff (Hidetsuna Gota) stressed the importance of preserving lamprey species and the associated culture (harvest and food). Seiji Yanai gave an introduction for Arctic Lamprey and their role in the ecosystem. Hiroaki Arakawa shared more information about his research on artificial propagation and the larvae. I was given a chance to present Pacific Lamprey restoration efforts and the cultural and ecological importance. Shigekazu Michishige, a local elder that have been harvesting lamprey for many years shared some of the tools he uses to capture lamprey and the history and culture surrounding lamprey (he recently received an award from the prefecture for his contribution in preserving traditional, local culture, including lamprey harvest). Students then explored the lamprey that were present in aquarium and under dissecting microscopes. Afterwards, students were given a container with larvae and each of them released them into the neighboring river (Machino River). Many students thought the small larval lamprey were cute and said they enjoyed releasing them.

Listed below are websites for some of the news release following the outreach event:

http://www.town.noto.lg.jp/www/info/detail.jsp?common_id=11255

<http://eco.chunichi.co.jp/news/2017/06/004023.html>

<https://enviromental-science-ipu.tumblr.com/post/162533798398/20170703kawayatsume>

https://www.facebook.com/permalink.php?story_fbid=1183810631724124&id=832879526817238

After the release event, we visited some of the irrigation diversion weirs and discussed ways to improve passage for lamprey. Opening slots on the bottom of the ladder pools and use of flexible hose or aluminum ramps were the primary alternatives discussed. We also visited a local restaurant (Kaji Hotel) that serves lamprey but unfortunately it was closed that day. At another restaurant where we ate, they said they used to serve lamprey and shared some of the ways they

would be served. “Kabayaki” was a common and popular way, but some people also liked “Yanagawa Nabe” most, which is a stew with cut lamprey meat and egg. They said a lamprey heart (as fresh as possible) is delicious is good for your eyes. Even 15 years ago, there were many local people that would harvest them (enough that they could serve them in many local restaurants, such as Takejiro Restaurant). There are still many people (especially elders) that express their desire to eat lamprey again.

The following day, I had an opportunity to visit Yuji Yamazaki (a professor at Toyama University who has studied lamprey ecology and genetics extensively) in Himi, Toyama, Japan, along with Seiji Yanai and Hiroaki Arakawa, at Mr. Yamazaki’s laboratory (Himi Lab Aquarium) in the country side outskirts of Toyama. He gave me a tour of their amazing lab with many aquariums displaying the rich fauna of native fish and aquatic species and informative posters and displays. We discussed the recent research on lamprey and discussed ways we could collaborate in the future (although Mr. Yamazaki said his time is spent on non-lamprey species primarily in recent years due to funding allocation).

Photos



The 4th grade students arrive. They have a school uniform for field trips (which is common in Japan).



Introduction by Hidetsuna Gota (Noto City Staff), explaining the importance of lamprey for cultural and ecological reasons.



Introduction by Mr. Gota. Notice how the Japanese students are very attentive and disciplined (standing perfectly straight and in their own respective position) compared to students of the same age from American schools. This is part of the Japanese culture to pay attention to speakers.



Presentation by Professor Seiji Yanai, giving an overview of Arctic Lamprey.



Lots of local and regional media documenting the outreach event.



Hiroaki Arakawa, graduate student leading the research on Arctic Lamprey artificial propagation, explaining his research to the students.



Hiroaki Arakawa interacting with the local students.



I gave a presentation about the Pacific Lamprey restoration and tribal cultural importance.



Kids were very attentive to the story of Pacific Lamprey.



Also, performed a short Japanese Arctic Lamprey rap song along with Hiroaki and his lab mate, Kenji Hashizume.



A presentation by Shigekazu Michishige, an elder who has done many years of lamprey harvest (one of the only two remaining local fishers that still continues the fishing for Arctic Lamprey in the local river). The gaff hook he is showing looks very similar to the Yurok Tribe's gaff hook they use for Pacific Lamprey harvest at Klamath River mouth.



Mr. Michishige recently received a prestigious award by the Prefecture for preserving traditional culture, such as lamprey harvest.



After all the presentations, students were given a chance to examine newly hatched larvae under dissecting microscopes and in the aquarium.



Hiroaki Arakawa helping students see the small larvae.



Students examining the larvae in aquarium.



Students getting ready to release their newly hatched larvae from plastic Tupperware.



Students carefully carrying their larvae towards the river.



Students carefully walking down the stairs toward the river.



Students carefully walking down the stairs toward the river, paying close attention to their containers to make sure they do not spill any larvae.



Students forming a line to release the larvae.



Release location for the larvae (Type I habitat with fine sediment and organic matter in slow water environment).



Another student releasing his larvae.



Adults in the stream and across the bank capturing the student release with their cameras. It is a heavily armored artificial stream unfortunately, which is very typical in Japan (due to flood protection). However, away from cities and towns, the streams are a lot more natural and more recent bank protection channelization work provides a wider floodplain for streams to move around more naturally.



Another student releasing her larvae.



Another student releasing his larvae.



A concluding remarks by Seiji Yanai, thanking the students and asking for their help in bringing Arctic Lamprey back to the local area.



Everything ends with a “bow” in Japan (to thank each other).



A photo with the university student crew (lamprey face).



A photo with the entire university crew, including Seiji Yanai.



An interview at the end of the event by the local TV media.



An example of lamprey passage barriers in the same river. Arctic Lamprey are not able to cling and climb like Pacific Lamprey, so even a small drop of water can prevent their migration upstream. We discussed potential solutions for passage using the Pacific Lamprey examples.



Another weir that is designed and structured almost identical to the above example further downstream.



A lot of rice fields in rural Japan everywhere but especially in this region (famous for terracing and traditional style of rice field farming).



A local restaurant / traditional hotel (Kaji Hotel) that serves Arctic Lamprey when there is a supply available. Customers make special reservations.



Hiroaki Arakawa and his lab mate proudly wearing the Pacific Lamprey t-shirt I designed (says “Respect Your Elders, especially when they are 450 million yrs old”)



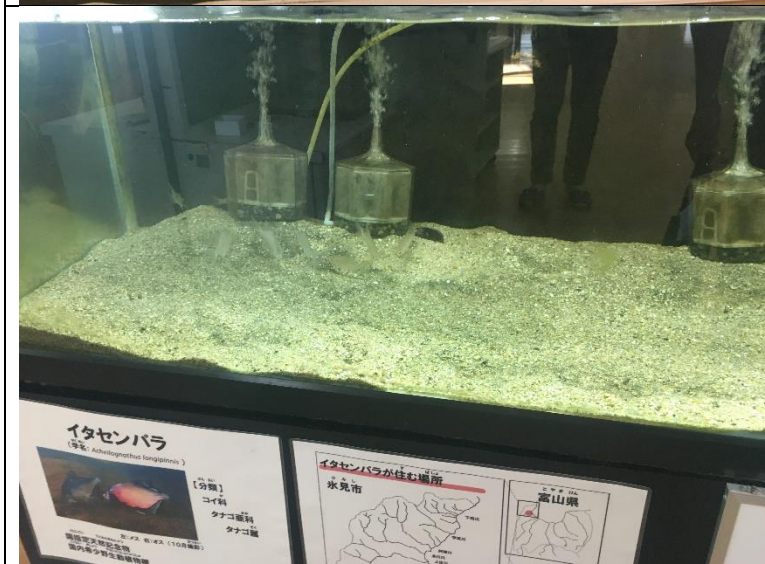
Visited Hiroaki Arakawa’s lab (larval lamprey rearing tanks), stationed right next to a rice field.




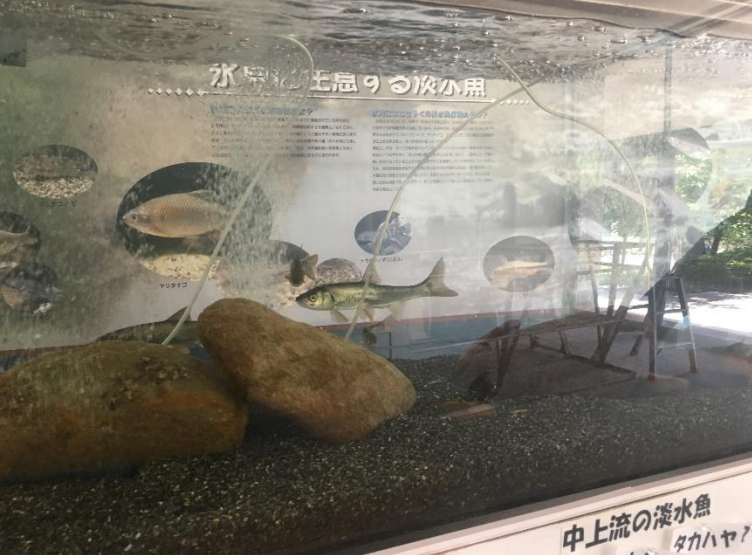
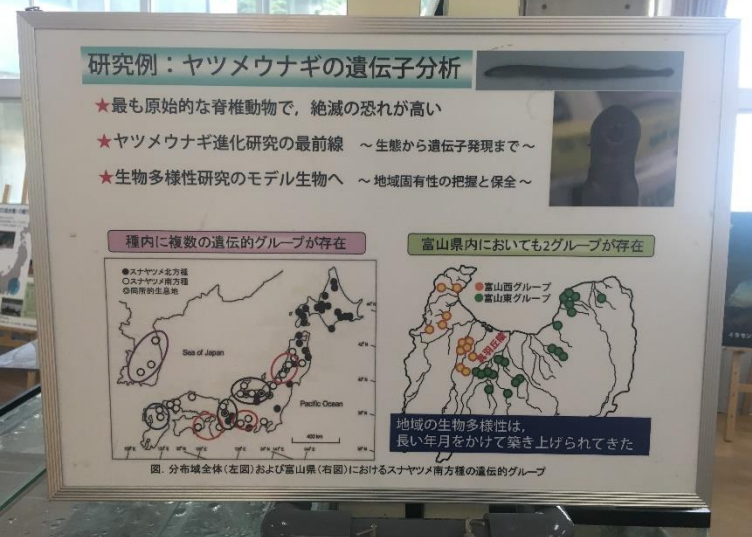
Close up of his tanks. He was a little bit concerned about the excessive fungus/algae built up (a little bit of fungus/algae is healthy for larvae rearing).

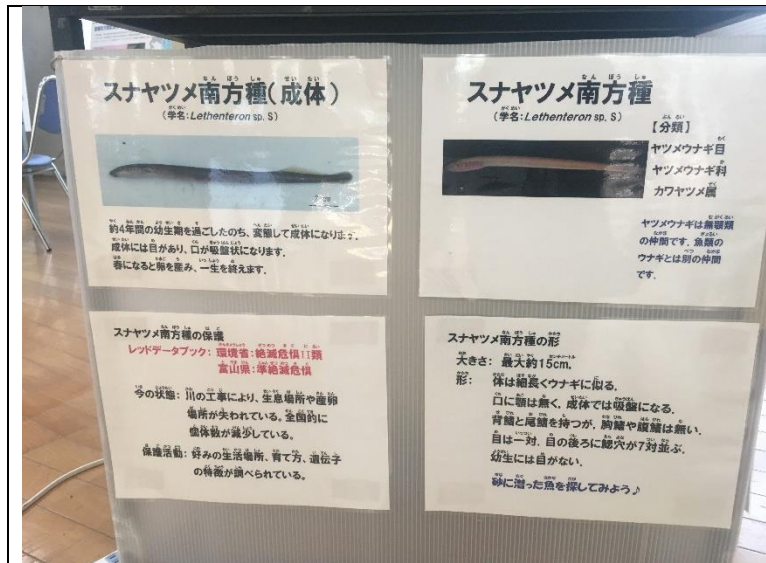


Also, on June 20, 2017, the next day after the release, we visited Yuji Yamazaki, a Toyama University professor, who has studied lamprey ecology and genetics extensively at his laboratory in Himi, Toyama, Japan. They have many aquarium with local fish fauna and great displays with information.



This is a native fish that is on the endangered species list, called Itasenbara.

	<p>Close up of Itasenbara in spawning colors.</p>
	<p>Other aquarium with resident native fishes.</p>
	<p>Poster display about resident lamprey genetics.</p>



More information about the resident lamprey and their differences.



Unfortunately, they did not have any lamprey in the aquarium at the time of the visit.



Group photo with Yuji Yamazaki, Seiji Yanai, and Hiroaki Arakawa after discussion (stuffed lamprey in the center)

Appendix B: Posters by Hiroaki Arakawa & Seiji Yanai





底質粒径が絶滅危惧種カワツメ初期幼生に与える影響 ～ワンド地形が持つ有用性～

荒川裕亮・柳井清治 (石川県立大学大学院)

1. 研究背景と対象生物

カワツメ (Lethenteron japonicum)

分類: 無類類上綱頭甲綱ヤツメウナギ目

ヤツメウナギ科カワツメ属

約3億5千万年から存在し続ける生物。

近年個体数が減少し、2007年に環境省のレッドリストにおいて絶滅危惧Ⅱ類に登録された。



2. 研究対象地



町野川

石川県能登半島の北部を流れる。
流域面積約169km²、幹川流長約21km。

調査地の柳田地区にはカワツメに関する独自の文化が存在する。

3. 研究目的

生息環境・生態を把握する → 減少要因を解明する



① 幼生は河川の底質に潜って生活

→ どのような河川環境に生息する?

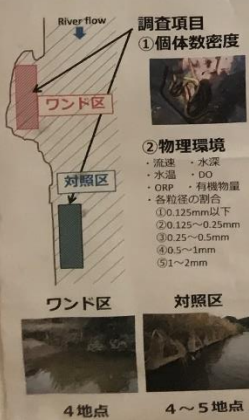
② 幼生は細かい粒径に潜砂する

→ 孵化直後の幼生や成長した幼生に違いは?

→ 潜砂できないと幼生はどうなるのか?

4. フィールド調査

2014年9月, 10月, 11月の計3回行った



調査項目

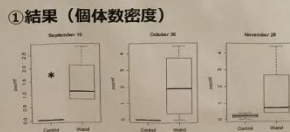
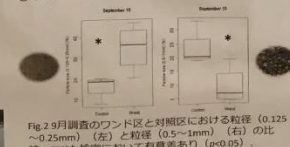


Fig.1 調査日毎のワンド区と対照区における幼生の個体数密度。**はマンホイットニーU検定において有意差あり (p<0.05)。

② 結果 (物理環境)



幼生は粒径 (0.125~0.25mm) が多く堆積したワンド地形に生息する

まとめ

① カワツメ幼生はワンド地形に生息する



粒径 (0.125~0.25mm) が多く堆積

粒径 (0.5~1mm) が少ない

→ 幼生にとって潜砂しやすい環境

② 孵化直後の幼生は潜砂能力が低く、潜砂することで着実に成長する

カワツメ減少要因のプロセス

- ・ 河川の護岸工事によって河岸が護岸・単調化
- ・ ワンドのような地形が失われる
- ・ 幼生の生息する環境が失われる (特に孵化直後の幼生に大きな影響)

5. 幼生の室内実験

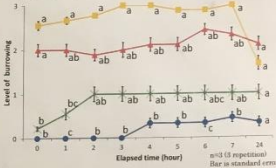
I. 実験の準備 (カワツメの人工授精)



II. 潜砂実験



① 結果 (孵化1ヶ月後の幼生)



② 結果 (孵化4ヶ月後の幼生)

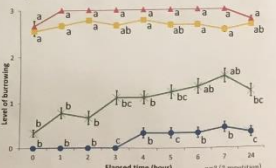


Fig.3 各粒径ごとの潜砂実験における幼生の潜砂レベル。マンホイットニーU検定を用いて多重比較を行った (p<0.0083)。

・ 孵化4ヶ月後の幼生

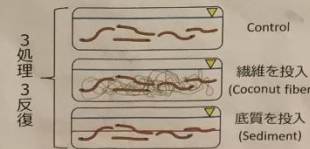
粒径 (0.25mm以下) でよく潜砂

・ 孵化1ヶ月後の幼生

粒径 (0.065~0.125mm) でよく潜砂

→ 孵化直後の幼生は潜砂能力が低い

III. 飼育実験



- ・ 餌を投入
- ・ 実験開始時と2週間後の実験終了時で
① 生存率と② 体長の成長率を比較した。
・ 自然光が当たる場所と暗所で行った

潜砂した幼生の生存率・成長率が高い

→ 成長するためには潜砂する必要がある

① 結果 (生存率)

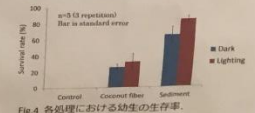


Fig.4 各処理における幼生の生存率。

② 結果 (体長の成長率)

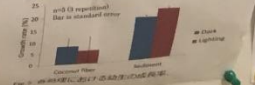


Fig.5 各粒径における幼生の成長率。