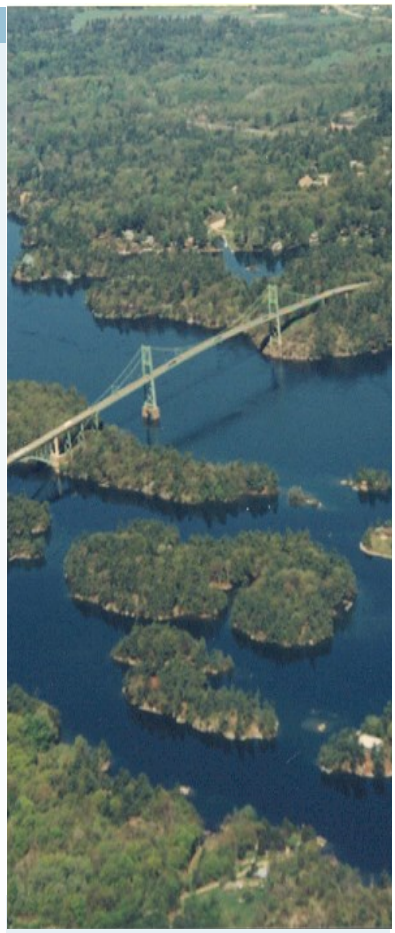
Spring 2021
Volume 1, Issue 1

RIVER DISCOVERY

Newsletter for the Friends of the Thousand Islands Biological Station

Dr. John Farrell observes fish egg collection device during spring



Welcome and becoming a TIBS Friend

We've been around a long time and you've probably heard about us and perhaps stopped by Governors Island, saw a talk or pulled a seine, and now there's an opportunity to do more by becoming a friend to engage in our exciting work in this amazing place. For over forty years ESF has been part of the river community with its long-term research, management, restoration and educations programs dedicated to building and applying conservation knowledge for the betterment of the river's ecological health and fisheries. We are reaching out for help and have some exciting news to share—come join us, there is important work to do!

Tagged Muskies provide both clues and mystery

A Canadian angler caught a Muskie in September that had a interesting accoutrement— a piece of scientific jewelry of pink with lettering. It was reported to staff of the Muskies Canada Gananoque Chapter Rob McRae who knew who to contact. What they discovered is this fish was part of a long-term study of muskellunge biology being conducted at the Thousand Islands Biological Station. Muskie tagging has been going on for decades and the fish can live for thirty years or more. Here are a few extraordinary stories of tagging and recaptures that yielded clues for scientists of their amazing lives *Continued on page 2*

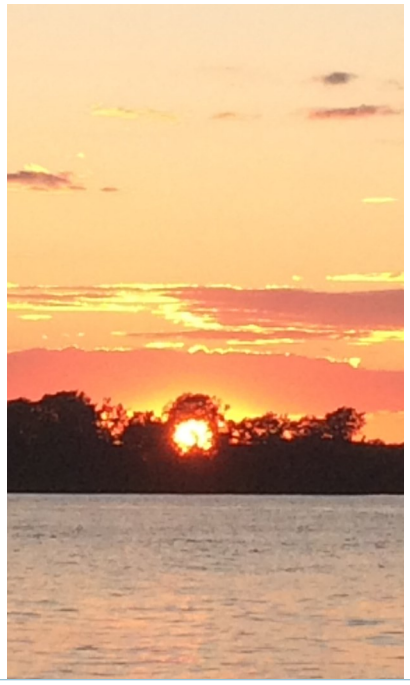
Gut microbiome may unlock secrets in the river's fish and humans too

Researchers at TIBS have found initial and promising pieces to a potentially complex and important puzzle regarding fish and perhaps human health. The study conducted by ESF graduate student Ben Gallo shows what you eat may regulate your gut microbiome (an intestinal bacterial community) and possibly influence your health. What is remarkable about the study is it began during early development before external feeding started when a tiny larval fish depends on yolk of maternal origin. Early data shows the intestinal microbiota is specific to species and river habitats. New research plans to use it to benefit fish such as Northern Pike in restoration! This work is published in *Fisheries* Magazine to learn more see https://afspubs.onlinelibrary.wiley.com/doi/10.1002/

Inside this issue

Special points of interest

- NEW FRIENDS PROGRAM TO BENEFIT TIBS AND THE RIVER!
- RECEIVE AN UPDATE ON EXCITING RESEARCH FINDINGS
- BE INVOLVED IN SUPPORTING TIBS PROGRAMS



From The Bluff

You are probably wondering who your director is. Dr. John Farrell (John) is a Professor of Aquatic and Fisheries Science at the SUNY College of Environmental Science and Forestry in the Department of Environmental Biology and director of TIBS), John received his BS degree from Cornell University and MS and PhD from ESF and has spent over thirty field seasons at TIBS. He conducts research on warm and cool water fish ecology but also works on topics including environmental monitoring, wetland ecology, lower trophic levels, invasive species, disease ecology, and habitat management. John has mentored over 160 students including High school seniors to college undergraduates, MS and PhD students and post-doctoral fellows. John strongly advocates for field stations and marine laboratories and is active on the Advisory Boards for the Central Michigan University Biological Station, and the Cornell University Biological Field Station. He also served as a past-president of Save The River and long-time director and currently is on the Thousand Islands Land Trust Board of Trustees. John lives on Governors Island April through October. His fascination with the River began as a youngster at his family camp in Oak Point NY. John enjoys fishing and hunting and spending time with his two sons (Jim and Ben) and his wife Kim and their dog, Flynn.

"TIBS mission is to conserve aquatic resources with ecosystem-based science applied toward decision making and proactive management, while providing unique training and educational experiences"

This Muskellunge received a Floy-type tag and was released in the 1990s to yield information if it was recaptured by scientists or an angler. Recapture rates by scientific field sampling can be as high as 25% over time but anglers capture a much lower percentage around 1-2%. This is likely due to the site fidelity and concentration of fish during spawning.

In future issues we will discuss findings related to Muskie genetics and site fidelity and findings from movements studies that employed radio and acoustic tags. TIBS scientist discovered that Muskellunge make migrations after spawning and have distinct patterns of seasonal movements.

Muskie tagging unravels and creates a mystery

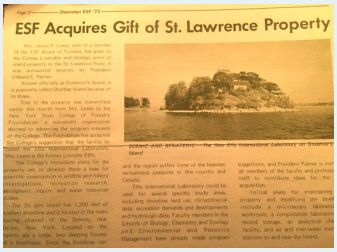
We tag fish in hopes of their recapture in the future by an angler or by TIBS researchers in our field surveys to learn about their movements, behavior, growth rates, and survival. Over the last 47 years Muskies have been sampled in the river in an attempt to monitor and better understand this complex fish. Many have been tagged in various ways in attempts at individual identification. The methods and technology has evolved from early labeled T-bar tags not dissimilar from those used in retail but with a vinyl coating and printed with an alphanumeric code (letters and numbers) to more advanced radio and acoustic tags where fine-scale movements have been studied. For the non-movement tags that require fish recapture, our studies of tag retention showed too many of these tags fell off and the method changed to use of soft metal strap tags and then thicker dart tags used for billfishes such as sailfish. Some amazing findings with these early methods in our program include learning that Muskies choose a spawning site and return there throughout their lives. Dr. Farrell as a graduate student tagged a male muskellunge in the 1990s in the Garlock Bay of the American Narrows and recaptured it in the exact same spot multiple times including 19 years later! We caught that fish four times and the last he was still feisty and spawning. His growth was slow but he eventually reached the size limit of 44 inches but then the regulation changed to 48" and he was undersized once again. This story may seem unique but tagging site and recapture site during spawning are amazingly consistent in the river despite the myriad choice of where to spawn and we now know that Muskies develop a strong fidelity to a spawning location. What remains a mystery is if they actually imprint on these sites from birth as a natal homing instinct or if they pick a spawning site and return to it year after year. It turns out that separation of these processes (site fidelity vs. actually reproductive homing) is a difficult science question to solve. Muskellunge are now injected with a passive-integrated responded or PIT tag including juveniles (where a 8mm tag smaller than a grain of rice is used) and a larger version for adults, applied just below the front edge of the dorsal fin. The PIT tag has tiny chip that can be read by a transponder in the field. We hope to track progress of the young-of-year juveniles to the point of spawning and see if they choose new sites or stay at their place of birth to finally shed light on this mystery. Stay tuned, we first applied them in 2017 in hopes of their return to spawn in 5 to 7 years for males and 6-8 years for females!

TIBS and USFWS combine forces with NYS DEC in program to study restoration of muskellunge spawning populations follow losses associated with VHS disease outbreaks and introduction of Round Goby in the mid-2000s. Photo: Eggs are stripped from a female St. Lawrence River Muskie and cultured fry and fingerlings are released in a multi-year study to assess population enhancement in the Thousand Islands Region.

TIBS lab experimental and culture facilities are critical to the research program Including studies designed to help rebuild sustainable fish populations—a focus exists on top predators including muskellunge, northern pike, walleye and bass

Becoming a Friend

Thank you for considering joining us by becoming a Friend of the Thousand Islands Biological Station (TIBS). You would be supporting and engaging with our mission: *To conserve environmental resources using ecosystem-based science to inform decision makers and society while providing exceptional educational experiences.* These river resources include our fisheries and the habitats and water quality they depend on. The attraction of people to want to live and travel to this incredible region that supports our economy is about the water, its quality and the fish and wildlife that thrive in it and on it. TIBS works with a variety of agencies and partners that have influence on the river's management and our long-term data and targeted studies contribute to a critical information base as a foundation to decisions and actions. Responding to emergencies, such as the effects of invasive organisms provide one example. We are engaged in securing the future iconic species, such as the muskellunge that in our lifetimes thrived, declined, were brought back by conservation efforts only to become at risk again due primarily to an invasive pathogen, viral hemorrhagic septicemia (VHS). TIBS again is focused on developing science-based approaches to reverse these trends and support our fisheries and native species that serve as the top predators in the river ecosystem. By becoming a TIBS Friend you will be supporting these efforts and also the students who are helping to conduct the work. Our graduates are gaining hands-on experience and will join the conservation workforce while contributing to our novel research and conservation efforts. We will communicate with Friends in a variety of ways to keep them informed and engaged of our progress, approaches and findings. Please join us to learn more and contribute to improving and protecting this incredible place through research and applied ecology programs at TIBS! See the logistics of becoming a friend on page 6.



A Short History of TIBS

The gift by James P. and Toni Lewis in 1973 of Governors Island in Clayton NY to the College of Environmental Science of Forestry (ESF) has changed the lives of countless students interested in a better river and world. Their generosity has led to the development of a highly regarded biological field station for the river and its community. Students are being trained, while the knowledge being generated is solving problems and helping to ensure sustainable environmental quality, habitat and fisheries. The field station was first named the Ellis International Laboratory after Toni's maiden name but was designated the Lorraine E. Lewis Thousand Islands Biological Station in 2000.

Jim and Tony Lewis c. 1955

FHCS wetland enhancements are working

Wetland connectivity impacted by dense invasive plants has been enhanced in numerous wetlands that serve as important fish nurseries. Projects include DEC lands in French and Cranberry Creek, private lands and with the Thousand Islands Land Trust with USFWS and Ducks Unlimited as key implementation partners. TIBS scientist follow up and monitor projects to see if they are working to improved fish use and reproduction. Result indicate hundreds of thousands of fish from 44 species including northern pike and largemouth bass. Great news is that almost no invasive fish have been found in projects.

TIBS Senior technician Emily Verbeck holds a Northern Pike prior to release in spring 2020.

Fish Habitat Conservation Strategy

With the Federal Energy Regulatory Commission (FERC) relicensing of the FDR Power Dam in Massena NY came a long and multi-partnered negotiation with NYPA, DEC, and USFWS as key agencies in the process. It led to the development of a grant program dedicated to the benefit of the St. Lawrence River fishes. The Fish Enhancement Mitigation and Research Fund started with $24M in an effort to offset unintended fish habitat losses associated with this massive public works project. The USFWS manages the fund along with a Fisheries Advisory Board with members across the management spectrum including NYPA, DEC, USGS, and the Akwesasne Tribe. The fund has fueled significant efforts to protect the river's aquatic habitat and solve difficult problems such as declines in American Eel and other species that have experienced declines as a result of the damming and its operation. ESF and the Thousand Islands Biological Station developed (with partners) a Fish Habitat Conservation Strategy (FHCS) with a focus on restoring critical reproductive habitat for key sportfish, including Northern Pike, Muskellunge and Walleye in the river. These species are known to be impacted by changes to the river and not only serve our fisheries but are also primary top predators that maintain balance in the ecosystem. Numerous projects with our partners have been completed or are planned. Several significant ones are associated with Thousand Islands Land Trust properties in wetlands damaged by invasive species.

Invasive hybrid cattail has severely impacted St. Lawrence River coastal wetlands and the FCHS is helping to restore fish habitat in many sites to benefit northern pike and many others

Tubenose Goby, our latest invader

In case you haven't heard, yes there's another fish in the river and it doesn't seem to be going away. The Western Tubenose Goby, *Proterorhinus semilunaris*, native to the Ponto-Caspian region of eastern Europe, first appeared in the Great Lakes basin in the early 1990s, alongside the better known Round Goby, *Neogobius melanostomus*. Both are here thanks to ballast water originating from the Black Sea; however the spread of the Tubenose Goby was slower than the rapid expansion observed for Round Goby. Now, they are commonplace in samples collected by TIBS researchers. It's a small fish relative to the Round Goby, reaching only 2-3 inches and has distinguishing nasal tubes. There were no records of Tubenose Goby in Lake Ontario or the St. Lawrence River until a single reported outside of Kingston, Ontario, in 2011. Beginning in 2016, Tubenose Gobies have appeared in ichthyological surveys of TIBS and the FINS program of the St. Lawrence Institute in Cornwall according to a recent publication in *BioInvasions Records* by recent TIBS graduate, Jessica Goretzke and her co-authors. Tubenose appear to be continuing their spread downstream. The presence of Tubenose indicates an expanding invasion front into the St. Lawrence Seaway followed by a secondary invasion facilitated by domestic ballast water transport and discharge, as well as passive downstream drift of larvae. A TIBS project funded by the Great Lakes Research Consortium (GLRC) to Drs. Roxanne Razavi and John Farrell led to acceptance of a graduate student, Iman Pakzad who is looking into the Tubenose and how it is able to gain a foothold on top of the abundant and ecologically similar Round Goby and also its role in contaminant uptake. The study shows that Tubenose are able to exploit a niche later in growth when Round Goby switch diets to focus on zebra and quagga mussels that Tubenose won't eat. As far as contaminants we focused on mercury and when methylated forms an even more serious toxicant. Interestingly and thankfully both goby species are relatively low in this contaminant. TIBS researchers and staff will be tracking changes and looking out for other invaders.

Tubenose Goby is a recent invader to the river (BOTTOM) significant questions include how they will affect food webs and native species. Round goby is significantly larger (MIDDLE) and the river have the biggest found in the Great Lakes (TOP)

It's time to help the Muskie population, again.

Dr. Farrell has been on the speaker circuit showing the data that indicates a troubling trend in the Muskie population and its fishery. TIBS faculty, staff and students work intensively and painstakingly to monitor this critical fish population. With partners starting with DEC Region 6 and the Ontario Ministry of Natural Resources and Forestry, the International Muskellunge Management Plan laid the groundwork of needs beginning in 1980. Contracts to ESF in 1983 from Sea Grant and then continuous support from DEC since 1987 and now with the additional help from the US Fish and Wildlife Service, efforts are now underway to rebuild a troubled St. Lawrence Muskellunge population. The first time Muskie declined was after decades of misuse and poorly informed management that led to concerned area guides and citizens about population status. Through better science led by TIBS and supporting agencies and conservation education by anglers and community groups such as Save The River, stocks began to increase and became stronger in the early 2000s. At TIBS we measured the whole response and learned so much along the way. We studied (that continues to this day) spawning, habitat quality, survival, growth, age structure and count the numbers of fish coming from nursery sites and the numbers of adults caught by anglers. It all looked great, more fish, bigger fish and strong reproduction. In 2005 Dr. Farrell received calls from the sampling crews, anglers and tour boat captains, dead Muskies floating all over. It started to unravel and the population has all but crashed. Former Great Lakes Unit Leader Steve LaPan who helped start the program calls it one of the greatest disappointments he's witnessed as a fisheries professional. Following several years of research with our partners at the Cornell Veterinary College Fish Health Diagnostic lab we learned the role of a invasive pathogenic disease (that may have originated in Round Goby) called viral hemorrhagic septicemia (VHS) that led to the Muskellunge deaths from 2005-2008. Research shows Round Goby also may feed on their eggs and have altered fish communities young muskellunge depend on for prey. All the population monitoring indices headed in the same direction, for the worse, and have not recovered for many years. Without the Muskie program we may never have known whole spawning populations were lost and the fish population is aging and now dependent on very low levels of reproduction. Now the bright side, TIBS and partners (DEC and FWS and others) are taking action to rebuild the population with an experimental stocking program. A multi-year shot in the arm to refill the river's core spawning and nursery sites with a goal of sustainability. This is a monumental effort and requires considerable investment. We cannot envision a river without its top-predator and need help to support the program. We have top scientists, managers and researchers leading the effort and an incredibly supportive community to make this possible. You will be hearing more in each issue about critical developments. We need everyone's help to turn this around– it's not the first time– we can do this, we need to do this.

59" Muskellunge found dead floating in near the Palisades in the upper River near Cedar Point. This fish was necropsied and tested positive for VHS. It is one of many fish recovered during the widespread mortality event of 2005-2008. Efforts are underway to rebuild the muskellunge population

Anna Conklyn, TIBS Graduate Student

TIBS students are at the core of our mission, we wouldn't be able to achieve much without them. They range from seasonal technicians getting their first jobs out of school to post-doctoral fellows working as accomplished scientists, all on a path towards meaningful contributions to society. In each Friends Discovery issue we plan to focus on a TIBS student, their research and contributions.

Anna Conklyn grew up in the hills of Deruyter NY and worked her way from a small rural high school to Cornell University where she excelled and joined the ESF graduate school on her quest for a Ph.D. in Fish and Wildlife. Her research is critical to our understanding of how the VHS virus is changing and maintained in the river through a study of host-pathogen relationships. We know that the invasive round goby is an important viral reservoir. Anna has studied how the biology of goby including their gender, age, growth and condition affects their viral levels. She is now extending this work to develop an understanding how they shed pathogens into the water potentially exposing virus and expose fish such as muskellunge. Anna is also researching changes to the VHS virus due to mutations similar to what is happening with the COVID-19 virus. Tracking viral transmission and change is critical to understanding its future effects to the river and the fish it infects. She will also use TIBS long-term data to look at effects on other river fish species that have been influenced by goby and VHS. Anna's findings will inform the muskellunge recovery effort. Anna also participates in long-term data collection at TIBS and has presented her work at regional conferences. She was lead instructor for a course in Limnology, the study of fresh waters last fall. She plans to have two more years on the river before graduation!

TIBS PhD candidate Anna Conklyn uses partitioned coolers to separate gobies by sampling. She continues her research aimed at understanding how they perpetuate the VHS disease in the river.

Becoming a TIBS Friend—How does it work?

Visit our Friends of TIBS website: **www.esf.edu/TIBS/support-tibs/.** Choose your level of annual membership and pay online. Membership levels:

Student: $25
Single: $40
Islander: $100
River Ecologist: $250
1000 Islands Supporter; $1,000
Muskie Enthusiast: $5,000

All Friends will receive a subscription to this new regular e-newsletter, *River Discovery,* that will include important research updates, student highlights, upcoming events, notes from the TIBS director, and more!

TIBS Aquatic Laboratory and the importance of cutting-edge facilities

When Jim and Toni made their incredible gift of Governors Island to ESF in 1973 it was a summer residence and not the biological research facility it has become today. Its been an incremental process upgrading the lab to do the work we need it to do. Our financial backing comes primarily through grants and we have been able to secure long-term support from DEC, initially (since 1987) from the Dingell-Johnson Act or DJ grants that support federal aid to sport fisheries nationwide including hatcheries, access, as well as research and management activities. DJ funds come from the resource users in the form of an excise tax on bait and tackle, fish equipment, boats and marine fuel. We now have grants through the NYS Environmental Protection Fund to support our operations and activities. A second major source of support is through the US Fish and Wildlife Service (FWS) and the National Fish and Wildlife Foundation (NFWF) for the Fish Habitat Conservation Strategy on the river. With the consistent funding, we have been able to build research and equipment infrastructure for TIBS and also at our labs on the main campus in Syracuse. Our facilities were greatly improved following a successful $2M facilities grant from the National Science Foundation in 2013 coupled with a philanthropic campaign by the river community that raised $600K. Those efforts renovated our aging labs into the Mark A. F. Baker Aquatic Laboratory in the TIBS boathouse and the Frank and Ann Cean Aquatic Researcher Building that provided a new office and residential facility completed in 2014. I'd like to think that we built the long-term research program first and the facility improvements followed. The addition of the TIBS annex in 2018 as a mainland facility was accomplished through a cooperative agreement with the Thousand Islands Land Trust and has been incredibly important to operations as it is within walking distance to the Clayton Yacht Club where we have been members since the times of Jim and Toni Lewis. Today we continue to grow and new demands require more technology and investment to be able to do the cutting-edge research the complex problems demand. We continue to build our capability as a conservation aquaculture facility in order to raise fish for studies intent on rebuilding the river's fisheries. Experimental facilities are also being improved including an outdoor tank system as environmental controls for our indoor labs. We have arrays of sensors in the field that need upgrades and maintenance and we look to new technologies to advance our observing systems. TIBS maintains a fleet of boats and vehicles to do our work and we currently do not have a research vessel with modern capabilities. With your help as TIBS friends we will continue to evolve and improve to become the world-class field lab the river deserves and needs.

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Major Donor Giving Opportunities

As a major donor to TIBS, you will be leading the charge to secure the future of TIBS and the future of our students. Major sponsors have the opportunity to directly contribute to several critical fundraising needs to support the longevity of the station and our programs.

For more information on how you can support TIBS as a Major sponsor contact :
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