

PART I: FACULTY SABBATICAL LEAVE COVER PAGE

1. **Type of Award:** Faculty Sabbatical Leave

2. **Applicant Information:**

Name: Dr. Richard D. Durtsche

Department: Biological Sciences

Office: Sciences Center 148

Office Phone: 859-572-6637

e-mail address: durtsche@nku.edu

Date of initial appointment to full-time tenure-track faculty status: August, 2000

Date(s) of previous sabbatical leave(s): Full Academic year 2017-2018;

Spring semester 2008

Type(s) of previous sabbatical leave(s) (FDA or re-entry): FDA

3. **Requested Leave Period:** Full Academic year 2025-2026

4. **Other Current FDA Award Applications: Project Grant & Faculty Fellowship**

5. **Title of Project: "Nordic Research on Fish Migration Physiology, Climate Adaptation, and Binational Teaching in Sweden"**

a. **IRB/IACUC/IBC Approval # / Status** (if applicable): IACUC 2019-06-22

b. Note: This information is for committee review and will not impact project scoring.

6. **Short Project Description** (200 word max):

Fishways are essential for fish migration in rivers blocked by dams. Understanding how small fish and juveniles, especially salmonids (trout and salmon), use resting stations and manage oxygen consumption can improve fishway designs. Additionally, studying how fish of all ages respond metabolically to rising temperatures, particularly in Nordic regions experiencing rapid climate change, is crucial for river management. During my 2025-2026 sabbatical at Karlstad University (Kau) in Sweden, I will explore small fish and juvenile salmonid metabolism and swimming physiology to enhance migration and river energy models developed by the Kau River Ecology and Management Group. Based on these models, I will field test juvenile salmonid migration patterns in a fishway with rest barriers to alleviate metabolic stress on these fish. I will also examine the effects of climate change on the metabolic physiology of different fish age groups. I will learn new techniques in Environmental Education based on sustainability development, and I propose teaching a Northern Temperate Ecology course, collaboratively with NKU and Kau faculty, combining study-abroad and online components with cross cultural field studies for NKU and Kau students in Sweden. My Swedish language skills will support this binational research-teaching effort.

7.

Richard D. Durtsche

signature*

9/30/2024

date

* By typing your name or pasting your signature in the space provided you are allowing this application to be reviewed by the Faculty Benefits Committee for a possible award. The applicant is also aware that failure to comply with the instructions may result in this proposal not being reviewed.

Part II. PROPOSAL BODY

A. DETAILED PROJECT DESCRIPTION:

My sabbatical request is for a multi-faceted program of engagement with the University of Karlstad (Kau - Karlstads Universitet) in Karlstad, Sweden where I currently hold an Affiliated Research Faculty position with the River Ecology and Management (REM or NRRV in Swedish) group (see supporting documents). My overall goals include: 1) professional development in two areas of urgent concern where new research on the ecophysiology of stream fishes in Sweden is needed; and 2) teaching development in ecological and environmental education to strengthen my pedagogical skills through collaborative biology teaching at Kau and development of a joint bicultural exchange course with Kau colleagues to bring NKU students to Sweden for joint field ecology studies with Kau students for the May intersession.

1. Background:

Improved Fishways for Small Fish Migration

Rivers and streams are often fragmented by dams, culverts, and channelization, significantly impacting fish passage, especially for small fish. Fishways are crucial for enabling migration in obstructed rivers, but smaller species (e.g., minnows, chub, juvenile salmonids) often struggle against strong currents. Fish passage designs typically focus on the critical swim rates of target species like salmonid (Noonon et al. 2012), while the needs of smaller fish are often overlooked, limiting their migration success (Knapp et al. 2019).

In Sweden, with approximately 11,000 hydropower dams (Fig. 1), improving fish migration for small and juvenile fish is critical to ensure the connectivity of fish populations. Spawning salmonids, such as grayling in early spring and brown trout in summer through fall, require high flow rates (2-4 body lengths per second) to guide them into fishways for migration (Bell 1986), so a 40 cm trout would need a flow of 80 cm/sec. However, juvenile salmonids often cannot withstand such speeds, favoring flow rates between 10-30 cm/sec during feeding (Armstrong et al. 2003). Boulder refuges near fast currents have been shown to offer juveniles shelter from strong flows and predators (Näslund 1989).

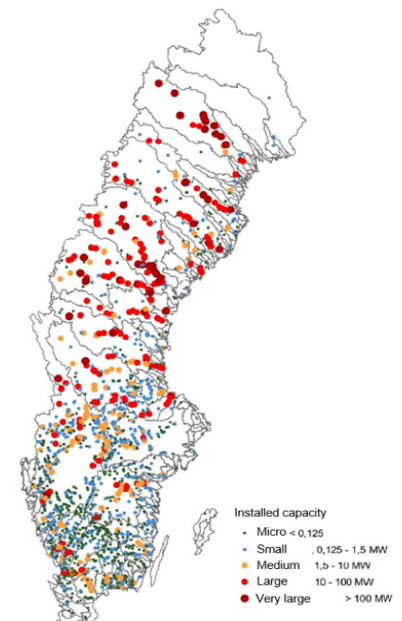


Fig 1. Hydropower dams in Sweden (Polato 2021)

While adding weirs to fishways can reduce stress on migrating fish (Shahabi et al. 2021), they often slow the water flow below levels needed to attract target species like salmonids (Polato 2021). Moreover, weirs can create lentic side-pools, which may become refuges for predatory fish, further threatening juvenile populations. There is a necessity to find solutions for juvenile and small fish passage in fast waters of fishways or road culverts to ensure the connectivity of fish populations.

Studying the ethophysiohydraulics (fish behavior and physiology in response to water flow) of small fish or juvenile salmonids in a controlled environment can provide valuable insights into how flow conditions and rock barriers affect their swimming capabilities. Testing these fish with different barriers can help identify strategies to reduce metabolic stress and improve passage through faster flowing fishways.

Impacts of Climate Change on Salmonid Fish Metabolism Across Age Classes

One of the major threats to fish and freshwater ecosystems, especially in northern temperate regions, is climate change (Durtsche et al. 2021, Nagelkerken et al. 2023). My previous studies with Kau faculty found that juvenile brown trout raised in elevated climate temperatures (+3°C above ambient) had significantly different metabolic rates compared to those raised in normal conditions. However, it remains unclear if these differences extend to older age classes, or if they reflect physiological plasticity or an epigenetic response triggered by climate conditions. While we measured acute metabolic responses in juvenile fish, long-term studies across age classes are lacking. Understanding how salmonids metabolically respond to increasing temperatures is crucial for assessing their evolutionary adaptability and genomic capacity, which will have significant implications for the fishing industry and conservation efforts.

2. Importance

Streams and rivers globally are impacted by habitat alteration where barriers impede fish migration or increasing water temperatures due to climate change. Sweden is especially impacted because of the number of dams on their rivers and intensity of elevated climate change temperatures compared to other parts of the world. Fast flowing fishways (designed for adult salmonid migration) and road culverts offer partial solutions to stream/river barriers, but preclude small/juvenile fish movement so improvements are needed for complete fish populations continuity. Also, according to the European Environment Agency (2024), the highest level of warming is projected in Scandinavia which based on one scenario was an increase of 4.1 to 8.5°C by 2100. So, understanding how salmonid fish for example respond to these changing conditions can be important in modeling river management systems to support these fish populations moving forward. In addition, the salmonid fisheries is very important to Sweden, both from the sportfishing and industrial/aquaculture perspective. According to Compassion in World Farming (2021), Sweden is only second to Norway in the export of salmon which is the 9th species used in aquaculture by volume globally. Gaining knowledge of the physiology of these fish in Sweden under these current threats to their populations and finding solutions now can result in management models and conservation practices that can be used in other areas of the world and on different fish species.

3. Goals (SMART)

a. Specific:

My goals include collaborating with the REM group at Kau to improve fishway designs for small and juvenile fish migration and contribute to stream ecological modeling by studying the eco-physiology of Salmonid fish (trout, salmon, grayling) in relation to metabolism and thermal changes (e.g., climate change). The first study will measure the metabolic rates of small fish (juvenile salmonids, cyprinids) under various flow conditions, testing different shapes and sizes of barriers (e.g., rocks) to reduce metabolic stress in high-flow streams. The effectiveness of selected barriers will then be modeled to determine how well small fish can navigate fishways designed for adult salmonid passage. Field validation will take place at a fishway associated with a Swedish dam.

The second study will examine the metabolism of different fish age classes acclimated to both current and climate change (+3°C) temperatures to assess their physiological plasticity

and potential epigenetic responses. We will test for epigenetic triggers (e.g., DNA methylation) and determine if metabolic plasticity in juveniles persists into adulthood.

In teaching, I plan to assist with teaching within several different courses (guest lectures or leading discussions) to see how instruction techniques and strategies in environmental education (e.g., sustainable development) used at Kau can enhance my teaching at NKU and bringing new environmental education courses to the NKU Research and Education Field Station (REFS). Additionally, we will develop a bicultural field ecology course for NKU and Kau students, with NKU students traveling to Sweden for the May Intersession. The courses will include Northern Temperate Ecology (NKU) and Conservation Biology (Kau).

- b. Measurable: The findings of these research studies will be presented at local (NKU), regional (Kentucky Academy of Sciences), and national/international scientific meetings (e.g., the Joint Meetings of Ichthyologists and Herpetologists, Society of Freshwater Science, etc.), and will ultimately be submitted for publication in refereed journals. Having the bicultural study abroad course for NKU students and future environmental education courses at REFS would be measures of pedagogical goals.
- c. Action Oriented: The research studies and student coursework whether in the laboratory or in the field is definitely action oriented. I would expect that I will be training and possibly supervising several Kau students with my research, from high school through Master's students as I have done in the past. The students are eager to learn and be part of the studies or classes, and I benefit from having extra hands when needed to carry out the experiments or even assist with the teaching of NKU students.
- d. Realistic: These studies are realistic. Kau has a full basement aquatics facility for fish research that dwarfs even what we have planned for the new science expansion at NKU. There is a whole group of collaborators working on fish and other aspects of stream and river ecology in the REM group, and my studies are integrated into the overall questions that the group is testing and will be used in modeling river ecosystems. They do not have an ecophysiolgist, so I meet a need lacking in these studies. I have taught and published with some of the faculty before from my last sabbatical, and we carried out a study abroad program in the past, so these aspects are also realistic.
- e. Time-oriented: I have provided a Gantt chart below that shows the breakdown in time devoted to different aspects of this sabbatical.

4. Procedures

Improved Fishways for Small Fish Migration

This study proposes to assess how small fish metabolism responds to high flow rates with and without barriers by testing the swim hydrodynamics and ethophysiohydraulics of juvenile salmonids (e.g., brown trout [*Salmo trutta*], grayling [*Thymallus thymallus*], etc.) or small cyprinids (e.g., Eurasian minnow [*Phoxinus phoxinus*]). The juvenile salmonids and cyprinids for this study could be obtained through seining or electrofishing and kept on the Kau campus until individually tested in ethophysiohydraulics experiments. Fish hatcheries could also be a source of juvenile salmonids for testing. A small swim test chamber has been constructed and is placed inside a large plexiglass tank made for viewing, and is filled with water during testing (Fig. 2). A long rectangular swimming area for the fish within the swim chamber is blocked off by stainless steel mesh on the rear end and a laminar flow grid at the front end. A remote-controlled water pump is placed in the long straight section opposite the straight swim area with curved portions on the ends in this oval chamber. Average flow rates in the swim area can be

measured at certain positions using a flow meter (electromagnetic, OTT Hydromet, model MF pro) in cm/sec. Various Jerepet brand ECO DC pumps (model number SND-3000 at 800 gph, model number SND-4500 at 1100 gph) can be used to create the current/flow in the swim

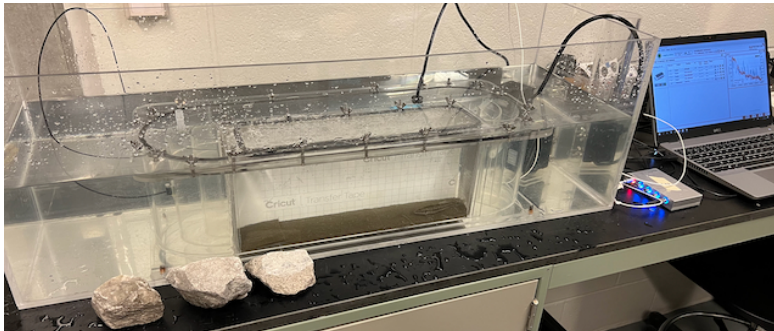


Fig. 2. Fish swim test chamber with optical oxygen spot sensors connected to the Pyroscience™ Firesting Oxygen Datalogger to measure dissolved oxygen. The oval swim test chamber is located within a larger transparent tank so that fish position and behavior can be observed.

3-4 hours at various current velocities to measure metabolism and endurance. Dissolved oxygen (DO) is measured by placing fiber optic cables at both ends of the fish chamber. DO measures are taken with an optical oxygen spot sensor read by the fiber optic cable and recorded with a PyroScience™ Firesting Oxygen Meter. Once DO levels drop to 90%, a recharge pump flushes the chamber with fresh water to reelevate DO levels so fish are not stressed by hypoxia in an intermediate-flow respirometry setup (Fig. 3). In the front of the swim chamber barriers (e.g., rocks) of various shapes and sizes will be placed to simulate different forms of rest areas for testing reduction in fish metabolism. Consumption of dissolved oxygen can be

chamber between 6 cm/sec and 30 cm/sec. With funds from a submitted project grant, a swim chamber could be constructed at Kau that would take a larger pump for faster flow rates and to accommodate some of the larger juvenile salmonids. The Jerepet brand has pumps with capacities of over 3000 gph. These experiments will involve placing the fish inside a sealed swim chamber to void all air bubbles and measuring the change in dissolved oxygen over a set period

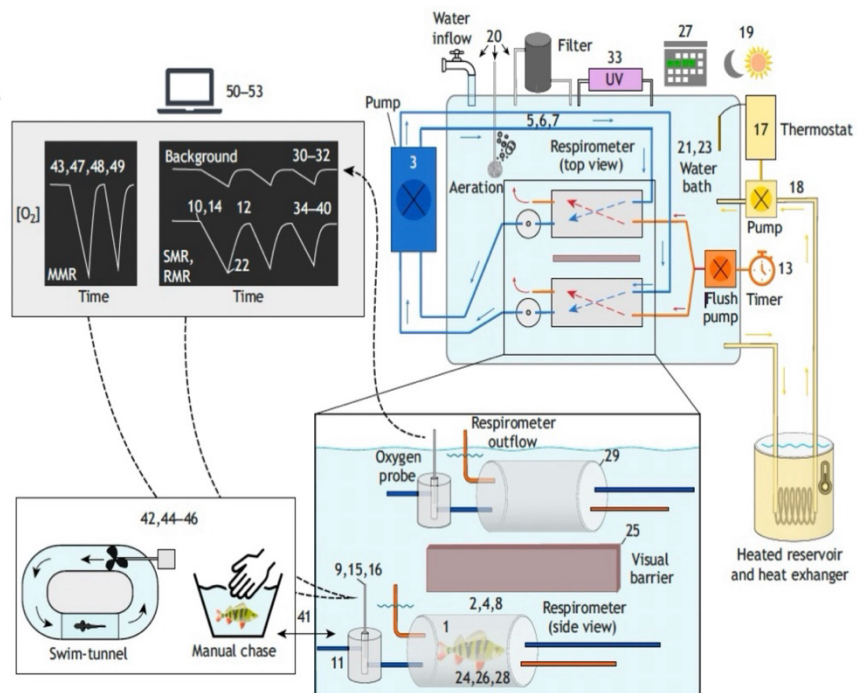


Fig. 3. Schematic of a typical intermittent-flow respirometry setup. The top right depicts a top-down view of the setup; the enlarged box below presents a more detailed side-view of two respirometers (one containing a fish and the other being an empty chamber for measuring background respiration). SMR, standard metabolic rate; RMR, routine metabolic rate; MMR, maximum metabolic rate; UV, ultraviolet. (From Killen et al. 2021)

standardized for the mass of the fish. Endurance rates for these fish will also be recorded with and without rock resting barriers at different flow rates to help determine the distance spacing needed between resting barriers in fishways. The respR software (Harianto et al. 2019) a R statistical package will be used to analyze oxygen consumption rates and determine metabolic rates under different rest barrier scenarios and with different flow rates. Parametric analyses will be used to evaluate metabolic between different flow rates and flow barriers (shape and size). All statistical analyses would be run with an alpha value of 0.05.

Once fish rest barrier shapes and sizes have been found to be beneficial in the test tanks, then an effective fishway model with rest barriers can be created. A test of the model could then take place in a fishway associated with a dam where experimental rock resting barriers will be placed according to the model and then observations made with migrating fish to see if they are used by small fish / juvenile salmonids moving through a fishway. Either naturally migrating or field-marked fish hatchery released juvenile salmonids can then be tested moving through and using the rest structures in the fishway with snorkel surveys or camera (trailcam above/fishcam underwater) monitoring and mark recapture collections used to determine if the rest barriers improve fishway migration success.

Impacts of Climate Change on Salmonid Fish Metabolism Across Age Classes

This study investigates if natural history age classes of fish show any epigenetic (different genes triggered at different temperatures) responses demonstrating adaptability to different temperatures or if responses might just be physiological plasticity within the fish species. Once we have collected fish of different age classes through seining or electrofishing or possibly from fish hatcheries, they will be kept on the Kau campus in the aquatics facility until individually tested. The fish can be acclimated over a two-week period to different temperature regime such that one temperature will be natural stream temperatures and the other temperature will be the elevated (+ 3°C) climate change temperatures. These higher temperature conditions reflect the projected temperature conditions that could occur in high northern latitudes over the next 50 years if climate change controls are not implemented (IPCC 2023). I would be testing the metabolic capacities of the fish at these different temperatures. Metabolic oxygen consumption will be measured during experimentation with an intermittent-flow respirometry system (Fig. 3). Fish will be individually tested in respirometry chambers connected to the intermittent-flow system (Fig. 4) in the Kau Aquatics Facility. The swimming chamber allows for the measurement of dissolved oxygen (DO) with a dedicated optical oxygen DO spot sensor and eight can be measured simultaneously. These measures of metabolism through the volume of oxygen consumed will provide a better picture of fish at all ages of the taxa responding to climate change. Others in the research group will measure if DNA methylation (sign of epigenetic response) has increased under higher temperature conditions.

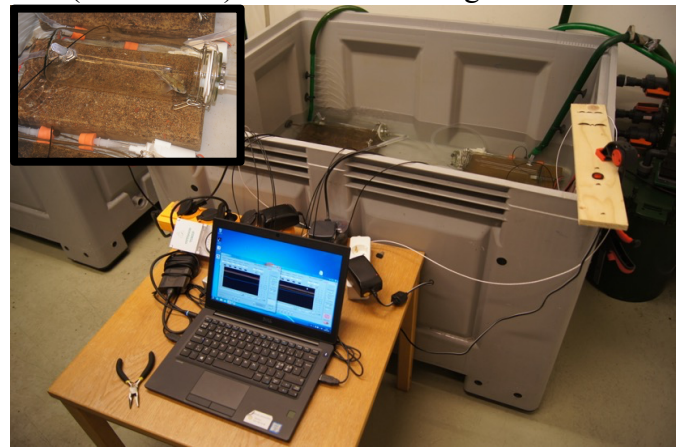


Fig. 4. Respirometry chambers (8) in the intermittent-flow respirometry system set up for salmonids in the Kau Aquatics Facility. The inset image shows one of the respirometry chambers while testing an Atlantic salmon.

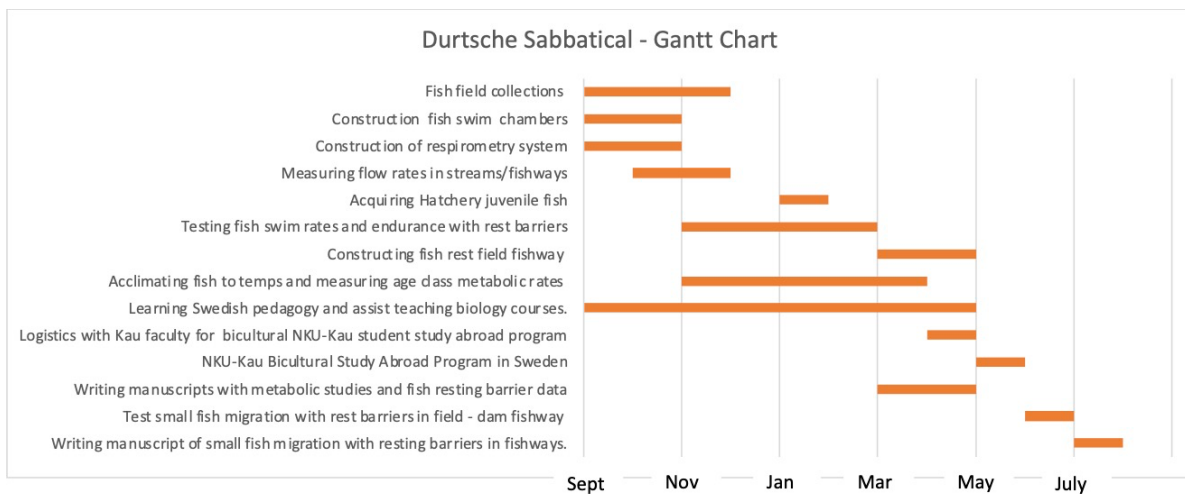
Pedegogy & Global Education: NKU's Northern Temperate Ecology, a Binational Course

Working with faculty teaching at Kau, especially since they several of the faculty have a pedagogical-based research focus, will give me the opportunity to learn new ideas about environmental education (e.g., sustainable development). These skills can be directly translated into my own ecological based courses, but also into new environmental education courses that can be taught at NKU REFS (which I direct). These could be summer courses for teachers or could be tied into the Environmental Education Microcredential offered by the College of Education.

Northern Temperate Ecology (BIO 465) will be a combined NKU – Kau bicultural course with students from both institutions participating in May Intersession. Myself, another NKU faculty, and KAU faculty and graduate students will be instructors. The field component of the course will be held in Sweden, with Kau students enrolled in their Conservation Biology course. Students from both universities will benefit from an intercultural exchange while they learn science together. Week one is distance-learning (Zoom or Teams) background on northern terrestrial and aquatic ecosystems. Weeks two and three are small group NKU-Kau collaborative hypothesis-based field studies in Sweden, one week terrestrial and the next week aquatic ecology. Students will also visit professional biologists (foresters, conservation biologists, aquatic ecologists) on separate days to gain firsthand career experience. My fluency in Swedish will also be an asset as an instructor, though Swedish students speak English and regularly have biology courses taught in English.

5. *Timeline:*

Below is a Gantt chart of the timeline of the sabbatical and summer research activities.



6. *References:* (see Supporting Documents 1.c. in Part III Appendices)

7. *Outcomes:*

Outcomes of this sabbatical will be the dissemination of new scientific knowledge through presentation and publication. The results of these studies can help to develop river ecology management models that can be tested, for example with fish rest barriers that will aid in fish

populations migrating where they once were not present. The hydroelectric power companies are often looking for solutions to environmental challenges created by their dams. I will gain pedagogical skills in environmental education and sustainable development that I can use in my courses and for future REFS Environmental Education courses. Students studying abroad and learning with students from Sweden will take away life changing experiences. They will learn more biology by hands-on experience and field-based experimentation than they would in a traditional laboratory-based course, and seeing professional careers in Sweden gives them another perspective on how biologists work in the environment.

8. *Criteria:*

Criteria for evaluating the success of this project will include the presentation of materials at scientific meetings and public forums by myself and by participating students, and the submission of manuscripts for publication. I expect to submit one manuscript for publication by the end of the sabbatical with several other (2-3) manuscripts collaboratively with Kau faculty within the year following the sabbatical. I will add a section to one of my ecology-based courses (e.g., Vertebrate Zoology or Herpetology) on environmental education, and plan to work with the College of Education on summer Environmental Education courses/workshops for REFS. Successfully completing the study abroad program (provided sufficient students enroll into the course) would be another criteria for evaluation.

9. *Urgency:*

Fish populations, especially salmonid fish, in Sweden are under severe pressures that could reduce their numbers and impact their health. Migration patterns, especially for small juveniles is impacted by dams (11,000) and other river barriers in Sweden and by fast flowing fishways that target larger fish for migration. Finding solutions for passing fast moving water with rest barriers are needed now to help juveniles stay connected to population of salmonids and crucial habitats needed for feeding and survival. Climate change is elevating temperatures even faster and higher in Sweden compared to other parts of the world which can also impact these fish. Every month we are hearing that it is the hottest on record, globally. My previous research showed a climate change related metabolic impact on juveniles, but we are missing information on other age classes. It is imperative that we run these studies to determine how salmonids of all ages metabolically respond to elevated so management models can be developed to prevent overheating and conservation efforts planned to maintain these fish populations. Changes in the metabolic physiology of these fish could alter their position as top predators in the ecosystem and result in the potential loss of their populations.

B. VALUE OF THE PROJECT:

1. To professional growth and status: This project will facilitate a multifaceted research program, part of which I have already begun, and which I plan to continue working on in collaboration with the Kau REM research team for several years to come. It will allow for professional growth in my field of biology and increase my status as a physiological ecologist. The data collected will also be used as pilot data in proposals for federal funding of expanded projects on stream fish here in Kentucky. I will also gain useful pedagogical skills on environmental education to take into the classroom.
2. To teaching and the students: This project facilitate my growth in pedagogical knowledge that I can use in my courses at NKU. Kau students and NKU students

- interested in a semester abroad are welcome to join my investigations there. These studies will continue after my return to NKU, but on Kentucky stream fishes and provide research opportunities for undergraduates. The bicultural study abroad course will also have a tremendous impact on the NKU and Kau students that participate.
3. To the scholarly community: This study addresses fish biology and river management to strengthen migration by small fish species and juveniles of larger (Salmonid) fish species that are impacted worldwide by barriers to migration. Additionally, evaluation of metabolism for different age classes of fish raised at different temperatures can provide an insight into the capacity of these fish to deal with potential climate change threats that loom over the northern temperate ecosystems and can spread globally.
 4. To the University: The University will benefit by strengthening ties to our only collaborative institution in Sweden where we have an exchange agreement. These studies will also help to strengthen a working research program between our institutions that can grow over time. Learning new pedagogical skills will be useful to establishing new environmental education workshops or courses at REFS. Teaching a binational course with instructors from both institutions also sets the stage for future exchange activities for both students and faculty alike either here at NKU or at Kau.
 5. To the non-academic community: The non-academic community can benefit from this project through seminars and talks in a public forum that increase the knowledge base of the public on fish biology and stream ecology. For some people in the community, e.g., Northern Kentucky Flyfishers (membership > 250 and one of the largest flyfishing clubs in the United States), this research would be of great interest as the Salmonid fish are a target species for this sportfishing group. In addition, outreach to secondary educators can include basic experiments about the ecology of fish designed from the outcome of these studies for use in the classroom.

C. APPLICANT BACKGROUND AND DILIGENCE RELEVANT TO THIS PROJECT:

1. Applicant Background: I have 26 years researching various aspects of physiology and metabolism in fish, amphibians, and reptiles and over 40 years of experience in ecological field studies of amphibians, reptiles and fish. In my tenure at NKU, I have mentored over 120 undergraduate research students, with several projects on metabolism of fish. I have much of the equipment needed to carry out the proposed studies of my sabbatical, and other instrumentation is available to me at Kau in Sweden. I am fluent in Swedish and have lived in Sweden for 4 years including my 2017-18 sabbatical to Karlstad, in addition to annual visits to see family. The exchange agreement between NKU and Kau is the third international university-based exchange agreement I have facilitated, the other two being with the Universidad Autonoma del Estado de Morelos in Mexico, and the National University (UNA) in Costa Rica. I have been taking undergraduates internationally since the mid-1990s and have taught a study abroad course at NKU (to Costa Rica or Mexico) almost every year since 2002.

During my last sabbatical at Kalstad University in Sweden, I was heavily involved in research and teaching activities, with their faculty and students. I participated in several workshops, assisted in teaching, gave two university seminars, supervised two internship students, one Bachelor's project, one Master's project, and was the examiner of one Bachelor's project. (See appendices)

Since my last sabbatical, I or my students have given ~15 presentations at local, regional, and national/international scientific meetings related to this research, and I published four articles in refereed journals with colleagues from Kau. One article in a highly ranked ecology journal, *Ecosphere*, was identified as the most cited article from the years 2021 and 2022 for that journal (see curriculum vitae). I published one additional article while on my sabbatical. A sixth article is still in progress. I presented at the presentation on my sabbatical research at NKU's first Spotlight of Scholarship (Oct. 2018) and at a Department of Biological Sciences Seminar (April 2019). I also wrote and incorporated a new section to my Animal Physiological Ecology Laboratory (BIO 441L) on Aquatic Respiration based on my sabbatical research. This past summer I mentored 2 URSTEM students in research to measure swim speeds and metabolic rates in two local small fish species. They presented their results at the Summer Celebration of Research. These studies form pilot investigations for the work I want to do with juvenile salmonid fish during my sabbatical in Sweden.

2. Other Support, Funding and Commitments:

- a. Support – I have intramural support from NKU Biological Sciences is allowing me to take some equipment and instruments needed (oxygen datalogger, fish swim test chamber, etc.) to Sweden. I also have extramural support from Kau including their invitation to join their faculty for the year and providing me with office space, using their laboratories, using their aquatics facilities, and some equipment and supplies there. I have a commitment from Kau as an Affiliated Researcher within the Environment and Life Sciences Department and the River Ecology and Management Group (see supporting documentation).
- b. Funding –
 - i. I have submitted a Faculty Project Grant to the NKU Faculty Benefits Program. These funds will help purchase supplies and small equipment and will be needed to carry out this project.
 - ii. I have submitted a Summer Faculty Fellowship proposal to the NKU Faculty Benefits Program next year for the summer of 2026 to field test fish rest barriers.
 - iii. I will be requesting \$1000 (max per fiscal year) from the Department of Biological Sciences as Professional Development Funds, Fiscal Year 26. This money will go toward my travel costs to Sweden.
 - iv. I am also applying to the American-Scandinavian Foundation for a fellowship to study and conduct research at an academic institution (e.g., KAU) in Sweden. This fellowship will provide support for my academic year-long stay. This funding will help offset salary deficiencies from a full year sabbatical and can provide funds for research supplies. The deadline for this application submission is November 1, 2024.
- c. Commitments – I will be passing on my duties at Director of the NKU Research and Education Field Station (REFS) to one of the faculty members of the REFS Steering Committee to fill-in in my absence. I am also a CoPI on an NSF grant that is currently in review where I have a commitment of 0.5 months in the summer. This will be a three-year grant, and if we receive it, there is flexibility on my commitment to adjust that 0.5 months to a different year within the study.

Part III. APPENDICES

1. SUPPORTING DOCUMENTATION:

- a. Letter of Invitation from the Institute of the Environment and Life Sciences at Karlstad University for the collaborative research I am proposing during a sabbatical leave.



Department of Environmental and Life Sciences
Karlstad University, S-651 88, Karlstad, Sweden

TO: Faculty Senate Benefits Committee
Northern Kentucky University

30 September 2024

We are writing this letter of invitation for Dr. Richard D. Durtsche from Northern Kentucky University, USA. We are very much interested in hosting Dr. Durtsche during the 2025-2026 academic year. As his formal host, Dr. John Piccolo will be working closely with Dr. Durtsche during his stay, and Dr. Olle Calles and Dr. Johan Watz are also planning on collaborating with him. There will be possibilities for other researchers in our group to work with him as well. Dr. Durtsche currently has an affiliation with our department but will be integrated into our relatively large and dynamic research environment, the River Ecology and Management Research Group. The research group, consisting of more than 10 researchers, works with theoretical and applied ecological research in freshwaters, primarily in rivers and streams and the surrounding landscape.

Dr. Durtsche's expertise in physiological ecology is a research area that we lack in Karlstad, and hence represents an important complement to the research program we conduct. His specific interests in metabolic physiology of ectotherms (cold - blooded animals) fits in nicely with the interests of our research group, where a number of members have worked on fish migration and river ecology modelling. Hence, we are very interested in collaborating with Dr. Durtsche on improving fishways for migration by juvenile salmonid (salmon and trout) fish, and studying the impacts of climate change on the metabolism of different age classes of these fish. We also expect Dr. Durtsche to contribute to other ongoing projects that have links to his physiological expertise. We are, for example, studying the effects of global climate change during winter conditions on the ecology and physiology of salmonid fish. His studies on the physiology of juvenile salmonid migration will fit nicely within our investigations of the swimming abilities of fish in relation to passing dams, as much of our research is focused on hydropower and fish passage.

We have had the opportunity to support a collaboration with Dr. Durtsche as an Affiliated Researcher in our department since his previous sabbatical in 2017-2018. The participation of Dr. Durtsche in our teaching program has promote further exchange between our universities. Dr. Durtsche has agreed to hold a course in Biostatistics, a course that is not taught in Karlstad, but which is needed and we believe will attract many students. We have also discussed with Dr. Durtsche co-teaching a course in Northern Temperate Ecology, with students from our respective institutions participating in a binational exchange. Having Dr. Durtsche here in Karlstad would enable us to further develop this idea. Dr. Durtsche has taught a similar course with our faculty and students in 2018, and the outcomes of the cultural and intellectual interchange for all students involved were excellent. In summary, we hope that Dr. Durtsche is awarded a sabbatical, project grant, and summer fellowship, allowing us to further develop relationships with him and with his university.

Respectfully,

A handwritten signature in blue ink, appearing to read "John Piccolo".

John Piccolo
Host for Dr. Durtsche

A handwritten signature in blue ink, appearing to read "Daniel Olsson".

Daniel Olsson
Head of Institution

- b. Letter from Karlstad University of my Affiliate Researcher position in Biology within the Institute of the Environment and Life Sciences – February 3, 2022 to February 2, 2026. I will be applying for a continuation for the next four years during my sabbatical.



I(1)

Fakulteten för hälsa, natur- och teknikvetenskap

Fakultetsnämndsbeslut

2022-02-03

Dnr HNT 2022/61

Ärende: Affiliering av Dr. Richard Durtsche

Handläggare: Marianne Johansson

Bakgrund

Institutionen för miljö- och livsvetenskaper föreslår att doktor Dr. Richard Durtsche antas som affilierad forskare vid Biologi, Institutionen för miljö- och livsvetenskaper, Karlstads Universitet.

Enligt rektorsbeslut nr 34/16 (C2016/222) är det fakultetsnämnden som beslutar om affiliering av forskare till centrumbildningar och institutioner.

Beslut:

Fakultetsnämnden vid Fakulteten för hälsa, natur-och teknikvetenskap vid Karlstads universitet beslutar att anta Dr. Richard Durtsche som affilierad forskare i Biologi vid Institutionen för miljö- och livsvetenskaper under perioden 2022-02-03–2026-02-02.

Kjell Magnusson
Dekan

Marianne Johansson
Fakultetshandläggare

Kopia av beslutet utsänt till:

- Larry Greenberg
- Ann Erlandsson
- Lutz Eckstein
- Diariet HNT

Karlstads universitet
651 88 Karlstad
Tfn 054-700 10 00
Fax 054-700 14 60
Information@kau.se

KAU.SE

Beslut:	2022-02-03	Dnr:	HNT 2022/61	Ersätter:		Dnr:	
Giltighet fr.o.m:	2022-02-03	t.o.m:	2026-02-02	Handläggare:	Marianne Johansson		

c. References

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2. VITA:

RICHARD D. DURTSCHÉ

PROFESSOR

DEPARTMENT OF BIOLOGICAL SCIENCES, NORTHERN KENTUCKY UNIVERSITY

HIGHLAND HEIGHTS, KY 41099

TELEPHONE: 859-572-6637. E-MAIL: durtsche@nku.edu**PROFESSIONAL PREPARATION**

University of Minnesota, Duluth	Biology	Bachelor of Science	(1983)
University of Minnesota, Duluth	Chemistry	Bachelor of Arts	(1983)
California State University, Fullerton	Biology	Master of Arts	(1988)
University of Oklahoma, Norman	Zoology	Doctor of Philosophy	(1999)

APPOINTMENTS

2017 – present, Affiliated Research Professor, Karlstads Universitet (Kau), Karlstad, Sweden.
 2016 – present, Director of the NKU Research and Education Field Station (REFS), Melbourne, KY
 2014 – present, Professor, Northern Kentucky University (NKU), Highland Heights, KY
 2006 – 2014, Associate Professor, Northern Kentucky University (NKU), Highland Heights, KY
 2000 – 2006, Assistant Professor, Northern Kentucky University (NKU), Highland Heights, KY
 2000 – present, Curator NKU Zoological Collections, Highland Heights, KY
 1997 – present, Research Associate, Universidad Autonoma del Estado de Morelos (UAEM), MX
 1999 – 2000, Adjunct Professor, University of Central Oklahoma, Edmond, OK
 1997, 1999 – 2000, Instructor, University of Oklahoma, Norman, OK

LANGUAGES

Spanish - fluent

Swedish – fluent

TEACHING EXPERIENCE (COURSES CREATED AT NKU †; [International](#)): 2000 – present

<i>Human Anatomy and Physiology (lecture & laboratory) – 5 courses</i>	<i>Ecology (BIO 304)</i>
<i>Introductory Biology I & II (lecture, laboratory, orientation) – 4 courses</i>	<i>Biometry (BIO 342) †</i>
<i>Introductory to Research (BIO 292)</i>	<i>Techniques of the Biological Sciences (BIO 392)</i>
<i>Directed Research (BIO 492)</i>	<i>Animal Physiological Ecology (BIO 441†/441L†)</i>
<i>Advanced Writing in Biology (BIO 291W)</i>	<i>Herpetology (BIO 404/BIO 404L)</i>
<i>Costa Rican Natural History (BIO 235) †</i>	<i>Tropical Ecology/Tropical Ecology Lab (BIO 462†/463†)</i>
<i>Northern Temperate Ecology (BIO 465) †</i>	<i>Biology of Fly Fishing (BIO 465) †</i>
<i>Vertebrate Zoology (BIO 303/303L)</i>	<i>NKU REFS – Wetlands Amphibian Assessment †</i>

Products (* indicates NKU undergraduate student author)

- Durtsche, R. D.**, B. Jonsson, and L. A. Greenberg. 2021. Thermal conditions during embryogenesis influence metabolic rates of juvenile brown trout *Salmo trutta*. *Ecosphere* 12(2): e03374 (*Ranked Top Cited Article by Ecosphere 2021-2022*)
- Durtsche, R. D.** and L. A. Greenberg. 2021. Respiration measurements of juvenile brown trout raised under varying embryonic temperatures to test climate impacts. *Bulletin of the Ecological Society of America* 102(2): 1-3
- Durtsche, R. D.**, B. Jonsson, and L. A. Greenberg. 2020. Oxygen consumption of juvenile brown trout, *Salmo trutta*, under varying thermal conditions during embryogenesis, *Dryad, Dataset*, <https://doi.org/10.5061/dryad.ftdz08rb>
- Boyce, R. L. and **R. D. Durtsche**. 2020. Plant colonization of a restored wetland in northern Kentucky: Contribution of seeding vs. natural sources. *Journal of the Torrey Botanical Society* 147: 9-21
- Piccolo, J. J., **R. D. Durtsche**, J. Watz, M. Österling, and O. Calles. 2019. Future rivers, dams, and ecocentrism. *The Ecological Citizen* 2:173-177.
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- Genet, T. S. Fredericksen, P. A. Kish, M. B. Kolozsvary, F. T. Kuserk, E. S. Lindquist, C. Mankiewicz, J. G. March, T. J. Muir, K. G. Murray, M. N. Santulli, F. J. Sicignano, P.D. Smallwood, R. A. Urban, K. Winnett Murray, and C. R. Zimmermann. 2018. Effects of urbanization on the population structure of freshwater turtles across the United States. *Conservation Biology* 32: 1150-1161.
- Mitchell, M. E., S. F. Matter, **R. D. Durtsche**, and I. Buffam. 2017. Elevated phosphorus: Dynamics during four years of green roof development. *Urban Ecosystems*. 20:1121-1133. DOI 10.1007/s11252-017-0664-3
- Buffam, I., M. E. Mitchell, and **R. D. Durtsche**. 2016. Environmental drivers of seasonal variation in green roof runoff water quality. *Ecological Engineering* 91:506-514.
- Durtsche, R. D.** 2013. The Ontogeny of Habitat Selection and Diet Shifts in Spiny-tailed Iguana: Life on the Cliffs. Pages 51-74 (ch. 4) in W. I Lutterschmidt (ed), *Reptiles in Research: Investigations of Physiology, Ecology, and Behavior in Diverse Environments*. Nova Publ.
- Boyce, R. L., **R. D. Durtsche**, and S. L. Fugal*. 2012. Impact of the invasive shrub *Lonicera maackii* on stand transpiration and ecosystem hydrology in a wetland forest. *Biological Invasions* 14: 671-680.
- McEvoy*, N. L. and **R. D. Durtsche**. 2004. The effects of an invasive plant species on the autumn biodiversity of herpetofauna at the Cincinnati Nature Center. *Journal of the Kentucky Academy of Sciences* 65: 27-32.
- Durtsche, R. D.** 2004. Ontogenetic variation in digestion by the herbivorous lizard *Ctenosaura pectinata*. *Physiological and Biochemical Zoology* 77: 459-470.
- Durtsche, R. D.** 2000. Ontogenetic plasticity of food habits in the Mexican spiny-tailed iguana, *Ctenosaura pectinata*. *Oecologia* 124: 185-195.

SELECTED PROFESSIONAL PRESENTATIONS (*MENTORED UNDERGRADUATE STUDENTS)

- Green, A.*, S. Juelg*, and R. D. Durtsche. 2024. Ethohydraulic impacts of barriers on metabolic rates in two Kentucky stream fish. NKU Summer Celebration. CINSAM – URSTEM Funded project.
- Durtsche, R. D., D. Mull*, and S. North*. 2024. Respiration rates of larval salamanders and the effects of water conductivity. Society for the Study of Amphibians and Reptiles, Ann Arbor, MI
- Walsh, A.*, R. Mckinley*, S. Thompson*, and R. D. Durtsche. 2024. Comparison of techniques for wetland amphibian rapid assessments. Society for the Study of Amphibians and Reptiles, Ann Arbor, MI
- North, S.* and R. D. Durtsche. 2023. The effects of water conductivity on the respiration rates of larval salamanders. Kentucky Academy of Sciences, Highland Heights, KY (High Honors – Zoology Division)
- Walsh, A*, J. Scott*, and R. D. Durtsche. 2023. Impact of Invasive Plant Removal on Amphibian Morphology and Phenology. Kentucky Academy of Sciences, Highland Heights, KY
- Saunders, P. A., B. C. Norman, S. Nobrega, R. Struminger, L. D. Roketenetz, C. Lorentz, and R. D. Durtsche. 2023. What makes your station special? Engaging diverse learners with place-based ecology concepts and research stories via The Virtual Field. Organization of Biological Field Stations Annual Meeting, La Selva, Costa Rica.
- Durtsche, R. D., S. Bauer*, and J. Danker*. 2022. Aerobic Scope in Kentucky Stream Fishes as a Fitness Indicator of Climate Change Impacts. Kentucky Water Resources Research Institute Annual Symposium, Lexington, KY.
- Durtsche, R. D., S. Bauer*, and J. Danker*. 2022. Aerobic Scope in Stream Fishes as a Fitness Indicator of Climate Change Impacts. Joint Meetings of Ichthyologists and Herpetologists, Spokane, WA.
- S. Bauer*, M. Danker*, and R. D. Durtsche. 2021. The Effect of temperature fluctuations on the aerobic scope of Kentucky stream fish and their offspring. (1st Place Zoology Division) Kentucky Academy of Sciences, Zoom.
- S. Bauer*, M. Danker*, and R. D. Durtsche. 2021. Aerobic Scope in Kentucky Stream Fishes and Their Offspring in Response to Temperature Fluctuations. (1st Place Poster Presentation) Ohio River Basin Consortium for Research and Education (ORBCRE), Thomas More University, Crestview Hills, KY.
- S. Bauer*, E. Steele*, O. Timmerding*, and R. D. Durtsche. 2021. Metabolic scope in Kentucky stream fishes in response to varied thermal conditions. Joint Meeting of Ichthyologists and Herpetologists.

Phoenix, AZ – On-line.

- S. Bauer*, E. Steele*, O. Timmerding*, and R. D. Durtsche. 2020. Metabolic responses of adult Bluntnose Minnows (*Pimephales notatus*) to a range of thermal conditions. (1st Place Zoology Division) Kentucky Academy of Sciences, Zoom.
- R. D. Durtsche. 2020. NKU REFS – Nature Adventure Day. Organization of Biological Field Stations Annual Meeting. Zoom Meeting
- K. Simmons*, S. P. Bauer*, and R. D. Durtsche. 2019. Effects of temperature variation on rainbow darters' (*Etheostoma caeruleum*) aerobic scope. (1st Place Poster Presentation; Zoology Division) Kentucky Academy of Sciences, Berea, KY.
- R. D. Durtsche, B. Jonsson., and L. Greenberg. 2019. Metabolism in Atlantic salmon and brown trout and the likely effects of climate change. Joint Meeting of Ichthyologists and Herpetologists. Snow Bird, UT.

SYNERGISTIC ACTIVITIES

- Developed, Coordinate, and Instruct (one course) the NKU Wetlands Management Professional Micro-credential taught at the NKU Research and Education Field Station – 6 courses (2021-2024)
- Developer of the bi-weekly Talk-&-Walk Nature Series (5-6 presentations per summer) at the NKU Research and Education Field Station (2017 – 2024)
- Designer of the Nature Adventure Day on the last Saturday of September at the NKU Research and Education Field Station with outdoor nature activities for the community. (2018 – 2024)
- Director of the week-long “Art of Nature Exploration” summer camp for middle school students taught at the NKU Research and Education Field Station (2016, 2017, 2021-2024).
- Organizer and construction leader of “A Bridge Through Nature” community and NKU REFS trail improvement project to build boardwalks on the St. Anne Wetlands public trail trails. 2021.
- Instructor of bilingual/bicultural global education semester courses: Northern Temperate Ecology in Sweden (2018); Tropical Ecology in Mexico in Spring 2002, and in Costa Rica even years 2004 – 2016, 2022; and Costa Rican Natural History in Costa Rica odd years 2003 – 2015, 2019.
- Designer and Coordinator of a biannual “Evolution Day” offered at NKU where faculty from Biological Sciences and Geology lead mini-courses for area Middle and High School students to increase interest and understanding in the relationships and diversity among organisms and how they have changed over time.
- PI and faculty director of the Northern Kentucky University (NKU) Ecological Stewardship Institute (ESI, 2012-2015), a transdisciplinary group of faculty with undergraduate scholars that address ecological issues in the community and work to increase environmental and ecological literacy of the public.
- Co-PI and Board Member of a Research and Environmental Education Community Partnership Program with the Sisters of Divine Providence in the establishment of the St. Anne Woods and Wetland Natural Areas in Melbourne, KY (2008-2014). This natural area is a 155 acre lowland wetland and upland mixed mesophytic old growth forest, and now conservation easement, that borders the Ohio River and is affiliated with the NKU Research and Education Field Station. It is used for research and environmental education. The Partnership included three local universities, the St. Anne Convent, local government (County Conservation District), and local Industry.
- Co-Director and Instructor in a week-long summer English Language Learner “Fun with Science Camp” for high school students in the Greater Cincinnati/Northern Kentucky area. (2003 – 2014).

UNDERGRADUATE RESEARCH AND RECOGNITIONS

- Durtsche has mentored over 120 undergraduates in research related activities, has been nominated for “Best Advisor” Award twice, and has been acknowledged as having a positive impact on a graduating student’s academic and personal development semesterly.
- Nominated for the Northern Kentucky University Frank Sinton Milburn Outstanding Professor Award 2024
- Awarded the Faculty Excellence in Outreach and Engagement Award, 2022
- Received the Northern Kentucky University Tri-Beta Biological Honor Society Excellence Award, 2019
- Awarded the Northern Kentucky University Faculty Excellence in International Education Award, 2016
- Received the Outstanding University Teacher Award for Kentucky, from the Kentucky Academy of Sciences (2004).

3. PREVIOUS FBC AWARDS:

I received a full year Faculty Sabbatical Award and Faculty Project Grant for the 2017-2018 academic year, and a Faculty Summer Fellowship Award for the summer of 2018. A letter from Karlstad University summarizes the activities of my 2017-2018 sabbatical there as an affiliated researcher (below).

2024-02-07

Summary of activities for affiliated researcher, Richard Durtsche

Dr. Richard D. Durtsche from the Department of Biological Sciences, Northern Kentucky University (NKU), USA is an affiliated researcher in biology at Karlstad University. He first contacted biology about 11 years ago, which led to an active exchange between NKU and Karlstad University. In 2014, he initiated a university exchange program between NKU and Karlstad University, which is one of four exchange programs that Karlstad University has with American universities. In 2017-18, Dr. Durtsche took a year's sabbatical at Karlstad University where he was deeply involved in many different activities, both teaching and research, and with both our staff and students.

Bachelor's Program

Regarding the Bachelor's Program, Dr. Durtsche has participated in many of our courses (see table below), and he has also brought a group of 10 students (plus extra teacher Rick Boyce) from an NKU course in "Northern Temperate Ecology". These students interacted with students and teachers (John Piccolo, Denis Lafage and Kristine Lund Björnås) from our biology course in Conservation Biology by doing a week-long field study together. In addition, the American students participated in a study visit where they learned about smolt migration in the Klarälven River with Eva Bergman and Larry Greenberg, how to assess the status of rivers and perform different field sampling methods with Karl Filipsson, and participated in Olle Calle's Master's course in Scientific Methods in Freshwater.

Course/Seminar	Date	Activity	Comments
Research and Teaching for Sustainability and Stewardship	28-29 aug 2017	Participated in workshop	Organized by J. Piccolo
Resilience Ecology	Aug-Sept 2017	teaching in the field	Organized by J. Piccolo
Freshwater Biology	Sept 2017	teaching	Organized by E. Bergman
Ecological Management	Oct-Dec 2017	teaching	Organized by J. Piccolo
Aquatic ecology and Land-water interactions	10-13 Oct 2017	lecturing	PhD course
Conservation Biology	Spring 2018	teaching	Organized by J. Piccolo
Presentation on <i>Study Abroad at Northern Kentucky University</i>	11 Oct 2017	lecturing	International Study Abroad Fair
Seminar <i>Amphibians, Wetlands Aquatic Ecosystems, & the Impact of Invasive Plants</i>	7 Dec 2017	lecturing	Biology's seminar series
Bachelor's project, Rachel Prokopius	2017-18	Advising students	Exchange student, NKU
Internship, Samuel Greenberg	2017-18	Advising a high school student	
Internship, Anissa Bengat	2017-18	Advising a French intern student	
Master's project Per-Olov Kautto	2017-18	Advising a Master's student	

2024-02-07

Bachelor's project, Oscar Adolfsson	March 2018	Course examiner	

Research

Dr. Durtsche was also active in research in biology. He helped PhD student, Kristine Lund Björnås, John Piccolo's PhD student, in the field and introduced a new sampling method for benthic invertebrates to her and the rest of the River Ecology and Management group (REM). He led a few projects while he was here, including one on "macroinvertebrate energetics". Several NRRV colleagues (John Piccolo, Denis Lafage, Eva Bergman and Larry Greenberg) participated in this project, and he is producing a manuscript from this work. Dr. Durtsche has also participated in REM's joint research on dam removal and co-authored an article on "ecological ecocentrism" with several members of REM:

- Piccolo, J. J., R. D. Durtsche, J. Watz, M. Österling, and O. Calles. 2019. Future rivers, dams, and ecocentrism. *The Ecological Citizen* 2:173-177.

Dr. Durtsche participated in Larry Greenberg's project on metabolism in salmon/trout. Here he set up a respirometry system and carried out many measurements. In addition, he was invited to participate in Larry Greenberg's Norwegian Research Council project, where he studied the effects of global warming on trout metabolism at a research station in Ims, Norway. This work has resulted in a few scientific papers:

- Durtsche, R. D., B. Jonsson, and L. Greenberg. 2020. Oxygen consumption of juvenile brown trout, *Salmo trutta*, under varying thermal conditions during embryogenesis. *Dryad, Dataset*. <https://doi.org/10.5061/dryad.fttdz08rb>.
- Durtsche, R. D., B. Jonsson, and L. Greenberg. 2021. Thermal conditions during embryogenesis influence metabolic rates of juvenile brown trout *Salmo trutta*. *Ecosphere* 12(2): e03374.
- Durtsche, R. D. and L. A. Greenberg. 2021. Respiration measurements of juvenile brown trout raised under varying embryonic temperatures to test climate impacts. *Bulletin of the Ecological Society of America*

Future

There is an open invitation for REM to visit NKU and NKU's field station. There is also discussion about a research application for a research project in the United States. There are also plans for continued interaction around various teaching activities.

Summary

In summary, our collaboration with Richard Durtsche has been very successful and a positive experience for everyone. He has made many important contributions to our program, both in teaching and research. He is an excellent teacher and has been greatly appreciated by staff and students alike. We have been very happy working with Dr. Durtsche and expect our collaboration will continue to flourish.

Best regards,

Larry Greenberg
Professor, Department of Environmental and Life Sciences

My reports were submitted: for the Summer Faculty Fellowship and the Sabbatical on 9/4/2018, and for the Faculty Project Grant on 11/5/2018. My report abstracts follow:

Sabbatical Report: Nordic Research on Physiological Aspects of Drift-feeding in Salmonid Fish and Binational Teaching in Sweden

Dr. Richard D. Durtsche
Department of Biological Sciences
2017-2018

Abstract:

My sabbatical at Karlstad University (Kau) in Sweden was very productive in scholarship and instruction, was rejuvenating, and collaborative. My research program had two main directives: 1) to develop a new method of digital surface area measurements for body size and energetics in stream/river macroinvertebrates, and 2) measuring the impact of altered developmental temperatures on the metabolism of salmonid fish. These directives were quickly incorporated into several collaborations to enhance the four ongoing research themes of the Kau River Ecology and Management Group including: *River Habitat*, *Drift Foraging in Salmonid Fish*, *Winter Ecology*, and *Dam Removal*. I completed a collaborative publication on turtle ecology in *Conservation Biology*, and contributed to an invited paper (submitted) on Rivers and Ecocentrism for the *Ecological Citizen*. I am the lead author on a collaborative manuscript, *Surface area – mass relationships in the determination of energetics in stream macroinvertebrates* that we plan to submit this fall. I also completed a 5-year strategic plan for the NKU Research and Education Field Station as its Director submitted to NSF. I participated in a Sustainability and Stewardship workshop, and was a presenter in an Aquatic Ecology and Land-Water Interaction Ph.D. course at Kau. I assisted in the teaching of four Kau Biology courses, directed an intern from France, was the examiner of one Kau honor's thesis, mentored an NKU honor's student at Kau, and the advisor of one Kau Master's student. I also taught a bicultural Northern Temperate Ecology course where NKU students (study-abroad) joined Kau students for field studies in Sweden.

Faculty Summer Fellowship Report: Nordic Research on Physiological Aspects of Drift-feeding in Salmonid Fish and Binational Teaching in Sweden

Dr. Richard D. Durtsche
Department of Biological Sciences
2017-2018

Abstract:

My faculty summer fellowship at Karlstad University (Kau) in Sweden was very productive in scholarship and collaborations. My research program had two main directives: 1) to develop a new method of digital surface area measurements for body size and energetics in stream/river macroinvertebrates, and 2) measuring the impact of altered developmental temperatures on the metabolism of salmonid fish. These directives were quickly incorporated into several collaborations to enhance all four ongoing research themes within the Kau River Ecology and Management Group including: *River Habitat* where I introduced a new method for macroinvertebrate seine sampling, *Drift Foraging in Salmonid Fish* where my surface area and energetic measures of macroinvertebrates are used in modeling, *Winter* where my measures of salmonid metabolism under different developmental temperatures add to our understanding of

the impact of climate change, and *Dam Removal* where I worked on establishing the evaluation of streams (experimental design and macroinvertebrate biomass via surface area measures) before and after dams are removed. The collaborative salmonid metabolism work took me to the Norwegian Institute for Nature Research near Stavanger, Norway in late May and early June for metabolism studies on Brown Trout to test climate change impacts. I also much time in the laboratory measuring macroinvertebrate energetic contents. I contributed to an invited paper (submitted) on Rivers and Ecocentrism for the *Ecological Citizen*, and I am the lead author on a collaborative manuscript, *Surface area – mass relationships in the determination of energetics in stream macroinvertebrates* that we plan to submit this fall.

Faculty Project Report: Nordic Research on Physiological Aspects of Drift-feeding in Salmonid Fish and Binational Teaching in Sweden

Dr. Richard D. Durtsche
Department of Biological Sciences
2017-2018

Abstract:

My faculty research project at Karlstad University (Kau) in Sweden was very productive in scholarship and collaborations. My research program had two main directives: 1) to develop a new method of digital surface area measurements for body size and energetics in stream/river macroinvertebrates, and 2) measuring the impact of altered developmental temperatures on the metabolism of salmonid fish. These directives were quickly incorporated into several collaborations to enhance all four ongoing research themes within the Kau River Ecology and Management Group including: *River Habitat* where I introduced a new method for macroinvertebrate seine sampling, *Drift Foraging in Salmonid Fish* where my surface area and energetic measures of macroinvertebrates are used in modeling, *Winter Ecology* where my measures of salmonid metabolism under different developmental temperatures add to our understanding of the impact of climate change on salmon and river ecosystems, and *Dam Removal* where I worked on establishing the evaluation of streams (experimental design and macroinvertebrate biomass via surface area measures) before and after dams are removed. The collaborative salmonid metabolism work took me to the Norwegian Institute for Nature Research near Stavanger, Norway in late May and early June for metabolism studies on Brown Trout to test climate change impacts. I also spent time in the laboratory measuring macroinvertebrate energetic contents. I contributed to an invited paper (*in press*) entitled *Rivers, Dams, and Ecocentrism* for the *Ecological Citizen*, and I am the lead author on a collaborative manuscript, *Surface area – mass relationships in the determination of energetics in stream macroinvertebrates* that we plan to submit later this fall.

Confirmation of my submission of my Faculty Development Award reports was made by the Faculty Senate Secretary, Grace Hiles (see below). In addition to the submission of FDA reports, I was required and gave presentations (2) on my sabbatical activities. The first presentation (Metabolism in Atlantic salmon and brown trout and the likely effects of climate change) was given in the NKU Spotlight on Scholarship event on Oct. 25, 2018, and the second presentation was a Department of Biological Sciences Seminar (Physiological Aspects of Climate Change in Salmonid Fish and New Bioenergetic Stream Macroinvertebrate Measures) on April 16, 2019.

Monday, September 23, 2024 at 04:28:23 Eastern Daylight Time

Subject: RE: Previous FDA Reports
Date: Thursday, September 19, 2024 at 9:22:44 PM Eastern Daylight Time
From: Grace Hiles
To: Richard Durtsche
Attachments: image001.jpg

Greetings Richard!

Yes. I can confirm!

Sabbatical: ***Nordic Research on Physiological Aspects of Drift-feeding in Salmonid Fish and Binational Teaching in Sweden***

Fellowship: ***Nordic Research on Physiological Aspects of Drift-feeding in Salmonid Fish and Binational Teaching in Sweden***

The accompanied photos are great, too.

Hope this information helps!

Grace

From: Richard Durtsche <DURTSCHER@nku.edu>
Sent: Wednesday, September 18, 2024 9:55 AM
To: Grace Hiles <hilesg1@nku.edu>
Subject: Previous FDA Reports

Hi Grace,

I will be applying for the Sabbatical, Project Grant, and Summer Faculty Fellowship FDAs.

I submitted my reports on my previous FDAs by sending these reports to Beverly Breeze on the following dates: for the Summer Faculty Fellowship and the Sabbatical on 9/4/2018, and for the Faculty Project Grant on 11/5/2018.

Can you please send confirmation of receipt of these reports so that I can add this to my FDA applications for this year?

Many thanks,
Richard



Richard D. Durtsche, Ph. D.
(he, him, his)

Director, NKU Research and Education Field Station
Professor and Curator of Zoological Collections

1 of 2

I also received a Faculty Sabbatical Award and Faculty Project Grant in the spring of 2008. This leave and these research funds allowed me to work on the impact of invasive species on amphibian larvae. For this research I traveled to Warnell School of Forest

Resources at the University of Georgia, maintained an active lab with seven undergraduate research, traveled to Minnesota for a month with two research students, developed two inventions including a specialized pH microelectrode and an active tissue holding chamber measuring gastric activity in stomach tissues, and wrote, submitted and received a \$102,000 National Science Foundation Kentucky EPSCoR grant for a high accuracy element analyzer called an Inductively Coupled Plasma - Optical Emissions Spectrometer. As a result of my FBC sabbatical and research grant activities, I or my students gave 13 presentations at local, regional, and national/international meetings, resulted in one manuscript that has been resubmitted to a third journal for publication, and the trajectory of this work lead to 20 other presentations and three other refereed publications.

Confirmation of my submission of my Faculty Development Award reports was made by the Faculty Senate Secretary, Grace Hiles (see below).

Subject: RE: Previous FBC Awards

Date: Monday, September 19, 2016 at 1:29:56 PM Eastern Daylight Time

From: Grace Hiles

To: Richard Durtsche

The provost office actually has your reports.. they are stated in their faculty development booklet that highlights faculty reports of FDA for 2007-2008.

So, therefore... YES!

You can accept this as a formal statement that we have your completed reports for the 2007-2008 applications:

**“Richard D. Durtsche — Sabbatical Leave, Project Grant and Summer Fellowship”
Understanding the Developmental Mechanisms and Control of Gastric Activity Using
Tadpoles as a Model System**

Hope this helps & best wishes!

4. Internal Support: Letters of support for my Faculty Sabbatical Leave will be submitted by my Department Chair, Dr. Lindsey Walters, and the Interim Dean of the College of Arts and Sciences, Dr. Bethany Bowling.

FDA Sabbatical Evaluation Form for Chairs

Instructions: Please print or type in the following form. Comment length is limited to this page. Forward a copy to Faculty Senate Benefits Committee c/o Grace Hiles hilesg1@nku.edu

Faculty applicant name: Richard Durtsche

Evaluations are based on criteria as defined in the Faculty Handbook **11. FACULTY DEVELOPMENT PROGRAMS** sections 11.1 through 11.4.

This individual qualifies to receive the proposed sabbatical (tenured/tenure track, after twelve (12) semesters of employment at the University, excluding summer terms, have elapsed since last sabbatical).

Yes X No

Indicate your assessment of the following items from very low to very high:

	Very low	Low	Neutral	High	Very high
Overall quality of proposal					X
Ability of applicant to carry out project					X
Overall value of project					X
Value to the department					X
Value to student learning					X
Value to the field of study					X

General Comments:

I strongly support this application by Dr. Durtsche. He will use this sabbatical to conduct research and teaching at Karlstad University in Sweden, focusing on the ecophysiology of stream fishes. His investigations into improving fishways for migration and into the effects of climate change on fish metabolism are urgently needed and will contribute to the field of conservation biology and to improving the fishing industry. Dr. Durtsche will also provide an impactful study abroad opportunity for NKU students in Sweden. The research and teaching experiences he has in Sweden will also be used to inform his research and teaching when he returns to NKU, benefiting his future NKU students and his work at NKU's field station (REFS).

Specific comments on categorical rankings including any category ranked neutral, low, or very low:



Name (typed or signed)

10/3/24

Date

Department: Biological Sciences

FDA Sabbatical Evaluation Form for Deans

Instructions: Please print or type in the following form. Comment length is limited to this page.
Forward a copy to Faculty Senate Benefits Committee c/o Grace Hiles hilesq1@nku.edu

Faculty applicant name: **Richard Durtsche**

Evaluations are based on criteria as defined in the Faculty Handbook **11. FACULTY DEVELOPMENT PROGRAMS** sections 11.1 through 11.4.

This individual qualifies to receive the proposed sabbatical (tenured/tenure track, after twelve (12) semesters of employment at the University, excluding summer terms, have elapsed since last sabbatical).

Yes **X** No

Indicate your assessment of the following items from very low to very high:

	Very low	Low	Neutral	High	Very high
Overall quality of proposal					X
Ability of applicant to carry out project					X
Overall value of project					X
Value to the college					X
Value to student learning					X

General comments:

Dr. Durtsche has a well-established relationship with the University of Karlstad in Sweden which has resulted in both strong research productivity and unique learning opportunities for students. The support letter from the Department of Environmental and Life Sciences at University of Karlstad indicates the continued strong relationship that is mutually beneficial. In his last sabbatical at Karlstad the work resulted in 15 presentations at local, regional, and national/international scientific meetings and four articles in refereed journals, including one in the highly ranked ecology journal, Ecosphere. Dr. Durtsche's research will further examine salmonids metabolic response to increasing temperatures due to climate change to better understand their evolutionary adaptability and genomic capacity, which could have implications for the fishing industry and conservation efforts. In addition, the proposed Northern Temperate Ecology course has been taught before and was well received. This is a unique learning opportunity for students to gain relevant skills but also apply to a global setting. Dr. Durtsche's overall plan is strong and I highly support.

Specific comments on categorical rankings including any category ranked neutral, low, or very low:

Bethany Bowling

10/2/24

Name (typed or signed)

Date

College: **College of Arts & Sciences**