

## EDUCATION

---

### *New Jersey Institute of Technology*

- **PhD Candidate** in Biology- Ecology and Evolution
- Dissertation: Evolution of Terrestrial Walking in Fishes

### *College of Charleston*

- **M.Sc.** in Marine Biology, December 2014 (4.00 GPA)
- Thesis: Skeletal Anatomy in the Chondrichthyan Tree of Life

### *University of Rhode Island*

- **B.S.** in Marine Biology, May 2010
- Minors: Leadership Studies and Wildlife & Conservation Biology
- *Summa cum laude*, University and Departmental Honors (3.92 GPA)

## RESEARCH EXPERIENCE

---

### **Dissertation Research** (2016-present)

- Conducting dissertation research under the NSF Understanding the Rules of Life
- Documenting specialized morphology in balitorid loaches, freshwater fishes of south and southeast Asia
- Using  $\mu$ CT to compare morphological differences related to terrestrial walking in fishes and tetrapods
- Determining the biomechanics of terrestrial walking in balitorid loaches:
  - o Collecting and analyzing Kinematics, Electromyography, and force transmission data

### **Associate in Research** in the Boyer Lab, Duke University (2015)

- Temporary position helping with completion of a grant on primate dental topography and morphology
- Completing MicroCT scans and segmentations of casts of extinct and extant primate teeth

### **Research Assistant** in the Naylor Lab, College of Charleston (2015)

- Segmenting CT scans of sharks, rays, and skates
- Scanning chondrichthyan specimens at the Medical University of South Carolina (MUSC)
- Mentoring undergraduate and graduate students

### **Master's Thesis Research** (2011-2014)

- Surveyed skeletal variation among Chondrichthyan fishes, creating a comparative anatomical atlas
- Created over 100 3-Dimensional digital segmentations from CT scans
- Noted patterns of chondrification and identified areas for future study

### **Visiting Graduate Student**, the American Museum of Natural History (November 2013)

- Completed a portion of my thesis research under the mentorship of Dr. John Maisey

### **Functional Morphology and Ecology of Marine Fishes**, Friday Harbor Marine Laboratory (Summer 2012)

- Studied material properties of hagfish and gunnel skin

### **Undergraduate Research** with Dr. Cheryl Wilga, University of Rhode Island (2009-2010)

- Assisted graduate students with thesis and dissertation research in elasmobranch functional morphology
- Observed feeding behavior of newborn spiny dog fish pups

### **Laboratory Technician**, Rutgers University Marine Field Station (Summer 2009)

- Assisted faculty and graduate students with summer research projects with emphasis on summer flounder bycatch mortality studies

### **NSF REU Participant**, Rutgers University Marine Field Station (Summer 2009)

- Implemented a summer flounder research project with guidance from advisor
- Studied movement of tagged summer flounder carcasses as part of a larger discard mortality study

### **Undergraduate Research** with Dr. Evan Preisser, University of Rhode Island (2008-2010)

- Aided graduate students in Hemlock Woolly Adelgid and Hemlock Scale research
- Identified arachnid species for species richness studies

## TEACHING EXPERIENCE

---

**Teaching Assistant, NJIT (2016-2018)**

- Planned, prepared, and graded laboratory lectures, quizzes, and practical examinations
  - Comparative Vertebrate Anatomy (*Fall 2016, Fall 2017, Fall 2018*)
  - Foundations in Ecology and Evolution (*Spring 2017*)
  - Ecological Field Methods- Honors (*Summer 2017 and 2018*)
  - Mammalian Physiology (*Spring 2018*)
  - Evolution of Animal Behavior-Honors (*Summer 2018*)

**Teaching Assistant, College of Charleston Department of Biology (2011-2012)**

- Planned and presented lectures and administered quizzes and practical examinations
  - Concepts and Application in Biology (*Fall 2011*)
  - Evolution, Form, and Function of Organisms (*Spring 2012*)

**Supplemental Instruction Leader, University of Rhode Island (2010)**

- Conducted twice-weekly tutoring, study skills, and review sessions for students in an introductory biology course with a high fail rate

---

**WORK EXPERIENCE****R&D Engineer II** in the Shared Materials Instrumentation Facility (SMIF), Duke University (2015)

- Assisted in the operation and maintenance of the MicroCT scanner
- Trained users on the use of the MicroCT Facility
- Performed MicroCT scans and reconstructions for internal and external users

**Administrative Assistant, Riverlands Marine Surveyors, Louisville, KY (Spring 2011)**

- Processed barge draft surveys, time sheets, and invoices
- Finalized survey reports and Maintained database records.

**Animal Rehabilitation Intern, Mote Marine Laboratory (2010-2011)**

- Assisted with rehabilitation of sea turtles and cetaceans through basic husbandry and animal care
- Maintained water quality and habitats and assisted with veterinary procedures

**Marine Naturalist Intern, Port Townsend Marine Science Center (2010)**

- Led hands-on education programs in marine science, natural history, and conservation
- Maintained tanks on a coldwater flow-through system and cared for animals in exhibits
- Worked with the volunteer docent team to interpret exhibits for the public
- Assisted with the marine mammal stranding network.

---

**PUBLICATIONS**

- Cohen, K.E., L.P. Hernandez, **C. H. Crawford**, and B.E. Flammang. E. (2018) Channeling vorticity: Modeling the filter-feeding mechanism in silver carp using  $\mu$ CT and 3D PIV. *Journal of Experimental Biology*, 221(19), jeb183350.
- McQuiston, A.D., **C. Crawford**, U.J. Schoepf, A. Varga-Szemes, C. Canstein, M. Renker, C.N. De Cecco, S. Baumann, and G. J.P. Naylor, (2017). Segmentations of the cartilaginous skeletons of chondrichthyan fishes by the use of state-of-the-art computed tomography. *World Journal of Radiology* 9, no. 4: 191.
- Clark, A. J., **C. H. Crawford**, B. D. King, A. M. Demas, & T. A. Uyeno, (2016). Material Properties of Hagfish Skin, with Insights into Knotting Behaviors. *The Biological Bulletin*, 230(3), 243-256.
- Crawford, Callie.**, Jenny M. Kemper, and Gavin JP Naylor. (2016). Complete mitochondrial genome of the winghead shark, *Eusphyra blochii* (Elasmobranchii: Sphyrnidae). *Mitochondrial DNA*.
- Yergey, M., T. Grothues, K. Able, **C. Crawford**, and K. DeCristofer. (2012). Evaluating discard mortality of summer flounder (*Paralichthys dentatus*) in the commercial trawl fishery: Developing acoustic telemetry techniques. *Fisheries Research*. 115-116: 72-81.

**INVITED SEMINARS/LECTURES**

*The Waterfall Climbing Cavefish*, Into the Darkness: Research and Conservation of Cave Organisms Across the Globe Outreach Event by the Metropolitan Society of Natural Historians at the American Museum of Natural History, New York, NY (2019)  
*Chondrichthyan Diversity*, Vertebrate Evolution Rutgers University-Newark, Federated Biology Department, Newark, NJ (2019)

## PRESENTATIONS

(\* DENOTES PRESENTING AUTHOR)

- Page\*, L., Z. Randall, P. Chakrabarty, P. Hart, **C. Crawford**, and B. Flammang. (2019) Oral Presentation- *Joint Meeting of Ichthyologists and Herpetologists*, Snowbird, Utah- "Evolution of Walking in Balitorid Loaches as a Model for Vertebrate Invasion of Land"
- Crawford\***, **C.H.**, P.B. Hart, Z.S. Randall, P. Chakrabarty, L.M. Page, and B.E. Flammang. (2019) Poster Presentation- *International Congress of Vertebrate Morphology*, Prague, Czech Republic- "The Road to a Phylogenomically-Based Bioinspired Robotic Model Approach to Address the Evolution of Terrestrial Locomotion"
- Flammang\*, B.E., **C.H. Crawford**, D. Soares, A. Suvarnaraksa, P. Chakrabarty, P. Hart, L. Page, L and Z. Randall. (2019) Oral Presentation- *International Congress of Vertebrate Morphology*, Prague, Czech Republic- "Terrestrial Walking in Fishes with Tetrapod-like Skeletons"
- Biondi\*, A.A., K.E. Bemis, **C.H. Crawford**, and B.E. Flammang. (2019) Oral Presentation- *International Congress of Vertebrate Morphology* Prague, Czech Republic- "Adventures in Scaling and Remodeled Morphology: The Case of the Ocean Sunfish"
- Crawford\***, **C.H.**, and B.E. Flammang. (2019) Oral Presentation- *Evolution*, Providence, RI- "Walking Fishes and the Evolution of the Tetrapod Pelvic Girdle"
- Crawford\***, **C.H.**, and B.E. Flammang. (2019) Oral Presentation- *NJIT-Rutgers University, Newark Graduate Student Research Day*, Newark, NJ- "Pelvic Morphology in the Balitorid Loaches"
- Crawford\***, **C.H.**, Z.S. Randall, P.B. Hart, L.M. Page, P. Chakrabarty, and B.E. Flammang. (2019) Oral Presentation- *Society for Integrative and Comparative Biology*, Tampa, FL- "The Muscles That Move The Fishes That Walk"
- Bernstein\*, J.M., **C.H. Crawford**, D.K. Wainwright, S. Ruane, and B.E. Flammang. (2019) Oral Presentation- *Society of Integrative and Comparative Biology*, Tampa, FL- "Snake Scale Keels: A Three-dimensional Investigation of Function"
- Biondi\*, A.A., K.E. Bemis, **C.H. Crawford**, and B.E. Flammang. (2019) Poster Presentation- *Society of Integrative and Comparative Biology*, Tampa, FL- "Mola mola Mismatched Muscle Mechanics"
- Amplio\*, H.E., **C.H. Crawford**, B.E. Flammang. (2019) Poster Presentation- *Society of Integrative and Comparative Biology*, Tampa, FL- "Head, Shoulders, Elbows, Fins: Frogfish Fin Morphology"
- Crawford\***, **C.H.**, Z.S. Randall, and B.E. Flammang. (2018) Poster Presentation- *Joint Meeting of Ichthyologists and Herpetologists*, Rochester, NY- "These Fins Were Made for Walking: Tetrapodal Morphology of Balitorid Fishes"
- Crawford\***, **C.H.**, Z.S. Randall, and B.E. Flammang. (2018) Poster Presentation- *Society for Integrative and Comparative Biology*, San Francisco, CA- "Variation in Pelvic Morphology of Balitorid Fishes"
- Cohen\*, K.E., L.P. Hernandez, **C.H. Crawford**, and B.E. Flammang. (2018) Oral Presentation- *Society of Integrative and Comparative Biology*, San Francisco, CA- "Secrets in master filtering: Using mu CT and 3D PIV to model Silver carp filter feeding"
- Crofts\*, S.B., **C. Crawford**, M. Bonnan, and B. Flammang. (2018) Poster Presentation- *Society of Integrative and Comparative Biology*, San Francisco, CA- "Skeletal morphology of swimming lizard tails"

- Gonzales\*, L.A., **C.H. Crawford**, J.T. Gladman, J.P. Alexander, J.I. Bloch, G.F. Gunnell, and D.M. Boyer. (2017) Poster Presentation- *American Association of Physical Anthropologists*, New Orleans, LA- "Documenting Skeletal Anatomy of Early Adapiforms"
- Crawford\*, C.H.**, and B.E. Flammang, (2017) Oral presentation- *Society for Integrative and Comparative Biology*, New Orleans, LA. "Skeletal Morphology of a Walking Cave Fish"
- Crawford\*, C.H.**, (2016) Oral Presentation- *Mid-Atlantic Regional SICB DVM/DCB Meeting*, Newark, NJ. "These fish were made for walking"
- Crawford\*, C.**, J. Denton, J. Maisey, and G. Naylor. (2015) Poster Presentation- *Interdisciplinary Approaches in Fish Skeletal Biology*, Tavira, Portugal- "Skeletal Anatomy in the Chondrichthyan Tree of Life"
- Crawford\*, C.**, and G.J.P. Naylor. (2015) Poster Presentation- *Society for Integrative and Comparative Biology*, West Palm Beach, FL- "Skeletal Anatomy in the Chondrichthyan Tree of Life"
- Clark\*, A.J., **C.H. Crawford**, B.D. King, A.M. Demas, and Uyeno, T.A. (2015) Oral Presentation- *Society of Integrative and Comparative Biology*, West Palm Beach, FL- "Material properties of hagfish skin with insights into knotting behaviors"
- Crawford\*, C.**, C. Canstein, and G.J.P. Naylor. (2014) Poster Presentation- *Joint Meeting of Ichthyologists and Herpetologists*, Chattanooga, TN- "CT Scanning Chondrichthyans: No Bones About It"
- Crawford\*, C.**, and G. Naylor. (2014) Oral Presentation- *Joint Meeting of Ichthyologists and Herpetologists*, Chattanooga, TN- "Anatomical Characters as Informative Ornaments on the Chondrichthyan Tree of Life"
- Crawford\*, C.**, and G.J.P. Naylor. (2014) Oral Presentation- *Society for Integrative and Comparative Biology*, Austin, TX- "Evolution of the Skeleton in Chondrichthyan Fishes"
- Crawford\*, C.**, and G.J.P. Naylor. (2013) Oral Presentation- *Joint Meeting of Ichthyologists and Herpetologists*, Albuquerque, NM- "Exploring Chondrichthyan Anatomy through Computed Tomography"
- Crawford\*, C.**, B. King, and A. Clark. (2013) Poster Presentation- *Society for Integrative and Comparative Biology*, San Francisco, CA- "Material Properties of Taut and Slack Skins in Elongate Fishes"
- Crawford\*, C.**, T. Grothues and K. Able. (2009) Rutgers REU Presentation, New Brunswick, NJ- "Exploring Summer Flounder, *Paralichthys dentatus*, Carcass Behavior in Preparation for Discard Mortality Studies"

#### **AWARDS, HONORS, AND FELLOWSHIPS**

---

**Sigma Xi**, Grants-in-Aid of Research, \$993 (2018)

**Carl Gans Collections and Charitable Fund**, Conference Grant for JMIH 2018, \$500 (2018)

**American Museum of Natural History**, Lerner Gray Memorial Fund, \$2,000 (2017)

**Research Triangle Nanotechnology Network (RTNN)**, Free-Use Fund Award, \$1,000 (2016)

##### **American Society of Ichthyologists and Herpetologists**

- Edward C. Raney Fund Award, \$1,000 (2017)
- Student Travel Award, \$300 (2013)

##### **American Elasmobranch Society**

- Jeffrey C. & Carol A. Carrier Student Poster Award, \$300 (2014)
- Student Travel Award, \$625 (2014)

##### **Society for Integrative and Comparative Biology**

- Charlotte Mangum Student Support Program Award (3 awards, 2013-2015)

**Mote Marine Laboratory**, Mote Marine Laboratory College Intern Scholarship, \$1,500 (2010)

**Foundation for Asia Pacific Education**, Scholarship for Overseas Education, \$2,500 (2008)

**National Science Foundation**, Honorable Mention for the Graduate Research Fellowship Program (2011)

**New Jersey Institute of Technology**

- Excellence in Instruction by Teaching Assistant award, NJIT, \$1,500 (2019)
- Class of '58 Scholarship, \$4,030 (2017)
- Graduate Student Association Travel Award, \$2,800 (4 awards, 2017-2019)
- Provost Doctoral Assistantship Award, \$25,000/year (2016-2018)

**College of Charleston**

- College of Charleston Outstanding Graduate Scholar in Marine Biology (2014)
- Second place poster at College of Charleston Student Research Colloquium (2012)
- Graduate Program in Marine Biology, Travel Award, \$750 (2 awards, 2013-2014)
- Office of Graduate Studies Graduate Student Research and Travel Grant, \$750 (3 awards, 2012-2014)
- Marine Biology Graduate Student Association, Travel Award, \$300 (3 awards, 2012-2014)
- Graduate Student Association, Research Presentation Grant, \$500 (2 awards, 2012-2013)

**University of Rhode Island**

- Alpha Award for achievement in research- Biological Sciences Department (2010)
- Elmer A. Palmatier Award, \$250 (2009)
- Mary Matzinger Merit Scholarship, \$1,000 (2009)
- Henry Davis Merit Scholarship, \$1,462 (2007-2009)
- Centennial Scholar, \$28,000 (2006-2010)

**MENTORSHIP AND LEADERSHIP EXPERIENCE**

---

**Colloquium Committee**, Biology Student Leadership, Federated Department of Biology (2019)

- Work with other committee members to facilitate organization of weekly Biology seminars and end of the year research day highlighting student research

**Honors Thesis Mentor**, New Jersey Institute of Technology (2017-2018)

- Mentored an undergraduate student completing her Honors Thesis

**High School Mentor**, New Jersey Institute of Technology (2017)

- Mentored two high school interns as part of the NJIT Provost High School Summer Research Interns

**President**, United Council of Academics at NJIT (UCAN), Graduate Student and Research Staff Union (2017)**NJIT Union Liaison**, Biology Student Leadership, Federated Department of Biology (2016-2017, 2018-2019)**Undergraduate Mentor**, New Jersey Institute of Technology (2016)

- Mentored an undergraduate researcher

**Undergraduate Mentor**, College of Charleston (2013-2015)

- Mentored an undergraduate researcher on her Bachelor's Thesis, Comparative anatomical study of evolutionary variation in Sphyrnidae, Hammerhead sharks, using 3-D modeling

**NSF REU Mentor**, College of Charleston (2014)

- Mentored an REU participant on her project, Evolution of Head Size in Hammerhead Sharks

**High School Mentor**, College of Charleston (2013)

- Mentored as honors student on his project, CT scan segmentation of an Angel shark, *Squatina japonica*

**Treasurer**, Marine Biology Graduate Student Association Treasurer (2012-2013), **member** (2011-2014)**URI 101 Mentor**, University of Rhode Island (2007, 2009)

- Mentored two classes of freshmen marine biology majors during a 1-credit seminar course
- Provided leadership and guidance to first year students

**Mentor**, We're Offering Women Wisdom (WOWW) (2006-2010)**SOCIETY MEMBERSHIPS**

---

- Association for Women in Science, AWIS (2019)

- American Association for the Advancement of Science, Science Program for Excellence in Science (2019)
- Society for the Study of Evolution (2019)
- Society for Integrative and Comparative Biology (2011-2019)
- Association of Ichthyologists and Herpetologists (2012-2019)
- American Elasmobranch Society (2012-2018)
- Sigma Xi (2012-2014, 2016-2018)

### **PROFESSIONAL SERVICE AND OUTREACH**

---

- Reviewer for: Scientific Reports
- **Panelist:** NJIT Teaching and Communication Skills Workshop, Teaching Panel Discussion (2019)
- Lecture organizer for a visiting scholar (2019)
- Career Day Presenter at Martin Luther King School (13<sup>th</sup> School) in Newark, NJ (2019)
- Rutgers Day Department of Biology Volunteer (2018, 2019)
- NJIT open house and welcome day volunteer (2017, 2018)

### **COMMUNITY SERVICE**

---

- Rutgers University-Newark Food Drive (2018)
- Habitat for Humanity (2011, 2012, 2014, 2015)
- Road and Beach Cleanups in Charleston, SC (2011-2014)
- Girl Scout Gold Award- Puppy raiser for Canine Companions for Independence (CCI) (2006)
- Women and Children's Advocacy Network Volunteer, Camp Golden Bear, Louisville, KY (2005-2009)

### **LICENSES, CERTIFICATIONS, ETC.**

---

Radiation Safety Training, New Jersey Institute of Technology (2018)  
 Laser Safety Training, New Jersey Institute of Technology (2018)  
 Trained User on SKYSCAN 1275 High Speed MicroCT scanner, New Jersey Institute of Technology (2017)  
 Trained User on XTEK XT H 255ST MicroCT scanner, Duke University (2015)  
 CFR/ATA Dangerous Goods Transportation Training, College of Charleston (2013)  
 PADI SCUBA: AWARE Specialty (2013)  
     Advanced Open Water (2007)  
     Open Water (2006)  
 Red Cross Certifications: CPR/AED and Standard First Aid (2010)  
 US Coast Guard Auxiliary Boating Skills and Seamanship Certification (2009)  
 Laboratory Animal Care and Use- Rutgers University (2009)

### **OTHER SKILLS**

---

Languages: Beginner level American Sign Language and Spanish, intermediate level French  
 Computer: MS Word, Excel, PowerPoint, Visio; File Maker Pro; Mimics by Materialise; Rstudio  
 Experience with:  
     3DSlicer  
         SlicerMorph  
         Auto3dgm  
     Medical and MicroCT Scanning  
     MIMICS CT Scan segmentation software  
     3Matic Design Optimization Software  
     Avizo CT Scan segmentation software  
     Meshlab 3D file processing software  
     Meshmixer 3D file processing software  
     3D Printing (Makerbot, SeeMeCNC Orion, Form1+ and Form2)  
     3D PIV (Particle Image Velocimetry)  
     Kinematic Data Collection  
     Handling and packaging preserved cartilaginous and bony fish specimens

Materials testing using MTS Systems

Restraining and caring for small cetaceans and sea turtles

Lotek Wireless Acoustic Tag and Hydrophone usage and maintenance

Molecular techniques used in PCR and RFLP