



HONOURS PROJECTS



OCEAN SCIENCES
Faculty of Science

Dr. Patrick Gagnon

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Research in my laboratory aims to elucidate the factors and processes that govern the stability and productivity of cold-water marine benthic systems. It investigates how environmental variability (e.g. temperature, light, wave action, salinity) affects recruitment, growth, survival, and interactions in native and invasive invertebrates and seaweeds, and ultimately the abundance and distribution of these organisms. We address a number of fundamental and applied (industry focused) research questions by combining field and laboratory experiments and observations. Data are typically collected and processed across a range of spatial and temporal scales with various sampling and analytical tools and methods such as SCUBA diving*, underwater photography and videography, wave tanks, raceways, remote sensors (airborne and satellite), and GIS. Honours projects are available in the following areas:

1. Effects of environmental variability on marine species interactions and population dynamics;
2. Ecology and ecosystem impacts of marine invasive species;
3. Mapping and study of shallow marine communities at broad spatial and temporal scales;
4. Land-based aquaculture (primarily urchin roe enhancement programs);
5. Biology and ecology of kelp and rhodolith beds.

* Honours students are not required to dive for their projects, though projects can be tailored to include diving depending on interest and qualifications.

Dr. Kurt Gamperl

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Positions are available in my lab for 4th year honors students to investigate various aspects of marine fish physiology. I am currently working with salmon, lumpfish and sablefish, and we are investigating aspects of their stress, metabolic and cardiovascular physiology as affected by changes in environmental conditions

Dr. Annie Mercier

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1. Biology of deep-sea invertebrates. This research involves the use of microscopy and imaging analysis techniques for the study of preserved specimens (possibly new or poorly known species). It may also involve collection of specimens (ship time) and assessment of feeding and reproductive cycles in live animals.
2. Breeding strategies of echinoderms (e.g. spawning periodicity and synchrony, ecology of brooding, fecundity, etc.). This research is based on behavioural observations, experimental trials in controlled environments, histology/microscopy, image analysis, and biochemical

analysis.

3. Biology and management of the sea cucumber *Cucumaria frondosa*. This research focuses on the study of the Newfoundland populations of sea cucumbers with respect to an emerging fishery and potential aquaculture program. It involves the study of growth patterns, tagging and aging methods, diets, prey-predator interactions and various other aspects of the biology and ecology of the species.

4. Various other projects on the general biology and ecology of marine invertebrates (e.g. symbioses, trophic ecology, competition, behaviour, morphology, etc.).

Dr. Chris Parrish

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Dr. Parrish works at the interface of chemistry and biology in the area of aquatic lipid research with an emphasis on nutritional and biomarker lipids in marine food webs. Lipids are of particular interest in marine research as they provide the densest form of energy which is transferred from algae to vertebrates via zooplankton. These carbon-rich compounds are also a solvent and absorption carrier for organic contaminants and thus can be drivers of pollutant bioaccumulation in marine ecosystems. Among the lipids, certain essential fatty acids and sterols are considered to be important determinants of ecosystem health and stability.

Ecological and nutritional projects related to marine lipids.

Dr. Paul Snelgrove

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Dr. Snelgrove's students undertake research in marine biology with a focus on biodiversity and conservation of seafloor habitats in coastal and deep-sea ecosystems. Projects address ecosystem functioning, spanning from habitat provisioning to nutrient recycling, and how functioning links to biodiversity of invertebrates and fishes

Dr. Uta Passow

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The AEON lab (Anthropogenic Effects on Oceanography of Newfoundland) investigates climate change, as well as oil and microplastic pollution. Sinking marine snow formed in the sun-lit surface ocean, carries food to organisms living in the deep, dark ocean. Inadvertently carbon is removed from the atmosphere when marine snow reaches below 1000 m depth. This mediates increasing pCO₂ concentration in the atmosphere. Will the ocean continue to take up

carbon? We are also interested in the interactions between organic matter and oil or microplastic, because the fate of these substances in the ocean depends largely on for example aggregation. One included in aggregates these particles can carry oil to the deep seafloor.

Iain McGaw

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My lab focuses on crustacean biology, in particular the physiological and behavioural responses of decapods to environmental challenge. More recently we have been working on an interesting group of animals – sub-tropical land crabs. These crabs spend their entire life in coastal Caribbean forests only having to return to the ocean to breed. Climate models predict a drying scenario in the Caribbean and MSc student Bill Bigelow has been investigating the effects of dehydration on the physiology and behavior of this species. During this time Bill has collected a lot of surplus data. With this in mind I have a lot of data that needs to be analysed. This could lead to a potential joint publication for an Honours student. Projects are

1. Biomorphometrics of the black land crab *Gecarcinus ruricola*. We have a lot of morphometric measurements of these crabs (size, weight, claw size) that needs to be collated. More interestingly these crabs exhibit a broad array of carapace colours from orange through purple to black,– but we have no idea of the significance (if any), if they are connected to size, or sex or even the possible function of these colour variants. In addition we have collected internal teeth from a range of sizes and colours of crabs. Using a new technique we hope to make fine slices of these teeth and count growth rings, much like one would do with a tree. This is a project for someone who enjoys data analysis and is good with computer programs. Tasks will include collating morphometric measurements, using ImageJ and ‘patternize’ to quantify colour patterns and perform principal component analysis to determine if different colours can provide camouflage against various backgrounds.

2. Feeding preference and abundance of land crabs Land crabs are primarily herbivorous, but are classed as opportunistic omnivores in that they will eat high quality food (animal material) if it becomes available. In this study the feeding preferences of land crabs were assessed at various states of dehydration on different types of food. We also have eight months of time lapse photos taken in the Caribbean around bait traps. The idea is to find out if land crabs are more active at certain times of the year or under certain weather conditions. As with above this is a project for a student that enjoys data analysis. The first task will be to determine if dehydration status affects food intake. The second task will be to use weather data (rainfall, temperature, humidity, moon phase etc.) to determine if this affects the activity level (number of individuals captured on film) and relative abundance (number of crabs as a function of other keystone species) of black and red crabs in Caribbean forests.

Dr. David Schneider

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Of the 15 honors or so theses that I have supervised in the Department of Biology, many have consisted of a large data set provided to the student, together with the opportunity to gather similar data. That approach will be difficult in the coming term, with the restriction of on and off campus activity. Here are some topics where I have data that can be used by students interested in learning important research skills: checking data, analyzing data, writing up results as a short note in a style suitable for publication in a peer-reviewed journal. The thesis format will 4 chapters (Introduction, Methods, Results, Discussion) together with summary of results written in the style of a short note suitable for publication.

Cod mortality in relation to body size.

Estimates of mortality are central to science based management of fish stocks. Estimates of cod mortality are available at different stages—egg, pelagic larva, post settlement juveniles, and adults. The goal of this project is to synthesize published estimates to produce a functional expression allowing an estimate of mortality at any size. Requires knowledge of regression

Biodiversity benchmarks.

A complete list of species within a well-defined area is the foundation for monitoring changes in biodiversity at sites with substantial human impacts. Biodiversity, expressed as number of species, increases with effort and with area covered. The goal of this project is to demonstrate the construction of a biodiversity benchmark using a collector's curve within a well-defined stretch of coast.

Intensity of natural selection in a fully censused population.

Natural selection, a central tenet in evolutionary biology, has been measured in a wide variety of phyla. These measurements are made from samples, usually from a poorly defined population. The project will produce the first estimate of the intensity of selection in a fully censused population of barnacles, hence results are free of sampling uncertainty.

Seasonal change in biodiversity in a mid-latitude salt marsh panne

Biodiversity varies seasonally where pulses of recruitment are reduced by predation. Gross measures such as species counts and indices of relative abundance miss the underlying dynamics. The data for this project consist of body sizes of benthic macrofauna. The goal is to demonstrate the dynamics that result in the observed patterns of change in diversity and relative abundance.