The University of the West Indies
Cave Hill Campus

Department of Biological and Chemical Sciences

RESEARCH PROJECTS

2024-2025

BIOC3990
BIOL3990
ECOL3990
MICR3990

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PROJECTS

PLEASE SUBMIT YOUR COMPLETED **APPLICATION FORM** AND **LABORATORY SAFETY REGULATIONS AGREEMENT** TO THE BIOLOGICAL & CHEMICAL SCIENCES DEPARTMENTAL OFFICE, GROUND FL., BIOLOGY BUILDING.

Course (s)	BIOC3990
Title	Investigation of Serum Vitamin D Concentrations and Uterine Leiomyoma in Barbadian Women
Supervisor (s)	Dr. Shane Austin & Dr. Angela Alleyne

Background:

Uterine leiomyomata (fibroids) are benign growths of the uterine muscle that are a major cause of productivity loss and morbidity in women. Previous studies have shown that women with uterine fibroids tend to have lower serum vitamin D levels than those without (Baird et al., 2013; Okoro et al., 2024). Previous studies in a Barbadian population have explored the impact of genetic factors related to hormone production (Alleyne and Bideau, 2019; Bideau and Alleyne, 2016; Bideau and Alleyne, 2019); to date, no studies have explored vitamin D and fibroids in a Barbadian population.

Objectives:

Determine the serum Vitamin D concentration of women with and without uterine fibroids and assess SNPs in the Vitamin D receptor of the same women.

Methods:

The proposed project uses anonymised blood samples and biometric data collected from women in a Barbadian population to assess vitamin D in women with and without fibroids. The student will conduct several molecular analyses and correlate these with participant biometric data. These include analyzing vitamin D using liquid chromatography and SNP polymorphisms in the Vitamin D receptor.

Requirements:

Must be comfortable working with blood samples.

References:

- Alleyne AT, Bideau VS. Haplotypes of CYP1B1 and CCDC57 genes in an Afro-Caribbean female population with uterine leiomyoma. Molecular Biology Reports 2019; 46: 3299-3306.
- Baird DD, Hill MC, Schectman JM, Hollis BW. Vitamin d and the risk of uterine fibroids. Epidemiology 2013; 24: 447-53.
- Bideau VS, Alleyne AT. Leu/Val SNP polymorphism of CYP1B1 and risk of uterine leiomyoma in a Black population. Tumor Biology 2016; 37: 4035-4040.
- Bideau VS, Alleyne AT. A preliminary study of fatty acid synthase gene and the risk of uterine leiomyoma in an Afro-Caribbean female population. Meta Gene 2019; 19: 74-77.
- Okoro CC, Ikpeze OC, Eleje GU, Udigwe GO, Ezeama CO, Ugboaja JO, et al. Association between serum vitamin D status and uterine leiomyomas: a case-control study. Obstet Gynecol Sci 2024; 67: 101-111.

Course (s)	BIOC 3990 - Biochemistry research project
Title	Characterization of Entomopathogenic fungi in infected sweet potato fields in Barbados.
Supervisor (s)	Dr Angela T. Alleyne, Dr Darren Browne and Mr Brett Taylor (Ministry of Agriculture and Food Security Barbados)

Background:

In Barbados and worldwide, *Ipomoea batatas* L. (sweet potato) cultivation is affected by several symptomatic and asymptomatic viruses, singly infected or as a deadly combination of two or more viruses (Alleyne et al. 2019). Hemiptera insect classes such as whitefly, (*Bemisia tabaci)* and aphids (*Aphiphidae*) are well-described destructive pests to an extensive range of crops, vegetables, and ornamentals, including sweet potatoes.
Fungal pathogens of insects are called Entomopathogenic fungi (EPF) (Bohatá et al. 2024). Well-known genera include *Beauveria, Metarhizium, Isaria, Hirsutella, and Lecanicillium* ((Bamisile et al. 2021)). Among them, *Beauveria bassiana (*Balsamo-Crivelli) Vuillemin, *Isaria fumosorosea* Wize, *Metarhizium anisopliae* (Metschnikoff) Sorokin, and *Lecanicillium lecanii* (Zimmerman) Viegas are well-studied fungal species (Li et al. 2011; Bugti et al. 2018; Bamisile et al. 2021). Several of the EPF species, when used as biocontrol agents for disease management, are considered safe and environmentally friendly; for example, *I. fumosorosea* can infect multiple hosts without showing any of the harmful effects usually associated with chemical pesticides (Gao et al. 2017). So many insect-pathogenic fungal strains have been formulated as bioinsecticides and are seen as environmentally friendly alternatives to synthetic insecticide sprays(Fang et al. 2014). However, before these solutions are deployed it is essential to have a clear understanding of the naturally occurring EPF in infected fields that may be potential biopesticidal agents for an integrated approach to managing sweet potato diseases as they become more prevalent in the Caribbean.

Objectives:

This research project aims to determine species of EPF in infected sweet potato fields in Barbados.

Methods:

Soil samples in infected fields will be screened for EPF fungi; pure cultures will be made and examined under the microscope and compared to known EPF species. Further, DNA extraction and diagnostic PCR will be conducted to confirm the identification of selected isolated fungi.

Requirements:

This project requires a student with experience in molecular biology and the ability to conduct some fieldwork.

References:

- Alleyne AT, Cummins C, Rowe K, et al (2019) Sequencing and assembly of small RNAs reveal the presence of several begomoviruses, potyviruses, badnaviruses and mastreviruses in the sweet potato leaf virome in Barbados. J Plant Pathol 101:339–347. https://doi.org/10.1007/s42161-018-00214-1
- Bamisile BS, Akutse KS, Siddiqui JA, Xu Y (2021) Model Application of Entomopathogenic Fungi as Alternatives to Chemical Pesticides: Prospects, Challenges, and Insights for Next-Generation Sustainable Agriculture. Front Plant Sci 12:741804. https://doi.org/10.3389/fpls.2021.741804
- Bohatá A, Folorunso EA, Lencová J, et al (2024) Control of sweet potato whitefly (Bemisia tabaci) using entomopathogenic fungi under optimal and suboptimal relative humidity conditions. Pest Manag Sci 80:1065–1075. https://doi.org/10.1002/ps.7837
- Bugti GA, Na C, Bin W, Feng LH (2018) Control of plant sap-sucking insects using entomopathogenic fungi Isaria fumosorosea strain (Ifu13a). Plant Prot Sci 54:258–264. https://doi.org/10.17221/118/2017-pps
- Fang W, Lu H-L, King GF, Leger RJSt (2014) Construction of a Hypervirulent and Specific Mycoinsecticide for Locust Control. Sci Rep 4:7345. https://doi.org/10.1038/srep07345
- Gao T, Wang Z, Huang Y, et al (2017) Lack of resistance development in Bemisia tabaci to Isaria fumosorosea after multiple generations of selection. Sci Rep 7:42727. https://doi.org/10.1038/srep42727
- Li S, Xue X, Ahmed MZ, et al (2011) Host plants and natural enemies of Bemisia tabaci (Hemiptera: Aleyrodidae) in China. Insect Sci 18:101–120. https://doi.org/10.1111/j.1744-7917.2010.01395.x

Course (s)	BIOC3990
Title	Investigation of Mosquito Bloodmeals in Barbados
Supervisor (s)	Dr. Shane Austin & Dr. Darren Browne

Background:
Mosquitoes are arthropods commonly found in tropical regions; they act as vectors for several known and novel viruses. Recent work in Barbados has indicated that many of these viruses have been previously unidentified [1]. Female mosquitoes can obtain bloodmeals from multiple sources and research has identified domesticated animals, livestock and birds as bloodmeal sources. These bloodmeals are necessary for the reproductive process of mosquitoes, specifically egg-laying. To date and to the best of available knowledge, bloodmeal analyses of female mosquitoes in Barbados have only been done by previous project students. This project seeks to build on this prior work and provide further information to the Ministry of Health and Wellness.

Objectives:
Determine the bloodmeals of various mosquito species captured during the Ministry of Health and Wellness mosquito aspiration activities

Methods:
The project will require (1) identification of mosquitoes species using a provided guide based on morphological features (2) isolation of DNA from the captured mosquitoes (3) PCR analysis using the isolated DNA [2] (4) PCR clean-up and preparation of PCR amplicons for sequencing as needed (5) Analysis of PCR amplicons by gel electrophoresis.

Requirements:
Must be comfortable working with mosquitoes daily.
Availability for early mornings on campus is desirable.

References:

- Thannesberger, J., et al., Viral metagenomics reveals the presence of novel Zika virus variants in Aedes mosquitoes from Barbados. Parasites & Vectors, 2021. 14(1): p. 343.
- Ngo, K.A. and L.D. Kramer, Identification of Mosquito Bloodmeals Using Polymerase Chain Reaction (PCR) With Order-Specific Primers. Journal of Medical Entomology, 2003. 40(2): p. 215-222.

Course (s)	BIOL3990
Title	Isolation of Reptile DNA from Soil in Barbados
Supervisor (s)	Dr. Darren Browne

Background:
Barbados has historically been home to several reptiles, including the endemic leaf-toed gecko (*Phyllodactylis pulcher*), an endemic skink (*Alinea lanceolata*) and an endemic thread snake (*Tetracheilostoma carlae*). The Barbados skink was last reported in 1889, the leaf-toed gecko is critically endangered, and no new sightings of the thread-snake have been reported for more than a decade. Environmental DNA is an effective means of monitoring endangered species (Katz et al., 2020; Matthias et al., 2021) and may be especially effective in monitoring the cryptic, fossorial reptiles of Barbados. This project seeks to test and refine the initial protocols that will form part of an eDNA metabarcoding pipeline for endemic reptiles in Barbados as part of the Conserving Barbados' Endemic Reptiles (CBER) project of the Ministry of Environment and National Beautification, Blue and Green Economy.

Objectives:
Establish and refine the initial protocols for sampling, DNA extraction and PCR to be used to monitor endangered reptiles based on soil samples.

Methods:
The project will require (1) collection of soil samples from sites that represent potential habitat for *T. carlae* (2) isolation of DNA from collected soil samples (3) design of primers to amplify the 16S rRNA gene of (a) snakes in the family Leptotyphlopidae and (b) *T. carlae* (4) PCR analysis using the primers designed (5) analysis of PCR amplicons by gel electrophoresis.

Requirements:
Must be comfortable working in both the field and the lab.
Must be familiar with using GenBank and its BLAST functionality.

References:

- Katz, A. D., Harper, L. R., Sternhagen, E. C., Pearce, S. E., Melder, C. A., Sperry, J. H., & Davis, M. A. (2020). Environmental DNA is effective in detecting the federally threatened Louisiana Pinesnake (*Pituophis ruthveni*). *Environmental DNA*, *3*(2), 409-425. https://doi.org/10.1002/edn3.126
- Matthias, L., Allison, M. J., Maslovat, C. Y., Hobbs, J., & Helbing, C. C. (2021). Improving ecological surveys for the detection of cryptic, fossorial snakes using eDNA on and under artificial cover objects. *Ecological Indicators*, *131*. https://doi.org/10.1016/j.ecolind.2021.108187

Course (s)	ECOL3990
Title	The ecology and distribution of Tourist Trees (*Bursera simaruba*) in Barbados.
Supervisor (s)	Dr Linton Arneaud and Dr Henri Vallès

Background:
Bursera simaruba, commonly known as the Tourist Tree, is a species of significant ecological and medicinal importance (Mitchell and Ahmad 2006, Ravelo et al. 2024, Morales-Martínez et al. 2024). In Barbados, the role of Tourist Trees in the island's ecosystem is yet to be fully understood. This project aims to investigate the ecology and distribution of *Bursera simaruba* on the island, contributing to the overall knowledge of Barbados' tree biodiversity.

Objectives:
The project aims to map the distribution of *Bursera simaruba* across Barbados, assess its ecological role in different habitats, identify potential threats to its populations, and recommend conservation strategies for the species.

Methods:
This project will entail a literature review, field surveys to map *Bursera simaruba* populations, data collection on habitat characteristics and threats, and data analysis to determine distribution and ecological relationships.

Requirements:
A strong understanding of Barbados' geography, vegetation types and proven hiking ability are essential for this project.

References:

- Mitchell, S.A. and Ahmad, M.H., 2006. A review of medicinal plant research at the University of the West Indies, Jamaica. West Indian Med J, 55(4), p.243.
- Ravelo Martínez, S.A., et al., 2024. Volatile metabolites, antioxidant and biological activities of *Bursera simaruba* (L.) Sarg. essential oil, from the tropical dry forest, Cesar, Colombian Caribbean Region. Journal of Biologically Active Products from Nature, 14(1), pp.51-63.
- Morales-Martínez, M., et al. 2024. Forest cover, tree structure, and fruit size as predictors of fruit consumption by birds in two tropical trees from southern Mexico. Studies on Neotropical Fauna and Environment, pp.1-13.

Course (s)	ECOL3990 / BIOL3990
Title	Assessing the condition, survivorship, and growth of *Acropora palmata* (*Elkhorn coral*) nubbins within the context of a coral restoration project at two sites in Barbados
Supervisor (s)	Dr Henri Vallès

Background:
The BCS is currently leading the execution of a coral restoration project (the WANSEC project) seeking to restore populations of elkhorn coral (*Acropora palmata*) at two sites in Barbados. The elkhorn coral is an important reef builder species that used to be dominant in the shallow fringing reefs of Barbados hundreds of years ago, forming dense thickets of interlocking branching colonies that acted as a barrier against wave action and coastal erosion. Although this coral is now functionally extinct, there is evidence that its populations are slowly and naturally recovering in Barbados.
This project seeks to assist and accelerate this natural recovery by using novel coral nubbin outplant generation techniques and operating at relatively large scales at two sites designated for restoration.
The project is currently at the nursery phase and will transition to the outplanting phase during the 2024 fall period. To assess the effectiveness of the project, periodic monitoring of the coral nubbins will be required during the nursery and outplanting phase as well as after the outplanting phase.

Objectives:
The project aims to quantify mortality and growth rates of Elkhorn coral nubbins obtained from different coral lineages during the nursery and outplanting phase as well as after the outplanting phase at two sites designated for restoration. The ultimate goal is to help identify the elkhorn coral lineages that best perform throughout these restoration phases in Barbados and to identify potential environmental and methodological factors affecting coral restoration success.

Methods:
The student will periodically collect growth, survivorship and condition data from coral nubbins obtained from different lineage colonies during the nursery phase, outplanting phase, and thereafter.
The student will also monitor the health status of the populations of Elkhorn coral at the sites from which the coral nubbins were obtained, which will serve as baseline.
The student is also expected to assist during the outplanting activities.

Requirements:
This project requires SCUBA diving. A SCUBA diver certificate and willingness to work during weekends if needed.

References:

- Johnson, M.E., Lustic, C., Bartels, E., Baums, I.B., Gilliam, D.S., Larson, L., Lirman, D., Miller, M.W., Nedimyer, K., Schopmeyer, S., 2011. Caribbean Acropora Restoration Guide: Best Practices for Propagation and Population Enhancement.. The Nature Conservancy, Arlington, VA.
- Macintyre, I.G., Glynn, P.W., Toscano, M.A., 2007. The demise of a major *Acropora palmata* bank–barrier reef off the southeast coast of Barbados, West Indies. Coral Reefs 26, 765-773.
- MacLean, R., Oxenford, H.A., 2016. Mapping the return of acroporid corals on fringing reefs along the west coast of Barbados, CERMES Technical report 80. Centre for Resource Management and Environmental Studies (CERMES) Faculty of Science and Technology, The University of the West Indies, Cave Hill Campus, Barbados, p. 61.

Course (s)	ECOL3990 / BIOL3990
Title	Abundance and resource use of the monarch butterfly (*Danaus plexippus*) at Walkers Reserve
Supervisor (s)	Dr. Henri Vallès

Background:

The monarch butterfly is one of the most familiar butterflies of the Americas. Some of its populations on the northern range can migrate considerable distances to overwintering sites, whereas other populations do not migrate. Monarch butterfly larvae feed on a wide range of latex-producing milkweeds and the adults are important pollinators. Some of its populations can be found as far south as the eastern Caribbean, including Trinidad and Tobago. In Barbados, they can be regularly observed at the Walkers Reserve, on the northeastern side of the island. However, little is known about the factors that drive the abundance and distribution of this iconic species in Barbados over time.

Objectives:

This project will seek to (1) map the distribution of food plants used by both the adults and larvae of monarch butterflies and (2) assess changes over time in the abundance of monarch butterfly larvae and adults at the Walkers reserve. These data will be used as baseline to assess changes in the future.

Methods:

This project will entail regular georeferenced field surveys at the study site to quantify the abundance of monarch butterfly adults and larvae and their food plants.

Requirements:

This project will require a student with good data handling and analysis skills. The student will spend considerable time in the field collecting data. Although not required, it would be advantageous if the student had access to his/her own means of transportation.

References:

- Walker, A.; Thogmartin, W. E.; Oberhauser, K. S.; Pelton, E. M.; Pleasants, J. M. (2022). "*Danaus plexippus*". IUCN Red List of Threatened Species. 2022: e.T159971A806727. doi:10.2305/IUCN.UK.2022-1.RLTS.T159971A806727.en.
- Nail, Kelly R. (2019). "Butterflies Across the Globe: A Synthesis of the Current Status and Characteristics of Monarch (*Danaus plexippus*) Populations Worldwide". Frontiers in Ecology and Evolution. 27: 362. doi:10.3389/fevo.2019.00362.

Course (s)	MICR3990
Title	Investigation of antibiotic-resistant bacteria in spring water in Barbados
Supervisor (s)	Dr. Kelly Brathwaite and Dr. Bidyut Mohapatra

Background:
Antimicrobial resistance is a significant global public health issue, driven particularly by the widespread overuse and misuse of antibiotics in humans, animals and plants. The emergence and dissemination of antibiotic-resistance genes (ARGs) and antibiotic-resistant bacteria (ARB) from environmental sources have become a cause for concern (Jian et al., 2021).

Natural water bodies have been found to harbor drug-resistant bacteria, as water contaminated with ARGs and ARBs may enter via discharge of clinical waste, excrement from human and animal sources, agricultural runoff and effluent from sewage treatment plants (Singh et al., 2022).

In Barbados, springs such as Porey Spring, Benn Spring as well as the springs at Codrington College, Pot House and Fortesque are traditionally used by locals for recreational purposes. Some persons may also use the water at these sources as drinking water. This project seeks to determine the importance of natural water sources in Barbados as potential reservoirs of ARB.

Objectives:
The objectives of this project are (i) to investigate the prevalence and diversity of antibiotic-resistant faecal bacteria in spring water sources in Barbados; (ii) to determine the antimicrobial resistance patterns of the spring water bacterial isolates and (iii) to assess the level of multi-drug resistance and the potential public health implications.

Methods:
Water samples will be collected from multiple spring water sites across the island, representing different geographical areas and potential contamination sources. Faecal bacteria (faecal coliforms and enterococci) will be isolated from the water samples and antibiotic susceptibility testing will be conducted to determine resistance profiles. PCR will be used to detect the presence of antibiotic resistance genes and integrons associated with the development of drug resistance.

References:

- Jian, Z., Zeng, L., Xu, T., Sun, S., Yan, S., Yang, L., Huang, Y., Jia, J. & Dou, T. (2021). Antibiotic resistance genes in bacteria: Occurrence, spread, and control. Journal of Basic Microbiology, 61 (12):1049-1070. https://doi.org/10.1002/jobm.202100201
- Singh, A. K., Kaur R., Verma S. & Singh, S. (2022). Antimicrobials and Antibiotic Resistance Genes in Water Bodies: Pollution, Risk, and Control. Frontiers in Environmental Science, 10:830861. https://doi.org/10.3389/fenvs.2022.830861

Course (s)	MICR3990
Title	Mining metagenome of *Sargassum* waste for cellulose-degrading enzymes
Supervisor (s)	Dr. Bidyut Mohapatra

Background:
Recently, two pelagic species of *Sargassum* (*S. fluitans* and *S. natans*) form blooms annually in the subtropical and tropical Atlantic. In 2018, these *Sargassum* blooms covered a distance of 8850 km, from the Gulf of Guinea to the Greater Caribbean Sea and the Gulf of Mexico, with an estimated weight of 20 million tons[1]. Currently, there is growing interest in the valorization of seaweed waste, especially to depolymerize cellulose, by utilizing the decomposed biomass as a feedstock for the sustainable generation of bioenergy and value-added products with applications in agriculture, biorefinery and food processing[2]. The increased utilization of seaweed in industrial processes necessitates characterization of the metagenome of putrefied seaweed biomass for cellulose-degrading enzymes.

Objectives:
The objectives of this research project are to (1) characterize the metagenome of *Sargassum* waste accumulated on Barbados' coast; and (2) assess the resulting metagenome sequences for the prevalence of cellulose-degrading microorganisms and functional genes.

Methods:
The metagenome will be characterized via next-generation sequencing. The resulting metagenome sequences will be analyzed to assess the phylogeny and functional genes of cellulose-degrading microorganisms via KEGG mapper[3].

References:

- Wang, M., Hu, C., Barnes, B. B., Mitchum, G., Lapointe, B., & Montoya, J. P. (2019). The great Atlantic *Sargassum* belt. Science, 365, 83–87.
- Miranda, J. L. L., Celis, L. B., Estévez, M., Chávez, V., van Tussenbroek, B. I., Uribe-Martínez, A., & Cauich-Kantun, C. (2021). Commercial potential of pelagic *Sargassum* spp. in Mexico. Frontiers in Marine Science, 8, 768470.
- Kanehisa, M., & Goto, S. (2000). KEGG: Kyoto encyclopedia of genes and genomes. Nucleic Acids Research, 28, 27-30.

Course (s)	MICR3990
Title	Molecular diversity of alginate-depolymerizing actinomycetes in *Sargassum* waste
Supervisor (s)	Dr. Bidyut Mohapatra

Background:
Recently, substantial research efforts have been directed to develop environmentally sustainable and cost-effective biocatalytic processes to deconstruct alginate, the major polysaccharide of the cell wall of *Sargassum*, into value-added chemicals[1]. The advantages of biocatalytic processes are the operation of bioprocesses at ambient temperatures and pressures and the reduced generation of secondary pollution[2]. Alginate lyase is the key enzyme that cleaves alginate into uronic acids-containing oligosaccharides. Alginate lyase has the potential to be used in biofuel, pharmaceutical, diagnostic, food, cosmetic and agricultural industries[3]. In view of the potential industrial applications of alginate lyase, it is essential to characterize this enzyme from various environmental niches.

Objectives:
The objectives of this research project are to (1) develop a culturomics strategy specifically for the actinomycetes associated with *Sargassum* waste; and (2) characterize the phylogeny and functional genes of the alginate-depolymerizing actinomycetes.

Methods:
The phylogeny and functionality of *Sargassum* associated actinomycetes will be assessed via DNA sequencing and CAZy mapping tool[4].

References:

- Kostas, E. T., Adams, J. M. M., Ruiz, H. A., Duran-Jimenez, G., & Lye, G. J. (2021). Macroalgal biorefinery concepts for the circular bioeconomy: A review on biotechnological developments and future perspectives. Renewable Sustainable Energy Reviews, 151, 111553.
- Mohapatra, B. R. (2021). Solid-state fermentation conditions optimization, homology modelling and molecular docking of β-mannanase of a novel *Streptomyces* species LB66 isolated from *Sargassum* seaweed waste. Biocatalysis and Biotransformation, 41, 187–197.
- Ertesvåg, H. (2015). Alginate-modifying enzymes: biological roles and biotechnological uses, Frontiers in Microbiology, 6, 523.
- Drula, E., Garron, M. L., Dogan, S., Lombard, V., Henrissat, B., & Terrapon, N. (2022). The carbohydrate-active enzyme database: Functions and literature. Nucleic Acids Research, 50, D571–D577.

Course (s)	MICR3990
Title	Assessment of food safety knowledge, attitudes and practices of fish handlers in Barbados
Supervisor (s)	Dr. Kelly Brathwaite, Dr. Angela Alleyne and Ms. Michelle Wiggins (Fish Markets, Ministry of Environment and National Beautification, Blue and Green Economy)

Background:
Fresh fish is highly perishable and may contain microorganisms that can cause foodborne illness or spoilage. Improper handling practices are a leading cause of deterioration and microbial contamination of fish (Boakye et al., 2024). In Barbados, where fish is a staple in the diet and an essential part of the local economy, fish handlers are tasked with maintaining the quality and safety of fish from the point of capture until it reaches the consumer. Their understanding of food safety principles and attitudes towards the implementation of hygienic practices, as well as their daily fish handling practices can significantly impact public health (Bedane et al., 2022; Ssubi et al., 2024). However, there is currently no published data available on the knowledge, attitudes and practices (KAP) of fish handlers in Barbados. This project therefore seeks to evaluate the KAP of local fish handlers considering their important role in maintaining fish safety, and aims to identify factors that can influence microbial contamination and the spread of foodborne illness .

Objectives:
To assess the knowledge, attitudes and practices (KAP) of fish handlers in Barbados to ensure public health and food safety.

Methods:
Fish handlers will be selected from fish markets and key processing facilities across the island. Their knowledge and attitudes will be assessed using quantitative and qualitative approaches, and hygiene practices will be observed. Microbial assessment of hygiene and sanitation will also be conducted in order to determine if cleaning and disinfection practices are effective, and to estimate the risk of microbial contamination.

References:

- Bedane, T. D., Agga, G. E. & Gutema, F. D. (2022). Hygienic assessment of fish handling practices along production and supply chain and its public health implications in Central Oromia, Ethiopia. Scientific Reports, 12: 13910. https://doi.org/10.1038/s41598-022-17671-5
- Boakye, M. W., Adanu, S. F., Adzoyi, P. N., Tornyi, J. M., Dzubey, I., Ayimah, J. C, Boakye, D. S. & Wiafe, E. D. (2024). Food safety knowledge, attitude, and practice among fish retailers in the Ho central market of Ghana. Food and Humanity, 2: 100231. https://doi.org/10.1016/j.foohum.2024.100231
- Ssubi, J.A., Mukisa, I.M. & Muyanja, C.K. (2024). Knowledge, attitudes and practices of fresh Nile perch value chain handlers towards food safety requirements in Uganda. Heliyon, 10 (10): e31432. https://doi.org/10.1016/j.heliyon.2024.e31432

SOME ADVICE FOR STUDENTS

The Research Project courses afford students the opportunity to carry out research themselves and to add to our knowledge of the world. Research is time-consuming, often frustrating, but also exciting and undertaking a project gives you a chance to see whether a research career is for you. Several students before you have carried out projects to such a high standard and with novel results that these have been published in internationally refereed journals!

CARRYING OUT THE PROJECT WORK

Before commencing work, it is important that you have a clear picture in your mind of what you are setting out to achieve. Discuss the project fully with your supervisor(s) and ensure you are clear as to the aim(s) of the project. Your research should not just be an open-ended exercise that finishes when you have a sizeable body of data but must have clear, realistic goals. It is you, not your supervisor, who will have to defend the project design so be prepared to be critical of any aspect of the planned study at this early stage. Your supervisor will help you plan your work schedule. **Regular consultation between the two of you on your progress is vital to project success**. You may need certain keys to the building and these can be obtained by paying a deposit to the Departmental Secretary and completing the necessary form. It is important you keep a record of all your project work in a notebook dedicated to the purpose, not scraps of loose-leaf paper. Success in this course is based on the effort you put in.

Your supervisor will advise you on the best way to commence writing up your research but you are encouraged to start writing the Methods (also termed Materials & Methods) section of the report as you go along. You will early on be directed to certain key references to help you understand the nature of the problem you are investigating. This literature review will also be vital to the writing of the Introduction section of your report. On completion of the experimental work, cleaning up of your work area is mandatory. Your project will not be considered complete unless this has been done and you will receive a low mark for your quality of work. Also, your key deposit will not be refunded unless your supervisor indicates that you have cleaned your work space.

THE PROJECT SEMINAR

On completion of your practical work you will be required to present your findings to members of the department. This will be assessed and contributes 15% toward your final mark. In the case of year-long projects, you are also required to present an initial seminar outlining what you are setting out to do. This is not for credit but will help you build confidence for the final assessed seminar and may provide valuable feedback on your project intentions.

It is vital when presenting your work that you explain to the audience early on what is the aim of your project. Surprisingly, such a key aspect of a presentation is often overlooked. In the time available you should explain why this is a problem that needs investigating, e.g. by referring to previous studies. The methods you have used should be presented in sufficient detail to allow the audience to understand what you have done. You should then present your results, interpret these and maybe suggest future work. The audience will then ask you questions arising out of what you have presented.

You should practice your talk beforehand ensuring you keep to the allotted time. Ideally, you should speak to your visual aids rather than read word for word from notes. Ensure you're your audience can easily read your slides. Simple with a single idea is best. Try to avoid complicated backgrounds. These can be distracting and/or make the slides difficult to read. Check that your presentation will run adequately on the system in the Demonstration Room and that your slides look good when projected. Colours do not always look the same as on your computer screen. A trial should be carried out the day before.

THE PROJECT REPORT

NB: This particular format might not be the best for your project. Your supervisors will advise you. This works for most biological projects.

The grade you receive in this course will depend largely on the quality of your Project Report since it accounts for 70% of your mark. Good presentation is important, but an attractive report that says nothing will not give you a passing grade. Likewise, fantastic results scrappily presented and shoddily written up will not give you even a passing grade. It will take time to compose and type the Report, prepare figures and have it bound. The submission deadline is final so ensure you budget 2-3 weeks for this. **THE PENALTY FOR LATE SUBMISSION IS 5% PER DAY.** Your report must be written in the format of a scientific paper and your supervisor will provide you with a sample paper and or previous report to guide you as to what is appropriate. Your supervisor will help you in planning how to write the report and will comment on draft portions to ensure you are on the right track. You must write in Standard English, carefully proof-reading the final draft. For all sections incorrect spelling and grammar will be penalised. Do not depend on a spell checker to find all spelling errors or a grammar checker to correct your grammar. Your Report will be graded in accordance with the enclosed marking scheme.

Abstract: The abstract summarizes your findings and possibly your interpretation of your results. Look at Abstracts from several papers related to your study and ensure you understand what constitutes an Abstract. It is usually about three-quarters of a page of your report. The most common fault here is that the student does not understand what an abstract is and writes what amounts to a mini-Introduction.

Introduction: The Introduction sets the scene. It provides a literature review of the area and explains the nature of the problem to be investigated. It will often include the socio-economic reasons why this investigation is warranted. It is important in reviewing the literature to get the balance right, e.g., an introduction to a project looking at the biochemistry of softening in mango fruit might have a sentence explaining that mango is but one species of the genus *Mangifera* but to spend a page reviewing the taxonomy of mango would be inappropriate in this case. Another common mistake is in the citing of the literature. Firstly, you must credit the sources of the information you present and you must do so correctly (see References section overleaf). Another common error is to cite the reference but then not list this in the reference section. If you have read about a study by Jones (1990) in a paper by Smith (1999) but not actually read the Jones paper it is incorrect for you to cite the Jones paper directly. Instead, you should cite this as (Jones, 1990, cited by Smith, 1999). Remember plagiarism is a serious offence that can be avoided by citing sources correctly and paraphrasing what you have read. **Give the objectives of the experiments in the introduction.**

Materials & Methods: Anyone reading this section should be able to repeat what you have done (and get the same results). The focus for this section is therefore accuracy and completeness. Look at relevant scientific papers as a guide to how this section is written. Where you are following a published method cite the reference. It is normal in this section that the full scientific name of the organism being studied is given if it has not appeared first in the Introduction. At the first mention of the scientific name the authority for the name must also be included (but dropped thereafter). This last rule does not apply to prokaryotic organisms. Also avoid all sorts of abbreviations that you have not previously defined in the text.

Results: A Results section is not simply Figures or Tables of data. In this section the results obtained are stated, though usually not interpreted. For this reason there is not usually any citing of the literature in this section. In this section, where appropriate there should also be the results of statistical analysis of the data. Raw data is more appropriately included in an Appendix to the report. Your supervisor will guide you on this. Figures and Tables should each bear a legend which provides enough information to make the Figure/Table intelligible without reference to the text. The Figures and Tables are numbered in order of their appearance in the text, i.e. the first figure referred to, is Figure 1. Photographs are also considered Figures. The Figures and Tables should appear in the text rather than *en masse* at the end.

Discussion: This section constitutes your interpretation of your results, what the results suggest and how these relate to previous published studies. You will therefore be carefully citing the literature where appropriate in this section. Where there has been major experimental failure you will want to discuss here why this transpired and how you would repeat the study so as to actually get data. The supervisor may advise that you combine the Results & Discussion sections but even in such a case the foregoing comments apply. As a guide you could consider the following:

- Give explanations for the results you obtained.
- Why did you obtain these results?
- How do these results satisfy the objectives of these experiments?
- What were the difficulties encountered?
- How would you proceed to get better results?
- What can you conclude from your results?
- What else could be done to support these conclusions?
- How could these experiments be improved?
- Compare your results with similar results in the literature

References: The Reference section must list the References in a standard accepted format cite. References are usually arranged alphabetically by author and then by year but they may also be assigned a number and listed in the order in which they are cited in the text.
Consult with your supervisor as to what format you should follow. When you start using a format for your references, adhere to it. Students often do "copy-paste" of references from different journals that have different formats. Be careful to check that ALL your references are in the SAME format.

Acknowledgments & Appendices:

If you wish to acknowledge help given this should be done in an Acknowledgements section following the Discussion. If you have received substantial help from anyone this **must** be pointed out in the Acknowledgements section. If your project involved a survey you might want to include the Survey Form in an Appendix or if there are raw data that need including, the Appendix is an appropriate place for this. This optional Appendix will be the last section of the report.

SAFETY

General safety rules apply to all activities in laboratories. ***Food and drink must NOT be taken into any laboratory*.** Lab coats are mandatory for the experimental parts of most projects. If you are not certain, consult your supervisor.

SAFETY IN FIELDWORK

This section provides an outline of some of the issues that need to be considered when undertaking a project that includes an element of fieldwork. Further details can be found in the Department of Biological and Chemical Sciences Safety Manual.

DEFINITION OF FIELDWORK

Fieldwork is defined as any practical work carried out by staff or students of the University for the purpose of teaching and research in places which are not under University control but where the University is responsible for the safety of its staff and students and others exposed to their activities. The definition includes activities as diverse as archaeological digs, social survey interviews as well as more recognised survey/collection work.

GENERAL CONSIDERATIONS

Students with any medical condition likely to affect their ability to undertake fieldwork must inform in advance the member of staff in charge.
As a general rule, fieldwork by solitary individuals is **NOT** allowed. Exceptions to this rule **MAY** be permissible if the nature of the risks, degree of isolation, nature of the location and experience of the person involved allow. Undergraduate and Masters students will only be permitted to carry out fieldwork alone in exceptional, low risk, circumstances.
DO NOT go into the field without leaving contact details with a designated member of staff (usually the project supervisor) and preferably a map showing expected location and time of return. Report to this person on your return.

PREGNANCY

The Department of Biological and Chemical Sciences acknowledges that some laboratory environments may present possible medical hazards to an unborn child. The Department of Biological and Chemical Sciences is committed to the concept and principles of ALARA (as low as reasonably achievable) with respect to hazards that may be present in the course of instruction. As part of this effort, it is also the policy of The Department of Biological and Chemical Sciences to establish procedures to minimize the potential for adverse health effects to the unborn child of a mother who attends class in an environment in which reproductive hazards may be present.

It is important to note that certain chemicals and biological materials (such as viruses and bacteria) may pose a risk to an unborn child. A project student who works in an environment in which bio-hazardous materials or hazardous chemicals are used – or are suspected to be used - should **immediately** notify her Supervisor, Department Head or Dean once pregnancy is suspected. The Instructor, Head or Dean (with support from the Safety Committee) must evaluate the work environment for the presence of reproductive hazards and then determine and communicate the risks for the unborn child. Based on this evaluation, the Department of Biological and Chemical Sciences may recommend changes in the environment and activities of the pregnant student or an academic course, or other appropriate accommodation in which there is minimal exposure to the hazard.

PLAGIARISM

The University considers plagiarism a serious offence. The UWI Examination Regulations deal with this subject in section (B) Cheating under Regulation 97as follows:

(i) Cheating shall constitute a major offence under these regulations.

(ii) Cheating is any attempt to benefit one's self or another by deceit or fraud.

(iii) Plagiarism is a form of cheating.

(iv) Plagiarism is the unauthorised and/or unacknowledged use of another person's intellectual efforts and creations howsoever recorded, including whether formally published or in manuscript or in typescript or other printed or electronically presented form and includes taking passages, ideas or structures from another work or author without proper and unequivocal attribution of such source(s), using the conventions for attributions or citing used in this University.

These conventions should be those appropriate for science in work produced for science courses.

In these regulations, examination refers to any written material to be assessed as part of the final mark for a course including project reports.

The penalties for plagiarism are stated in Regulation 103 as follows:

> *…. the Committee shall disqualify the candidate from the examination in the course concerned, and may also disqualify him/her from all examinations taken in that examination session; and may also disqualify him/her from all further examinations of the University, for any period of time, and may impose a fine ….*

If you have not done so, you should also read http://www.cavehill.uwi.edu/fpas/CurrentStudents/ plagiarism.htm and the links there.

ASSESSMENT OF RESEARCH PROJECTS
BIOC3990/BIOL3990/ECOL3990/MICR3990

STUDENT'S NAME: **EXAM NUMBER:**

TITLE OF PROJECT:

SUPERVISOR:

SECOND EXAMINER:

CATEGORY	**MARKS AWARDED**		
	SUPERVISOR	**SECOND EXAMINER**	**TOTAL**
1.WRITTEN REPORT /70			
Abstract /5			
Introduction /10			
Materials & Methods /10			
Results /10			
Discussion /20			
References /5			
Style and Presentation /10			
2. WORK /15			
Quality of Work /10			
Ability to Work Independently /5			
3. SEMINAR /15			
General Presentation /5			
Content /5			
Ability to Answer Questions /5			
TOTAL MARKS AWARDED /100			

The University of the West Indies - Cave Hill Campus

FACULTY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BIOLOGICAL & CHEMICAL SCIENCES

APPLICATION FOR RESEARCH PROJECT

NAME: _____ **STUDENT ID NO:** _____

RESEARCH PROJECT APPLIED FOR:-

BIOL3990 ☐ BIOC3990 ☐ CHEM3950 ☐ CHEM3955 ☐ MIRC3900 ☐

ENSC3020 ☐ ENSC3900 ☐ ECOL3990 ☐ BIOC3290 ☐

PROJECT CHOICES: -

FIRST CHOICE	
Supervisor(s):	
Project Title:	
SECOND CHOICE	
Supervisor(s):	
Project Title:	

Signature_____ **Date** _____

FOR DEPARTMENTAL USE

ACCEPTED FOR: 1st Choice ☐ 2nd Choice ☐

STUDENT HAS NECESSARY PRE-REQUISITES: Yes☐ No ☐

COMMENTS:

RECEIPT NO: (For Summer Only) _____

APPROVAL: _____ _____

Course Co-Ordinator **Head of Department**

Laboratory Safety Regulations Agreement

1. I have received and read the **"Safety"** section.

2. I agree to keep this safety section on hand in the laboratory and to abide by laboratory regulations and safety procedures.

3. I agree not to begin an experiment until I have studied and understood the purpose of the experiment, the procedures involved, and any particular hazards associated with the equipment and chemicals.

4. I understand that if I violate the laboratory regulations I may be asked to leave the laboratory.

5. I have given all important medical information to the coordinator of the course.

Course: _____

Emergency Contact Name: _____

Emergency Contact Number: _____

Student Name (PRINT): _____

Signature: _____

Date:_____

PLEASE SUBMIT YOUR COMPLETED **APPLICATION FORM** AND **LABORATORY SAFETY REGULATIONS AGREEMENT** TO THE BIOLOGICAL & CHEMICAL SCIENCES DEPARTMENTAL OFFICE, GROUND FL., BIOLOGY BUILDING.