2023 Ambrose Research Conference ARC

Science Poster Abstracts
Room: Airhart

12:30–2:00pm – Science Posters – ECOL 351 Conservation Biology
Moderator: Lizelle Odendall

The Importance of Reintroducing Native Biodiversity: A Case Study on the Attappady Hills, India
- Kimberly Giebler

Biodiversity loss is a devastating factor in the longevity of mankind, and our ability to continue harvesting resources as they become less available. A study in Attappady Hill in India takes this problem head on by systematically restoring the forest, while teaching local populations how to properly care for their resources, cycle the land and use what nature has given to them for financial gain without depleting their domestic resources. The aim of this poster is to explore the efficacy of biodiversity restoration, and whether it has a long-term impact on the humans that live in the environment. The Attappady case study indicates that by allowing local villagers to be the governors of their land, and by educating them on the importance of its use, they are better able to support not only themselves and their communities but are empowered to make communal decisions on how that land should be spared and used. The villagers choose not to use any resources from a predetermined area within an area close to their village (except for personal use), and these areas are now some of the only landscapes composed of natural forests and are 80% more biodiverse than other forests in the region. The case study indicates that purposeful ecological restoration and education can have a positive impact on biodiversity, and highlights how restoration could prove effective in method in conserving environments around the world.

Overexploitation of Red Coral in the Mediterranean Sea- Resubmission
- Julia Michota

Mediterranean red coral (Corallium rubrum) is a highly valued coral worldwide. Biologically they are important as red corals are considered keystone species. Keystone species are organisms that have a large impact on their ecosystems relative to their population, and without them, ecosystems would be drastically different or cease to exist altogether. In the Mediterranean Sea, they host high levels of biodiversity and provide shelter to shrimps, fish, and crabs to the coast. Red coral also has high economic value to humans due to the red calcium carbonate skeleton, and is widely used in creating jewellery. Recently, the increased demand for their skeleton has resulted in increased harvesting activities and overexploitation of these precious corals. These corals are slow growing and long-lived, thus their ability to replace themselves to keep

up with demand is nearly impossible. Therefore, if these keystone corals were to go extinct, implications such as habitat loss could lead to decreased biodiversity and destruction of the Mediterranean costal ecosystem. This poster explores the overexploitation of red coral and evaluates conservation measures that can be implemented to aid the recovery of red coral ecosystems, like imposing limit licenses and duration of harvesting seasons, to prevent extinction. Additionally, suggestions for future research to understand the growth patterns of red coral are discussed, and the potential results could inform conservation efforts to increase their abundance, and restore ecosystems.

Prevention of aquatic invasive species: how Alberta is preventing the spread of zebra mussels and quagga mussels
- Daniel Welsh

Invasive animals can have major impacts on ecosystems and on the economy. They can throw off the balance of ecosystem food chains and cost people millions by damaging infrastructure. Here I assess the importance of preventing invasive species from establishing populations in new areas. I will do this by using the example of how Alberta continues to prevent the spread of zebra mussels and quagga mussels. These mussels reproduce quickly and have no natural predators, which allows them to dominate the food supply, leaving the native species with nothing to eat. To prevent the zebra and quagga mussels from entering the province, the government has implemented several strategies, including monitoring, rapid response planning, education and outreach, watercraft inspections, and policies. However, some prevention and mitigation measures are not currently being used in Alberta, including hotwash stations and pesticides. Invasive species can have extreme effects on both humans and other animals.

What can I really do? Empowering Individuals to Halt Climate Change
-Annica Creighton

According to 2021 polls, Calgarians are interested in tackling climate change through strong political and industrial measures, as well as taking personal steps to contribute to the fight against climate change. Currently the City of Calgary is striving to be a net-zero emissions city by 2050. How much can individuals contribute through personal action? This poster will introduce eco-footprints as a way to assess the impacts of individual efforts. Ecofootprints, measured in global hectares, describe the portion of Earth required to sustain a particular individual or group at their current consumption and waste production levels. Canadians have some of the largest footprints in the world. This poster will suggest specific actions that can be taken to reduce Calgarians ecofootprints. Furthermore, it will provide information about free ecofootprint calculators to give attendees the tools to evaluate their impact, and so encourage more sustainable everyday activities that may halt climate change.

Anthropogenic effects on Water Insecurity for Canadian Indigenous Reserves: A Case Study on Grassy Narrows and Whitedog First Nations Water Status
- Joy Watson

Preservation of the environment (land and water) is crucial for sustainable biodiversity levels as well as human life and cultural customs; this case study serves as an example of this importance. This poster will explore the social and environmental issue responsible for water insecurity on indigenous reserves, using Grassy Narrows and Whitedog First Nations in Ontario as an example. On reserves across Canada, safe and clean water is hard to access. Often, water is often contaminated with heavy metals due to increasing industrialization or failing/abandoned infrastructure near reserves which contaminates the watershed, lack of legal framework regarding water management, and lack of inherent rights of indigenous peoples to water. The Grassy Narrows and Whitedog First Nations reserves in Ontario are both suffering from intergenerational mercury poisoning from the contaminated watershed. From the 1960's to 1970's, heavy metals (specifically mercury) from a pulp and paper plant were dumped into the English-Wabigoon River, poisoning and killing animal life in the water system and those who rely on the river for daily life. Currently, the river remains above the LD50 for mercury, leaving the water undrinkable and causing severe health effects for the residents on both reserves for generations. These reserves serve as only one example of how harmful anthropogenic activities can affect the environment but also affect the biodiversity and human life surrounding the area. Indigenous communities are closely tied to the land and water; when these are threatened their culture and customs are endangered at the expense of the environment.

Agricultural Desertification and Degradation
- Sierra Menchini-McHugh

Human population growth has put a great strain on the resources that mankind is dependent on for survival, like the soil used to grow our food, and help generate income. The impact of agriculture on the soil is known as degradation, or desertification which can be understood as the process of turning soil into dirt, which strips the nutrients away, therefore turning farming land into deserts. Several factors including harmful agricultural practices, overgrazing, climate change, and soil erosion all impact the severity of desertification. This loss of soil fertility results in the loss of vegetation and a significant reduction in the biodiversity of the environment. This research explores how agricultural practices in Canada influence desertification, and reviews management tools to help conserve soil fertility and ecosystem functioning. Understanding how agricultural practices, such as tilling, feed lots, and over-harvesting have impacted the environment, can help improve farming practices to benefit the land, ecosystems, and society. Furthermore, future studies of ecosystem impacts will help us better understand the human connection to the land and why agriculture needs management practices in place to conserve the land that was given.

The Challenges of Translocation of Threatened and Endangered Species: An Evaluation of Ethical Considerations and Efficacy

- Kaitlyn Limacher

Translocation is a popular approach to mitigate the impact of a rapidly growing human population on threatened species. This method involves movement of a species into a population of conspecifics, movement outside of the species' historical range, or movement back into a historical range from which it had previously disappeared from. Relocating species to a compatible habitat suitable to their ecological niche and role is thought to increase genetic variation, save species at risk of extinction in particular regions, or restore ecosystems previously degraded by extinction of species. While there are several cases of successful translocation, few cases have explored the ethical implications and potential risks of the practice. This poster reviews the response of translocated species and the receiving ecosystem to analyze the ethical considerations of the process, and the efficacy of translocation as a whole. Understudied issues of translocation include animal behaviour, complications of genetic diversity, potential disease introduction, and conflicts due to proximity to human life. Overall, this review concludes that translocation remains to be a practical method to mitigate threats on threatened and endangered species. However, success can only be achieved through sufficient monitoring of animal behaviour, physiological health, and movement, and by anticipation of interactions with biotic and abiotic factors of the novel environment.

Evaluating Impacts and Mitigation Strategies of Spotted Knapweed in Alberta's Restoration Sites

- Tegan McArthur

In Alberta, natural and anthropogenic disturbances such as extreme weather events, natural resource extraction, and expansion of infrastructure leave behind land in need of restoration. Through secondary succession, invasive plant species are often first to recolonize the land. However, extensive invasive growth, such as that of spotted knapweed (Centaurea maculosa), inhibits the growth of native species. A prohibited noxious weed, spotted knapweed is commonly found in Alberta's grasslands and is associated with a range of subsequent impacts, including a lack of soil nutrients and a decline in biodiversity. Combined with the ease with which spotted knapweed is spread between disturbed areas, the restoration of balanced ecosystems can be difficult to achieve. Thus, severely invasive species like spotted knapweed currently pose a significant threat to restoration projects across the province. Strategies for mitigation, including mechanical, chemical, and biocontrol methods, have historically varied in sensitive areas such as Waterton Lakes National Park. The ecological and economic costs of each method can be compared to generate practical recommendations for spotted knapweed mitigation in select types of sensitive areas across the province. As restoration continues to emerge as an essential means of conservation in Alberta, proper analysis of the impacts and severity of invasives like spotted knapweed is vital for

choosing effective, sustainable mitigation strategies for the long-term thriving of restored ecosystems, both ecologically and economically.

The Invasive Himalayan Balsam: Beauty or Beast?
- Sarah Ritter

Himalayan balsam (Impatiens glandulifera) is a highly invasive plant species that colonizes disturbed riparian habitats in Europe and North America. The ability for this plant to tolerate a wide range of conditions and rapidly invade waterways, including riverside areas, has made it a species of concern for many countries; in addition, this invader is believed to have a significant negative effect on local ecosystems. This paper investigates the biotic and abiotic ecological impacts of Himalayan balsam invasion, as well as traditional and biological control methods, with the purpose of answering the question: is this invasive plant a beauty or a beast?

Review of Current Pacific Salmon Populations and Link Between Declines with Climate Change and Diamond's 'Evil Quartet'
- Nathan Yeung

The sustainability of salmon consumption and status of salmon populations are of particular concern due to salmon's significant economic and traditional indigenous value in Canada. This presentation sets out to provide a basic understanding of the life histories and biology of the five species of Pacific salmon and review the most recent Pacific salmon stock assessment as well as link possible population declines to the effects of climate change and Diamond's "evil quartet" (habitat destruction, invasive species, over harvesting, and the combination of the three forementioned factors). Because salmon populations are under federal jurisdiction and a matter of national concern, Canada has conducted research into the effect of climate change on salmon populations. It was determined that individual salmon species have their own population trends, yet, cumulatively, all five species are in decline. It is also evident that population trends correlate with a period of recent warming suggesting climate change as a major driver in population dynamics. In addition, this review implicates the role of forest degradation invasive species, and significant commercial fishing as factors that negatively influence Pacific salmon populations. Salmon stocks are consistently becoming degraded due to human impacts on ocean ecosystems – to mitigate damage, dictate policy, and implement successful recovery plans, we must first understand the full extent of how we are affecting these species.

Effect of Harmful Algal blooms
- Gracey Nicol

(no abstract available)

12:30–2:00pm – Science Posters – MED 327 Medical Genetics
Moderator: Dr. Chris Wang, Associate Professor of Biology, Science Co-Chair

Duchenne Muscular Dystrophy
- Adibullah Nezami

Duchenne Muscular Dystrophy (DMD) is a infrequent genetic disorder that influences approximately 1 in 5,000 male births. DMD is caused by mutations. in the deoxyribonucleic acid that encodes dystrophin, a protein essential for muscle function. The omission of dystrophin leads to progressive muscle proneness and wasting, that typically begins in early babyhood and results in wheelchair dependence for one teen age. DMD affects all muscles in the material, including the essence and respiratory muscles, and can bring about life-threatening obstacles such as respiratory deterioration and cardiomyopathy.

Myoclonic Epilepsy: It's Challenges and What to do About Them
- Mikyla MacPherson

Myoclonic Epilepsy with Ragged Red Fibers is a multi-system mitochondrial syndrome characterized by progressive myoclonus and seizures. Affecting one in every hundred thousand individuals, this chronic disease has a wide variety of symptoms, effects, and possible treatments. While symptoms are different for every individual, ones such as stroke, progressive external ophthalmoplegia, and retinopathy can make it common to clinically misdiagnose. Since no one treatment has currently been labelled as most effective, the most common ones include antiepileptic drugs, coenzymes, or a vitamin B-complex. Caused by changes in the mitochondrial genome, it is only maternally inherited. While not being very common in the general public, knowing the details about this condition could become useful when coming in contact with someone who has it. Research done on this topic will enhance the knowledge individuals have and help them to deal with encounters as well as to understand the science behind how this, and many other, diseases come to be.

Genetic Disorder: Marfan Syndrome
- Jonathan Brown

The genetic condition known as Marfan syndrome affects an individual's connective tissue by altering the proteins responsible for building healthy connective tissue. Named after the French pediatrician Antoine Bernard-Jean Marfan, the syndrome confers a host of symptoms including: (1) dolichocephaly, which describes abnormally long limbs, fingers, and toes; (2) cardiovascular disease and; (3) high-grade myopia (Kodolitsch et al., 2019). Due to the wide range of organ systems it impacts, Marfan syndrome can be categorized as a pleiotropic disorder (Renard et al., 2017). The syndrome is caused by a mutation in the gene responsible for creating fibrillin-1 and its effects are well-known and documented (Kodolitsch et al., 2019). Nonetheless, the Marfan syndrome is found

in roughly 0.02% of the population and it affects humans equally across all races, ethnic groups, and sexes. Its universal nature and high rate of genetic inheritance makes it an ideal candidate for further exploration and education. Furthermore, some believe that Marfan syndrome has a darker, less understood side which lends further justification to additional explorations and investigations of its impact and etiology.

Miller-Diekers Syndrome: An Overview
- Charlotte Heida

Formally named in 1960 by physicians James Q. Miller and H. Dieker, Miller-Dieker Syndrome (MDS), or lissencephaly, is caused by a hemizygous microdeletion of 17p13.3. MDS is a fatal genetic disease affecting 1:100,000 live births. Physical findings of individuals with MDS include hypotonia, feeding difficulties and facial dysmorphism, with additional phenotypic characteristics of lissencephaly type 1 or type 2, severe global mental deficiency, and early death. MDS arises most commonly from a de novo microdeletion, with a minority inheriting a deletion from a carrier parent with a balanced chromosomal rearrangement and is unpreventable. Common diagnostic tools include fluorescence in situ hybridization (FISH), MRI, amniocentesis, or fetal chorionic villi screening. Following the pathogenetic traits of genetic haploinsufficiency, MDS onset is prenatal, with symptoms developing in newborns and infants. Caring for a child with MDS can be emotionally taxing, as most affected individuals will require pharmacological seizure management and nasogastric or gastrotomy tube feedings, and do not usually live past two years of age.

Fragile X Syndrome: Understanding Causes, Symptoms, and Management Strategies
- Saffron Godard

The purpose of this poster presentation is to raise awareness about Fragile X Syndrome (FXS) and provide a comprehensive overview of the disorder, its causes, and management strategies. The poster will explore the history and physical findings associated with FXS, and delve into its disease etiology, pathogenesis, phenotypes, inheritance risk, diagnosis, and related diseases. Additionally, the poster will present management and treatment options, as well as prevention strategies for families with a history of FXS. The poster aims to provide healthcare professionals, researchers, and the wider community with valuable information about this genetic disorder, which can lead to intellectual disability, social and emotional difficulties, and other challenges. By raising awareness of FXS and providing information on its causes, symptoms, and management, the poster aims to promote better understanding and support for individuals affected by the disorder. Ultimately, the poster seeks to promote research and progress in the field of FXS and to improve outcomes for individuals and families impacted by the disorder.

Beyond the Surface: Investigating the Complexities and Controversies of Alzheimer's Disease Research

- Kaitlyn Limacher

Alzheimer's disease (AD) accounts for majority of the reported dementia cases worldwide, leading to a wealth of research investigating its pathogenesis, manifestations, and treatment options. While AD is known to impact structures responsible for memory and cognitive function of affected individuals, research suggests that there is a range of clinical phenotypes that are expressed amongst the population, varying from language and association deficits to severity of memory decline. This may serve as an important tool in identifying key ideas about pathogenesis and potential causation of varying manifestations of the disease. Nearly the past two decades have been fueled by research that suggests a critical biomarker of AD development, and the disruption of memory and cognitive function, is the misfolding of amyloid-b proteins leading to the formation of harmful plaques. However, controversy in AD research regarding this widely accepted etiology has suggested that this mechanism may not accurately represent AD pathogenesis. As such, a comprehensive review on literature surrounding the foundational research on AD will be presented. Additionally, this poster will journey through insights and discoveries on the epigenetic factors involved by investigating exciting case studies, including a 19-year-old man diagnosed with probable AD despite a lack of genetic mutations common among young diagnoses. Ultimately, showcasing the progression of research in AD will provide a more holistic understanding of the disease and viable treatment options.

Thalassemia

- Alueter Demshakwa

Thalassemia is an autosomal recessive haematologic disorder that affects a person's ability to deliver oxygen to body tissues and can result in haemolytic anaemia. This disorder centres on the misfolded protein chains of the haemoglobin found in erythrocytes. Within all erythrocytes of an individual are included 4 globin chains, two beta chains and two alpha chains. These globin chains can be folded erroneously on the molecular level, based on mistakes that are made during gene expression that then distort the resulting amino acid chains that follow. This disruption in the folding process of the alpha and beta globin chains of an individual, can be disproportionally prevalent amongst those of African, Mediterranean, and Southeast Asian descent compared to those of other ethnicities. This research poster highlights the medial literature on thalassemia to explore what we know, and what areas the medical community can still elucidate about this hereditary disease that will better inform the treatment options and methods that are being taken now, and that can be taken in the future. This research poster will be focusing on areas such as the history and physical findings, disease aetiology and incidence, pathogenesis, phenotypes, inheritance risk, diagnosis, other related diseases, and management and treatments of thalassemia.

Understanding Chronic Myelogenous Leukemia
- Katie Ferner

Chronic Myelogenous Leukemia (CML) was found and understood as a myeloproliferative disorder, much like chronic neutrophilic leukemia and polycythemia vera. However, these two diseases lack a significant mutation that occurs in CML; the Philadelphia Chromosome, chromosome 22, and chromosome 9 undergo translocation. The fusion creates a breakpoint cluster region-proto-oncogene tyrosine protein kinase. After Peter Nowell and David Hungerford discovered the chromosome mutation in 1950. They found Chronic Myelogenous Leukemia the first cancer linked to this chromosomal translocation. The generated mutated protein no longer requires an activation loop, speeding up cell division and inhibiting DNA repair. As a result, this disease often portrays an elevated white blood count and enlarged spleen and liver. The diagnosis of CML is determined by cytogenetic testing and fluorescent in situ hybridization. Multiple treatments for battling CML have been designed to inhibit the tyrosine kinase protein. Current research on this cancer is to develop improved therapies or vaccines against BCR-ABL, the effect of Hypoxia, and tyrosine kinase inhibitors' impact on patients.

Hereditary Breast and Ovarian Cancer: Genetic and Clinical Understanding
- Kate Siemens

Genetic disorders impact 1 in every 50 people, so it’s important to understand the science behind them and ways to test for or prevent their effects. Hereditary breast and ovarian cancer (HBOC) is a genetic disorder that causes mutations in the BRCA 1 and 2 genes. These genes are associated with the prevention of breast and ovarian cancer so when they are mutated their abilities change and they don’t function properly. It is a highly heritable disease and functions as an autosomal dominant phenotype where a child who has a parent with the mutation will have a 50% chance of inheriting the disease. The gene mutation can be diagnosed through molecular genetic testing to examine the gene and look for any abnormalities such as duplications or deletions. It often is considered with respect to females however, males may also carry this disease and it increases their risk of getting breast or prostate cancer. Currently there are some preventative options available for individuals who have a BRCA 1 or 2 gene mutation and want to have a child. These strategies greatly decrease the risk of their child developing the disease, but currently there is no cure for it. While this disease is quite rare, it is important to be aware of multiple cases of breast and ovarian cancer within a family and should be referred to genetic testing.

Tuberous Sclerosis
- Maria Lazo

Tuberous sclerosis is a rare genetic disorder that causes non-cancerous tumours to progress in different parts of the body. A mutation in the TSC1 or TCS2 gene causes this

disease. These proteins aid in controlling cell growth, cell proliferation, and cell size. This disease has an autosomal dominant inheritance pattern in which one copy increases the risk of developing tumours. Symptoms of Tuberous Sclerosis include seizures, skin changes, developmental delays, behavioural issues, kidney problems, lung problems, heart issues, eye problems, and dental changes, depending on the location of the tumour. The diagnosis of this disease is dependent on the symptoms that arise. A physical exam, blood tests, and genetic tests are usually done. The different symptoms are evaluated through tests such as an electroencephalogram for seizures, an MRI, a CT scan, an ultrasound, an echocardiogram, an electrocardiogram, eye exams, dental exams, and developmental evaluations. There is no cure for tuberous sclerosis, but there are treatments to help manage symptoms, such as anti-seizure medicines, surgery, therapy, educational services, and mental health services. Tuberous sclerosis cannot be prevented as it is a genetic disorder, but early diagnosis can help manage symptoms early on.

Etiology and Phenotypes of CHARGE Syndrome
- Elijah Babcock

CHARGE syndrome is a genetic disorder that is present in approximately 1 in 10000 individuals. This disorder is caused by a loss-of-function mutation in the CHD7 gene, encoding for Chromodomain-helicase-DNA-binding protein 7 which is located on chromosome 8. CHARGE syndrome originally derived its name from key phenotypes associated with the disorder: coloboma, heart defects, atresia of the choanae, retardation, and genital and ear anomalies. However, CHARGE syndrome is no longer bounded by these phenotypes. Genome analysis has led to the discovery of many different, and less severe, phenotypic presentations of CHARGE syndrome. Thus, ‘CHARGE’ is no longer used as an acronym but has remained as the name of the disorder. Here, a brief description of phenotype, heritability, and etiology of CHARGE syndrome will be presented. Moreover, the implications of CHARGE syndrome during embryonic and fetal development and the major challenges in disease treatment will be discussed.