DEPARTMENT OF ZOOLOGY

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Land Acknowledgement

We respectfully acknowledge that the Department of Zoology is located on the traditional, ancestral, and unceded territory of the hən̓q̓əmin̓əm̓ speaking xʷməθkʷəy̓əm (Musqueam) people, who have been stewards of these lands and waters for countless generations.

As a department dedicated to studying animals and their ecosystems, we recognize the profound ecological knowledge embedded in Indigenous ways of knowing. The diverse wildlife that inhabits these territories, from the salmon that navigates coastal waters to the birds that fly above, has been integral to Musqueam culture, sustenance, and teachings.

Our scientific pursuits are enriched by Indigenous knowledge systems that understand the interconnectedness of all living beings. We have a lot to learn, but we commit to conducting our research, teaching, and learning with respect for the relationships between humans, animals, and ecosystems that the Musqueam people have nurtured for generations, striving to integrate these perspectives into all that we do.

Reconciliation Pole, Hereditary Chief 7idansuu (James Hart), Haida. UBC

Executive Summary

The UBC Department of Zoology is one of Canada's strongest broad-based life science departments, with a research scope spanning from molecular and cellular processes to ecosystems. Our reputation is built upon a long history of fundamental, discovery-based research that has expanded significantly over the decades, resulting in a research and teaching atmosphere that is not only highly productive and influential but also supportive, interactive, and collegial. We are a community of over 300 people, including dedicated and supportive staff, highly accomplished researchers and educational leaders, and stellar trainees with a shared passion for research, teaching, and learning across the biological disciplines, with clusters of expertise in:

Cell & Developmental Biology
Comparative Physiology & Biomechanics
Ecology
Educational Leadership
Evolutionary Biology

The research productivity of Zoology faculty, postdoctoral fellows (PDFs) and graduate students is substantial, with ~1,300 peer-reviewed articles published since 2018, of which >30% appear in top-tier journals. Annual research funding to the department ranges between $8.7-9.6 million from diverse sources, and the achievements of our research faculty are recognized through prestigious awards, fellowships, and research chairs, including the Crafoord Prize in Biosciences, the Canada 150 Research Chair, the Darwin-Wallace Medal, and many more. Furthermore, numerous research faculty have also been elected fellows in major learned societies, including the Royal Society of Canada and the US National Academy of Sciences. Our researchers are housed in modern facilities across campus according to their discipline and supported by numerous core and department-run facilities.

The Zoology Graduate Program currently enrolls 79 PhD and 32 MSc students, with numerous other students supervised in interdisciplinary programs such as Neuroscience and Cell & Developmental Biology. As a program, we are working to address concerns related to the cost of living in Vancouver. We recently increased the minimum annual stipend and are committed to regular increases over the next several years. Program completion times average 6.1 years for PhD and 2.7 years for MSc students, which are metrics the department is working to improve through enhanced guidance for students and supervisors.

In collaboration with the Department of Botany, we offer the undergraduate Biology Program, which has ~15,000 enrolments in Biology courses, with ~1,300 students in the Biology Major or Honours stream. The curriculum provides a comprehensive foundation in biological sciences, with specialized laboratories, field courses, and research opportunities in the upper years. The Biology Program benefits from new, state-of-the-art facilities, and innovation in the Biology Program is spearheaded by educational leadership (EL) faculty in conjunction with lecturers, research faculty, and students. Equity initiatives cut across our research, graduate and undergraduate programs and include many forward-looking initiatives emerging from the Zoology Equity Diversity & Inclusion (ZEDI) Committee

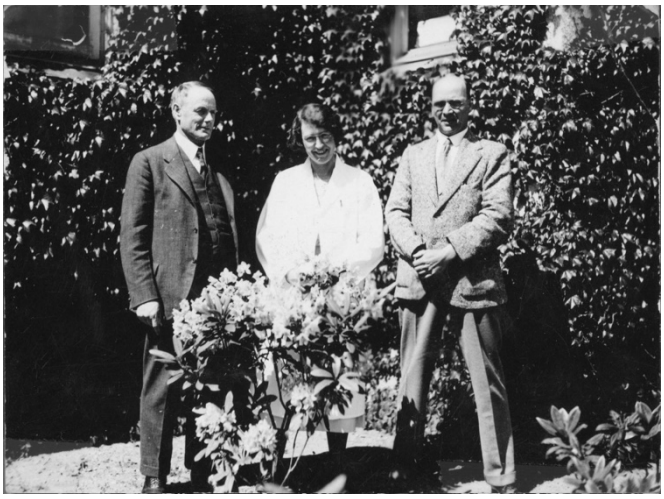
and Biology Indigenous Strategic Plan (ISP) Committee. We aim to create a supportive, diverse, and inclusive environment for all.

The Department of Zoology is performing well in all research, teaching, and learning aspects. We continue recruiting outstanding new faculty, excellent trainees, and dedicated staff, and we expect many recruitment opportunities over the next decade. Although we perform well, Zoology faces several interconnected challenges that will be described in more detail. The most significant threats to our research, teaching, and training excellence are:

- loss of Canada Research Chair positions
- increasing costs to maintain research infrastructure
- growing administrative burdens that reduce time for research & teaching
- the high cost of living in Vancouver, which affects faculty recruitment and trainee quality of life

Despite these challenges, opportunities exist to strengthen the Department of Zoology, and we have initiated strategies to address them.

Introduction



"The Pioneers: C McLean, Gertrude Smith, and George Spencer, until 1939". In William S Hoar scrap book.

The University of British Columbia was founded in 1908 and opened its doors to 379 students on September 30th, 1915. The first biology courses were offered in 1916, in a small Department of Biology headed by Professor Andrew H. Hutchinson. In 1920, Professor C. McLean Fraser was appointed to teach zoology and in 1924 became the first Professor and Head of the newly formed Department of Zoology. To help him in this endeavour, he hired Dr. Gertrude M. Smith and Dr. George J. Spencer and they became the three "pioneers" as the department expanded its scope in 1939 to include vertebrate and invertebrate courses. He was succeeded in 1940 by Professor W.A. Clemens as Head of Zoology, a department with three professors. Professor W.S. Hoar joined the Department in 1945 as a professor of Zoology and Fisheries, a chair funded by a large grant from H.R. MacMillan and BC Packers. A rapid period of growth and expansion followed in the post-war era. In the 1960s, under Professors Ian McTaggart Cowan's and Bill Hoar's leadership, the Department of Zoology expanded and grew strength in four core areas, including Ecology, Genetics, Parasitology and Physiology, with a growing complement of professors. The department has continued to grow and expand over the years. Today, we are the only remaining Zoology department in Canada, a distinction we are proud of. We are now well-recognized for our core clusters of research strength in Cell & Developmental Biology, Comparative Physiology & Biomechanics, Ecology, and Evolutionary Biology. Our clusters of strength expanded to include Educational Leadership when UBC implemented the tenure-track professor of teaching stream in 2010. Professors of Teaching (most often referred to as educational leaders) not only teach

but engage in pedagogical research and other leadership activities that aim to improve how undergraduate science education is accomplished. The Department of Zoology is well known for its world-class research, engaged and innovative teaching, effective and supportive mentoring, collegial atmosphere, collaborative work culture, and a strong team attitude to running the department.

This self-assessment document aims to describe how the Department of Zoology is fulfilling its mandate to educate and train the next generation of scientists and conduct cutting-edge research. The document is organized as prescribed in the Terms of Reference for this review (**Appendix 1**), centering around our strategic plans, research, undergraduate education, graduate program, governance and culture, infrastructure, finances, and plans for the future. The narrative describes our programs and goals, followed by appendices with additional information and relevant data.

Previous External Review & Subsequent Actions – December 24th, 2017

In 2017, the Department of Zoology underwent external review by a committee comprising Dr. Katie Gilmour, Professor of Biology, University of Ottawa; Dr. Locke Rowe, Distinguished Professor of Evolutionary Biology, University of Toronto; and Dr. George Somero, David and Lucile Packard, Professor in Marine Science, Emeritus, Stanford University. The committee was provided with a self-study document and visited UBC on Nov 30th and Dec 1st, 2017.

Overall, the review committee's report was positive and commented on the excellence of Zoology's contributions to innovative teaching and world-class research programs, excellent staff, and our highly collaborative and collegial work environment. The committee had no significant criticisms but made several valuable recommendations across six main themes. Below is a brief synopsis of our actions related to each theme. For a more complete description, please see **Appendix 2**.

Theme 1. Maintaining department cohesion

Challenges: The distribution of Zoology faculty across multiple research and teaching buildings was identified as a strength, but it was also viewed as a challenge to departmental cohesion.

Response: We have taken multiple steps to improve departmental cohesion, including:

- Ensuring all buildings can be accessed by all department members
- Rotate department meetings and weekly social gatherings among buildings
- Improve the graduate student research symposium
- Increase support for the Zoology Graduate Student Association (ZGSA) and the newly formed Zoology Association of PDFs and Research Associates (ZAPRA) to support graduate students, postdoctoral fellows (PDFs), and research associates

Theme 2. Maintaining size equality in the departmental research clusters

Challenges: At the time of the last review, the comparative physiology and biomechanics cluster was smaller than the other clusters and had lost a Canada Research Chair (CRC) position.

Response: Since the 2017 review, we:

- Hired three assistant professors into this cluster, bringing the total full-time equivalents (FTE) in line with the other groups
- Continue to advocate for CRC positions

Theme 3. Continued investment and support for EL faculty and lecturers

Challenges: The review committee identified the need to develop a strong recruitment plan for EL and lecturer faculty based on program needs, with equitable support for all teaching faculty.

Response: We have:

- Undertaken a substantial renewal of our EL faculty and lecturers (two EL and nine lecturers hired since 2017)
- Ensured our faculty mentoring program includes EL faculty and lecturers

Theme 4. Continued support for teaching innovation and infrastructure

Challenges: The review committee recommended sustained support for teaching innovation and equipment. They also recommended condensing multi-sectioned courses into fewer sections.

Response: To address these challenges, we have:

- Continued support for two Science Education Specialists
- Utilized the Faculty of Science teaching start-up program, which supports new faculty in their first teaching assignment
- Decided against condensing multi-section courses
- Purchased new teaching equipment for the undergraduate teaching labs

Theme 5. Support for faculty

Challenges: The review committee highlighted the concern of increasing administrative loads, lack of transparency, and the timing of seminars late in the afternoon as a challenge to faculty with family responsibilities.

Response: While there was no explicit recommendation associated with this theme, we have:

- Improved transparency around budget, service loads, teaching assignments, and other aspects
- Worked to identify ways that our excellent staff can better support faculty
- Implemented guidelines to ensure that all regularly scheduled departmental events end before 5:00 pm

Theme 6. Graduate and post-doctoral training

Challenges: An ongoing concern is graduate student time to degree completion and preparedness for non-academic jobs.

Response: Time to completion for both MSc and PhD degrees remains an issue. Please see the Graduate Education section for a detailed discussion. To address preparedness for non-academic jobs, we have:

- Developed courses, workshops, and panel discussions targeted explicitly at non-academic jobs

Strategic Plan: Vision, Priorities, and Implementation Strategies

As the Department of Zoology moves beyond its centennial celebration (1924 – 2024), it stands poised to build upon its legacy of excellence while embracing the challenges and opportunities of the coming decade. Drawing on its strong foundation, the department envisions a future characterized

by strategic renewal, innovation in teaching and research, and deepened commitments to equity, diversity, and inclusion.

UBC's Strategic Plan

The Department of Zoology's strategic plan is embedded within the UBC Strategic Plan, "Shaping UBC's Next Century" and the Faculty of Science Strategic Plan, "Improving our World through Science". Integrated into these plans and aligned with Zoology's strategic plan is the UBC Indigenous Strategic Plan. Throughout our research, teaching, learning, and operational domains, the Department of Zoology is committed to building disciplinary expertise while embracing interdisciplinary perspectives, engaging in forward-thinking PDF, graduate student, and undergraduate research training, expanding our commitment to evidence-based pedagogy and curriculum improvement, and integrating EDI and Indigenous perspectives as integral core values in all that we do.

For research, the department aims to recruit and retain world-class researchers from diverse backgrounds who can maintain and enhance Zoology's international reputation. The department will advocate for greater recognition of faculty achievements through national and international awards, highlighting the exceptional quality of work being conducted. Improving operational and infrastructure support remains crucial for maintaining research excellence, particularly as core facilities begin to age and require ongoing maintenance. The department will also promote diversification of research funding beyond traditional sources to ensure sustainability in an increasingly competitive funding landscape.

The undergraduate curriculum will continue to evolve to maintain the Biology Program as a leader in life sciences education. Building on a first-year curriculum review currently underway, the Departments of Botany and Zoology will implement changes that enhance experiential learning while providing students with increased flexibility. We will continue an examination of the entire curriculum to differentiate and highlight the unique qualities of the Biology Program amid growing alternative life science programs. Furthermore, we aim to increase equitable access to undergraduate research experiences, including redefining the honours program requirements and improving mechanisms for students to identify research opportunities.

At the graduate level, the department is committed to addressing completion times by revisiting thesis expectations, implementing more robust progress tracking, and providing clearer guidance on timelines. Enhanced mental health support for graduate students will be prioritized through wellness initiatives and improved connections to campus resources. The department will advocate for increased financial support and reduced tuition costs to address the funding challenges faced by graduate students and the pressures these funding challenges place on research funds.

The next decade will bring significant faculty renewal as approximately one-quarter of the research faculty and several EL faculty approach retirement. This presents an opportunity to shape the department's future while maintaining our core strengths. Faculty recruitment will focus on identifying scholars who excel in their specific disciplines and create bridges between the

department's research clusters and beyond, fostering interdisciplinary collaboration. The department will advocate for enhanced university-wide support to address Vancouver's housing challenges, historically impacting recruitment and retention.

The department's commitment to equity, diversity, inclusion, and Indigenous engagement will deepen and expand. We will continue to empower the ZEDI committee and the Biology Indigenous Strategic Plan Committee to identify opportunities for greater engagement and community-building initiatives. We aim to create an inclusive and engaging environment where all faculty, staff, PDFs, and students feel supported and are encouraged to grow.

When we began working on this self-study document, the global scientific landscape appeared reasonably stable, collaborative, and engaged in supporting research on some of the world's most pressing challenges. As we finalize this self-study document and reflect on our future, we do so in a very different scientific climate. Changes in the political landscape and emerging challenges to science in the United States, including research funding cuts, policy shifts on climate change and EDI, and restrictions on international scientific collaboration, have created a new reality that Canadian institutions must navigate. Although we do not know the longer-term trajectory of these changes, we feel it necessary to commit as a department to strengthening our support for innovative research on pressing scientific questions and to continue to build a scientific culture of openness, equity, collegiality, and curiosity.

Research, Scholarly & Professional Activity

OVERVIEW

The UBC Department of Zoology is one of Canada's strongest broad-based life science departments, with a research scope spanning molecules to cells, whole organisms, populations, and communities. Our reputation is built on a long history of fundamental, discovery-based research that has expanded significantly over the past decades, resulting in a research atmosphere that is not only highly productive and influential but also supportive, interactive, and collegial. The department has established world leaders in fields that span the biological sciences, emerging and influential mid- and early-career scholars, and engaged PDFs, graduate students, and undergraduates. The Zoology department and multiple affiliated centres and institutes support cross-disciplinary strengths and collaboration and provide access to world-class research infrastructure.

RESEARCH STRUCTURE, ORGANIZATION & INTERACTIONS

Zoology is a large, productive, and collegial department. The department's research interests fall roughly into four overlapping biology disciplines, with clusters of research expertise in:

Cellular & Developmental Biology
Comparative Physiology & Biomechanics
Ecology
Evolutionary Biology

These are commonly referred to as our research clusters. Zoology's fifth cluster is focused on EL, which is described in more detail in the subsequent section. The primary research cluster affiliation

of each faculty member is shown in **Appendix 3**; however, it must be noted that the research interests of many of our faculty span more than one cluster. As such, cluster affiliation is flexible and serves as a general organizing principle to ensure we sustain roughly equivalent strength in our core research and teaching areas. To this end, we aim to maintain approximately 8 to 9 full-time equivalents (FTE) in each cluster area, and with pending retirements and active searches underway, we anticipate achieving this goal within the coming year.

Among our 42 tenure-track research faculty, 29 are fully appointed in Zoology, and 13 share joint appointments with other departments and units at UBC. Among our research faculty, five are jointly appointed with Botany (Angert, Leander B, Parfrey, Tseng & Gaynor), two with Microbiology & Immunology (Abraham & King), one with Math (Doebeli), one with the Institute for Resources, Environment and Sustainability (IRES; Kremen), two with the Institute for the Oceans & Fisheries (Harley & Pauly), one with the Michael Smiths Laboratory (Snutch), and one with the Forest and Conservation Sciences in the Faculty of Forestry (Benson Amram). Numerous Zoology faculty are also part of major university-wide research institutes and centers, including 12 faculty who are part of the Life Sciences Institute (LSI), 26 who are part of the Biodiversity Research Centre (BRC), two who are part of the International Collaboration on Repair Discoveries (ICORD), and two who are members of the Interdisciplinary Biodiversity Solutions Collaboratory (IBioS).

Faculty from other units, both at UBC and elsewhere, maintain strong ties with the Zoology department through formal affiliations such as Associate and Adjunct faculty appointments. Indeed, numerous faculty members from the Institute for the Oceans & Fisheries are associate members of Zoology (Villy Chirstensen, Dave Rosen, Andrew Trites, and Amanda Vincent) as well as faculty from Math (Christoph Haubert), Forest and Conservation Sciences (John Richardson) and Psychology (Kiran Soma). Several other faculty members hold adjunct or affiliate status with Zoology, including George Iwama, Ora Johannsson, and Chris Wood, and these faculty enrich the Zoology research environment.

Research Clusters

Cell & Developmental Biology

This research cluster comprises 11 (9.7 FTE) research faculty who investigate various cellular and developmental processes, including immune and nervous system development, sensory neurobiology, embryogenesis, spinal cord repair, the evolution of genome complexity, and cellular trafficking of macromolecules. These questions are investigated in various model organisms, but the two dominant models are *Drosophila* spp. and *Caenorhabditis elegans.* For specific details on individual research programs, please see the faculty profiles in **Appendix 29**.

Within the cell & developmental biology research cluster, there are seven full professors (Abraham, Auld, Gordon, Matsuuchi, Pante, Snutch & Tetzlaff), two associate professors (Mizumoto & Ramer), and two assistant professors (Sugioka & Wei). Five of the members are over the age of 60 (**Appendix 4**); therefore, this cluster is undergoing active renewal. In addition to our recent hire (Wei in 2023) we have also successfully recruited Dr. Callista Yee to join the department (they accepted the job offer March 3rd, 2025).

The majority of the members of this cluster are members of the LSI and are housed in the Life Sciences Centre (LSC), the largest research building at UBC. The LSC opened in 2005 and accommodates over 80 principal investigators and their trainees from 11 departments of the Faculty of Science, Medicine and Dentistry, including eight faculty from Zoology. It is designed with a continuous open lab concept around research themes to promote cross-departmental collaboration, foster cross-lab training, and encourage interdisciplinary research. The LSI provides researchers with shared infrastructure and access to core facilities and actively promotes opportunities for researchers from across the spectrum of life sciences to interact with each other. Zoology members in the LSI regard this arrangement as key to their ability to remain highly competitive in their research fields. For a more complete description of the LSI, please see **Appendix 5.**

Comparative Physiology & Biomechanics

The Department of Zoology has enjoyed international prominence in comparative physiology and biomechanics since the 1970s, and it is arguably one of the strongest groups in North America, if not the world. The comparative physiology & biomechanics cluster comprises seven (7.0 FTE) research faculty, who investigate a variety of mechanistic questions related to complex locomotion in birds, adaptation to new or challenging environments, freeze tolerance in invertebrates, sensory-driven behaviour in mosquitoes, and respiratory and biomechanical adaptations of insects. This cluster also has engaged and research-active emeritus and adjunct faculty with active labs maintained by Bill Milsom, Bob Shadwick, Chris Wood (former CRC Tier I, McMaster University) and Ora Johannsson (former DFO scientist). The researchers in this cluster use various vertebrate and invertebrate animal models, with the dominant animal models being insects and fish.

The comparative physiology & biomechanics cluster has four full professors (Altshuler, Brauner, Richards & Schulte), two associate professors (Marshall & Matthews P), and one assistant professor (Matthews B). None of the faculty in this cluster are over the age of 60 (**Appendix 4**), so overall faculty renewal will be slow; however, we are currently searching in this area, and if successful, we will see the research cluster grow to eight faculty members, which is in line with the FTE allocated to each of the other research clusters.

The members of this cluster occupy the Biological Sciences Building (BioSci), which underwent a complete renovation of the research wings in 2011 to provide state-of-the-art open lab design and meeting spaces designed to foster networking and collaborative research among a collegial group of faculty and trainees. The Biological Sciences Building also contains state-of-the-art experimental animal facilities for work on fish (*In*itiative for the *S*tudy of the *E*nvironment and its *A*quatic *S*ystems; *InSEAS*), insects (Facility for the

Study of Insect Adaptability and Physiology; FSIAP) and birds (Avian Flight Behaviour Lab), plus other smaller facilities to housing diverse animals. For a more complete description of these facilities, please see **Appendix 5**.

Ecology

The Department of Zoology has a long history of conducting fundamental research in ecology and conservation. The ecology research cluster comprises 13 (9.1 FTE) research faculty who investigate a variety of interrelated processes, including the forces that shape the structure of populations and communities, the role of animal cognition in urban ecology, the ecology of human- and climate-altered environments, ecology and evolution of species coexistence, tropical ecology, ecological functions in agricultural landscapes and ecology of symbiosis. Among the research faculty from this cluster, there is a strong focus on translating findings from fundamental ecology studies toward conservation and the maintenance of biodiversity. Most of the members of this research cluster are housed along with members of the Evolutionary Biology cluster in the BRC (see below).

The ecology cluster is currently composed of seven full professors (Angert, Aviles, Harley, Kremen, O'Connor, Pauly, & Srivastava), three associate professors (Benson-Amram, Jankowski & Parfrey), and three assistant professors (Gaynor, Germain & Tseng), many of whom hold joint appointments with other departments. Two faculty members in this cluster are over 60 (**Appendix 4**); therefore, compared with other research clusters, it is anticipated that there will be relatively limited faculty renewal over the next five years except when unique opportunities arise. To this end, we recently participated in a Faculty of Science Black faculty cluster hire and recruited an exceptional fire ecologist, Dr. Kendall Calhoun, who will start as an assistant professor in Zoology in September 2026.

Evolutionary Biology

The evolutionary biology research cluster is arguably the strongest evolutionary biology group in the world. This cluster comprises 11 (8.6 FTE) research faculty who investigate various interrelated processes, including the evolution and maintenance of diversity, origins of novel structures, speciation across landscapes, host-pathogen interactions, sexual selection, adaptive radiation, and the genetic basis of local adaptation.

The evolutionary biology cluster has ten full professors (Doebeli, Irwin, King, Leander B, Mank, Otto, Schluter, Taylor & Whitlock) and two assistant professors (Bruce & Leeks), who started within the last six months. Four members of this cluster are over 60 (**Appendix 4**), and active renewal is underway with the recent hires of assistant professors.

Ecology and Evolutionary Biology faculty are housed in the BRC, which opened in 2009 and is currently undergoing an expansion, which is due to open in May 2025. The BRC houses 22 of Zoology's 42 research faculty, their students, staff, and PDFs. Beyond the faculty housed in the BRC, many other Zoology faculty are active members of the BRC community. The mandate of the BRC is *to understand and conserve the diversity of life on earth through research, education,*

and outreach. The BRC members are now widely acknowledged as one of the most distinguished and productive groups in biodiversity research worldwide. Many BRC faculty have ties with NGOs, governmental agencies, Indigenous groups, and industry, which help to translate research into practice. Furthermore, many Zoology and BRC members have been actively involved in policy development related to biodiversity issues through membership on important committees, including the Committee on the Status of Endangered Wildlife in Canada and BC Pacific Salmon Forum. The members of the BRC have contributed more broadly through their modelling expertise to provide expert advice on the COVID-19 pandemic response through leadership roles in CoVaRR-Net pillar 6 and the Public Health Agency of Canada COVID-19 External Modelling Experts Group. The BRC is a dynamic, influential, and collaborative research environment addressing important questions about earth's tremendous diversity of life and how it changes with time. For a more complete description of the BRC, please see **Appendix 5.**

RESEARCH QUALITY INDICATORS

International & National Rankings

The University of British Columbia consistently ranks among the 50 best universities globally. Times Higher Education ranks UBC 41st in overall quality, the Shanghai Ranking of World Universities places UBC at 47th, and the QS World University Rankings places UBC at 38th on the international stage. Please see **Appendix 6** for details and links. Within Canada, UBC consistently ranks in the top three, behind the University of Toronto, and often switching between second and third with McGill University. Within the Biological Sciences, UBC is 35th internationally and second in Canada. For plant and animal sciences, UBC is 14th internationally and first nationally. Within specific research areas, UBC ranks 67th internationally and second nationally in cell biology, and 13th internationally and first nationally in ecology. Evolutionary biology and comparative physiology & biomechanics are not subject categories captured in the online ranking tools; however, Zoology is internationally recognized for its strength in these areas.

The research conducted by Zoology faculty has contributed significantly to UBC's national and international stature. Since the last departmental review, Zoology research faculty have been remarkably productive according to the commonly employed metrics of academic scholarship. Of the 42 research faculty, 41 have been research active over the last review period, and they have published extensively, attracted impressive research support from diverse sources, garnered international recognition, and trained numerous highly qualified personnel as elaborated upon below.

Publications

Publication statistics can be derived from various sources, including ISI Web of Science, Scopus and the associated SciVal analytics tool, and Google Scholar. For the present analysis, we adopted SciVal to facilitate comparisons with peer institutions; however, it should be noted that SciVal yields lower publications and citation statistics than other online tools because it excludes citations from unverified publishers, self-citations, and duplicate citations. This means that SciVal usually has less coverage and citation counts than Google Scholar but yields more accurate and higher-quality citation data, permitting more robust comparisons between institutions.

Over the past six years (2018-2024), Zoology research faculty and their trainees have published 1291 peer-reviewed articles (31/faculty), of which 398 (10/faculty) appear in top-tier journals such as *Nature*, *Science*, etc (31% of all papers are in top-tier journals; **Table 1**). These peer-reviewed works are highly cited, with 35,122 total citations and roughly 856 citations/faculty member. The overall average Hirsch index (*h*-index) in Zoology is 35.2. By faculty rank, the average *h*-index for full professors is 44, while associate and assistant professors have average *h*-indexes of 26 and 12, respectively.

Table 1: Comparison of 2018 – 2024 publication statistics of research faculty from the Department of Zoology with faculty from similar national and international departments.

		Publications		Publications in top tier		Citations		
University	**Faculty**	**Total**	**Pubs/Faculty**	**Total**	**Pubs/Faculty**	**Total**	**Citations/Faculty**	**Average *h*-index**
UBC Zoology	**41**	**1291**	**31**	**398**	**10**	**35122**	**856**	**35.2**
Alberta	54	1788	33	323	6	54787	1015	32.1
Berkeley	45	1199	27	386	9	31650	703	37.7
McGill	48	1573	33	515	11	48405	1008	29.3
Toronto CSB	46	763	17	385	4	18262	397	25.8
Toronto EEB	29	750	26	423	15	25817	890	27.3
UCSD CDB	31	660	21	477	15	20443	659	32.3
UCSD EBE	18	378	21	368	20	6286	349	25.3
Washington	42	1133	27	369	9	23514	560	27.0

Metrics were obtained from www.SciVal.com. Publications in top tier refers to the number of papers published in the top 10% of most cited journals. The departments analyzed are: Biological Sciences, Alberta; Integrative Biology, University of California Berkeley; Biology, McGill University; Cell & Systems Biology (CSB) and Ecology & Evolutionary Biology (EEB), University of Toronto, St. George Campus; Cell and Developmental Biology (CDB) and Ecology, Behavior & Evolution (EBE), University of California San Diego; Biology, University of Washington.

Compared to similar broad-based biology departments at major Canadian and US Universities, Zoology research faculty are highly productive with comparable or better publication statistics than peer institutions. The number of peer-reviewed publications per faculty (31 for Zoology) between 2018 and 2024 is higher than all comparable departments except Biological Sciences at the University of Alberta and Biology at McGill, each with an average of 33 publications/faculty. The number of publications in top-tier journals is similar to that of peer institutions. Similarly, the number of citations/faculty is generally higher for the publications of Zoology faculty, except for the University of Alberta, McGill, and Ecology and Evolutionary Biology at the University of Toronto. Average *h*-index for Zoology faculty is higher than in all other comparable departments, except Integrative Biology at the University of California, Berkeley, which has an average h-index of 37.7. UBC Zoology fares well in all metrics compared to other public institutions with top-ranked biology departments.

Research Funding

The Zoology research community has had consistent success in attracting competitive external research funding (See **Appendix 7** for overall grant funding and **Appendix 8** for detailed funding by PI) from diverse sources, including tri-council funding, other provincial or federal funding bodies, and private/not-for-profit organizations. Please note that Appendices 7 and 8 only show grant funding managed through the Department of Zoology and does not include grants that are managed by other departments (e.g. those of joint-appointed faculty); thus, the values shown are an underestimate of the total grant revenue held by Zoology faculty. Over the last six years, grant

funding to Zoology research faculty has increased from $6.37 million in 2018 to a stable $8.77 to $9.61 million between 2020 and 2024 (**Appendix 7**). This overall growth in grant funding is mainly due to the recruitment of a Canada 150 Research Chair and increases in funding from non-tri-council government sources. On average, full professors in Zoology have maintained stable external funding levels at $255,404/faculty member (range $33,024 to $1,018,333/year) from diverse sources. On average, associate and assistant professors acquire $122,175/year (range $47,400 to 294,580) and $167,935/year (range $42,246 to $269,297) in external research funding from diverse sources.

Overall, research funding from NSERC has remained relatively constant at $2.04 to $2.64 million/year. All research-active faculty are recipients of an NSERC Discovery Grant (DG) with an overall departmental average grant of $58,024 (range $28,000 to $95,000). All but two NSERC DG are above the 2008-2022 average NSERC DG grant size of $34,232. By rank, the average NSERC DG for full professors is $66,366 (range $40,000 to $95,000); associate professors is $37,750 (range $28,000 to $47,000); assistant professors is $42,500 (range $30,000 to $52,000). These levels of NSERC DG funding are impressive, given the challenging environment for discovery-based research in Canada and the declining overall success rates. A significant portion of Zoology faculty also conduct research in areas relevant to CIHR funding (all members of the cell & development and some members of the comparative physiology & biomechanics cluster), with overall CIHR funding to the department ranging from $697,000/year to $1.42 million/year.

Zoology research faculty have a strong record of attracting funding from non-traditional sources. This diverse approach to securing high-level funding has kept the Zoology department at the leading edge of international discovery-based research in our field. Multiple faculty members attract funding from an array of agencies, including, but not limited to, Genome British Columbia, Genome Canada, US National Science Foundation, US Department of Energy, The Tula Foundation, The Moore Foundation, and others. In addition to competitive research funding, Zoology faculty have secured impressive infrastructure funding, with $7.57 million acquired from CFI/BCKDF between 2018 and 2024.

Recognition & Awards

Across all ranks, Zoology faculty are at the forefront of their respective careers and receiving major national and international awards, fellowships and recognition (See **Appendix 9** for a complete list). Over the past six years, seven Zoology faculty members have held major Canadian or UBC Research Chairs, of which six were held by established researchers and three by assistant/associate professors (CRC Tier 2). Our most established faculty are recognized for their life's work with major international recognitions, including the Crafoord Prize in Biosciences from the Royal Swedish Academy of Sciences (Schluter), the Tyler Prize for Environmental Sciences (Pauly), and Darwin-Wallace Medal (Otto). In addition, 16 faculty have been named fellows in major learned societies, including the Royal Society of Canada, US National Academy of Science, and others. Mid- and early-career researchers are distinguishing themselves with numerous awards, including E.W.R. Steacie Memorial Fellowship and the Arthur B. McDonald Fellowship. In addition, many prizes have been bestowed from additional scientific societies.

SYNTHESIS AND STRATEGIC PRIORITIES

By all metrics, the Department of Zoology is flourishing on the research front. Our publication statistics are similar to or better than those of other leading Canadian and US public universities. Our overall research funding is increasing, and our faculty at all stages of their careers are winning major awards and fellowships. Our departmental structure, wrapped around the four major research clusters, has provided a stable foundation on which to build research excellence. The clusters span the breadth of the biological sciences and have roughly equal strength (8 to 10 FTE/cluster). Each cluster recognizes the importance of each discipline within the broader context of biology. The research cluster structure is also universally viewed as contributing to the department's stability, agility, and collegiality. Each cluster can develop plans for future hires in their area, focusing on the current and emerging research directions in their respective fields. We envision continued growth in stature as our early- and mid-career faculty become more established. In addition, after relatively little faculty turnover, we have recently undertaken significant renewal with 10 new assistant professors hired since 2018 (9 research and 1 EL faculty), plus the recruitment of new faculty into major research chairs, including a Canada 150 Research Chair (Mank in 2018), a President's Excellence Chair in Biodiversity, Institute for Resources, Environment and Sustainability (Kremen in 2019) and most recently a Canada Excellence Research Chair (King in 2023). Although we have significantly benefited from the availability of external chairs, we have not sustained our historic complement of Canada Research Chairs, which, given the strength of our faculty, is an area that needs to be addressed. Furthermore, with 12 research faculty and two EL faculty over 60, there will be significant faculty renewal over the next 5 to 10 years, much of which is already underway. Thus, it is essential to continue to recruit and retain world-class researchers to build upon the prominence of the Department of Zoology and continue the fundamental research to understand how animals function at all levels of biological organization and the impacts of human activities on individuals, populations, communities, and ecosystems.

The key to staying at the forefront of research lies in recruiting talented researchers and supporting them in all aspects of their academic careers so that they flourish as world leaders. Thus, our vision for the future is to recruit, retain and support the next generation of Zoologists who have strengths in our core research areas, while being able to bridge and make interdisciplinary connections across our research clusters. To extend our strength in core research areas, we are united in our desire to increase the diversity of voices in our research ecosystem by hiring faculty from traditionally underrepresented groups.

Over the next five years, our strategic priorities for research are to:

- Recruit and retain world-class researchers from diverse backgrounds
- Ensure faculty are recognized with national and international awards
- Improve the operational and infrastructure support for research
- Promote diversification of research funding

CHALLENGES & OPPORTUNITIES IN MAINTAINING RESEARCH EXCELLENCE.

The three most significant obstacles faced by the Department of Zoology in maintaining research excellence and achieving our strategic goals are the loss of Canada Research Chair positions, the costs associated with maintaining core research infrastructure, and the increasing administrative load on our faculty and staff, diverting time from research and teaching. Over the next several years,

the Zoology department will work to address these challenges. The Zoology department will also explore opportunities to assist faculty, particularly early- and mid-career faculty, in identifying opportunities to diversify and expand their funding portfolios.

Retaining Canada Research Chair positions

At UBC, Canada Research Chairs are allocated from a central pool to each Faculty and then allocated to departments through a competitive process. In 2023/2024, CRC allocations were realigned across UBC, and the Faculty of Science lost/is losing several CRC positions (the equivalent of 18 Tier 2 CRCs). These changes trickled down to the departments, and likely due to timing, Zoology was particularly hard hit. For example, in 2019/2020, Zoology had six CRC Tier 1 (four wholly appointed in Zoology and two jointly appointed with Botany) and four CRC Tier 2 (two wholly appointed in Zoology and two jointly appointed with Botany). Presently, Zoology has two CRC Tier 1 (wholly appointed in Zoology) and one CRC Tier 2, which is jointly appointed. Recently, Dr. Rachel Germain was approved to apply for a CRC T2 in the upcoming competition, but even with this added CRC, our allotment is not in line with historical norms, nor does it reflect the exceptional calibre of Zoology faculty. The Zoology department will continue to advocate for CRC positions in the Faculty of Science so we can nominate our outstanding faculty for these chairs.

Maintenance of research infrastructure

The Department of Zoology has historically done very well in acquiring infrastructure funding for purchasing lab equipment and building shared research infrastructure. The shared infrastructure includes *InSEAS*, FSIAP, the south campus ponds, central computing support through the Zoology Computing Unit, and other facilities outlined in Appendix 5. As infrastructure ages, the responsibility to fund maintenance and upgrades currently falls to faculty users, which is not tenable on NSERC-DG funds or through departmental contributions. Indeed, the department contributes substantially to supporting some shared infrastructure, but increasing costs will divert resources from other initiatives, including hiring. Further complicating the maintenance of core infrastructure is that UBC Facilities, the department "responsible for full lifecycle stewardship of all academic and administrative buildings" is divesting itself of responsibility for maintaining core building infrastructure, and these expenses are falling to academic departments to cover, which have limited budgets. Related to this issue is the unwillingness of plant operations to address systemic problems in academic buildings once they are occupied. For example, the vertical LED lighting in the hallways of the new teaching wing presents challenges for individuals with sensory overload, and office lighting has been deemed too bright for computer work. However, when the issue is raised with plant operations, the response is that it is the department's responsibility to correct the problems and deficiencies in this 4-year-old building. Another related infrastructure issue is the difficulty established researchers have in acquiring larger grants to replace the critical infrastructure purchased at the time of hire, which has served its useful life. Zoology will continue to provide funding for shared research infrastructure to ensure continuity of research while seeking out other sources of UBC funding for ongoing operations and upgrades to shared facilities. Opportunities for external infrastructure funding will also be sought to undertake necessary upgrades.

Administrative burden

A perennial challenge for all academic institutions and their faculty is the growing responsibility and administrative burden of running a research program. Over the last decade (noted in previous

departmental reviews), administrative tasks have been downloaded to principal investigators, which has continued as UBC works to find efficiencies. Faculty recognize their responsibilities and work to fulfill their obligations, but this comes at the expense of increasing amounts of time spent fulfilling them rather than engaging in research and mentoring. Although the department cannot take on these responsibilities, our administrative team is searching for ways to streamline processes and simplify information exchange. Zoology will continue to work to streamline processes initiated and completed within the department, provide financial snapshots to faculty to simplify their financial oversight, update onboarding processes, and provide direct training assistance to early career faculty to improve their efficiency. Furthermore, "faculty support" is now part of a staff member's responsibility, and they will work to streamline processes and assist and support committees. In addition, in 2023, we established a monthly newsletter (Zootails) that aims to simplify and highlight internal communications of events, initiatives, and awards, thereby minimizing the number of emails forwarded to departmental members.

Diversifying research funding

Although our faculty are generally well funded from diversified sources (**see Appendix 8**), and most faculty have an NSERC DG that is above the average, a persistent and significant challenge to sustaining research excellence is research funding, especially for early-career faculty. NSERC-DGs provide stable funding, but the funding levels have not kept pace with research costs. To pay graduate students a competitive stipend, researchers must be prepared to allocate upwards of 40 to 50% of an average NSERC DG to support a single graduate student. Larger funding sources can be obtained from CIHR or for applied projects, but accessing these larger grants is difficult because of low success rates or the need to cultivate relationships and collaborations with government, industry, Indigenous groups, NGOs, or international researchers. Developing relationships with such groups can take time to foster, possibly accounting (in part) for the difference in funding levels between established and early/mid-career faculty in the department. This can be mitigated by encouraging collaborations between established and early/mid-career faculty and by the established faculty helping with network building.

Furthermore, staying informed of what relevant research funding opportunities are available is challenging. The Faculty of Science publishes a research newsletter, often not seen by all faculty, thus, opportunities are missed. To start to address these challenges, Zoology will create and maintain a list of Zoology-relevant funding opportunities on our website, create a repository of funded grants that can serve as templates for new faculty, encourage faculty to build and maintain collaborations by increasing interactions among faculty, and providing financial incentives for applying for partnership grants. In addition, the Zoology department will increase engagement with the Science development office and alumni to foster research opportunities.

Teaching & Learning

UNDERGRADUATE EDUCATION

The Departments of Zoology and Botany jointly offer an undergraduate Biology Program directed by Associate Head of Biology, Pam Kalas. Everyone involved in the Biology Program, from the program manager, Gigi Lau, and senior program assistant, Tammy Tromba, to graduate student teaching assistants, lecturers, EL and research faculty, is engaged in providing a modern and compelling

undergraduate experience, utilizing evidence-based pedagogy in a diversity of courses and experiential learning through inquiry-based laboratories, undergraduate research projects, and field experiences.

The biology program is built upon the core principles outlined under "Transformative Learning" UBC Strategic Plan (Shaping UBC's Next Century, 2018-2028), highlighting learning outcomes as the foundation for program design, experiential learning, interdisciplinarity, and strengthening student community. Ongoing development within the Biology Program is also consistent with the goals of the UBC Science strategic plan (Improving Our World Through Science, 2021-2026), emphasizing evidence-based teaching, integrating cultural competency and EDI in our curriculum, and reinforcing student-centered learning.

TEACHING

Zoology contributes substantially to teaching in the biology program with 42 (headcount) research faculty, 10 EL faculty, 10 lecturers, plus ~130 graduate student teaching assistants, all actively engaged in course delivery. The total full-time faculty available to teach in the Biology Program is 62 from Zoology and 47 from Botany, of which 15 faculty members are jointly appointed in both departments. Adjusting for these joint appointments results in 39 Botany faculty (representing 41% of the total available faculty) and 54 Zoology faculty (representing 59% of available faculty). Given that Zoology is the larger department, expectations for commitments in the Biology Program are generally split 60:40 (Zoology:Botany), with Zoology faculty teaching about 60% of the students enrolled in the Biology Program in more animal-based and fundamentals courses. Student enrollment across the courses taught by Zoology and Botany generally follows the same 60:40 split.

The relative contributions to teaching differ according to the faculty stream. The standard teaching load for research-active faculty is two courses/year, with a typical breakdown of one larger "service" style course and a second smaller, specialty course, often in the 4th year with a lower enrollment. In the Zoology department, EL faculty (see below) teach five courses/year, with the option for a one-course release (usually in the summer) to engage in more substantive EL. Lecturers teach seven courses/year. Sessional lecturers are typically hired to cover for sabbatical leaves or last-minute replacements. See **Appendix 28** for Zoology Workload guidelines for research, EL, and Lecturer faculty.

Educational Leadership Faculty

In 2010, UBC introduced the tenure-track professor of teaching stream with a career progression similar to that of research professors, including assistant, associate (with tenure) and professor of teaching. An integral part of this teaching stream is the requirement to engage in Educational Leadership (hence, this stream is often referred to as the Educational Leadership (EL) stream). Educational Leadership at UBC is "an activity taken at UBC and elsewhere to advance innovation in teaching and learning with impact beyond one's classroom." See Collective Agreement between UBC and the Faculty Association of UBC for details.

Of the 10 EL faculty in Zoology, two are at the rank of professor of teaching (Kalas and Leander, C), seven are associate professors of teaching (Berezowsky, Chen, Couch, Klenz, Lacombe, O'Neill, and Steinwand), and one is an assistant professor of teaching (Lee). Six of the ten EL faculty hold joint appointments with Botany. Our EL faculty are award-winning teachers; seven have received or been

nominated for teaching excellence awards, including the Killam Teaching Prize and West Coast Teaching Excellence Award. On top of teaching excellence, our EL faculty are at the forefront of pedagogical innovation and evidence-based teaching practice. They are leading initiatives to improve biology teaching both at UBC and beyond. Major initiatives undertaken by the EL faculty include implementing and evaluating Course-based Undergraduate Research Experiences (CURE) in diverse courses, development and implementation of "ungrading" to foster self-directed learning (Leander C, Lee & Steinwand), course leadership (Berezowsky), empowering scientific writing to enhance understanding of research articles (Chen), Indigenizing course content (Chen, Klenz & Steinwand), promoting sex and gender inclusivity in the classroom (Chen), incorporating fine-arts approaches to observational scientific studies (Couch), incorporating skills-based proficiencies into the curriculum (O'Neill), analysis of high-impact teaching and learning practices on student outcomes (Steinwand), development of resources to promote teaching and learning of complex concepts (*eg.* in genetics; Kalas), integration of community-engaged learning into first-year biology course (Kalas & Steinwand), and evaluation of alternative grading and assessment in biology (Leander C). Please see EL faculty profiles in **Appendix 29** for a summary of their accomplishments.

To facilitate pedagogical innovations, EL faculty have acquired over $600,000 in collaborative funding since 2018 from internal (*eg*. UBC Skylight Development grants & Teaching and Learning Enhancement Fund) and external (SSHRC) sources. These funds have supported ten graduate students on projects related to undergraduate biology pedagogy and over 60 undergraduate students for specific projects related to improving teaching. Although there are numerous ways in which impact outside of the classroom can be demonstrated, the most straightforward to enumerate are publications and presentations. Since 2018, EL faculty have published 18 peer-reviewed articles on pedagogy or course materials and presented numerous invited or contributed talks at national or international conferences and contributed countless presentations at local venues. This impressive output is a testament to our EL faculty's leadership in our program and biology teaching.

To support ongoing professional development for EL faculty and lecturers, the Botany and Zoology departments each contribute $10,000/year to a professional development fund. These funds are in addition to the professional development funds provided by UBC, and aim to facilitate EL faculty, lecturers, and their students to attend conferences and undertake other professional development opportunities.

Lecturers

At UBC, a lecturer is a faculty member who holds a renewable term appointment with responsibilities of teaching and related duties. These term appointments often begin with three years, then progress to five, and there is a possibility for ten-year appointments, with a review of teaching occurring before renewal. Zoology has ten lecturers (Ballagh, Blanchard, Fung, Lam, Moussavi, Norman, Odendaal, Sun, Waise, and Wilson), with four joint appointed with the Department of Botany. The lectures contribute substantially to the teaching excellence of our program with innovative and engaging teaching philosophies (See faculty profiles in **Appendix 29**). Three lecturers have either won, or been nominated for, teaching prizes (**See Appendix 9**). Beyond the classroom, many of our lecturers are also involved in educational leadership, which is a testament to their engagement in the Biology Program because these contributions are above and beyond the requirements of being a lecturer. Lecturers have worked alongside EL faculty to improve

the inclusion of sex and gender diversity in the biology classroom (Ballagh), design and evaluate alternative grading schemes (Blanchard), integrate Universal Design for Learning principles into the classroom (Fung), develop strategies to improve scientific writing (Lam), promote and assess CURE (Moussavi), and integrate Indigenous ways of knowing and best practices for using AI in the classroom (Wilson). Many lecturers collaborate closely with one another and with EL and research faculty on funding opportunities and the dissemination of EL results.

Research Faculty

Although research faculty teach fewer courses than EL faculty and lecturers, they are fully engaged in providing high-quality, evidence-based teaching. Zoology research faculty take their commitment to teaching seriously, achieving excellent teaching evaluations with numerous research faculty having received or been nominated for Killam Teaching Prizes (**Appendix 9**). Furthermore, research faculty are also actively engaged in EL work. Several research faculty have authored major undergraduate textbooks, including *Principles of Animal Physiology* by Chris Moyes and Trish Schulte and *The Analysis of Biological Data* by Mike Whitlock and Dolph Schluter. Research faculty have also taken on leadership roles and contributed to initiatives to transform undergraduate education. For example, Trish Schulte was director of the Life Sciences Carl Wieman Science Education Initiative until 2019 and worked with numerous Science Teaching and Learning Fellows to develop, apply, and disseminate the best teaching methods in biology and beyond. This program trained nine Science Teaching and Learning Fellows, many of whom are now faculty members at other institutions.

Sessional Lecturers

Sessional lecturers are appointed for less than 12 months to teach courses. Over the last decade, Zoology has worked to transition longer-term sessional lecturers into renewable lecturer appointments; however, we still hire sessional lecturers to cover sabbatical and leave replacements. During the 2023/2024 academic year, the Department of Zoology hired 19 sessional lecturers, of which 9 were PDFs currently employed in the department. These PDFs taught courses in their specialty, enabling them to develop a teaching portfolio for future academic jobs.

Teaching Assistants

On an annual basis, the biology program has ~290 Teaching Assistant (TA) positions available to graduate students, of which ~130 are used by Zoology graduate students (data from the 2023/2024 academic year). The responsibilities of TAs vary depending on the course, but they can be involved in teaching classes, grading and providing feedback on students' work, conducting tutorials or discussion sessions, facilitating hands-on laboratory exercises, and invigilating exams. A full one-term TA position consists of an average of 12 hours per week for one term of 192 hours. The TAs involved in the biology program are excellent, and many have won teaching awards for their work.

THE UNDERGRADUATE BIOLOGY PROGRAM STRUCTURE AND SCOPE

The Biology Program is a large undergraduate program with one major and eight honours options. The Biology Program is designed to provide students with a strong grounding in the fundamentals of the biological sciences through a progression of courses starting in the first year (See **Figure 1** for an overview of Biology Program and **Appendix 10** for an undergraduate program worksheet). Introductory courses include two first-year lecture classes, Biology of the Cell (BIOL 112) and Genetics, Evolution, and Ecology (BIOL 121), highlighting the breadth of biology while preparing

students for future courses. Before the COVID-19 pandemic, the first year was augmented with a lab-based course, Laboratory Investigations in the Life Sciences (BIOL 140), which was converted during the pandemic into Thinking Like a Life Scientist (BIOL 180), a small-format course that aims to teach students about the process and communication of scientific research. These courses are further augmented with a grounding in Structural Chemistry (CHEM 121), Thermodynamics, Kinetics & Organic Chemistry (CHEM 123), Differential Calculus and Integral Calculus (MATH 100 & 101), Physics (Energy & Waves; PHYS 131), Computational and/or Data Science (a selection of courses are available), and a communication requirement, of which the First-Year Seminar in Science (SCIE 113) has recently become a required course.

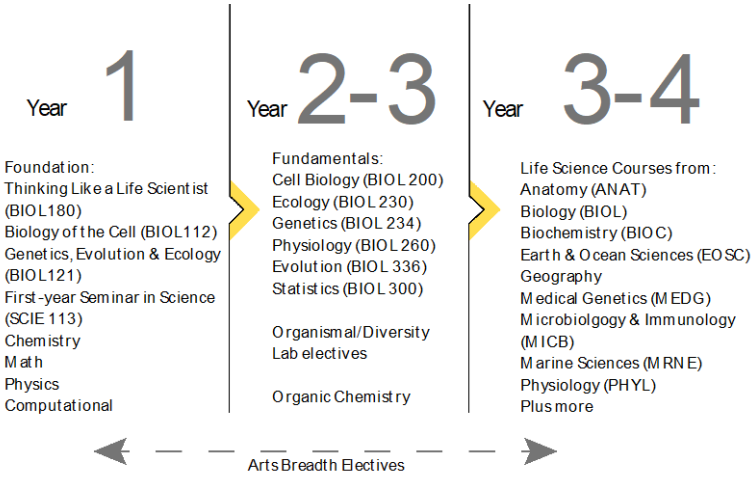


Figure 1. Overview of the structure of the Biology Program from first to fourth year.

During the second year, students take the fundamentals courses in Cell Biology (BIOL 200), Genetics (BIOL 234), Ecology (BIOL 230), and Physiology (BIOL 260), as well as organic chemistry (one of a selection of CHEM courses). Students also choose at least two of seven taxon-focused organismal courses designed to give students a strong foundation in organismal biology and phylogenetic diversity within eukaryotes. Most organismal biology courses have a laboratory component. Fundamentals of Evolution (BIOL 336) and Biostatistics (BIOL 300) are taken in the third year. Students also complete two upper-level lab or field courses from a selection of courses (see **Appendix 11**), which are intended to develop hands-on skills and provide experience in scientific research, writing, and oral presentations. Students then round out their degrees with a minimum of 20 credits of life science courses in the third and fourth year, plus electives. Biology students have access to more than 120 courses in Biology (see course calendar) as well as courses in programs including Biochemistry, Microbiology & Immunology, Cellular and Physiological Sciences, Bamfield Marine Sciences Center, Earth and Ocean Sciences, and more from faculties including Forestry, Land & Food Systems, Arts, and Medicine. This broad course selection allows students access to an impressive array of courses across the breadth of the biological sciences. Biology students also have the opportunity to broaden their academic experiences through options such as minors, double majors, co-op, and exchanges (*eg*. Go Global).

The honours option involves intense specialization in biology or a specific combination of fields. It is designed to provide an enriched research experience and is often considered a route to graduate school. To support research development, honours students enrol in two specialized courses, both titled Principles and Methodology in Biological Research, where they prepare to undertake an honours project (Biol 347) and are supported during their 4th-year research project (Biol 447).

Enrollment in the biology major has remained relatively constant at roughly 1300 to 1370 students/year (**Appendix 12**); however, a recent decline in enrollment has been noted (estimated to

be 1058 in 2024), likely due to growth in other life science programs (discussed below under challenges). It should be noted, however, that although there may be a slight decline in enrollment in the majors, overall, we continue to teach a significant number of undergraduate students in our courses, with ~15,000 individual course enrollments, which has remained relatively constant over the last decade (**Appendix 13**). Enrollment in the honours program has historically been lower than the majors, primarily due to the program's requirements and more intense nature. Still, we saw growth in the honours program starting around 2018, which was consistent with the growth in the majors (**Appendix 12**).

Based on 2024 graduation statistics, the Biology Program (major and honours) is the second largest BSc-granting undergraduate program at UBC (**Figure 2**) behind Computer Science, which is growing rapidly. In addition to the biology major and honours, students can also enroll in a combined major (or honours) with Biological Chemistry, Biology and Oceanography, or Biology and Computer Science, accounting for 38 graduating students in May 2024. Zoology and Botany, also provide core programming for other BSc majors. For example, in the Combined Majors in Science (CMS), a flexible major that allows students to combine three out of five areas of science, over 40% of the students (40 out of the 89 graduates, May 2024) are enrolled in the life sciences option, which requires them to take numerous biology courses. In addition, Zoology faculty make program-specific contributions to this specialization, including teaching the Integrative Biology Laboratory (BIOL 342) and Communicating Science (SCIE 300), which were designed explicitly for this specialization. Furthermore, ~60% of students (58 of the 97 graduates, May 2024) enrolled in the Integrated Sciences program, a highly flexible program for students whose interests intersect cross-disciplinary boundaries, strongly emphasize biology and take numerous 300 and 400-level biology courses. If we account for the contributions of Zoology and Botany faculty to these other programs, 24% of all BSc graduates in May 2024 are tightly associated with the Biology Program.

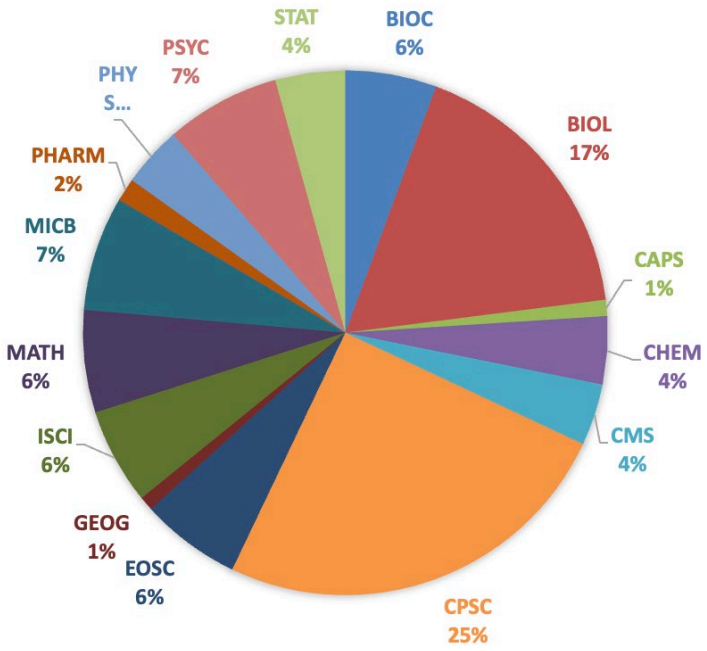


Figure 2. The proportion of BSc students at UBC who graduate from each major. Biology (BIOL) accounts for 17% of all graduating BSc students, second only to Computer Science (CPSC), but a significant portion of the Combined Majors in Science (CMS) and Integrated Sciences Program (ISCI) enrol specialize in biology-related fields. Biochemistry (BIOC); Cellular, Anatomical & Physiological Sciences (CAPS); Chemistry (CHEM); Earth and Ocean Sciences (EOSC); Geography (GEOG); Math (Math); Microbiology & Immunology (MICB); Pharmacology (PHARM); Physics and Astronomy (PHYS); BSc Psychology (PSYC); Statistics (STAT).

STUDENT BODY

The undergraduate students enrolled in the biology major have been predominately domestic (92 to 96%), with some growth in international students starting in 2022 (**Appendix 14**). More than 65% of the biology majors identify as women. Once entered into the program, there is a high retention, with 70 to 80% of the students staying in the program in subsequent years to ultimately graduate from the biology major. The same relative distribution applies to our biology honours (**Appendix 15**), although it is more variable year-to-year due to the smaller size of the program.

UBC launched a Student Diversity Census in 2023 to collect institutional data on students' ethnic identities. This work is in the early stages, so we do not yet have demographic data beyond gender identity for biology majors. However, the Faculty of Science student body overall is primarily composed of students who identify as white, East Asian or South Asian (**Appendix 16**). Students identifying as Indigenous comprise less than 3% of undergraduate students in the Faculty of Science.

SUPPORT FOR TEACHING INNOVATION

To foster innovation in teaching and support evidence-based teaching practices, research and EL faculty, lecturers and TAs are supported in various ways.

Science Education Specialists

Most departments in the Faculty of Science have a Science Education Specialist available to advise faculty on teaching and learning practices and work with them on course and curriculum revisions, pedagogical improvements, and assessment of teaching and learning effectiveness. These staff members are from the Science Centre for Learning and Teaching (Skylight) and are embedded in departments. In Zoology, Erica Jeffery is our Science Education Specialist, who, in collaboration with Christine Goedhard from the Department of Botany, provides strong support for both practical classroom challenges and scholarship of teaching and learning.

Paired Teaching Start-Up

The UBC Science Teaching Startup Program began in 2018 to provide new research and EL faculty members with an opportunity to develop their evidence-based teaching practices in a supportive environment. With this initiative, a new faculty member teaches their first larger course in partnership with a faculty member who is experienced in implementing evidence-based pedagogy, and both faculty members in a pair receive full teaching credit for the course. The Faculty of Science splits the cost of the additional teaching credit with the department. A Science Education Specialist also supports the two faculty. There is ample evidence that this type of early experience sets faculty members up well for their future teaching assignments at UBC, and every recent tenure-track hire has engaged in the paired teaching start-up during the first teaching assignment, with great success.

Peer-Review of Teaching

To support ongoing development in teaching, a peer-review of teaching (PRT) committee is struck at the time of reappointment or promotion (or at the request of an instructor or head) to undertake an interactive review of teaching. PRT committees are composed of EL and research faculty who have experience with modern pedagogical approaches and relevant content knowledge to provide feedback and an assessment of teaching. Integral to the PRT is the opportunity to share evidence-based practices and literature and, importantly, learn from one another. The PRT is intended to be a

reflective and collaborative process; reviewers often learn new teaching and assessment techniques and use this process to reflect on their pedagogical practices. There are two types of PRT: *formative*, which is highly collaborative and aimed at supporting teaching development, and *summative*, which is primarily evaluative to support reappointment and promotion. Ongoing PRT is critical to building and maintaining our strong teaching culture.

Support for Teaching Assistants (TAs)

Graduate student TAs contribute significantly to the teaching excellence of the Biology Program. To ensure TAs are trained in evidence-based practice and adequately prepared to support undergraduate learning, we have several opportunities for their pedagogy development. The Biology Teaching Assistant Development & Advancement (TADA) is an interactive training environment with evidence-based and inclusive pedagogical practices designed for graduate students teaching biology courses. It starts with the Teaching Assistant Orientation (TAO), which is hosted each year at the start of the fall term and is built upon with additional opportunities for professional development throughout the year. Graduate students can also obtain training from the Centre for Integration of Research, Teaching, and Learning (CIRTL), based in the Centre for Teaching, Learning and Technology (CTLT). Students who complete the TADA workshop can be recognized as members of the CIRTL community. As CIRTL is an international network of research-intensive universities across North America promoting evidence-based future faculty training, this provides practical benefits for future career opportunities. To acknowledge excellence in teaching, the Biology Program has two awards for TAs, the Biology TA Teaching Award and the Kathy Nomme Award for New Teaching Assistants, which are given out annually. UBC also awards the Killam Graduate Teaching Assistant Award annually for teaching excellence.

THE BIOLOGY PROGRAM ALIGNS WITH UBC'S TRANSFORMATIVE LEARNING STRATEGIC PLAN

Program-Level Learning Outcomes

UBC's strategic goal of "Transformative Learning" prioritizes program design around learning outcomes and core competencies. The Undergraduate Program Evaluation and Renewal (UPER) Project was initiated in Biology in 2019, which aimed to map program-level learning outcomes to empower students and faculty to develop core knowledge and competencies. In the first phase, the project focused on assessing transferable skills, asking: *Which skills are important? How are these skills delivered through the curriculum?* To answer these questions, faculty, alumni, and students were asked to complete a survey about the importance of 50 skills across eight skills groups, including the process of science, collecting and analyzing data, information literacy, communication, professional skills, data science, science in society, and teaching practices. The UPER project found that all stakeholders valued interpreting data and communication, but the coverage of these topics was inconsistent across the Biology Program. Data interpretation was relatively well represented across the curriculum, but communication was poorly represented in the curriculum. Furthermore, faculty and alumni value ethical reasoning, yet it was rarely addressed in the curriculum, and alumni and students value teamwork and professionalism, which are only discussed occasionally. Ongoing analysis is being done to map the skills and level of coverage across the curriculum (31 biological laboratory courses), and we continue to work to identify skills that have a low level of coverage and identify ways to introduce the missing skills to ensure continuous delivery and practice.

Biology Undergraduate Diversity in Research (BUDR)

Consistent with the theme of Inclusion (UBC Strategic Plan) and embedding equity and diversity in all we do at UBC, the BUDR program was developed by Diane Srivastava and is currently led by Michelle Tseng. BUDR connects undergraduate students from historically marginalized and disenfranchised backgrounds with volunteer mentors and paid research opportunities. This program aims to close the knowledge and experience gaps that frequently hinder academic and career progression by increasing diversity in research labs, providing the critical first employment in research, levelling the playing field for accessing undergraduate research experiences, and increasing biology-specific employment among undergraduates. BUDR mentors can include graduate students, post-doctoral fellows, and faculty members of any background, and they provide undergraduate students with guidance and insights on career and academic development. This can include advising on graduate school applications, navigating career options in the biological sciences, and educating students about research opportunities. BUDR aims to promote social and professional interdepartmental connections and facilitate networking opportunities. Through training and optional workshops, mentors gain communication and mentorship skills, and enhance their knowledge of issues and approaches for reducing barriers to underrepresented groups. The ongoing funding of BUDR is a challenge and currently, the funding is coming from the Departments of Zoology and Botany, with future funding coming from a Wall Fellowship awarded to Michelle Tseng. Alternate sources of funding should be secured to ensure the ongoing success of this program.

Practical Learning

Practical Learning is another key strategy embedded within "Transformative Learning" from the UBC Strategic Plan. The Biology Program strongly supports experiential learning in biology labs, fieldwork, classrooms, research, and outreach opportunities, and in collaboration with the UBC Beaty Biodiversity Museum and the Bamfield Marine Sciences Centre. CURE labs are embedded in many of our lab courses (BIOL 331, 340, 341, 342, 351, 352, 411, and others), allowing undergraduates to engage in independent research. We also offer many excellent non-CURE lab courses (*eg*. BIOL 337), which aims to teach essential skills in a compelling manner. Students are also encouraged to pursue individual research projects by conducting directed studies research projects (BIOL 448) and honours thesis research (BIOL 449), often mentored by graduate students and PDFs. The number of undergraduate students who have done BIOL 448 and 449 projects is shown in **Appendix 17**. Undergraduate research students have many opportunities to present their research and gain valuable communication skills, through presentations in research labs, UBC Multidisciplinary Undergraduate Research Conference (MURC), and National or International research conferences. In addition, several student-led initiatives provide information about research and work opportunities, such as the Science Undergraduate Society Research Information/Career Nights, Biological Sciences Society (BIOSOC), and numerous other undergraduate research opportunities (please see link).

The UBC Transformative Learning strategic plan for "Interdisciplinary Education" is being addressed in an exciting initiative led by Associate Professor of Teaching Brett Couch, who works with artists and the Belkin Art Gallery curators. Collaboratively, they have developed and implemented workshops on blending Art and Science, including in-class activities to help students develop observational skills in the protistology lab, BIOL 203, and in BIOL 121.

CHALLENGES & OPPORTUNITIES

There is a strong history of collaboration between the Departments of Zoology and Botany to offer an innovative, experiential, and evidence-based BSc program in biology that is accommodating, culturally progressive, and supportive. We are teaching many majors in the Faculty of Science, championing biodiversity, and actively enacting the strategic goals of the Faculty of Science and UBC's Transformative Learning strategies. Although we are proud of the innovative nature of the biology program, it faces challenges and opportunities that we are either already addressing or plan to address in the future.

Update our first-year curriculum

In response to the COVID-19 pandemic, we shifted our first-year lab course (BIOL 140) into Thinking Like a Life Scientist (BIOL 180), which provided students with an innovative, small-class experience aimed at teaching students to think scientifically, communicate science to a general audience, and work collaboratively to reach a shared goal. The goals of BIOL 180 now overlap with the First-Year Seminar in Science course (SCIE 113), which, like BIOL 180, offers students a small-class experience where they learn what science is and how it is done while strengthening critical thinking and communication skills. In light of this overlap in course coverage and the loss of a first-year lab course, we have embarked on a process to revise the first-year Biology Program. We have formed a curriculum working group that is undertaking a collaborative, consultative, and systematic review of the first-year biology program to provide recommendations to the department for a curriculum revision to refine first-year course content coverage, reintroduce experiential learning, and examine the possibility of freeing up space in our program for students to take electives in their first year. Proposals for a new first-year program are expected to be presented to Zoology and Botany members during a summer retreat, and a curriculum revision will follow.

Ongoing biology program curriculum review

The last systematic review of our entire Biology Program was conducted in 2010, when there were more limited program options for undergraduates interested in life science. Over the last few years, the Microbiology and Immunology undergraduate program has increased by ~50 undergraduate seats/year, the Cellular, Anatomical and Physiological Sciences has gone from offering only an honours program to also offering majors (started in 2024), and the Neuroscience Program (a collaboration between the Faculties of Arts, Medicine and Science; where Zoology is the unit in the Faculty of Science that is the partner in the program) has replaced the Behavioural Neuroscience Program, and is growing. Other life science adjacent programs are also available to undergraduate students, including Biochemistry (Medicine), Applied Animal Biology (Land and Food Systems), and others. Overall, these expanded life sciences offerings are positive as they give undergraduate students a greater choice of programs, but with this broader array of undergraduate options, we are observing a modest reduction in the number of biology majors, although the total number of enrolments in our courses remains strong at ~15,000 students. While the foundation of our Biology Program is solid, with comprehensive coverage, excellent individual classes, and ample lab and field-based courses, the increasing options in the life sciences presents an opportunity to examine our core curriculum and build upon the UPER map of program-level learning outcomes to define the unique aspects of the Biology Program. We plan to build upon the first-year curriculum review that is already underway to review the entire biology curriculum.

Increasing equitable access to research experiences for undergraduates

Less than 30% of our fourth-year undergraduate students enrol in BIOL 448 research experiences or in honours. The current requirements for a BSc honours specialization are stringent, with a higher course credit requirement (132 *versus* 120 for a major), maintenance of high academic standing, and automatic removal from the program should a student fail a course. While the honours program is viewed as a more rigorous degree, the high stringency of the program has come under question recently as it is viewed as a limiting factor for some excellent students. The requirements are also not forgiving should an honours student encounter difficulties that may affect academic performance outside their control. Efforts are underway to redefine the requirement of the honours program within the Faculty of Science (reducing the stringency while retaining the high concentration of specialized courses), which is welcome news to the Biology Program, who would like to see increased enrollment in the enriched experience of honours.

It is also well known that students looking to enroll in research-based experiences, such as BIOL 448 or honours, and paid undergraduate research experiences (*eg*. work-learn opportunities, summer undergraduate student research awards, etc) often struggle to identify a potential supervisor. Even in the case of our honours students who receive substantial assistance in identifying possible supervisors through enrollment in BIOL 347, ~10% of students still struggle to find a supervisor. The Biology Program seeks to change the structure and culture around how undergraduate students access research opportunities to increase accessibility for all. We sought funding to adopt a UBC-wide program like MUSER from Duke University, but were unsuccessful. Within the Biology Program, we aim to develop mechanisms to collate and advertise all research experiences, whether course-based or paid experiences, to increase accessibility. Similarly, we plan to look for ways to increase the number of research opportunities available to undergraduate students.

Participants in the biology program are passionate about education and dedicated to providing an accessible, evidence-based, experiential, and culturally inclusive program. The Departments of Zoology and Botany have a robust history of productive collaboration in the Biology Program, and this strong collaboration continues today. Together, we have built an undergraduate program that transforms teaching and learning and successfully trains the next generation of exceptional biologists.

GRADUATE EDUCATION

The Department of Zoology hosts a large and talented pool of young scholars as part of our graduate program. As of December 2024, 32 MSc and 79 PhD students were enrolled in the Zoology graduate program. In addition, faculty in Zoology supervise graduate students through a variety of interdisciplinary graduate programs including the Graduate Programs in Neuroscience; Cell and Developmental Biology; Genome Science and Technology; and Resources, Environment and Sustainability (currently 26 students in total across these programs). These students can interact with their peers in their own programs and with graduate students in Zoology. In addition, many Zoology faculty are cross-appointed or hold associate membership with other departments and take graduate students through those departments. These other programs are not the focus of this review, but they contribute greatly to both the trainee output of Zoology faculty and to the intellectual environment for many members of the department.

STRUCTURE & ORGANIZATION OF THE ZOOLOGY GRADUATE PROGRAM

The Zoology Graduate Program offers research-based degree programs leading to either an MSc or PhD degree in Zoology through the Faculty of Graduate and Postdoctoral Studies (G+PS). The program is highly flexible and is designed to accommodate the diverse backgrounds and interests of our students and faculty.

Staff & faculty support

The program is overseen by two faculty Graduate Advisors (currently Trish Schulte and Mike Whitlock), who are responsible for all academic/policy aspects of the program and assisting students with a wide range of professional and personal issues. Administrative aspects of the program are the responsibility of the Graduate Program Manager (Mimi Yu), who also plays an important role in supporting student wellness. Two committees support the Graduate Advisors, the Awards Committee (consisting of 3 to 4 faculty members), and the Graduate Advisory Committee (consisting of faculty members and graduate students).

The Zoology Graduate Student Handbook acts as the key reference for our graduate program. It provides information on program policies, expectations of graduate students and supervisors, survival tips, and where to turn for support.

The Zoology Graduate Student Association (ZGSA)

The ZGSA represents all graduate students in Zoology. Representatives are elected by fellow graduate students and composed of five members distributed across the four research clusters (Cell and Development, Comparative Physiology & Biomechanics, Ecology, and Evolutionary Biology). Voting is organized per cluster to ensure equal representation, with one cluster at random being represented by two elected members. Upon election, the representatives decide between themselves their role for a one-year term: President, Treasurer, Secretary, Communication Coordinator, and Events Coordinator. One representative takes on the additional role of Graduate Student Society (GSS) representative and another one of Mediator. Each representative receives an $800 honorarium from a departmental budget given to the ZGSA. The rest of the budget ($1,000) goes toward events organized by the ZGSA throughout the year. The ZGSA also obtains funds from the GSS.

The ZGSA organizes many annual events to encourage connection, wellness, and academic excellence among the students. Because Zoology spans many buildings across the UBC campus, the work done by the ZGSA is especially important in unifying its various research clusters. Some examples of events organized by the ZGSA during the 2024–2025 school year include: orientation and faculty symposium for new graduate students; back-to-school BBQ; pumpkin carving contest to encourage bonding within labs, annual general meeting; the Debbie and Justin Wragg-Schmidt Zoology Spring Symposium; 3-minute thesis competition; a year-long cluster competition; and various professional development workshops that augment those offered by G+PS (see list here).

In addition to hosting events, the ZGSA also advocates for graduate students' needs and serves as a link between the department and the students. Representatives attend department meetings, meet monthly with the Head, organize an annual town hall, and have check-in meetings with the Graduate

Program Manager. Work by the ZGSA has led to several positive outcomes, including an improved sense of community among graduate students within the department and closer relationships between graduate students and departmental faculty and staff. In 2024, ZGSA advocacy resulted in a graduate student stipend increase.

Program requirements

MSc students are required to complete 12 credits of coursework and write and orally defend a research-based MSc thesis. They can opt to transfer to the PhD program within the first 18 months of the MSc program. Students admitted to the PhD program without a master's degree must also complete 12 credits of coursework, while those admitted with a master's degree in a related subject are not required to take courses.

PhD students must develop a written research proposal and pass an oral comprehensive examination to be admitted to candidacy. Students must proceed to candidacy within 3 years (2 years is strongly preferred). The culmination of the PhD is the writing of the dissertation and the oral defence.

All students must form a supervisory committee within the first year of their program consisting of their supervisor plus at least 2 or 3 other faculty members for MSc and PhD students, respectively. This committee meets at least annually to ensure student progress through the program.

Graduate admissions

The Department of Zoology uses a "direct-admissions" approach, where prospective supervisors must accept students before they are admitted into the Zoology Graduate Program. The supervisor must commit to financially supporting the student for the duration of their program and demonstrate evidence of available funds for this support (see stipend policies below). The graduate program does not filter students for admission other than ensuring they meet the minimum requirements, including English language proficiency. Students can be admitted at the beginning of January, May, or September, with most students beginning their program in September.

Graduate courses

There are no required courses in the Zoology Graduate Program, thus students may take courses offered through any graduate program on campus, as recommended by their supervisory committee. The Zoology Graduate Program provides a diverse range of offerings, from 6-credit (two semester) and 3-credit (one semester) courses to 1-credit (one month) *graduate modules*. The 1-credit graduate course modules are divided into *key topics* and *professional development*. The key topic modules address concepts in ecology, physiology or evolutionary biology. Professional development modules include data presentation, data processing, science writing, careers outside academia, and professional skills. A complete list of our graduate course offerings can be found here.

PROGRAM DEMOGRAPHICS

Enrollment and student composition

As of 2024, the Zoology program had 111 graduate students, of whom 71% were PhD students. Since our last departmental review, enrollment has declined 24% (**Figure 3**), and the pattern of decline is most pronounced for MSc students (with enrollment declining by 38% *versus* 16% for PhD students).

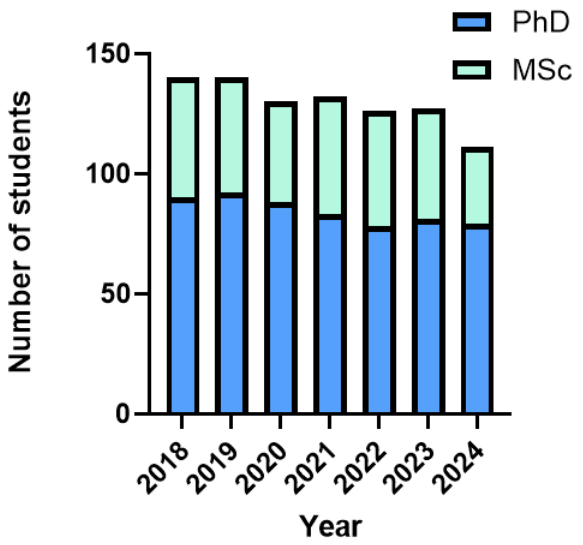


Figure 3: Zoology graduate program enrollment since the last departmental review.

Two main factors can explain the pattern in Figure 3. First, students entering the labs of some Zoology faculty can now choose among various graduate programs, including the Zoology program and new interdisciplinary graduate programs. This is a positive development because it allows students to better align their program to their interests. Currently, ~26 students supervised by Zoology faculty are enrolled in other programs. Second, the Institute for the Oceans and Fisheries (IOF) developed a new graduate program in 2019. Before 2019, IOF faculty enrolled most of their students in the Zoology Program, but now most of their students are part of their new graduate program. We estimate that this change alone accounts for roughly two-thirds of the enrollment decline from 2019-2024.

There has also been a long-term trend for a more pronounced decrease in the number of MSc students compared to PhD students, with the composition of the graduate program gradually changing from approximately 50% MSc and 50% PhD students in 2000 to the current 71% PhD students and 29% MSc students (**Appendix 18A and B**). This change likely reflects the higher cost of taking MSc *versus* PhD students. For example, in 2011 NSERC reduced the duration of MSc scholarship funding from 2 years to 1 year, making it more expensive to accept a funded MSc student. In addition, because our funding policy (see Stipend Policy and Sources of Support, below) requires that supervisors cover the costs of tuition, differences in the availability of tuition awards between MSc and PhD students have added to the financial cost of taking an MSc student. For example, the Faculty of Science provides a tuition award to all doctoral students in their first 4 years. For MSc students, a similar tuition award was introduced in 2023 on a trial basis, but this award only covers the equivalent of domestic tuition and is only available for the first year of the program. *The cost of supporting students is a growing challenge for maintaining enrollment in the Zoology Graduate Program* as the cost of living continues to increase, we increase stipends to keep pace but grant sizes are not increasing substantially. However, we note a welcome increase in NSERC DG sizes of ~$7,000 for all new grants, which is targeted explicitly to increasing graduate student stipends.

The number of students in the Ecology, Evolution and Comparative Physiology & Biomechanics clusters is similar (**Appendix 18C**), while faculty in the Cell and Development cluster take far fewer students through the Zoology Program. Instead, the Cell and Development cluster enrolls most of its

students through the Cell and Developmental Biology or Neuroscience Programs. When these students are included, the number of students supervised by faculty members in each cluster is similar. The distribution of students between the PhD and MSc programs differs among clusters, with the Comparative Physiology & Biomechanics and Cell & Developmental cluster enrolling roughly similar proportions of students in the MSc and PhD, while the other clusters predominantly enroll PhD students through Zoology (**Appendix 18C**).

The Zoology PhD program comprises a roughly equal mix of Canadian and international students, with 48% from Canada, 20% from the United States, and the remainder from other regions (**Appendix 19A**). By contrast, our MSc program comprises Canadian students (78%), with 13% from the United States and only a few students from other regions. Students who identify as women make up 65% of our PhD and 53% of MSc students (**Appendix 19B**). The gender breakdown of our MSc students is similar to that of the UBC and Science MSc population, but the Zoology PhD program has a much higher proportion of women-identifying students than most other PhD programs in Science (**Appendix 19C,D**).

Based upon data from G+PS, 5% of the students in the Zoology Program identify as Indigenous, similar to the Faculty of Science and UBC as a whole (**Appendix 20A,B**). The only data available for BIPOC students comes from a recent ZGSA survey. Although the survey had a low response rate of 34%, the results suggest that students belonging to a "visible minority" make up approximately 37% of our graduate students (**Appendix 21**), which is lower than our undergraduate population (~65 visible minority) but greater than the ~27% for Canada as a whole (from the 2021 census). In 2023, UBC started asking incoming students to declare whether they consider themselves to be BIPOC, and thus, we will also be able to track this aspect of diversity going forward.

Completion times

One of the major challenges for our program is the time required to complete the degree. Currently, the average time to completion is 6.1 years for PhD students and 2.7 years for MSc students, which exceeds our target times of 5 and 2 years for PhD and MSc, respectively. Little progress has been made in decreasing completion times (Figure 4) despite this issue being raised in both the 2012 and 2017 departmental reviews (see **Appendix 22A,B** for data on long-term trends in completion times).

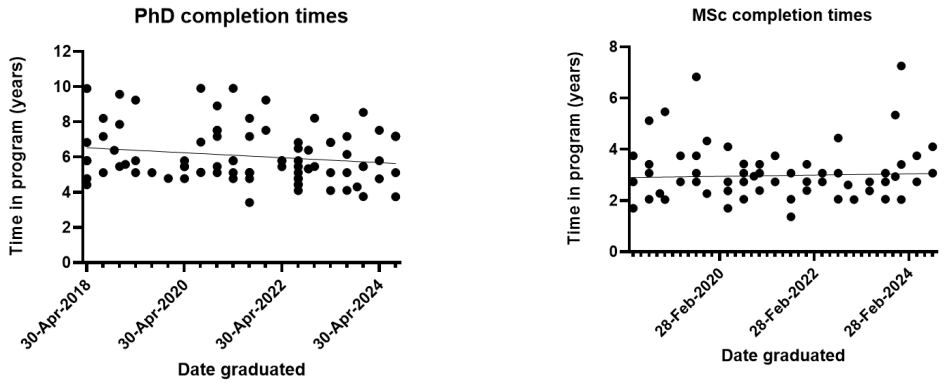


Figure 4: Time to completion for PhD and MSc students for all students graduating from the Zoology Program since the last departmental review. PhD: $R^2 = 0.03$; slope = -0.14; p=0.10. MSc: $R^2 = 0.003$; slope = -0.05; p=0.63. Note that these completion times do not include time spent on an official leave of absence.

Although our times to completion for graduate students are longer than our targets, they are only slightly higher than the average time to completion for other graduate programs at UBC (5.7 and 2.7 years for PhD and MSc students in science-related programs across all faculties at UBC). Our somewhat longer time to completion may, at least in part, be related to our slightly higher graduation rate (**Appendix 22C**) compared to other programs, as we prefer to extend student programs to allow them to complete rather than removing them from the program if they are unable to complete in a timely fashion. Similarly, our departmental culture has been to support students who are having difficulties (*eg*. with mental health) to remain as active students rather than insisting that they take unpaid leave, which can be particularly problematic for international students who might need to leave the country. Longer program lengths (within reason) can also allow students to graduate with a better publication record, which makes them more competitive for fellowships and other career opportunities. As such, Zoology supports a target program length of 5 years for PhD students (see below).

STIPEND POLICY AND SOURCES OF SUPPORT

Graduate students in Zoology are provided with a funding package to cover living expenses and tuition. One of the major challenges in the Canadian science ecosystem is that graduate student stipends are very low relative to the cost of living (see this recent feature in Nature). For context, the Market Basket Measure for a single individual from StatsCan for Vancouver sets the poverty line at $29,076/year. Our program has been keenly aware of this issue and has worked to address it for many years. Thus, the annual minimum stipend for PhD students has risen from $21,000 in 2012 to $31,500 in 2024, with a commitment to reach $35,000 for PhD students by 2028. A similar pattern has occurred for MSc students, with a current annual stipend of $30,000. The current minimum stipends result in take-home pay of ~$30,000/year for PhD students in the first 5 years and ~$28,500/year for MSc students for the first two years of their program. By 2028, the take-home pay for a PhD student will be ~34,000/year. Most graduate student pay is typically tax-free.

Doctoral students receive an automatic tuition scholarship from the Faculty of Science for their first four years. Beyond that, the President's Academic Excellence Initiative PhD Awards (PAEIPA) provides a scholarship to offset the cost of tuition partially. The amount of the PAEIPA has varied through time, but it currently covers ~22% of the PhD tuition fee. Because Zoology is committed to fully supporting students up to their expected completion time, we require the supervisor to top up the stipend for doctoral students in year 5 to cover the remaining tuition, and they may do so for subsequent years if student progress is good. For MSc students, the Faculty of Science currently provides domestic tuition support for year 1 and Zoology gives partial support for year 2 ($2,000), with the supervisor covering any additional required support.

The minimum stipend can be made up of any combination of Graduate Research Assistantships (GRA paid by the supervisor), Graduate Fellowships or Scholarships, and up to two Teaching Assistantships (TAs) per year. A student who TAs at the maximum level will earn between $15,000 and $15,500 from their TAship. Assuming they have no fellowship support, the supervisor must pay a GRA of approximately $16,000 for students in their first 2 or 4 years of the program (for MSc and PhD students, respectively). This represents ~35% of the average annual NSERC DG in the Life Sciences.

The amount paid by the supervisor increases substantially in year 5 of PhD and year 3 of the MSc when the GRA must also cover the cost of tuition.

Just over half (53%) of our PhD and 17% of our MSc students currently hold major fellowships worth $15,000/year or more (Figure 5). For the prestigious NSERC Doctoral and Masters fellowships ($40,000/year for PhD and $28,000/year for MSc students), 18% of our PhD students and 14% of our MSc students currently hold these awards. These numbers do not include current students who have held major awards at some point during their studies. If these students are included, 71% of PhD and 23% of MSc students have held a major award during their studies. For PhD students, 82% of domestic students and 61% of international students have received a major award. No international MSc students have held a major award, reflecting the small number of awards for which they are eligible.

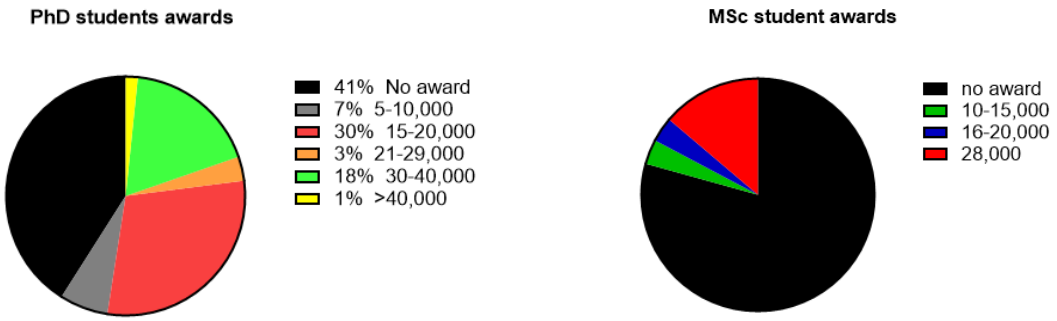


Figure 5: Fraction of students with major awards.

QUALITY INDICATORS

In addition to the high number of major awards held by our students, they also receive a wide variety of other awards, including some of the top scientific awards for trainees from major scientific societies. For example, in the last six years, Zoology graduate students have won the Cameron Award for the best PhD thesis in Zoology in Canada from the Canadian Society of Zoologists (2020 and 2024), the Student Research Award and the Jasper Lofus-Hill Young Investigator Award from the American Society of Naturalists (2019, 2021), the Entomological Society of British Columbia student award (2022), the Brain Star Award from the Canadian Association for Neuroscience (2023), as well as numerous awards for presentations at scientific meetings.

Our students also clearly go on to satisfying careers after graduation. Although we do not collect quantitative data on these outcomes, anecdotally, many graduates of our program are in faculty positions in Canada, the US, and Europe, and alumni are also in influential positions in industry and government.

CHALLENGES & OPPORTUNITIES

Completion times

Reducing time to completion has been a goal for many years, and while the averages have decreased somewhat (see Figure 4), we still have a lot of work to do, especially for the MSc students. Our goal is for a typical PhD student to finish in ~5 years, and for nearly all MSc students to finish in 2 years or less. Although there are numerous reasons for the longer completion times (see above), many of

which were exacerbated by the impacts of the COVID-19 pandemic, our goal is to continue efforts to ensure that students progress smoothly through our program. To this end, we have had numerous discussions about completion times at department meetings and faculty retreats, and there is general agreement to:

1) Revisit the expected scope of the MSc and PhD (*eg*. number of thesis chapters expected, the extent to which MSc students should develop their own projects, etc) and make these expectations clear to both students and faculty.
2) Carefully track student progress and enforce the expectations of annual committee meetings.
3) Provide additional guidance to students on degree timelines and expectations.

We formed a Graduate Advisory Committee comprised of faculty and graduate students to identify and reduce barriers to student progress. The first identified issue was a lack of clarity for expectations regarding the PhD proposal. In response, we developed a set of detailed guidelines for both students and their supervisory committees to clarify timelines, process, and expectations (including creating a rubric for assessing PhD proposals). Over the next year, we expect to develop similar documents for student onboarding and timelines for progress through the program.

Mental health and student support

The COVID-19 pandemic highlighted the challenges associated with maintaining graduate student mental health, with North American surveys suggesting that up to 50% of graduate students report symptoms of depression, anxiety, or burnout during their training. Although we do not have quantitative data on the mental health of our graduate students, anecdotal evidence suggests that they face similar challenges. UBC provides many resources through the G+PS and the GSS; however, connecting our students with these resources can be challenging, and wait times to see counsellors can be long. Over the last six years, we have increased the Department's focus on graduate student mental health through the Botany and Zoology Wellness Initiative and the activities of the ZGSA. Furthermore, the Zoology Graduate Program Manager will become the contact person to better connect Zoology graduate students with the range of wellness supports on campus. The Faculty of Science has recently hired a Science Embedded Counsellor, Stephanie Seo. Zoology plans to work closely with Stephanie to collaborate and explore opportunities to support graduate student wellbeing.

Funding for graduate students

Current funding from the university and outside is insufficient to support the number of graduate students we can attract and train. Similarly, current stipend policies are barely at a level sufficient for a student to live in Vancouver. As mentioned above, our minimum graduate student stipend is just above the poverty level in Vancouver, and even at this low level, paying stipends for graduate students exhausts most NSERC DGs.

It is also difficult to be transparent about graduate student stipends because of the complexity of the potential funding sources, and in particular, the patchwork of tuition awards from multiple sources within UBC (President's Office, G+PS, and the Faculty of Science), which seldom have long term guarantees of funding. This places us at a considerable disadvantage regarding recruitment as it is difficult for students to compare program offers. For example, the funding guarantee from the

University of Toronto ($40,000 annually for PhD students) can look very attractive compared to our guaranteed $30,000/year minimum stipend, but they are fairly similar in terms of take-home pay because students at Toronto must pay tuition out of this amount, whereas our stipend guarantee is on top of tuition.

We need to better advocate to all levels within UBC and to the Province of British Columbia to increase support for graduate students, reduce the cost of tuition, and streamline University support for PhD and MSc students. Increased funding for graduate students from other sources besides GRAs will also allow us to improve recruitment efforts to counter the decreasing size of the Zoology Graduate Program.

Courses

The Department is generally happy with our course offerings for graduate students, although students sometimes report challenges finding relevant courses, and course workloads can be challenging to balance with TA and research commitments. Now that we have a well-developed selection of 1-credit graduate modules, we will work to assess whether the mix of these modules fully meets our current needs and develop an approval process to ensure new courses fulfill specific needs.

Tracking program outcomes

It is difficult to objectively assess the quality and effectiveness of our graduate program because we have limited data on the career paths taken by our alumni. This also hampers our ability to appropriately tailor the nature and scope of the program for our students. To address this issue, in 2024 the job description of the Graduate Program Manager, Mimi Yu, was revised to include an alumni engagement component. Mimi will work with the departmental Communications Coordinator, Sylvia Heredia, to develop a plan for alumni engagement, working in partnership with the Faculty of Science Alumni Office and the University Office of Development and Alumni Engagement. In addition to tracking program outcomes, this initiative also has the potential to enrich our graduate program by connecting current students with alumni working in a variety of sectors. So far, Sylvia has curated a list of UBC Zoology graduates since 2018 (https://zoology.ubc.ca/people/alumni), but additional resources will be required to begin to collect data on outcomes for as many of these alumni as possible.

POSTDOCTORAL TRAINING

Postdoctoral fellows and research associates are drivers of research, mentors to graduate and undergraduate students, and the scientific leaders of tomorrow. Since 2018, the number of PDFs in the department has remained relatively stable at between 25 and 30, currently 27. After five years as a PDF, ongoing appointments must be transitioned to a permanent research associate position. The Zoology department presently has seven paid research associates and seven honourary research associates appointed in Zoology but paid by another institution. The quality of our PDFs and research associates is excellent. Several are funded through major external fellowships from agencies like the US National Science Foundation, NSERC, or the Michael Smith Health Research Foundation. Since 2018, postdoctoral fellows have published >260 peer-reviewed papers as first authors, and more than 45 postdoctoral fellows from Zoology have taken up academic positions at various universities worldwide.

To foster professional development among PDFs and RAs, the Zoology Association of Postdocs and Research Associates (ZAPRA) was established in 2024. The Zoology department funds ZAPRA to support professional development and community-building initiatives. These initiatives include organized debriefs with faculty search committee chairs, who aim to provide context for how faculty recruitment works, as well as seminars and workshops on various topics. A member of ZAPRA is also invited to attend all department meetings to ensure they are informed and have the opportunity to learn how academic units operate. These department-specific professional development opportunities augment the workshop and training opportunities offered by the UBC PDF Office (PDFO) in the Faculty of Graduate and Postdoctoral Studies. The PDFO also provides an orientation program for new PDFs, workshops and seminars, and information on relocation, work permits, medical coverage, child care, conflict resolution, ethics and biosafety guidelines, etc. as well as mentoring workshops for new Faculty members.

Beaty Biodiversity Museum. Don Erhardt / UBC Brand & Marketing

People, Leadership, Culture & Governance

PEOPLE, ENVIRONMENT & CULTURE

The Department of Zoology is a dynamic and collegial community of ~300 people with diverse roles, responsibilities, and areas of expertise. Zoology comprises 42 tenure track/tenured research faculty, 10 tenure track/tenured educational leadership faculty, 10 lecturers, 27 postdoctoral fellows, 14 research associates, 28 emeriti and 11 adjunct and associate members (See Table 2). As outlined in previous sections of this report, numerous faculty hold joint appointments with other departments. Currently, 111 graduate students enrolled in the Zoology Graduate Program, with still more supervised by Zoology faculty, but enrolled in other graduate programs.

Table 2: Summary of all Zoology full-time equivalents (FTE) and headcount across all types of personnel.

Zoology personnel	FTE	Headcount
Assistant Professors	7	8
Associate Professors	6	7
Full Professors	21.3	27
Assistant Professor of Teaching	1	1
Associate Professors of Teaching	4.8	7
Professors of Teaching	1	2
Lecturers	8	10
Postdoctoral Fellows	25	27
Research Associates	7	7
Honorary Research Associates	5.4	7
Graduate Students	111	111
Emeriti	28	28
Associate Members	7	7
Adjunct faculty	3	3
Affiliate faculty	1	1
Administrative & professional staff	9.6	10
Administrative staff 2950	2.6	3
Technicians 116	7.34	9

The Department of Zoology is supported by outstanding staff, including 13 management and administrative staff and nine technical positions. The core responsibilities of these positions are departmental administration, human resources, finance, graduate program management, communications, computer and server support, and facilities. In addition, several positions are shared with the Department of Botany and focused on managing and supporting the Biology Program.

GOVERNANCE STRUCTURE

Departments in the Faculty of Science are each led by a Head appointed for a five-year term and responsible for academic and administrative leadership. The Head reports to the Dean, and acts as both an advocate for the department's interests and a conduit for the University's policies and initiatives. In addition, the Head presents all cases for hiring, promotion and tenure of faculty members to the Dean and, along with the Director of Administration and Operations, Katie Pikor, is responsible for the budget.

In addition to faculty, the Department of Zoology is composed of numerous operational units, including *InSEAS*, ZCU, Mechanical Workshop, Undergraduate Biology Program, Finances, Human Resources, Communications, and General Administrative Support. Each unit specializes in a specific area and supports the department's research, teaching, and service mandate. Unit managers are responsible for overseeing the unit operations. All unit managers report to the Director of Administration and Operations, who is responsible for overall leadership and management of departmental operations. See **Appendix 23** for the organizational structure of the Zoology department.

Equity, diversity, and inclusion figure prominently in our governance structure and recruiting and our approach to EDI is described in more detail later in this report (See Nurturing a Culture of Equity and

Inclusion). Furthermore, an active and effective local safety committee works within the UBC health and safety framework to ensure our laboratories are safe and address emerging issues. The Department of Zoology also oversees field safety for researchers, which is a responsibility that the University should adopt as a whole.

FACULTY AND STAFF

Faculty Composition and Demographics

Research Faculty: The complement of research faculty has remained relatively stable for the last decade and beyond. In 2014, 40 (headcount) research faculty were spread across our four research clusters, similar to today. The relative proportions of each faculty rank have remained constant since 2014, with ~20% assistant professors, ~15% associate professors and ~65% full professors, indicating that faculty move through the ranks and complete their careers as expected. The average time to tenure is 6 years for men and 5.6 years for women (lower for both when adjusted for maternity, parental and adoption leaves), pointing to the fact that our assistant professors establish themselves quickly and move through the ranks smoothly. Over the last decade, we have made progress in increasing the diversity of our faculty. Based on available data, in 2014, ~33% of the research faculty identified as women and ~19% were BIPOC. Today, 47% identify as women and ~23% are BIPOC.

Educational Leadership Faculty: As described earlier in this document, the tenure-track professor of teaching steam was established in 2010 and is flourishing. Shortly after this tenure-track teaching stream was established, many existing instructors and senior instructors entered the EL stream, and eight of our current EL faculty were part of Zoology at the time of this transition and are now either associate or full professors of teaching. We have also had turnover in EL faculty, with two new faculty hired since 2020. Additional recruitment is underway for an assistant professor of teaching in biostatistics and data science. The relative proportion of each faculty rank is 10% assistant professor of teaching, 70% associate professor of teaching, and 20% professor of teaching. Based on available data, 80% of the EL faculty identify as women and 20% are BIPOC.

Lecturers: Zoology has ten lecturers, with 80% of them hired since 2018 to teach in specific areas. Based on the available data, 80% of the lecturers identify as women and 30% are BIPOC.

Faculty Hiring Plans

Based on our current age structure (**Appendix 4**), up to 12 research faculty and two EL faculty could retire in the next five to ten years. At our department retreat in the summer of 2024, we discussed our hiring plans and how they intersect with our departmental research and EL clusters. There was unanimous support for maintaining and strengthening the current cluster configuration and focusing our recruitment efforts around these clusters.

Our approach to hiring research faculty involves writing broad job advertisements that fit within established clusters while aiming to attract the widest and most diverse applicant pool possible. At the applicant review stage, we select the best and most diverse pool of applicants who would add new dimensions to our research clusters while ensuring they will have colleagues with whom to collaborate. We actively work to mitigate implicit bias in our evaluation process and have implemented multiple practices to ensure equitable assessment of candidates from diverse backgrounds and identities. Our recruitment strategy focuses on people and their scholarship, not filling a specific research or teaching need. We then select applicants who convey the most

compelling research program within the scope of the job advertisement, complement and extend current areas of expertise in the department, demonstrate the capacity to teach and mentor students effectively and contribute to a positive, equitable, diverse and inclusive research and teaching environment. This approach has been in place for several decades and serves us well.

While ensuring that we continue to build strength in our core research clusters, there is also strong support to ensure that our hiring practices contribute to building cohesion within the department. To this end, we also look for exceptional candidates that bridge between research clusters and provide new research directions within our department. In each case, the laboratory space (and thus the primary research cluster) will be assigned in the building with the most appropriate combination of infrastructure and colleagues with overlapping interests.

For the EL faculty cluster, our past practice has been to hire to fulfill specific teaching needs. Although content knowledge that aligns with teaching needs will likely continue to contribute to defining EL recruitment, there is an opportunity to focus future EL hires on facets of EL expertise rather than specific content expertise. For example, there is broad support for hiring an EL faculty who has developed expertise in learning assessment within biology.

Lecturers are primarily hired based on teaching needs.

Challenges and Opportunities in Recruitment

Cost of housing: The most significant challenge we face in hiring and retaining faculty is the cost of housing in Vancouver. Since 2010, we have failed to retain six faculty members, with housing costs and associated quality-of-life issues contributing to their decisions to leave. During negotiations with potential new faculty, housing costs are often a major concern, and UBC has limited initiatives to offset these expenses.

UBC recently updated the Faculty Home Ownership Program (FHOP) to provide $50,000 (as a taxable benefit) to assist with purchasing a home. However, this assistance remains inadequate, with two-bedroom condominiums averaging $800,000 and single detached houses ~$2 million in Vancouver. The UBC Prescribed Interest Rate Loan (PIRL) program represents progress in recruitment support, offering interest-payment-only loans to tenure-track faculty for primary residences in Metro Vancouver. However, this merit-based program is limited to a small number of "excellent" faculty as determined by the Provost's Office. Additionally, because UBC must charge the Canada Revenue Agency-prescribed interest rate to avoid creating a taxable benefit, these rates can sometimes exceed those available through external financial institutions.

Partner accommodations: Partner accommodation presents another significant challenge that, combined with housing concerns, can create insurmountable barriers to recruitment. While the Provost's Office offers several dual career programs to assist with spousal hires, these options are not typically activated until a candidate accepts an offer or can be difficult to initiate. This leaves candidates and their partners with little reassurance regarding dual career prospects at UBC. The university would benefit greatly from developing a more comprehensive university-wide plan to accommodate the academic spouses of recruits.

Staff

The Department of Zoology is supported by outstanding and dedicated staff (See staff profiles in **Appendix 24**). The overall staff complement has remained relatively stable over the last decade at ~22 employees, but there have been shifts in the type of staff employed. Since 2018, five long-term staff members have either retired (4) or resigned to focus on their family (1), including the ZCU Manager, ZCU Systems Administrator, Human Resources (HR) Manager, and two Mechanical Engineering Technicians. The ZCU Systems Administrator, HR Manager, and one Mechanical Engineering Technician have been replaced. We did not replace the second Mechanical Engineering Technician due to the declining need for mechanical and electrical repairs. The ZCU Manager position is currently vacant, and the recruitment process will be undertaken soon. Two important Management positions were added to the department, including managers of the Biology Program (Gigi Lau) and Zoology Office/Faculty Support (Holly-Anne Burrows), based on the evolving nature of teaching and research needs. We have also hired a communications coordinator and scientific artist, Sylvia Heredia, who has worked to improve external and internal communications and provide research illustrations. We are reviewing the departmental needs for a dedicated shipping and receiving clerk, which has been traditionally shared with the Department of Botany, but they have discontinued their funding for the position. Finally, based on anticipated retirements in the next five years, a few of our staff positions will become vacant, requiring ongoing recruitment. Based on available data, >85% of staff identify as women, and ~50% identify as BIPOC. All staff are provided with opportunities to engage in professional development.

CULTURE & CLIMATE

The Department of Zoology works diligently to build and maintain a positive work culture for faculty, staff, and students. We pride ourselves on our collegial, open, and inviting work environment that fosters collaboration, mutual respect, and a shared vision for research, teaching and mentoring excellence. We strive to maintain a positive work environment by investing in department-wide social activities, supporting numerous seminar series and discussion groups related to our research and EL clusters, and funding diverse initiatives and opportunities. For social activities, we have weekly Friday donuts, which rotate through our three main buildings, a summer BBQ and ice cream social, the Debbie and Justin Wragg-Schmidt Spring Symposium and banquet, a holiday party in downtown Vancouver, weekly Beveraginos in the BRC, the annual huts skit, plus numerous other planned and spontaneous activities. These social gatherings are often well-attended by faculty, staff, and students.

One noteworthy event was the two-day symposium held on April 30th and May 1st, 2024, to celebrate the department's centennial. The goal of the celebration was to not only celebrate our long and productive history but also to reflect on what it means to be one of the few remaining Zoology Departments in the world. We are proud of our history, accomplishments, and the productive, interactive, diverse, and inclusive environment we have collectively created. The symposium was comprised of invited speakers selected by the members of our research and EL clusters, and it aimed to highlight connections and innovation across the diverse areas of the biological sciences represented in the Department of Zoology.

Department of Zoology logo to promote the centennial events. Designed by Sylvia Heredia, 2024

Zoology faculty, postdoctoral fellows, and students have access to many seminar series, named lectures, and discussion groups hosted by the Zoology department or where the department contributes funding. For a complete list, please refer to the following links: weekly seminars, cell seminars, named lectures, and discussion groups. There is also a Zoology Departmental Seminar Series, which is hosted by the Head, where faculty under consideration for promotion are invited to present their research or EL work.

To continue building a positive and collegial work environment, we are improving transparency around the processes involved in the annual evaluation of merit, promotion and tenure, service assignments, and other aspects of departmental function (See below). We are also working to identify groups within the department that would benefit from additional support and who may lack a sense of belonging. To this end, the department continues to work with our graduate students and postdoctoral fellows to support them (see Graduate Education and PDF Training). Furthermore, staff has expressed that they lack a sense of belonging in the department. With the retirement of several long-term staff members, the consequent staff turnover, the changing post-COVID-19 work environment, and recent changes to reporting lines, some staff report that they don't always feel valued or are an integral part of the department. The staff are indeed integral, and to acknowledge their valued contributions and demonstrate our commitment to them, the department has introduced several new initiatives, including the summer BBQ, lunch walks, potluck lunches, ice cream social, and a brown-bag lunch program, and more to help build a sense of community. Furthermore, to formally recognize the excellent contributions of staff to the department, the department has developed a staff appreciation award, which is given out annually at the summer BBQ. To address belonging, we are replacing one of the faculty meetings in September with a department-wide meeting for all faculty, staff, PDFs, and associate and affiliate members to provide departmental updates that interest all. Staff will also be invited to regular department meetings.

NURTURING A CULTURE OF EQUITY & INCLUSION

We work diligently to ensure that Indigenous and EDI priorities and perspectives are honoured and integrated into our governance, hiring practices, research and teaching. This is accomplished by embracing training opportunities that improve our practices and forming active and engaged faculty, staff, and student committees that work collectively to identify challenges and opportunities in these areas.

Hiring Practices

For all faculty hiring, search committee members undergo mandatory EDI training provided by the Associate Dean of EDI, Dr. Stephanie van Willigenburg. This training equips committee members to understand how unconscious biases can affect all aspects of the hiring process and provides strategies to mitigate their effects. The Zoology department has a strong history of supporting this initiative, as the two previous Associate Deans of EDI, Ninan Abraham and Vanessa Auld, are department members.

During searches, departments receive demographic data about the applicant pool, which helps inform the composition of long lists and interview lists to ensure diverse representation. The department also actively engages in opportunities to increase the diversity of its scholars. For

example, in 2024, we participated in a Faculty of Science-wide Black Faculty Hiring initiative and contributed to leading interviews that resulted in hiring an exceptional fire ecologist. Beyond participating in existing opportunities, the department is also working to create new initiatives to increase diversity, mainly through the Biology Indigenous Strategic Plan Committee (see below).

Zoology Equity Diversity & Inclusion Committee (ZEDI)

ZEDI was formed in 2020 with a mandate to "ensure that the diversity of departmental members reflects the diversity within Canadian society, to ensure an inclusive working and training environment within the Department of Zoology, and to ensure equitable relationships between departmental members and between the department and members." Unlike most other committees, ZEDI has a broad representation of career types and stages, including faculty (2 representatives serving as co-chairs), staff (1), postdoctoral researchers (1), graduate students (2), and undergraduates (1). ZEDI acts in concert with other committees and on issues that cut across or fall between committees. In general, ZEDI's approach has been to consider specific populations within the department, interact with members of this population and relevant departmental committees to determine key issues, and then devise and implement action plans to address these issues.

ZEDI has started conversations, developed resources, advocated for change, and created solutions. For example, the members of ZEDI have engaged with disabled department members and carried out accessibility audits of Zoology buildings; this process helped to provide input into the design of the new BRC wing. ZEDI also worked with the field safety committee to consider how diversity creates inequitable risks in the field when the threat is not physical but from other humans and based on homophobia, transphobia, misogyny and racism. One of ZEDI's most successful projects has been the Biology Undergraduate Diversity in Research (BUDR) program. This program originated in a ZEDI brainstorming session, was developed through discussions with BioSoc (the undergraduate Biology society) and BEDI (ZEDI equivalent in Botany), and was initially funded by two Strategic Initiative Fund grants. While BUDR has now become its own program, with Michelle Tseng as Director, ZEDI continues to support it through developing outreach materials. For more information on BUDR, please see the Undergraduate Section.

Biology Indigenous Strategic Plan Committee

The Department of Zoology is actively implementing UBC's Indigenous Strategic Plan through a dedicated Biology Indigenous Strategic Plan (ISP) committee formed in partnership with the Department of Botany. This committee, which emerged from ZEDI, is jointly chaired by faculty members from both departments and includes diverse representation from faculty, staff, and students. After establishing terms of reference, the committee has identified three priority areas:

1) fostering community among Indigenous students in Biology and STEM fields
2) increasing representation of Indigenous peoples at all levels including faculty positions
3) enhancing awareness of Indigenous experiences and ways of knowing throughout the department

Significant progress has been made on these goals, particularly in building a community for Indigenous STEM students. The department has organized regular social events, established a

dedicated space for Indigenous STEM students in the Biological Sciences Building (room 2032), and commissioned biology-themed Indigenous artwork. The committee has proposed expanding the BUDR program to offer research experiences specifically for Indigenous students. Furthermore, the department and its faculty support the seed2STEM summer research program for Indigenous youth. Many faculty also participate in the CEDAR Camp, a UBC program providing Indigenous youth with culturally aware STEM activities designed to foster comfort and familiarity with the university environment. Additionally, the committee is developing faculty hiring plans to support recruiting Indigenous scholars and organizing reflection groups for department members to engage with the Weaving Relations course. The Biology Program also surveys instructors to understand better where Indigenous content is being incorporated across the curriculum, responding to Indigenous students' expressed desire to bring more Indigenous scholars into their educational experience. For more details on the activities of the Biology Indigenous Strategic Plan (ISP) committee and the preliminary outcomes of the most recent Biology Program survey results, please see **Appendices 25** and **26**.

Highlighting other activities that support the UBC Indigenous Strategic Plan.
Blaire Steinwand is a collaborator on a Social Sciences and Humanities Research Council Partnership Development Grant studying the socio-cultural dimensions of woodland caribou conservation in Canada. The project includes two Nations, Cold Lake First Nation and Splatsin, both of which have a deep and long-standing cultural connection to caribou. The project participants focus on relationship building as the study will be co-constructed and co-designed with the Nations. In 2023, the Splatsin hosted the first in-person gathering on their land, and together, we shared stories, ideas, food, and prayer in the community. In the coming weeks, the project participants are scheduled to travel to Cold Lake First Nation to connect again with each other and the community.

COMMUNITY ENGAGEMENT AND OUTREACH
The members of the Department of Zoology contribute significantly to the community around us through engagement and outreach. Below is a summary of Zoology faculty members' extensive community engagement, service activities, and outreach efforts, highlighting their contributions to academic journals, scholarly societies, advisory boards, leadership roles, and public engagement initiatives. To learn more about each faculty's contributions, please see the faculty profiles in **Appendix 29.**

Editorial Roles: Numerous Zoology faculty serve as editors or associate editors for major journals, including the *Journal of Experimental Biology*, *PeerJ Open Advances in Marine Biology*, *Journal of Phycology*, *Evolution Letters*, *Genetics*, *Proceedings of the National Academy of Science*, *American Naturalist*, and the *Proceedings of the Royal Society B* to name a few. Many more faculty serve on the editorial board of journals, including *Basic and Applied Ecology*, *Journal of Comparative Physiology B*, *Physiological and Biochemical Zoology*, *Trends in Ecology and Evolution*, *Comparative Biochemistry and Physiology*, and *Annual Review of Ecology, Evolution, and Systematics.*
Furthermore, the book series *Fish Physiology*, has been edited by Zoology faculty since it was established in the late 1960s. These editorial leadership roles in journals span fields from theoretical biology to comparative physiology, demonstrating the breadth of expertise within the Zoology department.

Society Leadership: The Zoology department's commitment to scientific community building is evident through our faculty taking on substantial leadership positions within professional societies.

Faculty members have held leadership positions in major organizations including, for example, the Canadian Society of Zoologists, the American Society of Naturalists, and the Society for the Study of Evolution, and in these roles they have helped to shape the direction of these societies. Our faculty actively contributes to the governance and advancement of scientific societies across ecology, evolution, and comparative physiology & biomechanics through committee memberships, council positions, and officer roles.

Advisory and Expert Panels: Faculty expertise extends well beyond academia by participating in influential advisory panels that aim to bridge science and policy. Zoology department members have served on multiple advisory boards including the Beijer Institute of Ecology and Economics, Conservation International, and the US Department of Agriculture, and have participated in high-level policy dialogues like the C20's discussions on sustainable farming. During the COVID-19 pandemic, faculty expertise in modelling was leveraged through leadership roles in national and provincial response groups. Furthermore, environmental stewardship is a core value in faculty engagement with contributions to expert panels focussed on conservation and sustainability. Several members hold leadership positions with conservation organizations, including The Nature Trust of BC. Others hold leadership positions in UN Decade initiatives focused on biodiversity and sustainable ecosystems, bringing scientific expertise to international environmental efforts. Finally, Zoology faculty also serves on the Board of Directors of important regulatory organizations, including the Canadian Council on Animal Care. The breadth of advisory work, ranging from fish genetics to sustainability and pandemic responses, showcases how the Zoology department's expertise contributes to solving national and international challenges.

Grant Review and Academic Service: Zoology faculty contribute significantly to the broader scientific community through their service on grant review panels and academic committees. Multiple members have served on NSERC DG and CIHR evaluation panels. Faculty also participate as directors or members of selection committees for prestigious fellowship programs like the Liber Ero PDF Program. Beyond review activities, members organize professional development workshops on numerous topics at conferences, including grant writing, publishing, and peer review, helping to nurture the next generation of scientists. This dedication to academic service strengthens the foundations of scientific research while mentoring emerging scholars.

Community Science and Public Engagement: Our faculty actively bridge the gap between scientific research and public participation through innovative community science initiatives. The Butterflies in My Backyard Community Science Program (BIMBY), led by Michelle Tseng and funded by the David Suzuki Foundation, trains volunteers across BC to monitor and photograph butterflies. What began as an outreach effort has evolved into a data-generating scientific endeavour due to exceptional leadership in community engagement. Similarly, faculty members Trish Schulte, Chris Wood, and Colin Brauner lead the Road Salt and Pacific Salmon Success Project, where community scientists monitor salt levels in over 30 Lower Mainland streams to assess impacts on coho salmon eggs. These initiatives exemplify our commitment to participatory research that addresses local environmental concerns while engaging the public in meaningful scientific work.

Beaty Biodiversity Museum (BBM): The BBM is a research, teaching, and public education facility affiliated with the Departments of Zoology and Botany. The BBM is dedicated to enhancing the

understanding, appreciation, and conservation of biodiversity through collections-based research, education and public outreach. It features six collections, containing more >2 million biological specimens. The Department of Zoology curates and manages the Cowan Tetrapod Collection, The Spencer Entomological Collection, The Fish Collection, and the Marine Invertebrate Collection. Also housed in the museum are the Herbarium and the Fossil Collection. The BBM is a high-profile attraction at UBC that attracts over 35,000 visitors per year, including over 5,000 UBC undergraduates who use the museum for various class activities. In 2024, a new undergraduate course was initiated in the Biology Program, Introduction to Natural History Collections and Biodiversity Science, which expands the connection to the BBM by utilizing the collections for hands-on learning. The Departments of Botany and Zoology and the Faculty of Science now fund three graduate student assistantship positions in the BBM to foster stronger ties and enable increased research capacity. The BBM is a UBC flagship for public outreach and University fund-raising activities.

Media Engagement and Public Communication: Faculty members regularly share their expertise with broader audiences through various media channels, enhancing public understanding of complex scientific topics. Several faculty members have been featured on prominent platforms, including CBC Radio, The Big Story Podcast, and television programs, where they discuss their research and its implications. These media appearances demonstrate our faculty's commitment to communicating science clearly and accessible. Faculty contributions to specialized podcasts like Big Picture Science from the SETI Institute and Quirks and Quarks on CBC Radio highlight our faculty's engagement as science communicators who can translate research findings for general audiences.

Educational Outreach and Youth Engagement: Our department maintains strong connections with K-12 education through numerous outreach activities designed to inspire the next generation of scientists. Faculty members lead field trips, like intertidal excursions for the UBC Ocean Education program, which engages K-12 teachers and high school students. Other faculty host lab experiences for UBC Geering Up, providing youth with hands-on science exposure. Numerous faculty have led sessions at the CEDAR Camp, a summer program that provides Indigenous youth with STEM education through culturally aware activities, helping to create equitable pathways to higher education. Faculty also support undergraduate research development, with members volunteering as reviewers for the Multidisciplinary Undergraduate Research Conference (MURC), reviewing abstracts and providing feedback to emerging researchers.

Zoology Website: To further enhance our community engagement and outreach efforts, we overhauled our website in 2019 (www.zoology.ubc.ca). The redesigned website highlights the recent achievements of faculty, students and staff, provides information on important events and seminars, and serves as a resource and compendium of critical operational information and resources as well as a repository of the department's achievements ("Departmental announcements") and new and past faculty members ("Welcome New Faculty" or "In Memoriam"). Furthermore, we have established a regular presence on Instagram , highlighting weekly academic events, the awards and recognitions received by all department members, and graduate student wellness activities. We recently opened a Bluesky account, slowly building up our presence in this new social media outlet to highlight scientific publications and amplify UBC, Faculty of Science, Department of Zoology news.

Physical Infrastructure & Facilities

Over the past two decades, there has been a substantial investment in facilities, and the members of the Department of Zoology now benefit from access to state-of-the-art teaching and research facilities. For teaching, the department utilizes the recently completed $91-million Undergraduate Life Sciences Teaching Laboratories, which consolidated all life sciences teaching labs on campus into one integrated complex that serves over 2,600 students and faculty across multiple disciplines. Completed in 2019, these modern facilities feature well-equipped teaching laboratories, classrooms, and collaborative study areas that significantly enhance the department's capacity to deliver high-quality education.

The department's research activities are supported by numerous specialized facilities and centres including the BRC, which houses 22 Zoology faculty members and their teams in open laboratory spaces designed to foster collaboration; the renovated Biological Sciences Building with state-of-the-art laboratories and specialized facilities including the InSEAS and FSIAP; the Life Sciences Institute (LSI), which provides 25,000 m^2 of interdisciplinary research space for faculty focusing on cell and developmental biology; the ICORD for spinal cord injury research; and field-based facilities such as the Experimental Ponds and the Bamfield Marine Sciences Centre. These facilities are complemented by core research support services including the UBC Bioimaging Facility, the BBM, and the Zoology Computing Unit (for details on these facilities, please see **Appendix 5**).

Financial Resources

The vast majority of funding to the Department of Zoology comes from recurring General Purpose Operating Funds through the Faculty of Science. Faculty salaries represent the largest expenditure, consuming approximately 90% of the current FY23/24 budget (see **Appendix 27**). About 5% of the budget is allocated to scholarships and bursaries, supplies and expenses for teaching, and capital expenses. The current fiscal year shows revenues exceeding expenses by approximately 5%, which reflects non-recurring funds held in reserve for faculty recruitment start-ups and commitments to capital expenditures for teaching lab equipment renewal.

Faculty salary costs have fluctuated over the past six years due to various factors, including faculty turnover, sabbatical leaves, and changes in research chair funding, specifically, the loss of approximately $800,000 in CRC salary funding with only $200,000 in new CRC funding. Additionally, while salaries for President's Academic Excellence Initiative and Canada 150 hires are covered by the Provost's office, these appear as faculty salaries in operational reports with corresponding funding shown under inter-fund transfers.

Challenges and Opportunities
Despite skillful and responsible budget management that has maintained financial stability, the Zoology department would benefit from diversifying its funding base to ensure future stability, especially as the University adjusts to decreases in foreign tuition revenue. The department plans to address this by increasing diversified research funding to benefit from associated indirect funding while exploring opportunities to diversify educational programs that could generate additional departmental income.

Planning for the Future

The Department of Zoology is well-positioned to address the challenges of the future. As one of Canada's strongest life science departments and the only remaining Zoology department in Canada, we have built and sustained excellence across research, teaching, training, and community engagement and will continue to do so long into the future. During the development of this self-study document, we came together during summer retreats, numerous department meetings, and focused discussion groups and town hall meetings to identify the factors that make us unique, discuss our challenges, and identify growth opportunities.

There is strong support among departmental members for maintaining our research and EL cluster format, which contributes to our sense of community while allowing for strategic hiring and research direction-setting within clusters. We remain committed to building a unified department by recruiting candidates with strengths within our clusters, but whose work bridges between clusters. This approach has contributed to our recognized excellence in research and teaching innovation.

As the global scientific landscape evolves, with political shifts affecting research funding, climate change policy, EDI initiatives, and international collaboration, we recognize our responsibility as a department with strong global connections. Moving forward, we commit to strengthening our support for innovative research on pressing scientific questions while fostering a scientific culture of openness, equity, collegiality, and curiosity that transcends national boundaries.

Looking forward, several strategic challenges require attention. The loss of Canada Research Chair positions represents a significant concern for maintaining research excellence. The department must continue advocating for these positions while exploring opportunities to support diversified research funding. The increasing costs of maintaining aging research infrastructure will require creative solutions and partnerships. Additionally, the administrative burden on faculty diverts valuable time from research and teaching, which is a challenge requiring structural solutions. A significant concern is Vancouver's prohibitive housing costs, which threaten the recruitment and retention of both faculty and trainees.

For student success, we aim to enhance our undergraduate and graduate programs. We will examine the entire Biology Program curriculum to define the program's unique aspects amid growing alternative life science undergraduate programs, while reintroducing experiential learning and improving flexibility. At the graduate level, addressing completion times through clearer

expectations and improved progress tracking is essential. Supporting graduate students financially remains challenging but crucial, with minimum stipends only recently rising above the poverty line.

Critical to these efforts is our commitment to equity, diversity, and inclusion. Building on the significant strides made by the ZEDI and Biology Indigenous Strategic Plan Committee, we will continue developing programs like the Biology Undergraduate Diversity in Research and creating dedicated spaces for Indigenous STEM students. Our goal is to establish an environment where the contributions of all faculty, staff and students are valued and they feel included.

As we look toward the future, maintaining research excellence, adapting educational offerings, fostering an inclusive environment, and addressing structural challenges will be essential to continuing our legacy of excellence while advancing solutions to pressing societal challenges in conservation, biodiversity, climate change, and human health.

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