

Report from the External Review Committee of the University of Michigan Department of Ecology and Evolutionary Biology

March 20-21, 2023

Report Submitted Apr 3, 2023

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**Executive Summary** - The Department of Ecology and Evolution Biology (EEB) and the associated University of Michigan natural history collections are widely recognized for their cutting-edge research and innovative educational opportunities for students and postdoctoral scientists. Acceptance into EEB's doctoral program is highly competitive, and the graduate students and postdoctoral fellows that receive training from this program go on to a variety of careers. EEB has long been at the forefront of initiatives dedicated to diversity and inclusion, and the Frontier MS program is a shining example. The EEB undergraduate program is healthy and growing, and the established partnerships with other campus units have allowed the program to grow in new directions. The new building, with the clever incorporation of public museum exhibits and numerous common areas, allows for additional cross-lab linkages and public engagement. Many of the long-standing climate issues have been resolved in the last several years. Assistant and associate professors in EEB, as well as graduate students and postdoctoral scholars, feel well-supported. The office staff and instructional staff are happy and productive and are finding ways to overcome some of the challenges inherent in occupancy across multiple buildings. Additional examples of the strengths and opportunities of the department are provided in the report.

This department is facing two major challenges. Most faculty in EEB departments are funded by grants from the National Science Foundation, and the increasing costs of graduate students have not been matched by increased funding rates. Given its current funding model, where the faculty pay one full year and three summers of GSRA support, the graduate program appears to be at its capacity and cannot increase in size without additional funding from the graduate college or LSA. This restriction on the size of the graduate program is occurring at the same time that EEB is increasing the number of junior faculty, who require a critical mass of graduate students to establish their research programs. The second challenge is determining mechanisms to realize the enormous potential of the collections. Specific recommendations are provided below.

## Response to the Charge

### I. Strategic Vision

*Strengths:* The department has demonstrated that they can be nimble to take advantage of opportunities to hire while maintaining their overall Mission and Vision. The department's work to integrate the Ecology, Evolution, and Biodiversity faculty is admirable. The intellectual distance between EEB and other units such as MCDB and SEES is closing, while the collaborative potential among these units is growing, and the faculty and their trainees are well-positioned to take advantage of new opportunities. The department's strategic vision also does an admirable job of integrating cutting-edge scholarship with teaching and mentoring. Their recent attention to DEIJ is also admirable. The world-class natural history collections managed by EEB are internationally recognized, provide outstanding opportunities for faculty and students at the University of Michigan and beyond, and are now housed in an excellent physical facility.

*Challenges:* The potential of the natural history collections is not now fully realized. The current hiring model, which caps the size of the faculty, can create tension within the department with respect to hiring. It is not enough to assign an assistant professor who works with a particular group of plants or animals as a curator. If a prospective candidate doesn't have the training or interest in curatorial duties, and these duties have not been clearly articulated or evaluated during the tenure and promotion process, the potential of the collections to contribute to the mission of the University of Michigan will remain unrealized and the collections are likely to be neglected.

#### *Recommendations for Strategic Vision*

- The department should work with the college and central administration to leverage the investments in faculty lines to ensure that the core needs of both the department and the collections are being met. Given the value of the collections, their cross-cutting potential, and the already substantial investment in physical resources, the central administration should invest directly in specific curatorial faculty lines to ensure this investment pays dividends. Further, engagement and curation of the collections by tenure-track faculty should be evaluated as a distinct area of faculty scholarship (in addition to research, teaching, and service) that should be codified and assessed through the tenure and promotion evaluation process.

### II. Intellectual Profile and III. Faculty

*Strengths:* The Department of Ecology and Evolutionary Biology is one of the leading departments of its kind in the country. It displays an impressive breadth of scholarly inquiry in each of its intellectual domains and is a national leader in these disciplines. Particular strengths of the department include the **study of biodiversity**, with particular strengths in the Museum of Zoology and Herbarium, often employing phylogenetic and comparative approaches or interrogation of the fossil record; **ecology**, with diverse strengths in community ecology, global

change, agroecosystems, and physiological ecology; **evolutionary ecology**, with foci in the biology of symbioses, mathematical ecology, host-parasite interactions, and social behavior; and **evolutionary biology**, with strengths in molecular evolution, population genetics, the evolution of gene expression, and computational biology. This is an impressive array of research interests and there were no glaring holes we perceived in the scholarly repertoire. Regardless of the citation trends and comparisons of papers published by EEB faculty with those of other institutions, EEB faculty are widely respected and leaders in their fields.

There is also a high level of engagement with other centers and departments and new collaborative possibilities are being developed. For example, there is the potential for exciting synergies of EEB faculty with the Green Life Sciences program, in the form of molecular approaches to plant biology and insights into biotechnology through biodiversity. Another excellent opportunity for synergy with other centers of excellence is with the Quantitative Biology initiative, where EEB talent could contribute to quantitative approaches from molecular biology to biophysics and big data science.

Like many departments nationwide, EEB is committed to broad searches in very wide domains, like evolutionary biology or ecology. We applaud this approach and note that the junior faculty that have been hired in the last ~7 years are all excellent. Many were hired through broad searches and we believe this is a good approach to hiring new faculty going forward, especially when done in the context of the “tiers” identified by the department to ensure that teaching needs are met. Of course, the department must be vigilant to maintain balance across the breadth of the evolutionary and ecological sciences. One area where EEB has declined over the years is theoretical ecology; another is robust scholarship in the areas typically associated with museum collections. The review committee believes that use of broad searches to attract top talent should be continued, but that new approaches and targeted investments should be made in areas associated with the RMC (see below).

The profile of faculty ranks in EEB seems healthy. There is a large cohort of junior faculty and a somewhat smaller cohort of senior faculty. The smallest cohort is the mid-career Associate professors. At 17% URM, the diversity of EEB faculty has increased from 6% in 2010.

*Challenges:* The review committee did not identify any significant challenges in the breadth and development of the non-museum EEB faculty. It is expected that the representation of specific subdomains within EEB will wax and wane over time. Presently, we believe that the department is in a good place. The openness of EEB to appointments adjacent to or even within emerging areas like global change, green biology, or sustainability was viewed as a plus that can be capitalized on through synergies with other schools and departments, such as SEES and MCDB.

#### *Recommendations for Scholarly Profile and Faculty*

- The recommendations are the same as for Strategic Vision.

#### **IV. Climate and VIII. Justice, Equity, Diversity, and Inclusion**

*Strengths:* Had we reviewed this department three years ago, we expect we would have written a very different report. Thanks to the outstanding leadership of Trisha Wittkopp, the department has made impressive progress in improving its culture and climate. With the exception of the museum staff, every stakeholder group expressed satisfaction with the department and where it was heading. EEB's commitment to DEI, as evidenced by the success of the Frontiers MS program and other policies that have been put in place over the past three years makes them a leader in STEM, not only at U of M but across the country. Broad faculty searches are the best practice for achieving a diverse pool, and the diversity of the faculty increased dramatically in 2018. It is clear that the departmental administration is attempting to create transparency regarding teaching and service loads. The Assistant Professors, graduate students, and postdoctoral scholars believed that they were receiving appropriate mentoring. The BSB and USB staff also reported feeling included in the department and satisfied with their jobs.

*Challenges:* The staff at the RMC does not yet feel fully integrated into the department. Additional information and recommendations are included in the "Museums" section. It is also clear that the success of JEDI has been spearheaded by the current Chair. There is some concern that there may be some regression if the new Chair does not place a similar emphasis on maintaining an inclusive climate.

As is typical in many departments, the associate professors noted a lack of mentoring when they were asked directly about mentoring by the review committee. Both faculty in this group are succeeding nonetheless.

##### *Recommendations for Climate and DEI*

- Both the department and the college should work to ensure that current EEB practices promoting communication, transparency, and inclusion continue.
- The BSB and USB staff are pleased with how Jen Wolf is managing and mentoring them. We recommend that the new Chair allows her to continue her current management and mentoring practices.
- The department and college should consider how to provide additional programming for postdoctoral fellows.
- The department and college should assess what formal and informal mentoring practices are needed for associate professors.

#### **V. Undergraduate Program**

*Strengths:* The undergraduate program is healthy and innovative. Best practices for inclusive pedagogy are the foundation for the introductory class, and a variety of majors are offered to match the diversity of student interests in biology such as pre-health and pre-vet, academic careers in ecology and evolution biology, and entering the workforce in government, not-for-profit, and industry careers. The Program in Biology is working well, as is the collaboration with other interdisciplinary partners. The Quantitative Biology major is a creative way to help

students with an interest in both biology content and computational skills make the best use of their undergraduate career. The Green Life Sciences proposal remains under development given new hires in the area of plant biotechnology. The intensive, immersive courses taught at the Biological Station provide students with life-changing experiences.

*Challenges:* The opportunity for students to participate in research with faculty at the museums is not fully realized based on the lack of reliable transportation and an accessible online information source for potential opportunities. The EEB majors reported that the limited space in some of the popular courses was difficult and a cause of stress. They also expressed a desire to have access to a schedule of when all future courses would be taught (e.g., every term, fall only, spring odd years). Finally, some students suggested the need for mentoring related to future employment opportunities outside of medicine or academia.

#### *Recommendations for the Undergraduate Program*

- Given that teaching at the Biological Station is as valuable as teaching on campus, we recommend that Biological Station courses be counted as part of the annual teaching load and as replacements for teaching in the fall or winter term
- Develop a website that provides a list of all courses available to undergraduates and the expected semesters in which they will be taught.
- Support the Quantitative Biology major development
- Work with the advising and instructional team to provide more information about career opportunities beyond health care or entering a Ph.D. program

## **VI. Graduate Education**

*Strengths.* The EEB Graduate Program is recognized as one of the strongest Ph.D. programs in ecology and evolutionary biology in the country. Graduate students in EEB are generally happy with the mentorship and support that they receive from faculty. They also feel included in multiple aspects of the department, with numerous opportunities to participate meaningfully in departmental governance and decision-making through service on departmental committees.

Notably, EEB has been at the forefront of diversifying the fields of ecology and evolution, including through its formation of the innovative Frontiers Masters program. Indeed, the number of under-represented minority students in the EEB graduate program has increased measurably during the past decade. The Frontiers program has been highly successful in increasing representation in graduate education in ecology and evolution, both at the University of Michigan and nationwide, and has served as a model for other similar programs at the university.

*Challenges.* Although the number of junior faculty has increased substantially in recent years, the size of the Ph.D. program has remained flat. With cohorts of ~12 Ph.D. students/year, there are currently insufficient numbers of graduate students to ensure that individual labs remain vibrant, productive, and cutting-edge. Thus, the lack of graduate students threatens to diminish the strength of the EEB graduate program. The major barrier to increasing the number of

students is the lack of sufficient funding to increase cohort size. Given that the share of graduate student support required of EEB faculty has recently been increased and that the sizes of federal grants in ecology and evolution are relatively modest, requiring additional support from faculty is not realistic. In addition, the department has already taken steps to advance students quicker to realize tuition savings. Two alternative ways that funding for graduate students might increase include greater support from LSA and Rackham. The upcoming review of the EEB graduate program by Rackham will presumably be favorable, given the increased retention of Ph.D. students and the improved climate in EEB (as noted elsewhere in this report), and will hopefully have a positive outcome for support of the graduate program. Funding from LSA has been largely flat over many years and should increase to reflect the growing need for graduate support as well as the strength of the graduate program.

The Frontiers Masters program, while undeniably strong, has suffered from the shift in funding from the National Science Foundation to Rackham, and an associated lack of clarity in the mission of the program. When initially funded by NSF, there was no pressure on the program to matriculate students from Frontiers into the Ph.D. program in EEB. However, with the change in funding, faculty perceive pressure from the College to admit students to Frontiers who are likely to go on to pursue PhDs at the University of Michigan. This change in focus, from admitting Masters students who would benefit most from the program to admitting students most likely to continue to pursue Ph.D. degrees, may not best serve students who would benefit most from the program. Indeed students participating in the program may conclude that their best interests are served by pursuing a Ph.D. elsewhere or by moving into a career following their MS. The upcoming review of the Frontiers program by Rackham should prove informative for ensuring that this program remains strong in serving the needs of students.

#### *Recommendations for the Graduate Program*

- LSA and Rackham should increase support for the graduate program to match the improved climate and outcomes for graduate students.
- With this additional funding, the department should review its internal policies on admission and sources of funding (GSA, GSRA, Fellowships) to increase the size of the Ph.D. program from 12 to 15 students/cohort.
- The department should work with LSA and Rackham to clarify the goals and the admissions process for the Frontiers program to ensure that the student's best interests are prioritized in admissions decisions and the definitions of success of the program.
  - a. We recommend that program completion and post-degree placement should be used as metrics of success rather than matriculation to the Michigan EEB Ph.D. program. Enrolling in a Ph.D. program that better matches the student's interests and/or family responsibilities or entering the workforce should be viewed as an indication of the program's success.

#### **VII. Postdocs**

*Strengths:* The four postdoctoral fellows that met with the review committee were pleased with their experience. They indicated that they had joined the program based on the excellent

reputation of the faculty, and the resources provided by the collections. They praised the mentorship that they were receiving, not only in their science but also in how to be a mentor and promote a diverse, inclusive environment.

*Challenges:* There are many intellectual, strategic, and equipment resources for postdocs in EEB, but they report that it is often difficult to locate them. For example, increasingly, postdocs in EEB have research programs suitable for applying for the NIH K99 award, yet they sometimes learn of this opportunity too late. Because many of the research resources for postdoctoral fellows are in the medical school, it can be difficult to find them, and then find the correct protocol to take full advantage of the equipment. Core facilities are mostly tailored for researchers in MCDB. The staff for these core facilities is also very overworked. The postdocs do not always know what they can and can't use. Postdocs also do not get retirement pay, which is an ongoing source of frustration. The Postdoc Association on campus is not an important resource for EEB postdocs and EEB could help provide more tailored career advice to their postdocs.

#### *Recommendations for Postdocs*

- Some EEB postdoc professional development would be welcome. There was an attempt to start these activities pre-COVID.
- The pandemic resulted in a loss of institutional knowledge that was traditionally conveyed from cohort to cohort. We recommend that the department be intentional about rebuilding the knowledge among trainees regarding how to access University resources.

### **IX. Department Administration, Staff, and Facilities**

*Strengths:* The department seems well staffed, with the exception of needing additional support in the teaching program and the vacant curator positions. The staff in the BSB and USB reported that they feel well-supported and part of a cohesive group. The new building promotes collaboration and interaction.

*Challenges:* EEB and MCDB have already outgrown the new space, and some faculty already feel as though they do not have access to adequate space. Since each “neighborhood” is controlled by a faculty member with space in that neighborhood, conflicts of interest in space allocation have emerged. In addition, malfunctioning built-in equipment has not only delayed research progress, but resulted in the loss of irreplaceable samples. The non-functional smoke shield blocks the light from entering the atrium. The administration suite is located in a hard-to-find corner of the building, which may make it difficult for students to drop in.

#### *Recommendations for the new building*

- Put neutral parties in charge of allocating space
- Attend to failing equipment

## X. Museums

*Strengths:* The University of Michigan's natural history collections are world-class and given their diverse biological sample availability across time, space, and diversity, this biodiversity infrastructure is an international treasure. The collections are staffed by experts with deep, authoritative expertise in natural history across plants and animals that is internationally recognized. The collections' staff use best practices in curation and work in an excellent renovated curatorial facility (RMC) with space for expansion and safe and permanent care of specimens. This new space includes cutting-edge analytical capabilities, cryobanking, 3D CT-Scanning, and molecular genetics. The planned pathogen identification and monitoring capabilities exemplify how collections can address some of the most pressing societal challenges such as disease emergence. There have been excellent, research-active curatorial hires in the last decade that demonstrate the potential of this facility. There also is a long tradition of using museum specimens in EEB course labs for undergraduate biodiversity courses (e.g., botany-related courses and so-called animal "ologies"). In the last two years, the introductory courses have taken a tour of the RMC (about 900 students annually) and surveys after these visits have reported very high student interest and appreciation for this resource.

*Challenges:* Student, staff, and faculty access to the remote RMC remains problematic with only a few shuttles each day. There are several challenges related to staffing. First is that the curatorial duties of the tenure-track faculty are not effectively acknowledged, and should be codified within the UM T&P process and recognized as an administrative duty that is distinct from teaching, research, and public service. The second challenge is that the staff (collection managers, and graduate assistants) need greater curatorial guidance and support. These staff members also need a clearly-defined promotional path that reflects their professional contributions to the University. A final challenge is that because the budget and leadership (i.e., directorship) for the RMC lies within EEB, the prominence of this facility is likely lower within the institution (vs. for example, the Field Station) and budgeting may be less secure as EEB Chairs rotate and priorities shift.

### *Recommendations for Museums*

- Establish regular, accessible, and timely transportation between the main campus and the RMC (e.g., extend existing bus lines that end nearby, establish electric shuttle transportation, etc)
- Create a promotion path for the collections managers
- Bring curators into national norms
  - Codify 'curation' within the T&P process
  - For tenure-track Curators, **increase commitment to curation at least 25% of employment** either through adjusting teaching load or adding summer salary compensation
  - Annually evaluate curatorial effort based on codified duties.
- Ensure that each division with the RMC is staffed with a **tenure track curator** to the maximum potential of this primary infrastructure. There exists an aggregated investment of time and money over many years and a trust invested in the University of Michigan to



maintain and explore the natural heritage of not only Michigan but many other biomes on the planet. When combined with the tremendous (in several cases currently unmet) potential of the RMC to uniquely contribute to the mission of the University of Michigan, these positions should be viewed as timely investments by the central administration that should not directly compete with other faculty hires in EEB. Current search and hiring decisions tend to conflict with the institutional need to fill these positions (a tension that is not unique to the University of Michigan).

- Collaborate with UM Foundation to develop a fundraising campaign to support specimen-based research and teaching initiatives, collections, and endowed faculty positions.
- Consider re-establishing the Director of Museum position to maximize the potential of the Museum in fundraising, research, and teaching initiatives, reduce the administrative burden on EEB, and raise the profile of the Museum within the university.