Priced out of belonging? Insufficient concessions on membership fees across international societies in ecology and evolution

Authors and affiliations:

- **Malgorzata Lagisz** (contact email: losialagisz@gmail.com)
  Evolution & Ecology Research Centre, School of Biological, Earth & Environmental Sciences, Kensington Campus, Sydney 2052 NSW, Australia; ORCID 0000-0002-3993-6127
- **Kevin R. Bairos-Novak**
  University of Queensland, School of the Environment, Brisbane 4072 QLD, Australia; ORCID 0000-0002-0152-1452
- **April Robin Martinig**
  University of New South Wales, Evolution & Ecology Research Centre, School of Biological, Earth & Environmental Sciences Kensington Campus, Sydney 2052 NSW, Australia; ORCID 0000-0002-0972-6903
- **Michael G. Bertram**
  Swedish University of Agricultural Sciences, Department of Wildlife, Fish, and Environmental Studies, Umeå SE-907 36, Sweden; Department of Zoology, Stockholm University, Stockholm 114 18, Sweden; School of Biological Sciences, Monash University, Melbourne 3800, Australia; ORCID 0000-0001-5320-8444
- **Ayumi Mizuno**
  University of New South Wales, Evolution & Ecology Research Centre, School of Biological, Earth & Environmental Sciences Kensington Campus, Sydney 2052 NSW, Australia; ORCID 0000-0003-0822-5637
- **Saeed Shafiei Sabet**
  University of Guilan, Fisheries Department, Faculty of Natural Resources P.O.Box 1144, Sowmeh Sara, Iran; ORCID 0000-0001-5919-2527
- **Matthieu Paquet**
  CNRS Theoretical and Experimental Ecology Station (SETE), UAR 2029 2 route du CNRS, 09200 Moulis, France; ORCID 0000-0003-1182-2299
- **Manuela S. Santana**
  Federal University of Paraná, Centre for Marine Studies, Pontal do Paraná - State of Paraná, 83255-000, Brazil; ORCID 0000-0002-4101-595X
- **Eli S. J. Thoré**
  Swedish University of Agricultural Sciences, Department of Wildlife, Fish, and Environmental Studies, Umeå SE-907 36, Sweden; TRANSfarm - Science, Engineering, & Technology Group, KU Leuven, Lovenjoel 3360, Belgium; ORCID 0000-0002-0029-8404

- **Nina Trubanová**
  University College Dublin, School of Biology and Environmental Science, Belfield, Dublin 4, Ireland; ORCID 0000-0001-8156-3304
- **Joanna Rutkowska**
  Jagiellonian University, Institute of Environmental Sciences, Faculty of Biology, Gronostajowa 7, 30-387 Kraków, Poland; ORCID 0000-0003-0396-1790
- **James A. Orr**
  University of Oxford Department of Biology, Oxford, UK; School of the Environment, The University of Queensland, Queensland 4072, Australia; ORCID 0000-0002-6531-5623
- **Elina Takola**
  Helmholtz-Centre for Environmental Research-UFZ, Department of Computational Landscape Ecology, Permoserstraße 15, 04318, Leipzig, Germany; ORCID 0000-0003-1268-5513
- **Yefeng Yang**
  Evolution & Ecology Research Centre, School of Biological, Earth & Environmental Sciences, Kensington Campus, Sydney 2052 NSW, Australia; ORCID 0000-0002-8610-4016
- **Patrice Pottier**
  Evolution & Ecology Research Centre, School of Biological, Earth & Environmental Sciences, Kensington Campus, Sydney 2052 NSW, Australia; ORCID 0000-0003-2106-6597
- **Dylan G. E. Gomes**
  United States Geological Survey, Forest and Rangeland Ecosystem Science Center, Seattle, WA, 98195, USA; ORCID 0000-0002-2642-3728
- **Ying-Chi Chan**
  Swiss Ornithological Institute, Seerose 1, 6204 Sempach, Switzerland; ORCID 0000-0002-7183-4411
- **Zhenzhuo Xian**
  University of New South Wales, School of Biology and Environmental Science, Kensington Campus, Sydney 2052 NSW, Australia; ORCID 0009-0000-4272-4857
- **Caleb Onoja Akogwu**
  University of Chinese Academy of Sciences Department of BotanyNo. 201 Juifeng 1st Road, East Lake High-tech Development Zone, 430074, Wuhan, Hubie Province, China; CAS Key Laboratory of Plant Germplasm Enhancement and Specialty Agriculture, Wuhan Botanical Garden, Chinese Academy of Sciences, China; ORCID 0009-0004-8342-4964
- **Szymon M. Drobniak**
  Jagiellonian University, Institute of Environmental Sciences, Gronostajowa 7, 30-387 Krakow, Poland; University of New South Wales, School of Biological, Environmental and Earth Sciences, Sydney, Australia; ORCID 0000-0001-8101-6247

- **Shinichi Nakagawa**
  Evolution & Ecology Research Centre, School of Biological, Earth & Environmental Sciences, Kensington Campus, Sydney 2052 NSW, Australia; ORCID 0000-0002-7765-5182

Authors' contributions (following CRediT):

Conceptualisation: Malgorzata Lagisz. Data curation: Malgorzata Lagisz, Kevin R. Bairos-Novak, April Robin Martinig, Michael G. Bertram, Ayumi Mizuno, Saeed Shafiei Sabet, Matthieu Paquet, Manuela S. Santana, Eli S. J. Thoré, Nina Trubanová, Joanna Rutkowska, James A. Orr, Elina Takola, Yefeng Yang, Patrice Pottier, Dylan G. E. Gomes, Ying-Chi Chan, Zhenzhuo Xian, Caleb O. Akogwu, Szymon M. Drobniak, and Shinichi Nakagawa. Formal analysis: Malgorzata Lagisz. Investigation: Malgorzata Lagisz, Kevin R. Bairos-Novak, April Robin Martinig, Michael G. Bertram, Ayumi Mizuno, Saeed Shafiei Sabet, Matthieu Paquet, Manuela S. Santana, Eli S. J. Thoré, Nina Trubanová, Joanna Rutkowska, James A. Orr, Elina Takola, Yefeng Yang, Patrice Pottier, Dylan G. E. Gomes, Ying-Chi Chan, Zhenzhuo Xian, Caleb O. Akogwu, Szymon M. Drobniak, and Shinichi Nakagawa. Methodology: Malgorzata Lagisz, Kevin R. Bairos-Novak, April Robin Martinig, Michael G. Bertram, Ayumi Mizuno, Saeed Shafiei Sabet, Matthieu Paquet, Manuela S. Santana, Eli S. J. Thoré, Nina Trubanová, Joanna Rutkowska, James A. Orr, Elina Takola, Yefeng Yang, Patrice Pottier, Dylan G. E. Gomes, Ying-Chi Chan, Caleb O. Akogwu, Szymon M. Drobniak, and Shinichi Nakagawa. Project administration: Malgorzata Lagisz and Shinichi Nakagawa. Resources: Malgorzata Lagisz and Shinichi Nakagawa. Software: Malgorzata Lagisz. Supervision: Malgorzata Lagisz and Shinichi Nakagawa. Validation: Malgorzata Lagisz, Kevin R. Bairos-Novak, April Robin Martinig, Michael G. Bertram, Ayumi Mizuno, Saeed Shafiei Sabet, Matthieu Paquet, Manuela S. Santana, Eli S. J. Thoré, Nina Trubanová, Joanna Rutkowska, James A. Orr, Elina Takola, Yefeng Yang, Patrice Pottier, Dylan G. E. Gomes, Ying-Chi Chan, Zhenzhuo Xian, Caleb O. Akogwu, Szymon M. Drobniak, and Shinichi Nakagawa. Visualization: Malgorzata Lagisz. Writing - original draft: Malgorzata Lagisz. Writing - review & editing: Malgorzata Lagisz, Kevin R. Bairos-Novak, April Robin Martinig, Michael G. Bertram, Ayumi Mizuno, Saeed Shafiei Sabet, Matthieu Paquet, Manuela S. Santana, Eli S. J. Thoré, Nina Trubanová, Joanna Rutkowska, James A. Orr, Elina Takola, Yefeng Yang, Patrice Pottier, Dylan G. E. Gomes, Ying-Chi Chan, Zhenzhuo Xian, Caleb O. Akogwu, Szymon M. Drobniak, and Shinichi Nakagawa.

All authors gave final approval for publication and agreed to be held accountable for the work performed therein.

Title

Priced out of belonging? Insufficient concessions on membership fees across international societies in ecology and evolution

Abstract

Learned societies, as professional bodies for scientists, are an integral part of the scientific system. However, their membership fees have the potential to be prohibitive to the most vulnerable members of the scientific community. To shed light on how membership fees are structured, we conducted a survey of 182 international learned societies relevant to researchers in ecology and evolution. We found that 83% of these societies offered fee concessions to students, but only 26% to postdoctoral researchers. An average regular membership fee was $67.8 USD, student fee – $27.4 USD (42.7% of the regular fee), and postdoctoral fee – $42.7 USD (52.9%). Other types of individual concessions, such as for emeritus, family, or unemployed, were rare (2–20%). Of the surveyed societies, 43% had discounts for members from developing countries (Global South). Such discounts were more common among societies located in high-income countries. Societies with a publicly visible commitment to equity, diversity, and inclusion, were more likely to offer different types of concessions. Currently, fees may prevent researchers from vulnerable and underprivileged groups from accessing multiple professional benefits offered by learned societies in ecology and evolution. We recommend tangible actions towards making learned societies more affordable and accessible.

Conflict of interest declaration:

The authors declare we have no competing interests except the following society memberships. M.L. is a member of the Society for Open, Reliable, and Transparent Ecology and Evolutionary Biology (SORTEE), and the European Society for Evolutionary Biology (ESEB); S.N. is a member of ESEB, SORTEE, the British Ecological Society (BES), and the Society for the Study of Evolution (SSE); S.D. is a member of ESEB, SORTEE, the European Ornithologists' Union (EOU), and the Evolution for Everyone (EvoKE) Society; A.R.M. is a member of the Animal Behavior Society (ABS), BES, the Ecological Society of America (ESA), the International Association for Landscape Ecology (IALE), the International Society for Behavioral Ecology (ISBE), SORTEE, and The Wildlife Society (TWS); M.P. is a member of the Association for the Study of Animal Behaviour (ASAB), EOU, ISBE, and SORTEE; E.T. is a member of the Ecological Society of Germany, Austria and Switzerland (Gesellschaft für Ökologie, GfÖ) and the Hellenic Ecological Society (HELECOS); Y.Y. is a member of SORTEE; Y.-C.C. is a member of SORTEE, the European Ornithological Union (EOU), and BES; P.P. is a member of the Australasian Evolution Society (AES), SORTEE, the Society for Experimental Biology (SEB), and ESEB; S.S.S. is a member of SORTEE; M.G.B. is a member of SORTEE, ABS, ASAB, the Australasian Society for the Study of Animal Behaviour (ASSAB), the Australian Society for Fish Biology (ASFB), the Fisheries Society of the British Isles (FSBI), the American Chemical Society (ACS), the International Bio-Logging Society (IBS), ISBE, the Society for Conservation Biology (SCB), and the Society of Environmental Toxicology and Chemistry (SETAC); C.O.A. is a member of the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), SORTEE, the International Association for Plant Taxonomy (IAPT), the Botanical Society of America (BSA), the Society of Systematic Biologists (SSB), SSE, and the Botanical Society of Nigeria (BOSON); J.A.O. is a member of SORTEE, BES; K.R.B.-N. is a member of SORTEE, SSE, and the Australian Coral Reef Society (ACRS); D.G.E.G is a member of SORTEE; E.S.J.T. is a member of SORTEE, and SETAC; M.S.S. is a member of SORTEE and SETAC; A.M. is a member of ISBE, SSE, and SORTEE; N.T. is a member of the Society for Experimental Biology (SEB).

Funding:

The authors acknowledge funding support from Australian Research Council (ARC) Discovery Project Grants (DP210100812 and DP230101248 to M.L. and S.N.), the Swedish Research Council Formas (2020-02293 to M.G.B.), the Kempe Foundations (SMK-1954, SMK21-0069, and JCSMK23-0078 to M.G.B.), the Natural Sciences and Engineering Research Council of Canada (RGPIN-2019-05520 to A.R.M), and the University of New South Wales' Scientia PhD scholarship support to P.P.

Acknowledgements:

We thank Jake Mitchell Martin for constructive comments on the protocol.

Keywords

career barriers; equity, diversity and inclusion; money; meta-research; open science; professional and academic organisations

1. Introduction

The need to belong is fundamental to humans. Being part of one or multiple groups is not just a matter of personal self-worth [1] but is beneficial for social and professional success. Filling this space, professional organisations for scholars and academics of various kinds (herein referred to as 'learned societies') have existed for several hundred years — e.g., The Royal Society of London for Improving Natural Knowledge dates back to the mid-17th century. From the very start, learned societies brought together like-minded people, fostering scientific communication, gradually expanding organisations' core missions and functions, branching into specialised areas, but also merging and growing into powerful institutions and communities [2,3]. What unites various learned societies, from local to international, and from specialist to interdisciplinary, is a dedication to innovation and/or community support, as often proclaimed in their mission and vision statements [4].

The last several decades have seen a growing commitment to address inequities and biases omnipresent in science and academia [5,6]. In this regard, equity, diversity, and inclusion (EDI) committees and officers are expected to initiate and oversee policies and actions that aim to recruit and support members from historically and currently underrepresented and underserved groups and backgrounds in science [7]. We are beginning to see more dedicated awards and prizes, networking events, mentoring programs, travel grants, discounts for attending meetings, workshops, and courses targeted towards marginalised and underprivileged groups (e.g., [8]).

Before gaining the support and opportunities provided by learned societies, one usually needs to become a member by paying membership fees. Such fees can be a barrier for some, preventing them from joining or renewing their membership [9]. Considering this, societies can introduce concessions, usually in the form of fee discounts or waivers. Such concessions can target groups of members that have traditionally been perceived as being the least likely to afford membership fees—for example, students, early-career (postdoctoral) researchers, or retirees. Further, societies with an international membership base can differentiate their fees based on the country of residence of prospective members. Other types of potential concessions can be based on personal circumstances, such as current income levels.

Practices related to making membership accessible differ among societies [10]. However, when societies fail to consider multiple factors that can influence the affordability of fees, they may propagate and reinforce existing group-level and individual biases in academia. Specifically, by making membership financially inaccessible, societies could contribute to the 'Matthew effect' where relatively privileged groups become more privileged by gaining access to more resources and opportunities via cumulative advantage [11]. Conversely, people with limited financial resources and who are not eligible for special considerations to apply for society memberships, could miss out on career-building opportunities, advice, inspiration, networking, and community, and can slide further behind through cumulative disadvantage.

Societies can change their fee structures to improve accessibility. Such actions are likely aligned with greater awareness and commitment to fostering EDI in science [5]. Recognising EDI as central to membership affordability could trigger a cascade of positive change, where an increasing number of societies would implement more inclusive membership practices,

67 especially if they can see that such practices have already been successfully implemented by
68 highly respected organisations [12].

69 Here, we focus on the fields of ecology and evolution to examine EDI questions in membership
70 fee structures. Ecology and evolution both are hyper-diverse fields, drawing researchers from
71 various countries and institutions from around the globe to international learned societies.
72 However, it is likely that most societies originate or exist to date as elite institutions in more
73 developed countries (represented by the Global North), which can affect their accessibility for
74 members from other regions and underrepresented groups. Thus, a thorough evaluation of the
75 range and inclusiveness of fees charged by ecology and evolution societies is warranted.

76 Aims and approach

77 The overarching aim of this work is to collate relevant evidence and advocate for change. To
78 achieve this aim, we conducted a survey focused on current practices related to structuring
79 membership fees across international learned societies that are broadly relevant and/or popular
80 among ecology and evolutionary biology researchers. From publicly available information, we
81 collected data on membership fee structures and amounts, as well as auxiliary data on the learned
82 societies themselves, and advertised membership benefits. We used this data to answer the
83 following research questions, grouped into five themes:

84 a) Individual full membership, student, and postdoctoral researcher fees: What are currently
85 the standard individual membership fees, student membership fees, and
86 postdoctoral/early-career researcher membership fees? By how much are the concession
87 fees reduced relative to the standard membership fee? For how many years are

postdoctoral researchers eligible for discounts (in terms of the number of years post-PhD or the total number of eligibility years)?

b) Country-level fee discounts and waivers: What is the geographical distribution of the locations (headquarters / registration / incorporation country and continent) of the international societies in ecology and evolution? Does geographical distribution affect membership pricing? Are discounted or waived fees available for individual members from some countries or regions? How are such countries or regions defined? Do societies from countries with developed economies discount rates for members from countries with developing economies? Do societies from countries with developing economies increase their rates for members from other countries?

c) Individual-level discounts and waivers: Are discounted individual membership fees currently available for the following groups: students, postdoctoral researchers, retired / emeritus, unemployed, employed part-time, junior (pre-university), family, educators / outreach / communication non-academic specialists, general community / public, or any other groups? Are complete or partial individual membership fee waivers currently available on individual request? How are they defined and who is eligible?

d) Societies' EDI characteristics: Do societies with a commitment to EDI state on their website or in their policy documents (or having dedicated EDI structures) offer a more inclusive individual membership fee structure (e.g., lower fees, more options for concessions)?

e) Membership benefits: What are the tangible benefits of individual society membership (e.g., opportunities to apply for awards, travel grants, conference fee discounts, journal subscription discounts)?

2. Methods

This project is registered with the Open Science Framework (https://osf.io/r3764/?view_only=a7d7b54cfd434ca69a26c58f0f0281c9). We developed the protocol during a Society For Open, Reliable, And Transparent Ecology and Evolutionary Biology (SORTEE) hackathon, which was held online on 18 October 2023. In Table S1, we present working definitions of the key terms used to define the scope of our work and inclusion criteria for data collection. Note that we consider a society to be "international" if a society has international reach, including having (or claiming to have) international chapters or activities in collaboration with societies from other countries. Additional methodological details are provided in the Supplementary Information files.

(a) Data compilation

We conducted a survey focused on current practices related to membership fees across international learned societies related to ecology and evolution (including whole-organism biology and ecosystem / environmental sciences). To compile the initial long list of potentially relevant societies, we consulted related literature (e.g., [13]), checked societies associated with journals from the SCImago category 'Ecology, Evolution, Behaviour, and Systematics', searched societies listed on Wikipedia, and received specialists' recommendations. This resulted in a long list of 215 societies, which is provided in the registered OSF protocol (https://osf.io/r3764/?view_only=a7d7b54cfd434ca69a26c58f0f0281c9). We then excluded societies without the option of individual membership (e.g., societies that are aggregations of

other societies or only offer institutional memberships), inactive societies, and societies without any international aspects or activities, as judged from publicly available online documents. After this initial screening, 184 societies remained for data extraction. During data extraction, after further examination, another two societies were deemed ineligible (one due to not being relevant to ecology or evolutionary biology and one as not being international).

(b) Data collection items

Table S2 presents a detailed list and descriptions of extracted data items. In brief, the extracted items included society identity information (full name, web page address, country of its headquarters / registration / incorporation), scope of its activities / membership (society type), and presence of EDI statements or structures on the society website. We then extracted data on each society's individual membership fee structure: the amount of annual regular fee, postdoctoral researcher and student fees, fee currency, types of other discounted membership fees available (namely: retired / emeritus, unemployed, family, junior, community, professional, other), and other characteristics of the fee structure, including currency. We also coded six categories of advertised society membership benefits (namely: conference registration discount or waiver; funding (e.g., travel awards/grants, research funding, prizes); journal subscription discount or waiver; publication fees (APC) discount or waiver; networking or professional development (e.g., membership platform, mentoring, exclusive webinars, workshops, training courses); other). We accompanied coded data with comments on the context (e.g., web links, text quotes) and notes on justifications and assumptions made when extracting data to make the data extraction process replicable. We extracted all data in duplicate (i.e., two individuals independently extracted data from each society) after an initial round of piloting and training on three randomly selected societies.

(c) Data analysis

We analysed the final consensus dataset using R computational environment v.4.3.2 [14] in RStudio v.2023.12.0+369. Full session information, including R packages used and all R code and outputs, are included in Supplementary File 1.

During data processing, we first removed data on societies that were deemed ineligible at the data extraction stage. We then counted and removed data on nine societies that did not have any publicly available information on their fees, and four societies that offered free membership for anyone (and, thus, had no fee structure). For the remaining data, we converted all recorded fee values (for standard / regular / full individual membership, student membership, and postdoctoral researcher membership) from their original currencies into United States dollars (USD). We used USD exchange rates from 2024/02/23, as listed on Google Finance (www.google.com/finance/).

We then followed the steps outlined in the registered protocol (https://osf.io/r3764/?view_only=a7d7b54cfd434ca69a26c58f0f0281c9) to summarise and visualise data across 169 societies to answer our pre-planned research questions. We summarised the dataset by extracted categorical variables and visualised pooled data relevant to each of our main questions. In brief, we examined the relationship between the full fee amount and the amounts charged for two main types of concession fees (student and postdoctoral researcher). We compared the fee amounts between societies based in Global North versus Global South countries, using to the United Nations List of Global South Countries (https://worldpopulationreview.com/country-rankings/global-south-countries). Further, we tested the association between the presence of EDI statements / structures and the amount of student and postdoctoral researcher discount relative to the full membership fee. Finally, we examined

the association between the presence of EDI statements / structures and the numbers of discount categories, as well as the presence of country-level fee discounts, increases, and other kinds of concessions coded in our dataset.

(d) Deviations from the protocol

We followed our study protocol with four exceptions and additions. First, during data extractions, we additionally coded which societies did not publicly present any information on their fees (e.g., fees or membership were mentioned, but fee descriptions were missing, claimed to be in preparation or temporarily suspended, membership is obtained by attending a conference / meeting, fees information only available upon request). Second, we coded which societies had their fees publicly shown in more than one currency. Third, instead of a Chi-square test, we used a Fisher's exact test for count data, due to small sample sizes [15]. Fourth, when comparing the fees of societies with and without EDI statements, instead of logistic regression, we used two-sample *t*-tests for independent samples and without assuming equal variances. This is because we assume that the presence or absence of EDI statements is more likely to drive or be associated with differences in fees across learned societies rather than the other way around.

3. Results

Our dataset consists of 182 societies that fulfilled our inclusion criteria. However, nine societies did not present extractable information on their individual fee amounts (the Australasian Evolution Society, the Asian Society of Vector Ecology, the Gazi Entomological Research

Society, the International Network for the Study of Asian Ants, the International Society for Systems Biology, the Iranian Society of Ichthyology, the Romanian Society of Palaeontologists, the Latin American Society of Bryology, and the Society for Vector Ecology) and four societies offered free membership to everyone (the European Ornithologists' Union, the European Pond Conservation Network, the International Association for Ecology, and the International Council for the Exploration of the Sea), thus we could not extract the fee discounts data for these societies. For the remaining 169 societies, we present detailed results structured by the five themes of our project below.

(a) Individual full membership, student, and postdoctoral researcher fees

Figure 1A shows data on fees charged in three individual membership categories across the 169 included societies with usable data (see above). Regular (full) individual membership ranged from 1 to 271 USD per year (mean = 67.8, median = 56.0). Student memberships were offered by 141 societies (83.4%) and ranged from $0 to $120 USD per year (mean = 27.4, median = 25.3). Student fees were typically around 40% of the regular fee (mean = 42.7, median = 44.4; Figure 1B). Only 44 societies (26.0%) offered postdoctoral researcher memberships, which varied in price from $0 to $119 USD per year (mean = 48.0, median = 49.0), and were around 50% of the regular fee (mean = 52.9, median = 50; Figure 1B). Out of 44 societies with postdoctoral researcher concessions, 15 reported eligibility timeframes for this member category, which were typically around 5 years (range = 3 to 8 years, mean = 4.9, median = 5 years post-PhD). Overall, fees higher than 50 USD were common for regular members (56.8% of the surveyed societies) and postdoctoral members (38.6%), but uncommon for student members

(6.4%). On top of the membership fees, 55.0% of the surveyed societies accepted voluntary monetary donations, usually through a link from their website to a payment portal.

(b) Country-level fee discounts and waivers

The 169 societies in our dataset were formally linked (e.g., incorporated / registered) to 28 countries across six continents. However, the United States of America (US; 50%), followed by the United Kingdom (UK; 12%), were the two dominating countries (Figure S1). This was also reflected in the frequencies of the listed currencies of the membership fees (Figure S2; USD 54%, EUR 15%, GBP 11%; Figure S2). Six Global South countries (India, Argentina, Kenya, South Africa, Brazil, and Philippines) were the base countries of 18 societies in our dataset (11%).

Societies' locations were linked to membership pricing. The average price (in USD) of regular individual membership was lowest for societies based in Africa, South America, and Asia (Figure 2A). A similar pattern was evident when base countries were grouped into Global South and Global North categories (Figure 2B), with Global North having significantly higher standard membership fees (Cohen's $d = 1.55$, $n_{GN} = 151$, $n_{GS} = 18$, $t = 10.8$, $p < 0.001$).

Country-level concessions were common. Overall, 43% of societies offered discounted or waived fees for individual members residing in selected countries or regions (Figure S3). Such countries or regions were usually defined in the eligibility criteria using words related to the country's economic development status or average personal income levels (Figure S4). Societies based in the Global North or Global South were offered country-level membership concessions at similar rates (Fisher's Exact Test for Count Data OR = 0.65, 95% CI = 0.188 to 1.978, p =

0.458; Figure 2C). Conversely, 13% of societies imposed higher than regular fees on individual members from other countries or regions (Figure S5). Such countries or regions were defined in the eligibility criteria using words related to the member's country of residence being outside, overseas, or foreign to the society's base country (Figure S6). Societies based in countries classified as Global South more often imposed increased fees for members from outside their country or region than Global North societies (Fisher's Exact Test for Count Data OR = 34.823, 95% CI = 9.490 to 151.962, $p < 0.001$; Figure 2D).

(c) Individual-level discounts and waivers

Societies varied in types and combinations of individual-level discounts (Figure 3). Student discounts were, by far, the most common (82%; Figure S7). Retired and emeritus members came next, but were not ubiquitous (38%). Postdoctoral researchers could get fee discounts in only a quarter of societies (24%) and family members in a fifth (20%). The fee category coded as 'other' appeared in 19% of the societies, but it was a composite of diverse types of concession memberships, such as honorary, group, institutional, lifelong, multi-year, donation, and some unclear options. Concession types that had limited popularity targeted non-academic specialists, young, unemployed, employed part-time, and members of the general community / public (3–11%). Only four societies (3%) structured their fees using a 'sliding scale' approach with fees proportional to personal income brackets. However, seven societies (4%) had a 'free' option and three societies (2%) allowed members to pay however much they could afford (discretionary fee amounts). This contrasts to the approach taken by 15 societies (9%) that offered no discounts of any kind.

One-third (36%) of the societies offered only one type of discount (Figure S8), usually for students. One quarter (25%) offered two, and one-fifth (20%) offered three types of discounts. Societies that offered more than three types of discounts made up the remaining 19%. On top of this, 15% of societies offered complete or partial fee waivers on individual requests. However, such on-demand fee waivers were sometimes exclusive to students or residents of developing countries, racial or ethnic minorities, or were limited to a maximum duration of one year. They typically required a written application with justification for the waiver request. One society offered potential fee waivers in exchange for in-kind contributions.

(d) Societies' EDI characteristics

Around half (47%) of the societies publicly expressed their commitment to EDI on their website or policy documents. These societies usually also had EDI-dedicated structures, such as a committee or officers (76%; Fisher's Exact Test for Count Data OR = 132.6, 95% CI = 30.876 to 1198.517, $p < 0.001$; Figure S10; due to this strong overlap, we focused on EDI statements only thereafter) and were more likely to be based in Global North countries (51% of societies from Global North vs. 11% of Global South; OR = 0.12, 95% CI = 0.01 to 0.54, $p = 0.002$; Figure S11). On average, societies with and without public EDI statements had similar relative levels of student and postdoctoral researcher concessions (Figure 4A). In contrast, societies with EDI statements often had a membership fee structure with more options for discounts in comparison to societies without EDI statements (Figure 4B). The former were also more likely to offer country-level discounts (Fisher's Exact Test for Count Data OR = 4.709, 95% CI = 2.351 to 9.687, $p < 0.001$; Figure S12), and less likely to impose increased fees for members from outside

283 their country or region (Fisher's Exact Test for Count Data OR = 0.272, 95% CI = 0.075 to
284 0.813, $p = 0.013$; Figure S13). Further, EDI statements were associated with a higher presence of
285 fee waivers on individual request, and concessions for students, postdoctoral researchers,
286 retirees, and non-academic specialists (Figures S14-S18). In contrast, we found no effect on
287 discounts for part-time or unemployed researchers, general community/public, family, junior,
288 sliding scale, discretionary fee amounts, or a 'no fee' option (Figures S19–S27).

289 ## (e) Membership benefits

290 Almost all (95%) of the included societies publicly listed tangible benefits provided for their
291 members. These benefits were grouped into six categories during data extraction. Among the six
292 categories, free or discounted journal subscriptions were the most common (70%; Figure S35),
293 followed closely by various networking opportunities (67%), conference registration discounts or
294 waivers (64%), and then funding and recognition opportunities via travel awards, research
295 grants, prizes, etc. (58%). Further, around a third (38%) of the societies offered discounts or
296 waivers of article processing charges (APC) in society-affiliated journals. Other benefits
297 included a broad variety of items ranging from free newsletters, discounts on purchasing books
298 from supporting publishers, discounts on joining partner societies, access to society's physical
299 library, podcast series, field trips, job placements, and even the use of a designated suffix after a
300 member's name. Most societies (67%) offered at least three types of membership benefits in
301 many different combinations (Figure 5).

302

4. Discussion

Our survey revealed the distribution of current practices related to structuring individual membership fees, benefits, and characteristics of learned societies in ecology and evolution. We discuss our findings, acknowledge limitations, and then provide recommendations for making membership fees more transparent and inclusive.

(a) Individual regular membership, student, and postdoctoral researcher fees

We found that regular individual membership fees often exceed $50 USD per year per member (57% of the surveyed societies). The membership fees were usually (83% of the surveyed societies) discounted for students to around 50% of the regular fee. However, only 26% of the societies offered similar concessions to other early-career researchers after PhD completion, and they were sometimes only eligible for up to five years. There are three major points to consider for interpretations and implications of our findings.

First, we should not see each membership fee as a one-off expense or separately from other memberships. According to two large-scale cross-disciplinary surveys conducted by Wiley [16], 41–44% of respondents were members of at least three societies and senior researchers were more likely to join multiple societies than junior researchers. Survey respondents also identified the loss of a funding source as the important barrier to joining a society and the most common reason behind letting their membership lapse. Such a pattern could be driven by the limited affordability of memberships to junior researchers who, despite concessions, cannot afford to pay for multiple memberships or for consecutive years, especially if their financial situation changes.

Conversely, an ad-hoc survey among the 21 authors of this work revealed that we held, on average, 3.7 memberships in 2023 (median = 3, min = 0, max = 11), but had to pay out of pocket for, on average, 1.7 memberships (median = 1, min = 0, max = 11). Four of the authors were eligible for free memberships, thus lowering the proportion of the fees that had to be paid privately. One author noted that their employers would not cover any membership fees and they had no other option but to pay out of pocket. Over half (13 out of 21) wished they could become a member of additional societies in 2023 but could not afford to (Supplementary Table S3).

Second, we can see that three-quarters of the societies surveyed may assume that concessions are no longer needed after PhD completion. Such an assumption could be interpreted as a legacy of the times when career prospects and financial realities were more optimistic for early- and mid-career researchers. As of the 21st century, survey after survey shows that postdoctoral researchers face deteriorating career prospects linked to growing job and financial insecurity, competitiveness, and earnings disproportionate to the increasing workloads [17–20]. Many have to carry student debts that are also growing in recent years for PhD holders, and which tend to disproportionately affect minority groups [21]. Further, the economically precarious postdoctoral stage is getting longer and now it often takes over 10 years to reach relative stability and benefits of a permanent role, if ever reached [22–24]. Further, mid-career is often the period of personal lives in which many face the financial implications of starting a family or caring for dependents [25]. Thus, the postdoctoral stage is when the most vulnerable members of the academic community slow down their careers or leave academia altogether [23].

Third, structuring fees by career stage ignores individual variation in access to resources, including research funding as well as personal funds. From the perspective of researchers or students from well-funded labs and organisations, the current fee amounts may seem reasonable

and concessions generous. However, funding in many countries has shifted from internal or institutional to increasingly competitive, external, and/or project-based funds [26,27], which tend to be disproportionately concentrated in the hands of elite researchers and institutions [27–29]. At the same time, research funders may not allow the use of research grants for professional membership fees (e.g., Australian Research Council Discovery Project grants cannot be used for membership payments) or researchers may be limited by internal institutional policies (e.g., University of New South Wales normally allows one membership payment per researcher to be paid from grants, and CNRS none, others would not allow paying for Masters students). Thus, we need to also be able to empathise with the situation of many who find it difficult to pay for professional belonging, especially where they are assumed to have financial resources because they already completed their PhD program or live in a relatively wealthy country.

(b) Country-level fee discounts and waivers

Our survey revealed that most international societies relevant to ecology and evolutionary biology are located in the Global North countries (especially the USA and UK) and societies in the Global North charge higher fees compared to societies based in the Global South (or in Africa, South America, and Asia). Around half of the societies surveyed have discounted or waived fees based on the country of residence of the members. Country of residence is occasionally used to impose increased fees for overseas members, especially within societies based in the Global South. This raises three important questions for readers to ponder.

First, why does country-level fee differentiation exist? Concessions based on country of residence are appealing and popular because it is easy to verify eligibility by looking at members' institutional affiliation. Country-level concessions may appear equitable because categories of

countries based on their economic development generally overlap with total research funding per country [30]. What is seldom noted, however, is that country-level discounts usually only apply to researchers from least developed economies (Global South), thus countries that are in the middle of the development / wealth spectrum are often bundled together with top-income countries, which seems far from equitable.

Second, do discounts according to country classification (Global North vs. Global South, or development index) function as proposed in providing equitable access to learned societies? Observational studies can shed some light on this question. Particularly, the two cross-disciplinary global surveys by Wiley [16] found that early-career researchers from Asia or Africa were less likely to be society members than those from North America or Europe. This observation may be a sign that society membership fee discounts are insufficient, and that the reduced fees are still prohibitive to potential members from many Global South countries, or the benefits cannot be realised.

Third, is the country of residence a good proxy for the ability to pay membership fees? As discussed earlier, a simplistic country-level fee discount (or increase) ignores often vast within-country heterogeneity in personal wealth, income, and research funding. It also fails to capture other dimensions of diversity or circumstances beyond the current country of affiliation, for example, being a recent immigrant from a developing economy, or having part-time or no employment. Thus, societies introducing other types of concessions that are based on personal characteristics or considering fee discounts/waivers based on individual circumstances may provide more equitable alternatives to current discount policies.

(c) Individual-level discounts and waivers

In our survey, we found evidence of concessions being offered for all of the following member types: students, postdoctoral researchers, retired / emeritus, unemployed, employed part-time, junior (pre-university), family, educators / outreach / communication non-academic specialists, general community / public, and other categories. However, there are societies that offer no discounts (9%) or only have discounts for students (21%). Most of the time (61%) we found only one or two concession categories from our list, which were typically for students, postdoctoral researchers, or retired members. Nevertheless, we also identified 15% of societies with complete or partial fee waivers on individual request, but fewer with no payment or discretionary payment options (6% in total). We provide three important considerations when thinking of these findings.

First, student, postdoctoral researcher, and emeritus categories could be considered 'traditional' concessions, based on an assumption of a linear, uninterrupted, and ascending, academic career path [31]. Not surprisingly, these three concession categories were the most common in our survey; other types of concessions are still uncommon. We argue that consideration of other concessions is critical, as they normalise and accommodate both deviations from the traditional career trajectory and what member categories are considered 'acceptable' by learned societies. Societies that are more open and supportive to junior (pre-university) members, non-academics, families, or people on limited or with no employment are the ones truly embracing the spirit of EDI and Open Science [32].

Second, fees proportional to an individual's annual income are rare. The 'sliding scale' approach has been historically used to provide more equitable access to medical services [33] and it could in principle work for any income level. To be effective, the scale has to capture a globally relevant range of incomes rather than be based on typical academic salaries from developed

414 economies. The fees from the top of the scale have to be balanced to compensate for the lower,
415 or zero, fees at the bottom of the scale. While concessions proportional to income may address
416 inequalities linked to personal income (including part-time work or lack of employment), they
417 cannot deal with inequalities in research funding or past inequities. The drawback is that
418 concessions proportional to income may address inequalities linked to personal income
419 (including part-time work or lack of employment) but cannot deal with inequalities in research
420 funding or past inequities.

421 Third, complete or partial fee waivers on individual requests may sound like a perfect solution.
422 However, we noticed such waivers may be offered only to a limited range of members and for a
423 limited time. Further, having to prepare and submit a written application for such a waiver
424 creates additional burden and stigma. Stigma may come from having to reveal personal or work
425 circumstances, or discomfort of being subject to the power of a stranger deciding whether one
426 deserves a waiver [34]. Further, ethical concerns arise if we consider that such power imbalances
427 may align with historical lines of division between countries, race, gender, or class. To counter
428 this, fee waivers need to be completed and considered without any questions asked—in our
429 survey, we found some examples of such practices. Specifically, out of 169 societies, seven
430 offered a ‘zero fee’ membership option and another three allowed discretionary fee amounts.
431 This number is greater if we consider the additional four societies that offer free membership to
432 everyone. Free memberships could be subsidised via membership fees from well-resourced
433 members, donations (which many societies solicit anyway), or other sources of revenue, as
434 available.

(d) Societies' characteristics

Our survey shows that publicly stated commitment to EDI aligns well with having dedicated EDI structures and with more inclusive membership fee structures. The fee structures with more concession categories catered for a greater variety of potential members. EDI-committed societies were more likely to offer discounts based on country of residence or fee waivers on request. While this all sounds like reasons to rejoice, there are also three missing pieces here.

First, it might be easily overlooked that around half of the societies captured in our survey did not have public EDI statements and / or dedicated EDI structures. These statements and structures are needed to drive development of effective policies and actions directed at bringing and supporting diverse members. Lack of diversity has plagued learned societies since their origin and progress towards greater EDI is frustratingly slow [35–37]. This is perhaps reflected in our findings related to poor consideration of equity of the membership fee structures, overall.

Second, societies with public EDI statements were more likely to offer traditional fee waivers for students, postdoctoral researchers, and retired members, fee waivers on individual requests, but not other types of flexible or 'no questions asked' discounts accommodating personal circumstances. This may be explained by the overall low frequency of the latter types of concessions in the dataset. Implementing such trust-based concessions could be seen as risky by learned societies, but isn't science largely based on building trust [38,38–40]?

Third, it is unclear how the EDI statements, structures, and fees are mechanistically linked to each other. Specifically, do policies and structures advocate for more inclusive fee structures and remove obstacles to a diverse membership base? Or does a diverse membership base push

456 societies towards adapting mission statements and creating support structures? What is the most
457 effective path towards transforming culture and climate and providing equitable access for all?
458 Perhaps we need all of it happening at once [41–43].

459 (e) Membership benefits

460 The tangible benefits of individual society memberships are hard to capture because of their
461 diversity. Our survey categorised information provided on the web pages into six broadly defined
462 benefit categories. We showed that the benefits offered by the majority of the societies fall into
463 at least three of these categories. These most commonly are: free or discounted journal
464 subscriptions, conference registration discounts or waivers, and funding and recognition
465 opportunities via travel awards, research grants, and prizes. All of these can be considered as
466 substantial, or even critical, for career progression, but especially for groups and individuals that
467 cannot afford to pay membership fees [5].

468 Recommendations

469 Finally, we offer eight actionable recommendations to make membership fees of learned
470 societies in ecology and evolution more transparent and equitable. We believe that institutional
471 transparency and equity are needed to ensure that learned societies are inclusive and diverse,
472 representing and supporting all stakeholders who would benefit from the society memberships.

473 1) Raise awareness about EDI among the society members and the leadership. Buy-in from
474 leadership and/or those with the privilege and power to create change will be essential for
475 changing the membership fee structure.

2) Collect comprehensive membership diversity data. Using such data, identify areas that are deficient or require improvement, consider implementing more inclusive practices, and evaluate changes when new fee structures or EDI initiatives are introduced.
3) Make the diversity of the past and current membership base and the leadership team publicly visible, and consider intersectional aspects of diversity, e.g., by annually publishing aggregated data summaries. Making the invisible visible is key to driving action towards greater institutional equity.
4) Survey society members and relevant non-members, including lapsed members, on their fee structure preferences, and collect feedback after implementing changes. Pay special attention to the voices of historically underrepresented and marginalised groups and consider sliding-scale, discretionary, and zero-fee membership options, even if they require an honour system and are based on trusting members.
5) Consider actively broadening your membership base to non-traditional contributors from outside academia and make it affordable for them. Recognising the value of more diverse individuals, welcoming them, and providing tailored access can benefit academics and scientific research as a whole.
6) Make generous concessions for postdoctoral researchers. They are a large group often treated as an invisible part of the academic workforce, and increasingly burdened by a precarious economic situation.
7) Remove time limits for all concessions. Concessions are needed as long as a person is affected by their professional or personal circumstances and it is not equitable to assume that their situation will change dramatically after a year or a few years.

8) Be clear about membership benefits and how they apply to different member groups. Have them explicitly listed on the membership page, regularly updated, and linked to other relevant documents, as applicable.

Limitations

The results of our survey should be considered in light of four limitations. First, the survey only presents a snapshot of data at a given point in time. Thus, no inferences of time trends can be drawn. Second, we had no information on the membership base composition of the surveyed societies. Thus, we could not relate how this aspect is linked to membership fee structures. Third, we did not extract the full scale of available membership options available at some societies because we focused on the most common and comparable broader membership categories. Fourth, we excluded the 'lifetime membership' category from our data collection because we assumed that this option is not viable for people with limited or precarious financial resources.

Conclusions

Current membership fee structures often do not take into account the realities of diverse individual members. By creating barriers to professional belonging and membership benefits, societies themselves may contribute to research career precarity and inequality and limit the progress of science more generally. On a more positive note, we observed a noticeable alignment between societies with EDI statements and structures and the diversification of their membership options. This brings hope that the ongoing movement toward greater recognition of EDI as a critical aspect of a healthy scientific system will reshape learned societies as a place of opportunities and belonging for all.

Data accessibility

Upon acceptance, the dataset will be publicly available on a GitHub online repository and archived on the Zenodo Digital Repository. The data file, code, and detailed methods and results descriptions are provided at https://osf.io/v2shf/?view_only=26461cd2d74044a09356d1ddb7c55d8f.

References

1. Jetten J *et al.* 2015 Having a Lot of a Good Thing: Multiple Important Group Memberships as a Source of Self-Esteem. *PLOS ONE* **10**, e0124609. (doi:10.1371/journal.pone.0124609)

2. Gibson SS. 1982 Scientific Societies and Exchange: A Facet of the History of Scientific Communication. *The Journal of Library History (1974-1987)* **17**, 144–163.

3. Schwartz MW, Hunter ML, Boersma PD. 2008 Scientific Societies in the 21st Century: A Membership Crisis. *Conservation Biology* **22**, 1087–1089.

4. Zagrodzka ZB, Johnson TF, Beckerman AP. 2024 Accelerating the open research agenda to solve global challenges. *Ecology and Evolution* **14**, e10887. (doi:10.1002/ece3.10887)

5. Morris VR, Washington TM. 2018 The role of professional societies in STEM diversity. *Notices of the American Mathematical Society* **65**, 149–155. (doi:10.1090/NOTI1642)

6. Ross-Hellauer T, Reichmann S, Cole NL, Fessl A, Klebel T, Pontika N. 2022 Dynamics of cumulative advantage and threats to equity in open science: a scoping review. *Royal Society Open Science* **9**, 211032. (doi:10.1098/rsos.211032)

7. Madzima TF, MacIntosh GC. 2021 Equity, diversity, and inclusion efforts in professional societies: intention versus reaction. *The Plant Cell* **33**, 3189–3193. (doi:10.1093/plcell/koab186)

8. Cobian KP, Hurtado S, Romero AL, Gutzwa JA. 2024 Enacting inclusive science: Culturally responsive higher education practices in science, technology, engineering, mathematics, and medicine (STEMM). *PLOS ONE* **19**, e0293953. (doi:10.1371/journal.pone.0293953)

9. Veenstra BR, Lewandowski JC, Whitelock CM, Deziel DJ, Velasco J, Cortina C, Myers JA. 2022 Current trends in surgical society membership: What does the future hold? *The American Journal of Surgery* **223**, 455–458. (doi:10.1016/j.amjsurg.2021.12.033)

10. Parrish D. 2015 AFS Membership: How Much Should it Cost? *Fisheries* **40**, 95–95. (doi:10.1080/03632415.2015.1010720)

11. Merton RK. 1968 The Matthew effect in science. The reward and communication systems of science are considered. *Science* **159**, 56–63.

12. Strang D, Soule SA. 1998 Diffusion in organizations and social movements: From hybrid corn to poison pills. *Annual Review of Sociology* **24**, 265–290.

13. Lagisz M, Aich U, Amin B, Rutkowska J, Sánchez-Mercado A, Lara CE, Nakagawa S. 2023 Little transparency and equity in scientific awards for early- and mid-career researchers in ecology and evolution. *Nat Ecol Evol* **7**, 655–665. (doi:10.1038/s41559-023-02028-6)

14. R Core Team. 2024 R: A language and environment for statistical computing. R Foundation for Statistical Computing.

15. Kim H-Y. 2017 Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test. *Restor Dent Endod* **42**, 152–155. (doi:10.5395/rde.2017.42.2.152)

16. Roscoe J. 2020 Building new societies: Insights and predictions from the 5th Wiley Society Member Survey. *Learned Publishing* **33**, 29–36. (doi:10.1002/leap.1277)

17. Hardy MC, Carter A, Bowden N. 2016 What do postdocs need to succeed? A survey of current standing and future directions for Australian researchers. *Palgrave Commun* **2**, 1–9. (doi:10.1057/palcomms.2016.93)

18. Christian K, Johnstone C, Larkins J, Wright W, Doran MR. 2021 A survey of early-career researchers in Australia. *eLife* **10**, e60613. (doi:10.7554/eLife.60613)

19. Grinstein A, Treister R. 2018 The unhappy postdoc: a survey based study. *F1000Res* **6**, 1642. (doi:10.12688/f1000research.12538.2)

20. Powell K. 2015 The future of the postdoc. *Nature* **520**, 144–147. (doi:10.1038/520144a)

21. Hanson M. 2023 Average Graduate Student Loan Debt [2023]: for Master's & PhD. *Education Data Initiative*. See https://educationdata.org/average-graduate-student-loan-debt (accessed on 15 June 2024).

22. Hampton SE, Labou SG. In press. Careers in ecology: a fine-scale investigation of national data from the U.S. Survey of Doctorate Recipients. (doi:10.1002/ecs2.2031)

23. Sarrico CS. 2022 The expansion of doctoral education and the changing nature and purpose of the doctorate. *High Educ* **84**, 1299–1315. (doi:10.1007/s10734-022-00946-1)

24. Stephan P, Ma J. 2005 The Increased Frequency and Duration of the Postdoctorate Career Stage. *American Economic Review* **95**, 71–75. (doi:10.1257/000282805774669619)

25. Piano M, Diemer K, Hall M, Hui F, Kefalianos E, Lawford BJ, McKibbin G, Jarden RJ. 2023 A rapid review of challenges and opportunities related to diversity and inclusion as experienced by early and mid-career academics in the medicine, dentistry and health sciences fields. *BMC Medical Education* **23**, 288. (doi:10.1186/s12909-023-04252-x)

26. Aagaard K, Mongeon P, Ramos-Vielba I, Thomas DA. 2021 Getting to the bottom of research funding: Acknowledging the complexity of funding dynamics. *PLOS ONE* **16**, e0251488. (doi:10.1371/journal.pone.0251488)

27. Gläser J, Velarde KS. 2018 Changing Funding Arrangements and the Production of Scientific Knowledge: Introduction to the Special Issue. *Minerva* **56**, 1–10. (doi:10.1007/s11024-018-9344-6)

28. Larivière V, Macaluso B, Archambault É, Gingras Y. 2010 Which scientific elites? On the concentration of research funds, publications and citations. *Research Evaluation* **19**, 45–53. (doi:10.3152/095820210X492495)

29. Sattari R, Bae J, Berkes E, Weinberg BA. 2022 The ripple effects of funding on researchers and output. *Sci Adv* **8**, eabb7348. (doi:10.1126/sciadv.abb7348)

30. Skupien S, Rüffin N. 2020 The Geography of Research Funding: Semantics and Beyond. *Journal of Studies in International Education* **24**, 24–38. (doi:10.1177/1028315319889896)

598 31. Baruch Y, Hall DT. 2004 The academic career: A model for future careers in other sectors?
599 *Journal of Vocational Behavior* **64**, 241–262. (doi:10.1016/j.jvb.2002.11.002)

600 32. In press. UNESCO Recommendation on Open Science - UNESCO Digital Library. See
601 https://unesdoc.unesco.org/ark:/48223/pf0000379949 (accessed on 15 March 2024).

602 33. Hall MA, Schneider CE. 2008 Learning from the legal history of billing for medical fees. *J*
603 *Gen Intern Med* **23**, 1257–1260. (doi:10.1007/s11606-008-0605-1)

604 34. Harle J, Warne V. In press. Open Access: challenges and opportunities for Low- and Middle-
605 Income Countries and the potential impact of UK policy.

606 35. Morrow S. In press. Pathway to Diversity in STEM Review.

607 36. Graves JL, Kearney M, Barabino G, Malcom S. 2022 Inequality in science and the case for a
608 new agenda. *Proceedings of the National Academy of Sciences* **119**, e2117831119.
609 (doi:10.1073/pnas.2117831119)

610 37. Roscoe J. 2022 The need for accelerated change in diversity, equity and inclusion in
611 publishing and learned societies. *Learned Publishing* **35**, 481–488. (doi:10.1002/leap.1457)

612 38. Hardwig J. 1991 The Role of Trust in Knowledge. *The Journal of Philosophy* **88**, 693–708.
613 (doi:10.2307/2027007)

614 39. Wilholt T. 2013 Epistemic Trust in Science. *The British Journal for the Philosophy of*
615 *Science* **64**, 233–253.

616 40. Ledford H. 2008 Collaborations: With all good intentions. *Nature* **452**, 682–684.
617 (doi:10.1038/452682a)

618 41. Khan T, Abimbola S, Kyobutungi C, Pai M. 2022 How we classify countries and people—
619 and why it matters. *BMJ Glob Health* **7**, e009704. (doi:10.1136/bmjgh-2022-009704)

620 42. Prince LR, Francis SE. 2023 Barriers to equality, diversity and inclusion in research and
621 academia stubbornly persist. So, what are we doing about it? *Dis Model Mech* **16**,
622 dmm050048. (doi:10.1242/dmm.050048)

623 43. Al-Abadleh HA. 2023 A critical look at the practice and culture of science with calls to
624 action. *Commun Chem* **6**, 1–4. (doi:10.1038/s42004-023-00855-z)

625

626

Figure Legends and Figures

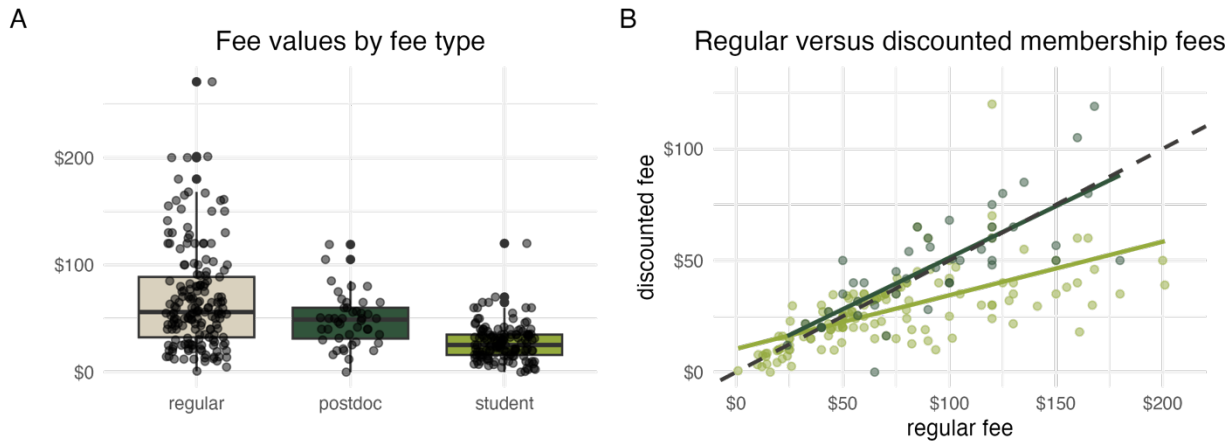
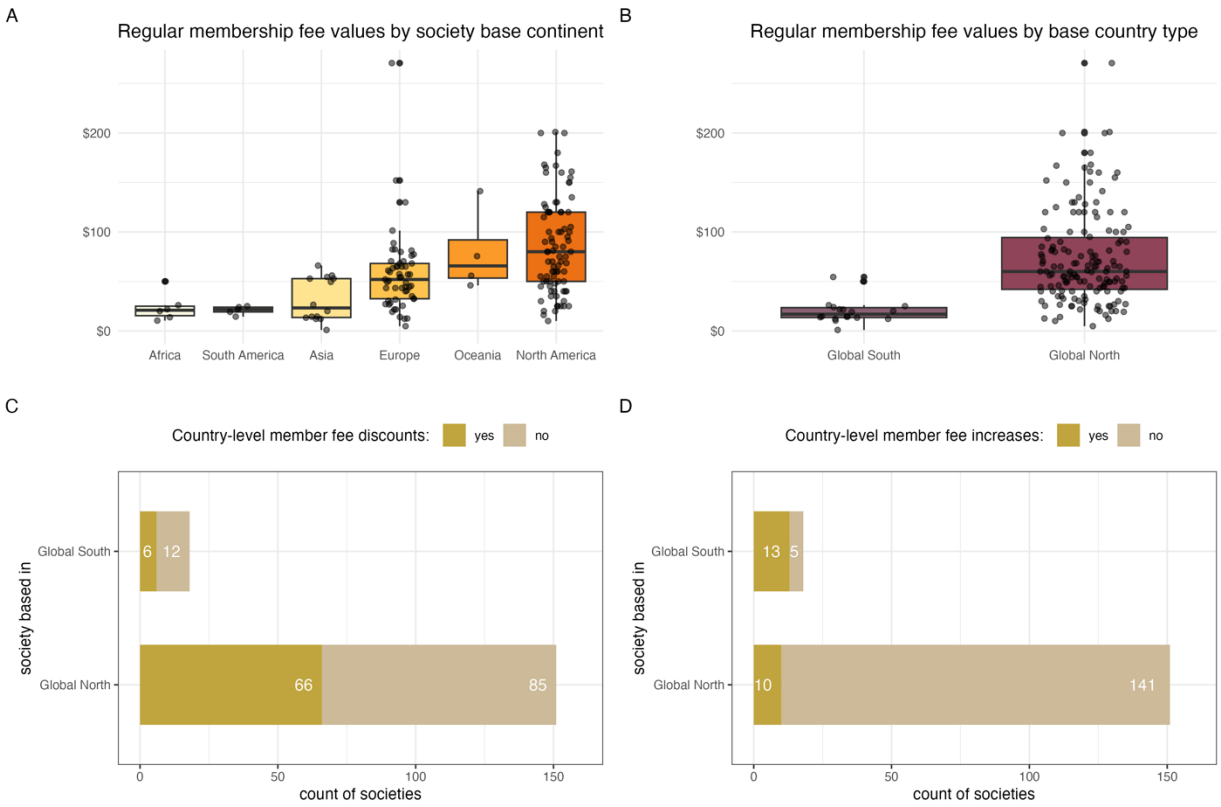
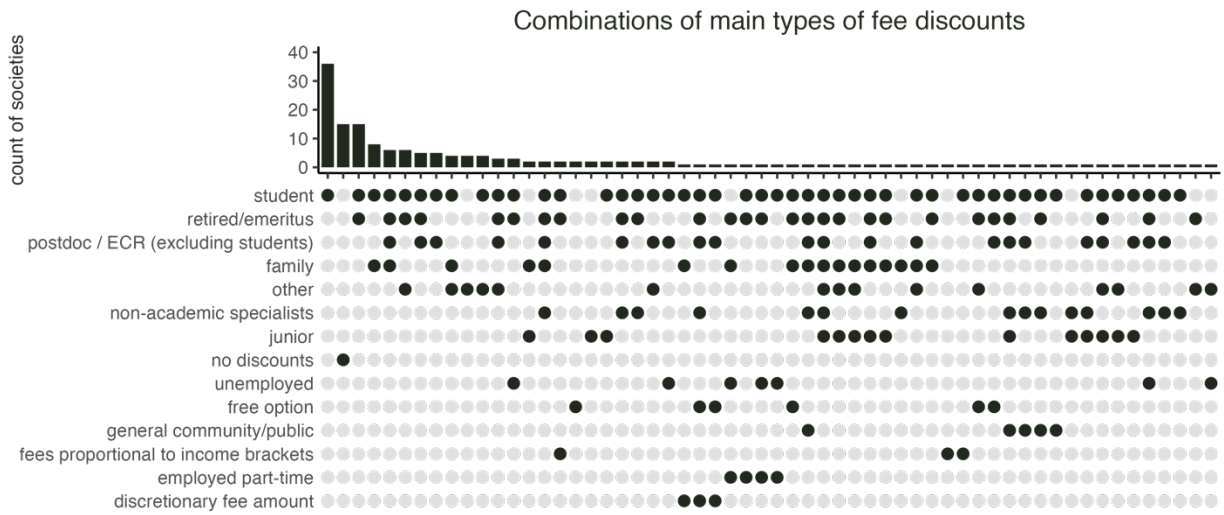


Figure 1. Comparisons of the three main categories of membership fees across 169 learned societies related to ecology and evolutionary biology. A - Distribution of the monetary amounts of regular, student and postdoctoral researcher individual membership fees. B - Regular versus discounted fees for students (lighter green) and postdoctoral researchers (darker green). The dashed diagonal line represents a 50% discount as a reference. "Postdoc" stands for "postdoctoral researcher".



635

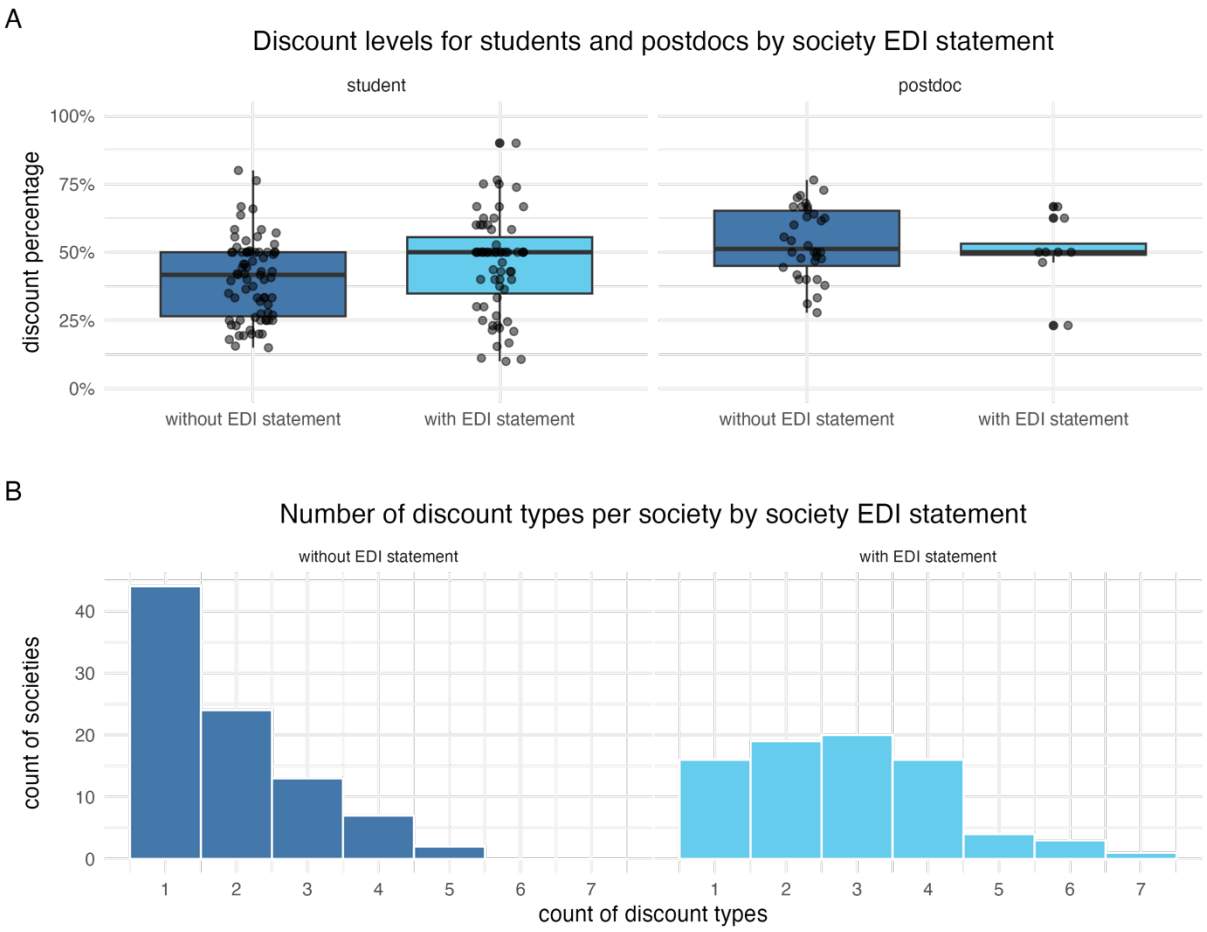
636 *Figure 2. Society base country and membership fees across 169 learned societies related to*
637 *ecology and evolutionary biology. A - Amounts (in USD) of regular individual membership fees*
638 *according to the continent on which society is based. B - Amounts (in USD) of regular individual*
639 *membership fees according to whether the society is based in a Global South or Global North*
640 *country. C - Availability of discounted or waived fees for members from other countries*
641 *according to whether the society is based in a Global South or Global North country. D -*
642 *Imposed increased fees for members from other countries according to whether the society is*
643 *based in a Global South or Global North country.*



644

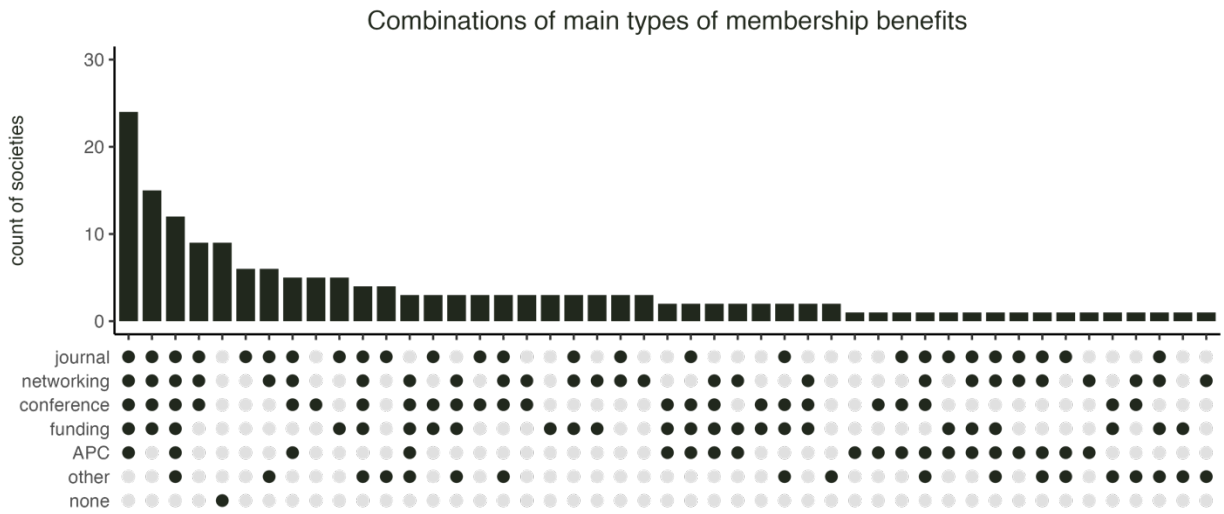
645 *Figure 3. Combinations of the main types of individual-level discounts across 169 learned*

646 *societies related to ecology and evolutionary biology.*



647

648 *Figure 4. Membership fee discounts in societies with and without public equity, diversity, and*
649 *inclusion (EDI) statements, across 169 learned societies related to ecology and evolutionary*
650 *biology. A - Student and postdoctoral researcher (postdoc) membership fees as a percentage of*
651 *the regular membership fee. B - Distributions of the number of available types of discounts per*
652 *society, as classified in our survey.*



653

654 *Figure 5. Combinations of the main types of membership benefits across 169 learned societies*

655 *related to ecology and evolutionary biology. 'None' stands for societies that did not publicly*

656 *describe any benefits for their members.*

Supplementary Information

Supplementary Methods

Longlisting

The initial list of societies was collated starting from a sample of 16 such societies identified in Lagisz et al. (2023). This list was then expanded by performing online Internet searches (DuckDuckGo: society|association ecology|evolution/biology membership; snowballing from the results), examining relevant Wikipedia pages (https://en.wikipedia.org/wiki/Category:Biology_societies, https://en.wikipedia.org/wiki/Category:Zoological_societies), personal recommendations from the team members, and by screening SCImago list of journals from SCImagojr 2022 Subject Category - Ecology, Evolution, Behavior and Systematics (https://www.scimagojr.com/journalrank.php?order=tr&ord=desc&category=1105; accessed on 30 October 2023).

Screening

The societies were then classified by whether they are international (as their statutory scope of work, or mention having members from multiple countries) and whether they offered individual memberships. Societies that appeared as inactive (no signs of activity on their Internet pages within the last three years or web pages not working) were also excluded. We noted that some of the included societies had no publicly available information on their membership fees (e.g., when the only joining option was by attending a conference, or the fee information was hidden until the application form had been filled in), and, as such, societies were excluded from full data extraction and analyses of the fees data.

Extractions

For data extraction, we only used publicly available documents, including society websites and online-posted documents (e.g., bylaws, policies, newsletters). During extractions, we reassessed eligibility of societies for full data extractions.

We performed data extraction independently in duplicate using a structured Google Form, representing our pre-piloted data extraction plan (tested on three societies before protocol registration and as a part of extractor training). The extractors were assigned to match their language skills to the language of the society, where possible, so that societies with webpages or documents in languages other than English had at least one extractor who could understand the language. To manage potential conflicts of interest or biases, extractors did not extract data from societies they are members of.

As part of our duplicate data extractions, we collected quotes from the websites and made additional comments on extracted values to justify any assumptions made and provide context. These quotes and comments were used to resolve any potential data extraction disagreements in coded items by a third independent researcher. If needed, the researcher performing data reconciliation referred to the original sources to cross-check the extracted information and used an interactive commenting function in Google Docs to resolve disagreements or missing data.

Before analyses, we archived snapshots of websites/documents containing membership fees information. We also noted which societies did not have any publicly available information on their fees and societies that had fees listed in more than one currency.

Analyses

We analysed the final consensus dataset using R computational environment v.4.3.2 (R Core Development Team, 2024) in RStudio v.2023.12.0+369. For the full record of our analyses, including R code and full session info, see Supplementary File 1.

Supplementary Tables

Table S1

Working definitions of the key terms used in the project.

Term	***Working definition***
Learned societies (=Societies)	Professional organisations led by scholars/academics/tertiary students and mainly (but not exclusively) targeting scholars/academics/tertiary students. This excludes societies exclusively focused on other types of professionals (e.g., practitioners, policy-makers), mainly targeting general public (e.g., conservation or education foundations / trusts), governmental and private science-related organisations (e.g., universities, institutes, centres, labs, zoological and botanical gardens, herbaria, museums).
International learned societies (=International societies)	Societies that claim to be international (e.g., by having a name implying involvement of multiple countries, by having explicit relevant statements in society descriptions, by claiming to have international members) or which appear to conduct international-level activities (e.g., organising international conferences).
Ecology and evolutionary biology-related learned societies (=EcoEvo societies)	Societies that claim to be catering for researchers from the fields of ecology and evolutionary biology (e.g., by having a name including relevant terms) or from the fields related to the whole-organism level or higher level research (e.g., specific taxonomic groups, ecosystems, biomes, biosphere), which are underpinned by ecological and evolutionary processes.
Membership fees	Fees paid by the members of learned societies for being considered as a member of such society. They may come with different sets of benefits and privileges and can have different fee amount levels. Donations that come without a membership status (even if associated with some benefits) are excluded.

Table S2

List of data items (variables and comments) extracted for each included society with relevant extractable data. Data items not included in the registered protocol are marked with *.

Data item name and description	*Data item type and options*
Extractor (full name of the extracting person).	Singular variable: text
Full name of the society (use the name from the master list, do not include or add abbreviated name).	Singular variable: text
Society info source Main source of society information (usually, the main webpage address of the society - **copy and paste the web link** here).	Singular variable: link
Society base country Country where society has been originally established / registered or has headquarters. Check the webpage footer, History and Contact info, if available. You may also need to check the formal documents of the society for this information (Bylaws, Constitution, etc.). Note: It will usually match the **currency** in which membership is paid, so if e.g. headquarters/chapters are in more than one country, only enter the country that matches the payment currency. Use the following abbreviations: USA and UK; for all other countries use the full name of the country.	Singular variable: text
Society type: ● International by name (society name includes 'International', or continent, or a broad region, or an equivalent term) ● National by name (society name includes the name of its country of origin, e.g. Japanese, Indian, British, American or equivalent) ● International by chapter (society claims to have international chapters / branches / sections, i.e. in other countries or regions than the original country, e.g. Ecological Society of America has a Latin America and the Caribbean Chapter) ● International by aims or scope of activities (select if none of the other options fit - i.e. only select this one if you did not tick any of the other boxes here)	Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no

Data item name and description	*Data item type and options*
EDI (Equity, Diversity, Inclusion) <u>statement</u> present Does the society have an EDI (Equity, Diversity, Inclusion) statement on the website or policy documents? Check on different subpages. If concepts related to EDI are only mentioned but not a focus of a given text passage, it should not count as an EDI statement.	Singular variable: yes / no
EDI (Equity, Diversity, Inclusion) <u>structures</u> present Does the society have an EDI (Equity, Diversity, Inclusion) structure (e.g, a dedicated committee, section, or an officer)?	Singular variable: yes / no
EDI comment Note or copy and paste any relevant information on EDI statement or structure (e.g., where it can be found).	Singular variable: text
Membership fees source Membership fees source of information (usually, a sub-page or a document). Ideally, copy and paste a link to an online page/document with information on membership fees. If not available, could be also a link to any document describing the fees. If you cannot find any information about the fees enter 'NA'. You can paste more than one link separated by a comma. [project leads will later download the screenshots of the relevant webpages / documents for archiving]	Singular variable: link
Currency of society fees Use **ISO 4217 currency codes** (e.g., USD, EUR, AUD).	Singular variable: text
Standard individual <u>regular</u> membership fee per year Only record the number, in the currency used by the society. If necessary, divide by the number of years the fee covers (e.g., for 3-year membership divide the fee by 3). For free membership, record 0. If information or a given fee type is not available, leave it empty. If multiple levels of regular fees are available (e.g., depending on country / region / income / mode of payment), record the highest one and add a comment below. **Exception:** if there is a lower fee without a mailed printed copy of a journal, select this online-only subscription fee category instead of a fee with a printed copy (here we assume it is not a significant benefit worth paying a higher fee and most regular members would be happy with online access only).	Singular variable: number

Data item name and description	*Data item type and options*
Comment on the standard individual <u>regular</u> membership fee per year Any comments, e.g. the name of the membership category used on the website, you can also copy and paste relevant text.	Singular variable: text
Standard individual <u>student</u> membership fee per year Only record the number, in the currency used by the society. If necessary, divide by the number of years the fee covers (e.g., for 3-year membership divide the fee by 3). For free membership record 0. If information or a given fee type is not available, leave empty. If multiple levels of student fees are available (e.g., depending on country / region / income), record the highest one and add a comment below. **Exception:** if there is a lower fee without a mailed printed copy of a journal, select this online-only subscription fee category instead of a fee with a printed copy (here we assume it is not a significant benefit worth paying a higher fee and most student members would be happy with online access only).	Singular variable: number
Comment on the standard individual <u>student</u> membership fee per year Any comments, e.g. the name of the membership category used on the website, you can also copy and paste relevant text.	Singular variable: text
Standard individual <u>Postdoctoral Researcher</u> membership fee per year Only record the number, in the currency used by the society. If necessary, divide by the number of years the fee covers (e.g., for 3-year membership divide the fee by 3). For free membership record 0. If information or a given fee type is not available, leave empty. If multiple levels of Postdoctoral Researcher fees are available (e.g., depending on country / region / income), record the highest one and add a comment below. **Exception:** if there is a lower fee without a mailed printed copy of a journal, select this online-only subscription fee category instead of a fee with a printed copy (here we assume it is not a significant benefit worth paying a higher fee and most postdoctoral researcher members would be happy with online access only).	Singular variable: number
Comment on the standard individual postdoctoral researcher membership fee per year	Singular variable: text

Data item name and description	*Data item type and options*
Any comments, e.g. the name of the membership category used on the website, you can also copy and paste relevant text.	
Eligibility time frame for standard individual postdoctoral researcher membership fee Only record the number of years representing either the number of years after PhD award when this fee category can be applied (e.g., within 2 years after PhD) or for how many years the fee category can be used (e.g., can be used for a maximum of 2 years). If no postdoctoral researcher fees or no information on the timeframe, leave empty.	Singular variable: number
Comment on the eligibility time frame for standard individual postdoctoral researcher membership Any comments, you can also copy and paste relevant text.	Singular variable: text
Discounted fees available for individual members from some countries or regions - Select 'yes' if the description mentions any discounts based on researcher location/affiliation. - Select 'no' if the description does not mention any discounts based on researcher location/affiliation (in the next question, you can copy and paste relevant text or make a note).	Singular variable: yes / no
Countries or regions eligible for discounted/waived fees Copy and paste from society documents (e.g., low-income countries, Global South, specific country names)	Singular variable: text
Comment on countries or regions eligible for discounted/waived fees Any additional comments (e.g., multiple discount levels, or additional conditions such as a limit on the number of years with discount)	Singular variable: text
Increased fees available for individual members from some countries or regions (e.g. outside society's home country) - Select 'yes' if the description mentions any fee increase based on researcher location/affiliation. - Select 'no' if the website / document does not mention any fee increase based on researcher location/affiliation (in the next question you can copy and paste relevant text or make a note).	Singular variable: yes / no

Data item name and description	*Data item type and options*
Comment on countries or regions eligible for <u>increased</u> fees Copy and paste from society documents (e.g., any foreign countries, developed countries, high-income countries, specific country names).	Singular variable: text
Discounted individual membership fees available for the following groups ● students ● postdoctoral researcher / ECR (excluding students) ● retired/emeritus ● unemployed ● employed part-time ● junior ● family ● non-academic specialists ● general community/public ● fees proportional to income brackets ● discretionary fee amount ● no fees ● other As stated in the membership information. More than one choice is possible. You can add comments below. - '**student**' includes university students at any level (undergraduate, postgraduate) - '**postdoc**' includes early career researchers (ECR) after PhD (excluding students) - '**junior**' includes pre-university students (e.g., high school) - '**non-academic specialist**' includes educators / outreach / communication and similar professionals - ignore **lifetime memberships (do not code them as 'other').**	Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no
Comment on groups eligible for discounted fees Any comments on the above categories (e.g., what are the 'other' discounts ps not captured above, time limits on discounts).	Singular variable: text
Complete or partial individual membership fee waivers available on <u>individual request</u> Code 'yes' if additional individual-based fee waivers/discounts available on request (e.g., due to any special circumstances). In the next question you can copy and paste relevant text from the website or make a note if no such document/information is available.	Singular variable: yes / no
Comment on <u>individual requests</u> for discounted fees or waivers	Singular variable: text

Data item name and description	*Data item type and options*
Wording of the eligibility criteria in relation to individual waivers or discounts (e.g., application procedure or no questions asked' fee waiver).	
Voluntary donations not linked to membership application Code 'yes' if society explicitly accepts or asks for such donations (e.g., on top of membership fee, or as a separate payment). This includes only donations that do not result in the membership status and do not come with any other direct benefits to the donating person, such as subscriptions, website access, etc.; donors names being listed somewhere are ok.	Singular variable: yes / no
Comment on voluntary donations not linked to membership application You can note anything relevant or unclear regarding donations.	Singular variable: text
Individual full membership benefits Select all applicable benefits for **full/regular/standard** members (excluding voting rights, volunteering etc.), as stated or inferred from the society website/documents. Focus on what s listed on the page advertising membership, you do not need to search the whole website to collect all activities society provides: ● Conference registration discount or waiver ● Funding (e.g., travel awards/grants, research funding, prizes) ● Journal subscription discount or waiver ● Publication fees (APC) discount or waiver ● Networking or professional development (e.g., membership platform, mentoring, exclusive webinars, workshops, training courses) ● Other	Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no Singular variable: yes / no
Comment on society membership benefits Copy and paste from the website/documents and add any relevant notes on the society membership benefits (e.g., define 'other', cannot find explicit information, no information / not clear what the benefits are, add any comments on special conditions and restrictions).	Singular variable: text
Comments_general Add any other notes and comments on issues, assumptions, or seeking additional information, for a given society in general.	Singular variable: text

Data item name and description	*Data item type and options*
***Censor-irrelevant** Recommendation to censor (exclude) a given society from data extraction and analyses because after closer examination it does not fulfil the inclusion criteria.	Logical variable: 0 = FALSE, 1 = TRUE
***Censor-noinfo** Recommendation to censor (exclude) a given society from data extraction and analyses because after closer examination it does not provide information about its individual membership fees.	Logical variable: 0 = FALSE, 1 = TRUE
***Multiple-currencies** Recording whether a given society lists its individual membership fees in more than one currency.	Logical variable: 0 = FALSE, 1 = TRUE

Table S3

Learned society memberships of the study authors in 2023. We conducted this self-survey in April 2024 by asking each co-author to record numbers of learned societies they joined in 2023 and for how many memberships they had to pay out of their own pocket. We separated the data into national or international ecological/evolutionary societies and other societies. Each row of data corresponds to a single author. All identifying information has been removed.

in 2023 member of how many international ecoevo societies?	in 2023 member of how many national ecoevo societies?	in 2023 member of how many any other learned societies?	in 2023 did you wish to be member of any other but could not afford to? [yes/no]	in 2023 for how many memberships you paid out of your own pocket?	any comments on 2023 memberships
2	0	2	yes	1	
5	2	2	no	1	
4	1	1	no	0	
7	0	0	yes	6	[Society] allowed me to pay what I could (so I registered for free)
4	1	1	yes	5	the ones I did not pay out of my own pocket were free
1	2	0	yes	3	

1	0	0	no	1	
3	0	0	no	0	[Society] was free because I am an Associate Editor
3	1	0	yes	0	
1	0	1	yes	0	
9	2	0	no	11	Paying for society membership through my Swedish university is not allowed, so I must pay all fees personally.
5	1	1	yes	1	The 5 new ecoevo and 1 new learned societies that I joined in 2023 all waived my membership fee.
2	1	1	yes	2	
2	1	0	yes	3	
1	0	0	yes	1	
2	0	0	yes	0	
1	0	0	no	0	
0	0	0	no	0	In 2024, I became a member of [Society] and one other learned society, both paid from my own pocket as a student.
0	1	0	no	0	
1	0	0	yes	1	
0	1	1	yes	0	I paid both learned societies' membership fees in 2022 (Does this count towards 2023?) - yes

69