Diversity at 100: women and underrepresented minorities in the ESA

Peer-reviewed letter

The 2015 Ecological Society of America (ESA) centennial celebration will recognize important efforts to recruit both women and underrepresented racial and ethnic minorities in the field of ecology (Bentley *et al.* 1993; Brewer *et al.* 2006; Ortega *et al.* 2006). To determine the impact of these efforts, we evaluated the degree to which ESA membership, governance structures, and awards reflect the diversity of the Society and of the US population as a whole.

We collated historical data for the ESA – including its governing board, journal editors, section and chapter officers, and award recipients – from the Society's websites, issues of the *Bulletin of the Ecological Society of America*, and ESA's Publications Office. We examined three periods of recent ESA history, determined by the publication dates of two reports from ESA's Women and Minorities in Ecology (WAMIE) Committee: pre-WAMIE I (the 14-year period between 1979 and 1992), between WAMIE I and II (the 14 years between 1993 and 2006), and post-WAMIE II (the 6-year period from 2007 to 2012). For detailed methods and results, see WebPanel 1.

Although the gender and racial composition of the ESA has changed markedly over the past 30 years, it still remains skewed as compared with the overall US population (Figure 1). In the ESA, the percentage of women increased from 23% to 37%, and the percentage of underrepresented minorities – excluding Asians/Pacific Islanders – more than doubled, from 4% to 9%. In the same period, US minority populations increased from 21% to 30%. Thus, minority populations in the US and in the ESA increased by a factor of 1.4 and 2.5, respectively. While these advances are laudable, minorities remain woefully underrepresented in the ESA.

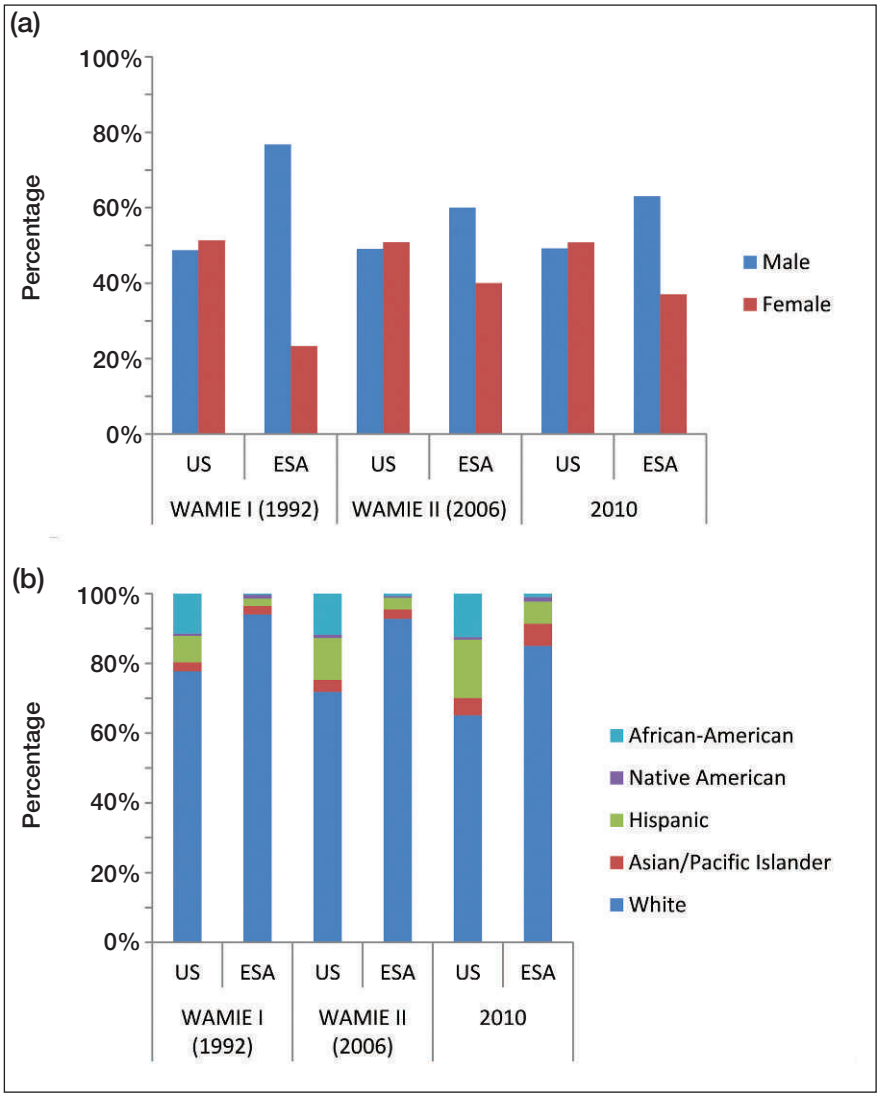

Figure 1. *(a) Proportion of males and females in the US population and ESA membership between 1992 and 2010. Note that the US Census and the ESA do not report statistics on transgendered individuals. We recognize that some ESA members may not identify as male or female, although data are generally lacking on this demographic (Lockwood* et al. *2013; D Reiners pers comm). (b) Changes in racial composition between 1992 and 2010 for the US population and ESA membership. WAMIE I (N = 6759 members), WAMIE II (N = 9758 members), 2010 (N = 9555 members). Data from Bentley* et al. *(1993), Ortega* et al. *(2006), ESA (2011), and US Census Bureau (2010).*

Historically, leadership and award winners were mostly white males (WebTables 1 and 2; WebFigures 1 and 2). Since WAMIE II, leaders (54% male) and awardees (52% male) have been more reflective of the gender demographics of the Society (63% male in 2010). However, these percentages are somewhat misleading given the male predominance in particular areas: (1) ESA President as well as Vice President for Finance; (2) editorial boards; (3) Mercer, Eminent Ecologist, and MacArthur awards; and (4) ESA fellows. In addition, underrepresented minorities are noticeably absent from positions of leadership and recipients of awards (see web-only materials [WOM]).

Lincoln *et al.* (2012) suggested two possible explanations that might underlie persistent bias in the distribution of scientific awards; these explanations are also likely applicable to the distribution of governance positions. The first is that a sufficient number of women and minorities

have not yet reached the stage in their careers to be nominated for awards or (by inference) governance positions. Thus, the lack of diversity in ESA leadership and senior awards may simply reflect a demographic time lag until younger members progress to mid- and late-career stages. In 1991, only 38% of ESA members under 30 were women (Lawrence and Holland 1993), but by 2005 that value had risen to 55% (Brewer *et al.* 2006). If this explanation holds true, future diversity of leadership and senior awards is expected to better reflect changes in ESA membership demographics. This premise is supported by observations of student award recipients, who are drawn from a younger, more diverse pool. The second, alternate explanation regarding this bias is that the respective selection committees fail to choose or nominate women and minorities for senior awards or leadership positions.

The ESA has exhibited notable progress in the diversity of awards recipients, particularly when compared to the pre-WAMIE report period, when male bias in Awards Committee membership was related to an increased likelihood of a male winning an award (see WOM). However, the gender of the chairs of the Awards Committees had no significant effect on the gender of award winners in any time period. Gender with regard to leadership is a different story. Since 1997, 26 of 59 ESA elections offered all-male or all-female candidate slates. Of these 26 single-gender slates, 22 were male-only. Therefore, one area of potential improvement is in committee membership and nominations for elections to the governing board.

Research suggests that committees that are either male biased or chaired by men are more likely to select males (Lincoln *et al.* 2012). Networks of individuals run along gender and racial lines (Granovetter 1973), and males are more likely to pass information about the nomination process to other males than to females (see references in Lincoln *et al.* 2012). Individuals' subconscious, implicit preference for male and non-minority candidates may also operate during the selection process (Greenwald *et al.* 1998; Khurana 2002; Gorman 2005; Lincoln *et al.* 2012). To counter implicit bias, we propose that – for all ESA Awards and Nominations committees – efforts be undertaken to foster committee membership diversity and to implement a discussion on the role of implicit bias in selection (Rudman *et al.* 2001; Moss-Racusin *et al.* 2012). While ESA's electoral process already allows governing board nominations from general ESA membership, these recommendations are filtered through a Nominations Committee selected by the serving ESA Past President. Increased transparency in Nominations Committee appointments and in the selection criteria used to advance candidates to the ballot would guard against the natural tendency toward in-group favoritism (Ding *et al.* 2013).

The ESA has made advances toward equal representation of women and minorities in membership, awards, and leadership; yet, inequalities still exist in these and other areas such as funding, publishing, and citation rates (Damschen *et al.* 2005; Martin 2012). While the ESA should rightfully recognize the progress that the Society has made over time, too much remains unaddressed for the Society to become complacent. We do not believe that the persistent lack of diversity in ESA governance and awards reflects intentional consequence of ESA structures or explicit preferences by ESA members. Nevertheless, we believe that the Society can and should take active steps to continue to progress toward a membership, leadership, and awards structure that more accurately reflects the demography of the ESA and the US population. For example, ESA's SEEDS Program (Abraham and Reynolds 2013) is recognized as a successful recruitment response to diversity issues (Torres and Bingham 2008). Yet SEEDS has been financially supported by a series of external grants and individual donations. To continue, we argue that the program needs to be established as a line item in the Society's annual budget.

With deliberate actions to recruit and mentor women and minority members and to counter the reality of implicit bias, we can provide avenues for positive change and movement toward the ultimate goal of creating a forward-thinking Society that expands the diversity of ecologists and is representative of all its members.

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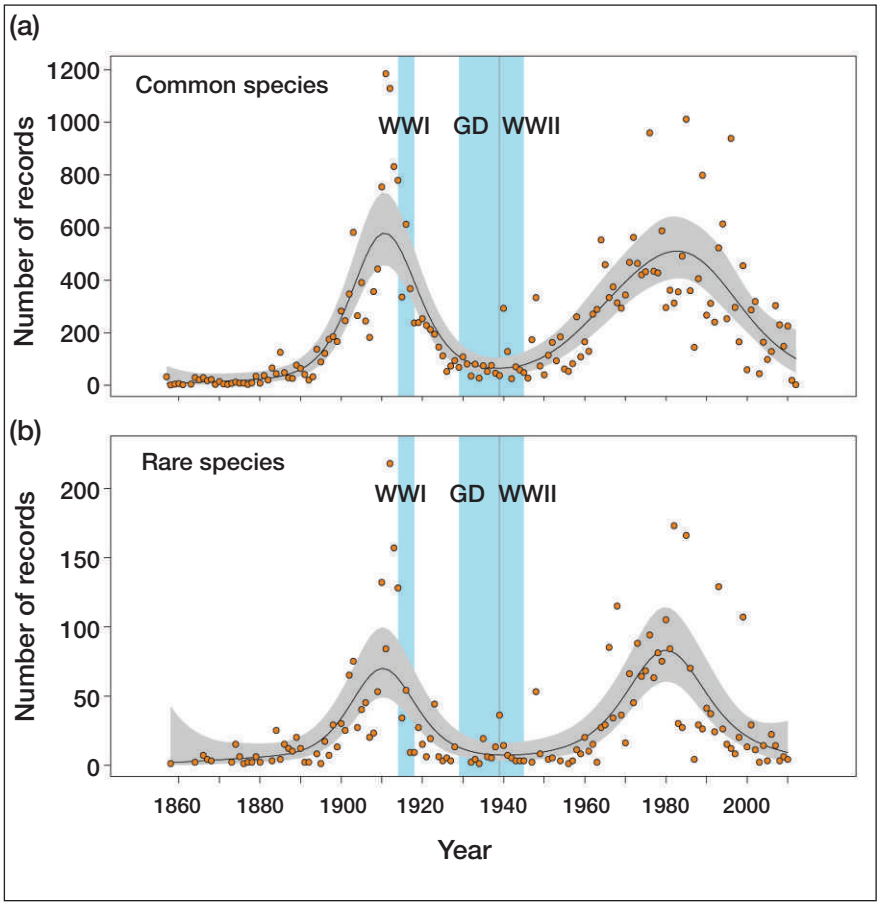

Figure 1. *Changes in the number of records of Meliphagoidea for (a) common and (b) rare species. Species status is based on estimates of range size (Symonds and Johnson 2006), calculated as the number of one-degree grid squares occupied (range = 2–652, mean = 123); rare species ≤ 20. The blue areas depict the periods of World War I (WWI, 1914–18), the Great Depression (GD, 1929–39), and World War II (WWII, 1939–45). The line represents the fitted Generalized Additive Model with a AR(1) term controlling for temporal autocorrelation in the model residual. The gray area is a 95% confidence interval. Data comprise 40 246 records from all major natural history collections in Australia (seven institutions) as well as two in the US (American Museum of Natural History, Smithsonian National Museum of Natural History: 17 098 specimens), either via the online resources of OZCAM (http://ozcam.org.au) and ORNIS (http://ornis2.ornisnet.org) or directly from institutions where records are not available online. These represent the vast majority of all collections worldwide, including the extensive HL White, Rothschild, and Matthews Collections. We included only dried skins in our analysis and excluded records for which no year of collection was recorded.*

Are natural history collections coming to an end as time-series?

Peer-reviewed letter

Much has been written about the value of natural history collections and their deteriorating state (WebReferences). Natural history collections are critically important to our understanding of the natural world, especially natural selection and evolution, because they preserve samples of Earth's biota extending back several centuries (Lister and Climate Change Research Group 2011). Less well appreciated is the serendipitous record they provide of anthropogenic effects on biodiversity: inherent in collections are valuable time-series with crucial baseline data beginning before accelerated rates of anthropogenic habitat modification (Tingley and Beissinger 2009; Johnson *et al.* 2011; Lister and Climate Change Research Group 2011). Innovative studies that provide insights into the long-term consequences of environmental change are made possible through the temporal record provided by natural history collections (for a list of selected studies, see WebTable 1).

Although many studies lament the declining status of natural history