

A Quantitative Analysis of the Contributions of Female Mammalogists from 1919 to 1994



Felisa A. Smith; Dawn M. Kaufman

Journal of Mammalogy, Vol. 77, No. 3 (Aug., 1996), 613-628.

Stable URL:

<http://links.jstor.org/sici?sici=0022-2372%28199608%2977%3A3%3C613%3AAQAOTC%3E2.0.CO%3B2-2>

Journal of Mammalogy is currently published by American Society of Mammalogists.

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/asm.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is an independent not-for-profit organization dedicated to creating and preserving a digital archive of scholarly journals. For more information regarding JSTOR, please contact support@jstor.org.

A QUANTITATIVE ANALYSIS OF THE CONTRIBUTIONS OF FEMALE MAMMALOGISTS FROM 1919 TO 1994

FELISA A. SMITH AND DAWN M. KAUFMAN

Department of Biology, University of New Mexico, Albuquerque, NM 87131

We quantified the contributions that women have made to mammalogy by surveying the 75 volumes (301 issues) of the *Journal of Mammalogy* from its origin in 1919 through 1994. Data were collected on publications (articles and notes), participation in The American Society of Mammalogists (ASM; membership, meeting attendees, committee members, and officers), and awards and honoraria. We found that women played a small, but significant, role in the Society from the outset, and that involvement in all facets has increased substantially since the late 1970s. As of 1994, women constituted 25% of the membership, and 38% of articles published in the *Journal of Mammalogy* contained at least one female author. We also found, however, that the actual contributions of women as measured by order of author lagged behind these figures, presumably reflecting demographic trends in the ages and positions of female mammalogists. The most frequent topics of publication have been reproduction and development, and population ecology, followed closely by behavior. More female authors have been affiliated with universities in California (11%) than in any other state or country. Since the 1970s, women have been represented on the Board of Directors of the ASM, albeit generally in low numbers. The percentage of women serving on committees has varied considerably, averaging 29% in 1994. Most heavily represented are those committees with education and outreach-oriented missions. Of the honorary memberships given by the Society, only one has been awarded to a female mammalogist, but two of the Hartley H. T. Jackson awardees have been women. There has been one female recipient of the C. Hart Merriam Award. The percentage of female students receiving honoraria or grants-in-aid has increased significantly since the mid-1980s, and currently averages 25%. Overall, 17% of the Shadle Award winners have been women, with all but one receiving their award in the past decade.

Key words: *Journal of Mammalogy*, American Society of Mammalogists, biology, female scientists

“. . . The following brief notes are further offered as amplifying slightly the distributional data lately published by Mrs. Hilda Wood Grinnell in her excellent synopsis of the Bats of California . . .” (G. Allen. *Journal of Mammalogy*, 1:1, 1919)

Periodically throughout the history of The American Society of Mammalogists (ASM), members have used special occasions to reflect on the changes time has brought to the discipline. Thus, for example, on the 50th anniversary of the ASM, several articles were published in the *Jour-*

nal of Mammalogy examining its evolution over the first one-half century (Hoffmeister, 1969; Storer, 1969). In 1994, the Society celebrated its 75th anniversary in Washington, D.C., with a number of special events and symposia, and with the publication of a book documenting the history of the discipline of mammalogy in North America (Birney and Choate, 1994). However, one aspect of the dramatic changes that have occurred over the past three-quarters of a century has not yet been fully explored; the significant increase in the participation of women in the science of mammalogy.

In the first part of the 20th Century, fe-

male scientists generally did not receive much recognition for their work. This was partly because they were few in number, and partly because they were typically confined as junior collaborators or assistants (Ogilvie, 1986, 1989; Rossiter 1982; Smith and Brown, 1996). The first paper published in the *Journal of Mammalogy*, for example, was based almost entirely on work conducted by Hilda Wood Grinnell (the wife of Joseph Grinnell), yet she did not appear as an author (Allen, 1919; quote above). Here we document the role women have played in The American Society of Mammalogists from its inception in 1919 to 1994, the 75th anniversary of its founding. We examine not only membership, but service within the Society as determined by committee participation, holding of office, and editorial positions. We also estimate the scientific output of female mammalogists during this time interval by quantifying the number of articles and notes published within the *Journal of Mammalogy*, and presentations at annual meetings. Our aims are to trace the changing role of women in the Society and to recognize those women who contributed to the discipline early on.

MATERIALS AND METHODS

We tabulated data from the 301 issues (75 volumes) of the *Journal of Mammalogy* from 1919 to 1994. The overall number of articles and notes was counted, and those with female authors noted. Order of authors was recorded, as was the author's name, affiliation, and subject of the article. Research areas were categorized as population ecology, reproduction and development, natural history, physiology, behavior, evolution and genetics, distribution, morphology and systematics, techniques, and other. Other includes general bibliographies, obituaries, community ecology, and any topic with <2% cumulative representation.

The gender of a number of authors could not be unambiguously assigned either because their names were indeterminate, or because they consistently used initials. We initially identified 831 authors falling into this category, but were able to later determine the gender of 255 using mem-

bership lists and personal contacts. Over 92% of the identified unknowns were male, with no apparent temporal bias. This result, combined with the difficulties associated with positively identifying all authors, as well as the relatively small number of unknowns remaining, led us to ignore the remainder in the calculations presented here. Thus, we have introduced some additional uncertainties in our statistics, but probably of a relatively small magnitude. We estimate that we may have overlooked ca. 45 women (8% of the 576 unresolved unknowns). We definitively determined the gender of all recipients of awards and honoraria.

The number of articles with a female author does not reflect order of authors, a potentially important measure of actual participation by women. Consequently, we also devised a statistic, C_f , which represents the contributions by female authors as weighted by order of authors. It was calculated as follows:

$$C_f = \sum_f \left(\frac{1}{P_f \sum_a \frac{1}{P_a}} \right)$$

where \sum_f represents a summation over all female authors, \sum_a a summation over all authors, P_f is the position of female authors, and P_a is the position of all authors on an article. Fig. 1 illustrates the weighting this index provides. Although we could have altered the relative contributions by author in a number of ways (e.g., by raising the reciprocal positions to a power), we believe that the weights our statistic provides are a realistic approximation of the actual efforts made by each author to a multi-authored paper.

Using the membership lists published at sporadic intervals and ASM membership ledgers housed at the Smithsonian Archives, we identified all female members of the Society since 1919. We recorded title, affiliation (if any), city, state or province of residence, date of nomination, and years of tenure with the Society. We calculated the percentage of the total membership comprised by women over time and their average length of tenure with the Society. Again, persons who consistently used only initials were ignored in our analysis. Total membership figures for 1919–1965 were taken from Hoffmeister (1969); those for 1973 to 1994 were obtained directly from the membership list of the Society.

Data were tabulated for papers scheduled for presentation at the annual meetings of the ASM.

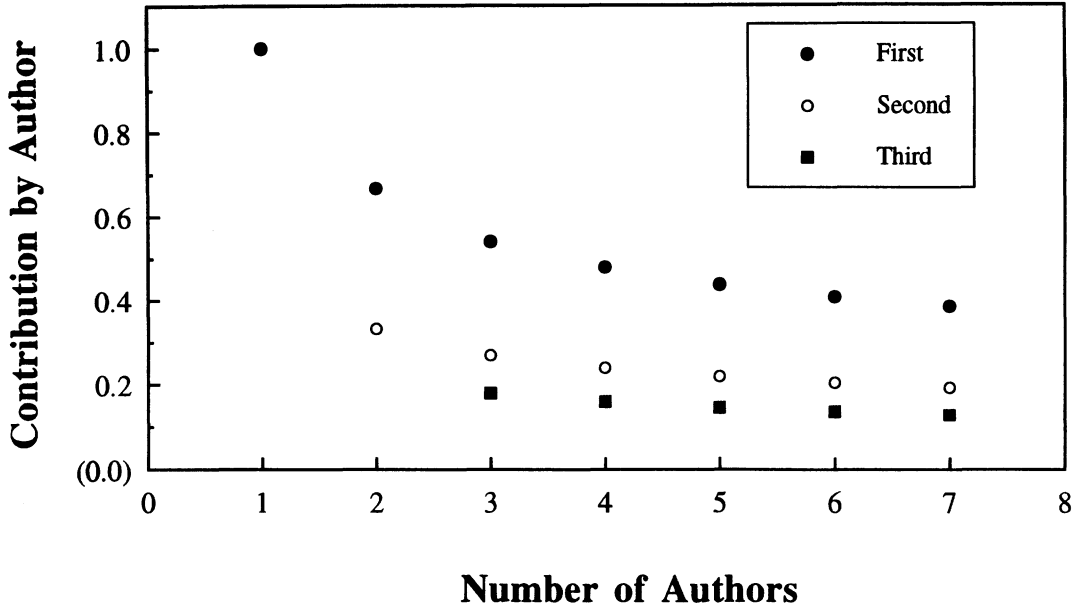


FIG. 1.—Contribution of author plotted against the number of authors of a publication. Note that the relative contribution made by the first author is not constant, but varies as a function of the number of authors. We explored different weighting factors, but believe that the one presented here accurately reflects actual participation by authors. These weights were used in the preparation of Fig. 3.

For the first 50 years, the complete program was published in the *Journal of Mammalogy*. Copies of the programs from 1971 to 1994 were obtained through the Smithsonian Archives or from personal records. Throughout, we made the simplifying assumption that the first author was the presenter of the paper. We did not include women who attended but did not present research, or who were junior authors. Consequently, we have probably numerically underestimated the actual participation by women in annual meetings. No distinction was made between oral and poster presentations.

Using covers of the *Journal of Mammalogy*, we tabulated data on the participation of women in the activities of the Society. Women who had served as officers or editors within the Society were identified, as were all female participants on committees. The average length of tenure was calculated. The mission statements for standing and current ad hoc committees were scrutinized and used to group them into main subject areas: 1) legal and legislation—Animal Care and Use, Conservation of Land Mammals, Legislation and Regulations, Marine Mammals, Resolutions; 2) science—Ecology (previously Life Histories of Mammals and then renamed

Life Histories and Ecology), Anatomy and Phylogeny, Checklist, Nomenclature, Anatomy and Physiology); 3) honors and awards—Grants-in-Aid, Honoraria (previously Honoraria for Graduate Students), Honorary Membership, Jackson Award, Merriam Award; 4) liaison and outreach—Economic Mammalogy, Mammal Slide Library, International Relations, Membership, Systematic Collections, Women and Minority Issues; 5) education—Development, Education and Graduate Students, Public Education; 6) societal service—J. A. Allen Memorial, Archives (previously Historian), Bibliography, Editorial (previously Publications), Index, Information Retrieval, Program. We did not include six committees that lasted ≤ 3 years, but none had contained female members and all were disbanded before 1953.

We identified all female recipients of senior awards (Jackson, Merriam, or Honorary Membership), as well as all students receiving the Shadle Fellowship, honoraria, or grants-in-aid. This information was readily available in the report of the annual meeting contained in the *Journal of Mammalogy*. The percentage of women receiving such awards was calculated and the recipient's affiliation was noted. For student

awards, data were summarized by 10-year intervals since the inception of the awards.

RESULTS

Women have published at a sustained, but low, rate since the establishment of the *Journal of Mammalogy* (Fig. 2). Since 1980, however, and in particular over the past decade, the number of publications with women as authors has sharply increased (Figs. 2 and 3). In 1994, e.g., ca. 40% of articles in the *Journal of Mammalogy* had at least one female author. Both articles and notes demonstrate the same overall trend, with statistically indistinguishable slopes (Table 1). When publications are corrected for order of authors (C_i), the curves display a somewhat flatter slope (Fig. 3; Table 1). The difference is consistently seen with articles (Fig. 3a) and notes (Fig. 3b), and may reflect the junior position of many women. Interestingly, and somewhat contrary to our initial expectations, the two curves overlap almost completely for the period of 1919–1950 (Fig. 3), indicating that publications by women during this interval were almost always sole authorships.

The most frequent subject areas of publication by women have been reproduction and development, and population ecology (Fig. 4). Reproduction and development in particular has been consistently represented in all time intervals. Behavior is the third most common topic, and is also consistently represented in all time periods (Fig. 4). Papers dealing with the natural history of mammals constituted a high percentage of all articles (ca. 40%) during the early part of the century, but have become a decreasingly important topic in recent decades. This undoubtedly reflects an increasing focus on experimental and manipulative science by mammalogists and others.

In the early part of the century, most female authors publishing in the *Journal of Mammalogy* were affiliated with a relatively small number of institutions (Fig. 5a). One-half of the articles in the period from

1919 to 1944 came from women in just four regions of the United States (in decreasing order): California, Washington, D.C., Massachusetts, and Michigan. The single, most-important university during this time interval was the University of Michigan, Ann Arbor, with 11% of all female authors. Four institutions are represented within California, but most women were affiliated with the Museum of Vertebrate Zoology (MVZ) at the University of California, Berkeley (7% of all female authors). The vast majority of papers came from women within the United States; only 6% listed foreign addresses. The first foreign woman was N. M. Dukelski from Moscow University, who published an article on the morphology of voles in 1927.

By the second time interval (1945–1969), female authors were somewhat more evenly dispersed across the United States (Fig. 5b). The top four states now accounted for only 33% of articles and notes within the *Journal of Mammalogy* (California, New York, Illinois, Michigan). Overall, more institutions were represented, but the distribution among them was still highly skewed. Many of the women were affiliated with just four institutions: University of California, Berkeley (7% of all female authors); University of Chicago (5%); University of Michigan (5%), and Cornell University in New York (5%). Although a small number of authors had foreign addresses, the majority of papers were from women residing in the United States (93%).

The last time-interval depicted (1970–1994) indicates a much more uniform distribution of authorships across the United States (Fig. 5c). Although “hot spots” remain, the women publishing were affiliated with universities or institutions in virtually all states within the United States and in 31 foreign countries. The top four regions now accounted for only 27% of all female authors. California was again the most common geographic region (12%), with most authors evenly dispersed between the University of California, Berkeley, and the Uni-

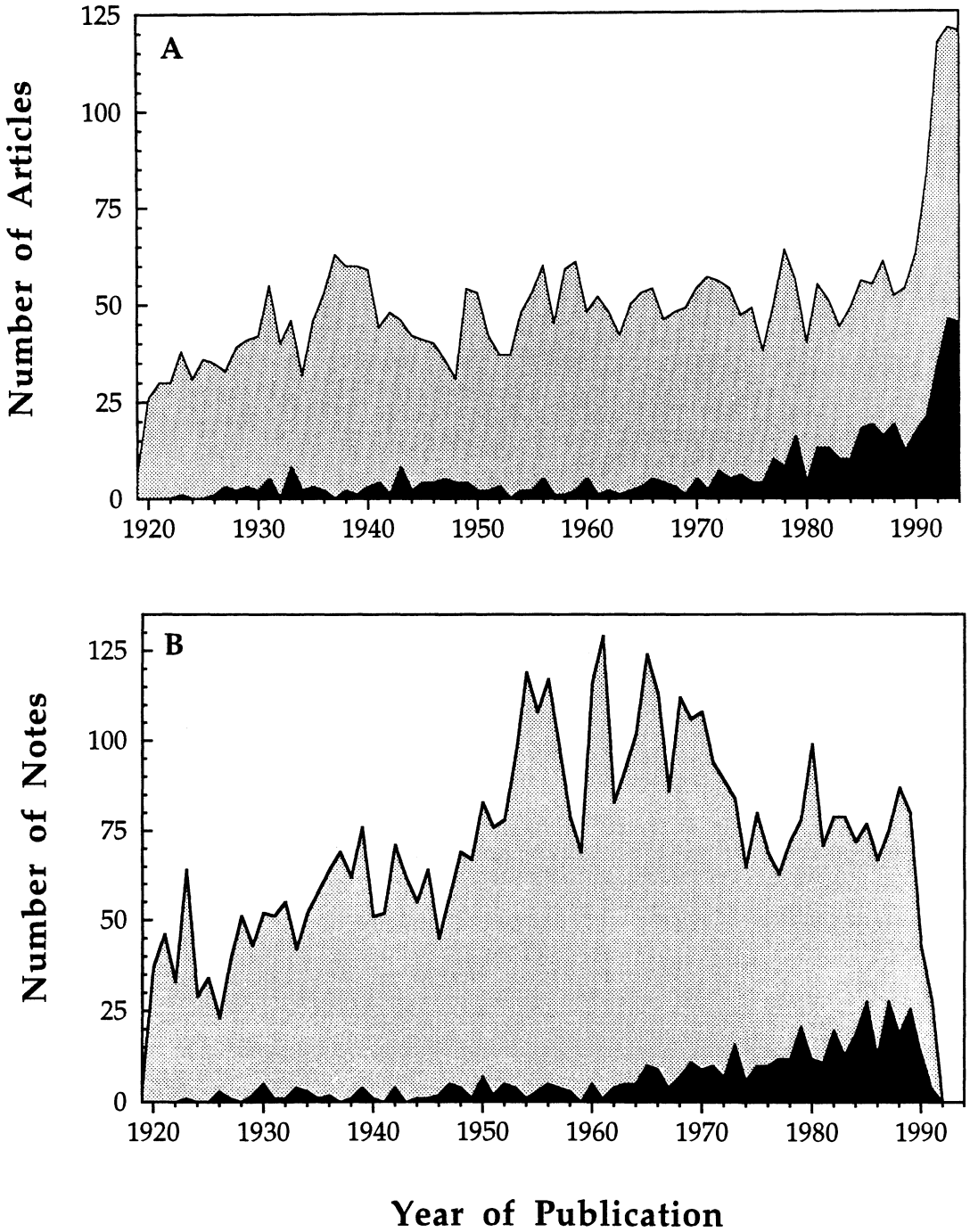


FIG. 2.—Diagrams showing the total publications in the *Journal of Mammalogy* from 1919 to 1994 (gray shading) and those with at least one female author (black shading). The first volume contained five issues instead of the usual four, with the first actually published in 1919; A) number of articles from the establishment of the Journal to 1994, B) number of notes. Publication of notes ceased in 1993.

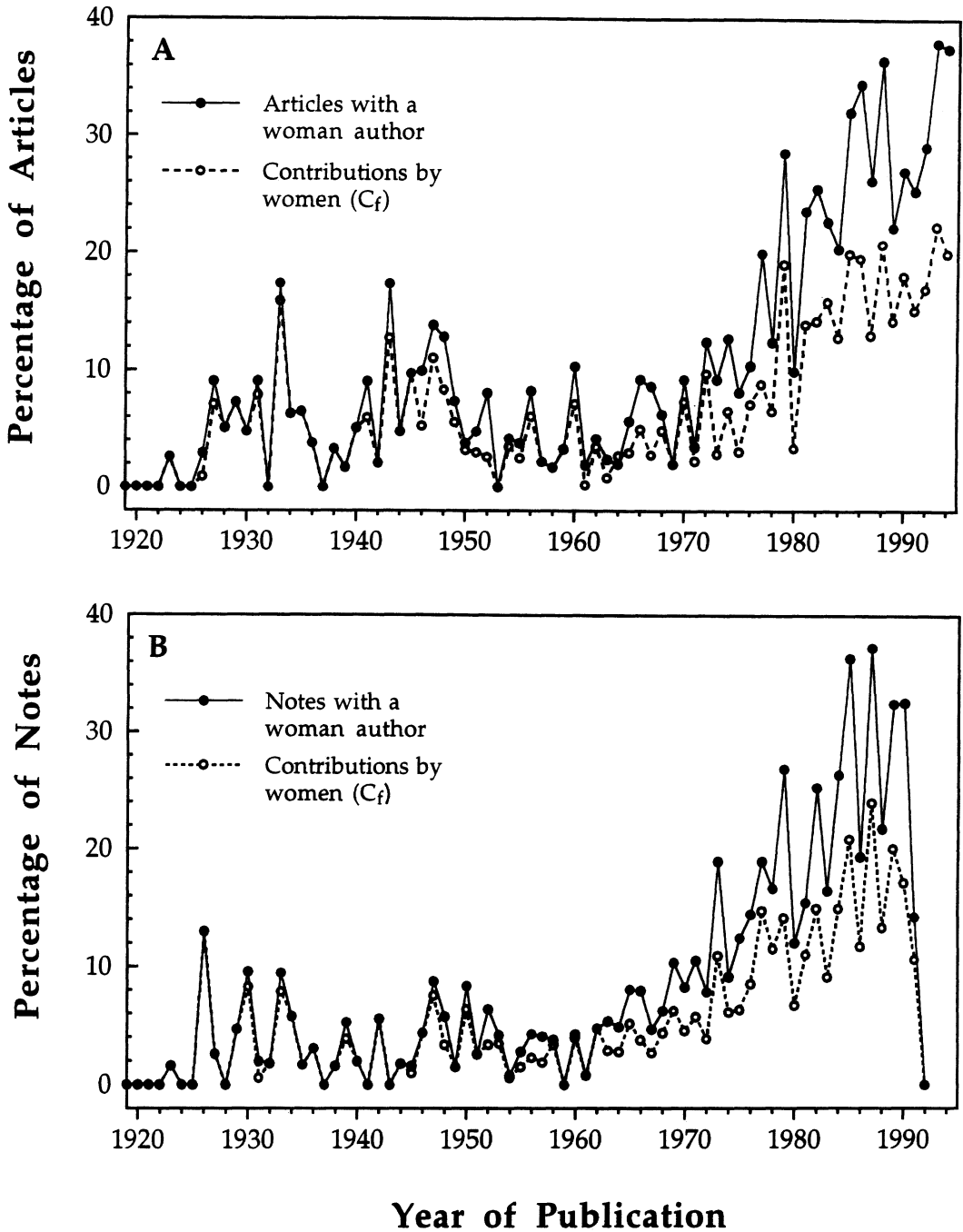


FIG. 3.—The percentage of publications authored by women, and their relative contributions (C_f) to those publications plotted by year of publication. Contributions by women is a function of the number of articles co-authored by women indexed by order of author (see text). Regression equations and levels of significance are presented in Table 1. A) The percentage of articles from 1919 to 1994, B) The percentage of notes from 1919 until their cessation in 1993.

TABLE 1.—Regression equations and statistical tests for percentage of publications and contributions by female authors (C_f) versus year of publication.

Regression	Equation	d.f.	R^2	P -value ^a
Articles by author	$y = 0.010 \chi^2 - 39.7 x + 38526$	73	0.713	<0.001
Articles by C_f	$y = 0.006 \chi^2 - 22.4 x + 21786$	73	0.558	0.001
Notes by author	$y = 0.010 \chi^2 - 39.4 x + 38212$	71	0.745	<0.001
Notes by C_f	$y = 0.006 \chi^2 - 23.7 x + 23039$	71	0.657	<0.001

^a In each instance, a second-order regression provided the best fit. P -values are for a two-tailed test.

versity of California, Los Angeles. The second most common area was Canada (6% of all female authors), followed by Texas (5%), and New York, Massachusetts, Illinois, and Pennsylvania (all at 4%). The number of female authors listing foreign addresses rose considerably and now averaged 20% of all papers within the *Journal of Mammalogy*. Most were affiliated with institutions in Canada or Argentina.

We have enumerated and presented these data in terms of female authors and not in terms of publications by women (e.g., Figs. 2 and 3). Consequently, each woman has been counted only once at an institution during a particular time interval regardless of her productivity. Because a few women published profusely in the *Journal of Mammalogy* (e.g., Viola Schantz, Edna Fisher, Lucille Stickel), this has undoubtedly led to some underestimation of the prominence of several institutions. We believe, however, that the number of different women is the more important indicator of participation by females.

Membership of women in the Society remained relatively constant at 5–7% for most of the 20th Century, but increased dramatically beginning in the 1980s (Fig. 6). In the early part of the century, many women with rural addresses became and remained members of the ASM, but never published in the *Journal of Mammalogy* or became active in the Society. Presumably, these women were interested in mammalogy, but were not employed in any professional capacity. By 1994, women comprised ca. 25% of the ASM membership. Likewise, presentations by women at an-

nual meetings rose dramatically during the 1980s and 1990s (Fig. 7; Gill and Wozencraft, 1994). At least numerically, we have probably somewhat underrepresented participation by women in annual meetings because we counted only the first author on papers.

Viola S. Schantz, who served as the ASM Treasurer for 23 years, was the first female officer of the Society (Table 2). She was also the first woman elected to the Board of Directors (1953–1957, 1959–1963). From 1964 to 1994, an additional 13 women served on the Board (11% of all Directors), with the majority (77%) taking office after 1980 (Table 2). J. Mary Taylor was both the first woman elected as Vice-President, and as of 1994, the only female elected as President of the Society (Table 2). To date, the only positions not held by women are Editor (with the exception of Associate Editor) or Trustee.

The representation of women on committees of the Society has grown significantly since the 1970s (Fig. 8a). As of 1994, 29% of all committee members were female, slightly more than their representation in the Society as a whole (Fig. 6). The distribution is not uniform, however, and more women serve on committees with education or outreach-oriented missions. This also is true historically (Fig. 8b). As might be expected, the ad hoc Committee on Women and Minority Issues has had the largest number of women participants (68%). Other committees that have had many female members include the Public Education and the Education and Graduate Student committees (with 46 and 37%, re-

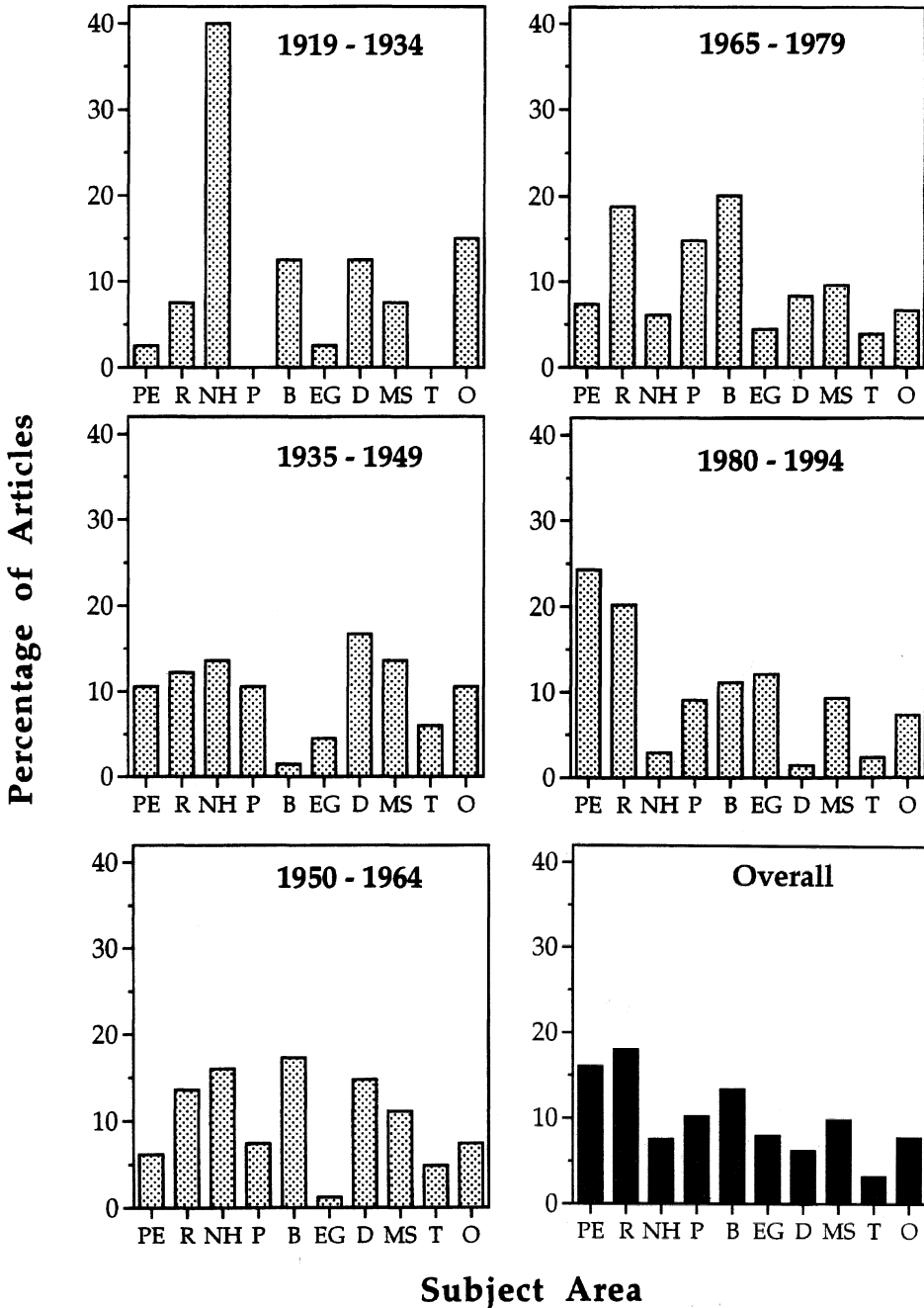
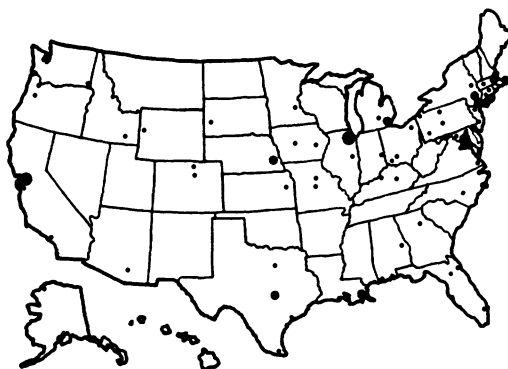


FIG. 4.—Subject area of articles and notes published by women in the *Journal of Mammalogy* from 1919 to 1994. Data are grouped within 15-year intervals: PE, population ecology; R, reproduction and development; NH, natural history; P, physiology; B, behavior; EG, evolution and genetics; D, distribution; MS, morphology and systematics; T, techniques; O, other. Population ecology is a general topic encompassing any aspect of general population biology that is not represented by the other categories; other includes general bibliographies, obituaries, community ecology, and any other topic with <2% cumulative representation.

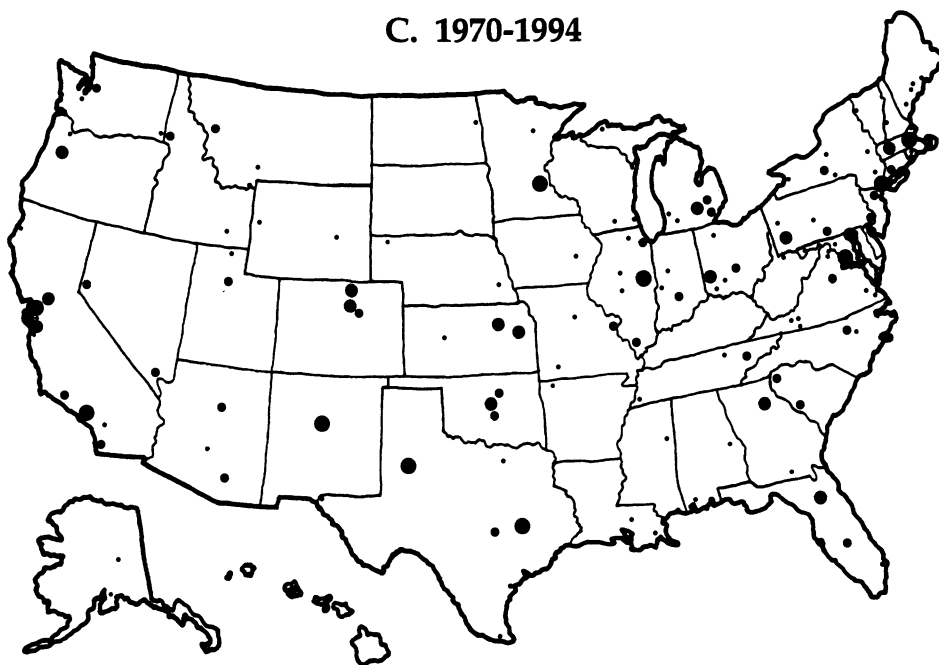
A. 1919-1944



B. 1945-1969



C. 1970-1994



1-2 Female Authors

• 3-5 Female Authors

• 6-9 Female Authors

• 10+ Female Authors

FIG. 5.—State and institutional affiliations of female authors within the United States that published in the *Journal of Mammalogy* from 1919 to 1994. Size of datum represents number of authors from that institution or university. Multiple papers by the same author within a single time interval are not included. Although not shown, numerous women also have published in the *Journal of Mammalogy* who were affiliated with institutions in Canada or South America; A) female authors from 1919 to 1944, B) female authors from 1945 to 1969, C) female authors from 1970 to 1994.

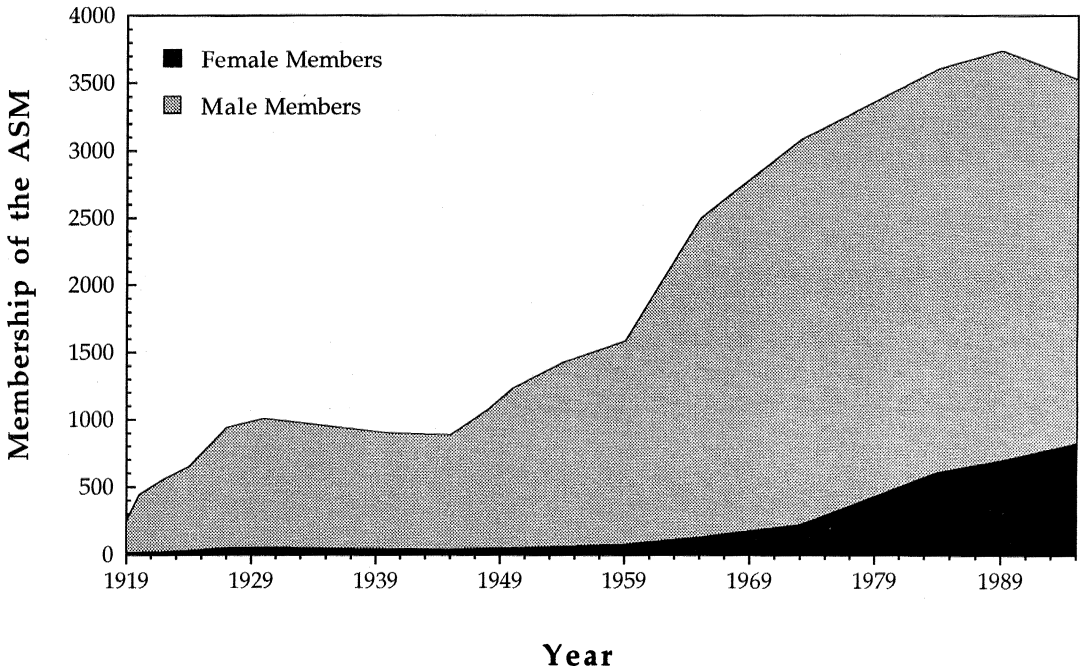


FIG. 6.—Membership of women in The American Society of Mammalogists from its establishment in 1919 through 1994. Data are taken from the published membership lists in the *Journal of Mammalogy*, and so represent unequal time intervals. Total membership figures for the period from 1919 to 1965 were obtained from Hoffmeister (1969); the remainder were determined directly from membership lists.

spectively), and the Program Committee (31%). Although there are several committees that, overall, have had low participation by women (e.g., Fig. 8b), these are, for the most part, old committees dating to the early part of the century. The Marine Mammals Committee, for example, has averaged only 2% female members over the 64 years of its existence. Yet, as of 1994, 17% of the members were female. Likewise, the Conservation of Land Mammals Committee, which averaged just 4% overall, currently has 41% female committee members. As with other indicators of participation by women discussed here, the changes in female membership of committees have predominantly occurred over the past decade.

The first woman to chair a committee was Viola S. Schantz, who led the Index Committee beginning in the 1940s. Such leadership positions were relatively rare until recently, however, and the proportion of women in leadership roles has increased

significantly over the past decade. In 1994, four women served as committee chairs (18% of all chairs).

Shortly after the incorporation of the ASM, a number of annual awards were established to honor distinguished senior members. The highest award given by the Society, Honorary Membership, was conferred on Erna Mohr in 1966 (Table 3). The award is presented for a distinguished record of achievement to the science of mammalogy, and the honoree is selected by a committee composed of the five most recent past presidents (Taylor and Schlitter, 1994). The C. Hart Merriam Award, established in 1974, is conferred for a record of excellence in scientific research as well as in education of mammalogists or service to the discipline of mammalogy (Taylor and Schlitter, 1994). To date, the only female recipient was Gail R. Michener in 1994. The Hartley H. T. Jackson Award was created in 1977 to honor

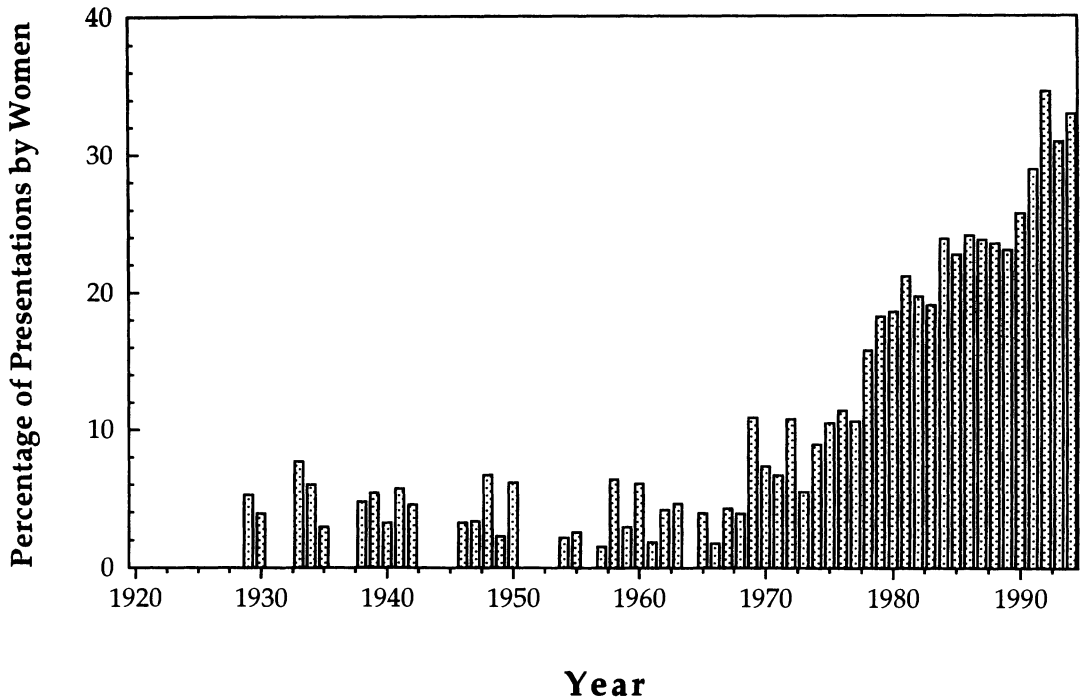


FIG. 7.—Presentations by women at annual meetings of The American Society of Mammalogists from 1920 to 1994. Because of World War II, there was no annual meeting in 1943 or 1945. In 1945, only the Board of Directors met. This figure probably underrepresents participation by women because it counts only first-authored papers. No distinction is made between oral and poster presentations. Data were taken from published programs and represent scheduled presentations; we have not attempted to correct for cancellations or changes.

members who have provided long and outstanding service to The American Society of Mammalogists (Taylor and Schlitter, 1994). Two women have been so distinguished, Marie A. Lawrence and J. Mary Taylor (Table 3).

Student awards were initiated in the mid-1950s with the establishment of the Honoraria for Graduate Students Committee (Gill and Wozencraft, 1994). The purpose of this committee is to honor the most promising students in mammalogy and provide funds to present their work at the annual meeting of the Society. Three honoraria are usually given; the Anna M. Jackson, A. Brazier Howell, and The American Society of Mammalogists awards. Since the 1950s, 16 of the 98 student honoraria have been won by women, with the majority conferred after 1980 (Fig. 9c). The Albert R. and Alma

Shadle Fellowship was established in 1972. This is the most prestigious award presented to students and is given to the Society's outstanding graduate student. It has been received four times by women (Patricia W. Freeman, Cynthia E. Rebar, Kimberlyn Nelson, and Jennifer K. Frey), with the latter three awarded in the past decade (Fig. 9b). The student grants-in-aid program was initiated in 1980 to provide research funds to deserving undergraduate and graduate students in mammalogy. To date, 155 awards have been presented, with 30% going to female students (Fig. 9a). Again, there has been a sharp increase in female grantees within the past decade. As of 1987, the top applicant for grants-in-aid has been recognized by the receipt of a special B. Elizabeth Horner grant; 75% of these have been awarded to women.

TABLE 2.—*Officers, editors, trustees, and elected members of the Board of Directors of the American Society of Mammalogists from 1919 to 1994. Only the editors and trustees are not elected by the membership at large.*

Office or Position	Years office available	Total number of officers	Female officers	Name of officer	Years served
President	1919–1994	38	1	J. Mary Taylor	1982–1984
Vice-President	1919–1974	37	0		
First Vice-President	1975–1994	10	2	J. Mary Taylor	1978–1982
				Alicia V. Linzey	1994–present ^a
Second Vice-President	1975–1994	9	3	Katherine Ralls	1990–1993
				Alicia V. Linzey	1993–1994
				Sarah B. George	1994–present
Recording Secretary	1919–1994	10	1	Laura L. Janacek	1992–present
Secretary-Treasurer	1957–1994	4	0		
Corresponding Secretary	1919–1957	11	0		
Treasurer	1919–1957	5	2	Viola S. Schantz	1930–1953
				Caroline A Heppenstall	1953–1957
Trustees	1919–1994	19	0		
Elected Directors	1919–1994	123	14	Viola S. Schantz	1953–1957
					1959–1963
				Caroline A Heppenstall	1957–1959
				J. Mary Taylor	1970–1972
					1975–1978
				Mary Etta Hight	1974–1977
				Marie A. Lawrence	1978–1983
					1985–1988
				Aelita J. Pinter	1981–1984
				Ayesha E. Gill	1983–1986
				Katherine S. Ralls	1983–1990
				Sarah B. George	1985–1994
				Alicia V. Linzey	1988–1993
				Karen McBee	1989–present
				Barbara R. Stein	1990–1993
				Carol N. Rowsemit	1992–1995
				Cynthia E. Rebar	1993–present
Managing Editor ^b	1919–1994	19	0		
Managing Editor ^c	1981–1994	5	0		
Editors ^d	1956–1994	36	0		
Associate Editors ^e	1919–1994	32	8	J. Mary Taylor	1981–1982
				Gail R. Michener	1983–1986
				Patricia W. Freeman	1992–1995
				Karen McBee	1992–1995
				Alicia V. Linzey	1993–present
				Elaine Anderson	1994–present
				Barbara H. Blake	1994–present
				Glenn A. Kaufman	1994–present

^a As of June 1995.

^b Managing Editor of the *Journal of Mammalogy*.

^c Managing Editor of *Mammalian Species* and *Special Publications* (previously called Special Editor).

^d Includes Journal Editor, Editor for Special Features, Editor for Reviews, Editor for Advertising, Productions Editor, and Editor for Special Publications.

^e Includes the Associate Editors of the *Journal of Mammalogy* and of *Mammalian Species*.

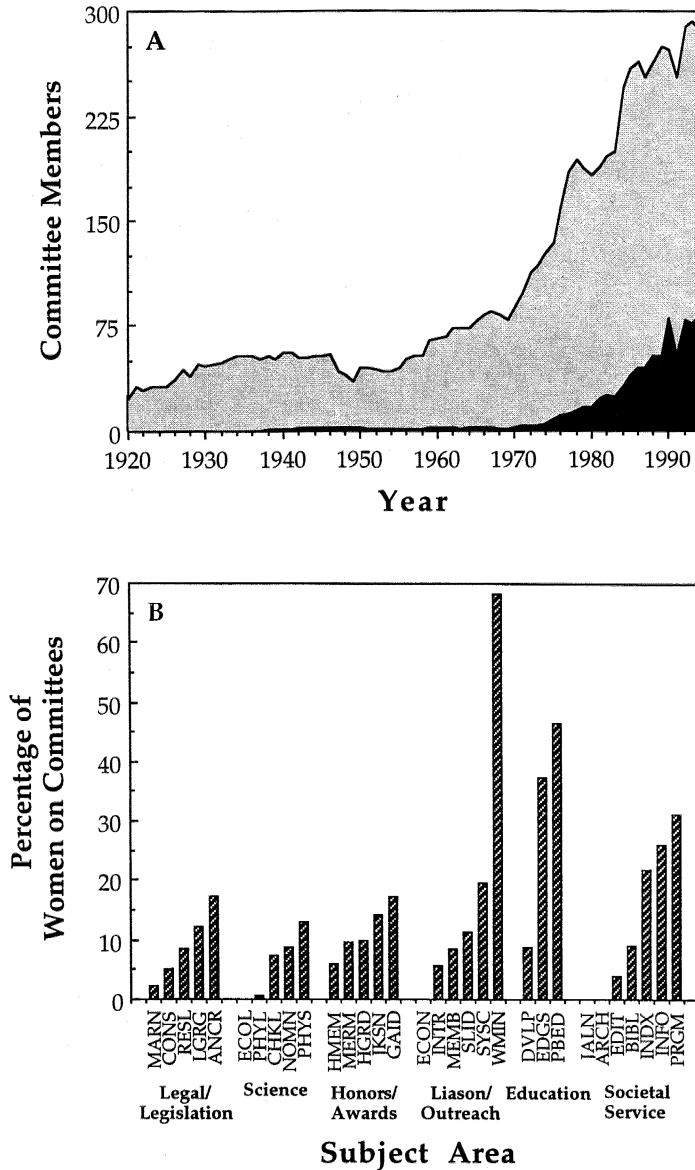


FIG. 8.—Participation by women in standing and current ad hoc committees of The American Society of Mammalogists from 1919 to 1994; A) diagram showing the male (gray shading) and female committee members (black shading). All standing committees of the Society are included; B) average percentage of women on committees by subject area. Six committees are excluded from the figure; these were all disbanded before 1953 and none contained female members. Legend is as follows: legal and legislative (MARN = Marine Mammals, CONS = Conservation of Land Mammals, RESL = Resolutions, LGRG = Legislation and Regulations, ANCR = Animal Use and Care); science (ECOL = Ecology, PHYL = Anatomy and Phylogeny, CHKL = Checklist, NOMN = Nomenclature, PHYS = Anatomy and Physiology); honors and awards (HMEM = Honorary Membership, MERM = Merriam Award, HGRD = Honoraria, JKSN = Jackson Award, GAID = Grants-in-Aid); liaison and outreach (ECON = Economic Mammalogy, INTR = International Relations, MEMB = Membership, SLID = Mammal Slide Library, SYSC = Systematic Collections, WMIN = Women and Minority Issues); education (DVLP = Development, EDGS = Education and Graduate Students, PBED = Public Education); societal service (JALN = J. A. Allen Memorial, ARCH = Archives, EDIT = Editorial, BIBL = Bibliography, INDX = Index, INFO = Information Retrieval, PRGM = Program).

TABLE 3.—Senior awards and honoraria presented by The American Society of Mammalogists to distinguished female mammalogists from 1919 to 1994.

Award	First given	Total awards	Female award-ees	Name of awardee	Year award received
Honorary Membership	1919	61	1	Erna Mohr	1966
C. Hart Merriam Award	1976	16	1	Gail R. Michener	1994
Hartley H. T. Jackson Award	1978	14	2	Marie A. Lawrence J. Mary Taylor	1990 1993

DISCUSSION

Clearly, women have been active to some degree in The American Society of Mammalogists since early in its history. In fact, 14 of the 57 people pictured in the 1919 photograph of the ASM founder's were women (Birney and Choate, 1994). Although many had accompanied their spouses and may not have had much independent interest in the fledgling Society, at least several became charter members. Florence Merriam Bailey, May T. Cooke, Jane S. Elliott, and Viola S. Schantz are examples. Florence Merriam Bailey was the wife of Vernon Bailey and the sister of C. H. Merriam. She was also a distinguished ornithologist and naturalist in her own right (Kaufman et al., 1996). We know little about May T. Cooke and Jane Elliott, other than that the former was unmarried and the latter came unattended by her husband. Both women remained members for >20 years, perhaps until their deaths. Viola S. Schantz became an influential member of the Society (Kaufman et al., 1996). These women, however, were the exception rather than the rule. For much of the Society's history, the number of women publishing in the *Journal of Mammalogy* or active in the ASM has been extremely limited (e.g., Table 2; Figs. 2–9).

The dominance of reproduction and development as a research area is consistent across time (Fig. 4). We suspect that the bias is gender based, but are unable to directly examine this as we did not tabulate similar data for men publishing in the *Journal of Mammalogy*. We were able, however,

to qualitatively compare our results with data presented by Verts and Birney (1994). The comparison was somewhat hampered by differences in experimental design (they sampled every other volume, used slightly different topics, and separated notes from articles), and problems of independence (our data includes some of theirs), but some tentative conclusions may be drawn. Verts and Birney (1994) found that studies in ecology and life history and in mammalian distributions were the most common topics among articles and notes, and that manuscripts on ontogeny and reproduction constituted a relatively small proportion of all papers. We find the same predominance of topics in ecology and life history (the sum of our categories population ecology and natural history), but a great discrepancy with the topic of ontogeny and reproduction (Fig. 4). The difference is corroborated by Pearson and Kenagy (1994), who reported that only 8% of papers published in the *Journal of Mammalogy* from 1919 to 1990 dealt with the topic of reproduction. Possibly early in the century the study of reproduction and development was more socially acceptable for women than other areas of mammalogy, or more amenable to laboratory work. A strong prejudice against women conducting field work persisted until the later one-half of the 20th Century (Smith and Brown, 1996). It also is possible that women were more attracted to this field of study. This is pure speculation on our part, however, as we have no data to confirm or refute any of these hypotheses.

During the period 1919–1969, more

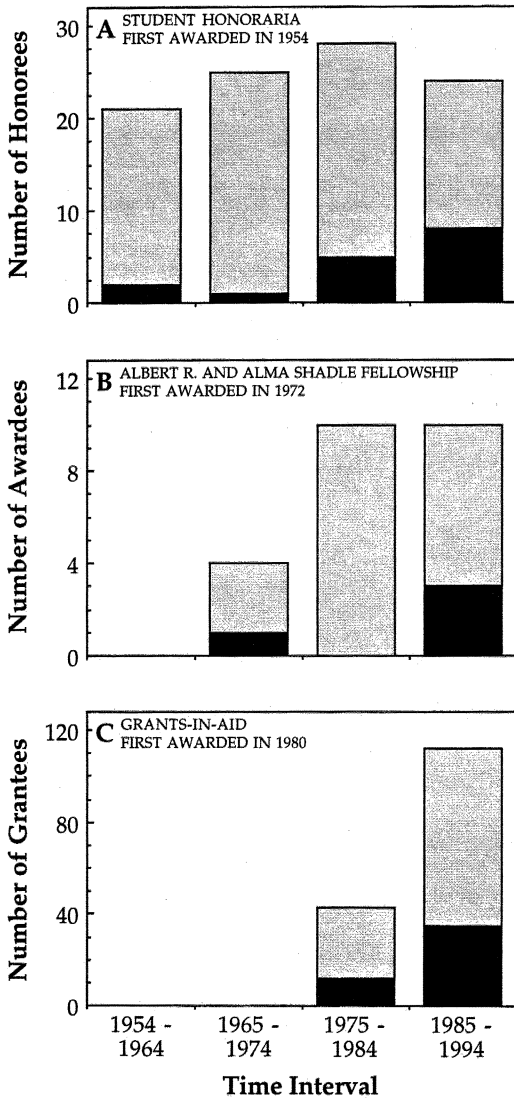


FIG. 9.—Student awards and grants-in-aid given from inception of programs to 1994. Data are grouped by 10-year intervals. Gray shading represents the total number given, black shading represents those awards received by female students: A) Recipients of research grants from the Society. Overall, 30% have been given to female students. B) Recipients of the Albert and Alma Shadle Fellowship. Overall, 16% have been awarded to women. C) Recipients of student honoraria. Overall, 16% have been received by women.

women publishing in the *Journal of Mammalogy* were affiliated with either the University of Michigan or the University of California, Berkeley, than any other university or institution (Fig. 5a, b). The highly skewed pattern may suggest that these two institutions were somehow more conducive to fostering the work of female mammalogists than others. We can only guess as to the causes because we have made no effort to determine the professional status of any woman in our dataset. It is unclear, for example, whether the female authors were graduate students, technicians, or volunteers. The dominance of the two universities may also simply reflect the size and strength of their academic programs. We have not calculated similar comparisons for men, for example, but suspect that these universities may also have been important centers of mammalogy for them as well. Nonetheless, our data do suggest the presence of sympathetic mentors (Fig. 5). The prominence of the Museum of Vertebrate Zoology, in particular, is consistent across the past 75 years. In fact, more papers were published by female authors affiliated with the MVZ than in any of the 81 states or countries represented in our dataset. It is interesting to note that the strong mammalogy tradition at the MVZ was established largely because of the backing of a single woman, Annie M. Alexander. Although she remained largely behind the scenes, it was because of her enthusiasm, monetary support, and drive that the Museum was founded (Stein, 1996). We can only speculate as to whether her presence as well as that of other early naturalists and mammalogists (e.g., Louise Kellogg, Hilda Wood Grinnell) contributed to the large number of female mammalogists we find affiliated with the MVZ.

We originally expected to find that early female mammalogists would publish collaboratively with their spouses. Previous work had suggested that women often gained entry into scientific disciplines in this fashion (Ogilvie, 1986, 1989; Rossiter 1982). With only a few exceptions (e.g.,

Lucille Stickel, Ruth Dowell Svihla), however, this did not appear to be the case. Even these women frequently published alone. In fact, during the first 30 years of the *Journal of Mammalogy*, publications by women were generally sole authorships (Fig. 3). The divergence between the two curves in Fig. 3 beginning in the 1960s probably represents the involvement of an increasing number of female students (Gill and Wozencraft, 1994), who published in collaboration with their advisors. It may also at least partially reflect the increasingly collaborative nature of modern mammalogy, with the result that papers tend to have more authors than they did previously. Verts and Birney (1994), for example, note a general trend toward multi-authored papers in the *Journal of Mammalogy*.

Our data clearly indicate that participation by women in The American Society of Mammalogists has increased significantly since the 1980s. This trend is consistently exhibited in publication efforts (Table 1; Fig. 2), membership (Fig. 6), presentations at meetings (Fig. 7), and in service to the Society (Fig. 8, Table 2). Almost 40% of the articles published in the *Journal of Mammalogy* (Fig. 3a), for example, now contain at least one female author. This figure is substantially greater than their overall membership in the Society (Fig. 6). Our data suggest that these percentages are increasing at a rapid rate (Table 1). The increased participation of women at all levels reflects the evolution of The American Society of Mammalogists from a traditionally male-dominated organization to one that increasingly and actively encourages participation by all people.

ACKNOWLEDGMENTS

We thank R. T. Bowyer and O. J. Reichman for their interest in this special feature. S. M. Elliott, B. E. Horner, G. R. Michener, J. L. Patton, J. M. Taylor, and an anonymous reviewer provided helpful comments on the manuscript, and D. W. Kaufman assisted with data collection. The ASM Archivist, A. L. Gardner, was

instrumental in obtaining access to historical documents housed at the Archives of the Smithsonian Institution. This work was supported by National Science Foundation grants DEB-9508715 and BIR-9308033 to F. A. Smith; D. M. Kaufman was partially supported by National Science Foundation grant DEB-9318096 to J. H. Brown and G. C. Stevens.

LITERATURE CITED

- ALLEN, G. C. 1919. Bats from Mt. Whitney, California. *Journal of Mammalogy*, 1:1-5.
- BIRNEY, E. C., AND J. R. CHOATE (EDS.). 1994. Seventy-five years of mammalogy (1919-1994). Special Publication, The American Society of Mammalogists, 11:1-433.
- GILL, A. E., AND W. C. WOZENCRAFT. 1994. Committees and annual meetings. Pp. 155-177, in *Seventy-five years of mammalogy (1919-1994)* (E. C. Birney and J. R. Choate, eds.). Special Publication, The American Society of Mammalogists, 11:1-433.
- HOFFMEISTER, D. F. 1969. The first fifty years of The American Society of Mammalogists. *Journal of Mammalogy*, 50:794-802.
- KAUFMAN, D. M., D. W. KAUFMAN, AND G. A. KAUFMAN. 1996. Women in the early years of The American Society of Mammalogists (1919-1949). *Journal of Mammalogy*, 77:642-654.
- OGILVIE, M. B. 1986. *Women in science: antiquity through the Nineteenth Century*. MIT Press, Cambridge, Massachusetts, 254 pp.
- . 1989. Marital collaboration: an approach to science. Pp. 104-128, in *Uneasy careers and intimate lives: women in science 1789-1979* (P. G. Abir-Am and D. Outram, eds.). Rutgers University Press, New Brunswick, New Jersey, 365 pp.
- PEARSON, O. P., AND G. J. KENAGY. 1994. Reproduction. Pp. 271-287, in *Seventy-five years of mammalogy (1919-1994)* (E. C. Birney and J. R. Choate, eds.). Special Publication, The American Society of Mammalogists, 11:1-433.
- ROSSITER, M. W. 1982. *Women scientists in America*. The Johns Hopkins University Press, Baltimore, Maryland, 439 pp.
- SMITH, F. A., AND J. H. BROWN. 1996. The changing role of women in North American mammalogy. *Journal of Mammalogy*, 77:609-612.
- STEIN, B. R. 1996. Women in mammalogy: the early years. *Journal of Mammalogy*, 77:629-641.
- STORER, T. I. 1969. Mammalogy and The American Society of Mammalogists, 1919-1969. *Journal of Mammalogy*, 50:785-793.
- TAYLOR, J. M., AND D. A. SCHLITZER. 1994. Awardees. Pp. 71-109, in *Seventy-five years of mammalogy (1919-1994)* (E. C. Birney and J. R. Choate, eds.). Special Publication, The American Society of Mammalogists, 11:1-433.
- VERTS, B. J., AND E. C. BIRNEY. 1994. Publications. Pp. 139-154, in *Seventy-five years of mammalogy (1919-1994)* (E. C. Birney and J. R. Choate, eds.). Special Publication, The American Society of Mammalogists, 11:1-433.