



Leaders Inspiring the Next Generation of Citizen Scientists – An Analysis of the Predictors of Leadership in Birding

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Citizen Science (CS) is a megatrend of the 21st century given its importance for nature conservation. CS projects dealing with birds often require knowledge and abilities to identify species. This knowledge is not easy to acquire and people often learn from leaders during field trips and lectures about birds. This emphasizes the need for leaders in ornithology. Although data of CS projects are increasing, less is known about people providing guidance and taking over leadership roles. In this study, leadership roles (leading field trips, giving lectures/presentations) are analyzed by studying demographic variables, birding specialization, and the social dimension of the involvement concept of serious leisure. Participants were recruited via many channels to cover a broad range of birdwatchers in Germany, Austria, and Switzerland who participated in the online survey. A total of 1,518 participants were men, 1,390 were women (mean age 47.7). Mean years of birding were on average 24.5. 845 persons lead at least one field trip, and 671 gave on lecture (in combination 991). Mean number of field trips led during the last 5 years was 13.43, mean number of presentations was 8.21. Persons that gave presentations also led field trips ($\Phi = 0.593$, $p < 0.001$). However, there are still people that preferred leading field trips over lecturing and vice versa. Men more than women took over leadership roles. A binary logistic regression showed an influence of age, gender, and university degree. Social relatedness was related to being a leader, also birding skill/competence as well as self-report behavior of birding were significant predictors for leadership roles. Years of birdwatching and both commitment scales were not significant. The data indicate that more diversity in leadership roles might be beneficial with more women and younger persons.

Keywords: birding, birdwatching, citizen science, recreation specialization, demographic, gender

INTRODUCTION

Citizen Science (CS) is considered a megatrend of the 21st century given its importance for nature conservation (Bonney et al., 2009). During CS projects, people adopt in part the status of an expert (Bhattacharjee, 2005) and their valuable voluntary contribution to science can be equal to millions of \$, an amount that could not be paid by any institution (Bonney, 1991). Recruitment for CS

projects often occurs by word-of-mouth or online procedures. However, inspiring and motivating the next generation of citizen scientists needs more than online recruitment, especially when participants should be retained within a program for longer time periods or when the programs are more complex and request a given level of knowledge (Wood et al., 2011). CS projects dealing with bird observations often require some knowledge and abilities to identify species (Sullivan et al., 2014; Randler, 2021a). This knowledge is not easy to acquire (Randler and Heil, 2021) and people often are accompanied by others when they start this recreational activity. The most common reason for birdwatchers to start their leisure activity (their initiation as birder) is a social reason, including family transmission of knowledge, but also teachers and leaders of excursions. Similar trigger events were often a specific travel experience and nature-related groups (for details see Randler and Marx, unpublished). This emphasizes the need for leaders in ornithology and the study of this process.

Citizen Science

Citizen Science projects are increasing in popularity in the scientific community because they enable researchers to study phenomena in nature on a large spatial scale, and also on a large time scale, given the short-time funded projects of many conventional research studies (Bonney et al., 2009). Citizen Science participants, in turn, are becoming a part of real scientific investigations. Participants in these projects gain knowledge about the specific research question, but also about scientific methods (Bonney et al., 2009). However, there is some criticism of CS projects, especially with regard to the potentially lower data quality. This can result from the fact that laypersons collect the data, while in professional science projects, experts are collecting the data (Cohn, 2008). However, this seems different in the diverse CS projects. Especially in birding, the lay persons are usually highly qualified (Randler, 2021b), and CS projects can be developed to address different levels of specialization (Randler, 2021a). Nevertheless, the aspect of data quality is related to the instruction of participants, which, in turn, focus on leaders that take over the role of instructing new adepts of birding. The recruiting process of CS participants is usually haphazard and often influenced by accident (Fischer et al., 2021), and only few studies have been carried out about the people joining these platforms and projects (Wood et al., 2011). Many of them often shortly contribute to CS projects (Parrish et al., 2019). Some projects only require a short introduction, e.g., by video tutorials, and thus relatively quickly gain participants, but most of them do not remain permanently in the program (Parrish et al., 2019). Retaining people within a program is more difficult and may depend on leaders or people giving personal guidance for such projects. Parrish et al. (2019) showed that an in-person, expert-led training session, achieved higher retention of the attendees in the program. Although data volumes of CS projects are increasing (Kelling et al., 2019), less is known about the citizen scientists themselves (but see, e.g., Jordan et al., 2011; Stylinski et al., 2020), and even lesser about people providing guidance and taking over leadership roles (see, e.g., Propst and Koesler, 1998 concerning outdoor education leadership). However, CS is typically driven by scientific professionals

and experts (Bonney et al., 2016), but in many cases leaders are volunteers, especially in European ornithology. Gaining information about these people is an important task. Here, we look for characteristics of people that take over leadership in birdwatching by guiding field trips or giving lectures. Analyzing this topic is important for nature conservation to help identify key factors of leaders and to further encourage other people to participate in leadership roles.

Leadership

Leaders are influencing other people, and when people are influenced, it is a result of effective leadership (Hogg, 2010). Although there is a bulk of studies on the personal characteristics of the leaders, like the cult of personality (Pestana and Codina, 2020) or the leadership style, especially with a focus on transformational leadership (Sun et al., 2017), the focus here lies on the specific predictors that characterize a person who takes leadership in birding. In this respect, the social categorization/social identity of leadership fits best (Haslam et al., 2011; Reicher et al., 2018; Turner and Chacon-Rivera, 2019; Pestana and Codina, 2020). First, the leader is one person of the group that is best representative, second, leaders are the most important persons who are responsible for promoting the interests of the group. Third, leaders are crafting a sense of the group or are entrepreneurs of the group identity, and fourth, leaders are making the group matter (e.g., by distinctness from other groups; Haslam et al., 2011; Reicher et al., 2018; Turner and Chacon-Rivera, 2019; Pestana and Codina, 2020). Thus, the identity component is an important aspect of leadership. Pestana and Codina (2020) introduced this prototype of a leader as an in-group person, integrating the individual and the situation in terms of the mutual influence between leaders and followers. This is important to the study of birding because a person being a leader today may enable and encourage other individuals, that are primarily followers, to become leaders in the future. Therefore, leadership is a process where it is fundamental to belong to a specific group and feel that this belonging is important to the self-perception and identity (Pestana and Codina, 2019). Leaders in birding are therefore assumed to be birders themselves (in-group), but also to bring the group forward, and being one of their best representatives. Thus, it is assumed that these leaders should stand out from the rest of the group in birding specialization measures, such as in the number of bird species the leader is able to identify, and in his/her behavior related to birding. Therefore, the birding specialization framework can be applied in assessing the predictors of leadership in birdwatching.

Leadership in birding requires the organization of field trips, but also includes instructing people about birds and their environment as well as to motivate them for data collection. This requires skills and knowledge beyond the simple organization of the events. Leadership in birding has been rarely addressed although in nature conservation, many people volunteer in field trips. For example, the German NABU organization, which arose primarily from bird conservation, and then turned into a nature conservation organization has 820,000 members in 2,000 local chapters throughout Germany (NABU, 2021),

and nearly all chapter leads some bird walks or field trips. Therefore, it is interesting to analyze predictors of leadership in birding. Some studies have been carried out previously, but only with few details and in North America. For example, more experienced birders are assumed to be more involved in wildlife conservation (Kellert, 1985) and in leadership roles (McFarlane and Boxall, 1996). McFarlane and Boxall (1996) showed that about 55% of the advanced birders led bird walks and/or gave presentations. The percentage of leading such activities increased from the novice to the advanced birder. This follows the pattern of longitudinal changes in recreation specialization in general (Bryan, 1977). Lee and Scott (2006) found that recreation specialization, with the four dimensions behavior, knowledge, personal, and behavioral commitment influenced the decision to obtain leadership roles. This leads to the importance of recreation specialization as an important aspect of birdwatching.

Birding Specialization and Serious Leisure

Different concepts have been applied in the study of serious leisure in its wider sense. One theory is based on Stebbins's (2017) definition of serious leisure, another conceptualization is based on recreation specialization (Bryan, 1977). Serious leisure is based on the following aspects (Stebbins, 2017): People immersed in a serious leisure activity develop a unique *ethos* on becoming involved, obtain lasting benefits (e.g., self-fulfillment), show perseverance, invest personal effort, and manage their leisure activity similar like a professional career, and, lastly, show a strong identification with the leisure activity (Codina et al., 2017). These aspects are all related to the hobby of birding. Concerning recreation specialization theory, this has been applied first to outdoor recreationists (angling, hunting, birding; Bryan, 1977). The essence of specialization theory is that outdoor recreation participants can be placed on a continuum from general interest and low involvement to specialized interest and high involvement (Bryan, 2000). Bryan (1977, 2000) further stated that the level of specialization is related to distinctive behaviors that are measured with commitment in time and money (e.g., replacement costs of the equipment, birdwatching tours, time spent birding, etc.), but also with personal and behavioral commitment. Both concepts are partly congruent but there are still many obstacles before these two could be unified (Scott, 2012). Both perspectives provide valuable insight into the complex forms of leisure activity. Scott (2012) has identified four important contributions of the specialization framework that helped to understand leisure phenomena: "there is *diversity* among participants involved in the *same leisure activity*, the number of specialized (or serious) participants can be quantified, there are gradations of seriousness, and there are practical applications of understanding that participants vary along a specialization continuum." (Scott, 2012, p. 370). From a more measurement-oriented perspective, serious leisure and recreation specialization overlap in the psychological dimensions, while recreation specialization differs in behavior and skill/knowledge, which is measured differently from the serious leisure concept.

Items from the serious leisure concept can be easily adapted to other leisure activities because they are generic, which is a real benefit of the concept, while items from the specialization framework must be refined and adapted for each activity [e.g., compare items about the number of bird species a person knows (birdwatcher) with the number of fish one caught (angler)].

Here, in this study, the concept of recreation specialization is applied and preferred over the serious leisure approach, because it is more widely used and accepted in birding research. Further, it fits the leisure activity of birdwatching better (see, e.g., Scott, 2012). Lee and Scott (2013) further showed that serious leisure might be the overarching term for the facets of recreation specialization and serious leisure, and they concluded that both conceptual approaches may measure the same construct and could be applied together. Tsauro and Liang (2008) similarly showed an interrelationship between both concepts. In general, the specialization framework applies more questions related to real behavior, like number of field trips, knowledge about species (how many birds you can identify) and others, which makes the specialization measure more specialized and the serious leisure construct more general, but also applicable to other leisure activities (e.g., sports or music).

Birding specialization is a multidimensional construct (Lee and Scott, 2004), although it is sometimes simplified, and birders are then classified into three or four groups, e.g., as casual, novice, intermediate, and advanced birdwatchers (Scott et al., 2005). Following Lee and Scott (2004), the dimensions related to birding are four-fold. First, skill and knowledge are considered as one important part of birding specialization. More knowledge is related to a higher specialization score. Second, behavior measures the activities, such as birdwatching trips or days spent in the field, as well as equipment costs. Two dimensions are considered with behavioral and personal commitment, i.e., to what extent people are committed to birding, and how important this leisure activity is for their lives (Lee and Scott, 2004).

Some other lines of research followed the involvement approach to explain sustained interest in a leisure activity. In this respect, involvement reflects the degree to which people devote themselves to an activity (Kyle et al., 2007). This construct is also multi-dimensional and includes different dimensions, such as centrality to lifestyle, attraction (of a given leisure activity) and social bonding (Kyle et al., 2007). This analysis is based primarily on the recreation specialization construct outlined above, because skill/knowledge and behavior seemed to be more relevant to leadership roles, compared to the psychological aspects of centrality to lifestyle and attraction. However, as leadership is a social role, the social bonding scale of the involvement measure was also included.

The benefit of the more complex, multidimensional measure of birding specialization used in this study is that differences among the dimensions in birding can be assessed separately which gains more insight into the differences between leaders and non-leaders. In addition, using the social bonding scale helps to assess the social dimension.

MATERIALS AND METHODS

Survey and Participants

We collected data via the Online Research Tool SoSciSurvey in 2020. Participants were informed on the first webpage about the purpose of the study. After the information, participants had to actively click on “yes” to give their informed consent and to start with the study. Participants could stop and leave the study at any time without any negative consequences. One aim was to study a broad range of birdwatchers from novices to advanced birders. Therefore, the study did not focus on only one sampling method but to recruit participants via many channels, e.g., using announcements on the webpages of large bird and nature-related organizations, like naturgucker.de, nabu.de, do-g.de, and club300.de. Mailing list were used from some organizations (Naturgucker.de). All regional chapters of scientific ornithological unions, societies and clubs were asked for participation by using postings on their websites or by distribution of the link on their mailing lists. In addition, Facebook groups with a relation to birdwatching were used to post an information about the study. Finally, an advertisement was published in a printed birdwatching journal. This procedure covered a wide variation of birdwatchers of different organizations in German speaking countries (Germany, Austria, and Switzerland), from people preferring backyard birdwatching, to highly specialized birders and (semi-) professionals.

Demographic Variables

Age, gender, and age of birding initiation were asked for, as well as the highest degree. The degree was later recoded dichotomously into having received a university degree (bachelor, master, and diploma, etc.) or not.

Birding Specialization Measurement

Birding specialization was measured with an array of previously published instruments (see Randler, 2021a). The birding specialization questionnaire is an instrument that relates the four constructs skill/knowledge, behavior, personal, and behavioral commitment as related dimensions within a second-order factor structure (Lee and Scott, 2004).

Skill and Knowledge

Different measures are used to form the skill/knowledge scale. This included a self-report of the number of species a person is able to identify without a field guide by appearance, and by song without a field guide (Lee and Scott, 2004). Participants assessed their knowledge on a scale from 1 (novice) to 5 (expert) adapted from Lee and Scott (2004), but transformed to a five-point Likert scale. This scale contained open-ended questions (number of species being able to be identified by song and appearance). These open-ended questions were z-transformed prior to analysis. This was done because the range was from 0 up to 1,000 different species. Cronbach's α of the skill/competence scale was 0.85.

Behavior

This scale is based on self-reported real behavior, measured with six items. Behavior comprised questions about the number of birding trips taken last year (at least 2 km away from home; McFarlane and Boxall, 1996; Lee and Scott, 2004), number of days spent for birding last year (Lee and Scott, 2004), number of bird species on a lifelist (Tsaur and Liang, 2008), number of bird books owned (McFarlane, 1994), replacement value of the total equipment (Tsaur and Liang, 2008) and number of species on a national list (Randler et al., 2021). Open-ended questions were z-transformed prior to analysis. Cronbach's α of the behavior scale was 0.80.

Personal Commitment

Personal commitment was measured with three questions: “Other leisure activities don't interest me as much as birding.” (Kim et al., 1997; Lee and Scott, 2004; Moore et al., 2008); “I would rather go birding than do anything else.” (Moore et al., 2008; Lee and Scott, 2013) and “Others would probably say that I spend too much time birding.” (Moore et al., 2008; Lee and Scott, 2013). All items were measured on a five-point Likert scale. Cronbach's α of the personal commitment scale was 0.76.

Behavioral Commitment

This scale refers to psychological aspects of behavioral commitment. Three items were used on a five-point Likert scale. “If I couldn't go birding, I am not sure what I would do.” (Lee and Scott, 2004; Moore et al., 2008); “If I stopped birding, I would probably lose touch with a lot of my friends.” (Moore et al., 2008; Lee and Scott, 2013) and “Because of birding, I don't have time to spend participating in other leisure activities.” (Moore et al., 2008; Lee and Scott, 2013). Cronbach's α of the behavioral commitment scale was 0.72.

Social Bonding Measurement

Involvement in birding was based on the social dimension of the modified involvement scale (Kyle et al., 2007). Three items each measured “social bonding” (Cronbach's α = 0.79). These items were Likert scale from 1 = fully disagree to 5 = fully agree. Items were “I enjoy discussing birding with my friends,” “Participating in birdwatching provides me with an opportunity to be with friends,” and “Most of my friends are in some way connected with birding.”

Leadership Questions

Leadership items were taken from McFarlane and Boxall (1996) and Lee and Scott (2006) and comprised two open questions: “How often during the last 5 years did you lead organized bird walks or field trips?” and “How often during the last 5 years have you given presentations about birds or birdwatching?”. As the original questions of Lee and Scott (2006) were dichotomous, we additionally coded a dichotomous variable out of these data with 0 = people that neither led walks or gave talks, and 1 = people that gave at least one talk or led one bird walk.

TABLE 1 | Number of participants that took over leadership in field trips or presentations about birds.

		Presentation		Total
		No	Yes	
Field trips	No	1,917	146	2,063
	Yes	320	525	845
Total		2,237	671	2,908

Statistical Analysis

The statistical program SPSS 26 was used for calculations. To assess nominal categories, a chi-square test was used with Cramer's phi to look for relationships. To correlate the number of field trips with the number of lectures, Spearman rho rank correlation was applied. Finally, to test all independent variables and their influence simultaneously, a binary logistic regression was applied. The sample sizes for the analysis differ for some reasons. First, for the binary logistic regression, outliers were removed, while in the chi-square test these data could be retained. For the correlation between field trips and number of lectures, all participants that gave neither a lecture nor led a field trip where ignored. To make the relative influence of the predictor variables comparable, a standardized measure of effect sizes was calculated. This measure was based on Menard's (1995) approach to obtaining fully standardized regression coefficients. These coefficients are interpreted as the predicted change in logits in standard deviation units per standard deviation unit increase on predictor k (Menard, 2004). The calculations were made with an excel sheet provided by Mike Crowson.¹

RESULTS

From the initial 2,992, some questionnaires could not be used because people stopped during the questionnaire. Non-binary participants and people that preferred not to answer their gender were excluded because of the low sample size. For this current analysis, 2,908 full datasets were available. 1,518 participants were men, 1,390 were women (mean age: 47.7 ± 15.5 ; range: 18–88 years). Mean years of birding were on average 24.5 ± 19.1 (range: 0–79 years). 845 persons lead at least one field trip, and 671 gave one lecture; in the combination 991 took over at least one of the two leadership roles (Table 1). Mean number of field trips led during the last 5 years was 13.43 ± 14.86 (median: 6), and mean number of presentations given was 8.21 ± 11.13 (median: 4). The range was between 1 and 50, only participants that gave at least one presentation or led one field trip have been included (Table 1).

People most likely support both roles. Persons that gave presentations usually also led field trips ($\Phi = 0.593$, $p < 0.001$). A correlation between the number of field trips and number of presentations was significant ($r_s = 0.502$, $p < 0.001$, $n = 525$), suggesting that people that give more presentations also lead more field trips. However, there are still people that preferred

TABLE 2 | Model fit values for leadership roles.

	–2 log-likelihood	χ^2	Cox and Snell	Nagelkerke's R^2
Leadership	2452.4	1267.9	0.355	0.490
Lectures	2151.1	983.6	0.288	0.436
Field trips	2381.8	1114.3	0.319	0.456

leading field trips but not giving presentations and vice versa (Table 1). Men more than women took over leadership roles ($\chi^2 = 214.96$ after continuity correction, $p < 0.001$, $df = 1$).

To address the influence of the predictor variables simultaneously, a binary logistic regression was used. For the binary logistic regression, outliers have been removed with a standardized residual higher than 5 or lower than –5. The variance inflation factors (VIF) were below 3; and the condition index was below 20. Table 2 summarizes the model characteristics. Three full models were calculated, addressing the leadership role in general by combining trip leading and lecturing, and by separating both activities because there seem to be differences between the two. The effect sizes of the full models were reasonably high when using Nagelkerke's R -squared as a pseudo-measure of effect size.

In all three models, age played a significant role, with higher age being related to less leadership (Table 3). Gender was also significant with men taking over leadership roles more often. Graduation was not significant in the combined dataset and in leading field trips. However, concerning lecturing, a formal university degree was related to a higher probability of giving lectures about birds. Years of birdwatching were not significant. Social relatedness in the involvement scales was related to being a leader, also birding skill/competence as well as self-report behavior of birding were significant predictors for leadership roles. The commitment scales, both behavioral and psychological commitment were no significant predictors in the model. Skill/knowledge and social bonding had the highest effect (Table 3).

The strongest influence as measured by effect sizes (Table 2) was skill/knowledge in all three models, followed by social bonding and behavior. University degree was a less important predictor. Also, the effect sizes of the psychological commitment scales (personal and behavioral commitment) were low.

DISCUSSION

This study analyzed predictors of leadership in birdwatching. The correlation between field trips and presentations is interesting, suggesting that leadership in birding is not dependent on a specific activity and most leaders accept both roles. However, in some cases, people led only field trips or gave only lectures. This is interesting and probably related to the university degree. Giving a lecture seems to be a more “academic” activity compared to leading a field trip because the university degree was unrelated to the probability of leading field trips but related to lecturing. This has an encouraging implication because it shows that for field trips in birding, people do not necessarily need an academic

¹<https://www.youtube.com/watch?v=W8ktaSKVCL0>

TABLE 3 | Predictors of leadership in birding.

	Coefficient B	Standard error	Wald statistics	P	Exp(B)	b (M)
(A) Leadership total						
Age	-0.020	0.004	19.844	<0.001	0.980	-0.097
Gender	-0.257	0.110	5.393	0.020	0.774	-0.040
University degree	0.041	0.105	0.155	0.694	1.042	0.006
Years of birding experience	-0.003	0.004	0.845	0.358	0.997	-0.018
Social bonding	0.723	0.076	89.722	<0.001	2.062	0.194
Skill/knowledge	1.452	0.129	127.024	<0.001	4.272	0.390
Behavior	0.624	0.132	22.239	<0.001	1.867	0.137
Personal commitment	-0.127	0.081	2.440	0.118	0.881	-0.037
Behavioral commitment	0.031	0.114	0.074	0.785	1.032	0.007
Constant	-0.794	0.328	5.876	0.015	0.452	
(B) Lectures						
Age	-0.024	0.005	21.730	<0.001	0.976	-0.130
Gender	-0.342	0.125	7.454	0.006	0.710	-0.060
University degree	0.306	0.116	6.977	0.008	1.358	0.053
Years of birding experience	0.000	0.004	0.000	0.988	1.000	0.000
Social bonding	0.626	0.081	60.058	<0.001	1.870	0.188
Skill/knowledge	0.966	0.115	70.757	<0.001	2.627	0.290
Behavior	0.634	0.127	24.968	<0.001	1.886	0.155
Personal commitment	-0.156	0.087	3.230	0.072	0.856	-0.051
Behavioral commitment	0.157	0.118	1.755	0.185	1.170	0.038
Constant	-1.463	0.355	16.988	<0.001	0.232	
(C) Field trips						
Age	-0.020	0.005	17.967	<0.001	0.981	-0.104
Gender	-0.272	0.115	5.627	0.018	0.762	-0.046
University degree	-0.034	0.107	0.101	0.750	0.966	-0.006
Years of birding experience	0.000	0.004	0.014	0.907	1.000	-0.003
Social bonding	0.653	0.077	72.480	<0.001	1.922	0.191
Skill/knowledge	1.273	0.121	110.501	<0.001	3.570	0.372
Behavior	0.514	0.127	16.386	<0.001	1.672	0.123
Personal commitment	-0.083	0.082	1.031	0.310	0.920	-0.027
Behavioral commitment	0.053	0.114	0.220	0.639	1.055	0.013
Constant	-1.164	0.333	12.226	<0.001	0.312	

Results of the binary logistic regressions. (A) Leadership total (including field trips and lectures). (B) People giving lectures. (C) People leading field trips. The standardized coefficients are in the last column [b (M)] and allow a comparison of the importance of the predictors.

degree, an aspect that is important for diversity in leadership and for role models of non-academics. Perhaps people preferring lecturing over a field trip might be afraid of the challenging nature of field trips because birds are unpredictable and move, so that species might appear that are unknown to the leader. Also, the participants can react more interactive during a field trip, while in presentations and lectures, one has more control about the situation. This might somehow be similar to biology teachers, usually with an academic degree, that prefer lecturing over field trips because of their inexperience and the unpredictability of the environment (Ateşkan and Lane, 2016).

Years of birdwatching was not significantly related to the probability of being a leader. This is an encouraging result because it shows that people may become leaders more quickly and do not need decades of experience before giving a talk or leading a field trip. This might also contribute to diversity when younger people take over such leadership roles.

However, an important predictor of leadership were the specialization measures, skill/knowledge and behavior. Skill knowledge was the predictor with the highest effect size (Table 3). People with a higher bird knowledge were more likely to be a leader in birding, which is a trivial result because a basic knowledge of birds should be available before someone starts leading trips or giving lectures. Interestingly, the behavior component also contributed to the models. Thus, leaders in birding also live what they proclaim; they are avid birders themselves and spent time outside birdwatching when they do not lead excursions. This is an important aspect because, again, this behavior helps in developing a leader to a kind of role model. Similarly, to McFarlane and Boxall (1996) this current study showed that specialization was a better indicator of participation in conservation activities than socioeconomic variables. The psychological and behavioral commitment scales from the birding specialization construct,

however, were unrelated to the leadership role. Using the multi-dimensional model of specialization helped to entangle these differences between the dimensions and is an improvement over the study of McFarlane and Boxall (1996) who used a classification into four birder groups. Lee and Scott (2006) used a similar conceptualization of birding specialization and found a significant influence of skill/competence, behavior, and behavioral commitment on leadership. In common with their study, psychological commitment was not significant in both. However, behavioral commitment received significance. It can only be speculated about this result. For example, their measurement of commitment was collated from two items, and in this study, it was based on three. Further, the sample size is higher compared to the study of Lee and Scott (2006; $N = 642$). Next, the studies were carried out on different continents, are more than one decade apart, and finally, the previous study was conducted with members of the American Birding Association, while this one covered a wider range of birdwatchers.

As addition to the previous studies, the social bonding scale of the involvement construct (Kyle et al., 2007) was applied, following the hypothesis that leading is a somewhat social aspect. This could be confirmed in the current analyses. This is another important aspect. Social bonding from a leisure point of view seems necessary to become a leader in birding. This scale is especially tied to sociality in the given leisure activity and not to sociality in general. Here, new venues of research should look for associations in personality, especially for the agreeableness component of the Big Five (Randler et al., 2017). Additionally, it might be interesting whether aspects of the “dark side” of personality, such as narcissism are related to leadership in leisure organization in a similar way as they are in business companies (Judge et al., 2009).

Another important aspect not considered in this study is identity, as it is related to both, the establishing of a serious leisure activity, where this activity forms a substantial part of the identity (Codina et al., 2017; Stebbins, 2017) but also with respect to leadership. In leadership theories, especially in the social categorization/social identity of leadership (Haslam et al., 2011; Reicher et al., 2018; Turner and Chacon-Rivera, 2019; Pestana and Codina, 2020), identity plays a central role because the leader is representative for the group and its best representative.

Men more than women engaged in leadership roles. At least previously, women encountered far more constraints to leisure than do males (Henderson and Hickerson, 2007; Lee et al., 2015). This might be explained with the persistence of gender role stereotypes but should change in the future because of gender role transitions. As an alternative interpretation, being leader in leisure needs self-esteem, and there is a significant gender gap, with males consistently reporting higher self-esteem than females (Bleidorn et al., 2016). These aspects deserve future investigation because female mentors are beneficial since they positively influence career success in women (Propst and Koesler, 1998). Leaders in nature conservation and in CS projects also serve as possible role model or as mentors, with mentors being involved in caring for their protégé – which is not necessary in role models (Propst and Koesler, 1998). In this case, women as

role models and/or mentors are important for educating the next generation of citizen scientists.

From a methodological viewpoint, concerning self-report measurements in questionnaires, one point should be made about the validity. Numerous studies have addressed the factor structure of the birding specialization questionnaires and the measurement model used here seems well established (Lee and Scott, 2004). Furthermore, Randler and Heil (2021) showed that people who assessed their bird knowledge higher in the questionnaire similarly performed better in a subsequent cognitive test where they had to identify different bird species ($r = 0.7$). This adds to the quality of the questionnaire.

Limitations

One limitation can be from the view of the theoretical underpinning because two approaches were used to assess serious involvement in a leisure activity (Scott, 2012). As Lee and Scott (2013) showed, the concept of recreation specialization and of serious leisure may measure the same construct and could be united somehow – although not many followers did really perform this – it might be an interesting idea for future studies to include both approaches into the study of leadership in birding. Further studies should also re-examine the relationship between the measures of recreation specialization and serious leisure. Nevertheless, skill/knowledge provided the highest effect size in all three models, suggesting that choosing the questionnaire focusing on recreation specialization, which contains exactly this measure, seemed the right choice.

This study did not cover the full side of the leadership construct but focused mainly on giving lectures and leading bird walks. However, this is still the major activity of leaders in birding. Future studies should address other roles of leaders as well as characteristics of successful leaderships. Other roles important in outdoor recreation leaders also include motivating the participants, encouraging them, empower volunteers and enable learning rather than distracting people from this activity (Ford and Blanchard, 1993; Benevone et al., 2020). A special focus may lie on transformational leadership, which concerns leaders who are highly inspiring and motivating for followers, helping them to meet higher performance targets (Almas et al., 2020). For volunteers in CS projects, effective leaders are necessary, at best with sympathetic personality and a non-hierarchical approach (Loos et al., 2015). In general, suitable leadership may transformational leadership, although it can coexist with a diverse range of leadership models (Charles et al., 2020). However, such studies have not yet been carried in birding and would be a fruitful venue of research. Further studies may also focus on the identity and social categorization of the leadership construct with respect to birding.

CONCLUSION

As a conclusion, this study adds to characterize leaders in birding, but open questions still remain on different roles of leadership, personality and motivational aspects, as well as in increasing

diversity of the leaders. As an implication, more diversity is needed because older men most often took leadership roles.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the author, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Social Science and Economic Faculty of the University of Tuebingen (Az A2.5.4.–113_aa). Written informed consent for participation was not required for this study in

accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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