Systematic map of conservation psychology

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Abstract: Conservation science and practice commonly draw on the theories and methods of social psychology to explain human cognition, emotion, and behavior germane to biodiversity conservation. We created a systematic map of the cross-disciplinary conservation science literature, which draws on social psychology concepts and methods in their application broadly described as conservation psychology. Established protocols were used to systematically collect and collate peer-reviewed research published in an explicit selection of multidisciplinary conservation journals. We sought to catalog the literature, elucidate trends and gaps, and critically reflect on the state of conservation psychology and its research practices that aim to influence conservation outcomes. The volume of publications per year and per decade increased from 1974 to 2016. Although a diversity of research designs and methods was applied, studies disproportionately focused on specific concepts (attitudes and beliefs), locations (North America and Europe), and contexts (terrestrial, rural). Studies also tended to be descriptive, quantitative, and atheoretical in nature. Our findings demonstrate that although conservation psychology has generally become more visible and prominent, it has done so within a limited space and suggest that disciplinary research principles and reporting standards must be more universally adopted by traditional and multidisciplinary conservation journals to raise the floor of empirical research.

Keywords: conservation psychology, conservation social science, human dimensions, social psychology, systematic map, systematic review

Resumen: Con frecuencia, la ciencia y la práctica de la conservación parten de las teorías y los métodos de la psicología social para explicar las facultades cognitivas, las emociones y el comportamiento humano relacionado con la conservación de la biodiversidad. Creamos un mapa sistemático de la literatura sobre las ciencias interdisciplinarias de la conservación, cuya aplicación está basada en los conceptos y métodos de la psicología social y el cual está caracterizado en términos generales como psicología de la conservación. Usamos protocolos estandarizados para recolectar y cotejar investigaciones revisadas por pares publicadas en una selección explícita de revistas científicas multidisciplinarias sobre conservación. Buscamos catalogar la literatura, esclarecer tendencias y vacíos y reflexionar de manera importante sobre el estado de la psicología de la conservación y sus prácticas de investigación que se enfocan en influir sobre los resultados de conservación. El volumen de publicaciones por año y por década incrementó desde 1974 hasta 2016. Aunque se aplicaron diversos métodos y diseños de investigación, los estudios estuvieron enfocados desproporcionadamente en conceptos específicos (actitudes y creencias), localidades (América del Norte y Europa) y contextos (terrestre, rural). Los estudios también tendieron a ser descriptivos, cuantitativos y de naturaleza carente de teoría. Nuestros hallazgos demuestran que, aunque la psicología de la conservación se ha vuelto más visible y prominente de manera general, lo ha hecho dentro de un espacio limitado que sugiere que los principios de investigación disciplinaria y los estándares de reporte deben

Article impact statement: Exploring the past helps conservation psychology highlight successes, recognize disparities, and shape the future of the field.

Paper submitted November 1, 2019; revised manuscript accepted January 23, 2020.

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ser adoptados más universalmente por las revistas científicas de conservación tradicionales y multidisciplinarias para incrementar el nivel de la investigación empírica.

Palabras Clave: ciencias sociales de la conservación, dimensiones humanas, mapeo sistemático, psicología de la conservación, psicología social, revisión sistemática

Introduction

There has been tremendous growth in the use of scientific theories and methods to observe, measure, and explain social, cognitive, and behavioral phenomena in biodiversity conservation over the past several decades (Mascia et al. 2003; Bennett et al. 2017). This stems from a recognition that individuals and societies cause and bear the consequences of conservation challenges and are fundamental to solutions. The theories and methods of social psychology play a prominent role, in this regard, owing to their utility and parsimony as means to understand and measure cognition, affect, and behavior relevant to conservation (Moon & Blackman 2014; Reddy et al. 2016). Concepts such as attitude, value, identity, motivation, belief, and norms are used to understand behaviors that influence conservation initiatives and outcomes (McCleery et al. 2006; Clayton 2012). Although the use social psychology frameworks, theories, and models (FTMs) in conservation has grown, few data exist that explicitly characterize their application (Selinse et al. 2018).

Advancing conservation psychology requires systematic knowledge about the scope of the discipline in terms of application. It is necessary to collate, catalog, describe, and assess the state of published research in the field. Our objective was to use established guidelines to produce a systematic map of empirical, peer-reviewed conservation literature that draws on the field of social psychology. We focused on formally ranked, traditional, and multidisciplinary conservation-focused journals. Our intent was to advance conservation psychology by identifying research trends and gaps, characterizing mainstream features of the literature, and describing the diversity of research in the field. A more complete picture of the state of the field facilitates the generation of novel research questions, allows development of recommendations to improve the actionability of findings, and presents an opportunity to reflect on past, present, and future practice.

Inquiry Scope

Social psychology is a core scientific discipline that seeks to understand the relationship between the individual and the social context and the subsequent effects of social interactions on cognition, emotion, and behavior (St. John et al. 2010; Steg et al. 2017). There are several sub-disciplines of social psychology that investigate topics germane to conservation: environmental and conservation psychology, subsets of sociology, and the broad multidisciplinary field. Scholars in these fields have expanded the psychological bases of human behaviors that affect the environment and sought to develop methods to shift society toward a more sustainable future (Clayton 2012).

We devised a systematic map of conservation literature that draws on concepts, theories, and methods from social psychology. These included but were not limited to traditions of values, attitudes, motivations, social identity, and social influence research (Abrams & Hogg 1990; Fishbein & Ajzen 2010; Schwartz 1992; Cialdini & Trost 1998; Ryan & Deci 2000). Given the interdisciplinary nature of conservation science and the broad set of disciplines that draw on social psychology, our map was based on search terms related to the content of studies adopting this epistemology, not of social psychology per se. That is, our effort focuses on an epistemological hub of FTM specific to conservation psychology, which is the focus of the special section (Dietsch et al. 2020). We believe our study is an initial step toward quantifying and characterizing a growing body of applied, cross-disciplinary literature in conservation that broadly applies social psychology concepts and methods.
Inquiry Method
Systematic mapping is used to collate and describe a body of literature across a broad subject of interest (James et al. 2016). The intent of a systematic map is to answer broad questions and build a catalog of evidence to identify or assess knowledge gaps and trends (Haddaway et al. 2016). Akin to a scoping review, the objective of a systematic map is to provide an overview of an evidence base, specifically, what research has been conducted, where and how, and in what form, among other variables of interest (Munn et al. 2018; Tricco et al. 2018). Systematic maps are appropriate when researchers wish to answer questions such as how much research is available on a topic or what is the current state of knowledge on a subject (Haddaway et al. 2016). Ultimately, the resultant literature catalog forms a searchable database that allows others to review, use, and update, as well as identify areas with sufficient representation to allow for a systematic review (James et al. 2016). The approach facilitates the establishment of a literature database within a protocol that facilitates future refinement, extension, and review.

Questions and Objectives
Our overarching goal was to characterize the empirical, peer-reviewed literature that applies social psychological perspectives published in ranked traditional and multidisciplinary conservation journals. We are cognizant that these specifications place parameters on the literature collected that is distinct from traditional systematic map protocols; we have done so purposefully. The inquiry is further guided by the following questions to better identify main concepts, FTMs, sources, and knowledge gaps: what is the scope of published research (e.g., how much research is available, in which journals, and what are the temporal publication trends); what research contexts are represented (e.g., where is research conducted and on what populations); what research designs, methods, and sample procedures are used (e.g., what are the epistemological foundations of the peer-reviewed evidence base); what FTMs do authors most commonly use; what are the characteristics, contexts, and themes of published research (e.g., are there identifiable trends, gaps, or areas of concern); and what recommendations and guidelines can be inferred to guide future research?

Methods
Our procedure followed guidelines established by the Collaboration for Environmental Evidence (CEE 2018). These guidelines derive from standards established in the medical field that have been adapted to environmental conservation contexts (Haddaway & Westgate 2018; Haddaway et al. 2018). We adhered to recommended guidelines to ensure a transparent and standardized design that would be repeatable and comparable (Grames & Elphick 2020). Our methods deviated from recommended guidelines in 2 respects. First, we did not formally engage with stakeholders in the development of the study design and search parameters. Our process consisted of establishing a review team with requisite knowledge and skill (i.e., listed authors) and an ad hoc expert review panel of colleagues who reviewed and commented on the study design and search parameters. Second, we did not preregister a protocol. At the time of project development (late 2017), no means were available to preregister a protocol with the conservation-specific journals identified for publication. However, our protocol does adhere to all other guidelines and complies with both PRISMA and ROSES reporting standards (Supporting Information) (Moher et al. 2009; Haddaway et al. 2018; Tricco et al. 2018).

Our search strategy consisted of four stages: identification, screening, eligibility, and inclusion (Fig. 1). The identification stage consisted of a systematic literature search in peer-reviewed publications ranked in the top 50 of the 2016 Journal Citation Report’s (JCR) “biodiversity conservation” category and the 2016 Scientific Journal Rank’s (SJR) “nature and landscape conservation” category (Clarivate Analytics 2016; SCImago Research Group 2016). A total of 85 journals were included, accounting for cross-listing (journal list and rankings in Supporting Information). To correspond with the journal rankings, our search protocol limited returns to articles published in 2016 or earlier.

Searches within these journals were conducted from 19 March 2018 to 23 March 2018 in 2 databases: Scopus and Web of Science Core Collection (via the Web of Science platform). We developed an English-language search string to search for specific keywords in the identified journals (modified for the search functionality of each database). We iterated on the parameters of the search strategy via ad hoc peer review from professional colleagues who are experts in the fields of social, environmental, and conservation psychology. The search string was designed to accommodate both basic conceptual terms core to social psychological inquiry (e.g., attitude, belief) and terms specific to social psychological theory (e.g., planned behavior, norm activation). The following were excluded terms deemed homonyms or in common usage and nonspecific to social psychological inquiry: value, motivation, identity, emotion, norm, awareness, preference, behavior, knowledge, perception, and affect. Although it is seemingly counterintuitive to exclude these terms, our iterative process included preliminary searches to evaluate the volume of returns and calibrate the query. For example, the final version of the search string plus all excluded terms yielded 42,880 returns and the addition of only value
yielded 9,397 (both volumes were deemed excessive in consideration of review logistics and the probability of containing a large proportion of irrelevant returns).

The final search string was “attitude” or “belief” or “cognitive hierarchy” or “value orientation” or “environmental value” or “ecological value” or “pro-environmental value” or “planned behavior” or “planned behaviour” or “reasoned action” or “norm activation” or “value belief norm” or “new ecological paradigm” or “descriptive norm” or “injunctive norm” or “personal norm” or “social norm” or “ecological identity” or “environmental identity” or “identity theory”
or “personal identity” or “place identity” or “role identity” or “self-identity” or “social identity” or “affective attachment” or “place attachment” or “diffusion of innovation”” or “theor“ of change”.” An additional string was created to ensure returns from only the 85 journals fitting our search criteria (search documentation in Supporting Information). Periodically, organizational (journal) websites were searched to ground truth returns from Scopus and Web of Science. All additional searches revealed consistent returns and no new articles were retrieved.

For the screening stage, we used the literature review management software, EPPI-Reviewer 4 (Thomas et al. 2010). The screening process began, first, with removing duplicate entries. Next, articles were manually screened by source, title, abstract, and, if needed, full text to judge adherence to the inclusion criteria and eliminate irrelevant results (see excluded articles in Supporting Information). At this stage, the eligibility criteria consisted of three considerations: article explicitly references conservation, article is empirical in nature (quantitative or qualitative), and article is situated within the general scope of social psychology. Software functionality allowed researchers to identify disagreements and reach a consensus for inclusion or exclusion in an iterative manner. A random sample of 10% (89/880) of records were dual screened by the study authors for inclusion criteria to assess intercoder reliability.

The inclusion stage consisted of full-text screening. Once deemed relevant to the scope of inquiry, included articles were coded for the following attributes: author or authors, title, year, number of authors, country of first author, keywords, research design, research methods, unit or units of analyses, study population or populations, sample designs, FTM, key terms (specific to social psychology or the FTM), study contexts, study country or countries, study continent or continents (Supporting Information). The determination of research design, research method, unit of analysis, and key terms relied on each coder’s expert judgment. However, coders followed specific instructions that required articles to explicitly state a sample design (e.g., probabilistic or convenience) and an FTM (e.g., self-determination theory, expectancy value). By design coders did not attempt to infer the intent of author or authors when these aspects of a study remained implicit or unexplained. The recorded FTMs were further analyzed via a content analysis procedure to group similar FTMs and reduce the data to a more manageable and interpretable format (Neuendorf 2017). For example, FTMs like identity theory, social identity theory, the social identity approach, and self-categorization theory were coded as identity, whereas approaches based on the theories of reasoned action or planned behavior were coded as attitude-behavior (expectancy value) (details in Supporting Information).

### Results

The systematic search of the literature yielded 2,027 unique records after accounting for cross-listing among search engines. Title and abstract screening reduced the number of potential records to 880, and full-text eligibility screening yielded 708 articles for analysis (Fig. 1). A consistency check (intercoder reliability) of inclusion and exclusion was acceptable according to accepted standards (Cohen’s $\kappa = 0.90$; 95% CI, 0.72–1.00; Cronbach’s $\alpha = 0.93$) (Lombard et al. 2002).

Of the 85 journals searched, 42 were represented, and 25 outlets had at least 5 publications (Table 1). These 25 outlets represented 94.3% of the articles analyzed (668 of 708). From 1974 to 2016, an upward trend in the number of publications per year was observed (Fig. 2). By decade and year this trend became more marked. In the 1970s $n = 5$ (1 article/year), 1980s $n = 17$ (average 2.8 articles/year), 1990s $n = 57$ (average 5.7 articles/year), 2000s $n = 240$ (average 24.0 articles/year), and 2010s $n = 392$ (average 56.0 articles/year). The descriptive analysis of articles by journal ranking (combined JCR and SJR ranks) showed 243 publications in journals ranked in

| Journal Name | Number of Articles |
|--------------|--------------------|
| Wildlife Society Bulletin | 86 |
| Landscape and Urban Planning | 78 |
| Biological Conservation | 75 |
| Environmental Conservation | 74 |
| Land Use Policy | 69 |
| Conservation Biology | 49 |
| Biodiversity Conservation | 33 |
| Oryx | 28 |
| Journal of Nature Conservation | 24 |
| European Journal of Wildlife Research | 21 |
| Journal of Wildlife Management | 20 |
| Landscape Research | 19 |
| Tropical Conservation Science | 11 |
| Wildlife Biology | 10 |
| Aquatic Conservation | 8 |
| Ecosystem Services | 8 |
| Conservation Letters | 7 |
| Urban Ecosystems | 7 |
| Animal Conservation | 6 |
| Conservation and Society | 6 |
| Journal on Protected Mountain Areas Research and Management | 6 |
| Forest Ecology and Management | 6 |
| Habitat International | 6 |
| Ursus | 6 |
| Ecological Management and Restoration | 5 |
the top 10; 285 in those ranked 11–25; and 180 in those ranked 26–50 (Fig. 2).

In terms of the geographic distribution of studies, 115 nations were represented in the literature (not mutually exclusive if the study was conducted in multiple countries) (Fig. 3). All continents were represented (excluding Antarctica): North America (n = 240), Europe (n = 187), Asia (n = 119), Africa (n = 98), Oceania (n = 55), South America (n = 27), global (n = 6). Institutions of the first author were in 81 nations. Rural (n = 350) and terrestrial (n = 584) social–ecological contexts represented a large proportion of the research body (Table 2). Mammals were the primary taxa of interest (n = 218). The mammalian and agricultural biases were consistent from the mid-1990s onward. Geographically, these trends were consistent with the fact that many studies are conducted in the United States.

Seventy-four distinct study populations were identified (not mutually exclusive if multiple populations were used for a single study) (Supporting Information). Many coded study populations represented a broadly general audience (e.g., residents, 37.7%, n = 256; stakeholders, 11.3%, n = 77). Studies that reported no sampling design represented nearly one-third of the systematic map (30.8%, n = 225), although roughly half (45.6%, n = 333) of the studies reported using a probabilistic (random) sampling design.

Our map revealed that a sizeable proportion of the studies adopted purely descriptive (n = 498; 58.0%) and quantitative research designs (70.1%, n = 547) (Table 3). After descriptive, relational designs (also referred to as associational), wherein an assessment of the relationship between measured variables is conducted, were the second most frequent design (31.8%, n = 273). Experiments were the least common design (1.7%, n = 15). Qualitative approaches were the second most frequent method represented (21.2%, n = 174). Analysis of the progression from a specified research design to the methods,
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North America: $n = 240$ studies
South America: $n = 27$ studies
Africa: $n = 98$ studies
Europe: $n = 187$ studies
Oceania: $n = 55$ studies
Global: $n = 6$ studies

Figure 3. Distribution of the reported study location (country) based on 708 publications identified in a systematic map of conservation social psychology.

Table 2. Research contexts represented in articles included in a systematic map of conservation social psychology.

| Context              | Frequency |
|----------------------|-----------|
| Socioecological      |           |
| rural                | 305       |
| mixed                | 185       |
| urban                | 67        |
| recreation           | 42        |
| hunt or fish         | 41        |
| suburban             | 14        |
| Habitat context      |           |
| terrestrial          | 584       |
| marine               | 31        |
| freshwater           | 15        |
| island               | 6         |
| multiple             | 6         |
| Faunal context       |           |
| mammals              | 218       |
| birds                | 26        |
| multiple             | 23        |
| ichthys              | 18        |
| herptiles            | 10        |
| arthropod            | 8         |
| other                | 1         |
| Floral context       |           |
| agricultural         | 62        |
| woody                | 37        |
| mixed                | 24        |
| herbaceous           | 6         |
| algae                | 4         |
| other                | 3         |

Table 3. Research design, method, and sampling design represented in articles included in a systematic map of conservation social psychology.

| Variable         | Frequency (%) |
|------------------|---------------|
| Research design  |               |
| descriptive      | 498 (58.0)    |
| relational       | 273 (31.8)    |
| case study       | 41 (4.8)      |
| intervention     | 32 (3.7)      |
| experimental     | 15 (1.7)      |
| Research method  |               |
| quantitative     | 574 (70.1)    |
| qualitative      | 174 (21.2)    |
| mixed method     | 34 (4.2)      |
| geospatial       | 16 (2.0)      |
| archival or historical | 11 (1.3) |
| observational    | 6 (0.7)       |
| computational    | 4 (0.5)       |
| Sampling design  |               |
| probability      | 333 (45.6)    |
| none             | 225 (30.8)    |
| purposive        | 63 (8.6)      |
| nonprobability   | 38 (5.2)      |
| convenience      | 34 (4.7)      |
| census           | 20 (2.7)      |
| quota            | 18 (2.5)      |

Most studies did not explicitly state the use of an FTM to guide the inquiry (66.1%, $n = 468$). A total of 317 FTM were identified and further analyzed with content analysis, which yielded 34 categories of FTM with multiple occurrences and 45 single-occurrence FTM (list and coding in Supporting Information). The most common FTM was categorized as attitude-behavior correspondence rooted in the expectancy value tradition ($n = 40$), sampling, and FTM used supported the tendency for studies to be descriptive, quantitative, and atheoretical (Fig. 4).
Figure 4. Flow of conservation social psychology research from design to method, sampling procedure, and use of a specified framework, theory, or model (frequency inclusive of a single study in which multiple designs, methods, sampling, or theories were used).

Discussion

Our systematic map provides, to our knowledge, the first of the peer-reviewed social psychological literature published in leading multidisciplinary conservation journals. It follows a tradition of structured and systematic exercises to assess bodies of research literature in both conservation and psychology (e.g., Grichting 1989; Qin et al. 2019). The resultant database constitutes a resource that can be used to critically assess the state of the field and serves as the basis for various other inquiries. It reveals a number of positive and negative trends. In the context of our search parameters, the current state of conservation social psychology is reflective of a field of research and practice that is maturing while negotiating a balance between increased relevance and standards.

Results showed a growing import of scientific approaches to observe, measure, and explain individual...
Table 4. Conceptual and theoretical terms represented in articles included in a systematic map of conservation social psychology.

| Term*       | Frequency (%) |
|-------------|---------------|
| Attitude    | 500 (28.4)    |
| Belief      | 396 (22.5)    |
| Behavior    | 193 (11.0)    |
| Experience  | 118 (6.7)     |
| Knowledge   | 116 (6.60)    |
| Value       | 111 (6.3)     |
| Intentions  | 78 (4.4)      |
| Motivation  | 38 (2.2)      |
| Awareness   | 36 (2.0)      |
| TRA or TPB  | 32 (1.8)      |
| Norms       | 32 (1.8)      |
| Identity    | 26 (1.5)      |
| Attachment  | 19 (1.1)      |
| NAM, VBN, or NEP | 16 (0.9) |
| Affect      | 14 (0.8)      |
| Risk        | 13 (0.7)      |
| Self-efficacy | 12 (0.7)  |
| Cognitive hierarchy | 8 (0.5) |

*Abbreviations: TRA, theory of reasoned action; TPB, theory of planned behavior; NAT, norm activation model; VBN, value belief norm model; NEP, new ecological paradigm.

and social phenomena in conservation. This is evinced by an upward trend in the number of papers published per year that met the systematic map search criteria and in the number of outlets publishing this research. Until the early 2000s, publications of this nature were relatively rare in the outlets included in our review, but this number has grown to nearly 80 manuscripts per annum (Selinske et al. 2018). Given the publication rate reported here, the number of articles published from 2017 to 2027 will total the number of papers published between the timespan of this study (1974–2016). Although the application of social psychology to conservation continues to expand, our results highlight compelling trends and gaps in this literature, as well as areas of strength and of concern.

The diversity and use of theory and theoretical concepts are a central topic to emerge from a synthesis of our results. A plurality of perspectives and methods exists within any scientific discipline or field of inquiry (Patterson & Williams 2005; Moon & Blackman 2014). Our systematic map reinforces that fact with respect to conservation social psychology. Though a subset of concepts dominates the reviewed literature, a diversity exists. The > 300 FTMs identified represent a broad range of established theoretical traditions as well as study-specific conceptual frameworks and models. The other side of the conceptual diversity and theory usage discussion provides empirical evidence that reinforces negative anecdotal appraisals of the research literature.

Based on both categorical keywords and observed FTMs, attitude was the most common theoretical concept used by authors. Though the legacy of attitudinal research in conservation is strong, a synthesis of our findings reveals conflation and ambiguity. Our reading of the literature revealed studies that did not operationalize attitude in psychological terms—a cognitive, affective, or connotative appraisal of an object—or left the definition of “attitude” implicit (Eagly & Chaiken 1993). For instance, only 27% of the 501 studies where “attitude” was coded as one of four possible key terms drew on an explicit FTM. Authors’ use of attitude was often only reflective of the cognitive dimension. Other scholars’ treatment of attitude was more reflective of a belief—the second-most identified conceptual focus. Although attitude is an appraisal of an object expressed in some measure of favor or disfavor, a belief is a conviction about the attitude object in question (Fishbein & Ajzen 2010). This distinction is important when considering the factors that are hypothesized to influence behavior and why and the explanatory power of social psychological FTMs. Although our results point to a disproportionate focus on attitude and some misapplication, they are not necessarily an indictment. In combination with other findings, particularly issues of conceptualization and operationalization, the result can allude to a wider problem that should be recognized and addressed as a field. There is a need to consider its theoretical treatment more explicitly and situate the attitude construct within the nomological network of associated social psychological constructs implicated in behavior.

The focus of conservation science and practice revealed by our results reinforces some common assumptions regarding study areas, taxonomic groups, and study populations. It is not entirely surprising that our results reveal study locations predominantly in North America and Europe, with the United States and United Kingdom accounting for a disproportionate amount of research activity. The converse geographical bias toward the United States, Australia, and the United Kingdom is also in alignment with previous structured reviews and maps (Griffiths & Dos Santos 2012; Di Marco et al. 2017). For example, Hickisch et al. (2019), in the context of conservation planning, found a publication bias against research in central and north Africa and central Asia. Like their results, our results reveal a similar trend and gap. As Hickisch et al. (2019) suggests, this finding may stem from persistent armed conflicts. Di Marco et al. (2017) suggests a publication filter process is another plausible explanation, wherein research conducted in developing countries is unlikely to be published in leading journals, resulting in the geographic biases. We speculate institutional, social, and economic barriers that combine to limit domestic research capacity are contributory but exacerbated by center-periphery dynamics that shift researchers away from the Global South (Salager-Meyer 2008). That is the Global North tends to have stronger research capacity and available financial and institutional support to address applied natural resource problems...
such that established funding–research–publication pathways exist and are readily accessible.

From the perspective of psychological research, these inequities align with a consistent trend of oversampling participants from WERID societies (Western, educated, industrialized, rich, and democratic) (Henrich et al. 2010; Rad et al. 2018). Research design constraints, such as access to reliable population-level data, sample frames, language and literacy barriers, and other issues associated with research infrastructure, may also be at play. Researchers may perceive nations such as the United States, United Kingdom, and Australia, as having more reliable data and infrastructure. Yet, from a global conservation prioritization perspective, these nations are overrepresented, whereas countries with rapidly growing populations and modernizing economies such as China, India, and Indonesia, which were not well represented as contexts of research in the systematic map, may offer unique and novel conservation insights and outcomes. Moreover, as Henrich et al. (2010) assert, WERID populations are among the least representative population researchers can generalize to humans (but see Gaertner et al. 2010). As with any bias, geographic or sampling bias, it is incumbent on not only authors, but also journal editors, reviewers, research sponsors, and the research community to require or incentivize discussions about these limitations and biases.

In addition to geographical biases, previously identified bias toward broadly defined landscape and taxonomic categories were also apparent. A large proportion of studies were categorized as investigating human–nature interactions in terrestrial, rural, or agricultural landscapes. Likewise, a distinct taxonomic bias toward mammals was apparent, which also aligns with other reviews of conservation research (Donaldson et al. 2016; Troudet et al. 2017). We suggest that societal preferences play a role in these biases. That is, within the United States, which produced most research in these landscape and taxonomic categories, wildlife conservation tends to be implemented via a game management framework— with associated federal and state funding. To an extent, our map reflects this reality, with the Wildlife Society Bulletin having the largest percentage of published records. The U.S. wildlife management framework inherently biases research toward terrestrial mammals in rural and recreation and hunting and angling settings given this focus. A corollary to this is emergence of human dimensions, which is a field that has distinct synergies with the U.S. wildlife management framework and its research priorities (Decker et al. 2012). The determination of whether these biases are good or bad for the field is not our purpose. But, when biases are made apparent, discussions within a field or research tradition can yield correction and positive conservation outcomes.

Critical Assessment of the Literature

Social psychological inquiry, like other established research traditions that are applied to conservation, has discipline-specific design, evaluation, and reporting standards. The field must be held to those standards via peer review while also being open to their reevaluation in the context of conservation. For instance, theory is a required part of any systematic interrogation of the social psychological basis of conservation-related behavior (Ranjan et al. 2019). Yet, our findings reveal an empirical–theoretical disconnect. Nearly two-thirds of the 700 studies reviewed did not situate their work within an explicit or consistent theoretical structure. Systematic observation must be coupled with systematic explanation. This synergy relies on theory, generally, to act as an a priori guide in the formation of research questions and definition of concepts and variables. Questions and variables then guide methods: sampling design, data collection, measurement, and analyses. Finally, together, theory and method act as a post hoc guide to interpret results and make inferences in relation to a broader body of literature, inform and guide subsequent application, and, ideally, contribute to practice. This is especially important in the context of associational or correlational research designs. Causal attribution is predicated on the tenability of the data generating mechanism— theory—underlying hypothesized associations (Kenny 2019). Theory allows the researcher to situate their findings in the context of past research and identify anomalous results and the boundary conditions of hypotheses while contributing to the scientific knowledge on a topic of practical concern. An empirical–theoretical disconnect is worrisome with respect to the veracity of findings to provide meaningful insights and data with broad relevance to conservation beyond specific contexts and populations.

An illustrative example of an empirical–theoretical disconnect is a default concept like attitude. What we mean by the term “default” is that the attitude concept is a convenient empirical metric. Conventional wisdom and lay theory hold that how people think directs how they act (Eagly & Chaiken 2007). In a dyadic relationship, measuring the antecedent, attitude, is both logical and convenient. Our findings suggest that conservation has an attitude problem. We contend the attitude concept is problematic because its prevalence is coupled with atheoretical application (73% of studies coded as attitude did not use an FTM). The existence of a default like attitude—particularly when considered in isolation from other variables—makes findings tenuous and more likely to lead to spurious interpretations (McCleery et al. 2006; Nilsson et al. 2020).

Nearly one-third of studies reviewed did not explicitly report the nature of their sampling design. The fact that this proportion of studies did not make an explicit statement as to their sampling design or procedure is
disconcerting. Our review protocol specified that only an explicit reference to a sampling design or procedure would be recorded—we deliberately did not infer when no direct statement was made. If accurate, this finding raises concerns about the generalizability and transferability of the research reported in these outlets. In the past, similar issues were apparent in the broader social psychology field, and many persist (Rosnow & Rosenthal 1989). In such cases, for example, the American Psychological Association succeeded in improving standards of significance testing and reporting and sampling design (Wilkinson 1999). The responsibility is in the hands of researchers, journals, reviewers, and professional organizations to promote, monitor, and enforce standards. This is a central imperative because researchers cannot remedy sampling design issues after the fact, and such studies should not pass a peer-review process unless adequately justifiable claims are made to defend the sampling choices.

In contrast, although nonprobability sampling designs are not ideal—researchers commonly want to generalize findings to a population beyond their sample—the nature and logistics of applied conservation can be such that the identification of probability-based sample frames is complicated or impossible (Reis & Gosling 2010). The approximately one-fifth of studies that reported a nonprobability sample aligned with emerging sampling trends outside of conservation. In a report on survey and public opinion research, Baker et al. (2013) note that a wide range of nonprobability designs are being used more frequently in applied research fields. When using a nonprobability sampling design, researchers should justify their choice to assure fit with purpose and inference or journals and reviewers should explicitly state or modify definitions of acceptable sampling procedures within a broader sampling-quality framework (Grovès & Lyberg 2010). A similar context on the horizon is the use of experimental designs and randomized controlled trials, which require proactive implementation and enforcement of standards related to recruitment, control groups, manipulation checks, and the use of power analysis to predetermine adequate sample sizes per treatment or block (few studies of this nature were found in the literature).

A justifiable and defensible evidence base is an imperative for conservation. Our critical assessment and the recommendations that follow parallel calls for evidence-based conservation. The need is no different in the context of scientific theories and methods to observe, measure, and explain social phenomena then it is for biophysical phenomena. The disparity in reported sampling protocols, for example, should not be discounted and may allude to other observations that research and sampling design are not yet comprehensively integrated into or valued by this area of peer-reviewed conservation research (St. John et al. 2014).

Recommendations for Improved Practice

Place-based, mission-driven research is compatible with conceptually sound, theory-driven empirical research. Moreover, standard methodological and sampling considerations are not incompatible with applied, problem-based research. A salient conclusion from our study is that disciplinary research and reporting standards must be adopted by traditional and multidisciplinary conservation journals to, in a sense, raise the floor of empirical conservation psychology research. Adoption of standards can then be buoyed by editorial boards and reviewers alike via tighter controls on reviewer selection, providing reviewer training, and implementing review quality instruments. We do not intend this to be interpreted as scientific paternalism but that there are, and should be, mutually understood core standards and considerations that lead to open, transparent, and reproducible science. Based on our findings, with an eye toward mitigation, we suggest the following as a starting points: better coordinated research reporting standards among researchers and journals and implementation of protocols akin to preregistration (Teel et al. 2018; Parker et al. 2019; Grames & Elphick 2020).

The strength or liability of a field of practice is incumbent on a shared understanding of common standards. The social psychology discipline, as with others that examine human behavior, is governed by its own set of conventions and norms that dictate standards of scientific research, peer review, and publication. With regards to reporting standards, the conservation community, by and large, recognizes the inherent human element and the need to prioritize scientific inquiry on human behavior and decision-making. This requires consideration and incorporation of theories and methods that define, delineate, and facilitate interpretation of behavioral antecedents and processes. That expanded theoretical and methodological scope requires the field hold itself to the established standards of parent disciplines and journals. Those standards, as part of judging adequacy for peer-reviewed publication, include consideration of the theoretical and conceptual framework, operationalization and measurement of variables, data collection and sampling design, and analyses chosen to interpret and present results. In isolation, our results do not reflect well on the field. We understand the landscape and context of research, particularly when conducted in rural and remote areas, which may not, for example, lend themselves to standard sampling designs. Yet, it is necessary for authors to do their utmost to describe their research design, sampling procedures, etc., openly and transparently to facilitate evaluation and replication.

As conservation continues to evolve so will the breadth of theories and methods it adopts. There are tremendous benefits to greater diversity of thought in conservation science and practice. However, the influx
of discipline specific FTMs and methods used by non-experts may inadvertently risk violating scholarly conventions and norms (Martin 2019). Conservation scholars untrained or without exposure to the ontological, epistemological, and methodological assumptions of a discipline may be drawn to them based on perceived accessibility, data needs, or intuitive comprehension (e.g., a deskilling process). However, there are several considerations with respect to conceptualization, operationalization, measurement, and analysis that are critical to interpretation and inference. We contend that these be at the forefront of conservation inquiry and standards (Teel et al. 2018).

Preregistration and registered reports naturally follow from concern for research standards (Nosek et al. 2018; Parker et al. 2019). Preregistration directs researchers to publicly archive their hypotheses, a priori, alongside associated sampling and analysis plans but without the prescriptions of a formal process. A preregistration format may ask a researcher to submit the following documentation, which is then archived and referenced via a DOI in a subsequent report or manuscript: study description with background, purpose, or research questions; hypotheses; design plan, including study type, design, and randomization; sampling plan, including data collection procedures, existing data, and sample size; variables; and analysis plan. Preregistration could alleviate or preempt trends of faulty research designs and unreliable findings by nudging researchers to present their research as transparent and unbiased. Aside from providing transparency, it serves as a checklist for researchers to assure common research standards are addressed and made explicit. However, valid arguments questioning the efficacy of preregistration are worth noting, particularly because our results showed how common it is for studies to operate without an underlying FTM (Szollosi et al. 2019). Preregistration to improve the diagnosticity of a research design, sampling procedure, or statistical tests may do little to improve scientific reasoning, theory development, or the use of an underlying theory (on which findings are mapped and inferences made) (Smaldino 2019). Although our results cannot speak to scientific reasoning or theory development, they suggest that an explicit preregistration requirement be a description of the FTMs that are the basis of an inquiry.

Limitations and Future Research

A limitation of our study is the initial conceptualization of our research focus, social psychology. From this, we developed a search string of common topics and concepts. Obviously, modification to the focus or search string would yield different results. In addition to the search string, we limited our inquiry to a range of journals. As with any systematic exercise, the semi-subjective nature of inclusion and exclusion stages are limitations and eligible articles may have been missed. Another limitation, and artifact of our focus on FTMs, is the implicit exclusion of certain qualitative research designs like ethnography. Few primarily qualitative studies were recorded, although several studies supplemented or prefaced their research design with qualitative or mixed method approaches. All limitations represent defensible choices on our part, as would be the case in any similar research exercise. Our protocol was not preregistered and so was not formally peer reviewed, as has been recently recommended (Haddaway et al. 2018). Such a process could entail formal stakeholder engagement or an expert workshop to determine additional conservation science journals to include with limited bias. In addition, a considerable contribution from future research would be a critical assessment of reliability, validity, degree of openness, and the replicability of a research design.

We acknowledge the parameters and limitations of our study and so encourage others to conduct similar scoping reviews that collate, describe, and catalog areas of research germane to the biodiversity conservation. Future research that builds on the present foundation may modify or expand the scope. A clear direction for future research would also be a longitudinal assessment of this body of literature with planned evaluations at five- or ten-year intervals. In addition, the inclusion of journals that were excluded based on the journal ranking databases used could provide an interesting comparison considering our findings. For instance, journals whose aims and scope are more specific to psychology, sociology, and similar research traditions would provide a counterpoint. We would expect such disciplinary-specific outlets to adhere to the norms of scholarship and reporting of their respective parent discipline. However, the extent to which these norms are evident in scholarship published in traditional and interdisciplinary conservation science journals remains unclear (Teel et al. 2018). From our findings, we know that such adherence is questionable and not widespread. The inclusion of additional journals for comparison would be a worthwhile contribution. Our use of the explicit rankings provided by the two citation databases was intended to alleviate potential bias.

Acknowledgments

We thank the anonymous reviewers, the editor in chief, and the senior editor for their efforts to help improve our manuscript. We also thank the staff at the EPPI-Centre for their technical assistance.

Supporting Information

Literature database (Appendix S1), excluded records (Appendix S2), key terms, study populations, and
FTM list (Appendix S3), list and rankings of journals (Appendix S4), and ROSES and PRISMA statements (Appendix S5) are available online. The authors are solely responsible for the content and functionality of these materials. Queries (other than absence of the material) should be directed to the corresponding author. The literature search string query and protocols (Appendix S6) are available from Figshare (https://figshare.com/projects/Systematic_map_of_conserva tion_social_psychology_research/73773).

**Literature Cited**

Abrams D, Hogg MA. 1990. Self-categorization and social identity theory. Pages 10–27 in Hogg MA, McGarty C, editors. Social identity theory: constructive and critical advances. Harvester Wheatshead, Hertfordshire.

Baker R, Brick JM, Bates NA, Battaglia M, Couper MP, Dever JA, Gile KJ, Tourangeau R. 2015. Non-probability sampling: report of the AAPOR task force on non-probability sampling. American Association for Public Opinion Research, city. Available from https://www.aapor.org/Education-Resources/Reports/Non-Probability-Sampling.aspx.

Bennett NJ, et al. 2017. Conservation social science: understanding and integrating human dimensions to improve conservation. Biological Conservation 205:93–108.

Cialdini RB, Trost MR. 1998. Social influence: social norms, conformity and compliance. Pages 151–192 in Gilbert D, Fiske S, Lindzey G, editors. The handbook of social psychology. McGraw-Hill, New York.

Clarivate Analytics. 2016. Journal citation report. Available from https://jcr.clarivate.com.

Clayton S. 2012. The Oxford handbook of environmental and conservation psychology. Oxford University Press, New York.

Collaboration for Environmental Evidence. 2018. Guidelines and standards for evidence synthesis in environmental management. Pullin AS, Frampton GK, Livoreil B, Petrokofsky G, editors. Available from http://www.environmentalevidence.org/information-for-authors. (accessed August 2017).

Decker DJ, Riley SJ, Siemer WF. 2012. Human dimensions of wildlife management. Johns Hopkins University Press, Baltimore, Maryland.

Dietsch AM, Wallen KE, Clayton S, Krester HE, Kyle GT, Ma Z, & Ver cammen A. 2020. Introduction: New directions in conservation psychology at a critical time. Conservation Biology 34:1335–1338.

Di Marco M, et al. 2017. Changing trends and persisting biases in three decades of conservation science. Global Ecology and Conservation 10:32–42.

Donaldson MR, Burnett NJ, Braun DC, Suski CD, Hinch SG, Cooke SJ, Kerr JT. 2016. Taxonomic bias and international biodiversity conservation research. FACETS 1:105–113.

Eagly AH, Chaiken S. 1993. The psychology of attitudes. Harcourt Brace Jovanovich College Publishers, Orlando.

Eagly AH, Chaiken S. 2007. The advantages of an inclusive definition of attitude. Social Cognition 25:582–602.

Fishbein M, Ajzen I. 2010. Predicting and changing behavior: the reasoned action approach. Psychology Press, New York.

Gaertner L, Seukides C, Cai H, Brown JD. 2010. It’s not WEIRD, it’s WRONG: when researchers overlook underlying genotypes, they will not detect universal processes. The weirdest people in the world? Behavioral and Brain Sciences 33:93–94.

Grames EM, Elphick CS. 2020. Use of study design principles would increase the reproducibility of reviews in conservation biology. Biological Conservation 241:108385.

Greichting WL. 1989. Psychology and sociology in Australia: the published evidence. Australian Psychologist 24:115–126.

Griffiths RA, Dos Santos M. 2012. Trends in conservation biology: progress or procrastination in a new millennium? Biological Conservation 153:153–158.

Groves RM, Lyberg L. 2010. Total survey error: past, present, and future. Public Opinion Quarterly 74:49–879.

Haddaway NR, Land M, Macura B. 2016. A little learning is a dangerous thing: a call for better understanding of the term systematic review. Environmental International 99:356–360.

Haddaway NR, Westgate MJ. 2018. Predicting the time needed for environmental systematic reviews and systematic maps. Conservation Biology 33:143–143.

Haddaway NR, Macura B, Whaley P, Pullin AS. 2018. ROSES RepOrting standards for Systematic Evidence Syntheses: pro forma, flow-diagram and descriptive summary of the plan and conduct of environmental systematic reviews and systematic maps Environmental Evidence 7: https://doi.org/10.1186/s13750-018-0121-7.

Henrich J, Heine SJ, Norenzayan A. 2010. The weirdest people in the world? Behavioral and Brain Sciences 33:61–135.

Hickisch R, Hodgetts T, Johnson PJ, Sillero-Zubiri C, Tockner K, Macdonald DW. 2019. Effects of publication bias on conservation planning. Conservation Biology 33:1151–1163.

James KL, Randall NP, Haddaway NR. 2016. A methodology for systematic mapping in environmental sciences. Environmental Evidence 5 https://doi.org/10.1186/s13750-016-0059-6.

Kenny DA. 2019. Enhancing validity in psychological research. American Psychologist 74:1018–1028.

Lombard M, Snyder-Duch J, Bracken CC. 2002. Content analysis in mass communication: assessment and reporting of intercoder reliability. Human Communication Research 28:587–604.

Neuendorf KA. 2017. The content analysis guidebook. Sage, Los Angeles. https://doi.org/10.4135/9781483370678.

Martin VY. 2019. Four common problems in environmental social research undertaken by natural scientists. BioScience 128. https://doi.org/10.1093/biosci/biz128.

Mascia MB, Brosius JP, Dobson TA, Forbes BC, Horowitz L, McKean MA, Turner NJ. 2003. Conservation and the social sciences. Conservation Biology 17:649–650.

McCleery RA, Ditton RB, Sell J, Lopez RR. 2006. Understanding and improving attitudinal research in wildlife sciences. Wildlife Society Bulletin 34:537–541.

Moher D, Liberati A, Tetzlaff J, Altman DG. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ, 339:b2535. http://doi.org/10.1136/bmj.b2535.

Moon K, Blackman D. 2014. A guide to understanding social science research for natural scientists. Conservation Biology 28:1167–1177.

Munn Z, Peters MJ, Stern C, Tufanaru C, McArthur A, Aromataris E. 2018. Systematic review or scoping review? guidance for authors when choosing between a systematic or scoping review approach. BMC Medical Research Methodology 18:143.

Nilsson D, Fielding K, Dean AJ. 2020. Achieving conservation impact by shifting focus from human attitudes to behaviors. Conservation Biology 34:61–135.

Noeske BA, Ebersole CR, DeHaven AC, Mellor DT. 2018. The preregistration revolution. Proceedings of the National Academy of Sciences 115:2600–2606.

Parker T, Fraser H, Nakagawa S. 2019. Making conservation science more reliable with preregistration and registered reports. Conservation Biology 33:747–750.

Patterson ME, Williams DR. 2005. Maintaining research traditions on biodiversity conservation research. BMC Medical Research Methodology 11:25.

Qin H, Prasetyo Y, Bass M, Sanders C, Prentice E, Nguyen Q. 2019. Seeing the forest for the trees: a bibliometric analysis of
environmental and resource sociology. Society and Natural Resources https://doi.org/10.1080/08941920.2019.1620900.
Rad MS, Martingano AJ, Ginges J. 2018. Toward a psychology of Homo sapiens: making psychological science more representative of the human population. Proceedings of the National Academy of Sciences USA 115:11401–11405.
Ranjan P, Church SP, Floress K, Prokopy LS. 2019. Synthesizing conservation motivations and barriers: what have we learned from qualitative studies of farmers’ behaviors in the United States? Society and Natural Resources 32:1171–1199.
Reddy SMW, Montambault J, Masuda YJ, Keenan E, Butler W, Fisher JRB, Asah ST, Greezy A. 2016. Advancing conservation by understanding and influencing human behavior. Conservation Letters 10:248–256.
Reis HT, Gosling SD. 2010. Social psychological methods outside the laboratory. Pages 82-114 in Fiske ST, Gilbert DT, Lindzey G, editors. Handbook of Social Psychology. Wiley, New York.
Rosnow RL, Rosenthal R. 1989. Statistical procedures and the justification of knowledge in psychological science. American Psychologist 44:1276–1284.
Ryan RM, Deci EL. 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist 55:68–78.
Salager-Meyer F. 2008. Scientific publishing in developing countries: challenges for the future. Journal of English for Academic Purposes 7:121–132.
Schwartz SH. 1992. Universals in the content and structure of values: theory and empirical tests in 20 countries. Pages 1–65 in Zanna M, editor. Advances in experimental social psychology. Academic Press, New York.
SCImago Research Group. 2016. SCImago Journal and Country Rank. Available from https://www.scimagojr.com/journalrank.php.
Selinske MJ, Garrard GE, Bekessy SA, Gordon A, Kusmanoff AM, Fidler F. 2018. Revisiting the promise of conservation psychology. Conservation Biology 32:1464–1468.
Smaldino P. 2019. Better methods can’t make up for mediocre theory. Nature 575:9.
St. John FAV, Keane AM, Jones JPG. 2010. Conservation and human behaviour: lessons from social psychology. Wildlife Research 37:658–667.
St. John FAV, Keane AM, Jones JPG, Milner-Gulland EJ. 2014. Robust study design is as important on the social as it is on the ecological side of applied ecological research. Journal of Applied Ecology 51:1479–1485.
Steg L, Keizer K, Buunk AP, Rothengatter T. 2017. Applied social psychology: understanding and managing social problems. Cambridge University Press, Cambridge.
Szollosi A, Kellen D, Navarro DJ, Shiffrin R, van Rooij I, Van Zandt T, Donkin C. 2019. Is preregistration worthwhile? Trends in Cognitive Science. https://doi.org/10.1016/j.tics.2019.11.009.
Teel TL, et al. 2018. Publishing social science research in Conservation Biology to move beyond biology. Conservation Biology 32:6–8.
Thomas J, Brunton J, Graziosi S. 2010. EPPI-Reviewer 4: software for research synthesis. EPPI-Centre Software, Social Science Research Unit, Institute of Education, University College London, London.
Tricco, et al. 2018. PRISMA Extension for Scoping Reviews (PRISMA-ScR): checklist and Explanation. Annals of Internal Medicine 169:467–473.
Troudet J, Grandcolas P, Blin A, Vignes-Lebbe R, Legendre F. 2017. Taxonomic bias in biodiversity data and societal preferences. Scientific Reports 7:9132.
Wilkinson L. 1999. Statistical methods in psychology journals: guidelines and explanation. American Psychologist 54:594–604.