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Towards coexistence: Can people's attitudes explain their willingness to live with Sumatran elephants in Indonesia?

Ardiantiono[1,2] | **Sugiyo**[1] | **Paul J. Johnson**[2] | **Muhammad Irfansyah Lubis**[1,3] | **Fahrul Amama**[1] | **Sukatmoko**[4] | **William Marthy**[1] | **Alexandra Zimmermann**[2,5]

[1]Wildlife Conservation Society-Indonesia Program, Bogor, Indonesia

[2]Wildlife Conservation Research Unit, Zoology Department, University of Oxford, The Recanati-Kaplan Centre, Abingdon, UK

[3]Asian School of the Environment, Nanyang Technological University of Singapore, Singapore, Singapore

[4]Way Kambas National Park, Jalan Raya Labuhan Ratu, Lampung, Indonesia

[5]Chester Zoo, Chester, UK

Correspondence
Alexandra Zimmermann, Wildlife Conservation Research Unit, Zoology Department, University of Oxford, The Recanati-Kaplan Centre, Tubney House, Abingdon Road, Tubney, Abingdon OX13 5QL, UK.
Email: alexandra.zimmermann@zoo.ox.ac.uk

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Abstract

Understanding coexistence between humans and threatened wildlife is a central focus in conservation. Way Kambas National Park in Sumatra Island, Indonesia, harbors one of the largest populations of the critically endangered Sumatran elephant (*Elephas maximus sumatranus*). The people who live alongside this population are affected by intensive crop foraging. Our study investigated the factors which influenced attitudes toward elephants. We then evaluated the implications of reported attitudes for future willingness to live with elephants. We surveyed 660 respondents in 22 villages around the park. People generally reported positive attitudes toward elephants (smartness 95%, usefulness 62%, importance 57%, and pleasantness 53%), apart from where human safety was concerned (safety 11%). Each dimension of attitude was explained by different factors including age, gender, knowledge of elephants, and distance to crop foraging locations. Most respondents (62%) expressed no willingness to coexist with elephants. Such willingness was lower when elephants were perceived to be more dangerous, but higher if beliefs in the benefits of elephants were greater. Efforts to improve crop foraging mitigation practice and to increase people's awareness of elephant benefits may promote support for their conservation. Through this study, we advocate the integration of social science to promote human–wildlife coexistence strategies, an approach that is currently limited in Indonesia.

KEYWORDS

attitudes, elephant crop foraging, human behavior, human–wildlife coexistence, social science

1 | INTRODUCTION

Promoting coexistence between humans and wildlife is one of the most widespread and challenging issues in conservation (Dickman, Marchini, & Manfredo, 2013). The Sumatran elephant (*Elephas maximus sumatranus*) is Indonesia's largest terrestrial mammal and conservation priority species. Sumatran elephant populations have

declined 21.2% between 2007 and 2017 (700 elephant losses) with current population estimate of 1,694–2,038 individuals in 2017 (KSDAE, 2020). The drastic population decline is caused by habitat loss, hunting, and negative human–elephant interaction. It prompted the Indonesian government to publish "Sumatran Elephant Emergency Action Plan 2020–2023" (Azmi & Gunaryadi, 2011; KSDAE, 2020).

Most of the 36 elephant populations across Sumatra are outside protected areas or surrounded by vast agricultural and human settlement areas (KSDAE, 2020). This has brought elephants into closer contact with people where they leave the forest and enter human areas. Crop foraging is the most common type of negative human–elephant interaction on Sumatra, while human injuries and property damage are less common (Azmi & Gunaryadi, 2011). Substantial crop loss to elephant foraging occurs and can reduce people's tolerance of elephants and support for their conservation (Abdullah, Sayuti, Hasanuddin, Affan, & Wilson, 2019; Gunaryadi, Sugiyo, & Hedges, 2017; Saif, Kansky, Palash, Kidd, & Knight, 2019). Retaliation, such as poisoning the elephants and relocation (involve capturing and moving problem elephants to conservation centers to establish captive elephant metapopulations and provide education to the public) are often reported in areas with high prevalence of crop foraging (Hedges et al., 2005; KSDAE, 2020).

Elephant crop foraging problems are especially pervasive in the Way Kambas National Park, the second-highest priority landscape for Sumatran elephant conservation, which harbors one of the largest populations of Sumatran elephants (Andyono, Marsono, Sadono, & Imron, 2018; Santiapillai & Jackson, 1990). It is estimated that 144–225 elephants (0.10–0.16 elephants/km^2) lived within the park in 2019 and constitute about 10% of total Sumatran elephant population (WKNP, unpublished data). The park also serves as a refugium for displaced herds of about 70 elephants from neighboring plantation areas during a major military operation (Operasi Ganesha) in 1984–85 (Santiapillai & Suprahman, 1996). Crop foraging incidents were reported to increase after these new elephants entered the park, potentially as the result of competition with local populations (Nyhus, Tilson, & Sumianto, 2000).

Between 2016 and 2020, an average of 150 crop foraging incidents was documented in 20 out of 38 villages around the park every year, with possibly the highest localized yearly incidents on Sumatra (WKNP and WCS-IP, unpublished data). Human and elephant casualties resulting from these interactions were rare in Way Kambas, with only two cases of fatal attack on humans and three cases of elephant death between 2010–2020 period (WKNP, unpublished data).

While numerous studies have explored Sumatran elephant crop foraging patterns (Berliani, Alikodra, Masy'Ud, & Kusrini, 2018; Qomariah, Rahmi, Said, & Wijaya, 2019; Sitompul, Tyson, Caroll, & Brien, 2010) and possible strategies to reduce damage (Gunaryadi et al., 2017; Hedges & Gunaryadi, 2010; Sugiyo, Ardiantiono, Santo, Marthy, & Amama, 2016), the human dimension of people-elephant interaction on Sumatra remains largely neglected (Abdullah et al., 2019). The human–elephant relationship is complex: it is driven not only by direct elephant damage (e.g., crop loss) but is also driven by intangible costs (Barua, Bhagwat, & Jadhav, 2013; Saif et al., 2019) and involves social, economic, and political factors (Dickman, 2010). As coexistence initiatives frequently depend on changing human behavior, understanding the links between psychological perspectives concerning elephants and how those perspectives are translated into human behavior is important for conservation planning (Dickman et al., 2013; St. John, Keane, & Milner-Gulland, 2013).

Human behavior is influenced by a web of individual and societal factors (Dickman et al., 2013). While many factors can predict behavior, most studies of human–wildlife interaction have focused on the individual level and examined psychological factors such as attitudes (Broekhuis, Kaelo, Sakat, & Elliot, 2020; Kansky, Kidd, & Knight, 2014). Positive attitudes are often associated with people performing favorable behavior (Kansky et al., 2014). According to Ajzen (2005), attitudes can be defined as "a disposition to respond favorably or unfavorably to an object, person, institution, or event." Attitudes are part of a cognitive system, which requires conscious control and allows calculation and the evaluation of technical data such as costs and benefits of living with wildlife (Bruskotter & Wilson, 2014; Slovic, Finucane, Peters, & MacGregor, 2004). Previous studies have explored various factors affecting people's attitudes toward wildlife such as their knowledge of species ecological roles and conservation status (Schumann, Walls, & Harley, 2012); demography for example, age and gender (Mayberry, Hovorka, & Evans, 2017; Zimmermann, Walpole, & Leader-Williams, 2005); and experience of interacting with species (Campbell-Smith, Simanjorang, Leader-Williams, & Linkie, 2010; Lee & Priston, 2005).

Measuring human behavior is often difficult as it can be hard to be immediately observed. Asking direct question about people's behavior may be unreliable (Manfredo, 2008; Nuno & St. John, 2014). Thus, conservation psychology studies use precursors to predict behavior (Ajzen & Fishbein, 2005; St. John et al., 2013). Behavioral willingness is often used as proxy for behavior as it represents openness to opportunity and readiness to

engage in certain behavior under favorable conditions (Besley, Dudo, Yuan, & Lawrence, 2018; Pomery, Gibbons, Reis-Bergan, & Gerrard, 2009). People willingness to live with wildlife is hugely influenced by the perceived benefits and costs of wildlife; when costs outweigh benefits, people will be reluctant to coexist or support conservation programs (Ngorima, Brown, Masunungure, & Biggs, 2020; Špur, Pokorny, & Šorgo, 2017).

Our study attempts to address the question "To what extent do attitudinal factors explain willingness to live with elephants in Way Kambas National Park?." We chose Way Kambas as our study site because of its unique people and elephant relationship. First, most people living around the park do not have cultural and historical association with Sumatran elephants as they originate from the neighboring island of Java as a result of the national transmigration program over the last century. Second, Way Kambas has become a role-model region for mitigating elephant crop foraging. These developed mitigation interventions, especially community-based guarding and trenches have prevented 50% of attempted elephant intrusion and significantly reduced crop loss, although frequent foraging is still present (Gunaryadi et al., 2017; Sugiyo et al., 2016).

To answer the abovementioned question, we first explored the influence of socio-economic, knowledge, and crop foraging experience as potential explanatory variables on five dimensions of attitude to elephants. We expand previous studies that focused on single attitude, for example, elephant conservation (Abdullah et al., 2019; He, Wu, Zhou, & Dong, 2011) to five attitudinal dimensions ("usefulness," "smartness," "pleasantness," "safety," and "importance"; Driscoll, 1995) on elephants traits and their interaction with humans. We then aim to scale up attitudinal study on human–elephant interaction by evaluating attitude-behavioral willingness relationship. People willingness is measured by asking favorability towards a statement "Are you willing to live together with elephants i.e. to protect and do not disturb them?." Therefore, we investigated which of these five attitudinal dimensions strongly explains people's reported willingness for future coexistence with elephants in Way Kambas.

2 | STUDY AREA

This study was conducted in 22 villages adjacent to Way Kambas National Park in Lampung Province, Sumatra, Indonesia (Figure 1). Way Kambas National Park was established in 1989 to protect three threatened taxa: the Sumatran elephant, rhinoceros *Dicerorhinus sumatrensis*, and tiger *Panthera tigris sumatrae* (BTNWK, 2020). The park covers 1,235 km^2, located below 50 m altitude, and is dominated by grassland and scrub ecosystem as the result of frequent fires and commercial logging in 1960–1970s (Gunaryadi et al., 2017). There are no forest patches or corridors to support wildlife populations adjacent to the park.

The park boundary is approximately 227 km long and has 38 village lands occupying about 65% (148 km) of its length, with a human population density (in 2020) of 196 individuals/km^2 (BPS, 2020a, 2020b; Sitompul, Carroll, Peterson, & Hedges, 2008). Permanent agriculture, primarily paddy fields and areas with cultivated bananas, cassava, and maize dominate the landscape surrounding the park as the main source of income for the local communities. No fences were erected around the park but 29 km trenches, with 3 m wide and deep, were built in some areas along the boundary of the south part of the park to prevent elephant movement to agricultural areas (Sugiyo et al., 2016). The northern boundary is separated by a large river with high boat traffic that acts as a natural barrier to elephants.

3 | METHODS

3.1 | Questionnaire design

We developed a semistructured questionnaire concerning psychological perspectives on Sumatran elephants consisted of five sections: (1) knowledge of elephants, (2) elephant crop foraging experiences, (3) attitudes toward elephants, (4) willingness to coexist with elephants, and (5) respondent's profile (Appendix S1). The questionnaire, including content and ethical consideration, was assessed by three reviewers in Wildlife Conservation Society-Indonesia Program (WCS-IP, 2016). The instrument was also piloted by previously trained enumerators with five local villagers for clarity with minor amendments were made as result.

Knowledge of elephants was inferred based on responses to six questions about elephant identification, their ecology (habitat, activity time, and principal diet), and conservation status (population trends and main threats). A correct answer was coded as one and wrong answer as zero, resulting in a knowledge score ranging from 0 to 6. Elephant crop foraging experience was explored using questions that elicited respondents' experiences of crop foraging in the village and their private property.

Attitudes toward elephants were explored using questions on five dimensions of attitudes: "usefulness," "smartness," "pleasantness," "safety," and "importance" as developed by Driscoll (1995). We asked respondents to interpret these attitudes as the terms were familiar

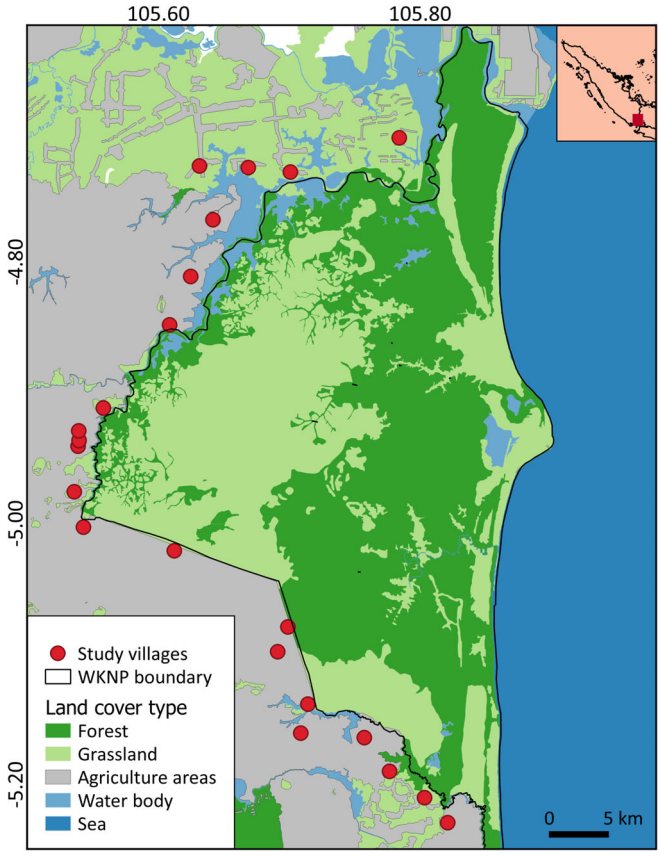

FIGURE 1 The distribution of respondents in 22 villages outside the boundary of Way Kambas National Park. Each village (30 respondents) is represented by a red point. The eastern side of the park faces the sea and no permanent settlements are present along the coast

to them and associate these attitudes to elephants in Way Kambas. Favorability to these statements were measured on a five-point Likert scale from negative to positive, for example, for perceived elephant smartness attitude ranging from not useful—less useful—neutral—quite useful—useful. To ensure the measurement of favorability, respondents were informed that higher scores (above three or neutral) mean positive attitude and vice versa. We used Driscoll attitudinal measurement instead of relatively well-known measurement from Ajzen & Fishbein (2005; i.e., attitude statement towards specific behaviors) for two reasons. First, Driscoll measurement considers several attitudinal dimensions which represent elephant characteristics, costs, and benefits, while other measurements often focus on single dimension. Second, experience with previous social surveys of communities around conservation areas on Sumatra and Flores (Central Indonesia) found that most respondents had difficulties in interpreting statements such as "Protecting animals in the wild is not my concern" (Komodo Survival Program, 2018; WCS-IP, unpublished data).

Willingness to coexist with elephants was measured using a statement of "Are you willing to live together with elephants i.e. to protect and do not disturb them?." A five-point scale Likert was used to record the willingness ranging from very unlikely—unlikely—neutral—likely—very likely. We chose behavioral willingness instead of behavioral intention as we were interested in conservation engagement behavior, while behavioral intention refers to plan to conduct specific behavior for example, adopting a certain crop foraging technique (Besley et al., 2018; St. John et al., 2013).

Information about the respondents' demographic and socioeconomic profiles was collected at the end of the survey. This approach was used to avoid sensitive or private questions at the beginning of survey. Information in this section included respondent age, education, occupation, and house coordinate (collected using Garmin GPS 78 s with permission in order to calculate the distance between respondent's house and crop foraging locations). The respondent's name (responses were anonymized in the analysis) and gender were recorded at the beginning of the survey.

3.2 | Data collection

Questionnaire-based interviews were conducted in 22 out of 38 villages (~60%) around Way Kambas National Park from November 2017 to March 2018. Thirty respondents were interviewed in each village resulting in a total of 660 respondents. Convenience sampling was used to select the respondents by visiting houses between 0900 and 1600 hr and interviewing available respondents to represent households with approximately equal male: female ratio. A notification letter was delivered to the head of village the day before the survey to obtain permission from the authority.

At the beginning of each interview, the enumerators informed the respondent of the survey aims, gave an assurance of confidentiality, and sought their permission to conduct the interview. We acknowledged potential organizational influence that may affect respondent's answers as enumerators need to inform that this survey was conducted by WCS-IP, a conservation NGO working on elephant conservation. To minimize the influence, we recruited five enumerators who were students from a local university (University of Lampung) and did not involve either WCS-IP or national park staffs in any interview to reduce the likelihood of respondents giving favorable answers. Informed consent was obtained verbally as the local villagers were uncomfortable with signing documents and this may have affected their answers or willingness to participate.

3.3 | Statistical analysis

3.3.1 | Variable selection

Relationships between five attitude dimensions (usefulness, smartness, pleasantness, safety, and importance) were assessed using Spearman's rank correlation test for ordinal data. Three dimensions of attitudes were found to be correlated to a moderate extent (usefulness-pleasantness correlation coefficient [*R*] 0.49, usefulness-importance 0.59, and pleasantness-importance 0.48), but below the cut-off *R*-value of 0.70 which is conventionally used as a cut-off in ecological studies to define problematic collinearity (Dormann et al., 2013). Thus, all five-attitude dimensions were used in the analysis.

Relationships between seven potential variables that explain attitudes (explanatory variables) such as gender, education, occupation, age, crop foraging experience, distance to crop foraging, and knowledge were similarly evaluated using Pearson's correlation test for discrete/continuous data (cut-off R value 0.70), chi-square test for categorical data, and *t*-test/ANOVA for categorical-discrete/continuous data. Distance to crop foraging was calculated using Quantum GIS (version 2.18.18) by averaging the distance from a respondent's house to the three closest crop foraging locations (WCS-IP 2013–2017 crop foraging data). Four explanatory variables were used in the model building: demographic factors (age and gender), knowledge of elephants, and distance to crop foraging locations.

3.4 | Model building

A set of cumulative link mixed models (CLMM) for ordinal data analysis were performed to investigate the relationships between explanatory variables and attitudes toward elephants (Schmidt, 2012). The spatial clustering of respondents in villages was accounted for by including village identity as a random factor. A global model incorporating all potential explanatory variables was chosen as the template to create candidate models using the "dredge" function which generates combination of models using variables from the template model (MuMin package R). The models were ranked using AICc (Burnham & Anderson, 2002).

Next, a set of CLMM models were constructed to assess the influence of attitudes in explaining willingness to coexist. Candidate models were built using "dredge" function and were ranked using AICc. Model averaging was performed if several models had $\Delta AICc < 2$. Caution in interpreting model-averaging coefficients as the result of multicollinearity among explanatory variables was acknowledged (Cade, 2015). Nevertheless, this study addressed the issue by testing the multicollinearity and excluded highly correlated variables (Dormann et al., 2013). All statistical analyses were performed in R version 3.4.3 (R Core Team, 2020).

4 | RESULTS

A similar proportion of males (53%) and females (47%) participated in the survey. The average age of respondents was 43 years (Standard Deviation/SD = 15.58 years). Respondents who completed elementary school constituted 45.15% of the total respondents, followed by junior (24.56%) and senior high school and college (20.91%). Around half of respondents worked as farmers (51.67%) and the rest were housewives, entrepreneur, and labor that were categorized as non-farmer (48.22%).

The average knowledge score was 3.95 ± SD 0.04 (maximum score 6). Around half of respondents (50.2%) reported elephant crop foraging present in their field. The average distance from respondents' houses to the nearest crop foraging locations was 9,320.05 ± SD 405.58 m.

Most respondents reported that elephants are smart (95%; respondent statement example: "They can learn new things quickly"), useful (62%; "Elephant tourism provides job to me and family"), important (57%; "Elephant is a protected animal"), and pleasant (53%; "I like seeing elephants, they are cute"). Conversely, 55% of respondents believed elephants to be dangerous animals ("Wild elephants are very dangerous"). A third of respondents (~30%) had neutral responses for attitudes to usefulness, importance, pleasantness, and safety (Figure 2).

The majority of respondents (62%) reported that they were either very unlikely or unlikely to favor coexistence, for example, to support elephant conservation in their areas (Figure 2; statement example: "I don't want elephants around our village" or "I am afraid of them around me and my family"). Only 22% of respondents expressed their willingness to coexist with elephants (likely and very likely; "I support elephants in Way Kambas as this is their home") and 17% were neutral.

Sixteen model combinations were built for each attitude dimension using four explanatory variables: distance to crop foraging locations, age, gender, and knowledge of elephants. Different dimensions of attitudes were associated with different explanatory variables in the final models (Figure 3; Appendix S1). Age and gender were the strongest explanatory variables of "importance" and "pleasantness" attitudes. Older respondents had lower

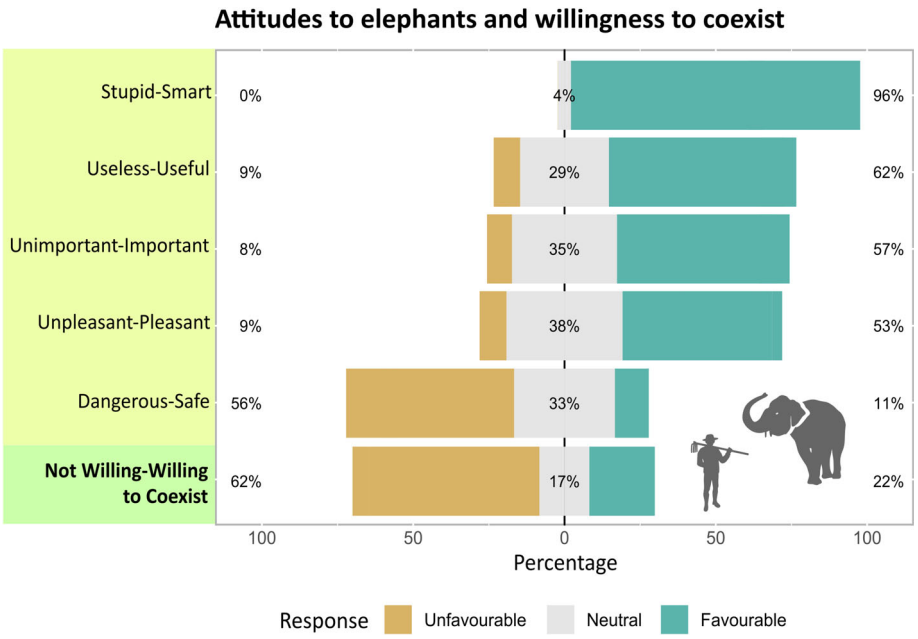

FIGURE 2 Respondents' attitudes to elephants in five attitude dimensions and their willingness to coexist. The left bar indicates negative attitudes and no willingness, center bar indicates neutral attitudes and willingness, and right bar indicates positive attitudes and willingness

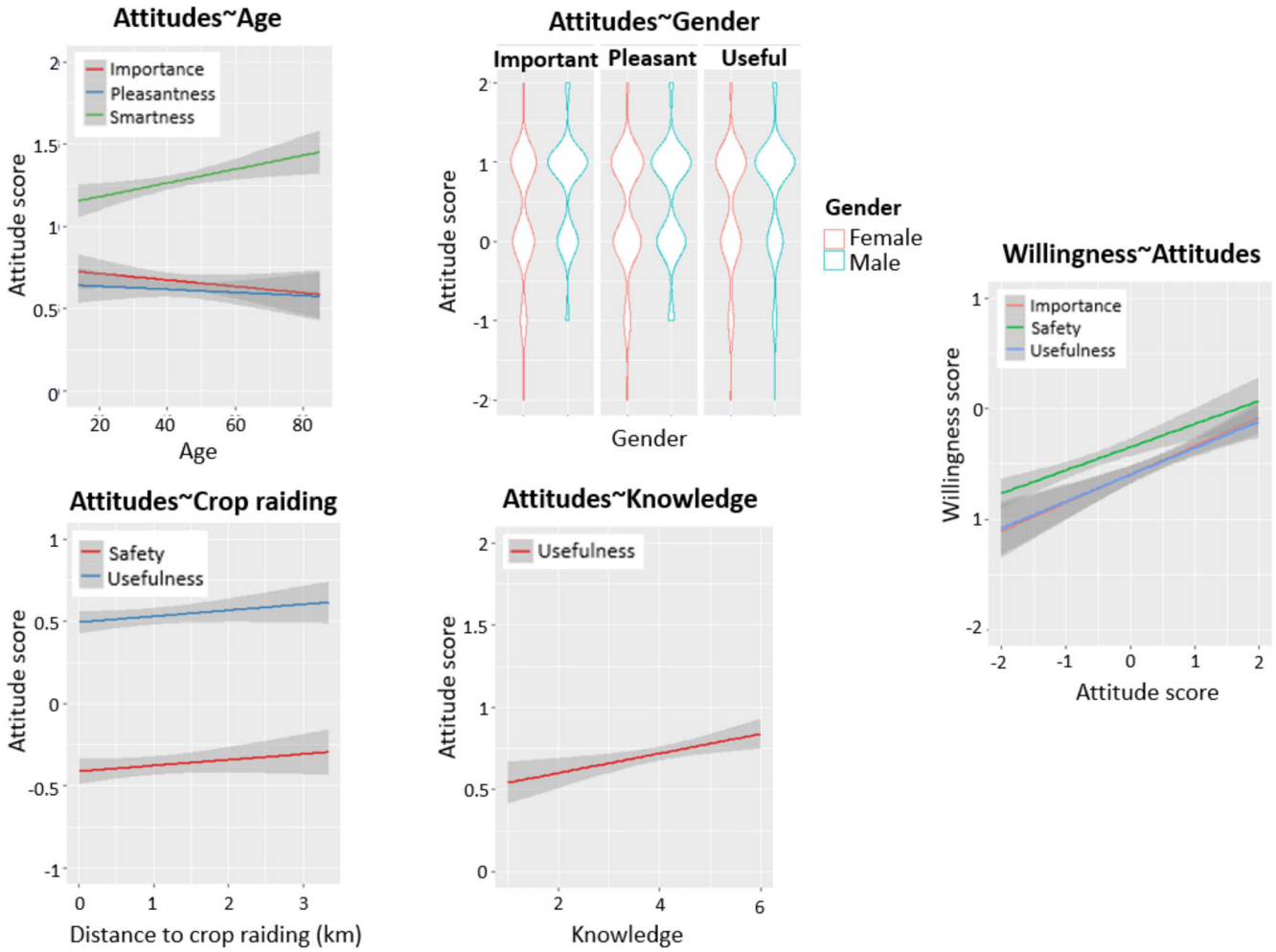

FIGURE 3 Effect plots of relationship between attitudes and significant explanatory factors, and between willingness and significant explanatory attitudes. Grey area represents 95% confidence interval

attitude scores while male respondents had higher scores. Conversely, older residents tended to report higher scores regarding elephant "smartness." Attitudes concerning elephants' implications for human safety were strongly explained by distance to elephant crop foraging locations; people who lived further away had higher attitude scores. People who lived further from crop foraging locations, who were male, and had higher knowledge scores, reported statistically significantly higher scores of attitude concerning usefulness.

Three attitude models to explain willingness received the highest support (ΔAICc < 2) and an averaged model was built from these models. Attitudes regarding the safety of elephants had the strongest association with willingness (e.g., people who perceive elephants as safe were more likely to be willing to coexist), followed by usefulness and importance (Figure 3; Appendix S1). People who reported higher scores for these three attitude dimensions were more likely to favor coexistence with elephants.

5 | DISCUSSION

5.1 | Factors explaining attitudes

This study found that attitudes towards elephants were generally positive except where personal safety was concerned. Gender was an important explanatory variable for three aspects of attitudes. Women reported lower scores for the importance, pleasantness, and usefulness of elephants. These results concur with those of previous studies that found women reported less positive attitudes towards wildlife (Carter & Allendorf, 2016; He et al., 2011). Familiarity through personal experience with elephants, for example, neutral and positive encounters with elephants (e.g., seeing elephants in their habitat) or involvement in conservation programs have been linked to more positive attitudes (Manfredo, 2008; van de Water & Matteson, 2018). Women around Way Kambas mostly work at home and consequently reported fewer direct experiences with elephants, possibly explaining the lower attitude scores. They were also less likely to view elephants as useful. Usefulness is related to the costs and benefits people perceive from elephants (Saif et al., 2019). This has been reported in previous studies; women often bear a larger burden of wildlife-related losses than men (Mayberry et al., 2017; Ogra, 2008). It is relevant in Way Kambas community, where women who manage the family economy may have perceived crop losses from elephants as a problem for their families well-being.

Respondent age was related to reported attitudes concerning elephant importance, pleasantness, and smartness. Older people were less likely to report elephants as important and pleasant. Older people who mostly work as farmers have experienced crop foraging which may influence their attitudes. Negative interactions (e.g., crop foraging) are likely to lead to less favorable attitudes and conversely, positive interactions (e.g., receiving benefits from tourism, cultural value) are likely to improve attitudes (Barua, 2010; Sarker & Røskaft, 2014).

Moreover, older people tended to acknowledge that elephants are "smart." In Way Kambas, this is the result of two effects frequently mentioned by respondents: first, people see elephants as animals that share human characteristics (anthropomorphism), that they can think and feel like humans (Serpell, 2003; Verissimo, MacMillan, & Smith, 2011). Second, people observe tame elephants performing "tricks" (e.g., football, elephant riding) in the Elephant Conservation Centre in the national park and associate smartness with these skills. However, people also associate elephant smartness with their ability to pass the barrier around agricultural areas. This was recorded in the experimental stage of chilli-fences, beehive-fences, and rolling drum (poles with spiky drum attached) where the elephants broke through the barriers after ~3 months of trials (Sugiyo et al., 2016). The dual interpretation of elephant smartness that related to both negative (crop foraging ability) and positive attitudes (intrinsic values, tame elephants) may explain the weak influence of smartness in explaining willingness.

Distance to crop foraging locations was associated with attitudes to usefulness and safety. People who live closer to conflict locations were more likely to encounter elephants. This is likely to contribute to the perception of danger frequently cited by respondents, as one respondent stated: "Elephants are dangerous as they are unpredictable when they see you." People with more knowledge of elephants were more likely to report that they were useful. People's appreciation of elephants' usefulness was associated with their knowledge of the ecological roles of elephants in their habitat and the economic benefits elephants can provide, for example, ecotourism.

5.2 | Attitude and willingness relationship

People's willingness to coexist with elephants was associated with attitudes towards elephant traits. The significance of attitudes supports previous studies identifying attitudes as explanatory variables of behavior to allow elephants in communal areas (Browne-Nunez, Jacobson, & Vaske, 2013) or support elephant anti-poaching efforts in Africa (Ngorima et al., 2020). This

was particularly true for three dimensions of attitudes toward elephants; importance, usefulness, and safety strongly explain willingness. A willingness to coexist resulted from the perceived risks and benefits of living with elephants. Attitude to safety was the strongest explanatory variable of willingness as elephants' large size and potential harm to humans lead to a rational perception of danger (Barua et al., 2013; Bruskotter & Wilson, 2014). Elephant attacks on humans are rare but can create long-lasting negative perceptions. For example, two instances of fatal attacks in 2000 and 2010 in Way Kambas National Park were repeatedly mentioned by respondents.

People were more likely to report willingness to coexist if they believed that elephants can provide benefits in their life (Kansky, Kidd, & Knight, 2016). At present, elephant tourism in Way Kambas has provided recreational activities and additional economic opportunities for the local communities through employment as guides, hospitality services, and souvenir sales (Ismaryati, 2018; Rakatama, 2008). Most people acknowledge the importance of elephants, especially when they aware this megafauna is protected by the government and an icon for Way Kambas tourism.

Although people acknowledge elephants as a protected species, elephant crop foraging has raised tension between Way Kambas National Park and local communities especially farmers who experienced crop loss by elephants. Farmers demanded the national park responsibilities to compensate for the loss as elephants are considered belong to government (Andyono et al., 2018; Oelrichs, Lloyd, & Christidis, 2016). On the other side, while elephant crop foraging still persists in Way Kambas, a combination of community-based guarding and other mitigation techniques have significantly decreased crop losses (Gunaryadi et al., 2017; Sugiyo et al., 2016). How do the relation between local communities and national park along with the efficacy of crop foraging mitigation techniques influence people's attitudes and willingness to live with elephants were not explored in this study and needs to be investigated in the future.

5.3 | Future recommendations

This study found that more than half of the respondents living around Way Kambas National Park reported lack of willingness to coexist with elephants, while general attitudes towards elephants were positive. A limitation of the current study may have been that attitudes are not sufficient to explain behavioral willingness. Integrating other theoretical frameworks will be beneficial, such as the Theory of Plan Behavior (Ajzen, 1991). This theory has become more prominent in conservation studies as a means of explaining the prevalence of wildlife management action by ranchers (Willcox, Giuliano, & Monroe, 2012) and community participation in conservation programs (Apipoonyanon, Szabo, Kuwornu, & Ahmad, 2020). Some explanatory variables in Theory of Planned Behavior should be explored in future studies, such as peer influence and approval from other people (subjective norms) and control over the behavior (perceived behavioral control), alongside with attitudes (Ajzen, 1991; St. John, Edwards-Jones, & Jones, 2010).

The options presented concerning willingness to coexist, for example, protect and do not disturb elephants, may have been hard to visualize. Defining a more specific behavior may be instructive, for example, "Are you willing to participating in elephant community guarding?." The willingness then can be realized as observable behaviors. This study also acknowledges the need to use attitude questions that specifically related to behavior of interest that is, in the context of time, place, and action of interest for example "It is important to conduct elephant community guarding in this village to protect crops" (Ajzen & Fishbein, 2005; St. John, Keane, Jones, & Milner-Gulland, 2014).

Our study currently focuses on the discipline of conservation psychology and inputs from other disciplines in social science will contribute to understanding the social dynamics of human–elephant interactions (Dickman, 2010). For example, future studies need to consider qualitative approaches to complement this current quantitative study. An ethnographic approach can give detailed insights into the people reality livelihoods, their historic and current relationship with elephants, and factors fostering people willingness that are not accounted in current theoretical frameworks (Jadhav & Barua, 2012; Mayring, 2004).

It is noteworthy that while this study recorded low willingness, the community in Way Kambas has already shown tolerant behavior towards elephants. This is evident through the low rate of elephant deaths due to interaction with people (three cases) since 2010 with all of them were accidental, for example, elephants trapped in the waterholes build by villagers, and no record of intentional retaliation. Thus, this study proposes two practical recommendations to maintain and increase this tolerant interaction.

First, we recommend to improve the effectiveness of existing crop foraging mitigation techniques to increase attitudes and willingness by reducing the costs of coexistence (Gunaryadi et al., 2017; Saif et al., 2019). It can be done in two ways. First, local communities together with park managers, government, and practitioners strengthening their

collaboration to develop and implement mitigation techniques where the local people lead the initiative. This has been documented in Way Kambas when the local communities initiated the idea and developed rolling drum barriers in 2015 to prevent elephant intrusion into agricultural areas (Sugiyo et al., 2016). Second, combining active mitigation approaches such as community-based guarding along with barriers such as trenches, fences, and rolling drums is important to provide optimum protection to crops and also reduce the manpower needed to guard the crops (Gunaryadi et al., 2017; Sugiyo et al., 2016).

Second, the development of awareness campaigns that focus on coexistence by highlighting the ecological, economic, and cultural benefits of elephants, can be done to improve attitudes and thus behavioral willingness favoring coexistence with elephants. To reduce the perceived danger of elephants, campaign efforts may include training people on how to behave when encountering elephants (e.g., do not make a sudden movements or shout) (Johansson & Karlsson, 2011).

5.4 | Mainstreaming social science in understanding human–wildlife interactions

Conservation social science has been long applied to understand the human dimension of human–wildlife interactions (Manfredo, 2008). It is worth noting that conservation social science comprises numerous disciplines from the classic (e.g., conservation psychology and sociology) to applied and interdisciplinary disciplines of conservation marketing and political ecology (Bennett et al., 2017). Our study contributes to the realm of conservation psychology by providing the baseline information of people's attitudes and willingness to coexist with elephants needed for developing effective conservation strategies. This study was conducted in predominantly transmigrant community in Way Kambas who has been widely praised for their advanced mitigation techniques to prevent frequent elephant crop foraging.

In broader context, our study emphasizes the importance of understanding the human dimension of people–wildlife interaction, something which has hitherto received little attention in Indonesia. Promoting coexistence is becoming more challenging in Indonesia as habitat loss and food depletion inevitably lead to increased negative interactions (Di Minin et al., 2016; Prawiradilaga & Soedjito, 2013). It also exacerbated by the fact that current human–wildlife interaction studies in Indonesia mostly lack sufficient input from the conservation psychology and other social science discipline. This is due to insufficient interdisciplinary collaborations between ecologists and social scientists resulted from the lack of knowledge about social science and what information it can offers (Bennett et al., 2017; Kamil, Susianto, & Dwiputra, 2018). The domain of human–wildlife relationship in Indonesia still focuses on the ecological and practical aspects of interaction, for example, what causes wildlife to contact humans or how to prevent wildlife from entering human settlements. Attempts to understand human dimensions of this interaction has been growing, but the efforts are often based on non-systematic observation in the field or studies without adequate theoretical framework. Thus, the social perspective of human–wildlife interaction urgently needs greater attention to ensure the protection of Indonesian biodiversity is consistent with human well-being (Kamil et al., 2018; St. John et al., 2018).

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Study design and fieldwork: Ardiantiono, Sugiyo, Fahrul Amama, William Marthy; data analysis: Ardiantiono, Paul J. Johnson, M. Irfansyah Lubis; writing the article: Ardiantiono, Sugiyo, Paul J. Johnson, Fahrul Amama, M. Irfansyah Lubis, Sukatmoko, William Marthy, Alexandra Zimmermann.

DATA AVAILABILITY STATEMENT

The data associated with the manuscript are available upon formal request to the first author. The questionnaire and detailed model ranking of this study are available in the supporting information.

ETHICS STATEMENT

This research abided by the Conservation Science and Practice guidelines on ethical standards. The study design and questionnaire fulfilled the Wildlife Conservation

Society standard for human subject research and were approved by three reviewers from Wildlife Conservation Society-Indonesia Program.

ORCID

Ardiantiono https://orcid.org/0000-0001-8398-1948
Alexandra Zimmermann https://orcid.org/0000-0002-4371-3997

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