“Chosen dangers: consensus and social differences norms about potentially lethal wildlife according to context and species”

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Abstract

This paper examines social tolerance of extremely dangerous wildlife using a structural equation model to examine the organization of public opinion about wildlife and to assess the impact of cultural and sociodemographic factors on it. **Principal findings**: (1) tolerance is high and the dimensionality of tolerance/public acceptance of potentially lethal wildlife requires an oblique solution: tolerance mainly reflects remoteness from human settlement, but there are also species-specific attitudes; (2) tolerance has few and weak connections to demographic and socioeconomic characteristics, even after correcting for attenuation due to random measurement error; (3) generalized positive feelings towards environmentalists have a substantial positive link to tolerance; (4) respondents generally do not favor governmental compensation for the families of victims of predation, but their policy preferences are very strongly shaped by predator tolerance. Implications for cultural materialism, risk society theory, and post-materialist theory are discussed. **Data**: 2000 IsssA, a nationwide random-sampled postal survey of Australians. **Model/method**: SEM with CFA and with imported test-retest reliabilities used to correct for attenuation due to random measurement error; estimated by Amos and SemGen.

Keywords: natural resource, risk, opinion, policy, recreation.
JEL Classification: Q2, Q5.

Introduction

Much recent sociological research on the interface of nature and society emphasizes risk and the interpretation of risk (Kelley, 2003; Habron, Barbier, and Kinnunen, 2008; Norgaard, 2007), with the risk society perspective emphasizing the chosen risk of allowing dangerous wildlife to exist as a form of existential resistance to perceived technological and technologically driven risks over which we have no control (Beck, 1995; Douglas and Wildavsky, 1983; Wildavsky and Dake, 1990).

"… management for human tolerance of a species is often more challenging than ecological management, but vital for ensuring long-term species survival." (Morzillo, Mertig, Garner and Liu, 2007, p. 418).

Local residents' perceptions of risk may not be the same as scientists' views (Treves et al., 2006). However, prior findings showing that perceptions of risk and willingness to tolerate the presence of dangerous predators do not vary substantially by the degree of exposure to the risk (Ghavez, Gese and Kranich, 2008) show that self-interest plays only a minor role in the attitudes, and that, instead, there is a moral component to the view that particular sets of wildlife related risks are, in themselves "good" or "bad", as appears also to be true of many other nature-related attitudes (Evans and Kelley, 2013)

A lively research tradition has been assessing the applicability and utility of a social-psychology model of the cognitive hierarchy (e.g. Rokeach, 1973; Schwartz, 1994) to the area of wildlife-related subjectivity. The model posits that deep-seated value orientations (Axelrod, 1994; Fulton, Manfredo and Lipscomb, 1996; Stern and Dietz, 1994) shape attitudes and norms about wildlife (Ojea and Loureiro 2007; Vaske and Donnelly, 1999) which in turn shape specific wildlife management preferences (Zinn, Manfredo and Vaske, 2000; Zinn, Manfredo, Vaske and Wittmann, 1998) and behavior (Vaske and Donnelly, 1999). The theory anticipates conflict in the values, attitudes, and norms about wildlife (Manfredo and Dayer, 2004).

More exploratory are hypotheses and assessments about the degree to which these conflicts are rooted in the material and cultural conditions of life. The materialist theory of culture provides expectations for some degree of linkage (Manfredo and Dayer, 2004), but the evidence concerning links to material conditions of life, i.e. demographic and socioeconomic influences, is mixed (Dietz, Fitzgerald and Shwom, 2005).

This paper explores (1) the degree to which the material conditions of life and culture shape norms about wildlife management and, (2) in turn, assessing the influences of material conditions, culture, and norms on policy preferences about compensation for harm by wildlife. Data for this setting on wildlife value orientations are not available, but it is likely that they would mediate the relationships between culture and norms.

The norms concern potentially dangerous wildlife, a topic often described as public acceptability/ stakeholder tolerance (Carpenter, Decker and Lipscomb, 2000; Decker and Purdy, 1988; Wittmann, Vaske, Zinn and Manfredo, 1998; Zinn, Manfredo and Vaske, 2000; Zinn, Manfredo, Vaske and Wittmann, 1998). How much these norms vary accord-

ing to the species and how much they vary according to the degree of choice in exposure to the danger are questions implicit in prior research that have not yet been systematically explored. This paper does so, investigating Australia which offers an abundance of potentially dangerous wildlife and contexts which vary greatly in the extent to which they are humanized. This paper extends prior research by comparing public acceptability/stakeholder tolerance of three different species of wildlife – great white sharks, salt water crocodiles, and (poisonous) tiger snakes – in three different settings that vary greatly in the degree of choice involved in exposure to the risks – one very remote from human settlement, another which is commonly used for recreation but is still at some distance from human settlement, and the third being within the everyday life world of urban or suburban life. The article explores the degree to which public tolerance for potentially lethal wildlife depends on the species and to what degree it depends on the setting.

Plan of the paper

Section 1 sketches the spatial distribution of the Australian population and introduces the three predator species which were asked about in the survey. Section 2 presents the hypotheses of the paper are presented. Section 3 describes the data, measurement, and methods, including an assessment of the degree to which attitudes vary by species and the degree to which they vary by proximity to human settlement. Section 4 gives the descriptive results, detailing the survey responses concerning tolerance/acceptability of the three species in settings distinguished by their proximity to human settlement. After that, the results of the structural equation model portraying the links of predator tolerance/acceptability to social-structural and cultural characteristics of respondents (Section 5). The final Section concludes the paper.

1. The Australian setting

The climate of opinion. As in many other societies, over the second half of the twentieth century, public concern with the environment rose, and "environmentalist" emerged as a legitimate sociopolitical role (Bean and Kelley, 1995; Kelley, Bean and Headey, 1990). Content analysis of mainstream Australian media suggests media orientations followed suit, tending away from humanism towards a nature-as-an-end-in-itself view (Webb, Bengston and Fan, 2007).

Australian spatial distribution. Australia is a highly urbanized society – a vast empty island with large urban/suburban agglomerations dotted around the edge (Hugo, 2002). The classic Australian lifestyle is suburban, with many waterfront dwellings, and beach oriented (Lattas, 2007), much of it is wild-land-urban interface. This brings people into contact with predators, either face-to-face or through news reports and urban myths.

1.1. Predator species. How much exposure to potentially dangerous animals for themselves and others will people tolerate? How prepared are they to accept killing off wildlife in particular circumstances? Research on the Northern Hemisphere has examined "Public tolerance thresholds" or "stakeholder acceptability" (Carpenter, Decker and Lipscomb, 2000; Decker and Purdy, 1988; Wittmann, Vaske, Zinn and Manfredo, 1998; Zinn, Manfredo and Vaske, 2000; Zinn, Manfredo, Vaske and Wittmann, 1998), finding generally rather high tolerance for potentially dangerous wildlife species. One unanswered question in this literature is to what degree the tolerance has to do with the particular species enquired about and to what degree tolerance has to do with the situation. We begin to disentangle these issues by investigating tolerance of three potentially lethal predator species.

Predator species. Two of the predators asked about in the survey, great white sharks and crocodiles, are known to have preyed upon beachgoers, and unexplained disappearances are often popularly attributed to these predators. For example, Australian Prime Minister Harold Holt disappeared while swimming from Cheviot Beach in Victoria, in 1967, and his body was never found. He is widely believed to have been killed and perhaps eaten by a great white shark. This article is dealing with cultural representations of three predator species, so it is worth pointing out that the approach taken here is that the representations are jointly constituted with ineluctable features given by the physical world, but their salience is created by our lifestyles and technologies (Freudenberg, Frickel and Gramling, 1995).

The three species included in the survey – great white sharks, salt water crocodiles and tiger snakes – are all potential killers and are all widely familiar to Australians. This differs from the North American situation where the predators that have been asked about are large fur-bearing mammals – wolves, bears, and cougars. The fish, amphibian and reptile predators in the Australian survey are likely to elicit less projection and pseudo-empathy.

1.1.1. Crocodiles. Humans have been harmed or killed in at least 62 well documented unprovoked attacks by the saltwater or estuarine crocodile (Crocodylus porosus) from 1971 to 2004 in Australia, in settings ranging from an urban backyard (the crocodile had slipped into Darwin's canal system) to isolated settings far from human settlement (Caldicott, Croser, Manolis, Webb and Britton, 2005). Risks from wildlife (and to

wildlife) may be aggravated by educational programs for wildlife personnel which strongly emphasize typical animal behavior and devalue local knowledge (Healy, 2007), and may be shifting with the advent of crocodile tourism (Ryan and Harvey, 2000). Australians are well aware of the difference between the smaller and milder "freshie" (freshwater crocodile) and the sometimes very large and very aggressive "saltie" which the survey asked about.

1.1.2. Sharks. About 1.2 people are killed by sharks annually in Australian waters (Taronga and Western Plains Zoos, 2008). It is difficult to tell from human remains (when available) which shark species made the attack, but there is little question that the great white (Carcharodon carcharias) is prominent among them, and it figures particularly prominently in the local cultures of southern Australia (Minnegal, King, Just and Dwyer, 2003). It was necessary to specify a species of shark in the question, because Australian waters also contain filter-feeding whale sharks (Rhincodon typhus) and mostly mellow grey nurse sharks (Carcharias taurus) which induce no discernible social conflict. Further natural science information on great white sharks is available on http://www.cmar.csiro.au/whitesharks/index.html.

1.1.3. Snakes. Tiger snakes, Notechis scutatus, have a very toxic bite preceded by a dramatic threat display (Shrine, 1987). Although their common name reflects prominent horizontal banding, they actually vary greatly in size and coloration (Keogh, Scott and Hayes, 2005). They are also probably more culturally relevant than less conspicuous snakes because of their prebite threat displays.

We will examine people's norms about treatment of these wildlife species on a continuum ranging from strong protection that precludes all hunting and trapping of that wildlife species to permissive hunting and trapping with government bonuses as an incentive (a biocentric vs anthrocentric dimension (Manfredo and Dayer, 2004)) – across a range of settings from true wilderness to recreation spots to the (sub) urban wildland interface.

Hypotheses

Prior research has not systematically examined whether predator tolerance/acceptability is entirely shaped by context (the degree of involuntary exposure, especially by vulnerable persons) and to what degree there are species-specific features (Whittaker, Vaske and Manfredo, 2006). Some findings suggest that tolerance/acceptability of potentially dangerous wildlife varies by situation (Koval and Mertig, 2004), but others report no significant location/potential exposure effects (Riley and Decker, 2000). It seems reasonable to expect a rather steep tolerance gradient depending on the context, but also to anticipate that the interplay of natural features and their cultural meanings (Freudenberg, Frickel and Gramling, 1995) will make for some species-specific differences in tolerance.

H1: Context matters: Tolerance close to settlement < Tolerance in recreation areas < Tolerance far from settlement. This hypothesis is tested both in the descriptive results (item means) and the factor analyses.

H2: If Australian attitudes towards dangerous wildlife are structured like American attitudes towards large predators, there will be species-specific factors (Kellert, 1985; Kellert, Black, Rush and Bath, 1996; Kleiven, Bjerke and Kaltenborn, 2004). There is no guidance from prior research about which species in the Australian context will be the most tolerated and which the least. An exploratory hypothesis here is that there will be species-specific tolerance differences in the mean levels of tolerance in different settings and that other species-specific features that will be evident as correlated errors in the structural equation model. This hypothesis is tested both in the descriptive results (item means) and the factor analyses.

H3: Relative importance: Context is a more important determinant of tolerance than species-specific factors (given that all three species are highly lethal with close contact). This hypothesis is tested in the descriptive results (item means). The alternative hypothesis here is that attitudes are primarily organized according to species which have importantly distinct social meanings (Kellert, 1985; Kellert, Black, Rush and Bath, 1996; Kleiven, Bjerke and Kaltenborn, 2004).

The following set of hypotheses concerns the potential determinants of tolerance/acceptance and of views on compensation for victims' families.

H4m-H18c: Materialist theories of culture suggest that demographic, social and economic forces ought to be constitutive of culture, i.e. there should be strong significant effects of demographic, social and economic variables on tolerance and on norms about whether government should compensate victims of these predators. Cultural dynamics theories, by contrast, encourage us to explore the causal linkages among aspects of culture, especially in terms of chains of moral reasoning. From this point of view, for example, in Australia, a largely Christian or post-Christian country, religiosity, which is largely established in childhood, provides a general frame of reference including the presupposition that people are more important than animals, so we would expect a negative effect of religiosity on tolerance. On the other hand Christianity also inculcates a duty of care for the unfortunate, so the cultural dynamics hypothesis implies a positive effect on desire for

compensation for the families of victims. There is a wide range of material conditions of life which might influence tolerance and desire to compensate, many of which have been examined in prior research, often with mixed results. There is also many potential cultural effects. For brevity, these hypotheses are presented in Table 1. Preexisting theory and evidence do not offer much guidance about how these effects might differ by context, so that is approached inductively.

Table 1. Summary of prior findings, and hypotheses

Variable	Prior research: Effect on wildlife tolerance or a closely related concept			Hypotheses: Predicted effect in SEM	
	positive	no effect	negative	Material culture	Cultural dynamics
Age	1	**5, 9, 12, 13**	**12,13, 15,16, 20,21**	H4 m: 0	H4c: 0 or –
Gender (female = reference category = 0, male = 1)	**15,21**	1, **9,12**	**5, 3, 8, 11, 12, 20**, 2, 4, 7, 10	H5m: - or 0	H5c: 0
Rural childhood		12, 14	4,15	H6m: -	H6c: 0
Religious belief				H7m: 0	H7c: --
Parents' education				H8m: +	H8c: 0
Father's occupational status				H9m: +	H9c: 0
Rural resident	17	8, **21**	13, 18, 19	H10m: -	H10c: 0
Coastal resident				H11m: -	H11c: 0
Has children under 16		**21**		H12m: -	H12c: 0
Education	6, 10,**13, 16, 19, 20**	**1,5, 8, 9, 17, 21**	4	H13m: +	H13c: -0
Occupational status				H14m: +	H14c: 0
Family income (ln)	1, 4, **13**	**5, 12, 21**	4, **10**	?	H15c: 0
Scientific knowledge	15, **21**			H16m: 0	H16c: +
Rightwing political party (affect) or right political attitudes		17		H17m: 0	H17c: -
Green political party (affect)	1			H18m: 0	H18c: +

Source: [1] (Dietz, Dan and Shwom, 2007); [2] (Dietz, Kalof and Stern, 2002); [3] (Dougherty, Fulton and Anderson, 2003); [4] (Kendall, Lobao and Sharp, 2006); [5] (Koval and Mertig, 2004); [6] (Manfredo, Teel and Bright, 2003); [7] (Mohai, 1992); [8] (Riley and Decker, 2000); [9] (Ryan and Harvey, 2000); [10] (Vaske et al., 2001); [11] (Zinn and Pierce, 2002); [12] (Naughton-Treves, Grossbergand Treves, 2003); [13] (Williams, Ericsson and Heberlein, 2002); [14] (Heberlein and Ericsson, 2005); [15] (Ericsson and Heberlein, 2003); [16] (Bjerke, Reitan and Kellert, 1998); [17] (Skogen and Thrane, 2008); [18] (Bruskotter, Schmidt and Teel, 2007); [19] (Randveer, 2006); [20] (Casey et al., 2005); [21] (Morzillo et al., 2007).
Notes: Bolded entries are findings from research on wildlife tolerance, unbolded are effects on WVOs or other major environment-related concepts.

In terms of effects on desire for governmental compensation of victims' families, the applications of the materialist theory of culture and the cultural dynamics theory are also shown in Table 1 above.

Compensation programs for damage by wolves in US are well-accepted (Naughton-Treves, Grossberg and Treves, 2003), so one obvious hypothesis would be that people for whom dangerous animals have important cultural or psychological meaning should favor compensation programs for the families of victims in order to "soften" the danger and increase acceptability in the broader public. However, another argument is that a large part of the cultural importance of these animals is their dangerousness and unpredictability, probably rooted in the sacred/profane dimension of wild life value orientations that has been noted in prior research (Bright and Manfredo, 2000). If so, then people who value them will want to enhance those traits by declining to offer compensation to victims' families. Hypotheses based on the latter argument are:

H19-H21: People who are more favorable towards dangerous animals in each of the three settings will be less favorable towards government compensation for victims' families, because that would soften the chosen risk.

3. Data, measurement and methods

3.1. Data. The data used here are from the IsssA-Debut 2002, because it is the only one that contains our dependent variables (the "Debut" files are representative cross-sections of new recruits) to the International Social Science Surveys/Australia. The IsssA selects primary respondents at random from the electoral rolls. Model reliabilities drawn from IsssA-Pool panel data (when the randomly selected primary respondents are later recontacted) are also included in the model to assess the reliability of retrospective measures.

The population sampled by the IsssA consists of citizens of Australia who reside at the address which they have provided to the Electoral Office, who can read English sufficiently well to answer a self-completion questionnaire, and who are not too cognitively impaired to answer a self-completion questionnaire. For simplicity, I will refer to this population as

"Australians". The IsssA is based on a simple random sample from its target population, so its standard errors do not require corrections for clustering.

The IsssA surveys are sent by post, individually addressed by name, to simple random samples of Australian citizens drawn by the Electoral Commission from the compulsory electoral rolls (which are public documents) using a minor modification of Dillman's Total Response Method (Dillman, 1993). Details on the survey's fieldwork and data preparation procedures are in (Kelley and Evans, 1999). The representativeness of IsssA achieved samples has been clearly established in prior research (Bean 1991; Sikora, 1997). For this sample, the response rate, calculated as WAPOR/AAPOR's RR6 (American Association for Public Opinion Research, 2006) was 60.5 per cent.

3.2. Measurement. Measurement of the independent variables is fairly standard, and is given in Table 2.

Table 2. Measurement of independent variables. N = 1,543 cases in Australia, 2000

Variable	Definition	Mean	s.d.	Test-retest reliability [1]
Age	Age (divided by 10 to reduce rounding error)	4.97	1.55	.998
Male	Dummy variable: 1 = male, 0 = female.	0.46	0.50	.988
Rural childhood	Population of place of residence at age 14 under 20,000	0.37	0.48	.814
Religious belief	4 item scale; low 0, high 100 (Kelley and De Graaf, 1997)[3]	60	32	.850
Parents' education	Years of primary, secondary, and tertiary education of mother and father, averaged.	9.1	2.99	.754
Father's occupational status	Status: 0 = farm labor through, 1 = professional (14 groups).	0.42	0.28	.809
Rural resident	Population of current place of residence under 20,000	0.29	0.45	.779
Coastal resident	Dummy variable: 1 = yes (self-defined)	0.20	0.40	.779
Has children under 16	Dummy variable: 1 = yes	0.28	0.45	.904
Education	Years of primary, secondary, and tertiary education	12.1	2.97	.868
Occupational status	Status: 0 = farm labor through 100 = professional (14 groups).	51	27	.876
Family income (ln)	Family income (Austrfalian dollars, logged)	10.58	0.82	.713
Scientific knowledge	Single item (self description). Low of 0 to high of 100.	63	25	.619
Political party	Michigan feeling thermometer, low of 0 to high of 100 ("Very warm or favorable feeling"). Rating for the Liberal Party (roughly equivalent to the Republican Party in the US)	44	27	.810
Pro-environmentalist	Michigan feeling thermometer, low of 0 to high of 100 ("Very warm or favorable feeling"). Rating for the Green Party.	39	25	.810

Notes: [1] Based on 2.5 year (or longer) Australian panel studies. Number of cases varies by item but is always over 1000. [2] Evans and Kelley, 2002: Appendix. [3] Questions on current belief in God; changes in belief about God; belief in a God concerned with every person; and feeling close to God.

Methods

In investigating linkages among social science variables, random measurement error can lead to parameter estimates that are biased and inconsistent (Bollen, 1989a; Pedhazur, 1997). An appropriate solution is to adjust parameter estimates in light of item reliabilities using structural equation models (Bollen, 1989b).

Test-retest item reliabilities have been reported for the panel files of the IsssA: International Social Science Survey/Australia for year born/age, gender, city size, number of siblings, religious denomination, church attendance, years of education, marks in secondary school, whether attended private school, books at home, occupational status, ownership (w employees), supervisor, solo self-employed, family income, parents' church going, parents' denomination, parents' education, parents' age, mother worked when R young, parents' books when R was 14; father's occupational status, father's ownership (w employees), father supervisor, father solo self-employed, satisfaction with life as a whole, satisfaction with income, satisfaction with children, satisfaction with marriage, trade union attitudes, privatization, abortion, scientific worldview (Evans and Kelley, 2004; Kelley and Evans, 2004). Unfortunately, the key dependent variables on norms about wildlife have not yet been included in any panels, so there are no test-retest reliabilities available for them. It seems more prudent here to be conservative and undercorrect for random measurement error in these items, so I have assumed perfect measurement for them.

4. Findings: descriptive

As shown in Table 3, the nine questions about tolerance for dangerous wildlife share a stem question which was carefully worded not to "sugarcoat" the danger, but a very substantial fraction of respondents chose the strongest tolerance category (implicitly including protection for animals that have threatened humans) for dangerous predators in the wild – 38% for tiger snakes, 46% for saltwater crocodiles, and 54% for great white sharks. And most of the remaining respondents chose the milder toler-

ance category "Commercial hunting banned, but people can kill animals that are a danger". On a points out of 100 basis, with the most predator-tolerant category scored 100, the least predator-tolerant category scored 0, and the other categories scored at equal intervals in between, the mean tolerance for tiger snakes in the wild was 77 points out of 100, the mean tolerance for salt water crocodiles in the wild was 80, and the mean tolerance for great white sharks in the wild was 82. Thus, there is a gradient in tolerance across the 3 species, but the differences are small. These results suggest a very high level of tolerance for dangerous wildlife in the wild, and a broad social consensus on the issue. Indeed, the very strong support for protection in this context suggests that the feeling goes well beyond tolerance to something close to endorsement – respondents are not just willing to put up with the animals being there, instead they feel that it is right for the animals to be there.

Table 3. Question wording and percentage distributions. Australia, 2000

Some of Australia's animals are man eaters – for example, salt-water crocodiles and great white sharks. The government now protects these magnificent but dangerous animals (as well as poisonous snakes), but some think that that it is more important to protect people. Which policy do but some you think is best... Animals strictly protected by law, with a heavy fine for anyone who kills them Commercial hunting banned, but people can kill animals that are a danger Government take no action one way or the other; leave people to do as they see fit Protect people by trapping dangerous animals (for example, as Queensland traps sharks)								
Question[1]	Strictly protected 100	No commercial hunting 75	No government action 50	Trap dangerous animals 25	Bounty on dangerous animals 0	(Total)	(Cases)	Mean
Tiger snakes in the wild, far from people?	38	44	10	6	3	100%	1468	77
Salt-water crocodiles in the wild, far from people – protect them?	46	38	7	7	2	100%	1471	80
Great white sharks (white pointers) in the open ocean, hundreds of kilometres from shore?	54	32	6	6	2	100%	1472	82
Tiger snakes in recreation areas where people go picnicking or bush-walking?	10	43	12	29	6	100%	1459	55
Crocodiles near beaches and rivers where people like to swim?	8	35	8	39	9	100%	1469	1469
Great white sharks near the coast, where scuba divers and people in small boats are about?	17	36	10	29	7	100%	1473	1473
Tiger snakes near people's homes, where children play?	4	32	11	39	13	100%	1461	44
Crocodiles near people's homes, where children play?	5	25	7	44	18	100%	1460	1460
Great white sharks near beaches where children like to swim?	8	26	7	40	18	100%	1460	42 40
	Definitely pay	Probably pay	??	Probably not	Definitely not		1449	
If the government does protect dangerous animals, from time to time they will kill people. Should the government be required to pay damages to the victims' families?	12	16	16	32	24	100%		

Notes: [1] This is the order in which we analyze the questions. In the questionnaire, the three snake questions were asked together (in the wild first, then in recreation areas, then near home), followed by the three crocodile questions (in the same order), then the three shark questions.

By contrast, when the context shifts to recreation areas, the average level of tolerance drops sharply, and some polarization of opinion is evident (Table 3). The average tolerance drops from around 80 (in the wild) to around the neutral point of 50 (in recreation areas). The concentrations of opinion here are in the mild tolerance category "Commercial hunting banned, but people can kill animals that are a danger" and in the mild intolerance category "Protect people by trapping dangerous animals" (for example, as Queensland traps sharks), with few respondents choosing the neutral middle ground. Tolerance for each species is lower in the recreational setting. People are again most tolerant of great white sharks (57); this time tiger snakes come next (55), and saltwater crocodiles last (49). Tolerance levels for all 3 species are polarized.

Tolerance decreases further, although polarization remains, when the context shifts to homes and their nearby open spaces. The average level of tolerance has dropped below the neutral point to about 40 points out of 100. About two thirds of respondents are divided between mild tolerance and mild intolerance, with the rest distributed across the extremes and the neutral category. Species differences are small.

5. Findings: analytic

Dimensionality of tolerance: H1-H3. Tolerance for different species is highly correlated within settings (Table 4). Moreover, the confirmatory factor analysis with settings as the factors and species as the items yields very strong and nearly uniform standardized factor loadings between .8 and .9. Moreover, the correlations with criterion variables across species within settings are closely similar – or example being near 0.14 for correlations of warmth towards the Green party with tolerance for all three species near homes, but around 0.23 for all three species in the wild – as required by the classical measurement model. In practical terms, this means that people's tolerance is strongly context-dependent.

Table 4. Correlations and standardized confirmatory factor loadings, Australia, 2002[1]

	Wild			Recreation			Near homes			
	Tiger snake	Crocodile	Great white snake	Tiger snake	Crocodile	Great white snake	Tiger snake	Crocodile	Great white snake	Govern-ment pay damages
In the wild:										
Tiger snake	**1**									-.26
Crocodile	**.73**	**1**								-.26
Great white shark	**.66**	**.73**	**1**							-.28
In recreation areas:										
Tiger snake	*.46*	.36	.34	**1**						-.23
Crocodile	.36	*.40*	.33	**.65**	**1**					-.24
Great white shark	.37	.38	*.47*	**.61**	**.66**	**1**				-.31
Near homes:										
Tiger snake	*.28*	.20	.21	*.71*	.59	.51	**1**			-.16
Crocodile	.23	*.24*	.21	.58	*.75*	.56	**.77**	**1**		-.17
Great white shark	.24	.22	*.28*	.56	.67	*.72*	**.67**	**.77**	**1**	-.21
Criterion variables:										
Age	-.18	-.18	-.13	-.13	-.12	-.0	-.07	-.08	-.08	-.02
Male	-.03	-.01	.0	-.01	-.05	.02	-.06	-.07	-.04	-.03
Rural childhood	-.06	-.06	-.04	-.02	-.02	-.03	.01	-.01	-.03	.01
Religious belief	-.12	-.1	-.09	-.1	-.0	-.0	-.08	-.06	-.08	.12
Parents' education	.16	.13	.10	.10	.11	.11	.08	.09	.11	-.04
Father's occupational status	.11	.09	.06	.08	.07	.09	.04	.04	.05	-.07
Rural resident	-.01	-.04	-.02	.02	-.04	-.01	.02	-.03	.02-	.04
Coastal resident	-.02	-.02	-.02	.01	.03	.03	.02	.00	.00	-.08
Has children under 16	.07	.05	.05	.05	.01	.01	.00	-.02	-.01	-.01
Education	.15	.17	.10	.11	.15	.11	.05	.07	.08	-.10
Occupational status	.09	.09	.07	.06	.09	.07	.06	.06	.09	-.13
Family income (ln)	.13	.11	.11	.08	.06	.06	.02	.01	.03	-.16
Scientific knowledge	.17	.15	.10	.16	.11	.11	.08	.06	.05	-.09
Political party (conservative)	-.05	-.06	-.01	-.06	-.04	-.02	-.03	-.03	-.03	-.08
Pro-environmentalist	.25	.23	.20	.1	.18	.16	.15	.13	.14	-.08
Factor loading: Model 4										
Factor 1	.82	.87	.85							
Factor 2				.82	.80	.82				
Factor 3							.87	.90	.85	

Notes: Bold text – inter-item correlations among items in a single scale. Italics – same animal, different context. The SEM model allows correlated error for these. [1] Approximately 1,481 cases, varying somewhat from item to item.

But are things that simple? To find out, a set of factor analysis models assesses the main possibilities. The simplest model is that people differ in their tolerance of potentially lethal wildlife, but do not further differentiate by setting or by species. This baseline model has an RMSEA of 0.127 indi-

cating that the fit is not very good (Table 5, Model 1). A slightly more differentiated model allows a distinction between the "wild" context and (grouped together) the recreational and settled contexts (with no differentiation by species). This model is a substantial improvement in fit, with a drop in chi-square of 3017.4 for 18 df, which is significant at the .001 level. The RMSEA has dropped to about 0.08, confirming the impression that this more differentiated model is better than the "all in one" model. Differentiating all three contexts provides another significant improvement in fit, with a drop in chi-square of 579.9 for 9 df and an RMSEA of 0.07. Finally, Model 4 differentiates all three contexts (like Model 3), but also allows correlated errors for each species across contexts. It fits best of all: Adding these terms in drops chi-square by 733.4 for 9 df, a highly significant improvement, and RMSEA is down to 0.042 indicating a very good fit.

Table 5. Confirmatory factor analyses. 1,481 cases; Australia, 2000

		chi-sq	df	Comparison model	change in chi-sq	change in d.f.	Signifi-cance	Fit: RMSEA
Model 1	Everything in one factor	5,166.3	267	(baseline)	-	-	-	.127
Model 2	Factor 1: Snakes, crocodiles & sharks in the wild far from people	2,058.9	249	Model 1	3107.4	18	$p < .0001$	.080
	Factor 2: Snakes, crocodiles & sharks in recreational areas; snakes, crocodiles and sharks near home							
Model 3	Factor 1: Snakes, crocodiles & sharks in the wild far from people	1,479.0	240	Model 2	579.9	9	$p < .0001$	.067
	Factor 2: Snakes, crocodiles & sharks in recreational areas							
	Factor 3: Snakes, crocodiles & sharks near home							
Model 4	Model 3 plus correlated error[1] Preferred model.	705.6	231	Model 3	773.4	9	$p < .0001$	.042

Note: [1] Correlated error between the same animal in different contexts. Nine terms; see the lightly shaded terms in Table 4 top panel for details.

Accordingly, Model 4 (one factor for each context, with correlated errors for each species across contexts) is used in the structural equation model, below.

Determinants of tolerance (H4m-H18C). Almost none of the sociodemographic factors have direct significant effects on tolerance in any of the three settings (Table 6). Age has no significant effect. Neither do gender, rural childhood, parents' education, father's occupational status, rural residence, coastal residence, respondent's education, respondent's occupational status, or adherence to the Liberal/National party coalition (Australia's mainstream right wing party, its policies are similar to America's Democrats). The non-significant effect of gender is particularly interesting, given evidence that there continues to be strong gender differentiation in Australia in attitudes and behavior related to a different natural danger, bushfire (Eriksen, Gill and Head, 2010).

Table 6. Structural equation estimates correcting for attenuation Metric (b) and standardized coefficients (std). N = 1,481, Australia due to random measurement error, 2000[1]

	Dangerous animals in the wild		Dangerous animals in recreation areas		Dangerous animals near homes		Government compensation	
	b	std	b	std	b	std	b	std
Age	-.92	-.07	-.62	-.04	-.79	-.05	**-1.93**	**-.09**
Male	.50	.01	-.51	-.01	-2.69	-.05	.88	0.1
Rural childhood	-2.03	-.04	-.39	-.01	.12	.00	-1.28	-.02
Religious belief	**-.05**	**-.08**	**-.07**	**-.09**	**-.05**	**-.06**	**.09**	**.09**
Parents' education	.45	.06	.42	.05	.89	.09	.36	.03
Father's occupational status	-1.06	-.01	.38	.00	-3.33	-.03	-3.57	-.03
Rural resident	2.58	.05	2.52	.04	2.02	.03	1.67	.02
Coastal resident	.16	.00	3.49	.05	1.43	.02	**-6.05**	**-.07**
Has children under 16	-2.05	-.04	-3.11	-.06	**-4.33**	**-.07**	-.80	-.01
Education	.20	.03	.39	.04	-.26	-.03	.26	.02
Occupational status	-2.02	-.03	-.03	-.03	.05	.05	-.07	-.06

Table 6 (cont.). Structural equation estimates correcting for attenuation Metric (b) and standardized coefficients (std). N = 1,481, Australia due to random measurement error, 2000[1]

	Dangerous animals in the wild		Dangerous animals in recreation areas		Dangerous animals near homes		Government compensation	
	b	std	b	std	b	std	b	std
Family income (ln)	**3.08**	**.11**	1.60	.05	.05	.00	**-5.63**	**-.12**
Scientific knowledge	.10	.09	**.15**	**12**	.05	.04	-.04	-.02
Political party	-.02	-.03	-.02	-.02	-.02	-.02	**-.11**	**-.08**
Pro-environmentalist	**.23**	**.25**	**.23**	**.21**	**.18**	**.16**	.04	.03
Dangerous animals:								
In the wild	-	-	-	-	-	-	**-.29**	**-.17**
In recreation areas	-	-	-	-	-	-	**-.44**	**-.32**
Near homes	-	-	-	-	-	-	.13	.11
(constant)	**33**		**19**		**34**		**149**	
(R-squared)	**.15**		**.12**		**.06**		**.19**	

Note: Bold text coefficients are not significantly different from zero at $p < .05$ two-tailed . [1] This is Model 5. Measurement coefficients are in Table 4 and model fit statistics in Table 5.

Christian religious belief has a significant small, negative effect on tolerance in all three settings. Plausibly, having children under age of 16 has a significant negative effect on tolerance of dangerous species near homes, but not in more remote settings. There are two other small significant effects: a significant positive effect of family income on tolerance in the wild but not elsewhere, and a significant positive effect of scientific knowledge on tolerance in recreation areas but not elsewhere. There is no very clear theoretical reason for expecting these effects in one setting but not others – scientific knowledge, for example plays an important role in some body-related attitudes, but not others (Evans and Kelley, 2014), so it is possible that they are chance occurrences. Finally, there are strong significant linkages to positive affect for the Green party in all three settings. It would be premature to interpret this causally as opinion leadership by the Green party (although that remains a possibility), because it could also be that wildlife tolerance leads people to be favorable towards the Green party, or that both wildlife tolerance and support for the Green party reflect deeper wildlife value orientations.

Turning to impacts on support for government compensation for the victims of wildlife, sociodemographic factors play a slightly larger role. Older people are less likely to favor government compensation, although they do not differ from their juniors in tolerance. Religious people are more likely to favor compensation, which, together with their lower levels of tolerance, makes sense in terms of the special place that humans occupy in their world view. Coastal residents are less favorable towards compensation – an effect that is clearly contrary to self-interest as they are substantially more exposed to at least two of the potentially lethal wildlife species that were asked about. Perhaps part of the specific code of honor attached to the coastal lifestyle requires no softening of the consequences of the wildlife risk. This could be one of the forces generating the strong bonding social capital observed in some Australian rural communities (Woodhouse, 2006). Self interest may be at the root of the negative effect of family income on support for compensation – high earners will expect new taxes to be directed at them. General political ideology preferring to minimize governmental interventions seems likely to account for the negative relationship between adherence to the rightwing parties and support for government compensation.

Wildlife tolerance is the most striking source of attitudes towards government compensation. People who are tolerant of potentially lethal wildlife in the wild are moderately less favorable towards compensation, and the effect is quite large for those who are tolerant of dangerous wildlife in recreation areas. The effect of being tolerant near homes is not significant.

Discussion

The hypothesis that context matters – that tolerance would range from high in wild settings to middling in recreational settings, to rather below middling in domestic settings (H1) – is strongly supported by the descriptive statistics and by the findings of high correlations of tolerance across species within settings, factor analysis loadings being very high, and correlations with criterion variables being similar. The very high levels of tolerance for these predators in remote setting suggest a consensus that might be

one element in an alternative national identity replacing the now-contested traditional agricultural outback national myth (Gill, 2005).

By contrast, the evidence is more mixed on the hypothesis that tolerance is differentiated by species (H2). The descriptive statistics show that tolerance differences across species are small or non-existent and not consistent across settings, so they fail to support H2. Nonetheless, correlations of tolerance levels within species across settings are somewhat higher than across species across settings. Moreover, high correlated errors within species across settings mean that models allowing them fit better. Accordingly, it seems fair to say that species differences exist, although they are subtle and probably small.

H3 posits that context is more important than species, and the evidence supports that, but it should be kept in mind that the evidence on H2 suggests that we cannot entirely ignore species. In practical terms, these results suggest that future research should continue to ask about multiple species.

Turning to the question of whether tolerance of potentially dangerous wildlife is materially based, or is generated by cultural dynamics not rooted in people's material conditions of life, the evidence is strongly in favor of the cultural dynamics hypothesis (Table 7). Of the 36 significance tests yielding results that differentiated between these two hypotheses, only 3 favored the material culture hypothesis.

Table 7. Summary of new results on tolerance/acceptability of dangerous wildlife and recommended working hypotheses

Variable	Hypotheses: Predicted effect in SEM		Results: Wildlife tolerance			Conclusion / working hypothesis for future research
	Material culture: MC	Cultural dynamics CD	In wild	In recreation area	Near homes	
Age	H4 m: 0	H4c: 0 or –	ns	ns	ns	MC and CD both compatible
Gender (female = reference category = 0, male = 1)	H5m: – or 0	H5c: 0	ns	ns	ns	CD
Rural childhood	H6m: –	H6c: 0	ns	ns	ns	CD
Religious belief	H7m: 0	H7c: –	–	–	–	CD
Parents' education	H8m: +	H8c: 0	ns	ns	ns	CD
Father's occupational status	H9m: +	H9c: 0	ns	ns	ns	CD
Rural resident	H10m: –	H10c: 0	ns	ns	ns	CD
Coastal resident	H11m: –	H11c: 0	ns	ns	ns	CD
Has children under 16	H12m: –	H12c: 0	ns	ns	–	MC
Education	H13m: +	H13c: –0	ns	ns	ns	CD
Occupational status	H14m: +	H14c: 0	ns	ns	ns	CD
Family income (ln)	?	H15c: 0	+	ns	ns	mixed
Scientific knowledge	H16m: 0	H16c: +	ns	+	ns	mixed:
Rightwing political party supporter	H17m: 0	H17c: ?	ns	ns	ns	both
Positive attitude towards environmentalists	H18m: 0	H18c: +	+	+	+	CD

Most prior research also find that sociodemographic effects are not statistically significant, but there has been a laudable, scientifically conservative reluctance to draw the conclusion that the culture of the environment, at least as it relates to wildlife, is not founded in the material conditions of life. The reluctance stems from two main causes – (1) awareness that effects could be attenuated by random measurement error and (2) fear of making a Type II error (rejecting the null when it is really true). This paper has made substantial strides towards eliminating the first source of reluctance: By including reliabilities in the structural equation model the coefficient estimates are corrected for attenuation due to random measurement error, and they are still nearly all non-significant. In terms of the second concern, one could approach it using Bayes theorem, but to do that would warrant an entire paper on its own based on a systematic and exhaustive review of the literature (with findings weighted by estimates of the quality of measurement). In the meanwhile, a practical compromise might be that we continue to collect data on sociodemographic variables, but our working hypothesis is that they will not have significant effects. By contrast, some cultural effects, including religious belief, appear to play a role in wildlife tolerance, as in other domains of attitudes about nature (Kelley, 1999) and deserve continued attention in future research.

In terms of sociodemographic effects on attitude towards government compensation for the families of victims of dangerous wildlife, once again nearly all the sociodemographic effects failed to reach statistical significance, so much of the evidence is against the hypothesis that culture has a material basis (Table 8). The only exception is income, where a "hip pocket nerve" is evident. On the other hand, from the cultural dynamics perspective, religiosity, party politics, and unmeasured cultural changes represented by age differences, all appear to play a role and warrant continued attention in future research. A novel finding, that those most exposed to the risk are most opposed to compensation, reminds us that exposure to risk is not exogenous – that people choose where they live (and move often), so living near a hazard contains an element of choice. Moreover it suggests that the danger probably has a positive meaning for those who choose to be exposed to the risk – that there is an element of social honor or prestige in their accepting the risk, and it would be undermined by compensation. This possibility is speculation based on one shred of evidence, but it is a hypothesis warranting explicit future testing.

Table 8. Summary of results on desire for compensation for families of victims of dangerous wildlife and recommended working hypotheses

Variable	Hypotheses: Predicted effect in SEM		Result: Effects on desire for government compensation	Conclusion / working hypothesis for future research
	Material culture: MC	Cultural dynamics CD		
Age	H4m: 0	H4c: 0 or –	-	CD
Gender (f = 0, m = 1)	H5m: -	H5c: 0	ns	CD
Rural childhood	H6m: -	H6c: 0	ns	CD
Religious belief	H7m: 0	H7c: +	+	CD
Parents' education	H8m: +	H8c: 0	ns	CD
Father's occupational status	H9m: +	H9c: 0	ns	CD
Rural resident	H10m: -	H10c: 0	ns	CD
Coastal resident	H11m:+	H11c: 0	-	both wrong
Has children under 16	H12m: -	H12c: 0	-	CD
Education	H13m: +	H13c: -0	ns	CD
Occupational status	H14m: +	H14c: 0	ns	CD
Family income (ln)	H15m:-	H15c: 0	ns	MC
Scientific knowledge	H16m: 0	H16c: +	ns	MC
Rightwing political party supporter	H17m: 0	H17c: -	-	CD
Positive attitude towards environmentalists	H18m: 0	H18c: 0	+	both right
Tolerance for dangerous animals:				
in the wild	H19m: 0	H19c: -	-	CD
in recreation areas	H20: 0	H20c: -	-	CD
near homes	H21:0	H20c:-	ns	MC

H19-21. Turning to effects of wildlife tolerance on attitudes towards compensation, tolerance for wildlife in recreation areas and in the wild have significant, substantial, negative effects on the desire for government compensation for the families of victims of dangerous wildlife. The fact that tolerance for dangerous wildlife in settled areas does not have a significant effect on attitudes towards compensation may have to do with the fact that many of the people in settled areas are present for reasons other than choosing to expose themselves to dangerous wildlife – they are children, or family members who are there for other reasons. The really interesting findings are the negative effects of tolerance in recreational areas in the wild on attitudes towards compensation. One might have expected people who have high levels of tolerance to favor compensation on the grounds that it would, perhaps, make dangerous wildlife more acceptable to less tolerant people, but the data show that it is not so. Like the findings that coastal residents are less favorable to compensation, these results suggest that people who are tolerant value the risk and do not wish it softened.

Why allow these dangers? The "risk society" perspective would suggest that they may be a form of resistance to the domination of modern social life by technology-related risks (e.g. nuclear accidents, which are extremely unlikely but horrific in the scope of their consequences (Ekberg, 2007)). From this perspective, people choose to allow dangers that stem from "nature" rather than from humankind, and which put at risk one or a few persons at a time as a way of populating their risk imagery with hazards that are real to individuals, but which do not put whole communities or even societies in danger. Their symbolic "uses" (Dutcher, Finley, Luloff and John-

son, 2007; Newig, 2007) may be to give people the feeling that they are part of "nature", doing something that benefits the environment and to help them overcome feelings of being dominated by the large-scale technological risks. There is evidence that people experience these large-scale, low probability, technology-related risks as stressful (Freudenburg and Jones, 1991), so choosing to have small-scale individualized risks may be, in part, a strategy for stress reduction.

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