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Attitudes toward forest diversity and forest ecosystem services—a cross-cultural comparison between China and Switzerland

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Abstract

Aims
Despite the current interest in services provided by ecosystems and the role of biodiversity, the relationship among human attitudes, biodiversity and ecosystem services has hardly been investigated. Moreover, few studies have examined attitudes toward nature in cross-cultural comparisons. This study investigates the attitudes of Chinese and Swiss people, both environmental experts and laypersons, toward forest biodiversity and ecosystem services.

Methods
Overall, 640 people in China and Switzerland were interviewed with the help of a standardized questionnaire. In each country, the study population was equally divided into an urban (80 city dwellers and 80 environmental science students) and a rural (80 forest visitors and 80 farmers) study group. The 15-minute interviews took place in the cities of Beijing and Zurich and in the rural forested areas of Dujiangyan, Sichuan Province and Lake Sempach, canton Lucerne. Attitudes toward forest biodiversity were investigated with the help of color photographs that depicted both monocultures and species-rich forests typical for China and Switzerland. Attitudes toward ecosystem services were investigated with the help of 13 statements on provisioning, regulating, cultural and supporting services of forests.

Important Findings
On average, Chinese participants showed no strong preferences for biodiversity, whereas the Swiss clearly preferred species-rich forests over monocultures. However, Chinese environmental science students did prefer species-rich forests and attributed to them a higher conservation value because of their higher biodiversity. Although there were no strong preferences for Chinese versus Swiss forests, all participants correctly answered that Chinese forests are more species rich in terms of plants and animals and thus found them less boring and more interesting, but also less managed, than Swiss forests. All participants highly valued the ecosystem services provided by forests; especially the regulating and supporting ones. Environmental science students and farmers placed more importance on the provisioning services, whereas city dwellers and forest visitors emphasized more on the regulating services. The disjuncture between the high ecological quality of species-rich forests and their low attractiveness to Chinese study participants points to a potential conflict between conservation policies and the public's preferences. A better communication of ecosystem services provided by forest biodiversity to the public might change these preferences in favor of ecological quality, as already observed among Chinese environmental science students.

Keywords: biodiversity preferences, cross-cultural comparison, forests, valuation of ecosystem services

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INTRODUCTION

Human alterations of the environment have resulted in a global loss of forest biodiversity (Sala *et al.* 2000). This loss may negatively affect ecosystem functioning and diminish the capacity of forest ecosystems to provide society with a stable and sustainable supply of essential goods and services (Hu *et al.* 2008; Quijas *et al.* 2010). The protection and conservation of

primary forests, the restoration of forests in ways to enhance biodiversity and improve ecosystem services and a sustainable forest management have thus become priority conservation goals around the world (Chazdon 2008; Schmitt *et al*. 2009). However, members of different cultures or cultural groups may value forest biodiversity and ecosystem services differently and, in consequence, may or may not support conservation goals set by governments for instance (Deng *et al*. 2006). Although it becomes increasingly evident that decision-making strategies that better align ecological goals and human values are needed (Gobster *et al*. 2007; Saunders *et al*. 2006), the relationship between forest diversity, ecosystem services and human attitudes has hardly been investigated. Moreover, few studies have examined attitudes toward nature in cross-cultural comparisons (Buijs *et al*. 2009; Eisler *et al*. 2003).

It has been pointed out that environmental problems are largely ingrained into traditional values, attitudes and beliefs of a given society (Deng *et al*. 2006; Xu *et al*. 2005). The influence of culture on both people's perception of landscapes and their attitudes toward nature has been extensively studied. Some studies have found that culture can have strong effects on landscape preferences (e.g. Buijs *et al*. 2009; Eisler *et al*. 2003; Zube and Pitt 1981). Other studies, however, have stressed that cultural similarities regarding such preferences are much larger than cultural differences (e.g. Herzog *et al*. 2000; Yang and Brown 1992). Only few studies have compared the attitudes of people living in Western and Asian countries toward nature (Yang and Brown 1992; Yang and Kaplan 1989). Moreover, only limited cross-cultural research has been carried out comparing people's attitudes toward forests (Kaplan and Herbert 1986).

Natural systems cannot be understood, conserved and managed properly without recognizing people's environmental perceptions and attitudes (Lee and Zhang 2008). Knowing these perceptions and attitudes can make it easier to develop effective conservation and management strategies, which are both sustainable in the long term and sensitive to the needs of local people (Castillo *et al*. 2005; Dolisca *et al*. 2007; Eisler *et al*. 2003; Xu *et al*. 2006; Zube and Pitt 1981). For example, knowing how landscape perception differs among various groups such as farmers or outdoor recreationists can help in crafting and implementing effective conservation measures (Junge *et al*. 2011; Natori and Chenoweth 2008; Van de Berg *et al*. 1998). Moreover, education plays a key role in increasing people's environmental knowledge (Lee and Zhang 2008) and preferences regarding natural landscapes and their conservation (Chen *et al*. 2011; Xu *et al*. 2006). Therefore, the environmental education and expertise of people should be taken into account when investigating attitudes toward natural landscapes.

In the present study, we compared the attitudes of two cultural groups (Chinese and Swiss people) and two subgroups (environmental experts and laypersons) toward forest biodiversity and ecosystem services. China was chosen as a case study for a large Eastern country with a rapidly developing economy, in which human behavior especially over the past 60 years has caused large environmental changes, including large-scale deforestation, high biodiversity loss, high levels of soil erosion and catastrophic flooding (Zhang *et al*. 2000). In the wake of the 1998 floods in the Yangtze River basin, the Chinese government initiated a 13-year forest conservation program to conserve natural forests and restore forest biodiversity and sustainability (Xu *et al*. 2006). Switzerland was chosen as a case study for a highly developed Western country that has experienced extreme deforestation until the mid-19th century but since then has put great efforts in increasing its forested area and into forest sustainability. Today, all forest clearings in Switzerland have to be counterbalanced by reforestations (Neet and Bolliger 2004). As in other European countries, forests in Switzerland are popular settings for outdoor recreation, and a shift to more nature-based management practices aims to increase their recreational values, which are highly dependent on visual appearance (Nielsen *et al*. 2007).

METHODS

In 2008, overall, 640 study participants in China and Switzerland were interviewed with the help of a standardized questionnaire (see online supplementary material). In each country, the study population was equally divided into an urban (80 city dwellers and 80 environmental science students) and a rural study group (80 forest visitors and 80 farmers). The city dwellers and forest visitors were chosen as representatives of the general public, i.e. people with a layperson's view on forest diversity and forest functions, whereas the environmental science students and farmers were chosen as representatives of people with an expert view. This design allowed us to test for the influence of environmental expertise on attitudes toward forest biodiversity and ecosystem services by comparing city dwellers (laypersons) with environmental science students (experts) in the urban subpopulation and forest visitors (laypersons) with farmers (experts) in the rural subpopulation.

The 15-minute interviews (conducted by the second and third authors as native speakers of Swiss German and Chinese, respectively) took place in the cities of Beijing and Zurich, as they harbor universities where environmental sciences can be studied, and in the rural forested areas of Dujiangyan, Sichuan Province and Lake Sempach, canton Lucerne. In Beijing and Zurich, city dwellers were addressed in well-visited areas such as parks, where they were likely to spend their leisure time, whereas environmental science students were addressed mainly during or after lectures. In the rural areas, farmers were either interviewed on their farmland or at home, whereas forest visitors were addressed when walking through a forest.

The Chinese study participants were 14–76 years old (mean age: 33.5 years). The Swiss study participants were 14–82 years old (mean age: 38.7 years). In both countries,

50% of the participants were women and 50% were men. At all data collection steps, full anonymity was guaranteed to the participants. They were given a little gift after completing the questionnaire (Swiss chocolates for Chinese and Chinese rice crackers for Swiss participants).

Attitudes toward forest biodiversity were investigated with the help of color photographs. Color photographs that represent landscapes and landscape elements such as forests have been found to elicit attitudes of test persons toward the real objects in a good way (e.g. Daniel 2001; Trent *et al.* 1987). The letter-sized photographs showed monoculture or species-rich forests typical for China and Switzerland. They were selected from a pool of pictures provided by Chinese and Swiss forest ecologists who considered them typical. All photographs had been taken from close-up view and under similar light conditions; none of them showed elements other than forest vegetation (see online supplementary material). Each of the four forest type combinations—(i) monoculture typical for China, (ii) monoculture typical for Switzerland, (iii) species-rich forest typical for China and (iv) species-rich forest typical for Switzerland—was replicated 10 times, resulting in overall 40 pictures. This allowed us to test differences between forest types against variation within forest types between particular forests, such as particular species within monocultures and particular species compositions within mixtures. Ten different sets of four photographs, representing each forest type combination once, were drawn at random, and each set was assigned to a separate subgroup of 64 participants representing the different study groups in equal proportions.

While looking at the pictures, participants were asked step-by-step which forest they liked most, disliked most, considered as most species rich, most familiar, most comforting, most interesting, most boring, most managed and most worth conserving. These adjectives have previously been found to reflect the perception of scenic beauty of landscapes by test persons well (e.g. Kaplan and Kaplan 1989) and have been used in other studies (e.g. Junge *et al.* 2011). They refer to physical characteristics of a landscape (plant species-rich and animal species-rich forests) and its conservation potential (worth conserving) and also to other associated thoughts and feelings (familiar, comforting, managed, boring and interesting).

Attitudes toward ecosystem services provided by forests were investigated with the help of 13 statements about provisioning, regulating, cultural and supporting services, as defined by the Millennium Ecosystem Assessment (2005). Study participants were asked to indicate their personal valuation of each service on five-step Likert scales (1: unimportant, 2: slightly unimportant, 3: neither unimportant nor important, 4: slightly important and 5: important).

Data analysis included the following fixed explanatory variables and their interactions: culture (China, Switzerland), study area (urban, rural) and environmental expertise (urban study area: city dwellers versus environmental science students; rural study area: forest visitors versus farmers). Differences in the participants' choices of forest types were analyzed by generalized linear mixed models (multiple logistic regressions). To avoid effects of variability among the pictures within monocultures or species-rich forests and within Chinese and Swiss forests, pictures (n = 40) were used as random-effects explanatory variable (see online supplementary material). In one analysis, the responses were classified according to the preference for species-rich forests versus monocultures (Table 1, top half and Fig. 1a), and in a second analysis, they were classified according to the preference for Chinese versus Swiss forests (Table 1, bottom half and Fig. 1b). The overall preference ("Mean" in Table 1) for species-rich forests or for Chinese forests, respectively, was tested against the mean deviance of the random-effects variable and the mean deviance changes due to entering the fixed-effects variables into the model were tested against mean deviances of their corresponding interactions with the random-effects variable. Here, "tested against" refers to using ratios of mean deviances as approximate F-test statistics. Compared with the use of the deviance as an approximate chi-square test statistic, the use of ratios of mean deviances has the advantage that it allows a simple incorporation of random-effects terms into the generalized linear mixed-model analysis (McCullagh and Nelder 1989). The analyses were carried out with GenStat (12th edition; VSN International Ltd).

To test for influences on the importance placed on forest ecosystem services (measured on five-step rating scales), the data were analyzed by generalized linear mixed models (multiple linear regression). These analyses were carried out with SPSS for Windows, version 16.0.1.

RESULTS

Overall, participants had different preferences for species-rich forests versus monocultures and for Chinese versus Swiss forests ("Mean" in Table 1). Monocultures were more disliked and considered more boring and thus less interesting but were also considered more strongly managed than species-rich forests (Fig. 1a). Species-rich forests were considered richer in plant and animal species and more worth conserving than monocultures (see Fig. 1a). Although there were no strong preferences for Chinese versus Swiss forests (Fig. 1b), all participants (correctly) answered that Chinese forests are richer in plant and animal species and thus they found them less boring and more interesting but also less managed than Swiss forests (see Fig. 1b).

In addition to these common preferences, there were clear differences in preferences among the different groups of participants, especially between Chinese and Swiss participants, between environmental science students and city dwellers and between forest visitors and farmers, but not so much between urban and rural participants (Table 1). For example, Swiss participants liked species-rich forests more than monocultures and found them more familiar and comforting, whereas

Table 1: influence of design variables on the study participants' (n = 640) choice of one forest type out of four, which they considered most representative for characteristics (a)–(j)

	F-statistics of differences in choice due to certain forest characteristics									
Design variables	(a) Liked	(b) Disliked	(c) Rich in plant species	(d) Rich in animal species	(e) Familiar	(f) Comforting	(g) Managed	(h) Boring	(i) Interesting	(j) Worth conserving
Species richness of the forest										
Mean	9.32**	16.05***	28.27***	27.96***	5.29*	1.86	12.73***	32.98***	16.04***	12.37**
Culture: China versus Switzerland	29.38***↓	11.34**↑	4.40	3.63	8.80**↓	6.58*↓	0.70	20.23***↑	8.22**↓	7.96**↓
Study area: urban versus rural	0.99	1.59	0.02	18.10***↓	2.60	0.56	1.74	1.37	2.14	3.37
City dwellers versus students (within group urban)	1.08	6.35*↑	0.00	0.51	0.26	0.19	0.96	2.28	0.09	5.06*↓
Forest visitors versus farmers (within group rural)	0.98	6.11*↓	3.01	0.02	0.21	0.34	0.88	6.08*↓	0.17	1.02
Origin of the forest										
Mean	1.34	0.39	5.61*	5.34*	7.29**	2.96	13.38***	4.89*	6.60*	2.49
Culture: China versus Switzerland	0.00	0.70	7.03*↓	4.28*↓	27.76***↑	6.30*↑	8.97**↑	1.33	1.06	9.83**↓
Study area: urban versus rural	3.68	5.58*↓	2.24	0.31	10.82**↑	1.79	0.21	5.02*	6.37*↑	2.21
City dwellers versus students (within group urban)	6.97*↓	8.39**↑	5.25*↓	7.93**↓	2.80	0.65	0.24	2.65	7.03**↓	3.77
Forest visitors versus farmers (within group rural)	0.95	20.75***↓	7.96**↑	1.95	2.66	1.72	0.04	5.38*↓	6.53*↑	0.91

Arrows denote (i) for species richness: ↑ more and ↓ less likely to select a species-rich forest; and (ii) for origin: ↑ more and ↓ less likely to select a Chinese forest. The forests varied in species richness (species-rich forest, monoculture) and origin (China, Switzerland). Data were analyzed by logistic regression using generalized mixed models. Table entries are approximate F-ratios (see Methods) and significance levels (***$P < 0.001$; **$P < 0.01$; *$P < 0.05$).

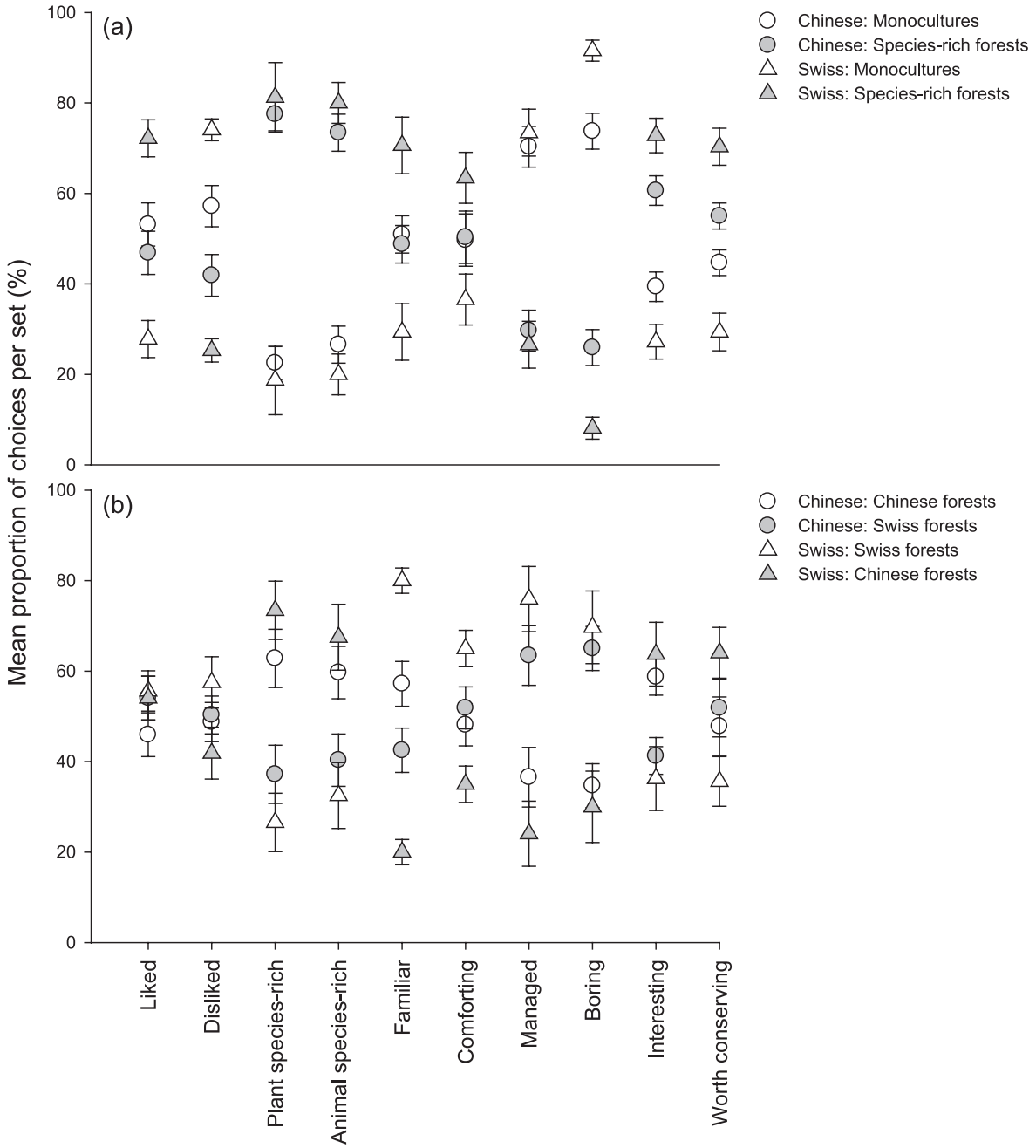

Figure 1: attitudes toward (a) forest diversity and (b) forest origin. In choice tasks, 320 Chinese and 320 Swiss people pointed out the one forest they liked most, disliked most and thought to be richest in plant species, richest in animal species, familiar, comforting, interesting, boring, managed and worth conserving. Each person judged one set of four pictures (one monoculture from China and one from Switzerland and one species-rich forest from China and one from Switzerland); altogether there were 10 replicate picture sets, each distributed to 32 Chinese and 32 Swiss participants (see online supplementary material).

Chinese participants did not show these preferences (Fig. 1a; line "Culture" in top half of Table 1). Urban participants had a stronger tendency than rural ones to consider species-rich forests as richer in animal species than monoculture forests. Moreover, environmental science students and forest visitors disliked monocultures more than did city dwellers and farmers, respectively, and environmental science students found species-rich forests compared with monocultures more worth conserving than did city dwellers. Farmers had a stronger tendency than forest visitors to consider species-rich forests as boring (see top half of Table 1).

Not surprisingly, Chinese participants found Chinese forests more familiar than Swiss forests and Swiss participants found Swiss forests more familiar than Chinese forests (Fig. 1b; line

Table 2: influence of design variables on the importance assigned to forest ecosystem services by 640 people from China and Switzerland

Ecosystem services of the forest	Mean score ± SEM		Significance	Mean score ± SEM		Significance	Mean score ± SEM		Significance	Mean score ± SEM		Significance
	Chinese	Swiss		Urban	Rural		City	Students		Forest	Farmers	
Provisioning services												
Produces timber	4.2 ± 0.07	4.4 ± 0.05	***	4.1 ± 0.06	4.5 ± 0.06	***	4.0 ± 0.09	4.3 ± 0.07	—	4.2 ± 0.10	4.7 ± 0.05	***
Produces food	3.4 ± 0.07	2.9 ± 0.08	***	3.1 ± 0.07	3.3 ± 0.08	—	3.1 ± 0.10	3.0 ± 0.09	—	3.3 ± 0.11	3.3 ± 0.12	—
Produces fuel	3.2 ± 0.08	4.0 ± 0.07	***	3.3 ± 0.07	3.9 ± 0.08	***	3.1 ± 0.11	3.5 ± 0.10	**	3.4 ± 0.12	4.4 ± 0.09	***
Regulating services												
Protects against natural hazards	4.8 ± 0.03	4.8 ± 0.04	—	4.8 ± 0.03	4.8 ± 0.04	—	4.8 ± 0.04	4.8 ± 0.04	—	4.8 ± 0.05	4.7 ± 0.05	—
Produces clean air	4.9 ± 0.02	4.9 ± 0.02	—	4.9 ± 0.02	4.9 ± 0.02	—	4.9 ± 0.02	4.8 ± 0.04	***	4.9 ± 0.03	4.8 ± 0.04	—
Produces clean water	4.6 ± 0.04	4.6 ± 0.04	—	4.4 ± 0.04	4.7 ± 0.04	***	4.5 ± 0.06	4.3 ± 0.07	**	4.7 ± 0.05	4.7 ± 0.05	—
Regulates the climate	4.8 ± 0.03	4.8 ± 0.03	—	4.8 ± 0.03	4.8 ± 0.04	—	4.9 ± 0.03	4.8 ± 0.04	—	4.8 ± 0.03	4.7 ± 0.06	**
Cultural services												
Is a place to recreate	4.1 ± 0.06	4.6 ± 0.04	***	4.4 ± 0.05	4.4 ± 0.06	—	4.3 ± 0.07	4.4 ± 0.07	—	4.4 ± 0.08	4.3 ± 0.09	—
Is a place to be physically active	3.8 ± 0.07	3.8 ± 0.07	—	3.7 ± 0.07	3.9 ± 0.07	—	3.8 ± 0.10	3.7 ± 0.09	—	4.2 ± 0.08	3.5 ± 0.12	***
Is of aesthetic value	4.2 ± 0.06	4.4 ± 0.04	***	4.3 ± 0.05	4.3 ± 0.05	—	4.3 ± 0.07	4.3 ± 0.06	—	4.2 ± 0.08	4.3 ± 0.07	—
Is of spiritual/religious value	3.2 ± 0.08	2.6 ± 0.08	***	2.9 ± 0.07	3.0 ± 0.09	—	3.0 ± 0.11	2.7 ± 0.10	—	3.0 ± 0.12	2.9 ± 0.13	—
Supporting services												
Is a habitat for animal species	4.8 ± 0.03	4.9 ± 0.02	***	4.9 ± 0.02	4.8 ± 0.03	—	4.9 ± 0.03	4.9 ± 0.03	—	4.9 ± 0.03	4.8 ± 0.05	*
Is a habitat for plant species	4.7 ± 0.04	4.8 ± 0.03	***	4.8 ± 0.03	4.7 ± 0.04	*	4.8 ± 0.05	4.8 ± 0.04	—	4.8 ± 0.05	4.6 ± 0.07	*

All values measured on five-step rating scales, with 1: unimportant, 2: rather unimportant, 3: neither/nor, 4: rather important, 5: important. Mean scores and SEM are derived from raw data. Significances are based on analyses of variance with all design variables and their interactions as explanatory variables. All degrees of freedom, df = 1, 632.
***$P < 0.001$; **$P < 0.01$; *$P < 0.05$.

"Culture" in bottom half of Table 1). The Swiss participants regarded Swiss forests as more comforting but less worth conserving than Chinese forests, whereas the Chinese participants had no such preferences (see Fig. 1b). Environmental science students found Chinese forests more interesting than Swiss forests, whereas city dwellers liked Swiss forests more than Chinese forests (see bottom half of Table 1).

All participants highly valued the goods and services provided by forest ecosystems (overall mean score of 4.2 on the five-step scale) and did not differ in the importance placed on regulating services (Table 2). However, among the provisioning services, food production was more important to the Chinese and timber and fuel production was more important to the Swiss participants; moreover, recreation was clearly more important to the Swiss people. Differences between and within the urban and rural subpopulations were much less pronounced (see Table 2). However, for the rural study participants, food production was more important to the Chinese than the Swiss participants (mean scores of 3.7 ± 0.11 and 2.9 ± 0.12, respectively; $F = 7.94$, $P = 0.005$); and for urban participants, clean air production (4.9 ± 0.02 and 4.8 ± 0.03, respectively, $F = 10.82$, $P = 0.001$) and climate regulation were also more important to the Chinese than the Swiss participants (4.9 ± 0.02 and 4.7 ± 0.04, respectively, $F = 6.81$, $P = 0.009$).

Environmental science students and farmers placed more importance on provisioning services, whereas city dwellers and forest visitors were more interested in regulating services of the forests. Not surprisingly, forest visitors especially recognized the value of forests as a place to be physically active and as a habitat for plants and animals (see Table 2).

DISCUSSION

Swiss and Chinese participants differed in their preferences for forest biodiversity and their valuations of ecosystem services provided by forests. Although the average Chinese participant showed no biodiversity preferences, the average Swiss participant clearly preferred species-rich forests over monocultures (~72% of choices). Recent experimental and large-scale field studies also demonstrated strong preferences of the Swiss public for species richness in grassland ecosystems (Lindemann-Matthies *et al.* 2010). This preference was mainly due to diversity itself and not so much due to the presence of particular species. The same observation was made in the present study, i.e. preferences for species-rich forests versus monocultures stood out against the much smaller variation within these two categories between different species compositions and identities shown in the picture sets.

Interestingly, Swiss and Chinese participants differed much less in their statements about Chinese versus Swiss forests, indicating that they were quite "objective" in their judgment, e.g. that Chinese forests harbor more species of plants and animals than do Swiss forests. This suggests that the observed differences in biodiversity preferences are not due to misconceptions of species richness. Other studies have also shown that humans can, at least roughly, discriminate between different levels of species richness (even if they do not know the species themselves; Lindemann-Matthies *et al.* 2010).

There are several, not mutually exclusive, explanations for the lack of a preference for species-rich forests among the Chinese participants. One explanation could be that Chinese participants have a more instrumental view of the natural world (Lee and Zhang 2008) than Swiss participants. In Chinese-language surveys, nature is commonly viewed as being alien and worthy of improvement by human manipulation (Harris 2006). According to Harris (2006), this mirrors traditional Chinese thought, notably Confucianism, which, despite sometimes being invoked as a model for environmentalism, is an anthropocentric paradigm (but see Deng *et al.* 2006). In contrast, the Western traditional world view of mastery over nature is shifting toward a more inclusive anthropocentric or even bio- and ecocentric view (Deng *et al.* 2006). Our findings corroborate these notions and are in line with recent studies that show a growing nature friendliness in Western cultures, with strong preference for variation, naturalness and species richness in forests and other ecosystems (Lindemann-Matthies *et al.* 2010; Nielsen *et al.* 2007; van den Born *et al.* 2001). It would be interesting to repeat our study in some years to see whether preference trends will also shift in this direction among the Chinese or whether the current preference for species-rich forests in Switzerland reflects a temporary phenomenon.

A second explanation why the Chinese participants show low preferences for forest biodiversity could be that environmental education until recently used to have a low priority in teaching (Lee and Zhang 2008). In 2003, the Chinese Ministry of Education mandated the inclusion of environmental education in all elementary and secondary school curricula, but this mandate has not yet been put into broad action (Efird 2012). Many secondary school teachers are reluctant to teach environmental issues as they are rewarded primarily for their students' achievement on high-stakes' examinations, whose contents do not include substantial environmental education knowledge (Lee and Zhang 2008; Lin and Ross 2004). However, environmental education has a strong potential to raise environmental awareness in China (Chen *et al.* 2011; Lee and Zhang 2008; Xiao *et al.* 2012). This could be seen in the fact that among the Chinese participants, the group of environmental science students, in contrast with the other groups, did have a preference for species-rich forests and attributed to them a higher conservation value due to higher biodiversity.

A third explanation for the low biodiversity preference of Chinese participants could be related to the following arguments. A part of our visual aesthetic preferences may be due to a cognitive understanding of ecological sustainability (Gobster *et al.* 2007; Kaplan and Kaplan 1989). This could explain the increased biodiversity preference among environmental science students in China, with the

corresponding ecological knowledge, which the other Chinese participants do not have. For these other Chinese participants, monocultures may be what they know and are familiar with, as they are still the most common forest type in China (Zhang *et al*. 2000), whereas forests in Switzerland are mostly managed as mixed stands. Familiarity and peacefulness, which includes a feeling of comfort and harmony, are two highly influential variables in landscape perception studies (e.g. Kaplan and Kaplan 1989). When looking *at* a scene, people imagine themselves at the same time *in* the scene, resulting in a strong need for security and well-being.

Both Chinese and Swiss participants acknowledged the benefits of ecosystem services provided by forests. The different valuations of provisioning services can be explained by the stronger reliance of rural people in China on forest resources and the growing perception of forests as a renewable energy source, especially as places for recreation, in Switzerland. The latter may be an important explanatory component for the strong preference for species-rich forests among the Swiss participants, because recreational values in many Western countries are currently linked to naturalness and diversity (Nielsen *et al*. 2007).

Caution should be exercised in generalizing the results of this study. We considered only two regions each within two countries of very different sizes, and differences found can thus not be interpreted as general differences between countries. In China, regional influences may be strong as it is a culturally, socially and economically highly diverse country (Xu *et al*. 2006). In Switzerland, differences may also occur between the three different language-speaking regions (German, French and Italian; Junge *et al*. 2011). Moreover, due to the restricted sampling, our study participants might also not be representative of laypersons and environmental experts, in general, in the two countries. However, as almost all people addressed were willing to participate in the interviews, they can at least be considered representative in sociodemographic variables such as age, sex and education in the two regions chosen.

Species-rich forests like the ones studied herein are an important focus of conservation efforts worldwide and it was a pleasing result that both Chinese and Swiss study participants regarded them as worth conserving. However, the disjuncture between the high ecological quality of species-rich forests and their low attractiveness to Chinese study participants points to a potential conflict between recent conservation policies and the preferences of the public. Furthermore, there is still little evidence that species richness has similarly beneficial effects on ecosystem services in forests as it has in grasslands (Balvanera *et al*. 2006). More ecological knowledge and a better communication of its application to the public at large might change preferences in favor of ecological quality, already seen among the Chinese environmental science students. We especially recommend communicating the possible link between biodiversity and the supporting services of forests, which were regarded as highly beneficial in both cultures. This should help people to realize that human well-being, wealth and environmental quality may be more closely linked than previously assumed.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Journal of Plant Ecology* online.

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