Fisheries Research 194 (2017) 173–187

Contents lists available at ScienceDirect

Fisheries Research

journal homepage: www.elsevier.com/locate/fishres

What determines the behavioral intention of local-level fisheries managers to alter fish stocking practices in freshwater recreational fisheries of two European countries?

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ARTICLE INFO

Handled by: George A. Rose

Keywords:
Fish stocking
Nonnative species
Culture-based fisheries
Stock enhancement
Recreational fishing

ABSTRACT

Angling clubs in central Europe regularly use fish stocking to maintain or enhance stocks. Our objective was to understand the behavioral intention of club decision makers to alter stocking practices. To that end, we conducted a survey among a random sample of fisheries managers in angling clubs in Germany (n = 1222) and France (n = 587). We report four key findings. First, the intention to decrease stocking was better predicted than the intention to increase stocking, suggesting that the decision to increase stocking is under less psychological control. Second, differing psychological constructs predicted the intentions to alter three distinct stocking practices (stocking amount in general, stocking of fry and juvenile fish, stocking of harvestable fishes), indicating that no universal set of psychological predictors for stocking decision making exists. Third, the perception of the socio-economic situation of the club and of the status of the club's waters had consistent explanatory significance, while the predictive power of basic sociopsychological characteristics related to stocking (attitude, norms etc.) was low. However, the clubs' past stocking measures (club typology) moderated the impact of the attitude, norms and beliefs, thereby revealing that the effect of the psychological disposition of the decision maker on intended future stocking behavior depended on the club's ecological and social context. Similarly and finally, beliefs about stocking-related ecological and genetic risks did not exert strong influence on the intention to alter stocking practices, but their explanatory power increased when the club typology was taken into account. We conclude (i) that contextual (social and ecological) factors, not psychological dispositions per se, inform stocking intentions and (ii) that intended stocking regime alterations depend on the interaction of the psychological disposition with the contextual frame within which stocking decisions are made.

1. Introduction

Fish stocking is a frequently used, and often abused, management tool in freshwater recreational fisheries (Arlinghaus et al., 2002, 2016; Cowx, 1994). Objectives for stocking range from species conservation to fisheries enhancement (Arlinghaus et al., 2016; Cowx, 1994; Lorenzen et al., 2012). Stocking regimes can broadly be classified into those that are culture-based (i.e., stocking of species that do not naturally recruit, thereby maintaining a catchable stock) and stock enhancing (i.e., stocking into recruiting populations to maintain or increase abundance over natural limits; Lorenzen et al., 2012). Stocking can produce fisheries benefits by maintaining or elevating fish stocks, which is particularly well documented in culture-based fisheries (Arlinghaus et al., 2015; Lorenzen et al., 2012). Culture-based stocking programs may involve nonnative fishes (e.g., rainbow trout, *Onchorhynchus mykiss*, in Europe), but may also involve native species when natural recruitment is strongly impaired or lacking (e.g., eel, *Anguilla anguilla*, in standing water bodies). Stock enhancements are usually directed at native species, but there is the risk of genetically polluting wild populations in the recipient ecosystems depending on the source of the stocking material and the intensity of stocking (Lorenzen et al., 2012). Stock enhancements may also occur with feral nonnative fishes that have established recruiting populations (e.g., with Pacific salmonids in the Great Lakes).

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http://dx.doi.org/10.1016/j.fishres.2017.06.001
Received 10 July 2016; Received in revised form 18 May 2017; Accepted 2 June 2017
Available online 15 June 2017

In many western and central European countries (e.g., France, Austria, Germany), the owner of a water body also owns the fishing rights (Daedlow et al., 2011). Fishing rights can subsequently be leased to other parties, such as angling clubs or commercial fisheries. Leasing out fishing rights to angler communities is very common in countries such as Germany, when the fishing rights belong to the government. The entire bundle of fishing rights includes the duty and the right to organize management activities, such as fish stocking, largely independently of other actors or organizations (Arlinghaus, 2006; Arlinghaus et al., 2015; Daedlow et al., 2011). Fishing rights owners are entitled to sell angling tickets; the angler as a ticket holder is then only allowed to fish with rod and line, while the management right continues to belong to the fishing rights owner. In countries such as Germany, angling clubs are by far the dominant decision-making bodies in relation to fish stocking, which is conducted largely independently of fisheries agencies or scientists (Arlinghaus, 2006; Arlinghaus et al., 2015). Key decisions about stocking are made by the clubs' management boards, which include elected members of the angling club that are trained in fisheries management issues by angler associations or agencies (Arlinghaus et al., 2015).

Although the benefits of successful stocking for fish conservation and fisheries are undisputed in some situations (Lorenzen et al., 2012), there is an increasing discussion that indiscriminate stocking may negatively affect biodiversity and ecosystem functioning (Eby et al., 2006; Johnson et al., 2009; Laikre et al., 2010; van Poorten et al., 2011). In addition, many stock enhancements fail to generate additive effects on stock size and can thus be economically wasteful (Arlinghaus et al., 2015; Hühn et al., 2014; Lorenzen, 2014), but these failures may not be perceived by the angler communities due to a lack of proper assessment of the outcomes of past stocking measures (Hühn et al., 2014; Lorenzen et al., 2012; Post et al., 2002). Lack of ability to discriminate stocked from wild fishes, ecological stochasticity and the resulting variation in angler successes, social pressure by anglers on managers to reinvest license fees into stocking, path dependencies, lack of alternative management tools and humans' general disposition to avoid future losses or regrets are likely mechanisms involved in explaining why stocking has evolved as a panacea in the management of freshwater recreational fisheries in angling clubs and associations (Anderson, 2003; Arlinghaus et al., 2015; van Poorten et al., 2011)

Fisheries management is as much about people management as it is about fish stock management (e.g., Arlinghaus et al., 2016). In this context, there is a need to better understand the social (i.e., the human) dimension of fisheries management including the drivers of stocking decisions made in angling clubs. Most of the existing research on understanding determinants of stocking-related preferences and attitudes in recreational fisheries has been devoted to the study of individual anglers (e.g., Arlinghaus and Mehner, 2005; von Lindern and Mosler, 2014) rather than decision makers. Studies targeting the people who actually make the stocking decisions in angling communities are rare and have mainly employed qualitative research techniques (Eden and Bear, 2011a,b, 2012; van Poorten et al., 2011; Sandström, 2010, 2011). Such research has revealed that decision makers engage in stocking according to their primary management goals (e.g., environmental vs. fishery management; Knuth et al., 1995), in accordance with their personal mental models and beliefs about how stock-enhanced ecosystems function (von Lindern 2010), and in response to social norms by the recreational angler constituency in light of budgetary constraints (Jackson et al., 2004; van Poorten et al., 2011). Moreover, when studying ordinary anglers, von Lindern and Mosler (2014) showed that the probability to contribute to stocking behaviors was a function of an angler's expectations of stocking outcomes, beliefs about stocking-related risks, the attitude toward stocking and the perceived control over actually participating in stocking behavior. Relatedly, anglers' preference for stocking over alternative management tools was found to be affected by environmental beliefs, attitudes, consumptive orientation and the general avidity level of the angler (Arlinghaus and Mehner, 2005). Although these studies focused on anglers rather than on stocking decision makers, they suggest that a number of psychological characteristics (e.g., beliefs, norms, attitudes) may be strong determinants of the stocking decisions made by fisheries managers in angler communities as well. Ultimately, the latter are ordinary anglers that had been elected as angling club members into their club's management board and thus became stocking decision makers. The objective of the present study was to use a quantitative survey-based approach in two European countries (Germany and France) to understand the systematic influence of the psychological disposition of these local-level decision makers on their intentions to modify stocking in the future. In addition to psychological characteristics, we included contextual information about the club's past stocking activities and accounted for the club's socio-cultural environment by testing the model in these two countries.

2. Theoretical background

2.1. Sociopsychological theory and behavioral model

The theory of planned behavior (TPB; Ajzen, 2005; Fishbein and Ajzen, 2010) and the value-belief-norm theory (VBN; Stern, 2000) have been widely used to explain human pro-environmental behaviors (Kaiser et al., 2005; Klöckner, 2013; Steg and Vlek, 2009), particularly in conservation contexts (Cooke et al., 2009; Decker et al., 2012; Milner-Gulland, 2012). Because both theories focus on the behavior of individual actors, they may help understand the psychological processes underlying stocking decisions made in angling clubs, which is considered pro-environmental behavior by local-level fisheries managers. Both theories assume a hierarchy of psychological constructs that exert influence on one another and ultimately inform conservation behavior. The TPB asserts that performing a certain behavior depends on an individual's intention to perform that behavior. This intention increases with an increase in the subjective, or social, norm (i.e., the experience of social pressure to perform the behavior), an increase in an individual's attitude toward the behavior (i.e., a positive evaluation of the behavior), and with an increase in perceived behavioral control (i.e., the belief that the behavior is under one's volitional control; Ajzen, 2005). The attitude toward a behavior is in turn influenced by beliefs about the consequences of that behavior (e.g., whether fish stocking is considered an effective management tool or whether it entails ecological risks). Behavioral beliefs are again influenced by other factors such as human personality traits (Ajzen, 2005). von Lindern and Mosler (2014) applied the TPB to the individual stocking-related behavior of Swiss anglers, who made decisions about their own participation in stocking activities conducted by their angling clubs (e.g., helping with releasing fishes). These respondents were, however, not stocking decision makers as in the present study (i.e., the person who decides which fish species and how many individual fish to release). They found that behavioral beliefs about ecological risks of stocking measures and about the success of these measures explained 58% of the variance in Swiss anglers' attitude toward stocking. The attitude, together with perceived behavioral control, in turn, explained 23% of the variance in the intention to participate in stocking activities, which again accounted for 53% of the variance in actual participation (von Lindern and Mosler, 2014). The study by von Lindern and Mosler (2014) thus supports the assumption that the TPB may be well suited for modeling the impact of psychological constructs on stocking behavior performed by decision makers in angling clubs.

Similar to the TPB, the VBN consists of a causal chain of psychological constructs that inform pro-environmental behavior. According to the VBN, the proximal determinant of a behavior is the personal (rather than social) norm. This is defined as a moral obligation felt by an individual to engage in a pro-environmental way. For example, if decision makers believe that stocking is a pro-environmental behavior aimed at keeping fish stocks in good shape and if they feel responsible for attaining this goal, they will feel obliged to stock fish. The ascription of responsibility in turn is influenced by the decision makers' awareness of consequences if not acting pro-environmentally (Steg and Nordlund, 2013; Stern, 2000). Previous research has revealed that personal norms were positively related to pro-environmental behaviors such as

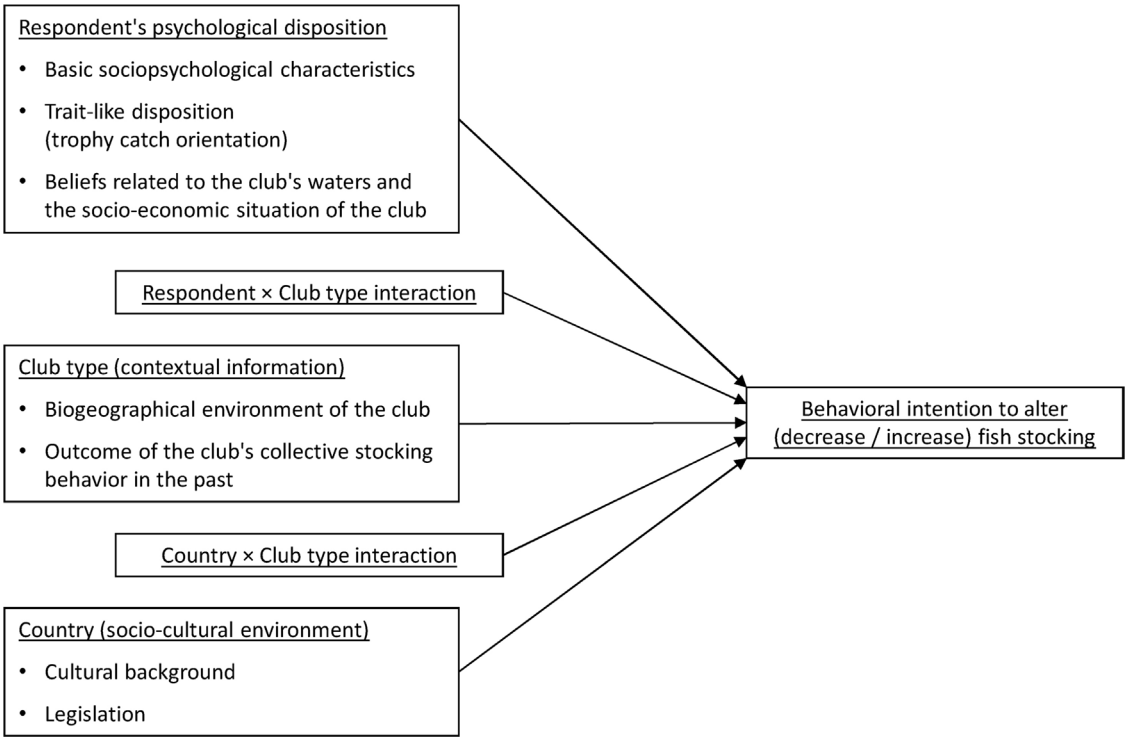

Fig. 1. Behavioral model of the decision to alter stocking behavior made in angling clubs.

conservation behavior of local residents of a tourism area (Zhang et al., 2014) and of visitors to a national park (van Riper and Kyle, 2014). Klöckner (2013) integrated components of the TPB and the VBN into his comprehensive action determination model and tested it in a meta-analytic framework. He showed that a combination of the constructs of both theories explained high frequency pro-environmental behaviors such as water use and environmental activism. We followed Klöckner's model and predicted that sociopsychological characteristics of both the TPB and the VBN together best explain fish stocking behavior as a regular management activity of angling clubs (Fig. 1).

Human traits are temporally stable and cross-situationally consistent psychological dispositions to behave in a particular way (Pervin, 2003). Trait-like dispositions that directly relate to the context of angling and fisheries management may also influence stocking decisions. In the context of recreational fisheries, the degree to which an angler values the act of catching or the consumption of fish (i.e., the catch or consumptive orientation) was found to differentiate between anglers (Anderson et al., 2007) and to affect the preference of anglers for stocking (Arlinghaus and Mehner, 2005). We assumed an angler's catch orientation to constitute a trait-like disposition, which we included in our behavioral model (Fig. 1). We also expected that the decision makers' perception of the ecological status of the club waters and of the socio-economic situation of the club would have an influence on their decisions (Fig. 1). Consequently, we assumed that the intention to alter current stocking practices by European angling club managers would be a function of three types of psychological dispositions: (i) basic sociopsychological characteristics related to fish stocking in general (attitude, norms, perceived behavioral control, stocking-related beliefs, e.g., in relation to ecological risks), (ii) the catch orientation as a trait-like disposition, and (iii) specific beliefs concerning the status of the club's water bodies and the socio-economic situation of the club (Fig. 1).

Human behavior is always performed in a situational context that facilitates and constrains behavioral options (Ajzen, 2005; Ross and Nisbett, 2011; Stern, 2000). Because a club's existing portfolio of water bodies is unlikely to change rapidly over time (Arlinghaus et al., 2015), it constitutes a temporally stable situational context within which stocking decisions are habitually made (Klein, 1996). However, the water body portfolios and their ecological status will differ between angling clubs in a variety of ways (e.g., number and size of water bodies, local species pool, ecosystems with suitable habitats vs. degraded conditions) leading to different likelihoods for fish species to be stocked depending on their habitat requirements. Thus, past stocking activities of a club in terms of the species as well as the numbers and sizes of the fish stocked indirectly reflect a club's biogeographical environment and its social preferences for particular fish species. A club's past stocking measures also constitute the outcome of antecedent decisions and thus shed light on a club's general stocking philosophy. Because it is socially beneficial to engage in behaviors that are perceived to have been successful in the past, it is very likely that the club context exerts an impact on stocking decisions.

We were particularly interested in understanding how decisions are made in clubs focusing on culture-based fisheries, which depend on stocking, as opposed to those that stock fish to enhance naturally reproducing stocks (Arlinghaus et al., 2016; Lorenzen et al., 2012). An example of culture-based fisheries in Europe is stocking of biogeographically nonnative salmonids (i.e., rainbow trout or brook trout, *Salvelinus fontinalis*). In Germany and France these species hardly reproduce (Keith et al., 2011; Wolter and Röhr, 2010) and thus must be maintained by stocking if they are to remain in the fishery. By contrast, stocking of native brown trout (*Salmo trutta*) suggests a club followed a stock enhancement philosophy by attempting to elevate natural stocks beyond what currently exists in a given water body. Based on these assumptions, we sorted the clubs by the focus of their past stocking activities (club typology; i.e., culture-based vs. stock enhancement-oriented) to account for both past decision-making processes and the biogeographical and ecological frames within which the decisions were made and incorporated the resulting club typology as contextual information in our behavioral model (Fig. 1).

Because of their different dependence on stocking, we expected some psychological variables to differently affect decision-making processes in both types of clubs (Ajzen, 2005; Stern, 2000). For example, social norms to stock may exert more effect in clubs focusing on culture-based fisheries than in stock enhancement clubs, which would become visible as statistical interactions between the club typology and psychological variables (Fig. 1). Finally, behavioral intentions to alter stocking practices might differ between cultural backgrounds and

legislations (Sevä, 2013). We therefore tested our model (Fig. 1) in two socio-cultural environments (France and Germany) and added interaction terms between the countries and the club types to test for cultural impacts. Given the large latitudinal difference between both countries, these two distinct socio-cultural environments are likely confounded with different biogeographical conditions that angling clubs in both countries typically have to cope with. This potential biogeographical influence might contribute to any effect that the socio-cultural differences may have on the intentions to stock.

2.2. Study hypotheses

We hypothesized that the perception of external threats to the club's fish stocks due to, for example, water engineering or agriculture, which are key impact sources on freshwater biodiversity (Arlinghaus et al., 2002; Cowx et al., 2010), should lead to a desire to increase stocking to compensate for the impacts of these threats (H_1; Table 1; for item wordings and psychometric properties of all items and scales of the psychological disposition see Table 2; for intercorrelations see Appendix A, Table A1). Because an angler's satisfaction with the angling year has been demonstrated to be a predictor of an angler's management orientation (Arlinghaus and Mehner, 2005), we also assumed that high personal satisfaction with the fish stocks and with the catch and stocking success should make decision makers want to maintain the current status (H_2; Table 1).

According to the TPB (Ajzen 2005) and in line with findings from von Lindern and Mosler (2014), we expected positive beliefs about the functionality of fish stocking to correlate with an intended increase in stocking measures (H_3, H_4, H_5; Table 1). Fish stocking may produce benefits for anglers but it also bears a risk for fish stocks, biodiversity and ultimately the long-term sustainability of fisheries (Laikre et al., 2010; Lorenzen et al., 2012), particularly when nonnative species or genotypes are released (Cucherousset and Olden, 2011; Gozlan et al., 2010). We thus predicted beliefs about possible ecological risks associated with stocking to lead to the intention to decrease stocking in the future (H_6, H_7, H_8, H_9; Table 1). The perception of these risks constitutes another group of behavioral beliefs that may underlie the attitude toward fish stocking within the TPB (Ajzen, 2005; von Lindern and Mosler, 2014). Risk perception can also be viewed as a manifestation of an awareness of adverse consequences of not acting pro-environmentally (problem awareness), which is an indirect driver of pro-environmental personal norms and behavior within the VBN (Stern, 2000; Steg and Nordlund, 2013).

Stocking decision makers are elected by, and have to act on behalf of, the club members. In this context, they will need to explain their stocking decisions, which are regularly financed through membership dues, to their electorate. Following standard reasoning about sociopsychological processes in groups (e.g., Smith and Mackie, 2007; Stern, 2000), we included the respondent's view on selected aspects of the socio-economic situation of the club in our models. These aspects were assumed to reflect respondent's perception of the club's internal resistance to, or acceptability of, alterations of the stocking regime. We hypothesized that the more the decision makers deemed a change in stocking measures socially and economically realizable, the more prone they should be to implement a corresponding change (H_{10}, H_{11}; Table 1). By contrast, the perception of an inflexible stocking regime within a club was expected to lead respondents to maintain the status quo (H_{12}; Table 1). We also expected that the perception of heterogeneity of club members' opinions about fish stocking would make a decrease of stocking more likely (H_{13}; Table 1), while available financial resources would have the opposite effect (H_{14}; Table 1). We further obtained information about the trophy catch orientation (i.e., the importance attached to catching a big fish; Anderson et al., 2007), which we assumed to be a trait-like disposition of the respondent. We selected this aspect because it referred directly to one of the three stocking practices that we modeled (i.e., the stocking of harvestable fishes; see 3.2.1). We assumed that the stronger the trophy catch orientation of a decision maker is, the more they would tend to increase stocking (H_{15}; Table 1), particularly of harvestable fishes. Finally, and consistent with theoretical assumptions and empirical findings (Ajzen,

Table 1
Hypothesized relationships between psychological dispositions and the intention to alter stocking practices.

	Directions of intended alterations with increasing strength of the psychological characteristics		
		in clubs with a major stocking practice oriented toward	
Respondent's psychological disposition	in general	culture-based fisheries (Club type 1)	stock enhancement-oriented fisheries (Club type 2)
Club- and stocking-related beliefs held by the respondent			
Status assessment of the club's waters			
External threats	H_1: ↑	–	–
Satisfaction	H_2: 0	$H_{2.1}$: 0 or ↑	$H_{2.2}$: ↓
Functionality of stocking			
Relative functionality	H_3: ↑	–	–
General functionality	H_4: ↑	$H_{4.1}$: ↑↑	$H_{4.2}$: ↑
Additive functionality	H_5: ↑	$H_{5.1}$: ↑↑	$H_{5.2}$: ↑
Negative effects of stocking			
Negative ecological impact	H_6: ↓	$H_{6.1}$: 0	$H_{6.2}$: ↓
Negative genetic impact	H_7: ↓	$H_{7.1}$: 0	$H_{7.2}$: ↓
Pathway for nonnative species	H_8: ↓	–	–
Pathway for diseases/parasites	H_9: ↓	–	–
Perceived socio-economic situation of the club			
Realizability of increasing stocking	H_{10}: ↑	–	–
Realizability of abandoning stocking	H_{11}: ↓	–	–
Inflexibility of the stocking regime	H_{12}: 0	–	–
Heterogeneity of opinions	H_{13}: ↓	–	–
Club's financial situation	H_{14}: ↑	–	–
Trait-like disposition			
Trophy catch orientation	H_{15}: ↑		
Sociopsychological characteristics			
Attitude toward fish stocking	H_{16}: ↑	$H_{16.1}$: ↑↑	$H_{16.2}$: ↑
Personal norm to stock fish	H_{17}: ↑	–	–
Social norm to stock fish	H_{18}: ↑	$H_{18.1}$: ↑↑	$H_{18.2}$: ↑
Perceived behavioral control over the stocking process	H_{19}: ↑	–	–

Note. Hypothesized behavioral intentions to alter stocking activities are symbolized by: ↑ = increase, ↑↑ = strongly increase, ↓ = decrease, 0 = no intention to alter stocking activities (i.e., maintenance of the status quo); — = No interaction hypothesized.

Table 2
Wording and psychometric properties of items and scales used for measuring the psychological disposition of the respondents.

Respondent's psychological disposition	Increasing scores indicate	*M*	*SD*	Cronbach's α	α if item deleted	Corrected item-total correlation
Club- and stocking-related beliefs held by the respondent						
Status assessment of the club's waters						
External threats[a]	Stronger belief	3.5	1.2	0.707		
Our fish stocks are threatened by the destruction of their habitats as a consequence of water management.[b]					–	0.553
Factors unrelated to fisheries such as agriculture and water engineering have a very negative impact on naturally reproducing fish stocks in our water bodies.[b]					–	0.553
Satisfaction[a]	Higher satisfaction	4.9	1.3	0.874		
With the fish stocks in our club waters, I am overall …[c]					0.778	0.805
With the catch success, I am overall …[c]					0.817	0.763
With the success of the stocking measures, I am overall …[c]					0.868	0.706
Functionality of stocking						
Relative functionality[a]	Higher effectiveness of stocking	4.3	1.4	0.726		
Compared to fish stocking measures, tightening of harvest restrictions (e.g., the allowed daily fish harvest per angler) is …[d,e]					0.632	0.554
Compared to fish stocking measures, increasing minimum size limits is …[d,e]					0.692	0.501
Compared to fish stocking measures, restricting angling intensities is …[de]					0.588	0.592
General functionality[a]	Stronger pro-stocking belief	2.0	0.9	0.801		
For water bodies, fish stocking is more damaging than useful.[e,f]					–	0.668
Fish stocking as a way to manage the club waters is inappropriate.[e,f]					–	0.668
Additive functionality	Stronger belief	2.6	1.2	–		
While every water body has an upper limit of the total quantity of a naturally reproducing fish species, this limit may still be increased through stocking.[b]						
Negative effects of stocking						
Negative ecological impact	Stronger belief	2.8	1.1	–		
Fish stocking increases competition in the water body and thus negatively influences various links of the food chain.[b]						
Negative genetic impact	Stronger belief	2.9	1.1	–		
Fish stocking measures lead to a reduction of genetic diversity due to crossbreeding of wild and stocked hatchery-reared fish.[b]						
Pathway for nonnative species	Stronger belief	2.9	1.1	–		
Fish stocking is not a major reason for the distribution of nonnative species.[b,e]						
Pathway for diseases/parasites	Stronger belief	3.0	1.1	–		
Fish stocking results in the introduction of diseases and parasites into a water body.[b]						
Perceived socio-economic situation of the club						
Realizability of increasing stocking	Easier realizability	3.7	1.0	–		
How do you judge the realizability of increasing fish-stocking measures?[g]						
Realizability of abandoning stocking	Easier realizability	2.3	1.3	–		
How do you judge the realizability of abandoning fish stocking measures?[g]						
Inflexibility of the stocking regime	Stronger belief	3.5	1.1	–		
In our club, we have developed a suitable stocking strategy which we are not likely to give up any time soon.[b]						
Heterogeneity of opinions	Stronger belief	2.4	1.2	–		
In our club, we have had controversies again and again about what is the best way of stocking fish.[b]						
Club's financial situation	Better situation	3.8	0.8	–		
How do you judge the club's financial situation?[h]						
Trait-like disposition						
Trophy catch orientation	Stronger catch orientation	2.9	1.3	–		
The bigger the fish caught, the better is the angling day.[f]						
Sociopsychological characteristics						
Attitude toward fish stocking[a]	More favourable attitude	3.8	0.9	0.689		
I strongly support fish stocking as a way to manage the club waters.[f]					0.518	0.578
For me, management and maintenance of the club waters without stocking is unthinkable.[f]					0.606	0.504
It feels good to take a stand for fish stocking measures in our club waters.[f]					0.665	0.448
Personal norm to stock fish[a]	Stronger norm	3.8	0.9	0.655		
It is part of my duties to take a stand for fish stocking in the club waters.[f]					–	0.492
I am morally obliged to stock fish in order to contribute to the management of fish stocks in the club waters.[f]					–	0.492
Social norm to stock fish	Stronger norm	4.1	0.9	–		

(continued on next page)

Table 2 *(continued)*

Respondent's psychological disposition	Increasing scores indicate	*M*	*SD*	Cronbach's α	α if item deleted	Corrected item-total correlation
Club members expect me to arrange for fish stocking in the club waters.[b]						
Perceived behavioral control over the stocking process	Stronger control	3.8	1.0	–		
I have a strong influence on the implementation of stocking measures in the club's waters.[f]						

Note. $n = 1128$. *M* = mean; *SD* = standard deviation.
[a] Items constituting a multi-item construct were intraindividually averaged to retain the metric of the original response scale.
[b] Scale from 1 (*does not apply at all*) to 5 (*fully applies*).
[c] Scale from 1 (*very unsatisfied*) to 7 (*very satisfied*).
[d] Scale from 1 (*very ineffective*) to 7 (*very effective*).
[e] Item scores were reversed prior to analyses to facilitate model interpretation.
[f] Scale from 1 (*strongly disagree*) to 5 (*strongly agree*).
[g] Scale from 1 (*impossible to realize*) to 5 (*very easy to realize*).
[h] Scale from 1 (*very poor*) to 5 (*very good*).

2005; Klöckner, 2013), we assumed that the basic sociopsychological characteristics of the TPB and of the VBN (attitude, norms and perceived behavioral control) would all lead to an increased intention to stock in the future (H_{16}, H_{17}, H_{18}, H_{19}; Table 1).

We also assumed that managers of clubs that focus on culture-based fisheries ("Club type 1"; Table 1) would be more inclined to increase stocking than those of stock enhancement-oriented clubs ("Club type 2"; Table 1). We therefore hypothesized that the club context might moderate the effect of seven psychological variables (Table 1). A high level of satisfaction with the status of the club's waters in stock enhancement clubs should lead to a decrease in the stocking intention ($H_{2.2}$; Table 1), while in culture-based angling clubs it should lead to the desire to increase stocking or to keep it constant ($H_{2.1}$; Table 1). Stronger beliefs about beneficial consequences (general functionality) and additive effects of stocking should correlate with a stronger stocking intention, particularly in culture-based angling clubs ($H_{4.1}$, $H_{4.2}$, $H_{5.1}$, $H_{5.2}$; Table 1). Perceived negative impacts of fish stocking should reduce the stocking intention in stock enhancement clubs ($H_{6.2}$, $H_{7.2}$; Table 1), while culture-based clubs should intend to keep stocking practices constant as these clubs do not risk polluting a recruiting population with foreign genes ($H_{6.1}$, $H_{7.1}$; Table 1). We further assumed that the more positive a decision maker's attitude toward stocking is in a stock enhancement club and the stronger the social pressure to carry out stocking is, the more stocking should be intended ($H_{16.2}$, $H_{18.2}$; Table 1); in culture-based angling clubs even more so ($H_{16.1}$, $H_{18.1}$; Table 1). We had no specific hypotheses about potential effects of the socio-cultural environment (i.e., about differences between countries). We also did not expect the psychological decision-making processes in French and German club managers to be fundamentally different, therefore we did not hypothesize interaction effects between the countries and the psychological disposition. But we speculated that the countries could have a moderating effect on the impact of the club types (context) on the intention to alter fish stocking activities, yet we had no hypotheses about any directions of alteration and thus analyzed data exploratively.

3. Materials and method

3.1. Sample and survey procedure

Data were collected in Germany and in France as part of two nationwide representative surveys among stocking decision makers in angling clubs. Both surveys were set up cross-sectionally and were conducted according to the tailored design method (Dillman et al., 2014). Sampling units were clubs that could provide information about stocking activities in their waters. Within each club, the person who was responsible for stocking activities, or who was able to provide information about them (e.g., the club head or the fisheries manager [water bailiff, *Gewässerwart* in German]), was asked to complete the questionnaire. Data were collected by means of a self-completion mail questionnaire. The questionnaire was accompanied by a cover letter, a stamped return envelope and a data privacy statement making clear that respondents' data would be kept and processed strictly anonymously and according to national data protection regulations. The questionnaire collected information about respondents' psychological disposition related to their role as fisheries managers, the club's intended future stocking measures and the stocking activities in the year preceding the survey.

The sampling procedures differed slightly between countries. In Germany, at the onset of the study, no sampling frame of angling clubs existed. A new sampling frame was developed comprising 76% ($N = 6488$) of all clubs organized in one of the two (in existence at that time) national angling associations ($N = 8584$). From this sampling frame, a nationwide simple random sample comprising 23% of all organized angling clubs ($N = 1993$) was generated. The questionnaire was developed in German and underwent extensive pretesting prior to its administration. Clubs were sent the questionnaire with the

Table 3
Key club characteristics and *t*-test results for non-responding and responding angling clubs in Germany in the year 2010.

	Non-responding clubs ($n = 300$)				Responding clubs ($n = 1222$)					
Club characteristic	*Min*	*Max*	*M*	*SD*	*Min*	*Max*	*M*	*SD*	*df*	t^a
Number of club members	3	9400	172.4	595.9	5	5000	154.6	274.9	329	0.50
Expenses for lease of fishing rights [€]	0	60,000	4,049.7	7,794.4	0	110,000	4,034.1	8,726.1	1.151	0.02
Investment in fish stocking [€]	0	130,000	5,249.7	12,369.1	0	70,000	4,149.7	6,684.6	237	1.25
Number of still waters	0	48	2.6	4.3	0	706	4.2	25.8	1504	−1.10
Total area of still waters [ha]	0	800	25.3	82.9	0	7724	52.9	383.7	1352	−1.03
Number of running waters	0	150	1.9	9.2	0	200	2.0	7.5	1.496	−0.08
Total area of running waters [ha]	0	3600	91.3	406.9	0	3241	28.5	161.3	84	1.40

Note. *M* = mean; *SD* = standard deviation.
No differences were found between non-responding and responding clubs in terms of (i) the share of clubs that stocked fish in 2010 (87.7% vs. 85.2%, resp.; $\chi^2 = 1.2$, $df = 1$, $p = 0.27$) and (ii) the rank order of the top three species that were actually stocked (open-ended question): 1 st carp, 2nd tench, 3rd pikeperch.
[a] All $p \geq 0.05$.

associated material together with a high-quality fisheries management book that served as an unconditional incentive to increase willingness to participate. The response rate was further increased by sending out a reminder letter to the non-responding clubs after three weeks followed by a phone call to those clubs that did not return the questionnaire within the additional three-week time limit set in the reminder letter. Eventually $n = 1222$ clubs returned a completed questionnaire (61.3% response rate). A short telephone interview with $n = 300$ of the non-responding clubs revealed that they did not significantly differ from the responding clubs in terms of key club characteristics (e.g., number of club members and managed waters; Table 3). This finding made us confident that the data were unbiased by a non-response error although we cannot rule out that it may have occurred. Fieldwork was carried out in 2011 by a professional polling institute (USUMA Institut für Markt- und Sozialforschung, Berlin, Germany). The data that were collected about the clubs' past stocking activities referred to the time interval from January to December 2010.

In France, a comprehensive list of all angling clubs was obtained from the French national angling association (FNPF) delivering a sampling frame for all public French angling clubs ($N = 3783$). The study area was confined to mainland France, excluding Corsica and all French overseas territories. A simple random sample of $N = 803$ angling clubs was generated within the remaining 92 administrative units (Départements) comprising 21% of the sampling frame. Of these clubs, $n = 533$ returned the questionnaires (66.4% response rate). A French translation of the German questionnaire was used, which was again pretested before it was fielded. Clubs were then sent the mail questionnaire and the associated material, but they did not receive a material incentive. Instead they were promised a summary of the study results. To show the integrity of the survey and thus enhance respondents' willingness to participate, the cover letter explained that the survey had been approved of by the FNPF. Clubs that did not respond within four weeks were sent two reminder letters and, if they still had not responded, subsequently contacted by phone to encourage their participation. In addition to the random sample, an electronic version of the questionnaire was sent to those clubs from the sampling frame that were not part of the random sample ($n = 2980$) and for which email addresses were available ($n = 1463$) to boost the information basis for data modeling. After one reminder had been sent out one month after the first email, $n = 54$ additional questionnaires were returned (3.7% response rate). These questionnaires were also included in the present analyses. This boost sample was generated exclusively for the purpose of increasing the French data basis for modeling. In contrast to the projection of survey data to the underlying population, data modeling does not require a strict random sample. Fieldwork was conducted in the winter of 2014/2015 and was self-organized by the French research team. The reporting period for the clubs' stocking activities was from January to December 2013. Given the assumed stability of club water inventories and stocking behavior over time (Arlinghaus et al., 2015; Klein, 1996; van Poorten et al., 2011), neither the time lag between the German and the French data collection periods nor any differences in survey conditions such as different incentive schemes were assumed to compromise the comparability of the French and the German results. Any potential effects of deviations in survey procedures would be blended into pre-existing cultural differences between the two countries, if any, and as such would become detectable at the analysis stage.

3.2. Psychological measures

We measured psychological constructs related to stocking behavior (Fig. 1; Table 2). Items were purposely constructed following standard procedures for psychological research (Ajzen, 2016; Dillman et al., 2014; de Leeuw et al., 2008; Oppenheim, 1992) either on an ad-hoc basis or as adaptations from publications in fisheries science (Anderson et al., 2007; Arlinghaus and Mehner, 2005). Some constructs were operationalized by more than one item to account for their multi-faceted character and to decrease the impact of measurement error (Nunnally and Bernstein, 1994; Tables 2 and 4). In these cases, the scores of all items belonging to the same construct were intraindividually averaged so that the resulting aggregate values could be interpreted in the metric of the original response scale (Tables 2 and 4). The relationship between items and constructs was verified using principal component analyses prior to data modeling.

3.2.1. Dependent variables

We measured respondents' intention to decrease or increase fish stocking in the future in relation to (i) the stocking amount in general, (ii) the stocking of fry and juvenile fish, and (iii) the stocking of harvestable fishes (Table 4). The response format for each of these intentions was a bipolar rating scale ranging from 1 (*strongly decrease*) to 5 (*strongly increase*) with 3 (*keep constant*) as the scale's midpoint. Thus, respondents had to make a decision between three alternative options for future stock management: decrease stocking, increase it or keep it constant that is, maintain the status quo of the existing stocking practices. Qualitative work with angling clubs and stocking decision makers led us to assume that the data generation process was different for each direction of intended change, because we expected both to partly require different resources. For example, given the conviction of many anglers that fish stocking is a panacea for stock maintenance (Arlinghaus et al., 2015), we assumed that an intended reduction of stocking would require the decision maker to have a clear concept about alternative measures for stock maintenance to be able to persuade the club members to support such a decision. Increasing stocking, on the other hand, would require less persuasion but enough financial resources to be able to perform this activity. Hence, we ran separate models for both directions of intended alterations because we hypothesized that they might be driven by different predictors. We included the middle category in both models so that respondents who had indicated their intention to keep stocking constant were part of both the increase and the decrease models. Given the three categories of stocking intentions, this approach resulted in six different models (Table 5).

Five of our study hypotheses (H_2, $H_{2.1}$, $H_{6.1}$, $H_{7.1}$, H_{12}; Table 1) assumed that the respondents favor the status quo that is, we expected them to intend keeping stocking activities constant with increasing strength of the independent variables. These hypotheses would be supported if the regression coefficients revealed a tendency towards the middle category (*keep constant*) of the response scale (i.e., a positive coefficient in the decrease models and negative in the increase models). For all other hypotheses, however, we would interpret an algebraic sign of a regression coefficient revealing a tendency towards the midpoint of the response scale (*keep constant*) to be indicative of a *status-quo bias*. In this case, we would assume that the respondents, for a host of possible reasons (e.g., loss aversion, regret avoidance; Eidelman and Crandall, 2012), tended toward the middle category even though they "should have had" a preference for change (Anderson, 2003; Eidelman and Crandall, 2012).

3.2.2. Independent variables

To capture information about the perceived present status of the water bodies, respondents were asked to respond to two items assessing potential threats to the club's fish stocks resulting from external factors such as water engineering or agriculture (Table 2). We also asked for the personal satisfaction with the status of the fish stocks and with the catch and stocking success using three items (Table 2). Measures for these constructs were based on the work of Cowx et al. (2010) and Arlinghaus and Mehner (2005). The construction of items to tap into beliefs about the functionality of fish stocking as an adequate management tool for fish stock maintenance and promotion was inspired by Ajzen (2005, 2016). We assessed functionality relative to harvest regulation-based management measures (3 items), in general (2 items), and as an additive effect beyond natural reproduction (1 item; Table 2). In a similar way, von Lindern and Mosler (2014) included beliefs about the success or failure of fish stocking as outcome expectancies of stocking behavior in their application of the TPB. We constructed one item to measure each of the beliefs about potential

Table 4
Wording and psychometric properties of items and scale used for measuring the intentions to alter fish stocking practices.

Would you decrease or increase …	Scale points (%)							
	strongly decrease (1)	decrease (2)	keep constant (3)	increase (4)	strongly increase (5)	*M*	*SD*	Cronbach's α
… stocking amount in general?	2.3	11.3	57.5	26.0	2.8	3.2	0.7	–
… stocking of harvestable fishes?	14.6	23.6	49.3	11.1	1.5	2.6	0.9	–
… stocking of fish fry?	16.4	10.6	34.2	24.9	13.9	3.1	1.2	–
… stocking of juvenile fish?	5.0	6.4	32.6	43.2	12.7	3.5	1.0	–
… stocking of fry and juvenile fish? (multi-item construct)[a]	–	–	–	–	–	3.3	1.0	0.692

Note. $n = 1128$. M = mean; SD = standard deviation.
[a] Items constituting this construct were intraindividually averaged to retain the metric of the original response scale.

negative effects of fish stocking (i.e., ecological and genetic risks associated with it, stocking as a potential pathway for the dispersal of nonnative species, diseases and parasites; Table 2) following Ajzen's (2005, 2016) and von Lindern and Mosler's (2014) approach. We also formulated one item to measure each of the five aspects of the socio-economic situation of the club as perceived by the respondent (Table 2). For measuring the trophy catch orientation as a trait-like disposition of the respondent, we adopted the corresponding item from the instrument published by Anderson et al. (2007; Table 2). Finally, we ascertained the personal norm to stock fish using two items (Table 2) that were constructed similar to those of Zhang et al. (2014) and van Riper and Kyle (2014). The attitude toward stocking as a key component of the TPB was assessed using three items, and the social norm to stock fish as well as the perceived behavioral control over the stocking process were measured with one item each (Table 2). Items were formulated following Ajzen (2005, 2016) and Arlinghaus and Mehner (2005; see also von Lindern and Mosler, 2014).

3.3. Contextual information of the club

Information about a club's biogeographical context and its stocking philosophy was derived from the detailed data that respondents supplied about their clubs' past stocking activities. In our attempt to derive a club typology, we focused on salmonids because initial data exploration revealed that these species were most regularly stocked in both countries, and salmonid species could be most clearly demarcated as either recruiting or non-recruiting in both countries. Starting with the total number of clubs in both countries, we sorted each club into one of three categories based on the biomass per fish species that was stocked. We assigned clubs as focusing on culture-based fisheries if they had stocked at least 20% of the total biomass as nonnative salmonids (i.e., rainbow trout and brook trout; Club type 1; n = 367). Of the remaining clubs, we identified in the next step all clubs that had stocked at least 20% of their biomass as native salmonids (i.e., brown trout, grayling [*Thymallus thymallus*] and arctic charr [*Salvelinus alpinus*]) as a more stock enhancement-oriented Club type 2 ($n = 298$). All other clubs constituted Club type 3 ($n = 711$), which served as the reference category.

3.4. Data analyses

We tested our models in a linear regression-analytic framework using the general linear model procedure of SPSS (version 19). Indicators of the psychological disposition were mean-centered separately for each of the six models to take different compositions and sizes of the subsamples into account and to facilitate interpretation of the regression coefficients (Table 5). All independent variables were entered simultaneously because we wanted to test the full model with all hypotheses jointly. Significance was judged at $\alpha < 0.05$. Modeling results are based on all clubs that reported to have stocked fish in the year preceding the survey and which had no missing data in any of the variables that were used for modeling ($n = 1128$).

4. Results

4.1. Descriptive information

The respondents ($n = 1128$) were on average 56.3 years old ($SD = 11.2$ years; range 20 − 87 years) and were overwhelmingly male (99.5%). For half of them (51%), angling was their most important pastime, and one third (35%) underwent formal training to become a water bailiff (i.e., fisheries manager) in the club. About half of the respondents intended to keep the stocking amount in general and the stocking of harvestable fishes constant in the future (58% vs. 49%, resp.; Table 4). The (relative) majority of clubs wanted to increase the stocking of fry (39%) and juvenile fish (56%; Table 4). The separation of the clubs into three context-dependent groups delivered the expected gradient from culture-based to stock enhancement clubs (Table 6). The culture-based type-1 clubs stocked on average 62% of total biomass as nonnative salmonids, the stock enhancement-oriented clubs of type 2 stocked 80% as native salmonids. The reference group (type 3) stocked hardly any salmonids but higher shares of cyprinids as well as non-salmonid piscivorous and coarse fish (Table 6). In the stock enhancement-oriented clubs, stocking density (kg/ha), the number of members, club income and the investments in fish stocking were lowest compared to the other club types (Table 6). Type-1 and type-2 clubs spent less money on the lease of fishing rights and on environmental activities compared to the reference group (type 3; Table 6).

4.2. Predictive power of the stocking models

The share of variance that was explained in the six models of intended alterations of future stocking behavior was moderate and varied between the different types of stocking regimes. The intentions to both increase and decrease stocking amount in general were best predictable (adj. $R^2 = 0.11$ and 0.34, resp.; Table 5) whereas the intentions to alter the stocking of fish of the two different developmental stages (i.e., fry and juveniles vs. harvestable fish) were less explainable (adj. $R^2 < 0.1$; Table 5). The intentions to decrease stocking were better predictable than the intentions to increase it (Table 5).

4.3. Behavioral determinants of the stocking models

Determinants of all three domains (respondent's psychological disposition, club context, socio-cultural environment; Fig. 1) affected the intention to alter stocking practices (Table 5). Of the 19 measures used to quantify the psychological disposition, 14 (74%) had explanatory power in at least one of the six stocking models that we tested, either as main effects or in interaction with the club types (Table 5). The club typology unfolded its explanatory potential solely in interaction with the psychological disposition and with the socio-cultural environment (Table 5; Figs. 2 and 3). On average, the French respondents scored higher than the Germans on their intention to increase stocking amount in general (main effect; Table 5).

The impact of the psychological constructs on behavioral intentions to alter the three stocking practices varied substantially at the main-effects level across the six models (Table 5). The most important group

Table 5
Multiple regression analysis summary (unstandardized coefficients) for the psychological disposition of the respondent, club type (contextual information) and country (socio-cultural environment) predicting respondents' behavioral intentions to alter (decrease vs. increase) stocking behavior.

	Intention to alter					
	Stocking amount in general		Stocking of fry and juvenile fish		Stocking of harvestable fishes	
Behavioral determinant	decrease[a]	increase[b]	decrease[a]	increase[b]	decrease[a]	increase[b]
Intercept	**2.838** *	**3.342** *	**2.544** *	**3.659** *	**2.391** *	**3.200** *
Respondent's psychological disposition						
Club- and stocking-related beliefs held by the respondent						
Status assessment of the club's waters						
External threats	−0.027	0.008	0.040	0.039	**−0.070** *	−0.008
Satisfaction	0.010	**−0.087** *	−0.008	**−0.064** *	−0.006	−0.005
Functionality of stocking						
Relative functionality	0.014	0.000	−0.020	**−0.049** *	0.006	0.017
General functionality	0.050	0.032	−0.001	−0.010	0.065	−0.006
Additive functionality	0.014	−0.005	**−0.074** *	0.021	0.050	0.009
Negative effects of stocking						
Negative ecological impact	0.001	−0.022	0.055	−0.030	−0.007	0.022
Negative genetic impact	0.000	0.032	−0.039	0.015	0.027	−0.036
Pathway for non-native species	**−0.027** *	0.022	−0.015	0.003	−0.011	0.011
Pathway for diseases/parasites	−0.027	0.013	−0.028	0.036	−0.010	0.002
Perceived socio-economic situation of the club						
Realizability of increasing stocking	−0.016	0.020	0.025	0.008	**0.079** *	−0.003
Realizability of abandoning stocking	−0.006	−0.011	−0.006	−0.012	**−0.049** *	0.018
Inflexibility of the stocking regime	**0.047** *	**−0.045** *	0.007	0.012	**0.063** *	**−0.042** *
Heterogeneity of opinions	**−0.042** *	0.011	−0.013	0.018	−0.016	0.027
Club's financial situation	−0.012	**−0.101** *	0.065	−0.052	−0.028	**−0.046** *
Trait-like disposition						
Trophy catch orientation	0.003	0.021	−0.005	−0.018	0.037	0.000
Sociopsychological characteristics						
Attitude toward fish stocking	**0.070** *	0.065	0.049	−0.081	0.065	0.054
Personal norm to stock fish	−0.002	0.035	−0.017	0.021	0.061	0.038
Social norm to stock fish	−0.012	0.046	−0.029	0.037	0.005	0.045
Perceived behavioral control over the stocking process	−0.027	0.008	0.009	−0.037	−0.018	−0.015
Club type (contextual information)						
Club type 3 (reference) vs. Club type 1	**−0.151** *	0.019	0.024	−0.020	0.155	0.085
Club type 3 (reference) vs. Club type 2	−0.020	−0.027	0.127	0.081	−0.041	−0.047
Country (socio-cultural environment)						
Germany (reference) vs. France	−0.113	**0.232** *	−0.083	0.010	−0.064	**0.206** *
Respondent × Club type interactions						
Satisfaction × Club type 1	−0.009	0.007	0.029	−0.001	−0.024	−0.021
Satisfaction × Club type 2	−0.032	0.042	0.026	0.026	**−0.092** *	0.028
General functionality × Club type 1	0.091	0.099	0.100	−0.010	−0.030	−0.056
General functionality × Club type 2	−0.027	0.069	0.123	0.049	**−0.207** *	0.087
Additive functionality × Club type 1	−0.046	0.000	0.111	−0.034	−0.058	0.023
Additive functionality × Club type 2	0.017	0.035	0.091	−0.024	−0.021	−0.045
Negative ecological impact × Club type 1	0.053	0.087	−0.062	0.064	0.028	−0.037
Negative ecological impact × Club type 2	0.012	0.017	−0.041	−0.047	−0.033	−0.038
Negative genetic impact × Club type 1	−0.012	−0.044	0.026	−0.036	0.027	−0.032
Negative genetic impact × Club type 2	−0.023	−0.028	**0.203** *	−0.046	−0.072	0.045
Attitude toward fish stocking × Club type 1	**0.172** *	−0.051	0.071	0.030	0.057	−0.036
Attitude toward fish stocking × Club type 2	**0.162** *	−0.004	0.098	0.068	0.048	0.015
Social norm to stock fish × Club type 1	0.054	−0.012	−0.119	**0.155** *	−0.010	0.004
Social norm to stock fish × Club type 2	0.057	**−0.104** *	0.119	−0.081	−0.004	−0.011
Country × Club type interaction						
Country × Club type 1	**0.228** *	−0.216	−0.150	0.062	−0.053	**−0.251** *
Country × Club type 2	−0.119	−0.044	−0.091	0.170	−0.076	−0.057
n =	793	962	509	808	964	681
adj. R^2 =	0.34	0.11	0.09	0.06	0.09	0.04

Note. Significant parameter estimates are shown in boldface. Club type 1 = culture-based fisheries; Club type 2 = stock enhancement-oriented fisheries.

[a] Scale from 1 (*strongly reduce*) to 3 (*keep constant*).

[b] Scale from 3 (*keep constant*) to 5 (*strongly increase*).

*$p < 0.05$.

of predictors comprised beliefs related to the club's perceived socio-economic situation. They all had significant effects on the intentions to alter the stocking amount in general and the stocking of harvestable fishes, but not on the intention to stock fry or juveniles (Table 5). For example, a strong belief that an increase of stocking is realizable within the club reduced the intention to decrease stocking whereas the realizability of abandoning stocking made a decrease more likely (Table 5). As a second example, controversial discussions among club members about the best way to stock fish (i.e., heterogeneity of opinions) led to an intended decrease in stocking, which indicated that diverse opinions about stocking among the club members reduced the future reliance on stocking (Table 5). The status assessment of the club waters also affected behavioral intentions. Overall satisfaction (with the current state of the fish stocks, the catch success and the success of the stocking measures) reduced the intention to increase stocking while the perception of the presence of external threats to the fish stocks predicted

Table 6
Means (*M*), standard deviations (*SD*) and ANOVA for variables reflecting (i) the outcomes of the clubs' collective stocking decisions in the past, (ii) the extent to which managerial measures were implemented, and (iii) the clubs' socio-economic status for the three club types in 2010 (Germany) and 2013 (France).

	Club type 1 (culture-based fisheries) $n = 367$		Club type 2 (stock enhancement-oriented fisheries) $n = 298$		Club type 3 (reference) $n = 711$		ANOVA	
Shares (%) of total biomass stocked as …	*M*	*SD*	*M*	*SD*	*M*	*SD*	F	df
Nonnative salmonids[a]	62.0_a	25.2	1.0_b	3.7	0.7_b	2.9	2,857.4 *	2; 1373
Native salmonids[b]	15.2_a	19.7	80.1_b	27.1	1.3_c	3.8	2,464.8 *	2; 1373
Conservation stocking of salmonids[c]	0.1	0.6	0.9	6.3	0.7	6.6	2.2	2; 1373
Large bodied cyprinids[d]	6.2_a	13.5	8.3_a	17.3	37.3_b	34.0	220.4 *	2; 1373
Piscivorous fishes[e]	5.2_a	10.7	2.6_b	8.0	13.2_c	24.2	43.7 *	2; 1373
Large bodied coarse fish[f]	2.3_a	5.5	1.7_a	5.1	9.3_b	15.6	65.7 *	2; 1373
Small bodied coarse fish[g]	7.6_a	13.4	2.7_b	9.3	15.5_c	26.3	45.6 *	2; 1373
Stocking density [kg/ha][h]	64.7_a	113.0	36.2_b	62.0	73.7_a	138.5	9.2 *	2; 1234
Number of club members	344.7_a	552.1	179.4_b	315.6	242.1_c	478.4	10.6 *	2; 1349
Club income [€][i]	$12,429.1_a$	20,920.8	$8,574.8_b$	14,938.9	$12,780.9_a$	23,231.7	3.6*	2; 1102
Club expenses for …								
Lease of fishing rights [€]	$2,145.3_a$	6,760.8	$2,560.4_a$	5,298.1	$3,726.3_b$	8,124.2	5.3 *	2; 1093
Investment in fish stocking [€]	$4,343.3_a$	4,599.9	$3,107.4_b$	4,551.7	$4,463.5_a$	6,904.6	5.0 *	2; 1159
Investment in environmental activities [€][k]	702.8_a	1,680.5	474.8_a	1,065.5	$1,153.4_b$	3,865.5	5.4 *	2; 1150

Note. Means in each row that share subscripts do not differ significantly ($p \geq 0.05$; Games-Howell test).
[a] Rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*).
[b] Brown trout (*Salmo trutta*), grayling (*Thymallus thymallus*), arctic char (*Salvelinus alpinus*). [c]Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*), huchen (*Hucho hucho*).
[d] Grass carp (*Ctenopharyngodo idella*), common carp/mirror carp/scaly carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*).
[e] Pike (*Esox lucius*), European perch (*Perca fluviatilis*), catfish (*Silurus glanis*), pike-perch (*Sander lucioperca*), largemouth bass (*Micropterus salmoides*).
[f] Ide (*Leuciscus idus*), chub (*Leuciscus cephalus*), tench (*Tinca tinca*), common nase (*Chondrostoma nasus*), barbel (*Barbus barbus*), burbot (*Lota lota*).
[g] Bream (*Abramis brama*), roach (*Rutilus rutilus*), rudd (*Scardinius erythrophthalmus*).
[h] Total biomass of all species stocked per totally managed water area.
[i] Membership dues and other income sources.
[k] Maintenance of shorelines, angling spots etc.
* $p < 0.05$.

the intention to decrease stocking (Table 5).

Of all remaining psychological characteristics, only three beliefs explained behavioral intentions as a main effect (Table 5). The belief about the relative functionality of fish stocking reduced the intention to increase stocking, and the belief in the additive functionality of stocking predicted the intention to decrease stocking (Table 5). In addition, the belief that fish

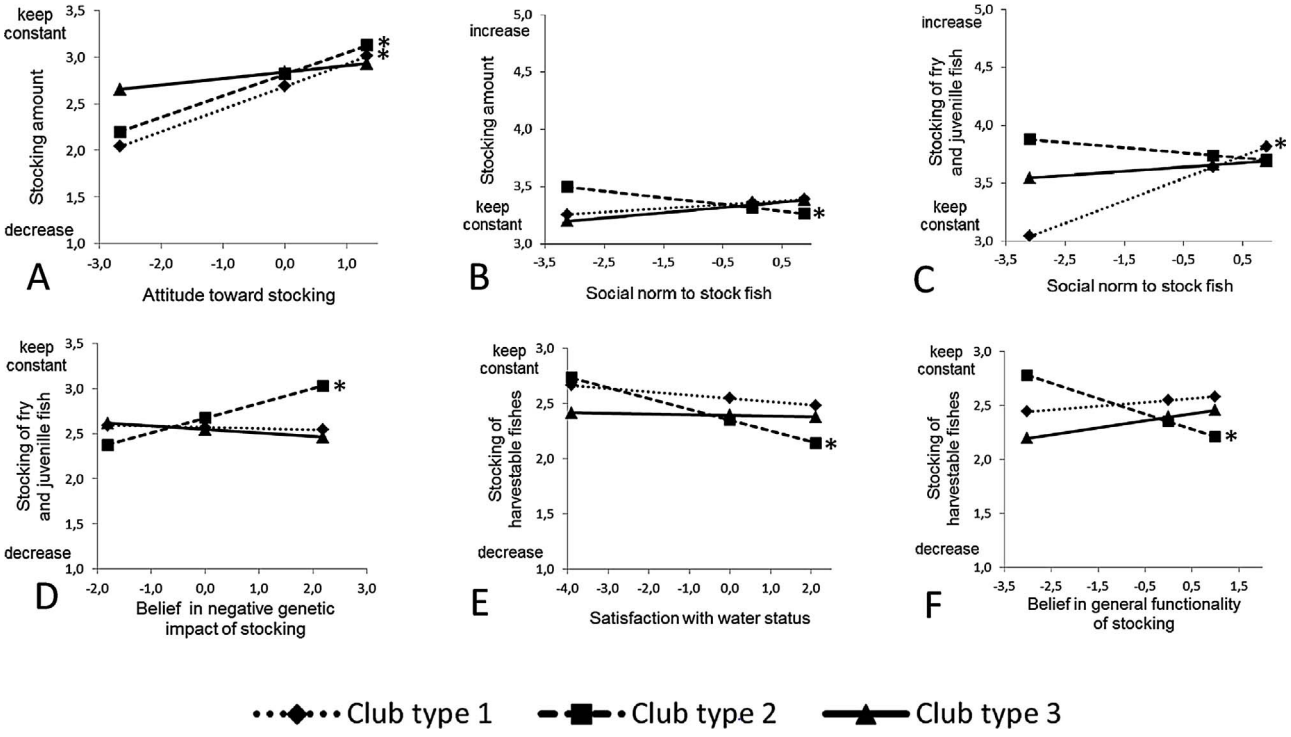

Fig. 2. Multiple regression analysis summary for respondents' psychological disposition and club type predicting behavioral intentions to alter (decrease/increase) fish stocking behavior: Visualization of significant interaction terms. Club type 1 = culture-based fisheries; Club type 2 = stock enhancement-oriented fisheries; Club type 3 = reference. For scale descriptions see text and Tables 2 and 4. * $p < 0.05$.

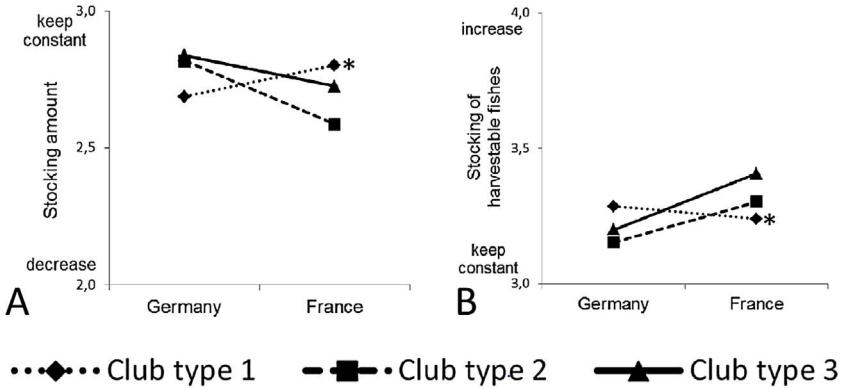

Fig. 3. Multiple regression analysis summary for country (socio-cultural environment) and club type (contextual information) predicting behavioral intentions to alter (decrease/increase) stocking behavior: Visualization of significant interaction terms. Club type 1 = culture-based fisheries; Club type 2 = stock enhancement-oriented fisheries; Club type 3 = reference. For scale descriptions see text and Table 4. * $p < 0.05$.

stocking is a vector of the dispersal of nonnative species was the only one from the group of potentially negative effects of stocking that had a main effect, it supported the intention to decrease stocking (Table 5). None of the basic sociopsychological characteristics (attitude, norms, perceived behavioral control), which are of importance to the TPB or the VBN, nor the trophy catch orientation as a trait-like disposition exerted any influence as a main effect (Table 5).

Of the 15 significant main effect coefficients related to the psychological disposition (Table 5), 10 supported our study hypotheses and 5 did not support them (Table 1). Six of the supporting coefficients were part of decrease models. They confirmed hypotheses about the influence of negative effects of stocking (pathway for nonnative species [H_8]) and about the club's socio-economic situation (realizability of increasing [H_{10}] and abandoning [H_{11}] stocking, inflexibility of the stocking regime [H_{12}], heterogeneity of opinions [H_{13}]; Tables 1 and 5). Four of the 10 supporting coefficients belonged to increase models (satisfaction [H_2] and inflexibility of the stocking regime [H_{12}]; Tables 1 and 5). For the latter dispositions we had hypothesized a preference for maintaining the status quo of stocking activities, which was operationalized as the middle category of the response scale (*keep constant*). By contrast, three significantly negative coefficients in models of an intended increase of stocking (in relation to the relative functionality of stocking [H_3] and the perception of the club's financial situation [H_{14}]; Tables 1 and 5) and two negative coefficients in decrease models (related to external threats [H_1] and additive functionality [H_5]; Tables 1 and 5) did not support our hypotheses because we had assumed a positive effect of these determinants (Table 1).

4.4. Interaction effects between the psychological disposition, club types and countries

Five of the seven variables that we interacted with the club types, notably the attitude toward stocking and the social norm to stock fish as basic sociopsychological variables, exerted influence on the behavioral intentions (Table 5). Specifically, we found that the more positive the attitude was, the less respondents intended to decrease the stocking amount in general in both the culture-based and the stock enhancement-oriented clubs (Club types 1 and 2; Table 5; Fig. 2A). However, this effect was more pronounced in culture-based (type-1) clubs (Table 5) supporting our hypotheses ($H_{16.1}$ and $H_{16.2}$; Table 1). Contrary to our hypothesis ($H_{18.2}$; Table 1), the social norm reduced the intention to increase the stocking amount in general in the stock enhancement (type 2) group of clubs (Table 5; Fig. 2B). Among the clubs focusing on culture-based fisheries (type 1), the social norm was predictive of the intention to increase stocking (Table 5; Fig. 2C), lending support to the study hypothesis ($H_{18.1}$; Table 1). The stronger the belief was about potentially negative genetic effects of stocking on fish stocks, the more respondents of Club type 2 (stock enhancement) intended to keep the stocking of fry and juvenile fish constant in the decrease model, indicated by a positive coefficient (Table 5; Fig. 2D). This result disagreed with the study hypothesis ($H_{7.2}$; Table 1). As hypothesized ($H_{2.2}$; Table 1), satisfaction with the club's water status had a negative effect on stocking intentions of harvestable fishes in type-2 clubs (Table 5; Fig. 2E). In the same model and for the same group of clubs we found a negative impact of the general functionality of stocking (Table 5; Fig. 2F), disconfirming our hypothesis ($H_{4.2}$; Table 1). We found no interaction effects between club types and the beliefs about additive functionality and negative ecological impact (Table 5).

When interacting countries and club types, we found that the culture-based clubs (type 1) differed from the reference clubs (type 3) in two crossover interactions indicating a moderating influence of the countries on the impact of the contextual information on the dependent variables. The French type-1 clubs had a stronger preference for maintaining the status quo in the models of decreasing the stocking amount in general and increasing the stocking of harvestable fishes (Fig. 3A, B).

5. Discussion

5.1. General observations

This study presents uniquely large data sets from random samples of stocking decision makers in German and French angling clubs. We tested a range of hypotheses about psychological determinants of fish stocking behavior complementing the tradition of sociopsychological research in the field of human dimensions of fish and wildlife that is based on variants of the TPB and the VBN (e.g., Decker et al., 2012; Manfredo, 2008; Manfredo et al., 2009). To our surprise, we found limited explanatory power of basic sociopsychological characteristics such as attitude, norms and beliefs about ecological risks associated with and the functionality of stocking when predicting intended future change of stocking behavior. Instead of being main effects, these constructs exerted their influence in interaction with the angling club's social and environmental context. This finding indicates that fisheries managers' individual decision-making behavior is constrained by economic, social and environmental parameters related to the situation in which the decisions are made. In this case, standard psychological theories such as the TPB or the VBN appear to exert their explanatory potential predominantly in concert with the social and ecological context (Ajzen, 2005; Stern, 2000). As main effects, both theories seem to be better able to explain the behavior of less constrained fisheries actors as in von Lindern and Mosler's (2014) application of the TPB to ordinary anglers' participation in fish stocking activities as helping hands. At the level of the actual decision makers, however, both theories were less predictive than we had anticipated.

We found that predictors of three domains of behavioral determinants (respondent's psychological disposition, club context, socio-cultural environment) contributed to the explanation of respondents' intention to alter three different stocking practices in the future (stocking amount in general, stocking of fry and juvenile fish, stocking of harvestable fishes). However, the pattern of predictors differed across the six models that we tested implying that no universal set of psychological predictors of all stocking variants exists. Overall, the share of explained variance was higher in the models of an intended decrease of stocking compared to an intended increase (Table 5). This difference suggests that a reduction was more under

the control of psychological characteristics than an increase, which may require more material resources (e.g., availability of money or stocking seed material) than a decrease.

5.2. Predictive power of the psychological dispositions

The three types of psychological dispositions that we tested (basic sociopsychological characteristics including stocking-related beliefs, trophy catch orientation as a trait-like disposition, and beliefs about the status of the club's waters and its socio-economic situation) contributed differently, if at all, to the explanation of stocking intentions (Table 5).

5.2.1. Beliefs about the status of the club's waters and the club's socio-economic situation

The perceived realizability of an alteration of a stocking practice made a corresponding change more likely, while with increasing perception of the inflexibility of the stocking regime respondents intended to maintain the status quo (Table 5). The perception of heterogeneity of stocking-related opinions led to an intended decrease of stocking (Table 5). While these effects appeared logically consistent and supportive of the study hypotheses, the overall picture emerging from them is in line with the assumption that stocking decision making has become a routinized habit in many angling clubs, at least in Germany (Arlinghaus et al., 2015; Klein, 1996; van Poorten et al., 2011). However, the heterogeneity of opinions (i.e., controversial discussions among anglers about the best way to stock fish) correlated with an intended decrease in stocking, suggesting that management interventions feeding new scientific knowledge into angler communities about the lack of consistent positive outcomes of stocking may reduce stocking in the future (Arlinghaus et al., 2015). We unexpectedly found negative coefficients for the club's financial situation in models of an intended increase in stocking activities (Table 5). These effects can be attributed to the status-quo bias (Anderson, 2003; Eidelman and Crandall, 2012) as respondents perceiving the financial situation to be in good shape tended to maintain the status quo of stocking in the future. As elaborated, we had suspected this bias to interfere with our general hypotheses and found evidence for it in relation to the perceived financial situation.

We found that intentions to increase stocking declined with respondents' increasing satisfaction with the condition of the club waters (Table 5). A systematic relationship between satisfaction and preferences for management options in ordinary anglers has previously been documented by Arlinghaus and Mehner (2005) where more satisfied anglers tended to opt for habitat management rather than for fish stocking. Contrary to our expectations, however, the perception of threats to the club's fish stocks resulting from external factors (e.g., water engineering, agriculture) made respondents intend to decrease stocking of harvestable fishes rather than to keep it constant (Table 5). It is conceivable that the respondents feared rapid loss of large (i.e., catchable and thus economically valuable) fish after stocking in degraded waters due to, for example, their dispersal in rivers to more suitable sites or predation by fish-eating birds.

5.2.2. Beliefs related to ecological risks and the functionality of stocking

The risk- and functionality-related beliefs refer to the perceived consequences of stocking, which were assumed to be antecedents of the attitude toward stocking within the TPB and of the personal norm within the VBN. We found one significant coefficient related to the belief in the additive functionality of stocking that did not, however, support our hypothesis: it made respondents intend to decrease stocking of fry and juvenile fish instead of keeping it constant (Table 5). Scientific work in naturally recruiting fishes has shown that under conditions of self-recruitment the stocking of fry and juveniles does not deliver positive outcomes in terms of additive effects (Hühn et al., 2014; Lorenzen et al., 2012). Additive effects may be expected at best when stocking large recruited fishes in situations of stock enhancements (Lorenzen, 2005). The item to measure additive effects emphasized a stock increase in situations of natural reproduction (Table 2). Possibly, the respondents were aware of the biological limitations of stocking young fishes in self-reproducing stocks, which might explain our results. The negative coefficient for the belief about the relative functionality of stocking (i.e., its perceived superiority over regulation-based management measures) in an increase model (Table 5) could again be attributed to the status-quo bias because respondents tended to maintain the status quo with increasing perception of functionality. It is possible that the longer respondents had been convinced that stocking is superior to regulation-based measures, the more they may have applied this tool in the past and thus may have arrived already at a satisfactory state with no need for alterations.

There is established scientific evidence that fish stocking may cause environmental damage by affecting ecological functions, native gene pools, predator-prey interactions and nutrient cycling (e.g., Cucherousset and Olden, 2011; Gozlan et al., 2010; Laikre et al., 2010; Lorenzen et al., 2012). However, of all the beliefs about negative effects of stocking, we found only one significant coefficient (of the belief about the spread of nonnative species) to be predictive of the intention to decrease stocking as a main effect (Table 5). These findings collectively suggest that stocking decision making is largely independent of the perceived functionality of stocking and of any ecological and genetic risks associated with it. This is surprising given previous research that found an effect of outcome expectations and stocking-related risks on stocking intentions within the TPB framework among ordinary anglers (von Lindern and Mosler, 2014) and of the awareness of consequences on pro-environmental behaviors within the VBN (e.g., Kaiser et al., 2005; van Riper and Kyle, 2014; Zhang et al., 2014). The lack of a substantial contribution of perceived ecological risks on future stocking behaviors suggests that variables unrelated to the ecological dimension were more important in driving future stocking behavior or that decision makers were not aware of the cause-and-effect relationships in the ecology of fish stocking. They may also reflect contextual effects. In fact, negative ecological or genetic impacts are not an inevitable consequence of every stocking event (Lorenzen et al., 2012). Hence, given the more general contents of our measurement items (Table 2), the variance of respondents' answers might carry an increased share of measurement error, which diminishes their explanatory power. We might also be witnessing a cognitive dissonance effect in the decision makers (e.g., Smith and Mackie, 2007) who either were not well informed about ecological risks of stocking or rationalized them away in order to maintain an internal cognitive balance to justify continued reliance on stocking.

5.2.3. Basic sociopsychological characteristics and trophy catch orientation

Neither the key components of the TPB (attitude, social norm, perceived behavioral control), nor the personal norm as part of the VBN and of Klöckner's (2013) integrative model, nor the catch orientation (Anderson et al., 2007) had a main effect on behavioral intentions (Table 5). This stands in marked contrast to earlier findings by, for example, von Lindern and Mosler (2014) who found that a pro-stocking attitude and perceived behavioral control, but not social norm, predicted anglers' intention to engage in fish stocking activities as helpers. Moreover, the personal norm has been found to be an immediate antecedent of pro-environmental behaviors in earlier studies (e.g., Kaiser et al., 2005; van Riper and Kyle, 2014; Zhang et al., 2014), and Arlinghaus and Mehner (2005) found that the degree of consumptive orientation affected anglers' preferences for stocking.

5.3. The importance of context for explaining stocking decision making

As was outlined above, respondents' beliefs about the functionality of fish stocking and their risk perception hardly exerted any influence on the intentions to alter stocking practices at the main effects level. These beliefs refer directly to the respondents and their world views related to aquatic ecology and fisheries. By contrast, all beliefs about the current status of the club's waters and its socio-economic situation, which encompasses the psychological dispositions of, and communicational processes among, the club members (i.e., the decision maker's electorate) as well as the club's financial situation, refer to the contextual frame within which stocking intentions are made and eventually implemented. This frame may facilitate or impede alterations of the current stocking practices. Furthermore, as expounded above, key constructs of the TPB, of the VBN and of the angler's

trophy catch orientation, most of which are also unrelated to the contextual frame, had no main effects on behavioral intentions (Table 5). However, when we interacted selected psychological characteristics with the club typology, we found significant effects of the attitude toward stocking, of the social norm and of risk- and functionality-related beliefs (Table 5; Fig. 2). Importantly, the club typology unfolded its impact on the behavioral intentions only as a moderator of the psychological constructs and not as a main effect. Hence, as soon as the contextual information contained in the club typology was taken into account, the effect of key constructs of the TPB (attitude, social norm) on behavioral intentions was unveiled, with directions aligning with theory (e.g., as the attitude toward stocking increases, future reduction of stocking declines). This moderating effect also emerged for beliefs underlying the TPB constructs (negative genetic impact, general functionality of stocking), and for the satisfaction with the water status. The effects of these beliefs became significant only in the group of the stock enhancement-oriented clubs (type 2; Table 5; Fig. 2D–F) while the attitude and the social norm took effect in both club types (Table 5; Fig. 2A–C). These results are consistent with the idea that stock enhancement clubs have more to lose when inappropriate genotypes or species are released and the stocking success strongly depends on current natural reproduction levels (Lorenzen et al., 2012). It is therefore understandable why functional beliefs and beliefs about genetic impacts selectively affected the stock enhancement clubs. By contrast, though ecological issues are less relevant for culture-based fisheries, social expectations about which species to stock are high, supporting the findings that attitude and social norm affect future stocking behavior of both club types.

Together these findings emphasize the relative importance of situational (i.e., contextual) factors for determining stocking behavior and for modifying the relevance of the decision makers' psychological disposition. It is important to note that, in contrast to the theoretical importance assigned to them (Ajzen, 2005; Fishbein and Ajzen, 2010; Stern, 2000), neither the personal norm as a feeling of moral obligation, nor perceived behavioral control over the stocking process had any influence on altering stocking intentions. These effects do not agree with Klöckner (2013) who found both constructs to be strong determinants of high frequency pro-environmental behaviors, and von Lindern and Mosler (2014) demonstrated an influence of club anglers' perception of control over their own stocking behavior on the intention to engage in stocking. This discrepancy is explainable by the type of stocking behavior that was modeled. The stocking intention investigated by von Lindern and Mosler (2014) referred to the intention of anglers to help release fish in support of ongoing stocking activities that had been determined by others. This behavior was clearly more under the individual's volitional control than the intention of the fisheries managers in our study to alter the stocking regime of the club as a whole because, as explicated, the latter type of behavior is far more constrained by the situational factors of the club context. The moderating effect of the club typology on the effect of the social norm agrees with past research in angling clubs by van Poorten et al. (2011). The relative importance of social over personal norms once again suggests that the psychological disposition per se is of comparatively low importance in the decision-making processes in angling clubs where situational factors may easily overrule the decision maker's personal stocking-related norms. Still, the role of psychology in stocking decision making should not be underestimated as we found that psychological variables do have an effect but to different degrees in different clubs. The dependency of human behavior on the situation within which it is performed is by far not a new phenomenon (e.g., Ross and Nisbett, 2011): the impact of situational factors as moderators of human traits (e.g., Pervin, 2003) and of sociopsychological dispositions has been described in the framework of both the TPB (Ajzen, 2005) and the VBN (Stern, 2000). Our innovation is to showcase that these general patterns are also applicable to decision makers in angling clubs. In this case, a standard application of the TPB or the VBN without accounting for the situational context would have revealed almost no explanatory power.

6. Conclusion

A rich literature on the human dimensions of fish and wildlife has suggested that psychological constructs such as beliefs, attitudes and norms predict pro-environmental and fishing-related behaviors. We report here that the impact of these constructs on intended stocking behaviors of fisheries managers in European angling clubs is moderated by the ecological and social context within which the decisions to stock are made. Moreover, we report that ecological and functional beliefs about the outcomes of stocking have only modest explanatory power. We conclude that stocking decisions of fisheries managers in angling clubs result from a multitude of psychological, social, ecological and economic determinants and, notably, their interactions.

This study's findings offer the potential for identifying targets of intervention programs (e.g., educational campaigns) designed to alter current stocking practices (von Lindern and Mosler, 2014) should this be desired by environmental policy makers to counteract the risks for biodiversity conservation inherent in some stocking programs. An intervention aimed at altering a stocking practice would try to change psychological constructs with a significant regression coefficient (Ajzen, 2005; Fishbein and Ajzen, 2010; Stern, 2000). For example, if the target were to decrease the stocking amount in general, management interventions tailored at feeding new scientific knowledge into angler communities about the lack of consistent positive outcomes associated with stocking (Arlinghaus et al., 2015) would contribute to a reduction of future reliance on stocking because they are likely to increase the heterogeneity of opinions among anglers (Table 5). As a second example, increasing fisheries managers' satisfaction with the status of their club waters would lead to an intended decrease of stocking of harvestable fishes, particularly in stock enhancement-oriented (type-2) clubs (Table 5; Fig. 2E).

To better understand stocking decision-making processes, future work must include contextual information in addition to the psychological disposition of the decision makers. This would call for designing multi-level studies, incorporating factors related to the club and to the society or the governance system in more detail, and testing the decision-making processes within structural, multi-level frameworks including interactions between club context and psychological dispositions.

Acknowledgements

This study was funded in Germany by the German Research Foundation (DFG; grant to R.A., grant number AR 712/4-1) and in France by the Agence National de le Recherche (grant to J.C., grant number ANR-13-EDIB-0002) within the project SalmoInvade in the BiodivERsA 2012-2013 Pan-European call. Funding in Germany was also received from the German Federal Ministry of Education and Research (BMBF) to R.A. within the project Besatzfisch (grant number 01UU0907) in the Programme for Social-Ecological Research. J.C., M.B. and R.L. are in the department EDB, part of the Laboratoire d'Excellence (LABEX) entitled TULIP (ANR-10-LABX-41). We would like to thank J. Hilsberg and A. McFall and other members of the Besatzfisch team at Leibniz-Institute of Freshwater Ecology and Inland Fisheries in Berlin for their contributions to the study concept and USUMA for conducting the fieldwork in Germany. We are also very grateful to two anonymous reviewers whose constructive feedback helped us to improve our manuscript. Last but not least we thank all participants in the surveys for their cooperation and commitment.

Appendix A

Table A1
Intercorrelations of items and scales used for measuring the psychological disposition of the respondents.

	1	2	3[a]	4[a]	5	6	7	8[a]	9	10	11	12	13	14	15	16	17	18
External threats 1	–																	
Satisfaction 2	−0.218*	–																
Relative funtionality 3[a]	0.009	−0.214*	–															
General functionality 4[a]	−0.268*	0.098*	0.067*	–														
Additive functionality 5	−0.186*	0.089*	−0.003	0.196*	–													
Negative ecological impact 6	0.183*	−0.073*	−0.067*	−0.382*	−0.107*	–												
Negative genetic impact 7	0.142*	−0.034	−0.109*	−0.378*	−0.051	0.340*	–											
Pathway for nonnative species 8[a]	0.027	−0.021	−0.026	0.009	−0.081*	−0.012	−0.029	–										
Pathway for diseases/parasites 9	0.058	−0.070*	−0.091*	−0.299*	−0.059*	0.290*	0.286*	−0.010	–									
Realizability of increasing stocking 10	−0.104*	0.140*	−0.062*	0.080*	0.070*	−0.021	−0.020	0.028	−0.013	–								
Realizability of abandoning stocking 11	−0.115*	−0.022	0.006	−0.179*	−0.100*	0.112*	0.080*	0.022	0.113*	0.114*	–							
Inflexibility of the stocking regime 12	−0.098*	0.163*	−0.033	0.203*	0.067*	−0.107*	−0.115*	0.006	−0.062*	0.086*	−0.079*	–						
Heterogeneity of opinions 13	0.240*	−0.135*	0.016	−0.293*	−0.118*	0.235*	0.171*	−0.033	0.101*	−0.047	−0.039	−0.093*	–					
Club's financial situation 14	−0.019	0.164*	−0.076*	−0.056	0.006	0.040	0.015	−0.002	−0.006	0.139*	0.028	0.061*	−0.005	–				
Trophy catch orientation 15	0.034	−0.057	0.026	0.008	0.081*	0.047	−0.019	0.015	0.053	0.001	0.005	0.025	0.077*	0.022	–			
Attitude toward fish stocking 16	−0.248*	0.141*	0.005	0.587*	0.295*	−0.313*	−0.261*	−0.061*	−0.226*	0.098*	−0.228*	0.234*	−0.180*	0.003	0.107*	–		
Personal norm to stock fish 17	−0.092*	0.100*	−0.035	0.353*	0.216*	−0.184*	−0.126*	−0.040	−0.140*	0.053	−0.157*	0.159*	−0.096*	0.041	0.142*	0.574*	–	
Social norm to stock fish 18	−0.064*	−0.016	0.005	0.150*	0.058	−0.023	−0.091*	0.004	−0.053	−0.017	−0.218*	0.124*	0.157*	−0.005	0.110*	0.322*	0.305*	–
Perceived behavioral control over the stocking process 19	−0.087*	0.120*	−0.051	0.172*	0.035	−0.084*	−0.027	0.002	−0.040	0.104*	−0.005	0.152*	−0.097*	0.055	0.018	0.259*	0.399*	0.150*

Note. $n = 1128$. For item wordings, scale descriptions and response scales see Table 2.

[a] Item scores were reversed prior to analyses to facilitate model interpretation.

* $p < 0.05$.

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