Received: 21 September 2020 | Revised: 6 February 2021 | Accepted: 3 May 2021

DOI: 10.1111/cobi.13758

Conservation Biology

CONTRIBUTED PAPER

Effects of experience with access regimes on stewardship behaviors of small-scale fishers

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Article impact statement: Experimental evidence supports the role of collective, exclusive access regimes in determining natural resource users' stewardship.

Funding information
Fondecyt, Grant/Award Number: 1160145; ANID Iniciativa Cientifica Milenio, Grant/Award Number: ICN2019_015; ANID PIA/Basal, Grant/Award Number: FB 0002; ANID/Becas Chile/Doctorado, Grant/Award Number: 72180436; Latin American Fisheries Fellowship Program

Abstract

Governance regimes that assign exclusive access to support collective action are increasingly promoted to manage common-pool resources under the premise that they foster environmental stewardship. However, experimental evidence linked to existing policies that support this premise is lacking. Overlapping access policies in small-scale fisheries provide a unique opportunity to test the effects of access regimes on users' stewardship behaviors. We performed a lab-in-the-field experiment to assess how fishers' previous experience with access regimes relates to compliance and peer enforcement ($n = 120$). Fishers' compliance and peer-enforcement decisions were compared in a common-pool-resource game. Treatments differed in framing to represent exclusive access and pseudo-open access regimes, both of which fishers face in real life. To contrast behavior in the game with real-life observations, we compared fishers' associations that have shown relatively high and low management performance under exclusive access policies. Compliance and peer enforcement were higher under the exclusive access treatment than under the pseudo-open access treatment only for fishers' associations with high management performance in real life. Behaviors in the game reflected differences between associations in real life. Our results support previous research on ocean governance by experimentally assessing the role of access regimes in determining users' stewardship and suggest potential mechanisms for stewardship internalization.

KEYWORDS

collective action, environmental stewardship, external validity, lab-in-the-field experiment, small-scale fisheries, territorial user rights for fisheries

Efectos de la experiencia con regímenes de acceso sobre comportamientos de gestión responsable de pescadores a pequeña escala

Resumen: Las políticas que asignan acceso exclusivo a grupos de usuarios para apoyar la acción colectiva son cada vez más promovidas para el manejo de recursos de uso comunitario bajo la premisa de que fomentan la gestión ambiental responsable. Sin embargo, la evidencia experimental vinculada a políticas existentes que respalde esta premisa es insuficiente. La superposición de diversas políticas de acceso en las pesquerías a pequeña escala proporciona una oportunidad única para analizar los efectos de los regímenes de acceso sobre el comportamiento de gestión de los usuarios. Realizamos un experimento, llevando el laboratorio al campo, para evaluar cómo la experiencia previa de los pescadores con regímenes de acceso se relaciona con sus comporatamientos de cumplimiento y de sanción de pares ($n = 120$). Comparamos el cumplimiento con cutoas de extracción de los pescadores y sus decisiones de sancionar a pares que incumplian las cuotas en un juego de recursos de uso comunitario entre dos tratamientos. Los tratamientos variaban en la contextualización del juego para representar una pesquería de acceso exclusivo y una de pseudo libre acceso, a las que se enfrentan los pescadores en la vida real. Para contrastar el comportamiento en el juego con las observaciones de la vida real, comparamos los resultados de asociaciones de pescadores que han mostrado un desempeño de manejo relativamente alto y bajo con las políticas de acceso exclusivo. El cumplimiento y la sanción de pares fueron mayores bajo el tratamiento de acceso exclusivo que bajo el de pseudo libre acceso sólo para aquellas asociaciones de pescadores con un alto desempeño de manejo en la vida real. Los comportamientos en el juego reflejaron las diferencias entre las asociaciones en la vida real. Nuestros resultados respaldan investigaciones previas sobre la governanza de recursos marinos mediante la evaluación experimental del papel que tienen las políticas de acceso en la determinación de la gestión del usuario y sugieren mecanismos potenciales para la internalización de dicha gestión.

PALABRAS CLAVE
acción colectiva, derechos de uso territorial para las pesquerías, experimento de campo, gestión ambiental, pesquería a pequeña escala, validez externa

INTRODUCTION

Environmental stewardship is a promising pathway toward the sustainable use and conservation of natural common-pool resources (CPRs) (Bennett et al., 2018). Local environmental stewardship can trigger the protection and responsible harvest of CPRs and avert "the tragedy of the commons" (Bennett et al., 2018; Ostrom, 1990). Compliance with appropriation rules and peer enforcement are stewardship behaviors linked to successful conservation and management outcomes across ecosystems (Bergseth et al., 2015; Ostrom, 1990; Rustagi et al., 2010; Wright et al., 2016). Therefore, identifying policies that enhance user compliance and peer enforcement is an important step to advance the conservation of CPRs. An approach increasingly applied to foster these behaviors among CPRs users is the establishment of formal, collective, and exclusive access regimes (CEARs) (Nguyen Thi Quynh et al., 2017). These regimes grant legal rights to a group of users to exclusively access, use, and manage resource stocks (Schlager & Ostrom, 1992). In theory, CEARs incentivize environmental stewardship relative to open access (OA) resource use by securing future benefits to those investing in a stock's sustainability and involving users in decision-making (Jentoft et al., 1998; Wilen et al., 2012).

Achieving sustainability by implementing CEARs rests, in part, on the assumption that formal access rights promote user compliance and peer enforcement. However, research shows mixed results regarding the relationship between access policies and local environmental stewardship (e.g., Gelcich et al., 2006; Gilmour et al., 2012; McDonald et al., 2020). This mixed performance is likely the consequence of the lack of counterfactuals (van Putten et al., 2014), reliance on self-reported behaviors prone to biases, especially when involving sensitive behaviors such as compliance (Gavin et al., 2010), and case studies encompassing a range of resource systems operating under different institutional and legal settings (van Putten et al., 2014; Gelcich et al., 2019). Experimental economics provides a complementary approach to assess the determinants of human behaviors by controlling for confounding variables (Smith, 1982; Ostrom, 2006). Moreover, by attaching financial consequences to decisions, economic experiments reduce the biases inherent to self-reporting (Smith, 1982). To recreate the collective-action problem faced by CPR users, researchers use CPR games. Insights from lab-in-the-field experiments based on CPR games have increased the robustness of findings from case studies and helped uncover the role of institutional arrangements in CPR use (Ostrom, 2006; Cardenas, 2011). Behaviors displayed by users in these experiments have been proven to relate to real-life observations supporting the external validity of this approach (Rustagi et al., 2010; Carpenter & Seki, 2011; Gelcich et al., 2013; Basurto et al., 2016). Accordingly, lab-in-the-field experiments constitute an appealing way to unpack the relationship between access regimes and local environmental stewardship.

Small-scale fisheries are CPRs for which compliance and peer enforcement are particularly important given the difficulty of establishing effective centralized management and enforcement (Costello et al., 2012; Donlan et al., 2020). Small-scale fisheries can be managed through different and overlapping access regimes, depending on the different target species, and therefore provide a unique opportunity to test the role of access policies in determining local stewardship. In central Chile, fishers operate in at least two distinct fishery-management access regimes: a CEAR that takes the form of territorial user rights for fisheries (TURFs) granted to fishers' associations to harvest benthic resources and a pseudo-OA regime for demersal fish species. We empirically assessed how Chilean fishers' experience with formal CEARs relates to compliance and peer enforcement with a between-subjects lab-in-the-field experiment.

We compared behaviors of fishers in CPR games conducted under two treatments that involved the same monetary incentives but differed in framing to represent a fishery that is managed under CEAR and another that operates as pseudo-OA. To assess the external validity of our experiment, we considered two types of fishers' associations depending on their real-life performance (high or low) with CEAR.

Assuming standard rationality, the predicted outcomes for the game were no compliance and no peer enforcement. However, deviations from rationality are common in social dilemmas such as CPRs due to subjects' internalized expectations and norms (e.g., Cárdenas & Ostrom, 2004; Rustagi et al.,

TABLE 1 Between-subjects design of an experiment that compares behaviors of fishers in a common-pool-resource game under two treatments that differ in framing to represent the loco fishery, which is managed under collective and exclusive access, and the hake fishery, which operates under pseudo-open access. Fishers were recruited from associations that have shown signs of relatively high and low performance under collective and exclusive access

	Collective and exclusive access regime (Loco frame)		Pseudo-open access (Hake frame)	
Treatment Association type	**Unenforced stage (first 10 rounds)**	**Peer-enforced stage (last 10 rounds)**	**Unenforced stage (first 10 rounds)**	**Peer-enforced stage (last 10 rounds)**
High performance	30 (six groups of five players)		30 (six groups of five players)	
Low performance	30 (six groups of five players)[a]		30 (six groups of five players)[a]	

[a]In two of the 12 game sessions, groups were randomly reallocated in each round (Appendix S5). Because subjects were unaware of the reallocation, behaviors should not differ from those expected in fixed groups. Subjects in these sessions potentially interacted with all the other nine subjects in the session. Therefore, to obtain independent observations, we computed the group mean compliance and probability of reporting across all 10 subjects in each of these two sessions.

2010; Fehr & Schurtenberger, 2018). Based on the premise that exclusive access favors the internalization of stewardship, we expected compliance and peer enforcement to be higher under the CEAR treatment than under the pseudo-OA treatment for high-performance associations. If our experiments were externally valid, high-performance associations would exhibit more compliance and peer enforcement than low-performance associations under the CEAR treatment but not necessarily under pseudo-OA. We additionally evaluated how peer enforcement affects compliance and explored the role of expectations and norms in the different settings.

METHODS

Implementation

In the CEAR treatment, the game was framed as the harvest of loco (*Concholepas concholepas*), which is harvested within TURFs (Gelcich et al., 2010). In the pseudo-OA treatment, the game was framed as the fishing of hake (*Merluccius gayi*), which is fished in a quota scheme that operates as pseudo-OA due to poor enforcement and unclear stock boundaries (Plotnek et al., 2016; Oyanedel et al., 2020). Fishers were recruited from fishers' associations that targeted loco and hake, were located <200 km apart to minimize geographical differences (Appendix S1), and could be categorized ex ante into high-performance and low-performance depending on their real-life performance with CEAR. We recruited a total of 120 fishers from two high-performance and three low-performance associations. Associations were categorized as having high or low performance with CEARs according to a TURF-performance index developed by Marín et al. (2012). The index includes indicators of fishers' pride in their TURF, compliance with TURF rules, trends of annual TURF quotas, and third-party assessments of TURF management (Appendix S2). All these variables are related to collective action in TURF management. We conducted 12 sessions, two in each association (one with each frame), except for one high-performance association in which we conducted four sessions (two with each frame). Half the fishers in each association were randomly assigned to the CEAR treatment and half were to the pseudo-OA treatment. The experimental design is summarized in Table 1.

In each session, 10 fishers from the same association entered the room and seated themselves in front of an individual laptop. A facilitator informed the subjects that they would play 20 rounds of a CPR game in fixed groups of five, randomly and anonymously assembled by the software. Subjects were also informed that decisions would be recorded anonymously and that they could leave the experiment at any time. After the instructions were read, subjects played three trial rounds. Game instructions were identical for both treatments except for the words used to describe the resource units (i.e., *number of locos* or *kilos of hake*), the action (i.e., *harvesting* or *fishing*), and the enforcement authority (i.e., *association's board* or *National Service of Fisheries*) (Appendix S3). The game was programmed in z-Tree (Fischbacher, 2007), and no communication was allowed. Once a session was completed, fishers left the room to receive their payments in private and the next group entered the room, thus avoiding communication. We obtained informed consent from all participants. Our protocol was approved by the ethics committee of Pontificia Universidad Católica de Chile.

The CPR game

At the beginning of each round $t \in \{0, \ldots, 9\}$, each fisher was given 100 units of the resource representing their individual quota, which was assumed to be harvested completely. Then, simultaneously, each fisher $i \in \{1, \ldots, 5\}$ had to privately decide the $x \in \{0, \ldots 50\}$ number of units to harvest above their quota (i.e., overharvest). There was a negative externality to mimic the cost that overharvest imposes on other users in real life. For each unit that a fisher decided to overharvest, all other members of their group ($j \in \{1, \ldots, 5\} \neq i$) lost half a unit. The unitary price of a unit was \$10 CLP (US\$ ~0.014). The individual payment per round was given by

$$\pi_{i,t} = \left(100 + x_{i,t} - \frac{1}{2}\sum_{j \in S_{-i}} x_{j,t}\right) \times \$10. \qquad (1)$$

The first 10 rounds of the game constituted the unenforced stage. At the beginning of the 11th round, the peer-enforced stage started, and a peer-enforcement mechanism was introduced unexpectedly and permanently. In the remaining rounds, once all fishers had entered their overharvest, two fishers were randomly assigned as inspectors and randomly and anonymously assigned to inspect another group member. The harvest of the inspected fisher was revealed to their inspector, and if overharvest was >0, the inspector had the opportunity to report the offender. Inspectors were never assigned to inspect themselves and subjects were aware of this. Once an offender was reported, their harvest for the round was seized. This mechanism recreates fishers' real-life decisions on whether to report noncompliance to authorities. Once inspectors entered their decisions, a summary screen revealed to each fisher their harvest, others' mean harvest, the number of units lost due to others' overharvest, their earnings, and whether their harvest was seized due to a peer's report. To recreate the payment a fisher would earn for patrolling, we added $250 CLP to a fisher's account each time they were appointed as an inspector. Because reporting a peer is costly in real life, inspectors had to pay $250 CLP to report.

The expected outcomes for the game differed under different models of behavior. Assuming standard rationality, the game equilibrium in the unenforced stage is a tragedy of the commons in which each subject overharvests the maximum and earns the minimum (Gelcich et al., 2013). Complying and reporting are rational decisions in the peer-enforced stage only if subjects expect high levels of others' compliance (above 80%) and a high probability of being reported (above 0.83) (Appendix S4). Models of other-regarding preferences can account for compliance and engagement in peer enforcement. For example, under models of negative reciprocity subjects are willing to pay for leveling of payments (Rabin, 1993; Fehr & Gächter, 2000). Similarly, subjects are willing to pay to sanction prejudicial behavior under inequity aversion (Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000). Alternatively, models of altruism predict compliance and a lack of reports because altruistic subjects will refrain from reducing their peers' payments (Andreoni, 1990). More important for our study, however, is that most models predict no differences between settings with the same monetary payments, such as our treatments, unless they consider context-specific parameters, expectations, or norms (Dufwenberg et al., 2011; Ellingsen et al., 2012).

Statistical analyses

We operationalized compliance as the percentage of resource units that were not overharvested (i.e., an overharvest of 50 units corresponded to 0% compliance and an overharvest of 0 units to 100% compliance). Peer enforcement was assessed as the probability of reporting (i.e., the number of reports divided by the number of opportunities to report). We aggregated individual behavior over the rounds and used nonparametric analyses to test the differences. We ran pairwise comparisons of the individual mean percent compliance and the individual probability of reporting between treatments for each association type and between association types under each treatment. We also compared the individual mean percent compliance between the unenforced and peer-enforced stages and between the first and last round in each treatment–stage–association type combination. We used the Wilcoxon test with two-sided hypotheses testing for each comparison. We adjusted p-values for multiple hypotheses testing within each set of comparisons with the Bonferroni correction at a 5% significance level.

We additionally applied a parametric approach, which provides greater power to test whether our results held when observations were aggregated at the group level in every round. We ran different specifications of ordinary least squared regressions (OLS) with robust standard errors to test the effects of experimental variables on compliance and peer enforcement. The independent variable for compliance was the group percent compliance in each round and for peer enforcement was the group probability of reporting in each round. The different OLS specifications sequentially included blocks of explanatory variables to check for the stability of coefficients across specifications and to disaggregate the effects of interacting variables. Explanatory variables used in the OLSs for compliance included dummies for the CEAR treatment, high-performance associations, and the peer-enforced stage; continuous variables to enumerate the rounds in the unenforced and peer-enforced stages (from 0 to 9); and interactions of these variables. In OLSs for peer enforcement, explanatory variables included dummies for the CEAR treatment, low-performance associations, and high-performance associations. We also included two control variables—a variable enumerating the round of the peer-enforced stage (from 0 to 9) and the mean overharvest of the inspected fisher in each group and round.

In the main text, we discuss only effects that were consistent across model specifications and report the results of the most parsimonious OLS for compliance and peer enforcement, which were selected based on Akaike's information criterion. In two of the 12 sessions, groups were randomly reallocated in each round (Appendix S5). Because subjects were unaware of the reallocation, behaviors should not differ from those expected in fixed groups. Subjects in these sessions potentially interacted with all the other nine subjects in the session. Therefore, to obtain independent observations, we computed the group mean compliance and probability of reporting across all 10 subjects in each of these two sessions. We added weights to the OLS based on the number of players aggregated in each observation. To assess how others' decisions affected individual compliance and peer enforcement, we ran a linear mixed model and a Probit model, respectively, for each treatment–association type combination (Appendix S6).

RESULTS

Differences in compliance

Compliance was higher under the CEAR treatment than under the pseudo-OA treatment for high-performance associations, which presented a mean individual percent compliance of 72% under the CEAR treatment and 44% under the pseudo-OA treatment (Wilcoxon test, $W = 965$, adjusted $p < 0.01$,

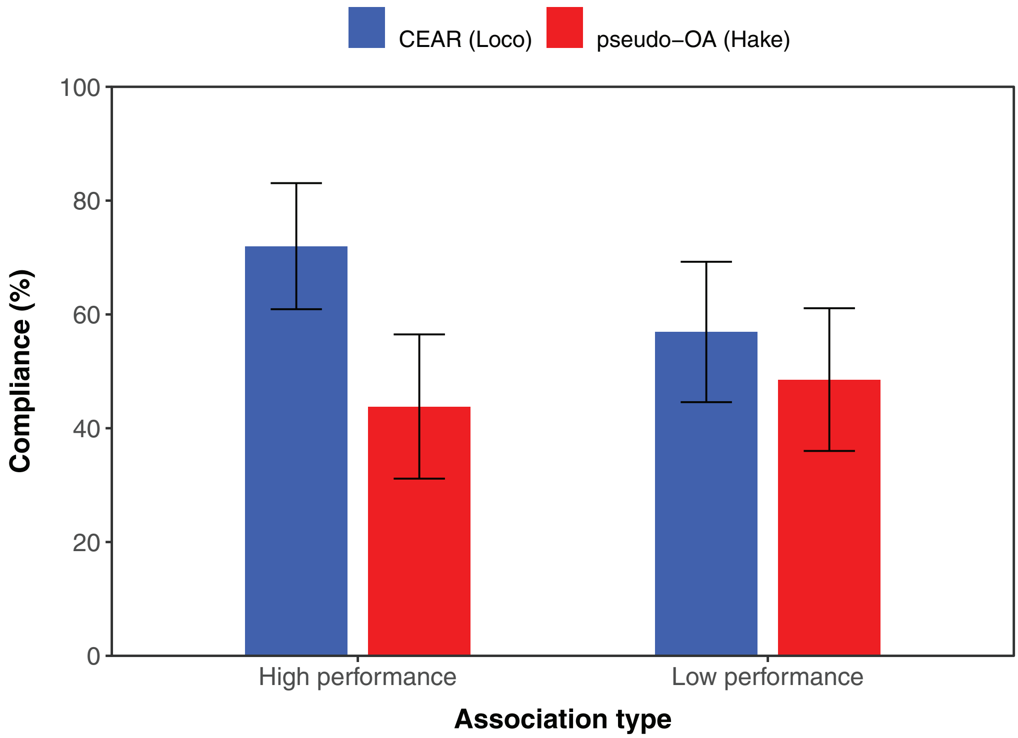

FIGURE 1 Mean percent compliance in the common-pool-resource game with the individual quota of loco, which is fished under collective, exclusive access (CEAR) in real life and with the individual quota of hake, which is fished under pseudo-open access (OA) in real life for high-performance associations and low-performance associations (error bars, 95% CIs computed at the individual level; $n = 30$).

$n = 60$) (Figure 1). In the case of low-performance associations, the mean individual percent compliance was 57% and 49% under the CEAR and pseudo-OA treatments, respectively, and there were no statistically significant differences (Appendix S7).

Strategies of players that chose to comply in every round (i.e., overharvest zero in every round) were revealing regarding motivations toward compliance. We found that in high-performance associations, 10 subjects chose to comply in every round under the CEAR treatment and only two applied this strategy under the pseudo-OA treatment (Fisher exact test, adjusted $p = 0.042$, $n = 60$). This difference was not significant in low-performance associations.

Differences in compliance between high- and low-performance associations under the CEAR treatment reflected real-life differences regarding success with CEAR. The mean individual percent compliance was significantly higher in high-performance associations compared with low-performance associations under the CEAR treatment ($W = 2362.5$, adjusted $p = 0.02$, $n = 60$) (Figure 1) but not under the pseudo-OA regime treatment (Appendix S7).

The most parsimonious OLS showed that the mean group percent compliance was almost 20% higher in high-performance associations under the CEAR treatment relative to the other treatment–association type combinations (CEAR × high-performance association = 19.81, $p < 0.001$, 95% confidence interval [CI]: 10.03–29.59 in model 5) (Appendix S8).

Differences in peer enforcement

Peer enforcement was higher under the CEAR treatment than under the pseudo-OA treatment (Figure 2). However, statistical differences were weaker than for compliance behavior. For high-performance associations, the mean individual probability of reporting was 0.70 under the CEAR treatment and 0.41 under the pseudo-OA treatment. This difference was significant but did not survive correction for multiple hypotheses testing ($W = 215.5$, $p = 0.03$, adjusted $p = 0.11$). In the case of low-performance associations, the mean individual probability of reporting was 0.31 and 0.19 under the CEAR and the pseudo-OA treatments, respectively, with no significant differences between treatments (Appendix S9).

Differences in peer enforcement between association types reflected real-life differences with CEAR. The mean individual probability of reporting under the CEAR treatment was significantly higher in high-performance associations compared with low-performance associations ($W = 476.0$, adjusted $p = 0.02$) (Figure 2). In the case of the pseudo-OA treatment, differences between association types did not survive correction for multiple hypotheses testing ($W = 560.5$, $p = 0.02$, adjusted $p = 0.06$).

The most parsimonious OLS revealed that the group probability of reporting was significantly higher under the CEAR treatment for high-performance associations compared with the other treatment–association type combinations (CEAR × high-performance association = 0.24, $p < 0.05$, 95%

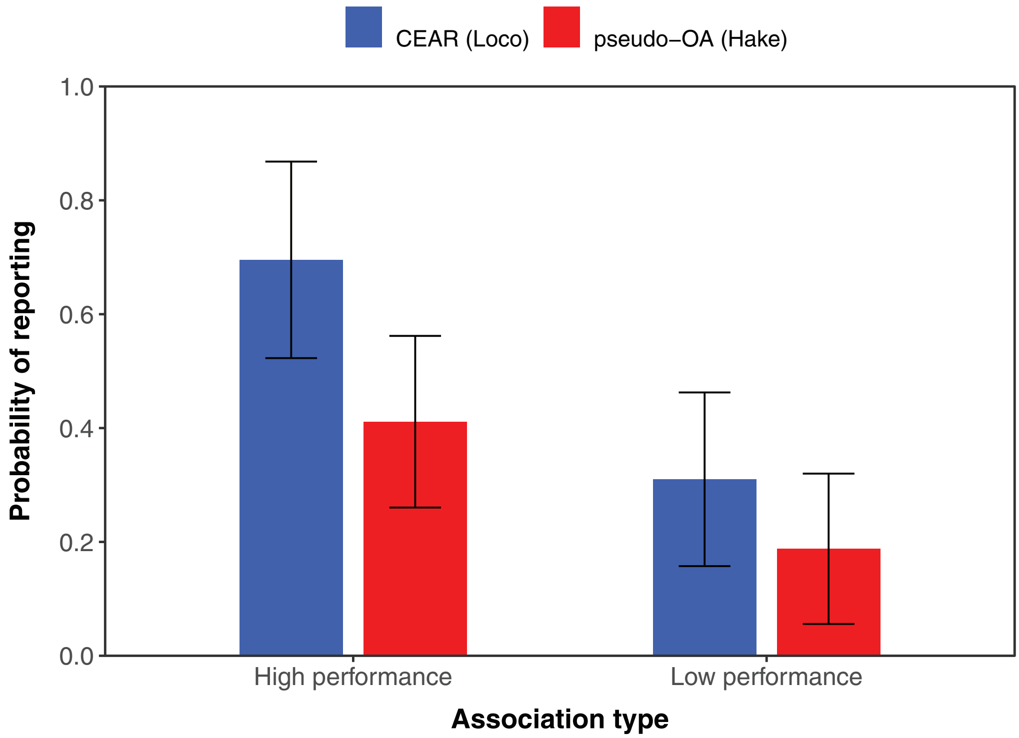

FIGURE 2 Mean probability of reporting a peer to authorities in the common-pool-resource game due to noncompliance with the individual quota of loco, which is fished under collective, exclusive access (CEAR) in real life, and due to noncompliance with the individual quota of hake, which is fished under pseudo-open access (OA) in real life for high-performance associations and low-performance associations (error bars, 95% CIs computed at the individual level). Sample sizes differ because the inspector role was randomly assigned in each round and inspectors could only report if the inspected fisher had overharvested. Therefore, not every fisher had an opportunity to report (for high-performance associations under CEAR treatment, $n = 22$; for high-performance associations pseudo-open access treatment, $n = 30$; for low-performance associations under CEAR treatment, $n = 30$; for low-performance associations under pseudo-open access treatment, $n = 28$)

CI: 0.03–0.46 in model 5; no overlap between the 95% CI of CEAR × high-performance association and other coefficients in model 7) (Appendix S10).

Effect of peer enforcement on compliance

There were no significant differences in the mean individual percent compliance between the unenforced and peer-enforced stages (Appendix S7). Nonetheless, peer enforcement averted the decline of compliance under the CEAR treatment for high-performance associations (Figure 3). In this case, the mean individual percent compliance was 80% in the first round of the unenforced stage and significantly declined to around 60% by the end of the unenforced stage (paired Wilcoxon test comparing the first and last round in the unenforced stage, $W =$ 147, adjusted $p < 0.01$, $n = 60$). In the peer-enforced stage, high-performance associations under the CEAR treatment restored high levels of compliance, which remained unchanged until the end of the game (Appendix S11). No significant changes in the mean individual percent compliance occurred within stages for the other treatment–association type combinations (Appendix S11).

A marginally significant decline in compliance during the unenforced stage was confirmed by the most parsimonious OLS with observations aggregated at the group level (unenforced rounds = −1.10, $p = 0.06$, 95% CI: −2.36 to 0.16 in model 5) (Appendix S8). Peer enforcement generated a net earnings loss in all the treatment–association type combinations (Appendix S12). The highest aggregated losses occurred in high-performance associations under the CEAR treatment, but losses, in this case, tended to decrease over rounds (Appendix S13).

Discussion

Identifying policy levers to promote environmental stewardship among users is necessary to prevent CPRs degradation in the absence of effective centralized management. We found evidence that access policies governing resource extraction can influence users' compliance and peer enforcement. Our results showed that fishers who experienced effective management under CEAR displayed higher stewardship in a CPR game framed as the harvest of loco, which operates under CEAR in real life, than in the same game framed as the fishing of hake, which operates under pseudo-OA. Although this result supports the role of formal CEARs in promoting users' stewardship behaviors, our results also showed that CEARs alone did not guarantee the internalization of environmental stewardship. This was confirmed by the relatively low stewardship displayed by low-performance associations under the CEAR treatment.

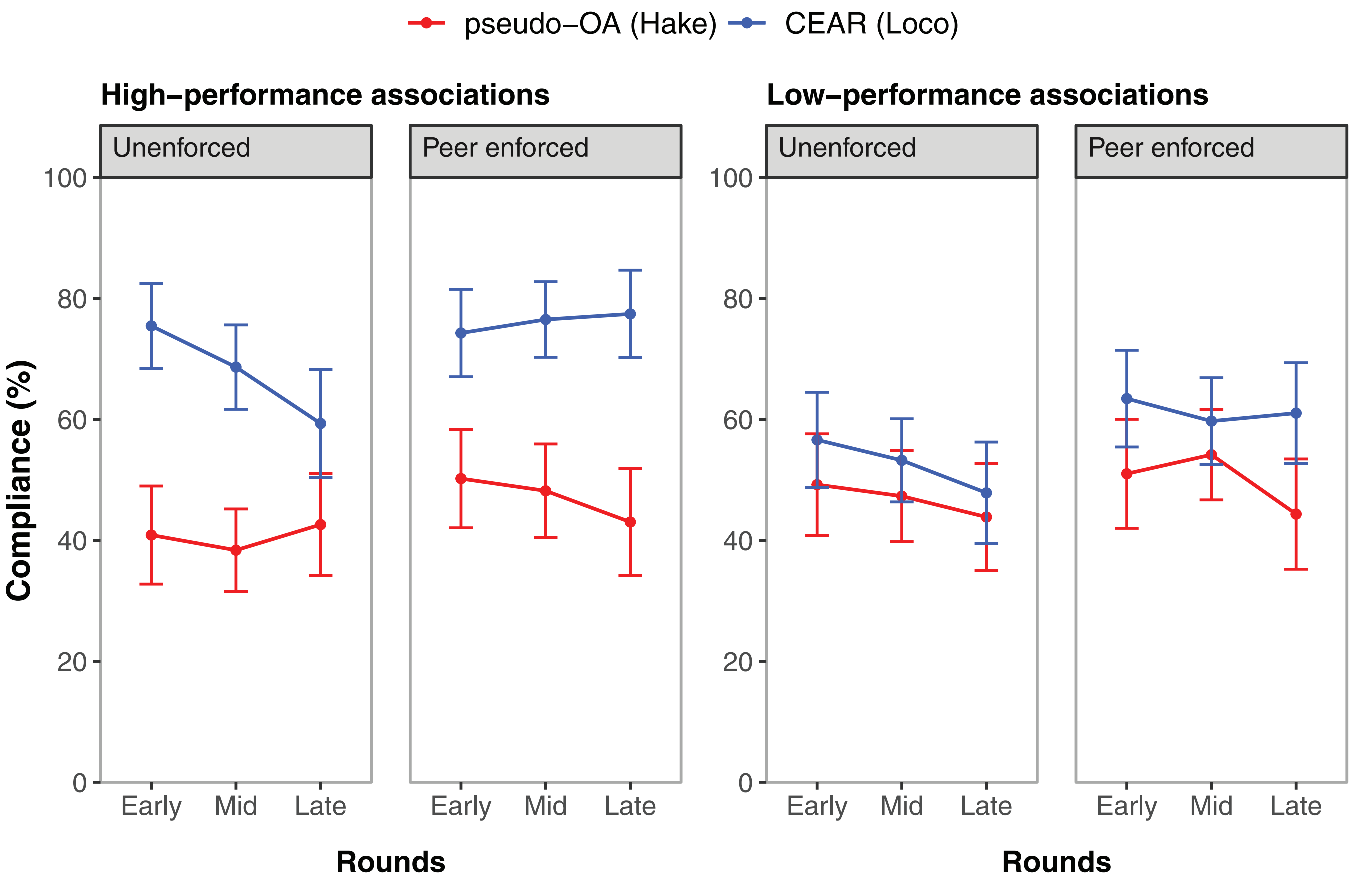

FIGURE 3 Mean percent compliance in the common-pool-resource game with the individual quota of loco, which is fished under collective, exclusive access (CEAR) in real life, and with the individual quota of hake, which is fished under pseudo-open access (OA) in real life for high-performance associations and low-performance associations in early (rounds 1, 2, and 3), middle (rounds 4, 5, 6, and 7), and late (rounds 8, 9, and 10) rounds of the unenforced and peer-enforced stages of the game (error bars, 95% CIs computed at the individual level; $n = 30$)

Our results provide experimental support consistent with observations that suggest that CEAR policies motivate fishers' local stewardship (Gelcich et al., 2010; McDonald et al., 2020). We found that for the same group of users, stewardship increased under the CEAR treatment relative to the pseudo-OA treatment. Our experimental approach accounted for potential selection biases that have raised concerns relative to previous studies in which stewardship behaviors were compared across access regimes with different samples (van Putten et al., 2014). Although we cannot establish a causal link between CEARs and increased local stewardship, our results suggest a role in shaping users' incentives toward stewardship. Similar results support the broader idea that the institutions that people deal with in their daily activities shape their capacity for collective action (Cárdenas & Ostrom, 2004; Leibbrandt et al., 2013; Bouma & Ansink, 2013).

Differences in behaviors observed in our experiment are arguably influenced by the expectations and norms that different fishers hold under each access regime. The levels of compliance observed in the first round suggest that the highest expectations about others' compliance occurred in high-performance associations under a CEAR treatment. On expecting high compliance from other group members, these fishers started with high levels of compliance in accordance with common reciprocation principles (Fehr & Schurtenberger, 2018). These expectations of high compliance are likely shaped by these fishers' real-life experience harvesting loco under effective CEAR (Cárdenas & Ostrom, 2004). Similar framing effects on expectations are reported in the experimental economics literature (Ellingsen et al., 2012).

Several fishers engaged in peer enforcement; it is common in social dilemmas such as CPRs games (Chaudhuri, 2011; Fehr & Schurtenberger, 2018). This cannot be justified by standard rationality in our game. Although reciprocity and inequity aversion could explain reporting decisions, they do not account for the differences between frames. The high levels of peer enforcement observed for high-performance associations under the CEAR treatment could be signaling the presence of social norms for cooperation (Fehr & Schurtenberger, 2018). These norms are theorized to be crucial for effective management under CEAR (Ostrom, 1990, 1998; Jentoft et al., 1998). Treatments did not differ in payments and strategic behavior cannot explain complete restrain from overharvesting. Thus, differences in the number of fishers that complied in every round suggest the presence of internalized norms in these settings. Our results are consistent with evidence from experiments that show norms are sensitive to framing (Krupka & Weber, 2013; Bouma & Ansink, 2013) and evidence from the field that shows that normative motivations relate to compliance of small-scale fishers (Oyanedel et al., 2020).

Peer enforcement did not affect mean levels of compliance as predicted by standard rationality. Nonetheless, in high-performance associations under CEAR, peer enforcement was key to averting the decline of compliance observed in the unenforced stage. This result is consistent with observations from experiments and the field that underscore the role of peer enforcement in sustaining collective action (Ostrom, 1990; Rustagi et al., 2010; Wright et al., 2016). The net earnings loss generated by the peer-enforcement mechanism is common in social dilemmas (Chaudhuri, 2011). Peer enforcement was particularly costly in high-performance associations under the CEAR treatment due to the high frequency and size of the confiscations. Nonetheless, net losses declined over the rounds for this setting, indicating that peer enforcement could become efficient in the long run (Gächter et al., 2008).

Correlates of individual decisions in high-performance associations under the CEAR treatment support the idea that norms and expectations guide stewardship behaviors (Appendix S6). On average, subjects behaved as conditional cooperators, adjusting their compliance to that displayed by others in the previous round. Because the match between one's and others' compliance presented a selfish bias, cooperation declined as subjects updated their expectations (Fehr & Schurtenberger, 2018). In the peer-enforced stage, the average strategy switched from conditional to unconditional compliance, showing that peer enforcement created an effective enforcement alternative that relieved subjects from having to overharvest to retaliate for the low levels of compliance of their peers (Andreoni, 1995). Interestingly, compliance was sustained by the presence of peer enforcement rather than by the actual implementation of reports because subjects did not adjust their compliance after being reported. Subjects either internalized the compliance norm in the presence of peer enforcement or anticipated a high probability of being reported that deterred them from overharvesting. Under the observed probability of reporting, peer enforcement cannot deter a rational subject from overharvesting. Therefore, the most likely explanation is norm internalization. This norm seems to mandate full compliance with the quota because the probability of reporting did not scale with the number of units overharvested.

Our experimental design involved trade-offs between simulating real life and the ability to make unbiased inferences. For example, the use of an alternative design in which the words for the managing authority (i.e., *association's board* or *National Service of Fisheries*) and the species (i.e., *loco* or *hake*) varied separately could have helped isolate the effects of each element in the frame. However, some of the resulting frames would have lacked parallels in real life. Similarly, to recreate the real-life situation of reporting, the peer-enforcement mechanism in our game involved a binary decision that only allowed for the punishment of defectors. Incorporating stock dynamics could have made the game more realistic but would have also made it more difficult to understand, hindering the interpretation of the observed behavior. All these features may affect behavior. Static, repeated dilemmas facilitate cooperation relative to dynamic ones (Vespa, 2020) and allowing for the punishment of cooperators can reduce cooperation (Herrmann et al., 2008). Gradual sanctions may increase cooperation relative to binary systems (Couto et al., 2020). Nonetheless, our focus was not on the levels of cooperation per se, but on the relative differences between frames and samples.

Our results highlight that framing is a crucial feature of lab-in-the-field experiments (Alekseev et al., 2017). Its consideration allowed us to design the experiment and interpret the results. Norms and expectations are context specific and are unconsciously activated by situational cues (Cárdenas & Ostrom, 2004; Krupka & Weber, 2013; Bouma & Ansink, 2013). Framing increased subjects' familiarity with the task providing the situational cues for each fishing context as suggested by the differences between treatments in high-performance associations. Our study also contributes to the literature supporting the external validity of lab-in-the-field experiments because performance under CEAR in real life correlated to the stewardship displayed in the game (Rustagi et al., 2010; Carpenter & Seki, 2011; Gelcich et al., 2013; Basurto et al., 2016).

The interpretation that access regimes drive the differences between frames should be made with caution. Access regimes are not the only difference between the loco and the hake fishery. Loco is harvested by diving, whereas hake is fished using gill nets and longlines. The loco fishery collapsed in the 1980s. After its transition to the TURF system, its status has improved (Gelcich et al., 2010). Instead, the hake fishery started its decline in the early 2000s and its status is still unstable (Arancibia & Neira, 2008; Plotnek et al., 2016). Differences like these can affect the mental models that drive decisions under each fishing context (Gelcich et al., 2007). Yet, the fact that the differences between frames occurred only in high-performance associations indicates that access regimes explain the framing effect, at least in part. All associations in our sample share the same historical, biological, and regulatory backgrounds for each of the fisheries (Arancibia & Neira, 2008; Gelcich et al., 2010; Phillips & Pérez-Ramírez, 2017). Arguably, the only difference between high- and low-performance associations was their ability to self-organize under CEAR. If characteristics other than the access regime were driving the differences between the treatments, we would have observed the same patterns of behavior in both types of associations.

The implementation of formal CEARs is a promising approach to respond to the current call for a sustainable and equitable blue economy (Bennett et al., 2019). In our study, fishers from the same association behaved differently when randomly assigned to CPR games signaling different access regimes that they face in real life. This design accounts for the possibility that differences in behavior are only due to subjects' predispositions for collective action, suggesting that CEAR policies can shape users' stewardship. Access regimes seem to shape norms and expectations, but not in all users' groups operating under CEAR. This stresses the need to further identify the conditions under which access policies lead to group dynamics that favor resource stewardship. This knowledge is crucial to guide the design of access regimes that promote the sustainable use of CPRs.

ACKNOWLEDGMENTS

We thank V. Landaeta-Torres, S. Tapia-Lewin, and C. Vargas for field assistance; M. McElroy and S. Tapia-Lewin for valuable comments on initial versions of this manuscript; and fishers who participated in this study for their patience and support. This research was funded by Fondecyt 1160145, ANID-Iniciativa Cientifica Milenio ICN2019_015, ANID-PIA/Basal FB 0002 (to S.G.), ANID/Becas Chile/Doctorado72180436 (to M.I.R.-H.), and the Latin American Fisheries Fellowship Program (to M.I.R.-H.).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Rivera-Hechem MI., et al. Effects of experience with access regimes on stewardship behaviors of small-scale fishers. *Conservation Biology*. 2021;1–10.