**Supplementary Information for “Experience with access regime policies influences compliance and enforcement behaviors of common-pool resource users”**

**Categorization into high- and low-performance associations**

To categorize association according to their performance with CEAR we used the social integration and management capacity dimensions of the co-management performance index developed by Marín et al. (2012). **Table S1** describes de variables included, their scale, and justification. We estimated a CEAR-performance index as the average score of the included variables using data provided by Marín et al. (2012) and Gelcich et al. (2013). To define the cutoff at which an association would be considered a high- or low-performance association we calculated the median value in the whole sample by Marín et al. (2012), which is representative of the region of interest. All associations with performance index above the median were considered high-performance associations and those below the median were considered low-performance associations.

**Instructions of the common-pool resource game (implemented in Spanish)**

Welcome, and thank you for being here. This research is concerned with the harvesting/fishing of loco/ hake. It is part of a project carried on jointly Pontificia Universidad Católica de Chile and the Research Center in Social Complexity from the Universidad Del Desarrollo. Your association’s board, and National fisheries authorities like the National Service of Fisheries (SERNAPESCA) and Aquaculture and The Undersecretary of Fisheries (SUBPESCA) are not involved in this study. The game will last around an hour. By participating you could earn up to $32.500 CLP each. Once the session ends you will receive your payoffs individually and privately.

Now we will read the instructions aloud. If you have any questions, please rise your hand in silence and we will answer them aloud. Let us start. You will play the game via computers. Do not worry if you have never used a computer before because we will only be using the numeric keypad, which works very similar to the numeric keypad in a cellphone or a calculator.

Before starting the game, the ten participants in the room will be randomly assembled in two groups of five fishers each. All the interaction with your partners will be anonymous via the computer. You will never know who the other members of your group were, neither during the game nor after it.

The game recreates a situation in which you go out harvesting/fishing for loco/hake and have to decide individually how many units of locos/kilos of hake to harvest/fish. The game is divided into 20 rounds, which represent fishing trips. Each one of you has an individual quota of 100 units of locos/kilos of hake per round, which was established by the association’s board/ SUBPESCA ― this is just a recreation given that the association’s board/SUBPESCA is not really involved in this study. The computer will always assume that you will harvest/fish all the units of locos/kilos of hake from your individual quota. In addition, you will have the chance to harvest/fish up to 50 more units above your quota in each round.

Harvest/fish more units of locos/kilos of hake than the quota established by the association’s board/SUBPESCA brings more economic benefits to you, but it produces economic harm to the other members in your group. This is because for every two units of locos/kilos of hake you overharvest/overfish the other members in your group will lose one units of loco/kilo of hake each from their individual catch. This mimics the damage that overharvesting/overfishing generates over the marine ecosystem reducing everyone’s’ productivity.

Now, we will show you the screens that you will see in the computer during the game. In each round the computer will ask the same question: How many units of locos/kilos of hake above your individual quota you want to harvest/fish (from 0 up to 50)? If you want to comply with your quota, the answer must be zero.

Your answers will be recorded anonymously in the computer. Neither the researches, nor the other participants will know how many units of locos/kilos of hake you harvest/fish during the game. Your identity will never be revealed. To remain anonymous, it is very important to be quiet during the game and no make any comments. It is not allowed to speak during the game, if you need any help please rise your hand in silence and a monitor will assist you.

Once every group’s member had entered their responses, you will see a summary screen, summarizing the results of the round. As you can see, it will tell you:

* + The number of units of locos/kilos of hake that you harvested/fished in that round.
  + The number of units of locos/kilos of hake harvested/fished, on average, by the rest of the members in your group in that round.
  + The number of units of locos/kilos of hake that you lost due to the overharvesting/overfishing of the other members of your group in that round.
  + The number of units of locos/kilos of hake that you ended up with and are available to be sold in that round.
  + The amount of money that you earned in that round.

Once you have read the screen press the red button to continue. Once everyone has read their screens, the next round will automatically begin. Summarizing:

* + You have an individual quota of 100 units of locos/kilos of hake in each round.
  + You have the chance of harvest/fish beyond your quota up to 50 additional units of loco/kilos of hake in each round.
  + For each additional unit of loco/kilo of hake you overharvest/overfish the rest of the members in your group will lose half a unit of loco/ kilo of hake from their catch in that round.
  + We will pay you $10 CLP for each unit of loco/kilo of hake at the end of each round.
  + Your earnings will be accumulated during the 20 rounds of the game and will be paid privately at the end of the session.

Before starting you will play three trial rounds just to practice. These rounds are not for real money. Please rise your hand in silence if you have any question and wait until a monitor can assist you. Once the trial rounds are completed, the real game will start, and you will be playing for real money.

Please remember that communication during the game is not allowed!

Starting from round 11 a new rule will be implemented. After everyone has decided how many units of loco/kilos of hake they want to overharvest/overfish, the computer will randomly match two players in each group. One person in each of the couples formed by the computer, will be assigned as the inspector and will be allowed to observe their partner’s catch without knowing their identity. Since the groups have five players, two persons in each group will be inspectors, two will be inspected and one person will remain inactive. The computer will randomly assign the roles in each round.

If you are randomly chosen as an inspector, you will see a screen that will show you your partner’s catch. It is like you could see how many units of locos/ kilos of hake the other fisher has in her or his boat. If your partner has exceeded her or his quota, you will have the chance of reporting her or him to the association’s board/SERNAPESCA ― again this is just a recreation given that the association’s board/SERNAPESCA is not really involved in this study. If you are selected as an inspector, $250 CLP will be added to your account. You can use them to report your partner if she or he has exceeded their quota. If you do not spend the $250 CLP in reporting your partner, they will be accumulated in your account. If the association’s board/SERNAPESCA is informed about a quota violation, it will punish the offender by seizing all their catch for that round, leaving that fisher with zero units of locos/ kilos of hake. In the game, the computer will play the role of the association’s board/ SERNAPESCA. Since the game is anonymous, no one will really know who exceeded their individual quota.

If you are being inspected in a given round, the screen will let you know that your catch is being inspected by other fisher, and you should wait in silence for the next screen. If you have been selected to remain inactive during this stage, it means you do not inspect anyone’s catch nor will someone inspect yours. The screen will ask you to wait in silence for the next screen.

After inspectors have decided whether to report, everyone will see a summary screen. As you can see, it will tell you:

* + The number of units of locos/kilos of hake that you harvested/fished in that round.
  + The number of units of locos/kilos of hake harvested/ fished, on average, by the rest of the members in your group in that round.
  + The number of units of locos/kilos of hake that you lost because of the overharvesting/overfishing of the other members of your group in that round.
  + Whether you have been reported to the association’s board/SERNAPESCA and your catch has been seized in that round.
  + The number of units of locos/kilos of hake that you ended up with and are available to be sold in that round.
  + The amount of money that you earned in that round.

Once everyone had read their results, the next round will start. Summarizing:

* + You have an individual quota of 100 units of locos/kilos of hake in each round.
  + You have the chance of harvest/fish beyond your quota up to 50 additional units of locos/ kilos of hake in each round.
  + For each additional units of loco/kilo of hake you overharvest/overfish the rest of the members in your group will lose half a unit of loco/kilo of hake from their catch in that round.
  + After everyone have entered their decisions, the computer will randomly assign two players as inspectors two as inspected, and one will remain inactive in each round. Each inspector will see the catch of an inspected
  + If the inspector sees that the inspected has exceed her or his quota, she or he can decide whether to report it to the association’s board/SERNAPESCA. The inspector will receive $250 CLP in her or his account that can be spent in reporting a quota violation. If the inspector does not use the $250 CLP for reporting, they will be accumulated in her or his account.
  + The association’s board will seize all the catch of a reported offender, including their individual quota.
  + We will pay you $10 CLP for each unit of loco/kilo of hake at the end of each round.
  + Your earnings will be accumulated during the 20 rounds of the game and will be paid privately at the end of the session.

Before starting you will play three trial rounds just to practice. These rounds are not for real money. Please rise your hand in silence if you have any question and wait until a monitor can assist you. Once the trial rounds are completed, the real game will start, and you will be playing for real money. Please remember that communication during the game is not allowed!

**Supplementary Figures**

**Imagen que contiene texto, mapa

Descripción generada automáticamente**

**Fig. S1**. Location of high-performance (white circles) and low-performance (dark gray circles) associations included in our sample.

**Supplementary Tables**

**Table S1.** Variables considered to assess association’s performance under CEAR. Adapted from Marín et al., (2012).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dimension** | **Variable** | **Survey question/ Source** | **Scale** | **Variable justification** |
| Social integration | Pride in TURF | In our organization we are proud  of our TURF | 4 = Highly agree to  1 = Highly disagree | More pride with TURF = higher recognition of fishers’ stewardship role in benthic  resources sustainability |
| Self-assessed compliance to  TURF’s rules | Our union members observe the management agreement to the  Letter | 4 = Highly agree to  1 = Highly disagree | More compliance = reduced poaching and better self-governance |
| Management capacity | Trend in official MEABR annual  TACs | SUBPESCA statistics | 1 = Increased  -1 = Decreased  0 = No significant trend | Biologically assessed TURF TACs maintained or increased =  sustained resources stocks |
| Third party assessed “star  associations” | TURFs considered successful/  model cases of co-management in each region | 1 = Star  0 = Other | Better current results = better perceived management capacities |
| Third party assessed current  performance of TURF | Which of these words better describe the overall performance of the associations’ TURFs? | 5 = Success  4 = Stability  3 = Improvement  2 = Stagnation  1 = Failure | Better future projections = better  perceived long-term management  capacities |
| Third party assessed future  projection of TURF | Assign a score to each organization reflecting its future projections with respect to their TURF performance? | 5 = Good performance to  1 = Bad performance | Better future projections = better  perceived long-term management  capacities |

Table S2. Non-parametric comparisons of the individual percent of compliance between treatments (i.e. CEAR vs. *pseudo*-OA), association types (i.e. high-performance vs. low-performance), and game stages (i.e. non-enforced vs. peer-enforced).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Treatment | Stage | Association type | Test | p value | Adjusted p value\* |
| CEAR vs. *pseudo*-OA | All rounds | High-performance | Wilcoxon test | 0.000 | 0.000 |
| CEAR vs. *pseudo*-OA | All rounds | Low-performance | Wilcoxon test | 0.204 | 1.000 |
| CEAR | All rounds | High- vs. low-performance | Wilcoxon test | 0.003 | 0.024 |
| *Pseudo*-OA | All rounds | High- vs. low-performance | Wilcoxon test | 0.638 | 1.000 |
| CEAR | Non- vs. peer-enforced | High-performance | Paired Wilcoxon test | 0.056 | 0.448 |
| *Pseudo*-OA | Non- vs. peer-enforced | High-performance | Paired Wilcoxon test | 0.020 | 0.160 |
| CEAR | Non- vs. peer-enforced stage | Low-performance | Paired Wilcoxon test | 0.019 | 0.153 |
| *Pseudo*-OA | Non- vs. peer-enforced stage | Low-performance | Paired Wilcoxon test | 0.577 | 1.000 |

\* P values were adjusted using the Bonferroni method for multiple hypotheses testing considering 8 hypotheses and a significance level equal to 5%.

Shaded rows show significant differences after correction for multiple hypotheses testing.

Table S3. Results of OLS regression models to test the effect of treatment and other relevant explanatory variables on the group percent of compliance per round.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Dependent variable:**  **Group percent of compliance** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| **CEAR treatment** | 18.28\*\*\* | 18.28\*\*\* | 18.28\*\*\* | 6.74\* | 6.74\* | 11.34 |
|  | *[13.56, 22.99]* | *[13.62, 22.94]* | *[13.63, 22.93]* | *[-1.21, 14.68]* | *[-1.19, 14.66]* | *[-3.44, 26.12]* |
|  |  |  |  |  |  |  |
| **Peer-enforced stage** |  | 6.78\*\*\* | 3.67 | 4.38 | 1.27 | 7.62 |
|  |  | *[2.12, 11.44]* | *[-4.97, 12.32]* | *[-3.57, 12.32]* | *[-9.41, 11.96]* | *[-7.16, 22.40]* |
|  |  |  |  |  |  |  |
| **High-performance association** |  | 5.17\*\* | 5.17\*\* | -5.50 | -5.50 | -7.94 |
|  |  | *[0.51, 9.83]* | *[0.52, 9.82]* | *[-13.44, 2.44]* | *[-13.42, 2.43]* | *[-22.72, 6.83]* |
|  |  |  |  |  |  |  |
| **Non-enforced rounds** |  |  | -1.10\* |  | -1.10\* |  |
|  |  |  | *[-2.25, 0.04]* |  | *[-2.23, 0.03]* |  |
|  |  |  |  |  |  |  |
| **Peer-enforced rounds** |  |  | -0.41 |  | -0.41 |  |
|  |  |  | *[-1.56, 0.73]* |  | *[-1.54, 0.72]* |  |
|  |  |  |  |  |  |  |
| **CEAR × Peer-enf. stage** |  |  |  | 3.27 | 3.27 | -8.04 |
|  |  |  |  | *[-5.90, 12.44]* | *[-5.88, 12.42]* | *[-25.10, 9.02]* |
|  |  |  |  |  |  |  |
| **CEAR × High-perf. assoc.** |  |  |  | 19.81\*\*\* | 19.81\*\*\* | 23.60\*\*\* |
|  |  |  |  | *[10.64, 28.98]* | *[10.66, 28.96]* | *[6.54, 40.66]* |
|  |  |  |  |  |  |  |
| **Peer-enf. stage × High-perf. assoc.** |  |  |  | 1.53 | 1.53 | 0.14 |
|  |  |  |  | *[-7.64, 10.70]* | *[-7.62, 10.68]* | *[-16.92, 17.21]* |
|  |  |  |  |  |  |  |
| **CEAR × High-perf. × Non-enf. rounds** |  |  |  |  |  | -2.02\* |
|  |  |  |  |  |  | *[-4.18, 0.14]* |
|  |  |  |  |  |  |  |
| **CEAR × High-perf. × Peer-enf. rounds** |  |  |  |  |  | 0.18 |
|  |  |  |  |  |  | *[-1.98, 2.33]* |
|  |  |  |  |  |  |  |
| **Pseudo-OA × High-perf. × Non-enf. rounds** |  |  |  |  |  | -0.06 |
|  |  |  |  |  |  | *[-2.22, 2.10]* |
|  |  |  |  |  |  |  |
| **Pseudo-OA × High-perf. × Peer-enf. rounds** |  |  |  |  |  | -0.57 |
|  |  |  |  |  |  | *[-2.73, 1.59]* |
|  |  |  |  |  |  |  |
| **CEAR × Low-perf. × Non-enf. rounds** |  |  |  |  |  | -1.62 |
|  |  |  |  |  |  | *[-3.78, 0.53]* |
|  |  |  |  |  |  |  |
| **CEAR × Low-perf. × Peer-enf. rounds** |  |  |  |  |  | 0.07 |
|  |  |  |  |  |  | *[-2.09, 2.23]* |
|  |  |  |  |  |  |  |
| **Pseudo-OA × Low-perf. × Non-enf. rounds** |  |  |  |  |  | -0.70 |
|  |  |  |  |  |  | *[-2.86, 1.46]* |
|  |  |  |  |  |  |  |
| **Pseudo-OA × Low-perf. × Peer-enf. rounds** |  |  |  |  |  | -1.32 |
|  |  |  |  |  |  | *[-3.48, 0.84]* |
|  |  |  |  |  |  |  |
| **Constant** | 46.18\*\*\* | 40.21\*\*\* | 45.16\*\*\* | 46.36\*\*\* | 51.31\*\*\* | 49.28\*\*\* |
|  | *[42.85, 49.51]* | *[35.55, 44.87]* | *[38.22, 52.10]* | *[40.29, 52.43]* | *[43.42, 59.21]* | *[38.00 60.57]* |
|  |  |  |  |  |  |  |
| **Nm. Observations** | 480 | 480 | 480 | 480 | 480 | 480 |
| **R2** | 0.11 | 0.13 | 0.14 | 0.16 | 0.17 | 0.18 |
| **AIC** | 4,504 | 4,495 | 4,495 | 4,483 | 4,482 | 4,491 |
|  |  |  |  |  |  |  |

Each model presents a different combination of explanatory variables. Variables “CEAR treatment”, “High-performance association”, and “Peer-enforcement stage” are dummy variables while “Non-enforced rounds” and “Peer-enforced rounds” enumerate rounds of the game in each stage (from 0 to 9). Standard errors are robust and shown in parentheses. Significance levels are represented by the following notation \*\*\* = p < 0.01, \*\* = p < 0.05, \* = p <0.1. Note that the dependent variable is a percent. The shaded column shows the most parsimonious model based on Akaike’s information criteria (i.e. the model with the lowest AIC score).

Table S4. Non-parametric comparisons of the individual probability of reporting between treatments (i.e. CEAR vs. *pseudo*-OA) and association types (i.e. high performance vs. low performance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatment | Association type | Test | p value | Adjusted p value \* |
| CEAR vs. pseudo-OA | High-performance | Wilcoxon test | 0.027 | 0.108 |
| CEAR vs. pseudo-OA | Low-performance | Wilcoxon test | 0.217 | 0087 |
| CEAR | High- vs. low-performance | Wilcoxon test | 0.004 | 0.016 |
| Pseudo-OA | High- vs. low-performance | Wilcoxon test | 0.015 | 0.062 |

\*P values were adjusted using the Bonferroni method for multiple hypotheses testing considering 4 hypotheses and a significance level equal to 5%.

Shaded rows show significant differences after correction for multiple hypotheses testing.

Table S5. Results of OLS regression models to test the effect of treatment and other relevant explanatory variables on the group probability of reporting per round.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent variable:**  **Group probability of reporting** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** |
| **CEAR treatment** | 0.21\*\*\* | 0.21\*\*\* | 0.22\*\*\* | 0.24\*\*\* | 0.10 | 0.12 |  |  |
|  | *(0.06)* | *(0.06)* | *(0.06)* | *(0.06)* | *(0.08)* | *(0.08)* |  |  |
|  |  |  |  |  |  |  |  |  |
| **Round** |  | -0.01 |  | -0.01 |  | -0.01 |  | -0.01 |
|  |  | *(0.01)* |  | *(0.01)* |  | *(0.01)* |  | *(0.01)* |
|  |  |  |  |  |  |  |  |  |
| **Mean observed overharvest** |  | 0.00 |  | 0.00 |  | 0.00 |  | 0.00 |
|  |  | *(0.00)* |  | *(0.00)* |  | *(0.00)* |  | *(0.00)* |
|  |  |  |  |  |  |  |  |  |
| **High-performance asso.** |  |  | 0.24\*\*\* | 0.24\*\*\* | 0.13\* | 0.13\* |  |  |
|  |  |  | *(0.06)* | *(0.06)* | *(0.07)* | *(0.07)* |  |  |
|  |  |  |  |  |  |  |  |  |
| **CEAR × High-perf. asso.** |  |  |  |  | 0.25\*\* | 0.26\*\* |  |  |
|  |  |  |  |  | *(0.11)* | *(0.11)* |  |  |
|  |  |  |  |  |  |  |  |  |
| **Pseudo-OA × High-perf. asso.** |  |  |  |  |  |  | -0.35\*\*\* | -0.37\*\*\* |
|  |  |  |  |  |  |  | *(0.08)* | *(0.08)* |
|  |  |  |  |  |  |  |  |  |
| **CEAR × Low-perf. asso.** |  |  |  |  |  |  | -0.37\*\*\* | -0.38\*\*\* |
|  |  |  |  |  |  |  | *(0.08)* | *(0.08)* |
|  |  |  |  |  |  |  |  |  |
| **Pseudo-OA × Low-perf. asso.** |  |  |  |  |  |  | -0.48\*\*\* | -0.50\*\*\* |
|  |  |  |  |  |  |  | *(0.08)* | *(0.08)* |
|  |  |  |  |  |  |  |  |  |
| **Constant** | 0.28\*\*\* | 0.43\*\*\* | 0.16\*\*\* | 0.27\*\* | 0.22\*\*\* | 0.32\* | 0.69\*\*\* | 0.82\*\*\* |
|  | *(0.04)* | *(0.17)* | *(0.05)* | *(0.17)* | *(0.05)* | *(0.08)* | *(0.06)* | *(0.16)* |
|  |  |  |  |  |  |  |  |  |
| **Nm. Observations** | 187 | 187 | 187 | 187 | 187 | 187 | 187 | 187 |
| **R2** | 0.06 | 0.06 | 0.15 | 0.14 | 0.16 | 0.17 | 0.16 | 0.17 |
| **AIC** | 190 | 192 | 173 | 175 | 170 | 172 | 170 | 172 |
|  |  |  |  |  |  |  |  |  |

Each model presents a different combination of explanatory variables. Variables “CEAR treatment”, “Low-performance asso.”, and “High-performance asso.” are dummy variables while “Round” enumerate rounds of the game in the peer-enforced stage (from 0 to 9), and “Mean observed overharvest” is the mean overharvest observed by inspectors in a given group and round. Standard errors are robust and shown in parentheses. Significance levels are represented by the following notation \*\*\* = p < 0.01, \*\* = p < 0.05, \* = p <0.1. The shaded columns show the most parsimonious model based on Akaike’s information criteria (i.e. the model with the lowest AIC score).

Table S6. Non-parametric comparisons of the individual percent of compliance between the first and the last round in each stage for each treatment-association type combination.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Treatment | Stage | Association type | Test | p value | Adjusted p value\* |
| CEAR | Non-enforced | High-performance | Paired Wilcoxon test | 0.001 | 0.007 |
| CEAR | Peer-enforced | High-performance | Paired Wilcoxon test | 0.272 | 1.000 |
| CEAR | Non-enforced | Low-performance | Paired Wilcoxon test | 0.061 | 0.488 |
| CEAR | Peer-enforced | Low-performance | Paired Wilcoxon test | 0.695 | 1.000 |
| Pseudo-OA | Non-enforced | High-performance | Paired Wilcoxon test | 0.519 | 1.000 |
| Pseudo-OA | Peer-enforced | High-performance | Paired Wilcoxon test | 0.254 | 1.000 |
| Pseudo-OA | Non-enforced | Low-performance | Paired Wilcoxon test | 0.111 | 0.890 |
| Pseudo-OA | Peer-enforced | Low-performance | Paired Wilcoxon test | 0.421 | 1.000 |

\*P values were adjusted using the Bonferroni method for multiple comparisons considering 8 hypotheses and a significance level equal to 5%. Shaded rows show significant differences after correction for multiple hypotheses testing.