Legitimacy, Local Participation, and Compliance in the Galapagos Marine Reserve[*]

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Abstract: We analyze the compliance behavior of the small-scale fishery boat-owners of the Galapagos Marine Reserve. Our empirical analysis considers aspects related to the participatory management system of the reserve as determinant factors of the decision to violate the regulations. The econometric results indicate that, along with surveillance and fines, the level of legitimacy that norms have among the boat-owners, the sense of belonging of individuals, the legitimacy of their local organizations, as well as their participation levels in these organizations are additional determinant factors in the decision to transgress the agreed regulations. Policy recommendation to improve compliance are also discussed.

Key Words: local participation, compliance, legitimacy, natural resource management.
JEL Classification: Q22, K42, C52.

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1. Introduction

The objective of this paper is to develop an empirical study of the behavior of the boat-owners of the small scale fishery fleet of Galapagos (SSFFG) in relation to their decision to transgress the regulations.[1] The analysis is devoted to identify the decisive factors that motivate the decision to infringe the current regulations, and to estimate the effect of these factors on this decision. Concerning the decision to transgress the regulations, the study puts special emphasis on estimating the impact of the following: the participation of boat-owners in the institutions that comprise the participatory management system of the Galapagos Marine Reserve (GMR), the perception of boat-owners regarding the legitimacy of regulations, and the traditional enforcement instruments available for the authority (surveillance and fines). The empirical analysis is based on the theoretical contribution regarding the behavior of an individual fisherman proposed by Sutinen and Kuperan (1999).

The paper is organized in five sections. In section 2 we briefly describe the regulatory system currently used in the GMR. Section 3 contains a description of the theoretical model on which the empirical analysis regarding the decision of infringing the regulations is based. The theoretical specification is used to perform an empirical analysis of the effect of the independent variables on the decision to transgress the agreed regulations. This section concludes with an econometric specification used in the empirical analysis.

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[1] In this document, the term "boat-owner" refers to a small-scale fishery boat-owner from Galapagos.

Section 4 addresses the empirical verification of the model. In this section we present the results of the econometric estimations of the boat-owners' decision model. The results allow us to evaluate the relevance of the different variables included in the model, with a particular emphasis on those related to traditional enforcement activities and to the participatory management system of the GMR. As a result, aspects such as surveillance, the application of fines, the legitimacy of the norms, the sense of ownership to the community and participation in the local organizations that comprise the system, are evaluated on their contribution to reduce the transgressions of the regulations.

Finally, in section 5 we discuss conclusions that arise from this analysis. In addition, we present some insights on policy options to improve the compliance of the fishery regulations in the GMR.

2. Management System in the Galapagos Marine Reserve (GMR).

The management system in Galapagos is an innovative experience in the management of natural resources and one of the few examples in Ecuador and in the world in which the management scheme incorporates the rights and responsibilities of local users in the decision-making process of the administration of a protected area (Heylings and Bravo, 2002). The management system was established as part of the Law of the Special Regime for the Conservation and Sustainable Development of the Province of Galapagos (LSRCG) in 1998, to face the existing conflicts of the use of natural resources among antagonistic groups of the marine reserve and, as a strategy, to obtain local users' commitment towards the decisions and regulations devoted to improve the management and conservation of natural resources, as well as to promote compliance of these

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regulations[2]. The LSRCG contains a series of instructions that seek to delegate decision-making of natural-resource management, especially fishery resources, to a local coordination body constituted by representatives of the tourism sector, the small-scale fishery sector and the conservation sector. In addition, the Law grants to the Galapagos National Park (GNP) the authority and the instruments required to promote the implementation of regulations and decisions agreed to by the mentioned sectors.

In regard to small-scale fishery, the LSRCG establishes two main aspects with the aim to regulate the use of fishery resources in the marine reserve. First, the Law considers the establishment of a local management regime of a common property resources with an identified and limited group of users. In this sense, the LSRCG restricts fishery activities in the area of the GMR to small-scale fishery, as it is defined in the Management Plan (Article 42, LSRCG) and applies entrance barriers to small-scale fishery through the imposition of a series of requirements that affect both fishermen and boats.

Second, the Law establishes a scheme of decision-making for the control of small-scale fishery activities[3]. This consists of the involvement of local fishermen in the

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[2] These aims are reflected in the vision of the new management regime elaborated by the *Grupo Núcleo* (group made up of representatives of the fishery and tourism sectors in the Galapagos, the Charles Darwin Foundation, the GNP and the Fisheries Bureau) in June 1997. The vision highlights the effective participation of local sectors in decision-making as a key element to promote local commitment towards the compliance of the regulations (Heylings, *et al.* 1998).

[3] The decisions agreed upon to regulate small-scale fishery have their origin in the participatory management system established by the LSRCG, which works through three levels: 1) the GNP, who is responsible for the administration of the area and the control of natural-resource management; 2) the Inter-Institutional Management authority (IMA), which is comprised of institutions which have competence and control over the area; it is also the top level agency for policy making in regard the management of the GMR; and 3) the Participatory Management Board (PMB), the body that channels the responsible participation of local users of the reserve, including small-scale fishermen. Decision-making begins with a participatory process in which local users of the reserve submit their proposals to the PMB to be discussed. The decisions agreed upon by consensus in the

decision-making process through the Participatory Management Board where several aspects related to the development of fishery activity are analyzed in this body and subsequently proposed to the Inter-institutional Management Authority (IMA). The decisions taken in this regard are summarized in the fishery calendar, which is the instrument that contains information about which kind of species to catch, their quotas and seasons. Once approved by the AIM, the fishery calendar becomes the "rules of the game" which the small-scale fishermen must obey.

Furthermore, the LSRCG designates the Galapagos National Park Direction (GNPD) as the organism in charge of the administration and control of the GMR. With these aims, the GNPD should keep records of and regulate the number of individuals involved in small-scale fishery; control the activities that are carried out in the reserve through a surveillance and patrol program; and in the case that an infraction be detected, establish administrative procedures against the offenders and apply the sanctions described in the LSRCG.

In an peer review of the strategies and activities performed by the management authority to promote compliance of regulations among the boat-owners of the SSFFG, Viteri and Chávez (2002) analyze the results of such activities and identify, in a preliminary way, factors that impact the decision to comply with the regulations. This study, of descriptive nature, concludes that while the activities of surveillance and patrolling achieve a detection level of 6% of the fleet concerning transgressions of fishery regulations, the occurrence of transgressions could be larger. In addition, according to responses obtained from a field survey directed to the boat-owners of the SSFFG (see section 3.3) the self-

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PMB pass to the IMA for their approval by voting. Inside, the PMB the GNP behaves as any other stakeholder seeking a consensus; in the IMA, the GNP serves as Technical Secretariat. Then, the GNP is responsible for implementing the decision made, with the support of the co-responsible stakeholders in the system. (Heylings and Bravo, 2002).

declared rate of regulation transgressions is close to 30% of the total boat-owners,

suggesting that the objective to reduce the occurrence of transgressions to the agreed

fishery regulations is not bounded just to improve logistical or technical aspects to increase

the surveillance capacity of the authority, but also to address social and economics aspects.

The preliminary evidence on the observed infraction levels to the fishing norms in the

GMR, encourage us to analyze with more detail the determinant factors that motivate the

boat-owner to transgress the agreed norms.

3. Behavior of the Fishery Boat-Owner

In this section, we describe the theoretical model regarding the decision of the

individual to infringe the regulations, in which our empirical analysis is based. We briefly

disccuss a deterrence model, where the infraction decision is motivated by purely economic

variables (expected costs and benefits of transgressing the regulations) as well as social

variables, which we consider to be decisive for the transgression decision[4]. Then, we

specify an econometric model to carry out the empirical verification.

3.1 Individual decision to transgress the regulations.

The literature on common-property resources that analyze the performance of

governing systems, suggests that compliance of regulations does not depend only on

economic variables, such as the expected earnings of illegal activity or fines faced by the

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[4] The literature of common-property resources that analyze the performance of governing
systems suggests that compliance of regulations does not depend only on economic
variables, such as the expected earnings of illegal activity or fines faced by the offender,
but also on social variables such as legitimacy of the regulations, local control, membership
of a community, participation levels, degree of the individual's moral development and
social pressure. [See: Bardhan (1993), Sutinen and Kuperan (1999), Beckenkamp and
Gümbel (2000), Cardenas *et.al*. (2000), Hatcher *et. al* (2000)].

offender, but also on social variables such as legitimacy of the regulations, local control, membership of a community, participation levels, degree of the individual's moral development and social pressure. [See: Bardhan (1993), Sutinen and Kuperan (1999), Beckenkamp and Gümbel (2000), Cardenas *et.al*. (2000), Hatcher *et. al* (2000)].

Our conceptual understanding of the individual decision to transgress the regulations is primarily based the contribution of Sutinen and Kuperan (1999). The model explains the fisherman's behavior facing the decision of infringing the norms; it merges the basic deterrence model with intrinsic and extrinsic motivations that influence the individual's decision of whether to obey the law.

Specifically, to evaluate the influence of social factors in the decision to comply with norms, Sutinen and Kuperan (1999) extend the clasical deterrence model of Becker (1968) by explicitly considering two additional factors: the moral and social reputation of the individual. The first factor describes how the compliance decision is influenced by individual's moral development, personal values and perception of the legitimacy of the norm. The second factor attempts to reflect how social pressures inside the community affect to the individual's decision [5].

Likewise, Bardhan (1993) suggests that the compliance of social norms will depend on, among other aspects, the level of legitimacy of the norm, the institutions which promote that norm and the level of ownership of the individual to the community. Hatcher *et. al*. (2000) underlines that it is frequently suggested in the current literature of fishery

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[5] In the same line, Hatcher *et. al* (2000) analyze the non-monetary factors that affect the compliance of a catch quota among fishermen of the United Kingdom. Their model, as in the model of Sutinen and Kuperan (1999), is an extension of the basic deterrence model to evaluate the influence to compliance of moral obligation, peer attitudes and perceived legitimacy of the norm. In this case, the authors show that a better level of involvement of

management with local focus on "co-management" that broader participation of fishermen in the management process results in an increment of compliance levels due to the regulations being agreed upon with more legitimacy. This fact can be understood as the individual feeling a moral commitment towards the compliance and success of the regulations, under the premise that when an individual identifies with a regulation and he does not feel it to be an obstacle to his freedoms imposed by some external body; this regulation is more likely to be successful[6].

According to Sutinen and Kuperan (1999), the inclusion of the individual's social reputation and their commitment to the institutional framework results in two effects. First, the number of offenders decreases because the condition for the decision about infringing the norms is stricter than in the simple case of the classic model of deterrence. Second, since in the extended model the marginal costs of infringing are larger than the marginal costs of infringing in the context of the classic model of deterrence, the magnitude of the infraction decreases because fishermen allocate less effort to illegal activities.

Thus, following the analysis of the fisherman's compliance decision carried out by Sutinen and Kuperan (1999) and Hatcher *et. al*. (2000), and from considering the participatory management system of the GMR and its potential effects over the compliance decision, we consider a set of social factors that we presume influence the individual's behavior: legitimacy of regulations and institutions related to fishery management; the

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individuals in the management process leads to better compliance levels since the regulations will be accepted with more legitimacy.
[6] Cárdenas, Stranlund and Willis (2000) introduce a similar proposition in their conclusions. In addition, it is worth reviewing Martin Beckenkamp y Wiebke Gümbel (2000) who addressed the issue of freedom losses due to external regulations and their effect on an individual's behavior in the framework of common property resources.

boat-owner's sense of belonging to the community; and the boat-owner's participation in local organizations.

3.2 Hypothesis

The empirical analysis is guided by the theoretical response observed in boat-owner compliance behavior when changes are perceived in independent variables. As in Sutinen and Kuperan (1999), we denote Y^* as the difference between the maximum expected utility transgressing the regulations and the maximum utility the individual gains by obeying the regulations; that difference is likely to depend on variables such as the price of landings (p), the surveillance effort from regulatory authority (probability of detection and conviction) (v), the magnitude of fine ($\bar{f}$), the cost structure linked with the characteristics of the vessel (size, power, employees, storage capacity, etc) ($\bar{k}$), the legitimacy of the current regulations (l), the sense of belonging of the individual in the community (s), the participation level that the individual has in the institutions involved in the creation of the norm (u), and a set of characteristic of each individual ($\bar{a}$), that is:

$$Y^*(p,v,\bar{f},\bar{k},l,s,u,\bar{a}) \qquad [1]$$

We interpret Y^* as the magnitude of the incentive that individuals have to not respect the rules and to allocate effort to illegal fishing activity; it means that if the difference is positive then there are incentives to make infractions (If $Y^* \geq 0$, individuals infringe the regulation). It can be shown that the magnitude of the incentive to infringe diminishes as result of increases in the surveillnce effort from the regulatory authority (detection and conviction probability), as well as for positive changes in the magnitude of the fine. The same effect is observed when we consider social variables, thus the incentive to infringe responds negatively to variations on the legitimacy of norms, the sense of

belonging of individual, and the individual's participation levels on the institutions that generate the norms.[7]

3.3 Econometric model specification and data description

In this section, we are interested in evaluating the probability of violating an agreed regulation by a boat-owner of the small scale fishery fleet of Galapagos. The equation we use to evaluate the decision to transgress a regulation is[8]:

$INFRACTION_i= INFRACTION$ [ZONE, MOTORHP, AGE, PROB1, PROB2, PROB3, PUNISH, FINE, STORAGE, DAYCOST, CAPITAL, INDEBT, PRICEIND, MARRIED, [2] FAMILIA, EDUCACI, ISLAND1, REGGRL, REG_SH, REG_SE, REG_SC, OTROS, JMPAIM, LEAD_REP, NATIVO, MOVECONT, YRSMIG, FISHEXC, YRSEXP, COOPDIR, ATTEND].

Where, $INFRACTION$ is equal to one if the fisherman violates the regulations, otherwise the variable takes a value of zero. Assuming a normal distribution of errors, the probability of observing $INFRACTION_i = 1$ is given by the value of the normal distribution function evaluated with the estimated parameters coming out from the equation [2].

The data used in the estimates are from the field survey directed to the boat-owners of the SSFFG done in September 2002. The survey was carried out thanks to the collaboration of the Galapagos Small-Scale Fishermen Cooperatives: COPESPROMAR (acronym in Spanish), Cooperative of Fishery Production "San Cristóbal"(COPESAN, acronym in Spanish), Cooperative of Fishery Production Horizons of Isabela, and Cooperative of Galapagos Small-Scale Fishery Production (COPROPAG, acronym in Spanish); and the Participatory Management Board. The survey was confidential; as a result, no data that could reveal the identity of the boat-owner was requested. In addition,

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[7] Comparative static results were obtained by Sutinen and Kuperan (1999).
[8] The meaning of each variable can be observed in Table 1(a).

the survey design allowed the boat-owner to fill out the survey on his own[9]. We got, 155

observations of a population of 426 small-scale boat-owners registered by the Unit of

Marine Resources of the GNP.[10]

The survey included several sections that address different topics. In the first

section, the survey requested information about the characteristics of the boat-owners and

their families. The second section asked data about technical characteristics of the boat and

details of the fishery activity. The third section inquired about the boat-owners' perception

of the surveillance activities performed by the authority. The fourth section interrogated

the boat-owners about their behavior in regard to the compliance of regulations; the last

section asked boat-owners about their perception regarding the fishery regulations, the

management authorities, the fishermen cooperative and their participation in these

organizations.

In the section about compliance, the survey asked boat-owners to choose a sentence

that best described their fishery activity in the last season (2001); it also asked them directly

if in the last season the boat-owner committed some of the most frequent infractions

according to the records of the GNP's patrolling reports. Thus, with the information

collected, we proceeded to classify the boat-owner as offender or non-offender. We define

an offender to be any individual who stated that, in the last season, their fishery activities

"rarely fulfill the regulations, because there are too many stipulations", or who stated

directly that they have carried out some activity judged as an infraction.

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[9] To maintain confidentiality, the results of this paper do not refer to any specific town.
[10] In the sampling, we employed stratified sampling technique (Scheaffer, 1986). The
sample was divided into three strata according to boat type (*boat, fibra* and *panga*); to make
this division we used the detection variances observed in each boat type group of boat-
owners. Additionally, the selected strata were distributed proportionally among the three

In Tables 1(a) and 1(b), we present a description of the variables used in the econometric estimations with their possible values and a description of basic statistical information (average and standard deviation). Table 1(a) is divided in two sections. The first section shows the dependent variable (INFRACTION) that represents the decision to infract a regulation. The second section shows, contained in blocks, the explanatory variables used for the estimate. Each block represents an element of the vector of independent variables specified in the theoretical model: $v, \bar{f}, \bar{k}, p, \bar{a}, l, s, u$.

Thus, block I *"Probability of Detection and Punishment (v)"* contains the variables ZONE, MOTORHP, AGE, PROB1, PROB2, PROB3, and PUNISH; and attempts to represent the perception of each boat-owner regarding the probability that an offender is detected and punished. Block II *"Magnitude of the fine ($\bar{f}$)"* contains the variable FINE, and represents the size of the fine perceived by the boat-owners. Block III *"Structure of Costs ($\bar{k}$)"* includes STORAGE, DAYCOST, CAPITAL, INDEBT; and indicate the cost structure faced by the boat-owners. The block IV *"Structure of Prices (p)"* has the variable PRICEIND ; which is an indicator of market prices that the boat-owner observe of the caught species. Block V *"Individual Characteristics ($\bar{a}$)"* contains MARRIED, FAMILIA, EDUCACI, ISLAND1; these describe the personal features, family characteristics and place of residence of each boat-owner. Block VI *"Legitimacy of the Regulations and Authorities that promote them (l)"* includes: REGGRL, REG_SH, REG_SE, REG_SC, OTROS, JMPAIM, LEAD_REP; which represents the degree of legitimacy that regulations and authorities that promote them have among the boat-owners. Block VII *"Sense of Ownership to the community (s)"* contains the variables: NATIVO, MOVECONT,

towns. The sample size resulted in 148 observations of a population of 426 boat-owners,

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YRSMIG, FISHEXC, YRSEXP; and represents the level of ownership of the boat-owner

towards his town and union. Finally, block VII *"Participation (u)"*, includes: COOPDIR,

ATTEND, attempts to indicate the degree of involvement of the boat-owner in the local

organizations (cooperatives). Additionally, Table 2(b) exhibits the expected signs of the

parameters resulting from the econometric regressions.

Insert Table 1(a)
Insert Table 1(b)

4. Econometric Results

This section first presents the econometric results obtained from the estimation of

the decision model of the infringement of fishery regulations by the SSFFG.   Secondly,

based on the previous estimations, the impact of the independent variables on the decision

to violate is quantified.

4.1 Estimation results of the decision model of the infringement of fishery regulations

Due to the dichotic nature of the dependent variable, a PROBIT model was

employed to carry out the estimations. Table 2 shows the results corresponding to two

models. The first, Model 1, is estimated according to the original specification of equation

[2]. Model 2 incorporates the elimination of certain variables based upon the results of the

first model: variables that were determined to be non statistically significant, highly

correlated variables and the variable PUNISH that obtained a sign that was contrary to what

was expected[11]. This way, a simpler specification of the model was obtained[12].

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with a theoretical error of 3% and a confidence level of 95%.

[11] This variable does not adequately represent the factor that we wish to represent: the existence of previous experience with authorities increases the certainty of being punished, which would thus have an effect on the probability of being detected and punished for committing an infraction. This is probably due to a spurious relation between CSTIGANT and the dependent variable.

Insert Table 2

To evaluate the relevance of the econometric specification of the model, it is useful to focus on two elements of Table 2. First, the maximum-likelihood statistic whose χ^2 value is presented to test the global significance of the model through the evaluation of the following null hypothesis: $H_o : \beta_1 = \beta_2 = ... = \beta_k = 0$, where k = number of parameters in the model. Due to the fact that the in the two cases, the statistic is higher than the critical value, the null hypothesis is rejected and thus we can affirm that the parameters estimated together are statistically different to zero and therefore both models are relevant when explaining the decision to infringe by the small-scale boat-owners..

The second relevant indicator that suggests to us the appropriateness of the model is the percentage of correctly predicted observations: 85.5% for the first model and 80.5% for the second. This tells us that both models, based on the information of the independent variables, can correctly forecast the individual's compliance decision in more than 80% of the observations.

It is interesting to highlight that the majority of the individual estimated parameters turned out to be statistically significant and to have the expected signs according to the

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[12] The variables with high correlation were: ANIOSMGR with NATIVO; and ANIOENPE with EDAD. Highly correlated variables were considered to be those variables with correlation coefficients higher than 0.5. Furthermore, in order to avoid the omitted variable problem, a omitted variable test was carried out before the elimination of each variable. Here, the evaluated null hypothesis $H_o : \beta_i = 0$, against the alternative hypothesis $H_1 : \beta_i \neq 0$. For this, we use the maximum-likelihood $MV = -2.(\ln L_R - \ln L_{NR})$, which has a χ^2 distribution; its critical value with 1 degree of freedom is 3.84 (at 5% level of significance). As a result, H_o was not rejected. Furthermore, the Wald-statistic was calculated to evaluate the null hypothesis that the parameters of the 20 variables eliminated as one group are all equal to zero. The value obtained was 22.44 for which the null hypothesis is not rejected [critical value at the 5% significance level is $\chi^2_{(20)} = 31.41$], that is to say, the 20 parameters of the variables equal to zero as a group.

related literature. If we consider the parameters that turned out to be relevant taking into account the blocks in which the independent variables were, it can be noted that all blocks had at least one relevant variable except for Block IV "Structure of prices", which is to say that the factors considered in the theoretical model are relevant to the individual's decision to infringe. In Block I "*Probability of Detection and Punishment",* the variable PROB1 was relevant and had the expected sign. For Block II "*Magnitude of the fine ($\bar{f}$)",* FINE was relevant and had the expected sign. In the case of Block III "*Structure of Costs ($\bar{k}$)",* only the variable STORAGE was relevant with the expected sign; this can be easily explained by the correlation that may exist between the variables of this block, since, for example, a large storage capacity may be related to high costs and a higher capital investment. Block IV which contains the INDPREC obtained an expected sign, however it was not statistically relevant; probably due to its elaboration this variable does not adequately reflect the economic incentives for the boat-owner to transgress the regulations[13].

The results obtained in these first four blocks confirms the relevance of the probability of detection, the amount of the fine, and economic considerations as determinant in the decision to infringe.

The variables ISLAND1 and EDUCACI from Block V "*Individual Characteristics ($\bar{a}$)",* were registered as statistically relevant with positive signs. This is to say that

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[13] It should be remembered that the variable INDPREC (price index) is constructed based on market prices of the species that the boat-owners are dedicated to catch and weighted by the percentage that each species represents in the total capture. Other authors who analyze the price effect on compliance levels of boat-owners concentrate one or two types of infraction and try to reflect the economic incentive for the boat-owner to infringe by identifying any difference that may exist between mean productivity of legal and illegal activities.

individuals that reside on that specific island or those with a higher level of education are more likely to infringe than the rest of the boat-owners who do not display these characteristics. For Block VI, "*Legitimacy of the Regulations and Authorities that promote them"*, the following variables were observed to be relevant with the expected sign: REGGRL, REG_SC, OTROS y LEAD_REP. Block VII, "*Sense of Membership of the community(s)"*, as contains various relevant parameters (YRSMIG and YRSEXP),and have the expected sign. For the last block *"Participation (u)"* the variable ATTEND turn out to be relevant with the expected sign. As in the case of the previous blocks, the results obtained from blocks VI–VIII of special importance because they corroborate the results obtained in different studies of the management of local common resources which highlight the importance of social factors such as legitimacy, membership and participation, on the decision of the compliance of norms.

4.2 Effect of the independent variables on the decision to infringe.

Considering the results of estimation of the decision model for the small boat-owners of the LSRCG, we proceeded to calculate the marginal effects of the relevant variables on the infringement decision. The importance of evaluating these marginal effects lies in desire to appreciate the isolated effect of one independent variable over the dependent variable. Table 3 shows the results of the marginal effects obtained for each variable – we can see that there is no great difference between the results obtained for model 1 and model 2 in respect to the relevant variables. Therefore, only comments regarding the results of model 2 will be presented.

In Block I *"Probability of Detection and Punishment (v)",* the variable PROB1 has a marginal effect over the probability of infringement of –0.14. This is to say that boat-

owners who affirm that they have seen with some frequency the surveillance of the GNP

and the National Navy have 0.14 less probability of committing a transgresion. For Block

II *" Magnitude of the fine ($\bar{f}$)"* the variable FINE has a marginal effect of –0.25 , while in

Block III "*Structure of Costs ($\bar{k}$)",* the proxy STORAGE reaches a marginal effect of

0.04. This is to say that those individuals that consider the GNP fines to be high have a

0.25 lower probability of transgression. Furthermore, when considering storage space, we

observe that the probability of infringement increases by 0.04 for each metric-ton

increment.

In the following group of variables from Block V *"Individual Characteristics ($\bar{a}$)",*

the variables EDUCACI and ISLAND1 obtained marginal effects of 0.04 and 0.30,

respectively. This indicates that for each additional year of education, the probability of

infringement rises by 0.04[14]. Also, if the boat-owner resides on Island 1, the probability of

infringement increases by 0.30. Block VI " *Legitimacy of the Regulations and the*

Authorities that promote them (l)", presents the marginal effects of the variables:

REGGRL (-0.19), REG_SC (-0.26), LEAD_REP(-0.35) y OTROS (0.21). These results

indicate that boat-owners who display some of affinity with the regulations in general

(REGGRL), or with the sea-cucumber regulations (REG_SC), have a transgression

probability that is 0.19 and 0.26 lower, respectively. The same occurs with those who

consider that the boat-owner leadership represents their interests since their probability of

transgression decreases by 0.35. The contrary occurs with those individuals who declare

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[14] This result is counter-intuitive; it is normally expected that an individual with a higher
level of education respects the laws and regulations more. Nevertheless, it is necessary to
understand this result within the context of the operation of the participatory management
system of the Galapagos since a more detailed analysis suggests that those with a higher

that other fishermen commit infractions (OTHER), since in this case the infringement

probability increases by 0.21. In Block VII *"Sense of membership within the community*

(s)" the variables YRSMIG and YRSEXP, obtained marginal effects of 4.1 and 0.01,

respectively. The result of 4.1 for YRSMIG means that a unitary change of this indicator

throws us outside the upper limit of the probability interval. For example, if we consider

the extreme case of a recent arrival, that is to say and individual with an immigration

indicator equal to 1, this individual exhibits a probability of infringing close to or equal to

the upper limit of the probability interval (that is, 1) which will always be higher than any

other fisherman who has resided in the islands for a longer time.[15] Analogically, it is

important to highlight the marginal effect of YRSEXP since it expresses that a unitary

increase in the years of fishery experience reduces the infringement probability by 1%.

Finally, in Block VIII *"Participation (u)"* the variable ATTEND has a marginal effect of

–0.24, which means that the boat-owners who attend the co-operative meetings also display

a 0.24 lower probability of infraction.

Insert Table 3

Using the coefficients obtained in the econometric estimation of Model 2 of the

decision model of reported infractions shown in Table 2, and considering the sample

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education are also more critical of the regulations and their own leader (see conclusions in
section 5).

[15] Remember that ANIOSMGR is an immigration index that is constructed as:: 1/(Number
of years residency in the Galapagos). The index adopts the value of zero en the case of
natives and one for recent immigrants with a residency of one year. This index is not very
sensitive to the variance of years of residence on the islands, thus we see that for the
interval of migration years observed in the sample – 1 to 53 years – the average increment
of the index is very small (0.0185) for each year less of residency. Hence, if we multiply it
with the marginal effect (4.102), we obtain a percentage increase of 0.08 in the probability
of infraction. This is to say, a unitary change in the number of years of immigration, on
average within the interval (1-53 years) leads to an increase of 8% in the probability of
infringement.

averages of the selected variables presented in Table 1(b), we can write the probabilities of

infraction of the fishery regulations of the SSFFG in the year 2001, as:

Probability(INFRACTION=1)= Φ [-0.695-0.528* PROB1 –0.917* FINE+0.144* 1.841+0.127* 10.058+1.091* ISLAND1-0.710*REGGRL-0.947 REG_SC+0.782* 0.721-1.276* LEAD_REP+15.04* YRSMIG-0.033* 19.604-0.864 *ATTEND]. [3]

With the purpose of enriching the analysis and highlighting the effect that the

economic and social factors have on the decision of compliance, Table 4 presents the

estimated probabilities of transgressing the regulations for various categories of boat-

owners. Initially the boat-owners were divided in two groups: recent immigrant (7.5 years

of residence[16]) and natives of the Galapagos Islands[17]. This first differentiation between

individuals complies with the fact that the marginal effect of YRSMIG is very strong; for

this reason in an initial phase of the study, the existence of a structural difference between

the group of natives and migrants was suspected. Nevertheless, the statistic that was

calculated to evaluate whether the infraction decision is based on being an immigrant, does

not cast enough evidence to affirm the existence of structural differences.

Additionally, within the immigrant and native groups, the individuals were

differentiated according to their perception of the authorities' vigilance, their perception of

the size of fines, their place of residence, their affinity to the regulations and leadership of

fishery co-operatives, and their participation in co-operative meetings. These divisions

generated 12 profiles with the peculiarity in that each individual within the immigrant

group has a counterpart within the native group. Finally, the probability of infraction was

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[16] The immigration index (ANIOSMGR) in this case is 0.133. The number of yeas residency considered (7.5) is consistent with the expansion of migration registered in the 1990s.
[17] The immigration index (ANIOSMGR) for natives of the islands is 0.

calculated for each individual profile using expression [3]. These results are presented in

Table 4.

Within the group of recent immigrants, a probability of infringement is shown for

individual "M" (0,997) who: has not observed GNP or Navy vigilance; does not consider

the fines applied by GNP to be high; does not agree with the regulations; does not consider

the leadership of fishery co-operatives to be representative; does not have a high

attendance to organization meetings. In contrast, M's counterpart within the group of

natives, individual "N", shows a probability of non-compliance of 0.78.   It is interesting to

note that if only the variables from Blocks I and II are modified – the individual has

observed surveillance and considers the fines to be high – the immigrant person (A_M)

displays a probability of infringement of 0.90 while his counterpart in the native group (A_N)

also experiences a decrease in the transgression probability to 0.25. Another important

observation occurs when the variables of Block VI, related to the legitimacy of the

regulations (REGGRL and REG_SC) are modified. In this case, the individual B_M from the

immigration group exhibits an infraction probability of 0.87 and the counterpart in the

native group (B_N) presents a probability of 0.19.   This result indicates that individuals who

show a degree of agreement with the regulations are more likely to respect the regulations.

If we now modify the variables of Block VI , related to the attendance of organization

meetings, related to the level of representation of the fishery leadership, and Block VIII,

related to attendance to organization meetings, we observe that individual (C_M) exhibits an

infringement probability of 0.74 – inferior to that of the previous individuals. Similarly, its

counterpart (C_N) in the native group presents a probability of 0.09; quite a lot lower than the

previous native individual. This result indicates that fishermen who feel that they are

represented by the organizational leadership and also get involved in co-operative meetings

tend to have a lower probability of infringement than those who do not feel represented by the leadership and who do not attend the co-operative meetings. Furthermore, the decrease in the probability due to these variables (LEAD_REP y ATTEND) is higher in magnitude than the decrease in probability that is due to the variables of Blocks I, II and those related to the legitimacy of the regulations.

Additionally, when modifying jointly the variables grouped in Blocks VI and VIII (those that represent legitimacy of the regulations, representation of the leadership and participation in the co-operatives), its effect on the probability of infraction is magnified, achieving a reduction to 0,15 in the case of the immigrant subject (D_M) and 0.001 in the case of the native individual (D_N). This combined effect of the variables in Block VI and VIII on the probability of infraction is reduced in the case of the fishermen that reside on Island 1 (the probability of infraction associated with the profile of a boat-owner such as E_M is 0.526, while that of the profile E_N is only 0.026).

Insert Table 4

Finally, it is worth mentioning that in the presented results, in general, the probability of infraction for each of the profiles for native boat-owners is inferior to the probability of its counterpart within the group of inmigrant profiles. This result reaffirms the importance of the sense of belonging to a community as a determining key at the moment of deciding on the compliance of agreed norms. Furthermore, this is an indication that the problems of transgression of fishery regulations for the recent immigrant group need to be dealt with specifically for this group.

5. Conclusions

In this paper, we estimated a model of the decision to transgress the fishery regulations that incorporate not just economic aspects but also sociological types of variables. The estimation uses information based upon a special survey applied to a sample of fishery boat-owners who carry out their activities in the Galapagos National Park Marine Reserve of Ecuador.

The results obtained from the econometric analysis are satisfactory. Effectively, our estimations indicate that the decision of infraction of the fishery regulations in the case of boat-owners of the GNP are not only determined by expected costs and benefits of illegal activity but also by variables related to the perception of boat-owners with respect to the legitimacy of regulations, the level of membership within the community and participation in organizations. Specifically, it is important to emphasize the behavior of variables related to classic aspects considered in enforcement and compliance models, such as the probability of detection and punishment, the size of fines and economic incentives to infringe. According to our estimations, the estimated parameters for these variables turn out to be, in general, stastically significant and their effects on the decision of infraction show the expected signs.

It is important to also emphasize the results obtained from variables that represent social aspects, which we consider to have influence on the compliance decision within the theoretical model: the level of legitimacy of the norms (l) and the sense of belonging to the community (s); as well as the moral commitment the individual has to the compliance and success of the regulations, reflected in the level of participation in the institutions that generate the regulations (u). The variables selected as proxies for the formerly mentioned aspects obtained statistically significant parameters and with expected signs. These results

imply that the level of legitimacy that the regulations have within the group of boat-owners, the individual's sense of belonging, the legitimacy of local organizations as well as the levels of intervention in these organizations[18], are factors that positively influence the decision to respect the agreed regulations. In this way, the obtained results contribute with empirical evidence to the validation of recent theoretical developments to explain the decision of compliance of the regulations that govern the management of natural resources under schemes of common property goods.

The mentioned results suggest that the decision of the Galapagos fishery boat-owners to violate regulations do not only consider such as surveillance, perception of the probability of being punished or the size of fines, but also that their decisions consider economic incentives linked to vessel operation and aspects referring to the participatory management system of the GMR such as level of agreement with the regulations, their affinity with the regulating institutions and the level of representation of grass-root organizations.

Additionally, the results are limited in terms of determining a profile based on particular characteristics. Only two characteristics were identified to be significant in the decision: the residency of Island 1 and the level of formal education. The result concerning residency shows that individuals who reside on Island 1 have a higher tendency to commit infractions than the rest of the boat-owners.   Equally, the result concerning education implies that those who have a more years of education tend to violate the regulations more. Nevertheless if we analyze the individuals with higher levels of education within the context of participatory management, we observe that the majority of these individuals (56%) disagree with the regulations, and also most of them (81%) consider the

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[18] By local organizations, we refer only to fishery co-operatives.

representation of the leadership to be mediocre or inadequate[19]. This suggests that there is a relation between education and adopting a critical position towards the regulations and the leadership, and as we observed in the previous results, these aspects are vital in the decision to comply.

The results obtained in the calculation of marginal effects of each variable on the decision to violate the regulations and the level of probability for selected types of boat-owner, give rise to interesting conclusions that may be useful for the management authority of the reserve. It is important to underline that the results suggest that policy instruments that are limited to improving the capability of detection and increasing the level of applied sanctions always have inferior results in terms of deterring the violation of regulations when compared to those instruments orientated towards promoting the legitimacy of the norms, improving the representation of individuals by the leadership of local organizations or increasing the participation of individuals with-in grass-root organizations. This result is observed whether the boat-owner is a recent immigrant or native, and whether the individual resides on Island 1 or not. This result is specially useful for the national park authority as well as conservation organizations that work in the islands since an assignment of effort and resources directed at improving the legitimacy of the regulations and strengthening the co-operative organizations will have positive pay-backs in terms of respecting the regulations. This does not mean abandonment of traditional strategies of enforcement, control and surveillance and the application of fines, since it is likely within all groups, the presence of chronic violators of the regulations who can only be controlled by traditional methods such as toughening the sanctions and more surveillance. The control

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[19] Those individuals with 12 or more years of schooling were considered to belong to the higher educated group; they represent 37% of the sample.

of these individuals becomes important in the context of that the illegal conduct of these individuals erodes the level of legitimacy of norms and increases the probability of infractions of their fellow fishermen – remembering that the variable OTHER has a marginal effect of 0.21 on the probability of infringement[20].

In summary, the empirical results confirm the positive contribution of the Participatory Management System implemented by the Galapagos Marine Reserve on the compliance of the regulations, and furthermore, underline the potential of the system to increase compliance of the regulations between the boat-owners of the SSFFG. This is a desirable objective considering that the conservation and sustainable management of this important economic ecosystem depends upon them.

Finally, it would be desirable in the future to develop an investigation that goes further into the probable differences that exist in the compliance decision of the native individual with deeper roots islands, and the recent immigrants since the potential results would be useful for improving the management policies of the GNP.

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[20] It is important to underline that the surveilence effort of the GNP is not destined soley to the control of the activities of the SSFFG, but also the illegal incursion of continental and foreign vessels.   The weakening of control or sanctions of the illegal conduct of the chronic infringers or vessels outside of the community, according to Kuperan and Sutinen (1997) may send two messages to the rest of the boat-owners who normally comply: 1) the regulations are unfair and 2) the regulations do not adecuately protect the fishery resource nor the local fisherman.

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Table 1(a). Description of the Variables used in the Econometric Model

Name of the Variable and description

DEPENDENT VARIABLE

INFRACTION: 1: If the boat-owner acknowledges: capturing shark; rarely fulfilling regulations or having made some infraction. 0: otherwise.

INDEPENDENT VARIABLES

I. Probability of Detection and Punishment (*v*)

ZONE: 1: If the boat-owner fishes in North, North West, or West zones or declares to operate in the whole archipelago. 0: otherwise.

MOTORHP: Defined as the power of the boat 's motor; this variable is expressed in horses of power (HP).

AGE: Age of the boat-owner in years.

PROB1: 1: If the boat-owner states having seen the surveillance of the GNP or the National Army: always (A), almost always (AA) or sometimes (ST). 0: otherwise.

PROB2: 1: If the boat-owner states having been boarded for inspection A, AA or ST by personal of the GNP or the National Army. 0: otherwise.

PROB3: 1: If the boat-owner considers that ships detained for infractions are punished A, AA or ST. 0: otherwise.

PUNISH: 1: If the boat-owner indicates having been punished at some time. 0: otherwise.

II. Magnitude of the fine. ($\overline{f}$)

FINE: 1: If the boat-owner considers that the fines applied to offenders are high. 0: otherwise.

III. Structure of Costs ($\overline{k}$)

STORAGE: Indicates the storage capacity of the boat in metric tons (TM).

DAYCOST: Indicates the daily cost in American dollars of a fishery trip.

CAPITAL: Indicates the commercial value of the ship in American dollars.

INDEBT: 1: If the boat-owner declares having a debt related to fishery activity. 0: otherwise.

IV. Structure of Prices (p)

PRICEIND: Price Index based on the market prices of the species the boat-owner caught, weighted by the share of each species in the total income of boat-owners. The index is expressed in American dollars.

V. Individual characteristics ($\overline{a}$)

MARRIED: 1:If the boat-owner is married or cohabiting. 0: otherwise (single, separate, widow)

FAMILY: The number of boat-owner family members.

EDUCACI: Number of years of formal education completed.

ISLAND1: 1: If the boat-owner lives on the Islands. 0: otherwise

VI. Legitimacy of the Regulations and Authorities that promote them (l).

REGGRL: 1: If the boat-owner strongly agrees (SA), agrees (A) or neither agrees nor disagrees (NA/ND) with the fishery regulations. 0: otherwise

REG_SH: 1: If the boat-owner strongly disagrees (SD), disagrees (D) or NA/ND, with allowing shark fishery. 0: otherwise.

REG_SE: 1: if the boat-owner strongly agrees (SA), agrees (A) or NA/ND with the statement: " no-catch seasons benefits the fisherman ". 0: otherwise.

REG_SC: 1: If the boat-owner strongly disagrees (SD), disagrees (D) or NA/ND with allowing unregulated fishery of sea cucumber. 0:otherwise

OTHER: 1: If the boat-owner declares that other fishermen usually make some infraction of those commonly detected by the GNP. 0: otherwise.

JMPAIM: 1: If the boat-owner considers that the JMP/AIM takes into account the sector fishery little time, most of time or every time. 0: otherwise.

LEAD_REP:1: If the boat-owner considers that his leaders represent the interests of the sector appropriately or at least they represent them fairly. 0: otherwise

VII. Sense of Ownership to the community (s).

NATIVE: 1: The boat-owner was born in the Galapagos. 0: otherwise

MOVECONT: 1: If the boat-owner declares that he could change his residence to the continent. 0: otherwise

YRSMIG: 1/Number of years of immigration.

FISHEXC: 1: If the boat-owner is exclusively devoted to the fishery activity . 0: otherwise

YRSEXP: Years of experience that the boat-owner has in the fishery activity.

VIII. Participation (or)

COOPDIR:1: If the boat-owner is a representative or occupies some directive position in the Cooperatives. 0: otherwise.

ATTEND:1: If the boat-owner attends all the meetings of the cooperative. 0: otherwise.

Source: Elaborated by the authors.

[a]: The variables ZONE, PROB1, PROB2, PROB3, MARRIED, ISLAND1, REGGRL, REG_SH, REG_SE, REG_SC, JMPAIM, and LEAD_REP that originally were of multiple discreet answer have been transformed to binary discreet variables, with the purpose of increasing the degrees of freedom in the regression and of obtaining a better behaved model.

Table 1 (b). Description of the Variables used in the Econometric Model

Variable	Average	Standard deviation	Coefficient of Variation	Expected Sign[a]
DEPENDENT VARIABLE				
INFRACTION	0.305	0.462	1,51	N/A
INDEPENDENT VARIABLES				
I. Probability of Detection and Punishment (v)				
ZONE	0.760	0.429	0.56	-
MOTORHP	68.554	42.452	0.62	+
AGE	40.507	10.640	0.26	-
PROB1	0.409	0.493	1.21	-
PROB2	0.305	0.462	1.51	-
PROB3	0.409	0.493	1.21	-
PUNISH:	0.292	0.456	1.56	-
II. Magnitude of the fine. ($\bar{f}$)				
FINE	0.481	0.501	1.04	-
III. Structure of Costs ($\bar{k}$)				
STORAGE	1.841	2.430	1.32	+
DAYCOST	108.920	115.591	1.06	+
CAPITAL	43746.200	103634.000	2.37	+
INDEBT	0.468	0.501	1.07	+
IV. Structure of Prices (p)				
PRICEIND	2.412	1.726	0.72	+
V. Individual characteristics ($\bar{a}$)				
MARRIED	0.877	0.330	0.38	?
FAMILIA	3.500	1.958	0.56	?
EDUCACI	10.058	3.869	0.38	?
ISLAND1	0.286	0.453	1.58	?
VI. Legitimacy of the Regulations and Authorities that promote them (l).				
REGGRL	0.435	0.497	1.14	-
REG_SH	0.305	0.462	1.51	-
REG_SE	0.909	0.288	0.32	-
REG_SC	0.708	0.456	0.64	-
OTHER	0.721	0.450	0.62	+
JMPAIM	0.552	0.499	0.90	-
LEAD_REP	0.273	0.447	1.64	-
VII. Sense of Ownership to the community (s).				
NATIVO	0.474	0.501	1.06	-
MOVECONT	0.084	0.279	3.32	+
YRSMIG	0.023	0.028	1.22	+
FISHEXC [b]	0.805	0.397	0.49	-
YRSEXP	19.604	10.447	0.53	-
VIII. Participation (u)				
COOPDIR	0.273	0.447	1.64	-
ATTEND	0.370	0.484	1.31	-

Source: Elaborated by the authors based on the survey of September 2002.

[a]: The sign "+"means the expected sign for the parameter of this variable is positive. The "- " means we expect a negative sign for this parameter. The "?" points out there is uncertainty about the sign of the parameter for this variable.

[b]: The variables FISHEXC and YRSEXP represent the involvement of the boat owner in their union, therefore it is expected that those whose only economic activity is fishery or who have several years of experience in the sector are more likely to be respectful to regulations.

Table 2. Estimation Results

Block	Variables	Model 1 Coefficient	Model 1 "t" Std.	Model 2 Coefficient	Model 2 "t" Std.
	CONSTANT	-1.077	-0.608	-0.695	-0.807
I	ZONE	0.402	1.014		
	MOTORHP	0.003	0.494		
	AGE	0.004	0.158		
	PROB1	-1.003	-2.307**	-0.528	-1.793*
	PROB2	0.416	1.022		
	PROB3	-0.055	-0.151		
	PUNISH	0.759	1.895*		
II	FINE	-1.154	-2.695***	-0.917	-2.959***
III	STORAGE	0.177	2.020**	0.144	2.590***
	DAYCOST	-0.004	-1.626		
	CAPITAL	0.263	1.162		
	INDEBT	0.356	1.020		
IV	PRICEIND	0.037	0.416		
V	MARRIED	-0.797	-1.407		
	FAMILIA	0.009	0.099		
	EDUCACI	0.125	2.359**	0.127	2.870***
	ISLAND1	0.843	1.987**	1.091	3.253***
VI	REGGRL	-1.075	-2.548**	-0.710	-2.352**
	REG_SH	0.368	0.822		
	REG_SE	-0.025	-0.043		
	REG_SC	-1.174	-2.831***	-0.947	-2.969***
	OTHER	0.723	1.686*	0.782	2.281**
	JMPAIM	-0.155	-0.418		
	LEAD_REP	-1.378	-3.174***	-1.276	-3.418***
VII	NATIVO	0.856	1.531		
	MOVECONT	0.115	0.172		
	YRSMIG	21.529	2.184**	15.040	2.667***
	FISHEXC	0.459	0.954		
	YRSEXP	-0.047	-1.885*	-0.033	-2.122**
VIII	COOPDIR	0.299	0.726		
	ATTEND	-1.048	-2.805***	-0.864	-2.954***
	Number of Observations	154		154	
	χ^2	81.11		62.85	
	Critical Value at 5%	$\chi^2_{(31)} = 44.99$		$\chi^2_{(12)} = 21.03$	
	% correct	84.4		80.5	

Source: Elaborated by the authors from the econometric estimation results of the models.

   *   Coefficient significant at 10%, two-tail test
  **   Coefficient significant at 5%, two-tail test
 *** Coefficient significant at 1%, two-tail test

Table 3. Marginal Effects of the Independent Variables

Block	Variables	Model 1 Marginal Effect	Model 2 Marginal Effect
	CONSTANT	-0.216	-0.190
I	ZONE	0.095	
	MOTORHP	0.001	
	AGE	0.001	
	PROB1	-0.229**	-0.144*
	PROB2	0.092	
	PROB3	-0.013	
	PUNISH	0.175*	
II	FINE	-0.263***	-0.250***
III	STORAGE	0.040**	0.039***
	DAYCOST	-0.001	
	CAPITAL	0.059	
	INDEBT	0.080	
IV	PRICEIND	0.010	
V	MARRIED	-0.189	
	FAMILIA	0.003	
	EDUCACI	0.028**	0.035***
	ISLAND1	0.188**	0.297***
VI	REGGRL	-0.247**	-0.194**
	REG_SH	0.085	
	REG_SE	-0.004	
	REG_SC	-0.264***	-0.258***
	OTHER	0.163*	0.213**
	JMPAIM	-0.035	
	LEAD_REP	-0.311***	-0.348***
VII	NATIVO	0.182	
	MOVECONT	0.034	
	YRSMIG	4.601**	4.102***
	FISHEXC	0.106	
	YRSEXP	-0.011*	-0.010**
VIII	COOPDIR	0.067	
	ATTEND	-0.237***	-0.236***

Source: Elaborated by the authors with the econometric estimation results.

   * Coefficient significant at 10%, two-tail test

  ** Coefficient significant at 5%, two-tail test

*** Coefficient significant at 1%, two-tail test

Table 4. Probability of committing an infraction by type of boat-owner [a]

Block	Variable	Characteristics of the Boat-owner [b]	Recent Immigrants						Natives					
			M	A_M	B_M	C_M	D_M	E_M	N	A_N	B_N	C_N	D_N	E_N
I	PROB1	Boat-owner has observed surveillance of the GNP or the National Navy almost always or sometimes.	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO
II	FINE	Boat-owner considers the fines to be high	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO
V	ISLAND1	Boat-owner resides on Island 1	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
VI	GRL	Boat-owner strongly agrees, agrees or is indifferent with the regulations of small-scale fishery in general.	NO	NO	YES	NO	YES	YES	NO	NO	YES	NO	YES	YES
	REG_SC	Boat-owner strongly agrees, agrees or is indifferent with the regulations that are applied to the capture of sea-cucumber.	NO	NO	YES	NO	YES	YES	NO	NO	YES	NO	YES	YES
	LEAD_REP	Boat-owner feels that the leadership of the fishery sector represents its interests or at least moderately represents them.	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
VII	YRSMIG	Number of years that the boat-owner has resided on the islands in the case of not being a native.	7.5	7.5	7.5	7.5	7.5	7.5	Native	Native	Native	Native	Native	Native
VIII	ATTEND	The boat-owner attends all of the co-operative meetings	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
	Probability of infringement		0.997	0.908	0.868	0.736	0.153	0.526	0.779	0.249	0.187	0.085	0.001	0.026

Source: Elaboration by the authors with the results obtained from the econometric estimations (2002).

[a]: Model 2 is defined as:
INFRAC2=INFRAC(CONSTANT,PROB1,FINE,PUNISH,STORAGE,EDUCACI,ISLAND1,REGGRL,REG_SH,REG_SC,OTROS,LEAD_REP,YRSMIG ,ATTEND).

[b]: To calculate the probability of infraction, the specified variables were considered relevant at 5% and 10%. The most prominent results are presented here.

[c]: The probability of infraction is calculated with the average of the variables (continuous and discrete), except for the variables presented in this table.