

## ILLEGAL FISHING: AN ECONOMIC ANALYSIS

COELHO Manuel Pacheco, (P), FILIPE José António Candeias Bonito, (P),  
FERREIRA Manuel Alberto M., (P), PEDRO Isabel, (P)

**Abstract.** Monitoring and enforcement considerations have been largely ignored in the study of fishery management. This paper explores this issue with a formal model of fisheries law enforcement to show how fishing firms behave and fisheries policies are affected by costly, imperfect enforcement of fisheries law. This model combines standard Economics of Fisheries analysis with the Theory of “Crime and Punishment” of Becker. The conclusions of the model are used to discuss the reform of the control and monitoring regime of the Common Fisheries Policy.

**Key words.** Fisheries, Enforcement, Common Fisheries Policy

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### 1 Introduction

Public enforcement of law, that is, the use of public agents to detect and sanction violators of legal rules is an obvious important subject. First literature on the subject of law enforcement dates from eighteenth century: Montesquieu (1748), Beccaria (1767) and Bentham (1789). Curiously, after the sophisticated and expansive analysis of Bentham, the subject of enforcement “lay essentially dormant in economic scholarship” (POLINSKY and SHAVELL (2000)), until the influential article of Gary BECKER (1968), “Crime and Punishment: An Economic Approach”.

In the context of Fisheries Economics, the problem can be seen as an externality arising when exclusive property rights are absent (CHEUNG (1970)). And that absence depends on, among other things, the costs of defining and enforcing exclusivity.

Efficiency considerations, by itself, don't dictate the choice of a certain property rights regime. In some systems of property rights (as the case of “common property”) the re-alignment of the property rights can have a very high or even prohibitive cost.

The establishment and enforcement of a system of rights depends, of course, on efficiency considerations, but also on the individual preferences and the political and social realities in a

community. These include the lack of means (or other insufficiencies) of the administration to control and enforce the execution of legal rules (DEMSETZ (1967)).

Most of the literature on fisheries management and regulation implicitly assumes law can be perfectly and costless enforced. Despite the astute observations in the traditional literature (see, for example, SCOTT (1979)), monitoring and enforcement considerations have been largely ignored in the study of fishery management.

This paper explores this issue with a formal model of fisheries law enforcement to show how fishing firms behave and fisheries policies are affected by costly, imperfect enforcement of fisheries law. This model combines standard Economics of Fisheries analysis with the Theory of “Crime and Punishment” of Becker.

The conclusions of the model are used to discuss the reform of the monitoring and control regime of the Common Fisheries Policy.

## **2 Illegal fishing**

By definition, anything that is an infringement of the law is illegal.

Illegal fishing therefore covers a wide range of behaviour, which can take place at several levels. For example, for members of the European Union, any violation of national laws or EU regulations, or failure to comply with the recommendations of international bodies, especially those of Regional Fisheries Organisations, constitutes an infringement.

Illegal fishing has always existed, but, in recent decades, there has been a sharp rise in violating activities, due to several factors such as the significant technical progress in motorization, freezing techniques, improved gear and new forms of stocks detection and information. At the same time, new forms of surveillance and detection of violators were introduced.

Obviously, it's impossible to quantify or qualify infringements. They are known to take place at all levels and to take different forms at different times. Some violations are detected but many remain unnoticed. Infringements take the traditional forms of fishing over the quota or using non-permitted mesh-size, but are also in situations of non-permitted by-catches or transshipment; even in the fake world of convenience flags.

The vast majority of fishing activities worldwide take place within EEZs or inshore zones. Fraud committed on the High Seas is consequently marginal, but it seems that it went on growing during the 80s and 90s and made the cause of many “fish wars”.

Illegal fishing occurs at all stages of fishing activity: on the vessel, at landing or during commercial operations. A large number of offenders are fishermen motivated by various interests: the lure of short term profit offered by certain species, the financial difficulties fitting vessels with regulatory gear, the need to secure a return on a major investment, the weight of tradition. But fishermen are not the only ones involved. Fraud can take place along the entire channel. Note that the possibilities after landing are tremendous.

National administrations sometimes bear part of the blame. Every state is responsible for enforcing the existing rules and monitoring activities (policing its territory, conducting controls and penalising offenders).

At the Community level, the responsibility for wrongdoing falls down on Member-states. At international level it is more difficult to oblige sovereign states to enforce rules, because there is no supranational authority. Conventions and Treaties incur the liability only of the states that ratify them.

This is also the cause of proliferation of *flags of convenience*, a frequent occurrence on the High Seas, which many see as the most pernicious element of illegal, unregulated and unreported fisheries (IUU). The globalisation of the economy, by liberalising markets and capital movements, has multiplied the number of ship owners registering their vessels in a country other than their own. Increasingly binding regulations and the burden of social charges on employers contributes to the development of this phenomenon. Fishermen are interested in this new game rules: it enables them to side-step the constraints imposed in their countries, gaining free access to resources, avoiding controls and improving competitiveness. For the state, there are, also, advantages: tax revenues and creation of jobs. The states involved are usually developing countries lacking the will and the means to set effective controls (even less if the action take place in areas and resources that are not theirs).

### **3 “Crime and Punishment” – Theoretical Analysis**

Despite the enormous volume of literature on Fisheries Economics, only a few numbers of papers are devoted to the issue of enforcement. It has always been “the neglected element in fishery management” (SUTINEN and HENNESSEY (1986)).

Our approach explores this issue with a formal model to show how fishing firms behave and to study how fisheries policies are affected by costly, imperfect enforcement of fisheries regulation. This model (See SUTINEN, J. and ANDERSEN, P. (1985)) combines standard Economics of Fisheries analysis with the Theory of “Crime and Punishment” of Becker.

The fundamental problem in fisheries management is to obviate the tendency towards overexploitation of the resources under open access. Regulation methods used to curb this tendency of overfishing and overcapacity includes gear restrictions, area and seasonal closures, TACs, ITQs, limiting entry and other forms of reducing fishing effort.

Assume that, whatever means are applied to reduce catch rates, any catch level above the level of the permitted quota for a certain fishing,  $q^*$ , is illegal. If we suppose a system of individual non-transferable quotas, the amount of the individual firm catch above its quota ( $q_i - q_i^*$ ) is illegal.

If detected and convicted, a penalty fee is imposed on the firm in an amount given by  $f$ ,

$$f = f(q_i - q_i^*),$$

where  $f > 0$ , if  $q_i > q_i^*$ ; and  $f = 0$ , otherwise;

and  $\partial f / \partial q \geq 0$ ;  $\partial^2 f / \partial q^2 \geq 0$ ;  $\forall q_i > q_i^*$ .

We assume that the function  $f(\cdot)$  is continuous and differentiable for all  $q_i^* > q_i$ . This penalty fee has a finite upper bound and each firm is assumed to face the same penalty fee schedule.

An individual firm’s profit before penalty is given by

$$\Pi^i(q_i, x) = p q_i - c^i(q_i, x),$$

where  $p$  denotes the price of fish,  $x$  is the size of fish stock and  $c(\cdot)$  is the cost function. We assume that firms are price takers.

In an imperfect law enforcement regime not every violator is detected and convicted. Let the probability of detection and conviction be given by  $\theta$ , and, to simplify, let us assume that all firms face the same probability.

If detected and convicted of a violation, a firm’s profit will be  $\Pi^i(q_i, x) - f(q_i - q_i^*)$ ; if not,  $\Pi^i(q_i, x)$ .

So, expected profits are

$$1) \theta [\Pi^i(q_i, x) - f(q_i - q_i^*)] + (1 - \theta) \Pi^i(q_i, x)$$

Assuming firms are risk neutral and maximising expected profits, each  $q_i$  is determined by the first order condition (subscripts other than  $i$  denote partial derivatives)

2)  $\Pi_q^i(q_i, x) \geq \theta f_q(q_i - q_i^*)$ .

The solution to 2) for one form of the marginal penalty schedule,  $f_q$ , has a clear economic meaning:

For a given stock size ( $x$ ), the firm sets its catch rate at a level in excess of its quota, where marginal profits equal the expected marginal penalty. If there were no penalty for fishing beyond legal quota, or if there were no probability of being detected and convicted ( $f = 0$  or  $\theta = 0$ ) the firm would set its catch at the open access catch rate,  $q_i^0$ . If the expected marginal penalty schedule lies above the marginal profit schedule for all  $q_i$  above the legal quota, the firm's "optimum" catch equals its quota. Firms with no quota have an expected net gain for entering, illegally, in the fishery, if their expected marginal penalty schedule begins below their marginal profit schedule.

This approach reveals the importance of empirical studies trying to estimate the factors that ensure compliance with the regulation. These studies give important basis for public authority decision about the actions to be implemented.

STIGLER (1970) argues that public authorities have four basic means to improve compliance:

- minimise the chances that violations will go undetected,
- maximise the probability that sanctions will follow the detection of violations,
- speed up the process from time to detection to assignment of sanction,
- make the sanctions large.

There is dispute among experts about the best alternatives. Some scholars have argued that the probability of being detected is more important than the size or magnitude of the sanction, while others argue that making the charging time follow as closely as possible to the detection of illegal behaviour is the most important factor in enhancing compliance.

Others, also, put in evidence the level of expenditure oriented to monitoring activities. Global enforcement costs equation can be represented by  $E(q, x, q^*)$ , where  $\partial E / \partial q < 0$ ,  $\partial E / \partial x > 0$ ,  $\partial E / \partial q^* > 0$ . That is:

- A reduction in the catch level requires an increase in enforcement costs.
- Increase in the fish stock or quota requires greater enforcement costs to achieve a given catch level.
- The size of the quota also affects enforcement. The least cost quota depends on the form of the marginal penalty schedule and is another question to investigate further.

#### 4 The Reform of the Common Fisheries Policy - Concluding Remarks

Since 2003, Common Fisheries Policy (CFP) is developing a process of Reform. The Control and Monitoring Regime of common fisheries is one of the most important subjects where this reform takes place. Applying theoretical analysis to the guidelines of CFP reform, suggests the following concluding remarks:

- Implementing Community policies in Member States is never easy, especially when myopic individual interests do not match with long term collective interests. This is the case in fisheries. Fishermen do not have greater propensity to altruism than the rest of the society; so, they are little inclined to refrain catches for the sake of a clear conscience, if they think their competitors are less scrupulous (EUROPEAN COMMISSION/ DGF (2000)). That is, without a clear and effective policy of control and enforcement, the Commission is certain that the "Tragedy of the Commons" will result and that overfishing and overcapacity will occur.

The reform of CFP insists in the philosophy of intervention of its early days, when the Commission put the problem of control in terms of ethical reasons: "It's the only way to assure that

the sacrifices of some member states in the recovery of the stocks are not in vain because of the irresponsible action of others” (COMISSÃO EUROPEIA (1976)).

According to BECKER (1968), individuals rationally decide whether or not engage in criminal activities by comparing the expected returns to crime with the legitimate business. His main thesis is that crime is less attractive if the government increases the probability and severity of punishment. Since imposing a fine is costless, this fine should equal an individual’s entire wealth and be complemented by a probability of punishment to optimally deter crime (GAROUPA (2000)).

The analysis of the Commission proposals seems to give a special attention to the increase of the probability of detection as a means to deter criminal behaviour and increase compliance with regulation. Introduction of severe penalties is not in the first line of measures to control illegal fishing. Of course they are considered and an important effort to clear define the legal procedures to penalise the violators, is made. But they are not in the centre of the policy.

The reasons stand, perhaps, in this: The Commission believes that the financial support will guarantee the indispensable means of surveillance and control to the Member States. This will increase the deterrence capacity of control in Member States, in uniform manner, and increase transparency and trust between partners.

But the Commission also knows that legal administration, in the Member States, have significant differences and that judicial machinery has a great inertia. The capacity and efficiency of Member States justice is not only a question of financial means devoted to his mission. It has also cultural and historical roots. It’s virtually impossible to put all the Member States in uniform position in terms of speed and severity of penalties application.

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### Current address

#### **Manuel Francisco Pacheco Coelho, Professor Auxiliar**

ISEG – Instituto Superior de Economia e Gestão

SOCIUS – Centro de Investigação em Sociologia Económica e das Organizações

Rua do Quelhas, 6, 1200-781 Lisboa (Lisbon, Portugal), Tel.+351 213 925 800

e-mail: coelho@iseg.utl.pt

#### **José António Candeias Bonito Filipe, Professor Auxiliar**

ISCTE - Instituto Superior de Ciências do Trabalho e da Empresa

UNIDE – Unidade de Investigação e Desenvolvimento Empresarial

Av. Forças Armadas 1649-026 Lisboa (Lisbon, Portugal), Tel.+351 217 903 000  
e-mail: jose.filipe@iscte.pt

**Manuel Alberto Martins Ferreira, Professor Catedrático**

ISCTE - Instituto Superior de Ciências do Trabalho e da Empresa  
UNIDE – Unidade de Investigação e Desenvolvimento Empresarial  
Av. Forças Armadas 1649-026 Lisboa (Lisbon, Portugal), Tel.+351 217 903 000  
e-mail: manuel.ferreira@iscte.pt

**Maria Isabel Craveiro Pedro, Professor Auxiliar**

IST - Instituto Superior Técnico (Technical University of Lisbon)  
CEGIST – Centro de Estudos Gestão  
Av. Rovisco Pais 1100-099 Lisboa (Lisbon, Portugal), Tel.+351 21 423 35 07  
e-mail: ipedro@ist.utl.pt

