Society & Natural Resources

A Classification of Poachers from the Sea: Four Types to Rule Them All

Hugo M. Ballesteros, Gonzalo Rodríguez-Rodríguez, Pierre Failler, Andy Forse & Benjamin M. Drakeford

To cite this article: Hugo M. Ballesteros, Gonzalo Rodríguez-Rodríguez, Pierre Failler, Andy Forse & Benjamin M. Drakeford (2024) A Classification of Poachers from the Sea: Four Types to Rule Them All, Society & Natural Resources, 37:4, 495-520, DOI: 10.1080/08941920.2023.2291781

To link to this article: https://doi.org/10.1080/08941920.2023.2291781

A CLASSIFICATION OF POACHERS FROM THE SEA: FOUR TYPES TO RULE THEM ALL

Hugo M. Ballesteros[a] , Gonzalo Rodríguez-Rodríguez [a], Pierre Failler[b] ,Andy Forse[b], and Benjamin M. Drakeford[b]

[a] Department of Applied Economics, EcoPesca Fisheries and Natural Resource Economics Research Group, University of Santiago de Compostela, Galicia, Spain;
[b] Centre for Blue Governance, Faculty of Business and Law, University of Portsmouth, Portsmouth, UK

Abstract: The poaching of marine resources has been defined as the conscious breaking of fishery regulations, a situation that occurs at serious levels and high frequencies in many socio-ecological contexts around the world. Poaching as a representation of illegal unreported and unregulated fishing (IUU fishing) impacts the management of marine resources and represents one of the main threats to the conservation of marine biodiversity, especially in in small scale fisheries (SSF). A classification of poachers is thus fundamental to defining the actors and the scale of poaching. This will contribute to the development of conservation policies that are best suited to management needs and to guiding specific actions against poaching. Proper classification of poachers has yet to be designed, hindering the development of management approaches that seek to recognise and reduce poaching. This paper provides a theoretical typology of four general types of poachers that can be applied in different contexts of fisheries resources appropriation governed by co-management systems (1. *Members of Regulated Activities from the Community; 2. Members of Regulated Activities from outside the community; 3. Non-Members of Regulated Activities from the Community; 4. Non-Members of Regulated Activities from outside the community)*. The characteristics of the four categories of poachers were derived from analysis of the property rights at stake. This classification

may help outline better compliance and enforcement strategies, including the active involvement of fisheries users and the consequent improvement of the legitimacy of fishing regulations. Additionally, we recommend a set of measures to assist in the fight against poaching associated with each of the four types of poacher.

Keywords: Poaching; Typology; Property Rights; Shellfish; Non-Compliance

1. INTRODUCTION

Poaching is a severe threat for species and ecosystems. It impacts economic activity based on natural resources and thus the livelihood of communities, as well as being a distorting factor for scientific assessments and ultimately the effective management of the resource (Ayling, 2013; Ballesteros & Rodríguez-Rodríguez, 2019; Romero et al., 2021; Song et al., 2020). Specifically, poaching of marine resources has been defined as the conscious breaking of fishery regulations, a situation that occurs at serious levels and high frequencies in many socio-ecological contexts around the world (Ballesteros 2018). Moreover, poaching of marine life is a representation of illegal unreported and unregulated fishing (IUU fishing), which undermines the management of fisheries and represents one of the main threats to the conservation of marine biodiversity, especially in small-scale fisheries (SSF) communities, which are highly dependent on fishing.

Given the harmful effects of poaching, appropriate classification of poachers is fundamental to defining conservation policies best suited to different types of poachers and guiding specific actions against them. Gerring (2011) argued that the proper classification of a real-life phenomenon should be based on exclusive and exhaustive criteria (Gerring, 2011). *Exclusivity* allows individuals to be classified into just one category of the classification. The *exhaustiveness* guarantees that the classification categories are broad enough to include all individuals who must be classified.

To date, however, no proper classification of poachers has been designed since most of them are based on non-exclusive criteria such as a poacher's personal or collective attributes, motivations for poaching or poacher's *modus operandi* (Gerring, 2011). (Blevins & Edwards, 2009; Eliason, 2008, 2013; Forsyth, 2008; González Arias et al., 2011; Lambrechts & Goga, 2016; Musgrave et al., 1993; Muth & Bowe, 1998 Tailby & Gant, 2002) . The lack of a proper and shared definition of poachers makes the current classifications ambiguous, whereby the same individual can be classified in several ways simultaneously, making it difficult to develop management approaches that seek to recognise and reduce poaching in a way that is adapted to the local circumstances.

In marine resources management, the ambiguity of non-exclusive classifications may drive political action towards generic coercive measures of control and punishment (Ballesteros et al., 2020; Oyanedel et al., 2020). Although coercive measures must be implemented, they do not work in all non-compliance situations or with all non-compliers (Kuperan & Sutinen, 1998; Sutinen & Kuperan, 1999). Moreover, in some cases, anti-poaching coercive actions can be counterproductive by bringing social injustice to fishing communities affected by poverty, unemployment or inequality (Ballesteros & Rodríguez-Rodríguez, 2019; Song et al., 2020). To promote better, fairer and more legitimate anti-poaching measures, they should adapt to small-scale communities' realities considering the context and the complexity of local nuances (Oyanedel, Gelcich, & Milner-Gulland, 2020; Song et al., 2020).

For the reasons set out above, the aims of the classification are:

i) Fill a methodological gap by providing a classification based on criteria of exclusivity and exhaustiveness.

ii) The classification must be comprehensive enough to consider the contextual nuances promoting poaching and help to manage marine resources at local level.

iii) The classification should assist in policymaking by generating information about the individuals it classifies and, therefore, about the phenomenon. It must also highlight measures against poaching in a way that is adapted to both the poacher's profile and the context in which they operate. Packages of coercive and non-coercive deterrence measures will be recommended.

The classification we propose is new and based on the premise that valuable marine resources are regulated either tacitly or explicitly by defining who can legitimately access and withdraw them (Agrawal, 2001; Bess & Harte, 2000; Grafton et al., 2009; Guerin, 2003; Hilborn et al., 2005; Ostrom, 1990, 2005; Schlager & Ostrom, 1992; A Scott, 2000). This implies, regardless of the type of regulation (formal or informal), some form of governance of the user's behaviour and resource exploitation. In fisheries management theory, the institutional figures of property rights are widely used to induce desired behaviours, either formally or informally (Guerin, 2003; Jentoft, 2004; Ostrom, 1990, 2005; Pomeroy, 1995; Pomeroy & Andrew, 2011; Schlager & Ostrom, 1992; A Scott, 2000; Shotton, 1999).

In this work, we will use the poacher´s possession of formal or informal property rights as the key to setting up exclusive classification criteria. The exhaustiveness condition will be fulfilled through the theoretical analysis of the characteristics of the property rights at stake. The third section of this paper will explain how property rights are used to establish the basis of the classification.

The following section sets up the theoretical framework that supports this paper. The literature review allowed for the identification of limitations of the current non-exclusive classifications. Among them, Ballesteros & Rodríguez-Rodríguez (2018a) is the most comprehensive study case. In the fourth section of the paper, we test the classification by

applying it to the 19 types of poachers identified by Ballesteros & Rodríguez-Rodríguez (2018a) in their research of shellfish poaching in Galicia.

In the discussion section, we have included a table of packages of anti-poaching measures that combine coercive and non-coercive regulatory measures. In this sense, the classification provides a baseline for policymaking, while the recommendations mark a starting point for political action. Each package is linked to the types of poachers proposed by the classification: 1. *Members of Regulated Activities from the Community; 2. Members of Regulated Activities from outside the community; 3. Non-Members of Regulated Activities from the Community; 4. Non-Members of Regulated Activities from outside the community.*

2. THEORETICAL FRAMEWORK

Currently, there are different categorizations of poachers from the study of illegal hunting, fishing, and gathering of animal life in different contexts of appropriation, formulated under the prism of specialities such as economics, sociology, social psychology, or criminology (Blevins & Edwards, 2009; Eliason, 2008, 2013; Forsyth, 2008; González Arias et al., 2011; Musgrave et al., 1993; Tailby & Gant, 2002). Von Essen et al (2014) set out the difficulty in establishing profiles of poachers since they act in multiple contexts, with different degrees of organisation, frequency, and technology. They respond to different motivations, and commit various types of offence. Therefore, attempts to create profiles of poachers have been characterized by the use and combination of three fundamental classification criteria: i) the attributes of poachers, ii) their motivations, and iii) their modus operandi (von Essen et al., 2014).

The poaching classifications we have identified create descriptive categories that explain particular poaching realities. These are valid but challenging to apply in other socio-

ecological contexts. The difficulty in extrapolating results is that most do not use exclusive categories to classify poachers, so the classifications are ambiguous. In other words, without exclusivity, the same individual can be classified in several categories in the same scenario and simultaneously.

A first example would be the classification of Bessey (1985), who identified the motivations and modus operandi of poachers, noting the existence of: 1) property-oriented violators, those who poach for meat or money; 2) dangerous offence violators, individuals who have an illegal lifestyle, where poaching is just another facet of criminal activity, 3) unethical methods violator, those who practice poaching in an opportunistic way for their own self-satisfaction, holding a strong emotional connection to the activity. In this classification, an individual could perfectly well poach for meat or money and simultaneously obtain psychological satisfaction from poaching. Forsyth and Marckese (1993) studied poaching hunting in Southwest Louisiana and discussed socialisation as a generating mechanism for poaching and learning poaching techniques as part of local subcultures. These authors identified psychological motivations in their case study that promoted poaching, creating an indirect classification of poachers. Those who poach for i) trouble, ii) excitement, iii) smartness, iv) toughness, v) autonomy.

Another example of a non-exclusive classification is that derived from Muth and Bowe (1998) from their proposal for a typology of motivations for illegal hunting and fishing in the US. These authors categorised poachers into ten groups based on their motivations, which could be economical, psychological, derived from cultural factors or tradition, and the perception of the legitimacy of the prevailing laws, among other factors: i) Poaching for commercial gain; ii) Poaching for household consumption; iii) Poaching for recreational satisfaction; iv) Trophy poaching.; v) Thrill killing; vi) Protection of self and property; vii) Poaching as rebellion; viii) Poaching as a traditional right; ix) Poaching as

disagreement with specific regulations; x) Poaching as a gamesmanship. Again, although it is a highly descriptive categorisation, it is not exclusive.

Similarly, Tailby & Gant (2002b) focused their research on the illegal fishing of Australian abalone and identified five types of poachers based on their methods and the sophistication of their organization: i) Organised Poachers; ii) Licensed Divers; iii) Shore-based Divers; iv) Extended Family Groups; v) Individuals. This classification is once again very rich in detail and is particularly interesting when linking the offending types with the commercialization of poaching but it is not exclusive. Putt & Anderson (2007), in their work on crime in the Australian fishing industry, adopted the same classification to explain local abalone poaching trends but without advancing criteria that would make the classification exclusive.

Eliason (2008) in a qualitative study in which he interviewed conservation officers from the US state of Kentucky, identified different poachers: i) the Back door poacher; ii) Chronic poacher; iii) Opportunistic poacher; iv) Poacher who mixes up his schedule; v) The quiet poacher; vi) Trophy poacher. Years later, the same author, Eliason (2013), asked Montana conservation officers which poacher was the most difficult to apprehend. From this question, another classification was derived based on the experience of anti-poaching agents specific to the context where it was carried out: i) Poachers who work alone, ii) Poachers who hunt on private property and behind locked gates, iii) Poachers who have been caught before; iv) Others.

Similarly, to Eliason (2008), Blevins and Edwards (2009) proposed Types of Wildlife Offenders in which they differentiated between i) the back door poacher; ii) the habitual or chronic poacher, iii) the opportunistic poacher, and iv) the trophy poacher. Although useful in their description of the local phenomenon, these classifications are difficult to extrapolate to other contexts.

González Arias et al., (2011) identified seven types of poachers in Spanish fisheries: i) The holidaymaker poacher; ii) Legal Poacher; iii) Recreational Poacher; iv) Poachers who are at risk of or suffering social exclusion; v) Professional poachers; vi) Local Poachers; and vii) Poachers for economic need.

Ballesteros & Rodríguez-Rodríguez (2018a) interviewed 55 members of the Galician fishing sector, coastguards and local shellfish collectors to describe the types of shellfish poachers existing in Galician fisheries. They expanded the González Arias et al. (2011) findings by creating a list of 19 poacher profiles based on their modus operandi, motivations, and attributes: i) Unemployed Poachers; ii). Tourists or holidaymakers; iii) Old-age pensioners; iv) Retired fishers; v) Local residents; vi) Local youths; vii) Housewives; viii) Family groups; ix) Bankrupts; x) Persons at risk of or suffering social exclusion; xi) Recreational poachers; xii) Professional poachers; xiii) Drug addicts; xiv) Organized poachers; xv) Insider poachers; xvi) Poachers for self-consumption; xvii) Greedy poachers; xviii) Needy poachers; and xix) Profit-motivated poachers. What is common to all of these classifications is that they are highly descriptive and valid for explaining local experiences, but they are not exclusive.

Although exclusive, other revised classifications use classification criteria so broad that they make the classification a limited tool for poaching management. In the first research of its type that is known, Stoll (1975) classified US small game poachers, identifying their motivations and differentiating between: i) Unintentional poachers and ii) Intentional poachers. In a more sophisticated way, Musgrave, Parker, & Wolok (1993) identified poachers into two large categories, commercial and non-commercial, associating them to three different causes: i) Poaching for Subsistence; ii) Cultural influences; and iii) Misperceptions about Wildlife (for example, they believe that wildlife resources are unlimited).

A further example is Glover and Baskett (1984) classification of hunting poachers based on their motivations using a dichotomous criterion; i) commercial poachers and ii) recreational poachers. However, the exclusivity of this classification was dissipated by the breadth of the categories.

The previous classifications established dichotomies categorising poachers as, for example, commercial and non-commercial, as accidental or premeditated, organised or opportunistic, allow for a broad vision of the phenomenon but are insufficient when it comes to establishing adapted packages of anti-poaching action in socio-ecological contexts highly dependent on natural resources, such as small-scale fishing communities.

This review of the theoretical framework, while not a comprehensive review of the literature, shows the approach to poaching studies thus far and demonstrates the need for unique classifications of poachers based on exclusivity and exhaustiveness.

3. THEORETICAL FRAMEWORK: CLASSIFICATION CRITERIA, THE RELEVANCE OF PROPERTY RIGHTS

The two conditions to set up a classification, exclusivity and exhaustiveness, will be determined by the ownership and the characteristics of property rights. On one side, the tenancy of property rights will provide exclusivity, since it allows for differentiating poachers from legitimate users by identifying who can get access and withdraw the resources and who cannot. On the other side, the theoretical analysis of the main features of the property rights held by the users of the fisheries resource will guarantee the exhaustiveness (Alchian & Demsetz, 1973; Schlager & Ostrom, 1992).

3.1. EXCLUSIVITY CRITERIA: HOLDING FORMAL PROPERTY RIGHTS

In small scale fisheries (SSF) the formal property rights are held by specific individuals, generally industry members such as fishers or shellfish-gathers. Moreover, other users such as scuba divers, recreational fishers, or anyone who practices a legally regulated fishing activity through a fishing license, also hold formal property rights to access and withdraw resources, although generally to a lesser degree than commercial fishers or shellfish-gathers. Analysing the ownership of *formal property rights* is important because holding *formal property rights* induces specific behaviours from those who hold them based on a clear definition of rights and obligations regarding the use of resources. The better defined the rights and obligations are, the easier it will be to monitor who complies and who does not and establish corrective measures for non-compliance. The existence of formal property rights in fishing favours its management, since it makes it possible to establish:

1. **Who** is allowed to fish by fishing licences?
2. **How** fishing is carried out: what fishing gear, types of boats, maximum capacity allowed etc.
3. **What** can be caught? What species are allowed, which are banned or prohibited, what minimum catch sizes are established, what maximum catch quotas per individual, vessel, fleet, or fishing session are allowed, etc.
4. **Where:** Establishing in which fishing grounds, shellfish beds, and marine or coastal areas, professional or recreational fishing activities can be carried out. Also, which areas are protected, in which fishing is banned or limited in some way.
5. **When:** In which seasons, at what times and days of the week, when the fisheries closed for their recovery, etc.

Regarding poaching and its combat, formal property rights allow for:

i) Defining the types of poaching offences better. For example, poaching can occur due to excess quota, fishing of prohibited species, use of illegal gear, fishing in prohibited places, times of the year that are not allowed, etc.

ii) It also allows the establishment of measures to combat poaching that are specifically oriented to the holders of formal fishing rights, whether they are:

    a. Coercive measures, such as the partial or complete revocation of fishing titles or reduction of quotas for non-compliers (which can have a significant impact among commercial fishers), fines, warnings, sanctions, etc.

    b. Management measures focused on non-coercive measures: training and awareness campaigns aimed at licence holders.

To set up the classification, we will consider that, belonging to the "*Members of Regulated Activities"* group implies the holding of formal property rights, resulting in the identification of two potential kinds of poachers:

iii) Poachers who are *Members of Regulated Activities:* Poachers who formally hold property rights but breach them in some way, for example, exceeding catch limits, fishing protected species or in forbidden areas, etc.

iv) Poachers who are *Non-Members of Regulated Activities*: Poachers who exploit natural resources without holding formal property rights e.g., those who are not fishers, shellfish-gatherers, licensed divers, etc.

3.2. EXCLUSIVITY CRITERIA: HOLDING INFORMAL PROPERTY RIGHTS.

Being eligible to hold informal rights to access and withdraw natural resources, is the second criterion to determine a mutually exclusive classification of poachers. However, the eligibility of who can hold informal rights is not as clear as in the case of formal property rights. The literature points out that the members of the communities are the only

ones who can get informal access and withdraw rights (Ballesteros & Rodríguez-Rodríguez, 2018a; McGoodwin, 2001; Ostrom, 1990). Some recent works have explored the role of the community in the management of fisheries resources, emphasising the difficulty of defining what the community is (Ballesteros & Rodríguez-Rodríguez, 2018a; Pascual-Fernández et al., 2005). Nevertheless, these studies have observed that the fishing communities are defined by three main factors: i) the communities are linked to a territory that has clear boundaries known by its members; ii) they have an economic dependence on fishing; iii) they are defined by the existence of a shared internal system of rules and values based on common features of identity and cultural attributes of its members (Jentoft, 2000; Pascual-Fernández et al., 2005). In this context, the community works either as an informal regulatory and enforcement system, alone or alongside the formal system and, therefore, has the capacity to generate de facto property rights allowing access to and the exploitation of resources (Grafton et al., 2009; Jentoft, 2004; Ostrom, 1990) The criteria for granting these rights will depend on each case, but they will always be associated with the community and its members (Ballesteros & Rodríguez-Rodríguez, 2018a, 2018b).

Regarding poaching, the community reacts against undesirable behaviours that run counter to local usages, customs or regulations, penalising those who operate for reasons that are perceived as perverse and/or predatory (Ballesteros et al., 2020; Ballesteros & Rodríguez-Rodríguez, 2019; Cepić & Nunan, 2017; Gezelius, 2004). By contrast, behaviours that fit in with common codes will be considered "acceptable", especially in situations of vulnerability or social injustice affecting the community members (Ballesteros & Rodríguez-Rodríguez, 2018a, 2018b, 2019, 2022; Bell et al., 2007; Gezelius, 2004; Lambrechts & Goga, 2016). In such cases, the community is in favour of the common good and creates informal compensation mechanisms that reinterpret legal regulations (Ballesteros & Rodríguez-Rodríguez, 2018b).

By considering informal property rights in anti-poaching management, we give context to the poachers. They belong (or do not) belong to the community, which allows for:

i) Observation of which poaching actions may be tolerable in specific contexts and, in this sense, guide the adapted political action.

ii) The identification of the contextual causes of poaching and not just the immediate motivation of the poacher.

iii) Preventing the development of counterproductive measures that promote social injustice or measures that do not prevent poaching from becoming chronic.

Poachers are therefore identified as those who either carry out their activity without formal titles, or those who are not recognised by the community members as eligible to take part in the informal exploitation of its resources. Based on the criteria of belonging to the community, two different kinds of poacher can be classified:

i) Members of the Community: Poachers who are recognised as part of the community – they may hold informal property rights over the resources.

ii) Community Outsiders: Poachers who do not belong to the community and cannot hold informal property rights.

3.3. EXCLUSIVE CLASSIFICATION OF POACHERS

The combination of two exclusive classification criteria enables a typology of poachers consisting of four generic types to be produced (depending on the property rights that they hold – as shown in Table 1).

Table 1. Four generic types of poachers in fisheries management.

Type of Poacher	Possibility of Hold Property Rights	
	Formal	Informal
1. Regulated Activities Member + Community Member	✓	✓
2. Regulated Activities Member + Community Outsiders	✓	✗
3. No Regulated Activities Member + Community Member	✗	✓
4. No Regulated Activities Member + Community Outsiders	✗	✗

The application of a combined dual criterion guarantees an exclusive classification, eliminating the possibility of a poacher being simultaneously included in more than one category, thereby putting an end not only to duplications in the classification but also to the ambiguity that characterises existing poacher classifications.

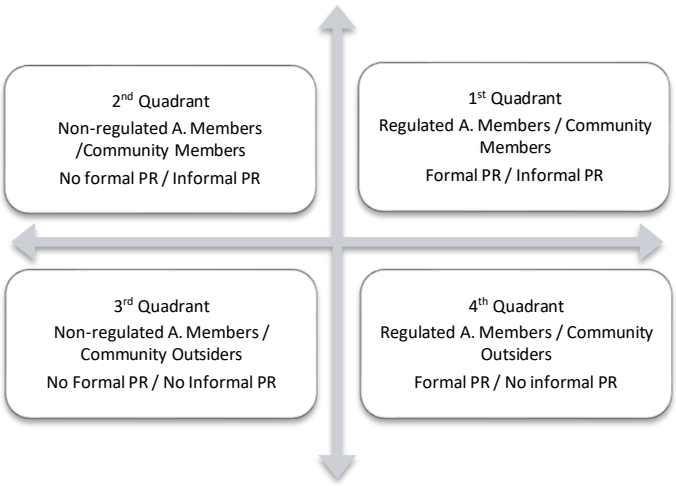
4. EXHAUSTIVENESS CRITERIA: RANKING POACHERS BY FORMAL AND INFORMAL PROPERTY RIGHTS

4.1. EXHAUSTIVENESS CRITERIA: CARTESIAN PLANE OF POACHERS.

Once exclusive criteria have been established, the classification must be able to allocate all the individuals who practice poaching in to one of the classification categories; that is, it must be exhaustive.

To help distribute poachers within the four categories, we created a Cartesian Plane (Figure 1), which gives graphical support to the classification. Each quadrant represents one of the suggested generic types of poachers. The x-axis of the plane was assigned to, *Membership of the Regulated Activities*, while being a *Community Member* was assigned to the y-axis.

Figure 1. Cartesian plane distributing poachers by quadrants.



Each of the four general categories of poachers, established in Section 3, must be able to accommodate every type of illegal appropriator who fulfils the conditions for belonging to each quadrant. To this end, it will be necessary to establish criteria for allocating a range to the individuals catalogued within each category. The features of the formal property rights combined with the informal access and exploitation rights implemented by the community, makes it possible to assign classificatory ranges to the poachers. Since the same property rights may exist to a different degree, and several individuals may hold property rights over the same resources at the same time (Alchian & Demsetz, 1973; Guerin, 2003), the classification range will depend on the degree to which formal or informal property rights are present in each situation.

4.2. RANKING POACHERS BY FORMAL PROPERTY RIGHTS

From the formal perspective, allocation of a rank measuring the membership to the ***Regulated Activities*** sphere can be done through the analysis of the features of the licences held by legal resource users. In this sense, Scott (1988), established the defining characteristics of real property rights applied to environmental management, being the

most relevant: Transferability[1], Exclusivity, Durability and Security. Additionally, Anderson (2002) adapted these characteristics and applied an ordinal scale to develop a *Property Rights Index* to enable the evaluation of the development of the aquaculture industry (Table 2). These theoretical perspectives enable the creation of a ranking scale applicable to poachers.

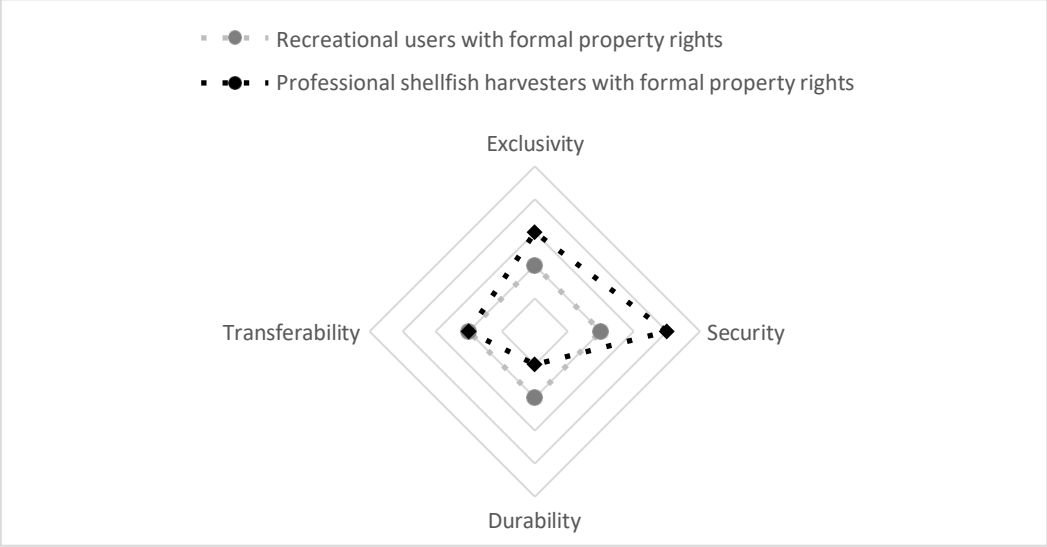
As an example, Figure 2, which is based on Scott (1988) and Anderson (2002), presents the characteristics of the formal property rights of legal shellfish gatherers and legal recreational users in Galicia. Both kind of users hold legal titles of the same nature, with the same right of access and exploitation[2], but in differing degrees. While the formal rights of fishery sector professionals enjoy greater security, exclusivity and durability, in accordance with the needs of professional harvesting activities, those of recreational users are weaker (Guerin, 2003).

The underlying implication is that formal users can be classified by assigning them a rank according to the overall strength of their property rights. In this work, the formal property rights would be ranked as **Weak (1), Moderate (2) and Strong (3).**

[1] Definition of each property rights features.

[2] As set out in Galician fisheries law (Xunta de Galicia, 2008).

Figure 2. Quality of the formal property rights of Galician fisheries sector professionals.



Source: Xunta de Galicia (2020). Adapted from Scott (1988) and Anderson (2002).

Table 2. Appraisal criteria for property rights characteristics proposed by Anderson (2002)

Characteristics of P.R.	None	Weak	Moderate	Strong	Very Strong
	1	2	3	4	5
Durability	Daily	Seasonal	1-to-5 years	5-to-10 years	> 10 years to perpetuity
Transferability	Not Transferable.	Transferable under highly restrictive and very limited conditions.	Transferable within a defined group (i.e., fishermen).	Fully transferable with poor/illiquid market institutions	Fully transferable with well-established, efficient market institutions.
Exclusivity	Unrestricted open access	Limited control over inputs, outputs, and harvest management.	Some inputs and outputs are controlled, and harvest is managed by the right holder	Most property management is in the right holder's control.	All decisions and access to the property are controlled by the owner
Security	No security. Rights are not protected by any means	Rights are only minimally protected by law or are protected only by private security forces.	Theft is common or rights are at risk with changes in administration.	Reasonably protected by enforcement and legal system	Well-enforced rights through enforcement and the legal system

Source: Anderson (2002)

Transposing the above example to the classification of poachers in the Cartesian plane, illegal harvesters working in the fisheries sector will be placed towards the maximum value of sector membership. Thus, the stronger the property rights, i.e. the more exclusive, transferable, durable and secure they are, the closer they will be to the maximum value of the horizontal axis. Recreational users will be assigned a more central position, closer to 0, because they hold weaker formal rights. This ranking is applicable to the positive side of the horizontal axis, which includes users with formal property rights, regardless of community membership, i.e. in quadrants 1 and 4.

4.3. RANKING POACHERS BY INFORMAL PROPERTY RIGHTS

The negative side of the horizontal axis needs additional input because it is the theoretical representation of the absence of formal property rights (quadrants 3 and 2), which does not necessarily mean a lack of regulation. It is precisely in the co-management environment where informal property rights could fill the formal management gaps, facilitating the pragmatic management of natural resources (Schlager & Ostrom, 1992).

For SSF, as in the case of formal property rights, ranks can be assigned to the *de facto* rights. In this vein, Ballesteros & Rodríguez-Rodríguez (2018b) measured the informal acceptability of poaching in the most important Galician shellfish gathering community. They demonstrated the relationship between the concession of informal property rights that allow poaching (Acceptability) and membership to the community of those individuals involved in non-compliance activities. Moreover, they identified the "acceptable" non-compliance behaviours; mainly actions guided by need e.g. unemployment, poverty, drug abuse or by self-consumption. In some research related to compliance with fishing laws, similar behaviours were detected (Ballesteros & Rodríguez-Rodríguez, 2018a, 2018b; Bell et al., 2007; Gezelius, 2003, 2004; Hampshire et al., 2004). In this way, when unauthorised harvesting occurs, community reasoning interprets the poachers' motivations, degree of membership of the community and personal situation in order to determine whether it is acceptable, tolerable or reprehensible (Ballesteros & Rodríguez-Rodríguez, 2018a, 2018b). Additionally, Ballesteros & Rodríguez-Rodríguez (2018b) measured the membership of the poachers' community according to the perception of the legal users of the resources. The shellfish gatherers highlighted that affiliation to the community depended on who the individual was, but also on how and why they poached. Those who violated the internal rules of the community, including the conditions for the tolerance of the "acceptable" poaching,

achieved a lower degree of belonging to the community than the poachers who respected them.

According to the above, the concession of informal property rights over the resources will affect only the poachers in quadrants 1 & 2, to whom community acceptance could be applied, but never to the community outsiders in quadrant 3 or 4.

The rank assigned to poachers based on the degree to which they belong to the community will affect their position in the Cartesian plane. While those poachers that act reprehensibly in the eyes of the community will be located on the periphery due to the limited possibilities of creating informal institutional arrangements that might benefit them, those who are accepted or tolerated will be located more towards the centre, given that such informal arrangements will in all probability apply to them. In order to determine what kinds of poaching will be considered acceptable or reprehensible by the community there must be a thorough prior understanding of the specific institutional contexts in which the users of the natural resources operate.

4.4. RANGE OF VALUES USED TO CLASSIFY POACHERS WITHIN EACH QUADRANT

Reflecting the possibility that property rights may exist to different degrees, Table 3 includes a range of values designed to catalogue poachers according to the characteristics of the rights they may hold. The suggested values, which range from -3 to 3, define membership of both the regulated activities and the fishing community depending on the strength of formal property rights held and on the possible existence of informal property rights, respectively. The position of the different categories of poacher on the Cartesian plane will fit the values attributed to each kind of poacher that has been identified.

Table 3. *Ad hoc* range of values used to classify poachers within each quadrant.

Community Membership (*y*-axis)	Value	Membership Regulated Activities Sphere (*x*-axis)
Poachers with informal property rights. Poachers accepted by the community; whose actions do not violate community morality.	3 STRONG	Persons with strong formal property rights.
Poachers with moderate informal property rights. Members of the community and traditional users, their low impact actions are tolerated.	2 MODERATE	Persons with moderate formal property rights.
Poachers from the community whose actions go against community morality. Little chance of holding informal property rights.	1 WEAK	Persons with weak formal property rights.
	-1 STRONG	Persons lacking formal property rights but having strong informal property rights.
	-2 MODERATE	Persons lacking formal property rights but having moderate informal property rights.
Poachers alien to the community whose actions are unacceptable from the standpoint of community reasoning.	-3 WEAK	Persons lacking formal property rights and having little chance of holding informal property rights.

4. TESTING THE CLASSIFICATION

The classification proposed should allow for the exclusive and exhaustive categorisation of a substantial number of poachers who fish or harvest different marine species in multiple socio-ecological contexts, driven by several motivations and interacting with particular regulatory contexts. To test its validity a real case on poaching has been used. The research of Ballesteros & Rodríguez-Rodríguez (2018a) on shellfish poaching in Galicia is a poaching management case in which different types of natural resources offenders were identified (19). Table 4 details the 19 types of shellfish poachers identified in Galicia.

Table 4. The 19 different types of shellfish poacher identified in Galicia.

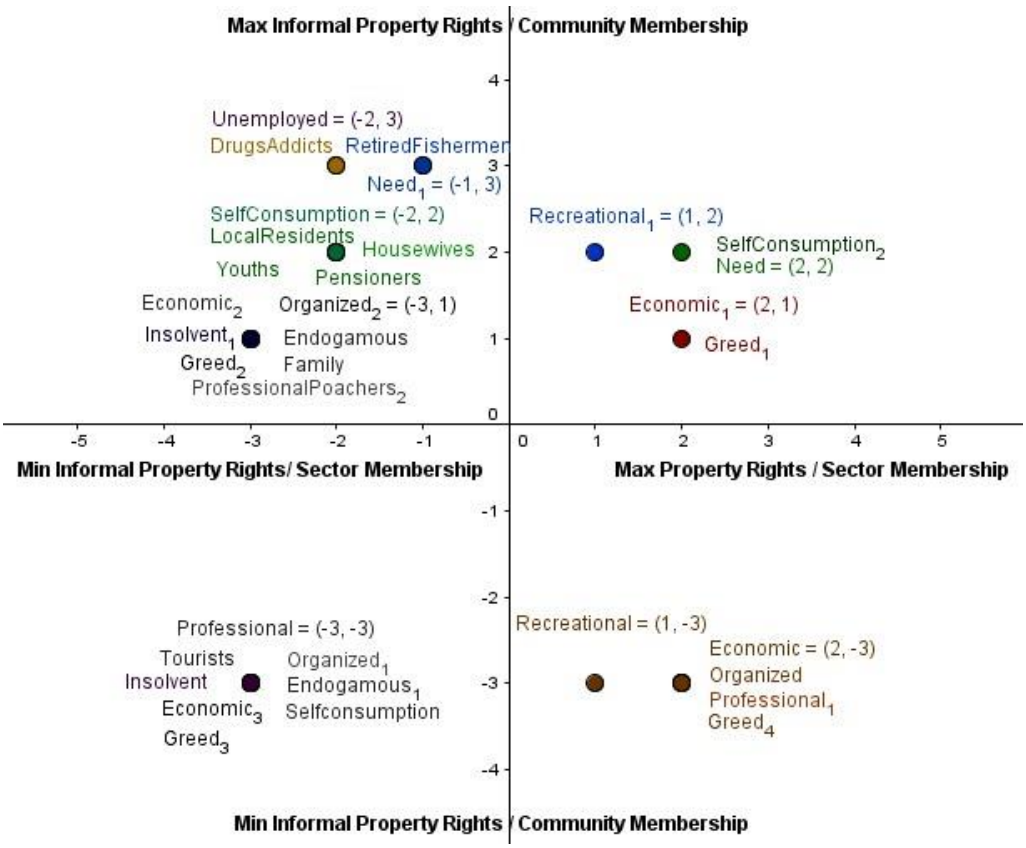
Classification Criteria	Type of Poacher
Individual or collective attributes	**1. Unemployed persons:** those who poach to obtain an alternative source of income to allow them to cope with being unemployed.
	2. Tourists or holidaymakers: occasional poachers who make the most of their trips to the beach to gather some shellfish
	3. Drug addicts: people with drug-related issues who use poaching as an alternative source of income. They tend to be easily recognizable members of the local community.
	4. Old-age pensioners: retirees, usually members of the local community, who poach out of habit, for self-consumption or to make some money to supplement their pension.
	5. Retired fishermen: retired fishermen or shellfish harvesters who continue to practice their former profession out of habit. They are well-trained, experienced and technically well-equipped to catch fish or gather shellfish.
	6. Local youths: younger members of the local community who poach for self-consumption or profit.
	7. Housewives: female members of the local coastal community who poach out of habit, for self-consumption or for profit.
	8. Endogamous Groups / Family groups: People belonging to the same family who poach for profit, with a certain degree of organisation in their activity
	9. Persons at risk of or suffering social exclusion: members of the local community who poach in order to obtain an alternative source of income to help them make ends meet.
	10. Local residents: members of the local coastal community who poach out of habit, for self-consumption or for profit.
	11. Bankrupts: people who usually poach for profit, using their status as bankrupts as a strategy to avoid any possible fine or punishment.
Modus Operandi.	**12. Recreational poachers**: holders of recreational fishing permits who also harvest shellfish illegally on foot, from boats or under water.
	13. Professional poachers: people for whom poaching is their main source of income. They poach with a high degree of frequency and tend to be rejected within their local community.
	14. Organized poachers: they work in groups with varying degrees of organisation to harvest and commercialize the shellfish they poach, at times using technological means. They are very familiar with local conditions and can harvest large amounts of shellfish solely for profit.
	15. Insider poachers: licensed professional shellfish harvesters who also poach the resource
Driving force	**16. Profit-motivated poachers:** people who poach purely to make a profit. Their activity is frowned upon by the local community and the shellfish-growing industry alike.
	17. Needy poachers: this group includes anyone who poaches shellfish out of need. This motive is acknowledged and largely tolerated by fishing and shellfish-growing communities, especially when the persons concerned are one of their own.
	18. Greedy poachers: people who poach the resource, usually for profit or self-consumption, but with no need to do so in order to provide themselves with a livelihood. They are rejected by fishing and shellfish-growing communities.
	19. Poaching for self-consumption: on the whole these are people who harvest the resource illegally because they are in the right place at the right time, for example when there is no surveillance. Their activity is generally a low-impact one and may even be tolerated, especially amongst members of their own communities. They don't trade with the shellfish. They poach in order to get free food, avoiding paying for it in local markets or auctions.

Source: Ballesteros & Rodríguez-Rodríguez (2018a)

The virtue of the classification is to give homogeneity to all the expressions of poachers in the four generic types of poachers, integrating them independently of their individual and/or collective characteristics, their *modus operandi*, the frequency, organisation and technology they employ and the reasons driving them to carry out unauthorised harvesting. The characteristics of the initial 19 types of poachers in Table 1, identified with no defined classification pattern, could be so broad that some of them can fall within more than one quadrant in the proposed classification. However, the exclusivity of the classification ensures that although poachers may share some common features such as *modus operandi* or driving force for poaching, they are in fact different kinds of poacher, determined by their differing possibilities of accessing and exploiting resources.

Following the guidance of the ad-hoc range and the information from Table 4, the poachers were classified (Figure 3). The Annex includes detailed explanations of the coordinates attributed to each of the 19-classified poachers.

Figure 3. Classification of Galician Poachers.



5. DISCUSSION

In this paper, we filled a methodological gap by providing a classification of marine resource poachers that satisfies the fundamental classification criteria: exclusivity and exhaustiveness. Therefore, the classification allows for the sorting of all the possible poachers into clear and exclusive categories.

In the literature review we don't find classifications because there are not exclusive. If exclusive criteria are not used, we get *lists* of poachers, but not classifications (Gerring, 2011). The lists are sometimes highly descriptive and do add precise information about poachers in specific contexts (Blevins & Edwards, 2009; Eliason, 2008, 2013; Forsyth,

2008; González Arias et al., 2011; Musgrave et al., 1993; Muth & Bowe, 1998 Tailby & Gant, 2002) . This information is undoubtedly valuable and can significantly help resolve particular cases; however, it is of limited use for extrapolation of the classification and its application in other poaching experiences and contexts.

Our classification of poachers is based on formal and informal property rights allowing the recognition of different spheres of resource regulation. Property rights as institutional tools allow for establishing common bases that favour the management of resources in different contexts (Agrawal, 2001; Bess & Harte, 2000; Grafton et al., 2009; Guerin, 2003; Hilborn et al., 2005; Ostrom, 1990, 2005; Schlager & Ostrom, 1992; A Scott, 2000). From this idea, the classification initially designed to address poaching management, especially in small-scale fisheries (SSF) managed by co-management systems, can be extrapolated to other socio-ecological contexts in which resource appropriation occurs.

Another classification contribution is the interaction of formal and informal regulation on resource management. By introducing the criterion of informal property rights ownership among poachers, we give them context; they belong (or do not) belong to the community. Regarding poaching in SSF, fishing communities function as informal enforcement systems that, through informal arrangements, adapt their contextual reality to the needs of fisheries management, including the fight against poaching (Ballesteros & Rodríguez-Rodíguez, 2018a; Gezelius 2003; 2004, Bell et al.; 2007). In an extended way, Von Essen et al. (2019) showed the existence of "communities of practice" that create a self-defined identity that marks the limits of who is external to the community and internal to it, generating solidarity among its members. Some identity markers (belonging to the community, morally tolerable poaching operations) can determine the attribution of legitimised informal agreements in the shellfish communities (Ballesteros et al., 2022).

Some of the informal institutional arrangements are given by the self-perception of identity and affiliation to the community and the moral commitment not to act against the values that should not be transgressed, for example, practising poaching when there are no economic needs, to make a profit, etc. (Ballesteros & Rodríguez-Rodríguez, 2018a; Gezelius, 2004). Therefore, given the right conditions, some poaching practices may be acceptable. The literature reinforces the idea of the difference between outsiders and members of a community, the latter being the ones who can be owners of informal property rights in the community environment. It is precisely the recognition of the group of members of a fishing community and other associated aspects (Ostrom, 2015) that can shape informal management widely used in the management of common resources worldwide (Ostrom, 2015).

For the above mentioned, this classification puts the need to broaden the management approach on the table, making considering the existence of informal management of resources as necessary as the formal one. Indeed, by granting and articulating informal arrangements, communities generate adequate incentive systems, which can minimise poaching (Ballesteros et al., 2020; Ostrom, 2015). This happens through the acceptance of non-compliance in the short term by poachers from the community acting for reasons legitimated by the community, which guarantees its prevalence, as well as a reduction in damage from poaching practices (Gezelius 2003). Or, from the persecution of what they deem unacceptable poaching i.e. openly illegitimate and harmful to the community.

Another contribution of the classification is to expand the management of marine poaching as part of illegal, unreported and unregulated (IUU) fishing. In this sense, managing poaching in artisanal fisheries requires a broader, more accurate, and fair perspective than that established by the mainstream in IUU fishing. In this sense, combating IUU fishing is based on a binary approach that characterises fishers as

compliant and non-compliant, as legal or illegal fishers, standardising poachers and their motivations, and betting on coercion as a method of deterrence (FAO, 2018). However, this approach is limited in addressing non-compliance actions in small-scale fisheries (SSF), which are often influenced by contextual, cultural, social, and economic nuances and promoted by a range of motivations beyond illegal fishing motivated by making profits (Song et al., 2020). In this sense, fishers who don't comply with the regulations in marine environments can be motivated by economic profit, by need triggered by situations of unemployment, poverty, or lack of opportunities or as a desire to continue traditional practices in the use of the resources. It also can occur as a result of other drivers such as a rebellion against illegitimate laws or by recreational motivations (Ballesteros & Rodríguez-Rodríguez, 2018b; Bell et al., 2007; Bergseth & Roscher, 2018; Geiger et al., 2022; Gezelius, 2004; Oyanedel et al., 2018; Raemaekers et al., 2011; Romero et al., 2021; Von Essen, Hansen, Nordström Källström, et al., 2014; Weekers et al., 2021).

The IUU fishing binary approach identifies the poacher as a mere lawbreaker; thus, the focus of anti-poaching measures is the disincentive to non-compliance. Therefore, the predominant measures to discourage IUU fishing are usually purely coercive (FAO, 2018). The microeconomic rationale behind this approach is to make poaching riskier and, consequently, more expensive for poachers to carry out their operations (Becker 1974, Stigler 1974). By increasing surveillance, fines, investing in better means of control, etc., a more significant risk is generated for non-compliers, reducing the chance of success in poaching operations, and sometimes poaching deterrence. Using this coercive approach is critical and should be applied but does not work in all non-compliance situations or with all non-compliers (Kuperan & Sutinen, 1998; Sutinen & Kuperan, 1999).

Another of the significant limitations of this coercive approach is that it standardises poachers and their motivations, ignoring the wide range of contextual nuances that can promote the practice of poaching, which, in the context of economic crisis, unemployment, poverty or social inequality, could generate severe problems of social injustice and embed chronic poaching behaviours (Ballesteros & Rodríguez-Rodríguez, 2019; Song et al., 2020). Moreover, by systematically opting for control and coercive punishment, it omits other possible action, such as those articulated informally by fishing communities, worldwide. The danger of ignoring the context is that counterproductive, unfair and illegitimate measures of action are generated, which help to make poaching chronic instead of combating it (Ballesteros & Rodríguez-Rodríguez, 2019; Song et al., 2020). In this sense, Ballesteros & Rodríguez-Rodríguez (2019) observed that the sanctioning of poaching based on administrative fines, prohibitions, suspensions or revocations of permits and formal exploitation licenses led to some poachers abandoning poaching activities while others continued with illegal actions to pay the fines or to maintain their income. In these circumstances, "*Vicious Circles of Poaching*" materialise, which becomes a trap of economic sanctions and insolvency for poachers who act out of "necessity", consolidating their poverty and inability to generate income by socially excluding them.

Our classification considers the underlying causes of poaching and not only the immediate motivation of the poacher. Again, the typology includes informal management based on local realities, which can activate measures to combat poaching that are not purely coercive. To promote better, fairer and more legitimate anti-poaching measures, they should adapt to small-scale communities' realities considering the context and the complexity of local nuances (Oyanedel, Gelcich, & Milner-Gulland, 2020; Song et al., 2020).

Another of the objectives of the classification is that it helps formulate anti-poaching policies. The measures against poaching are based on the premise that the different types of poachers must be combated in a way adapted to both the poaching profile and the context in which they operate. In this sense, Table 5 presents coercive and non-coercive measures to deter poaching. These packages are linked to each type of poacher in the classification. Policymakers must verify the validity of policy recommendations and adapt them to different socio-ecological contexts affected by poaching.

Table 5. Packages of coercive and non-coercive measures to deter poaching. 4

Type of Poacher	Possibilities Hold Property Rights		Measures Combination of Strategies	
	Formal	Informal	Coercive	Normative Actions, aim the voluntary compliance based on an appropriate incentive structure
1.Regulated Activities Member + Community Member	✓	✓	-Fines, inspections confiscations and seizures of products, gears, equipment, and vessels. -Temporary or permanent revoke of permits. -Temporary reduction or permanent revocation of fishing quotas. - Increasing control by investing in technical means (boats, helicopters, etc) and surveillance personnel to fight against poaching. -Review of internal rules for the resolution of conflicts or appropriate internal penalty systems in co-management communities. - Disincentive poaching by undermining black market channels, persecution of sellers and buyers of poached species.	-Generate compliance incentives through informative and training campaigns among industry members. -Campaigns on negative externalities of non-compliance, such as economic, social, and ecological problems brought about by poaching. -Public awareness campaigns on the economic, social, and environmental adverse effects of poaching. - Public awareness campaigns on the danger of consuming some species of shellfish sold illegally and without sanitary control. - Specific information campaigns on tax evasion from poaching activities. - When suitable, involve economic sectors such as recreational fishing or tourism in the fight against poaching, showing how the environmental degradation of poaching can reach these activities. -Adaptive management of poaching based on co-management. -Social policies aimed at individuals who poach. -Training workshops for industry members focused on the recycling of old allowed practices. -Training of guard's coast to improve communication with the sector and promoting a perception of legitimacy in enforcement actions and their processes. - Policies to increase social inclusion, reduction of inequality and poverty
2.Regulated Activities Member + Community Outsider	✓	X	-Fines, inspections confiscations and seizures of products, gears, equipment, and vessels. -Temporary or permanent revoke of permits. -Increase of surveillance and control. -Increase inspections in marketers and potential buyers of poachers' material. -Closures of sales premises.	-Generate compliance incentives through informative and training campaigns among industry members -Campaigns on negative externalities of non-compliance, such as economic, social, and ecological problems brought about by poaching. -Social policies aimed at individuals who poach. -Training workshops for industry members focused on the recycling of old allowed practices. - Specific information campaigns on tax evasion from poaching activities. - When suitable, involve economic sectors such as recreational fishing or tourism in the fight against poaching, showing how the environmental degradation of poaching can reach these activities.
3.No Regulated Activities Member + Community Member	X	✓	Fines, inspections confiscations and seizures of products, gears, equipment, and vessels. -Temporary or permanent revoke of permits. -Increase of surveillance and control. -Increase inspections in marketers and potential buyers of poachers' material. -Closures of sales premises.	-Public awareness campaigns on the dangers of poaching, including consumption of poached animals -Campaigns on negative effects of poaching for the regulated sector, fishers, shellfishers. -Training of guard's coast to improve communication with the sector and promoting a perception of legitimacy in enforcement actions and their processes. - Policies to increase social inclusion, reduction of inequality and poverty - Information about overexploitation effect of poaching. -In some cases, acceptability of non-compliance as a compensation mechanism into the communities.
4.No Regulated Activities Member + Community Outsider 5 6	X	X	-Fines, inspections confiscations and seizures of products, gears, equipment, and vessels. -Temporary or permanent revoke of permits. -Increase of surveillance and control. -Increase inspections in marketers and potential buyers of poachers' material. -Closures of sales premises.	-Campaigns on negative externalities of non-compliance, such as economic, social, and ecological problems brought about by poaching. -Public awareness campaigns on the economic, social, and environmental adverse effects of poaching. - Public awareness campaigns on the danger of consuming some species of shellfish sold illegally and without sanitary control. -Social policies aimed at individuals who poach. - Policies to increase social inclusion, reduction of inequality and poverty

6. CONCLUDING REMARKS

The fundamental contribution of this paper has been to develop a homogeneous classification of poachers that can be applied in different contexts of fisheries resources appropriation ruled by co-management systems. The main challenge was to establish mutually exclusive classification criteria that would at the same time make it possible to classify a vast and heterogeneous number of individuals.

Adoption of the premise that all valuable natural resources are regulated, either formally or informally, opened up the avenue of resource management as an approach to tackling the issue of poaching. The consideration of this dual regulatory perspective made it possible to carry out a comprehensive analysis of the phenomenon, emphasising the formal aspects without losing sight of the nuances in resource management provided by internal regulation within the local community. The criteria defined in this paper, namely membership of the local community and membership of regulated activities, in association with formal and informal property rights, established the patterns required to create a classification that overcomes the limitations of previous proposals. What is more, by taking both levels of management into consideration, the classification ceases to be purely synthetic and immerses itself in the day-to-day reality of natural resource management.

Additionally, this typology has been proposed to further appropriate anti-poaching measures, starting from the premise that not all poachers are equal, thus rendering a “one size fits all” policy inappropriate. Rather the measures to be applied must fit each type of poacher and their circumstances. A prerequisite of this adaptive perspective is a thorough knowledge of the specific institutional environment in question, endowing the institutional approach used to develop the classification with greater solidity. The anti-

poaching measures developed must focus on the need for a comprehensive understanding of the institutional environment, but also the relevance of a combined application of instrumental (coercive) and normative measures to shape adaptive policies that promote and favour regulatory legitimacy and compliance.

Recent research on compliance within fisheries suggests that approaches that focus on normative measures over coercive action can yield stronger management (Ballesteros et al., 2020; Oyanedel et al., 2020; Thomas et al., 2014, 2015, 2016; Turner et al., 2016). The legitimacy of activity is strengthened where management is derived from social norms, the idea that it is those engaged in the activity who regulate themselves. This classification therefore allows for powerful policy interventions by understanding the activity present in the management area and tailoring the approach to appropriately engage with the stakeholders to build tools that are not simply accepted but become part of the fabric of the community.

Although the typology was set up for the management of poaching in small-scale fisheries, bringing in specific information on the institutional framework where the resources are exploited, it could be applied in other contexts. Regarding this possibility, further research on the issue should be undertaken.

7. REFERENCES

Agrawal, A. (2001). Common property institutions and sustainable governance of resources. *World Development*, *29*(10), 1649-1672. https://doi.org/10.1016/S0305-750X(01)00063-8

Alchian, A. a., & Demsetz, H. (1973). The Property Right Paradigm. *The Journal of Economic History*, *33*(01), 16-27. https://doi.org/10.1017/S0022050700076403

Anderson, J. L. (2002). Perspectives aquaculture and the future: why fisheries

economists should care. *Marine Resource Economics*, *17*(3939), 133-151.

Ayling, J. (2013). What Sustains Wildlife Crime? Rhino Horn Trading and the Resilience of Criminal Networks. *Journal of International Wildlife Law & Policy*, *16*(1), 57-80. https://doi.org/10.1080/13880292.2013.764776

Ballesteros, H. M., & Rodríguez-Rodríguez, G. (2018a). How much in the clan are you? The community as an explanatory factor of the acceptance of poaching in small-scale fisheries. *Marine Policy*, *97*(June), 188-196. https://doi.org/10.1016/j.marpol.2018.06.014

Ballesteros, H. M., & Rodríguez-Rodríguez, G. (2018b). "Acceptable" and "unacceptable" poachers: Lessons in managing poaching from the Galician shellfish sector. *Marine Policy*, *87*(January 2018), 104-110. https://doi.org/10.1016/j.marpol.2017.10.015

Ballesteros, H. M., & Rodríguez-Rodríguez, G. (2019). "Economic Crisis and Poaching: Advice on Anti-Poaching Management from The Galician Shellfish Sector". *Deviant Behavior*, *40*(12), 1508-1521. https://doi.org/10.1080/01639625.2018.1525804

Ballesteros, H. M., Rodríguez-Rodríguez, G., Ferreiro-Seoane, F. J., & Martínez-Cabrera, H. (2020). The Fewer Insider Poachers, the More Normative Compliance: Clues for Managing Poaching in the Shellfish Sector. *Deviant Behavior*, *42*(6), 747-761. https://doi.org/10.1080/01639625.2020.1854635

Ballesteros, H. M., Rodríguez-Rodríguez G., Martínez- Cabrera, H., Sánchez-Llamas, E., Rama, P., & García-Negro, M. C. (2022). Saltarse las reglas como refuerzo de la comunidad. Anuario de estudios marítimos, 1, 231-253

1 Becker, G. (1974), Crime and punishment: an economic approach, in: G.S. Becker,
2 W.M. Landesd (Eds.), Essays Economics of Crime and Punishment, NBER, 1974, pp. 1–
3 54.

4 Bell, S., Hampshire, K., & Topalidou, S. (2007). The political culture of poaching: a
5 case study from northern Greece. *Biodiversity and Conservation*, *16*(2), 399-418.
6 https://doi.org/10.1007/s10531-005-3371-y

7 Bergseth, B. J., & Roscher, M. (2018). Discerning the culture of compliance through
8 recreational fisher´s perceptions of poaching. *Marine Policy*.
9 https://doi.org/10.1016/j.marpol.2017.12.022

10 Bergseth, B. J., Russ, G. R., & Cinner, J. E. (2015). Measuring and monitoring
11 compliance in no-take marine reserves. *Fish and Fisheries*, *16*(February), 240-258.
12 https://doi.org/10.1111/faf.12051

13 Bess, R., & Harte, M. (2000). The role of property rights in the development of New
14 Zealand's seafood industry. *Marine Policy*, *24*(4), 331-339.
15 https://doi.org/10.1016/S0308-597X(00)00009-9

16 Blevins, K., & Edwards, T. (2009). Wildlife Crime. En M. J. (Ed.), *21st Century*
17 *criminology : A reference handbook.* (pp. 557-563). SAGE Publications, Inc.
18 https://doi.org/10.4135/9781412971997.n65

19 Cepić, D., & Nunan, F. (2017). Justifying non-compliance: The morality of illegalities
20 in small scale fisheries of Lake Victoria, East Africa. *Marine Policy*,
21 *86*(September), 104-110. https://doi.org/10.1016/j.marpol.2017.09.018

22 Curcione, N. (1992). Deviance as delight: Party boat poaching in southern California.
23 *Deviant Behavior*, *13*(1), 33-57. https://doi.org/10.1080/01639625.1992.9967897

Eliason, S. L. (2008). Wildlife Crime: Conservation officers perceptions of elusive poachers. *Deviant Behavior*, *29*, 11-128.

Eliason, S. L. (2013). Policing the Poachers in the United States : A Qualitative Analysis of Game Wardens and Profiling. *International Journal of Criminal Justice Sciences*, *8*(2), 235-247.

FAO. (2018). *Technical guidelines on methodologies and indicators for the estimation of the magnitude and impact of illegal, unreported and unregulated (IUU) fishing*. http://www.fao.org/3/CA0458EN/ca0458en.pdf

Filteau, M. R. (2012). Deterring Defiance: «Don't Give a Poacher a Reason to Poach». *International Journal of Rural Criminology*, *1*(2), 236-255. https://doi.org/10.18061/1811/53696

Forsyth, C. J., Gramling, R., & Wooddell, G. (1998a). The Game of Poaching: Flok crimes in Southwest Louisiana. *Society & Natural Resources*, *11*, 25-38.

Forsyth, C. J., Gramling, R., & Wooddell, G. (1998b). The game of poaching: Folk crimes in southwest Louisiana. *Society & Natural Resources*, *11*(1), 25-38. https://doi.org/10.1080/08941929809381059

Forsyth, C. J., & Marckese, T. A. (1993). FOLK OUTLAWS: VOCABULARIES OF MOTIVES. En *International Review of Modern Sociology* (Vol. 23, Número Spring). https://doi.org/10.2307/41421592

Geiger, K. J., Rivera, A., Aguión, A., Álvarez, J., Arrontes, J., Borrell, Y. J., Cruz, T., Davoult, D., Dubert, J., Feis, M. E., Fernandes, J. N., Fernández, C., García-Flórez, L., Jacinto, D., Jollivet, D., Macho, G., Mateo, E., Mateus, D., Morán, P., … Acuña, J. L. (2022). Coping with poachers in European stalked barnacle fisheries:

Insights from a stakeholder workshop. *Marine Policy*, *135*, 104826. https://doi.org/10.1016/j.marpol.2021.104826

Gerring, J. (2011). *Social Science Methodology*. Cambridge University Press. https://doi.org/10.1017/CBO9781139022224

Gezelius, S. (2003). *Regulation and Compliance in the Atlantic Fisheries: State/Society Relations in the Management of Natural Resources.* Springer Science & Business Media. https://doi.org/10.1007/978-94-010-0051-2

Gezelius, S. (2004). Food, money, and morals: Compliance among natural resource harvesters. *Human Ecology*, *32*(5), 615-634. https://doi.org/10.1007/s10745-004-6099-5

González Arias, M. Á., Molano Martín, F. J., & Bandín Buján, C. (2011). *O Furtivismo Mariño e a súa incidencia na Comunidade Autónoma de Galicia*. Xunta de Galicia.

Grafton, R., Hilborn, R., Squires, D., Tait, M., & Williams, M. (2009). *Handbook of marine fisheries conservation and management*. http://books.google.com/books?hl=en&lr=&id=rZACECFPe1AC&oi=fnd&pg=PR11&dq=Handbook+of+Marine+Fisheries+Conservation+and+Management&ots=WyXGE6XeTa&sig=jl6cgoMdVCHgLE9OTejJHgkqt7s

Guerin, K. (2003). *Property rights and environmental policy: A New Zealand perspective*. http://ideas.repec.org/p/nzt/nztwps/03-02.html

Hampshire, K., Bell, S., & Wallace, G. (s. f.). *Society & Natural Resources : An " Real " Poachers and Predators : Shades of Meaning in Local Understandings of Threats to Fisheries '' Real '' Poachers and Predators : Shades of Meaning in*

Local Understandings of Threats to Fisheries. *March 2014*, 37-41. https://doi.org/10.1080/08941920490278656

Hampshire, K., Bell, S., Wallace, G., & Stepukonis, F. (2004). "Real" Poachers and Predators: Shades of Meaning in Local Understandings of Threats to Fisheries. *Society & Natural Resources*, *17*(4), 305-318. https://doi.org/10.1080/08941920490278656

Hilborn, R., Orensanz, J. M. L., & Parma, A. M. (2005). Institutions, incentives and the future of fisheries. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, *360*(1453), 47-57. https://doi.org/10.1098/rstb.2004.1569

Jentoft, S. (2000). The community: a missing link of fisheries management. *Marine policy*, *24*, 53-59. http://www.sciencedirect.com/science/article/pii/S0308597X99000093

Jentoft, S. (2004). Institutions in fisheries: what they are, what they do, and how they change. *Marine Policy*, *28*, 137-149. https://doi.org/10.1016/S0308-597X(03)00085-X

Jones, D. J. V. (1979). The Poacher: A Study in Victorian Crime and Protest. *The Historical Journal*, *22*(04), 825. https://doi.org/10.1017/S0018246X00017143

Kuperan, K., & Sutinen, J. (1998). Blue water crime: deterrence, legitimacy, and compliance in fisheries. *Law & Soc'y Rev.*, *32*(2), 309-338.

Lambrechts, D., & Goga, K. (2016). Money and Marginalisation: The Lost War Against Abalone Poaching in South Africa. *Politikon*, *43*(2), 231-249. https://doi.org/10.1080/02589346.2016.1201728

McGoodwin, J. R. (2001). *Understanding the Cultures of Fishing Communities: A Key to Fisheries Management and Food Security* (F. & A. Org. (ed.)). Food & Agriculture Org., 2001. http://www.fao.org/3/y1290e00.htm

Musgrave, R. S., Parker, S., & Wolok, M. (1993). The Status of Poaching in the United States-Are We Protecting our Wildlife? *Natural Resources Journal*, *33*, 977-1014. http://digitalrepository.unm.edu/nrj/vol33/iss4/5/

Muth, R. M., & Bowe, J. F. (1998a). Illegal harvest of renewable natural resources in North America: Toward a typology of the motivations for poaching. *Society & Natural Resources*, *11*(1), 9-24. https://doi.org/10.1080/08941929809381058

Muth, R. M., & Bowe, J. F. (1998b). Illegal harvest of renewable natural resources in North America: Toward a typology of the motivations for poaching. *Society & Natural Resources*, *11*(1), 9-24. https://doi.org/10.1080/08941929809381058

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press. https://doi.org/10.1017/CBO9780511807763

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton University Press.

Oyanedel, R., Gelcich, S., & Milner-Gulland, E. J. (2020). A synthesis of (non-)compliance theories with applications to small-scale fisheries research and practice. *Fish and Fisheries*, *April*, 1-15. https://doi.org/10.1111/faf.12490

Oyanedel, R., Keim, A., Castilla, J. C., & Gelcich, S. (2018). Illegal fishing and territorial user rights in Chile. *Conservation Biology*, *32*(3), 619-627. https://doi.org/10.1111/cobi.13048

Pascual-Fernández, J. J., Frangoudes, K., & Williams, S. (2005). Local Institutions. En J. Kooiman, M. Bavinck, S. Jentoft, & R. Pullin (Eds.), *Fish for life: interactive governance for fisheries* (MARE Publi, p. 427). Amsterdam University Press. http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Fish+for+Life:+Interactive+governance+for+fisheries#0

Pires, S., & Clarke, R. V. (2012). Are Parrots CRAVED? An Analysis of Parrot Poaching in Mexico. *Journal of Research in Crime and Delinquency*, *49*(1), 122-146. https://doi.org/10.1177/0022427810397950

Pomeroy, R. (1995). Community-based and co-management institutions for sustainable coastal fisheries management in Southeast Asia. *Ocean & Coastal Management*, *27*(3), 143-162. https://doi.org/10.1016/0964-5691(95)00042-9

Pomeroy, R., & Andrew, N. (2011). Small-scale Fisheries Compliance: Integrating Social Justice, Legitimacy and Deterrence. En *Small-scale Fisheries Management Frameworks and Approaches for the Developing World*. https://doi.org/Doi 10.1079/9781845936075.0196

Putt, J., & Anderson, K. (2007). *A national study of crime in the Australian fishing industry* (Número 76). Australian Institute of Criminology. www.aic.gov.au/media_library/publications/rpp/76/rpp076.pdf

Raemaekers, S., Hauck, M., Bürgener, M., Mackenzie, A., Maharaj, G., Plagányi, É. E., & Britz, P. J. (2011). Review of the causes of the rise of the illegal South African abalone fishery and consequent closure of the rights-based fishery. *Ocean and Coastal Management*, *54*(6), 433-445. https://doi.org/10.1016/j.ocecoaman.2011.02.001

Romero, P., Estevez, R. A., Romero, P., & Gelcich, S. (2021). *Artisanal fisher association leaders' estimates of poaching in their exclusive access management areas*. *8*(January), 1-10. https://doi.org/10.3389/fmars.2021.796518

Schlager, E., & Ostrom, E. (1992). Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Economics*, *68*(3), 249. https://doi.org/10.2307/3146375

Scott, A. (2000). Introducing Property in Fishery Management. En R. Shotton (Ed.), *Use of Property Rights in Fisheries Management, pp. 1-13. (Proceedings of the FishRights99 Conference. Fremantle.* (p. 468). FAO Fisheries Technical Paper. Nº. 404/1.

Scott, Anthony. (1988). Development of Property in the Fishery. *Marine Resource Economics*, *5*, 289-311.

Sethi, S. a., & Hilborn, R. (2008). Interactions between poaching and management policy affect marine reserves as conservation tools. *Biological Conservation*, *141*(2), 506-516. https://doi.org/10.1016/j.biocon.2007.11.005

Shotton, R. (1999). Use of property rights in fisheries management. FAO fisheries technical paper, 404/1. En R. Shotton (Ed.), *FAO fisheries technical paper*. FAO. http://www.fao.org/docrep/003/x7579e/x7579e00.htm

Song, A. M., Scholtens, J., Barclay, K., Bush, S. R., Fabinyi, M., Adhuri, D. S., & Haughton, M. (2020). Collateral damage? Small-scale fisheries in the global fight against IUU fishing. *Fish and Fisheries*, *21*(4), 831-843. https://doi.org/10.1111/faf.12462

1 Stigler, G.J.(1974) The optimum enforcement of laws, Essays Econ. Crime. Punishm. I
2 55–67, http://dx.doi.org/10.1086/259646.

3 Sutinen, J. G., & Kuperan, K. (1999). A socio-economic theory of regulatory
4 compliance. *International Journal of Social Economics*, *26*(1/2/3), 174-193.
5 https://doi.org/10.1108/03068299910229569

6 Tailby, R., & Gant, F. (2002a). The Illegal Market in Australian Abalone. *Australian*
7 *Institute of Criminology*, *225*, 6. http://www.aic.gov.au/publications/current
8 series/tandi/221-240/tandi225.html

9 Tailby, R., & Gant, F. (2002b). The Illegal Market in Australian Abalone. *Australian*
10 *Institute of Criminology*, *225*(Trends & issues in crime and criminal justice), 6.

11 Thiault, L., Weekers, D., Curnock, M., Marshall, N., Pert, P. L., Beeden, R., Dyer, M.,
12 & Claudet, J. (2020). Predicting poaching risk in marine protected areas for
13 improved patrol efficiency. *Journal of Environmental Management*, *254*(August
14 2019), 109808. https://doi.org/10.1016/j.jenvman.2019.109808

15 Thomas, A. S., Gavin, M. C., & Milfont, T. L. (2014). Estimating non-compliance
16 among recreational fishers: Insights into factors affecting the usefulness of the
17 randomized response and item count techniques. *Biological Conservation*, *189*, 24-
18 32. https://doi.org/10.1016/j.biocon.2014.09.048

19 Thomas, A. S., Milfont, T. L., & Gavin, M. C. (2015). What determines fishers'
20 knowledge of and attitudes towards regulations? A case study from the
21 Marlborough Sounds, New Zealand. *Marine Policy*, *51*, 547-554.
22 https://doi.org/10.1016/j.marpol.2014.09.024

23 Thomas, A. S., Milfont, T. L., & Gavin, M. C. (2016). New approach to identifying the

drivers of regulation compliance using multivariate behavioural models. *PLoS ONE*, *11*(10), 1-12. https://doi.org/10.1371/journal.pone.0163868

Turner, R. A., Addison, J., Arias, A., Bergseth, B. J., Marshall, N. A., Morrison, T. H., & Tobin, R. C. (2016). Trust, confidence, and equity affect the legitimacy of natural resource governance. *Ecology and Society*, *21*(3). https://doi.org/10.5751/ES-08542-210318

Von Essen, E., Hansen, H. P., Nordstrom Kallstrom, H., Peterson, M. N., & Peterson, T. R. (2014). Deconstructing the Poaching Phenomenon: A Review of Typologies for Understanding Illegal Hunting. *British Journal of Criminology*, *54*(4), 632-651. https://doi.org/https://doi.org/10.1093/bjc/azu022

Von Essen, E., Hansen, H. P., Nordström Källström, H., Peterson, M. N., & Peterson, T. R. (2014). Deconstructing the Poaching Phenomenon: A Review of Typologies for Understanding Illegal Hunting. *British Journal of Criminology*, *54*(4), 632-651. https://doi.org/10.1093/bjc/azu022

Weekers, D., Petrossian, G., & Thiault, L. (2021). Illegal fishing and compliance management in marine protected areas: a situational approach. *Crime Science*, *10*(1), 1-14. https://doi.org/10.1186/s40163-021-00145-w

Xunta de Galicia. (2008). Lei 11/2008, do 3 de decembro, de pesca de Galicia. *Diario Oficial de Galicia*, *243*, 22275-22317. http://www.xunta.gal/dog/Publicados/2008/20081216/Anuncio4C1EE_es.html

Xunta de Galicia. (2022). *Pesca de Galicia*. https://www.pescadegalicia.gal/

[43] Arias, A. (2015). Understanding and managing compliance in the nature conservation context. Journal of Environmental Management, 153, 134–143.

https://doi.org/10.1016/j.jenvman.2015.02.013

[44] Bergseth, B. J., Gurney, G. G., Barnes, M. L., Arias, A., & Cinner, J. E. (2018). Addressing poaching in marine protected areas through voluntary surveillance and enforcement. Nature Sustainability, 1(8), 421–426. https://doi.org/10.1038/s41893-018-0117-x

[45] Thomas, A. S., Gavin, M. C., & Milfont, T. L. (2014). Estimating non-compliance among recreational fishers: Insights into factors affecting the usefulness of the randomized response and item count techniques. Biological Conservation, 189, 24–32. https://doi.org/10.1016/j.biocon.2014.09.048

[46] Thomas, A. S., Milfont, T. L., & Gavin, M. C. (2015). What determines fishers' knowledge of and attitudes towards regulations? A case study from the Marlborough Sounds, New Zealand. Marine Policy, 51, 547–554. https://doi.org/10.1016/j.marpol.2014.09.024

[47] Thomas, A. S., Milfont, T. L., & Gavin, M. C. (2016). New approach to identifying the drivers of regulation compliance using multivariate behavioural models. PLoS ONE, 11(10), 1–12. https://doi.org/10.1371/journal.pone.0163868

[48] Turner, R. A., Addison, J., Arias, A., Bergseth, B. J., Marshall, N. A., Morrison, T. H., & Tobin, R. C. (2016). Trust, confidence, and equity affect the legitimacy of natural resource governance. Ecology and Society, 21(3). https://doi.org/10.5751/ES-08542-210318