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The incentives of a resource owner: Evidence from a private oyster fishery

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ABSTRACT

European flat oyster *Ostrea edulis* fisheries were once abundant around the UK coastline. The sole remaining productive *O. edulis* fishery in Scotland is in Loch Ryan. This fishery has been privately owned and managed by a single family since 1701. Economic theory predicts that ownership, whether public or private, is a necessary condition for rational fishery management. In this paper, a series of four leases and a licence are examined, covering an 85-year period over the 20th and 21st century, to examine whether the management of the Loch Ryan fishery conforms to the expected norms of rational management. The leases show that, over this period, the owners appear more willing to expend resources on regulating tenant behaviour, supporting the conclusion that successive generations of owners developed an evolving sense of what "rational management" might require. The results of this study could inform the management of other fisheries – both public and private – by emphasising the importance of learning from experience.

1. Introduction

The unregulated fishery is a classic example of the tragedy of the commons. The tragedy unfolds because, in the absence of private ownership or regulation (government ownership), fishermen possess the unlimited right to fish, and individual, rational fishermen will fish as much and as quickly as they can until doing so is no longer profitable. The end result is that the fish stock – a potentially renewable resource – is mined [1]. In the terminology of fisheries management, such a fishery is deemed to be "overfished" [2].

According to the economic theory, ownership of the resource will solve the tragedy of the commons [3]. The right to exclude others gives an owner the incentive to rationally exploit the fishery, that is, to adopt catch levels and methods that maximise the net present value of the resource [1,4]. In theory, an incentive for rational management should be present regardless of whether ownership is vested in a private entity, a community, or the government [3]. This prediction is known as the "sole-owner hypothesis" [5].

It is difficult to empirically test the sole-owner hypothesis, perhaps especially so for fisheries. Due to factors largely beyond the control of decision-makers, such as pollution or climate, failed management may occur despite a consistent series of rational decisions on the amount, timing, and methods of resource exploitation [6]. One method of empirically testing the sole-owner hypothesis is to examine historical records to assess whether a manager's decisions have been rational, that is, consistent with an attempt to achieve an optimal result [7]. This decision-assessment form of empirical testing is sometimes feasible in the context of a regulated (government-owned) fishery, where decisions are often explained in writing, and records of those decisions are publicly available. It is rarely possible to test the sole-owner hypothesis in the context of private ownership, not only because private fisheries are rare, but also because records of private decisions are, unlike government documents, not readily available.

There are reasons however, why testing the sole-owner hypothesis in private fisheries could be valuable. In many ways, owners of private and public fisheries face similar challenges in attempting to execute rational management. One such obstacle is uncertainty surrounding key information, in combination with cognitive biases such as the "valence effect," which can lead both scientists and managers to overestimate critical parameters, such as stock abundance and the beneficial impacts of conservation measures [8,9]. At the same time, there are challenges unique to government-owned fisheries. Most notably, regulators (the agents of government owners) are subject to forces arising from the political economy of fishery management, specifically concentrated-group (fishing industry) lobbying, which often motivates regulators to make decisions inconsistent with good

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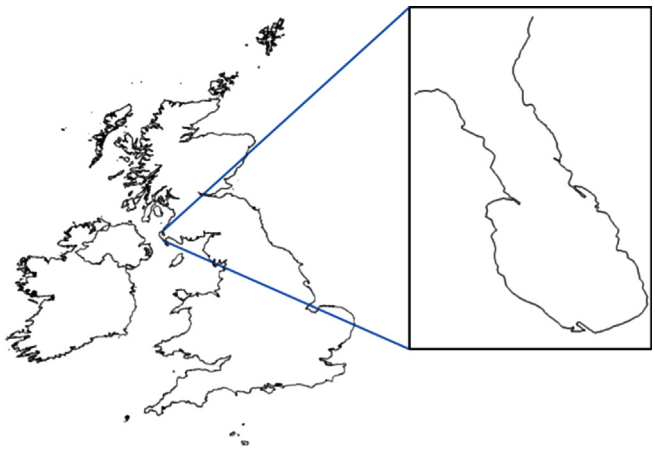

Fig. 1. Loch Ryan oyster fishery, Scotland, UK.

management [7,10,11,12]. The study of fisheries not subject to these political forces might shed light on the relative strength of these two types of challenges [13].

The Loch Ryan oyster fishery, located in southwest Scotland (Fig. 1), provides an opportunity to test the sole-owner hypothesis in a private fishery. Pursuant to Royal Charter, a single family has held the exclusive right to take oysters (*Ostrea edulis*) from the Loch since 1701; the family has complete control of the Loch Ryan stock because it is reproductively separate from other *O. edulis* stocks. In addition, the family has made available to us records of decisions made between 1928 and the present day. These records include four leases and the present licence that the family has used as its means for obtaining revenue from its oyster rights. In this paper, the leases – instruments of private regulation – are examined for evidence of rational decision-making.

2. An historical overview of *O. edulis* and the loch Ryan fishery

The European flat oyster *Ostrea edulis* was once prolific across Europe and the UK. Bertram [14] calculated oysters to be worth £4,000,000 annually to England in 1873. With inflation at about 65 times since then, this would give a value of £260 million today. In Scotland there were a number of oyster fisheries around the coastline. The largest was the Firth of Forth, on the east coast, with the highest annual landings of 30 million oysters recorded in the late 18th and mid 19th century both resulting in a sharp decline in landings [15]. Export of young oysters was common to repopulate other European waters even though restrictions were imposed [16]. By 1920 the fishery was closed because of overfishing and has never recovered [17]. Since 1900, Loch Ryan, on the West coast, has been the largest producer of *O. edulis* in Scotland, with production peaking in 1913 of 1.3 million oysters [15] (Fig. 2a). Currently Loch Ryan is the only wild native oyster fishery in Scotland, with annual production of around 300,000 oysters (Fig. 2b).

The fishery at Loch Ryan was first privatised in 1701 under King William III, when the King gave the Wallace family a Royal Charter containing the right to fish oysters within the boundaries of the Loch below the low water mark. It is not clear how, or under what types of agreements, the family harvested oysters between 1701 and 1874, however from 1928 to 1998, the family entered into a series of four lease agreements with individual fishermen or fishing companies. These leases provided those parties the exclusive right to take oysters during each respective lease period. Except between 1957 and 1970, when the fishery was in such poor condition that the Wallace family chose not to continue leasing its

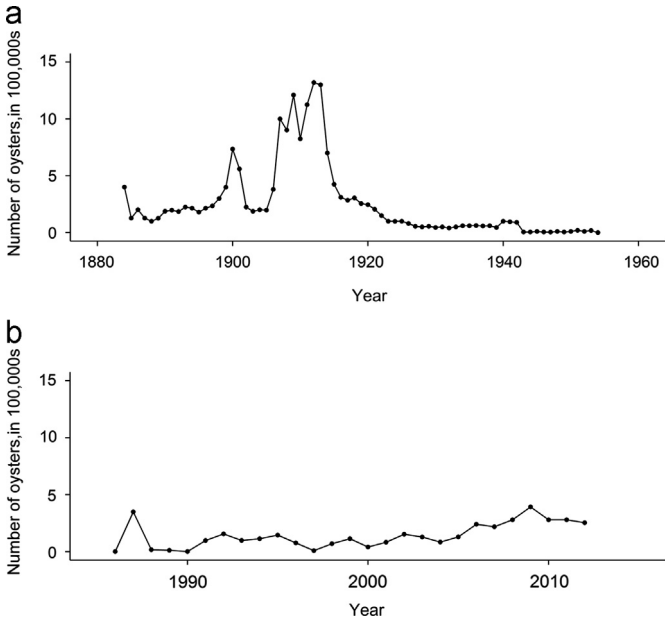

Fig. 2. Oyster landings in Loch Ryan (A) from 1884 to 1954. Adapted from Millar [15] and (B) from 1986 to 2012 [18].

rights for commercial fishing. Instead, the family chose to execute a lease with scientists at the Marine Biology station at Millport, Scotland under the guidance of Dr Millar. During this 13-year period, four main surveys were carried out in 1957, 1962, 1965 and 1967. The proportion of marketable oysters (over 60 g) increased over this time period, from an unnaturally low 3% in 1957, to approximately 50% by 1962 and 67% by 1967 [19]. To help restock the beds they also tested importing oysters from Brittany [20].

Since the last lease terminated in 1999 the fishery has been controlled differently and a licence based system introduced. The licence is between the Loch Ryan Oyster Fishery Company Ltd., which is a joint company owned by the Hugh-Jones's and the Wallace's, and Mr. Wallace allowing them to fish the oysters.

3. Methods

To test for rational management, the existence and development of measures undertaken to achieve the Maximum Sustainable Yield (MSY) for the fishery were investigated. MSY is a commonly used standard for measuring successful fishery management [21,22]. This study examines historical management documentation and compares the findings to what would be expected of good estate management. The documentation examined centred on four leases which were in the records of the fishery held by the Wallace family; these dated from 1928, 1970, 1976 and 1991. Along with historical leases, the current generation of owners also allowed access to the licence agreement pursuant to which the fishery is now managed. The study also includes information from private scientific reports that were written for the family. These provide a biological background to the fishery, alongside landings records. The authors collected and analysed all of this data whilst in discussion with the Wallace family.

The study focuses on four types of provisions common to each of the four leases: 'lease term and termination', 'structure of lease payments', 'monetary penalties' and 'restrictions on harvest amounts or techniques'. These provisions were chosen because the particular expression of each, e.g. lease term and termination, varied across the four leases. With respect to each provision we examined three features: (a) the range of alternatives available