

**FISHERIES MANAGEMENT IN ICELAND AND  
J. WARMING'S CONTRIBUTION TO THE ECONOMICS  
OF THE FISHERIES\***

GYLFI Þ. GÍSLASON

*University of Iceland, Faculty of Economics and Business Administration,  
101 Reykjavík, Iceland*

*In this paper I argue that the origin of the economics of the fisheries can be traced back to a Danish Professor Jens Warming. In 1911 he published an article comparing the rent available from fishing grounds and land. He pointed out a common property qualification that open access fishing without charge tends to decrease the rent from fishing. He also discussed how to price fishing licenses to restrict the amount of fishing. In light of Warming's contributions I also briefly discuss the construction of fishing licences in Iceland since 1984. (JEL Q22).*

The beginnings of modern fishery economics are usually traced to two articles published in the 1950s by Canadian economists H. Scott Gordon (1954) and Anthony Scott (1955). It is rarely mentioned that the origin of the discipline can be traced to the University of Copenhagen, to the year 1911 and professor Jens Warming. As far as this writer is aware of, he first presented the idea of tradeable fishing licences to avoid the problems of unregulated, rent-free fishing. These early results are still pertinent to the debate over fishing rights underway at present in Iceland.

In 1911 Warming published an article where he compared the rent available from fishing grounds and land. Land is, for the most part, in private hands and land rents thus a privilege of private landowners, whereas fishing grounds are not privately owned but are considered common property. The differences do not change the basic economics common to both forms of management. Warming pointed out

the common property qualification that open access to fishing grounds without charge tends to decrease the rent. He proposed to alleviate this through transferable fishing licences.

Warming applied price theory to determine the price of such licences. His main argument concerned how to prevent too many persons from turning to fishing for their living; the price of the licences had to represent the difference between the amount that a fisherman would earn from unrestricted, rent-free fishing and the amount he would earn on land. Without introducing control of fishing by direct regulation, licence fees could ensure that fishing effort would decline to the level where a fisherman's work would yield the same income as his work on land. Fishing licences are thus an appropriate method for the authorities to prevent over-fishing and thus ensure a maximum sustainable catch. Maximum production is, however, not the economic goal of fishing, but rather maximally profitable production. Warming's major conclusion was that the price of fishing licences must be stated so that

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yield providing a maximal flow of profit is achieved.

Warming maintained that fishing is subject to diminishing returns. In determining the price of fishing licences, therefore, it is the marginal revenue of the fishermen which ought to be compared with their potential income on land, rather than their average return from fishing. He constructed a number example to substantiate his claims that, using this latter standard of comparison, licensing fees would be higher than with maximum sustainable yield and fishing effort less. The reduced effort would prove most profitable from the standpoint of the national economy as a whole.

Warming's article went largely unnoticed. Twenty years later, however, in 1931 he published another article which went into more detail and presented the views and arguments of the 1911 article in a manner resembling H. Scott Gordon's argumentation in his 1954 article.

This time Warming was contributing to political debate. Traditional Danish law granted shorefront owners the right to set eel traps in the sea adjacent to their property. Property owners were entitled to charge others for permission to set traps in specified offshore areas. At an annual meeting of the Danish Fishing Association, a proposal to abolish private eel-trapping rights had been unanimously approved. Warming's article was a protest against this resolution. After a lengthy debate between interest groups and the Danish government, the matter was resolved with the adoption of Act No. 178 of 1956, which abolished the private rights of shorefront owners to set eel traps adjacent to their property. They were to be compensated for this loss of privilege according to specific provision.

In his article Warming opposed the introduction of free-access fishing to replace rental fishing in the limited area in which the latter had applied. This, he argued, would lead to over-fishing and dissipation of these rents. Warming did, however, support the principle that property rights could not apply to the high seas.

These theoretical arguments are presented in Figure 1, taken from Warming's 1931 article. The returns from fishing are shown on the vertical axis. The curve QF shows how the returns

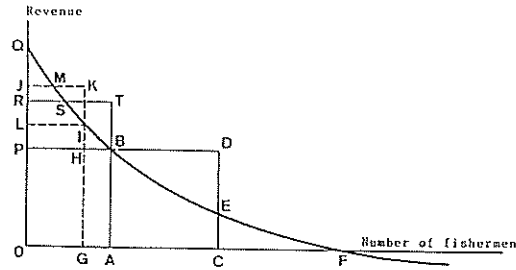


Figure 1.

diminish with increased fishing effort. The line PD shows the marginal cost in fishing. Total benefits are maximized when the number of fishermen is OA. Warming compares fishing with farming and maintains that the number of workers hired by a profit-maximizing farmer will be such that the last worker hired produces as much as he receives in wages.

The total income of the fishermen is the area OABP at the level of effort OA. But the total income from fishing is OABQ. The value PBQ is the rental – the sea rent – for access to the resource on the fishing grounds. If no one collects the sea rent, and fishing is rent-free, the average income of OA fishermen will be higher than AB. As this potential sea rent is divided among them their mean income is AT, i.e. the median height of OABQ so that the value RSQ is equal to the value STB. High average profit draws more people into fishing. Equilibrium is achieved where fishing effort is OC (PBQ = BED) and total income is equal to the total cost of fishing. The additional fishermen produce, in reality, only ACEB, and could produce more in some other pursuit. They only receive the required ordinary income by having PBQ added to their production. The sea rent is therefore wasted: it subsidizes the income of extra fishermen whose production does not correspond to their wages.

At this point Warming reiterates his proposal from 1911, maintaining that in order to prevent the number of fishermen from increasing beyond OA, fees should be collected for fishing licences. A private owner would collect such fees. Moreover, the fee ought to be BT, which would result in the optimal number of people, i.e. OA, in fishing. This would provide

PBTR in the form of fees and retain OABP which would provide the required ordinary income. The owner, in this case the nation, would receive PBTR, an amount which corresponds exactly to the sea rent. If the fee were to be increased, the number of fishermen would decrease in such a way that the return from the fees would be less, as shown by the broken lines in the diagram. If, on the other hand, the fee were less than BT, the return would also be lower, because part of the sea rent would go toward increasing the incomes of superfluous fishermen.

Since 1984 a system of fishing controls based on licences has gradually been constructed in Iceland. The aim of fisheries management legislation is to preserve the fishing stocks which are the cornerstone of the nation's economy, and ensure at the same time that they are effectively utilized to ensure stable employment in the fishing industry and strengthen regional development. Licences are issued to fishing vessels, according to fixed rules, for one year at a time. Vessel owners may buy, sell or trade these licences, or »quotas«, among themselves at whatever price they agree upon. An owner of several vessels may transfer the licenses between them as he sees fit. If a vessel owner sells all of a vessel's quota that vessel must cease operation permanently.

The Icelanders have chosen to follow a different course in fisheries management than the one proposed by Warming: limit the pursuit by limiting the issuing of fishing permits instead of accomplishing this by charging payment for fishing permits. Some economists consider

that this will lead to the same results as long as the fishing permits are tradeable: these fishing rights will be bought up by those who are most efficient and have the greatest ability to pay for them. The rent will then be capitalized in the value of the right, just as land rent becomes capitalized in the value of the land.<sup>1</sup> The use of licence fees would achieve the desired goals in a shorter time and avoid the social injustice of allowing the sea rent to accrue to a limited group.

It is interesting to note how pertinent are the writings of this professor in Copenhagen some 80 years ago to the debate among Icelanders today over one of their most important methods of economic control.

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<sup>1</sup> The efficiency properties of tradeable fishing quotas are discussed, *inter alia*, in Moloney and Pearse (1979).