

## IS OUTPUT CONTROL EFFECTIVE AS A MEASURE TO ADJUST REDUCTION OF OVER-CAPACITY?

Yoshihiro Kuronuma, Professor of Otsuma Women's University, sbt@otsuma.ac.jp

### ABSTRACT

This paper is intended to examine and discuss in what way output control, one of the fisheries management measures, is effective in reducing over-capacity, and can become an effective means towards sustainable management of living marine resources. It was made clear theoretically and empirically that output control is applicable as a means to reduce over-capacity for production as a whole indirectly; however, it cannot serve as a measure to adjust reduction of over-capacity in individual enterprise directly. NTQ (national transferable quota) is considered as one of the options in output control at the global level in order to achieve sustainable utilization of it from an economic functional point of view. Further, as optional measures for short-term industry adjustment at the time of the introduction of the system, one can consider preferential tax measures to enterprises forced to withdraw from the fishing activities, reduction of fishing vessels by allocation of public fund and financial assistance for job training for re-employment.

**Keywords:** output control, reduction of over-capacity, national transferable quota, financial assistance, sustainable management

### INTRODUCTION

This paper is intended to summarize and discuss in what way output control, one of the fisheries management measures, is effective reducing over-capacity, and can become an effective means. For this goal, an overview of output control is presented in the next section, and in section three, the possibility of reduction of over-capacity by means of output control and its effect will be summarized. Section four focuses on national quotas under output control on an international level, and discusses how the advantages and disadvantages arising out of transfer of quotas among a number of nations will affect the reduction of over-capacity. Section five observes the advantages and disadvantages discussed in section four based on an experience of national quota allocation in 1962 among Antarctic whaling nations.

### OUTPUT CONTROL

The purpose of output control is to regulate production amount directly and achieve sustainable use and conservation of the resources. A representative output control measure is total allowable catch (TAC). It has been adopted by international organizations as management measures. As specific instances, we can cite TAC applied in Northeastern Pacific halibut fisheries between the United States and Canada in 1932 and catch quota set by the International Whaling Commission (IWC) from 1946. With respect to tuna fisheries, it is employed for yellowfin tuna in the eastern Pacific, bluefin tuna fisheries in the Atlantic, and southern bluefin tuna fisheries. On a national level, a number of countries have introduced this system. As one of oldest cases, we can cite the introduction of TAC in 1936 for herring fisheries in the Pacific area of Canada and from 1969 for herring fisheries in Iceland \*1.

It has been pointed out theoretically that conservation that enables sustainable use of the resources can be attained when the output control management is implemented with the catch quota established based on accurate scientific information on the targeted species. However, in case where, for example, only output control through TAC approach is implemented, it is liable to cause consequences such as intensified competition over catch, shorter operation period, lower quality of products, increase in incidental catch and disposal, fluctuations in fish landing, deterioration of fishery labor safety and increasing fishing costs (over investment), and it has been validated that such an approach would not contribute much to prevention of over exploitation of the resources. In addition to this, established TACs exceed overall catch amount in many cases \*2.

This shows that management through output control, especially which based solely on TAC, has problems to be solved even for stock management in the real world, and suggests that it could have negative effects at least on the aspects of fishery entrepreneurial and economic management. In other words, it is validated both theoretically and practically that competition over-catch intensifies because of the economic incentives for preemptive rivalry in the free competition within the framework of established catch quotas, and various negative economic effects as mentioned above come to the fore. In spite of many of these negative effects, it is important to note that output control is still one of the management criteria to which objectively can be attached based on scientific evidence among various international management measures and is relatively easily comprehensible for many countries as compared to socio-economic grounds.

In international-level output control, relatively clear framework of management measures can be considered, such as establishment of TAC on a global scale and allocation of gross national quotas and management by individual nations within the framework of the gross national quota. For this reason, output control is adopted by many international management organizations. However, at the same time, in the actual situation, it involves a number of issues such as scientific criteria in determination of TAC, criteria for national allocation and management criteria by individual states, this causing conflicts and confusion. There are questions over how the “market failure” on an international level can be improved through international cooperation, in other words, how to use the cards of existing measures in actual management. It thus suggests that adjustment measures that best adapt to each case of targeted species and related fisheries are now being explored. Furthermore, there is an issue of how to procure costs for implementation of output control on an international level including costs for administering an international organization, resource survey expenditure, enforcement costs, etc., and how to manage it efficiently at low costs.

## **OUTPUT CONTROL AND REDUCTION OF OVER-CAPACITY**

In dealing with the issue of over-capacity under market failure situation, we face some prerequisite issues as follows: what are the criteria for reduction? Or more precisely, do those criteria have the top priority in resource conservation? Are they within the framework of economic management of the industry as a whole or in improvement of individual fishery enterprises or optimum management by the society as a whole or all-inclusive fishery management? For example, the portion of over-capacity reduction needed from the viewpoint of economic management of the industry as a whole does not necessary coincide with that of over-capacity needed by the establishment of TAC based on resources conservation, as in the case of differences between Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY). This observation can also be applied for the reduction of over-capacity needed from the viewpoint of the optimum management of society as a whole. Thus, it is indicated that a criteria of output control would be changed depends on targets of over-capacity. [2]

As stated in the preceding section, output control like TAC is considered, as a matter of theory, to be effective for conservation of the resources as a whole because of the regulations to determine the overall catch quotas. In this respect, it becomes possible to exclude harvest volume exceeding TAC before establishment of the TAC. The over-capacity portion corresponding to the excluded portion will be resultantly reduced. From the viewpoint of overall management, it has a potential to reduce over-capacity although indirectly.

The measures aimed to improve the disadvantages of these “easy-to-understand control measures” and dissolve intensifying competition over catch, attracting attention of fisheries administrators and managers, include Individual Quota (IQ), which is being implemented in some advanced nations, Individual Vessel Quota (IVQ) and Individual Transferable Quota (ITQ). Although these measures have their own advantages and disadvantages \*3, major effectiveness as management techniques in the economic aspects of fishery management is a correction of market failure through creating artificial private property rights. It creates the right for private property in a functional way and improves economic efficiency of the industry as a whole by artificially establishing the right for use of specific resources. In other words, there underlies a concept to ensure evasion from the “tragedy of the commons” by creating private property, and thus amend and improve the “market failure”. However, it should be noted that this initiative itself could be denied in the international society as a theory cherished by advanced nations, even if it gains recognition as a matter of principle.

The issue of individual quota method, especially individual quota and the reduction of over-capacity on an international level will be discussed in the next section. Here let it suffice to touch slightly on fishery administration measures in implementing the individual quotas. Let us assume that a certain fishery is in the condition of over-capacity and output control by means of TAC, in which the target of over-capacity reduction was established at the MSY level of the targeted stock, was implemented under individual quota. In this case, the catch volume in specific fisheries before implementation of TAC will inevitably decrease. For this reason, in case profitability cannot be secured within the framework of allocated catch, some enterprises might be forced out of the fisheries as a result of this allocation. This suggests that there exist issues relating to administrative measures for management. In other words, should this phenomenon be dealt in a laissez-faire approach based on the principle of natural selection as a natural consequence of capitalistic economy? Or, conversely, should some artificial establishment of the rights be considered and the issue be dealt in the form of subsidy measures to enterprises that are withdrawing from fisheries.

In the case of laissez-faire approach, entry in and exit from a certain industry apparently seems compatible with the principle of free competition. However, fishermen who had been harvesting based on the principle of free competition prior to the introduction of TAC will certainly find hardships when, all of a sudden, prerequisites vis-à-vis the resources change from open access to jointly management on artificial private property of common property resources, and are forced to scale down their previous catches. Often this is taken as an unavoidable phenomenon because it is a measure to dissolve economic risk in harvesting industry targeting at natural resources. However, is there no room for discussion to conduct economic adjustment from the standpoint of administrative measures concerning fisheries?

This does not necessarily deny that the laissez-faire approach under the individual quota management based on TAC stabilized sustained fishery entrepreneurial management, and is a mid- and long-term measure that has a potential to improve economic efficiency as a whole. The point here, however, is whether there is need to discuss adjustment measures to avoid disruption as management measures for the industry as a whole in face of the disadvantages to fishermen which arise in connection with the

introduction of this measure in a short- and/or mid-term. As adjustment measures at the time of introduction of the system, we may consider, for example, preferential tax measures for enterprises forced to go out of business, reduction of fishing vessels with the assistance of the governmental fund and financial assistance for job training for re-employment.

While giving consideration to adjustment measures for withdrawal from fisheries, it is also necessary to discuss, in some way or other, adjustment measures for new entries. This is an issue pertaining to equity in initial allocation of individual quotas under TAC. Artificial establishment of the right leads to market assessment of individual quotas, and will constitute an obstacle for enterprises considering new entry in the area of management capital. In this case, we could consider establishing beforehand quota for certain new participants within the framework of TAC establishment targeting at the reduction of over-capacity, but it is also necessary to discuss what type of implementation can be effective in the resources jointly managed on an international level, especially those targeted by fisheries which are found at excessive harvesting level.

### **INDIVIDUAL QUOTAS UNDER OUTPUT CONTROL AND REDUCTION OF OVER-CAPACITY**

In the discussion in the previous section, we came to understand that output control is applicable as a measure to reduce over-capacity of the fisheries as a whole, although indirectly, but cannot be used as a measure to directly reduction of over-capacity in individual fisheries operations. Then, the author would like to discuss in this section what kind of adjustment measures can be considered within the framework of output control in order to use this management measure effectively from economic functional point of view.

One improvement measure being proposed in terms of functional adjustment at the international level is National Transferable Quota (NTQ) \*4. This NTQ is an application of ITQ under international TAC, and is called National Transferable Individual Quota (NTIQ). It has been validated, both theoretically and historically, that NTQ can be used for adjustment of interests over national catch quotas among a number of nations and is effective in improving economic efficiency on a global scale. To give some examples, we can observe them in the instances where, between Iceland and European Union, 30,000 tons of capelin in the Greenlandic waters were transferred to Iceland in exchange for transfer of 3,000tons of redfish in the Icelandic waters to the European Union (EU) since 1994, as well as transfer of national mother ship quota in the Antarctic whaling quotas to Japan through transaction in the 1960s \*5. This adjustment measures based on output control, that is movement of catch quota among nations, is theoretically applicable to fishing effort control. It is an application to the international level of transferable IFQ (individual fishing effort quota), and, more accurately, can be said to be National Transferable Individual Fishing Effort Quota (NTIFQ). Furthermore, this concept to make possible the transfer of quota may also apply to resource rent management. The transfer of resource rent is, for example, transfer of tax, and trading among plural nations is made on the condition of the transfer of corresponding catch quotas or fishing efforts quotas.

The important points of these measures are that they ensure adjustment of interests among many nations, especially adjustment of individual fisheries beyond the boundaries of nations, in accordance with the natural capital logic which tries to improve economic efficiency which is difficult to be adjusted in the management of such as output control of fishing effort or resource rent by the fact that economic adjustment function which is called “transfer” (selling and leasing) is added. In proper management by means of yields, fishing effort and economic rent, the economic function arising from natural economic

activities in which individual fishery enterprises try to improve efficiency on an individual level generates negative economic effects caused by intensifying competition over the catch for fisheries as a whole. By contrast, in NTIQ and NTIFQ, its effects are direct and evident because transparent international market evaluation is made. It has effect in improvement of economic efficiency on an international level by transferring freely beyond national boundaries to enterprises with high economic efficiency.

If this is applied under TAC targeting at reduction of over-capacity, there is ample possibility that it can become an adjustment measure among multiple nations, along with improvement of economic efficiency. Further, if this adjustment measure allows free transfer as stated in the preceding section, it would lead to reduction of subsidy cost of the government in slashing over-capacity. It should be noted, however, that NTQ, in this context, should be an adjustment measure only after scientific estimation of yield and fishing effort and quantification of economic rent are implemented under an international agreement and quotas agreed among nations concerned are allocated. Further, when it is applied, attention should be directed to the issue of international monopolistic supply which can be anticipated as its logical consequence as well as empirical results.

At the Kyoto Conference on the Prevention of Global Warming, held in December 1997, the proposed international trading of national exhaust quota, which was incorporated in the text of final resolution at the strong instance of the United States, is an instance of applying the aforementioned concept within the framework of international rules. The economic adjustment measure of NTQ is aimed at improvement of economic efficiency on international level, in other words, Pareto improvement. However, as we can understand from the trend observed at the United Nations Environment Conference in Kyoto, there remains the possibility for NTQ not accepted depending on the objectives of management, which differ in terms of social, economic and natural conditions of the countries involved, as well as external factors such as international political situation. There are some inherent issues; for example, the issue that pertains to foundations of the capitalistic economy that the logic of management based on planned economy contradicts the principle of free competition under capitalism.

#### **NATIONAL TRANSFERABLE QUOTA AND REDUCTION OF OVER-CAPACITY: Empirical Evidence on National Quota Allocation in 1962 among Antarctic Whaling Nations**

The process of transferability of quotas and its reduction of over-capacity can be observed in the implementation and results of the 1962 national quotas' agreement. Whaling nations reached a voluntary agreement to change the management scheme for whale resources from an overall quota system (imposed by the IWC) to one of individual national quotas \*6 in 1962. This implies some sort of individual economic share rights (or 'property rights') to international common property resources. Of course, there were many difficulties until the countries involved reached an agreement on national quotas in 1962.\*7 However, the important question is how they managed to allocate individual economic share rights to Antarctic whale resources, and whether they were able to managed to reduce its over-capacity as a result.

As can be observed from Table 1, Norway's original proposal was based on empirical catch proportions except in the case of the former Soviet Union.\*8 However, the national quotas arrived at in the final agreement in 1962 differed from this proposal. This was because of structural changes in the international whaling industry brought about by adjustments between Antarctic whaling nations through scrapping and/or transferring some factory ships.\*9 It is worth noting that the final agreement on national quotas involved the transfer of factory ships as a type of stock certificate. This implies a situation where transferable quota rights exist. In other words, the agreement attempted to allocate some sort of ownership rights to these international common-property resources between whaling countries.\*10 It

should also be noted that there were strong economic and biological factors which created the situation in which a voluntary agreement on national quotas could be reached in 1962.\*11

**Table 1 National Quotas in 1962**

	1947-58 catch (%)	Norway's (%)	proposal BWU	1962 agreement (%)
Norway	39.45	33.63	5,045	32
Japan	30.94	26.37	3,955	33
UK	17.32	15.00	2,255	9
The Netherlands	5.44	5.00	750	6
Sub-total	93.15	80.00	12,000	80
Soviet Union	6.85	20.00	3,000	20
Total	100.00	100.00	15,000	100

Note: Antarctic whaling season: Dec. of the IWC meeting to April of the following year

Source: [9] p.347

The voluntary agreement between Antarctic whaling nations on national quotas, in addition to the IWC overall quota system, seemed to be successful in terms of the utilization of Antarctic whale resources. However, this system faced difficulties because of several factors. One major factor was the downward shift in the supply schedule for whale resources which resulted from the declining whale stock. This led to a decline in the total supply of whale products. The decline in whale stocks was mainly brought about by the IWC's overall misallocation of quotas by using the blue whale unit (BWU) as the measure of whale stocks at that time. Under the BWU overall quota system, whaling nations could harvest any species within their national quota. Thus, Antarctic whaling nations targeted those species which had a higher economic value (e.g. blue, fin, and sperm whales etc.). As a result, some species were overexploited and this made it difficult for some Antarctic whaling nations to harvest their full national quotas.

Another factor was the downward shift in the demand schedule for whale products due to the development and increasing use of substitute commodities (e.g. other edible fats and oils) resulting from technological advances. These substitute commodities became very competitive with whale products. From 1963 to 1967, for example, the price of whale oil fell dramatically [11], indicating that the decline in the demand for whale products had been greater than the decrease in their supply.

Mainly as a result of the above factors, the United Kingdom (1963), the Netherlands (1964), and Norway (1968) discontinued Antarctic whaling. Other factors which influenced the decline of Antarctic whaling by these countries according to Tonnesen and Johnsen [11] (pp.585-643) were as follows: 1) the United Kingdom sold its last two factory ships, with their quotas (Southern Venture in 1962 and Southern Harvester in 1963) to Japan; 2) the Netherlands also sold its last two factory ships and their quotas (Willem Barendse I and II in 1962 and 1964 respectively) to Japan; 3) Norway scrapped two factory ship in 1962, and one in 1966. One of its remaining factory ships (Thorshovdi) was converted into an oil-boring platform drillship in 1966. Two of its remaining factory ships were withdrawn from operations because they were unprofitable (Thorshavet in 1967 and Kosmos III in 1968). In the 1985-86 whaling

season, only Japan and the former USSR were involved in Antarctic whaling. This indicates that, as the result, they were successfully managed to reduce its over-capacity under this process of adjustments.

It is worth noting that the cessation of whaling operations by the other three Antarctic whaling countries created better whaling conditions for Japan and the former USSR. The United Kingdom and the Netherlands were able to sell their factory ships and quotas, and receive appropriate payment from Japan. Neither was Norway worse off, as it was able to convert one of its remaining factory ships to another use (oil rig). It is therefore reasonable to conclude that the agreed national quota system, involving transferable rights to quotas, is an effective management scheme for Antarctic whaling, since the historical process shows some evidence of a Pareto improvement. Although the concept of transferable quotas was not formalized at the time, the system itself has proved its potential for avoiding international conflict between whaling nations. At the same time, it is also reasonable to conclude that as the result of these series of international transfer, they were able to managed to reduced its over-capacity; therefore, output control of NTQ is applicable as a means to reduce over-capacity for whaling nations as a whole under this case of national quota allocation in 1962.

## CONCLUSION

This paper summarized and discussed in what way output control is effective in reducing over-capacity, and can become an effective means. It was made clear from foregoing discussion that output control is applicable as a means to reduce over-capacity for fisheries as a whole, although indirectly, but cannot serve as a measure to adjust reduction of over-capacity in individual fishery enterprises directly, and in order to achieve effective utilization of it from functional point of view, NTQ is considered as one of the options in output control. Further, as optional measure for short- and/or mid-term fishery adjustment at the time of the introduction of the system, it can be considered preferential tax measures to enterprises forced to withdraw from the fishing activities, reduction of fishing vessels by allocation of public fund and financial assistance for job training for re-employment.

## REFERENCES

- [1] OECD, 1997, *Towards Sustainable Fisheries: Aspects of the Management of Living Marine Resources*, OECD, Paris.
- [2] Kuronuma, Y. 2001, Towards Sustainable Management of Living Marine Resources: Study on Effectiveness in Reducing Over-capacity under Output Control [in Japanese], *Otsuna Journal of Social Information Studies*, 10, pp. 23-31.
- [3] Copes, P., 1996, Adverse Impacts of Individual Quota Systems on Conservation and Fish Harvest Productivity, Paper presented at the European Fisheries Economists Society (Dec. 1996), pp.14
- [4] Kuronuma, Y. 1997, TAC Management of Fisheries among OECD Countries: Its Issues and Possibilities [in Japanese], *Japanese Journal of Fisheries Economics (Gyogyo Keizai Kenkyu)*, 42(2), pp. 35-56.
- [5] Kusakawa, T. 1994, Fisheries Management based on Individual Quotas [in Japanese], *Japanese Journal of Fisheries Economics (Gyogyo Keizai Kenkyu)*, 39(2), pp. 55-77.
- [6] Retting, R. B. 1992, Recent Changes in Fisheries Management in Developed Countries, *International Perspective on Fisheries Management (Proceedings of the JIFRS/IIFET/Zengyoren Symposium on Fisheries Management)*, Zengyoren, Tokyo, pp.359-398.

- [7] Scott, A.D. 1996, The ITQ as a Property Rights: Where it came from, How it works, and Where it is going, *Taking Ownership: Property Rights and Fishery Management on the Atlantic Coast*, B.L.Crowley (ed.), Atlantic Institute for Market Studies, Halifax, Nova Scotia.
- [8] Kuronuma, Y. 1993, A Proposal for International Management of Southern Bluefin Tuna [in Japanese], *Suisan Sekai (Fisheries World)*, 41(1), pp. 46-49.
- [9] Kuronuma, Y. 1996, Is National Transferable Quota an Economic Policy Option? *International Journal of Social Economics*, 23(3/4/5), pp. 346-356.
- [10] Gambell, R. 1977, Whale Conservation: Role of the International Whaling Commission. *Marine Policy*, 1(4), October.
- [11] Tonnensen and Johnsen, 1982, *The History of Modern Whaling*, University of California Press. Berkeley, USA.

## ENDNOTES

1 See [1], pp.207-208, pp.233-234.

2 See [1], p.14, pp.72-74.

3 As to detailed description of advantages and disadvantages of IQ, IVQ, and ITQ, see [3], [4], [5], [6], [7], etc.

4 As to NTQ, refer to [8] and [9]

5 As to outline of the agreement on the Antarctic whaling catch quota in 1962, see next section as well as [9], pp.346-348 for more details.

6 Under the terms of the 1946 Convention, the IWC could only set a total catch limit for the Antarctic as a whole. [10] Therefore, negotiation of national quotas took place on a voluntary basis

7 The negotiating process is discussed in [11], pp. 585-608.

8 As can be observed from Table 1, the national quotas proposed by Norway involved a 10-15% in each nation's share of the 1947-58 catch, in order to allocate 20% of the total quota to the Soviet Union. The basic idea behind this proposal was to preserve the highest possible quota for Norwegian whaling before Japanese and Soviet whaling expanded [11] (p.585). We should also note that the former Soviet Union insisted on an increased national quota because of the potential to expand its harvesting capacity. As a result, Norway increased the Soviet quota from 16% to 20% of the total allocation in its final proposal [11] (p.590).

9 One British factory ship (Balaene), along with its quota, was sold to Japan in 1959 [11] (p.592); one Norwegian factory ship (Suderoy) was laid up in 1959 [11] (p.604); and three Norwegian factory ships (Kosmos III and two old factory ships) and their quotas were sold to Japan in 1961 [12] (p.603)

10 This can only be said of the countries which took part in the voluntary agreement. In a strict sense, this situation did not change the status of the common-property resources, because it is not possible to



distinguish ownership before the whales are caught. Therefore, these resources are perfectly open to everybody (including countries which were not party to the agreement) as the IWC does not have any jurisdiction over non-members.

11 In other words, the overall quotas under the BWU management system led to the depletion of whale resources and also to the overcapitalization of the whaling industry (e.g. during the 1951-52 season, there were 20 factory ships and 268 catchers operating in the Antarctic [10]).