韓國 다랑이 漁業의 經營에 관한 硏究

李　　裁　　厚*

A Study on the Korean Tuna Fishery Management and Economics

Je-hu Lee

Contents

Ⅰ. Introduction

Korean tuna and tuna fishing is implementing over most of the tropical waters of the Warld's oceans, especially, this study of the Korean longline tuna fishery and the fish and the fishing vessels are highly mobile. No country can deal in isolation with the problems of its tuna fishery and of any tuna fishery in its waters, without collaborating with other countries. This cooperation is often best established through some formal international mechanism. The essential requirement are for imformation on resources, the fishery, the trade and to identify where management actions are need to conserve the resources or to maintain the economic or social function of the fishery. These will also usually require some form of international mechanism.

With the changes in the Law of the Sea, the situation in respect of management of tuna considered among the highly migratory species, requiring special treatment has also changed. At present there are both uncertainty regarding tuna management and development and political argument as to how such management and development can be the best implemented. Bearing this in mind, together with the fact that only few tuna stocks have shown

* 國立水產振興院, 海洋資源部 遠洋資源科 水產硏究士

clear evidence of serious depletion through over-exploitation, present will be placed on information requirements. This study included compiling the data necessary to review the state of stocks in the World's Ocean tuna fishing, especially economic situations.

Information on the resources-where the fish are, their quantity, their movement, demand and supply, trade market, consumption, ect.-is important, whether in planning development of new fisheries, or considering the need for collaboration with other countries and Joint Ventures (in a certaining to what extent their catches may affect catches of the national fleet) or for conservation measures. A major source of information is statistics for development and management, and economic in future centries. Especially the major source of information is the biological and economical statistics of catching and fishing effort from existing commercial vessels. These need to be assembled for all fisheries on the stock on Ocean wide basis. The statisitical data also need to be analysed and interpreted, and combined with biological and economical data (e.g., on growth, mortality and migration rates, and supply and demand, foreign exchange, joint ventures, etc) to provide information that is intelligible and useful for biologist, economist, administrator and other decision-makers. This must also be undertaken on a resources-wide or ocean-wide basis. Finally, because of the world wide similarities in the methods of catching, prosessing and marketing fish, there is a particular but not exclusive need in those countries just beginning to develop their tuna fisheries-to have ready access to a synthesis of information of tuna fishery, tuna biology and tuna fisheries eonomic and political data on the World.

In addition to, tuna fisheries feasibility study need to apply in U.K. e.g. When twenty longline tuna vessel operating in Atlantic for one year, each vessel can catch one million pounds in a year, twenty vessels will catch average amount 20 million pounds in a year. The feasibility study possible to consider in the future.

Ⅱ. Tuna Dynamic Population

Tuna fishery is often thought of only one pattern that has developed in the Pacific Ocean, Indian Ocean, and Atlantic Ocean. Tuna fishery, usually on sixty one species, are troubled by each species catch rate(and possible also economic different price and different species total catch); biological research shows that this is due to too much fishing, and further research determines what patern of tuna fishing would be "Optimum" in same sence or other, and in due course control (catch quotas, size limit, etc.) are applied that will move the tuna toward optimum patterns.

The economic importance of tuna fishery is much greater, in the tuna fishery virtually all fish are discarded, and landing are all different species tuna and different price each species. Once the economic advantages of tuna fishery had been demonstrated, the tuna fishes grew without much direct government involvement.

Overall, thought, the effect of development actions of one sort or another on the fisheries is large, and probably much greater that the effects of management action. The use of production model in multispecies has been shown in the Korean tuna fishery, the relations between total catch (usually as total weight of all species, but also as weight of marketable species, or total value), total effort, and catch-per-unit-effort,

1. The Assessment and Measurement of Multispecies in Tuna Fishery.

1) Assessment of method in tuna fishery

When the tuna data collect three kinds of form has been prepared, first is the sheet form for catch statistics, and second is the sheet form of discard fish, third is length frequrecy measured data. The three data are contributed multispecies of tuna for assessment and measurement.

The first, there are at least 14 species of tuna and the otherpelagic fish caught, all are recorded on the sheet forms for catch statistics in economically difference value of each species. Eg, the highest price species is southern bluefin tuna, but it is not target fish of Korean skippers. Korean tuna fishery needs more advanced technology to catch bluefin tuna. Some day it will be cought by Korean tuna skippers.

Therefore among the target fish the most highest price species is bigeye tuna and the lowest price tuna is skipjack.

The second, there are at 7 species of fish, among them almost not commercial size tuna and other fishes.

The third, there is one tuna species is measured to 30 fishes each sheet form and then are collected each of them, it is key to assess and measure of tuna multispecies.

Above three of them are applied to assess aod measure for at least 12 multispecies. The assessment and measurement of 12 multispecies are illustrated through a mortality use for D. Pauly's Method.

2) Mortality

(1) Total mortality

A basic equation used in tuna fishery biology for expressing the mortality of bigeye tuna is

$$Nt = NoE^{zt} \quad \cdots\cdots(1)$$

Where No and Nt are bigeye tuna numbers at time zero and t, respectively and where z is the total mortality effecting the stock of bigeye. Also we have,

$$Z = F + M \quad \cdots\cdots(2)$$

Which states that total mortality of bigeye tuna is the sum of bigeye tuna fishing mortality F plus natural mortality M. A major task of the fishery we working on bigeye tuna stock is the splitting up of Z into its component papers, F and M; often methods for estimation Z have reviewed.

On E of the simplest method to assess total mortality is to estimate Z from the mean size is the catch, as suggested by Beverton and Holts (1956), the method was discussed in Pauly (1980) and Munro (1982).

Another method of estimating Z is to construct catch curves, ie., plots of the natural log. of fish numbers against there age, where Z is the slope, with sign changed, of the "decending" part of the curve (Ricker 1975).

Where bigeye both are relatively longlined and can be aged by means of annual rings on pinrays, otholiths or bones, catch curves can be constructed and interpreted quite straight forwardly. Eg, as described by Robson and Chapman (1961).

(2) Natural mortality

Natural mortality (M) is a parameter that is generally extremely difficult to estimate, and typically, natural mortality estimates of bigeye tuna have been obtained from estimates of mortality in stocks known, or assumed to be unfished (eg, Thompson and Munro 1978; Weber and Jothy 1977, Pauly and Martosubroto 1980). In a few cases, however, it has been possible to obtain time series of values of Z from the bigeye tuna stock, and the plot there against their corresponding values of effort, with M being obtained from the intercept of the line fitted to above three tuna collect data. Ricker (1975) gives the rationale of the method, which also provides an estimate of the catchability coefficient(G) of gear in equation (for an example at IATTC).

Beverton and Holts (1959) and others to identify, a predictors of M based on comparative studies, a compilation was under taken of 175 fishes of estimations M, ranging from freshwater to marine and from polar to tropical fishes. It was then shown (pauly 1980) that M can be predicted from a knowledge of the growth parameters of a given stock.

(3) Fishing mortality

The various methods used to estimate fishing mortality, four may be listed below;

—Tagging/recapture studies

—Subtraction of M from Z

—Swept area method

—Virtual population analysis (VPA) or Cohort analysis

The detailed analysis will be introduced the other paper, at here pauly (1980) provided estimating of growth parameters ane of Z while the growth parmeters, combined with an estimated value of mean environmental temperature can be used to provide an estimate of M from equation (2), which is than substrcted from Z to obtain F.

The method allows for a quick estimate of whether a stock is overfished or not based on the assumption that the value of F with optimizes yield be similar to M or

$$\text{Eopt}=\frac{F}{F+M} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(3)$$

When Eopt is the exploitation rate which optimize the yield from a given stock (Gulland 1971).

Another method of estimating fishery mortality in other fisheries is the "swept area method", as treated in Gulland (1969). The method can be summarized in one equation namly

$$F=\frac{A*X1}{A} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(4)$$

Where "A" is the total area "swept" by the combined effects of all gears of a freet, A is the total area inhabited by the stock in question, and $X1$, is escapement factor, ie., the fraction of the fish in the path of the gear.

2. Multispecies Schaefer Models

Under the Schaefer model for a simple species the dynamics of an exploited population in terms of its biomass N and fishing mortality rate F are described by

$$1/N * dN/dT=R-AN-F \cdots\cdots(5)$$

When $F=O$, there is unexploitedable equilibrium at

$$\text{No}=B/A \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(6)$$

and if $F=QF$, where F denoted fishing effort, the sustainable yield at given F is

$$Y(F)=QF(B-QF)/A \cdots\cdots\cdots\cdots(7)$$

Thus the sustainable yield curve as a function of F is parabolar, with a maximum at 1/2 No. If the fishing mortality rate resulting in the taking of the maximum sustainable yield (MSY) is approximately the same as M. The natural mortality rate, we then have the valuated formular (Gulland 1970).

$Y_{max} = 1/2$ MNo ·····(8)

The multispecies Schaefer model is a first order Taylor series approximately to the more general models. Let us examined this, and suppose that $N2*$, $N2*$,···MN: is an equlibrium point for the set of equations

$1/Ne * dNi/dT = F1(N1, N2, \cdots,$ Nm) for $i = 1, 2, \cdots,$ m

Then F1(N1, N2, ···, Nm) may be expended in a Taylor series about this equation, yielding to first order

F1(N1, N, ···, Mm) = Sum J=1(NJ−NJ*)

dFI/dNJ(N1*, N2*, ···, Nm*)

Where the superscrept estimates in the partical derivations indicate that the derivates are to be evaluated at the equilibrium point ccmbining these two equations we indeed find

1/N1*dN1/dT = Bi−M Sum J=1 Aji*NJ

For same constants Bi, Aij

Pope's(1976, 1979) analysis of multispecies Schaefer models suggested that the sustainable yeild effort curve should be parabolic, provided the individual species catchabilities remain constant. In terming this implies that the equilibrium catch-per-unit-effort should be linear related to the effort. However, the typical observed plot of total catch per effort is concave rather than linear.

3. Discussion

The major aim of this topic of below model

1/N1*dNi/dT = Fi(N1, N2, ···, Nm)

And their implication for management of tuna multispecies fishing was determine whether an approach based on examination of the relationship between total biomass yield and fishing effort or relative species biomass level was feasible. The work of Pope (1976, 1970) outlined above certainly suggests that much or approach merits close attanton. Using a multispecies Schaefer model, Pope should that for any constant vector of catchabilities, the relation between total yield occured at species biomass of close to one half time unexploited levels it the criterions were systermatrix or wash.

Examination of the extent to which the multispecies Schaefer model is aquate approximation to the more general models leads to the conclusion that the globed results obtained by Pope only hold when the multispecies Schafer model is the concrete model. This occurs because while the form of the model appropriate in the points of equation of management

model, the value change as the point of equiliblium.

The rational conclusions may be drawn from it, and in the it may even be possible to adjust the individual catchabilities and bend toward the overall MSY using method to the suggestion by Pope(1979). Further study will be need economically assessment and measurement of the Korean tuna fishery.

Ⅲ. Development and Management of Tuna Fishery

Most non-western countries need development for fisheries than management. Now a day the coastal states especially non-western countries respect to the exploration, exploitation, coservation and management of the living resources in their exclusive economic zone are the basis for the rational management and optimum use of these resources. Among them the first priority is development of fisheries.

Management should be conceived and understood not as constraint upon rational exploitaion but as an essential tool for the sound, sustained development of fisheries. Hence, management of fisheries is an integral part of the development process.

This essay is introduced development, management, regulation and discussed and criticised what is most important issue in the non-western countries.

Especially, in the view point of Korean tuna fisheries with coastal countries over the world is discussed and criticised through this essay.

1. Fisheries Development

1) Discussion of Fisheries Development

H. Scott Gorden analysis that open-access exploitation of common property fish stock attracts excessive effort, leading to description of sources rent, is now widely accepted. The real constrained lies in the need for a coastal state to be seen resonable in its application of one things which are obviously intended to develop for under-exploitation of variable stocks. Before go to discuss of fisheries development, here I need discuss in Rimouski, a variety of question concerned with fisheries economic and trade, but with a particular concentration of my attention on the problems and prospects of under developed fisheries in context of economic development.

An increasing number of countries are trying to re-evaluate their past efforts and reallocate their resources more efficiency through the establishment of fisheries development plus with states objectives and strategies.

The change in the jurisdiction of the ocean, which creates new conditions for the devel-

opment of fisheries calls for a reviews of policies and strategies locally to do acheivment of economic and social objection of fisheries plans. Domestic fisheries and in particular tuna fisheries, may called upon to play a crucial role in the new strategies and alternative for fisheries economic development.

The issue related to strategies for fisheries development are numerous and of a broad nature. The present discussion paper deals with some critical problems and options which coastal countries, eg. has tuna come around migration fishing ground countries, in particular the developing countries which has many resources of tuna fish stocks, face in the tuna fisheries development sector but they has no amount capital and infrastuctures, but they intended very much to develop for tuna fisheries.

2) Tuna Fisheries Development

The tuna fisheries development considered to be a phase charactrized by the possibility of increasing physical output from underexploited or new tuna fish resources.

It is also often characterized by the expression of effective effort (new tuna long liner boat, gear, etc). Ass opposed to this development phase the subsequent phase would be of nature fisheries in which a certain adjustment would occur between the level of investment (tuna boat, long liner gear, etc) and the tuna fisheries resources.

The definition of tuna fisheries development is insufficient if it takes into consideration only, production growth aspect, without including other essential issue much as income distribution of tuna fisheries and among the population and the sustaing aspect of the profits.

Objective of tuna fisheries development for all the fisheries development base to be linked to the objective of national development which were defined by the 11th Special Session of UN General Assembles as part of the their development decade of UN. The ultimate aim of development is the constant improvement of the well-being of the entire population or the basis of its full paticipation in the process of development a firm distribution of the benefits therefore in the tuna fisheries development perspective, economic growth production employment and social equity are fundamental and invisible elements of development.

Fisheries development is human, socio-economic process through which a certain population engaged in tuna fishing sector gets its livelifood and contribute to the welfare of a tuna fishermen group of the people (through food suppy, foreign exchange, etc.).

The economic growth, as one of the objective of tuna fisheries development, especial developing countries, eg. Korean fisheries is led by the tuna fisheries to development in

1960's, anyhow the objective can be reached not only through physical increase in output but also things in crease in productivity and in the value of product.

Tuna Fisheries Development Plan

Objective: general goals (short, medium long term) to be attained (economic growth, increase standard of living of the fishermen, etc.).

Goals and targets: interproducts of objective into physical and quantitative terms.

Policies: indicate selected option and choosen to acheieve general development objective taking into account biological, socio-political and economic criterias and constraints.

Strategies always and new selected in order to implement policies.

Policy instrument: are also after used indicate specific tools(taxes, price control) designed to carry out selected policies.

Developing countries that do not always have the mean to ensure surveillance of the areas under their jurisdiction a prerequisition for the management are the rational development of fisheries resources international organization should help developing countries which so describe to set up as efficient surveillance system is possible.

Tuna fisheries development financial outlay, which is after an instrumentable obstacle to the implementation of development purpose. It is therefore necessary that specialized agencies their effort to allocation eg. Korean Deepsea fisheries Association, the maximum usable of source tuna fisheries.

Economic technical corporation in future development countries play an increasingly important role in the World fisheries expension high migratory tuna fisheries.

Many advantages may be gained from international development, including the provision of showing of technical expertise, additional employment, improvement to infrastructure, training for local staff, improved knowledge of resources increase revenues and foreign exchange earnings, and economic in use of limited resources.

Developing countries may especially benefit from collaborate or complementry activity with other developing countries in the some region by learning from past efforts and adjust enterprise, for example in research, training, development of appropriate technology, resources development, production, processing and process effort.

Consequentely, non-western countries very keen need for development of fisheries than regulation. Especially fisheries economic development from this centry until future centries will be emphasised further more. Particularly high migration fish which is tuna fisheries ecnomic developmet important than regulation.

2. Tuna Fisheries Management

1) Rational Resources Management

The 200-mile limited is an inperfect instrument for rational resources management, especially high migration tuna fish, in so far as it give authority to states in relation to geographical defined area rather than to distant at geographical units, because the tuna come around to appropriate fishing grounds.

Having also no great motive power ambitions the country has shown an underwided concern for the protection of coastal fisheries and has taken a leading role in international deliberations promoting the interast of coastal states that are now experience in oversea countries.

From global welfare-economic prospection the advantage of the 200-mile fishing limit lies in the circumstance that coastal states become role owners of fish stocks within the limit, excluding their to introduce rational management.

At same time, coastal states are likely to neglect the producer surplus that may be lost in diverting fisheries resources from operations in foreign fleets to marginal operations in domestic fleets. However, causal assesment leads to conclude that the 200-mile limit is likely to cause much greater than increase rate their losses in consumption and production surplus.

With the extension of fisheries jurisdiction around world alternative employment opportunities of distant water fleets are greatly shrunken.

The aquisition of property weight to all the stocks is coastal countries 200-mile zone new permit the division and excess fishing effort inshore to exploitation of off shore stocks there to replace foreign offer that may be forced out.

The management has moved away increasingly from simple biological managemet that has tended to emphasize the acheivement of maximum sustainable yield is physical term.

A more consideration of bio-economic and socio-economic factor is now sought (Copes, 1979).

The guiding principle in their fact has been described as the 'best use' of society's resources as 'defined by the sum of net social benefit (personal income, occupational oppotunity, consummer satisfaction and so on)' divided from the fisheries and industries livelifood to them.

In terms of bio-economic management the 'best use' principle has been explicity translated into a managemet regime requiring that each stock will be exploited at an optimum sustainable yield(OSY) involving a level of effort that capable with MSY. This is included

confirmly with the new conventional notion of fisheries economic that maximum net economic benefits are acheived at a level of effort below the MSY.

It apears that the pressure of regional unemployment will reverse such that most of the additional jobs in the offshore and precessing sector may be used to reduce the role of the unemployment, rather than draw off surplus below from inshore sector.

2) Fisheries Management Measure

There is now wide recognition that the high intensify of problems that occur in the fishing industry is related the common property natures of fisheries resources which involve serious 'external dis-economics'. When fishermen make common use of fish stocks, there are many ways in which they impose cost on one another.

The most serious externalities tend to occur where to there is open access to the fishery resources.

But even in the fisheries to which access difficult to achieve fully rational exploitation of the fish stock.

The typical problems of the fish industry relate in one way or an other to over exploitation of the available stocks. In the theory we know very well that to be about this we must limit fisheries effort by restrictitng input (ie. fishermen, boat, and gear) or restricting output (ie. allowable catch), or by restricting both of these. If we restrict fisheries effort, stock will recover and larger yield will results. If we reduce the number of fisherman, the larger catch will be solved.

IN practice there are number of obstacles to the limitation of fish effort. They tend to be particularly severe in small scale fisheries and especially so for those in developing countries.

The obstacles include the followings

(i) Lack of knowledge concerning stock conditions stock dynamics necessary to determine level of efforts.

(ii) Lack of administrative capability of the necessary resources to set management.

(iii) Lack of will or ability to overcome political and social obstacles to the sustainable use of the available fish resources.

In the case of developing countries it solved be possible to overcome or reduce problems.

I would like mention in which fisheries management may improve returns from on existing fishery without reducing the number of workers employment.

3. Fisheries Regulations

The principle methods via which fisheries have been or might be regulated. Reguratory techniques are often classified quotas, gear restriction, closed seasons, closed areas, taxation, licencing, individual fish quota (Cunningham et al, 1985).

Concerns property right systems as they affect the management of non-western countries fisheries. for the beging of their involvement in fisheries analysis, element have related fisheries problems to the questions of right systems for regulations. Indeed, they have tended to blames the problems of the fishing almost entirly in the absence of adequatly specific property right, locally to the common property over exploitation of fishery resources. They have also looked at means of extending of property right in the fishing increase to bring about non-rational and profitable exploitation of the resources. We look increasing at cooperation management devices such as co-management by government agency and group of fishermen and self regulation-by fishery community (Ruddle and Akiweek, 1984, Ruddle and Johann 1985), including the comprehensive systems of cooperative management long establish by law in Japan(Asada et al., 1983) and Korea.

However, non-western countries have own regulations but more important issue is development, espesially to supply for human food.

Previously, almost discussed about, development management, and regulations.

Consequentely, most non-western countries need to development, but it is need mangement and regulation too. Above three issues that the first priority is development, therefore sometimes signored management and regulations. Especially management not need hurry, the first of all fisheries must be developed even if fish resources development not biological development. For instance, supply and demand of fish products, appropriate investment, employment, and infrastructure, in the future fisheries economic plans, etc.

Therefore, non-western countries need to development fisheries economics. But management and regulation useful for fisheries development. Because non-western countries no need management and regulation, it is not true they are need to regulation and management for their own fisheires devlopment.

In conclusion, non-western countries for management should be conceived and understood not as constraint upon rational exploitation but as an essential tool for the sustained development of fisheries. Hence, management of fisheries is integral part of the development process.

Ⅳ. Tuna Fishery Joint Ventures

With extension of national jurisdiction over coastal living resources, new dimensions and objectives should be added to international cooperation in fisheries concepts. For distant -water fishing nations, joint exploitation of these resources is today considered not only as a way of producing additional income opportunities, but first of all as at least a partial solution to neutralization of harvesting limitations imposed on them in traditionally exploited fishing grounds. There are three kinds of joint ventures in tuna fisheries in Korea are mentioned and general view of Korean joint ventures disccused. We discussed advantages and disadvantages of the economic in fishery joint ventures.

1. Korean Tuna Fishery Joint Ventures

Korean tuna fishery joint ventures are implementing three ways, firstly the data exchanging method with America, secondly private tuna company join with Japan tuna fishery company, thirdly the participating in the South Pacific countries sea area.

1) Joint venture with United States of America

The Korean tuna fishery started to exchange of information and data for joint venture further way. According to both governments side agreed as follows.

The representative of Government of the Republic of Korea and the representative of the Government of the United States noted that they would cooperate at in the exchange of scientific and technical information relating to species of tuna mutual interest with a view to the establishment of regional arrangements, including appropriate international organizations, to ensure conservation of the species and joint ventures. Such scientific exchange would also include the reporting of tuna and associated catches. The two repesentatives noted that, commencing with the effective data of the agreement and until such time as appropriate regional arrangements are in place. The government of the Republic of Korea would in order to establish a base of scientific information to further such arrangement, provide to the appropriate United States authorities, statistics on tuna and associated catch off the coast of the United States.

① Agreement between the Government of the Republic of Korea and the Government of United States concerning off the United States, agreed minutes 8.

The agreed minutes come from as follows joint ventures based: the government of Republic of Korea shall cooperate with and assist the United States fishing industry and the increase of United States fishery exports by taking such measures as reducing or

removing inpediments to the importation and stable of United States fishery products, providing information concerning technical and administrative requirements for access of United States fishing products into the Republic of Korea, providing economic data, sharing expertise, facilitating the transfer of harvesting or processing technology to the United States fishing industry, facilitating appropriate joint ventures and other agreements, informing its industry of trade and joint ventures appropriate with the United States, and taking such other actions as may be informing its industry of trade and appropriate.

② Agreement between the Government of USA and the Republic of Korea concerning fisheries off the coast of the United Statees, Article V

2) Joint venture with Japan's private tuna fishery company Korean tuna fishery private company and Japan private tuna fishing company have good relationship joint ventures.

It is special characterics of joint ventures that is investment to the vessel, and then supply some bait and boat equipment. Japan is leading in number of joint ventures run by Korean tuna boats of the abroad. The Korean tuna fishing company is suppling fish products to the Japan consumption market. The case is just investment joint ventures but after fishing the most tuna land to the Japanese fish market.

3) Joint ventures in participating in the South Pacific countries sea area.

Korean tuna fishing company began to build her cooperational links with coastal states, eg. Kiribati in recent years when it became clear that is can alleviate harvesting restrictions and increase employment opportunies for her fishing fleets. For the developed coastal states, joint ventures with Korean could be seen as a way to develop these coastal resources which temporarily can not be utilized by local fishermen, mainly for economic reasons.

Korean joint ventures fishing activities with Kirbati were mainly in the longline operation until Korean fleet was laid up 1984 because of the spiral increase in fuel prices and the continued depression in the world tuna business. The Korean have recently signed an access agreement with Kiribati following non-renewal inaugral arrangements made in 1980-1982.

Korean were very hard hit by the outcome of UNCLOS III, Kirbati waters had been not bad fishing grounds for the Korean longliners before the Law of the Sea. The South Pacific Commission(SPC) estimated that during the period 1975-1978, a third of the total Korean catch in the SPC region came from Kiribati waters, but according to the Korean tuna catch statistics different with them, there was not much catch about that.

The inaugral fishery agreement with Korea was made in 1979 and was extended for two years. As with the Japanese nagotiations, there was considerable initial secrecy and reservation on the part of Korean to discuss with fishing industry, the fishery associations and

relationship to the government and most importantly, Korean fishing effort in the Pacific region.

The supportive efforts of the FAO and commonwealth Secretariat fisheries experts during the 1981 negotiations could not extract the desired fees from Korea and compromise was reached in which Korea agreed to pay US $ 185,000 for a licence for up to 200 vessels. There was no renewal of licensing agreements in 1983 and 1984 because of paralyed state of the Korean tuna industry. A new agreement was made in 1985 for which the fee was set at US $ 200,000 for a licence for up to vessel. But the most tuna skippers complain not much catch before 1983. In addition to, the agreement was made in 1986/87 for which the fee was US $ 500,000 for up to 95 vessels.

2. General View of Joint Ventures

During the freedom of fisheries era and particularity in times when coastal living resources were aboundant, their joint utilization by local and foreign partners was based on the mutual interst in getting the highest direct economic benifits for the participating companies. Although joint ventures were somtimes restricted in the species to be harvested and area of operation in the coastal waters of the host country, limitations as to the volume of catch were generally based rather on the biological factors and total production capacity of such a company.

Foreign partners, mainly form developed fishing nations, looked principally for highest returns on their invested capital. Thus majority of the fishery joint ventures, for example, were specializd in high valuable species, principally high-priced fin fishes like tuna, and some bottom fishes, and the other species. After being processed by joint ventures, they were exported to foreign markets, principally to the developed countries of Japan, Europe and USA.

Numerous joint ventures in Africa and Latin America with foreign partners from Korea, Europe, Japan or USA could serve as an example, between Korea and Ivory Coast, between Korea and Senegal of this tendency. With the development of distant-water fisheries, joint ventures began to serve not only as a source of additional financial benefits for both sides, but as the bases for handling the ready-made fish products brought by the factory trawlers of the foreign partner. They could be unloaded and stored until the support vessels would take them to the foreign partners home country or to international markets. We can mention here the joint ownership of the Samoa cold storage by local and Korean partner. With the increasing range of operations of distant-water fishing fleets, land-based facilities for fish cargoes, vessels and their crews have became more important for foreign

partners them the immediate results of these ventures.

The diastant-water fleets, if their capacity is to the efficiency utilized, should operate with constant support of auxiliary vessels(mothership, transport vessels, tankers, etc.) or with the land-based installations as near to their fishing areas as possible. The second alternative usually requires cooperations links with the neighbouring coastal states. For example, large fishing base established by Korean and United States in Alaska are providing a full line support services, from fish cargo handling and storing up to ship repair and crew recreational facilities. This land base, run by local and foreign intersts is, thanks to its excellent geographic location, providing lower costs for vessel operation and is increasing the economic efficiency for both distant-water fleets on the North-Pacific fishing grounds. There are many other fishing bases established and run by local and diastant-water countries.

With implementation of extended jurisdiction, new expectations were added to the international cooperation by distant-water fishing nations. As a principal goal, cooperative agreemenmts are expected to provide an open access to the fishery resources within the 200-mile economic zone with the simultanious opportunity for further utilization of their large and actually over capitalized distant-water fishery potential.

The highest number of Japanese joint ventures operate in host countries with large coastal fishery resources like the United States (28 companies), Indonesia(11), Australia(8), Canada(8) or in countries providing the best investment opportunities in fisheries like the Republic of Korea(19) or the Phillipines(10). It is very significant that nearly half of those ventures are specialing in processing activities. Joint harvesting activities are developed principally on valuable species like tuna or shellfish, which could provide the highest economic returns for these companies.

A principal benefit which such a joint venture is beginning to the distant water country fishey economy is production and supply of fish food for the distant-water country consumption market. These productions are taken by Japan as a coperation for as well as a shore in the net income produced by such companies.

The joint ventures with distant-water country participation are specialized in haresting and processing only those species or products which are of special interest to distant-water country.

Joint ventures with the developing countries still could assure relatively cheaper manpower and lower coasts of vessel operation due to the shorter distant between fishing grounds and base ports. Such countries as Korea, Indonesiae, the Phillipines, and Taiwan are still attractive in this field.

Consequently, it can be expected that cooperative companies are also able to produce profits and hard currency for their partners. The distant-water fishing nations are intensifying their effort to establish fisheries joint ventures in countries with rich coastal resources. Coastal water country is offering large fishing potential, know-how and experience in commercial exploitaion of the fishery resources now under extended jurisdiction of coastal nations. As the species of higher market value, such as shellfish, salmon and hlaibut, are fully reserved for the local coastal fishermen, distant-water-fleets are foucusing on under utilized species of lower market value. In these group we can mention pacific hake, alaska pollock, atkamackerel, dogfish, silver hake, capelin and others.

In Kora, Japan, USSR and Eastern European fishing countries, the demand for fish products based on the above mentioned species is high and tends to increase with time.

3. The Economic Advantages and Disadvantages within Joint Ventures

There are several advantages and disadvatages in joint ventures. If a distant-water fleets have a comparative advantage in the provision of a harvesting/processing service and if the coastal state refuse to enter into a cooperative fisheries arrangement(cfa) then the contribution of the relevant fishery or fisheries to the coastal state's national income will be reduced for two reasons.

First, the resource rent to be enjoyed from any given level of harvest will be diminished. For example, let it be supposed that the coastal state faces a simple choice between full domestic exploitation of fishery resource and a joint ventures arrangement in which distant-water vessels harest the resource for delivery to onshore processors.

The second reason that coastal state refusal to enter into a cfa could reduce the contribution which the relevant fishery would make to the coastal state's national income over time is much less obvious. It involves the "underexploitation" of the resource or resources.

Of the factors giving rise to possible distant-water nation comparative advantage, some are familiar from the general literature on international trade, others are peculiar to the fishery. Economists tend to give considerable emphasis to relative factor proportions in attempting to explain patterns of comparative advantage. Thus a country which has a relative abundance of natural resources, but a relative scarcity of labour, could be expected to have a comparative advantage in resource intensive industries and comparative disadvantage in labour intensive industries. Relative industries, relative factor proportions certainly are relevant in fisheries. Thus for example, in the capital intensive offshore tuna fisheries in the South Pacific, it is not surprising that fleets of capital-rich, distant-water nations, such as Korea, have a marked comparative advantage in harvesting the

resource in relation to the mainifestly capital-poor coastal state of the region.

It should be recognized at this junture that there is another advantage that a coastal state might gain from cfas which, strictly speaking, is quite seperate from the concept of comparative advantage. It is also appropriate to recognize on the other side, that there is a negative factor which can disguse a distant-water nation's comparative advantage and cause even the most free-trade oriented coastal state to reject the cfa option.

One yeardstick for evaluating a joint ventures' export marketing performance is how well the venture contributes to achieving fisheries development objectives, in the tuna fishery joint ventures, it generally appears that coastal water country seek to① increase export earnings from tuna sales② increase the value added to lacally cought tuna and③ assimilate technical and business skill from foreign patners.

① Foreign patners can contribute key export marketing management inputs.

Distant-water country come equipped with financing source, established distribution systems.

② Joint ventures can export large quantities of fish and fisheries products.

The factors have generally contribute to higher tuna export values, additional tuna throughout and increase average value added per ton of tuna landed.

③ The ristricted number of foreign countries whose companies can enter into fishery joint ventures arrangement with coastal country.

The limiting factors are available surplus processing capacity and the demand for fish in foreign countries availability of hard arrange.

④ joint ventures foreign partners represent interests of large transnational cooperations, government owned or sponsored organizations or large international fish business companies.

These partners are big enough to exersise 'monopsony' power, i.e, monopoly buying power, in influence through their own purchases the market price level for fish.

⑤ An increasing number of coastal water fishermen are willing to enter into joint ventures arrangements. Harvesting capacity is much higher thses joint ventures sales.

There are at least three important problems related to their utilization in joint ventures operations.

① Impact of harvesting patterns on target species.

In some coastal nations introduction of large factory fleets is frequently criticized for their massive fishing technologies which can endanger the local ecosystem equiblium, particular if the disignated area of operations is small. Factory fleets, in order to work efficiency, should obtain, for example, a high catch rate of 50 up to 100 or even more metric tons round fish per day. Consequently they have to operation on the richest stock

and largest commercial concentrations of target species, which can also be highest interest for local fleets. This obviously will require a careful management policy tobe applied by the coastal states when establishing joint operations based on such vessels.

② Socio-economical efforts of joint ventures operations.

It is known that almost all distant-water fishery fleets are heavily subsidized by their home governments. They may be inclined to continue the same economic to support their companies engaged in joint operations. This assumption is particularly valid when foreign vessels, crews, equipment and other materials are delivered as a contribution to such joint ventures. It a joint ventures is also contributing to softening the host country's unemployment difficulties or to the economic development of the neighbouring coastal zone where it is located, it can expect additional support also from local government. Consequently, the sucessful joint company is expected to be extremely competitive with the exsisting coastal fishing communities, which are not able to quickly develop an efficient and massive exploitation of some coastal resources. It cause many controversies.

③ Political constraints.

This particularly is valid when possibilities of cooperation between partners of various political and economic system are involved. It we try to establish the list of the most important countries potentially interested in establishing a joint exploitation of the fishery resources close to the coastal states, the resulting picture will be quite significant.

Joint ventures with both countries will be appeared same advantages and disadvantages. But more advantage along the joint ventures. Joint ventures developing fisheries resources will be attractive for both sides if they could produce additional volumes of fish for the foreign markets and offer an economically more effective way of resources utilization would be possible in non-cooperatives. Cooperation in fisheries between foreign distribute and developed nations can find a good future in the development of lower market values species in coastal nations which, represent a very large fishing potential.

The benefit, and constraints for each joint ventures operation should be considered a case by case.

Ⅴ. Summary

Examination of the extent to which the multispceies Schaefer Model is aquate approximation to the more general models leads to the conclusion that the globed results obtained by Pope only hold when the multispecies Schafer Model is the concreat model. This occurs because while the form of the model is appropriate in the point of equiliblium.

The rational conclusions may be drawn from it, and in the it may even be possible to adjust the individual catchabilities and bend toward the overall MSY using method to the suggestion by Pope(1979). Further study will be need economically assessment and measrurement of the Korean tuna fishery.

Previously, almost discussed about, development, management, and regulations.

Consequentely, most non-western countries need to development, but it is need mangement and regulation too. Abve three issues that the first priority is development, therefore sometimes ignored management and regulations. Especially management not need hurry, the first of all fisheries must be developed even it fish resources developed thers still need for economic development not biological development. For instance, supply and demand of fish products, appropriate investment, employment, and infrastructure, in the future fisheries economic plans, etc.

Therefore, non-western countries need to development fisheries economics. But management and regulation useful for fisheries development. Because non-western countries no need management and regulation, it is not true they are need to regulation and and management for their own fisheires development.

In conclusion, non-western countries for management should be conceived and understood not as constraint upon rational exploitation but as an essential tool for the sound, sustained development of fisheries. Hence, management of fisheries is integral part of the development process.

Joint ventures with both countries will be appeared same advantages and disadvantages. But more advantage along the joint ventures. Joint ventures developing fisheries resources will be attractive for both sides if they could produce additional volumes of fish for the foreign markets and offer an economically more effective way of resources utilization would be possible in non-cooperatives. Cooperation in fisheries between foreign distribute and developed nations can find a good future in the development of lower market values species in coastal nations which, represent a very large fishing potential.

The benefit, and constraints for each joint ventures operation should be considered a case by case,

Reference

1) Beverton, R. J. H. and S. J. Holt(1956): A review of methods for estimates in expected populations with special reference to source of bias in catch sample, Rapp. P. V. Reun. Cons. Int. Explor Man 140:67-83.

2) Chang, S. H. (1966): The Theory of Fishing grounds, The Fisheries Management and Administration

pp. 89-118, Korean.

3) Copes, P. (1979): The economics of marine fisheries management in era of extended jurisdiction: The canadian perspective, American Economic Review, Vol. 69(2), May 1979, pp. 256-260.

4) ——— (1979): Marine fisheries management in Canada; Policy objective and in stitutional constraints, Simon Fraser University of Economics and Commerce Discuss Paper, p. 20.

5) ——— (1986): Resources management and the deve[opment of small-scale fisheries, Discussion Paper 86-1, Institute of Fisheries Analysis, Simon Fraser University. Burnaby, B. C. Canada, p. 16

6) Cunningham, S., M. R. Dunn and D. Whitmarsh(1985): Fisheries Economics an introduction, Manshell Publishing Limited, London, p. 372,

7) Cycon, D. E. (1986): Managing fisheries in developing nations: A plea for appropriate developement National Resources Journal Vol. 26, UNM School of Law, p. 1-14.

8) Diegues A. C. S. (1983): Policies and strategies for fisheries development some relevant issues for developing countries, FAO fisheries report NO. 295 Supplement, p. 15.

9) FAO(1986): Strategy for fisheries management and development, p. 26.

10) GONG, Y., Y. C. PARK, W. S. YANG, J. H. LEE(1987): A Study on the Management of the Indian Ocean Tuna Fishing Grounds, The Journal of Korean Fisheries Business Administration, no. 1, pp. 59-97, Korean

11) Gordon, H. S. (1954): The Economic Theory of A Common-Property Resources Fishery. J. Polit. Econ., 62:124-42.

12) Gulland, J. A. (1971): The fish resources of the Oceans, FAO/Fishing News(Books) Ltd. Surrey.

13) Gulland, J. A. and S. Garcia(1984): Observed patterns in multispecies fisheries, Exploitation of marine communities, ed. R. M. May p. 155-190.

14) Houghton, R. G., N. A. nielson and C. Verdelhen(1981): Analysis of methods used to determine fishing capacity, and establishment of method suitable for community needs. EEC, International information on fisheries, NO. 12, Nov. 1981, p. 104.

15) Kacsyanski, w. m. (1979): Joint venture in fisheries between distant-water and developed coastal nations: economic view, Ocean management, 5, p. 39-48.

16) ——————(1984): Joint ventures as an export market, Marine policy 8(1), p. 16-29.

17) LEE, J. H. (1981): The Trend of the North Pacific Fisheries in 1980's, througth Dr. Marasco's View The Journal of Fisheries Business Administration, Vol. 12, No. 2, pp. 73-99.

18) ————(1984): Study on the Fisheries Management from the Population Dynamics Stand Point in the North Ocean, Bull. Fish. Res. Dev. Agency 33, pp. 185-206, Korean.

19) ——— (1986): A Study on the Horizontal Management of the Fisheries in the North Eastern Pacific, The Jonl. Fish. Business Administration, Vol. 17, No. 1, pp. 41-76, Korean.

20) Munro, G. (1985): Coastal states, distant water fisheries and EFJ. Marine policy 9(1), p. 2-15.

21) Munro, J. L. (1982): Estimation of biological and fishing parameters, Theory and management of tropical fisheries, ICLARM/SCIRO, p. 71-82.

22) National Fisheries Research & Development Agency(1986): Deep-sea fisheries resources data book I, Text for Korean distant water fisheries skippers, Pusan Korea, (Korean), p. 776.

23) Pauly, D. (1980): On the relationships between natural mortality, growth populations, and near environmental temperature in 175 fish, Journal Cons. Can. Int. Explor. Mem. 39(3): 175-192.

24) ————(1982): Studying single species dynamics in a tropical multispecies context, Theory and management of tropical fisheries, ICLARM/CSIRO, p. 33-70.

25) Pauly, D. and P. Martosubrote(1980): The population dynamics of *Newipterus marginatus* off wes-

tern Kalimantan, South China Sea, J. Fish. Biol. 17: 263-273.

26) Pope, J. G. (1976): The effect of biological interaction on the theory of mixed fisheries Int. Comm. Northern Atlantic fish. Soc. Paper 1: 157-162.

27) ————(1979): Stock assessment in multispecies fisheries with special reference to the trawl fishery in the Gulf of Thailand, South China Sea Fisheries Development and Corrdinating Programe, Malaysia, SCS/DEV/79/19, p. 106.

28) Ricker, W. E. (1975): Computation and interpretation of biological statistics of fish populations Bull Fish. Res. Board Can. 191, p. 382.

29) Robson, D. S. and D. G. Chapman(1961): Catch and mortality rate, Trans. Ameri. Fish. Soc. 90(2) 181-189.

30) Samples. K. C. (1985): Export marketing strategies for fish and fisheries products; Lesson from international tuna joint ventures in the South west Pacific.

31) Sathiendrakumar, R., C. A. Tisdell((1987): Optimal economic fishing effort in the Maldivian Tuna fishery: An opporiate model, Marine Resources Economics, Vol. 4, pp. 15-44.

32) Teiwaki, R. (1987): Access agreements in the South Pacific, Kiribati and distant water fishing nations 1879-1986. Marine policy Oct. 1987, pp. 273-284.

33) Thompson, R. and J. L. Munro(1978): Aspects of the biology and ecology of Caribbean reef fishes: Serrandwichue(kinds and groups), J. Fish. Biol. 12: 115-146.

34) Weber, W. and A. Jothy(1977): Observation on the fish *Newipterus* app. (Family: Newspteridae) in the coastal waters of East Malaysia Arch, Fischeriwiss 28(2/3): 109-122.

35) Whecler, Alwyne(1985), The World Encyclopedia of Fishis, Macdonald Co. Ltd. LONDON, p. 368

摘　　要

그간 다랑이遠洋漁業硏究는 單純한 統計와 生物·資源的 側面에서 考察되어 왔다. 그러나 現時點에서는 무엇보다 經營과 經濟的 貢獻度를 比較하면서 그 實質的 發展策을 찾아야 할 것이다.

그 理由로는 200海里經濟水域이 定着化되어 가는 現狀況에서 좋든 싫든 大多數의 遠洋漁業을 遂行하는 國家들이 그 制度를 받아 들여야 할 立場이기 때문이다. 이러한 立場은 遠洋漁場에 進出하는 國家들 뿐만 아니라, 아무런 對應策도 없이 無條件 200海里經濟水域을 設定하여 놓은 沿岸當事國들도 自國의 經濟水域內에 있는 水產資源을 經營經濟的으로 有效하게 活用하기를 希望한다.

더우기 다랑이魚種의 主要回遊路가 200海里經濟水域內의 沿岸國家들에 連接되어 있다. 그러므로 200海里經濟水域을 保有하고 있는 沿岸國家들과 同水域에 進出을 企圖하는 遠洋漁業國家들 間에 合作漁業을 實施해야 할 것이다. 물론 優先的으로 入漁操業의 前段階를 밟아야 하나 終局的으로는 合作漁的이 타당직하다.

合作漁業의 重要性은 漁業自體 뿐만 아니라 그 波及效果를 거둘 수 있다는데 있다. 合作漁業은 政治的·社會的 硏究도 隨伴되나 優先的으로 附加價値를 가져와야 하므로 經營經濟的 側面에서 硏究考察되어야 한다.