THE ORGANIZATION FOR THE PROMOTION OF RESPONSIBLE TUNA FISHERIES

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FOR CONSERVATION AND SUSTAINABLE USE OF TUNAS

Tuna Science

Genetic research on bluefin tuna is in steady progress

Interview with Dr. Motohiko Sano, Director, Research Center for Aquatic Genomics, National Research Institute of Fisheries Science, Fisheries Research Agency

Q: First, I would like to ask you how we should understand the genetic research on fish.

SANO: There is nothing special about this field of study because genes can be found in all living organisms. Genes are a blueprint of all life. DNA (deoxyribonucleic acid) is, so to speak, a chemical substance that writes that blueprint. Chromosome is like a book that integrates various blueprints of life. Recently, the word "genome" is often used. Genome means genes that are comprised in organisms; in other words, it means the entire genetic information. Some scary image may hang around genetic research as though it appears to be touching on the information on life that we should not see. But that is not true. The research now being conducted on fish doesn't intend to artificially modify genes--a blueprint of life-- by humans. It is the research to find genes from the whole genome sequences and to try to make the extensive use of the information for the benefit of aquaculture, stock management and other purposes.

Q: What is the merit of knowing the genetic information?

SANO: Let's take the example of livestock. Humans have developed livestock having beneficial characteristics for them by selecting the individuals through generations of crossbreeding and making animals that, for example, can produce more meat and are more resistant to diseases. In this process, the parents seemingly having excellent characteristics were crossbred in many ways and were made to breed their offspring. After the offspring, bred in this way, grow up, the individuals that seem more excellent are further crossbred. Selective breeding is advanced in this manner through accumulation of crossbreeding in a span of several tens or hundreds of years. By analyzing genetic information, the characteristics of the individuals, which could not be known by appearance, will come to be known clearly, and excellent individual groups having characteristics desired by humans can be produced with minimum crossbreeding using genetic information.

Q: How can this technique be applied effectively to tunas?

SANO: For example, wild Pacific bluefin tuna migrating in the near-shore area of Japan is still in stable stock conditions. Stock management of this species have been launched with the aim to conserve and use them sustainably. Genetic research is useful in supplementing such efforts to manage the stock. What I mean is that, in the case of tuna farming--expanded actively in recent years--, juvenile tunas caught in the wild are reared in net cages until they become marketable sized- fish. Studies are also advanced on closed cycle breeding system, that is, growing adult tunas from the eggs which were spawn by captured tuna. Under the current circumstances, however, bluefin tuna farming still relies on wild juveniles.

Closed cycle breeding has been achieved in the limited institutions, but it has not yet reached the practical stage in the aquaculture industry. In the wild, a tuna grows into a parent fish in three years at the earliest, but in farming it takes as long as five years. The efficiency of breeding will improve drastically if the period to maturity is shortened. It is in this respect that the use of genetic information will contribute to tuna farming. If we develop some genetic DNA marker of tuna linked to early maturation, and select such parents from among a large number of tunas to

crossbreed, it is possible to make tuna matured in three years. If the number of tunas that can reach maturity in a short span of time and spawn eggs increases and seedling operation succeeds with higher survival rate, then we can secure the necessary number of individuals for farming without catching juveniles in the wild. As a result, it will become possible to reduce fishing pressures on the wild stocks, thus enhancing conservation of natural resources. The same principle applies to developing tuna which are highly resistant to diseases and have high-quality meat.

Q: What kind of research is your division promoting now?

SANO: As the only research institute specializing in fisheries in Japan, the Fisheries Research Agency has been promoting from early times the genetic research on the tuna, which is one of highly important fishery resources for Japan. In 2009, the agency introduced the most advanced sequencing device called the "next-generation sequencer," and succeeded in the genome analysis of bluefin tuna. Since fiscal 2011, we launched new research project, commissioned by the Fisheries Agency, the Government of Japan. In the genetic studies, we are trying to find genes that may determine the period of first maturation, faster growth rate and resistance to diseases from the genome. We were able to study that because we had already completed the general analysis of the draft genome sequence of the Pacific bluefin tuna. This research is now drawing attention of scientists in the field all over the world.

Q: Will that research require large amount of efforts?

SANO: Analysis speed improved dramatically after the installation of the next-generation sequencer in our division. The flourishing genetic research throughout the world in recent years owes greatly to the development of this device. The technological level of the sequencer has been upgraded year by year, and the analysis speed will become even faster in the days ahead. The sequence of bluefin tuna genome will be made clear by combining enormous amount of data coming from the sequencer. This is a work requiring huge amount of efforts using computers. It is not an easy work to find out the precise genes which account only for a several percentage of the genome. But at the same time it is a fascinating work because it is an undertaking we have launched for the first time and it provides new discoveries continuously. It is really worth advancing this work because it opens up many ways of use and possibilities if the accurate genome organization, blueprint of the bluefin tuna, is made available.

Q: Will there be no need to use wild tunas if the genetic research advances and tuna farming is practiced actively?

SANO: It is quite probable that productivity in tuna farming becomes very high when genetic research on bluefin tuna makes progress. I believe the speed of commercialization will be accelerated because we are promoting the project in coordination with private enterprises. Wild tunas have their benefits while farmed ones have also their own advantages. I think both will coexist by supplementing each other. Therefore, sustainable use of wild resources will assume a greater importance in the future. In other words, the importance of using wild tunas will remain solid. In order to use the natural stocks on a sustainable basis, I think it is important to establish closed cycle breeding system as soon as possible by using genetic information positively so that there may be no catch of juvenile tuna for farming to the extent that it would adversely affect the stock itself.

To know more about the Fisheries Research Agency, please visit http://www.fra.affrc.go.jp/

OPRT General Meeting

Further efforts to address overcapacity

--OPRT business target in 2012--

On May 17, OPRT held its Annual General Meeting in Tokyo and resolved the Business Plan for 2012. With a view to ensure the effectiveness of the management measures implemented by Regional Fisheries Management Organizations, the efforts to eliminate IUU fishing activities will be continued by monitoring production of tunas imported to Japan, the largest sashimi market in the world, implementing DNA test to confirm correctness of the import data, and so forth.

Noting the problems caused by the increase in the number of large scale purse seine fishing vessels in the Western and Central Pacific Ocean, catching immature bigeye and yellowfin tunas by fish aggregating devices (FADs) and the recent increase of small scale longline fishing vessels, efforts will also be made to address overcapacity.

Yoshio Tsutsumi, who was re-elected as OPRT President at the meeting, stated, “Together with all stakeholders related to production, distribution and consumption of tunas, OPRT will make utmost efforts for ensuring the sustainable use of tuna resources and development of responsible tuna fisheries”. (Details of the Business Plan

are on the OPRT web. www.oprt.or.jp)

Tuna Management

OPRT Members discuss the worrisome situation of the WCPFC managment

On the occasion of its Annual General Meeting in Tokyo, OPRT held its members' meeting on May 17. The major topic discussed was the present situation of the Western and Central Pacifc Fisheries Commission (WCPFC).

Dr. Jiro Suzuki, tuna scientist who attended the WCPFC annual meeting in Guam last March, delivered a keynote speech in which he expressed his view concerning the result of the meeting. (For a summary of his speech, see Annex 1 below).

OPRT members shared Dr. Suzuki's concern and recognized the need for the WCPFC and its member governments to take appropriate actions to implement effective management measures before the stock becomes unsustainable.

Annex 1

A summary of Dr.Suzuki's keynote speech

Bigeye tuna management has been one of the most serious issues of concern in the WCPFC. The members, who gathered in Guam for the annual meeting (WCPFC8), were assigned the important job to formulate new regulatory measures replacing the current ones that expire at the end of 2011. However, the outcome of the WCPFC8 was disappointing because only interim measures covering one year were adopted with almost simple rollover of the current measures that are far apart from required additional measures to end over fishing of bigeye stock in the WCPFC. As a result, the concern over competence of the WCPFC is growing, especially because it seems difficult to foresee agreement between the distant water countries (DWCs) and small island developing countries (SIDCs) on adopting any meaningful regulatory measures for bigeye stock while the stock has been depleting toward overfished state.

Conflict of interest between the DWCs and the SIDCs became even more serious now. For example, the SIDCs refused any compromise for limiting the fishing activities, claiming that the DWCs should take all responsibilities concerning future bigeye management since the DWCs themselves increased purse seine fishery using the FADs (Fish Aggregating Devices) with a significant juvenile bigeye bycatch and that aggravated the stock status of this species. Moreover, the SIDC aspiration to develop their fishery is assured by the Convention of the WCPFC. As for the DWCs, capping the number of their purse seiners was proposed, but no consensus was available even among the DWCs. The interim regulatory measures contain one key important element, i.e., the base year to limit vessel days (VD) was changed from 2004 to 2010. Statistics show that represents a 20% increase in the VD from 2004 (a 30% increase in 2011) despite the fact that the Commission is requested by the Scientific Committee to implement further decrease of fishing mortality.

I would like to emphasize four points to get away from this stalemate:

1) keep in mind that the scale of fishing should be commensurate with the resources' productivity;

2) make sincere effort to compromise between the DWCs and SIDCs as I am afraid the SIDCs would be eventually the largest loser in case of management failure because they have no alternative resources even if the DWCs duly respect the SIDCs' aspiration for development of the tuna fishery;

3) promote fishing capacity freezing of large scale purse seiners in the developed countries and establish ways to transfer the capacity to developing countries (KOBE III recommendation), and

4) urgently control FAD operation more effectively with transparent VD management.

New Member

Vanuatu joins OPRT

OPRT approved the enrollment application of Ming Dar Fishery (Vanuatu) Co. Ltd.(MDFC) at its Extraordinary Board Meeting held in Tokyo on May 17. MDFC represents 31 tuna fishing companies in Vanuatu and 49 large scale tuna longliners owned by them were registered with OPRT.

MDFC is recognized by the Government of Vanuatu as an organization which has been involved in promoting and implementing responsible tuna fisheries for the Vanuatu international tuna fishery.

As a result, OPRT member tuna fishing organizations in the world increased to 17, and the total number of large

scale tuna longline fishing vessels registered with OPRT reached to 1,048.

MDFC President Chu-Lung Chen (right) and OPRT President Tsutsumi

OPRT Seminar

China's sashimi market -Developing potentiality is strong - Professor Xiabo --

The trend of sashimi tuna market in eastern Asia was reported by Professor Lou Xiabo, Tokyo University of Marine Science and Technology at the OPRT seminar for its members on May 16. He analyzed the trend using various statistics and information. He estimated the market in Taiwan, Korea and China is expanding, standing at 8,000 tons, 20,000 tons and 10,000 tons, respectively, in 2011 although no official data are available.

"China has the largest potentiality to develop its sashimi market in the future, if a cold chain supplying frozen sashimi tuna could be developed and if carbon monoxide treated tuna (CO-treated tuna) could be eliminated from the market", Professor Xiabo said. CO-treated tuna gives a false impression about the freshness of the fish but it is neither fresh nor tasty. CO-treated tuna will not create real sashimi tuna market. Japan prohibits sales of CO-treated tunas to prevent the health risk to consumers.

Dr. Miyake's Column

Longline or Purse seine?

Dr. Makoto Miyake,
Visiting Researcher at the National Research Institute of Far Seas Fisheries

The tuna industry can be grouped into two major sub-industries. One is the high-priced fresh fish (particularly of sashimi) market mostly supported by longliners. The other is low-priced canned tuna market where tuna have been mainly supplied by purse seiners in recent years. The demand for canned tuna has been expanding very rapidly and accordingly, the purse seine fleet has also expanded rapidly.

Some people argue that purse seine fishing, particularly with Fish Aggregating Device (FAD), is the most economic fishing method with less impact to earth ecology. It is true that among industrialized fisheries, the quantities of fish captured per gallon of fuel is highest with purse seine fishery on FADs, if we disregard the economic yield or fish prices.

If the supreme objective of the tuna industry were the maximum reduction of carbon dioxide produced by the combustion of fuels by fishing vessels, the best would be to fish near the coast using only man power (like artisanal vessels without any engines). We all know that is not really a pragmatic option. Then, if we were to catch all tuna only using purse seiners on the basis of their fuel consumption levels, what would happen? Total catch which can be sustainable (MSY) would be much lower, as shall be explained later. In addition, without longline fishery, there would be no tuna available for sashimi consumption and the reduction in total economic yield would be very substantial.

Purse seiners catch a great number of relatively inexpensive young small-sized tuna, while longliners catch much less number of very high-quality expensive large-sized fish. It is known that a cohort of tuna gains mass until a certain size/age (i.e. gain by growth exceeds loss by natural mortality) and thereafter the cohort mass will decline (i.e. natural mortality loss is greater than growth gain). This critical point is about 40 kg in yellowfin tuna and 70 kg in bigeye tuna. These critical sizes correspond to the fish captured by longliners. Therefore the total weight of fish which can be sustainably taken by purse seiners alone would be much less than those taken only by longliners. Indeed, the current maximum sustainable yield (MSY) of bigeye tuna taken by longline and an expanded level of purse seine fisheries in the Pacific Ocean has been reduced to almost a half of the level of 20 years ago when bigeye tuna were taken by longline alone.

If we were to use only longline for catching tuna in order to increase MSY of bigeye, what would happen? It will ease the pressure on the bigeye stock. However, to achieve the current level of tuna catches (in weight) by longline alone, a substantial increase in the number of longline vessels would be required, and even then, we may still not catch as much fish as currently being caught. Further problem is that skipjack cannot be harvested at all and yellowfin catches will also drop far below the MSY level. The canning industry will be collapsed due to severe shortage in tuna supply and higher price of fish. Therefore, it is not realistic either.

In conclusion, we have to seek a point of compromise through a fair balance of social, economic, environmental and biological factors. The duty of scientists is to find an unbiased and transparent means of achieving equilibrium among these various factors, without being affected by prejudiced propaganda, money or political pressures.

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