

## PROPOSAL OF SOME IMPORTANT RESEARCHES ON THE ATLANTIC BLUEFIN TUNA

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### SUMMARY

There are several outstanding important research activities regarding population studies of the Atlantic bluefin tuna in ICCAT. This document reiterates the important aspects of improving: (1) abundance indices, including experimental fishing; (2) re-examination of stock structure; and (3) collection of more information on the reproductive biology of medium-sized fish. A new monitoring program for the stock status of Atlantic bluefin tuna on a real time basis is proposed in order to meet with intensified regulations.

### RESUME

Plusieurs recherches importantes, de caractère significatif, sont en cours à l'ICCAT pour étudier la population de thon rouge de l'Atlantique. Le présent document rappelle les domaines importants à améliorer: 1) indices d'abondance comprenant la pêche expérimentale, 2) réexamen de la structure du stock, et 3) collecte d'informations plus nombreuses sur la biologie de la reproduction des poissons de taille moyenne. Un nouveau programme de suivi en temps réel de l'état du stock de thon rouge atlantique est proposé pour appuyer des réglementations intensifiées.

### RESUMEN

En ICCAT están en marcha varias e importantes actividades de investigación sobre la población de atún rojo en el Atlántico. Este documento reitera la importancia de mejorar algunos aspectos: (1) los índices de abundancia, incluyendo la pesca experimental, (2) un nuevo examen de la estructura del stock y (3) recoger más información sobre la biología reproductora de los peces de talla media. Se propone un nuevo programa de vigilancia de la condición del stock de atún rojo atlántico, en tiempo real, con el fin de ajustarse a la intensificación de las regulaciones.

## Introduction

Although SCRS has been studying hard to make reliable assessment of the stock status of the Atlantic bluefin tuna, there still remains several critically important subjects related to the assessment which require further investigation. Those subjects are summarized in the reports of the Bluefin Year Program (BYP) and the coordinated research activities were initiated (ICCAT, 1992). However, it appears that while overall research activities be heightened to improve reliability of the assessment of this stock to meet with more stringent management measures, it has become more important to introduce experimentally designed research activities. Since the new program proposed now collects the data on real time basis, it also serves as early warning system for the stock status. This short document briefly describes some aspects of researches presently required and makes relevant proposals.

## Changes in regulatory measures and bluefin fisheries

Recent changes in regulatory measures, especially for the western stock, are characterized by overall reduction of the quota, 25 % of reduction of the 1991 quota by 1995 with more restriction of capturing the small fish, minimum weight of 30 kg with 8% allowance. In addition, it is recommended to encourage fishermen to tag and release all fish less than 30 kg (ICCAT, 1992).

These changes in the regulatory measures affect the practices in the fisheries and researches because most of scientific information come from the fisheries data. For example, catches of Atlantic bluefin tuna in the western Atlantic by the Japanese longline fishery has been low, less than the allocated quota during recent years with no operations within the US 200 mile waters. This change was caused by less attractiveness of the western Atlantic due to intensified regulations coupled with finding of more promising new fishing ground recently established in the central north Atlantic. The US fisheries on bluefin tuna are also affected, especially sport fishery on which increasingly restrictive measures are imposed such as reduced quota and minimum size regulation. Most of CPUEs which are now used in tuning the VPA in the western stock are provided by those two fisheries. The longline CPUE provides valuable information on medium and large sized fish which have wider distribution in the offshore oceanic areas where the longliner operates. In contrast, the US sport fishery gives abundance indexes of the small, medium and large sized fish stocks. Since the fishery is restricted in the coastal waters where the small fish has their major habitat, the CPUE of this fishery for the small fish is informative. In the western stock, monitoring of the parental stock size is of most important subject. However, for this segment of the stock, no reliable CPUE, comparable to one used to be provided by the Japanese longline boats operating in the spawning ground of the Gulf of Mexico, is available for more than a decade.

In the Mediterranean, no Japanese longline fishing is permitted during peak spawning season. However, the longline CPUE should be improved so that it covers major spawning season and area in the Mediterranean because the Japanese longline CPUE is the only index standardized, among other nominal indexes, used in tuning the VPA in the assessment of the eastern stock.

## Proposal 1

Reduction of quota and introduction of more restrictive measures inevitably deteriorate the quality of these CPUEs and cause difficulties to keep continuity of the time trend of CPUE with that obtained before the introduction of the regulatory measures. In addition, more timely retrieval of the data, especially from the longline fishery is required to match with the intensification of the regulations. Real time monitoring of the stock status is an essential tool for an early warning system. Therefore, it is necessary to have an experimental program to overcome these situation.

Such program has already been in function with southern bluefin fishery. Japan, Australia and New Zealand cooperatively initiated from 1991 the Real Time Monitoring Program (RTMP) to retrieve reliable fishery information, relatively free from any potential biases which might be caused by introduction of severe regulatory measures imposed on this stock. Detailed catch-and-effort information with size measurement data (Table 1) are collected through IMMARSAT on a real time basis covering major fishing areas and seasons. The program started with 12 Japanese longline boats, some of which have observers on board of some boats, and the number of boats increased to 18 in 1993. Total catch made by the RTMP boats is about 5-7 %, in terms of weight, of the overall quota for the three countries. The program has been providing indispensable information and further expand of the program is recommended (Anonymous, 1992).

The following is a basic idea of Japanese proposal to introduce a program similar to the RTMP into Atlantic bluefin tuna primarily for the purpose of improving quality of longline CPUE but potentially for much wider research purposes. It should be noted that the use of any other fishing gears which will give useful information should also be considered if it is not feasible to use the Japanese type of longline boats.

Area	Period	No. Boats	Expected catch (No. fish)
Canadian and US 200 mile waters	2 months (Dec.-Jan.)	10	1500 (3fishx25daysx2monthx10boats)
Gulf of Mexico	2 months (Mar.-Apr.)	5	500 (2x25x2x5)
Mediterranean	2 months (May-June)	5	1000 (4x25x2x5)

Tentatively a maximum of 10 boats will be deployed in the first year. Those 10 boats start to operate in the Canadian and US waters from December. After that, of the 10, 5 boats will move to the Gulf of Mexico and possibly try to catch medium fish in the summer seasons for the purpose of taking samples of gonads for reproductive biology.

The importance of reproductive study is briefly explained in the following part. Other 5 boats will move to the Mediterranean. To be successful in this experimental fishing, joint effort and participation to the program among various countries capturing bluefin tuna are required.

A similar program should also be designed for the U.S. sport fishery, especially for improvement of CPUE for the small fish.

#### Re-examination of the stock structure

Assessment of the Atlantic bluefin tuna is being currently made under separate stock hypothesis, western and eastern stocks divided approximately in the middle of the Atlantic. However, it seems that this hypothesis comes from management point of view rather than concrete scientific evidence, i.e., reflecting the fact that the fishing grounds of the Atlantic bluefin used to have been localized in both sides of the Atlantic. Tagging experiments demonstrated some 140 transatlantic migrations between the western and eastern stocks for all size classes (ICCAT tagging database). The SCRS regards the mixing rate is limited to a degree which does not negate the assessment based on the separate stocks hypothesis. However, there still are strong arguments over this assumption among the scientists in the SCRS.

There are a few critical facts which drive the scientists to re-examine the stock structure of the Atlantic bluefin tuna. First, transatlantic migration records demonstrated that some juveniles tagged in the coastal waters of the US have been recovered in the Mediterranean as medium sized or giant bluefin during the spawning season there (ICCAT tagging database). These recoveries suggest that some juveniles originated in the western Atlantic spawn in the Mediterranean. Further, if no medium sized fish spawn in the western Atlantic as is so far believed, then two possibilities remain for future migration of the medium sized fish. They remain in the western Atlantic and spawn in the western Atlantic as giant or they migrate to the Mediterranean where bluefin start spawning when they attained the medium size. Although reality of migration appears much more complicated than hypothesized here, there is no doubt that critical review of the present separate stock hypothesis should be urgently done. Note that tagging experiments show link of giants between Bahama waters and Norwegian waters and further link between Norwegian waters and Gibraltar waters (Deriso and Bayliff (editors), 1991). These suggest the migration of giant bluefin between the two spawning grounds. The recoveries of fish released from the western Atlantic and recovered in the Mediterranean demonstrate the suggested link between the two spawning grounds is in existence also for juvenile and medium sized fish. Newly adopted regulation to increase in tagging activities will be a good opportunity in re-examination of stock structure, especially for smaller fish.

Second, new fishing ground of the Japanese longline was formed recently in the central north Atlantic (Miyabe and Hiramatsu 1993). Since the catch is significantly large, how this catch is treated in stock assessment is a hard problem to the scientists at the present level of the knowledge.

#### Proposal 2

The number of fish tagged and released have been increasing recently both in the western and eastern Atlantic. Those activities should be maintained and further expanded. In addition to the conventional type of tagging, archival tags should be considered to be utilized which will provide more detailed information on migration. Archival tags are scheduled to be applied this year for southern bluefin tuna by the joint program between Australia and Japan. If it is demonstrated to be practical, it should be given high priority in the BYP.

At the same time, it is noted that genetical approach with the mtDNA method should be encouraged. Collection of the samples from various parts of the Atlantic for comparison of genetical variability is important. International survey for larval collection is planned under the BYP with a cooperation among various countries concerned with the Atlantic bluefin tuna.

#### Study on reproductive biology of medium sized fish

Little information is available for reproductive biology of Atlantic bluefin tuna, especially for medium sized fish in western Atlantic bluefin (Deriso and Bayliff (editors), 1991). Analysis of this subject will provide valuable information not only on estimation of reproductive potential but also stock structure as mentioned previously. However, difficulties in obtaining gonad samples from the medium sized fish in the spawning season hamper progress of this subject.

#### Proposal 3

If it is proven feasible to obtain the samples from the longline boats in the offshore waters, experimental longlining should be designed with using the longline boats in the summer season in the areas off the US, south of 40°N in the western Atlantic.

#### References

- Anonymous 1992: Report of the eleventh meeting of Australian, Japanese and New Zealand scientists on southern bluefin tuna, Shimizu, Japan, Oct. 1992.
- ICCAT 1992: Report of biennial period, 1990-1991, Part II (1991) English version, 294 pp.
- Miyabe, N and K. Hiramatsu 1993: Description of the Japanese longline fishery operating in the central North Atlantic, SCRS/93/49
- Deriso, R. B. and W. H. Bayliff (editors) 1991: Report of World meeting on stock assessment of bluefin tunas: strengths and weaknesses, IATTC Special Report(7), 357 pp.

Table 1. Catch report form of the RTMP boats used for monitoring southern bluefin fishery

ミナミマグロ資源調査報告書  
Catch Report of SBT RTMP Vessel

【報告年月日: 19\_\_年\_\_月\_\_日 調査船名: \_\_\_\_\_ 報告者氏名: \_\_\_\_\_】  
Reporting Date yy mm dd Vessel Name Name of Reporter

調査船番号: 1992\_\_\_\_ 操業許可番号: \_\_\_\_\_ コールサイン: \_\_\_\_\_  
Research Vessel No. Licence No. Int. Call Sign

活動形態番号: \_\_ (1=操業、 2=移動又は適水、 3=入港中、 4=荒天でささえ中)  
Activity Code Fishing Shifting In Port Bad Weather

船内使用時間とグリニッジ標準時との時間差: +/-\_\_h (日本時間は +9h)  
Time difference between GMT and the time zone on which times are based. (JST = GMT + 9)

	年月日時刻 Year Month Date Hour minute	緯度 Latitude	経度 Longitude	表面水温 Surface Temp.
投縄開始 Start Set	19__年__月__日__時__分			
投縄終了 End Set	19__年__月__日__時__分			
正午位置 Noon Position	19__年__月__日12時00分	__° __' N/S	__° __' E/W	__° C
揚縄開始 Start Haul	19__年__月__日__時__分			
揚縄終了 End Haul	19__年__月__日__時__分			

【漁具 GEAR】  
使用つり鉤数: \_\_\_\_\_本 1鉢当りの鉤数: \_\_\_\_\_本  
Number of Hooks set Number of Hooks per basket

【漁獲物 CATCH】

【みなみまぐろ測定: 全数測定 SBT SIZE】

種類 Species	取込み 尾数 Number Retain 本	製品重量 Processed Weight kg
1:クロマグロ Bluefin		
2:ミナミマグロ Southern Bluefin		
3:ヒンナガ Albacore		
4:メナチ Bigeye Tuna		
5:キナダ Yellowfin Tuna		
6:メカジキ Swordfish		
7:マカジキ Striped Mar. & White Mar.		
8:クロカジキ Blue Marlin		
9:シロカジキ Black Marlin		
10:ハシロカジキ Sailfish		
11:フウライカジキ Spearfish		
12:カツオ Skipjack		
20:ガストロ Gasterochisma		
21:さめ類 Sharks		
22:その他 Other		
23:		
24:		
25:		

測定 番号 SBT No.	尾叉長 Fork Length cm	製品重量 Processed Weight kg	雄♂=1 雌♀=2 不明 impossible to determine=3 未測 Uncheck=4
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

この操業の用紙数: \_\_枚 (Number of sheets)

この用紙は : \_\_枚目 (Sheet No.)

注) 書ききれない時は、もう1枚用紙を用いて記入する。