

INTERNATIONAL COMMISSION FOR THE
CONSERVATION OF ATLANTIC TUNAS



COMMISSION INTERNATIONALE POUR LA
CONSERVATION DES THONIDES DE L'ATLANTIQUE

COMISIÓN INTERNACIONAL PARA LA
CONSERVACIÓN DEL ATÚN ATLÁNTICO

SCI-027 / 2004

**REPORT OF THE 2ND MEETING OF THE WORKING GROUP TO DEVELOP
INTEGRATED AND COORDINATED ATLANTIC BLUEFIN TUNA
MANAGEMENT STRATEGIES**
(Marseille, France, 17-20 May 2004)

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COORDINATED ATLANTIC BLUEFIN TUNA MANAGEMENT STRATEGIES**
(Marseille, France, 17-20 May 2004)

1. Opening of the Meeting

The meeting was opened by the Commission Chairman, M. Miyahara, who welcomed participants. Mr. Miyahara thanked the EC and the Government of France for their invitation to host the meeting in Marseille.

The Working Group Chairman, Mr. François Gauthiez (EC-France), noted that the meeting would be conducted as agreed upon at the first meeting of the Working Group in Dublin (Agenda is attached as **Appendix 1**). There were two sessions, the first part being scientific presentations and the second devoted to discussions of management alternatives. Following each presentation there will be time for relevant questions.

The List of Participants is attached as **Appendix 2**.

There were no verbal opening statements. Written statements are attached as **Appendix 3**.

2. Election of the Chairman

The Chairman, Mr. François Gauthiez, had been elected during the first meeting of the Working Group.

3. Appointment of the Rapporteur

Ms. Rebecca Shuford (United States) was appointed Rapporteur for the Working Group.

4. Adoption of the Agenda

The Agenda (**Appendix 1**) had been adopted during the first meeting of the Working Group.

5. Review of information relevant to stock structure and mixing

The Chair provided an overview of the presenting scientists, the title of their presentations and the order of presentation. After each presentation the Chair opened the floor to questions and comments from the delegates. Abstracts are attached in **Appendix 4**.

Drs. Geoffrey Arnold (EC-UK), Barbara Block (United States), and Molly Lutcavage (United States) each made a presentation on recent advances in tagging research.

Drs. Joe Powers (United States), Jean-Marc Fromentin (EC-France), and Enrique Rodriguez Marin (EC-Spain) gave presentations that reviewed the present state of knowledge and research related to bluefin tuna stock structure and assessment.

Dr. John Neilson (Canada) presented a new software tool for the cartographic display of ICCAT catch and effort data. Dr. Antonio Di Natale (EC-Italy) presented historical and recent data on a unique longline fishery in the Straits of Messina and central-northern Adriatic Sea. Dr. Abdellah Hattour (FAO-COPEMED) presented information on the FAO-COPEMED project on large pelagics.

Two presentations about management alternatives were given by Drs. Joseph Powers (United States) and Ziro Suzuki (Japan). Discussions on these two presentations were held during the management session of the meeting.

Following the presentations given by the national scientists, Dr. Joao Pereira, SCRS Chairman, provided a review of the SCRS recommendations made in the 2001 Report of the ICCAT Workshop on Bluefin Mixing (SCRS/2001/020).

There was extensive discussion on the information presented by the scientists. Many delegates noted the objectivity, professionalism, and high quality of the research presentations. There was much learned from the information provided. Gaps in knowledge were identified as well as future research needs. The scientists responded to specific questions on the research presented.

6. Develop alternative options for managing Atlantic bluefin tuna and consideration of the feasibility of alternative scenarios

Proposals for management alternatives were presented (see **Appendices 4.10, 4.11**) followed by brief discussions.

Japan presented two documents attached as **Appendices 5.1** and **5.2**. Noting the lack of recovery of the western stock even after 20 years of rigorous management as well as the information regarding mixing presented during the scientific session, Japan felt that the current management measures are not sufficient to rebuild the western stock. They noted that the 45°W degree management boundary is arbitrary and expressed the need for a change in the fundamental strategy in the management of Atlantic bluefin tuna. Japan's proposal (**Appendix 5.1**) suggests the need to intensify research while at the same time implementing immediate measures to protect the western spawning population, including extending time-area closures in the Gulf of Mexico. The need for more balanced utilization of the resource across the Atlantic was also expressed. Japan also suggested that the Atlantic and Mediterranean be managed as separate units. In addition, Japan proposed a five-year research program that would include intensification of both microchemical analysis and archival tagging research. Japan also noted that there has already been some effort to control Japanese fishing in this area.

In response to Japan's proposal for an extended time-area closure in the western Atlantic, the United States pointed out that the Gulf of Mexico is currently closed to directed bluefin tuna fishing from January to June. However, being aware of potential hot spots of incidental catches of bluefin in fisheries targeting other species, the United States is willing to consider additional measures.

The United States presented a proposal for management in the Atlantic (**Appendix 5.3**). Despite the remaining uncertainties, this does not mean that action should not be taken. The United States felt that a lot has been learned and enough new information has been developed to begin to improve our approach to management. The evidence for two breeding populations exhibiting some degree of site fidelity indicates that fish from both eastern and western origin should be protected through appropriate management. Based on the evidence of mixing, no boundary can be drawn that precisely divides bluefin into two stocks. The United States felt that the 2001 mixing report accurately identifies the most biologically realistic long and short-term management approaches. In the long-term, the oceanic box approach is ultimately where management needs to go. To achieve this, a commitment to research is needed to improve information on movements and origin of fish. With time this can be accomplished through increased tagging and otolith microchemistry analysis. The United States recommended that an Action Plan be developed by the 2005 Commission meeting that identifies the activities necessary for the Commission and SCRS to undertake to implement such an integrated management approach and be fully implemented by 2008. In the short-term, based on the knowledge that is now available from tagging studies, it is clear that the status quo is no longer appropriate. The United States recommends that at the 2005 meeting the SCRS provide advice on allowable catches and recovery scenarios for the western Atlantic management unit. From this advice, the Commission should develop appropriate TAC levels, allocation schemes, and a rebuilding program which will be effective until the implementation of the long-term plan.

Following the proposal presentations of Japan and the United States, several delegations provided their perspectives on appropriate management alternatives based on the current base of scientific knowledge. Canada felt that there is much we still need to learn about bluefin mixing and origin in the Atlantic and Mediterranean. However, based on current tagging information that provides sufficient evidence of mixing of the eastern and western spawning stocks, the distribution of the fisheries throughout the mixing range, and the failure of the western management unit to recover despite intensive regulatory efforts, Canada felt that the status quo is not acceptable. It is necessary to make immediate changes to protect the western fish, including management of the central Atlantic fishing area and rigorous scientific monitoring. They remarked that the United States proposal to include area 3 in the western management area is a good step and that it might also be appropriate to consider

area 4 in the same capacity. Canada further noted that fisheries distribution maps of effort from 1950-1999 show a distribution of fish along the Mid-Atlantic Ridge. Placement of a boundary line utilizing a natural or oceanic feature such as this would be an alternative supported by Canada.

The EC felt that, although the scientific presentations were very well done and provided useful information on both the extent and gaps in our knowledge, there is still too much uncertainty to draw definitive conclusions, particularly with respect to the origin of fish in the east and west and the variability of life history traits such as age-at-first maturity. It is true that the delineation of the line is an issue. However it was universally felt by the EC that given the absence of new compelling data, there is not sufficient reason to move the line at this time. However, it is noted that future changes to the management of bluefin in the Atlantic and Mediterranean need to be assessed and that research that will continue to clarify movements and origin be continued and expanded. It is proposed that joint initiatives be developed to improve management and that previous work by the SCRS be assessed to establish priority areas from which to move forward. It is further suggested that the ICCAT Bluefin Tuna Research Program be strengthened and that regional projects be encouraged.

The point of view developed by the EC was supported by Tunisia, Libya, Morocco and Turkey. Tunisia also emphasized the need for bilateral coordination between those more technologically advanced countries and those less advanced.

7. Other matters

No other matters were discussed

8. Recommendations

The Working Group, on the basis of the work carried out at this session, arrived at the following interim conclusions:

- It agreed that the research effort on the stocks needs more harmonized and coordinated research. In that regard it considered that the Bluefin Tuna Research Program proposed by SCRS in 2003 (SCRS/2003/014) offers the prospect of a more coherent research effort on the stocks. The Working Group recommended that the SCRS, at its 2004 Meeting, should re-examine this program with a view to identifying priority actions which could be undertaken, as well as a corresponding revised budget on a more modest level.
- It encouraged the development of cooperation between members to further research activities, in particular, through the use of advanced tagging technology and stock identification techniques.
- It endorsed the importance, in order to develop alternative management approaches, of programs to identify the origin of fish taken in the central Atlantic fisheries and spawning grounds.
- It noted that Panel 2, on the basis of the 2004 SCRS Report, would be undertaking at the 2004 Commission meeting a review of the current management measures in force for the bluefin stocks. In particular, for the western Atlantic, give special consideration to the application and effectiveness of controls such as time and area closures, additional measures to facilitate rebuilding of spawning fish, and to the implications of fishing activities in the central Atlantic.
- It considered that in order to fulfill the terms of reference established by the Commission, notably in relation to the elaboration of a range of management options on the basis of which the SCRS would give advice at the 2005 Commission Meeting, it would be necessary to hold further sessions of the Working Group. In this regard, Japan kindly offered to host the third session of the Working Group in 2005.

The Working Group requested that the Commission endorse this work plan at its 2004 meeting.

9. Adoption of the report

It was decided that the report would be adopted by mail.

10. Adjournment

Mr. Driss Meski, Executive Secretary, thanked the European Community and the Government of France for financing the costs of the meeting and for arranging the excellent logistics. He and the Delegates joined in congratulating Mr. Gauthiez for an excellent job as Chairman. Mr. Gauthiez in turn thanked the assistance provided by the interpreters, the staff of the Marseille World Trade Center, and the Secretariat.

The meeting was adjourned.

Agenda

1. Opening of the Meeting
2. Election of the Chairman
3. Appointment of the Rapporteur
4. Adoption of the Agenda
5. Review of information relevant to stock structure and mixing
 - 5.1 Review of scientific information on bluefin tuna biology
 - 5.2 Review of historical data from the fisheries
 - 5.3 Evaluation of available biological information on stock structure
 - 5.4 Consideration of available biological information on mixing
6. Develop alternative options for managing Atlantic bluefin tuna taking account of information arising from items 5.1 to 5.4 and consideration of the feasibility of alternative scenarios
7. Other matters
8. Recommendations
9. Adoption of the report
10. Adjournment

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Opening statements

3.1 Canada

We have been managing bluefin tuna in the Atlantic as two separate stocks for almost 20 years. The Report of the Workshop on Bluefin Mixing (Madrid, 3-7 September 2001) points out that the stock structure of bluefin tuna has been the subject of intensive discussion by scientists since the International Commission for the Conservation of Atlantic Tunas (ICCAT) began its scientific work in 1971. The Workshop report also notes how the current 45° boundary line came about in 1980 –it was based on discontinuities in the distribution of catches at that time, our limited biological knowledge as well as taking more or less the midpoints, geographically, from the east and west continents. While the management approach initiated in 1982 may have been appropriate at the time, much has changed since then.

The overall distribution of the catch in the 1990s is much more continuous across the North Atlantic than was seen in previous decades. Further, there are biological data from tagging that describe a greater degree of movement across the east-west boundary line than was indicated from earlier tagging studies. The 2001 SCRS Report notes that there are 2 stocks of bluefin with mixing between the two and that the boundary is not well defined – but that it is not at 45° - and that any boundary line is unlikely to be clear-cut. In Canada's view, the recent electronic tagging data offers the most compelling support of the stock structure and boundary questions.

Over the years, more than 95% of conventional tags are recaptured in the area of release. With electronic tagging we see greater movement of fish across the boundary line than previously seen with conventional tagging, as these latter tags are fishery-independent. Most of the tagging has been carried out in the west and most tags report from west of the mid-Atlantic Ridge. These initial results support a two-stock hypothesis, but it also indicates that the boundary is not at 45°. Unfortunately, even with our enhanced knowledge, any boundary is unlikely to be clear-cut. As well, catch is now more continuous across the Atlantic than seen during the 1980s. We know that there are at least 2 spawning areas. There is an older age of maturity in the west, with a more variable age of maturity in the Mediterranean. However, this has not been well studied yet. On the genetics side, there is no difference between DNA in the northwestern Atlantic and Mediterranean large or larval fish. However, this lack of difference does not necessarily indicate a single stock. Given the recent common ancestry of the bluefin lineage and because even low rates of mixing can produce populations that are not genetically differentiated, the result is not surprising.

It is clear to Canada that we need to protect those fish in the central area (east of 45°) that are clearly associated with the western management area. The Workshop report clearly states that it is likely that the feeding ground for bluefin tuna found in the west extends north and east across the 45° line, such that these bluefin are also vulnerable to fishing in the East Atlantic management area. Under the current management scheme, the catch of western origin fish in the East Atlantic management area generates a higher proportion of the fishing mortality rate on the western origin fish than is the case for the converse scenario. This conclusion is likely because the population size in the eastern Atlantic is large compared to that in the western Atlantic. It is also a problem given lack of reporting basic catch and effort data for the east. (Farming is another complicating factor.) It is important to remember that for many years the SCRS has very clearly advised that fisheries in the east could adversely affect the recovery in the west if there is not adequate management applied to both the east and west management units (1998, 2000, 2001, 2002).

In the face of continuing uncertainty, we believe it is precautionary to manage bluefin on a two-stock assumption at this time. Tagging information tells us that more fish spend time on the side of the Atlantic where they were tagged than migrate far away. This implies the potential for localized depletion. Fishing the entire Atlantic and Mediterranean as one stock could jeopardize the weaker and/or smaller component. There is a danger of depleting one stock entirely and the other stock would continue to flourish. Doing a common assessment for the entire Atlantic and Mediterranean could also lead to the dilution of relatively high quality data, which we have in the west, with data of poorer quality from the east.

Canada understands that given the current scientific evidence, any specific boundary may never be clear-cut given the mixing between east and west, but also believes moving the boundary eastward would provide more protection to the western stock. Canada believes it is important to protect fish associated with the West Atlantic management unit and therefore we feel, as a minimum, it is important to resume and strengthen management in the central North Atlantic as soon as possible. In addition, there is a need for rigorous scientific monitoring in this area. We also believe that further work is required to determine stock origin in this postulated mixing area.

3.2 United States

Let me begin by saying on behalf of the United States how pleased we are that this ICCAT Working Group meeting is taking place. We have been asking for this gathering of scientists and managers for a long time, and want to thank the parties who are here for their interest and commitment. The United States views the conservation and management of Atlantic bluefin tuna as being of the utmost importance to ICCAT. It is certainly one of the most difficult issues that ICCAT faces. The critical fact is that how well we manage bluefin tuna is a measuring stick for the success of ICCAT as whole. So we have every incentive to want to do this right, in a way that reflects the best current science and promotes conservation.

Our subject for this Working Group meeting is to develop integrated, coordinated management strategies for Atlantic bluefin tuna. ICCAT has been struggling for the past thirty years or more to come up with a management strategy for this stock that made sense, considered the needs of the parties, and reflected the best science. In the earliest years of bluefin tuna management, ICCAT recognized the importance of spatial variation in the distribution of the stocks when it directed that parties not transfer effort between the eastern and western Atlantic areas. It was more than twenty years ago that ICCAT developed separate quotas for the eastern and western fisheries. And yet we have also known throughout this time that even if separate bluefin tuna spawning populations can be identified, the stocks are nonetheless interrelated. In 2001, the SCRS gave us the mixing report that recognized that bluefin tuna from different spawning areas intermingle to some degree throughout the Atlantic Ocean. And even more telling from our viewpoint, the SCRS report told us that, if there really was substantial mixing and stock interchange, fishing mortality in area 3 would have a greater relative impact on the west than on the east.

Today we have even more scientific information that tells us how much the stocks are interrelated. This week, we expect to hear the advice that substantial mixing and stock interchange is a fact. The scientific presentations at this meeting will show that bluefin tuna from the east and west, although they may be separate spawning populations, interact extensively with each other; and that this interaction both influences, and is influenced by, the fisheries all across the Atlantic Ocean.

The United States believes that the time has come for ICCAT to do what it has always done – that is, to advance the management of tuna and tuna-like species based on the best available science. We see this as an evolutionary step in response to the clear indications of the latest scientific research, which we will hear about over the next few days. What is very clear from the scientific evidence is that the rebuilding of the western spawning population is plainly being affected by more than just the fisheries in the west.

It is not important to talk about one-stock, two-stock; or east stock, west stock. The reality is that we have two, or perhaps more, spawning populations that are affected to some degree by fisheries across the Atlantic Ocean. Our job as fishery managers is to provide our bluefin tuna resources with the protection and rebuilding that they need, given the intermixed nature of the fisheries.

We recognize that this is not going to be an easy matter. It will take us some time –a number of years– to take the SCRS mixing report, along with the new scientific information, and put it in an operational context. We can be patient for a long-term solution. But it would be irresponsible for ICCAT to do nothing in the meantime in light of the persuasive scientific evidence. So we must consider some interim steps as well, based on the scientific advice that we receive.

The United States is looking forward to the scientific presentations that many of our scientists have prepared for this week. We have a number of government and private scientists who have been involved and will be making presentations. We will listen carefully and then plan to discuss with our ICCAT colleagues how to proceed to a long-term response; and what steps we can take in the interim.

Let me also thank the Secretariat for their efforts in organizing this meeting. We are sure that the venue will work out well for us all. We would also like once again to congratulate Mr. Meski on his new position, and thank him for his efforts to make this working group meeting a success.

Abstracts of Scientific Presentations

(In order of presentation; names of presenters are in bold face)

4.1 Movements of bluefin tuna (*Thunnus thynnus* L.) tagged in the Mediterranean Sea with pop-up satellite tags

By G. De Metrio (University of Bari, Italy), **G.P. Arnold** (CEFAS Laboratory, UK), J.M. de la Serna (*Instituto Español de Oceanografía*, IEO), Spain, B.A. Block (Stanford University, USA), P. Megalofonou (University of Athens, Greece), M. Lutcavage (University of New Hampshire, USA), I. Oray (University of Istanbul, Turkey), M. Deflorio (University of Bari, Italy).

Although there have been several studies of the migratory movements of Atlantic bluefin tuna (*Thunnus thynnus* L.) between the western and eastern Atlantic, the two-stock hypothesis remains untested and exchange rates are still unidentified.

TUNASAT, an EU-funded research program involving Italy, Spain, Greece and the UK, which was carried out during the three-year period 1998-2000 in the Mediterranean Sea and the Strait of Gibraltar, and a subsequent tagging program funded by the Italian Ministry of Agriculture and Forestry Policies, which was carried out during 2003 in the eastern Mediterranean, aimed to better understand this problem. Both bluefin tuna tagging programs were executed using pop-up satellite tags.

Specifically, the projects set out to identify and describe movements of this species both within the Mediterranean and between the Mediterranean and the Atlantic Ocean in relation to spawning and nursery areas, and to improve our understanding of the relations between fish behavior and environmental characteristics.

Tagging in 2000 was carried out in conjunction with the Tuna Research and Conservation Center, as part of the U.S. co-coordinated TAG program; tagging in 2003 was conducted in co-operation with the University of New Hampshire (USA).

As regards the first tagging program, a total of 84 bluefin tuna (42-230 kg) were tagged in traditional traps (Sardinia, Spain) or pens (Spain), using an underwater gun or harpoon; during sport fishing (Corsica waters), using a T-shaped stick or hand-stick on deck; and during hand-line fishing for bluefin tuna (Aegean Sea), using a hand-stick on deck.

Pop-up satellite tags were: 61 single-point tags (PTT-100, Microwave Telemetry) and 23 archival tags (PAT, Wildlife Computers), programmed to pop-up from 5 to 300 days after the date of deployment.

Allowing for 6 tags recovered from recaptured fish, ARGOS detection rates were 21% (12/57) for PTT-100 tags and 62% (13/21) for PAT tags. Comparable detection rates obtained by U.S. scientists in the western Atlantic were 56-93%. Among 25 detected tags, 23 transmitted valid data. Most of the tagged bluefin tuna were located in the Mediterranean (70%), 13 of them with size of 42-100 kg and 3 with size of 150-170 kg. The rest of the tagged specimens (30%) were located in the eastern Atlantic, these tuna weighed between 150 and 230 kg.

During the second program, a total of 43 bluefin tuna (31-155 kg) were tagged using a hand-stick on deck. The fish were taken from schools of bluefin captured by Turkish purse seiners in the Levantine Sea, or from pens located along the Turkish coast, in the Aegean and Levantine Seas, or on the northeastern coast of Cyprus.

Pop-up archival satellite tags were: 20 PTT-100 (Microwave Telemetry) and 23 PAT tags (Wildlife Computers), programmed to pop-up from 34 to 300 days after the date of deployment.

To date, ARGOS detection rates are 65% (13/20) for PTT-100 tags and 91% (21/23) for PAT tags. No messages were received by ARGOS from 4 tags (two of each type) on the programmed dates. Several tags transmitted valid messages but with a certain percentage of missing or corrupted data. Five PTT-100 tags were still expected to surface during August 2004. Most of the tagged bluefin tuna were located in the eastern Mediterranean (70%), showing a tendency to remain in probable feeding areas. Only two fish moved towards the central Mediterranean: one surfaced southeast of Malta, the other in the Bocche di Bonifacio, between Corsica and Sardinia.

Because of the low detection rates experienced during the original project, a series of tag detection tests were carried out in several European sites and in the United States. Results clearly indicated that there is a problem with tag detection in the Mediterranean, especially with PTT-100 tags, which are less powerful than PAT tags. This problem almost certainly prevented us detecting tags that otherwise surfaced successfully on the programmed date. Our ability to detect and locate tags was certainly much less in the Mediterranean than it was in the eastern Atlantic and probably also much lower in the eastern Atlantic than it was in the western Atlantic.

Results from both tagging programs indicated that adults (< 100 kg) remain in Mediterranean after spawning and feed in areas of high primary productivity, as indicated by SeaWiFS satellite data for chlorophyll-a concentration. After spawning large bluefin (150-230 kg) migrate into the eastern North Atlantic, either south towards the Cape Verde Islands or north to Iceland and the Norwegian Sea. Some large bluefin move to and fro between the Alboran Sea and Atlantic, feeding on both sides of the Strait of Gibraltar. No evidence of transatlantic movement was observed, despite a progressive increase in the probability of tag detection across the Atlantic from east to west.

4.2 Movements and biology of Atlantic bluefin tuna revealed by archival and pop-up satellite archival tags

By **B. Block** (Stanford University, USA) and coauthors from Stanford University TAG-A-GIANT Scientific Team, Monterey Bay Aquarium and NMFS.

We have deployed 800 electronic tags on northern bluefin tuna in the Atlantic Ocean. The recapture of 25% of the first 279 archival tagged bluefin tuna (1996-1999) and the successful download of data from 210 pop-up satellite tags are providing new insights into the seasonal movements, habitat utilization, breeding behaviors and population structure of western and eastern tagged bluefin tuna. In addition, the data are revealing migration corridors, hot spots and physical oceanographic patterns that are important for understanding how northern bluefin tunas use the open ocean environment. The implications for stock structure hypotheses are discussed.

4.3 Pop-up satellite tagging of bluefin tuna in the northwest Atlantic, 1997-2003

By **M. Lutcavage** (University of New Hampshire, USA) and coauthors.

The movements and dispersal patterns of adult bluefin tuna tagged in summer and fall in the New England shelf region are presented. Tagging data and biological information support the view that these fish comprise a mixed assemblage with diverse migration histories and spawning habits.

4.4 Advances in understanding spatial dynamics of bluefin tuna in the Atlantic and Mediterranean: A review of historical scientific understanding of bluefin movements and mixing

By **J. Powers** (National Marine Fisheries Service, USA).

Current assessment procedures and management boundaries for bluefin tuna are currently based upon the scientific understanding that was extant in the 1970s and 1980s. That information base is briefly reviewed. However, subsequent research suggests that alternative procedures may be useful. The new data are presented in the two subsequent talks.

4.5 Atlantic bluefin tuna: Some issues related to stock delimitation

By **J.M. Fromentin** (IFREMER, France).

This presentation aims to give a brief overview about three major issues on Atlantic bluefin tuna stock assessment, which are strongly related to each other, i.e., the spatial and temporal dynamics of this species, the fisheries background, and the stock delimitation. The presentation tries to distinguish what is known with certain confidence, to what is suspected or totally ignored and needs to be known. The first part reviews the population dynamics of this species, including historical information about the past fisheries, such as the Atlantic and Mediterranean trap fisheries and the Norwegian fisheries. The spatial dynamics of this species appears complex because of high spatial and temporal variability in the migratory behavior and there remain strong uncertainties about site fidelity, spawning activity and the proportion of spawners being resident in a given area versus those migrating from one area to another. The second part deals with another source of complexity, related to changes in the fisheries dynamics as well as in the economic context, which have strongly affected the quality and quantity of official catch and effort data and so impaired the stock assessment of the East Atlantic and Mediterranean stock. The last part briefly presents the general scientific basis generally used to define stock unit and lists the various arguments in favor of one and two stocks hypotheses. The overall conclusion of this presentation is that there is no unequivocal scientific basis to decide between these two hypotheses and that any

progress on this issue would imply getting more accurate and reliable fisheries information and to initiate an international and coordinated scientific program to fill our gaps in knowledge.

4.6 Necessary information to improve the bluefin assessment: The eastern Atlantic and Mediterranean case
By **E. Rodriguez-Marin** (*Instituto Español de Oceanografía-IEO*, Spain).

In the ICCAT Bluefin Tuna Research Program Planning Meeting held in 2003, clear research lines were identified on bluefin tuna to improve future assessments. Following these lines and the recommendations of the Standing Committee on Research and Statistics of ICCAT about the bluefin tuna research, this presentation points out the gaps and shows the research requirements for improving East Atlantic and Mediterranean bluefin tuna assessment. During the presentation some Spanish research activities are described.

4.7 A tool for the graphic display of the geographic distribution of catch and effort data: Applications for the bluefin tuna stock structure issue

By **J.D. Neilson** and G.A.P. Black (Department of Fisheries and Oceans, Canada).

A software tool for the depiction of ICCAT catch and effort data is introduced. In the context of the Working Group examining options for the management of bluefin tuna and the adequacy of current management boundaries, the distribution of catch and effort in Atlantic bluefin fisheries is examined, both on an annual and seasonal basis. The available data are summarized for the period prior to 1980 when the decision on the current management unit boundary was made, and compared with more contemporary fishery information. The utility of fishery distribution information will be compared with other types of information relevant to management unit decisions.

4.8 Line bluefin tuna (*Thunnus thynnus* L.) fisheries in the Italian seas: Old and new data

By **A. Di Natale** (Aquastudio, Italy), **A. Mangano** (Aquastudio, Italy), **C. Piccinetti** (University of Bologna, Italy), **E. Cavaglia** (University of Bologna, Italy), and **A. Celona** (Aquastudio, Italy).

The tuna hand line fishery is important in several Italian areas. In the Straits of Messina, the most important narrow passageway in the Mediterranean Sea, it has been studied for several decades. The old and new data sets might help to add knowledge about the movements of the bluefin tuna stock.

A recent longline fishery for tunas has been developed in the central north Adriatic Sea and it is carried out all year round, providing the same level of information as the hand line fishery.

According to these data, it appears quite clear that there is an important part of the stock remaining in the Mediterranean also in fall and winter times, possibly for more than one year, and this fact is constant.

The size composition of this autumn-winter component includes only "resident" tunas, while the spring-summer fishery includes both the "resident" and the "migratory" components.

The stable trend over the long term of the "resident" tunas in the Mediterranean Sea confirms the importance of this bulk component of the stock.

4.9 Project FAO-COPEMED: Large Pelagics

By **A. Hattour** (Tunisia).

COPEMED is a regional project dealing with cooperation in the field of marine science in the western Mediterranean, part of it concerned with large pelagic fish. The main objective of the program is to increase our knowledge on the environmental, fisheries and historical development, statistical database and biological parameters. This program started in 1998 and continued up to 2003 and focused on bluefin tuna and swordfish in the western part of the Mediterranean. The results (40 documents) were published in the SCRS documents as well as in five annual reports of activities.

4.10 Implications of new information on stock assessments and management

By **J. Powers** (National Marine Fisheries Service, USA).

Movements of bluefin tuna have been shown to be complex and variable. More spatially detailed assessment and management procedures appear to be warranted as suggested by the Report of the ICCAT Workshop on Bluefin

Mixing. Mechanisms to advance the efforts for spatial evaluation and management are suggested. Additionally, there are some specific concerns for the central Atlantic which are discussed.

4.11 An alternative approach for management of the Atlantic bluefin tuna

By **Ziro Suzuki** and Yukio Takeuchi (National Research Institute of Far Seas Fisheries, Japan).

Based on a two-stock assumption with Gulf of Mexico (GOM) and Mediterranean (MED) origin bluefin tuna and fairly extensive mixing between the two stocks in the areas outside the spawning areas, an alternative short-term approach for the present management scheme was proposed. This approach, based on extended time and area closure for the spawning populations, is a variant of the present management scheme but specifically aimed at more protection of the assumed GOM origin stock (west stock) robust to magnitude of the mixing and imbalance in stock size between the two stocks. Since this approach is simple and crude, the extent of the time and area closure for actual implementation based on this idea may require more discussions.

Other Documents Presented at the Meeting

5.1 Japanese Concept Paper on Integrated & Coordinated Management Strategies for Atlantic Bluefin Tuna

Explanatory Note

In 1981, the ICCAT established the boundary of 45°W in the mid-Atlantic and started separate management measures for the western and eastern Atlantic. However, this boundary is not based upon scientific evidence but was chosen just for practical management purposes. Moreover, the SCRS admitted from the beginning significant uncertainties with stock structure and migration patterns of bluefin tuna while accepting the two-stock assumption for its assessment. It should be recalled that one population in the entire Atlantic and the Mediterranean (low or even no spawning site fidelity) is also a plausible and scientifically valid assumption.

On the two-stock assumption, the western stock was assessed to be depleted in 1981. Since then, the total catch of western Atlantic bluefin tuna has been restricted to an extremely low level whereas the Gulf of Mexico has been closed to protect spawning bluefin tuna. However, during the past two decades, the western bluefin tuna stock was always estimated to remain at the historically lowest level every time the SCRS conducted a stock assessment. The only logical conclusion we can draw from this experience is that the stock assessment involves fundamentally wrong elements or assumptions.

As a result of the recent development of tagging studies, it turned out that the degree of intermingling of eastern and western spawned fish is much larger in terms of time and areas in the entire Atlantic than was expected before. Such studies should be intensified to enhance both the quality and quantity of information on the degree of intermingling. However, those studies take years to be completed. At least sampling in the spawning areas has to be conducted to find the composition of fish of eastern and western origins by application of stable isotope and micro-element analytical technologies to otoliths.

The high degree of intermingling poses a fundamental question on the current management boundary of 45°W. Japan would strongly urge the Commission to abolish this boundary while strengthening the measure to protect spawning and small fish, particularly that in the western Atlantic.

Further, in the past two decades, utilization of Atlantic bluefin tuna somewhat lacks a fair balance between the western and eastern sides of the Atlantic. The western catch was extremely low whereas the eastern catch increased dramatically (**Appendix Figure 5.1a**). Although it is practically difficult, the current balance should be changed gradually so that a more balanced utilization of Atlantic bluefin tuna is achieved in the entire fishing area.

Suggested changes to the management strategy

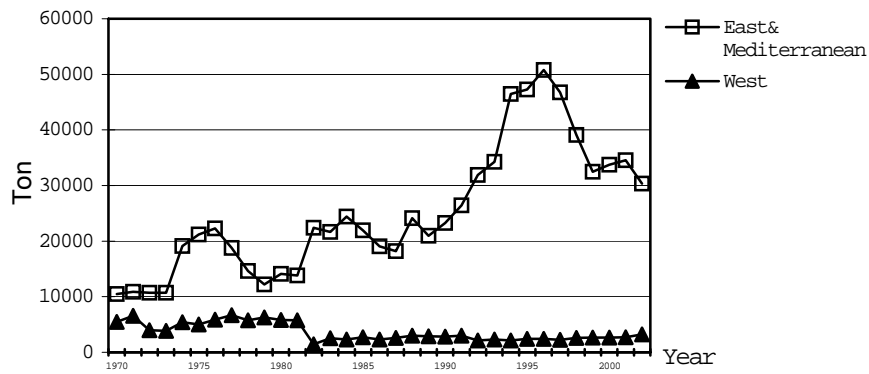
1. Intensified research

A five-year research program should be established to cover the following items.

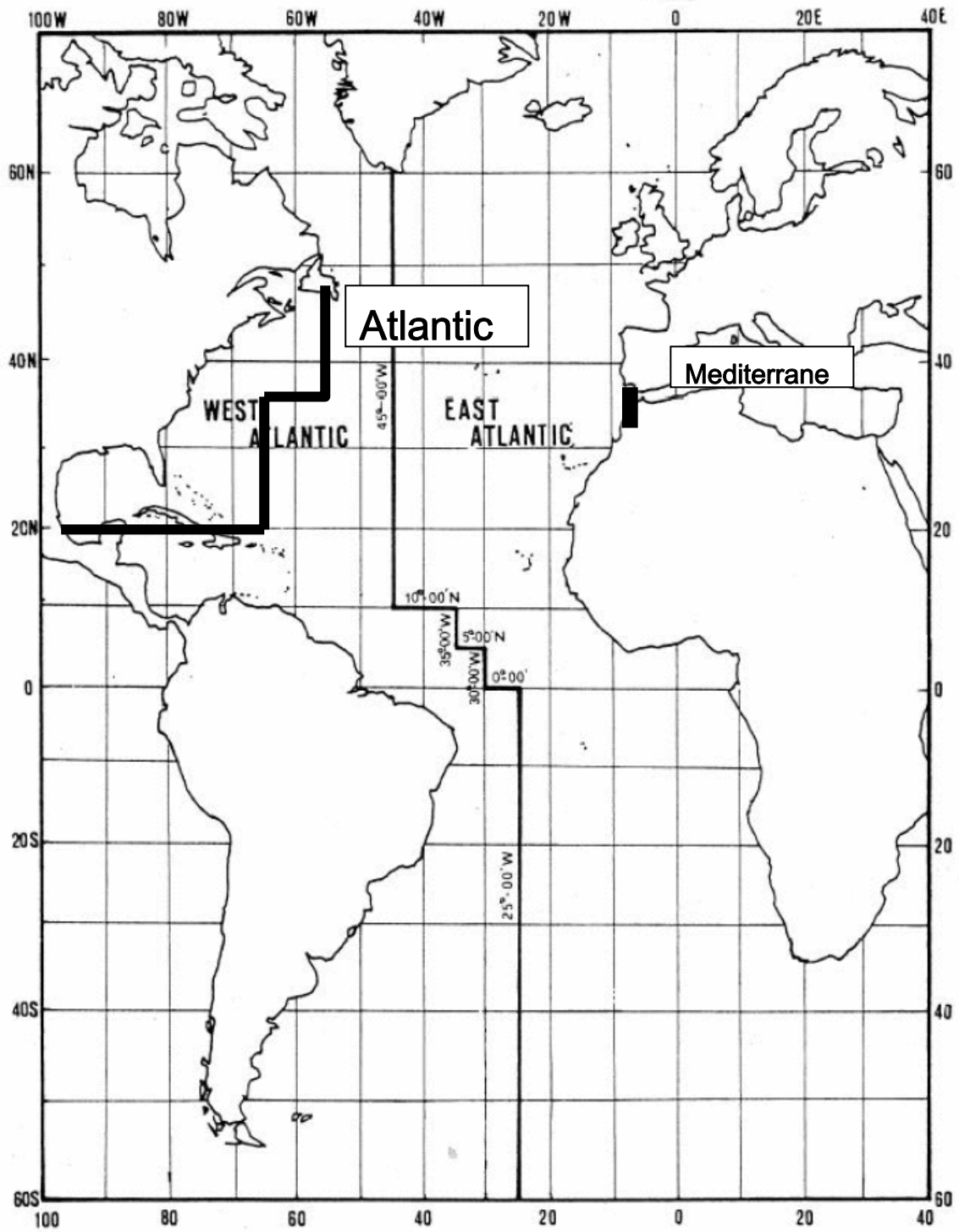
- i. Stable isotope and micro-element analysis of otolith samples obtained in the spawning areas: the Mediterranean and the Gulf of Mexico. For this research, a small amount of sampling quota should be established in the Gulf of Mexico.
- ii. Increase of archival tag releases. The target of total released fish should be 500 (100 annually).

2. Management measures

- i. Abolishment of the 45°W boundary and establishment of new management areas: the Atlantic and the Mediterranean (**Appendix Figure 5.1b**).
- ii. Protection of spawning and small fish
 - Closure of the area north of 20°N and west of 65°W and 35°N and west of 55°W from February 1 to June 30 (**Appendix Figure 5.1b**).
 - An additional closed season or any other measure to protect spawning fish in the Mediterranean.
- iii. Gradual change of balance of catches in the eastern and western Atlantic



Appendix Figure 5.1a. Historical catch of Atlantic bluefin tuna.



Appendix Figure 5.1b. Suggested management areas.

5.2 An Alternative Approach for the Management of Atlantic Bluefin Tuna

By **Ziro Suzuki** and Yukio Takeuchi, National Research Institute of Far Seas Fisheries, Japan).

1. Information on mixing

1.1 General

Recent information on migration and mixing of Atlantic bluefin tuna has been increasing dramatically by the use of the archival type of tags that indicates the extent of migration is much larger than previously believed. However, the present level of information is not enough to grasp the overall picture of the complicated migration of Atlantic bluefin due to the limited number of archival tags deployed, the limited locations of their release and the imbalance in the number of released fish from both sides of the Atlantic. One of the biggest problems in understanding the migratory characteristics is that the origin of tagged fish (whether they originated from the GOM or the MED, cannot be known at present. The proximity of the fish in question with respect to the two spawning areas does not tell the fish is from a closer spawning area except for very young juveniles, as the recent preliminary analysis of bluefin otoliths suggested (Rooker and Secor 2003). It is unknown whether or not the spawning site fidelity with the two stocks exists but it is assumed that the spawning site fidelity is likely to exist (ICCAT 2002). If, in fact, cross breeding occurs between the assumed two stocks, then the management strategy could be much more simple.

1.2 Degree of mixing between the two stocks

It has been demonstrated both by conventional tagging and recent archival types of tagging that trans-boundary (approximately 45°W in the North Atlantic) migration occurs. However, the extent of mixing of the two stocks are unknown quantitatively, although it is generally assumed that the extent of migration increases with the increase of the size of fish. Implantable and pop-up archival tagging provide valuable information of the fish migration, especially the times and areas covered by the tagged fish at liberty. Hence archival tagging provides more relevant information about the management boundary and mixing than conventional tagging does. Therefore, the information obtained from the archival tags, both implantable and pop-up types, is referred mostly in this paper with some supplementary knowledge provided by conventional tagging.

Available information on the analyses of archival type tagging in the Atlantic is summarized as follows:

- A substantial amount of adult fish tagged in the east coast of the Atlantic crossed the management boundary (e.g., in some cases 30-58%: ICCAT 2002).
- No fish tagged in the MED crossed the management boundary.
- Some adult fish tagged in the east coast Atlantic entered into the GOM as well as into the MED.

The second bullet could be an artifact due to the smaller number of pop-up tags deployed so far and the lower success rate of data retrieval, especially for adult fish. For juveniles, there is no record of movement of the fish tagged in the MED moved beyond the boundary line. However, conventional tagging demonstrated a clean connection for juveniles between the U.S. coastal waters and the Bay of Biscay and further the fish tagged in the Bay of Biscay recovered in the MED (Cort 1991). This indirectly indicates a link exists between GOM areas (Florida waters), via the Norwegian purse seine fishery, and MED areas (Bay of Cadiz).

Management options

Several management options were discussed with their merits and demerits and appropriate time and area stratification for future assessments to address alternative management options that were previously proposed by SCRS. One of the key questions to the present management is how to protect the GOM stock, a much smaller stock than the MED stock, while the origin of the fish captured and the mixing of the two stocks are unknown. Simulation models, such as the operating model, have been extensively used for assessing the impact and bias stemming from those uncertainties on stock assessment models and management procedure. This type of approach should provide valuable insight to stock management of Atlantic bluefin. However, it may take several years before the results of the operating model materialize into management procedures since even for the much simpler case of southern bluefin tuna in terms of stock structure and fisheries, the completion of the operating model is anticipated to take at least three years, and additional years for finally adopting the management procedure (CCSBT 2002).

Therefore, while ICCAT devotes efforts along with the developing operating model, interim approaches for alternative management are necessary to be formulated.

An alternative approach

The essence of this approach is the extended time-area closure of the spawning areas, especially for the GOM stock under the assumption of the existence of spawning site fidelity, i.e., no breeding occurs between the two stocks although the fish from the two stocks mix extensively outside the spawning area and seasons. It is also assumed that, for each stock, the closer the adult fish are caught in area and time to the spawning season/area, the higher the probability of being members of the respective stock. Protection of the spawning segment of the stock in the spawning season and spawning ground has significant merit for bluefin tuna compared to other tunas. That is, this species concentrates its spawning population in a small time and area during the spawning that makes them much more vulnerable to the fisheries targeting them than during the non-spawning period and time where the adults spread over a vast open sea area.

On the other hand, the difficulty of this approach is that it is unknown how long the spawning fish remain in the respective spawning grounds and how fast and how widely the post-spawning fish disperse outside the spawning grounds. There is a trade-off for this approach in terms of the extent of the time and area closed. If the extent is too small, there is higher probability of capturing the pre-spawning and spawned fish outside the extent, whereas if it is too large there is higher probability of mixing of the two stocks, hence less chance to selectively catch the respective spawning group, with especially high concern about the GOM because of its smaller stock size.

For the GOM stock, the adults begin to migrate into the GOM in February and leave the GOM by July, according to the Japanese longline data (**Appendix Figure 5.2**). The peak month of spawning activity is in May. Incidentally, it is suggested that adults can cross the Atlantic in as little time as two months (Block *et al.* 2001). Hence, it is assumed that the fish spawned in the GOM stay, from February to August, mostly in the western Atlantic. In order to protect the spawning stock of the GOM stock, a time-area closure to all fisheries in the western Atlantic from February to August should be implemented.

For the MED stock, tagging experiments show that some adults released in the U.S. 200-mile EEZ are recovered in the MED in the spawning season there. They are assumed to be of MED origin. However, since information on the spawning area and season of the MED is still poor and new information has been provided in recent years, such as spawning activity around Turkey, there might be some heterogeneity in genetics in the spawning group of the MED. As the SCRS analysis for the MED stock indicates that the current level of catch would not be sustained in the long run, more protection of the spawning stock in the MED is also necessary along with the protection of the spawning stock of the GOM. This will become more a relevant approach if the two stocks are proven to be the same single stock. The major spawning season in the MED appears from June to August (Cort and Liorzou 1991).

Currently, the time-area closure in the MED stock has been made for the longline and purse seine fisheries, June and July for the former, and from mid-July to mid-August (except in the Adriatic where the closure for purse seine is in May) for the latter. Extending the time-area closure during June and August for longline secures more protection of the spawning stock in a consistent way. For the purse seine fleet, an additional time-area closure to the existing one will also contribute to the protection of the spawning stock.

Issues relevant to the extended time and area closure

The introduction of the extended time-area closure has had an impact on the present fisheries (**Appendix Tables 5.2a and 5.2b**). These tables, taken from the ICCAT CATDIS database, show the catch of Atlantic bluefin tuna by the East and West Atlantic Oceans and the Mediterranean Sea, by quarter, and by fishing countries, which can give rough idea of how extended the time-area closure impacts on the catch. In processing the CATDIS, it is noted that there are several countries with important bluefin catches that do not provide the basic Task II statistics (catch and effort statistics by area and time), especially in the MED. The amount of reduction of bluefin catch caused by the regulation differs by countries and fishing gears, but this approach covers the major segments of the participants in the fisheries, including the West Atlantic, central Atlantic and the MED. Therefore, this approach serves as a starting point of discussion if it is a matter of interest for stakeholders of Atlantic bluefin tuna management.

Along with the protection of the spawning stocks of Atlantic bluefin tuna, it is also indispensable to keep the current small fish protections and strengthen them, as was done for the eastern bluefin stock recently (Recommendation [Ref. 02-09]: ICCAT 2003).

The extended time-area closure is associated with less data available, especially basic information for stock assessment, such as abundance indices. This necessitates effort to improve the present data collection, especially for the GOM stock, to which a more extensive time-area closure is applied. Of these, efforts to improve fisheries-dependent and fisheries-independent indices of abundance must be considered to be higher priority.

The release of adult fish with archival tags from the GOM should provide valuable direct information of mixing and spawning site fidelity. Studies to ascertain the origin of fish should also be strengthened. The current BYP Program should accordingly be adjusted and enhanced to meet the new requirements of management of the species. Without the improvement of information on the basic biology and statistics for this species, it is obvious there is no success in the management.

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Appendix Table 5.2a. Quarterly bluefin catch (t) in the western and eastern Atlantic oceans and the Mediterranean Sea, by country, in 1999 and 2000 (calculated from CATDIS). Catch shown in the Year column indicates that only annual catch is available in CATDIS. If catch for a country appears in both the quarterly and annual columns, then the quarterly catch is available for some of the fisheries of that country, but not for others.

Western Atlantic Ocean

Fleet	1999					1999 Total	2000					2000 Total
	1	2	3	4	Year	1	2	3	4	Year		
CANADA		1.3	549.8	36.0		587.1		1.6	405.5	188.0		595.1
CHINESE TAIPEI		0.3				0.3						
FRANCE.OT					1.0	1.0						
JAPAN	26.8	0.8		77.0		104.6	207.7		0.3	106.4		314.5
MEXICO	12.0	1.3		0.7		14.0	22.4	5.8	0.5			28.7
NEI-81		0.4				0.4						
PANAMA	0.0	0.2				0.2						
U.S.A	30.5	31.4		7.6	248.0	317.5	34.6	31.8	5.1	0.1	275.2	346.8
U.S.A	3.3	38.6	859.2	32.8		934.0	4.0	135.3	611.1	180.2		930.5
UK-BERMUDA					1.0	1.0					1.0	1.0
Total	72.6	74.4	1409.0	154.1	250.0	1960.1	268.7	174.4	1022.5	474.7	276.2	2216.6

Eastern Atlantic Ocean

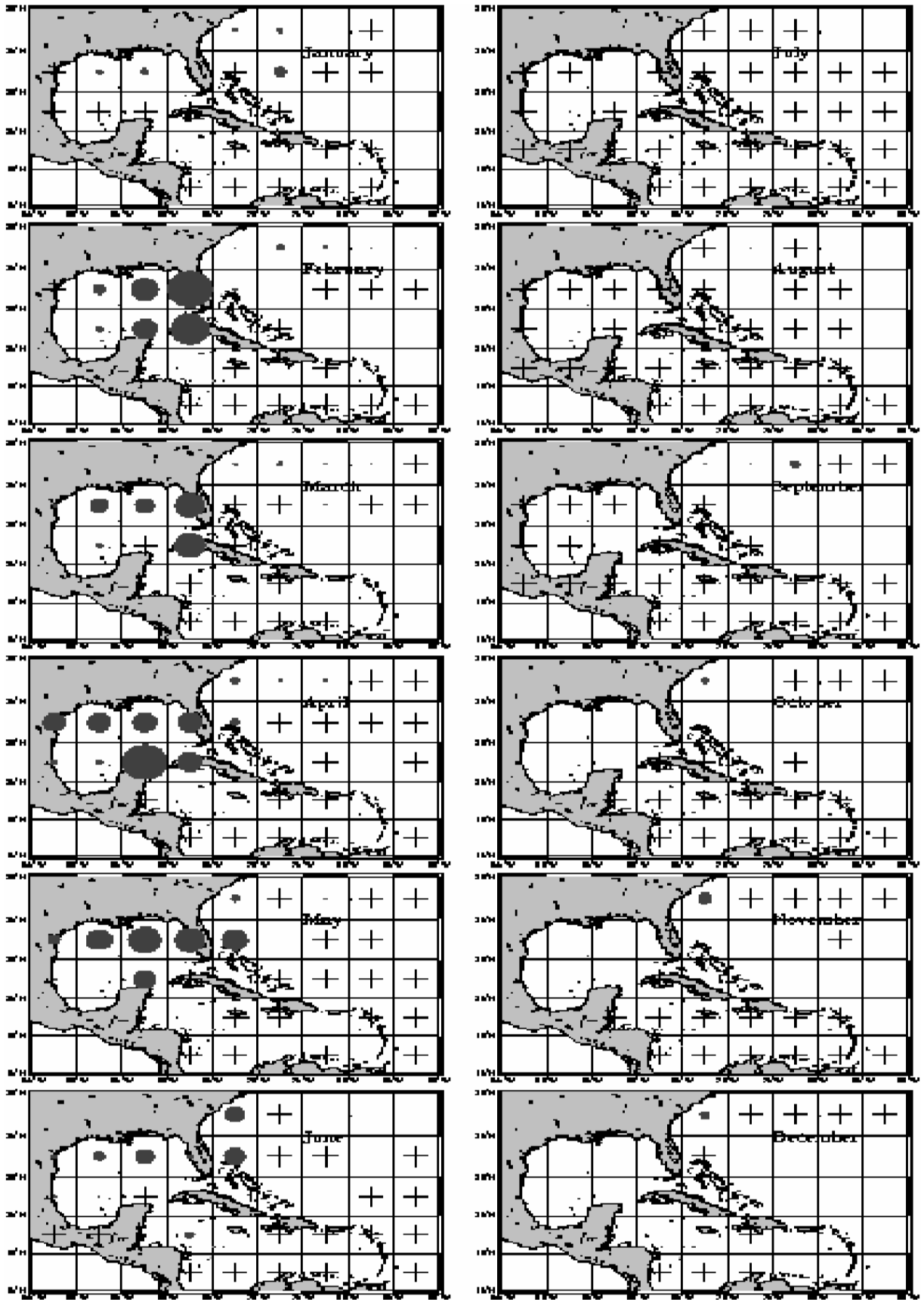
Fleet	1999					1999 Total	2000					2000 Total
	1	2	3	4	Year	1	2	3	4	Year		
CHINA.PR	23.5	21.5	22.9	35.1		103.0			17.6	62.0		79.6
CHINESE TAIPEI	71.6	150.1				221.7	86.6	56.6				143.2
EC-AZORES	0.5	1.2		0.4		2.0		0.3	0.5	0.1		0.9
EC-CANARY_B	2.4	17.5	3.7	8.5		32.0	15.0	4.7	4.9	1.7		26.3
EC-ESPAÑA	0.2	1986.8	1294.0	39.0		3320.0		1546.4	1345.7	552.2		3444.3
EC-France					588.0	588.0					541.5	541.5
EC-IRELAND					52.0	52.0					24.0	24.0
EC-MADEIRA	2.2	0.8				3.0		0.7	0.3	0.1	397.5	398.6
EC-Portugal					406.3	406.3		11.0	30.1	0.2		41.3
EC-UK					12.1	12.1					0.4	0.4
FAROE ISLANDS					104.0	104.0					118.0	118.0
ICELAND	0.4	11.2	9.1	6.2		27.0						
JAPAN	189.3	413.2	745.0	1603.9		2951.5	1025.8	763.7	2848	998.2		3072.5
MAROC	5.4	1084.2	413.5	14.9	709.0	2227.0	68.0	1352.8	147.2		660.0	2228.0
NEI-40							35.1	23.0				58.1
NEI-81	123.4	258.6				382.0	39.6	25.9				65.4
NORWAY					5.0	2.0						
PANAMA	0.2	0.3	0.0	0.1	12.0	12.6						
SIERRA LEONE											92.6	92.6
U.S.A.				0.5		0.5		0.4	0.7	0.1		1.2
Total	419.1	3945.5	2488.3	1708.5	1888.4	10449.8	1270.0	3785.4	1831.8	1614.7	1834.0	10335.9

Mediterranean

Fleet	1999					1999	2000					2000	
	1	2	3	4	Year	Total	1	2	3	4	Year	Total	
ALGERIE					2142.0	2142.0						2330.0	2330.0
CHINESE TAIPEI		27.0				27.0		169.0					169.0
CROATIA					970.0	970.0						930.0	930.0
CYPRUS					31.0	31.0	2.1	43.0	14.0	1.8			60.8
EC-ESPAÑA	20.0	1469.7	481.3	32.0	8.4	2011.4	34.8	1752.0	412.9	118.4	457.1	2775.3	2775.3
EC-FRANCE					6153.0	6153.0						6779.6	6779.6
EC-GREECE		55.3	121.8	65.9	5.0	248.0	301.4	21.0	88.0	201.7	10.0	622.0	622.0
EC-ITALY					3278.6	3278.6						3845.4	3845.4
EC-MADEIRA												60.8	60.8
EC-PORTUGAL					76.0	76.0							
JAPAN		381.0				381.0		136.0					136.0
LIBYA		745.0			450.0	1195.0		1062.8				486.5	1549.3
MALTA	0.5	395.2	51.8			447.5		339.1	36.9				376.0
MAROC												695.0	695.0
NEI-10					42.0	42.0							
NEI-118		20.0				20.0							
NEI-40								68.6					68.6
NEI-81		124.5				124.5		94.2					94.2
NEI-COMB					1995.0	1995.0					109.0	109.0	109.0
TUNISIE		2272.0	80.0			2352.0	1074.1	839.9	49.3	220.6			2184.0
TURKEY					1200.0	1200.0					1070.0	1070.0	1070.0
YUGUSLAV. F.R.							1.2	0.9	1.0	1.1			4.4
Total	20.5	5489.8	734.8	97.9	16351.0	22694.0	1413.6	4526.4	602.2	543.6	1673.4	23859.4	23859.4

Appendix Table 5.2b. Quarterly bluefin catch (t), by area, in 1999 and 2000 (calculated from CATDIS).

	1999					1999	2000					2000
	1	2	3	4	Año	Total	1	2	3	4	Año	Total
West	72.6	74.4	1,409.0	154.1	250.0	1,960.1	268.7	174.4	1,022.5	474.7	276.2	2,216.6
East	419.1	3,945.5	2,488.3	1,708.5	1,888.4	10,449.8	1,270.0	3,785.4	1,831.8	1,614.7	1,834.0	10,335.9
Med	20.5	5,489.8	734.8	97.9	16,351.0	22,694.0	1,413.6	4,526.4	602.2	543.6	16,773.4	23,859.4
Total	512.2	9,509.6	4,632.1	1,960.5	18,489.4	35,103.8	2,952.4	8,486.2	3,456.6	2,633.0	18,883.6	36,411.8



Appendix Figure 5.2. Average monthly bluefin CPUE by Japanese longline around the Gulf of Mexico, from 1970 to 1980. (The size of the solid circles and + denote relative values and no catch with effort, respectively.)

5.3 Draft Recommendation By ICCAT on the Management of Atlantic Bluefin Tuna (Proposed by the United States)

Recalling that the current boundary between eastern and western management areas was established for the purpose of managing spatially distinct fishing grounds and spawning areas;

Further recognizing that uncertainty surrounding the boundary between the eastern and western management areas for bluefin tuna may impact negatively on the effectiveness of management actions throughout the Atlantic and Mediterranean;

Recognizing that there is clear evidence that a portion of fish present in the western management area cross the boundary and become vulnerable to the fishery in the eastern management area;

Desiring to avoid undermining the rebuilding plan for the western Atlantic management unit;

Also noting that the SCRS recommends in the 2001 Mixing Report that the Commission adopt a short-term solution until a long-term solution to the mixing problem can be developed;

Recognizing the multi-year effort of the Working Group to Develop Integrated and Coordinated Atlantic Bluefin Tuna Management Strategies is underway;

Considering new scientific information presented at the 2nd Meeting of the Working Group to Develop Integrated and Coordinated Atlantic Bluefin Tuna Management Strategies, including information from research conducted in response to the 2001 Resolution by ICCAT Regarding the SCRS Mixing Report on Atlantic Bluefin Tuna;

Also noting that the 2001 SCRS Mixing Report states that, "catching western origin fish in the East Atlantic management area generates a higher proportion of the fishing mortality rate on the western origin fish than is the case for the converse scenario;"

Recalling the terms of the Working Group to Develop Integrated and Coordinated Atlantic Bluefin Tuna Management Strategies;

THE INTERNATIONAL COMMISSION FOR THE CONSERVATION
OF ATLANTIC TUNAS (ICCAT) RECOMMENDS THAT:

Long-term

1. Contracting Parties, Cooperating non-Contracting Parties, Entities or Fishing Entities through the Working Group to Develop Integrated and Coordinated Atlantic Bluefin Tuna Management Strategies develop for adoption at its 2005 meeting, an Action Plan that identifies the activities to be undertaken by the Commission and the SCRS that are necessary to implement an integrated management scheme for bluefin tuna throughout the Atlantic and Mediterranean. This Action Plan, to be fully implemented for 2008, shall include:
 - a) the designation of spatial zones for management of Atlantic bluefin tuna similar to, but not limited by, the areas suggested in the SCRS Report of the ICCAT Workshop on Bluefin Mixing, 3-7 September 2001, Madrid (SCRS/2001/020);
 - b) the specification of research and evaluation activities required of the SCRS, similar to, but not limited by, the activities identified in the 2003 Bluefin Tuna Research Program Planning Meeting Report; and
 - c) the development of catch allocation schemes and other operational protocols for the integrated management scheme.

Short-term

2. The SCRS provide to the Commission at its 2005 meeting management advice on allowable catches, including appropriate recovery scenarios, for the western Atlantic management unit, defined as the area north of 10°N and west of 30°W.
3. At the 2005 meeting, the Commission shall develop and adopt an appropriate TAC level and allocation scheme and if appropriate, a rebuilding program, based on SCRS advice for the western management unit as defined above.
4. This scheme will be in effect until such time as the integrated management scheme for bluefin tuna is implemented.