GFCM:SAC8/2005/Inf.5

October 2005

E

GENERAL FISHERIES COMMISSION
FOR THE MEDITERRANEAN

COMMISSION GÉNÉRALE DES PÊCHES
POUR LA MÉDITERRANÉE

GENERAL FISHERIES COMMISSION FOR THE MEDITERRANEAN

SCIENTIFIC ADVISORY COMMITTEE

Eighth Session

Tirana, Albania, 25-28 October 2005

GUIDELINES ON SUSTAINABLE BLUEFIN TUNA FARMING PRACTICES

GUIDELINES ON SUSTAINABLE BLUEFIN TUNA FARMING PRACTICES IN THE MEDITERRANEAN

Prepared by the Ad Hoc GFCM/ICCAT Working Group on Sustainable Bluefin Tuna Farming/Fattening Practices in the Mediterranean

PART 1 – INTRODUCTION

1. The development of bluefin tuna (BFT) farming[1] practices in the Mediterranean since the mid-1990s has been accompanied by a series of concerns about the sustainability of this important industry and about its impacts. The price of bluefin destined for sashimi, coupled with the ability to rapidly increase the weight of wild-caught bluefin in farms, has created more demand for bluefin captured at sea and, consequently, placed greater pressure on the stock.

2. In 2002, the General Fisheries Commission for the Mediterranean (GFCM) called for the establishment of a Working Group, to be convened jointly with the International Commission for the Conservation of Atlantic Tunas (ICCAT), with a mandate to develop practical guidelines to address known problems, with emphasis on fishing and farming statistics, and to propose research needed in order to investigate potential problems.

3. The Working Group met three times between 2003 and 2005 to develop the Guidelines that are presented in this document.

PART 2 – NATURE AND SCOPE

4. The farming of Atlantic bluefin in the Mediterranean Sea should be considered an activity clearly overlapping between capture fisheries and aquaculture. The potential of bluefin farming, all the perceived risks associated with it, and all matters relevant to the sustainability of this recent commercial activity, clearly encompass issues specific to both the fisheries and aquaculture sectors.

5. In the long-term, the potential sustainability of BFT farming is linked also to the research advances in the successful “domestication” of the species. Although considerable progress has been made in this regard, the economically feasible “closed-cycle” production of BFT has not

[1] Tuna farming in the Mediterranean is currently practiced as capture-based aquaculture. It involves the collection of wild fish, ranging from small to large specimens, and their rearing in floating cages for periods spanning from a few months up to 1 to 2 years. Fish weight increment or change in the fat content of the flesh is obtained through standard fish farming practices. Confinement of captured fish during short periods of time (2–6 months) aimed mostly at increasing the fat content of the flesh, which strongly influences the prices of the tuna meat in the Japanese sashimi market, can also be referred to as "tuna fattening".

been achieved yet. The Guidelines have thus been prepared based on BFT farming as currently practiced in the Mediterranean.

6. The Guidelines encompass a series of statistical, socioeconomic, biological, environmental and management issues. They have been limited to only those issues arising, or potentially arising, because of BFT farming. In other words, the Guidelines do not address the sustainability issues that could exist even without farming. The Guidelines were written by a group of experts – primarily scientists – in these disciplines.

7. The Guidelines are advisory in nature. They are intended to reinforce the basis for the regulations[2] that have already been introduced by GFCM and ICCAT for bluefin tuna in the Mediterranean, primarily for the capture fisheries component. The Guidelines could also serve as a basis for a broader management framework that takes into consideration other aspects related to the sustainability of the farming industry.

PART 3 – GUIDELINES

3.1 Capture fisheries

8. Farmed bluefin tuna comes from capture fisheries. The expansion of tuna farming activities in the Mediterranean has generated a growing demand of wild fish specimens. Hence, one of the main concerns about this demand is the current and potential pressure to increase fishing effort. A main step towards responsible and sustainable fishing is to enforce the conservation and management measures of the regional fisheries management organizations, particularly ICCAT and GFCM (e.g. Rec. [02-08]).

9. *Catches*. In order to ensure that the potential pressure to increase fishing effort due to farming is not realized, it is necessary to ensure compliance with the quotas established for the conservation of the stock. In addition, under a number of international instruments, flag States of the fishing vessels have responsibilities to collect and report catch data, irrespective of whether the fish are destined for either the market or farming.

10. *Illegal, unreported and unregulated (IUU) fishing*. Every effort should be made to combat and eliminate IUU fishing and farming, including through the development of a responsible trading system among countries, in order to ensure that only fish caught and farmed in accordance with agreed conservation and management rules is allowed to enter into international trade. In particular, the recommendation that ICCAT and GFCM members prohibit landings from fishing vessels, placing in cages for farming and/or the trans-shipment within their jurisdiction of tunas or tuna-like species caught by IUU fishing activities, should be enforced ([Rec. 03-16]).

11. *Other information*. The Recommendation on BFT farming ([Rec. 04-06]) specifies types of data that flag States of fishing or transfer vessels should collect and maintain (vessel logs, quantities,

[2] Available from www.iccat.es and www.faogfcm.org. Specific regulations cited in the text are listed at the end for ease of reference.

time and place of catch, vessel lists, etc.). In addition to these requirements, research should be conducted on methodologies to obtain accurate estimates of the size composition of the catch; such methodologies should be adopted for the collection and reporting of size composition data.

3.2 Transport and transfer

12. A critical point of this phase is the control of the amount (quantitatively and qualitatively) of fish that are transferred from the fishing gear to the transport and/or farming cages.

13. *Fish transfers*. The traceability of the transfer of live fish into cages should be ensured, particularly when different countries are involved. The ICCAT Bluefin Tuna Statistical Document Program ([Res. 94-5], [Rec. 97-04], [Rec. 03-19]) set the modality of collecting trade data but does not cover live fish transfers. The ICCAT Recommendation [03-16] prohibits the transhipment of fish caught by IUU activities. The ICCAT Recommendation [04-06] regulates the statistical data to be taken by tugs or fishing vessels and farms.

14. Research should be promoted to further develop the methods and techniques presently available for quantifying live fish (e.g. underwater video cameras or acoustic methods); standards should be agreed to and adopted as soon as possible, also to allow for fair transactions thus avoiding conflicts between vessel and farm operators.

15. *Scientific research*. The provision of fish specimens to the research community, if required, will ensure the collection of valuable scientific information on the wild BFT population that may benefit both the fishery and farming sectors. Therefore, the industry should be encouraged to facilitate the provision to the research community of specimens accidentally killed during fishing, transfer or transport, as they represent a significant biological sample from the wild stock. Furthermore, specimens collected at the beginning of the farming process will provide 'point zero' information required to properly evaluate the performance of the farming activity at the end of the production cycle. Areas of research could include, among others: reproduction biology, growth, mortality, genealogy, stock structure and behaviour.

3.3 Farming

16. This section refers to the BFT production phase itself. The culture technique follows in some ways the traditional offshore cage system, with similar rearing structures and technical constraints. On the other hand, farming of this pelagic species raises a series of distinct issues that require particular attention.

3.3.1 Registration

17. Licences/registration. It is essential to adopt a system to license or register farming facilities in order to comply with the requirements for listing authorized facilities in the ICCAT Recommendation [04-06], which should help prevent IUU farming. In addition, if excess farming capacity is deemed undesirable, due consideration should be given to the magnitude of the total allowable catch established for this species in the region.

3.3.2 Socio-economic issues

18. *Socio-economic issues*. A preliminary socio-economic appraisal to evaluate the context in which farming takes place appears to be an important requisite. Activities linked to BFT farming should be addressed particularly in view of job opportunities.

19. Studies for integrated coastal zone management should be carried out to avoid the possibility of conflicts between the BFT farmers and other resource users including those from the tourism, other aquaculture activities, and small-scale fisheries sectors. During the site selection process in particular, it would be advisable to give considerable attention to avoidance of conflicts with other sea users; consideration should be given to making arrangements for the involvement and participation by local fishermen, e.g. in the supply of baitfish.

20. *Subsidies*. Currently, BFT farming is unquestionably tied up to the availability and exploitation of natural resources (both seed and baitfish) and the practice of subsidizing activities that utilize limited natural resources is not generally in line with sustainable management policies. In some Mediterranean countries, subsidies for aquaculture development exist including funds for BFT farming. However, it remains unclear whether these will have a positive or negative impact on the development and sustainability of the BFT industry. This important issue certainly requires further monitoring and analysis.

21. The industry, in collaboration with public authorities, should develop, apply and monitor procedures and standards which aim to guarantee appropriate labour and safety conditions in BFT farming operations.

22. The Mediterranean aquaculture sector, including BFT farming, will benefit significantly from human resource development efforts, including capacity-building and promotion of skills on good farm management, as well as training of farm technicians and other farm workers.

3.3.3 Environmental issues

23. *Feeding*. In the absence of a formulated feed, the current practice is to feed the BFT using frozen baitfish from wild stocks of different geographical origins. The main risks resulting from the use of this kind of feed could be:

- The possible overexploitation of wild stocks of small pelagic baitfish;
- The involuntary introduction of pathogens. Frozen allochthonous species can be vectors to pathogenic organisms as well as potential aetiological disease agents of autochthous wild populations.

24. The use of baitfish from local fisheries could represent a solution to the risk of introducing new pathogens. However, stock assessment and monitoring of local baitfish populations would be required to prevent the overfishing of these resources and, in the cases in which vessels are providing the baitfish directly to the farm without landing it, the quantities caught should be collected and reported by the flag State in order to be included in the national capture production statistics.

25. A standardized quality-control system should be developed to ensure the quality of baitfish [i.e. screened for heavy metals, polychlorinated biphenyls (PCBs), dioxin, etc.] and to ensure the absence of potential pathogens.

26. Furthermore, it appears essential that research on the nutritional requirements of BFT be promoted with the aim to develop an artificial feed capable of guaranteeing acceptable meat quality standards as required by the market.

27. In order to minimize the amount of baitfish used, and to avoid the polluting effect of uneaten food, improvement of feeding management practices is advisable.

28. *Site selection, Environmental impact Assessment (EIA) and farm design*. The steps of selecting an area where the farms will be located, a specific site within that area, and the evaluation of any potential environmental impacts are closely related. In addition, farm design considerations are important. Once an area is chosen, site selection should be preceded by an EIA. Factors that should be taken into account include, but are not limited to:

- avoiding sensitive ecological areas;
- ensuring the presence of an adequate water current pattern to properly/effectively disperse settling/floating particles/substances/debris and sediments;
- maintaining a safe distance from potential sources of pollution (e.g. industrial parks, urban areas) to prevent contamination of the farmed fish;
- ensuring a safe distance between farms and river beds, in order to avoid potential problems associated with floods;
- ensuring the development and effective implementation of site rehabilitation plans, as appropriate;
- ensuring a minimum and safe distance between farms, as well as a minimum distance between individual cages;
- ensuring a sufficient minimum distance between the cage bottom and the sea bed in order to allow for adequate water circulation;
- minimizing both visual and environmental impacts through farm design;
- avoiding the use of copper- and zinc-based antifouling on nets and mooring systems.

29. *Environmental monitoring*. Approval of farming concessions and licenses should be, for all intents and purposes, linked to the submission of environmental monitoring plans. While all countries involved in BFT farming in the Mediterranean have requirements for EIA and environmental monitoring of aquaculture sites, it would be useful to develop minimum standards to be applied for bluefin at a regional or national level. The Committee on Aquaculture (CAQ) of GFCM should consider the feasibility of developing such standardized guidelines. Standard analysis of the main water and sediment's physical, chemical and biological parameters at agreed distances from the farm site should be the norm, at an agreed-upon frequency. As with other aquaculture activities, the results of monitoring procedures should be transparent and available to the public. The frequency of monitoring should be controlled and closely planned with the competent local environmental authorities, and could be

conducted with the assistance of accredited independent environmental monitoring and certification services.

30. Environmental monitoring might, when and as appropriate, include the monitoring of ecological effects on (i) the benthos, including changes in biodiversity parameters, and deposition; (ii) the water column and water surface; (iii) interactions with attracted species and populations.

31. Environmental monitoring guidelines may include reference to the need/opportunity for regular assessment, including meaningful quantitative and interpretative analysis of environmental impact status and trends, as well as regular updates on the use of the information thus generated. This includes information on improved management (especially production practice and farm operation; waste reduction/reuse) and contingency planning efforts.

3.3.4 Data and research

32. *Farm data and records*. Information concerning farming operations and environmental parameters (fish movements between cages, stocking densities at any possible given/possible time, feed application/use, effective feed consumption, temperature, dissolved oxygen, etc.) should be properly collected, recorded and made available for monitoring purposes. Respecting confidentiality requirements, this information should also be made available for research purposes.

33. *Scientific research*. The farming activity presents a valuable opportunity for cooperative research between the industry and the scientific community, and such collaboration should be encouraged. Furthermore, collaborative efforts should be aimed at designing experiments on live fish during farming, especially on captive behaviour, reproductive physiology, growth performance, nutritional demand and feed conversion rates. The non-marketable parts of fish that die incidentally during recruitment and/or farming should be considered as potentially suitable samples for research.

3.3.5 Animal welfare

34. *Animal welfare*. The welfare status of captive livestock is an important determinant of society's overall acceptance of farming technology. In general terms, the following would be advisable:

- During all phases of the production cycle, due care should be taken to avoid inflicting unnecessary stress to farmed fish. Handling of the fish should be reduced to a minimum during both fishing and transfer of the BFT into the transport or final cages.
- Setting an upper limit to the density of the cultured fish in the cages (kg/m³). This parameter is closely related to the overall well-being of the fish in terms of its likely correlation with the incidence of pathogens, as well as with stressful conditions at high densities.
- Adequate and standard harvesting procedures should be followed to minimize the suffering of the fish, and to guarantee quality standards of the final product required by the market.

3.4 Harvesting and marketing

35. The harvesting process is the production phase in which the data that can be collected and reported for biological and statistical purposes are measurements that are not as affected by estimation error as in the capture/transfer phase. These data, along with the farming reports, can be cross-checked with the estimates of inputs, as a means for validating the initial amount of farmed fish. It is essential that the concerned local authorities survey the correct application of the ICCAT/GFCM recommendations to ensure the accuracy of reported harvest and trade data.

36. *Biological samples and research*. In the input phase, accidentally-killed fish represent valuable specimens for scientific purposes. However, the data on input biomass are estimates. On the other hand, during the harvesting phase, all fish are physically available, such that accurate data and biological samples can be collected from a significant number of fish. The availability of specimens for sampling and data collection would facilitate the implementation of research activities.

37. *Waste management*. During harvesting and processing of the fish for the market, a large amount of biological waste is produced. Unless used for research purposes, this waste should be properly stored, treated, landed and disposed of. Licensed farms should have approved waste-disposal plans, including plans for farm material subjected to renewal (e.g. nets, ropes).

38. *Farm harvest data*. The output data of the harvesting activity should be recorded and reported.

- For stock assessment purposes, it is important to obtain the size composition of the captured fish. Since there currently are technological difficulties for measuring the fish at the time of capture with the desired degree of accuracy and precision, it is necessary to record and report the size composition at the time of harvesting, as specified in the ICCAT recommendation [04-06, par. 2]. Estimates of the round weight of harvested fish should also be obtained, as these data would be useful for monitoring regional farming activity and for cross-checking inputs and outputs.
- Summary information on annual inputs and outputs to farming operations should also be reported in accordance with the ICCAT Recommendation [04-06, par. 5]. This information should be made available in round weight so that it can be analysed with respect to catch and aquaculture statistics.

39. *Trade*. The traceability of all internationally-traded tuna can be accomplished with instruments such as the ICCAT Bluefin Tuna Statistical Document Program [Rec. 03-19]. However, the usefulness of this Program should be improved by amending its coverage to include international transfers of live fish, and by ensuring that all ICCAT and GFCM members submit bi-annual summaries of their imports, as required by the Program. The data collected by the Program will also provide information useful for validation and estimating unreported catches.

3.5 Summary of statistical issues

40. From the point of view of the sustainability of the bluefin resource, it is clear that a number of statistics have to be collected, reported and analysed at the regional level, so that the stock can

be assessed and managed properly. Such requirements for data collection and reporting in capture fisheries directed at BFT existed well before the practice of farming begun (e.g. in the ICCAT Convention, in various ICCAT recommendations and resolutions, in the 1995 UN Fish Stocks Agreement, in the FAO Code of Conduct for Responsible Fisheries). It is important to obtain the following:

- accurate estimation of total weight of the catch from the wild;
- accurate estimation of the biological characteristics of the catch (e.g. size composition);
- accurate statistics on the origins of the catch (flag, area, season, transfer and destination);
- accurate statistics on purse seine fishing operations (e.g. fishing effort and fishing strategy);
- accurate estimates of input to and output from the cages, growth and conversion rates, and a brief description of the method used to measure the input;
- information on authorized farming facilities.

41. The framework for the separation of the capture and aquaculture components of tuna farming was established by the Coordinating Working Party on Fishery Statistics (CWP). The CWP noted that "*the problem was to ensure that the weight of the captured organisms is recorded as capture fishery production and that subsequent incremental growth in captivity is recorded as aquaculture, so as to avoid partial or total double counting*".

42. The data specifically requested on the aquaculture and fisheries components should be reported by members to FAO, GFCM and ICCAT in accordance with the formats established by these organizations. It is important to stress that flag states have the responsibility to collect and report catch data for vessels flying their flag, irrespective of whether the fish are destined for canneries or farms.

43. However, the separate account of the capture and aquaculture components is often difficult to implement. The key point in the collection of statistics from tuna farming remains the measurement/estimation of the number and weight of the fish introduced in the cages.

44. When such techniques are not yet well or completely developed, and considering the uncertainties associated with quantifying fast-moving fish, it would be practical to consider additional sources of information that can be used to complement or cross-check such data. For example, the outputs from farms can be estimated quite accurately and, with a good estimate of growth rates, the initial input into the farms can be back-calculated. Similarly, trade data can be used to validate or complement output reports, although at the current time not all ICCAT Contracting Parties that import bluefin tuna (or its products) provide summaries of the Bluefin Statistical Documents to ICCAT. Thus, full implementation of the Statistical Document Program (which has been recently amended to include information on farming) will strengthen its ability to serve as a validation tool.

45. It is also necessary to ensure that standard types of measurements are used when reporting data, in order to ensure consistent interpretation and comparisons. In general, all fish measurements of weight should be reported in round weight (live weight) and all measurements of size should be reported in fork length in accordance with the ICCAT Field Manual. Although conversion factors and length-weight relationships are available for wild bluefin, these do not necessarily apply to farmed bluefin. Furthermore, the relationships and conversion factors may change

depending on the duration of the farming operations, the feed used, and other factors. It is recommended that accurate conversion factors and relationships between measurement types be developed for the different types of farming operations.

Recommendations cited

[Res. 94-05] *Resolution by ICCAT Concerning the Effective implementation of the ICCAT Bluefin Tuna Statistical Document Program.*

[Rec. 97-04] *Recommendation by ICCAT Concerning the Implementation of the ICCAT Bluefin Tuna Statistical Document Program on Re-export.*

[Rec. 02-08] *Recommendation by ICCAT Concerning a Multi-year Conservation and Management Plan for Bluefin Tuna in the East Atlantic and Mediterranean.*

[Rec. 03-16] *Recommendation by ICCAT to Adopt Additional Measures Against Illegal, Unreported and Unregulated (IUU) Fishing.*

[Rec. 03-19] *Recommendation by ICCAT Concerning the Amendment of the Forms of the ICCAT Bluefin/Bigeye/Swordfish Statistical Documents.*

[Rec. 04-06] *Recommendation by ICCAT on Bluefin Tuna Farming.*