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Appendix 4

**REPORT OF THE ICCAT ATLANTIC-WIDE RESEARCH PROGRAMME FOR BLUEFIN TUNA
(ICCAT GBYP)**

*(Activity report for the last part of Phase 6 and the first part of Phase 7 (2016-2017),
including a general overview of the activities up to 2017)*

1. Introduction

The ICCAT Atlantic-wide Research Programme for Bluefin Tuna (ICCAT GBYP) was officially adopted by the SCRS and the ICCAT Commission in 2008, and it started officially at the end of 2009, with the objective to:

- a) Improve basic data collection, including fishery independent data;
- b) Improve understanding of key biological and ecological processes;
- c) Improve assessment models and provision of scientific advice on stock status.

The total budget of the programme was estimated at about 19 million Euros for six years, and the European Union and some other Contracting Parties undertook to contribute to this programme in 2009 and in the following years; the budget officially approved by the ICCAT Commission in 2008 was 19,075,000 Euros for six years. The costs of the initial year were 653,864 Euros (against the original approved figure of 890,000 Euros), the costs of the second phase were 2,318,849 Euros (against the original figure of 3,390,000 Euros), while the costs of the third phase were 1,769,363 Euros (against the original approved figure of 5,845,000 Euros). The fourth phase had a total budget of 2,875,000 Euros (against the original approved figure of 5,195,000 Euros) and final costs were 2,819,557 Euros. The fifth phase had a total budget of 2,125,000 Euros (against the original approved figure of 3,345,000 Euros) and final costs were 1,995,787 Euros. The sixth phase had a total budget of 2,125,000 Euros (against the original approved figure of 410,000 Euros) and the final costs were 1,945,137 Euros. The seventh phase has a budget of 1,808,985 Euros. The overall ICCAT GBYP operating budget for the first seven phases, covering eight years (a total of 13,311,541 Euros) is about 69.78% of what it was supposed to be (the 19,075,000 Euros approved by the Commission), and it was used over 8 years instead of 6. Several private or public entities provided some additional funds or in kind support. These budget reductions have had an impact on all activities carried out so far even if the results were always well above the initial objectives.

The ICCAT GBYP funding is provided by voluntary contributions from the ICCAT Contracting Parties. The European Union has funded 80% of the budget for each Phase since the beginning of the programme. The remaining 20% has been provided by most of the CPCs having a bluefin tuna quota for the eastern stock and by other CPCs.

Taking into account that the funding of this programme is a serious constraint on its activities, the Steering Committee submitted a proposal for funding the ICCAT GBYP through an annual scientific quota. This proposal has been rejected by the Commission several times as well as other alternative proposals by some CPCs.

The Steering Committee has repeatedly stated that this programme is of great importance. For this reason, in 2014, the Steering Committee and the SCRS proposed to the Commission to extend the programme up to 2021 and the proposal was endorsed by the Commission along with the SCRS report, however funding is still an issue which needs to be solved. The second external review in 2016 stated that the ICCAT GBYP is a success and should further continue.

The detailed ICCAT GBYP report is presented as document SCRS/2017/139.

2. Coordination activities

2.1 ICCAT GBYP coordination

The sixth phase of the ICCAT GBYP officially began on 20 February 2016, following the signature of the Grant agreement for the co-financing of ICCAT GBYP Phase 5 (SI2.727749) by the European Commission. The partial results were presented to the SCRS and the Commission in 2016 (Di *et al.*, 2017) and they have been approved. The final report for Phase 6 has been officially approved by the European Union.

The seventh phase of the ICCAT GBYP officially started on 21 February 2017 following the signature of the Grant agreement for the co-financing of the ICCAT GBYP Phase 7 (SI2.752957) by the European Commission and will end on 20 February 2018.

The staff level (one Assistant and one Data base specialist, in support to the Coordinator) was resumed from May 2015. The ICCAT Secretariat has always provided the support necessary for ICCAT GBYP activities.

The ICCAT GBYP coordination activity has had a total cost so far in the amount of 2,395,429 Euros¹, including many components and also all costs for the Steering Committee and the two external reviews in 2013 and 2016. This cost represents 18% of the total operative budget.

A total of eight calls for tenders and three invitations were issued in Phase 6, awarding a total of 20 contracts to various entities in Phase 6. Nine additional calls for tenders have been announced to date in the first part of Phase 7 and a total of 16 contracts have been awarded to date to various entities in Phase 7.

A total of 132 contracts have been awarded under the ICCAT GBYP up to the first part of Phase 7 to 102 entities, located in 24 different countries; many hundreds of researchers and technicians have been involved to date in the various ICCAT GBYP activities. This extensive and open participation in ICCAT GBYP activities is considered to be one of the best results of this research programme.

A total of 54 reports were produced in the framework of Phase 6 of the ICCAT GBYP. Several additional documents and reports have also been issued by the ICCAT GBYP for the needs of Steering Committee meetings. A total of 50 scientific papers were produced in Phase 6, while others will be published later on. A total of 16 reports have been produced in the first part of Phase 7, along with 17 scientific papers. The total number of reports produced by ICCAT GBYP up to the first part of phase 6 is 263, and 238 scientific papers have been published so far.

3. Steering Committee

The ICCAT GBYP Steering Committee is currently composed of the SCRS Chair, the west bluefin tuna Rapporteur, the east bluefin tuna Rapporteur and the ICCAT Executive Secretary. The external expert was has not been contracted yet.

The activity of the Steering Committee included regular correspondence by e-mail with the ICCAT GBYP coordination, which provided the necessary information, as well as a monthly report. In Phase 6, the Steering Committee held one meeting (30-31 July 2016), discussing various aspects of the programme including the plan for Phase 7, and providing guidance and opinions. In Phase 7 the Steering Committee held one meeting (7-8 March 2017), revisiting entirely the activities for Phase 7. All finalised reports of the Steering Committee are available [here](#).

4. Data mining and data recovery

The total budget for data mining and data recovery activities over three years was 600,000 Euros; so far, the total expenditure for seven years of activities has been 612,801 Euros² (102.13% of the original budget), and much more data have been recovered than initially planned. Several SCRS meetings and workshops

¹ The cost includes 380,950 Euros in the full Phase 6, which might be different at the end of the Phase.

² Including the costs planned for Phase 7 (60,000 Euro), an amount which might be different at the end of the Phase.

have been held on bluefin tuna data, including the Symposium on Bluefin Tuna Traps. To date, the ICCAT GBYP objectives set for data recovery and data mining in these first Phases have been largely accomplished. The total cost for data mining and data recovery activities represents only 4.6% of the total operative budget over the first ICCAT GBYP phases.

The specific activity for recovering genetic data from ancient bluefin tuna samples that was carried out in the last part of Phase 4 and in the first part of Phase 5 was duly completed. An initial report (Melvin, 2015) was presented to the SCRS in 2015, while the final comprehensive report (with genetic data from the 2nd century B.C. to the early 1900s) was duly presented at the end of Phase 5. The data demonstrated the lack of any genetic erosion in the bluefin tuna population over these 22 centuries.

The data mining and data recovery activity continued according to the objectives recommended by the Steering Committee, concentrating efforts mostly on trap and LL data. A complete and detailed overview of the data recovered in the last period of Phase 6 and the first period of Phase 7 is available (SCRS/2017/031, SCRS/2017/039, SCRS/2017/40, SCRS/2017/041, SCRS/2017/042, SCRS/2017/043 and SCRS/2017/171, SCRS/2017/191). ICCAT GBYP data were used also in papers SCRS/2017/019, SCRS/2017/027, SCRS/2017/028, SCRS/2017/045, SCRS/2017/166 and SCRS/2017/169. The further analyses of the market and auction data provided to the ICCAT GBYP as a donation in kind (Mielgo, 2015) was presented to the SCRS bluefin tuna data preparatory meeting in March 2017 (SCRS/2017/013). All ICCAT GBYP data have been progressively incorporated in the ICCAT bluefin tuna data base, making them fully available for the SCRS.

The non-GBYP electronic tags data sets recovered in Phase 6, after the necessary checking, were sent (along with the ICCAT GBYP e-tags data) to the two experts defined by the SCRS (Lauretta and Carruthers) and used, together with other biological data, for assessing the mixing in the various areas, both for the bluefin tuna stock assessment and the ICCAT GBYP MSE-OM trials.

Furthermore, an updated bibliography for the bluefin tuna traps, also including video and audio documents, for a total of about 2,200 titles, was made available to the SCRS bluefin tuna species group (SCRS/2017/119).

5. Aerial survey

The ICCAT GBYP aerial survey on bluefin spawning aggregations was initially identified by the Commission as one of the three main research objectives of this programme, in order to provide fishery-independent trends and estimates on the minimum SSB. The original programme included a total of three surveys over a maximum of three areas, but this was later modified by the Steering Committee, and a first power analysis revealed that under the best possible conditions a minimum of six/seven surveys will be necessary for detecting a trend in the four main spawning areas.

The total original budget set for three surveys in three areas was 1,200,000 Euros; the cost of carrying out five surveys in many more areas (four main "internal" areas and seven "external" areas) is approximately 2,024,056³ Euros (168.67% of the original budget, but with much more than twice the activities). So far, the ICCAT GBYP objectives initially set for the aerial survey on spawning aggregations in these first Phases have been largely accomplished, except for the calibration requested in the past by the Steering Committee, for which a detailed SWOT analysis clearly showed the difficulties for implementing it (see Di Natale, 2016). The costs for the aerial surveys represented so far just 15.21% of the total ICCAT GBYP operative budget and the last external review showed that they have been the lowest when compared to any other aerial survey carried out by other entities.

Two aerial surveys (2013 and 2015), according to the specific request of the Steering Committee, were conducted in a very extended area, including four "internal" areas and seven "external" areas, covering more than 60% of the Mediterranean Sea. The logistic of these extended surveys was extremely heavy and complex.

³ Including the costs planned for Phase 7 (388,000 €), an amount which might be different at the end of the Phase.

The Steering Committee, in Phase 5, requested a further complex and comprehensive analysis, including a cost/benefit analysis; the reports are available [here](#). The data collected in Phases 4 and 5 confirmed the validity of the approach adopted in Phases 1 and 2, but at the same time confirmed the need for conducting several surveys before detecting any trend for a minimum SSB, due to the high variability of the oceanography in the Mediterranean Sea and the adaptive behaviour of bluefin tuna. The power analysis recommended to continue the survey in the four main spawning areas only.

The ICCAT GBYP reviewers pointed out that the aerial survey is still one of the very few available methodologies for providing fishery independent indices and, if continued, it should be limited to the main spawning areas for the logistic problems linked to the extended survey.

Therefore, the ICCAT GBYP aerial survey was resumed in Phase 7, covering the four main spawning areas (Balearic Sea, southern Tyrrhenian Sea, central-southern Mediterranean Sea and Levantine Sea, for a total effective surface of 265,626 km²), according to the standardisation adopted in Phase 5. The survey in 2017 has been very successful, also thanks to the extremely supportive cooperation of the EU countries and Turkey. A new strategic approach allowed the ICCAT GBYP to have the reports checked in real time, and the analyses were provided just after one week to the SCRS bluefin tuna species group and then at the SCRS BFT Assessment Session (SCRS/2017/149). These standardised results allowed for the first time to the use of the ICCAT GBYP aerial survey data for the MSE and the OM. The abundance of bluefin tuna schools in 2017 was one of the highest registered so far, confirming the strong presence of the species.

Furthermore, the last survey was able to detect, in real time, a shifting in the abundance of bluefin tuna (less presence in the central-southern Mediterranean, with increased presence in all other areas), which was mirrored by the different strategy of the main purse-seine fleets, confirming the importance of this tool and the need to continue the survey over the four main areas in the next Phases.

6. Tagging

The initial, short-term ICCAT GBYP objective approved by the Commission in 2008 was to implant 30,000 conventional tags and 300 electronic tags in three years in the eastern Atlantic and Mediterranean, with a total budget of 9,765,000 Euros; the mandatory tag awareness and reward campaigns, as well as the tagging design study and protocol, were not included in the original budget. So far, with only 50.95% of the funding (a total of 4,975,482 Euros⁴), the ICCAT GBYP has deployed 85.96% of the conventional tags (25,587) and 128% of the electronic tags (384 in total; 326 mini PATs⁵, 50 internal archival tags and 8 acoustic tags). Furthermore, the tagging design and protocols, the awareness and reward campaigns have been included in the activity carried out to date. The costs for tagging in the first seven Phases represented 37.38% of the total ICCAT GBYP budget, and it is certainly the most important cost component of the programme. It is very clear that the general objectives set for the tagging activities in these first Phases have been largely accomplished and even exceeded so far in terms of the total number of tags to be deployed, taking into account the proportion of the available budget.

6.1 Conventional and electronic tagging activity

The tagging activities carried out up to the first part of Phase 6 were reported to the SCRS (SCRS/P/2016/139, SCRS/2016/138 and SCRS/2016/143). The final results of Phase 6 were included in the ICCAT GBYP Report to the EU and then reported to the SCRS at the 2017 bluefin tuna data preparatory meeting (SCRS/2017/042). Furthermore, the data sets obtained from miniPATs implanted in tunas that entered the Mediterranean Sea during the spawning season and coincided with the aerial survey, were used for the first time for a tentative assessment of an additional variance for the ICCAT GBYP aerial survey (Quilez Badía *et al.*, 2016).

The strategy adopted by the Steering Committee in Phase 7 was similar to the one enforced in Phase 5 and 6, excluding the conventional tagging (which was limited to the complimentary activities) and focusing the ICCAT GBYP activities only on the electronic tagging with miniPATs.

⁴ Including the costs planned for Phase 7 (290,000 Euro), which might be different at the end of the Phase.

⁵ Additional 40 miniPATs should be deployed in autumn 2017.

ICCAT GBYP issued two Calls for Tenders in Phase 6 and six contracts were awarded in 2016. Following the first set of three contracts (for the spring-summer activities), 14 miniPATs were deployed in a Moroccan trap (Larache), 19 (of a total of 20) miniPATs were implanted in tunas caught by a purse seiner in the Turkish area and 20 miniPATs were deployed in a Sardinian trap (Isola Piana). In the second set of contracts, for summer-autumn activities, 24 tags (over a total of 25) were deployed in a Portuguese trap, 15 tags (over a total of 21) were deployed in the Strait of Messina (including 3 complimentary tags provided by WWF) and 15 were planned for the Irish waters, but this contract was cancelled in July 2016 by the Steering Committee. Most of these tags had a premature release, suspected to be mostly due to fishing operations but also due to some manufacturer problems that were noticed for the new type of the miniPATs. However some tags provided important results.

As concerns the tagging activities in Phase 7, two Call for tenders were issued, resulting in two contracts. A total of 40 e-tags were deployed in the Portuguese traps, while other 40 will be deployed in autumn in Danish and Swedish waters (13 tags have already been deployed). 33 tags, among those deployed in Portugal, had already popped off and four of them were moving towards the North Sea. A complimentary activity will be carried out by the *Korean National Institute for Fisheries Science* that will deploy 12 electronic tags in the Atlantic during their bluefin tuna fishing activity, sharing the data with the ICCAT GBYP.

The results of the electronic tagging activities not only provided new and totally unknown insights of several bluefin tuna movements, but finally support the results of the ICCAT GBYP genetic studies, which showed a full mixing in all bluefin tunas sampled in the Mediterranean Sea, without any evident isolation; they also confirmed that several bluefin tunas stay in the Mediterranean over winter.

The results from the tags deployed in Morocco in 2016 show that all tunas entered into the Mediterranean Sea, possibly for spawning. Even here, a re-analysis of the full data sets from the tags deployed in Morocco since the beginning of the ICCAT GBYP, along with the data concerning the fish natal origin obtained by the ICCAT GBYP micro-chemistry analyses, detected a possible solution for explaining why several tunas did not enter in the Mediterranean for spawning in some years. It seems that the highly variable percentage of western Atlantic-origin fish in the Moroccan traps could be a major motivation, although not the only one; this fact revealed another area of mixing that was previously unknown, with a very high interannual variability.

Additional complimentary tagging activities with conventional tags are being or have already been carried out in Phase 5, 6 and 7 in Canada, Ireland, Italy, Morocco, Portugal, Spain, United Kingdom and USA, while others are planned also in other areas. The full data will be available at the end of Phase 7.

In total, up to 20 September 2017, the total number of bluefin tunas tagged in all Phases of ICCAT GBYP is 18,407, and a total of 26,171 tags of various types have been implanted, mostly in juvenile bluefin tunas. Among these, 7,964 bluefin tunas were double tagged, amounting to 43.27% of the total tagged fish, a percentage which is well over the target (set at 40%).

An analysis about the migration into the Mediterranean Sea of bluefin tunas tagged in the Atlantic Ocean (detected with both electronic and conventional tags) was requested by the SCRS bluefin tuna species group during the 2017 bluefin tuna data preparatory meeting and duly provided by the ICCAT GBYP at the SCRS bluefin tuna assessment session (SCRS/2017/131). The ICCAT GBYP tag data have been used also in the paper SCRS/2017/177.

These last activities and results show how important the tagging activity is and how essential it is to continuously refine both the objectives and the comprehensive analyses, taking into account the many ICCAT GBYP (and other) research projects and the extremely complex and adaptive behaviour of bluefin tuna. These results clearly show the great interest of ICCAT GBYP tagging activities, which are able to provide inputs for a more realistic management of the bluefin tuna stocks.

6.2 Tag awareness and tag recovery activities

According to the recommendations provided by the Steering Committee in all meetings, the ICCAT GBYP continued the tag awareness campaign, for the purpose of improving the tag recovery and reporting rates. Further, thousands of awareness material in 12 languages (posters and stickers) were produced and distributed in all Phases. Details are available [here](#). Specific training was provided yearly to ICCAT ROPs

(except in Phase 6, when this training was not authorized), requesting that they pay maximum attention to tags (including natural marks) when observing harvesting in cages or any fishing activity at sea. A [field tag awareness programme](#) was developed in 2014 in which several countries have been visited, and contact made directly with local authorities, fisher organizations, tuna factories, tuna traps, observers and sport fishers:

The tagging awareness campaign is coupled with a tag reward campaign which includes substantial rewards, special T-shirts and increased annual lottery prizes. The ICCAT GBYP also provides immediate feedback to the tagging teams and the tag recovery persons, informing them about the history of each tag.

To improve information and tagging programme awareness, the ICCAT GBYP is developing contacts with various stakeholder organizations and journalists. Information on the ICCAT GBYP is now present on various websites, while some articles have been published in local newspapers.

A short video on ICCAT GBYP tagging activities, along with a spot, were produced in Phase 6, following a Call for tenders. The videos and spots were translated in 8 languages and were presented at the SCRS meeting in September 2016. While it is now available for free download, it is envisaged to develop the ICCAT GBYP bluefin tuna tagging visibility campaign and use these video materials for this purpose, by distributing them to main TV stations and other media in Mediterranean CPCs. Some CPCs had already used the videos on national television channels. All videos are uploaded on [YouTube](#) as a preview and their download in the high quality is easily available on request. For better informing all ICCAT CPCs and scientists about the possibility to freely use these videos and spots, the Secretariat released ICCAT Circular #0361/2017 (on 1 March 2017), with all the details. So far, the ICCAT GBYP videos had 3,127 visualisations in 71 countries.

A total of 648 tags (602 conventional tags, 26 mini-PATs, 13 archival tags, 4 commercial tags and 3 acoustic tags) from bluefin tunas have been reported to ICCAT GBYP up to 19 September 2017, showing a very substantial improvement in the total number of reported tags (see details in SCRS/2017/139). Even if the tag reporting rate is still low (2.48% of the total deployed tags of various types, 2.39% for the conventional tags only), comparing the mean annual bluefin tuna tag reporting rate to the ICCAT one for the eight years (2002-2009) prior to the ICCAT GBYP (0.88 tags/year) and the current reporting rate for the full period of the ICCAT GBYP up to 19 September 2017 (87.37 tags/year), the increase is about 9,928%. As a matter of fact, the tag reporting continuously increased in the years when the conventional tagging activities were carried out and continued even when the conventional tagging was cancelled.

Furthermore, the double tagging activity planned for studying the shedding rate of the different types of spaghetti tags and the specific recoveries reported so far (from 202 fish, with a reporting rate of 2.34%) showed that the results between single-barb spaghetti and double-barb spaghetti are quite comparable, because the single-barb ones were still on the fish in 80.69% of the cases, compared to 79.21% of the double-barb ones. The shedding rate was 40.1%.

6.3 Close-kin genetic tagging

Close-kin genetic tagging (now usually called Close-kin mark recapture, CKMR) is a technique which may provide an estimation of the total abundance and the spawning stock biomass, under the condition to have a very limited number of spawning grounds and a very good and extended sampling, either for spawners and juveniles. It seems to work for southern bluefin tuna and it is now currently used by the CCSBT Commission for assessing this species.

The Steering Committee, in Phase 5, recommended to fund the first part of the feasibility study for Close Kin Genetic Tagging. After a Call for tenders, a contract was awarded and the report was provided in the very last part of Phase 5. The first part of the CKMR feasibility study report provided by the contractor showed some problems in the part of the contents concerning the east bluefin tuna reproductive biology and therefore it was later revised various times. Therefore, the Steering Committee decided to have a refined and revised report in Phase 6, before going on with the dedicated genetic workshop and the second part of the CKMR feasibility study. Both these latter activities were postponed at least to Phase 8.

In Phase 6, the Steering Committee decided to start collecting the necessary samples for practically testing the feasibility and real costs for carrying out a CKMR study for the eastern bluefin tuna; the enhanced sampling was continued in Phase 7; this part is better described under point 7 of this document.

6.4 Other activities related to tagging

In order to better assess the post-release mortality in tag-and-release activities, and following the recommendation of the ICCAT GBYP Steering Committee, the GBYP is supporting a complimentary study which was proposed by the Croatian Institute for Oceanography and Fisheries. This study is using fish caught by a purse-seine and moved into a cage, where the tag and release activity (usually carried out by sport fishers) will be tested. The results of this study will be made available at the end of Phase 7.

A new and useful electronic tag data base with a Shiny application has been developed by ICCAT GBYP in Phase 7 and it is now available for the SCRS scientists (SCRS/2017/192). The application allows for an easy visualisation of the data and particularly the tracks.

7. Biological studies

The initial, short-term ICCAT GBYP objective approved by the Commission in 2008 was to collect samples from 12,000 fish (including western Atlantic and the Japanese catches and markets) and carry out aging, genetic studies, and micro-constituent analyses in three years in the eastern Atlantic and Mediterranean, with a total budget of 4,350,000 Euros. So far, with only 59.75% of funding (a total of 2,598,525 Euros⁶), the ICCAT GBYP collected samples from 12,771 fish (106.4% of the target) up to Phase 6 and carried out ageing, genetic and micro-constituent analyses; furthermore, the sampling design, the sampling protocols and the otolith shape analyses were included in the activity carried out so far. Additional 2,130 fish should be sampled in Phase 7, bringing the total to 14,901 fish, about 124.2% of the objective, but with just about half of the budget. The amount of funds used for biological studies in the first seven Phases represents 19.53% of the total budget available so far for ICCAT GBYP. It is very clear that the general objectives set for the biological studies in these first Phases were largely accomplished so far, even without taking into account the proportion of the available budget.

An SCRS meeting was organized in May 2013 in Tenerife for reviewing the bluefin tuna biological parameters and the report is available [here](#). The latest data were reported to SCRS Plenary in 2016 (Di Natale A., *et al.* 2017). The details of the sampling areas were revised jointly by the ICCAT GBYP coordination and the Steering Committee prior to the field activities in 2016 and 2017 and now there are 12 areas, 38 strata and 79 substrata, allowing for detailed analyses. At the SCRS bluefin tuna data preparatory meeting in 2017, new biological data were presented (see documents SCRS/2017/040, SCRS/2017/041). The last update regarding the situation of the ICCAT GBYP biological studies in Phase 7 was reported to the SCRS in document SCRS/2017/139.

The Steering Committee, in Phase 6, requested ICCAT GBYP to start trying the collection of an additional number of samples from the four main spawning areas in the Mediterranean Sea, to be used for a CSMR trial, also with the purpose to better assess the feasibility and the costs. After several contacts with the industry and the farms, several invitations have been circulated and the first three contracts were released, covering three of the four main spawning areas (with 300 adult fish minimum to be sampled by area).

A Call for tenders was released to cover the usual annual needs in terms of sampling and analyses, but in Phase 6 it also included the additional needs for CKMR samplings, as decided by the Steering Committee. Furthermore, following specific ICCAT GBYP scientific needs, it was also decided to include a comparison of the genetic results obtained using only SNPs, re-analysing the same samples using micro-satellites, in order to have a further confirmation. Another Call was released after the Steering Committee meeting in July, requesting a considerable amount of additional ageing analyses. A contract for biological sampling and analyses was awarded to a large Consortium of 14 entities and 7 sub-contracted entities, belonging to 8 different countries. The Call for tenders for additional aging analyses received no bids.

A ICCAT GBYP workshop for larval studies and surveys was held in Madrid on 12-14 September 2016, with the participation of scientists from EU, Japan and USA, updating knowledge and needs for developing this fishery independent index. The report was presented as SCRS/2016/176.

⁶ Including the costs planned for Phase 7 (539,000 Euro), an amount which might be different at the end of the Phase.

In Phase 7, the Steering Committee recommended a broader list of biological studies, along with the continuation of the additional sampling activities for CKMR purposes. Four invitations were provided for the additional sampling, resulting in three contracts, while another invitation was issued for an extensive ageing of 2,000 fish, resulting in one contract. A Call for tenders was issued for the other sampling activities and analyses, resulting in three contracts.

In total, 12,771 bluefin tunas have been sampled up to February 2017 and about 40% have already been analysed; additional samples will be analysed in Phase 7, even if most of the genetic and micro-chemical analyses have been postponed to Phase 8. The list of available biological samples by type (muscle/fins, otoliths, spines), already stocked in the ICCAT GBYP tissue bank, currently maintained by AZTI, was circulated during the bluefin tuna intersessional meeting in July 2016 and again at the bluefin tuna data preparatory meeting in March 2017.

The first results, which can still be considered preliminary, are extremely interesting and very promising:

- Genetic analyses show that there is a clear genetic difference between the western Atlantic bluefin tuna and the eastern Atlantic bluefin tuna, and a certain mixing is present in almost all areas, with different proportions and with a high interannual variability. At the same time, for the eastern Atlantic stock, it is evident that there are no subpopulations within the Mediterranean and the intra-Mediterranean mixing is very evident. These results were confirmed with all genetic analytical methods.
- Microchemistry analyses showed that the current main stock components are well identified. Mixing in the Mediterranean Sea is minimal. The presence of important percentages of bluefin tuna from different areas in the central-North Atlantic and the Atlantic Iberian-Moroccan need to be investigated much more and further checked before having more solid results, however, it seems that the two stocks can be present there, with a very high interannual variability. These data were used for the MSE and the OM.
- A variable percentage of bluefin tuna cannot be currently attributed to any of the two stocks. This fact might be related to various factors, including the possible occurrence of additional spawning areas in the Atlantic Ocean, and it shall be further studied in the future. A study for the NW Atlantic area has been committed in Phase 7.
- The otolith shape analyses showed that bluefin tuna population components show some differences in shape. The otolith shape is better for describing the life history of the fish more than clearly detecting the origin in most of the cases.
- A first ageing calibration was carried out in 2014, with broad participation from scientific institutions and scientists belonging to several CPCs. The initial results show good improvements and similar exercises for smoothing the biases, which are essential for more accurate ageing of bluefin tuna, must be continued. The ICCAT GBYP ALK provided additional data in Phase 6, which were passed immediately to the SCRS bluefin tuna species group. A massive ageing of otoliths collected in previous ICCAT GBYP phases and stored in the ICCAT GBYP tissue bank in currently ongoing.

8. Modelling approaches

The initial, short-term ICCAT GBYP objective which was approved by the Commission in 2008 was to carry out operating modelling studies from year 4, with a total budget of €600,000. So far, with 117.5% of the funds (a total of €704,848⁷), the ICCAT GBYP carried out many modelling activities from Phase 2, following the recommendations of the Steering Committee and the SCRS. It is very clear that the general objectives set for the modelling studies in these first Phases have been, to date, largely accomplished taking into account both the needs to develop a MSE and the proportion of the available budget. Furthermore, the modelling plan was fully revised and now it has been extended up to 2021, as it was endorsed by the Commission. The total amount of funds set for the modelling approaches in the first Phases represents only the 5.3% of the total ICCAT GBYP budget available so far.

⁷ Including the costs planned for Phase 7 (174,000 Euro), which might be different at the end of the Phase.

Five meetings of the ICCAT GBYP Core Modelling MSE Group have been held so far, setting and updating the Modelling Plan and to revise the actions and their development. The reports are available [here](#). The list of members of the ICCAT GBYP Core Modelling MSE Group was updated in Phase 5 and then again in Phase 6, taking into account the new bluefin tuna rapporteurs and the SCRS Chairman.

A Modelling coordinator and a modeling technical assistant were contracted in Phase 5, according to the decision taken by the Steering Committee. The contract for the modelling assistant was extended also to Phase 6 and 7, while the Steering Committee decided not to extend the contract for the Modelling coordinator, which will possibly be replaced by a Modelling communicator.

An ICCAT GBYP VPA training course was held in Miami on February 2017. 11 scientists attended the course from different ICCAT CPCs. The training was kindly provided by Dr. Laurie Kell, Dr. Ai Kimoto and Dr. Clay Porch. A technical meeting for conducting a SAM assessment was held in Madrid in May 2017. The results are presented in SCRS/2017/146.

The documents concerning the various products developed within the modelling approaches in all Phases are available [here](#). New information was provided to the bluefin tuna intersessional meetings in 2016 (see documents SCRS/2016/144, SCRS/2016/145 and SCRS/P/2016/033) and in 2017 (SCRS/2017/178). All details regarding the ICCAT GBYP activities for the Modelling Approaches are provided in document SCRS/2017/139.

The data obtained from the electronic tagging activities have been included in the trials, including all those recovered in Phase 6 and all the ICCAT GBYP e-data sets. In 2017, for the first time, the ICCAT GBYP aerial survey data were also used for the OM. The work necessary for developing new modelling approaches will take several years, however, according to what was pointed out during the recent ICCAT GBYP review, the results of the modelling efforts will result in a much more focused research activity for the future.

All the ICCAT GBYP data were moved into the ICCAT system almost in real time in each Phase, after being accepted by the ICCAT SCRS Sub-committee on Statistics, while others were provided directly to the specialist identified by the SCRS bluefin tuna species group. In the first part of Phase 7 the great majority of the ICCAT GBYP data was used in the 2017 bluefin tuna stock assessment, in the MSE and in the OM. **Table 1** shows the details.

9. Legal framework

ICCAT adopted Rec. 11-06 in its meeting in Istanbul (November 2011), which allows for a “research mortality allowance” of 20 t of bluefin tuna per year for the ICCAT GBYP and for the use of any fishing gear in any month of the year in the ICCAT Convention area for ICCAT GBYP research purposes. To implement the recommendation, the ICCAT Secretariat issues one or more circulars in each year of the ICCAT GBYP activity.

A total of 245 ICCAT GBYP RMA certificates have been issued up to 1 September 2017, for a total of about 11,519 kg of bluefin tuna in the last 6 years (SCRS/2017/139), but the sampling activity is ongoing.

10. Cooperation with ROP

The ICCAT GBYP coordination, together with the ICCAT Secretariat, is maintaining and improving the contacts with the ROP observers, to strengthen the cooperation and provide opportunities. The ROP observers are engaged in directly checking the bluefin tuna at harvest for improving tag recovery and reporting. The observers are also requested to report any natural mark and a specific form was provided by the ICCAT GBYP to ROPs. The specific training, yearly provided by the ICCAT GBYP Coordinator to the ROP, has been suspended since 2016. Several tags have been reported by ROPs in the last years. The trials for collecting additional biological samples which were agreed with the ROP in Phase 7, will be evaluated at the end of the Phase.

11. ICCAT GBYP Web page

The ICCAT GBYP web page, which was created in the last part of Phase 1, is usually updated regularly with all documents produced by the ICCAT GBYP. In some cases, due to the huge workload, some sets of documents are posted all together. Updates also includes the budget page, where all contributions (monetary or in kind) are regularly listed, to ensure full transparency. The ICCAT GBYP web pages have recently been fully revised and improved.

12. Following activities

The ICCAT GBYP Steering Committee, recommended the following activities for Phase 8:

- a) *Data recovery and data mining*: If additional reliable data regarding any bluefin tuna fisheries in the last decades or other additional data sets, not already included in official Task II data, are detected, then these data should be recovered and used for improving our understanding of these fisheries. Efforts will be done for recovering the historical bluefin tuna catches from the ICES area.
- b) *Aerial survey*: after the good results of the last survey in 2017, the aerial survey should continue, carrying out the activity only on the four overlapping areas.
- c) *Tagging*: Electronic tagging should be partly carried out, focusing the distribution of tags according to the emerging needs set by the SCRS. Tag awareness activity will be continued, possibly improving communications with the media by using the video tools developed in Phase 6. If availability is confirmed by the external specialist, the second part of the CKMR feasibility study will be done, taking into account the preliminary trials for collecting dedicated samples in Phase 6 and 7. Furthermore, the CKMR genetic workshop should be organised.
- d) *Biological and genetic sampling and analyses*: Sampling should be continued, covering the less sampled areas or those where mixing problems have recently been detected; the analyses of the available samples should be improved, particularly for microchemistry, genetics and ageing, the latter taking into account the dedicated effort carried out in Phase 7. The trials for obtaining additional samples for CKMR shall be continued.
- e) *Modelling*: New additional efforts should be devoted to work on the best approaches to use fishery independent data and innovative approaches to better quantify uncertainties. The dialogue with stakeholders shall be activated and thoroughly improved. The revised plan should be enforced, according to the outputs of the ICCAT GBYP Core Modelling MSE Group. The modelling capacity building shall be further improved.

The total budget necessary for Phase 7 is provisionally set once again at €2,125,000.

The ICCAT GBYP will continue to encourage and support additional research activities carried out by the various CPCs.

Evolution of the Atlantic-Wide Research Programme for Bluefin Tuna: According to the current situation, it has been fully demonstrated that it is impossible to reach the level of funding initially approved by the ICCAT Commission for the first six years of the ICCAT GBYP and, as a consequence, to carry out the various activities as originally planned. The extension of the programme up to 2021 was discussed and endorsed by the Commission in 2014, following the SCRS recommendation. However, the ICCAT GBYP funding system should be revised and better defined, stabilised and improved, in order to ensure the regular development of the activities. Regardless of the type of system envisaged, the budget by Phase or year, subject to the Commission's approval, must be ensured.

The second external review (see SCRS/2016/192) provided an independent overview of the work carried out so far and possible proposals for the following extension, underlying that the ICCAT GBYP should become an institutional and continuous stream of scientific data.

Table 1. Details on the use of ICCAT GBYP data up to the first part of Phase 7 in the stock assessment, in the MSE and in the OM.

<i>Activity</i>	<i>Use in the BFT Stock Assessment</i>	<i>Use in the BFT MSE and OM</i>
Data mining and data recovery	size data, LL CPUE, historical trap data, BB data, non-GBYP electronic tagging data	size data, LL CPUE, historical trap data, BB data, non-GBYP electronic tagging data, historical genetic data
Aerial survey on BFT spawning aggregation	not so far (too short series)	yes
Tagging	conventional tag data, growth data, electronic tag data	conventional tag data, electronic tag data
Biological studies	genetic and microchemical data (mixing), ALK, reproductive characteristics, L/W correlation	genetic and microchemical data (mixing by area), ALK, reproductive characteristics, L/W correlation
Modelling approaches	SAM application, VPA training course	MSE and OM development, Modelling Multi-Year Plan