

Report of the ICCAT Atlantic-Wide Research Programme for Bluefin Tuna (GBYP)

(Activity report for the last months of Phase 14-2024 (September 2024-December 2024) and Phase 14-2025)

1. Introduction

The ICCAT Atlantic-Wide Research Programme for Bluefin Tuna (GBYP) officially started at the end of 2009 with the objectives of improving a) basic data collection, including fishery independent data; b) understanding of key biological and ecological processes; and c) assessment models and provision of scientific advice on stock status. The general information about GBYP activities and results, as well as information on budgetary and other administrative issues of the GBYP programme, from the beginning of the programme until today, are available on the [GBYP webpage](#). All the relevant documents related to programme development, including final reports of every activity and the derived scientific papers, Annual Reports to the Standing Committee Research and Statistics (SCRS) and European Union, GBYP workshops or Steering Committee (SC) meeting reports, are also readily available on the [GBYP webpage](#).

Phase 14 started on 1 February 2024 (Grant Agreement 101169569), and was scheduled to run for 23 months, as a biannual project aimed at providing financial and technical support for the SCRS Bluefin tuna Species Group to develop its 2024 and 2025 annual workplans. The first activities and results of Phase 14 were reported during the 2024 SCRS plenary meeting ([Anon., 2025](#)). Therefore, this report focuses on the activities carried out between September 2024 and December 2025.

2. Scientific activities and results achieved by main line of activity

2.1 Data management

In addition to the routine data management tasks, such as the update of data repositories to store the information generated within GBYP funded research, the updating of the ICCAT conventional tags database and compilation of data sets to attend external data requests (four in 2025), GBYP has further contributed to the development of the new ICCAT Secretariat information systems on biological data and on electronic tagging data. These activities have been carried out as “in house tasks”, by ICCAT Secretariat and GBYP staff.

As regards the biological data database, following several revisions throughout 2024, the final version of a standardized reporting form was launched in 2025. This form is used to report sampling and analysis activities to ICCAT for both Atlantic bluefin tuna and other ICCAT managed species. Additionally, a comprehensive review of previously generated data was conducted to adapt it to the new structure and reduce inconsistencies. Finally, a dashboard on bluefin tuna data is underway, which will show the available samples by type, fish size, area and sampling month.

Once this database is operative, it will integrate all available relevant information on biological data, provided by GBYP or by CPC national research teams, about the species managed by ICCAT, which will allow to develop broad collaborative studies to estimate reliable biological parameters and to optimize sampling programs, and consequently improve stock assessments.

In relation to the ETAGS database, the specific objectives within GBYP Phase 14 have been: i) Develop a new module within the ETAGs database integrating all the data and metadata required to allow in deep analyses of satellite tags transmission performance and ii) Continue the compilation, standardization and uploading of data from archival tags deployed on Atlantic bluefin tuna, identifying, and addressing whenever possible, any technical problem affecting such process.

To achieve the first objective, the new module integrating the metadata about electronic tags deployments submitted by CPCs research teams, as well the metadata of all the ICCAT owned Wildlife Computers (WC) MiniPAT pop up tags and all the data available about its satellite transmissions accessible in the WC portal, has been completed, and a first analysis of the evolution of WC MiniPATs transmission performance from 2012 onwards, as recommended by SCRS in March 2024, has been carried out. Tag performance was evaluated using multiple indicators, including transmission success, number of days transmitting, total number of messages received, and the proportion of light-based geolocation (lightloc) data transmitted. Results were examined by tagware version and by tag manufacturing year, concluding that the latest tagware

versions and the new tag model available from 2025 present acceptable levels of performance. In relation to objective ii, new etuff files (including from metadata and raw data from archival tags in standardized formats) have been created and uploaded, as well Power BI tools have been created to visualize the tracks uploaded in the ETAGS database. Once the process of generating and uploading the etuff files from all the available datasets from archival tags is completed, this ETAGS database will allow performing joint analyses of broad datasets, which will contribute to improving knowledge on bluefin tuna population structure and spatial patterns.

2.2 Stock fishery independent indices: GBYP aerial survey on bluefin tuna spawning aggregations and bluefin tuna larval surveys

Three main types of activities have been undertaken within this line in 2025: i) development, following SCRS decision of limiting the GBYP aerial surveys to western Mediterranean, of a new campaign during June 2025 over the Balearic Sea; ii) strict update of the GBYP aerial surveys index time series, incorporating the results from 2025 campaign, and iii) preparation of aerial survey data and environmental data to estimate abundance and biomass of bluefin tuna in the Mediterranean Sea using model-based analysis.

The latter activity was not initially included in the original GBYP Phase 14 proposal, but once the SCRS Bluefin Tuna Species Group took the decision of cancelling the aerial surveys in the Central Mediterranean within the 2025 ICCAT Bluefin Tuna Species Group Intersessional Meeting held in hybrid format in Sète, France (8-11 April 2025) (Anon., 2025c) and set as a new priority the standardization of aerial survey index following model based approaches accounting for environmental variability, this new activity was added through a Grant Amendment presented to this end.

Regarding the 2025 GBYP aerial survey, four replicates were covered in Balearic Sea (Area A), following the same design and sighting methodology used in 2024. Before the missions, an online training course was held with the participation of all members of the crew (pilot, professional spotters, two scientific spotters), to provide them with detailed instructions on the methodology and the way to fill the sighting forms.

The survey was carried out with a Partenavia P-68 plane, from 8-28 June 2025. To cover the entire four replicates (30 transects in total), 18 flights were made in 14 days. For three days weather conditions were worse than allowed by the field protocol – wind stronger than 10 knots or high chance of low clouds and the flights were cancelled. One day was dedicated to plane maintenance. In total, during the time on effort, 31 observations of bluefin were recorded, of which 23 were on effort and on transect, four on effort but out of transect and four off effort. The total estimated number of individuals in these sightings was 11,385, with an estimated biomass of 1477 t, of which 7.5% were small fish (less than 25 kg), 44.55% medium sized fish (between 25 and 150 kg) and 47.94% were large fishes between 150 and 300 kg. No giant fish over 300 kg were observed.

For further details, see the Report on 2025 Aerial Survey (Documents section, Phase 14) (available [here](#)).

The analysis of the 2025 aerial survey data aiming at producing a strict update of the GBYP aerial survey index of relative spawning stock biomass and abundance time series, as well as the reanalysis of the Balearic Sea GBYP aerial survey time series following a model-based approach aiming at the interannual standardization of the index values, were integrated within a single Call and contract.

The analysis for the strict update of the index incorporating data from 2025 survey was completed, and the results provided to the SCRS. Specifically, the estimated number of individuals (N, in thousands) and biomass (B, in tonnes) in block A in 2025 were 31.2 and 4,404, respectively. These index values are a bit higher than those obtained from the 2024 survey, despite the similar number of sightings. This is because the expected size and biomass of each school in 2025 was higher than in 2024, contributing to higher estimates.

However, due to the late approval of the Phase 14 Grant amendment, finally not all the subtasks required for the index time series standardization could be completed. Only the two first subtasks, identifying relevant environmental variables influencing the distribution and detectability of bluefin tuna spawners and estimating the response variables necessary to apply a model-based approach to the considered series, were addressed. The modelling tasks to standardize the available abundance/biomass index time series accounting for the environmental influence on the index values across years were postponed to the next GBYP Phase.

For further details, see the Report on 2025 Aerial Survey (Documents section, Phase 14) (available [here](#)).

These activities have allowed to update the GBYP aerial surveys abundance indices time series, which are directly used within the current bluefin tuna management system based on the Management Strategy Evaluation (MSE) approach, and have set the basis for the elaboration of a new standardized time series of GBYP aerial survey abundance and biomass index in the Balearic Sea that can be used in the next cycle of bluefin tuna MSE, from 2028 onwards.

2.3 Tagging activities

This line of research has faced several problems from the beginning of the programme, such as low recovery rates, premature release of electronic tags due to inadequate tagging methodologies or technical problems of the tag itself, as pin-broke. These problems were minimized along the previous GBYP Phases through awareness actions and methodological improvements, increasing significantly the time spent on fish and the percentage of recovered tags during the last years. Unfortunately, an additional technical problem affecting the performance of the Wildlife Computers satellite tags used within GBYP programme, which resulted in bad or null data transmission, mainly in those campaigns developed in warm waters, started to occur in 2018, and affected very negatively some surveys carried out in 2021 and 2022.

Intensive work was done over the past few years, in close collaboration with the tags manufacturing company, to prevent and minimize the negative effects of these potential problems, as application of stricter tags maintenance and testing protocols by the collaborating tagging teams and ICCAT Secretariat staff, besides tagware improvements carried out by the manufacturer. As a result, according to the last available data about transmission performance of tags deployed in 2024, the success in transmission rates, even in tags remaining on fish one complete year, has improved. In addition, the increasing rate of electronic tags physical recoveries observed from 2021 has been maintained throughout 2024 and 2025, which has allowed not only to get high quality data sets, but to minimize the impact of transmission failures, since some of the recovered tags had not transmitted properly, or not transmitted at all, the recorded data through Argos satellite system due to the aforementioned technical problems.

2.3.1 Tagging campaigns

Throughout 2025 some of the field activities associated to Memorandum of Understanding (MoUs) signed in 2024 were carried out and reported, as tagging campaigns in the Slope Sea, the western Mediterranean Spanish coasts and the Canary Islands. The latter could not be completed successfully because of the later than usual arrival to the area of bluefin tuna specimens.

In addition, considering the priorities for GBYP etagging program agreed at the 2025 Bluefin Tuna Species Group ICCAT Intersessional Meeting held in Sète in April 2025 (Anon., 2025c), a new Call for deploying 32 pop-up satellite tags and 9 internal archival tags in Mediterranean spawning areas, and 30 acoustic transmitters in the Gulf of Cadiz region (Circular G-00303/2025), was launched. As a result, three proposals were awarded and the respective MoUs were agreed, with the *Instituto Português do Mar e da Atmosfera* (IPMA), *Institut français de recherche pour l'exploitation de la mer* (IFREMER) and a Consortium constituted by the General Directorate of Fisheries and Aquaculture (GDFA) of the Republic of Türkiye, the University of Stanford and the company Group Sagun, aiming at the deployment of 30 acoustic tags off the Algarve (Portugal) southern coast, 10 pop-up tags in western and Central Mediterranean and 22 pop-up tags in eastern Mediterranean, respectively.

The acoustic tagging campaigns associated to these 2025 MoUs were successfully concluded, while the tagging in the western and Central Mediterranean faced some problems, due to bad weather conditions and changes in the fishing areas of the vessels collaborating in the tagging operations, and not all the available tags, specifically only four from 10, could be deployed. Unfortunately, the campaign in the eastern Mediterranean had to be cancelled due to a force majeure reason, that is the decision taken at the very last moment by the company that had committed itself to provide the logistic support for the campaign to move all its fishing fleet to Central Mediterranean, due to the scarcity of schools in their eastern Mediterranean fishing grounds at the beginning of the fishing season, and the MoU was not finally signed. The GBYP Steering Committee took the decision of moving this eastern Mediterranean tagging campaign to 2026, as well the campaign in the Canary Islands, assigning to it the same number of pop-up tags that could not be deployed in 2025.

The reports on the campaigns that were not cancelled are available [here](#).

As regards conventional tags, within the reporting period associated to Phase 14, 925 “spaghetti” tags, along with applicators and the tagging protocols and forms to report tagging operations, were delivered to various institutions. During this reporting period, a total of 683 fish were tagged.

2.3.2 Tag recoveries

The increasing trend in the recovery of electronic tags observed from 2021 continued in 2025, reaching 54, including 6 internal, 35 pop-up and 13 acoustics. It is worth remembering that the physical recovery of pop-up satellite tags allows to download 100% of data recorded by the sensors and hence produce high quality data sets from which not only more precise and accurate tracks can be obtained, but also data to inform about species behaviour and vertical movements.

The results from all these tagging activities are improving the knowledge on bluefin tuna spatial patterns, and are directly used to create the movements matrix used within the MSE based management system to inform about the proportion of individuals of the eastern and western bluefin tuna stocks in the catches occurring in the different statistical areas, which is crucial for the management of such stocks.

2.4 Biological studies

In the first year of Phase 14, following the recommendations of the SCRS adopted by the Commission in 2022 and 2023, GBYP biological studies focused on genetic analyses aiming at informing on a feasibility study for the potential implementation of a Close Kin Mark Recapture (CKMR) study for the determination of the absolute abundance of the Atlantic eastern bluefin tuna stock, which is one of the main uncertainties affecting Atlantic bluefin tuna stock assessment.

Thus, a kinship analysis to evaluate the adequacy of larvae as source of juvenile fraction of the eastern Atlantic and Mediterranean stock and a study to determine the frequency of the different Atlantic bluefin tuna mitochondrial haplotypes, aimed at setting the basis for improving the currently available SNP array for bluefin tuna genetic studies allowing to provide information about the sex of the shared parent in juvenile kinship relationships, which is relevant for the model, were completed.

As regards the sibship evaluation among Atlantic bluefin tuna sampled within the Balearic Sea, 3,822 larvae samples were genotyped using the Atlantic bluefin tuna SNP array, providing genotype information at > 6,000 neutral SNP markers that can be used to identify the presence of kin pairs among the analyzed samples. The stations and number of samples of each station were determined following the proposal from the team currently in charge of the development of the CKMR model for the eastern Atlantic bluefin tuna. The genotyped individuals were analyzed together with previously genotyped larvae and young-of-the-year from the Mediterranean Sea captured between the years 2018 to 2023. Parent offspring, full sibling, and half sibling pairs within the analyzed samples were determined using genotype information.

The main conclusions from this study were:

- Atlantic bluefin tuna array developed during GBYP Phase 10 allows for accurate detection of full sibling and half sibling pairs among Mediterranean larvae.
- High proportions of sibship are found within sampled stations in the Balearic Sea.
- The detection of full and half-sibling pairs among larvae collected at different stations confirms that a single adult individual can spawn across multiple stations within the same spawning season. This information should be considered when designing the larval sampling strategy for the implementation of the eastern Atlantic bluefin tuna CKMR model.
- The detection of half sibling pairs involving larvae captured in different years in the Balearic Sea confirms spawning fidelity of the same adult individuals to the same area.

As a first step in relation to the objective of determining the frequency of the different Atlantic bluefin tuna mitochondrial haplotypes, it is necessary to determine what parents share a pair of half-siblings, which is relevant for the model. The mitochondrial genome, if sufficiently variable within the population, can provide information about the sex of the shared parent in half-sibling pairs or the sex of the parent in parent-offspring pairs. The mitochondrial variability in the Atlantic bluefin tuna Mediterranean population, was explored making use of three different data sets: pool-sequencing data, individual whole genome sequencing data and genbank downloaded sequences.

The main conclusion showed that individual and pooled whole-genome sequencing prepared datasets provide sufficient coverage to detect polymorphic positions in the bluefin tuna mitochondrial DNA, if existent, among hundreds of individuals. This is the first step in determining whether the Mediterranean Atlantic bluefin tuna mitochondrial variability allows for assessing if two half-siblings share the same mother. These data, together with longer publicly available sequences, should be sufficient to confidently recover entire haplotypes. This could enable the design of specific assays to detect these haplotypes in newly sampled individuals, provided there is enough variability.

The specific results from these two studies are detailed in the Final report of GBYP Phase 14 2024 biological studies available [here](#).

The original plan for 2025 was to initiate, following SCRS recommendations, a CKMR study in the eastern bluefin tuna stock. However, during the 24th Special Meeting of the Commission held in November 2024, the SCRS workplan for the effective implementation of a CKMR study in the eastern Atlantic bluefin tuna stock from 2025 onwards was not accepted. Therefore, during the 2025 Bluefin Tuna Species Group ICCAT Intersessional Meeting held in Sète, France ([Anon., 2025c](#)), the Bluefin Tuna Species Group updated the Bluefin Tuna Species Group workplan for 2025, setting a series of new research priorities not directly related to eastern bluefin tuna stock CKMR implementation.

Consequently, the GBYP biological studies in 2025 have been focused in improving the knowledge on populations structure, paying special attention to the data requirements derived from the implementation of the MSE approach, specifically on further understanding the interbreeding between eastern and western Atlantic bluefin tuna, aiming at determining the potential genetic homogenization of Atlantic bluefin tuna populations and their adaptability to anticipate the effect of changing environmental conditions, as well in further characterizing mixing dynamics of Atlantic bluefin tuna populations. As usual, the activities also included field sampling to ensure the availability of samples to carry out the analyses to achieve these objectives, the maintenance of the whole GBYP Tissue Bank and the improvement and consolidation of the information system for its management.

To further understand the interbreeding between eastern and western stocks, genetic analysis on 248 larvae from the Slope Sea have been performed, together with those of 724 reference samples from the two main spawning areas in the Mediterranean Sea and the Gulf of Mexico. The results obtained contribute to support previously formulated hypothesis, reveal relevant aspects for future analysis (such as quality of the samples, levels of kinship found) and highlight the need for further sampling in the area. Ten samples have been selected based on these results to sequence their whole genomes.

The stock of origin information available from genetic and otolith microchemistry assignments of Atlantic bluefin tuna collected in different feeding areas has been merged into respective complete datasets. The process for estimating proportion of Mediterranean individuals and the standard deviation has been unified between both methods, so that these data can be directly integrated in the MSE process. Proportion of Mediterranean fish across the strata applied in the MSE was calculated. This exercise is essential for further developing stock assessment models that include mixing among areas and use of biologically realistic operating models (OMs) for more rigorous management options testing.

The detailed results from the 2025 GBYP biological studies are detailed in the Final Report, available [here](#).

2.5 Modelling approaches

The modelling program addresses the GBYP general objective 3, which is to “Improve assessment models and provision of scientific advice on stock status through improved modelling of key biological processes, further developing stock assessment models including mixing between various areas and developing and use of biologically realistic OMs for more rigorous management option testing”.

In line with the provision of the *Recommendation by ICCAT establishing a management procedure for Atlantic bluefin tuna to be used for both the western Atlantic and eastern Atlantic and Mediterranean management areas* (Rec. 22-09), SCRS bluefin tuna workplan for 2025 included several tasks aimed at evaluating the implications of new information regarding abundance, indices and stock mixing on the bluefin tuna MSE. Consequently, two contracts were awarded in 2025, specifically to evaluate the impact of i) the incorporation of West CKMR estimates; ii) testing of the “value of information in MSE”, considering removal or changes in the frequency of GBYP aerial surveys and the inclusion of revised indices and iii) the effects of a “lite reconditioning” including new information as that from CKMR and revised indices.

The main results and conclusions from these studies are summarized below.

When the current BR MP for Atlantic bluefin tuna is retuned taking into account the re-conditioned West CKMR scale estimate for the western stock, the resultant tuning parameters are more positive for the East and especially for the West area. Illustrative and preliminary (as not all indices are available yet) calculations indicate that using BRn3 in place of the current MP, the values of C1 (the 2026 Total Allowable Catch (TAC)), for the East area would remain unchanged with a 20% increase, whereas those for the West area would change from a 6% decrease to a 5% increase.

If the re-tuning of the Atlantic bluefin tuna MP to take account of the inclusion of the West CKMR estimate in the OM conditioning is updated to take account of recent updates in the conditioning of OM29 and OM35, it hardly affects the performance statistics for the West, but those for the East become a little more conservative in terms of catches.

Re-tuning BR MP under the most recent re-conditioning of the Atlantic bluefin tuna OMs which set the CV of the western stock CKMR estimate to 0.20 rather than the 0.05 specified previously for that re-conditioning results in an MP which is slightly more conservative, i.e. slightly lower catches, for both the East and the West areas.

If the West CKMR estimate is taken into account in the Atlantic bluefin tuna MSE computations using a simple likelihood weighting approach, the results suggest that this estimate does “matter”, as the associated calculations indicate that notably higher TACs for the West area might be possible. The availability of a CKMR estimate for the East would likely have important implications for the MP performance for the East. Moreover, fewer future GBYP aerial surveys in the East would lead to a slight deterioration in conservation performance there, though this could be ameliorated by a minor retuning the MP. It must, however, be emphasised that these results are dependent on a simple and approximate method for taking the West CKMR estimate into account. The reliability of this approach therefore needs to be checked by repeating these computations under formal re-conditioning of the OMs to incorporate the West CKMR estimate.

The detailed results from the GBYP Phase 14 2025 modelling tasks are available [here](#), as well in the papers listed below:

Butterworth DS and Rademeyer RA. BR MP runs under the operating models for Atlantic bluefin tuna MSE re-conditioned to include the close-kin mark recapture estimate of western stock scale. *Col. Vol. Sci. Pap. ICCAT*, 82(4), SCRS/2025/154: 1-10 (2025) (and associated Addendum).

Butterworth DS and Rademeyer RA. BR MP runs under the operating models for Atlantic bluefin tuna MSE re-conditioned to include the close-kin mark recapture estimate of western stock scale with both OM29 and OM35 updated now included (ABTMSE v8.1.0). *Col. Vol. Sci. Pap. ICCAT*, 82(4), SCRS/2025/167: 1-4 (2025).

Butterworth DS and Rademeyer RA. BR MP runs under the operating models for Atlantic bluefin tuna MSE re-conditioned to include the close-kin mark recapture estimate of western stock scale assuming a CKMR CV of 0.2 (ABTMSE v8.2.3) *Col. Vol. Sci. Pap. ICCAT*, 82(4), SCRS/2025/220: 1-4 (2025) (Annex 3)

Butterworth DS and Rademeyer RA. 2025. A brief initial analysis of ‘does the west CKMR estimate matter for the ABFT MSE?’ *Col. Vol. Sci. Pap. ICCAT*, 82(4), SCRS/2025/049: 1-9 (2025).

SCRS/2025/P/138 “Reconditioning of operating models for Atlantic Bluefin Tuna MSE to include the close-kin recapture estimate of western stock scale”.

References

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[Anonymous 2025c](#). 2025 Bluefin Tuna Species Group ICCAT Intersessional Meeting held in hybrid format in Sète, France (8-11 April 2025).