

**ICCAT ATLANTIC-WIDE RESEARCH PROGRAMME
FOR BLUEFIN TUNA (GBYP) PHASE 14 (2024-2025):
ACTIVITY REPORT FOR THE PERIOD SEPTEMBER 2024-AUGUST 2025**

Francisco Alemany¹, Stasa Tensek¹ and Alfonso Pagá García¹

SUMMARY

The ICCAT GBYP Phase 14 was initiated on 1 February 2024, with a duration of 23 months. However, from the financial point of view, years 2024 and 2025 have been managed separately, following the budget tables for the BFT SCRS work-plans approved by the Commission. As in previous years, GBYP program has promoted and funded several activities in the following lines: (a) data recovery and management, (b) biological studies, (c) stock indices: aerial survey on spawning aggregations, (d) tagging, including awareness and rewarding programs and (e) further steps of the modelling approaches. The present report summarizes the main results and conclusions of the activities carried out in the first year of Phase 14 (2024) and describes the activities initiated during the second year of Phase 14 (2025), and their preliminary results, if available, corresponding to the reporting period September 2024-August 2025.

RÉSUMÉ

La phase 14 du Programme GBYP de l'ICCAT a été lancée le 1er février 2024 pour une durée de 23 mois. Toutefois, d'un point de vue financier, les années 2024 et 2025 ont été gérées séparément, conformément aux tableaux budgétaires des plans de travail du thon rouge du SCRS approuvés par la Commission. À l'instar des années précédentes, le Programme GBYP a encouragé et financé plusieurs activités dans les domaines suivants : (a) récupération et gestion des données, (b) études biologiques, (c) indices des stocks : prospection aérienne des concentrations de reproducteurs, (d) marquage, y compris campagne de sensibilisation et de récompense et (e) nouvelles étapes des approches de modélisation. Le présent rapport résume les principaux résultats et conclusions des activités menées au cours de la première année de la phase 14 (2024) et décrit les activités lancées au cours de la deuxième année de la phase 14 (2025), ainsi que leurs résultats préliminaires, s'ils sont disponibles, correspondant à la période de référence septembre 2024-août 2025.

RESUMEN

La fase 14 del GBYP comenzó el 1 de febrero de 2024 con una duración de 23 meses. Sin embargo, desde el punto de vista financiero, los años 2024 y 2025 se han gestionado por separado, siguiendo las tablas presupuestarias de los planes de trabajo para el atún rojo del SCRS aprobados por la Comisión. Como en años anteriores, el GBYP ha fomentado y financiado diversas actividades, en la siguiente línea: (a) recuperación y gestión de datos, (b) estudios biológicos, (c) índices del stock: prospección aérea de concentraciones de reproductores, (d) marcado, lo que incluye una campaña de concienciación y recompensas y (e) más avances en los enfoques de modelación. El presente informe resume los principales resultados y conclusiones de las actividades realizadas durante el primer año de la fase 14 (2024) y describe las actividades iniciadas durante el segundo año de la fase 14 (2025), así como sus resultados preliminares, si están disponibles, correspondientes al período comprendido entre septiembre de 2024 y agosto de 2025.

KEYWORDS

Bluefin tuna, ICCAT, databases, biological analyses, tagging, genetics, CKMR, aerial survey, MSE, modelling, Mediterranean Sea, Atlantic Ocean

¹ ICCAT, GBYP – Calle Corazón de Maria 8, 6^a – 28002 Madrid (España)

1. Introduction

1.1 Historical background

The Atlantic-Wide Research Program for Bluefin Tuna was officially adopted by the ICCAT Commission in 2008, endorsing the SCRS Chair's report on Bluefin Tuna Research Priorities and Potential costs. In 2009 the SCRS advised the Commission that, in order to substantially improve the scientific advice, such program would focus on the improvement of basic data collection through data recovery, understanding of key biological and ecological processes, and improvement of assessment models to provide scientific advice on stock status. More details about the evolution of GBYP program since then are available in previous reports (Alemany et al., 2024; DiNatale et al. 2018)

1.2 Objectives

At the beginning of the program the GBYP Steering Committee defined as the main objective of the GBYP the improvement of the knowledge and understanding of the Atlantic bluefin tuna (*Thunnus thynnus*) stocks and populations. Aiming at the achievement of this strategic objective, a series of general objectives was set considering the priorities initially stated by SCRS (data collection, understanding of key biological and ecological processes and assessment improvement). These broad objectives have been maintained throughout the program, but along the successive phases they have been adapted to the evolution of the "state of the art" as regards scientific knowledge on bluefin tuna, in order to better match SCRS research needs and Commission recommendations. In addition to these initial objectives, some new ones, aiming not only at generating new knowledge but also to consolidate and make the best use of available data, have been set along the last GBYP Phases.

Therefore, the current general objectives of GBYP program are:

- Improve basic data collection.
- Improve understanding of key biological and ecological processes.
- Improve assessment models and provision of scientific advice on stock status.
- Enhance the coordination between GBYP activities and the monitoring and research activities on BFT carried out by other institutions, both at national and international level.
- Contribute to the implementation within ICCAT Secretariat of new BFT information management systems.

In relation to each of these broad objectives, the specific objectives initially set for GBYP Phase 14 were:

- a) Ensure the collection of the biological samples necessary to develop the studies designed to address the SCRS research priorities.
- b) Enhance the information available on BFT spatial distribution and mixing, by promoting and supporting electronic tagging campaigns, and continuing the support to CPCs conventional tagging activities.
- c) Provide SCRS with updated and reliable data on biological parameters and stock structure.
- d) Develop a feasibility analysis and a plan for the implementation of the Close Kin Mark Recapture methodology to BFT Eastern stock, exploring the possibilities for integrating West and East BFT stocks CKMR studies and, if recommended by SCRS and adopted by the Commission, initiate the implementation of a BFT CKMR study.
- e) Update and improve fishery independent aerial survey index of abundance time series.
- f) Support the further development and implementation of BFT Management Strategy Evaluation (MSE).
- g) Contribute to the implementation of an internationally coordinated and optimized BFT sampling system.
- h) Promote the integration of data generated by CPCs research institutions into the ICCAT electronic tags DB, as well as its joint analysis by relevant research teams.
- i) Promote the integration of biological data generated by CPCs research institutions into the ICCAT biological data DB.
- j) Contribute to the design and implementation, in close coordination with ICCAT Secretariat Statistics department, of an Information System on BFT biological data.
- k) Contribute to the implementation, in close coordination with ICCAT Secretariat Statistics department, of an Information System on electronic tags data.

1.3 General management issues and financial aspects

The GBYP program has been historically managed by a dedicated coordination team, with the support of ICCAT Secretariat staff and under the direct supervision of ICCAT Assistant Executive Secretary. The GBYP coordinator in straight coordination with Secretariat staff engaged in the program, develops the following activities on a day-to-day basis: implementation of the project, at the field and financial levels; drafting proposals for the successive Grant Agreements; drafting and launching Calls for subcontracting different types of activities and for the Expressions of Interest to collaborate GBYP lines of research; drafting of contracts and Memoranda of Understanding; reviewing of the deliverables, both in terms of the administrative process and scientific content; organizing GBYP related meetings and workshops; regular reporting on the GBYP activities to the SCRS and producing the annual global and executive reports presented to the SCRS Plenary and to the main donor (the European Union).

Furthermore, the GBYP coordination team participates, or provides scientific support whenever required, at national or international initiatives relevant for BFT stocks evaluation and management, aiming to increase the effectiveness of the program and the achievement of its objectives. For example, since 2010 the GBYP coordinator has been part of the Evaluation Committee of the NOAA BTRP and has participated regularly in the EU Data Collection Framework Regional Coordination Group (RCG) Liaison meetings and in those of the RCG Large Pelagics group.

The GBYP program development is supervised by a Steering Committee, which has the role of guiding its implementation. It is composed of the SCRS chair, W-BFT rapporteur, E-BFT rapporteur, one external member and the ICCAT Executive Secretary, which is often substituted by the ICCAT assistant Executive Secretary (and ICCAT Science coordinator). The Steering Committee is regularly informed and consulted by the GBYP Coordinator about all relevant matters. The Steering Committee meets at least once a year to review the activities carried out, and to refine and propose the follow-up of the program and its budget.

The GBYP is funded by voluntary contributions of CPCs and other entities, as Chinese-Taipei. In addition, several private or public entities can also provide occasionally some additional (minor) funding or in-kind support. Up to Phase 13 the budget had been set annually, and activities planned for 12-month periods, even though the implementation periods were usually extended for some months, aiming the completion of all activities. Contrastingly, Phase 14 was conceived, for the first time, for a biannual period, with a duration of 23 months (from 1 February 2024 to 31 December 2025), with no extensions allowed. However, the Phase 14 budget has been managed separately by calendar year (2024 and 2025), in line with the Commission decisions in terms of the approved detailed lines of activity, related assigned funds and timeframe.

The general information on GBYP activities and its results, as well on budgetary and other administrative matters, are available on ICCAT GBYP webpage (<https://www.iccat.int/GBYP/en/>). All the relevant documents related to the program development, including final reports of every activity and derived scientific papers, annual reports to SCRC and the European Union, as well GBYP workshops or Steering Committee meetings reports, are also easily available therefrom.

2. Budget

Phase 14 of the ICCAT GBYP is mostly funded through the Grant agreement signed with the European Climate, Infrastructure and Environment Executive Agency (CINEA) for the co-financing of the ICCAT GBYP Phase 14 (Project 101169569). In accordance with the amounts approved by the Commission during the 2023 annual meeting for the implementation of the BFT Species Group workplan, the total costs were initially set at 1700000€. Among CPCs, European Union has historically provided 80% of total budget, but in Phase 14 the contribution requested from the EU for Phase 14 was limited to 800000€, corresponding to 47% of the total approved budget. Other CPCs with BFT Eastern stock quota were requested to provide, as voluntary contributions, an amount proportional to their quota percentage, for a total of 340.000€. In addition, Canada committed itself to provide a voluntary contribution of 64743€. Other expenses, up to the maximum of 1700000€, would be covered by the GBYP balance fund, that accumulated over the previous phases of the program.

The GBYP budget for 2024 and 2025 was set at 865000€ and 815000€, respectively. Since at the 2024 annual meeting of the Commission there were taken decisions that affected the Bluefin tuna workplan proposed for 2025 presented by the SCRS, and that the latter decisions were assigned to the BFT Species Group that met intersessionally in April 2025, the Secretariat requested in July 2025 an amendment to the original Grant agreement with the EU, both in terms of GBYP activities and budget, including a reduction of the total amount covered by the grant agreement from 1700000€ to 1459250€.

The committed amounts and those effectively provided as voluntary contributions to GBYP Phase 14 by year, as of 18 September 2025, are compiled in **Tables 1 and 2**.

3. Program Coordination

3.1 Coordination team

During previous Phases the GBYP coordination team funded directly by the Program was composed of a Coordinator, an Assistant Coordinator and a Database Specialist. However, following the Secretariat request and the Commission decisions, the Assistant GBYP Coordinator and the DB specialist were integrated into the ICCAT Secretariat staff in January 2024 and January 2025, respectively, to support all the ICCAT Research and Data Collection Programs, under the overall coordinator of ICCAT Assistant Executive Secretary. Their new role includes the provision of support to GBYP as deemed necessary.

3.2 Steering Committee

During the reporting period the GBYP Steering Committee was composed by: SCRS chair (Dr. Craig Brown), the Western BFT rapporteur (Dr. John Walter), the Eastern BFT rapporteur (Dr. Enrique Rodríguez Marín until March 2025 and Dr. Tristán Rouyer from then), the ICCAT Executive Secretary (Mr. Camille Jean Pierre Manel) and the external expert (Dra. Ana Parma, researcher at the Centre for the Study of Marine Systems - CONICET). The contract for the external member of the Steering Committee was signed for 2024, following the decision of its *ex officio* members, and renewed in 2025, considering her expertise in lines currently crucial for the program, namely on MSE process.

Within this reporting period, one SC meeting was held in Madrid on 19 September 2024, back-to-back with SCRS BFT Species Group meeting, and a second one in Sète, on 10 April 2025, on the margin of BFT Group intersessional meeting. Other consultancies and decisions have been taken via email, following the regular correspondence held between the GBYP Coordinator and SC members for all relevant issues.

3.3 Project management activities

During the first year of Phase 14, a total of three calls for tenders and one official invitation were released, which resulted in a total of five contracts awarded to various entities and/or experts. In addition, one call for Expression of Interest (EoI) related to the collaboration on GBYP electronic tagging program was published in July 2024, which resulted in ten Memorandums of Understanding signed. During the second year of Phase 14, until August 2025, three additional open calls were launched, besides one official invitation, which resulted also in five new contracts. A second Call for EoI to collaborate on the GBYP e-tagging program was launched in April 2025, and as a result three new MoUs proposals were elaborated.

Other routine project management activities included the actions related to GBYP Research Mortality Allowance, the maintenance of the Tag awareness and reward program, the regular communication with the Steering Committee members and the update of the GBYP web page.

Regarding the bluefin tuna Research Mortality Allowance, in 2024 was used for covering the incidental death of 39 specimens, which amounted to 1769 kg, reported through 15 forms. Considering the number of specimens, 72% related to sampling activities and 28% to tagging, while in terms of weight, the most corresponded to incidental deaths due to electronic tagging activities (99.5%) and only 0.5% to sampling of small specimens (average individual weight of 0.472 kg).

In addition to the coordination tasks related to activities developed under these contracts or agreements, and other day-to-day communication tasks with different stakeholders, within this reporting period the GBYP coordination team has participated in all SCRS meetings focused on or relevant for bluefin tuna, that is:

- Bluefin tuna Species Group Meeting (Madrid, 18-22 September 2024)
- Standing Committee on Research and Statistics (SCRS) meeting (Madrid, 23-27 September 2024)
- 24th Special Meeting of the Commission meeting (Limassol, Cyprus, 11-18 November 2024)
- Panel 2 intersessional meeting (Madrid, 4-6 March 2025)
- Intersessional Meeting of Bluefin Tuna Species Group (Sète, 8-11 April 2025)

Furthermore, the GBYP Coordinator or the GBYP DB specialist participated, in person or online, in the following meetings:

- SCRS Subcommittee on Statistics (Madrid, 16-17 September 2024)
- Coordination Meeting ICCAT/DG Mare (Brussels, 16-17 October 2024)
- Meeting of the online reporting technology Group (WG-ORT) (Online, 11-12 February 2025)
- SCRS Officers meeting (Madrid, 2 April 2025)
- SCRS Science Strategic Plan meeting (Madrid, 9-11 July 2025).

4. Activities

The activities carried out during this reporting period, adapted to the current SCRS research needs and Commission requests, were structured considering the main lines of research established since the beginning of the program, i.e. data recovery and management, biological studies, tagging, stock indices (aerial surveys) and modelling. The main activities carried out throughout GBYP Phase 14, as well their final results, whenever available, are summarized below.

4.1 Data recovery and management

Most of the efforts throughout the last year have been directed at the further development of information systems allowing the proper storage of the data from GBYP and other ICCAT funded research activities, as well as other data provided by CPCs research programs relevant for BFT and other ICCAT species management. This is an in-house task, carried out in close collaboration between the GBYP DB specialist and the ICCAT Secretariat statistics department staff, aiming specifically at the design and implementation biological data and electronic tagging information systems.

Regarding the biological data information system, a new version (6th) of the standardized template for data sharing has been elaborated and released. It includes improvements in samples identification, procedures, storage and maintaining the confidentiality of the personal data. Once terminated and functional, this relational database will integrate all available information relevant for BFT biological data, provided by GBYP, other ICCAT science projects or by CPC national research teams. It will also allow to develop broad collaborative studies to estimate more reliable biological parameters and to optimize sampling programs, ensuring that they are complementary.

In relation to the further development of ETAGS database, which is still in development, the main achievement within this reporting period has been the completion and consolidation of the module containing all the information gathered from the tags manufacturer about pop-up tags performance, including detailed data about satellite data transmission, which is already operative. This module allows to analyze in detail the performance of the satellite tags used in all the ICCAT species. Once this ETAGS database integrates all the available electronic tagging datasets from ICCAT and CPCs e-tagging programs, it will allow performing joint analyses of broad datasets, which will contribute to improving knowledge on BFT population structure and spatial patterns.

The outputs from these two databases will be directly used to improve the parameterization of assessment models (input data) and therefore the management of BFT stocks as well.

At the same time, other tasks related to data management have been carried out, such as processing and preparing the aerial survey data for the GBYP aerial survey indices time series update. Also, following the ICCAT data dissemination policy, seven external data requests have been attended, three related to GBYP aerial surveys data, three about e-tagging data and one on historical traps catch data.

4.2 Fishery independent stock abundance indices (Aerial Surveys)

Two main activities have been undertaken in relation to GBYP Aerial Surveys during last year: the updating of the index time series incorporating the results from 2024 campaign and the development of a new campaign in summer 2025.

The contract for aerial survey data analysis was awarded to the CREEM team of the University of St. Andrews, which are the original developers of the DISTANCE methodology applied for the aerial surveys data analyses. This work comprised the analysis of the 2024 aerial survey data and updating the estimates of the GBP aerial indices time series for the period 2017-2024. Abundance and biomass in the surveyed blocks were estimated using line transect distance sampling methods. The tuna indices were updated in two ways: a) actualization of the whole time series (Task 1), to be considered in a future for reconditioning the Operating Models (OMs) within the BFT MSE, and b) strict update of the index for 2024 (Task 2) to update the indices currently used within the framework of the current cycle of BFT MSE.

Regarding Task 1, data from summer 2024 aerial surveys, that took place in three regions (A: Balearic Sea, C: Tyrrhenian Sea and E: Ionian Sea), were combined with data from previous surveys (years 2017-2023) in the same areas to provide an update of estimates of abundance and biomass of Bluefin tuna.

Table 3 summarizes the size of the area covered by the survey and number of adult schools encountered within 1500 m (n), estimated encounter rate (ER; schools per km) and associated coefficient of variation (CV).

The highest encounter rate occurred in block A and the lowest in block C. The median school sizes observed in 2024 were smaller than recent years but like school sizes in years 2017 to 2019. This pattern was also reflected in the biomass. The biomass estimates from Task 1, it is considering improved detection function calculated considering new 2024 data, are presented in **Table 4** and **Figure 1**. There was a reduction in biomass in all blocks compared to 2023. The estimates for the previous years based on the newest detection function are comparable with the estimates from the previous reports.

In relation to the strict update of the index, the abundance and biomass results for the three areas, detailed in **Table 5** and **Figure 2**, are very similar to the pattern in the abundance estimates for all three blocks and to estimates from Task 1. A new Call for the analysis of GBYP aerial surveys data, considering 2025 survey results, has been launched in August 2025.

The GBYP aerial survey in 2025 has been carried out, following the decision taken by the SCRS BFT Group during its April 2025 intersessional meeting, only in the Balearic Sea area, applying the same design and sighting methodology as in 2024.

The survey in Area A (Balearic Sea) was carried out with a Partenavia P-68 plane, from 8-28 June 2024. To cover the entire four replicas (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, 4 on effort but out of transect and 4 off effort. The total estimated number of individuals in these sightings was 11385, with an estimated biomass of 1477 tons, 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 300kg. No giant fish over 300kg were observed. The location of these BFT sightings is shown in **Figure 3**.

4.3 Tagging

This line of research has faced several problems from the beginning of the program, 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 program, 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 throughout the last 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.

4.3.1 Tagging campaigns

As in previous phases, the GBYP tagging program in 2024 and 2025 has been carried out along with electronic tagging programs developed at national level, which has allowed strengthen collaboration with national teams, taking advantage of the synergies between the different tagging programs, and increasing its efficiency. A Call for expressions of interest was published in July 4 (ICCAT Circular #G- G-05159/2024), for deployment of a total of 109 GBYP owned electronic tags, including not only pop-up satellite tags, but also internal archival tags and acoustic transmitters. As a result, 10 new MoUs were signed, to deploy these tags between September 2024 and May 2025. Another MoU was signed with a BFT farming company, Balfegó S.L., for the deployment and data management of 5 pop up tags owned by the company, which were deployed in Western Med BFT farming facilities. The number and type of tags awarded by team is summarized in **Table 6**. Most of the activities covered by these MoUs have already been concluded successfully, two required and extension to complete tagging operations (MoUs with AZTI and Stanford/Barcelona Zoo) and are close to finish, and other two (MoU with Stanford University for tagging in Canary Islands and with Jersey Government and Univ. of Exeter for tagging off Jersey could not be successfully implemented due to force majeure reasons (lack of BFT in the tagging areas during the surveys). The complete description of these tagging activities is available in the respective final reports, downloadable from GBYP webpage.

In 2025, considering the priorities for GBYP etagging program agreed at the SCRS BFT Species Group interseasonal meeting held in Sète in April 2025, 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 in April 2025. As a result, three additional MoUs were agreed, with IPMA, IFREMER and a Consortium constituted by the General Directorate of Fisheries and Aquaculture (GDFA) of the Republic of Türkiye, the Univ. 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.

Acoustic tagging campaigns were successfully concluded, while the one in the Western and Central Med is still ongoing. Unfortunately, the campaign in the Eastern Mediterranean had to be cancelled due to force majeure reasons, 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 Med fishing grounds at the beginning of the fishing season, and the MoU was not finally signed. The GBYP SC took the decision of moving this Eastern Med tagging campaign to 2026, assigning to it the same number of pop-up tags that couldn't be deployed in 2025.

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 (**Table 7**). During this reporting period, a total of 683 fish were tagged (**Table 8**).

4.3.2 Tag recoveries

The ICCAT GBYP tag recovery activities, supported by awareness and reward programs, has continued as usual during the last year. The current strategy includes the following rewards: 50€/ or a T-shirt for each conventional tag; 100€ for acoustic tags, 1000 € for each archival electronic tag, and the annual ICCAT GBYP lottery (September): 1000 € for the first tag drawn and 500 € each for the 2nd and 3rd tag drawn. This rewards policy, along with the strong tag awareness activity, including last years meetings with ICCAT ROPs representatives, has demonstrated to be very useful for improving the tag recoveries. So, in the year 2024, a total of 264 tags were recovered, as can be seen in **Figure 6**. It is worth highlighting the exponential increase from 2021, coinciding with the specific awareness actions directed to ICCAT observers, in the recovery of electronics tags, as shown in **Figure 7**.

4.3.3 Biological studies

During the first year of GBYP Phase 14 (2024) this research line focused on genetic studies aiming at overcoming some knowledge gaps detected within the framework of the feasibility study for the implementation of CKMR approach carried out by the Bluefin tuna Species Group. 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, aiming at setting the basis for improving the currently available SNP array for BFT genetic studies, making it able to provide information about the sex of the shared parent in juvenile kinship relationships, which is relevant for the model, were completed. In addition, the GBYP tissue bank incorporated new larvae samples. The main results from these sampling tasks and studies are summarized below.

4.3.2 Biological sampling and analyses

During this Phase 14 AZTI team received larval samples containing 3998 BFT larvae from the Balearic Sea, provided by the IEO-CSIC team in charge of BFT larval surveys in the area, along with finlet, caudal, and keel tissue samples from one medium and five large ABFT individuals captured in Portuguese traps provided by IPMA. All samples underwent rigorous quality checks to ensure their suitability for subsequent analyses. No significant issues were encountered during the reception process, and all samples met the required quality standards. All these samples have been catalogued and stored together within the biological tissue bank.

4.3.3 Sibship evaluation among Atlantic bluefin tuna sampled within the Balearic Sea

The success in the implementation of CKMR models depends on appropriate sampling design. One of the main sample sources considered in the design of the CKMR model for the eastern Atlantic bluefin tuna are larval surveys yearly conducted in the Balearic Sea. One relevant feature of this source to be considered for the definition of the sampling strategy is the level of sibship within sampled stations. To evaluate this sibship level 3822 larvae were genotyped using the Atlantic bluefin tuna SNP array, providing genotype information at > 6000 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:

- ABFT 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 ABFT 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.

4.3.4 Towards determining the frequency of the different Atlantic bluefin tuna mitochondrial haplotypes

The implementation of Close-Kin-Mark-Recapture (CKMR) models for stock abundance estimation requires the detection of kin pairs in the population. Three types of kin-pairs are included: full-siblings, half-siblings and parent-offspring pairs. For half-siblings and parent-offspring pairs, in addition to the number of pairs found, information about the sex of the shared parent 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. As a first step to develop a methodology able to determine the sex of shared parents in related juveniles, the mitochondrial variability in the ABFT 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 was 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 ABFT 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 at GBYP webpage.

4.3.5 Modelling

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 operating models for more rigorous management option testing”.

In previous GBYP Phases, modelling tasks were mostly focused on the development of MSE related models. Given that the BFT Management strategy evaluation (MSE) modelling tasks were already completed within Phase 12, in phase 13 GBYP modelling efforts focused on CKMR issues, following the SCRS work plan for BFT.

In line with the provision of 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 BFT work-plan for 2025 included several tasks aimed at evaluating the implications of new information regarding abundance, indices and stock mixing on the BFT MSE. Consequently, two contracts have been awarded in 2025, specifically to evaluate the impact of the: i) incorporation of West CKMR estimates; and ii) removal or changes in the frequency of GBYP aerial surveys and the inclusion of revised indices. These contracts are still ongoing, but the results will be presented as SCRC papers during the September 2025 SCRS BFT Species Group meeting.

Table 1. Amounts requested and provided for the first year of GBYP Phase 14 by CPC.

CPC	Requested	Received
Albania	2462	2462
Algeria	18866	18866
Canada	0	45129
China	1044	3051
Chinese Taipei	942	942
Egypt	4784	0
European Union	400000	400000
Remanent funds	308000	308000
Iceland	2089	2089
Japan	29040	29040
Korea	2061	2061
Libya	23762	0
Morocco	34505	34505
Norway	3432	19000
Syria	1203	0
Tunisia	27977	0
Türkiye	24247	24247
United Kingdom	588	0
USA	0	0
TOTAL	885000	889390

Table 2. Amounts requested and provided (by 18 September 2025) for the second year of GBYP Phase 14 by CPC.

CPC	Requested	Received
Albania	2267	2267
Algeria	17373	17374
Canada		19624
China	962	962
Chinese Taipei	867	3000
Egypt	4406	4406
European Union	400000	320000
Remanent funds	252000	252000
Iceland	1924	1924
Japan	26743	26743
Korea	1898	1898
Libya	21882	
Morocco	31776	31776
Norway	3160	19000
Syria	1108	
Tunisia	25764	37844
Türkiye	22329	22329
United Kingdom	541	
USA		
TOTAL	815000	761145

Table 3. Size of the area covered by the survey and number of adult schools encountered within 1,500 m (n), estimated encounter rate (ER; schools per km) and associated coefficient of variation (CV).

Block	Covered area (km ²)	n	ER	CV
A	17062.6	7	0.0036	0.43
C	14965.0	3	0.0006	0.55
E	21702.2	8	0.0011	0.37

Table 4. Estimated biomass (B, in tonnes) per block and year with coefficient of variation (CV) and lower (LCL) and upper (UCL) 95% confidence levels. Coefficient of variation (CV) is also provided for the results from this analysis. The orange values apply to estimates in Chudzinska et al. (2024). All estimates are based on sightings from blocks: A, C and E.

Label	B	CV	LCI	UCI	B	CV	LCI	UCI
	This report				Chudzinska et al. (2024)			
A-2017	9223	0.4	3988	21331	8665	0.4	3747	20037
A-2018	15442	0.3	8520	27986	14499	0.3	7974	26364
A-2019	13683	0.4	6355	29460	12858	0.4	5973	27678
A-2021	7471	0.6	2663	20960	7287	0.5	2605	20387
A-2022	10259	0.4	4313	24403	10554	0.5	4408	25272
A-2023	10472	0.5	4139	26497	10877	0.5	4256	27799
A-2024	2175	0.8	528	8969				
C-2017	7487	0.4	3376	16606	6970	0.4	3158	15382
C-2018	5597	0.6	1854	16896	5221	0.6	1735	15712
C-2019	3411	0.6	1118	10403	3175	0.6	1044	9661
C-2022	12188	0.4	5410	27456	10735	0.4	4663	24718
C-2023	4613	0.7	1303	16333	4036	0.7	1136	14337
C-2024	3880	0.7	1105	13627				
E-2017	7036	0.6	2361	20962	6348	0.6	2131	18904
E-2018	4137	0.6	1426	12000	3852	0.6	1331	11147
E-2019	3553	0.5	1377	9165	3383	0.5	1313	8713
E-2022	1031	0.8	244	4348	2115	0.8	539	8301
E-2023	16987	0.4	7285	39613	14897	0.4	6277	35354
E-2024	9701	0.6	3417	27539				

Table 5. Estimated number of individuals (N, in thousands) and biomass (tonnes) per block in 2023 and 2024 with lower (LCL) and upper (UCL) limits for a 95% confidence interval. Coefficient of variation (CV) is also provided for the results from this analysis. All estimates are based on detections from all blocks: A, C, E and G from 2017 to 2022, following a strict update approach.

Label	N	CV	LCL	UCL	B	CV	LCL	UCL
	Abundance				Biomass			
A-2023	47.0	0.5	18.6	118.5	9420	0.5	3772	23523
C-2023	34.8	0.7	10.2	119.3	3714	0.7	1066	12937
E-2023	157.3	0.4	72.4	341.4	13752	0.4	5972	31667
A-2024	8.5	0.7	2.4	30.5	1979	0.8	487	8046
C-2024	29.1	0.7	8.5	99.8	3115	0.7	897	10816
E-2024	98.5	0.4	41.6	232.9	7868	0.5	2839	21806

Table 6. Number and type of GBYP owned etags awarded within the GBYP Phase 14 first Call for EOI to collaborate with GBYP e-tagging program.

<i>Institution</i>	Type of tag		
	<i>PSAT</i>	<i>Internal</i>	<i>Acoustic</i>
Marine Institute	4		8
DTU	6		8
Acadia Univ.	5		
AZTI	4	8	
Stanford (Canaries)	6		5
Stanford/ Barcelona Zoo	3	4	8
Stanford (Slope Sea)	8	6	
Jersey Government/Exeter Univ	4		3
IMR	5		
SLU	6		8

Table 7. Number of conventional tags sent to different collaborators in Phase 14

Country	Institution	N Conventional tags
Denmark	Technical University of D	200
Ireland	Marine Institute	500
USA	The University of Maine/	225

Table 8. Number of fish tagged during Phase 13 & 14 (from March 2024 to March 2025). *IFAPA (28) + ICCAT (3)

Area	Conventional	Internal	Acoustic	Satellite
Gibraltar Strait	5	0	0	0
West Med	45	0	2	15
Central Med	13	0	0	0
NW ATL	0	0	0	19
NE ATL	382	8	31*	48
Canada	88	0	0	2
East Med	32	0	0	17
Canary Islands	0	0	0	7

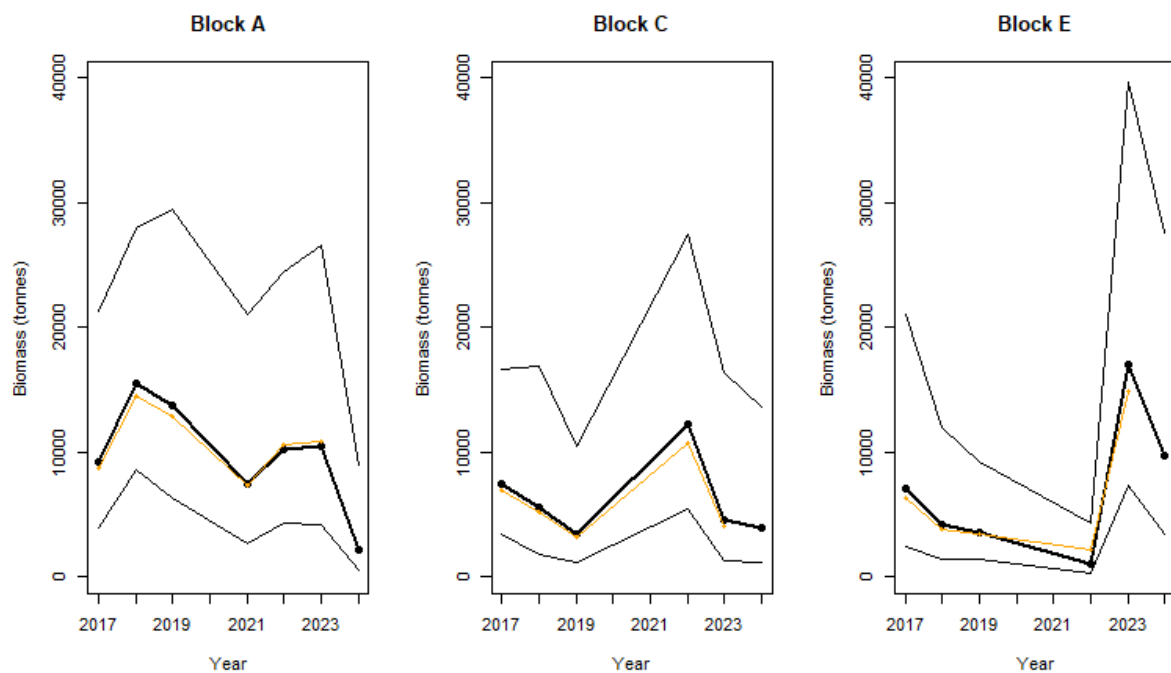


Figure 1. New estimates of BFT biomass (in tonnes) incorporating 2024 aerial survey data. Black colours show estimates from this study: dots show estimated values, and thin lines indicate upper and lower limits of the 95% confidence interval. Orange colour shows estimates from the Chudzinska et al. (2024), including data up to 2023.

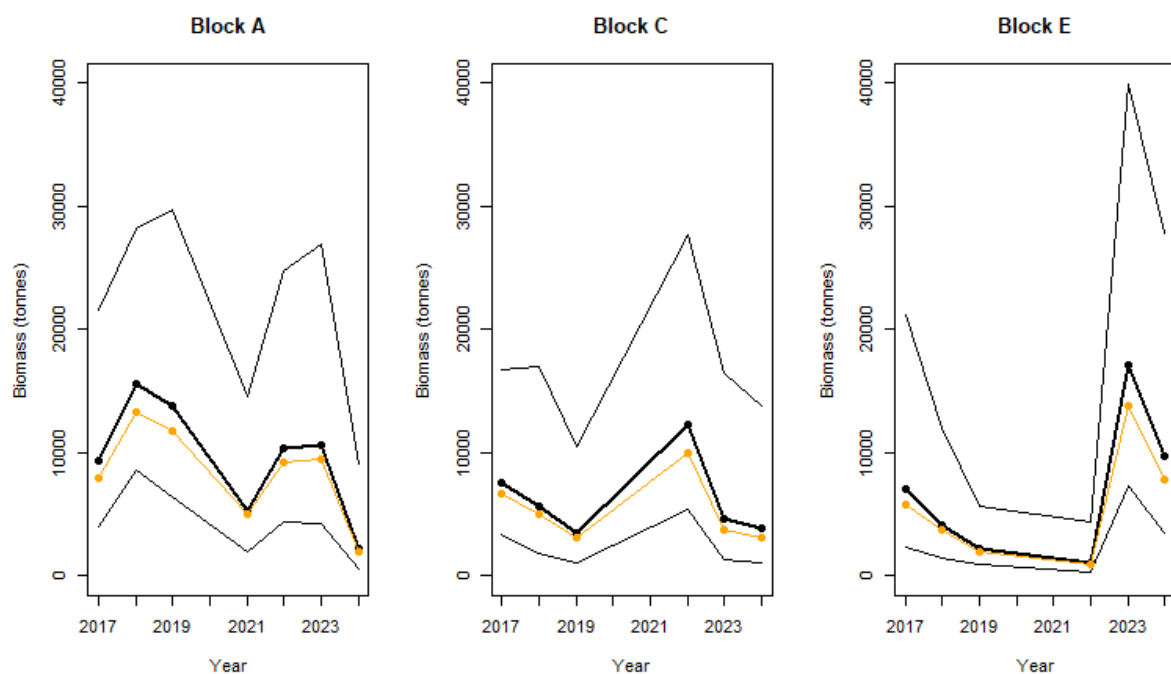


Figure 2. GBYP aerial survey strict update of BFT estimated biomass (in tonnes) for surveyed years and blocks. Black colours show estimates based on all four blocks (A, C, E and G) for Task 1. Dots show estimates and thin lines indicate upper and lower limits of the 95% confidence interval. Orange colour shows strict update estimates obtained in Task 2.

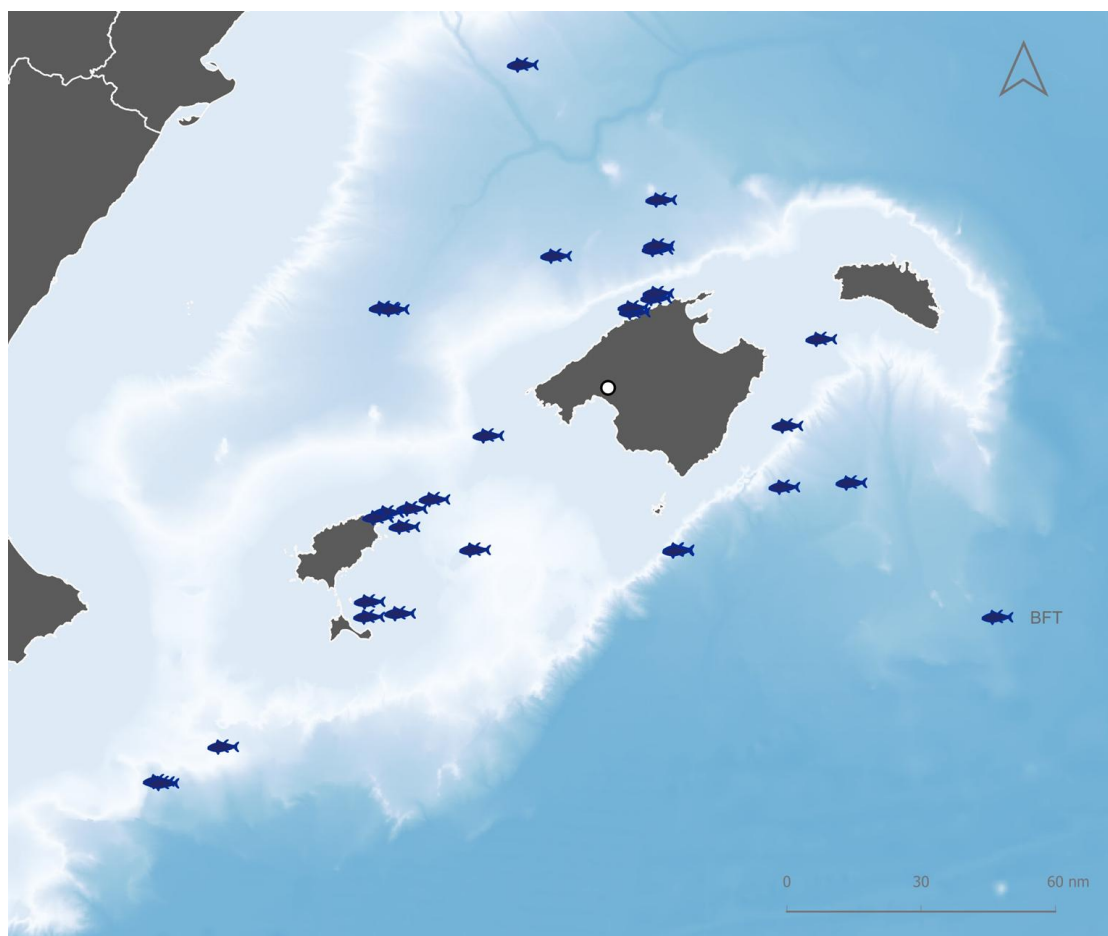


Figure 3. Bluefin tuna GBYP aerial survey observations in the Balearic Sea area in 2025.

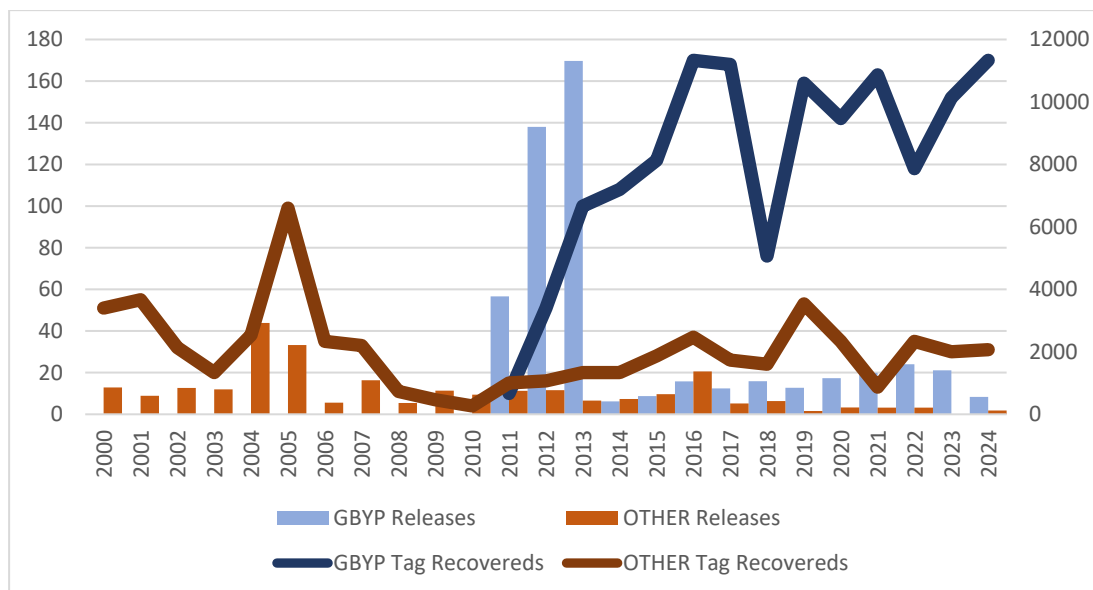


Figure 6. Annual trend of bluefin tuna tag recoveries reported to ICCAT since 2002 (up to 1 March 2025).

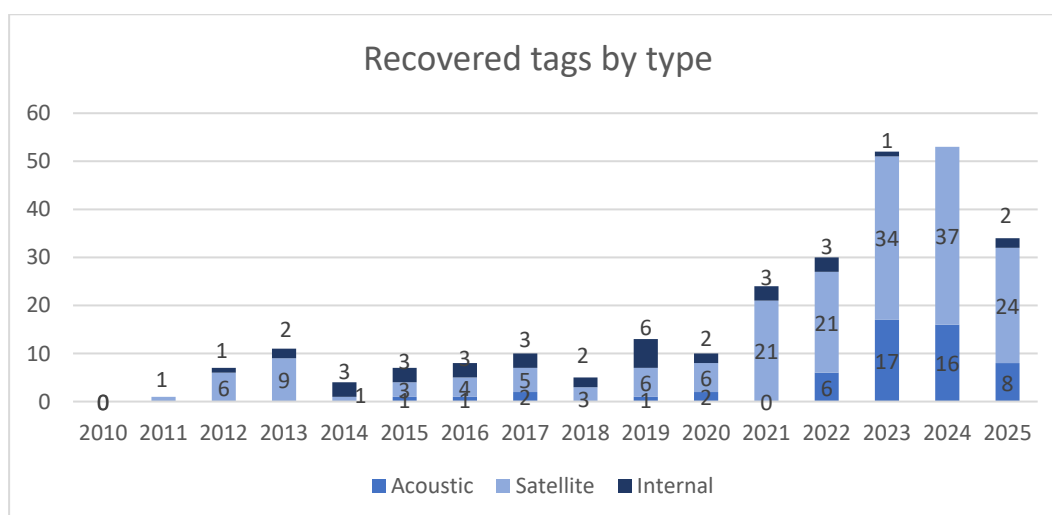


Figure 7. Electronic tags recovered within GBYP program.