THE ATLANTIC-WIDE RESEARCH PROGRAMME FOR BLUEFIN TUNA
(GBYP Phase 12)

Electronic tagging in The Gulf of St. Lawrence, Canada 2022

Final Report

14 August 2023

Stanford University

This project is co-funded by the
European Union

Introduction

Stanford University with Acadia University and Fisheries and Oceans Canada (DFO) have been electronically tagging Atlantic bluefin tuna (ABT) in the Gulf of St. Lawrence (GSL), Canada, over the past two decades. Our team has used the data collected through this program to enhance our understanding of the spatial distribution of Atlantic bluefin tuna (*Thunnus thynnus*; ABT) with the goal of improving assessment models. A primary aim is to use these long-term spatial datasets to better quantify parameters necessary for effective management such as seasonal movement patterns and natural and fisheries mortality. By combining satellite tag data with multi-year acoustic records we can validate model assumptions and improve the accuracy of our mortality estimates. Additionally, genetic analysis of fin clips collected during the tagging can be used to validate stock-of-origin assignments based on visitation to a spawning ground.

The GBYP Phase 12 MOU with Stanford and DFO was approved by ICCAT in June 2022. The intention of this MOU was to carry out a tagging campaign in the GSL. The MOU awarded 9 WC PATs, and 9 Lotek PSATs. In the end 9 WC PATs and 7 Lotek PSATs were deployed in the GSL in Fall 2022. One Lotek PSAT was deployed in North Carolina in December 2022, and the last one was deployed in the same location in March 2023. One extra tag (WC PAT) that was not originally assigned to this MOU was deployed in the Canary Islands in 2023.

Results: 2022 and 2023 tagging campaigns: Canada , Canary Islands and North Carolina

Table 1: Accounting of Phase 12 tags.

MOU	Tag Number	PTT	Status	Tag Type	Manufacturer
Phase 12	21P2268	233971	deployed Canaries 2023	PAT	Wildlife
Phase 12	21P2272	233973	deployed Canada 2022	PAT	Wildlife
Phase 12	21P2276	233976	deployed Canada 2022	PAT	Wildlife
Phase 12	21P2277	233977	deployed Canada 2022	PAT	Wildlife
Phase 12	21P2280	233979	deployed Canada 2022	PAT	Wildlife
Phase 12	21P2289	233981	deployed Canada 2022	PAT	Wildlife
Phase 12	21P2290	233982	deployed Canada 2022	PAT	Wildlife
Phase 12	21P2293	233984	deployed Canada 2022	PAT	Wildlife
Phase 12	21P2294	233985	deployed Canada 2022	PAT	Wildlife
Phase 12	21P0421	220571	deployed Canada 2022	PAT	Wildlife
Phase 12	L330-3455	225501	deployed Canada 2022	PAT	Lotek
Phase 12	L330-3462	225496	deployed Canada 2022	PAT	Lotek
Phase 12	L330-3463	225497	deployed Canada 2022	PAT	Lotek
Phase 12	L330-3860	225498	deployed Canada 2022	PAT	Lotek

Phase 12	L330-3861	225499	deployed Canada 2022	PAT	Lotek
Phase 12	L330-4019	225503	deployed Carolina 2022	PAT	Lotek
Phase 12	L330-4020	225504	deployed Canada 2022	PAT	Lotek
Phase 12	L330-4021	225505	deployed Canada 2022	PAT	Lotek
Phase 12	L330-4022	225502	deployed Carolina 2023	PAT	Lotek

Table 2: Metadata pertaining to all ICCAT tags deployed in the GSL. (BB–Dr. Barbara Block, RS-Robbie Schallert, PC-Perry Comolli, TM-Taryn Minch, GN-Greg Norton)

Event ID	Tag Number	PTT	Tag Type	Date	Latitude	Longitude	CFL (cm)	Tagger	Pop Date	Rec Date	Status
512204600	21P0421	220571	PAT	9/19/2022	46.0554	-61.7282	203	BB			Deployed
512204700	21P2272	233973	PAT	9/19/2022	46.0443	-61.669	192	RS	6/23/2023		Premature Relea
512205000	21P2276	233976	PAT	9/20/2022	45.9291	-61.6704	267	BB	7/7/2023		Premature Relea
512205100	L330-3860	225498	PSATFLEX	9/21/2022	45.9137	-61.6609	220	BB			Deployed
512205200	L330-3861	225499	PSATFLEX	9/21/2022	45.9693	-61.6163	285	BB	11/12/2022		Premature Relea
512205400	21P2289	233981	PAT	9/22/2022	45.9766	-61.6221	249	BB			Deployed
512205600	21P2280	233979	PAT	9/28/2022	45.9236	-61.6481	258	BB	10/7/2022		Premature Relea
512205700	21P2293	233984	PAT	9/28/2022	45.9276	-61.6431	267	BB			Deployed
512205800	21P2277	233977	PAT	9/28/2022	45.9236	-61.6578	263	BB			Deployed
512205900	L330-3463	225497	PSATFLEX	9/28/2022	45.9273	-61.6488	270	BB			Deployed
512206000	21P2290	233982	PAT	9/30/2022	45.9078	-61.6456	258	BB			Deployed
512206100	21P2294	233985	PAT	10/3/2022	46.0384	-61.623	226	PC			Deployed
512206400	L330-3462	225496	PSATFLEX	10/4/2022	45.9325	-61.6572	283	PC			Deployed
512206500	L330-3455	225501	PSATFLEX	10/4/2022	45.9304	-61.646	272	PC	11/19/2022		Premature Relea
512206600	L330-4021	225505	PSATFLEX	10/14/2022	46.5307	-62.7233	230	TM/GN			Unknown
512206700	L330-4020	225504	PSATFLEX	10/16/2022	46.5171	-62.7394	257	GN			Deployed

The annual tagging campaign conducted by the TAG program for the past 14 years in the Gulf of St. Lawrence, based out of Port Hood, Nova Scotia has been vital to the understanding of the migration of ABT. Both historically recognized stocks, the western (spawning in the Gulf of Mexico) and the eastern (spawning in the Mediterranean Sea), mix in the Gulf of St. Lawrence during the late summer and early fall (August-November), utilizing the vast biomass of herring and mackerel found in the gulf during these months as critical forage for their long migration back to their respective spawning grounds. With a long-term focus on tagging in this region, the TAG program (with help from ICCAT GBYP and the Canadian Department of Fisheries and Oceans) is continuing to shed light on how these migration trends, and spatial usage of the Gulf of St. Lawrence by these two important stocks has changed over time. The continuity of this large, long-term data set is critical to providing important insight and useful data

incorporation into the fishery management of ABT throughout the entirety of the north Atlantic.

The Canada 2022 tagging campaign was conducted out of Murphy's Pond, Port Hood, Nova Scotia. We deployed 16 tags from the MOU during this trip (9 WC PATs and 7 Lotek PSATs, Table 2). This was accomplished across a three-week time span and interrupted by hurricane Fiona which made landfall directly where we were working while we were present. The hurricane interrupted all activities for 8 days and stirred up the water such that conditions were poor post hurricane.

Table 3: Metadata pertaining to all ICCAT tags deployed in North Carolina. (BB–Dr. Barbara Block, RS-Robbie Schallert)

Event ID	Tag Number	PTT	Tag Type	Date	Latitude	Longitude	CFL (cm)	Tagger	Pop Date	Rec Date	Status
512207000	L330-4019	225503	PSATFLEX	12/14/2022	34.738	-76.251	211	RS			Deployed
512300800	L330-4022	225502	PSATFLEX	3/30/2023	35.5502	-74.778	205	BB	4/26/2023		Premature Rel

In December 2022, we continued our deployments in the USA in the state of North Carolina prior to the opening of the US commercial fishery. This was accomplished by partnering with sport fishers to electronically tag Atlantic bluefin tuna (*Thunnus thynnus*; ABT) with satellite and archival tags in the waters off Morehead City, NC. One tag (Lotek PSAT) was deployed at this time. We returned in the winter months (second quarter, March 2023) and tagged 1 more ABT with the final Lotek tag from this MOU off Oregon Inlet NC.

Table 4: Metadata pertaining to all ICCAT tags deployed in La Gomera. (RS-Robbie Schallert)

Event ID	Tag Number	PTT	Tag Type	Date	Latitude	Longitude	CFL (cm)	Tagger	Pop Date	Rec Date	Status
512301100	21P2268	233971	PAT	4/14/2023	27.902	-17.1773	253	RS			Deploy

The Canary Islands, located in the Atlantic Ocean off the northwest coast of Africa, are situated at a crossroads of major ocean currents, creating exceptional oceanographic conditions. Furthermore, the islands' complex topography, characterized by steep drop-offs and underwater ridges, contributes to the upwelling of nutrient-rich waters from the depths. Consequently, the Canary Islands are a gathering place for various marine species, including migratory giants like whales, dolphins, and ABT. ABT are concentrated mainly during Spring, supporting a small artisanal fishery. It is also a known hot spot for

recreational anglers. We were able to use our collaboration with ACPR and the presence of recreational anglers to undertake this novel expedition.

Robbie Schallert from the Stanford team was in La Gomera in April 2023. He was able to deploy 5 tags in total, including the extra tag (WC PAT) from this MOU.

Conclusion

The Phase 12 MOU has enabled Stanford University, in collaboration with DFO to maintain the continuity of this important western Atlantic tagging dataset that contributes management-relevant information into the ICCAT GBYP. The improved natural mortality estimates, stock-specific movement patterns, and insights into regional mixing dynamics have all been valuable to ABT management, especially for the development of the multi-stock M3 mixing model supporting the new Management Strategy Evaluation process. Future campaigns supported by ICCAT GBYP will continue to add critical spatial use and migration information from these important regions utilized by ABT.

Acknowledgments

This work has been carried out under the ICCAT Atlantic-Wide Research Programme for Bluefin Tuna (GBYP), which is funded by the European Union, several ICCAT CPCs, the ICCAT Secretariat, and other entities (see https://www.iccat.int/gbyp/en/overview.asp). The content of this paper does not necessarily reflect ICCAT's point of view or that of any of the other sponsors, who carry no responsibility. In addition, it does not indicate the Commission's future policy in this area.