ICCAT GBYP 04/2017

Tagging Programme 2017

Atlantic-wide Research Programme on Bluefin Tuna

(ICCAT GBYP-Phase 7)

Electronic tagging of adult bluefin tunas by sport fishery or hand lines in the North Sea, off the coast of Sweden and/or other countries.

Deliverable 4: Final project report

Deliverable deadline: Dec. 4, 2017.

Partners:

National Institute of Aquatic Resources, Technical University of Denmark (coordinator)

Institute of Marine Research, Department of Aquatic Resources, Swedish University of Agricultural Sciences, SLU

WWF-Netherlands, Oceans Programme

Submitted Nov. 29, 2017

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Introduction:

This report is the final report (Deliverable 4) for the tagging contract to tag bluefin tuna in the Skagerrak-Kattegat in response to the tender offer:

Electronic tagging of adult bluefin tunas by sport fishery or hand lines in the North Sea, off the coast of Sweden and/or other countries.

According to the terms of the tender and contract, the report must be submitted latest Dec. 4, 2017.

The report describes project activities related to the tagging of bluefin tuna in waters near Denmark and Sweden during September 2017. The report provides an overview of the planning, contact with fishermen, collaboration and the overall results of the tagging operation and related sampling.

This is the first time that bluefin tuna have ever been tagged in waters near Denmark and Sweden, and the first time ever that advanced data storage and satellite-transmitting tags have been deployed in waters of northern Europe (i. e., North Sea, Skagerrak, Kattegat, Norwegian Sea). The earliest taggings of bluefin tuna in this region were conducted with conventional (non-data storage) tags by Norwegian scientists in the Norwegian Sea/northern North Sea in the late 1950s and early 1960s (Hamre, 1963; Mather *et al.*, 1995).

Bluefin tuna have been rare/absent from the region since the 1960s until the last few years, and neither Denmark nor Sweden have commercial or recreational fishing quotas to catch bluefin tuna. As a result, the project could not obtain bluefin tuna for tagging purposes from commercial fishing operations (e. g., purse seines, traps) as has been done in many other ICCAT tagging projects. Instead this project received a special permission from ICCAT to catch and release bluefin tuna for tagging purposes based on rod-reel fishing. All tunas tagged in this study were caught using rod-reel methods by volunteer anglers.

Project objective:

The overall objective was to identify migration patterns and origin of bluefin tuna occurring in Danish and Swedish waters. The method to obtain this information was to deploy up to 40 miniPATs (pop-up satellite) tags on bluefin tuna in waters near Denmark and Sweden in 2017.

Methodological terms of reference (from ICCAT tender):

a) A minimum of 20 miniPATs should be implanted in each area, on adult bluefin tunas; these electronic pop-up tags will be set for the longest possible time frame; the applicators and the miniPATs will be provided by the ICCAT GBYP, along with precise instructions.
b) The tender shall specify the period in which the tagging activity will be carried out.
c) Rod and reel or hand line shall be the fishing gear to be used for tagging. The vessel time available for this tagging activity by vessel shall be set at a minimum of two weeks. Any in-kind vessel time

provided should be clearly mentioned in the offer. (The tagging period was defined by the consortium to be Sept. 8 – 21, 2017).
d) Adult tunas shall be tagged on board or along the side of the boat by expert taggers, possibly removing the hook which was used for fishing them. Tagging operations shall be carried out following the methodology reported by the ICCAT GBYP Tagging Manual. The sequence of tags, pictures and size measures shall be properly recorded for future uses and controls, while the number of each tag and the length (SFL, Total Straight Fork Length) shall be properly recorded on the ICCAT forms.
e) A conventional tag shall be implanted on the dorsal part of each fish tagged with electronic tags; conventional tags will be provided by ICCAT GBYP.
f) Carry out biological sampling during the tagging activities; biological samples must be collected from the same school of fish, possibly from the same tagged fish if the tagger will be properly equipped; if sampling the tagged fish is not possible, samples should be possibly collected from other fish in the same school. Sampling shall be conducted according to the protocols adopted by the contractor(s) in charge of the biological and genetic sampling and analyses; the samples shall be shipped to the laboratory in charge.
g) A Coordinator for tagging activities who has specific experience in electronic tagging on tunas; this tagging Coordinator could be hired under a short-term contract. The Tagging Coordinator, who would work in close, constant contact with the ICCAT GBYP Coordination team, shall be responsible for directly managing all field activities, the scientific team on board, and their training and monitoring; (due to the key relevance of this figure, the Terms of Reference for this position are provided in **Annex 1**).

Planning and organisation of tagging operations:

The tagging coordinator appointed to the project was Dr. Gemma Quilez-Badia.

The tagging teams comprised the following members:

Denmark: Tagging coordinator Dr. Gemma Quilez-Badia, Dr. Kim Aarestrup, Ph.d. student Kim Birnie-Gauvin, Prof. Brian R. MacKenzie (overall project coordinator);

Sweden: Tagging expert Iñigo Onandia, Dr. Andreas Sundelöf, Dr. Massimiliano Cardinale, Prof. Michele Casini and research assistants Mikael Ovegård, Anders Wernbo and Anna Von Wirth.

Contact to and communication with potential fishermen:

The project depended heavily on the good-will and voluntary efforts of ca. 200 recreational big-game anglers in Denmark and Sweden. As bluefin tuna have not been present in the region for many decades, new contacts between this community and the research institutes had to be established and intensive dialogues had to be held to inform fishermen about the project, its requirements and objectives.

DTU and SLU were actively engaged with the sport fishermen communities in both countries to identify qualified anglers possessing big-game fishing experience, appropriate gear and boats to participate in the project. The objective was to involve as many experienced fishers as possible, to increase the likelihood

that the 40 tunas would be tagged. Identification of a large pool of qualified fishermen was necessary, because it was highly unlikely that most would be able to volunteer two full weeks of their time and resources to the project on short notice (i. e., after it was known when the tunas were present). Although several fishermen volunteered to be in place with their boats for the entire 14-day period of the study in the two areas, most fishermen were not available for such a long period due to work and family commitments, and instead participated on a part-time basis (e. g., evenings, weekends, etc).

To establish contact with the sport fishing communities, SLU arranged with the Swedish Angler Association to identify and nominate qualified participants for its part of the project. DTU Aqua made direct contact with fishermen and associations (e. g., Dansk Sportsfiskerforbund, Fishing Zealand) and via a notice on its website asking for volunteers. Angler associations also put notices on their websites similar to the DTU Aqua notice. A similar procedure was used by SLU and the Swedish Angler Association (Sportfiskarna).. The notices specified that participants had to have experience with capture and ideally release of large tunas or tuna-like fish, and appropriate gear for doing so. Interested fishermen were requested to contact DTU Aqua and SLU Aqua.

The efforts to contact the fishermen demonstrated that there was a large number of experienced big-game fishermen in both countries. Their experience has been obtained from fishing in foreign waters, such as the Mediterranean (especially Croatia), Azores, eastern Canada, Australia and USA. DTU Aqua and SLU each received expressions of interest from many (> 50) interested and well-qualified fishermen; nearly all had suitable boats and gear to capture and release good-condition tunas.

Lists of accepted fishers were prepared in both Denmark and Sweden, and all were given further details of the fishing operation. Meetings were held before fishing started between the fishermen, institute scientists and tagging experts to describe how the tagging and release operations would proceed.

Gear and boat requirements:

Tuna that should be released for tagging studies must be captured, tagged and released in good condition. This can be achieved by a combination of angler experience, appropriate fishing gear, and careful handling of the tuna.

Inquiries to ICCAT and the tagging coordinator, and examination of the ICCAT tuna tagging manual, about the specific gear requirements for use of rod, reels, and lines for capture-release bluefin tuna fisheries indicated that there was no information available (the tagging manual only has information for tunas caught in traps, purse seines and hook-line). As a result, the project has chosen to follow guidelines used by DFO Canada for Catch-Release (DFO Canada, 2017) fishery for bluefin tuna of sizes similar to those present in Danish-Swedish waters, and advice from experienced large-tuna anglers in Denmark, Sweden and Spain. Priority was given to gear types with high probability that released tuna would survive the catch, tagging and release operations. The recommended gear requirements were

-minimum 130 lbs line

-minimum 180 lbs leader.

-barbless circle hooks, preferably bio-degradable.

Participating boats had to be of a size that permit safe operation of the fishing gear in sea conditions near Denmark and Sweden. All boats had to have VHF equipment for communication and other safety equipment.

Timing and location of tagging operations:

The tagging operation was originally planned for 14 days from Sept. 8 to Sept.21. Fishing was planned to continue for 14 days or until the 20 tags in each area were attached to tunas. Tagging operations in Danish and Swedish waters were conducted at the same time.

The study was conducted in two locations (Figure 1). One was an area ca. 15-20 nautical miles north of Skagen, Denmark at the junction of the Skagerrak and Kattegat, and the other was an area ca. 16-20 nautical miles off the Swedish west coast southwest of Lysekil, Sweden. These areas and times were chosen based on the high frequency of sightings in these areas during late summer-autumn in 2016 and in earlier decades before the tunas disappeared in the 1960s.

Figure 1. Location of main rod-reel fishing areas used by Danish (red box) and Swedish (green box) volunteer sportfishermen in September, 2017 for tagging of bluefin tuna. Also shown are the locations of the main ports used as basis for the tagging operations (Skagen, Denmark and Kungshamn, Lysekil, Ellös, Mollösund, and Björlanda, Sweden).

Fishing operations:

Fishing was done with rod-reel via trolling or chumming depending on fisher preference. Baits were herring and mackerel.

The number of boats fishing at a given time in each area was restricted to 15-20 boats to facilitate keeping an overview of boat locations and communications. Each boat had 2-9 crew members.

In each of the two areas, the tagging crew (the tagging expert and 1-3 other scientists to assist with the operation and sampling) was on one boat which was in contact with the fishing boats. All fishing boats were

instructed to remain within 30 minutes sailtime of the tagging boat. When a tuna was caught, the fishermen informed the tagging crew, who then sailed to the fishing boat and waited nearby until the tuna was brought to the fishing boat.

In Denmark, the tuna was gaffed by the fishermen and transferred with a rope to the tagging boat (Figure 2). Tagging was done onboard the tagging boat (Figure 3) whenever possible to facilitate effective tag attachment and sample collection. This requirement placed additional demands on the tagging boat (door at stern, hose onboard with running seawater etc.). If the tunas were too large or sea conditions prevented safe onloading and offloading of the tuna, then the tuna was tagged in the water.

In Sweden, the tagging crew was transferred from the tagging boat to the fishing boat and the tagging crew did the gaffing, tagging and sample collection, while the tuna was in the water alongside the boat (Figure 3).

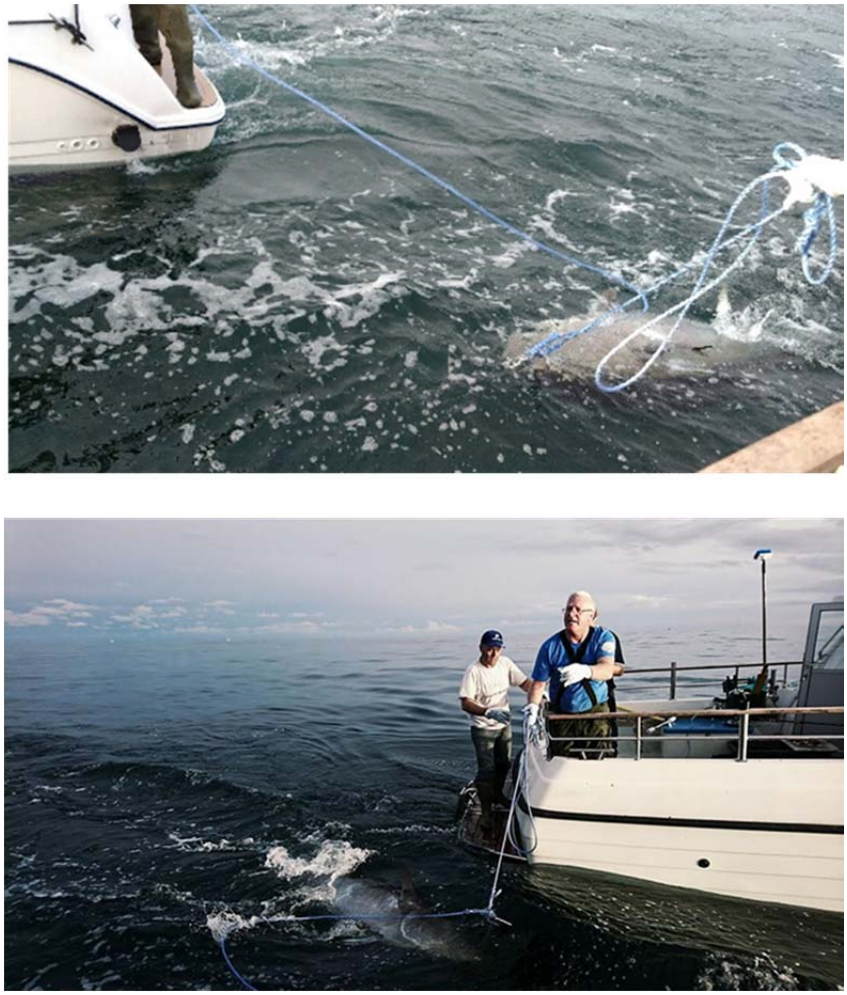

Figure 2. Photographs showing the transfer of a gaffed bluefin tuna from an angling boat (skipper Jess Wittus Hansen) to the tagging boat used in Denmark. The tuna was hauled on the tagging boat deck where tagging and measurements were done and then the tuna was released. Top photo credit: Jess Wittus Hansen; lower photo credit: Kim Bernie-Gauvin, DTU Aqua.

Figure 3 (top). A bluefin tuna (251 cm; estimated weight 285 kg) being hauled onboard for tagging by scientists from DTU Aqua and a bluefin tagging expert Gemma Quilez-Badia from the Catalan Association for Responsible Fishing (ACPR; Spain) in the Skagerrak near Skagen, Denmark, September 9, 2017 (photo: Westin Fishing). (Bottom). The first bluefin tuna (225 cm; estimated weight 234 kg) being tagged in Sweden by tagging expert Iñigo Onandia from AZTI Technalia assisted by angler and scientist from SLU September 9th 2017 (Photo: Mikael Ovegård).

Fishing was conducted in daily operations, typically leaving at or before sunrise and returning at sunset. Prior to departure from the harbour on each day, a brief logistical meeting was held with fishermen and

scientists to plan the location and duration of fishing and distribution of the fishing vessels in each of the two main fishing areas. During the day, fishermen were free to move to different locations based on their preference and experience, but within the constraint of remaining within 30 minutes sail from the tagging boat. Fishermen were asked to record the gear types, fishing depth, and locations of bait-bites by and sightings of (jumping) tuna.

Fishing permits and contact with local fishery inspection authorities:

Any incidental mortality of this study was covered with the ICCAT GBYP Research Mortality Allowance (ICCAT Rec. 11-06). The local fishery inspection authorities in Denmark and Sweden were informed about the study, and provided with a list of the names of anglers and their boats. Participating boats were each given a small flag (Figure 4) to attach to their boat indicating that they were participating in this research project. All fishermen participating were told to have this flag mounted in a visible location on their boats while fishing for tuna in this project.

Figure 4. Flags distributed to Danish (left) and Swedish (right) fishing boats participating in the tagging project in the Skagerrak, September 2017. All participating boats had to have the flag visible while fishing. Images of the flags were sent to Danish and Swedish fishery control authorities to assist them with fishery inspectiion activities.

Tag preparation and shipment to tagging sites:

The tags were programmed by ICCAT staff and were shipped to Denmark and Sweden in late July-early August.

Tagging and sampling operations:

All tagging operations followed procedures implemented by the tagging coordinator and according to ICCAT guidelines; e. g. using a slippery mat, a sea water hose and a wet dark cloth to cover the tuna's eyes when tagging on board. Also, prior to taking the tuna on board or to tagging it (when tagged in the water), the condition of the fish after the fight was assessed and if needed the tuna was allowed to swim slowly alongside or behind the boat until its behaviour indicated that it was recovered and ready to be tagged or to be taken on board for tagging.

In general a minimum of two types of tags were applied to each bluefin tuna. One was the miniPAT tag which was programmed to detach after 1 year (Figure 5). The second was a conventional spaghetti tag. In Denmark, a third data-storage tag was attached which was programmed to detach after a shorter period (e. g., 2-5 months). The tag is a Wildlife Computer test tag (smaller than the miniPAT tag) designed to provide a precise location within a few months and additionally transmit some temperature data. In the present context, the tags were programmed to detach partway through the full deployment period of the minipopup tag and will reduce the uncertainty of the location estimates for the minipopup tag on the same tuna.

Figure 5. The miniPAT tag applied is an advanced data-storage and satellite-transmitting device which is pre-programmed to detach after 1 year, after which it rises to the surface for data transmission (photo: Brian MacKenzie, DTU Aqua).

A small tissue sample was collected from a fin for genetic analyses of population source. These samples have been sent to the ICCAT GBYP Tissue Bank (AZTI Tecnalia, Spain). Overall length was measured and converted to weight using ICCAT standard conversion relationships (ICCAT, 2013).

After tagging, the behaviour of the fish was observed before release, and if necessary the tuna was allowed to swim slowly alongside or behind the boat for some minutes to ensure recovery.

Results and findings:

Fishing operations:

Overall the fishing operation and the participation of the anglers were extremely successful. The fishermen were highly supportive of the entire operation and were enthusiastic, cooperative participants.

To ensure efficient handling of the tuna, a safe working environment for the tagging and fishing crews and the viable release of the tagged fish, the teams only operated in good weather, i. e., winds <5-8 m/s depending on wind direction, and waves < ca. 1 m In height.

Fishing was conducted on 6 days during the planned 14-day period but had to be cancelled on the other days due to strong wind conditions. Because of the loss of fishing days, the operation was extended 3 days longer until Sept. 24. This resulted in fishing for 2 more days, so the total number of fishing days was 8 of 17 days.

Numbers and sizes of tunas caught and tagged:

The project tagged 18 bluefin tunas (Table 1), 4 of which were tagged by the Danish tagging crew (# 1-4 from Table 1). Three of these were additionally tagged with a mrPAT – Table 2) and 14 (# 5-18 from Table 1) of which were tagged by the Swedish crew (Figure 6).

Table 1. Summary of the 18 miniPAT tags deployed in Skagerrak from Sept. 8 to Sept. 21, 2017.

									Current day	07/11/2017												
#	Deployment Date	MiniPAT #	Argos ID	Conventional	DNA Vial ID	miniPAT dart	GMT	Area	Tag position	In water/On board	Deployment Latitude (N)	Deployment Longitude (E)	CFL (cm)	Weight*	Tagger	Vessel	Prog. days	Expected release	Pop-off Date	Days at liberty	Days left	Pop-off Latitude	Pop-off Longitude
1	09/09/2017	34839	16P1221	-	101	Umbrella	10:10	Skagerrak	2 dorsal left	On board	58º02,227'	010º40,494'	251	284	Gemma	Lunatic	365	09/09/2018	12/09/2017	3		58,0361	10,6223
2	09/09/2017	34840	16P1250	-	102	Umbrella	14:00	Skagerrak	2 dorsal left	On board	58º02,819'	010º38,223'	247	271	Gemma	Bluefin	365	09/09/2018			306		
3	18/09/2017	34859	16P1388	BYP 027547	104	Umbrella	08:50	Skagerrak	2 dorsal left	On board	58°00.318	10°47.089'	246	267	Gemma	Rov Dyret	365	18/09/2018			315		
4	23/09/2017	34861	16P1433	BYP 027537	106	Umbrella	13:20	Skagerrak	2 dorsal left	In water	58º01,642'	010º39,097'	221	194	Gemma	Verona	365	23/09/2018			320		
5	09/09/2017	162992	16P1064	BYP 027551	T1	Umbrella	10:02	Skagerrak	2 dorsal left	In water	58º10'	11º00,7'	225	204	Iñigo	Rabbidabi	365	09/09/2018			306		
6	09/09/2017	162994	16P1068	BYP 027552	T2	Umbrella	10:09	Skagerrak	2 dorsal left	In water	58º04,8'	10º52,8'	185	113	Iñigo	Cityfiske	365	09/09/2018			306		
7	09/09/2017	162993	16P1066	BYP 027553	T3	Umbrella	16:01	Skagerrak	2 dorsal right	In water	58º05,6'	10º47,8'	227	210	Iñigo	Darwin	365	09/09/2018	06/10/2017	27		59,273	5,192
8	15/09/2017	162995	16P1069	BYP 027554	T4	Umbrella	6:30	Skagerrak	2 dorsal right	In water	58º02,11'	10º52,64'	240	248	Iñigo	Pink lady	365	15/09/2018	02/10/2017	17		58,411	9,096
9	15/09/2017	162996	16P1071	BYP 027555	T5	Umbrella	8:00	Skagerrak	2 dorsal left	In water	58º03,5'	10º38,8'	230	218	Iñigo	Garmin	365	15/09/2018	18/09/2017	3		58,0577	10,948
10	15/09/2017	162997	16P1072	BYP 027556	T6	Umbrella	9:00	Skagerrak	2 dorsal right	In water	58º03,3'	10º53,71'	235	233	Iñigo	4-Real	365	15/09/2018	22/10/2017	37		59,429	4,699
11	15/09/2017	162998	16P1073	BYP 027557	T7	Umbrella	9:40	Skagerrak	2 dorsal right	In water	58º01,56'	10º54,22'	230	218	Iñigo	Pink lady	365	15/09/2018			312		
12	15/09/2017	162999	16P1076	BYP 027558	T8	Umbrella	10:45	Skagerrak	2 dorsal left	In water	58º02,99'	10º55,3'	245	264	Iñigo	Navia	365	15/09/2018			312		
13	15/09/2017	163000	16P1077	BYP 027559	T9	Umbrella	14:28	Skagerrak	2 dorsal left	In water	58º05,49'	10º57,54'	225	204	Iñigo	Sardin	365	15/09/2018	26/10/2017	41		58,409	-7,668
14	16/09/2017	163001	16P1078	BYP 027560	T10	Umbrella	9:37	Skagerrak	2 dorsal left	In water	58º03,52'	10º49,45'	256	301	Iñigo	Pink lady	365	16/09/2018	16/10/2017	30		60,9595	4,0525
15	16/09/2017	163002	16P1079	BYP 027561	T11	Umbrella	12:50	Skagerrak	2 dorsal right	In water	58º05'	10º49,69'	215	178	Iñigo	Darwin	365	16/09/2018	07/10/2017	21		58,375	1,934
16	21/09/2017	163003	16P1082	BYP 027562	T12	Umbrella	14:20	Skagerrak	2 dorsal left	In water	58º07,43'	10º57,42'	227	210	Iñigo	Galia	365	21/09/2018	25/09/2017	4		58,1684	10,894
17	22/09/2017	163004	16P1083	BYP 027563	T13	Umbrella	7:00	Skagerrak	2 dorsal right	In water	58º08,18'	11º00,99'	240	248	Iñigo	Black Pearl	365	22/09/2018	31/10/2017	39		58,6206	4,908
18	22/09/2017	163005	16P1088	BYP 027564	T14	Umbrella	13:30	Skagerrak	2 dorsal right	In water	58º01,63'	10º45,18'	239	245	Iñigo	Sardin	365	22/09/2018	09/10/2017	17		62,4069	3,7463

*Weight estimated using the official ICCAT conversion equation (ICCAT, 2013).

Table 2. Summary of the 3 mrPATs tags deployed in Skagerrak from Sept. 8 to Sept. 21, 2017 and their miniPAT deployment correspondence from Table 1.

#	Deployment Date	MiniPAT #	Argos ID	Conventional	mrPAT #	SN	Tether #	mrPAT prog. days	mrPAT dart
2	09/09/2017	34840	16P1250	-	172707	17U1351	17Z0133	120	Umbrella
3	18/09/2017	34859	16P1388	BYP 027547	172712	17U1356	17Z0138	150	Umbrella
4	23/09/2017	34861	16P1433	BYP 027537	172698	17U1338	17Z0124	60	Umbrella

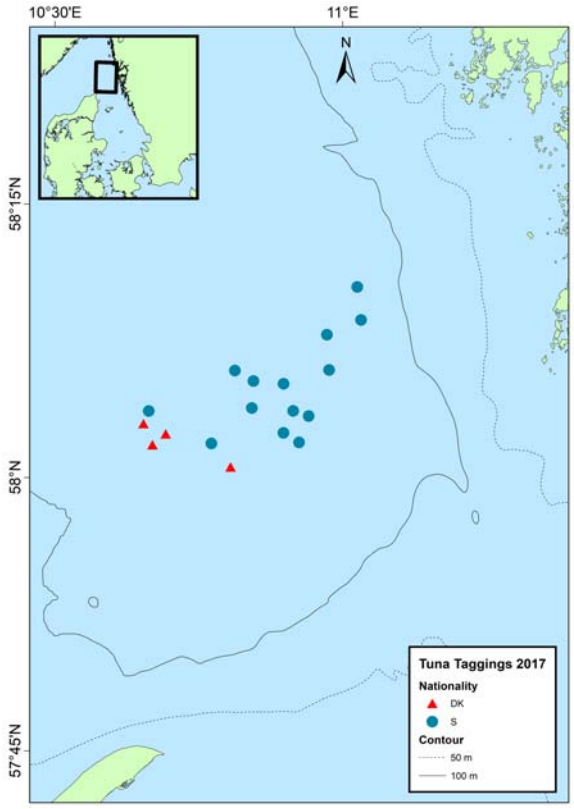

Figure 6. Map of locations where bluefin tuna were tagged and released in the Skagerrak, September, 2017.

The bluefin tunas were all adults and ranged in size from 185 - 256 cm curved fork length (mean = 232; standard error = 3.8), corresponding to estimated weights 113 - 301 kg (mean = 228; standard error = 10.4; Figure 7 – histograms of lengths and weights). According to the length-at-age curve (Cort, 1991) used in stock assessments (ICCAT, 2013), this length range corresponds to an age range of 8-15 years, with a mean age of 12 years (SE = 0.4). The age range and mean age corresponds to the year-classes 2002-2009 and 2005, respectively.

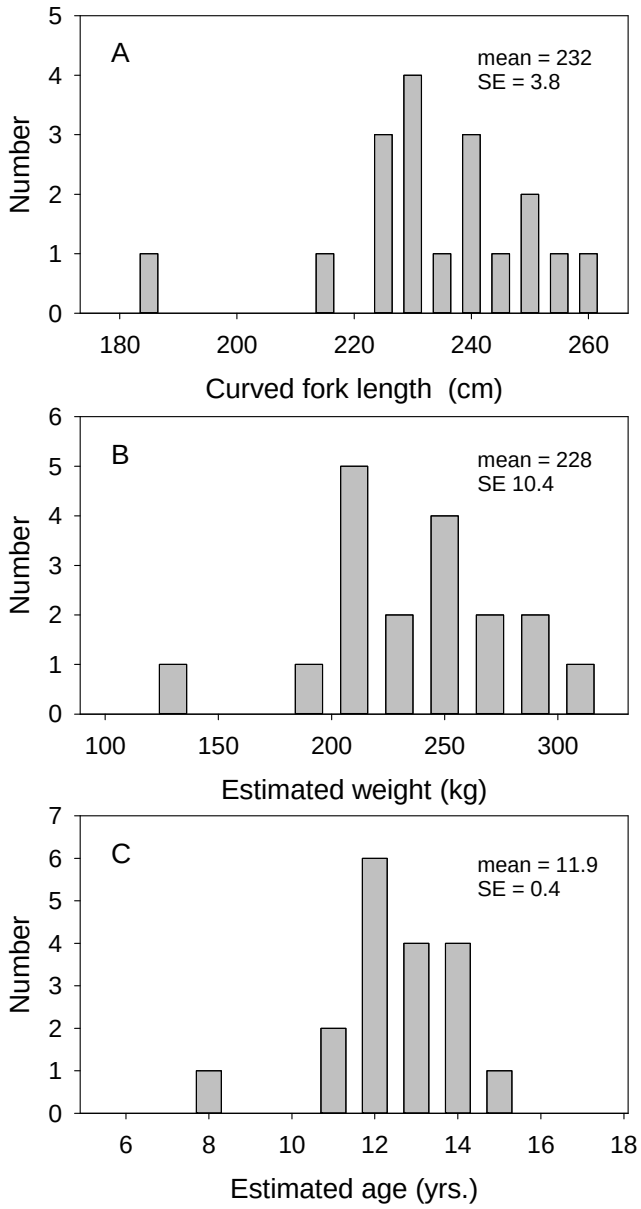

Figure 7. Frequency distributions of measured curved fork lengths, estimated weights and estimated ages for bluefin tuna tagged in the Skagerrak in September 2017. Weights were estimated from a length-weight relationship (ICCAT, 2013). Ages were estimated from straight fork lengths assuming the relationship between curved and straight fork length (Parrack *et al.*, 1979) and a straight fork length-age von Bertalanffy growth relationship (Cort, 1991) for north east Atlantic bluefin tuna used in stock assessment (ICCAT 2013).

In addition to these tagged tunas, several tunas were caught but escaped for various gear-related reasons. These included line breaks, bent hooks, entanglement with the boat or its engine, rod breaks and other reasons. One captured tuna was released without tagging because it appeared too stressed by the catching operation. One bluefin tuna died during another catch-tagging operation and the RMA form was duly submitted to the ICCAT GBYP . A summary of all the catches, taggings, releases and mortalities is in Table 3. On nearly every day, bluefin tuna were seen jumping at the surface, sometimes clear of the water, by fishermen or the tagging crews.

Table 3. Summary of the catches of bluefin tuna in the tagging operation in Skagerrak, September, 2017.

Category	No. Denmark	No. Sweden	DK + S
Hooked bluefin tuna	22	32	54
Tagged bluefin tuna	4	14	18
Escape	16	18	34
Released	1	0	1
Mortality	1	0	1
tagged/hooked	0.18	0.44	0.33
(tagged+released+mort.)/hooked	0.27	0.44	0.37

Samples collected:

Fin clips (< 0.5 cm in size) were taken from all 18 tagged tunas for genetic analyses of population source ("DNA Vial ID" from Table 1). An additional sample was taken from the tuna that was not tagged as it was too stressed from the fishing operation (DNA vial ID # 103).

Tag detachments:

Eleven (11) of the tags have detached to date (Nov. 29, 2017). The popoff dates and locations are shown in Table 1, and Figure 8. At the time of report submission, the reasons for the tag detachments are not known and could be due to mortalities, capture in commercial fishing operations (including as bycatch) or loss of the tag from the tuna.

The overall detachment rate as of Nov. 29, 2017 is 61% (11/18). Among the 11 tags which have detached so far, 7 came off within 30 days. It is common that tags popoff before their pre-programmed detachment dates. For example, during 9 years of previous tagging studies in the Mediterranean and Morocco, approximately half (and sometimes 90-100%: (Abid *et al.*, 2016; Cau *et al.*, 2016)) came off within 30 days (Cermeno *et al.*, 2012; Quilez-Badia *et al.*, 2013; Tudela *et al.*, 2011); G. Quilez-Badia, pers. observation). Among the tuna tagged in the Skagerrak 2017 study and whose tags came off prior to report submission on Nov. 29, 2017, the longest attachment before popoff so far was 41 days.

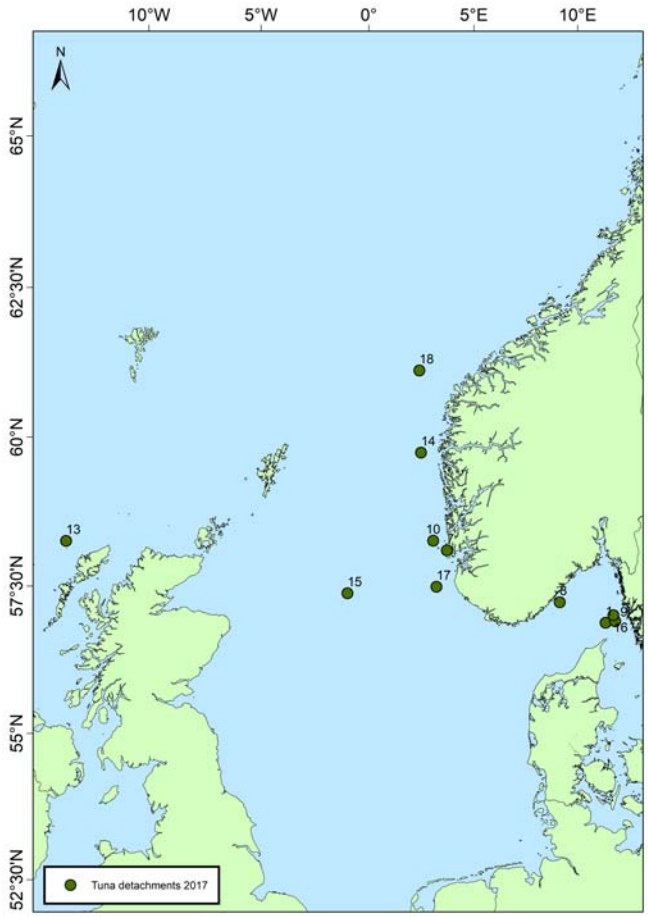

Figure 8. Map of pop off locations for tags deployed on bluefin tuna in the Skagerrak during September 2017. Numbers on map refer to tag numbers shown in Table 1.

Table 4. Summary of popped-off tags from the tagging study in Skagerrak, September 2017. The data are up to date as of Nov. 29, 2017.

	Total tagged	Detached	Still on, as of Nov. 29, 2017
Danish tags	4	1	3
Swedish tags	14	10	4
Total	18	11	7

Overall summary and conclusions:

The project successfully engaged the sportfisher community to participate in a tagging operation for bluefin tuna for the first time ever in waters near Denmark and Sweden. 18 tunas were tagged during 8 fishing days and related biological samples have been collected from the tagged tunas.

Recommendations and suggestions for tagging using rod-reel methods of capture:

Each fishing boat should have at least 3 crew members for maximum efficiency of the fight and handling of the tuna.

After the tagging operation and prior to release, the bluefin tuna should be towed slowly (1-2 knots) alongside or behind the boat for several minutes to allow it to swim and recover.

To minimize early popoff events, the tunas should be brought onboard if possible and other attachment methods considered (e.g. double anchorage).

A new section to the ICCAT tagging manual should be prepared and included for rod-reel capture-release methods.

References:

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